



Long-term Pension Investment Strategies under Risk-based Regulation

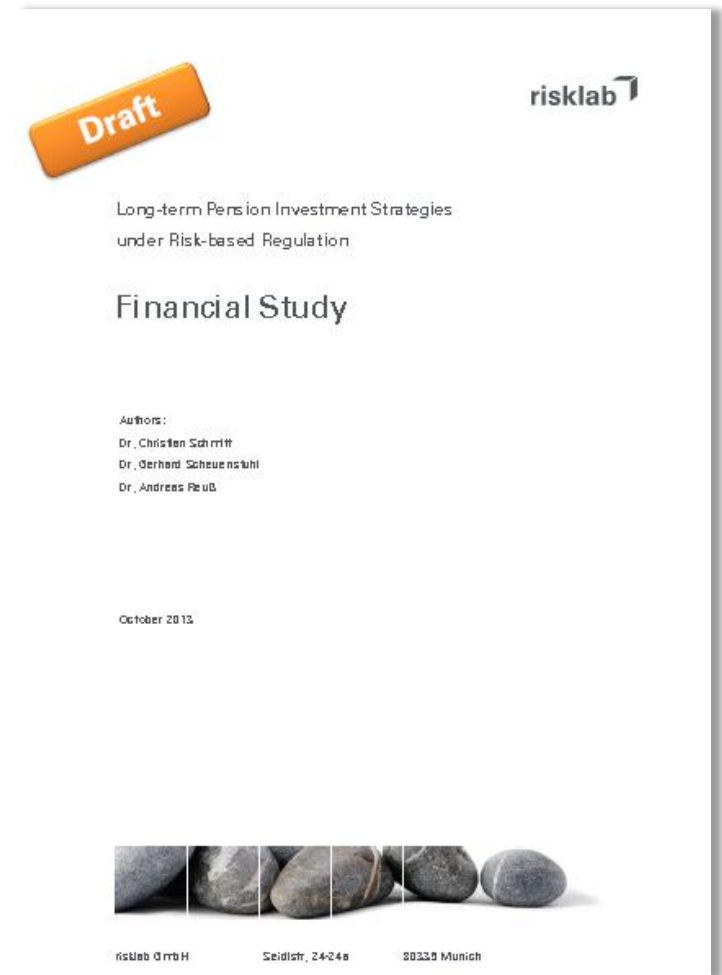
Amsterdam, 7th April 2014

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Agenda

1. Introduction and Overview
2. Methodology: Risk-based Solvency Regulation
3. Assessment: Impact on Strategic Asset Allocation
4. Impact of Design Components
 - Modification on Security Level (SCR 95)
 - Modification on Capital Charges (Tighter regulation)
 - Economic-based view



Introduction and Overview

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Project Background

OECD PROJECT on Long-term Investments by Institutional Investors

The increasingly short supply of long-term capital since the 2008 financial crisis has profound implications for growth and financial stability. The aim of this project is to facilitate long-term investment by institutional investors such as pension funds, insurance companies, and sovereign wealth funds, addressing both potential regulatory obstacles and market failures.

Why is long-term investment important?

Patient capital allows investors to access illiquidity premia, lowers turnover, encourages less pro-cyclical investment strategies and therefore higher net investment rate of returns and greater financial stability.

Engaged capital encourages active voting policies, leading to better corporate governance.

Productive capital provides support for infrastructure development, green growth initiatives, SME finance etc., leading to sustainable growth.



G20/OECD HIGH-LEVEL PRINCIPLES OF LONG-TERM INVESTMENT FINANCING BY INSTITUTIONAL INVESTORS

September 2013

This document contains the eighth version of the G20/OECD High-Level Principles on Long-Term Investment Financing by Institutional Investors developed by the OECD Task Force on Institutional Investors and Long-Term Financing. The Task Force is open to OECD, G20, FSB, APEC members and includes several international organisations.

This version includes comments expressed on previous versions at the occasions of 4 plenary meetings of the Task Force and numerous written contributions, including inter alia from the (OECD, G20, FSB and APEC) Members of the Task Force, several OECD bodies [such as the Committee on Financial Markets (CMF) and the Insurance and Private Pensions Committee (IPPC)], International Organizations (IMF, World Bank, FSB, various SSBs), G20 Study Group on Finance for Investment and the European Commission. It has also been submitted for public consultation, which provided a large number of very constructive comments from various stakeholders (including industry and trade unions). This version takes also into account the comments expressed at the July 2013 meeting of the G20 Finance Ministers and Central Banks Governors who welcomed the Principles and called on the OECD to identify approaches to their implementation. The present version is submitted to the G20 Leaders for endorsement.

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Principle 4: Financial regulation, valuation and tax treatment

Objective of Research Study

Objective of Research Study

Assess potential impacts on the investment behavior of long term pension investors resulting from rules and regulations on the investment framework - such as accounting standards or solvency/ funding regulations currently discussed by supervising authorities (ref. EIOPA proposals and (draft) technical specifications for QIS).

Research Approach

- Consider a generic DB pension plan (typical pension obligations (w/ risk sharing), plan assets)
- Consider selected aspects of transnational regulations currently being discussed (such as IORPS II, Solvency II, and IAS 19)
- Analyze in what ways and how these regulation impact directly or indirectly the pension plan, such as methods for valuating long-term obligations and requirements on asset funding
- Assess the potential effects of pension investment management driven by regulatory changes or design, regarding specifically:
 - Strategic Asset Allocation and Risk Management decisions
 - Pro-cyclical investment behavior, dynamics of portfolio adjustments
- No attempt to model all details of the solvency regulations and accounting standards mentioned in the OECD report, not meant to identify ways for regulatory arbitrage and not meant to design new pension plans as a reaction on new risk based regulatory demands

Building Blocks of Research Study

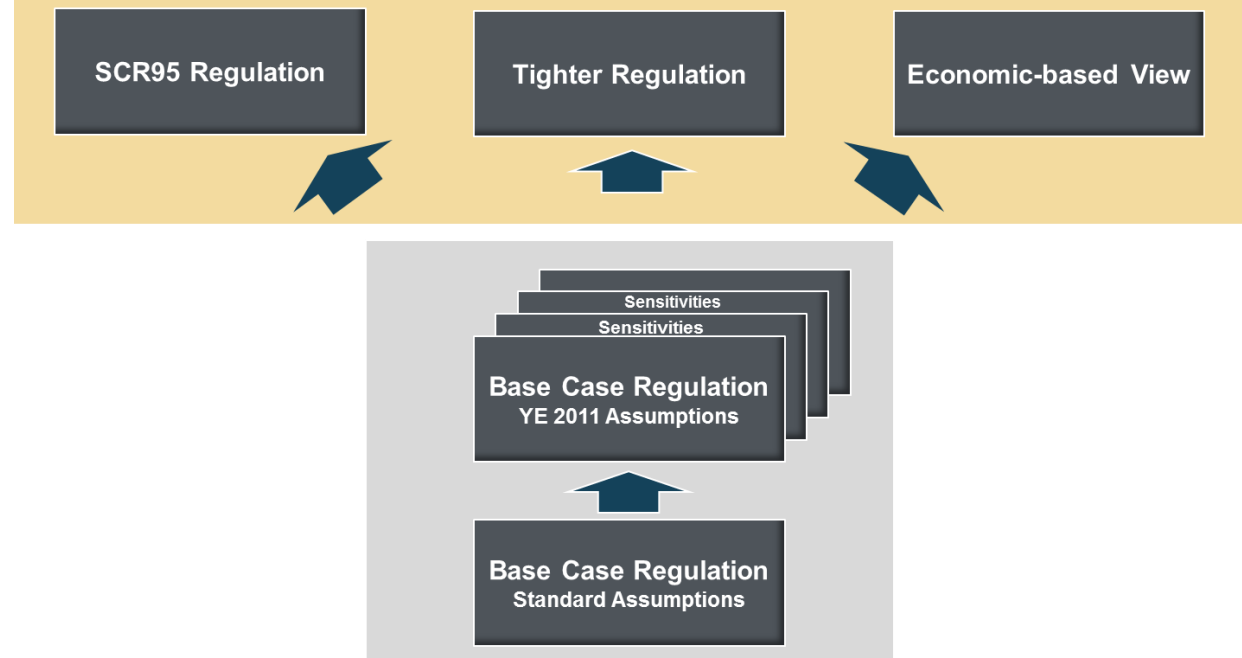
Focus today

Three modified frameworks

- Regulation with a relaxed security level (SCR95 regulation)
- Tighter Regulation which would assign higher capital charges to asset classes which are privileged under the current solvency design
- Economic-based view by applying internal risk models to assess the appropriate capital market parameters for correlations and capital charges and allow a more differentiated universe of asset classes

Impact on choice of Strategic Asset Allocation

- Relative attractiveness of single asset classes
- Effects of (limited) diversification
- Need to de-risk investment portfolios
- Impact on risk management activities (matching portfolio)
- Impact on pro-cyclical investment behavior over time (equity dampener, allowance for a counter-cyclical premium (CCP))



Technical Specifications for the Quantitative Impact Study on Institutions for Occupational Retirement Provision (IORPs) issued by the European Commission in October 2012 (cf. EIOPA(2012a)).

