QIS on IORPs: A new Paradigm with new Issues

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QIS on IORPS: A new Paradigm with new Issues

QIS Technical specifications present 2 main innovations in comparaison with the QIS 5 for insurance compagnies:

1. **Holistic Balance Sheet** as a tool for measuring security mechanism specific to pension funds (sponsor covenant, pension protection funds, ex-post reduction of future benefits)

2. Inclusion of **Inflation Risk**: a major risk for pension funds that was not fully adressed in the QIS5 (inclusion of a specific sub-module in the interest rate risk module of the standard formula)

“The public consultation on the technical specifications raised a number of issues. There was not enough time to resolve these issues before the start of the QIS exercise and the decision was made to revisit them at a later stage.”

(EIOPA, QIS on IORPs Preliminary Results for the European Commission, April 2013).

Agenda

1. Presentation of the Holistic Balance sheet: Novations and questions
2. Inflation Risk: Technical issues related to the calculation of the Best Estimate and the SCR
3. An illustrative example: An application to a theorical pension funds in UK

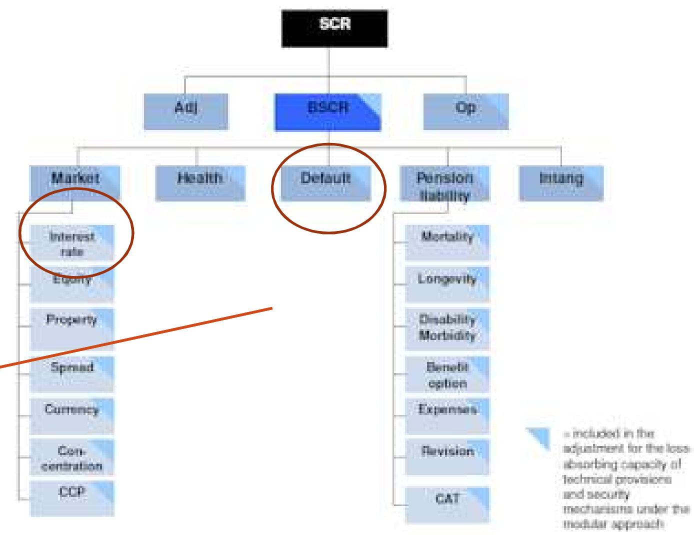
The Holistic Balance Sheet

Presentation and main issues

The Holistic Balance sheet

Beneficiaries’s point of view

New modular structure



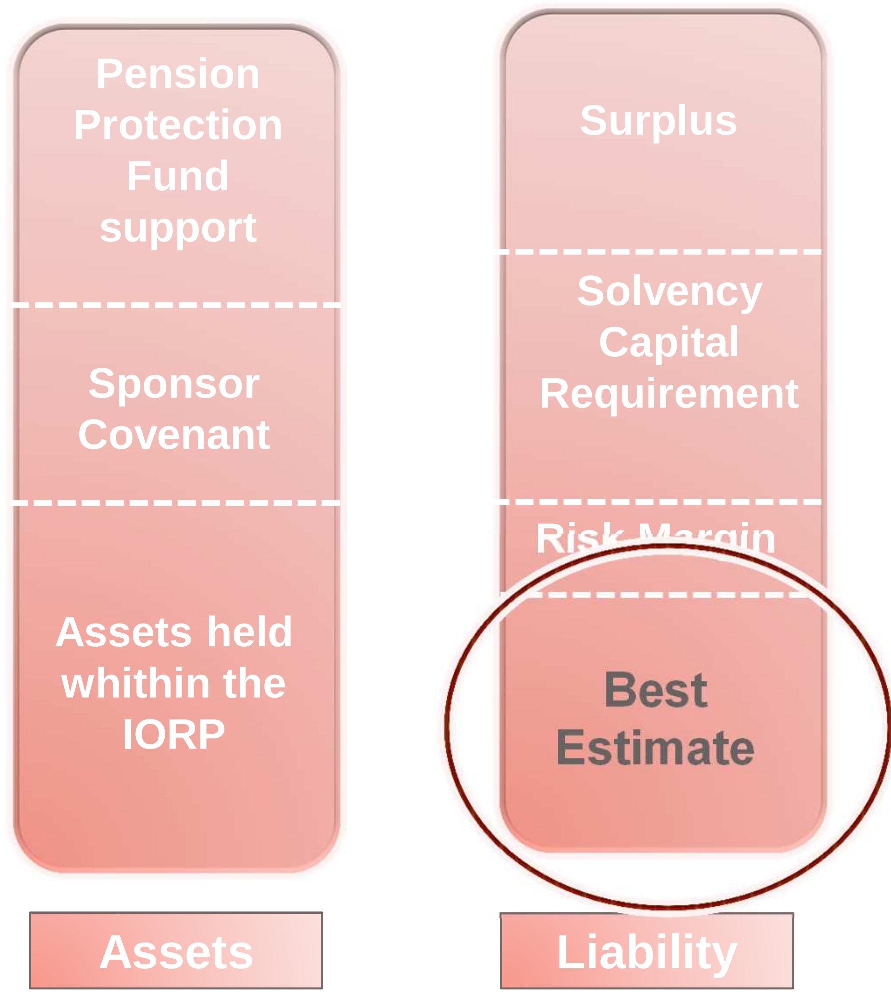
Market value

Assets	Liability
Pension Protection Fund support	Surplus
Sponsor Covenant	Solvency Capital Requirement
Assets held whithin the IORP	Risk Margin
	Best Estimate

