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Solvency II: New risk-based capital standards altering the capital requirements for the insurance industry within the European Union

Potential effects on asset allocation within Swedish life insurance companies

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Abstract

The objective of this thesis is to analyse the perceptions of how the incoming regulation, Solvency II, will affect Swedish life insurance companies regarding changes in asset allocation. The main hypothesis, divided into 4 sub-hypotheses, focuses on evaluation of the asset classes known as fixed income, public equity, other equities/alternative investments and real estate. To achieve the objective, we used a closed-question survey; to confirm and secure the results, semi-structured interviews were performed involving both Swedish life insurance companies and prominent experts. In addition, we made a modelled simulation based on one of the companies in the study. We find that both insurance companies and experts expect the changes in the regulatory landscape to have an impact on the companies' investment strategies. According to our results, the impact on asset allocations will differ between large and small insurance companies. The perception is that the impact will be more extensive for the small insurers and that this group will have to de-risk their allocations to a larger extent. In general, the asset allocations will decrease or remain unchanged for public equity, other equities/alternative investments and real estate in favour of investments in more low-risk assets of fixed income. Finally, we found that Swedish life insurance companies are well prepared for the coming regulation of Solvency II as some adjustments of asset allocation have already occurred during the past few years, meaning the effect will not be too dramatic.

Keywords: Solvency II, Asset Allocations, Life Insurance, Regulation, Risk-based, Capital Charges

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1. Introduction

In January 2014, a new regulatory framework for insurance companies within the European Union (EU), Solvency II, is expected to come into force. The framework introduces a risk-based standard approach, which among other things will alter the capital requirements for insurance companies. One of the most notable aspects of the Solvency II regulation is that it for the first time introduces risk-based capital charges on assets (Davidson, 2010); meaning that eligible capital must be held to cover the risks arising from the companies' investments. The attractiveness of an asset class for insurance companies under Solvency II will not only depend on its expected performance in terms of risk and return, but will also be related to a solvency-associated capital charge applied for the asset class (Braun et al., 2012). One possible consequence of this change in regulation might well be changes to the asset allocations of the insurance companies.

Solvency I, the predecessor of Solvency II, became a rather weak attempt to coordinate the development of insurance regulation in the EU, and the need to protect policyholders and to encourage a sound financial environment is reflected in the increased regulatory activity. In a world where many of the major economies have already shifted towards more principle-reliant, risk-based capital standards (Eling et al., 2008), the outdated rule-based EU standards had lost authority. As a result, national regulatory bodies developed different solutions, experimenting with their own adjustments with the aspiration to cover the risks in the market. In Sweden, the "traffic-light model" was developed by Finansinspektionen (FI – the Swedish Financial Supervisory Authority) as a supervisory tool to ensure solvency in insurance companies. The initiative was far more advanced than Solvency I and could be considered a step towards the new Solvency II regime.

The risk inherent in the insurance business model requires regulatory attention. Regulation aims to provide sufficient assurance to policyholders that the insurance companies can meet their obligations; meaning that the companies must have sufficient capital buffers to absorb whatever significant unforeseen losses they might face. There is an issue of moral hazard at stake here; to ensure that portfolio managers will not apply too risky strategies, thereby risking policyholders' money (Klein, 2012), a regulatory regime must be in place. The current EU Solvency I regime, however, simply requires insurance companies to hold capital set by flat percentages of their liabilities (The Economist Intelligence Unit, 2012); meaning that the risk focus is limited to covering the liability side of the balance sheet. Solvency II introduces a more comprehensive risk-based framework, where EU regulators for the first time require that the risks on both the asset and liability side are considered in interconnection to each other. The capital requirement under Solvency II forces the insurance companies to hold capital according to the risk they take on. Thus, more capital must be set aside to cover the risks the companies take on in their investments.

If the assessment of the associated capital charges for an asset class, from a solvency perspective, fails to represent its risk characteristics, the result may be a negative effect on asset allocation from an efficient portfolio perspective (Braun et al., 2012). The key idea is that risky assets retain a higher capital charge than less risky ones. As part of the shift from the former rule-based standard, Solvency II will allow the use of an "internal model". However, the regulators also provide a "standard approach" that can be used and for which standardized capital charges are applied. There is a wide range of capital charges under

the standard approach. For example, European Economic Area (EEA) government bonds do not attract any capital charge, but other equities/alternative investments incur a 49% charge. The associated market risk capital charges may well have an effect on the attractiveness of the different asset classes, in particular if they represent an inappropriate assessment of the capital charge for the asset in question.

In 2011, Swedish life insurance companies managed a total investment portfolio of 2 447 billion SEK (Svensk Försäkring, 2012). Comparing this amount, for example, to the Swedish bond market of approximately 2 516 billion SEK (Sveriges Riksbank, 2011) highlights the insurance companies' role as important financial investors and their possible impact on financial markets. Thus, changes in the asset allocation of life insurance companies might well have implications that go beyond the life insurance industry per se and could have a large impact on the entire Swedish economy.

The Swiss Solvency Test (SST), a regulatory solvency framework for insurance companies in Switzerland, was implemented in 2006 and, like Solvency II, represents a risk-based capital standard. Even though implemented prior to Solvency II, the SST was developed with the objective to be compatible with the EU Solvency II regulation. The SST is also considered to have a comparable level of sophistication to Solvency II (Eling et al., 2008). The implementation of the SST in Switzerland could serve as an indication of asset allocation changes that might occur in the Swedish life insurance market as Solvency II comes into force. The similarities between Switzerland and Sweden, for example, in size of population and nature of financial markets further enhance the value of examining SST in the frame of an investigation into possible effects of Solvency II in the Swedish environment.

The purpose of our thesis is to examine the perceived impact of Solvency II on asset allocation within Swedish life insurance companies. It is important to underline that in our study we focus on the sector of the Swedish life insurance industry in which companies, and not policyholders, decide upon the allocation of assets. Basically, this sector corresponds to the companies with traditional life insurance products that include minimum guaranteed returns. In this study we examine the expected changes, both according to the Swedish life insurance companies themselves as well as from the perspective of prominent experts. Finally, we assess the potential of using an internal model by analysing whether a life insurance company satisfies the Solvency II capital requirements under a fictive internal model and according to the standard approach set up by regulators.

The core research questions that lead to our main hypothesis are these: To what extent will Solvency II really change the life insurance companies' investment behaviour? Will the companies choose to allocate their assets differently when Solvency II goes into force and, in that case, what changes can be expected?

We believe that the regulative change brought about by Solvency II will have an impact on asset allocation within Swedish life insurance companies. This expectation is presented in our main hypothesis:

Solvency II regulation will have an impact on asset allocation within Swedish life insurance companies.

We investigate effects on asset allocation, focusing on the following asset classes: public equity, fixed income, real estate, and other equities/alternative investments[1]. The potential impact on each of the four classes is formulated within four sub-hypotheses:

Sub-hypothesis 1: Allocations to public equity will decrease.
Public equity retains a relatively high capital charge. The example of SST implies that most of the change happened prior to implementation in form of reduced commitments to public equity. Even though equity positions might already have been reduced, we expect the life insurance companies to further decrease their allocations to public equity.

Sub-hypothesis 2: Allocations to other equities/alternative investments will decrease.
Due to conservative capital requirements for investments in other equities/alternative investments, we expect that life insurance companies will reduce their commitments to this asset class. The experience of SST indicates that commitments to private equity (for example) will decrease, which further strengthens our expectations regarding this asset class.

Sub-hypothesis 3: Allocations to fixed income will increase.
Solvency II clearly promotes holdings in fixed income. Fixed income securities with long duration will be favorable for duration matching between assets and liabilities. Investments in high-rated bonds with shorter durations are also encouraged and incur a low capital charge. In the case of EEA government bonds, there is no capital charge at all. The SST experience supports an increase in the demand for this asset class, thus we expect the commitments to this class to increase.

Sub-hypothesis 4: Allocations to real estate will increase.
The capital charge that applies to real estate is neither exceptionally high nor low, and could provide good diversification effects. Real estate investments provide a valuable hedge against inflation. Their main drawback is that they are rather illiquid; nevertheless, the long-term focus of life insurance companies' investments makes liquidity less of an issue, and we expect the allocations to real estate to increase.

The rest of our thesis is structured as follows: Section 2 is an overview of the Swedish life insurance industry. In Section 3, we provide a broad account of the current regulatory landscape of the life insurance industry. From here we move in Section 4 to a description and theoretical overview of the Solvency II framework, where we also present the standard approach for market risks under Solvency II, comparing the treatment for the different asset classes. In Section 5, we discuss the experience from the SST implementation in Switzerland and provide a general overview of other recent industry studies and reports, leading to our hypothesis and sub-hypotheses in Section 6. Section 7 explains our methodology. The results and analysis are presented in Section 8 and discussion and concluding remarks in Section 9 and 10. Finally, Section 11 presents implications for future research.

[1] Including private equity, hedge funds, commodities and emerging market equities with special characteristics (according to what under Solvency II falls under the same capital charge group).

2. The Life Insurance Market in Sweden

The concept of insurance makes it possible for individuals and companies to live and work in economically stable conditions. Individuals and companies covered by insurance will be more ready to invest time and money in new risky projects. In this way insurance promotes growth and stability in the economy. Premium income from the policyholders generates considerable resources for the insurance industry, which are invested in various assets such as bonds, equities, etc. The insurance industry is an important investor in the society and is important for economic growth. How the insurance industry allocates investments to different assets will have an impact on financial markets and the national economy. At the end of 2011, insurance companies' investment portfolios amounted to 2 943 billion SEK. This corresponds to approximately 90% of Sweden's GDP. Out of the 2 943 billion SEK, 83% or 2 447 billion SEK are investment assets in the life insurance industry. (Svensk Försäkring, 2012)

Life insurance offers insurance where the risk of the claim is linked to policyholders' lives, health or ability to work. The main idea of life insurance is that it pays compensation when the policyholder is injured or dies, and when the policyholder reaches pensionable age. Life insurance products that contain both insurance and saving components are called pension insurance. In 2011, premium income for Swedish life insurance companies amounted to 207 billion SEK and the 10 largest companies constituted 86% of the total market. (Svensk Försäkring, 2012) Among the total number of 42 life insurance companies there are many very small companies (so-called micro companies).

2.1. Swedish life insurance industry – a major investor

Managing large portfolios, insurance companies play a substantial role as financial investors. Comparing the value of the Swedish life insurance investment portfolio that in the end of 2010 were 2 452 billion SEK to the financial markets in Sweden, its potential influence is huge (see Table 1). According to Sveriges Riksbank (2011), the total Swedish bond market is estimated to be about 2 516 billion SEK in 2010, of which government bonds represent about 802 billion SEK. The value of public equities is estimated to be around 4 300 billion SEK and the private equity market 470 billion SEK. These data highlight Swedish life insurance companies' potential effect on the financial markets, meaning that significant changes in their asset allocations could have market wide consequences.

According to Sveriges Riksbank (2011), Swedish insurance companies invest the major part of their investment capital in equities and bonds, while real estate property markets play only a marginal role. Swedish life insurers´ allocation to equities at the end of 2010 was 21% of the investment portfolio. In Switzerland, the portion stocks and investment fund shares in the insurers' portfolios went down from 17.36% to 7.92% in the period between 1999 and 2005, and stock investment for the life insurance industry was 10.14% in 2006 (Eling et al., 2008). In Germany, insurance companies have reduced their equity investments from around 10% to 4% as a consequence of the financial crisis. On average, a European life insurer's portfolio has roughly 7% equities. (Deutsche Bank, 2011)

Table 1. Comparison of major Swedish investors with major Swedish markets

Life insurers account for **34%** related to major market

Portfolio Size *In billions of SEK*	
Life insurance companies	2,452
Non-life insurance companies	498
Reinsurance	n.a.
AP funds	1,037
Fund management companies	1,944
Total	**5,931**

Major Swedish Financial Markets *In billions of SEK*	
Corporate bonds (including mortgage bonds)	1,714
Government bonds	802
Bonds total	**2,516**
Private equity	470
Public equity	4,300
Total	**7,286**

Source: Sveriges Riksbank (2011), Svensk Försäkring (2011)

Since the available data for different life insurance products are incomplete in specification, we have found it necessary to estimate some numbers in order to differentiate between two conceptually different groups of products:

1. Life insurance products for which the insurance company handles the asset allocation;
2. Life insurance products for which the policyholders decide upon the asset allocation.

In group 1, we find the traditional life insurance products that include a guarantee of minimum return. This will increase the risk level for the insurers. Their asset portfolios have to be able to generate a sufficient return to cover the required guarantee. In group 2, we find the unit-linked products for which the policyholders take on the investment risk, because the products are only guaranteed for the market value of the investment. In studying the possible impact of Solvency II on life insurance companies, it is therefore more relevant to investigate asset allocation in group 1.

The division of unit-linked portfolio and other life insurance portfolio was at the end of 2010 was 310 billion SEK and 1 639 billion SEK respectively, amounting to total of 1 949 billon SEK (Svensk Försäkring, 2011). This number excludes occupational pension insurances and the difference (2 452 – 1 949 = 503 billion SEK) to the total investment portfolio for all life insurance companies of 2 452 billon SEK can thus, more or less, be explained by the exclusion of Alecta, representing a portfolio of 494 billion SEK (Svensk Försäkring, 2011). Alecta provides traditional life insurance and is thus included in the other life insurance group. Estimating investment portfolio for group 1, amounting to 2 136 billon SEK (1 639+497). According to available statistics, the life insurance companies are divided into unit-linked companies and other life insurance companies. The latter of the two (group 1, above) mainly provides traditional life insurance products and it is the focus of this thesis.

3. Current Regulation

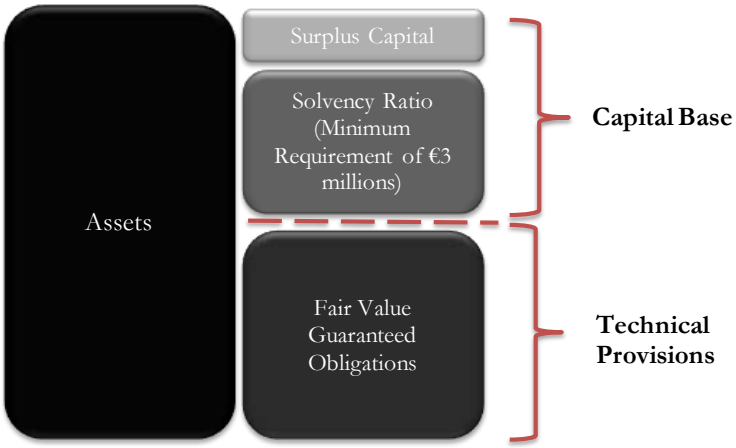
The current Swedish solvency regulation for insurers is based on the insurance directive set by the EU (Solvency I). The first EU life insurance directive was adopted in 1979, and the current regulation on solvency mostly reflects this directive, which requires that all insurers should have sufficient capital relative to operations. The development of the more extensive solvency regulations which would lead up to Solvency II was initiated in 2001. The current Solvency I regime resulted from an urgent need to manage weaknesses in the regulation; it was adopted in 2003 and went into effect in the Swedish market in January 2004. The Solvency I Directive meant that tighter rules were introduced and certain clarifications were made in comparison to the previous directives. (Statens Offentliga Utredningar, 2011)

3.1. Legislation in Sweden

Swedish insurance regulation on solvency lies within the framework of Försäkringsrörelselagen (FRL (2010:2043) – the Insurance Business Law) and prescriptions from Finansinspektionen. The Swedish Insurance Business Law divides the insurance market into two parts: life insurance and non-life insurance (FRL (2010:2043), Kap.1 §4). As this thesis focuses on life insurance, this section addresses the regulation of that part of the market.

According to current regulations, insurance companies are to value assets and liabilities at fair value (FRL (2010:2043), Kap.6§27). In order to ensure financial stability and to protect the business against unexpected events, companies must at all times be able to show that they have enough assets to cover their technical provisions, in other words that they have enough solvency. The level of assets must be sufficient to cover the commitments agreed between insurers and policyholders (liability coverage) plus a sufficient capital base (FRL (2010:2043), Kap.7 §1). The capital base consists of a solvency margin and surplus capital. Calculation of the solvency margin is based purely on the value of the liabilities and amounts to approximately 4% of the technical provision for guaranteed commitments and 1% of unit-linked liabilities (the fund value) and their guaranteed return, and 3% of positive risk sums (FRL (2010:2043), Kap.7 §12). According to the regulations, the solvency margin is limited by a minimum requirement that must be held (FRL (2010:2043), Kap.7 §2), which is set at a fixed amount equal to €3 million, but could under certain circumstances be somewhat higher (FRL (2010:2043), Kap.7 §18). Figure 1 shows the capital requirements under FRL.

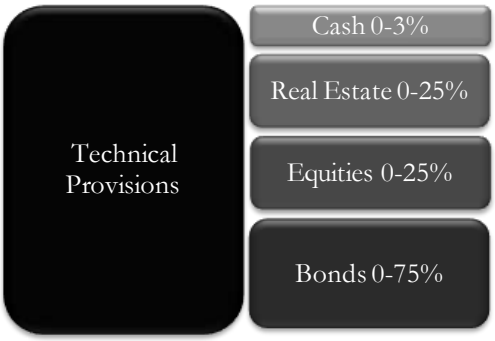
Figure 1. Capital requirements under FRL



3.2. Current regulation on investments and liability coverage

In principle, the current regulation divides the investment portfolio into two parts, one of which can be used for liability coverage. The regulation explicitly states the percentage limits for each type of asset class that can be used for liability coverage and how much of the coverage can be located in a particular asset class (Statens Offentliga Utredningar, 2011). The remaining assets represent the excess portfolio. This is a simple tool to encourage insurers to invest across different assets, while differentiating between risks inherent to the specific allocation (Eling et al., 2010). Some asset classes may not be used for liability coverage; e.g., hedge funds fall outside this scope. Only the asset classes of bonds, equities, real estate and cash may be used for liability coverage. The regulation specifies the proportions in which insurance companies are allowed to use the different asset classes: 75% bonds, 25% equities, 25% real estate and 3% cash (FRL (2010:2043), Kap.6 §12), as shown in Figure 2. The amount that can be allocated to an individual investment and from the same issuer is also restricted (FRL (2010:2043), Kap.6 §14).

