

The evolution of insurer portfolio investment strategies for long-term investing

by

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The recent global financial crisis, combined with regulatory changes in financial industries, has altered the financial landscape in terms of how financing can be achieved and the potential role of institutional investors. The potential role that insurers, particularly life insurers and pension funds, can play as long-term institutional investors has become a central topic of discussion in various fora. How this role develops will, in the long run, affect how firms obtain financing for their investments and ultimately lead to growth of the real economy. This article provides an overview of the evolving investment strategies of insurers and identifies the opportunities and constraints they may face with respect to long-term investment activity. The report investigates the extent to which changes in macroeconomic conditions, market developments and insurance regulation may affect the role of insurers in long-term investment financing. It concludes that regulation should neither unduly favour nor hinder long-term investment as such, but place priority on incentivising prudent asset-and-liability management with mechanisms that allow for a “true and fair view” of insurers’ risk exposures. In risk-based solvency regulation, an asset’s risk relative to liabilities is reflected in the capital requirements.

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Executive Summary

The recent global financial crisis, combined with regulatory changes in financial industries, has altered the financial landscape in terms of how financing can be achieved and the potential role of institutional investors. Before the crisis, banks and capital markets were significant sources for project financing. However, increases in the cost of interbank lending and the expectation of tighter regulations have constrained the ability of banks and equity markets to provide long-term financing. The potential role that insurers, particularly life insurers and pension funds, can play as long-term institutional investors has become a central topic of discussion in various fora. How this role develops will, in the long run, affect how firms obtain financing for their investments and ultimately lead to growth of the real economy.

In the current low interest rate environment, financing long-term investment can be beneficial for *inter alia* life insurers (as well as pension funds) looking to match their long-term liabilities with long duration assets, and having a steady investment income stream from these investments. On the other hand, the risks associated with such assets and their regulatory treatment may inhibit insurance company investments.

The objective of this report is to provide an overview of the evolving investment strategies of insurers and to identify the opportunities and constraints insurers may face with respect to long-term investment activity. The report investigates the extent to which changes in macroeconomic conditions, market developments and insurance regulation may affect the role of insurers in long-term investment financing. To complement the analysis, the OECD carried out the OECD Large Insurer Survey on Investment between February and June 2015 to collect information from insurers on investment decisions around the world with a view of better understanding changes in their long-term investment activity across time, particularly for infrastructure investments.

In response to the recent financial crisis and the current macroeconomic conditions, the risk appetites of insurers and pension funds are diversifying. In searching for higher yields, some fund managers have opted for “re-risking” strategies by investing in alternative assets (illiquid assets) or in emerging markets. Others have chosen “de-risking” strategies by investing in shorter-term assets so as to cope with changing regulation. Further, since fixed income instruments are presently the predominant asset class of life insurers, low interest rates have led to lower investment income and earnings might be insufficient to cover investment guarantees that often constitute an important product feature of life insurance contracts.

The asset and liability management (ALM) strategies of insurers vary depending on the company’s lines of business. Non-life insurers primarily use stochastic models such as dynamic financial analysis (DFA) to cope with their liquidity risks. Life insurers generally engage in immunisation strategies, optimisation strategies, and scenario analyses, where stochastic modelling is extensively used in economic scenario generators (ESG) for

valuation and risk modelling purposes. Derivatives are considered a valuable instrument for the ALM of insurance companies and pension funds, and a liquid derivatives exchange market with a sufficiently long time horizon is important for this purpose. ALM theories suggest that direct long-term investments are, in principle, a suitable asset class for life insurers, and less so for non-life insurers due to the illiquidity of life insurers' liability portfolio and as surrender payments and unexpected benefit payments are a less important feature of life insurers' portfolios. However, some lines of non-life business have long-term payout patterns, such as liability insurance, with the possibility of investing in long-term duration assets.

Large insurers hold relatively more diversified insurance and investment products, which give large insurers greater latitude to invest in assets or underwrite obligations which could otherwise be considered risky on a stand-alone basis. Generally speaking, risk-taking by insurers may become excessive if the risk of an insurer's liabilities increases without the insurer charging sufficient premiums or if the insurer has an imprudent underwriting policy. Insurers can change their asset allocation toward a riskier investment portfolio after collecting premiums from policyholders or reduce their equity capital endowment to the minimum regulatory capital required, leading to a higher probability of insolvency. Otherwise, an insurer may fail to sufficiently manage risks through reinsurance arrangements.

Additional considerations to insurers' long-term investment include the continued slow growth of major economies coupled with an aging population in certain developed markets may negatively impact the insurance industry's growth in some economies. Exposure to the default risk of sovereign bonds of certain countries and bonds of other financial institutions remains a concern in many countries (particularly some European countries); although this largely depends on the extent to which insurers are themselves invested in such assets or are invested in companies that are invested in such assets. Additionally, emerging risks such as cyber risks and world/regional health risks (for example, EBOLA) are important emerging issues for insurers.

Many countries have implemented or are planning to implement a risk-based solvency regime. Under such a regime, the method for evaluating insurer assets and liabilities, in most cases transitions to a fair valuation. The evolution of regulatory regimes will impact insurers' investment decisions, including affecting investment in certain illiquid assets, and may influence long-term investments if it appears (dis)advantageous. For example, regulatory regimes that use a short-term time horizon could discourage matching long-term liabilities with infrastructure investments.

In this respect, it is expected that governance requirements that have insurers internally assess their own risks and solvency (such as ORSA in the EU or the Risk Management and Own Risk and Solvency Assessment of NAIC) will lead to better understanding and handling of the risks involved in their investments and prudent investment decisions. Through this, insurance undertakings are expected to know the nature and risks of their investments as well of their products sold. For many long-term investments, especially direct infrastructure investments, this implies that the insurer must gain expert knowledge, not only of the financial instrument, but also of the underlying project. As the procurement of such technical know-how is rather cost-intensive, it could dis-incentivise long-term investment. Further factors affecting insurers'

long-term investment include the availability of appropriate financing vehicles, investment expertise in specific asset classes and high-quality data.

Regulation should neither unduly favour nor hinder long-term investment as such but place priority on incentivising prudent asset-and-liability management with mechanisms that allow for a “true and fair view” of insurers’ risk exposures. In risk-based solvency regulation, an asset’s risk relative to liabilities is reflected in the capital requirements. This enables the matching of maturity and foreign exchange of asset and liabilities for the quantification of interest rate and/or foreign exchange risks. Capital requirements could better capture the risk management considerations for long-term investments.

In principle, private sector investors will determine the level of risk they wish to bear with regard to their investments. To enable (especially small and medium-sized) insurers to invest in long-term assets, appropriate investment vehicles which accommodate cash flow needs would be required. Nevertheless, to support a long-term investment project, risk mitigation by the public sector may assist and should be justified by a clear and strong public interest. In order to render long-term investments through public-private partnerships more attractive relative to other investments, fiscal guarantees, e.g. for revenues of infrastructure projects, could be granted to increase the expected return on long-term investments and at the same time decrease their risk, although, possible market distortions leading to disinvestments from other assets should be taken into account and the fact that private institutions get the benefit of guaranteed returns above risk free rates while taxpayers take the downside risks require a balanced consideration. Such schemes have been able to deliver support to, for example infrastructure investment, in some countries.

Insurers could devise ways of gaining illiquidity on their liability side through product innovation which can facilitate long-term investment, although the increased illiquidity may render the product less attractive for the policyholders. On the other hand, recently introduced product designs have tended to offer more, not less, liquidity to policyholders in response to market demands.

I. Insurance business and insurers as institutional investors

1. Nature of insurance business and differences across insurers¹

Insurance companies assume risk on behalf of their policyholders in exchange for a premium. An insurance contract is a “contract under which one party (the insurer) accepts significant insurance risk from another party (the policyholder) by agreeing to compensate the policyholder if a specified uncertain future event (the insured event) adversely affects the policyholder”.²

The insurance industry contributes to economic efficiency and fosters economic growth in several ways. First, insurance improves risk allocation of an economy and reduces transaction costs. Second, by protecting existing assets, insurers provide economic agents with a more stable financial basis. Third, insurers foster governance through their asset holdings by encouraging risk mitigation through warranties and/or risk exclusions, and direct monitoring of risks. Fourth, insurance can be an alternative and supplemental financial support in the event of economic losses caused by, for example, accidents, catastrophes and bankruptcies.

Insurers are generally classified as either a primary insurance company or a reinsurance company. Primary insurers cover individual and corporation risk and can be

categorised according to the type of event that is insured. Most insurers are either life insurers or non-life insurers, although some companies can be composite insurers with both life and non-life businesses. Reinsurance companies insure the risks of primary insurers, and are thus an important element of the latter's risk management.

*Life vs. non-life insurers*³

Life insurers offer a hedge against the risk of an interruption in individual's and/or family's finances, or in the case of key personnel insurance, a business' income stream, such interruption often being caused by death, disability or retirement. Life insurance contracts can be for short periods (for example, accident and death) or for longer periods (for example, a whole life). Life insurance products often incorporate a savings element, where life insurance companies contribute to financial-sector flow of funds. The main life insurance products are whole life insurance, term life insurance, endowment life insurance and annuities (see Table 1).

Table 1. Main types of life insurance products

Life insurance	Description
Whole life insurance	The contract covers the insured throughout his or her life, regardless of how long or short that is, with designated beneficiaries being paid when the insured dies.
Term life insurance	The contract covers only a certain number of years, meaning that the insured's beneficiaries receive payment only if he or she dies within the period of coverage.
Endowment insurance	Benefits are payable to a living insured on a specified future date or to the beneficiaries of the insured if he or she dies before the date specified in the policy.
Annuities	Life insurers promise to make a series of future payments to the insured until his or her death, in exchange for an immediate lump-sum payment or a series of regular payments.

Non-life insurance companies offer policies such as property and casualty insurance that also comprises liability insurance (see Table 2). Property and casualty (P&C) insurance protects against fire, theft, weather perils, negligence, and other acts and events that can result in injury to persons or property. In addition to traditional insurance lines – automobile, fire, marine, personal liability and property coverage – many P&C insurance companies offer health and medical insurance, thus competing with life insurance companies that offer similar services. Liability insurance protects against claims for indemnification.

Table 2. Main types of non-life insurance contracts

Non-life insurance	Description
Property insurance	The contract protects businesses and owners from the impact of risk associated with owning property. This includes replacement and loss of earnings from income-producing property as well as covering financial losses suffered by owners of residential property.
Casualty insurance	The insurance comprises three common forms of contracts: automobile, flood, and liability.

There are a number of key differences between life and non-life insurance business. Life insurance contracts are relatively longer-term compared to non-life insurance policies, which are usually for a term of one year or less, whereas uncertainty about the timing and volume of non-life insurance claim payments as well as the difficulty of predicting perils has led non-life business to being considered riskier than life insurance. In contrast, life insurance mainly insures one event – death, the risk of which for any individual is often

based on a standard mortality table. Further, the potential losses from non-life insurance are more difficult to predict than for life insurance.

The different natures of their business mean that life and non-life insurers have different operating strategies. Non-life insurers tend to maintain substantial liquidity, since claims may arise from the day the policy is underwritten. In contrast, claims towards life insurers are generally better estimated enabling life insurers to invest in less liquid assets, such as long-term assets, and to follow a “buy and hold” strategy.

Reinsurers⁴

Reinsurers insure the risk of primary insurers. Reinsurance can be defined as a financial transaction by which the risk is (partly) transferred from an insurance company to a reinsurer in exchange for a premium.

There are several reasons for primary insurance companies to purchase reinsurance. For example, reinsurance can increase an insurer’s underwriting capacity. Reinsurance also leads to lower solvency capital requirements and thus allows primary insurers to take more diverse risks with the same working capital. Furthermore, reinsurance allows insurers to more effectively protect themselves from extreme events such as earthquakes, floods, airplane crashes, and other catastrophic events. In addition, purchasing reinsurance may provide insurers with access to the reinsurer’s expertise in, for example, underwriting and claims management.

2. Pension funds⁵

Pension funds provide individuals with a hedge against the loss of income in their retirement years. They enable employees to invest a portion of their current income in a portfolio of bonds, stocks, real estate, and other assets in the expectation of having more money in the future from investment returns.

Private pension funds are sponsored by employers, groups, and individuals as alternative and/or supplemental to public pension plans. Private pension funds are increasingly becoming a standard part of retirement planning, as concerns about the sufficiency of the public pension system increases. Pension plans are either defined benefit plans or defined contribution plans (see Table 3). Private pension plans may retain life insurers as asset managers, annuity providers and plan administrators.

Table 3. Types of pension plans

Pension Plans	Description
Defined benefit plans	They promise specific retirement payments to employees, depending on their salary during their working years and their length of employment. Such programs have the advantage of a guaranteed retirement income, but exposes the plan provider to the risk of having lower than expected investment return.
Defined contribution plans	Such plans specify how much each employee must contribute each year, but the amount to be received after retirement will vary based on the amount saved and the investment returns of accumulated savings. The funds saved typically belong to the employee and are portable.

Similar to life insurers, pension funds are long-term investors with relatively predictable liquidity needs. The cash inflows of pension funds can be assessed with considerable accuracy, since each employee/beneficiary usually pays in a fixed percentage of their salary. Similarly, the cash outflows of pension funds can be well forecasted because the formula for benefit payments is set out in the contract between the fund and its

beneficiaries. These characteristics enable pension funds to invest in long-term assets like bonds, equity, mortgages and real estate, and fund managers tend to hold these assets for a relatively long term. Further, rising longevity has increased pressure on pension funds to invest in long-term assets.

The OECD survey of 99 large pension funds (LPFs) and public pension reserve funds (PPRFs)⁶ shows that both LPFs and PPRFs exhibit similar asset allocation trends for the period 2010 to 2015: decreasing investments in equities, with increasing investments in fixed income, and gradually increasing investments in alternative assets such as infrastructure and private equity. The survey results indicate growing interest in this form of investment by pension fund managers. This suggests the existence of considerable barriers and disincentives limiting such investment. Specifically, when considering total assets under management for the complete survey (i.e., 104 funds), infrastructure investment in the form of unlisted equity and debt in 2013 represents only 1.0% of the total assets under management by the surveyed funds.

3. Risk-taking by insurers' investment decisions – factors for consideration

To better understand why insurers may make risky investments, this section reviews academic literature on risk-taking behaviour of insurers. The studies reviewed incorporate both the empirical and the theoretical research and cover global insurance markets for different types of insurance undertakings.

In corporate finance theory, excessive risk taking indicates that firms are transferring wealth from bondholders to shareholders by increasing firm risk after bonds have been issued.⁷ If shareholders cannot commit to an appropriate risk strategy, this may lead to a detrimental situation for bondholders, with in turn detrimental consequences for shareholders. This agency problem can also arise within the shareholder-policyholder relationship of a stock insurance company.⁸

Specifically, there are mainly four ways in which insurers may be taking excessive risks. First, the risk of an insurer's liabilities can increase if the insurer charges insufficient premiums or has a imprudent underwriting policy, both activities having the potential to rapidly expand an insurer's volume of business. Second, after collecting premiums from their policyholders, insurers can change their asset allocation toward a riskier investment portfolio. Third, insurers can reduce their equity capital endowment to the minimum regulatory capital required, which leads to a higher probability of insolvency. Finally, an insurer may fail to sufficiently manage risks through reinsurance arrangements.

Academic studies show that firm size has a significant and mixed impact on insurer risk. On the one hand, larger insurers generally hold relatively more diversified insurance products and investment portfolios, which give large insurers greater latitude to control their risk. On the other hand, size may be an important contributing factor for large insurers to take on more risks (particularly if there is a perception of "too big to fail"), which could potentially result in a greater impact on the market and policyholders.⁹

Cummins and Weiss (2014) examine primary indicators that determine whether U.S. insurers are systemically risky, as well as contributing factors that exacerbate vulnerability to systemic events. One of the primary indicators they identify is firm size. They emphasise that size should not be solely defined by conventional measures (for example, assets), but should be defined by, for example, volume of transactions, exposure to off-balance sheet positions, and use of derivatives. The authors emphasise that insurers do not pose

systemic risk due to their size alone. However, other factors such as interconnectedness, lack of substitutability, high leverage, lack of liquidity, complexity and opacity of the insurer, and the unintended consequences of financial safety nets should be taken into consideration when considering the systemic risk of insurers.

The International Association of Insurance Supervisors (IAIS) will adopt a revised methodology for the assessment of globally systemically-important insurers (G-SIIs) from 2016. To counter the risk of such systemically-important insurers, IAIS has developed enhanced regulatory requirements designed to mitigate their systemic risk such as the Basic Capital Requirements (BCR) and the Higher Loss Absorbency (HLA).

Several empirical studies have focussed on identifying the internal and external determinants of insurer risk. Specifically, the firm-specific determinants of non-life insurer solvency risk are: firm size, investment performance,¹⁰ underwriting income,¹¹ liquidity,¹² operating margin,¹³ premium growth,¹⁴ and the growth rate of equity capital.¹⁵ Consistent with the findings for non-life insurers, firm size, investment performance, and operating margin are factors that determine the risk of life/health insurers. Additionally, changes in asset mix,¹⁶ changes in product mix,¹⁷ and insurance leverage¹⁸ are found to be important risk indicators for life/health insurers. The market/economic factors that affect non-life insurer risk are: the number of insurers (competition), underwriting cycle, combined ratio, unanticipated inflation, interest rate level, and interest rate change.¹⁹ With respect to life/health insurers, important external risk indicators are: accident and health underwriting cycle, interest rate levels, investment-related products, long-term interest rates, personal income, and real estate returns.²⁰

The findings on the determinants of insurer risk have been mainly based on the U.S. insurance industry. The study of Chen and Wong (2004) expands the field by testing previous hypotheses in the Asian insurance market. They find, first, that the factors that significantly affect non-life insurer solvency risk in Asian economies are firm size, investment performance, liquidity ratio, surplus growth, combined ratio, and operating margin. Second, the factors that significantly affect the financial health of life insurers are firm size, change in asset mix, investment performance, and change in product mix.

In addition, Eling and Marek (2012) analyse the impact of both firm-specific and external factors on European insurer risk-taking based on a sample of 35 German and U.K. insurers over the period of 1997-2010. Their results show that significant risk indicators include firm size, capital structure, liquidity, economic development, and corporate governance system (for example, compensation and board independence). A more recent contribution by Fields, Gupta, and Prakash (2012), based on an international sample, suggests that investor protection, governance quality, and contract enforcement also have significant effects on the risk taking and the performance of both life and non-life insurers.

II. Detailed assessment of insurer investment tools and decisions

1. Common investment models²¹

The basic theoretical model for investment management is the Markowitz portfolio selection model. The Markowitz model assumes that risk-averse investors only care about the expected return and risk of their portfolio investment, measured by the variance of the portfolio return. They thus build mean-variance-efficient investment portfolios to minimise the variance of portfolio return given a desired expected return, or maximise the expected return, given a specific variance of the portfolio return.

The efficient risk-return opportunities available to the investor are, as a first step, mapped by the so-called efficient frontier of risky assets. This frontier is a diagram of the lowest possible variance that can be attained for a given portfolio's expected return. In the second step, by including a risk-free security, the investor searches for the so called capital allocation line (CAL)²² with the highest reward-to-volatility ratio (i.e., the steepest slope). The market portfolio is found where the CAL is tangent to the efficient frontier. Finally, the investor chooses the appropriate mix between the optimal risk portfolio and risk-free securities. Sophisticated insurers may use models with risk measures such as VaR or TailVar, which are more appropriate than the variance. In addition they do not use a multivariate normal distribution for the movements of assets and liabilities. Therefore, the portfolio allocation is constructed in a different way in these approaches.

Although the Markowitz model is based on a perfect capital market, which assumes no taxes and transaction costs, perfect information and no restrictions on investment or financing, this model is the basis for many real-world investment models.