- Ex-post reduction of future benefits
- Distinction between conditional, unconditional and discretionary benefits

The Holistic Balance sheet

Definition of contract boundaries



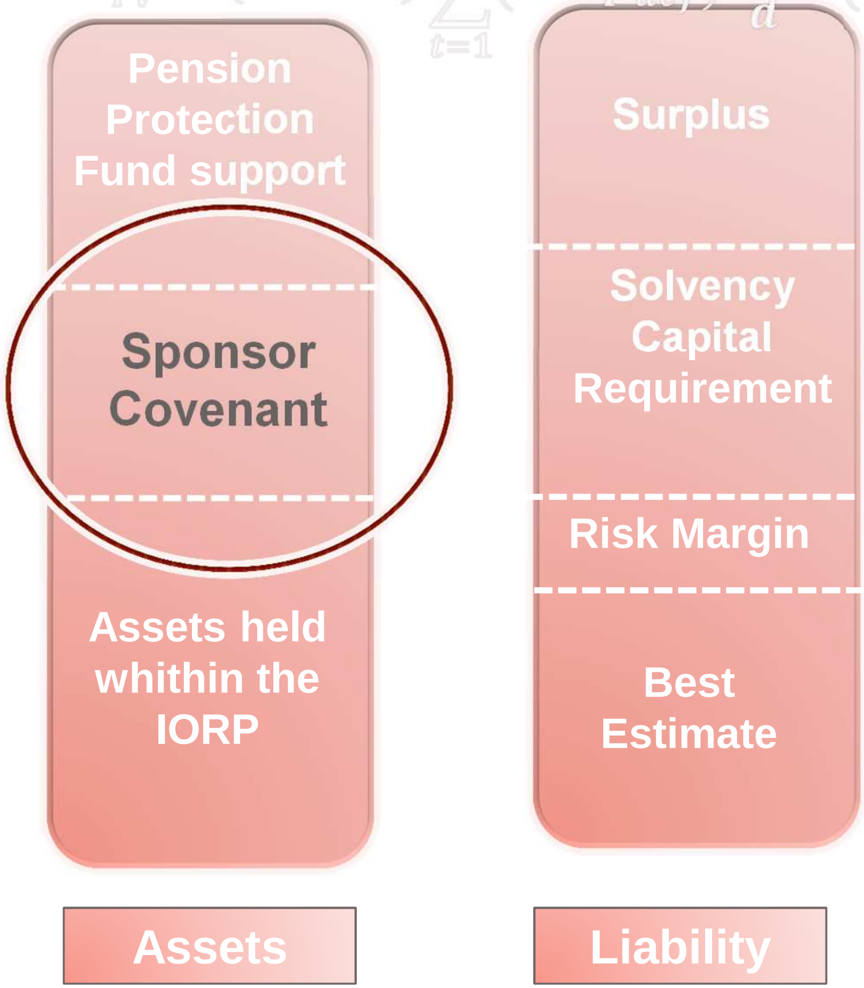
Best Estimate calculation:

- Future salary increases ? (PBO/ABO)
- Future accruals ?
- Distinction between conditional and discretionnary benefits

The Holistic Balance sheet

Calculation of sponsor covenant

$$SS_{FV} = (TP - A)\sum_{t=1}^{d}(1-p_{def})^{t}\frac{1}{d} + (1-p_{def})^{t-1} p_{def} RR\left[1-\frac{t-1}{d}\right]$$