Figure 2. Asset allocation limits for technical provisions under FRL (2010:2043)



3.3. Benefits and drawbacks of current regulation

The benefit of the current regulatory model is that it provides a relatively simplistic yet robust approach, which brings advantages in terms of supervision and compliance. However, there are a number of drawbacks and weaknesses of this rule-based regulatory framing. The academic research suggests that the number of drawbacks in the current regulation significantly outweigh the benefits (Trainar, 2006; Cummins and Phillips, 2009; Van Rossum, 2005; Eling et al., 2010). We acknowledge several drawbacks of the current standard, such as its failure to be accepted by national regulators (Bonhard, 2010) or its dependence on not-yet-synchronized accounting valuation of liabilities (Duverne and Le Douit, 2007), but we focus on the disadvantages relevant to this thesis.

Solvency I is what Power (2009) calls “the risk management of nothing”. The regulation looks at the company only at a given time but disregards any future risks. Demands on the insurance industry have increased, with different products and business structures, such as bancassurance, raising the number of risks that are outside the scope of Solvency I (Van Rossum, 2005). The fact that the risk margin is calculated as a fixed percentage of liabilities fails to recognize asset risks and to capture their role in liability coverage. To match liabilities, assets should have similar characteristics – for example, in terms of expected outflows and interest rates (Trainar, 2006). The rule-based asset limits motivate compliance rather than good risk management (Cummins and Phillips, 2009) and reduce the full potential of portfolio diversification (Markowitz, 1952; Trainar, 2006). As internal models are not allowed, the

regulation lacks in flexibility to accommodate for risks faced by specific companies that diverge from the "standard-type" company (Trainar, 2006). Table 2 summarizes benefits and drawbacks.

Table 2. Benefits and drawbacks of Solvency I

Benefits
• Easy to understand, fast to implement and cheap - no need for data modeling (Eling et al, 2010)
Drawbacks
• Rules motivate compliance rather than risk management (Power, 2009; Cummins & Phillips, 2009)
• Lacks to cover the risks of invetsment portfolio. It does not recognize market values, and reality that drop in asset value could cause insolvency (Cummings, 2009)
• Could limit efficient portfolio investment (Trainar, 2006)
• The asset limits disregard the full potential of diversification (Markowitz, 1952; Trainar, 2006)
• Only focuses on underwriting risk, and fails recognize the asset liability matching (Cummins & Phillips, 2009; Trainar, 2006)
• Unable to capture the changes in insurance industry, such as use of new products (Van Rossum, 2005)
• Fails to recognize differences between companies (Eling et al, 2010)

The overall opinion of the regulation under Solvency I seems to be that it provides a somewhat limited approach and fails to manage overall risk. As a result of the weak standard, national regulators have initiated their own projects (Flamee and Windels, 2009).

3.4. The traffic-light model of Finansinspektionen

The independent initiative of the traffic-light model in Sweden suggests that Solvency I is perceived as insufficient. In practice, the capital requirement of insurance companies is currently observed under Finansinspektionen's traffic-light model. However, it is important to stress that this model does not represent any legal requirement; the traffic-light system is merely a supervision tool (Statens Offentliga Utredningar, 2011).

The traffic-light model is a part of Finansinspektionen's methodology for supervising Swedish insurance companies. The model is not new; the original version was used in Denmark in 2001 and after the successful trial was adopted in Sweden (Jørgensen, 2007). It aims to capture companies' exposure to major market risks and provides a basis of measurement for the companies' capital requirements. The model first calculates a capital base, derived from the fair value of the company's assets and liabilities, which is then subjected to a number of stress scenarios set by Finansinspektionen. This test provides an indication of the capital the company must hold in order to absorb losses due to risk exposure and will represent the company's capital requirement. If the company has a capital base that is insufficient in relation to the calculated capital requirement, the traffic-light model will show a red light. Deeper analysis of the company's financial position will then be conducted, regarding both quantitative and qualitative measures (Finansinspektionen, 2012). The characteristics of the traffic-light model resemble requirements set up by the Solvency II directive, as will later be explained, under Section 4. The demands of the traffic-light model are significantly higher than the Solvency I requirements, but are on average lower than those proposed under Solvency II (Statens Offentliga Utredningar, 2011).

4. Solvency II

The Solvency II Directive is expected to be implemented by Swedish legislation in January 2014, mainly by revising of FRL (2010:2043) (Regeringskansliet, 2011). Solvency II, in comparison to previous directives, represents a fundamental reformulation of the regime, moving toward a more risk-based regulatory approach (Studer and Wicki, 2010). It is also a move towards a more holistic approach, where risk governance requires integration within the whole organization (Power, 2009). It attempts to evaluate risk both qualitatively and quantitatively and requires results to be properly communicated. The Solvency Capital Requirement (SCR) under Solvency II is a shift towards looking at the company's future needs instead of only regarding the current state (Lehman and Hofmann, 2010). One of the most notable aspects of the Solvency II regulation is that it for the first time introduces risk-based capital charges on assets (Davidson, 2010). The regulation is extensive and includes a number of new requirements for life insurance companies. In the context of this thesis, the regulation is too extensive to discuss all the parts in detail; therefore we will only address the parts where the substance is most relevant to the issues under consideration.

Solvency II is built upon three pillars, defined as a way to group its requirements. Roughly, the three pillars divide these requirements as follows:

Pillar I - Capital requirements
Pillar II - Governance requirements
Pillar III - Disclosure and regulatory reporting requirement

For the purpose of this thesis, we concentrate on the first of the three pillars as being the most relevant; Pillar I is the most extensive pillar as it covers the quantification of risk into capital requirements. Pillar II mainly focuses on the non-quantifiable human risk factor, and Pillar III focuses on the reporting and disclosure issues that aim to increase the quality of disclosed information to both the public and the supervisors (Statens Offentliga Utredningar, 2011). Although we recognize the importance of human error, intentional risk mismanagement and transparency, we consider these parts to be outside the scope of this study.

4.1. A shift in regulatory restrictions of investments

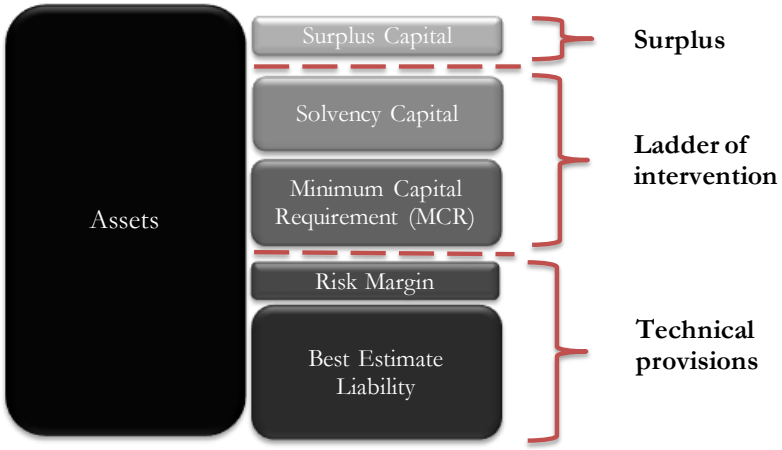
Solvency II, in contrast to the current regulation, will allow companies to include all their assets in the liability coverage. The new regulation will shift away from detailed restrictions in the form of investment rules, specifying eligible assets and quantitative restrictions regarding the proportion that can be invested in each asset class. It does not mean, however, that insurance companies are allowed to invest freely but rather represents a move towards more qualitative investment rules (Statens Offentliga Utredningar, 2011). Unlike the flat capital charge on liabilities applied under Solvency I, the Solvency II regulation proposes to introduce conservatively calibrated risk-based capital principles, resulting in a higher capital requirement for companies (interview with major investment bank, March 2nd, 2012). According to Solvency II directions, all investments must be made according to the "prudent person principle" and in consideration of certain qualitative measures (Statens Offentliga Utredningar, 2011).

As currently proposed, the capital requirements will be higher with the introduction of Solvency II, both for Swedish and for other European insurance companies (Finansinspektionen, 2008; EIOPA, 2011). In an overview, the capital requirements under Solvency II can be divided into three main blocks:

i) Technical provisions including a Risk Margin
ii) Solvency Capital Requirement (SCR)
iii) Minimum Capital Requirement (MCR)

(i) Technical provisions must cover all the obligations to policyholders and must represent a best estimate of liabilities combined with a risk margin. In addition, insurance companies must hold eligible funds of their own to cover (ii) the SCR, which must provide protection against the possibility of company sustaining significant unforeseen losses. If an insurer's resources fall below the SCR level, increased supervisory oversight would be triggered. Furthermore (iii) if the capital falls below the MCR, the insurer is considered insolvent and supervisory authorities suspend its operations (Statens Offentliga Utredningar, 2011). In order to minimize the possibility of supervisory interference, it is also desirable to have additional capital that exceeds the target to some extent, and this is termed Surplus Capital. Figure 3 illustrates the Solvency II requirements.

Figure 3. Overview of capital requirements under Solvency II



4.2. Ladder of intervention

The innovation in Solvency II is the "ladder of intervention" (see Figure 3), which provides the benefits of early intervention as well as the time for the adjustments. Another concept is the adoption of Value-at-Risk (VaR) as a main tool for determination of capital. Although this measure is criticized for its reliance on unrealistic normal distribution assumptions (Eling and Schmeiser, 2010), the measure is widely used by banks and proposed by accounting standards (O'Brian, 2010), which makes it easily applicable.

The ladder of intervention divides capital requirements into two tiers:

1) The lowest tier of the capital requirements is the MCR. Breach on this level is seen as an unacceptable amount of risk and triggers ultimate regulatory intervention. A position below this level will lead to suspension of the business (Statens Offentliga Utredningar, 2011).

2) The required level of solvency capital is measured by the SCR and will enable insurance companies to face a reasonable level of unforeseeable loss; meaning that the capital will cover a once-in-200-years event. It represents the first level where, if an insurance company's resources fall below, initial supervisory actions will be triggered (Directive 2009/138/EC, Section 4, Article 101).

The SCR can be calculated either by a so-called standard model, or if approved by the regulator, a so-called internal model, which may be either complete or partial (Statens Offentliga Utredningar, 2011).

The **standard model** for SCR is intended to reflect the risk profile of most insurance companies. However, there may be some cases where the standardized approach is not optimal and where the standard model fails to adequately reflect the specific risk profile of a company. However, since an internal model, described in more detail below, might be costly and complex to implement, the European Commission has established a scenario-based standard model that aims, as far as possible, to cover the risks that an insurer is exposed to (Studer and Wicki, 2010). Allowing the use of the **internal model** is an innovation compared to Solvency I and will from the user perspective represent a trade-off between increased costs and closer internal risk management (Eling et al, 2009). The main reasons for applying an internal model are (i) to incur lower risk charges and/or (ii) to get a more accurate picture of the company's risk profile (interview with major investment bank, March 2nd,2012). An issue of concern with the internal model is the moral hazard it evokes, providing insurance companies with an opening to manipulate models and mislead regulators (Trainar, 2006).

Since internal models are subject to customization by insurance companies, the following part reflects the process of calculation of the SCR as defined under the standard model. The SCR under the standard model must comprise a number of individual risk models, including at least non-life underwriting risk, life underwriting risk, health underwriting risk, market risk and counterparty default risk. The SCR is then calculated through an adjusted aggregation of the individual risk modules (Directive 2009/138/EC, Section 4, Article 104). The focus for our thesis is on market risks as it is the risk module most connected to the risks associated with asset allocations. The market risk module is divided into a number of sub-modules that capture risks within the module: interest rate risk, equity risk, property risk, spread risk, currency risk and market risk concentration (Directive 2009/138/EC, Section 4, Article 105).

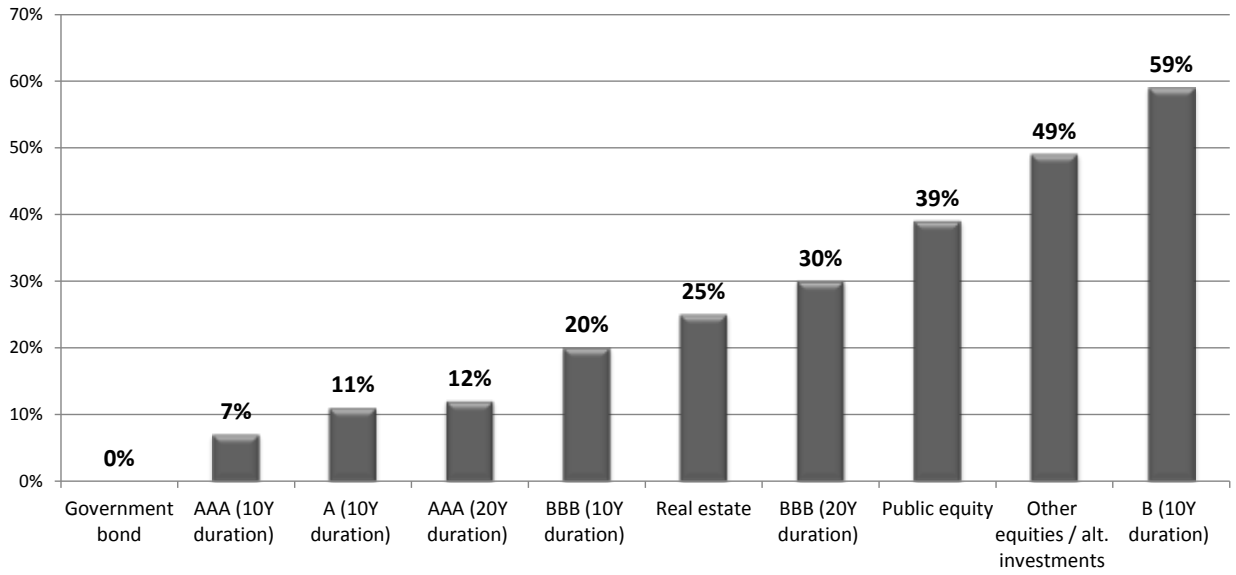
Solvency II does not use asset limits for the liability coverage; instead, it differentiates assets according to their riskiness, as represented by volatility. Each asset reduces capital by either the standardized percentage or what is determined by the regulators to represent the core idea of 99.5% Value-at-Risk (VaR). Under the standard model, risk weights are applied for the different asset classes, representing the possible decrease in capital base that can arise as a consequence of particular stress tests (for example, as a result of interest rate developments or stock market changes) which is within what can

happen over a one-year time-horizon 0.5% probability. The first step is to determine, for each current risk, a one-year event that can be expected to occur with a probability of 0.5%. As a part of the harmonization of the framework, these scenarios are standardized in the standard model (an example of a 0.5% stress test is that stock prices would fall by 39% in one year). The 0.5% scenario that the different asset classes would fall by is discussed in further detail below. Once the capital requirements for individual risks have been established, they are aggregated (Statens Offentliga Utredningar, 2011). The aggregation process will also take into account diversification effects, which are quantified through the prescribed correlations between individual risk modules. To reduce complexity, the section below does not consider these effects.

4.3. Capital charges under the Solvency II standard model

To provide an overall illustration of capital charges, Figure 4 presents the charges for the different asset classes of fixed income, public equity, other equities/alternative investments and real estate. For fixed income securities, the charge differs according to the duration[2] and credit rating of the fixed income security.

Figure 4. Capital changes under the Solvency II standard model



Fixed income securities are affected by interest rate risk and credit spread risk. The interest rate risk is based on the sensitivity to shifts of the yield curve. This aims to capture the risk embedded in the mismatch of duration between assets and liabilities. The larger the mismatch is, the larger is the capital charge. Unlike other capital charges, this does not punish volatility in the asset per se, but rather looks at the risk of having different durations for assets and liabilities. The credit spread risk will capture duration

[2] It represents a measurement of the sensitivity to changes in interest rates, taking the timing of the cash flows as well as the maturity into account. When the interest rises, the value drops (and the other way around) and the larger the duration, the larger is the impact (Saunders, 2011).

and credit rating of the fixed income securities. Lower-rated securities and those with longer duration will receive a higher capital charge.

The risk in public equity is simply captured in the volatility of its market price. To simplify, the capital charge is predetermined by the regulators. To derive this value, regulators perform stress test scenarios for the public equity capital market, represented by an index, to capture the sensitivity in the value of the public equity. The stress test predicts with the 99.5% confidence that the maximum drop of public equities would be 39% in one year. Thus the capital charge for public equity is 39%.

The asset classes defined as other equities/alternative investments and real estate are subjected to similar stress scenario tests as for public equity, but according to the volatility of market prices of indexes representing other equities/alternative investments and real estate, respectively. The other equities/alternative investments asset class receives a capital charge of 49%, and the real estate asset class receives a capital charge of 25%.

These solvency-associated capital charge applied for the asset class will reduce the capital base. Below we provide a simple numerical example of the risk-based capital requirements' impact on a fictive company's capital base.

4.3.1. The impact of introducing risk-based capital charges on assets

In this section we provide a numerical example of a simplified company under Solvency I and Solvency II. To provide an illustration of how the volatility of the capital base held by the company changes with the incoming regulations of Solvency II, some basic calculations have been made. First, a base case scenario of a simplified fictive company has been assumed and is presented in Table 3 below.

Table 3. Base case scenario balance sheet for fictive life insurance company

Base Case Scenario			
Assets	100	30	Capital base (i.e. Assets - Liabilities)
		70	Liabilities (Technical Provisions)

Solvency ratio is the central measurement used within the insurance industry to get a picture of the financial strength and health of companies. It measures the relationship between the value of assets and commitments to policyholders. A solvency ratio of 150%, for example, means that a life insurance company has 50% more assets than guaranteed commitments. If the solvency ratio falls below 100%, this means that the company has less capital than the commitments require (Andersson and Carlén, 2012). The base case scenario here represents a company with a rather good financial position, having a solvency ratio of over 140% (100/70). The capital base represents the difference between the company's assets and liabilities and will thus be 30 (100–70) in the base case scenario.

To understand the shift in the sensitivity of the capital base before and after the implementation of Solvency II, two interest scenarios are calculated to illustrate the change under the current regulations of Solvency I. The first scenario illustrates the effect of an increase of the discount rate of one percentage point; the second scenario illustrates the effect of a decrease of the discount rate of one percentage point. The calculations are very simple and are only to show a rough illustration of the effects. To

perform the calculations, an assumption has been made about the duration of the liabilities, which is assumed to be 15 years (consultation with the chief actuary at SEB Trygg Liv). There are different definitions for duration and this number is regarded as a so-called modified duration. The modified duration may be put in relation to interest rate sensitivity. In reality, interest rate sensitivity is more convex than linear, i.e., liability will increase even more in percentage the more interest rate falls, and it increases less, the more the interest rate goes up. However, as a rule of thumb, a duration of 15 years generally means that a one percentage point change of the discount rate will change the value of the liabilities by 15%. (Nöjd, April 30th, 2012; Elton, 2011) If the discount rate goes up, this result in a decreased value of the liabilities; and if the discount rate goes down, this results in an increased value of the liabilities. Table 4 illustrates the two scenarios.