The same applies to the capital asset pricing model (CAPM), which identifies the relationship between systematic risks and expected (required) return of financial assets. Specifically, the CAPM aims to answer the following two questions: what are the risk-adequate prices for financial assets if the capital market is in equilibrium?, and is an investment advantageous or disadvantageous compared to its "fair" rate of return based on the CAPM? In the CAPM, the expected (required) return of securities is calculated as the risk-free rate of return plus a risk premium that is dependent on the systematic risk of securities. Thereby, the CAPM deals with two types of risk, namely, unsystematic and systematic risk, that is, the non-diversifiable risk. The model's central implication is that only systematic risk determines asset prices.

There are several measures used to examine the performance of an investment, taking its risk into account. Jensen's Alpha measures the difference between the expected return of an investment and the investment's required "fair" rate of return, as determined by the CAPM. Investments with a positive Alpha promise an excess return to be realised. Jensen's Alpha can be seen as a measure of how much an investment "beats the market" and is thus often used to evaluate fund manager performance.

The Treynor Ratio measures the excess return over the risk-free rate per each unit of market risk. Specifically, it equals the expected return of a portfolio minus the risk-free rate of return, divided by the systematic risk measure of the CAPM. The market risk premium is defined as the expected return of the market portfolio minus the risk-free rate of return for each additional unit of systematic risk. If the Treynor Ratio exceeds the market risk premium, the investment should normally be undertaken.

The Sharpe Ratio can be used to compare different investment opportunities with different risk levels (measured by the standard deviation of a portfolio's return) because it measures expected excess return per unit of risk. Specifically, it equals the expected return of a portfolio minus the risk-free rate of return, divided by the total portfolio risk. The Sharpe Ratio differs from Jensen's Alpha and the Treynor Ratio in that it does not build on systematic risk (i.e., non-diversifiable risk), but on the entire portfolio risk.

The OECD Large Insurer Survey requests the participating insurance companies to describe their model(s) of asset allocation process (such as mean variance optimisation,

scenario analysis and factor-based model). The responses indicate that the following asset allocation methods are applied by insurers around the world:

- Asset allocation is based mainly on the mean variance optimisation modelling with consideration for tax and capital charge simplifications.
- Liability driven investment techniques (including efficient frontier analysis) that takes into account the nature of the liabilities are utilised: guaranteed products primarily utilise duration targeting with limited cash flow matching considered for shorter durations. Pass-through product strategies vary with the level of risk sharing and the expectations set with policyholders regarding asset mix, portfolio turnover and other factors. Stress scenario analysis is also carried out.
- The strategic asset allocation (SAA) is based on an asset-liability-management process, relying on mean variance optimisation. It can be combined with an asset-liability-management approach depending on the maturity structure of liabilities and the optimisation of risk capital.
- Both SAA and tactical asset allocation (TAA) are applied to determine the asset allocation. The SAA uses the multi-step Monte Carlo simulation, whereas the TAA sticks to the mean variance optimisation with a robust optimisation method. It can be the case that the planned overall investment return, asset-liability-management framework and constraints stem from the SAA, which is in line with the company's risk bearing capacity in a mid- to long-term. The short- and mid-term asset allocation can be determined from the TAA according to market expectations.
- Following a policy of surplus management-type ALM, the asset allocation is set through the profitability and risk analysis based on economic values and the immunisation analysis of interest rate fluctuations on current accounting standards.
- A risk-return optimisation model simulates a variety of asset strategies, which lead to combinations of risk (economic capital, EC) and return (economic value, EV). The asset portfolio that generates the highest EV-EC ratio is adopted as the most appropriate asset allocation strategy.

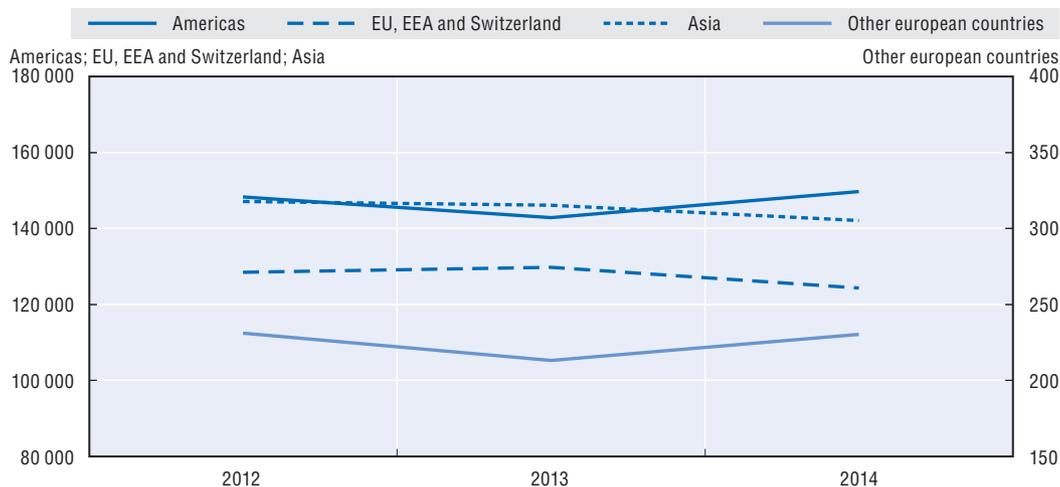
2. Insurer investment decisions – the outcome of the OECD Large Insurer Survey

Based on the OECD Survey on Insurers and Long-Term Investment, the asset allocations of a sample of insurers around the world (on an aggregated basis) are presented. The focus is on changes in insurers' investment activities from 2012 to 2014 in four major economic areas: Americas;²³ EU, EEA and Switzerland; Asia; and Other European Countries. Depending on data availability, the breakdowns of certain asset classes are also illustrated. The survey comprises responses of 39 insurers with a total investment volume of USD 3.07 trillion. Of these, 5 insurers are from the Americas with a total investment volume of USD 741 billion, 4 insurers are from the EU, EEA and Switzerland area with a total investment volume of USD 514 billion, 11 insurers are from Asia with a total investment volume of USD 1.81 trillion and 19 insurers are from Other European Countries with a total investment volume of USD 4.39 billion.

Figure 1 presents the average total investments of the insurers in different regions from 2012 to 2014. On average, the total investment does not vary largely for the recent period. Specifically, the average total investments in the EU, EEA and Switzerland and the Asian areas decrease slightly in the year 2014, whereas total investments in the Americas and the Other European Countries areas have a small increase. It should be noted that the

volume and proportion of asset allocation indicated in Figures 1 to 22 will be impacted by fluctuation in market prices of assets.

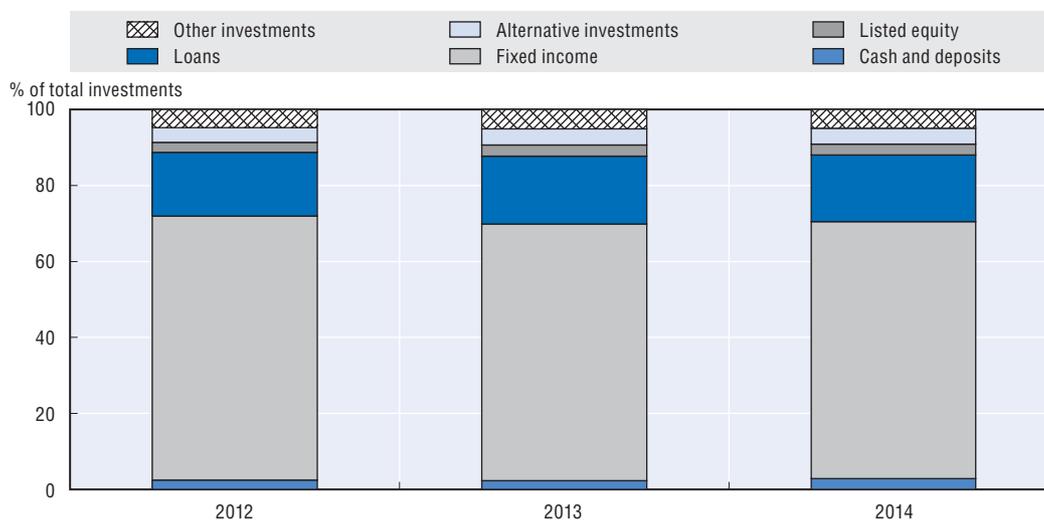
Figure 1. Average total investment of insurers by region, 2012-2014 (in millions of USD)



Source: OECD Large Insurer Survey. The average total investments in the areas of Americas, EU, EEA and Switzerland, and Asia align to the left y-axis, whereas the average total investment in Other European Countries is reflected by the right y-axis. All investment volumes are in million USD.

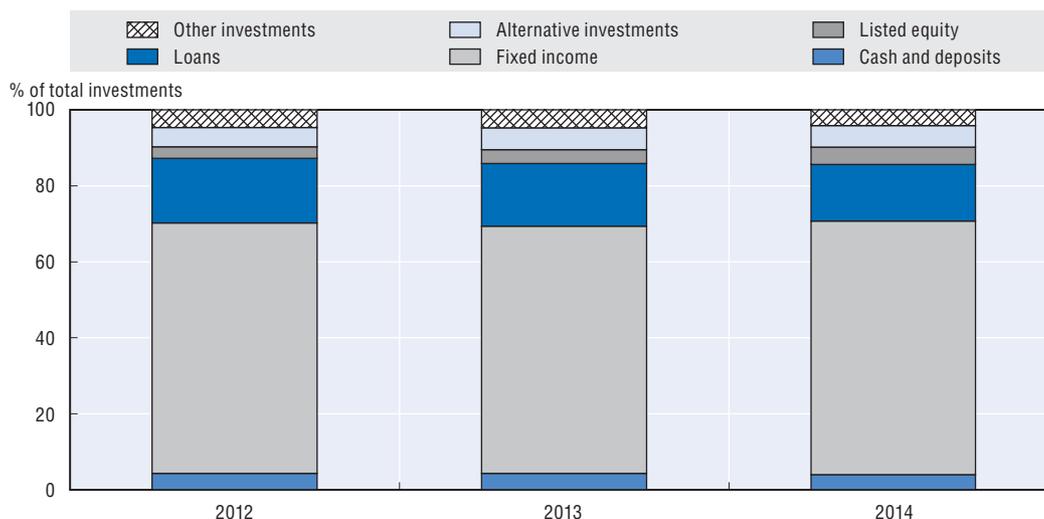
Figures 2 to 5 illustrate the average asset allocation in different economic areas from 2012 to 2014. Assets are classified into the following classes: cash and deposits, fixed income, loans, listed equity, alternative investments and other investments. The average asset allocations in the Americas and the EU, EEA and Switzerland are similar, in the sense that fixed income and loans account for approximately 90% of the total asset portfolio (see Figures 2 and 3).

Figure 2. Average asset allocation in the Americas, 2012-2014



Source: OECD Large Insurer Survey. The asset allocation is illustrated by the percentage of total investments in seven asset classes: Cash and Deposit, Fixed Income, Loans, Listed Equity, Alternative Investment and Other Investments, reflected from the bottom of the figure to the top correspondingly.

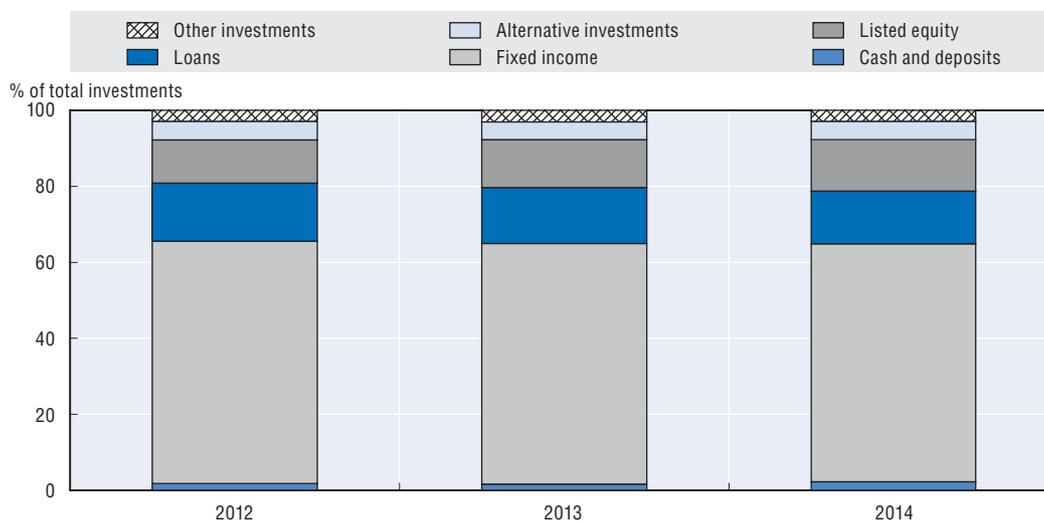
Figure 3. **Average asset allocation in the EU, EEA and Switzerland, 2012-2014**



Source: OECD Large Insurer Survey. The asset allocation is illustrated by the percentage of total investments in seven asset classes: Cash and Deposit, Fixed Income, Loans, Listed Equity, Alternative Investment and Other Investments, reflected from the bottom of the figure to the top correspondingly.

However, insurance companies in Asia tend to invest a relatively higher portion of their investments in listed equity (see Figure 4, where the percentage of total investment in listed equity lies between 11-14%). The sum of investments in fixed income and loans still accounts for the largest portion of asset allocation.

Figure 4. **Average asset allocation in Asia, 2012-2014**

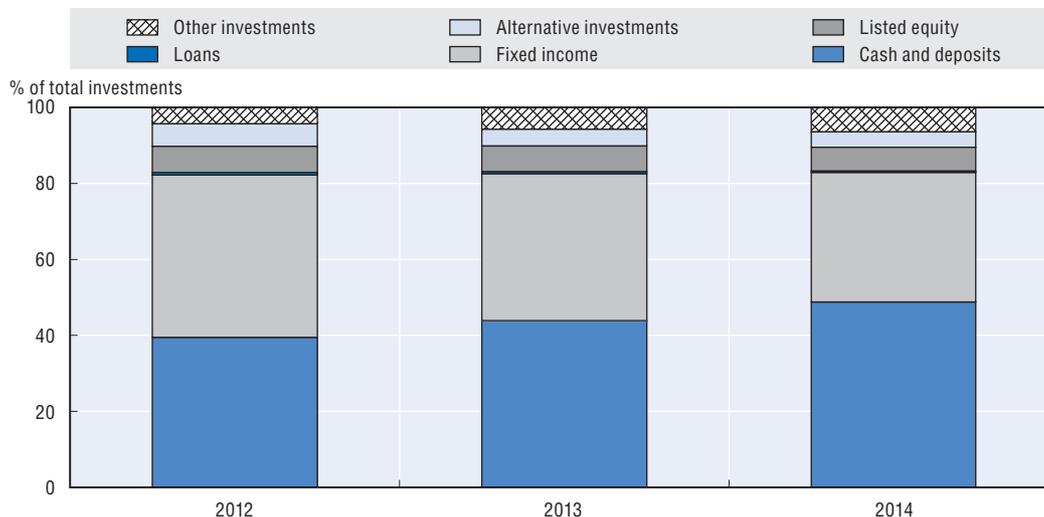


Source: OECD Large Insurer Survey. The asset allocation is illustrated by the percentage of total investments in seven asset classes: Cash and Deposit, Fixed Income, Loans, Listed Equity, Alternative Investment and Other Investments, reflected from the bottom of the figure to the top correspondingly.

Figure 5 demonstrates that insurance companies in Other European Countries have large portions of their assets in cash and deposit, with their holding of cash and deposit becoming stronger from 2012 to 2014. The second largest class of assets is fixed income,

although the average portion of investments in fixed income has decreased in recent years, at approximately 30% in the year 2014.

Figure 5. **Average asset allocation in Other European Countries, 2012-2014**



Source: OECD Large Insurer Survey. The asset allocation is illustrated by the percentage of total investments in seven asset classes: Cash and Deposit, Fixed Income, Loans, Listed Equity, Alternative Investment and Other Investments, reflected from the bottom of the figure to the top correspondingly.

In Figures 2 to 5, despite the low-interest rate environment, asset allocation has not generally witnessed a marked change in recent years – although with some regional variance – towards higher yielding products such as listed equity and alternative investments.

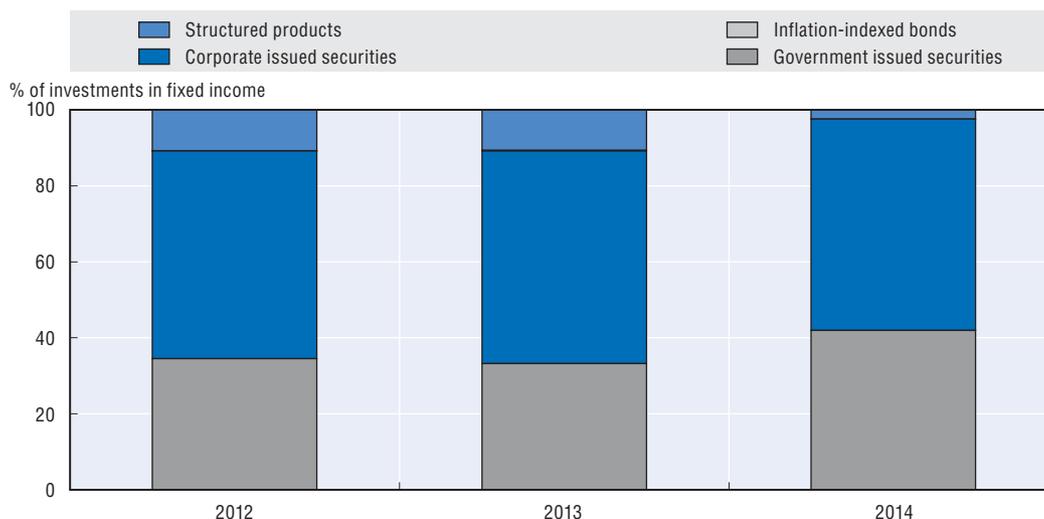
Figures 6 to 8 present the breakdown of fixed income investments in the Americas, EU, EEA and Switzerland as well as Asia from 2012 to 2014.²⁴ Insurance companies in the Americas invest mainly in government issued securities and corporate issued securities, and the investment in government issued securities on average increased by approximately 8 percentage points in 2014, compared to the previous years (Figure 6). The structured products on average decreased largely in 2014 for insurers in the Americas.

For insurers in the EU, EEA and Switzerland, government issued securities and corporate issued securities are also the two major assets, which account for more than 80% of the fixed income investments. The third largest investment in fixed income is structured products with an average portion of approximately 12%, and the rest in inflation-indexed bonds. The breakdown of fixed income investments is relatively stable in the EU, EEA and Switzerland area (Figure 7).

The structure of fixed income investments in Asia is similar to the Americas for 2012 and 2013. However, the investment in government issued securities dropped significantly by approximately 25 percentage points in Asia in 2014, with investment shifting to corporate issued securities.