Complex calculation involving many parameters

Timing of support not specified

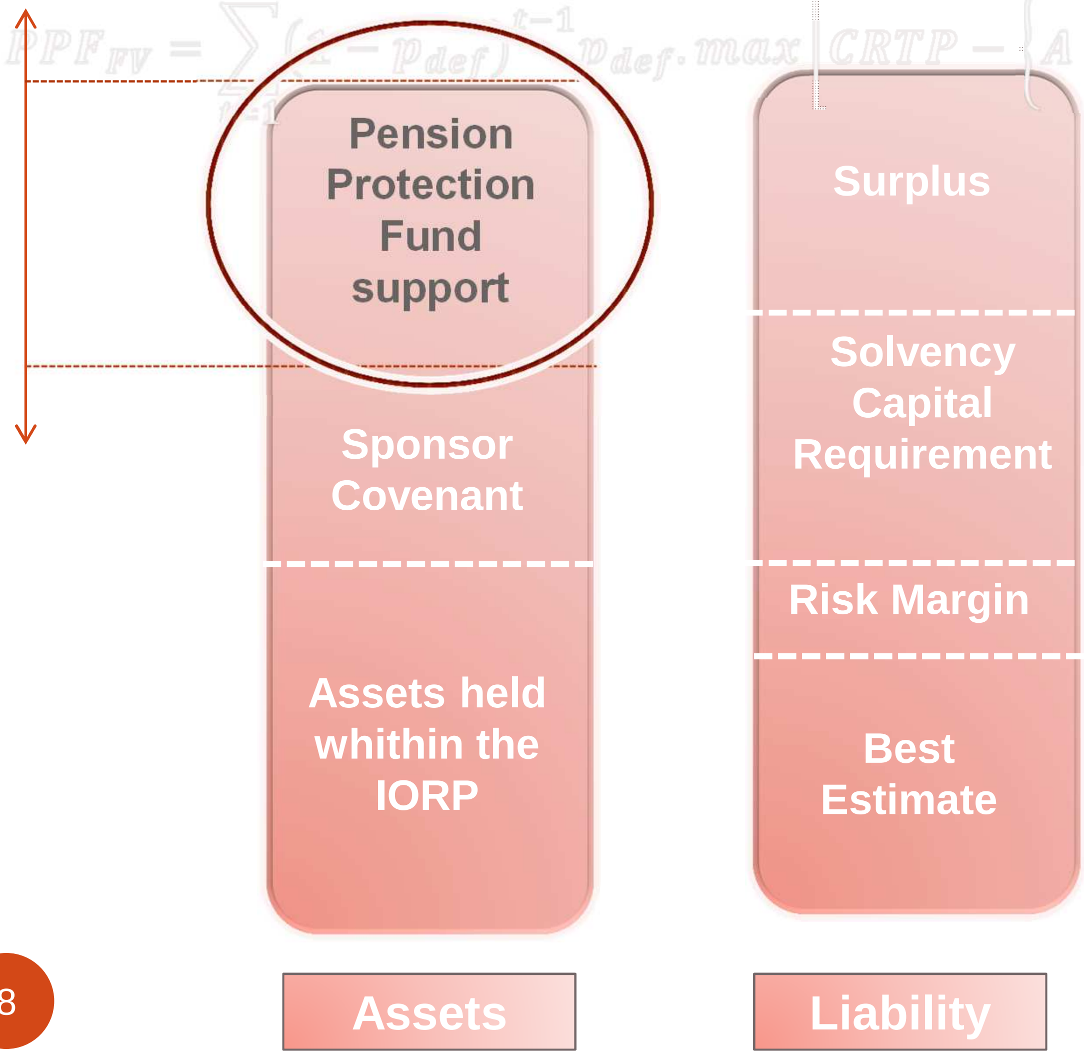
Results very sensitive to parameters and assumptions choices

Liquidity risk of the sponsor not included

The Holistic Balance sheet

Pension Protection Fund Support

$$PPF_{FV} = \sum_{t=1}^{d} (1 - p_{def})^{t-1} p_{def} . max\left[CRTP - \left\{A + \frac{t-1}{d}(TR - A)\left(1 - \frac{t-1}{d}\right)\right\}; 0\right]$$



Complex calculation involving many parameters

Probability of default (sytematic risk) not included

Last resort mechanism => SCR always nil if Pension Protection funds strong

Inflation Risk

Inflation Risk

- **Pension** plans are vulnerable to **inflation shocks** on both the **asset** and the **liability side** of the balance sheet:
  - When benefits are inflation linked
  - When assets are composed of inflation linked financial instruments (inflation linked bonds, swaps,..)

- Inflation risk is **persistent** and **cumulative** so it is mainly a **long term risk**

- An adverse inflation shock corresponds to an **unexpected increase of future inflation** or in other words **a shift in expectations about future inflation**

=> How to infer about future inflation ?

Inflation forecast

- **Many approaches:**
  - Historical data, econometric models
  - Inflation target of the Central Bank, concensus forecasts,…
- **Break-even inflation rates** : a **market consistent** approach

Market expectations on future inflation are **extracted from Bonds prices** through the **Fisher relation** which is a **no arbitrage condition**:

$$(1+i)=(1+r)*(1+\pi^a)$$

Return on Nominal Bond = Nominal expected return on real Bond

$$\begin{aligned} &\textit{Break even Inflation rate} \\ &\quad = \textit{Nominal rate} - \textit{real rate} \\ &\quad = i\text{-}r \approx \pi^a \\ &\approx \textit{Market expectations about future inflation} \end{aligned}$$

Inflation shock scenario

Fisher relation offers a **structural framework** that can be used to derive inflation shock in taking into account interactions with interest rates

Nominal Rate = Real rate + Implied Inflation

- **Option 1: Future inflation not modified**

	Nominal rate	Real rate	Future inflation
Mkt Int Up	↑	↑	→
Mkt Int Down	↓	↓	→

- **Option 2: Real interest rate and inflation shocks are uncorrelated and each accounts for half of the variance of nominal interest rate.**

	Nominal rate	Real rate	Future inflation
Mkt Int Up	↑	↑	↑
Mkt Int Down	↓	↓	↓

	Nominal rate	Real rate	Future inflation
Mkt Int Up	↑	↑	→
Mkt Int Down	↓	↓	→

	Nominal rate	Real rate	Future inflation
Mkt Int Up	↑	→	↑
Mkt Int Down	↓	→	↓

Introduction of an inflation shock scenario

Inflation shock scenario

- **An alternative scenario: Nominal rate not modified**

	Nominal rate	Real rate	Future inflation
Mkt Inf Up	→	↓	↑
Mkt Inf Down	→	↑	↓

- **Under this scenario the rise of implied inflation can result from a shift in market expectations or from bonds prices distortions**

=> Main limitation of this approach: bond market prices can be affected by various kind of risk premium

A modern version of Fisher relation

Numerous academic papers report the existence of various types of risk premium in Government Bond prices (without credit risk)

- **Inflation risk premium**: affect nominal Bonds prices and reward the risk of unexpected rise of inflation

  => Lowers Nominal Bond prices

- **Illiquidity risk premium:** affect real Bond prices and reward the risk of not being able to sell the Bond at market price