Methodology: Risk-based Solvency Regulation

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Methodology: Pension Liabilities

- **Basis for analyses:**

- Methodology for valuation of long-term pension obligations and risk-based solvency/funding requirements as described in the **Technical Specifications for the QIS on IORPS** (European Commission, October 2012)

- **Liabilities:** Consider a generic pension fund

- **Career average** plan with unconditional indexation, mixed portfolio of plan members

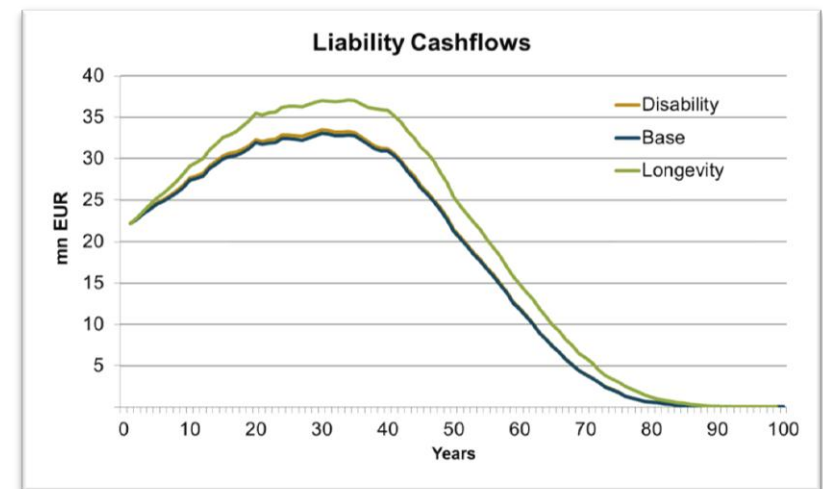
- Duration approx. 20 years

- **Liability valuation** based on risk-free interest rate curve (including extrapolation to UFR, with/without CCP)

- Technical Provisions

- **Sensitivities** as prescribed by standard formula

- SCR (liabilities), Risk Margin



- Assumptions and valuation based on average **long-term interest rate level (2.5% (3 months), 3.8% (10 years), 4.0% (30 years))** and **inflation level (2.0%)**

- Sensitivity: Interest rate level year-end 2011

Methodology: Pension Assets

- **Basis for analyses:**

- Methodology for valuation of long-term pension obligations and risk-based solvency/funding requirements as described in the **Technical Specifications for the QIS on IORPS** (European Commission, October 2012)

- **Assets:** Consider a generic set of asset classes

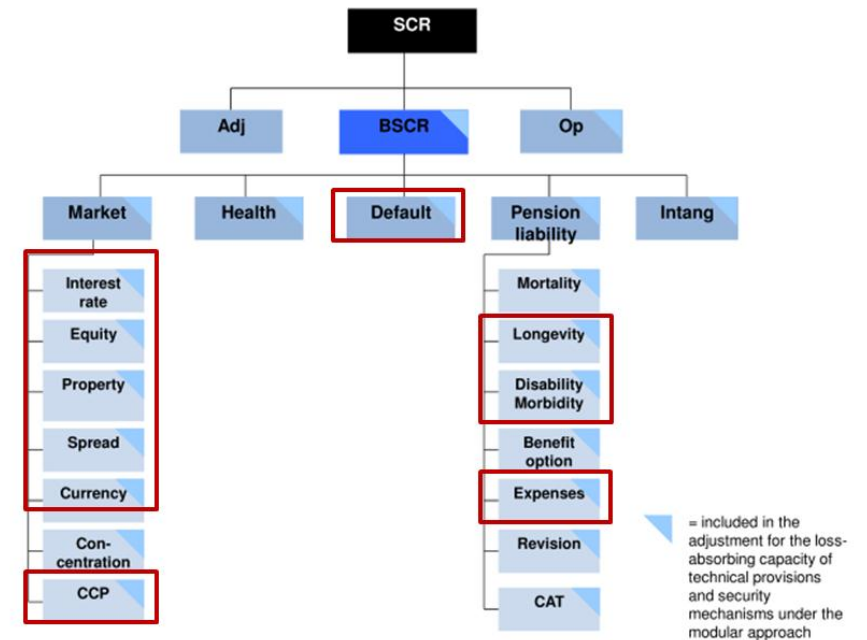
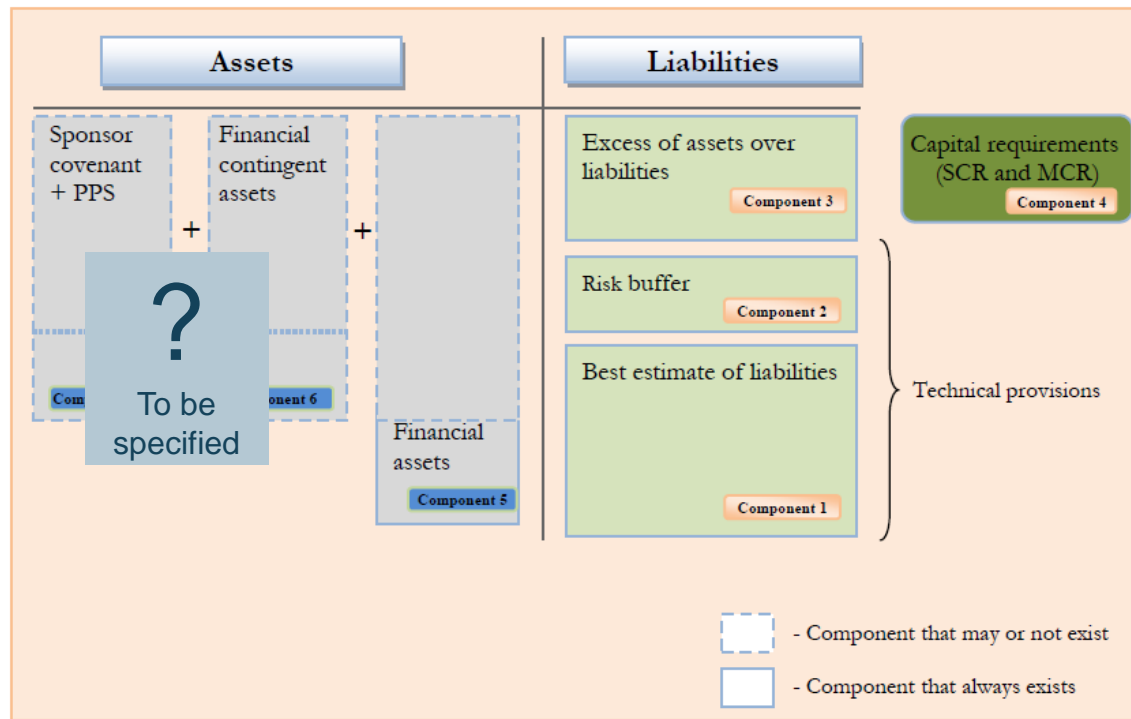
- **Expected return assumptions** derived from YE2001 assumptions

- **Funding Level:** market value of assets = **125% x Technical Provisions** (incl. Risk Margin)