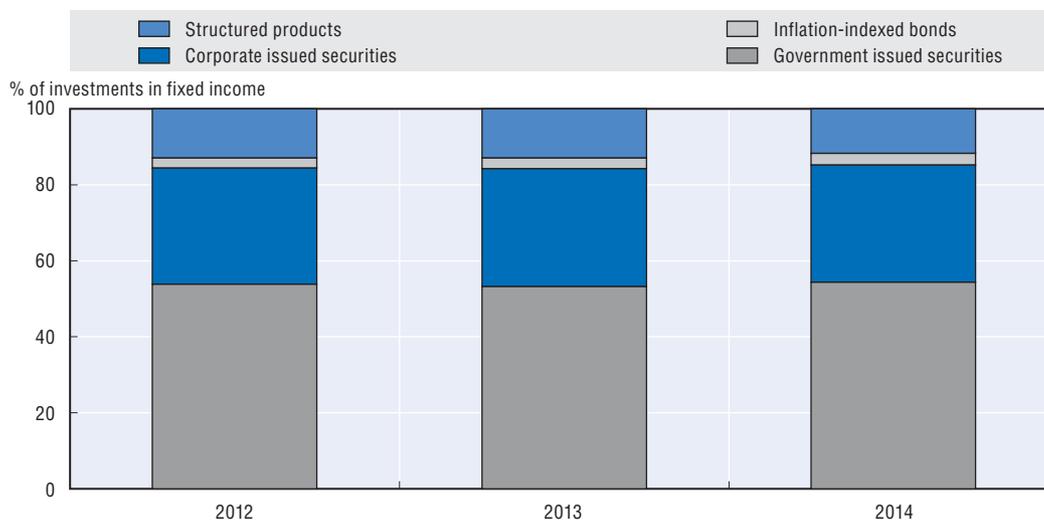
Figures 9 to 17 show the breakdown of investments in government issued securities, corporate issued securities as well as structured products in the Americas, EU, EEA and Switzerland as well as Asia from 2012 to 2014. In the Americas, insurance companies, on average, invested approximately equal portions in investment grade, non-investment

Figure 6. Fixed income investments in the Americas, 2012-2014



Source: OECD Large Insurer Survey. The breakdown of asset allocation in fixed income is illustrated by the percentage of investments in the following fixed income asset classes: Government Issued Securities, Corporate Issued Securities, Inflation-Indexed Bonds and Structured Products, reflected from the bottom of the figure to the top correspondingly.

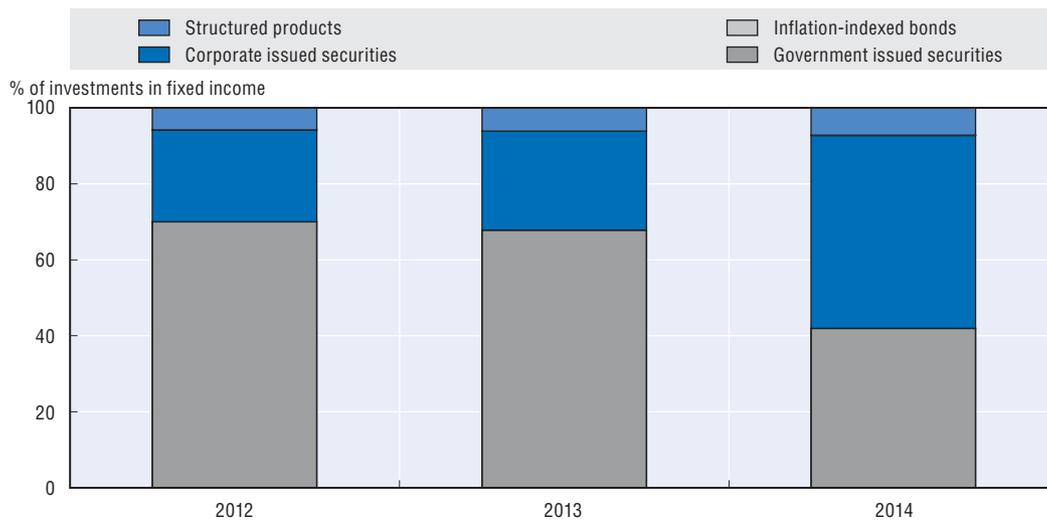
Figure 7. Fixed income investments in the EU, EEA and Switzerland, 2012-2014



Source: OECD Large Insurer Survey. The breakdown of asset allocation in fixed income is illustrated by the percentage of investments in the following fixed income asset classes: Government Issued Securities, Corporate Issued Securities, Inflation-Indexed Bonds and Structured Products, reflected from the bottom of the figure to the top correspondingly.

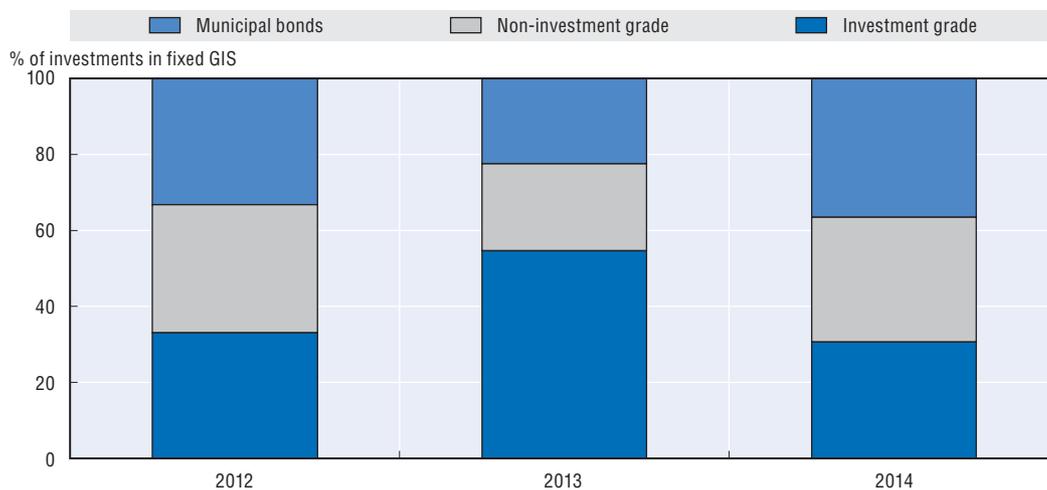
grade and municipal bonds in 2012. Municipal bonds are exempt from federal taxes and from most state and local taxes in the US, which may explain the high proportion of investment in this asset class in Figure 9. In 2013, investments in securities with investment grade increased largely, with a proportionate decrease in both non-investment grade and municipal bonds investments. In 2014, the investment breakdown of government issued securities in the Americas returned to a similar situation as in 2012.

Figure 8. **Fixed income investments in Asia, 2012-2014**



Source: OECD Large Insurer Survey. The breakdown of asset allocation in fixed income is illustrated by the percentage of investments in the following fixed income asset classes: Government Issued Securities, Corporate Issued Securities, Inflation-Indexed Bonds and Structured Products, reflected from the bottom of the figure to the top correspondingly.

Figure 9. **Government issued securities investments in the Americas, 2012-2014**

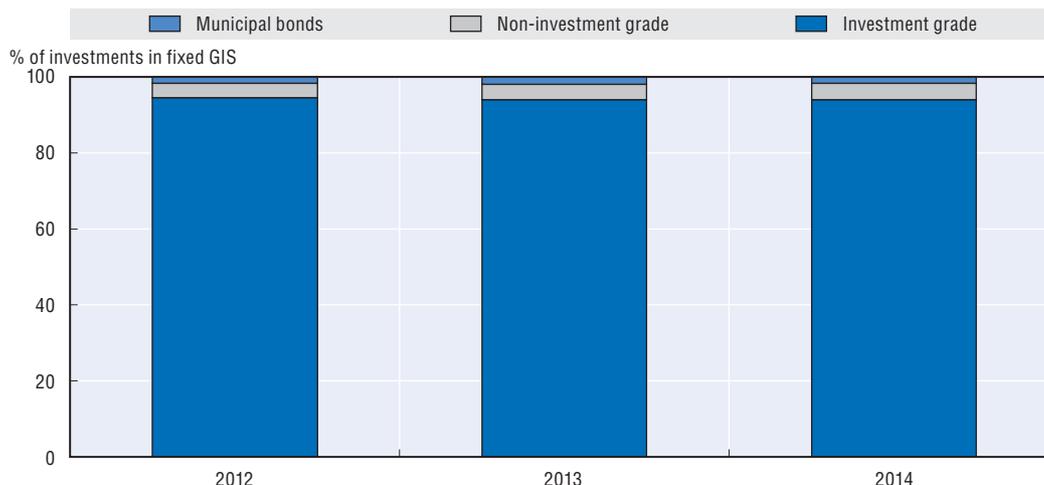


Source: OECD Large Insurer Survey. The breakdown of government securities investments is Investment Grade, Non-Investment Grade and Municipal Bonds, reflected from the bottom of the figure to the top correspondingly.

For insurers in the EU, EEA and Switzerland, securities that are investment grade comprise the largest proportion of investments in government issued securities with an average of approximately 94% from 2012 to 2014. This is similar in Asia, where insurers tend to hold a significant amount of securities that are investment grade. Regarding corporate issued securities, insurance companies tend to hold mostly securities with investment grade. This applies to insurers around the world and for all analysed time periods..

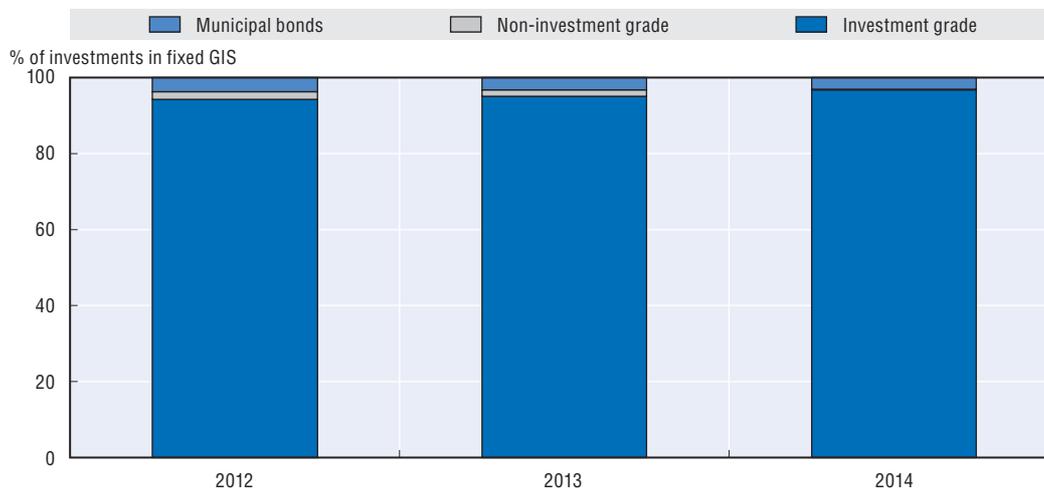
Furthermore, the breakdown of structured products investments in the Americas indicates that products with investment grade, mortgage-backed securities and asset-backed securities are the three major asset classes from 2012 to 2014.

Figure 10. **Government issued securities investments in the EU, EEA and Switzerland, 2012-2014**



Source: OECD Large Insurer Survey. The breakdown of government securities investments is Investment Grade, Non-Investment Grade and Municipal Bonds, reflected from the bottom of the figure to the top correspondingly.

Figure 11. **Government issued securities investments in Asia, 2012-2014**

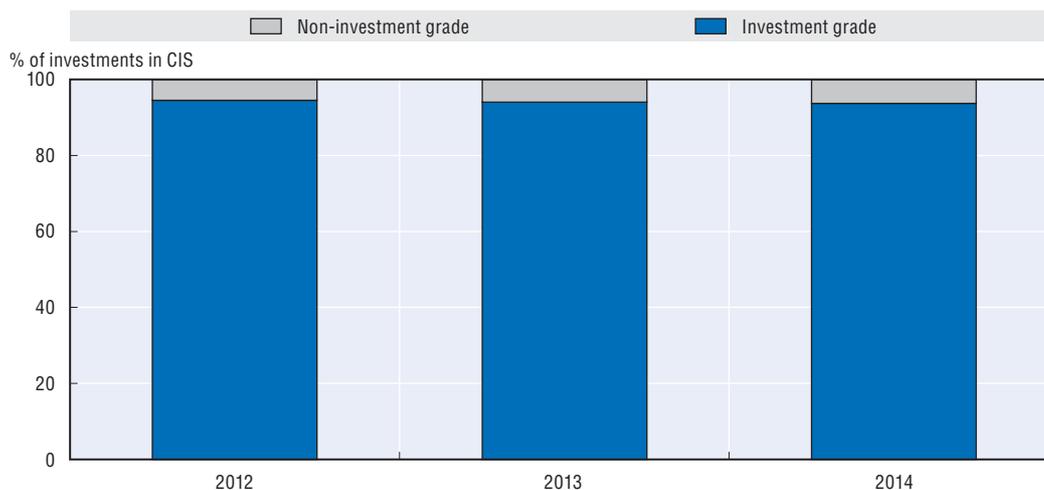


Source: OECD Large Insurer Survey. The breakdown of government securities investments is Investment Grade, Non-Investment Grade and Municipal Bonds, reflected from the bottom of the figure to the top correspondingly.

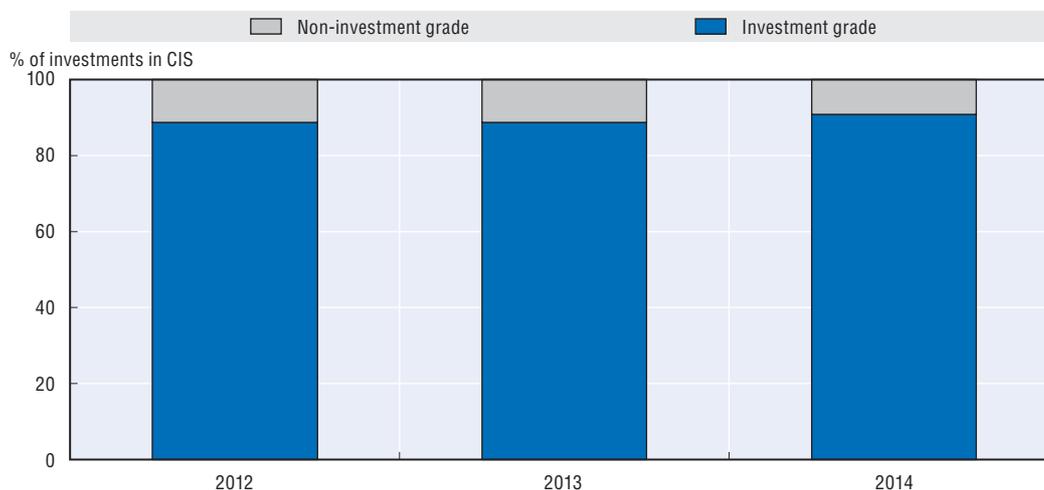
In the EU, EEA and Switzerland as well as Asia, insurers mostly invested in structured products which were investment grade and mortgage-backed securities. Investments in asset-backed securities are relatively small, compared to the Americas. Investment in structured notes has increased from 1.8% in 2012, to 3.6% in 2013 and 2014.

In Asia, the investment in structured notes increased on average by 5 percentage points from 2013 to 2014 to 10.1%. There is a large proportion of other structured products, and mortgage-backed securities which increased to 45.0% in 2014.

Figures 18 to 20 present the loan portfolio of insurance companies in the Americas, EU, EEA and Switzerland as well as Asia from 2012 to 2014. The results of insurers' loans breakdown vary largely in different economic areas. For example, insurers in the Americas operate mostly mortgages, and infrastructure loans. It should be noted from Figures 2 to 4

Figure 12. **Corporate issued securities investments in the Americas, 2012-2014**

Source: OECD Large Insurer Survey. The breakdown of corporate issued securities investments is Investment Grade and Non-Investment Grade, reflected from the bottom of the figure to the top correspondingly.

Figure 13. **Corporate issued securities investments in the EU, EEA and Switzerland, 2012-2014**

Source: OECD Large Insurer Survey. The breakdown of corporate issued securities investments is Investment Grade and Non-Investment Grade, reflected from the bottom of the figure to the top correspondingly.

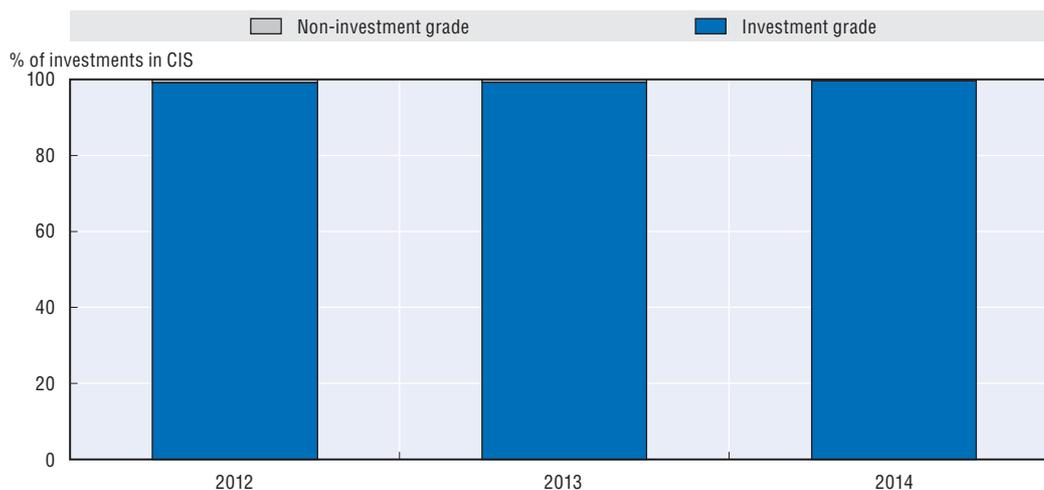
that the proportion of loans to the overall investment allocation is 17.5% in the Americas, 14.9% in EU, EEA and Switzerland, 13.8% in Asia, and 0.36% in other European countries in 2014.

In the EU, EEA and Switzerland, on average around 90% of loans are direct loans.

In Asia, insurance companies on average hold approximately 40% direct loans, 30% direct corporate/SME lending and 20% mortgages.

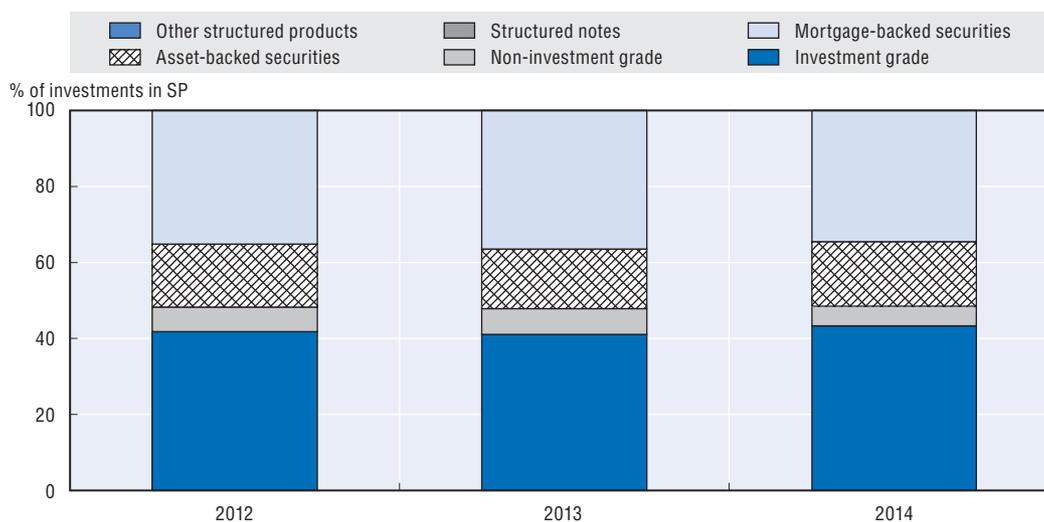
Regarding alternative investments, Figure 21 shows that insurers in the Americas invest largely in land and buildings, at approximately 50% of all alternative investments. The second largest alternative investment is private equity, followed by unlisted real estate equity and unlisted infrastructure equity.

Figure 14. **Corporate issued securities investments in Asia, 2012-2014**



Source: OECD Large Insurer Survey. The breakdown of corporate issued securities investments is Investment Grade and Non-Investment Grade, reflected from the bottom of the figure to the top correspondingly.