  => Lowers real Bond prices

- **Scarcity premium:** due to the excess of demand and lack of supply,

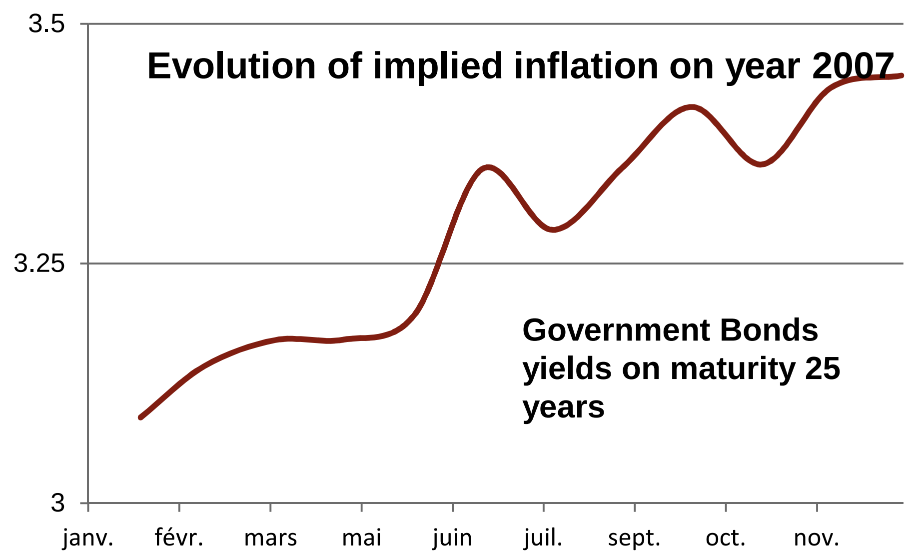
  => Increases real Bond prices

- This lead to a **modern version of Fisher relation:**

$$BEI = i - r = \pi^a + P, \qquad P \in \mathbb{R}, \text{ } P \text{ is time-varying}$$

The case of the UK indexed Bonds market

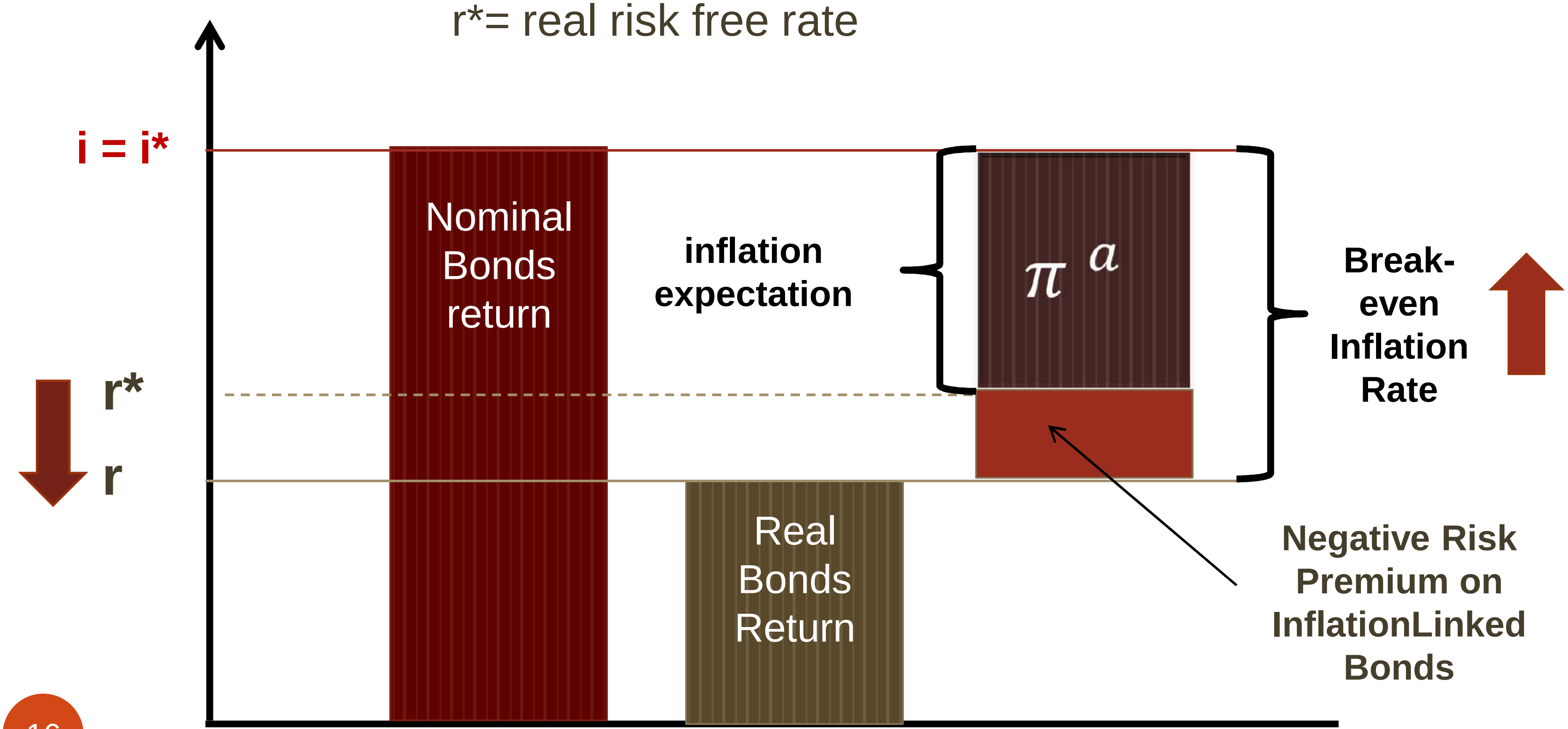
According to Campbell et al (2009), and Joyce et al (2010), the **progressive decline of real yields** observed in year 2007 on long dated Gov. Bonds in the UK is **due to an excess of demand and not to a shift in inflation expectations**