Asset Classes	Abbrev.	Expected Return p.a.	IR Sensitivity (IR Down)	Capital Charge
Fixed Income				
Cash	Cash	1.1%	0.0%	0.0%
Government Bonds EUR	Gov	1.9%	7.5%	0.0%
Government Bonds EUR 10+	Gov10+	2.4%	14.7%	0.0%
Covered Bonds EUR	Cov	2.9%	4.5%	3.8%
Government Bonds EUR Inflation Linked	GovInfl	1.9%	9.5%	0.0%
Corporate Bonds EUR	Corp	2.8%	4.5%	5.9%
High Yield Global	HY	4.3%	5.8%	30.0%
Emerging Market Bonds	EM	4.2%	10.3%	8.7%
Equity & Alternatives				
Equity Developed Global	EQ	5.1%		39.0%
Equity Emerging Markets	EQ EM	6.1%		49.0% / 15.0% (FX)
Hedge Funds / Commodities	HF / Comm	3.6%		49.0%
Other Alternatives (Private Equity / Infrastructure)	PE / Infra	9.1%		49.0%
Real Estate	RE	3.8%		25.0%

Methodology: Risk-based Solvency Framework

- Generic risk-based solvency framework (based on Solvency II / IORP II standard formula)



For each relevant sub-module, a revaluation is made based on prescribed stress scenarios. The stress may have an impact on the market value of assets (e.g. interest rates up/down, equity, property, spread, currency) and/or an impact on liabilities (e.g. interest rates up/down, CCP, longevity, disability, expenses).

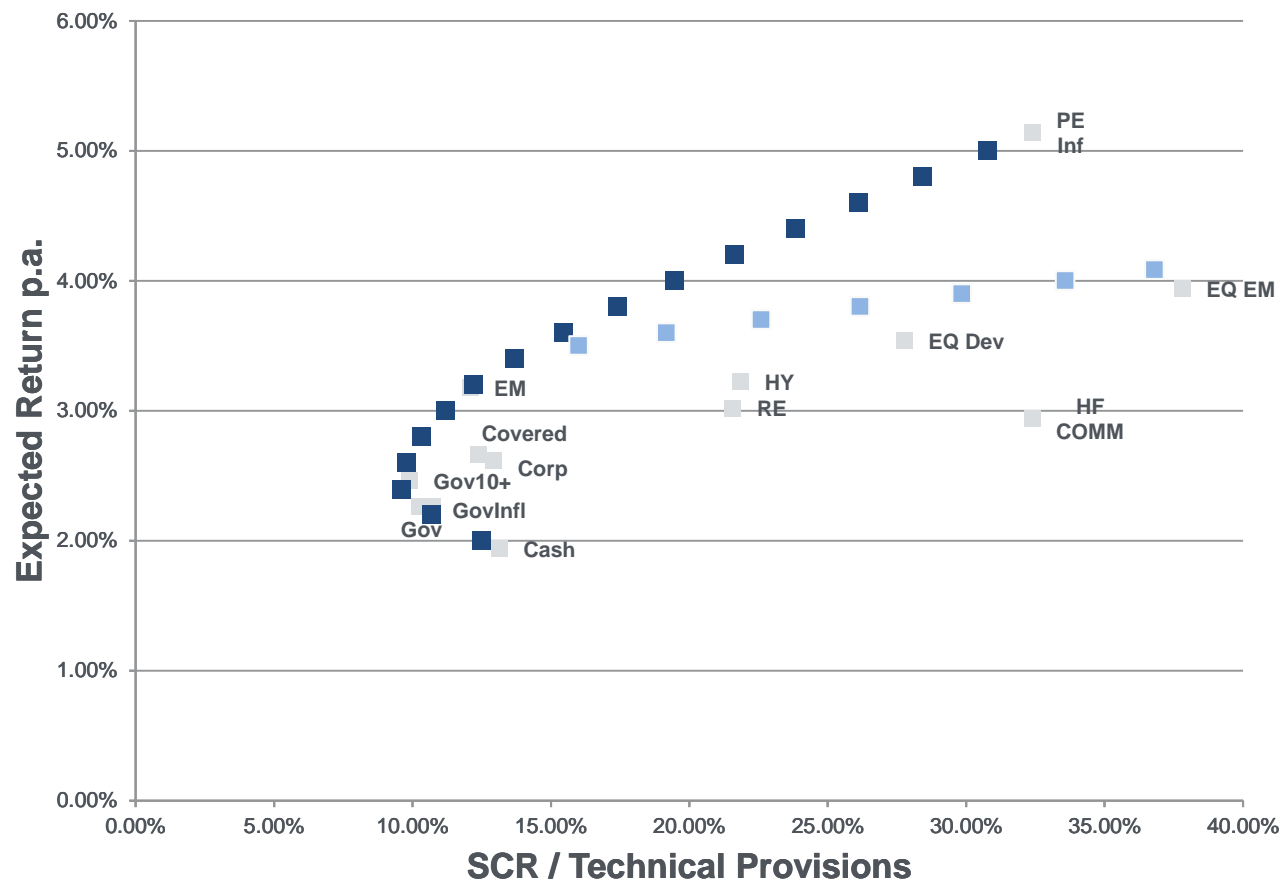
Assessment: Impact on Strategic Asset Allocation

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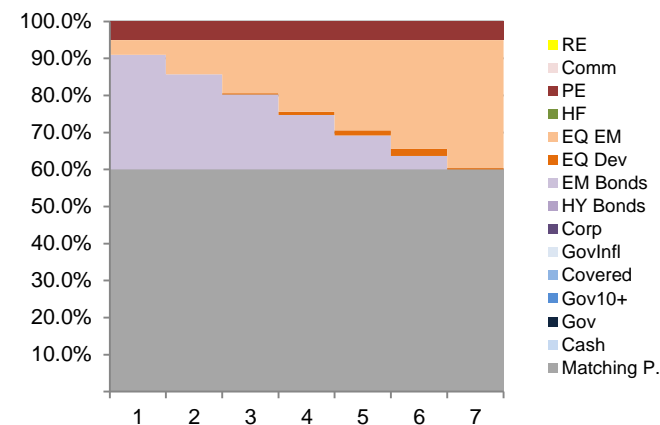
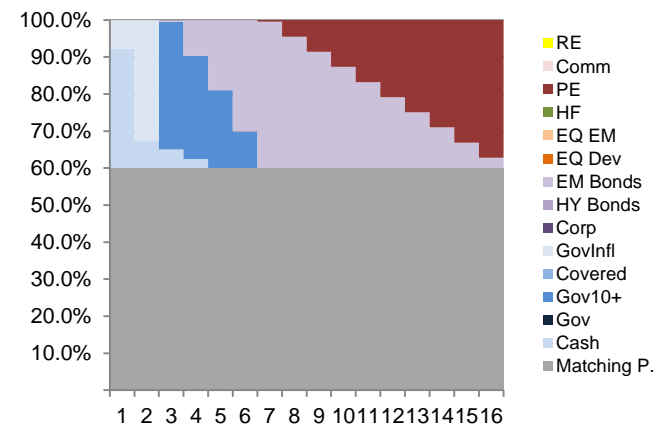
Results

Base Case Regulation - Optimization of Growth Portfolio (75% hedged)

Funding Level 125%; MP = 75% of TP



Composition of efficient portfolios (restricted/unrestricted)

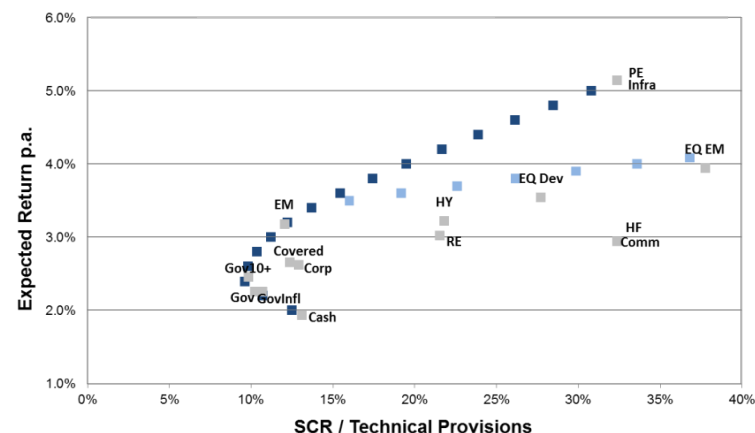


Results

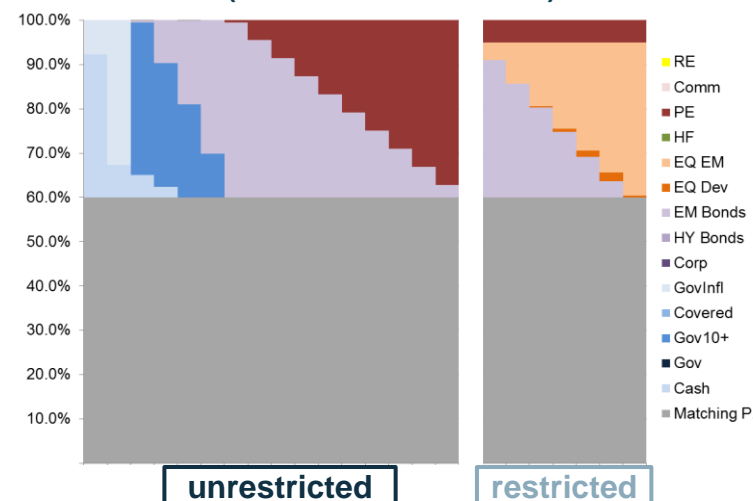
Base Case Regulation - Optimization of Growth Portfolio (75% hedged)