Figure 15. **Structured product investments in the Americas, 2012-2014**



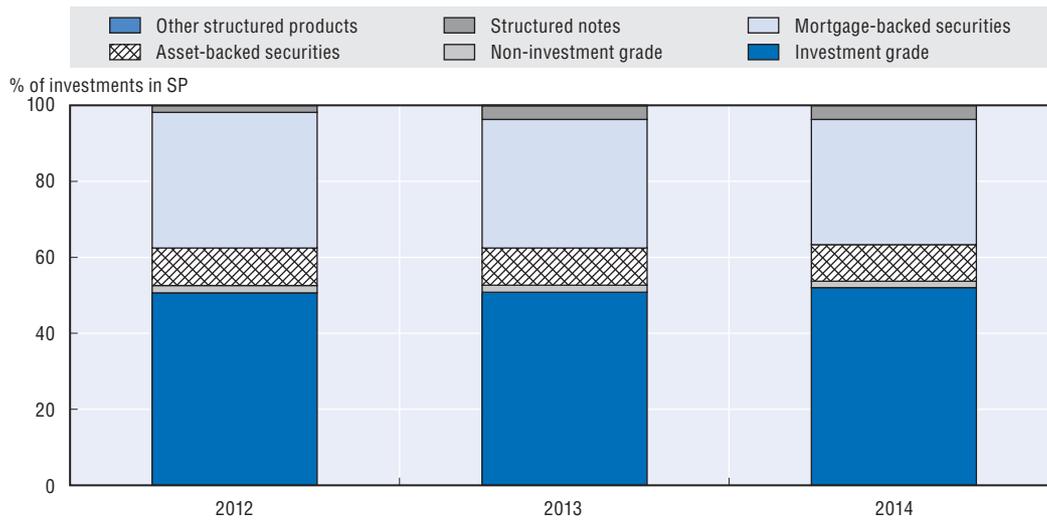
Source: OECD Large Insurer Survey. The breakdown of structured products are Investment Grade, Non-Investment Grade, Asset-Backed Securities, Mortgage-Backed Securities, Structured Notes and Other Structured Products, reflected from the bottom of the figure to the top correspondingly.

In the EU, EEA and Switzerland, the “Land and Buildings” asset class dominates the others, on average being around 75% of insurers’ alternative investments portfolio (see Figure 4). Compared to the Americas, investments in hedge funds are more significant, whereas investments in commodities are relatively small.

The two major alternative investments asset classes in Asia are “Land and Buildings” and “Private Equity” (see Figure 23).

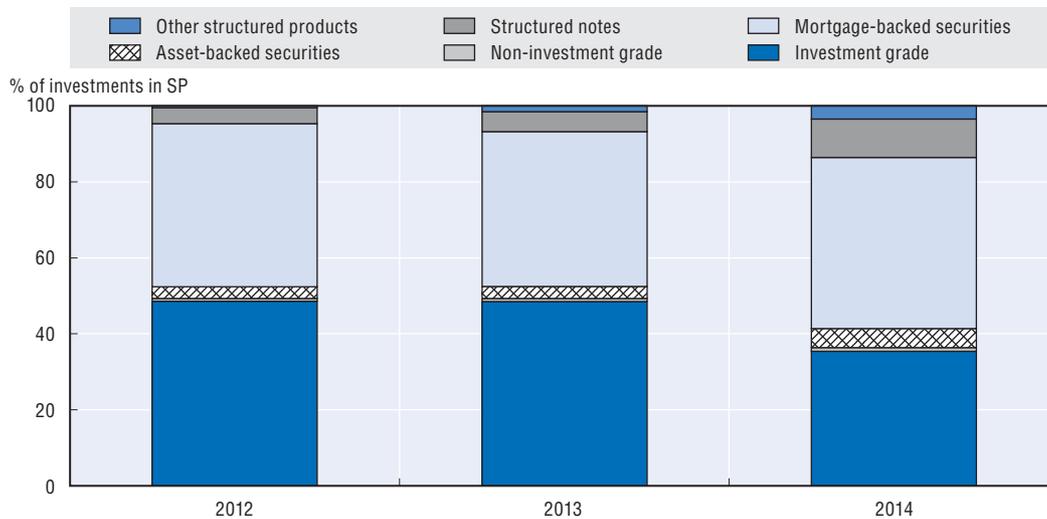
As mentioned above, the general asset allocation has not changed significantly, and the total amount invested has also remained at similar levels although the Americas have experienced an increasing trend and Asia a decreasing trend. The regional difference most

Figure 16. **Structured product investments in the EU, EEA and Switzerland, 2012-2014**



Source: OECD Large Insurer Survey. The breakdown of structured products are Investment Grade, Non-Investment Grade, Asset-Backed Securities, Mortgage-Backed Securities, Structured Notes and Other Structured Products, reflected from the bottom of the figure to the top correspondingly.

Figure 17. **Structured product investments in Asia, 2012-2014**

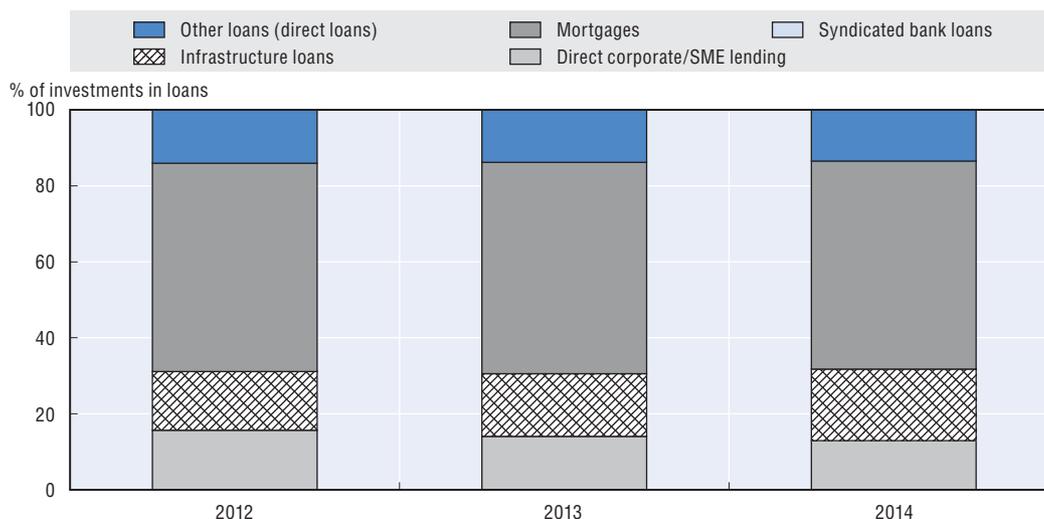


Source: OECD Large Insurer Survey. The breakdown of structured products are Investment Grade, Non-Investment Grade, Asset-Backed Securities, Mortgage-Backed Securities, Structured Notes and Other Structured Products, reflected from the bottom of the figure to the top correspondingly.

prominent is that the proportion of investments allocated to listed equities have grown in Asia.

In terms of specific asset classes, for fixed income investments, the Americas have been investing less in structured products, with government issued securities rising. In Asia, the allocation of corporate issued securities has risen, with government issued securities dropping between 2013 and 2014.

Figure 18. **Loans in the Americas, 2012-2014**



Source: OECD Large Insurer Survey. The breakdown of loans are Direct Corporate/SME Lending, Infrastructure Loans, Syndicated Bank Loans, Mortgages and Other loans (Direct Loans), reflected from the bottom of the figure to the top correspondingly.

Figure 19. **Loans in the EU, EEA and Switzerland, 2012-2014**



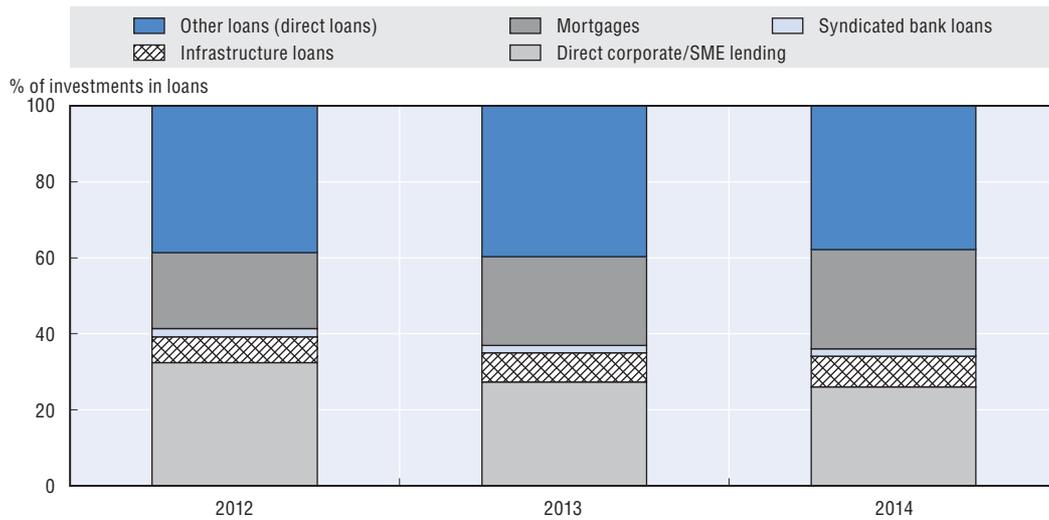
Source: OECD Large Insurer Survey. The breakdown of loans are Direct Corporate/SME Lending, Infrastructure Loans, Syndicated Bank Loans, Mortgages and Other loans (Direct Loans), reflected from the bottom of the figure to the top correspondingly.

For structured products, while the asset allocation in Europe and Americas remains the same in the past three years, other structured products have grown in proportion in the last year in Asia, with investment grade structured products experiencing a small fall.

The loan breakdown between regions is vast, with mortgages being the main investment in Americas, while direct loans are the majority of investments in Europe. In Asia, the loan breakdown is more mixed.

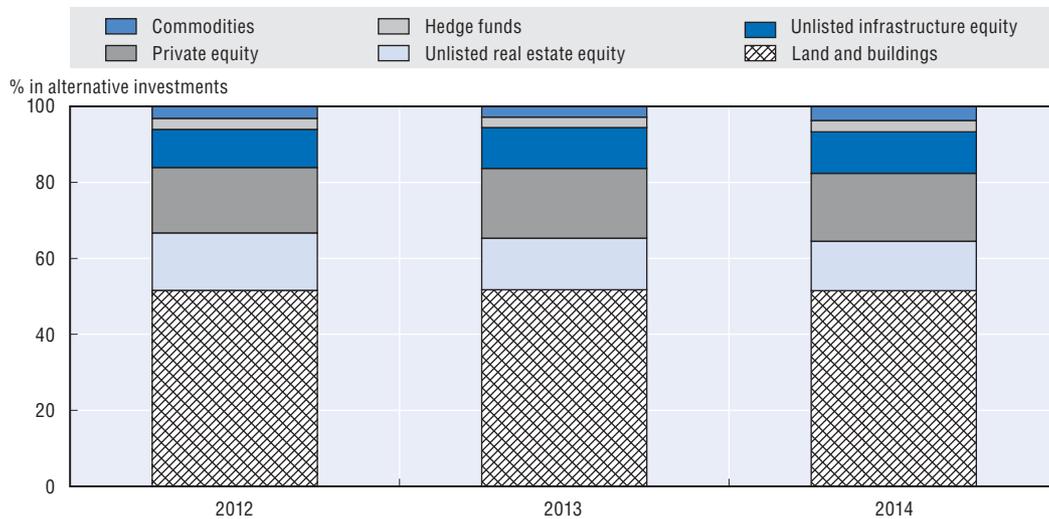
Without taking into account the volume of assets, it appear that Asia is increasing the proportion of assets being allocated to riskier asset classes in general, while Europe and the Americas maintain the current conservative investment policy.

Figure 20. **Loans in Asia, 2012-2014**



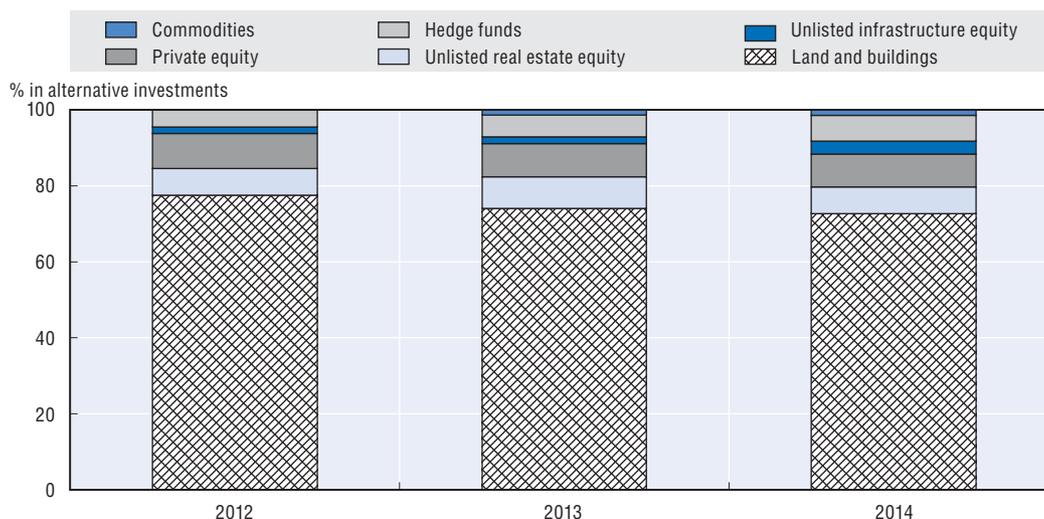
Source: OECD Large Insurer Survey. The breakdown of loans are Direct Corporate/SME Lending, Infrastructure Loans, Syndicated Bank Loans, Mortgages and Other loans (Direct Loans), reflected from the bottom of the figure to the top correspondingly.

Figure 21. **Alternative investments in the Americas, 2012-2014**



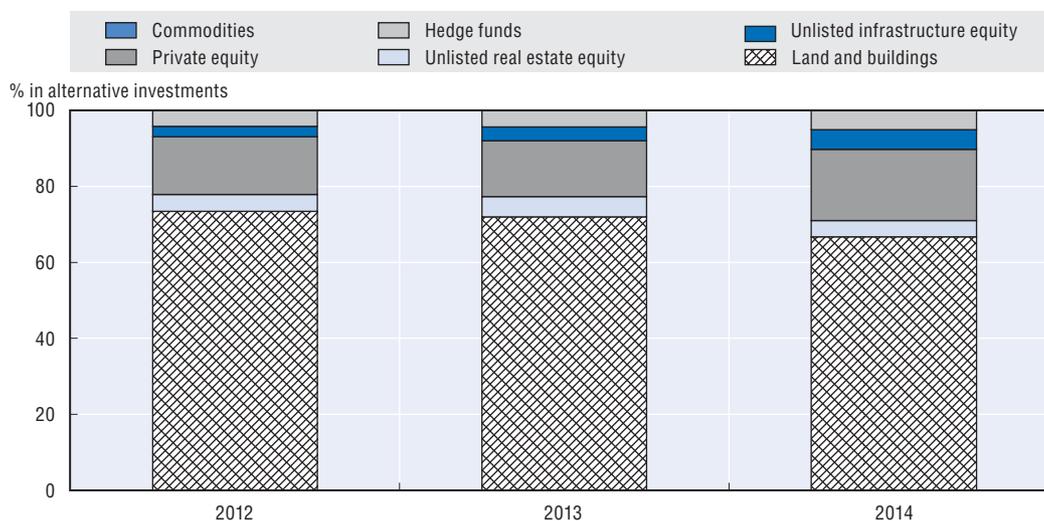
Source: OECD Large Insurer Survey. The breakdown of loans are Land and Buildings, Unlisted Real Estate Equity, Private Equity, Unlisted Infrastructure Equity, Hedge Funds and Commodities, reflected from the bottom of the figure to the top correspondingly.

Figure 22. **Alternative investments in the EU, EEA and Switzerland, 2012-2014**



Source: OECD Large Insurer Survey. The breakdown of loans are Land and Buildings, Unlisted Real Estate Equity, Private Equity, Unlisted Infrastructure Equity, Hedge Funds and Commodities, reflected from the bottom of the figure to the top correspondingly.

Figure 23. **Breakdown of alternative investments in Asia, 2012-2014**



Source: OECD Large Insurer Survey. The breakdown of loans are Land and Buildings, Unlisted Real Estate Equity, Private Equity, Unlisted Infrastructure Equity, Hedge Funds and Commodities, reflected from the bottom of the figure to the top correspondingly.

III. Risk management and its relation to insurer investment policies

1. Asset and liability management of insurance companies

The motivation behind asset and liability management (ALM) in insurance companies is to avoid an isolated analysis of assets or liabilities which can have the effect of ignoring risks as well as matching and diversification effects between the two sides of an insurer’s balance sheet. The matching and diversification effects occur due to the interrelations between asset classes, underwriting lines, and the time structure of investment cash flows and claim payments.

Asset and liability management can take several forms in insurance companies: immunisation strategies, optimisation strategies and scenario analyses.

Immunisation strategies consist of cash flow, duration and currency matching. The *cash flow matching strategy* matches the maturity of each position in the liability portfolio with cash flows from assets. It aims to eliminate the effects of interest rate changes. However, there are several limitations to the cash flow matching strategy. First, when the timing and amount of claims are uncertain, which is particularly likely to be the case for non-life insurers, cash flow matching may not be precise. Second, cash flow matching can be costly, since this strategy requires insurers to select certain types of assets in which to invest for their cash flow needs, foregoing investing in alternative assets with higher yields.

The *duration matching approach* balances the duration of an insurer's assets with that of its liabilities. Duration matching aims to immunise the firm's value against interest rate changes. However, there are limitations to the duration matching strategy due to the underlying assumptions. For example, it only works accurately if cash flows are known with a high degree of certainty, only for small changes in interest rates (otherwise second order terms cannot be neglected), and only for parallel shifts of the entire yield curve. The portfolio will need to be re-immunised if further interest rates changes occur.

Currency matching approach is when asset cash flows are denominated in the same currency as the (expected) liability cash flows. This reduces foreign exchange rate risks although currency risks from unexpected cash flows will remain.

Optimisation strategies are typically based on a multi-period setup of the Markowitz approach and the Leibowitz approach. The *Markowitz approach* is used to find the asset structure with the optimal risk-return trade-off, given a fixed structure of the insurance portfolio. However, the principle of ALM is to provide a framework for managing both assets and liabilities by allowing the structure of the insurance portfolio to change.

Leibowitz and Henriksson (1988) developed a *portfolio optimisation strategy* that allows simultaneously selecting investments and underwriting lines so as to create an efficient mean-variance portfolio. Insurer liabilities are treated as a short position within the overall portfolio. Return and risk are then measured in terms of changes in the surplus of the asset value over the liability value. In this surplus framework, the optimal asset mix may differ substantially from the mix that is optimal when only the asset side is considered. Nevertheless, the Markowitz and Leibowitz approaches both account for correlations between assets and liabilities.

Scenario analyses predict the development of asset and liability values by assuming diverse, possible scenarios. Two common methods of scenario analysis are dynamic financial analysis (DFA) and stress testing. *DFA* implies modelling the entire insurance company and its environmental factors in an integrated manner. This is typically done by linking certain key figures of the insurer (e.g. the premium income, investment income or loss ratio) with macroeconomic developments (e.g., GDP, interest rate environment or unemployment rate). Since these environmental factors are stochastic, it results in a stochastic model of the insurance company. From such an approach it is possible to derive, for example, the insolvency probability of an insurer, taking the relevant interdependencies between assets and liabilities into account.

Stress testing includes both quantitative and qualitative analyses. Quantitative stress testing aims to determine the ruin probability or expected shortfall in diverse, extreme scenarios, for example, a stock price decline of a certain percentage, whereas qualitative

stress testing is widely applied when identifying emerging risks, and is particularly useful when quantifying certain risks.