Table 4. Overview of capital requirements under Solvency I

Discount Rate	Up by one percentage point	Base	Down by one percentage point
Assets	100	100	100
Capital base (i.e. Assets - Liabilities)	40.5	30	19.5
Liabilities (Technical Provisions)	59.5	70	80.5
Solvency ratio	168%	143%	124%
Change in capital	35%		-35%

If the discount rate goes up one percentage point, this will result in a decrease in the value of the liabilities, which in this scenario will be worth 59.5 (70 x (1-0.15)). If the discount rate goes down one percentage point this will result in an increase in the value of the liabilities, which in this scenario will be worth 80.5 (70 x (1+0.15)). The first scenario implies an increase in the capital base of approximately 35% (40.5/30-1) and the second scenario implies a decrease in the capital base of approximately 35% (19.5/30-1), compared to the base case scenario. This represents a rather noticeable effect on the shift in the capital base under current regulations as market valuation is applied (on liabilities), even if to a lesser extent than under Solvency II. Under the current regulation, the value of assets in determining the solvency ratio remains unchanged.

What must be noticed here is that the characteristic of a life insurance company's investments is rather long-term. Life insurance companies must be able to cover risks over a long period of time and are thus less affected by short-term market volatilities. Financing must, therefore, be long-term focused, reflecting the characteristic of the expected inflow and outflow. Under current regulations, short-term shifts on the market are reflected in a rather large effect on a company's capital base. However, these shifts can be expected to be even larger under Solvency II.

In order to do sample calculations of how a balance sheet example will be affected by Solvency II, it is necessary to apply a once-in-200-years event stress test on the balance sheet (as described in Section 4). To do so, an assumption must be made about how assets are allocated. A simple division of allocation into asset classes has been made and the example in Table 5 represents a somewhat conservative portfolio. Only having government bonds is an assumption far from reality as a portion of capital is

placed in bonds with at least some credit risk, e.g. corporate bonds. If incorporating bonds with credit risks, the spread risk for these must be calculated. For reasons of simplicity, these types of bonds have not been included in our example.

Table 5. Portfolio allocation assumptions

Portfolio Allocations	
Government bonds (Duration 5 years)	60%
Public equities	25%
Real estate	10%
Other equity / alternative investments	5%

Government bonds are assumed to be risk-free and to have duration of 5 years (consultation with chief actuary at SEB Trygg Liv). This assumption is made after consideration of what the Swedish market can offer in this respect, being approximately the top level of duration available on the Swedish market. When considering available bonds on the market, it is usually said that there is a liquid trading of bonds with maturities up to ten years. The assumption about the duration of the liabilities is still assumed to be 15 years. The same rule of thumb (for duration) is applied here and will in this case also have an impact on asset value for government bonds with the 5-year duration.

As a result of the capital charges on the different asset classes, the asset side will be reduced. The 5-year duration on government bonds implies that if the discount rate goes up one percentage point, this will result in a decrease in the value of the assets, which in this scenario will be worth 57 (60 x (1-0.05)). If the discount rate goes down one percentage point, this will result in an increase in the value of the assets, which in this scenario will be worth 63 (60 x (1+0.05)). As government bonds are assumed to be risk-free, they will not be subject to any additional capital charge. For the other asset classes, the risk charges suggested by Solvency II applies and will result in a reduction in asset value. Public equities are subject to a 39% capital charge and their value will thus be reduced to 15.25 (25 x (1-0.39)), real estate is subject to a 25% capital charge and their value will thus be reduced to 7.5 (10 x (1-0.25)) while other equities/alternative investments are subject to a 49% capital charge and their value will thus be reduced to 2.55 (5 x (1-0.49). Important to notice here is that potential diversification effects are disregarded. The Solvency II framework does not require companies to assume that all risks occur simultaneously, but that there are certain correlations between the risks, which are under the standard model captured with the prescribed correlation matrix; meaning that the total effect of capital requirement will in reality be lower than when (as in this case) the risks are treated as purely additive.

To obtain the effect on the capital base, the variation of liabilities must also be included. Table 6 shows the total balance sheet effect on the capital base under the two scenarios.

Table 6. Illustration of stress tests' effects under the Solvency II

Portfolio	Portfolio Initial Value	Stress Test	Post Stress Test Value	Base Value	Post Stress Test Value
Discount Rate			**Up by one percentage point**		**Down by one percentage point**
Government bonds (Duration 5 years)	60	5%	57.0	60.0	63.0
Public equities	25	39%	15.3	25.0	15.3
Real estate	10	25%	7.5	10.0	7.5
Other equity / alternative investments	5	49%	2.6	5.0	2.6
Total Assets	100		82.3	100.0	88.3
Capital base (i.e. Asset - Liabilities)			22.8	30.0	7.8
Liabilities (Technical Provisions)			59.5	70.0	80.5
Total Liabilities and Capital Base			82.3	100.0	88.3
Solvency ratio			138%	143%	110%
Original solvency ratio (Solvency I)			168%	143%	124%

The first scenario implies a decrease of the capital base of approximately 24% (22.8/30-1) and the second scenario implies a decrease of the capital base of approximately 74% (7.8/30-1), compared to the base case scenario.

The comparison of shifts in capital base looks rather different under the two regulations. A company that has a rather good solvency under the current regulations will give another impression under Solvency II. Looking at the example in Table 6, under Solvency II calculations, the company will probably be regarded as being "on the edge" in terms of how much more risk it can take on.

The shift towards risk-based capital requirements provides companies with incentives to reduce the duration mismatch. Furthermore, the risk weights for the different asset class significantly affect asset value. This would provide incentives for insurers to look for assets with lower risk weights in order to reduce the capital requirement. This in turn would result in a reduction of risk in their portfolios. Potentially, this could mean that the companies would shift to invest in assets that require them to hold less capital – meaning that they might sell risky and less liquid assets and buy liquid and low-interest assets.

In order to obtain further indications on how asset allocations are likely to be affected, in Section 5 we will examine the implementation of a similar regulation to Solvency II – the Swiss Solvency Test and investigate other recent industry studies and reports.

5. Experience from Switzerland and Input from Industry Studies and Reports

5.1. Swiss Solvency Test

Since 2006, Switzerland has implemented a new risk-based capital standard for insurance companies called the Swiss Solvency Test (SST). The SST has many similarities to the EU Solvency II regulatory framework (Holzmuller, 2009; Eling et al., 2008). The fact that Switzerland and Sweden are also similar in population, have active financial markets that are similar in size e.g. having similar sizes of bond and equity markets (Elton, 2011) and have kept their own currencies should potentially further increase the value of looking at the Swiss experience (Eling et al., 2008). One important objective of the SST was that it should be compatible with Solvency II (Federal Office of Private Insurance, 2004). Therefore it should be valuable to build expectations for Sweden upon the experience to date of the Swiss life insurance industry with changes in asset management and possible changes in asset allocation.

5.1.1. Differences and similarities

Before analysing the influence of the SST on the asset management of Swiss insurance companies, this section compares the two regulations and identifies similarities and differences (see Table 7).

The SST relies on more advanced scenario testing and uses the expected shortfall concept as risk measure, whilst Solvency II uses the value-at-risk approach. The expected shortfall concept requires higher capital coverage and is specifically suitable for risks with low frequency and high severity.

Despite some variances between the regulations, such as the use of different risk measures, approach for measurement of operational risk and scenario testing only under SST, both tests are structurally similar (Holzmuller, 2009; FINMA 2010). Both regulations require companies to value assets and liabilities as best estimates of market value and as such recognize that a drop in value can lead to insolvency (Cummins and Phillips, 2009). Both regulations have a principle risk-based character, and both divide capital into tiers to provide a ladder of intervention. Both allow the use of internal models, quantify risk through risk groups and focus on similar risk for the market risk module. This is important since the focus for this thesis is market risks as it is the module in Solvency II most connected to the risk associated with asset allocations. The SST market risk model takes into account changes in interest rates, stock prices, currencies and real estate prices, which are calculated by the expected shortfall model at a calibration of 99% confidence level. This method is a little more conservative and in contrast to the VaR also provides information about the severity of the default (O'Brien, 2010). The SST is regarded as advanced as the Solvency II regulation and despite some differences between the two models, they are expected to result in almost the same capital charge (FINMA, 2010).

Table 7. Swiss Solvency Test and Solvency II compared

	Name	Swiss Solvency Test		Solvency II
Key Differences	Risk Measure	Expected short fall (Tail Var) at 99% VaR	vs.	Value at risk at 99.5%
	Operational Risk	Qualitatively in report	vs.	Quantified as a part of scenario testing
	Market Stress Test / Scenarios	Market stress tests + scenarios	vs.	Market stress tests
	Disclosure	Does not require public disclosure	vs.	Requires public disclosure
Key Similarities		Economic balance sheet, where market value of assets less market value of liabilities gives economic capital		
		Principle based, complemented with technical rules		
		Both allow internal models		
		Cover similar risk groups (interest rate, stock, price, currency, …)		
		Total capital charge is similar		
		Two level capital calculation		

Source: Holzmuller (2009), Swiss Financial Market Supervisory Authority (FINMA)

5.1.2. Observations in terms of changes in asset allocation

The experience of the introduction of the SST in Switzerland suggests that asset allocation in the insurance industry is affected by the new regulation. This change did not come abruptly but rather through a gradual adjustment of asset allocations that had most likely already started before the actual implementation of the SST in 2006 based upon the awareness of the coming regulation (Eling et al., 2008). The main change is the shift towards more conservative investment strategies; under which insurers allocate more to fixed income and less to equities (Whittaker, 2011).

Effects on public equity

According to Eling et al. (2008), life insurers' investment in public equity in Switzerland was 10.14% of total investment in 2006. According to the SST standard model, return on investments is not considered for life insurers. This means that public equity assets require relatively more capital to be held. Because of this, insurers might select safer investments demanding less capital. Eling et al. (2008) suggest that insurers, being aware of the coming SST, started to reallocate capital away from equities years before the implementation of SST. Insurers' investment in stocks decreased from 17.36% to 7.92% between 1999 and 2005 (Eling et al., 2008). The main driver for this shift was most likely the international financial crisis, but the upcoming new regulations were most likely contributing to the shift (Eling et al., 2008). The parallel increase in safer assets like fixed-income securities could be additional support for this belief. Eling et al. (2008) conclude that there will not be much further decrease in equity investment.

Effects on other equities /alternative investments

Braun et al. (2012) are performing an analysis of life insurers' capital charges of private equity under Solvency II and the SST. They show that both regulations to an excessive degree penalize private equity when using a standard model. They also find that if you can develop a good internal model, the capital charge for private equity can be reduced and even be less capital-demanding than for public equity.

Effects on real estate markets

There is an ongoing discussion in Switzerland as to whether real estate should be allowed to be used for duration matching, which is essential for insurance companies since they intend to use real estate assets for duration matches and in that way reduce capital requirements (Eling et al., 2008).

Two different situations might arise:

1. Duration matching will be approved: this could lead to a possible increase of asset allocation to real estate within the insurance industry.
2. Duration matching will not be approved: real estate will be less attractive and could result in no change or decrease of investment.

Effects on bonds

Eling et al. (2008) identify two different factors derived from the SST regulations that will cause Swiss insurers to increase allocation specifically to high-rated bonds and long-term bonds:

1. The SST's demand for enough solvency capital will support the shift to less risky investment such as high-rated bonds. In the SST model, ratings are essential in determining credit risk. This will lead to "bad" – or not-rated bonds appearing less attractive and might lead to a decreased demand for such assets.
2. Specifically for life insurers, it is of importance that the SST model supports a reduction of duration mismatch between assets and liabilities. This might lead to a reallocation by life insurers to long-term bonds.

The discussion suggests that new regulation does change the behaviour of insurance investors, and the summarized effects are presented in Table 8.

Table 8. Effects of Swiss Solvency Test on investor behaviour

Asset Class	Expected Change
Public Equity	**No further decrease**
Alternative Investments / Other Equities	**Decrease**
Private Equity	In general, possible decrease. Exception, possible increased demand from life insurers with large bond portfolios with internal models due to diversification effects
Fixed Income	**Increase**
Investment-Grade Bonds	*Increase*
Long Term Bonds	*Increase*
Non-Investment Grade Bonds	*Decrease*
Real Estate	**Possible increase**

5.2. Other recent industry studies and reports

The Solvency II development is being closely followed by the whole financial industry because the implementation of the standard is predicted to have far-reaching consequences for the insurance industry. The changes may include possible changes of insurance products, increased cost of capital and/or economic impacts such as changes of yield curves. Most importantly, Solvency II will affect portfolio management, as some industry experts claim (Fitch, 2011; Oliver Wyman, 2010; KPMG, 2011; Deutche Bank, 2011):

1) Solvency II could lead to significant changes in asset allocations.
2) Capital requirements will be impacted by asset risks.
3) Solvency II will punish private equity and hedge funds.
4) Missing stress charge for EEA bonds may create a strong bias towards sovereign debt.
5) Asset-liability management is expected to get a greater role.

The foregoing statements indicate that Solvency II could shake up the life insurance industry, create a need for Solvency II-friendly products and create significant challenges for portfolio management. For example, many claim that the demand for high-rated and short-maturity products will increase, while long-term corporate bonds are expected to suffer the most (KPMG, 2011; Fitch, 2011). Industry studies have applied their own simplified models trying to determine which asset classes will become the most popular; for example, Oliver Wyman's (2010) calculations suggest that the three- to five-year AAA-rated bonds will be the best choice from a capital reduction perspective. The missing long-term duration management will be approached through EEA issued bonds or through a wider application of swaps (Fitch, 2011).

The effects on public equity are less clear and the arguments range between encouragements of neutral positions (Fitch, 2011) towards further allocation reductions (Oliver Wyman 2010). Alternative investments, such as private equity and hedge funds are believed face more severely decreases. Diversification is predicted to come from corporate bonds and real estate (Fitch, 2011). Diversification lowers capital requirements under Solvency II, which is based upon the assumption that it is extremely unlikely that risks will materialize at the same time. Diversification is therefore becoming an increasingly important factor in insurers' portfolio management (Deutsche Bank, 2011). There are still uncertainties regarding effects on asset allocation. For example, effects on corporate bonds are unknown due the complex effects on duration matching, furthermore, the attractiveness of government bonds will decrease for insurers who will recognize the risks of defaulting countries under their internal models (Deutche Bank, 2011). It shall also be acknowledged that the financial crisis of 2008-2009 and the European debt crisis have significantly affected the insurance companies' asset allocations towards less risky investments. In Germany, insurance companies reduced the equity part of their portfolios from 10% to roughly 4% in recent years. Investment in real estate also decreased sharply (Deutsche Bank, 2011).

The Economist Intelligence Unit (2012), conducted a survey of 254 EU based companies, including insurers and other financial institutions and companies, on the potential impact of Solvency II on

different stakeholders such as the insurance industry and the policyholders. Some key findings of specific interest for this thesis are as follows:

1) Insurers expect to further de-risk their asset allocation.
2) A majority of respondents (58%) believe that the capital shift within the insurance industry will come gradually and not in a dramatic way.
3) Policyholders will ultimately bear the cost for the consequences of Solvency II.
4) The responses from insurers on their view on changes of reduced/increased appetite for different assets as a consequence of Solvency II indicate quite significant changes (see Table 9).

Table 9. Expected effects of Solvency II on European insurers

	Expected Change	
Asset Class	Increase	Decrease
Public Equities	11%	64%
Alternative Investments / Other Equities		
Hedge funds	6%	47%
Private Equity	24%	29%
Fixed Income		
Non-Investment-Grade Corporate Bonds	6%	67%
Investment-Grade Corporate Bonds	49%	24%
Real Estate	18%	44%

Source: The Economist Intelligence Unit, 2012

6. Hypotheses

The previous sections have presented a theoretical overview of the regulatory changes in the Swedish life insurance market. After compiling relevant information regarding the possible effects, gathered mainly from the directives, from experiences in Switzerland and from recent industry studies and reports, a number of hypotheses were developed.

We believe that the regulative change brought about by Solvency II will have an impact on asset allocation within Swedish life insurance companies. This expectation is presented in our main hypothesis:

Solvency II regulation will have an impact on asset allocation within Swedish life insurance companies.

We investigate effects on asset allocation, focusing on the following asset classes: public equity, fixed income, real estate, and other equities/alternative investments. The potential impact on each of the four classes is formulated within four sub-hypotheses:

Sub-hypothesis 1: Allocations to public equity will decrease.

Public equity retains a relatively high capital charge. The example of SST implies that most of the change happened prior to implementation in form of reduced commitments to public equity. Even though equity positions might already have been reduced, we expect the life insurance companies to further decrease their allocations to public equity.

Sub-hypothesis 2: Allocations to other equities/alternative investments will decrease.

Due to conservative capital requirements for investments in other equities/alternative investments, we expect that life insurance companies will reduce their commitments to this asset class. The experience of SST indicates that commitments to private equity (for example) will decrease, which further strengthens our expectations regarding this asset class.

Sub-hypothesis 3: Allocations to fixed income will increase.

Solvency II clearly promotes holdings in fixed income. Fixed income securities with long duration will be favorable for duration matching between assets and liabilities. Investments in high-rated bonds with shorter durations are also encouraged and incur a low capital charge. In the case of EEA government bonds, there is no capital charge at all. The SST experience supports an increase in the demand for this asset class, thus we expect the commitments to this class to increase.

Sub-hypothesis 4: Allocations to real estate will increase.

The capital charge that applies to real estate is neither exceptionally high nor low, and could provide good diversification effects. Real estate investments provide a valuable hedge against inflation. Their main drawback is that they are rather illiquid; nevertheless, the long-term focus of life insurance companies' investments makes liquidity less of an issue, and we expect the allocations to real estate to increase.

It is expected that, because of Solvency II, Swedish life insurance companies are likely to have an increased/reduced appetite for different assets. Changing prerequisites for making investments in different asset classes could further have possible implications that even go beyond the life insurance industry. This thesis therefore also elaborates on some of the possible effects that might arise from a possible change in asset allocation.