- To assess the relative attractiveness of the individual asset classes we assume that
 - 60% of the available assets (125% FL) are invested in the matching portfolio (→ Hedge Ratio = 75%)
 - 40% are invested in one single asset class / in optimized growth portfolio.
- **Composition** of portfolios: Only a few asset classes relevant
- Analysis of **diversification** effects
 - significant effect (more than 25% for portfolios with lower expected return); decreasing if expected return increases
- High proportion of Private Equity may not be realistic (due to illiquidity)
 - Consider constraint: Private Equity $\leq 2.5\%$ of total assets (= 12.5% of growth portfolio)
 - Effects of **constraint** regarding Private Equity:
 - No change for portfolios with low expected return; Private Equity replaced by Equity Emerging Markets; flattening of efficient frontier: lower expected return / higher SCR

Funding Level 125%; MP = 75% of TP



Composition of efficient portfolios (restricted/unrestricted)



Results

Base Case Regulation - Optimization of Growth Portfolio (100% hedged)

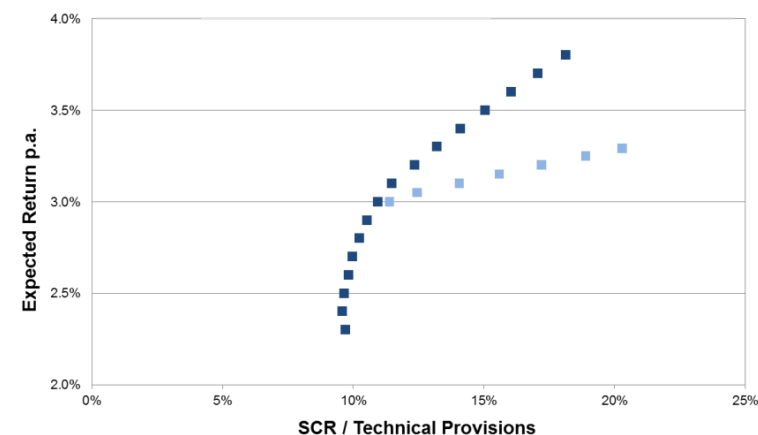
- Matching Portfolio (MP) = 100% of TP
- Funding Level = 125% of TP → Growth Portfolio = **20%** of assets

- Similar effects of **constraint** regarding Private Equity
 - No change for portfolios with low expected return; Private
 - Equity replaced by Equity Emerging Markets; flattening of efficient frontier: lower expected return / higher SCR

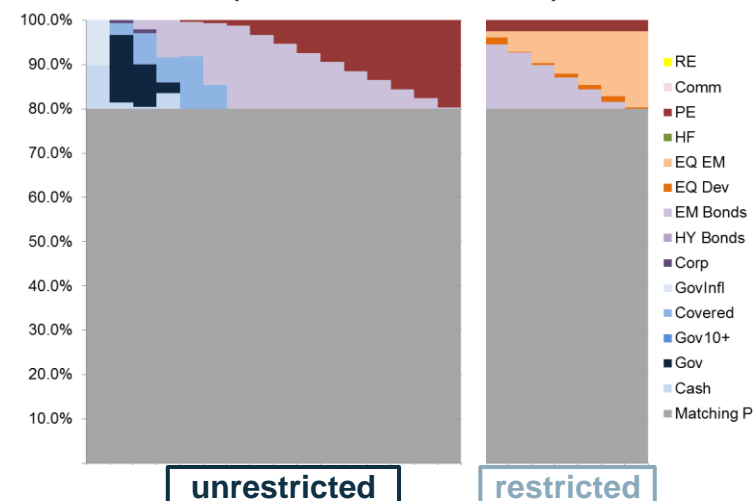
- **Composition of portfolios**
 - Portfolios now include additional asset classes
 - Covered Bonds
 - Government Bonds
 - Long-term Government Bonds less relevant
 - Still high relevance of Emerging Market Bonds
 - Relevance of Private Equity unchanged (proportion increasing to almost 100%)

- Analysis of **diversification effects**
 - Higher diversification effect (more than 30% for portfolios with lower expected return); decreasing if expected return increases

Funding Level 125%; MP = 100% of TP



Composition of efficient portfolios (restricted/unrestricted)



Impact of Design Components

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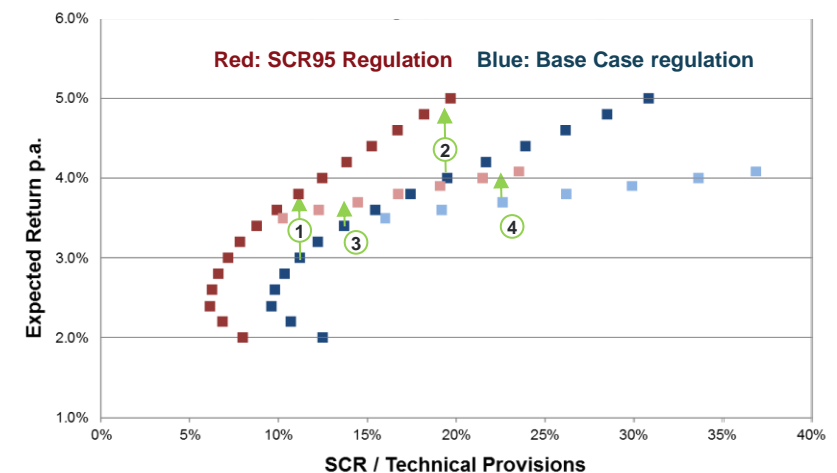
- Modification of Security Level (SCR 95)
- Modification of Capital Charges (Tighter regulation)
- Economic-based view

Modification of Security Level (SCR 95)

Reduce Confidence Level from 99.5% to 95%

- **Approximation of SCR for lower confidence level (cf. EIOPA):** The adjustment is performed by assuming a normal distribution of basic Own Funds. With the quantiles of the standardized normal distribution $q_{N(0,1),99.5} \approx 2.576$ and $q_{N(0,1),95} \approx 1.645$ we get $SCR_{95.0\%} \approx 64\% \times SCR_{99.5\%}$
- This linear transformation of the SCR implies that the optimized portfolios show no structural changes under this low regulation setting
- But the admissible portfolios (for fixed Own Funds) will change and we see an **increase in expected return** of max. admissible portfolios for given OF since the efficient frontier(s) move to the left
- Additionally we see an increase in Own Funds, since the Risk Margin decreases due to the reduction in confidence level and therefore we see a reduction in the Technical Provisions (TP); e.g. the **FL** increases from **125%** to **130.8%** for our starting portfolio and OF from **25%** to **30.8%**
- For a first analysis we neglect the increase in Own Funds (which extends the range of admissible portfolios) and only take a look at the return difference for the same SCR
- In the **unrestricted optimization** the difference (green arrows 1 and 2) is between **80 and 95 basis points**
- When putting a **constraint** on Private Equity the difference (green arrows 3 and 4) is between **25 and 35 basis points**
- When taking the change in Own Funds into account this difference is even higher

Impact of a lower confidence level



Efficient frontier; SCR95 regulation vs. base case regulation; hedge ratio 75%

Modification on Capital Charges (Tighter Regulation)