Insurance companies' asset and liability management strategies vary depending on the companies' lines of business. Non-life insurance companies offer short-term contracts, and their claim distributions are typically more volatile, making the management of their liquidity risks an important goal of the ALM. Therefore, non-life insurance companies primarily use stochastic models such as DFA. In life insurance companies, where contracts are relatively long term with claim numbers, and size of claims being less stochastic as long as the underlying mortality tables remain stable. Consequently, predicting mortality rates is of great importance for assessing future cash outflows. The importance of this factor continues to increase as life insurance companies develop products designed to insure against longevity risk. Furthermore, life insurers usually have a long planning horizon for their asset investment, and thus interest rate risks are of bigger concern than liquidity risks. Therefore, life insurers generally engage in immunisation strategies, optimisation strategies and scenario analyses.

Whatever strategy is being used, the possibility of model uncertainty or failure should be borne in mind. Models may not take into consideration the appropriate assumptions, which could lead to failure of the model. Investment strategies should not rely solely on models but also have a comprehensive risk management strategy that goes beyond models.

The OECD Large Insurer Survey asks insurance companies to describe the method(s) of their Asset Liability Management (ALM), such as immunisation strategies, optimisation strategies and scenario analyses. The results show that the ALM methods mentioned above are applied in practice. However, the specific applications of these ALM methods are heterogeneous among the sample insurance companies due to their different business models, i.e. different liability structures. The following are a list of (selected) responses the sample insurers:

- *“Our ALM program is limited given the short-term duration of our liabilities and the liquid nature of our investment portfolio. Most claims are paid out of current operating cash flows. We have a small ALM program which looks to match average duration.”*
- *“ALM methods depend upon the nature of liabilities in the segment. Public equity vs. fixed income mix is managed actively to target participating and other pass-through segments. For guaranteed segments, appropriate rebalancing toward fixed income duration targets is achieved using limited rebalancing of derivative overlays. Asset mix targets for these segments are achieved through ongoing sourcing of desired illiquid fixed income and alternative long duration assets. Total company risk is primarily reviewed and reported through loss measures, including Earnings at Risk, Earnings Sensitivity, Economic Value-at-Risk and Economic Capital-at-Risk. Risk forecasts are updated continually and management actions developed to achieve operating targets.”*
- *“Firstly, portfolios are managed in defined segments/portfolios, each supporting specific blocks of liabilities. Portfolio managers use replicating portfolio derived metrics, where appropriate, to manage interest rate risk. Secondly, portfolio construction is informed by Strategic Asset Allocation (SAA) and Marginal Asset Allocation (MAA) analyses. Investment portfolios are structured to have sufficient cash and diversified marketable securities to meet their obligations. Thirdly, managers also consider Risk Adjusted Capital (RAC) and capital constraints during portfolio construction/optimization, and manage portfolios in a way that adheres to applicable liquidity policies of the Treasurer.”*

- “For the long term, ALM pursuit immunization strategy which combined with short term scenario analysis such as interest rate volatility, rate expectation, and primary market circumstance of long term maturity bonds.”
- “Following a policy of surplus management-type ALM, we control the surplus derived from the difference between the economic values of assets and liabilities through purchases of super long-term bonds aimed at prolonging asset duration and reductions of high volatility assets such as equity.”
- “Asset Investment Policy of the firm is determined annually through scenario analysis. Investment strategies, tactics and plans are set in the beginning of every year. Furthermore, interest and currency stress tests are applied; asset liability maturity details are calculated.”

Derivatives as a tool of ALM

Since derivatives provide a means of managing a variety of firm-wide risk exposures, they are valuable instruments for ALM by insurance companies and pension funds. Indeed, insurers and pension funds use derivatives for several purposes, including investment and portfolio hedging, replicating assets, and generating additional income.

In practice, there are several common types of derivatives used by insurance companies and pension funds:²⁵

- Swaps: Insurers and pension funds can purchase interest rate swaps to manage cash flow risks caused by interest rate changes. Exchange rate swaps help insurers manage foreign currency dominated investments.
- Options: Options, mostly in the form of caps, floors, and swaptions, are used frequently by life insurers and pension funds to hedge against interest rate risk, and particularly for products embedded with minimum guaranteed returns.
- Credit derivatives: Credit default swaps (CDSs) and collateralised debt obligations (CDOs) can be utilised by insurers and pension funds as alternatives to debt security portfolios.

Non-life insurers usually use derivatives as a means of standard asset management with the objective of generating higher investment returns. Life insurers and pension funds use derivatives extensively as a tool for hedging risks. Life insurance contracts with guaranteed returns and pension funds with defined benefits especially use derivatives to build up investments so as to mirror these promised guarantees.

One could argue that life insurers and pension funds sell embedded option contracts (put options) to policyholders and beneficiaries, for example, by making investment guarantees. Hence, one ideal way to hedge against their positions is to buy similar put options from the derivatives exchange market to achieve ALM. However, in practice, finding such derivatives in the capital market is difficult and swaps, in particular interest rate swaps, are used instead.

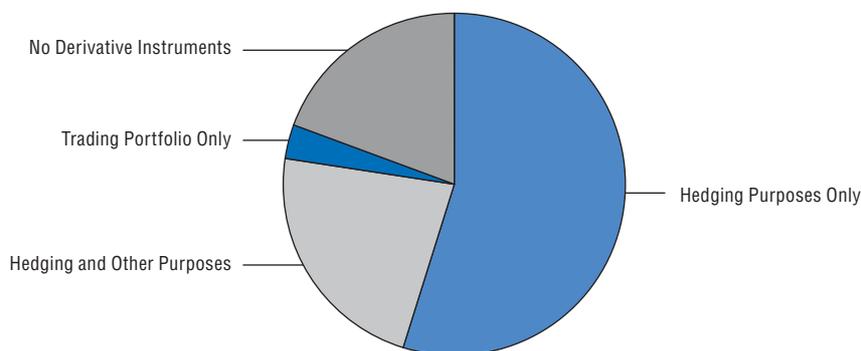
Life insurers and pension funds invest a large portion of their assets in fixed income securities. The time value of life insurers’ and pension funds’ liabilities are calculated by the discounted, expected future cash flows, which is also subject to interest rate risk, which swaps can be used to hedge.

Derivatives are seen as an efficient tool for asset and liability management, as it enables insurers and pension funds to hedge large volumes of capital with fewer transaction costs. However, the liquidity of derivative exchange markets is of concern in this regard. For example, there is no liquid market for equity derivatives that provide

insurers or pension funds with longer than five years of equity exposures. One solution is to purchase these derivatives from investment banks, which may increase the cost of the transaction and change the nature of counterparty risk. For interest rate derivatives in euros, the markets may be liquid for derivatives with a term of ten or twenty years, but unlikely for a term exceeding twenty years. However, in Sweden, for example, the length of insurance or pension liabilities is usually longer than thirty years which there is no market for hedging.

The OECD Large Insurer Survey asks participating insurance companies to describe the main objectives of their derivatives policy (for example, hedging purposes only, market entry or as substitute to cash market instrument, asset-liability duration matching). Among the thirty-one valid responses, sixteen sample insurers indicate that they use derivatives for hedging purposes only. Seven insurance companies use derivative instruments for other purposes than hedging, such as market entry or as substitute to cash market instrument, asset-liability duration matching, acquisition preparation, economic steering and speculation (if necessary). One insurer uses derivative instruments in its trading portfolio. Six insurance companies do not participate in any derivatives operations (See Figure 24).

Figure 24. **Objectives of derivatives policy in practice**



Source: OECD Large Insurer Survey. The “Other Purposes” stands for objectives of using derivative instruments such as market entry or as substitute to cash market instrument, asset-liability duration matching, acquisition preparation, economic steering and speculation (if necessary).

2. Impact of ALM on insurer investment strategies

Appropriate asset and liability management will result in an insurer structuring its assets and liabilities in such a way that the overall firm risk stays within its predefined risk appetite, for example, measured by a maximum insolvency probability for a certain period of time. A necessary condition for ALM to work is that there are risk interdependencies between the insurance risks (and other insurer liabilities) and investment risks. These interdependencies can have a timing dimension and a size dimension.

Non-life insurance

In property and casualty insurance, it is rare to find assets that exhibit risk dependencies with liabilities, either in the timing or claim size dimension. Common risk sources that drive both asset prices and claims would have to be considered individually. An example of this is a building company that prospers due to a hurricane event in a certain region. Thus, a flood insurer might consider investing in a building company for

ALM purposes. Credit insurance claims are higher in times of economic downturns that are positively correlated with stock price indices. Therefore, buying puts on stock price indices can help a credit insurer in its ALM.

However, for personal accidents or liability cases, it is impossible to find risk dependencies with certain assets. As property and casualty risks are less precise compared to life and health risks, the aim of ALM would mainly be to ensure short-term liquidity management. Therefore, property and casualty insurers are usually not able to invest a large part of their portfolio in illiquid, long-term investment projects. However, for long-term investment projects financed through investment funds, the shares of which can be easily sold, property and casualty insurers could invest more easily.

Life insurance

In a broad portfolio of life and health insurance contracts, due to underlying mortality and morbidity assumptions, claim sizes and the timing of cash flows can be predicted fairly well. This enables life and health insurers to employ immunisation and optimisation strategies for ALM. The first candidate assets for ALM purposes are bonds because they typically have a fixed term to maturity and yield regular payments. As long as bonds do not default and the bond market has sufficient depth, it is possible to construct a bond portfolio that matches the expected cash flows of liabilities, or their duration through a duration matching strategy.

However, incidental deviations from mortality tables or systematic changes of mortality not covered by the tables could lead to false predictions of life insurance liabilities. Options embedded in life insurance contracts also lower the predictability of cash flow due to the policyholder's discretion in when to exercise, for example, a surrender option or a paid-up option, that is, a possible exemption from premium payment. In this case, immunisation strategies usually try to match the expected cash flows rather than the actual ones.

On the asset side, asset classes other than bonds can be taken into account for an ALM. Although their cash flows are not completely certain, a regular income stream from residential real estate investments or relatively constant dividend payments from share investments can serve as cash flows that approximately match liabilities. Using such cash flows for ALM can overcome the problem that, for many life insurance contracts, duration is longer than the maturity of bonds in the market. These investments therefore can help close a "duration gap" between assets and liabilities that is crucial for interest rate risk, although the volatility of cash flows from dividends is much higher than for bonds.

In principle, direct long-term investment is a suitable asset class for life insurers' ALM. In this case, the inherent illiquidity of long-term investment fits well with illiquid liabilities and creates a sort of "natural marriage".

However, market demand for products that offer more, not less, liquidity could be an impediment for long-term investment by life insurers. Especially if policyholders' surrender options are granted for consumer protection purposes which require a degree of liquidity by the insurer. Such liquidity must then be supported by investments in liquid assets, which reduces the capacity for investing in illiquid, long-term assets.

This may explain some of the observations made in the OECD Large Insurer Survey that the asset allocation of insurers has not moved towards long-term investments in the last couple of years. Despite the low-interest rate environment, illiquidity premiums of

long-term investments were not sufficient to outweigh the disadvantages of long-term investments' inherent illiquidity (see Figures 2 to 5).

IV. Macroeconomic environment and its influence on insurer investing

According to the IMF *World Economic Outlook* (October 2015), the global economy experiences subdued growth in 2015, specifically, a 3.1% increase in world output, which falls 0.2 percentage points below the growth rate of 2014.²⁶

Macroeconomic uncertainties pose risks to the global insurance industry, which can be categorised into four major issues. The slow economic recovery from the recent financial crisis resulted in high unemployment rates in some countries. This, together with an aging population, can negatively impact the insurance industry and pension fund growth in these countries. Consequently, insurers, particularly from developed countries, are inclined to seek higher yields in emerging markets. Rising individual wealth and aging populations in emerging markets generate growth opportunities for insurers and pension funds from advanced economies. However, these high yields are associated with potential legal and political risks due to different regulatory standards and political uncertainties.

In response to the global financial crisis and the recession since 2007, the central banks of major economic areas – in particular, the United States, the United Kingdom, the Eurozone, and Japan – have cut short-term interest rates and kept interest rates low through quantitative easing. The loose monetary policy generates interest rate scenarios similar to those observed in Japan since the 1990s. This monetary policy aims to stabilise the financial system and foster economic recovery, but it has led to an environment of persistently very low interest rates.

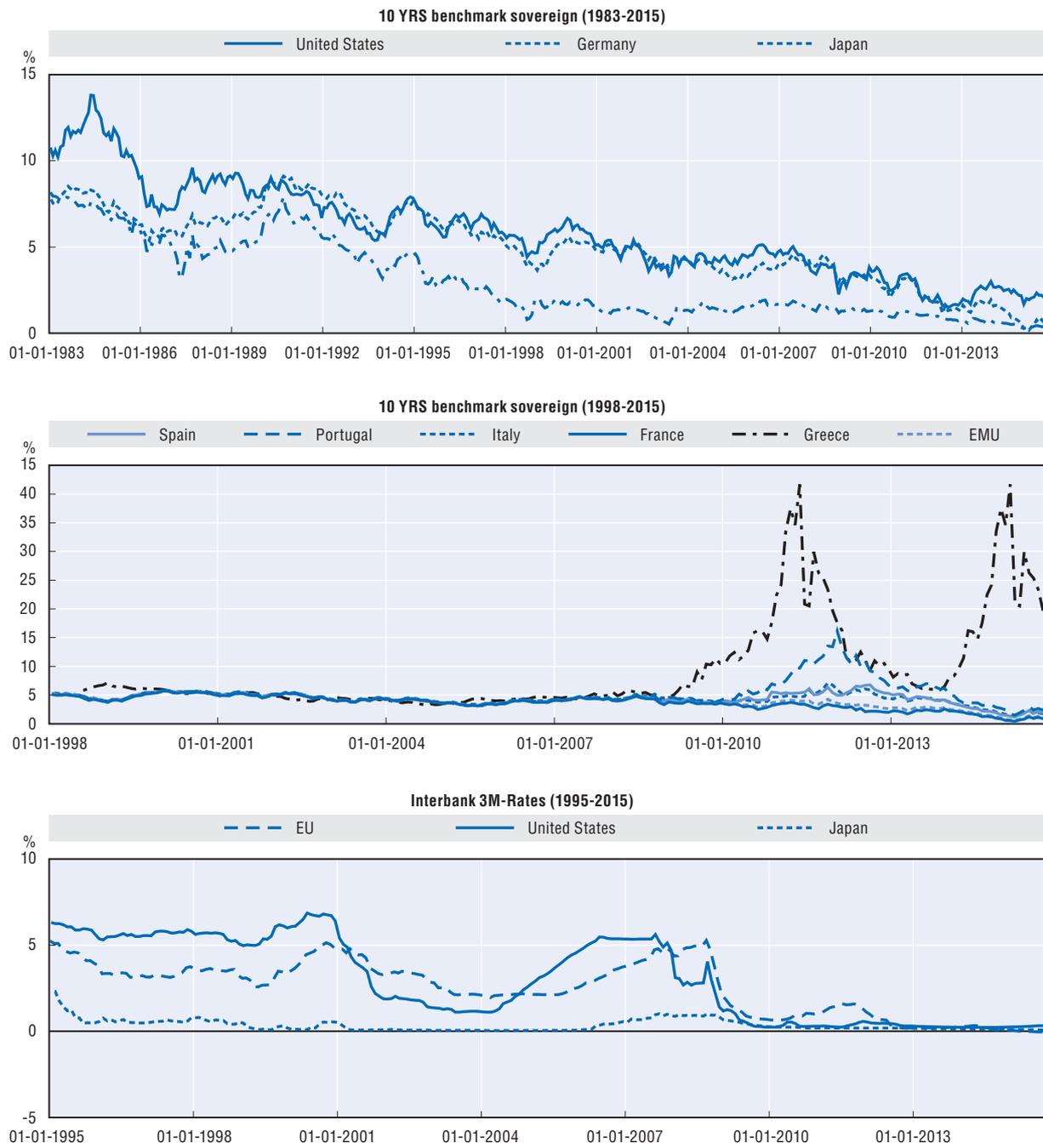
Long-lasting low interest rates affect both the assets and liabilities of insurers. On the one hand, low interest rates constrain profits by generating insufficient investment returns, particularly for life insurers and pension funds that invest many of their assets in long-term, fixed income securities. On the other hand, the value of insurers' liabilities increases when applying the reduced rate for discounting. Hence, the low interest rate environment can cause a financial distress for life insurers and pension funds.²⁷

Taking the Eurozone as an example, the sovereign debt crisis in Europe increased investors' risk aversion, inducing a "flight-to-quality" phenomenon. Specifically, a shift in investment toward some countries (for example, Germany) led to an increase in sovereign bond prices and, consequently, a decrease in bond yields (Figure 25). Low interest rates are having an important impact on the investment returns of the life insurance industry and pension funds, particularly in countries such as Germany, Italy, and the United States, where saving products with high guaranteed returns sold in the past represent a prominent share of the total portfolio of life insurers.²⁸

Contagion risks from exposure to sovereigns bonds and bonds of other financial institutions continue to be of high concern to the insurance industry in many regions, notably in many European countries, as government and corporate bonds tend to occupy a large proportion of insurers' asset portfolio, particularly for life insurers and pension funds.²⁹ Therefore, a deterioration of sovereign or corporate credit quality induces higher credit risks for insurers.

Emerging risks, such as cyber risk and world or regional health risk (for example, EBOLA), are of substantial concern to the insurance industry.³⁰

Figure 25. Long-term benchmark interest rates and interbank rates



Notes: The top figure shows the yields of 10-year government bonds in the United States, Germany, and Japan. The downward trend reflects the decreasing global long-term interest rates. The middle figure demonstrates that the sovereign debt crisis in the Eurozone since early 2009 has driven up long-term interest rates in several southern countries of the European Monetary Union (EMU). The bottom figure shows that the quantitative easing policy of central banks has kept the short-term interest rates in the European Union, the United States, and Japan at low levels since late 2008. Data source: DataStream, Thomson Reuters.

Life insurance products and their exposure to interest rate risk have been extensively studied in the academic literature. For example, Holsboer (2000) describes the potential impact that a worldwide downward trend in interest rates could have on the life insurance industry in the presence of products with minimum guarantees. He highlights that the

duration mismatch between the asset and the liability side plays a major role. For life insurers' risk situation – as the Japanese example from the past (*nota bene*: most Japanese insurance companies have currently resolved their prior spread problems) or the current situation in some European countries may show – when prevailing interest rates are substantially lower than they were at the time of contract inception, the existing stock of liabilities becomes more expensive to fund, as assets that come due are reinvested at a lower rate of return.

Gerstner et al. (2008) include additional sources of risks – surrender and mortality risk – and find that early death of or early surrender by policyholders are significant drivers of insurers' default risk. The surrender option value embedded in many life insurance contracts is studied by Albizzati and Geman (1994). They stress how changes in prevailing interest rates can be a major challenge for insurers that provide products featuring such an option. Because policyholders, in times of highly volatile financial market returns, may opt for more attractive investments elsewhere, life insurers have the incentive to offer higher guaranteed returns, with a consequent increase in their interest rate risk exposure.

Schmeiser and Wagner (2014) investigate the relation between interest rate guarantees, solvency requirements, and asset allocation for life insurers. Their findings suggest that if the risk-free interest rate (i.e., the return on the bond portfolio) approaches the guaranteed interest rate, the insurers' investment strategy tends to become less risky.

In Germany, for example, life insurers typically offer products with minimum investment return guarantees and minimum profit participation ratios. Regulators decide on the maximum of the allowed minimum return according to the presently achievable interest rates. The minimum return set at contract inception cannot be changed during the lifetime of the contract without the approval of the regulator. The natural implication of this product feature is the simultaneous existence in the insurer's portfolio of products with different minimum investment returns.

The Financial Stability Review (2013) released by the Deutsche Bundesbank, and Kablau and Weiss (2014) report the results of stress scenarios conducted on German life insurers. According to the report, persistently low interest rates will have a strong negative impact on the solvency situation of a subset of insurers. Under the most extreme scenario, by 2023, more than one-third of all life insurers operating in Germany will not be able to meet the regulatory capital requirements mandated by Solvency I.³¹ In the German market, the estimated average guaranteed return of life insurance contracts was 3.12% in 2013, and products with a guaranteed return of 4% still account for approximately 24% of the extant contracts.