7. Methodology

This section describes the research methodology. The purpose of our thesis is to examine the perceived impact of Solvency II on asset allocation within Swedish life insurance companies, both from the perspective of the companies themselves as well as from the perspective of prominent experts. The research uses a closed-question survey, complemented with semi-structured interviews. In addition, a modelled simulation was performed on one of the companies. The methodology may be classified as an epistemological qualitative study, because its aim is "to understand the social world through an examination of the interpretation of that world by its participants" (Bryman and Bell, 2007: 402).

The qualitative approach was chosen to test a not-yet-finalized regulation, based on the perspective of affected life insurance companies and the knowledge of insurance industry advisors and experts. The experts include persons with different backgrounds but with the common denominator that they all have a comprehensive understanding of the regulatory landscape and possess significant knowledge within the area. Another viewpoint will be added from the perspective of experts; this includes an elaboration on Swedish life insurance companies' perception of asset allocation changes and its possible impact on the Swedish life insurance industry. The methodology is chosen to reduce the biases and weaknesses of the qualitative study. We employ data triangulation, a method whereby we try to look at a research question from several perspectives to crosscheck for data reliability (Bryman and Bell, 2007). Information is gathered from (i) a closed-question survey sent out to Swedish life insurance companies, (ii) semi-structured follow-up interviews conducted with some of those companies and (iii) semi-structured interviews with prominent experts.

i) The principal method of data collection is a closed-end questionnaire. This enables access to several companies in the industry, creates comparable data sets and provides subjects with a perception of anonymity in a sensitive area (Bryman and Bell, 2007). The questionnaire covers specific topics relating to the direction, timing and perception of changes in asset allocations, arising from implementation of the new regulation. The survey provides a basis of what the market believes at this current state and a good base for collecting more information via interviews with participating companies and prominent experts.

ii) In some instances, validity of the answers is checked through follow-up, semi-structured interviews directed to survey participants. The semi-structured interview is chosen because it combines the flexibility of the unstructured interview with the structured basis suitable to test a pre-formulated set of hypotheses (Bryman and Bell, 2007). A predefined set of questions similar to the ones covered in the main survey is used, but subjects are allowed to bring up new topics of interest in order to provide a deeper understanding of the consequences of the topic in question.

iii) Further, the initial perspective of the directly affected parties is complemented with the views of prominent experts. Experts are less likely to answer sensitive questions incorrectly because of professional integrity or fear of revealing a corporate strategy. Again, the semi-structured interviews avoid missing important aspects of several asset classes, while at the same time allowing more leeway to capture a wide array of additional effects of the new

regulatory framework (Bryman and Bell, 2007). The experts are asked questions regarding their perception of the potential effects of Solvency II on Swedish life insurance companies, with a focus on changes to asset allocation and resulting implications. Furthermore, to obtain a better understanding of the outcome of the questionnaire, some of the results are discussed with the experts.

For the semi-structured interviews, face-to-face conversation is preferred, but in some instances the phone interview is used to overcome geographical distance or meet an individual's availability. Some interviews are recorded in cases where it may be difficult to get back to the interviewee. In this way the interviews are accurately documented so that answers can be fully explored, inconsistencies checked, and understandings confirmed with interviewees after the collection of data (Bryman and Bell, 2007). For the other interviews, careful notes are made during the interviews and the notes checked carefully directly after each interview. If necessary, a new contact will be made to obtain clarification. Company materials, comprising mainly annual reports and internal research studies, are consulted and used to check the reasonableness of the answers received and to identify crucial clarifying questions where answers diverged from the presented material.

Modelled simulation

Finally, we attempt to illustrate and check the rationality of the new regulation. The probability of failure under the 99.5% VaR assumption is modelled for one of the undisclosed companies. Two scenarios are applied, which attempt to describe the different effects of the internal model and Solvency II standard model.

Questionnaire with closed questions

Swedish life insurance companies were initially contacted by phone. They were asked if they would agree to participate in the study and to fill in the questionnaire on the impact of the Solvency II regulations on their allocation of assets. Company names remain undisclosed due to the sensitivity and strategic implications of the questions.

A total of 18 life insurance companies were contacted based upon industry statistics from the Swedish insurance industry association, Svensk Försäkring. These 18 companies are believed to constitute close to the whole market (in terms of invested capital) in traditional life insurance. Very small, so-called micro companies were excluded. Of these 18 initially contacted, 16 agreed to participate in the study. One company did not respond to the inquiry and one informed that it would not fall under Solvency II but under the "Tjänstepensionsdirektivet" (Occupational Pensions Directive).

The questionnaire was sent to the remaining 16 companies, and 11 companies completed the questionnaire. Of the five missing companies, two did not return, and two stated that since their policyholders themselves decided the asset allocation, there was no reason for the companies to participate (these should never have been included in the beginning); finally, one major player in the market decided not to join the study and referred to competitive reasons, stating also that the company

would most likely choose to work under the "Tjänstepensionsdirektivet" – an option that has recently been reconsidered by the Swedish Ministry of Finance.[3]

Out of the 11 responding companies, two small companies were excluded from the analysis because the policyholders themselves decided the asset allocation, (these should never have been included in the beginning).

The remaining 9 companies constitute a representative sample of the Swedish life insurance industry for traditional life insurance, covering approximately 50%[4] of the market (in terms of invested capital). It should be noted that one of the companies that decided not to participate represents around 23% of this market. Furthermore, when decided not to participate, this company informed that they would probably choose to abide under "Tjänstepensionsdirektivet" rather than Solvency II.

Characteristics of the nine companies

Size of portfolio

- 5 companies with > 100 bn SEK
- 1 companies with 50-100 bn SEK
- 3 companies with 10-50 bn SEK

Type of company

- 4 mutual companies
- 5 stock companies

The persons representing the life insurance companies had different backgrounds, but the common denominator was that they represented the top management of the companies and had a good insight and/or direct responsibility on strategies for asset management.

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[3] ***Ministry of Finance – Memorandum regarding Relation between Solvency II Directive and the Swedish Tjänstepensionsdirektiv (Occupational Pension Directive) – April 12, 2012.*** Prior to the memorandum from the Swedish Ministry of Finance, published on April 12, 2012, concerning the relation between Solvency II Directive and the Swedish Tjänstepensionsdirektiv, the former assessment report stated that life insurance companies had a potential possibility to follow the regulations of the Tjänstepensionsdirektivet as an alternative to implementing the Solvency II Directive. The two directives were assessed to be two alternative regulation frameworks. The survey for this study was sent out prior to April 12, meaning the answers reflect the option of choosing between the Directives. On April 12, the Ministry of Finance announced in a memorandum that the option to follow the regulations of Tjänstepensionsdirektiv as an alternative to the Solvency II regulations could not be implemented and that the impact of the Solvency II Directive needs to be re-evaluated from a Swedish perspective.

[4] The invested capital of traditional life insurance for each company was collected from annual reports and through direct contacts

The company interviews

Two semi-structured interviews were conducted with two of the life insurance companies that had completed the questionnaire. The basis for the interviews was the completed questionnaire from the respective company.

Interview 1: The CEO of a >100 bn company.

Interview 2: The Head of Investment in a 10–50 bn company.

The expert interviews and communication

Pre-study: Two interviews were conducted with two Solvency II experts at a major investment bank; the name of the company or the expert cannot be disclosed.

In-study: Six prominent experts were contacted, comprising two face-to-face interviews, two telephone interviews and two expert opinions and views on the subject were received in writing.

The industry experts were identified as persons to represent diverse opinions of groups that participate in formulation discussions and calibrations of the new regulation. This group was a well-balanced mix of persons with academic, regulatory, and investment banking background.

Other telephone and mail contacts

Contact was made with five companies participating in the study concerning discussions and questions on the subject “Solvency II and asset management”.

Contacts with other key specialists

Chief Actuary SEB, Harald Nöjd, for the “The impact of introducing risk-based capital charges on assets – A numerical example of a simplified fictive company under Solvency I and Solvency II”.

Assistant Professor, Henrik Andersson, Stockholm School of Economics, for our modelled simulation.

8. Results and Analysis

This section presents the findings of the study on the potential effects of Solvency II regulation on asset allocation within Swedish life insurance companies.

As detailed in previous sections, the main hypothesis and sub-hypotheses were developed after bringing together relevant information on the shift of the regulatory framework, including information on the regulations and related issues of substance. The four sub-hypotheses represent the four different asset classes investigated; these express the potential change in allocations to different assets expected to result from Solvency II. The survey questionnaire yielded responses from major Swedish life insurance companies on their expectations about the effects of Solvency II on asset allocations; these responses were complemented with interviews and correspondence with other major Swedish life insurers and prominent experts from Sweden and other parts of Europe. The analysis thus represents a combination of the viewpoints of the companies and the experts. ***Please note that the views expressed (in addition to survey results) in this section are interpretations of the answers received from the interviewees.***

To put the shifts in asset allocations into perspective, we collected information about initial asset allocations (see Table 10). Insurers are mostly invested in fixed income, about 60% of their allocations. Public equity accounts for 22%, followed by relatively high allocations in other equity /alternative investments, leaving real estate with only a small share. But there is a difference between large and small companies, where smaller companies have more conservative portfolios and substantially larger positions in fixed income. Secondly, the allocations show that companies follow two different portfolio strategies: either they reduce risk by holding large investments in bonds, or they apply portfolio diversification distributing allocations more evenly across asset classes.

Table 10. Initial asset allocations of major Swedish life insurers

Current allocations Life insurance companies	Undisclosed Life Insurers 1	 2	 3	 4	 5	 6	 7	 8	 9	Total	Small	Large
Public equity	30%	2%	35%	9%	29%	30%	16%	15%	28%	22%	11%	30%
Other equity / alternative investments	2%	8%	0%	24%	0%	16%	6%	18%	29%	11%	14%	9%
Fixed income	60%	85%	65%	64%	62%	34%	74%	63%	33%	60%	72%	51%
Real estate	8%	5%	0%	3%	9%	20%	4%	4%	10%	7%	4%	9%

8.1. Being well prepared

In terms of risk management, experts consider that Swedish life insurers are among the best-prepared in Europe and that to a certain extent they have already adapted to the incoming Solvency II. However, it must be pointed out that insurers probably do not yet fully appreciate all the volatility issues. How you define being “well prepared” is also up for discussion. Experts elaborate on how prepared insurers are from different perspectives and they are confident in their ability to deliver the correct numbers; however, they point out that incorporating a transformation of risk management and investment strategies will probably take a longer time. Some major factors, already in place before Solvency II regulations are put into practice, may contribute to a smooth implementation phase. One of the key aspects is that, even though to a lesser extent, a market-value focus has already been apparent. This focus, combined with the fact that Finansinspektionen has been early in its development towards a new risk regime, may have a large impact on how extensive the effects on the companies will be.

Finansinspektionens' supervision tool, the traffic-light model, has been used since 2006. The tests in this model capture many of the asset risks through the same stress-testing approach, so insurers are aware of many of the implications. The traffic-light model resembles requirements introduced with Solvency II, being far more similar to Solvency II than to Solvency I. However, the risk modules differ as the traffic-light system was designed to suit Swedish companies, while the requirements of Solvency II were developed in consideration of companies from all countries covered by the directive. As assumptions regarding risks are reflected in different ways, some elements and stress levels will differ from one method to another. In general, the traffic-light model is similar and, therefore, has provided a good preparation ground for Swedish life insurers looking ahead to the incoming Solvency II regulations. The similarity of Swedish life insurance companies also simplifies adjustments to a new regulatory framework. Many insurers several years ago set up specialized teams and units within their organizations to prepare their operations for Solvency II. Many companies also have propped up their capital bases in the aftermath of the 2008–09 financial crisis. All in all, it would be reasonable to conclude that Swedish life insurers are rather well prepared for the upcoming launch of Solvency II.

Changes to asset allocations are to a large extent expected to be phased in over a longer period, meaning that the total effect on changes of allocation will be smoothed out over time. This indicates that some of the adjustments to allocation changes have already been made. To reflect on this situation and to capture possible (earlier) effects of the Solvency II regulation, the study looks at how companies' allocations have developed during the last three years. This will be done under the relevant sections for each asset class.

8.2. Capitalization and solvency ratio

Current capitalization and solvency ratio are considered to have impact on the expected allocation changes. Well-capitalized companies with solid solvency ratios, mainly represented by larger insurance companies, will not be very affected by the increased capital requirements and will thus be able to continue to commit capital even to asset classes with high risk weights. Conservative capital charge, however, will be more noticeable for less well-capitalized companies, mainly represented by the small and medium-sized companies in the market. This group will thus be more likely to abandon asset classes with higher capital charges. The companies must evaluate according to their individual "risk budget" and then decide how much risk they can afford to take on.

The smaller companies are in general expected to be more affected by the regulation. To see how expectations differ in relation to the size of companies, the companies in this study were divided into two different groups: "small" and "large" companies. A "large" company is defined as one with a portfolio/portfolios with a fair value above 100bn SEK and the remaining companies are regarded as "small". Companies included in the "large" group are, with one exception, so-called mutual insurance companies (i.e., they do not have any shareholders). The mutual companies have very large consolidation funds, providing them with large capital buffers to capitalize on. Regarding solvency ratio, the mutual companies in the "large" companies group have the highest solvency ratios. It must be acknowledged that the measurements of solvency ratio and capitalization could in the case of some companies become less relevant. For insurers with major banks as owners, it becomes less of a problem to have a lower solvency ratio as they can get injections of capital from the bank.

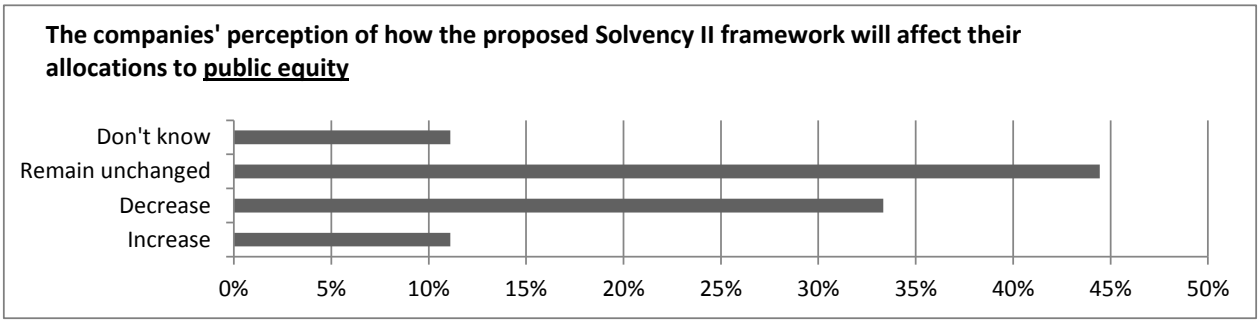
8.3. Internal vs standard model – Standard model favoured

Solvency II provides insurance companies with the opportunity to employ internal models to calculate their capital requirements. These models are in general associated with a certain flexibility and a stronger economic foundation, thus potentially leading to lower market risk capital charges than proposed under the standard model. Since the choice of model could affect insurers' perceptions about from the Solvency II directive on their allocations we also incorporated this in the analysis. Regarding all asset classes, most insurers anticipate that the choice of model does not affect their allocation to the asset classes, the exception is for the other equities/alternative investments for which a larger proportion of the insurers expect the choice of model to impact their commitment to this asset class. With one exception, all companies expect to apply a standard model. The company that does not expect to apply the standard model expects to use a so-called partial internal model. A reason for this could be their relatively large proportion invested in private equity.

8.4. Sub-hypothesis 1 – Allocations to public equity will *decrease.*

The majority of the insurers expect that their allocations to public equity will remain unchanged (see Figure 5). Considering the companies that anticipate that Solvency II will have an impact on their allocations to the asset class, the majority of insurers expect a decrease rather than an increase. The conservative capital charge will force companies into a constraint to decrease their allocations to public equity, and as a result they will probably end up holding less public equity as Solvency II comes into force. The well-capitalized companies are expected to be less affected by the high capital charge; there is no direct solvency risk for them to allocate capital to public equity and thus it is not a large problem to keep their allocations (this explains the "remain unchanged" responses in the figure). The uncertainty about the possible Solvency II impact on the public equity asset class is interesting. In the view of the experts, the clarity of the Solvency II treatment regarding public equity is obvious and the companies should have a rather clear picture of how it might affect them, given the fact that this has been known for a long time.

Figure 5. Companies' perception of how Solvency II will affect allocation to public equity



8.4.1. Large and small companies

The large insurers are quite in harmony in their opinions on the expected effects from implementation of the regulatory framework. The majority does not expect any effect at all, while others expect a decrease in allocation to the asset class. As for the small insurers, their expectations are more divergent. Both experts and insurers are of the opinion that the small companies are in general less prepared. This makes the division of the companies into large and small highly relevant. Figures 6 and 7, respectively illustrate the large and small insurers' expectations.