Increase Risk Charges

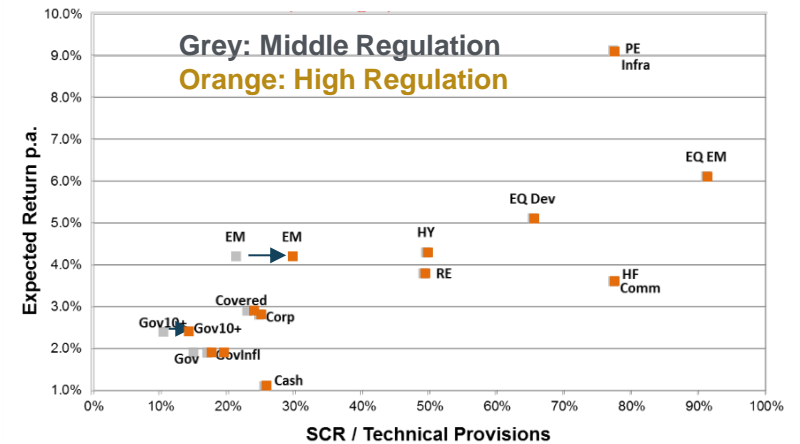
- In the current setting there is no SCR charge applied to EEA Government Bonds
- Furthermore, for EM Bonds and Covered Bonds lower SCR charges are applied than for Corporate Bonds with comparable rating

Approach for Tighter Regulation:

- Instead of increasing the confidence level (which implies increasing the SCR charges for all asset classes by a constant factor):
 - Set **higher SCR charges** for selected asset classes
 - For EM Bonds and Covered Bonds **the same** SCR charges are applied as for Corporate Bonds with comparable rating
 - For EEA Bonds **half of the** SCR charges of Corporate Bonds with comparable rating are applied
- All other SCR charges and correlations remain unchanged.

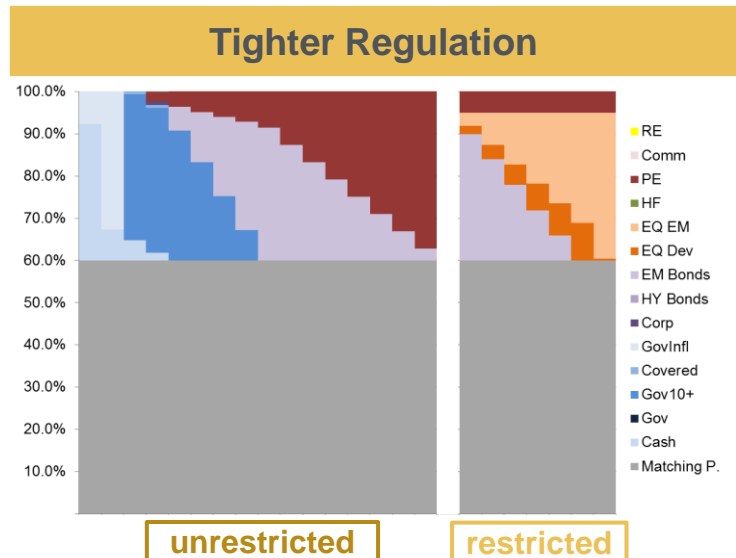
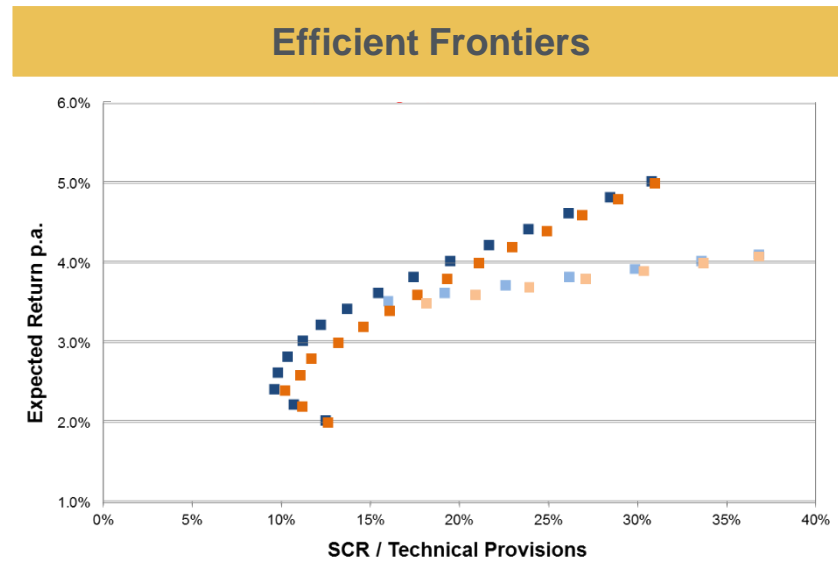
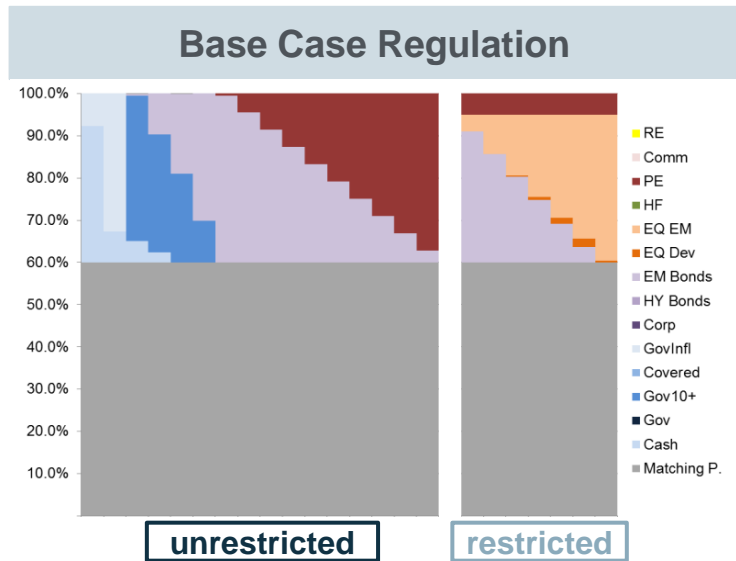
SCR Charges	Tighter Regulation	Base Case
Cash	0.0%	0.0%
Govt Bonds	3.2%	0.0%
Govt Bonds 10+	5.0%	0.0%
Covered Bonds	4.6%	3.8%
Govt Bonds Infl	3.5%	0.0%
Corporate Bonds	5.9%	5.9%
High Yield Global	30.0%	30.0%
EM Bonds	16.1%	8.7%
Equity Developed	39.0%	39.0%
Equity EM	49.0%	49.0%
Hedge Funds	49.0%	49.0%
Private EQ / Infrac.	49.0%	49.0%
Commodities	49.0%	49.0%
Real Estate	25.0%	25.0%

Tighter Regulation (all assets in one asset class)



Modification on Capital Charges (Tighter Regulation)