The OECD Large Insurer Survey asks the participating insurance companies about the impact of the prolonged, low interest rate environment on their profitability, return on investment, interest income, business strategy, and asset allocation, and whether they are induced to adjust their business model to cope with the low interest rate environment. Among the 30 valid responses, only 4 insurance companies report no significant impact from the low interest rate environment, and consequently did not have to adapt a new business model or investment strategy. The remaining majority reports influences of the prolonged low interest rate environment as well as the corresponding changes:

- *“The low interest rate environment has placed pressure on accounting investment income and profit. The business has generally reduced its offering of products with material investment guarantees (interest rate or equity) and/or substantially reduced the nature of the guarantees that*

remain in the existing product suite. The company has thus the incentive to switch its focus to unit-linked products.”

- “The steady fall in interest rates has reduced the investment income of the company and in turn has meant transferring this fall to policyholders, with significant impact on pension annuities. This has required revising the distribution of assets in search of better returns.”
- “Based on the group’s disciplined approach to ALM, the capital position of the company has not decreased due to the lower yields, and this strong capital basis allows the group to deploy moderately more capital to take financial market risks. The company has undertaken initiatives such as higher asset allocation to equities and illiquid assets (i.e. private debt).”
- “Sales activities have become more difficult in terms of attaining the same margin. Products like closed end funds become unattractive and have to be compensated by new offers on open-ended fund and capitalisation.”
- “The low interest rate environment in the domestic market has been steadily eroding the company’s investment return. Therefore, the company has controlled its new investment volume in the domestic government bond market and increased foreign fixed income securities as well as credit related financial instruments.”
- “The low interest rates induced the company to actively enlarge its exposure of loan to prime enterprises, alternative investment, structured products and overseas investments to achieve portfolio diversification.”
- “Apart from the negative impacts of the low interest rate environment, it has its positive effect on the stock market, which eventually makes the company’s pension products more preferable to customers.”

Berdin and Gründl (2015) assessed and quantified the effects of current low interest rates on the balance sheet of a representative German life insurer, given the current asset allocation and liability structure. By generating a stochastic term structure of interest rates, as well as stock market returns to simulate investment returns of a stylised life insurance business portfolio in a multi-period setting, they observed the evolution of the life insurer’s balance sheet over time with a special focus on its solvency situation. In response to this, Germany has been requiring an additional premium reserve for life insurers to establish an additional buffer since 2011. In January 2015, the Life Insurance Reform Act was implemented in Germany which limits the sharing of valuation reserves with policyholders upon the expiry of their contract to only when the life insurers has sufficient reserves to meet interest rate guarantees. A new maximum interest rate is being from January 2015 of 1.75% to 1.25%. On 1 January 2017, the maximum interest rate will be further lowered to 0.9%.

V. Insurance regulation and its impact on insurer investment strategies

1. Changes in insurance regulation

In many countries, regulation of the insurance market has undergone dramatic reform in recent years and many other countries are expected to move towards risk-based capital regimes which have already been implemented in some OECD markets such as: Australia, Canada, Japan, South Korea, Switzerland, and the United States. This global trend toward (more) risk based capital regimes may influence insurers’ abilities or willingness to make long-term investments.

These regulatory regime changes not only involve substantive changes to insurance regulation itself, but also extend to the regulatory regime and organisation of regulation and supervision. A shift in substantive regulations toward a more risk-based regime is often accompanied by a shift from a rule-based to a more principle-based regime. In such a situation, insurance regulators are often granted more leeway in closing regulatory gaps by granting many supervisory/regulatory agencies the authority to pass non-legislative rules (such as, using U.S. terminology, interpretive releases, policy statements, staff legal bulletins, staff no-action letters, etc.). In all countries in which a principle-based approach is taken and decisive positions are rarely taken at the legislative level, the soft law passed by the regulator may have a substantive effect on investment decisions.³² Thus, reform of regulatory regimes has implications for insurer investment strategies.

Changes to Substantive Insurance Regulation

Most insurance regulatory regimes have gone through or are in the process of going through dramatic changes, especially in the areas of risk evaluation and the inclusion of new risks in solvency assessments. Australia, Canada, Japan, South Korea, Switzerland, and the United States are OECD member countries that are already operating under risk-based capital regimes, with Canada and Korea currently attempting to modernise their systems. Some countries have opted to follow the three-pillar approach of Solvency II (described below); others have chosen to focus more closely on market, credit, and operational risk in their solvency assessments.

Canada and the United States introduced risk-based capital standards as early as 1992 and 1994, respectively. Japan followed suit in 1996, with its Solvency Margin Standard, and Australia did so in 2001 with the enactment of the General Insurance Reform Act. While Solvency II has been implemented in the EU from January 2016, some EU countries shifted their systems toward a risk-based approach earlier, for example, the United Kingdom in 2004 with its Enhanced Capital Requirement and Individual Capital Assessment and the Netherlands in 2006 with the Financial Assessment Framework (these two approaches are not risk-based in a strict sense, but are scenario based), although these systems will now be thoroughly reformed due to the transposition of the Solvency II directive. In 2006, Switzerland also altered its Insurance Supervisory Act by introducing the Swiss Solvency Test (SST).

At the international level, the International Association of Insurance Supervisors (IAIS) is developing the Risk-based Global Insurance Capital Standard (ICS) which would be applicable to internationally active insurance groups (IAIGs) as part of the IAIS' common framework for the supervision of IAIGs, or ComFrame. This will likely impact the application of risk-based capital regimes in countries with IAIGs.

Many Latin American countries are currently preparing to shift towards a risk-based approach, with the IAIS Insurance Core Principles and Solvency II being major influences. In Chile, for example, a draft law on a risk-based framework was presented to Congress in 2011 and is currently being reviewed by the Senate. This draft legislation takes into account OECD and IAIS recommendations, and experiences in Canada, the U.S., Australia, and the European Union, in particular the Solvency II framework. Another example is Mexico, where the Comisión Nacional de Seguros y Fianzas (CNFS) started working on a Solvency II type law in 2008, which was approved by Congress in 2013 and entered into effect in April 2015. Several non-OECD countries are also developing risk-based capital regimes, for example, Brazil, where the Superintendência de Seguros Privados (SUSEP) is working on a

framework similar to that of Solvency II. In South Africa, a Solvency II style regime called SAM is expected for implementation in January 2016.

Several Asian countries, including the Philippines, Taiwan, and Malaysia, have already introduced risk-based capital regimes; others are working on bringing about such a change, including China, where the China Insurance Regulatory Commission (CIRC) developed the China Risk Oriented Solvency System (C-ROSS) for implementation from January 2016. Turkey seems to be the only OECD country in which there has been no concrete movement toward risk-based insurance regulation. However, ever since 2008, the country has witnessed several small legislative reforms and hosted seminars in preparation for the introduction of a Solvency II style approach and this still appears to be the legislative intention.³³

In the U.S., the business of insurance is primarily regulated at the state level. Through the National Association of Insurance Commissioners (NAIC), state insurance regulators have, however, sought to establish generally consistent solvency approaches. The NAIC's Financial Regulation Standard Accreditation Program requires state insurance regulators to have the statutory and/or regulatory authority to enforce key solvency provisions, including the so-called Risk-Based Capital (RBC) requirements. In addition to supervision at the state level, under the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010, the Federal Reserve assumed responsibility for the consolidated supervision of insurance holding companies that own federally chartered thrifts or banks as well as insurance holding companies designated by the Financial Stability Oversight Council. The insurance holding companies for which the Federal Reserve is the consolidated supervisor is 12.6% of the U.S. insurance industry's direct holding.³⁴

Under the RBC approach, there are two capital requirements, with the Company Action Level (CAL) serving as a warning to the insurer and the regulator that the insurer needs to take corrective action and the Regulatory Action Level (RAL) working as a trigger for regulatory action (there are also the Authorized Control Level and the Mandatory Control Level, which, when reached, allow or require for the commissioner to take control of the undertaking). RBC is intended to give the regulator the authority to take specified action including the authority to place a company under its control. It is designed to provide state regulators with an analytical tool that is transparent, auditable, and which does not unnecessarily rely on company-by-company judgment. It is not intended to require an "economic level" of capital, but rather a minimum level of capital. State regulators use other tools (such as, beginning from this year, ORSA) for information on the insurance group's internal capital requirements to carry out its current business strategy. A difference between U.S. RBC and Solvency II has to do with calculation of the capital requirements in regard to the valuation of the assets. Although both Solvency II and RBC take a modular approach concerning the risks to be evaluated, Solvency II follows a very stringent market value approach to evaluating assets that focuses on interaction and risk sensitivity of assets and liabilities on the balance sheet. Under the RBC approach certain assets (here under the category of fixed-income assets) are valued at amortised costs focusing more on the duration of the assets in relation to the liabilities that they support.

For long-term investments this may of course – especially during periods in which interest rate changes are expected – lead to rather different approaches under the two systems. Under the U.S. system, most states utilise a defined limits approach to limit insurers' investments in certain types of defined investments, while other states utilise a

prudent person approach that allows a broader approach to be used by insurers, provided policyholder liabilities are supported by prudent assets.

The Swiss Solvency Test (SST) is a predecessor of Pillar 1 of Solvency II and as such very similar to the Solvency II system; and Switzerland was the first to receive equivalence status to Solvency II. The “Zielkapital” (target capital), which is the functional equivalent to the Solvency Capital Requirement (SCR) under Solvency II and to CAL under the U.S. RBC system, is calculated at a confidence level of 99%, using the tail-value-at-risk as the risk measure.³⁵ Similar to Solvency II, positions are valued market consistently, that is, according to observable prices. For those assets for which prices are not observable, market-consistent values have to be determined using modelling techniques that are in accord with financial and actuarial methods: Asset cash flows are to be discounted with a risk-adjusted rate. There is, however, a small difference between SST and Solvency II when it comes to the risks to be evaluated. While Solvency II will require insurers to take into account not only insurance, market and credit risks, but also operational risk. In Swiss regulation, operational risk taken into account qualitatively, with the SST requiring capital for operation risks only on a case-by-case basis. Concerning investment decisions, the Swiss regulation applies a prudent investor test, which will, in all likelihood, prove similar to the prudent person test.

The Swiss system takes an interesting approach in dealing with the problem that is created by the market value method in low interest periods. Instead of applying auto-corrective mechanisms, the Swiss law gives FinMA, the financial supervisor, the authority to grant alleviation in the valuation of liabilities in such periods. In 2012, FinMA granted the use of such alleviations for the years 2013 until 2015, of which a part has been prolonged. Another method by which the Swiss system attempts to steer insurers toward investing in projects involves deviations in allowed counterparty risk. In its technical provisions, the Swiss tied asset regime allows an exposure of less than 5% to any one counterparty, but this limitation is lifted for all assets that are receivable from the Swiss state, its cantonal sub-units, banks with the Swiss state guarantee, or any asset guaranteed by a state with an AAA rating. Finally, in a recent revision of the Insurance Supervisory Act, the Swiss system incorporated a special approval mechanism that grants FinMA the authority to allow insurers to qualify as tied assets certain assets that technically do not qualify for that status. Such a case-by-case permission allows insurers to invest in certain long-term assets that otherwise would not have been usable as tied assets.

In the European Union, member states were required to transpose the Solvency II Framework Directive into national law for implementation from January 2016. The previous supervisory regime will be dramatically reformed by Solvency II with three ‘pillars’: Pillar 1: capital requirements (quantitative requirements); Pillar 2: governance and, especially, risk management requirements (qualitative requirements) and powers of the insurance supervisor; and Pillar 3: new transparency requirements. Furthermore, the rules applicable to group supervision are considerably transformed. The Directive’s transposition will put into place a supervisory system that is risk-based and transparent for consumers, and – due to increased use of principle-based law – more flexible. Within Solvency II, which is enacted via the Lamfalussy Process, the Directive and its national implementation acts set out only the core principles; detailed regulation is and will be undertaken by other bodies (i.e., the EU Commission and EIOPA).³⁶ This is intended to allow for swift and efficient adaptation of legal provisions to meet changes in the market or in other regulatory fields, for example, accounting or company law.

The transition from Solvency I to Solvency II, that is, from a rule-based approach to a principle-based one, will have a definite impact on investments. Under Solvency I, the supervisory requirements for investing assets covering so-called technical provisions enumerate all admissible forms of investment and provide quantitative limits to the maximum share of the same investment instrument (diversification) and for the maximum amount of investment with the same issuer (spread).

Solvency II is more complex. All (direct) investment requirements are drafted as principle-based provisions (see Arts. 132-135). Pursuant to Article 132, para. 1, all investments of assets are to be made with entrepreneurial caution (the prudent person principle). Neither the framework Directive nor the Level 2 provisions – since there is no derogation on this point (see Art. 135 in the version of the Omnibus II directive) – provide for any limitations as to what types of investment instruments are acceptable or set fixed quotas regarding investment mix or spread. Apart from these rather vague, directly applicable investment requirements, future investment decisions will be significantly influenced by the fact that the undertaking is required to set aside eligible own funds to address the market risk inherent in each investment. The amount of the respective capital requirement will have a profound practical effect, serving as either an incentive or a disincentive for particular investments.

Concerning long-term (infrastructure) investments, their riskiness may differ profoundly depending on the underlying project and the form of the investment. Usually, such investments are in the form of loans, but increasingly they also take the form of equity and, in some instances, bonds. Insurers need to set aside eligible own funds equalling the value of 39% to underlie equity (equity risk), 25% for an investment in real estate (property risk), and 49% for investments in private equity instruments or hedge funds (equity risk); investment in state loans by member states (spread risk) carried no obligation to set aside own funds. However, the European Commission has proposed a risk buffer that may be appropriate for certain long-term investments. For example, according to EIOPA, the risk charge for equity investments in infrastructure should be 30-39% for well-diversified portfolios of qualifying infrastructure equity investments in operational projects.³⁷ For other long-term equity investments, such as private equity or venture capital, EIOPA suggested a risk charge of 49% ($\pm 10\%$).³⁸

The charge for project bonds and infrastructure loans varies depending on their rating, their maturity, and whether they are repackaged. The European Commission has proposed to reduce the charges for infrastructure debt investments compared to other corporate debt by approximately 30%. This change is still under scrutiny by the EU co-legislators, the European Parliament and the Council.

To summarise, Australia, Mexico, Switzerland, South Africa, Bermuda and the EU and others have similar solvency regimes. Canada and the United States follow a risk-based approach that is not the same as Solvency II. Under the influence of the IAIS's ICG, it is likely that this momentum will accelerate globally.

Globally, one thing seems certain: the move toward fair valuation and risk-based regulation is likely to gain momentum in the coming years. This is foremost an outcome of international harmonisation of supervisory regimes to create a more level playing field.

2. The effects of regulatory changes on insurer investment strategies and long-term investments

Insurers' investment strategies are contingent on a plethora of factors, including regulatory requirements which could be one of the most important. Indeed, regulatory requirements can either incentivise or dis-incentivise long-term investment. To bring to light the features of regulatory regimes that have the most influence on long-term investment, the OECD conducted a survey designed to collect information from regulators and the private sector about the evolving regulatory framework for insurers (including the shift to risk-based capital regimes and increased reliance on governance and risk management principles to guide prudent investment behaviour) and how it may influence insurer investment strategies.³⁹ Regulatory factors that have a noticeable influence on insurer investment strategies, and thus also on long-term investment, are, for the most part, either quantitative regulations concerning insurers' capital endowment or risk governance requirements. Regulatory disclosure duties were not explicitly identified as having an identifiable effect on investment decisions. In countries in which a broad transparency regime has hitherto not existed, this could lead to insurers shying away from long-term investments that require disclosures (for example, atomic plants, prisons, infrastructure projects in certain countries) that have the potential to attract the public's disfavour and might harm the corporate image.⁴⁰

In terms of the global regulatory developments, a central counterparty for OTC derivatives transactions is now required and as part of this, centrally cleared derivatives are being required to pledge cash to cover collateral needs. This will likely impact life insurers which hold only limited cash on their books.

In the following, we identify the impact of both quantitative regulations (based on the OECD survey) and risk governance requirements on insurer investment strategies. We also discuss the extent to which regulatory changes encourage or discourage insurers from investing in certain alternative assets or assets with longer durations.

The Impact of Market Consistent Valuation and Risk-based Capital Regulations

Valuation. The market consistent valuation method employed for risk-based capital regimes links the value of insurer assets and liabilities closely to market values. Solvency capital calculations reflect the economic volatility and mismatch between insurer assets and liabilities. Volatility may be induced by uncertainties in cash flows from long-term assets and by liabilities which are shorter in term than the assets. Such volatility would dis-incentivise insurers to maintain long-term business and subsequently to hold positions in long-term assets.⁴¹

To evaluate long-term investment projects, one will have to take into account both uncertainty over cash flows and illiquidity of the projects. Both aspects will contribute to low project values that lessen the extent of own funds in the solvency balance sheet. This can be seen as an – economically reasonable – obstacle to long-term investment.

Capital requirements. Risk-based capital systems reflect the riskiness of investment projects in the capital requirements. Investing in long-term projects, with their illiquidity and cash flow uncertainty (which is partly caused by low data availability), and partly due to uncertainty of the future economy, leads to higher solvency capital requirements. However, a well-designed risk-based solvency regulation can recognise, where appropriate, that long-term investment is a means of reducing the mismatch and so the duration gap

between assets and liabilities. The ability of long-term investments to mitigate interest risk would then be reflected in lower capital charges. Some responses in the OECD survey indicate that a risk-based capital system could discourage long-term investment, as insurers might switch to safer assets to cope with stricter capital charges.⁴²

Disincentives to invest can also be created in the context of risk-based capital when differences in risks are not appropriately accounted for. For example, an exposure to short-term market risk and long-term/hold-to-maturity exposure to default risk are not the same, although they could be treated similarly.

One of the developments of Solvency II, which would likely impact investments, is the capital risk charges for equity investments. Equity listed in EEA or OECD jurisdictions (type 1) requires a 39% risk charge (plus a symmetric adjustment, set at 6.65% in June 2015), while equity listed outside of EEA or OECD jurisdictions will have a 49% risk charge (plus a symmetric adjustment)(OECD, 2015a).

Supervisory discretion to foster long-term and infrastructure investments. There appears to be a clear trend in many jurisdictions towards encouraging insurers to make more long-term investments and avoid creating disincentives towards them. The political motivations for this include attracting investors for important infrastructure projects and meeting the financing needs of state(s) and the real economy. However, possible volatility introduced by changes to a market consistent valuation and risk-based regulatory regime could prove a barrier to achieving such goals. In solvency margin regimes, investments can be indirectly controlled toward certain investments by imposing quantitative restrictions (on other investments). This is not to say that risk-based regimes are unable to impose quantitative restrictions, but that they are less likely to do so. Instead of direct quotas, however, risk-based regimes could include requirements that have an indirect effect on investment, such as matching, counterparty, derivatives, or concentration requirements for regulatory capital (OECD, 2015a).

Insurers look for a balance between expected returns and risk, which will in turn be able to meet its capital requirements. Thus, granting supervisory discretion to enable investment in certain long-term assets on a case-by-case basis, as done under the Swiss tied asset regime, may give the flexibility for insurers to be able to consider long-term investments. A disadvantage of such an approach – if it were implemented at a global scale – is that it could lead to increased risk of supervisory arbitrage and as such make the playing field less level. On the whole, possible barriers to long-term investment resulting from risk-based capital regimes are economically reasonable and serve the purpose of providing protection against insurers' insolvency. Any improvement of conditions for long-term investments (in comparison to their normal treatment under the regime) should thus be balanced with the possible impact on the solvency of insurers' for policyholder protection.