Figure 6. Large companies' perception on effect of Solvency II on allocations to public equity

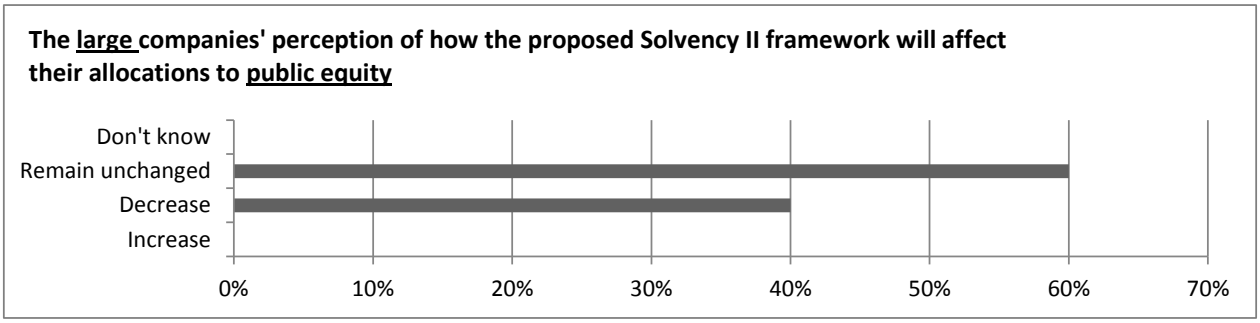
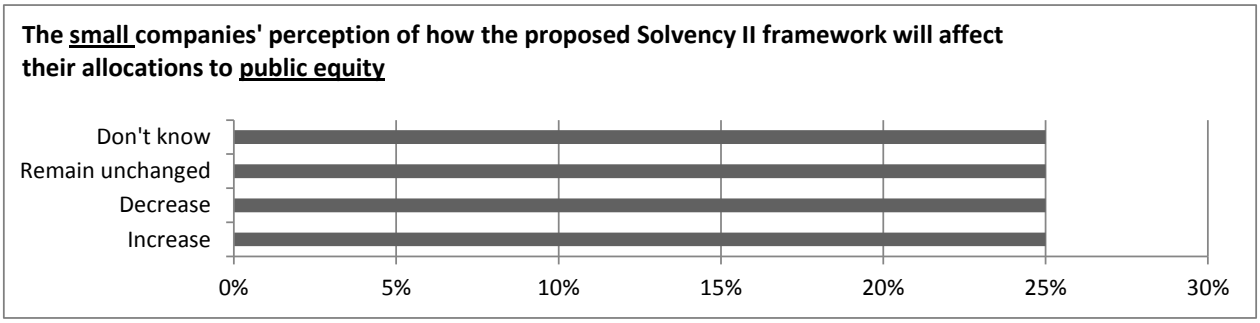


Figure 7. Small companies' perception on effect of Solvency II on allocations to public equity



8.4.2. The important role of public equity

Swedish life insurance companies, in general, make significantly higher allocations to public equity, compared to other European companies. This could be explained by limited availability of fixed income; there is a small supply of long-term securities and the liquid market for these assets is very limited. The large exposure to public equity make allocations to this asset class of special relevance for the Swedish market, as possible changes of allocation could have large implications. In addition to the limited availability of fixed income, the equity is an important source for generating sufficient returns to match insurers' long-term commitments that were made in the past, when interest levels were much higher than today. Insurance policies with relatively high returns were offered, reflected by the high interest rates. In order to live up to these undertakings and provide sufficient return to the policyholders, the companies must be exposed to the equity market, as there are no long-term fixed-income securities with this type of expected return. These are suggested reasons for why many companies, despite increased capital requirements implied with Solvency II, will continue to have large allocations in equity.

As to the treatment of assets with similar returns, it is considered preferable to allocate to public equity, compared to assets in other equities/alternative investments, as public equity represents a "pure" product – meaning that it is clear what it is and that available public information improves transparency (which is missing in the case of complex hybrid products). Thus, if hybrid products (e.g., hedge funds) are equally or more expensive as currently proposed under Solvency II, all things being equal, they will be less attractive, as clean products are more easily managed and easier to work with. There is one company that expects to increase its committed capital to public equity. This company currently has relatively low allocations to the asset class.

8.4.3. Previous trends

Most companies have during the past three years been decreasing their commitments to public equity. All but one of the companies that replied "remain unchanged" have decreased their allocations to public equity during the last three years, indicating that some early adjustments have already been made for the effects of Solvency II. Companies that have increased their equity stake in the past are overall anticipating a decrease due to Solvency II impacts. Experts believe that this asset class to a large extent has already been impacted, thus limiting future effects on the asset class from Solvency II implementation. The industry's overall allocations to equity have faced a downward trend and although the explanation is not clear, one impetus could well be the anticipation of Solvency II. The effects of the financial crises of 2008–2009 must be acknowledged as a main driver of the previous development of this asset class. However, effects can reasonably be attributed to both the effect of the movement towards a new regime and the general stress level for this asset class.

In summary, the expectation for allocations to public equity is to decrease as a response to Solvency II. The conservative capital requirement will affect some companies' ability to hold this asset class and will push some insurers to reduce their allocations to public equity.

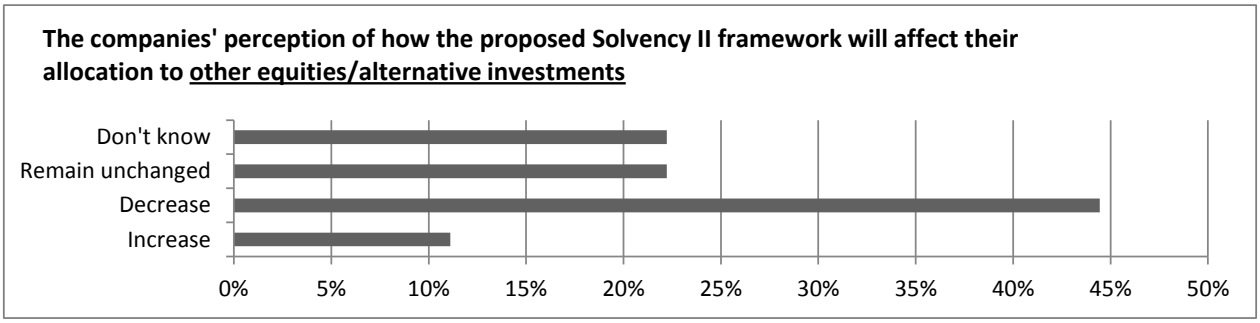
Sub-hypothesis: *Accepted*

- The impact of Solvency II on allocations to public equity is expected to decrease.
- The insurers are in general well prepared for the incoming regulations; meaning that some adjustments are likely to have occurred also during the past couple of years. As the suggested changes in the allocation to public equity have already begun, the effect will be less dramatic.

8.5. Sub-hypothesis 2 – Allocations to other equities/alternative investments will *decrease.*

Expectations regarding asset allocation changes to other equities/alternative investments represent the clearest trend (see Figure 8). The majority of the companies anticipate a decreasing impact on their allocations to this asset class. The conservative risk weight which this asset class is subjected to under Solvency II will force some insurers to decrease their allocations. There is however some uncertainty among insurers about the potential impact. The asset class brings complexity and experts believe that there are still some question marks concerning treatment of some of the assets in this group. This could contribute to the uncertainties about expectations. Experts also expect that some companies still believe that changes might be made regarding the treatment of the asset class and hope that the rules will become less severe.

Figure 8. Companies' perception of how Solvency II will affect other equities/alternative investments



8.5.1. Large and small companies

Unlike large companies, all small companies that expect a change in asset allocation anticipate a decrease (see Figure 9 and 10). If several companies abandon this asset class, this could provide an opportunity for larger, well-capitalized companies, which are not expected to be very affected by the conservative capital requirement; meaning that they will be able to continue to commit capital to it.

Both insurers and experts elaborate that a possible decrease in demand for this asset group as a result from the high capital charge could make it too expensive to motivate such investments; indeed, for some companies, it might even be impossible to hold them at all. The result could be that these assets become cheaper on the market, thus providing an opportunity for larger and well-capitalized firms to invest cheaply. If an individual asset generates a high enough expected return, then a high capital charge might not be a big problem as the return on capital will still be very high.

Figure 9. Large companies' perception of how Solvency II will affect allocations to other equities/alternative investments

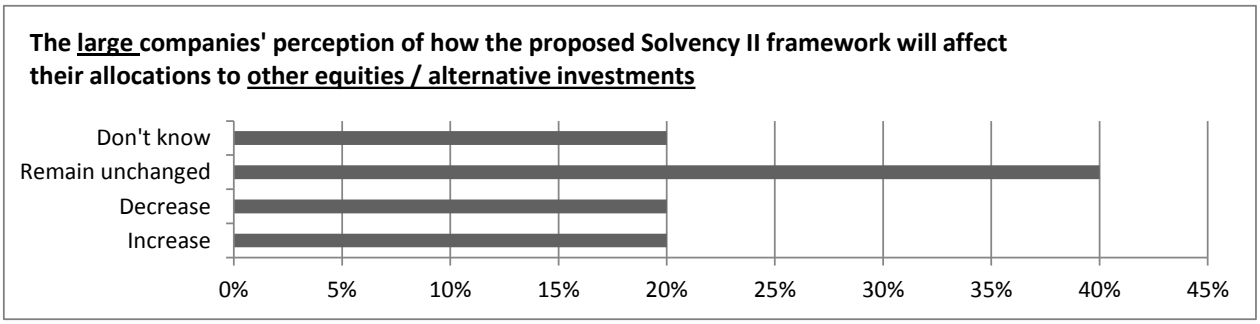
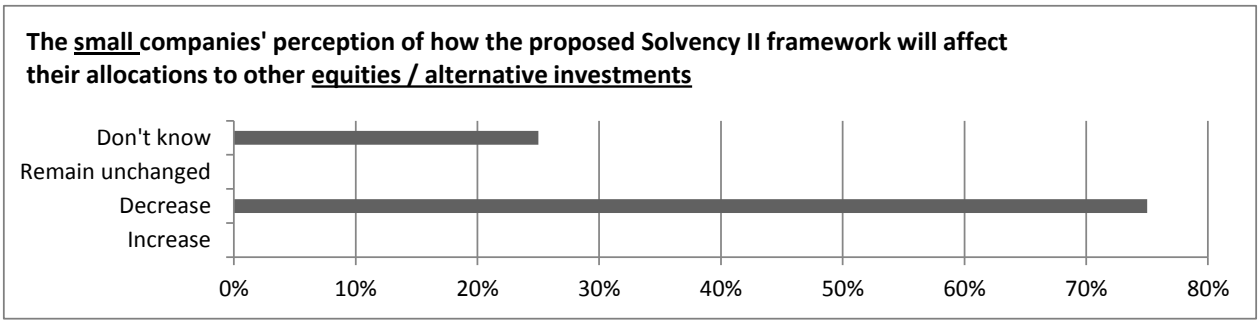


Figure 10. Small companies' perception of how Solvency II will affect allocations to other equities/alternative investments



8.5.2. Hedge funds disadvantaged under the group classification

This asset class represents a diverse group of assets. The character of the investment and the type of strategy applied will have a larger impact on the attractiveness of individual assets under Solvency II. For example, a hedge fund that invests in equity will be less attractive with the introduction of Solvency II, as it will receive a substantially higher charge than direct investment into equities. The investment strategies of hedge funds, for example, will be even more important under Solvency II and the insurers' view is that this might affect allocations to this asset class. Experts believe that new strategies and compositions are likely to be developed. The industry is largely exposed to competition and the hedge fund innovativeness could, for example, find business opportunities in uncorrelated constellations. If these types of uncorrelated hedge fund portfolios could be developed and generate attractive returns, insurers could possibly push for reasons why they should not be classified in another way and thus be subjected to a lower risk weight.

8.5.3. Overly conservative capital charges

A high capital charge for hedge funds could be seen to be applied to capture the risk of unregulated quantities; it is more a question of what hedge funds are allowed to do in combination with a lack of transparency. This punishes hedge funds with less volatile strategies and the capital charge is highly debated for not separating different hedge funds strategies. In addition, compared to the current treatment under the Finansinspektionens supervisory tool, the traffic-light model, private equity will be punished more severely under Solvency II. The index for private equity used to establish the capital charge under Solvency II (LPX50) is much debated. Many consider it to be inappropriate because this

index represents listed private equity and does not correctly represent the risk characteristics for private equity. The LPX50 is considered to have a higher volatility than regular private equity, indicating that this asset group should have a less sever capital charge. On this point, the choice to develop an internal model might be beneficial. However, considering the small amounts of allocations to private equity, at levels around 0–1% of total assets under management for most companies, it does not really have a very large impact. An allocation to private equity below 4–5% does not warrant the cost of developing an internal model, but companies above that level could consider the alternative.

8.5.4. Additional regulations might impact

Experts point out that other international regulations are under development. There is a spider web of regulatory changes coming into force during the same time, resulting in a general shift towards a more expensive environment as the regulations head the industry towards investments in low-yield assets. Three different regulatory initiatives that in different ways may have an impact for this asset class are Basel III, Solvency II and the Alternative Investment Fund Managers Directive (AIFMD). All three are expected to affect this asset class, although to a varying degree. Thus, potential spillover effects from the other regulations coming into force might impact this asset class.

In summary, the expectations regarding other equities/alternative investments suggest that allocations to other equities/alternative investments will decrease.

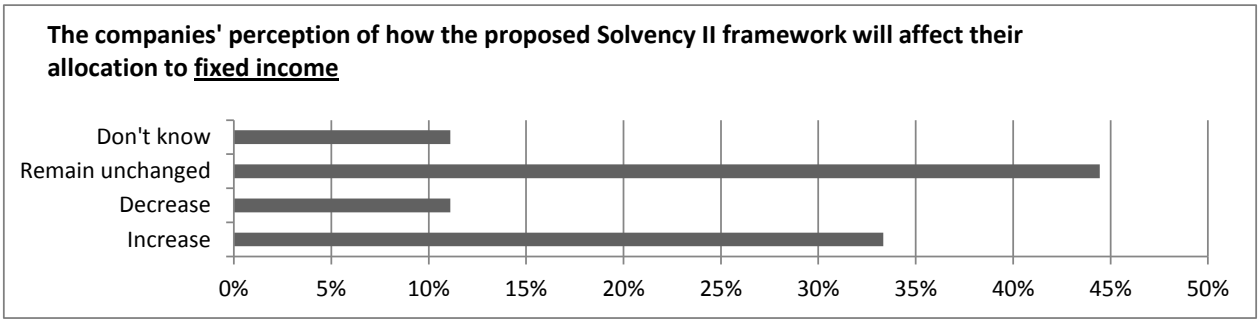
Sub-hypothesis: *Accepted*

- The impact of Solvency II on allocations to the other equities/alternative investments is expected to decrease.
- There may be an opportunity for well-capitalized companies, less affected by the high capital charge, to invest cheaply if the demand for these assets goes down.
- The internal model can be beneficial for companies with large commitments to this asset class.

8.6. Sub-hypothesis 3 – Allocations to fixed income will *increase.*

Insurers mainly expect an increase in asset allocation to fixed income securities. Only one company expects to decrease allocation. Experts also believe that the impact from Solvency II will increase allocations to this asset class, representing a shift towards a new regime with a lower yield environment. However, the expert view is that an even larger increase will be expected. An explanation for the insurers anticipating unchanged allocation could be that they are well-capitalized and do not need to increase their commitment. Another explanation could be the limited availability of fixed income on the Swedish market in combination with the need to generate sufficient returns to cover the relatively high guarantees. Even if marginal, there is some uncertainty regarding the insurers' expectation about allocation to this asset class. Experts point out that there could be uncertainty about the discount curve. The lack of clarity around the discount curve refers to how market-linked the curve will be and how much credit spread will have to be included. The latter concern is however suggested less of an issue for Sweden compared with the rest of Europe.

Figure 11. Companies'perception of how Solvency II will affect allocations to fixed income securities



8.6.1. *Large and small companies*

Small and less well-capitalized companies have larger incentives to shift to more low risk investments. Hence, it is not strange that none of the smaller companies are anticipating a decrease in allocations to fixed income. Some insurers remain on the same level, but there is a clear tendency for companies to anticipate increasing investment in fixed income securities. The beneficial treatment of this asset class under Solvency II will make it an attractive asset class to invest in.

Figure 12. Large companies' perception of how Solvency II will affect allocations to fixed income securities

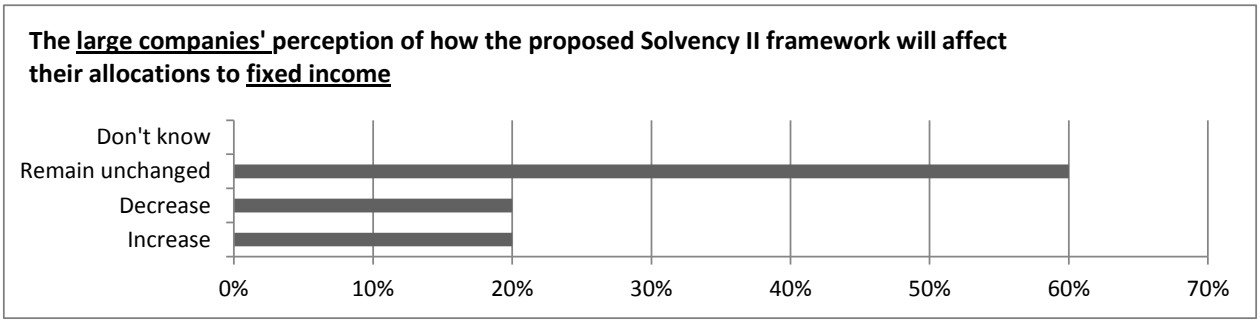
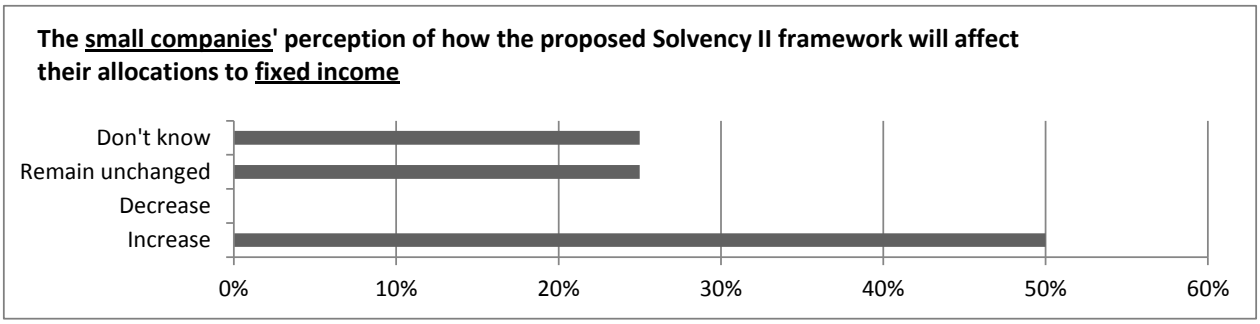


Figure 13. Small companies' perception of how Solvency II will affect allocations to fixed income securities



8.6.2. *Increased need for corporate bonds*

The supply of bonds with long maturities with a liquid market is limited in Sweden. As already mentioned under the public equity section, there is a problem of commitments being made to policyholders under different interest rate conditions than currently prevail (being much higher in the past). The current market for fixed income makes it hard for insurers to match the high promised yields and as public equity under Solvency II retain a relatively unfavorable capital charge, it is suggested that the current situation needs a well-functioning corporate bond market with long maturities.

In summary, the expectation for allocations to fixed income is to increase as a response to Solvency II.