Authors reffer to **preffered habitat theory** that explains why, on certain market segments, **Investors whose aims is to hold bonds to maturity are not impacted by illiquidity risk**.

The case of the UK Bonds market

i = Nominal Bond yield,
i* = Nominal risk free rate,
r = Real Bond yield,
r*= real risk free rate



The case of the UK Bonds market

- In this context **break-even inflation overestimates market expectations** about future inflation and **does not provide the best possible estimations of future cash-flows**

$$BEI = i - r = \pi^{a} + P, \qquad P > 0$$

- Under IFRS or regulatory context, Pension liability valuation is based on a corrected measure of implied inflation (correction ranges from 10bp to 50bp depending on the period or maturiy)

- In the context of the QIS, bonds on the asset side are measured at their market value.

→ Variations of risk premiums that affect bond prices is a market risk that should be adressed

The Matching Adjustment Mechanism

- Introduced in the context of Long-term Guarantee Assessment (**LTGA**) and extended to the QIS on IORP with a simplified version

- **WHY ?** The basic idea is that Insurers holding bonds for predictable portfolios can be more certain that they will be able to hold their bonds to maturity, and are therefore less exposed to short-term fluctuations in bond values. They are still exposed to default and to the cost associated with maintaining the credit quality of the portfolio should downgrades occur.

⇒ **NAV should not be affected by illiquidity shocks when Bonds are not aimed to be sold**

- **HOW ?** The matching adjustment is an adjustment to the basic risk-free interest rate used to value such predictable liabilities. The matching adjustment shall be equal to the difference between the spread of the investment return over the basic risk-free rate of the assets of the assigned portfolio of replicating assets and the associated fundamental spread.

⇒ Elements to be considered :

  - Matching Assets / Matching Liability
  - Matching Premium => Matching Adjustment => Adjusted Best Estimate

Illustrative example

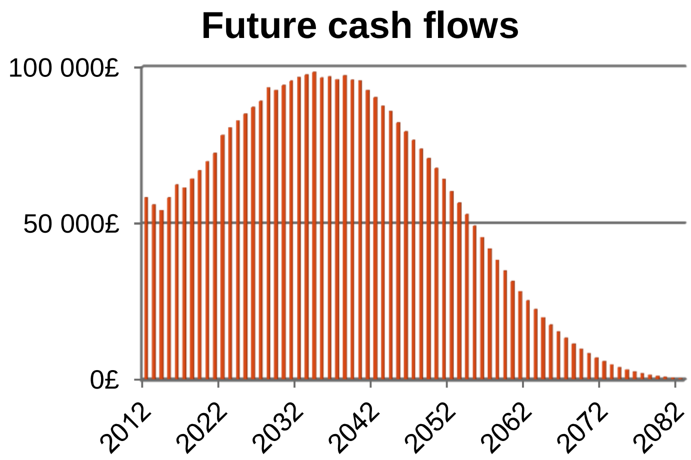
A theorical pension fund in the UK

An illustrative example: application to a theorical Pension Funds in the UK

- Simple benefits formula: final salary pension scheme with inflation indexation guarantee (no options)
- No sponsor or PPF support, no possibility of an ex-post benefits reduction
- Closed Scheme, 56% active members, 44% retirees
- Fully funded under IFRS,

IFRS (IAS 19)