The Impact of Enhanced Risk Governance. Statutory governance requirements will not only influence insurer investment decisions, but induce them to strengthen their internal control processes, and ensure that certain key function holders (management or board of directors) are responsible for the insurer's risk management and investment strategy. These function holders (and the insurer as a legal entity) have a duty to review actual assets to ensure compliance with regulatory requirements.⁴³

A central part of enhanced risk governance is the "own risk and solvency assessment" (ORSA), which is intended to provide a multi-year overview of insurers' risk situations in an

integrated (i.e., holistic) risk management approach that covers all relevant risks of an insurance company. Examples of these include the NAIC's Risk Management and Own Risk and Solvency Assessment Model Act and the Australian Internal Capital Adequacy Assessment Process (ICAAP). In conducting an own risk and solvency assessment, insurers, of course, not only fulfil a regulatory requirement, but also engage in financially prudent activities. The OECD survey⁴⁴ highlights that the changes in governance systems (especially the introduction of ORSA in the Solvency II regime) require insurers to enhance their internal risk control processes, and place greater responsibility on insurers to ensure that they have (forward-looking) adequate capital to deal with stressed scenarios.

As with any asset, insurers need sufficient expertise to properly assess the riskiness of investment and in this case particularly long-term investments. This could involve the accumulation of substantial technical know-how, which is very costly to acquire and thus reduces the profitability of investments. An alternative to in-house expertise is to outsource the assessment. However, the costs of doing so would also be borne by the insurer.

Facilitating the Creation of Appropriate Investment Vehicles⁴⁵. An additional obstacle to investing in long-term assets – especially for small and medium-sized insurers – is a marked shortage of appropriate investment vehicles that are structured to generate a steady income stream. The creation of such vehicles might, however, be induced by appropriate legislation, such as the European Commission's draft regulation on European Long-Term Investment Funds (ELTIFs) in June 2013 which was further developed with corresponding regulatory technical standards by ESMA (European Securities and Markets Authority) and came into effect in all EU member states on 9 December 2015.⁴⁶

ELTIFs are a new type of (alternative investment) fund (EU AIF) that focus on investing in long-term assets, particularly in infrastructure projects. The fund – if it has received authorisation by the competent national supervisor – can be operated cross-border with authorisation from one Member State being effective in all other EU Member States, and are comparable to collective investment schemes under the Undertakings for Collective Investment in Transferable Securities Directive (UCITS). The ELTIFs provide a direct access for both institutional and retail investors to long-term assets, such as energy, transport and communication infrastructures, industrial and service facilities and social housing. The objective of the ELTIFs regulation is thus to increase the amount of non-bank finance available to EU companies needing long-term capital.

This regulation may generate positive impacts for life insurers and pension funds investing in long-term assets, particularly for small and medium-sized companies that are suffering from a lack of proper investment vehicles for long-term investments. However, it is not clear whether this advantage will outweigh the effect of Solvency II capital requirements which could dis-incentivise investments in ELTIFs, depending on the position that the legislator or regulator takes. In view of the recent regulatory initiatives to facilitate insurers' investments into long-term (especially infrastructure) assets,⁴⁷ it is expected that the capital charge will be set at 39%.

VI. The role of insurers in long-term investment financing⁴⁸

1. Changes in the financial landscape⁴⁹

The recent global financial crisis altered the financial landscape due to the changing role of the banking sector and the effects on equity markets from certain regulatory changes. In the banking sector, the recent crisis has had a negative impact on the size of bank lending. For example, European banks are usually important contributors to the international syndicated loan market to emerging economies, with market shares typically higher than 80%. However, the volume of deals involving European banks has dropped significantly since the crisis. Moreover, banks have switched their lending away from riskier corporate borrowers to safer investment grade borrowers. The crisis also limited the long-term financing ability of banks, since banks have been de-risking (de-leveraging) globally and addressing non-performing bank loans. As for capital markets, the uncertain macroeconomic prospects and the low interest rate environment have had adverse effects on demand for long-term equity capital. Additionally, some regulatory changes (particularly in response to corporate governance scandals) have turned equity financing into a more costly funding approach. The scale of share buybacks also indicates that capital is not being put into productive investment but for the financial management of corporates.

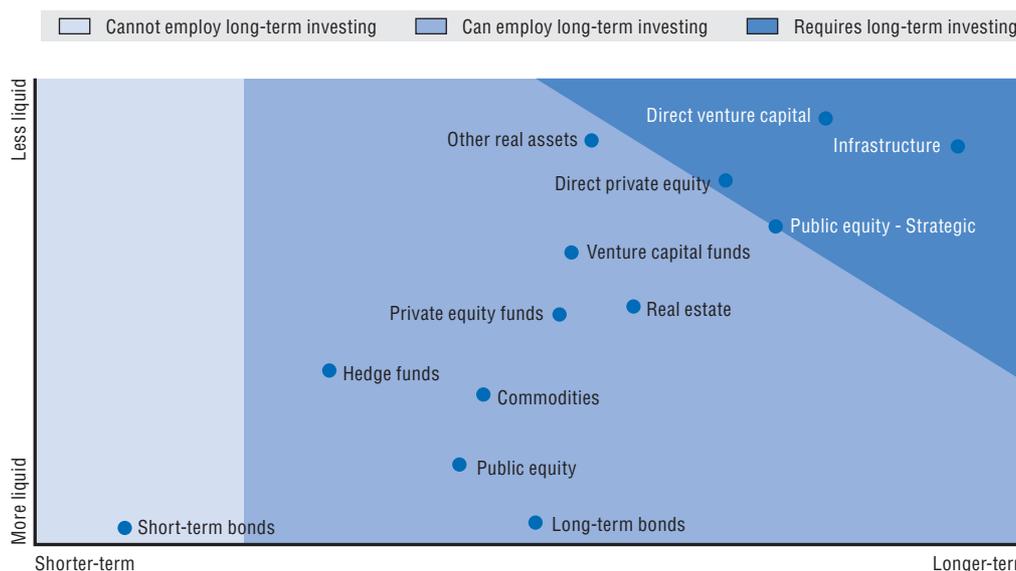
2. The evolution of insurers and pension funds as long-term investors

The OECD defines three types of long-term investments: patient, engaged and productive capital, in particular in terms of the role of institutional investors in more illiquid assets such as infrastructure investments.⁵⁰ World Economic Forum and Oliver Wyman (2011) indicates that long-term investment implies the expectation of holding an asset for an indefinite period of time (typically more than 10 years) by an investor with the capability of doing so. Figure 26 presents different types of investment classes according to their liquidity and time horizon of investing. Asset classes that are appropriate for long-term financing are direct private equity and venture capital, infrastructure, and strategic stakes in public companies. These asset classes exhibit the features of being more illiquid and longer-term, and consequently being perceived as riskier.

Direct private equity investment, where an investment is made directly into unlisted companies, plays an important role in financing start-up companies, typically in innovative business. The returns of direct private equity investment are uncertain and long-term, consequently generating high risk premiums for investors. Similarly, direct venture capital investment, where a direct equity investment is made into early-stage companies with fast growing prospects, have similar risk-return patterns as private equity.

Long-term infrastructure projects can be in industrial, extractive, environmental and other projects/public services (including social, sports and entertainment)(OECD, 2015c). Infrastructure investments typically face illiquidity risk, with a long economic lifetime and capital commitment of around 60 years on average and even up to 99 years.⁵³

In a challenging environment of low fixed-income returns, insurers may invest in equities for possible higher, long-term returns. Strategic stake holding in public companies may be associated with a board position and a potential lockup period; however, this does not occur when insurers invest through private money managers, index funds, or other managed products (such as in ELTIFs). Apart from the advantage of generating higher yields, equities allow insurers to hedge against inflation and are tax-efficient. However, the

Figure 26. **Asset class liquidity versus time horizon**

Source: "The future of long-term investing", a World Economic Forum report in collaboration with Oliver Wyman (2011, p. 14).

capital charge for investing in equities is substantially higher than that for high quality bonds, and the duration mismatch resulting from equity investments produce additional regulatory challenges in terms of cash flow and stress testing.

Life insurers and pension funds are the two major institutional investors for long-term investment financing. The size of life insurers' and pension funds' assets continues to grow, as both life expectancy and consumer awareness increases. Life insurance companies and defined benefit pension funds have longer-term liabilities, positioning them to want more investment in long-term illiquid assets.

The OECD survey on Pension Funds' Long Term Investments (2014) reviewed the trends in assets and asset allocation of 104 large pension funds (LPFs) and public pension reserve funds (PPRFs). The survey findings suggest that both LPFs and PPRFs exhibited similar investment trends with increased allocations to equities and reduced fixed income, on average, while the opposite was true amongst LPFs. The incentives for large pension funds to invest in alternative assets, such as infrastructure and private equity, have increased. Australia and Canada are the two leading countries in infrastructure investment, with roughly 5% of their pension funds invested in this asset class, although it should be noted that both countries have a number of very large pension funds on a global scale. Thus, the size of the pension schemes appears to be an important factor when it comes to investing in illiquid asset classes. Moreover, these two countries have mature personal pension plans, stable political environments, and relatively more flexible regulation of pension fund investment and solvency.

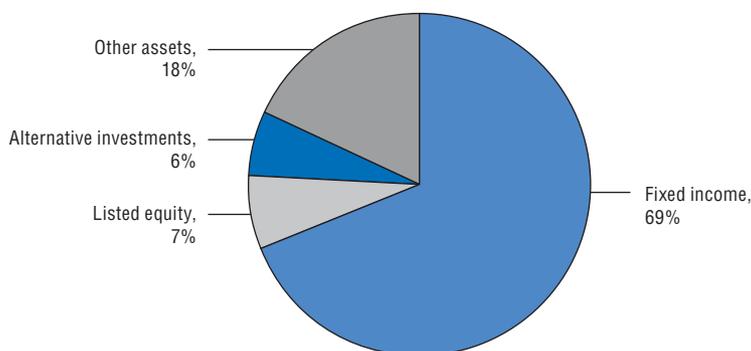
The OECD Large Insurer Survey provides some indications of changes in insurers' asset allocation for the last three years; for instance:

- “The company has marginally increased its risk by looking at high-quality preferred shares and alternative investments such as private infrastructure funds due to the low yields on fixed income products.”
- “In order to seek better investment returns, the company increased the financial leasing and real estate exposure and set the long-term target asset allocation to a time horizon of around 3 years.”
- “The company increased the share of illiquid assets such as infrastructure debt and equity in order to earn illiquidity premia. It also increased its exposure to European peripheral sovereigns.”
- “For companies in the low interest rate environment, some of them increased the foreign fixed income securities.”

The participating insurance companies were asked about their target asset allocation for the longer term. Insurers indicated that fixed income will still be the most important asset class in their target portfolios, which will be around 60-70% of the total investments for most regions, although in other European countries it stands at 38% (see Figures 27, 29, 31 and 33). For insurers in the Americas and Asia, the second largest asset class is listed equity, expected to occupy 7% and 10% in the investment portfolio, respectively. Alternative investments follow as the third important asset class on average for around 6%.

When comparing this to actual asset allocation in 2014, alternative investment and other investment are the main asset classes in which there is a greater scope to reach the target allocation. Listed equity, to some extent, is also below the target allocation in some regions (see Figures 28, 30, 32 and 34).

Figure 27. **Target asset allocation for the longer term in the Americas**



Source: OECD Large Insurer Survey. The target investment percentages in different asset classes are on an average basis for all the participated insurance companies in the economic area. “Other Assets” here mostly stand for loans.

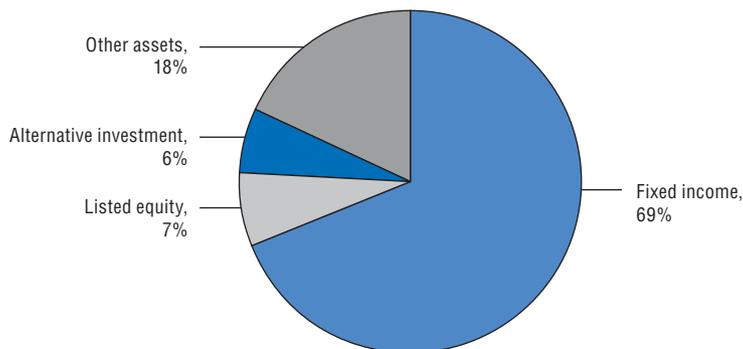
Figure 28. **Actual, target and difference from target asset allocation, Americas**



Source: OECD Secretariat

In the EU, EEA and Switzerland, the listed equity asset class is less preferred (3%), whereas insurers try to invest a relatively higher portion in alternative assets (14%).

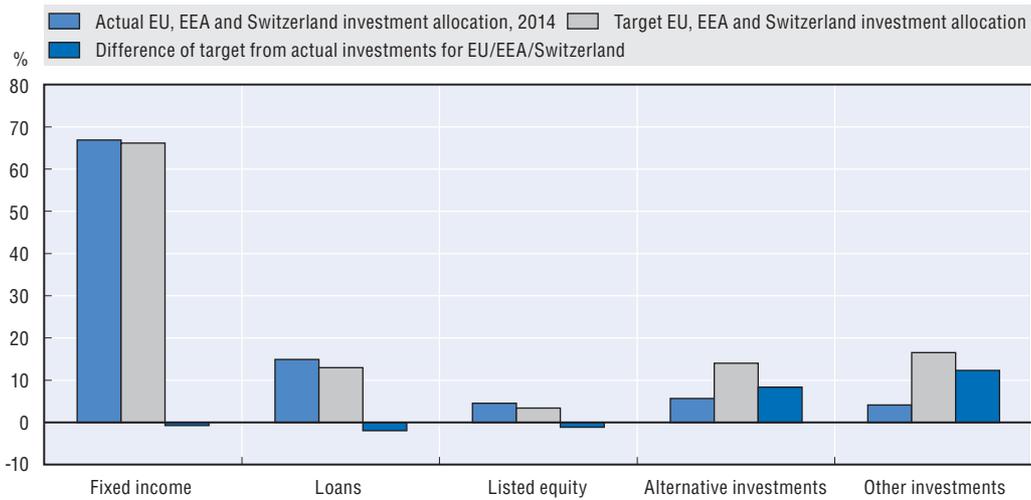
Figure 29. **Target asset allocation for the longer term in the EU, EEA and Switzerland**



Source: OECD Large Insurer Survey. The target investment percentages in different asset classes are on an average basis for all the participated insurance companies in the economic area. "Other Assets" here mostly stand for loans.

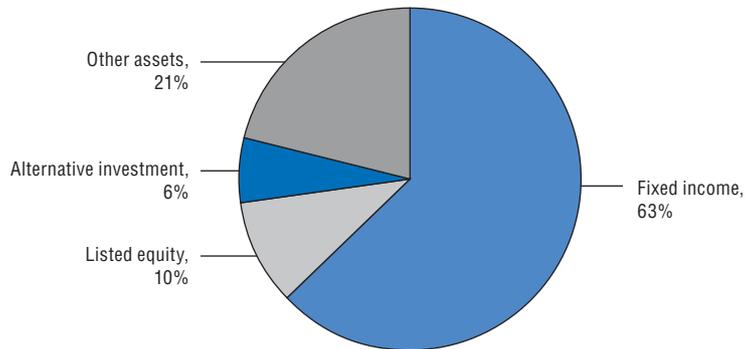
One exception is the insurance companies in Other European Countries, where they tend to hold a relatively high portion of cash and deposits (denoted as "Other Assets" in Figure 33). Despite this phenomenon, fixed income is still considered to be an important asset class in their investment portfolio, followed by listed equity (14%).

Figure 30. **Actual, target and difference from target asset allocation, EU/EEA/Switzerland**



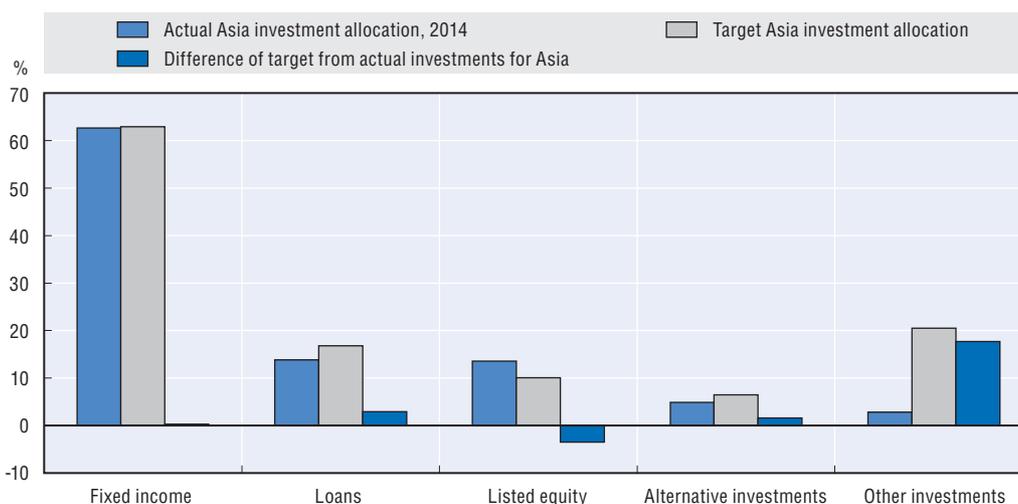
Source: OECD Secretariat

Figure 31. **Target asset allocation for the longer term in Asia**



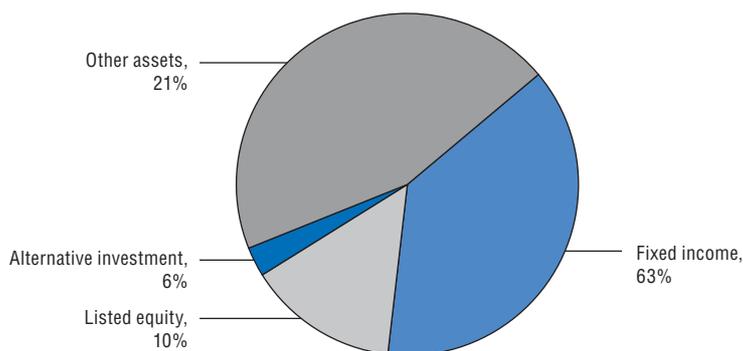
Source: OECD Large Insurer Survey. The target investment percentages in different asset classes are on an average basis for all the participated insurance companies in the economic area. "Other Assets" here mostly stand for loans.

Figure 32. **Actual, target and difference from target asset allocation, Asia**



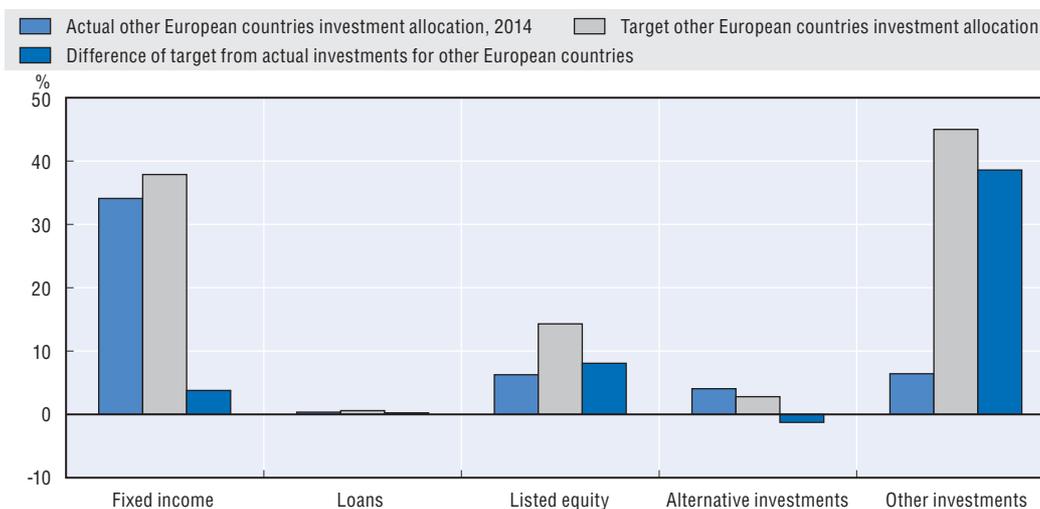
Source: OECD Secretariat

Figure 33. **Target asset allocation for the longer term in Other European Countries**



Source: OECD Large Insurer Survey. The target investment percentages in different asset classes are on an average basis for all the participated insurance companies in the economic area. "Other Assets" here mostly stand for cash and deposits.