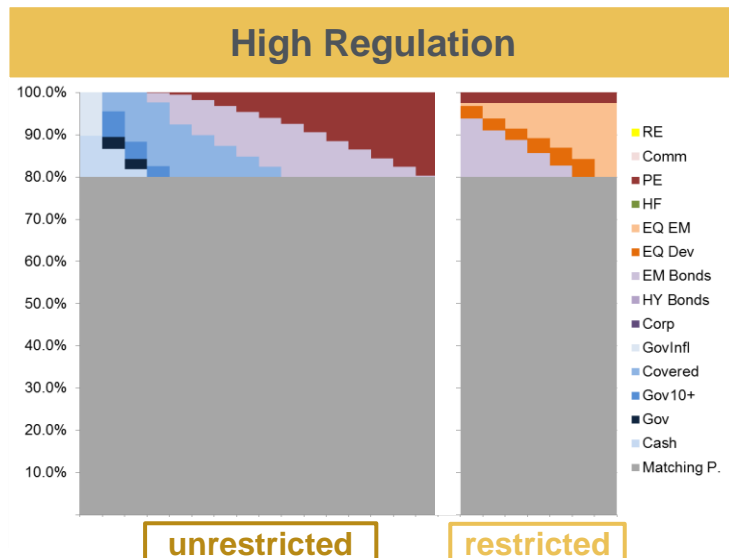
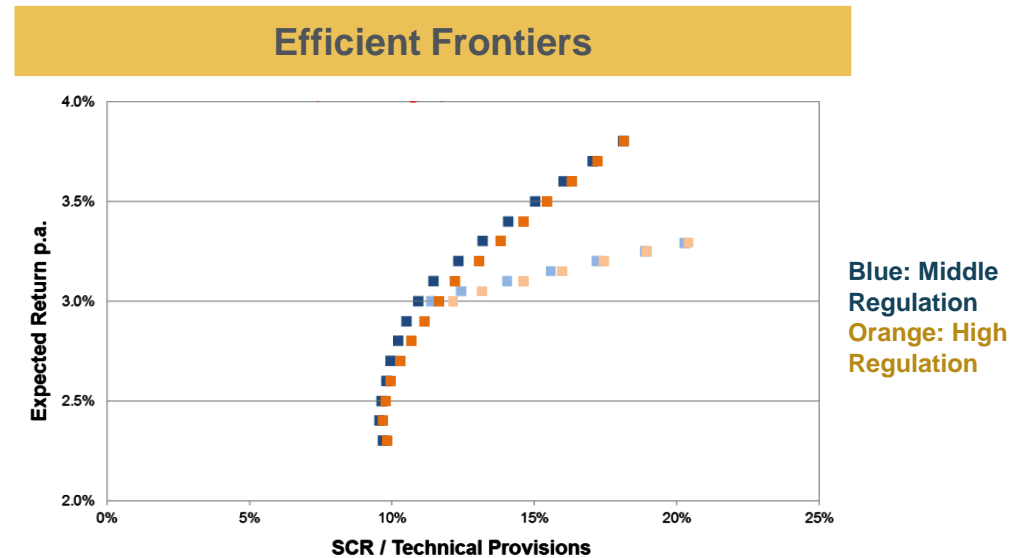
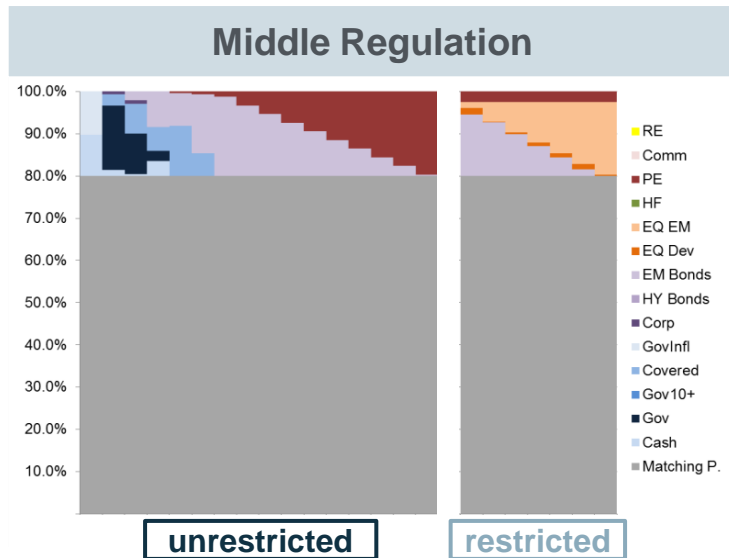
Optimization of Growth Portfolio with Hedge Ratio 75%



- The **basic composition** of the optimized portfolios **does not change**
- For the unrestricted optimization we see **more long-term Government bonds** and **more private equity** and **less EM bonds**
- For the restricted optimization EM bonds and Equity EM are partially **replaced by Equity Developed**
- Due to the higher SCR charge for selected asset classes the optimized portfolios show a **higher SCR** (exception: 100% PE or 100% Equity),
- Under the tighter Regulation the **expected return** for the same SCR is **up to 37 basis points lower** than under the base case regulation.

Modification on Capital Charges (Tighter Regulation)

Optimization of Growth Portfolio with Hedge Ratio 100%



- The basic composition of the optimized portfolios does not change.
- For the unrestricted optimization we see **more long-term Government bonds, more covered bonds and more private equity and less Government Bonds and EM bonds**
- For the restricted optimization EM bonds and Equity EM are partially replaced by Equity Developed
- Due to the higher SCR charge for selected asset classes the optimized portfolios show a higher SCR (exception: 100% PE or 100% Equity).
- Under the tighter Regulation the **expected return** for the same SCR is **up to 12 basis points lower** than under the base case regulation.

Calibration based on an Economic-based View

- When looking at the current approach from an economic-based view it is striking that all **alternative** asset classes are allocated to „Other Equity“
- Therefore no allowance is made for diversification between alternatives and equity, fixed income and real estate
- From an ALM standpoint this is very simplifying and reduces the set of available asset classes significantly
- **Extension:**
 - **Introduction of Hedge Funds, Private Equity and Commodities** as additional asset classes with specific characteristics.
- **Implementation** Approach:
 - Extension of **Correlation Matrix** for **Equity/Alternatives**
 - Reviewing and (if required) adjusting **Correlation Matrix** for **Market Risk**
 - Reviewing and (if required) adjusting the **SCR charges**

Economic-based view: Approach

Extension of Correlation Matrix

- **Motivation:** Parsimonious Approach
- The resulting correlations are based on the analysis of correlations of **historical data with rolling windows** for different frequencies
- We use **conservative estimates** for rolling 12 month correlations, even though the historical long-term correlations are lower

CorrIndex	Global	Other
Global	1	
Other	0.75	1

Extended correlation matrix based on current approach

CorrMkt	Global EQ	EM EQ	PE	HF	Comm
Global EQ	1	0.75	0.75	0.75	0.75
EM EQ	0.9	1	1	1	1
PE / Infra	0.9	0.9	1	1	1
HF	0.8	0.85	0.8	1	1
Comm	0.6	0.8	0.7	0.8	1

Adjusted correlations used for economic based view

Adjustment of Correlation Matrix

- Based on the analysis of correlations of historical data with rolling windows for different frequencies for the CorrMkt matrix we reduced **selected correlations for Equities/Alternatives** (while keeping the rest unchanged)
 - EQ/Alternatives and IR risk: from 0.50 to **0.25**
 - EQ/Alternatives and property risk: from 0.75 to **0.50**
 - EQ/Alternatives and Spread risk: from 0.75 to **0.50**

CorrMkt	Interest	Equity	Property	Spread	Currency	Concentration
Interest	1					
Equity	A	1				
Property	A	0.75	1			
Spread	A	0.75	0.5	1		
Currency	0.25	0.25	0.25	0.25	1	
Concentration	0	0	0	0	0	1

CorrMkt	IR	EQ / Alt.	Property	Spread	Currency	CCP
IR	1	0.50	0.50	0.50	0.25	0.00
EQ / Alt.	0.25	1	0.75	0.75	0.25	0.00
Property		0.50	1	0.50	0.25	0.00
Spread		0.50		1	0.25	0.00
Currency					1	0.00
CCP						1

Adjusted correlations used for economic based view

Economic-based view: Calibration SCR Charges

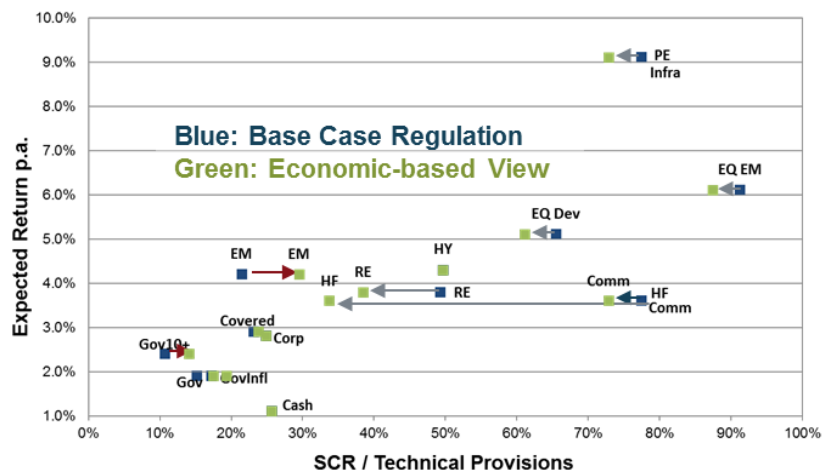
- From an ALM standpoint it is striking that on the one hand no SCR charges are applied to EEA Government Bonds and on the other hand the same SCR charges are used for EM Equity, Private Equity, Hedge Funds and Commodities
- **Fixed Income**
 - For an adequate treatment we put **higher SCR charges** on selected fixed income asset classes
 - For EM Bonds and Covered Bonds **the same** SCR charges are applied as for Corporate Bonds with comparable rating.
 - For EEA Bonds **half of the** SCR charges of Corporate Bonds with comparable rating are applied
 - This approach is identical to “High Regulation”
- **Hedge Funds**
 - Based on forward looking simulations by the risklab Economic Scenario Generator (ESG) and analysis of historical Data the SCR charge for Hedge Funds is set to **13% (instead of 49%)**
 - This is based on the assumption that we look at a well-diversified portfolio of Hedge Funds (not single Hedge Funds, which are riskier). This is also reflected in the low return expectation (which is even lower than Real Estate)
- **Real Estate**
 - For Real Estate an SCR charge of **15% (instead of 25%)** is applied