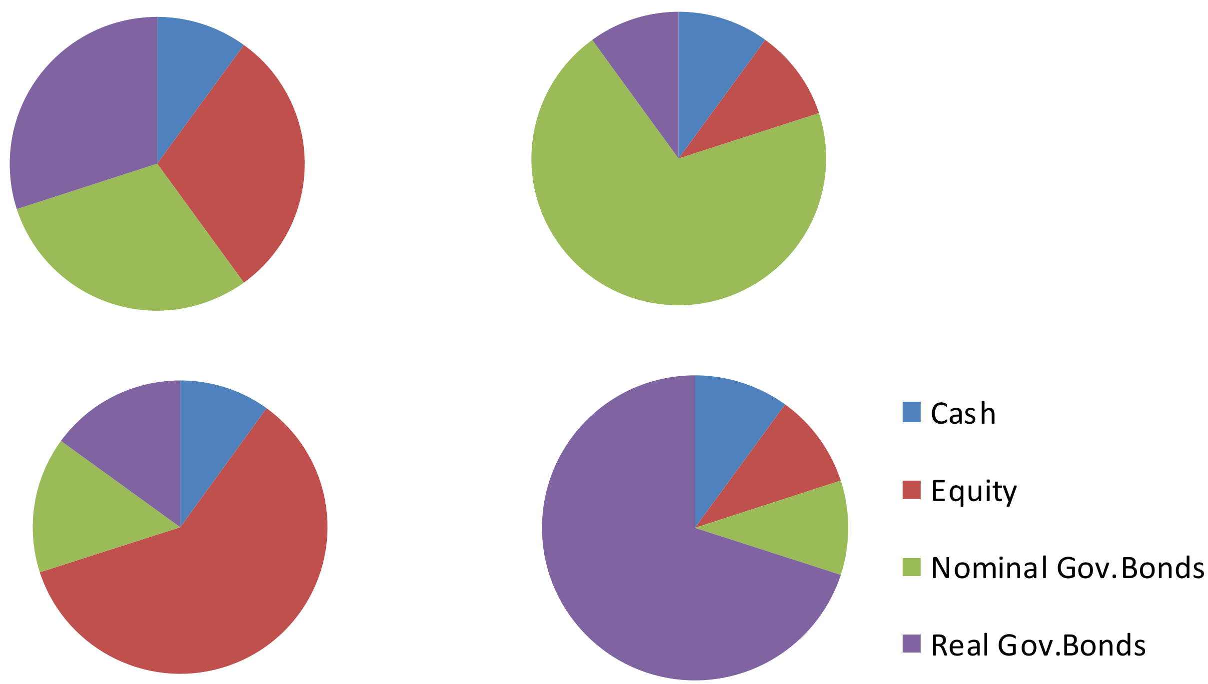
PBO:	1 440 M£
Funding ratio:	100%
Discount rate:	iBoxx £ Corporate AA 15y
Inflation assumption:	Break-even inflation rate BOE 15y



An illustrative example: application to a theorical Pension Funds in the UK

4 Asset allocations considered :

Central scenario | **60% Equity**



70% Inflation linked Government Bonds | **70% Nominal Government Bonds**

An illustrative example: application to a theorical Pension Funds in the UK

Case 1: Use of implied inflation rate for the calculation of the Best Estimate (without correction for risk premium)

- Best Estimate calculated on the basis of:
  - QIS discount curve (swap rates)
  - Break-even inflation rates (extrapolated through Smith Wilson UFR:2.7%)
  - Accrued rights, future salary increase (PBO calculation)

$\Rightarrow$ BE = 146% of PBO

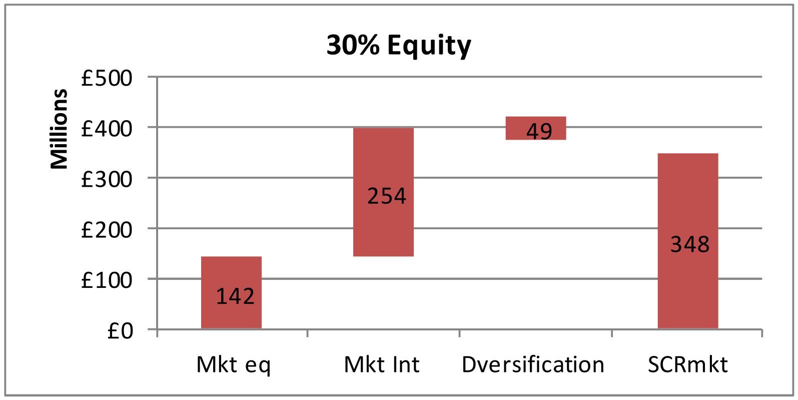
- Longevity risk: most important risk on the liability side

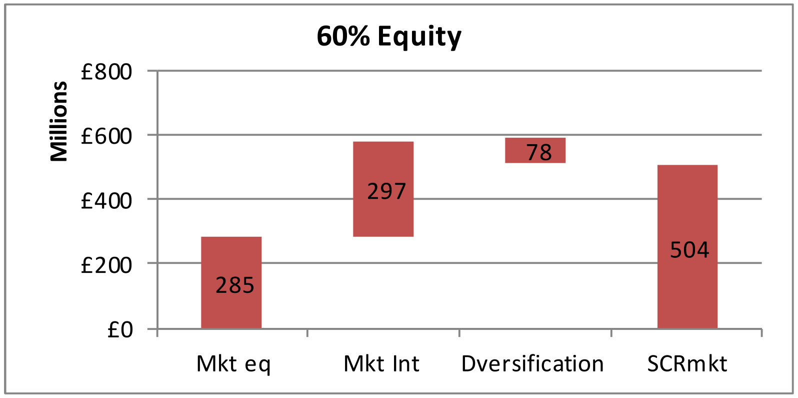
=> $SCR_{Longevity}$ = 8% of BE

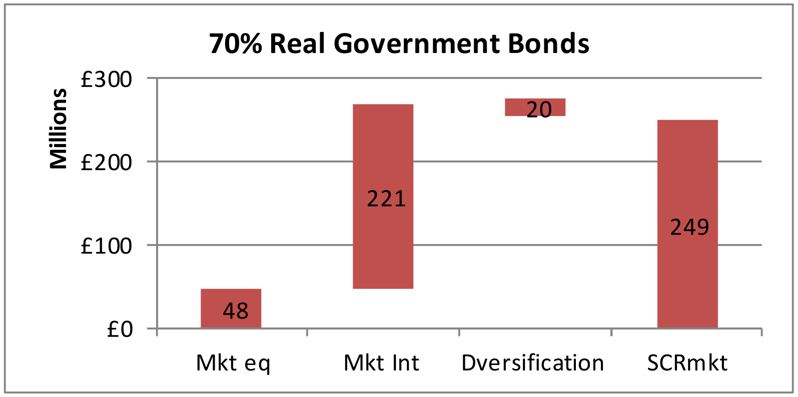
- SCR_{mkt} varies between 12% and 24% of BE depending on asset allocation and stress scenario considered for the calculation of interest rate risk capital requirement