Figure 34. **Actual, target and difference from target asset allocation, Other Europes**



Source: OECD Secretariat

3. Further factors affecting insurer long-term investments

This subsection discusses several other factors that possibly affect insurers' decision on long-term investment. An insight into the main drivers and constraints for alternative investments from insurers' perspective is also analysed based on responses to the OECD Large Insurer Survey.

Appropriate financing vehicles

According to findings from the OECD survey on Pension Funds' Long Term Investments (2014), only the largest institutional investors have the capacity to invest directly in infrastructure projects. Infrastructure projects are typically illiquid, and this also applies to other long-term projects financed by direct private equity and the direct venture capital. The illiquidity makes long-term projects disadvantageous, particularly for smaller insurers that have fewer investment alternatives. One possible solution, particularly for smaller insurers, is to invest in these long-term projects through appropriate financing vehicles, such as private equity funds, venture capital funds, real estate investment funds or long-term bonds. Since the availability of such vehicles was limited in the past, some jurisdictions have taken measures to propagate the creation of such vehicles – such as, e.g., ELTIFs.

Public-Private-Partnerships

Financing Public-Private Partnerships (PPPs) can be another form of life insurers' long-term investments. PPPs are long term contractual arrangements between the government and a private partner whereby the latter delivers and funds public services using a capital asset, sharing the associated risks.⁵⁴ Through PPPs, long-term infrastructure projects can have a well-defined income stream which serves as the main source of the return to the financing institutions.

The private party of a PPP, typically a project company, raises funding via equity financing (e.g. through private equity funds) or debt financing (e.g. by issuing long-term bonds).⁵⁵ In the European Union, life insurers are explicit target investors for the new European Fund for Strategic Investments (EFSI), a PPP investment model that aims to overcome investment barriers in different areas of the real economy.⁵⁶

PPP financing can involve fiscal commitments, e.g. guarantees to compensate the private party for low revenues.⁵⁷ Such guarantees make investments in PPP less risky and contribute to PPP financing by insurers because of insurers' interest in well-predictable long-term yields on their investments. However, investors will have to take into account the degree of long-term commitment by the government on long-term guarantees or subsidy provision.⁵⁸

The UK introduced a guarantee scheme for infrastructure investments in 2012, which provides an unconditional and irrevocable guarantee to the lenders of infrastructure projects in both the public and private sectors. The scheme transfers project risk to government, but charges each infrastructure project a market-oriented fee.⁵⁹

Expertise

Direct investment or co-investment is the most common method to gain exposure to infrastructure. The OECD Large Pension Survey indicates that some of the largest funds have the size and expertise for direct investments in infrastructure, and this would be

applicable to insurers too. However, the smaller insurers and pension funds would lack the requisite expertise, particularly in comparison with banking institutions that have been traditionally involved in infrastructure projects and have accumulated the know-how of such projects.

High-quality data

The lack of high-quality data on long-term investment projects gives rise to diagnosis and prognosis difficulties for insurers. Insurers cannot accurately quantify the risk of these projects or assess the correlation between the risk of a long-term investment project and the risks of the existing assets and liabilities. This ambiguous situation in turn causes investors to demand a risk premium as compensation that might make long-term projects unattractive.

Demographic change

Populations in OECD countries, where life insurance companies and pension funds are among the largest institutional investors, are aging. These demographic changes may also influence insurers' long-term investment decisions, concerning the need to find longer-term investments to better meet the increased life expectancy of the insured. Such strategy could include investing in infrastructure such as nursing homes or hospitals – though the anti-trust regulations of some countries may make such investments difficult for insurers – thus enabling insurers to hedge against longevity driven pay-out requirements.

Climate change

Climate change is expected to have a pivotal effect on insurers in the future – be it through altering the risk exposure or by affecting the risk inherent in certain investments. Insurers have a long history of lobbying for public policy changes aimed at slowing down climate change, and reinsurers have in particular been one of the prime protagonists of climate change research, having established a far reaching database allowing other researchers to analyse the phenomena linked with climate change.⁶⁰

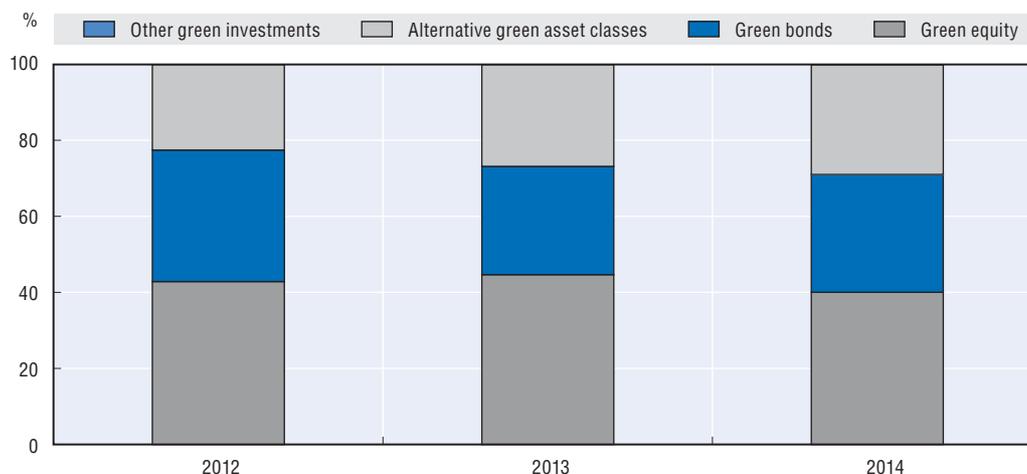
To hedge against risks of investments associated with climate change, insurers could engage in green investments. Green investments broadly refer to low carbon and climate resilient investments made in companies, projects and financial instruments that operate primarily in the renewable energy, clean technology, environmental technology as well as those investments that are climate change specific or environmental, social and corporate governance (ESG) screened. It is difficult to clearly define green or ESG investments since the criteria used by institutional investors may vary. A loose description was provided for green or ESG investment but left it up to survey respondents to determine the corresponding investment, and provide an open ended question as part of the survey to expound further on what green or ESG investing means to the organisation responding to the survey.⁶¹ As such, these investments are not necessarily long-term investments in the sense of this report, but can be, depending on the asset class. Green investments exhibit a long-term feature in that they are aimed at aiding the conservation of natural resources – which might *inter alia* need to be long-term to achieve this objective.

With growing environmental awareness of policyholders and investors alike, green investments can, furthermore, have a positive public relation impact for insurers.⁶² Despite the interest that many insurers have expressed for green investment,⁶³ insurers' asset allocation to such green investments is relatively limited. Within the OECD Large Insurers

Survey, several insurers indicated that they do not have a specific policy or target on green investments. Total investment in green investments was USD6.6 million for insurers surveyed in the Americas, USD11.8 million for insurers surveyed in EU/EEA/Switzerland, USD2.1 million for surveyed Asian insurers, and USD0.2 million for survey other Europe insurers and would represent respectively 0.004%, 0.009%, 0.001% and 0.086% of their total investments.⁶⁴ The fact that several insurers have not even established a definition of green investments may explain the low volume of green investments, in spite of the public pledges to dramatically increase green investments.⁶⁵

However, of insurers that actually have a policy on green investments, there was a noticeable allocation to green assets. Green Equity, especially stocks of environmentally friendly undertakings, makes up around 40% of green investments, and Green Bonds – usually issued by governmentally-qualified organisations to raise capital to salvage environmental problems – are around 30% of green investments. Investments in Alternative Green Asset Classes – which include real estate, infrastructure and private equity – have grown from 22% of green investments in 2012 to 29% in 2014 (at the cost of Green Equity and Green Bonds) (see Figure 35).

Figure 35. **Asset allocation in green investments – all regions**



Source: Factors addressed in the OECD Large Insurer Survey

In the OECD Large Insurer Survey, participating insurance companies were requested to explain the main external and internal drivers and constraints for their alternative investment decisions. Most of the insurers responded that potential returns and diversification are the main drivers of alternative investment decisions. Particularly, sufficient earnings to finance guarantees and expected profits are important for insurers that sell guaranteed products. The main constraints for insurers to invest in alternative assets are, for example, liquidity and solvency capital charges. Besides, accounting, ratings, currency, investment time horizon and correlation with other existing asset classes are of concern to insurers when deciding on investing in alternative assets. Furthermore, internal limits play a role in terms of how each company implements its investment policy that specifies either a maximum percentage of alternative investments or country (currency) exposure limits.

VII. Prospects of insurer long-term investment and policy implications

1. Prospects of insurer long-term investment

Long-term financing by insurance companies (and pension funds) is critical for global economic growth, particularly after the recent global financial crisis, which had a huge and negative impact on the supply of long-term investment financing. Many OECD countries recognise the importance of promoting long-term investment, with a number of countries introducing legislative changes to make financing long-term investment projects more accessible. However, insurers continue to face several challenges if investing long-term.

Based on insurers' asset and liability management (ALM), life insurers should be incentivised to invest in long-term assets because of the illiquidity of the insurers' liabilities. However, in the interest of consumer protection, life insurance contracts usually contain certain options (for example, a surrender option or a paid-up option) which allow policyholders to exercise the contracts before maturity and making the insurers' future cash outflow more difficult to predict, although this can be mitigated by surrender penalties. This in turn requires insurers to invest in more liquid (short-term) assets so as to be able to meet future pay-outs.

The economic downturn brought about by the recent global financial crisis has had an adverse impact on the growth of insurance and pension markets due in part to higher unemployment rates. In a low interest rate environment, life insurers and pension funds have an incentive to invest in longer-term (illiquid) assets so as to obtain higher yields. However, the possibility of rising interest rates, especially in the Americas, somewhat dampens this incentive. Additionally, insurers and pension fund managers have been cautious of re-risking, especially given the uncertainty of credit risk for certain sovereign bonds.

Compared to previous solvency margin regimes, where asset risks were completely ignored, risk-based capital requirements, when combined with market-consistent valuation in the solvency balance sheet, can have a negative impact on investment in illiquid assets. Certain asset classes, such as infrastructure and private equity, receive particularly high capital charges, and their riskiness leads to low mark-to-model values in the solvency balance sheet.

2. Policy issues and implications

Enhancing long-term investments is one way in which insurers and pension funds can contribute to economic growth. However, the main objective of insurance companies (and pension funds) is to provide policyholders with insurance protection, payments in accordance with contract terms, and returns on equity in the case of publicly listed insurers. Any change of insurance regulation that aims at fostering long-term investments should therefore not neglect the primary policyholder-protection goal of insurance regulation.

Insurance regulation should continue to place priority on incentivising prudent asset-and-liability management. Investing in long-term projects can substantially contribute to a better matching of life insurers' assets and long-term liabilities, if they entail well-predictable returns. Therefore, insurance regulation should contain mechanisms that provide a "true and fair view" of the insurers' risk exposition, taking into account both asset and liabilities.

In light of risk-based capital regulation, on the one hand, a long-term investment asset class should be reflected in the capital requirements according to its actual risk. This may lead to higher capital requirements for higher-risk investments, but lower requirements if the respective cash flow exhibits low volatility and uncertainty. In short, capital requirements should map the real risk of long-term investments but ought not be (ab-)used to promote certain asset classes.

On the other hand, regulation that has the possibility of greater discretion in capital charges for investments in certain asset classes that entail a higher capital requirement – when accompanied by the appropriate risk management – could in turn facilitate and address some of the wider concerns for long-term investment. However, this should be well scrutinised and a mechanism to implemented so that regulatory discretion could be limited to circumstances which are well scrutinised.

In the area of public-private partnerships, fiscal guarantees, e.g. for revenues of infrastructure projects, could increase the possibility of long-term investment, although there may be possible market distortions and downside risk to taxpayers. As demonstrated by the UK fiscal guarantee scheme for infrastructure investments, which charges a market-oriented fee, such guarantees provide a competitive advantage for long-term investments, compared to other asset classes, without distorting life insurers' risk management incentives. Also, public sector entities directly involved with or sponsoring infrastructure project could use their balance sheet to improve the creditworthiness of certain long-term investment projects, in particular for those in infrastructure, and thus help to attract capital.

To allow more insurers, particularly many small and medium-sized insurers, to invest in long-term assets, appropriate investment vehicles are needed. The creation of such vehicles could be induced by legislation, as with the ELTIF regulation.

Life insurers could consider obtaining illiquidity on their liability side through product innovation that should be in accordance with the objective of consumer protection, but may not align with consumer preference for flexible product designs. Insurers should continue to monitor illiquidity risk in their products through appropriate risk management techniques. In turn, insurers are able to invest in less liquid assets as long-term investments, and policyholders could receive the corresponding illiquidity premiums as compensation for the increased inflexibility of such products.

Despite the policy discussions taking place on long-term investment, insurers – as evidenced by the responses to the OECD Large Insurer Survey – have not yet exhibited a significant shift towards long-term investments, although target investment allocations remain above actual allocation in alternative investments and other investments. Developments in the regulatory treatment of long-term investment financing of insurers may require greater clarity for insurers to be able to increase their investments towards target allocations. Greater regulatory certainty of capital charges of long-term investments will be a prerequisite for robust long-term investment to take place.

Notes

1. See Zweifel and Eisen (2012, pp. 1-15).
2. See IFRS (2013, p. 37).

3. See Rose (1989, pp. 135-147); Mishkin and Eakins (2012, pp. 553-565). Health insurance can either be practiced on a similar technical basis to that of life insurance, or of property-casualty insurance.
4. See Wehrhahn (2009).
5. See Rose (1989, pp. 147-151); Mishkin and Eakins (2012, pp. 571-580).
6. See OECD (2016), OECD (2014) and OECD (2013, p. 14).
7. See, for example, Jensen and Meckling (1976), Green (1984), and MacMinn (1992).
8. See Mayers and Smith (1981, pp. 425-426).
9. In 2013, the Financial Stability Board (FSB), in consultation with the International Association of Insurance Supervisors (IAIS) and national authorities, identified an initial list of Global Systematically Important Insurers (G-SIIs). "The FSB guidance on identification of critical functions and critical shares services" suggests three steps for determining G-SIIs: "Impact assessment", "supply side analysis", and "firm-specific test". In November 2014 (Ref. no: 73/2014) the FSB updated its list of G-SIIs after consultation with IAIS.
10. See Kim et al. (1995) and Kramer (1996).
11. See Browne and Hoyt (1995).
12. See Hampton (1993); Lee and Urrutia (1996).
13. See Kramer (1996).
14. See Kim et al. (1995).
15. See Lee and Urrutia (1996).
16. See Klein (1995); Ambrose and Carroll (1994); BarNiv and Hershberger (1990); Carson and Hoyt (1995).
17. See BarNiv and Hershberger (1990).
18. See Carson and Hoyt (1995).
19. See Munch and Smallwood (1980); Chen, Wong, and Lee (1999); Staking and Babbel (1991); Winter (1991); Browne and Hoyt (1995).
20. See A. M. Best Company (1992); Browne, Carson, and Hoyt (1999).
21. See Bodie, Kane, and Marcus (2009, pp. 279-318).
22. The capital allocation line (CAL) consists of the set of feasible expected return and standard deviation pairs of all portfolios. It shows all possible risk-return combinations available under the assumption that risk can be represented by standard deviation.
23. The sample of Americas includes 4 companies from North America and 1 insurer from Latin America and the Caribbean.
24. The breakdown of specific asset classes is only available for the areas of the Americas, EU, EEA and Switzerland and Asia due to data constraints.
25. See Hoogendijk (2013).
26. IMF (2015), p. 2.
27. See Chapter 4 of OECD (2015b).
28. According to SwissRe (2012), based on their product characteristics, Germany, Italy and the United States report the highest exposure to interest rate risk among major insurance markets around the world.
29. See Insurance Europe and Oliver Wyman (2013).
30. See EIOPA (2014).
31. It should be noted that the Solvency II regime is being implemented since January 2016.
32. On the increased importance of soft law in principle-based systems see Pohlmann (2011).
33. See Thomas (2014).
34. For the Federal Reserve's role in the U.S. insurance sector, cf. Sullivan (2014).
35. Under Solvency II, the Solvency Capital Requirement (SCR) is based on a Value-at-Risk measure calibrated to a 99.5% confidence level over a 1-year time horizon.

36. The reality of Solvency II has been that EIOPA has had to issue guidelines and detailed technical specification for its implementation.
37. EIOPA, Final Report on Consultation Paper No.15/004 on the Call for Advice from the European Commission on the identification and calibration of infrastructure investment risk categories (EIOPA-BoS-15-223)(29 September 2015). EIOPA is currently carrying out a consultation on risk charges of infrastructure corporates (SPVs). EIOPA, Consultation Paper No. CP-16-005 on the request to for further technical advice on the identification and calibration of other infrastructure investment risk categories i.e. infrastructure corporates (EIOPA-CP-16/005)(15 April 2016).
38. EIOPA (2013a), EIOPA (2013b) and European Commission (2014).
39. OECD (2015a).
40. For an example, the interrelation between public disclosure and investment decisions – though not concerning long-term investments – reference can be made to the decision of Allianz to cease investing (directly) in agricultural commodities after having been publicly denounced by NGOs as food speculators; Allianz (2014), pp. 91-93.
41. See OECD (2014).
42. See OECD (2014).
43. As per the OECD Guidelines on Insurer Governance.
44. See OECD (2014).
45. See Clifford Chance (2015) and BNP Paribas (2014).
46. Art. 38 of Reg. (EU) 2015/760 on European long-term investment funds, OJ L-123/2015, p. 98.
47. EIOPA (2015a); EIOPA (2015b).
48. See for a general overview IMF (2011) and sigma (2013).
49. See G20 (2013).
50. “Patient” capital has the ability to hold investments for longer periods, lowers portfolio turnover, encourages less pro-cyclical investment strategies and facilitates investment in less liquid assets. It can therefore lead to higher net returns and greater financial stability.
51. “Engaged” capital encourages active voting policies, leading to improved corporate governance and better managed companies.
52. “Productive” capital provides support for infrastructure development, green growth initiatives, SME financing and seeks to addresses sustainable growth.
53. See Gatzert and Kosub (2014).
54. OECD Recommendation of the Council on Principles for Public Governance of Public-Private Partnerships (May 2015).
55. See International Bank for Reconstruction and Development/The World Bank, Asian Development Bank, and Inter-American Development Bank (2014), pp. 50-63.
56. See European Investment Bank (2015); Katainen (2015).
57. See International Bank for Reconstruction and Development/The World Bank, Asian Development Bank, and Inter-American Development Bank (2014), p. 97.
58. See International Bank for Reconstruction and Development/The World Bank, Asian Development Bank, and Inter-American Development Bank (2014), p. 147-148.
59. Given the European State Aid guidance, The UK scheme had guarantees with a value of GBP1.7 billion to seven projects, with 39 more projects pre-qualified for a guarantee. National Audit Office, UK Guarantees scheme for infrastructure (HC909, Session 2014-15, 28 January 2015).
60. See e.g. NatCatSERVICE loss database established by MunichRe in the 1970s.
61. This description was used for the OECD Large Insurer Survey in 2015. For an overview of possible definitions see OECD (2012).
62. See Allianz (2014), p. 95.
63. IFC (2012), p. 33.

64. These figures are only indicative as they only represent large insurers which responded to the OECD Survey, and do not represent the majority of insurers' investments. In addition, "green" investment could be in asset categories not captured by responses the Survey.
65. Tarbuck (2014). The initiative pledges an increase of green investments by the insurance industry up to USD 84 billion by the end of 2015.

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