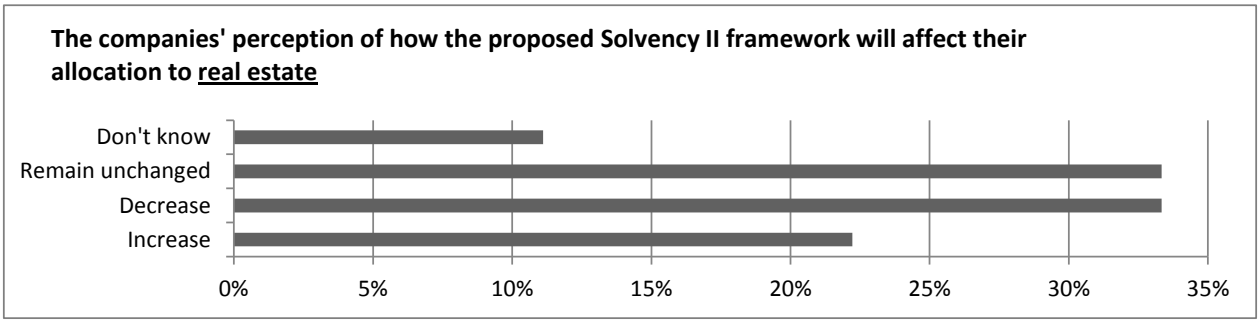
Sub-hypothesis: *Accepted*

- The impact of Solvency II on allocations to the fixed income asset class is expected to increase.
- The limited availability of fixed income will impact Swedish life insurers' opportunities to increase allocations to this asset class.

8.7. Sub-hypothesis 4 – Allocations to real estate will *increase*.

Most companies anticipate an unchanged or decreased allocation to real estate (see Figure 14). Suggested arguments for the expected appetite for the asset class differ, and the interviewees held rather different views. One view was that investments in real estate are rather unattractive as they lack of liquidity. As Solvency II requires insurers to hold more capital, it is not appealing to tie up capital for long periods. On the other hand, commitments to real estate are attractive if looking at the possible expected returns compared to its low volatility. The possibility to hedge inflation risk is too an attractive feature of investments in real estate.

Figure 14. Companies' perception of how Solvency II will affect allocations to real estate



8.7.1. *Large and small companies*

Large companies anticipate an unaffected or decreasing asset allocation to real estate rather than an increase. Expectations from small companies are of a wider scope, with divergent beliefs and quite a large uncertainty rate.

Figure 15. Large companies' perception of how Solvency II will affect allocations to real estate

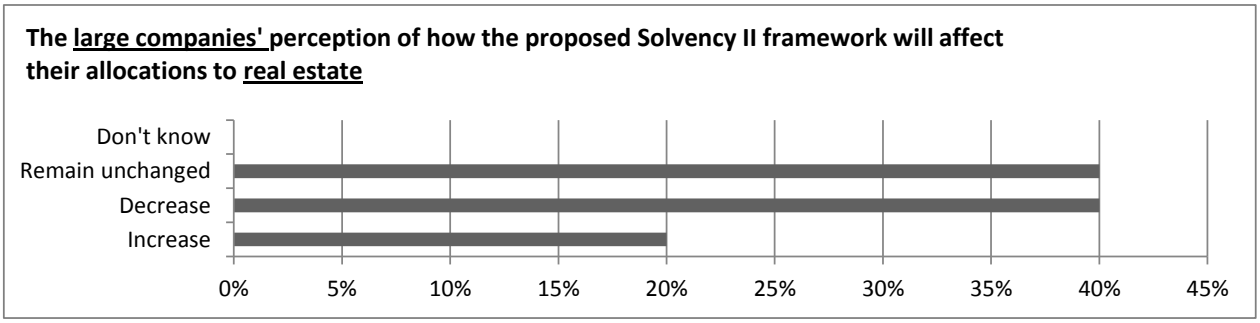
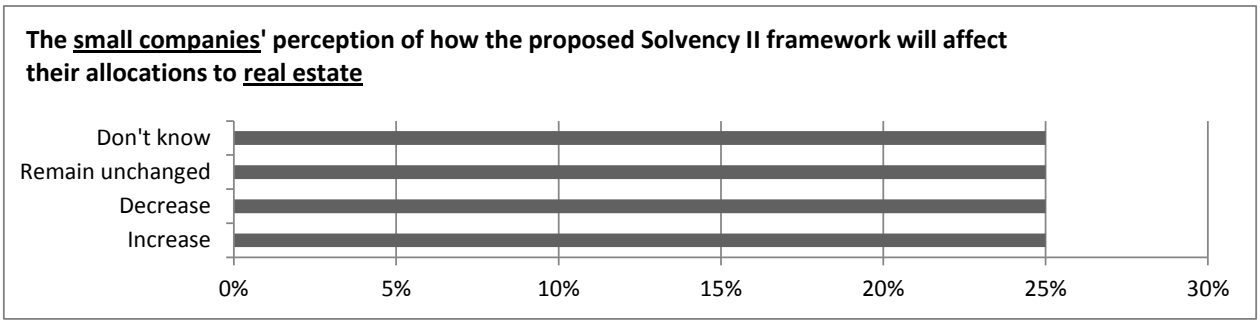


Figure 16. Small companies' perception of how Solvency II will affect allocations to read estate



8.7.2. Broad spectrum of opinions

Some experts expect that Solvency II will stimulate insurers to invest in real estate while others argue the opposite. Another view is that the asset class might be unaffected, at least from a short-term perspective, but that allocations to the asset class in the long run could increase as they may pose an alternative to invest in public equity. The relatively low capital charge combined with good expected returns and acceptable volatility will make this asset class more attractive. Under the traffic-light model, real estate is currently treated similar to public equity. Under Solvency II, real estate receive a significantly lower risk weight compared to the traffic-light model and is therefore expected to increase in attractiveness. It is suggested that the characteristics of real estate could provide accounting smoothing effects for insurance companies, as it is not very volatile from year-to-year, making it an attractive asset class to invest in. The responses from insurers, however, do not reflect this view. Experts believe that insurers' expectations to decrease their commitments in real estate may be explained by a poor view of expected returns from real estate and/or due to companies' prudent approach to real estate (perhaps related to the crash during the 1990s). It is put forward that in most countries, that will abide under Solvency II regulation, one can observe indications that insurers are looking to increase allocations to real estate. The responses from the Swedish companies do not reflect this view.

The limited availability of fixed income could also affect allocations to real estate. There are arguments for this asset class being used to match the liabilities and possibility to provide an inflation hedge. On the other hand, even though it pays out over a longer period of time, it does not mean that it is linked to the interest rate risk. As an example, you do not find many government bond traders holding real estate in their trading books to offset mark-to-market risks for their bonds. The underlying change of market value in real estate is not interest rate-linked.

In summary, insurers do not seem to appreciate the potential benefits suggested by some of the experts. Experts also have different perceptions regarding the changed attractiveness of real estate. Overall, it seems as Solvency II will slightly decrease the appetite for real estate.

Sub-hypothesis: *Not Accepted*

- Solvency II impact on allocations to the real estate asset class is rather unclear. Insurers expect to decrease committed capital to this asset class, while experts bring slightly different anticipations: some in line with the insurers', but others providing a more opportunistic view of future commitments to real estate.
- Real estate allocations can be impacted by the limited ability of fixed income and could in the long-term become an alternative to investments in equity.

8.8. Impact on returns

As suggested by the results, insurers are in generally expecting a shift in allocations toward less risky assets (see Table 11). The expected changes in allocation are by the majority of the insurers expected to have an unchanged or negative effect on the companies' returns. No company expects the changes in asset allocation impacted by Solvency II to have a positive impact on their overall return. The anticipation of unchanged returns might be explained by the fact that the asset allocation will not differ so much that it will have a very noticeable impact on the expected return. It is also suggested that the increased cost will be transferred to policyholders and/or changes in product design.

Table 11. Summarized Impacts under the Solvency II

Perceived impact of Solvency II

Area	Solvency II	Impact
Asset allocations	Equity	• The impact of Solvency II on allocations to public equity is expected to decrease. • The insurers are in general well prepared for the incoming regulations; meaning that some adjustments are likely to have occurred also during the past couple of years. As the suggested changes in the allocation to public equity have already begun, the effect will be less dramatic.
	Other equities / alternative investments	• The impact of Solvency II on allocations to the other equities/alternative investments is expected to decrease. • There may be an opportunity for well-capitalized companies, less affected by the high capital charge, to invest cheaply if the demand for these assets goes down. • The internal model can be beneficial for companies with large commitments to this asset class.
	Fixed income	• The impact of Solvency II on allocations to the fixed income asset class is expected to increase. • The limited availability of fixed income will impact Swedish life insurers' opportunities to increase allocations to this asset class.
	Real estate	• Solvency II impact on allocations to the real estate asset class is rather unclear. Insurers expect to decrease committed capital to this asset class, while experts bring slightly different anticipations: some in line with the insurers', but others providing a more opportunistic view of future commitments to real estate. • Real estate allocations can be impacted by the limited ability of fixed income and could in the long-term become an alternative to investments in equity.
Capital requirement calculations	Standard model	• Strongly preferred, despite conservative character with high capital charges
	Internal model	• Expensive, and requires approval, only one company interested in partial internal model
Size	Small Large	• Larger need to move to less risky assets • Able to hold positions in riskier asset classes
Impact on returns	Higher capital requirements	• No or negative impact on returns

8.9. Modeling Solvency II effects for a specific case company

We look at our survey results from the perspective of a specific firm scenario, for which we opted to construct a fictive internal model. We built the model with the assistance of the text Modern Portfolio Theory and Investment Analysis (Elton, 2011) but extended the theory presented in it to capture the probability of insolvency. We measure insolvency risk with Value-at-Risk (VaR), selected by the regulators as a risk measure for Solvency II. The fictive internal model tests whether the current asset allocations are robust enough to keep the probability of bankruptcy within the 99.5% VaR limits defined by the Solvency II standard. The purpose of the model is to test whether the switch towards the fair value balance sheet will drive the insurer to insolvency and so force the company to switch asset allocations. The results of the fictive internal model are then compared to the capital requirement calculated by Solvency II standard model, with the conclusion that some life insurers achieve substantial capital requirement reduction if the internal model is used.

For the simulation, we obtained data from a Swedish life insurance company. The company requested to remain anonymous, and so we changed the absolute balance sheet values into the stylized example. The company's total value of assets (A) is 12 billion SEK. For simplification, we assume that all assets are investments and disregard fixed assets. The asset portfolio is composed of public equity, private equity, government bonds, corporate bonds, real estate and alternative investments (including hedge funds and emerging markets equity). Company liabilities (L) are 10 billion SEK and represent both guaranteed and expected return on policyholders' claims. The company in this scenario has a 120% solvency ratio (1/0.83).

We identified a set of market indexes to approximate the characteristics of each allocation. The indexes were chosen and tailored to mimic the properties of the Swedish market, influenced by the EIOPA calibration studies and the characteristics of our tested company (see Table 12). For liabilities, we assumed the equivalence to the corporate bond with the long duration of 15+ years and A credit rating. (for details, see the Appendix A)

We rearranged the balance, shifting liabilities to the asset side of the portfolio. Then we calculated expected return, ($\overline{R_P}$), of 8.32% and standard deviation, (σ_P), of 34.65% for the rearranged portfolio (for a detailed explanation of our calculations, see the Appendix A).

Table 12. Benchmark indices

Asset Class	Index	Illustration	Estimation Period	Weight (Xi)	Expected Return	Standard Deviation
Public Equity	MSCI World	Stock developed countries worldwide	1991-201:	54%	7.1%	19.8%
Private Equity	UK-Ds Inv.Trusts Private Equity	Global listed and unlisted private equity	1991-201:	30%	9.1%	29.0%
Government Bonds Short	FTSE Global Govt. E-Zone 1-3Y	Money market in the Europe, rf	2000-201:	12%	2.1%	2.4%
Government Bonds Long	BD Benchmark 30 Year DS Govt. Index	Government bonds for Europe	1995-201:	130%	4.3%	7.9%
Corporate Bonds	IBOXX £ Corp. All Mats. A	Worldwide corporate bonds, A rating	1999-201:	232%	4.6%	10.6%
Real Estate	FTSE EPRA/NAREIT Developed	Real estate worldwide	1991-201:	18%	6.1%	23.9%
Alternative Investments	HFRI Fund Weighted Hedge Fund	Hedge funds worldwide	1991-201:	127%	5.7%	12.2%
Liablities	IBOXX £ Corp. 15+ Years A	Global longterm corporate bonds, A rating	1999-201:	-502%	4.6%	10.6%
Total				100.0%		
Portfolio Return (R̄p)						**8.32%**
Portfolio Standard Deviation (δp)						**34.65%**
Probability of Bankruptcy, (Return < -100%)						**0.09%**

We assumed that returns are normally distributed and from the normal distribution we found the probability of bankruptcy of 0.09% which is substantially lower than the 0.5% threshold allowed by the Solvency II regulators (for details, see Appendix A). Thus, the model suggests that asset allocations will not have to change.

8.9.1. Solvency II capital requirements

To put the results of our fictive internal model into Solvency II perspective, we follow with the simple illustration of the calculations as prescribed by the standard model, using the latest set of calibrations (European Commission, 2011). The results of this illustration suggest that if the company used the Solvency II standard model, it would breach the SCR levels. This is mainly a consequence of conservatively calibrated correlations between the risks under the standard model, which illustrates possible capital reduction benefits of the internal models.

Calculated SCR_{test} = 2.32 billion, which is 0.32 billion more than the 2 billion of equity for our company. The total risk diversification reduces our capital charge by 0.21 billion, representing significant reduction but which is insufficient to avoid the breach of solvency (for details, see table 13).

Table 13. Capital requirements calculations by standard model

Equity Risk Correlation Matrix					
	Global Equity	**Other Equity**	**Capital (000,000s)**		**Equity SCR (000,000s)**
Global Equity	1	0.75	421		**1,866**
Other Equity	0.75	1	1,529		
			Σ 1,950		

Market Risk Correlation Matrix							
	Equity risk	**Property risk**	**Interest risk**	**Capital (000,000s)**	**Test SCR (000,000s)**		**Equity (000,000s)**
Equity risk	1	0.75	0.75	1,866	**2,319**		**2,000**
Property risk	0.75	1	0.5	90			
Interest risk	0.75	0.5	1	485			
				Σ 2,441			

Total effect of diversification = total undiversified capital charge - total capital = 2,525,000,000 - 2,319,000,000 = 206,000,000 SEK
Result: The SCR margin is breached by about 319,000,000 SEK

8.9.2. Internal models can reduce capital requirements

Our case company would have to make adjustments to its investment portfolio. Our modelling results suggest that Solvency II could be too conservative, as it would require increasing the capital for the firm facing only 0.09% bankruptcy risk. This could be explained by conservatively rounded risk correlations, which understate the diversification effects. For example, the standard model does not account for the diversification due to presence of government bonds. It sets the 0.75 correlation between bond and equity risks, which according to our calculations could be much lower (about 0.3; see Appendix A), or it assumes perfect correlation between private equity and hedge funds.

It is important to point out that our model is sensitive to the choice of standard deviation, correlation and expected returns. The different choice of data series could possibly breach the probability of bankruptcy threshold. But we can make a point that at some instances the life insurers can derive significant benefits from designing their own internal models.

9. Discussion

According to the results of our study, Solvency II is expected to impact the distribution of assets within Swedish life insurance companies. The extent of the impact for the different asset classes differs, but the effects are in general not very pronounced. Compared to the general industry view, representing the impact on EU countries in general, our results indicate that the effect on the Swedish market will be less extensive than for other EU countries. Under Solvency II, smaller insurers predict larger changes in their portfolio structures, with Solvency II steering these companies to low-risk assets. Especially noticeable is the case of allocations to other equities/alternative investments, where an evidently decreasing trend within these companies is expected. On the other hand, we find that large insurance companies are expected to have rather unaffected asset allocations, arguably because these companies are well-capitalized and prepared.

9.1. Affecting financial markets and asset prices

Swedish life insurance companies manage large amounts of assets. Thus, if allocations to the asset classes change, it could have a severe impact on the financial markets. The extent of the effects will however depend on the timing and amount of the allocation changes. Regarding this, a change in asset allocation could potentially have an effect on the asset prices. One example that Solvency II standard approach in its current designs strongly promotes government bond holdings over more risky asset classes. The positive effect on the duration mismatch gap in combination with the favorable treatment under Solvency II pushes the life insurers towards government bond investments. This in turn possibly leads to higher prices (lower yields) on the instruments affected, while for other, more risky asset classes, the opposite may be true. The impact of Solvency II on asset allocation could lead to an increased demand for assets that everybody wants and a reduced demand for assets that nobody wants, thus affecting the pricing of the assets; leading to the price for the assets that the life insurers want possibly going up. If the acquisition value of the assets increases, by definition that implies that the return goes down.

9.2. Double advantage for the large insurers and tougher climate for the small insurers

We find that large insurers are little affected by the Solvency II capital requirements. Their expectations indicate relatively unchanged allocations to both fixed income securities and other equities/alternative investments. While the larger companies will be able to continue to hold diversified portfolios, the smaller insurers with initially high fixed income positions are expecting a further shift towards low risk assets. The effects of changed regulations have been suggested to have adverse effect on the smaller insurers (Van Rossum, 2005), which could be observed also on the Swedish life insurance market. The small companies currently have a relatively large exposure to other equities/alternative investments. This exposure does not seem to be sustainable under Solvency II. Our findings suggest a clear withdrawal from small insurers in commitments to this asset class, compensated by a further increase of already large fixed income allocations. It is suggested that the large insurers are likely to continue to invest in risky asset classes with higher capital charges, while some of the smaller companies will be forced to decrease their commitments in these assets. Therefore, we expect that the larger companies might possibly gain further advantages in that they can buy these assets cheaply as a result of decreased demand.

Table 14. Expected asset allocation changed for large and small life insurers

Large (> 100 bn SEK) Average Allocation		Expected Change
Fixed income	50.8%	=
Equity	30.4%	↓
Other equity / alternative investments	9.4%	↑
Real estate	9.4%	↓

Small (< 100 bn SEK) Average Allocation		Expected Change
Fixed income	71.5%	↑↑
Equity	10.5%	=
Other equity / alternative investments	14.0%	↓↓
Real estate	4.0%	=

9.3. The fixed income puzzle

While the clear trend is to increase allocations to fixed income securities, it is mainly the small insurers that are seeking to de-risk their portfolios by larger commitments to this asset class. Large companies are likely to hold the same positions in fixed income as before, even though their current allocation to this asset class is substantially lower than for the smaller companies (looking at the average). Even if this probably limits the effect on the fixed income market the large number of small life insurers predicting to increase their fixed income positions is likely to increase the competition for fixed income assets and thereby increasing the price (lowering the yields). The limited availability of fixed income on the Swedish market raises a concern about the increased demand of these assets. It might not be possible for companies to reallocate to this asset class to the extent that is expected unless more fixed income securities are issued.