SCR Charges	Economic View	Base Case Regulation
Cash	0.0%	0.0%
Govt Bonds	3.2% ↗	0.0%
Govt Bonds 10+	5.0% ↗	0.0%
Covered Bonds	4.6% ↗	3.8%
Govt Bonds Infl	3.5% ↗	0.0%
Corporate Bonds	5.9%	5.9%
High Yield Global	30.0%	30.0%
EM Bonds	16.1% ↗	8.7%
Equity Developed	39.0%	39.0%
Equity EM	49.0%	49.0%
Hedge Funds	13.0% ↘	49.0%
Private EQ / Infrast.	49.0%	49.0%
Commodities	49.0%	49.0%
Real Estate	15.0% ↘	25.0%

Economic-based view: Results

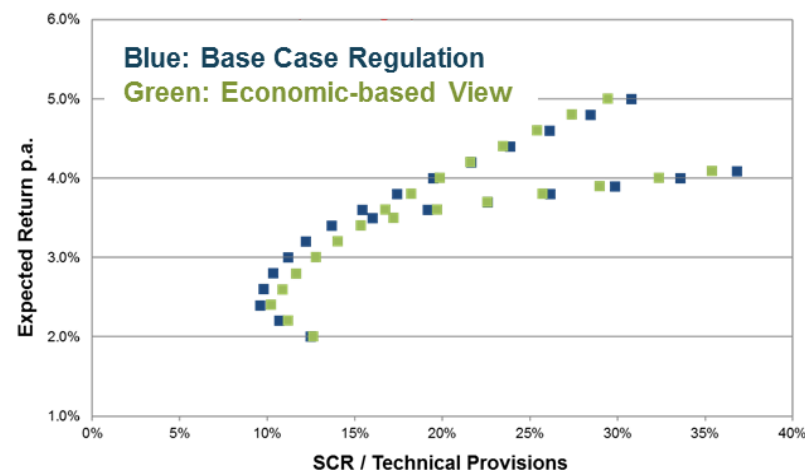
- The impact on the overall SCR then investing all assets in one asset class is **depending on the asset class**
 - For the **fixed income classes** with a higher SCR charge the overall SCR **increases**
 - For **Hedge Funds** and **Real Estate** the overall SCR is significant **lower** mainly due to the lower SCR charge
 - For **PE, EQ developed, EQ EM and Commodities** the **lower** overall SCR is a result of the higher diversification effect.

Economic View (all assets in one asset class)



100% of portfolio in one asset class; base case regulation vs. economic-based view

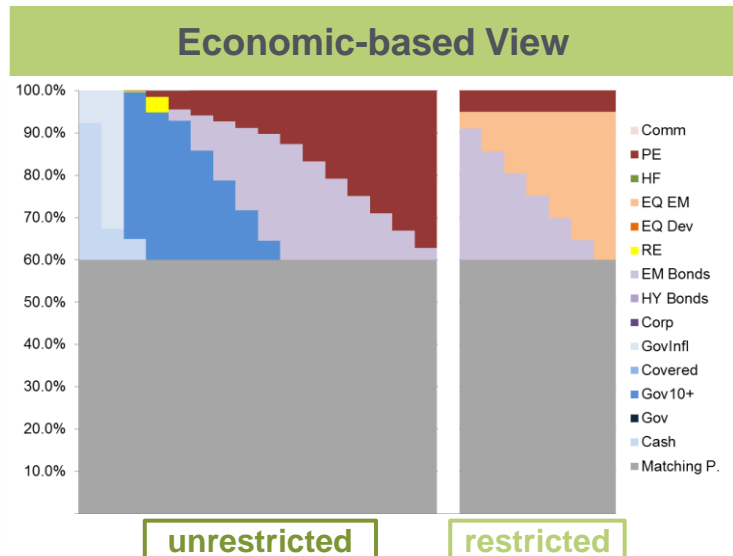
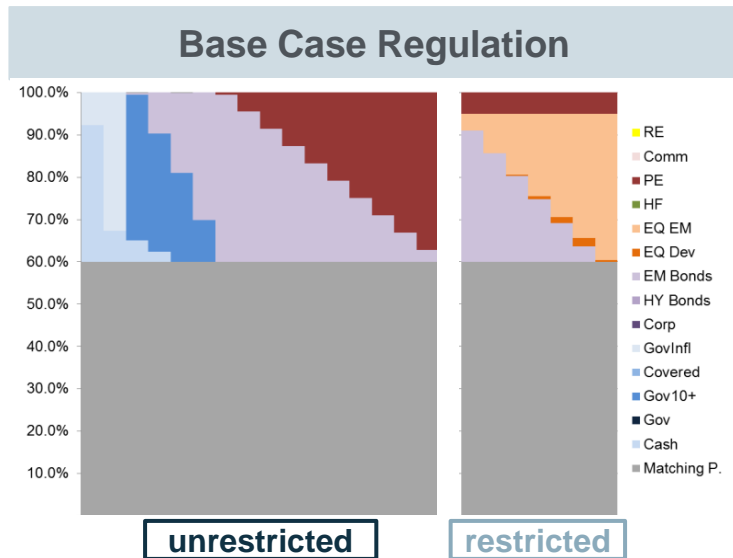
Efficient Frontiers



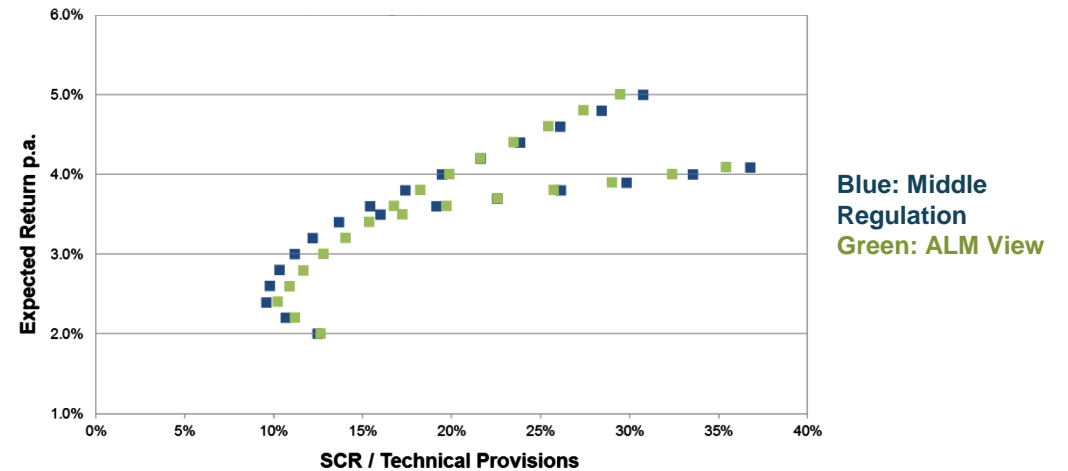
Efficient frontier; base case regulation vs. economic-based view; hedge ratio 75%

Economic-based view: Results

Optimization of Growth Portfolio with Hedge Ratio 75%



Efficient Frontiers



- The basic composition of the optimized portfolios does not change
- For the unrestricted optimization we see more long-term Government bonds and more private equity and less EM bonds
- For **low-SCR portfolios Real Estate is part of the optimized asset allocation**
 - Please note: As shown in the report in May, Real Estate is not part of the optimized portfolio in the current setting (base case regulation), only when decreasing the SCR for Real Estate to 15%