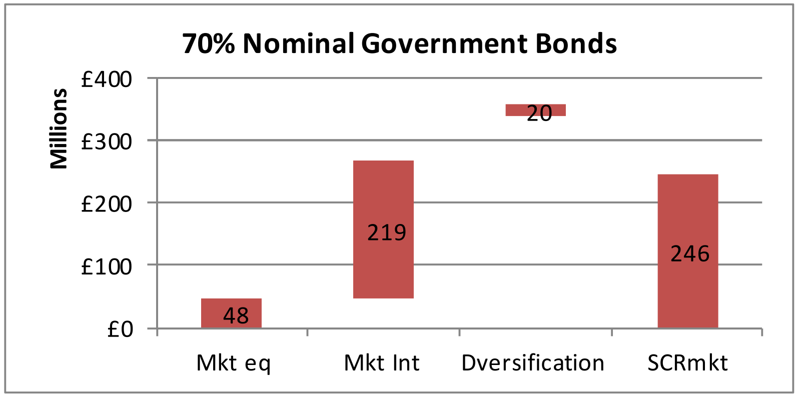
SCR Market: Option 1

	Nominal rate	Real rate	Future inflation
Mkt Int Down	↓	↓	→









SCR Market: Option 2

- SCRmkt reduced compared with option 1 for all asset allocations
- Inflation shock has no effect on Best Estimate

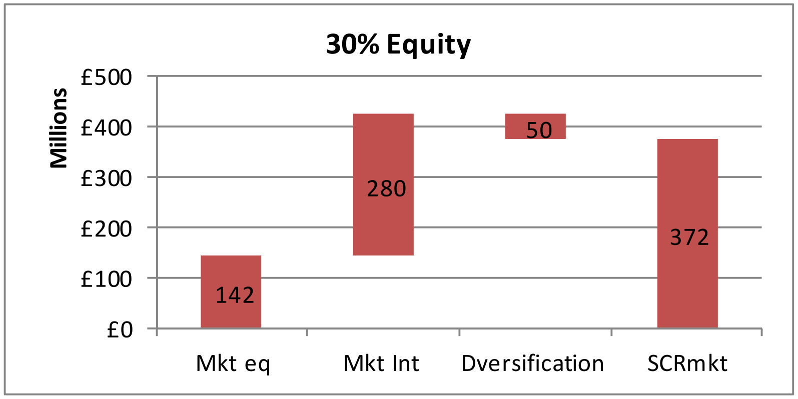
	Nominal rate	Real rate	Future inflation
Mkt Int Up	↑	→	↑

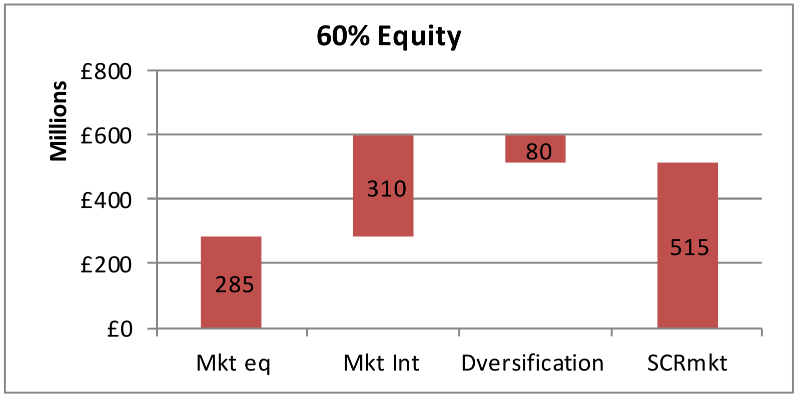
- "In the United Kingdom pension obligations are indexed to prices. **The exclusion of the inflation module results in an increase of the gross SCR**. The reason is that the **inflation module mitigates the negative impact of a downward interest rate shock through the discount rate**. Part of the downward interest stress will be caused by lower inflation, which reduces the value of future liability cash flows."

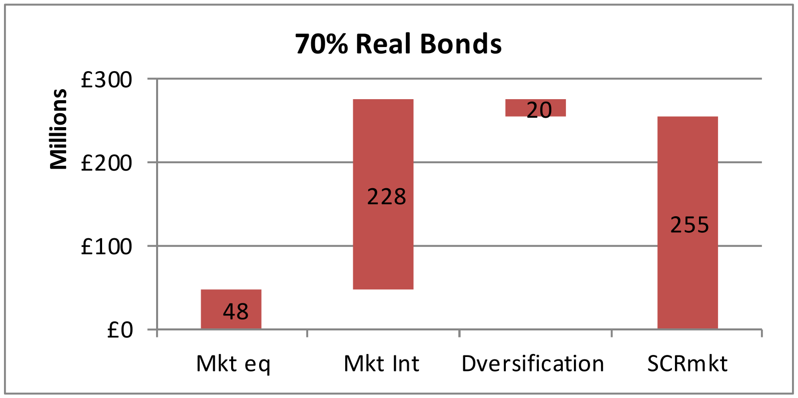
(EIOPA, QIS on IORPs Preliminary Results for the European Commission, April 2013).