The major issuers of bonds are the government, mortgage institutions and non-financial companies (Sveriges Riksbank, 2011). The current situation in Sweden, with a limited national debt and government finances in balance provides low incentive for the government to substantially increase the supply of government bonds. Investments in other European government bonds might be attractive due to the absent capital charge for spread risk, but will substantially lose in attractiveness, as the capital risk charge for currency risks will increase. Furthermore, as insurers' liabilities are valued at Swedish rates, this situation would create a risk in that the European rates will develop differently from the Swedish rates, creating a mismatch between the companies' assets and liabilities. Insurers are probably not willing to exchange one risk exposure for another; considering the cost of hedging currency risks, this alternative does not seem very attractive. Finally, the corporate bond market (excluding mortgage bonds) is rather small, a consequence of a well-functioning public equity market. If the increased demand of fixed income will lead to lower yields, this could provide an opportunity for Swedish companies to get relatively cheap financing by issuing bonds. The expected decrease of public equity in the insurers' portfolios further supports this trend. Overall, the need for a well-functioning corporate bond market seems apparent.

9.4. Equity markets vs. real estate: country-specific implications

Many large insurers seem to be hesitant to leave their public equity positions despite of relatively large initial allocations. We believe this situation could be country-specific for Sweden. The SST indicated reductions of insurers' equity positions below the 10% threshold, and European studies also expect significant reductions. Under Solvency II, public equity is treated worse than BBB-rated corporate bond and real estate investments. But historically, Swedish equity has been a good source of high returns (Dimson et al, 2002).

Investment in real estate on one hand represents a rather illiquid investment; on the other hand, it attracts lower capital charge than public equity, can provide good diversification effect and offers an inflation hedge. We believe that the adverse attitude to the asset class could have foundations in previous disappointments such as historical events and crises.

9.5. Understated benefits of the internal model

Under certain conditions, it will be possible for insurers to use risk weights other than the relatively crude standard approaches. This assumes that companies have developed their own complete or partial internal models for their risk calculation, a process that is both expensive and complex. The internal model must be approved by the local supervisory agency (Finansinspektionen in Sweden), so the company must convince the agency that risk weights the company wishes to use in its internal model are more accurate to use than the ones suggested by the standard approach. The choice of model introduces important implications especially for asset classes such as other equities/alternative investments. A lower risk weight would be rather simple to motivate under an internal model, but the costs must be exceeded by the benefits. Therefore, only companies with large exposure to assets such as private equity should consider this model. We find that there is a strong preference towards the standard model rather than the internal model most likely as a consequence from that the insurers allocation decisions are not very affected by the choice of model.

The consensus on the intent to apply the standard model is surprising, with regards to the potential advantages with an internal model. We find that life insurers follow two sets of risk reduction strategies. Either they carry large, more than 60%, allocations in fixed income products, or they seek to reduce risk through portfolio diversification. The company in our modeling case applies a risk diversification strategy that requires it to place larger allocations in for example alternative investments. The portfolio risk reduction is significant, exposing the company to only 0.09% insolvency risk, measured with 99.5% confidence. However, risk diversification strategies are not well recognized under the Solvency II treatment, and companies following the diversification strategy are likely to be required to raise their capital as a consequence of the high risk capital charges, especially due to their exposure to the alternative investments. While arguments are put forward to change the currently applied risk weights, the possibility of this change is remote. The general view seems to be that the current approach will remain, even though some still believe that changes might be made. Considering the current requirements, we can see two possible scenarios. Either the risk-diversifying companies will have to change their strategy and increase their positions in fixed income, or they will have to apply an internal model. If the first scenario happens, the Swedish life insurance industry might become more exposed to systemic risk, as the standard model encourages similar investment decisions. Pushing it to the extreme, all companies would have the same portfolio, thus resulting in the same returns. Competitive edge would be hard to achieve under these conditions. From this perspective, the internal model could be an attractive option. However, internal models are costly and complex. In summary, the adoption of the internal model might provide a competitive advantage if the insurer has large allocations, for example, to hedge funds and private equity. But most insurers have little exposure to these asset classes compared to, for instance, fixed income securities and public equity.

9.6. Allocation changes from the perspective of policyholders – a possible shift in product design

The shift toward de-risked asset allocations would provide a more stable environment at the cost of lower returns. This will impact the policyholders expected return, but could be motivated as policyholders receive a higher level of protection in exchange. Whether or not this is perceived to be good probably depends on an angle of view. For life insurers that offer high minimum guarantees the de-risked portfolio may cause problems in meeting their obligations to policyholders. One consequence of the punishment of traditional life insurance products might well be a shift towards unit-linked products, where the investment risk is shifted to policyholders. This would increase the risk for individual policyholders, who under these policies would be only guaranteed the market value of the investments – that is, they have no guarantees. If this development occurs as a result of the implementation of Solvency II, one could largely question the regulation's main objective to provide better protection for the customers. In this matter, politicians should carefully investigate how the regulation will affect product design on the Swedish life insurance market.

9.7. A long event window of change

Insurance companies expect a relatively clear direction for how their asset allocations will be impacted by Solvency II. However, some adjustments are believed to have already gone into effect. For coming effects a prolonged event window of change can be expected. As mentioned earlier, experts elaborate that it could take years before companies have truly adjusted their investment strategies according to the new regime. Looking at how the companies are expecting to adjust over the coming three years it is not always consistent with the effects expected from Solvency II regulation. Some insurers express the lack of clarity regarding implementation date; affecting how they look upon the timing of changes. There seem to be conflicting opinions as to whether Solvency II will be implemented according to plan.

10. Concluding Remarks

Following a lengthy period of development, the European regulation known as Solvency II is soon to be legislated into force in Sweden. We find that both Swedish life insurance companies and experts expect the changes in the regulatory landscape to have an impact on the companies' investment strategies. No life insurer will be entirely unaffected by the incoming regulations yet we find that preparatory factors have contributed to that the effects are less pronounced than initially believed.

Even though the general anticipation is a shift towards a low-risk environment, the Solvency II impact on asset allocation will be largely dependent on the companies' size and capitalization. Larger companies are well-capitalized and prepared for the incoming regulation. We find that they are expecting to be quite unaffected by Solvency II, being able to continue to invest in risky asset classes that attract high capital charges. Small insurers are likely to be more affected by the regulatory changes, being forced to move allocations to low-risk assets. Overall, demand for fixed income securities is expected to increase as insurers de-risk their allocations. In contrast, riskier assets such as public equity and other equities/alternative investments are punished by high capital charges. Solvency II will in terms of capital adequacy make it more expensive to hold these assets, which are expected to receive less committed capital from Swedish life insurance companies. The expected change in allocation to real estate is more uncertain and we find that expectations go in both directions.

While large insurers will be able to continue to invest in high-risk assets with good expected return, small insurers do not appear to have the same opportunity to hold high-return investments with high capital charges. The small insurers on the other hand are expected to be the main driver of the increased demand for fixed income securities, as the trend for small insurers seems to be to substitute their quite large commitments to alternative investments with larger exposure to fixed income securities. As a result of the shift in asset allocation, we find that a general decrease of returns in the industry is expected. The adoption of lower risk strategies will likely decrease the expected returns. However, we expect that at least a part of the increased cost will be transferred to policyholders and/or reflected in changes in product design.

We find that most insurers will adopt the standard model and while our illustration with a fictive model indicates potential capital charge reduction for the companies following the risk diversification strategies, it seems that the companies are deterred by the high costs and complexity involved in the development of such a model.

Overall, expectations reflect that the regulatory changes introduced with Solvency II will have an impact on asset allocation within Swedish life insurance companies. We expect that some adjustments have already been made since the regulatory changes have long been expected. As well, Swedish insurers should have a good understanding of risk-based regulation, given their experience with the traffic-light model. We expect that changes will be adopted over a longer period also in the future.

11. Implications for Future Research

The aspiration with this thesis was to observe the direction of the asset allocation changes. Thus, we recognize that our thesis in this sense indicates possible trends in the shift of asset allocations but we have not evaluated the total size of the changes. We focused on life insurers and did not investigate Solvency II effects on non-life insurers or reinsurance, where the results could differ from this study. Our thesis did not include operational risks and new disclosure requirements. The study is country-specific, so different results could be seen in other countries. The model that we developed for the study is a simplification of the complex internal model. Our model does not provide a clear answer as to what assets it would be most beneficial to allocate to, as we did not perform portfolio optimization. But the model does indicate the benefit of applying an internal model and by this contributes to new discussion of its potential use. Finally, our study is limited to the effects of the Solvency II regulation only; the final shifts in portfolio could look different if the changes of accounting treatments or other regulations were considered. Solvency II is yet to be implemented, and until then it could undergo significant changes which in turn could change some implications presented in this study.

Our study identified several areas that might be interesting to investigate; we put forward the following suggestions for possible topics that could add important insight into the effects of Solvency II:

1. ***Solvency II could have an impact on the financial markets in Sweden.***

Life insurers manage large portfolios thus reallocations could lead to shifts in market demand, with implications for the financial markets. The scale of the asset shifts would be particularly interesting to examine in relation to fixed income markets. The relatively small Swedish bond market might see decreasing yields on fixed income instruments as result of increasing demand from investors.

2. ***Solvency II could have an impact for the policyholders of Swedish life insurance.***

The insurance companies are unlikely to absorb increased costs themselves and will try to shift the costs to their customers. Life insurers are letting the guarantee portfolios expire and motivate customers to substitute unit-linked products. This creates an externality where risk-averse customers lose protection against risk and carry the costs.

3. ***The limited use of risky investments might require changes in performance rewards.***

The lower possible returns and limited choice of investment products could result in less motivated portfolio managers and drive the most skilled managers out of the life insurance company, so a new motivational structure might be required.

4. ***Are there political interests behind Solvency II?***

Controversial risk-free treatment of European government bonds and the initial intent to leave pensions out of Solvency II scope both imply possible political bias. A closer examination of parties involved in development and lobbying groups could uncover those who derive the largest benefits from the new standard.

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Assistant Professor, Henrik Andersson, 2012-04-22

Appendix – A: Internal Model and Standard Model Simulation

a. Theory and method

The traditional portfolio theory, as defined by Markowitz (1952), looks for highest expected returns at a given level of risk. The risk-averse investor expects a premium for taking up the increased risk, which turns into higher expected returns. The combination of the highest expected returns and the lowest risk makes up the efficient frontier. This traditional framework in the cited text applied only to the investment portfolio, representing the asset side of the balance sheet. In our model, however, we simplify the complex internal life insurance model, and instead of using a multivariable stochastic model for life insurance liabilities, we treat them as a short position in corporate bonds. This approach allows us to move the liabilities onto the asset side of the balance sheet and incorporate them in the portfolio framework. We do not try to optimize for the best risk-return allocations, but only calculate the expected portfolio returns and expected portfolio volatility of the current positions. We assume that expected returns are normally distributed and use the two variables to find the probability that the insurer will become insolvent. Insolvency is represented by 100% decrease in returns, which would in the rearranged portfolio reduce the equity to zero. These asset allocations are representative for only one Swedish life insurance company, and so we recognize that this test could yield different results for other insurers.

i. Rearranging the innitial balance sheet

As is common for the industry, the examined company has a large, 62% allocation placed in fixed income instruments, where 38.5% is in investment-grade corporate bonds and 21.5% is in long-term government bonds. The company placed a surprisingly high allocation of 19% in hedge funds, which are classified together with emerging markets (2%) under the alternative investments. This allocation exposes the company significantly to the capital charge under the standard model, which treats other equities/alternative investments as the group with the highest risk and so incurs the highest capital charge. In relation to survey results, the 10% allocation to public stocks is relatively small. The smallest allocations are placed in private equity and real estate, limiting their contribution to returns, diversification or capital charges under the standard model.

To test for the probability of default, we rearranged the initial balance sheet, and shifted the liabilities to the asset side, assuming a large short position and substantial leverage (see Figure 17).

Figure 17. Rearranged balance sheet used to determine probability of failure

Base Case

Asset		Liabilities	
Stocks	9.0%		
Private Equity	5.0%	**Equity**	**17%**
Goverment Bonds			
- Short term	2.0%		
- Long term	21.5%	**Liabilities**	**83%**
Corporate Bonds	38.5%		
Real Estate	3.0%		
Alternative Investments	21.0%		

Rearranged

Asset		Liabilities	
Stocks	54.2%		
Private Equity	30.1%		
Goverment Bonds			
- Short term	12.0%		
- Long term	129.5%	**Equity**	**100%**
Corporate Bonds	231.9%		
Real Estate	18.1%		
Alternative Investments	126.5%		
Liabilities	**-502%**		

ii. Indice choice and reasoning

For **liabilities**, we assumed the equivalence to the corporate bond with the long duration of 15+ years and A credit rating. The choice of the coupon bond instrument is intended to mimic the predictability of the insurance policy claims. The short position mimics the cash outflow arising from settlements of life insurance policy claims. We chose long-term bonds as a widely-used liability matching instrument (Elton, 2011), with sufficiently long duration matching the characteristic of life insurance policies. The lower credit rating was chosen to represent risks such as early surrender rate or actuarial misstatement of longevity.

Equity is represented by **MSCI World (MSWRLD)** which measures public equities in developed countries. This choice was motivated by the intent to preserve the same index as was used by the EIOPA to determine the calibration of the equity stress test. **Private equity** is represented by **UK-Ds Inv.Trusts Private Equity (ITVCAPT),** an index that covers both listed and non-listed private equities. We elected to use a different index from the EIOPA, because we believe it is insufficient to consider the listed equity only, as it does not properly captures the volatility arising from illiquidity of unlisted private equity. For **governmental bonds** we chose **FTSE Global Govt. E-Zone 1-3Y (RGAL1T3)** and **BD Benchmark 30 Year DS Govt. Index (BMBD30Y)**, two purely European indexes. We acted under the assumption that insurers will allocate the majority of governmental bonds allocation in instruments issued in the European Economic Area to take advantage of the stress test exception granted by Solvency II. The choice of the 30-year maturity for the case of long-term bonds should represent the need for the hedging instrument in the asset–liability duration gap matching. For **corporate bonds** we use **IBOXX £ Corp. All Mats. A (IB£CAAL)** which represents the investment grade bonds, with risk character suitable for the risk-averse character of life insurers. We did not set a preference for risk maturities, because the bonds offer the opportunity of flexible investment choices for fund managers seeking to increase returns or match the missing coupon cash flow streams. **Real estate** is represented by **FTSE EPRA/NAREIT Developed (FEGLOBL)** which is was used to determine the calibration for the Solvency II property stress test. For **alternative investments** we use **HFRI Fund Weighted Hedge Fund (HFRIFWC)**, global hedge fund performance index which is considered the industry benchmark and is one of the indexes used in Solvency II stress test calibration for alternative investments. Choice of the index is motivated by the fact that hedge funds account for the majority of the alternative investments in the selected company. The **corporate bonds** are represented by the investment-grade long maturity bond index **IBOXX £ Corp. 15+ Years A (IB£CA15)**. The choice of A rating was made to approximate the effects of the actuarial and surrender risks, while the long maturity corresponds to the characteristics of life insurance policy.

iii. Calculation of portfolio expected return and standard deviation

We calculated the expected return ($\overline{R_P}$) and standard deviation (σ_P) of the rearranged portfolio. The examined company has a portfolio return, $\overline{R_P}$, of 8.32%, calculated as a weighted average of expected returns for each asset allocation (Equation 1):

$$\overline{R_P} = \sum_{i=1}^{N} x_i \overline{R_i} \qquad \textit{(Equation 1)}.$$

The company has standard deviation, σ_P , of 0.35, calculated according to formula below (Equation 2). The portfolio standard deviation is not a weighted average summation because it is considered that some securities move in directions that offset each other's volatility:

$$\sigma_P = \left[\sum_{i=1}^{N} X_i^2 \sigma_i^2 + \sum_{i=1}^{N} \sum_{\substack{j=1 \\ j \neq 1}}^{N} X_i X_j \sigma_i \sigma_j \rho_{ij}\right]^{1/2} \quad \textbf{(Equation 2).}$$

where

1) σ_i is standard deviation of return of the security;
2) X_i is a percentage weight of asset allocation in rearranged balance sheet; and
3) ρ_{ij} is a correlation between the returns of two securities.

Monthly returns were extracted from Datastream. For each index we estimated standard deviation, σ_i, calculated (Equation 3) as a square root of the estimated variance of the volatility of the monthly returns for the period 1991 to 2011. Some exceptions were made and a shorter period used due to unavailability of the earlier data set (see Section 8, Table 12):

$$\sigma_i = \left[\sum_{i=1}^{N} \frac{R_{ij} - \overline{R_j}}{N}\right]^{1/2} \quad \textbf{(Equation 3).}$$

Correlations between monthly returns of all asset class pairs, ρ_{ij}, were calculated from the data set (Equation 4), and the results of our calculations are presented in the Table 14. Correlation is the standardized measure with value always between -1 and +1, where +1 means that stocks move in the same direction and the co-movement is same is of the same strength. A value close to zero means that stocks movements are unrelated:

$$\rho_{ij} = \frac{\sigma_{ij}}{\sigma_i \sigma_j} \quad \textbf{(Equation 4).}$$

where covariance, σ_{ij}, is the product of the deviations of the returns for two assets from their mean values (Equation 5):

$$\sigma_{ij} = \frac{1}{T-1} \sum_{t}^{T} \left[\left(R_{i,t} - \bar{R}_i\right)\left(R_{j,t} - \bar{R}_j\right)\right] \quad \textbf{(Equation 5).}$$

iv. Comments on estimates and expected return premiums

Private equity and real estate show the highest standard deviations of σ_B = 0.29 and σ_F = 0.24 subsequently, which could be interpreted as a consequence of low liquidity. On the other hand, the short-term government bonds, according to expectations, show the lowest volatility of σ_C = 0.02. It should be noted that the index used in calibration of property by Solvency II regulators misstates the diversification effects of direct investment in real estate. The index represents traded real estate, which has strong correlation to equity and so understates the potential diversification effects (Hoevenaars et al., 2008). Despite our prior knowledge of this issue, we rely on the choice of EIOPA due to unavailability

of the data series with the length corresponding to the period of our choice. The index shows a high correlation of 0.7553 between the public equity and real estate index, which is same as the one found in the standard risk correlation matrix of Solvency II calibrations. As such, both our test and Solvency II disregard the fact that the real estate is less sensitive, has good diversification properties (Chaney & Hoesli, 2010) and in effect overstates the probability of bankruptcy.