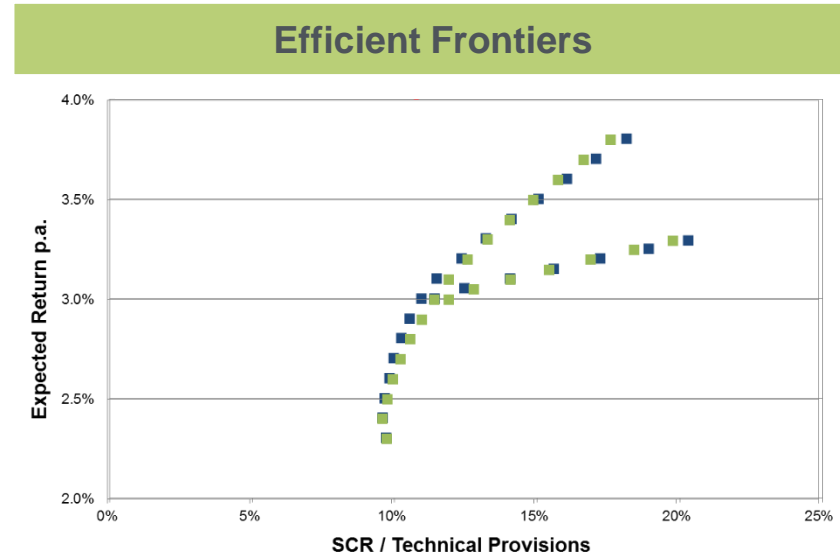
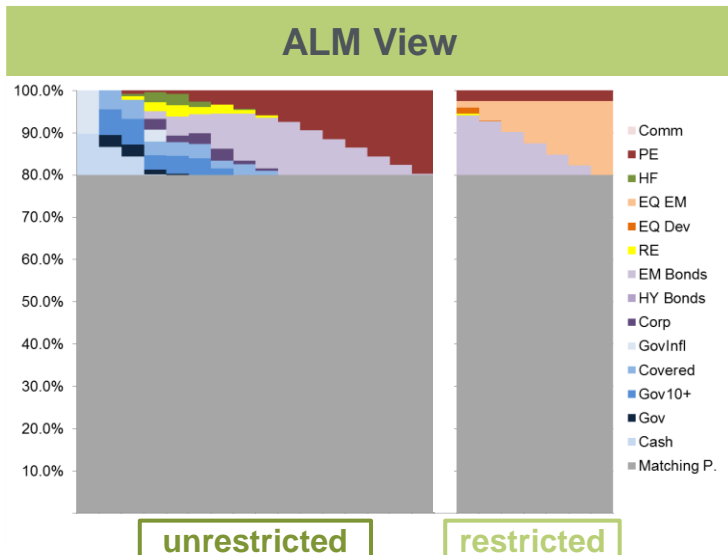
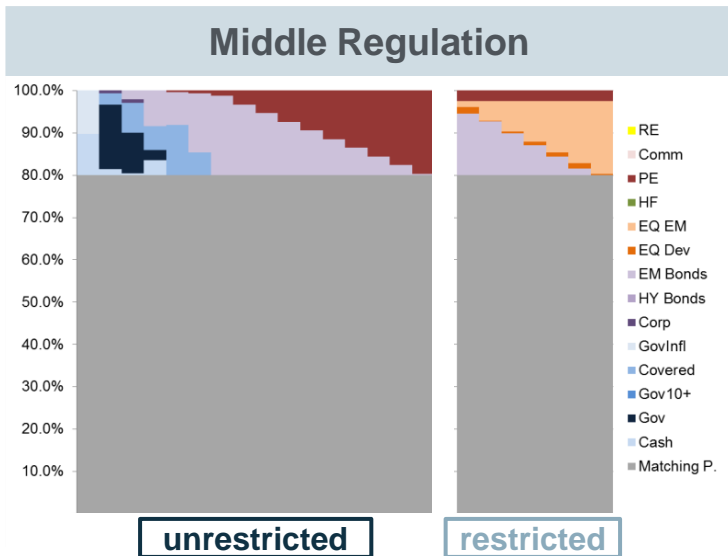
Economic-based view: Results

Optimization of Growth Portfolio with Hedge Ratio 75%

- The effect on the SCR is **twofold**:
 - Due to the **higher SCR charge** for selected **fixed income asset classes** the SCR for the optimized portfolio with a lower return expectation is higher, since these exhibit a high fixed income allocation
 - With increasing return expectation (constrained and unconstrained) the share of equities and alternatives increases and as these asset classes now show a **higher diversification** the overall **SCR decreases**
- It is interesting to note that the efficient portfolios mainly consist of **long-term Government Bonds, EM Bonds, and Private Equity** (and Equity EM when PE is restricted)
- As the following results will show, this might be the **result of incompletely hedged liabilities**

Economic-based view: Results

Optimization of Growth Portfolio with Hedge Ratio 100%



- As seen before, the **SCR** under the Economic-based view is **higher for low- and mid-return** portfolios. Additionally the overall **SCR for high-return portfolios decreases** under the Economic-based view
- When the Liabilities are fully hedged, (i.e. Matching Portfolio = 100% of Technical Provisions) the **portfolio composition** along the efficient frontier **changes dramatically/significantly**
- Almost all assets classes** (except Commodities and HY bonds) are **included** in one or another portfolio along the efficient frontier. Besides Corporate Bonds also **Hedge Funds** (and **Real Estate**) are now part of the optimized asset allocations

Summary

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Tentative Conclusions

- **Regulation in form of risk based solvency charges affects asset allocation decisions of LTI**
 - For some asset classes, the capital charges applied in the standard formula do not appear in line with the volatility or downside risk measures of the respective asset classes. This triggers different investment behavior under an economic view compared to the regulatory view
 - The standard formula provides an **incentive to heavily invest in a matching portfolio** for the liabilities: The SCR for market risk is negligible for an optimized portfolio of interest rate (and inflation) swaps
 - **Tighter regulation demands the de-risking** of investment portfolios and thus induces the exclusion of portfolios with higher expected returns. The opposite applies for lower regulation
 - Sensitivity analyses illustrate the dependency on underlying assumptions
 - The rules under discussion however could rather stifle than encourage true “long-term” investment

- Specifications of the required amount of Solvency Capital have a significant impact on the **relative attractiveness of asset classes**
 - Emerging Market Bonds appear attractive compared to other fixed income classes
 - The significant SCR charges for equity and alternatives (including high yield bonds) imply (compared to traditional asset portfolios) a need to de-risk pension investment portfolios - and with that to invest in less return-generating asset classes
 - Private Equity (and also Infrastructure) appears attractive compared to other equity classes
 - Real Estate and Hedge Funds appear unattractive due to high SCR charges

Tentative Conclusions

- **Different design versions** of the risk-based solvency regulation (compared to the current status of the EIOPA proposal) have partially significant effects on the portfolio composition:
 - A regulation based on a lower confidence level (**SCR95 regulation**) is equivalent with a linear transformation of the SCR. This implies that the optimized portfolios show no structural changes under this more relaxed regulation setting since all calculated SCR values are multiplied by the same factor
 - A **tighter regulation** with higher capital charges to asset classes which are privileged under the current solvency design implies higher SCR and possibly the need for de-risking of the portfolio
 - Under an **economic-based view** using internal risk models to assess the appropriate capital market parameters for capital charges and correlations for a more differentiated universe of asset classes (and consider the specific correlation characteristics of Hedge Funds, Private Equity and Commodities) , the SCR for the optimized portfolios with a lower return expectation was comparably higher. When moving along the efficient frontier with increasing return expectation the overall SCR decreases compared to the base case regulation (constrained and unconstrained) providing an incentive for more highly diversified portfolios

- **Diversification plays an important role for the choice of asset allocation**
 - Alternatives are summarized under „other equity“. From an ALM standpoint this simplifies the investment universe greatly and reduces the set of available asset classes significantly
 - When **allowing for the diversification effects** of alternative asset classes (even under very conservative assumptions, as described under the economic-based view) we get **broadly diversified portfolios** also including Hedge Funds and Real Estate

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