We initially calculated averages of annualized returns to find expected returns ($\bar{R}_t$). But in some instances such as in the case of bonds and hedge funds, our returns were significantly affected by the recent crises. For European bond indexes, only ten-year data were available, and the returns were understated from the long-term perspective; in the case of the short-term government bonds, they even turned negative (Ibbotson, 2012). Referring to the literature in the text, which states that short estimation span reduces statistical significance and makes the task of the precise prediction almost impossible (Elton, 2011; Timmermann, 2008), we decided to use the risk premiums determined by an expert for the given investment security. We admit a bias in this approach, because we use different data sets for returns and standard deviation, which are in some instances based on US studies (Ibbotson, 2012). At the same time, however, the bias is mitigated as for the public equities, private equity and real estate the market premiums differ at most 0.2% from our original estimates.

For **equities** we opt for the average industry stance and assume 5% market premium, implying the expected return, $\overline{\mathrm{R_A}}$ = 7.14% (Fernandez, 2006). **Private equity** has higher expected return than public equity because of the effects of the illiquidity premium, which is assumed to be 2% over the public equity, giving us the expected $\overline{\mathrm{R_B}}$ = 9.14% (Jegadeesh, 2010). For **short-term government bonds** we use the risk free rate, $\overline{\mathrm{R_C}}$ = 2.14%, calculated as the historical average rate of the past 10 years for European Interbank overnight deposits. For **long-term government bonds** we assume the risk premium of 2.2% corresponding to $\overline{\mathrm{R_D}}$ = 4.34%, which is based on the lengthy data series stretching 84 years back (Ibbotson, 2012).The **corporate bonds** in the portfolio of our company are assumed to be investment-grade and with average AA rating, which motivates the higher risk premium of 2.5% and corresponding to $\overline{\mathrm{R_E}}$ = 4.64% (Ibbotson, 2012).We assume a risk premium of 4% for **real estate,** yielding for long-term and illiquidity premium and giving us expected return of $\overline{\mathrm{R_F}}$ = 6.14%, which is higher than expected return for corporate bonds (Ibbotson, 1984).For **alternative investments** we choose $\overline{\mathrm{R_G}}$= 5.7% (Mackey, 2006), which is reasonable, knowing that hedge funds use dynamic trading strategies and have skilled portfolio managers who can take advantage of the volatile markets (Elton, 2011). Finally, for **liabilities** we use the same expected return of $\overline{\mathrm{R_H}}$ =4.64% as we do for corporate bonds. Expected return for liabilities is higher than the majority of current guarantee rates, but we find it reasonable under the assumption that many contracts have embedded a profit-sharing option, which motivates insurers to generate higher returns than the promised guarantees (Grosen and Jørgensen, 2002).

Table 15. Correlation between returns of the benchmark indices

	Public Equity	Private Equity	Government Bonds Short	Government Bonds Long	Corporate Bonds	Real Estate	Alternative Investments	Liablities
A. Public Equity	1.00							
B. Private Equity	0.69	1.00						
C. Government Bonds Short	-0.37	-0.31	1.00					
D. Government Bonds Long	-0.19	-0.23	0.42	1.00				
E. Corporate Bonds	0.29	0.27	0.13	0.43	1.00			
F. Real Estate	0.76	0.60	-0.33	-0.10	0.32	1.00		
G. Alternative Investments	0.27	0.41	-0.18	-0.22	0.22	0.27	1.00	
H. Liablities	0.27	0.19	0.15	0.50	0.92	0.29	0.16	1.00

v. Calculating probability of bankruptcy with normal distribution

Having both portfolio return and portfolio standard deviation, we perform the last step of our analysis and calculate the probability of bankruptcy. For this purpose, we assume that the returns are symmetrically distributed around the expected portfolio return ($\overline{R_P}$) and use the estimated portfolio standard deviation (σ_P) to determine the probability of the -100% negative returns (Equation 6), corresponding to the reduction of the equity to zero, in other words insolvency. The case company has probability of bankruptcy of 0.09% estimated with VaR 99.5% confidence level.

$$Pr(\overline{R_P} < -1) = Pr(Z < Z_{-1}) = Pr\left(Z < \frac{-1-\overline{R_P}}{\sigma_P}\right) = Pr\left(Z < \frac{-1-0.083}{0.346}\right) = Pr(Z < -3.13) \approx 0.09\% \quad \textbf{(Equation 6).}$$

b. Standard model

The section below describes the simplified calculations according to the Solvency II standard model. For simplicity, we focus only on the market stress calibrations and consider only the key risk modules, which apply to the investments on the asset side. However, we do not perform the interest risk stress test and do not use any stress test related to actuarial or operational risks. As a consequence, the calculated capital charge, SCR_{test},understates the total capital requirement as required by Solvency II. Despite the simplifications, we opt to apply the simplified standard model test in the light of the recent QIS 5 findings, according to which market risk accounts for 67% of the total SCR requirements (EIOPA, 2011).

To calculate the total SCR_{test}, each asset allocation is multiplied by the corresponding stress test percentage, giving us the SCR_i, capital charge for each asset allocation. The stress charge of 10.5 % for corporate bonds was derived by regulatory formula (Art. 105(4)(d) of Directive 2009/138/EC), where 10-year duration and A rating were used as inputs. Summation of capital charges gives 2.48 billion SEK capital requirements prior to the risk diversification effects (see Table 15).

Table 16. Calculation of SCR for individual asset class

Asset Class	Test Charge	(000 000s SEK)	SCRi
Public Equity	39%	1,080	421
Private Equity	49%	600	294
Government Bonds Short	0%	240	0
Government Bonds Long	0%	2,580	0
Corporate Bonds	11%	4,620	485
Real Estate	25%	360	90
Alternative Investments	49%	2,520	1,235
Total (exl. Risk diversification)			**2,525**

Solvency II does not assume a perfect correlation of 1 between the risks. To incorporate the effects of the diversification, we apply the risk correlation matrix as defined by the standard model, and calculate the SCR_{test} using the three main stress tests: equity, property and spread (Equation 7).

$$\mathrm{SCR}_{Test} = \sqrt{\sum_{i,j} Corr_{i,j} * SCR_i * SCR_j} \qquad \textit{(Equation 7)}.$$

The capital charge for equity, SCR_{Equity}, of 1.86 billion (in SEK) is calculated assuming the standard correlation of 0.75 between the public equity (Type1E) and other equities/alternative investments (Type2E), (Equation 8):

$$SCR_{Equity} = \sqrt{SCR_{Type\ 1\ E}^2 + 2 * 0.75 * SCR_{Type1E} * SCR_{Type2E} + SCR_{Type2E}^2} \qquad \textit{(Equation 8)}.$$

Calculated SCR_{equity} = 1.87 billion and SCR_{test} = 2.32 billion.

Appendix – B: Survey Questionnaires

Questionnaire for Insurance Companies

Investment focus

1. What is the fair value of the investments in your portfolio/portfolios?

<10bn SEK 10-50bn SEK 50-100bn SEK >100bn SEK

2. What is the primary focus for your investments?

_____

3.1. Breakdown your invested capital (%) within the asset class…

(i) …public equity ____%

(ii) …alternative investments[5] ____%

(iii) …fixed income ____%

(iv) …real estate ____%

3.2. If possible; Breakdown your invested capital (%) within …

(i) … private equity ____%

(ii) … commodities____%

(iii) … hedge funds ____%

(iv) … emerging markets equity____%

[5] *Alternative investments("other equities")* include private equity, commodities, hedge funds and emerging markets public equity with very different characteristics.

3.3. If possible; Breakdown your invested capital (%) within …

(i) … governmental bonds____%

(ii) … investment grade corporate bonds____%

(iii) … corporate bonds below investment grade ____%

(iv) … emerging markets debt____%

4. How frequently are (i) tactical[6] and (ii) strategic[7] asset allocation targets re-determined?

i)	Weekly	Monthly	Quarterly	Yearly	Not in use
ii)	Weekly	Monthly	Quarterly	Yearly	Not in use

5. To what extent do you use i) financial derivatives and ii) reinsurance to manage risks in your portfolio?

i)	None	Little	Medium	Large	Very Large
ii)	None	Little	Medium	Large	Very Large

[6] Investment horizon < 12 months
[7] Investment horizon >12 months

Allocations

6.1. How has your allocation to (i) Public equity, (ii) Alternative investments, (iii)Fixed income and (iv) Real estate changed during the **last 3 years**?

i.	Increase	Decrease	Remain unchanged	Don't know
ii.	Increase	Decrease	Remain unchanged	Don't know
iii.	Increase	Decrease	Remain unchanged	Don't know
iv.	Increase	Decrease	Remain unchanged	Don't know

6.2. More specific regarding Alternative investments; How has your allocation to (i) private equity, (ii) commodities, (iii) hedge funds and (iv) emerging markets equity changed during the **last 3 years**?

i.	Increase	Decrease	Remain unchanged	Don't know
ii.	Increase	Decrease	Remain unchanged	Don't know
iii.	Increase	Decrease	Remain unchanged	Don't know
iv.	Increase	Decrease	Remain unchanged	Don't know

6.3. More specific regarding Fixed income; How has your allocation to (i)Government bonds,(ii) Investment grade Corporate bonds, (iii)Corporate bonds below investment grade and (iv)emerging markets debt changed during the **last 3 years**?

i.	Increase	Decrease	Remain unchanged	Don't know
ii.	Increase	Decrease	Remain unchanged	Don't know
iii.	Increase	Decrease	Remain unchanged	Don't know
iv.	Increase	Decrease	Remain unchanged	Don't know

7.1. How do you expect your allocation to (i) Public equity, (ii) Alternative investments, (iii) Fixed income and (iv) Real estate change in the **next 3 years** (including current year)?

i.	Increase	Decrease	Remain unchanged	Don't know
ii.	Increase	Decrease	Remain unchanged	Don't know

iii.	Increase	Decrease	Remain unchanged	Don't know
iv.	Increase	Decrease	Remain unchanged	Don't know

7.2. More specific regarding Alternative investments; How do you expect your allocation to (i) private equity, (ii) commodities, (iii) hedge funds and (iv) emerging markets equity change in the **next 3 years** (including current year)?

i.	Increase	Decrease	Remain unchanged	Don't know
ii.	Increase	Decrease	Remain unchanged	Don't know
iii.	Increase	Decrease	Remain unchanged	Don't know
iv.	Increase	Decrease	Remain unchanged	Don't know

7.3. More specific regarding Fixed income; How do you expect your allocation to (i) Government bonds,(ii) Investment grade Corporate bonds, (iii)Corporate bonds below investment grade and (iv)emerging markets debt change in the **next 3 years** (including current year)?

i.	Increase	Decrease	Remain unchanged	Don't know
ii.	Increase	Decrease	Remain unchanged	Don't know
iii.	Increase	Decrease	Remain unchanged	Don't know
iv.	Increase	Decrease	Remain unchanged	Don't know

Allocation under Solvency II

8. How will the proposed Solvency II framework affect the frequency of the re-determination of (i) tactical and (ii) strategic asset allocation targets**?**

i	Increase	Decrease	Remain unchanged	Don't know
ii	Increase	Decrease	Remain unchanged	Don't know

9. How will the proposed Solvency II framework affect your allocation to (i) Public equity, (ii) Alternative investments, (iii) Fixed income and (iv) Real estate?

i.	Increase	Decrease	Remain unchanged	Don't know

ii.	Increase	Decrease	Remain unchanged	Don't know
iii.	Increase	Decrease	Remain unchanged	Don't know
iv.	Increase	Decrease	Remain unchanged	Don't know

10. More specific regarding Alternative investments; How will the proposed Solvency II framework affect your allocation to (i) private equity, (ii) commodities, (iii) hedge funds and (iv) emerging markets equity?

i.	Increase	Decrease	Remain unchanged	Don't know
ii.	Increase	Decrease	Remain unchanged	Don't know
iii.	Increase	Decrease	Remain unchanged	Don't know
iv.	Increase	Decrease	Remain unchanged	Don't know

11. More specific regarding Fixed income; How will the proposed Solvency II framework affect your allocation to (i)Government bonds,(ii) Investment grade Corporate bonds, (iii)Corporate bonds below investment grade and (iv)emerging markets debt

i.	Increase	Decrease	Remain unchanged	Don't know
ii.	Increase	Decrease	Remain unchanged	Don't know
iii.	Increase	Decrease	Remain unchanged	Don't know
iv.	Increase	Decrease	Remain unchanged	Don't know

12. How do you expect changes to asset allocation (due to the proposed Solvency II framework) to be implemented? Please mark the most probable alternative.

_____ All at once, directly impacting asset markets over a short period of time

_____ On a phased basis over a long period of time, with no shock effect to markets

_____ In different ways, so no asset class is adversely impacted

13. How do you expect the changes to asset allocation to effect your overall returns (considering the proposed Solvency II framework)

Increase Decrease Remain unchanged Don't know

14. How will the proposed Solvency II framework affect your use of i) Financial derivatives and ii) Reinsurance to manage risks in your portfolio?

i. Increase Decrease Remain unchanged Don't know

ii. Increase Decrease Remain unchanged Don't know

15. If you answered **"Increase"** on question **14. i)**; please comment or specify what type of Financial Derivatives will apply.

_____

16. How will the proposed Solvency II framework affect your time horizon of investments?

Increase Decrease Remain unchanged Don't know

17. How do you judge the overall effect of Solvency II on the Life insurance industry in Sweden?

Positive Neutral Negative Don't know

Calculation of capital requirements

18. Do you use the standard model or do you develop an internal model?

Standard Model Internal Model Partial internal model Don't know

19. If you answered **"Partial internal model "**on the previous question; please, specify for which areas that falls under this model.

_____

20. Does the choice of model (standard model or internal model) affect your allocation to (i) Public equity, (ii) Alternative investments, (iii) Fixed income and (iv) Real estate?

(i)	Yes	No	Don't know
(ii)	Yes	No	Don't know
(iii)	Yes	No	Don't know
(iv)	Yes	No	Don't know

21. Solvency II sets capital charges for different assets according to their risk level, what do you expect to happen to the capital charges of Solvency II?

Regulators should reconsider the capital charges for the asset classes

Yes No Don't know

Please, comment or specify

_____

22. Does Solvency II go too far in ensuring that insurers[8] have sufficient capital to meet their guarantees?

Yes No Don't know

[8] Swedish life insurance companies

Basis for Interview with Experts

Overview

1. What type (size) of insurers[9] will be affected the most by Solvency II?

Small Large Don't know

2. Do you believe that Solvency II will be implemented according to plan?

Yes No

3. If you answered **"No"** on the previous question; what do you believe is the major reason for that the implementation of Solvency II will be postponed?

_____

4. What do you believe will happen to insurers' overall commitments to (i) Public equity, (ii) Alternative investments, (iii) Fixed income and (iv) Real estate going forward?

(i)	Increase	Decrease	Remain unchanged	Don't know
(ii)	Increase	Decrease	Remain unchanged	Don't know
(iii)	Increase	Decrease	Remain unchanged	Don't know
(iv)	Increase	Decrease	Remain unchanged	Don't know

[9]Swedish life insurance companies

Allocations under Solvency II

5. With regards to the previous question, do you believe this effect to mainly be a response to the incoming regulation of Solvency II?

Yes No Don't know

6.1. What is your perception of how the proposed Solvency II framework will affect allocations to Public equity (i), Alternative investments (ii), Fixed income (iii) and Real estate (iv)?

(i)	Increase	Decrease	Remain unchanged	Don't know
(ii)	Increase	Decrease	Remain unchanged	Don't know
(iii)	Increase	Decrease	Remain unchanged	Don't know
(iv)	Increase	Decrease	Remain unchanged	Don't know

6.2. More specific regarding Alternative investments; How do you believe the proposed Solvency II framework will affect allocations to private equity (1), commodities (2), hedge funds (3) and emerging markets equity (4)

(1)	Increase	Decrease	Remain unchanged	Don't know
(2)	Increase	Decrease	Remain unchanged	Don't know
(3)	Increase	Decrease	Remain unchanged	Don't know
(4)	Increase	Decrease	Remain unchanged	Don't know

6.3.. More specific regarding Fixed income; How do you believe the proposed Solvency II framework will affect allocations to Governmental bonds (I), Investment grade Corporate bonds (II), Corporate bonds below investment grade (III) and emerging markets debt (IV)

(I)	Increase	Decrease	Remain unchanged	Don't know
(II)	Increase	Decrease	Remain unchanged	Don't know
(III)	Increase	Decrease	Remain unchanged	Don't know
(IV)	Increase	Decrease	Remain unchanged	Don't know

7. How do you expect changes to asset allocation (due to the proposed Solvency II framework) to be implemented? Please mark the most probable alternative.

_____ All at once, directly impacting asset markets over a short period of time

_____ On a phased basis over a long period of time, with no shock effect to markets

_____ In different ways, so no asset class is adversely impacted

8. How do you expect the changes to asset allocation to effect the insurers' overall returns (considering the proposed Solvency II framework)

Increase Decrease Remain unchanged Don't know

9. What is your perception of how the proposed Solvency II framework will affect the use of a) Financial derivatives and b) Reinsurance to manage risks in the insurers' portfolios?

a) Increase Decrease Remain unchanged Don't know

b) Increase Decrease Remain unchanged Don't know

10. If you answered **"Increase"** on question **11. a)**; please comment or specify what type of Financial Derivatives will apply.

_____

11. What is your perception of how the proposed Solvency II framework will affect the time horizon of investments for the insurers?

Increase Decrease Remain unchanged Don't know

12. How do you judge the overall effect of Solvency II on the Life insurance industry in Sweden?

Positive Neutral Negative Don't know

Calculation of capital requirements

13. Which will be the predominant model that insurers will use?

Standard Model Internal Model Partial internal model Don't know

14. Solvency II sets capital charges for different assets according to their risk level, what do you expect to happen to the capital charges of Solvency II?

i) Regulators should reconsider the capital charges for the asset classes

Yes No Don't know

Please, comment or specify

_____

ii) Regulators should maintain the current capital charges

Yes No Don't know

15. Does Solvency II go too far in ensuring that insurers have sufficient capital to meet their guarantees?

Yes No Don't know