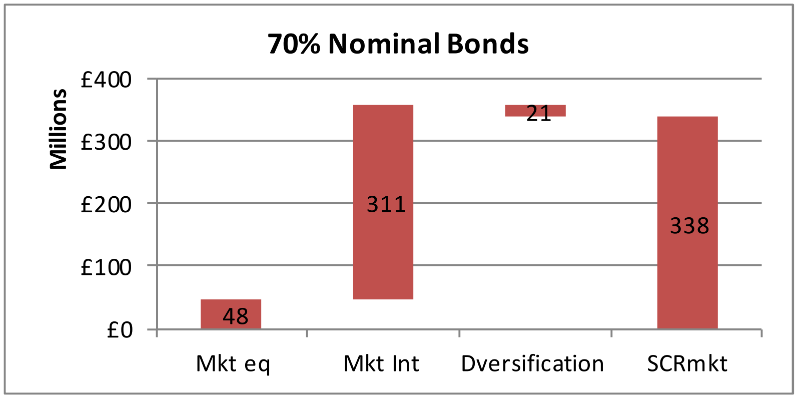
SCR Market: Alternative scenario

	Nominal rate	Real rate	Future inflation
Mkt Inf Up	→	↓	↑









Matching Adjustment and illiquidity premium

Case 2: Use of corrected implied inflation rates for the calculation of the Best Estimate (correction for risk premium)

$$BEI = i - r = \pi^{a} + P$$

For P=0.10% => BE is reduced of 1.92% (BE= 144% PBO)

Allocation 70% of Inflation Indexed Bonds

Matching Assets

90% of Plan Assets:
Cash, Nominal and real Gov. Bonds

Matching Liability

73% of Best Estimate
Cash-flows till 2037
Expected shortfalls = 16% of BE

Asset (K£)		Liability (K£)	
Cash	**143 998**	**Best Esimate**	**2 067 995**
Equity	**144 083**	**Matching Premium**	**1.16%**
Nominal Gov. Bonds	**144 082**	**Matching adjustment**	**- 210 465**
Real Gov. Bonds	**1 007 817**	**Adjusted Best Estimate**	**1 857 529**
Total	**1 439 980**	**Total**	**1 857 529**

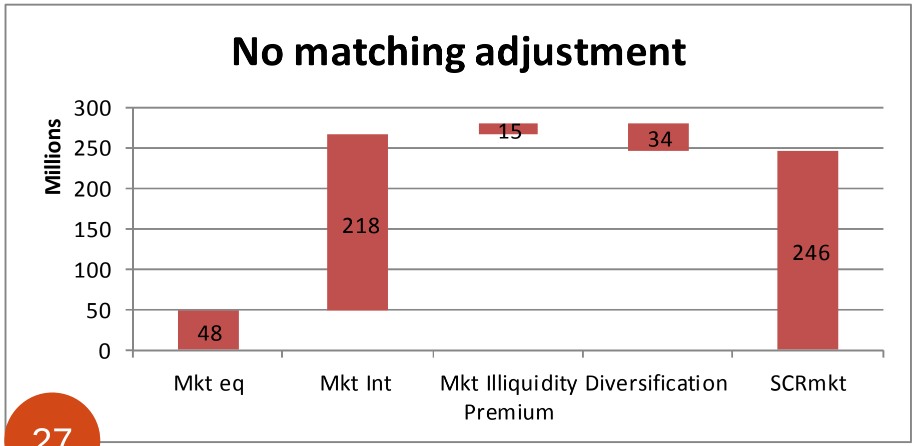
Matching Adjustment and illiquidity premium

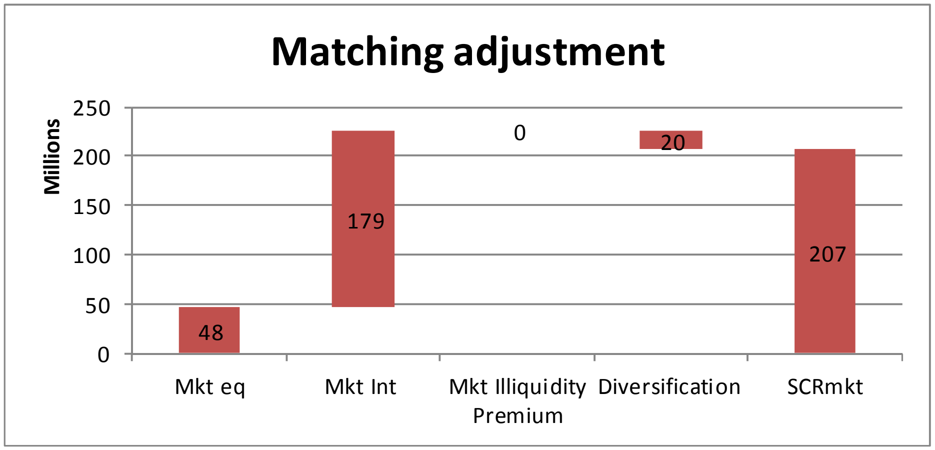
- A scenario of prices distortion on real bonds market:

↘ P (P=0) => ↘ real bond prices

Adjsutment mechanism => ↗ Matching premium => ↘ Adjusted BE

Asset (K£)		Liability (K£)	
Cash	143 998	Best Esimate	2 067 995
Equity	144 083	Matching Premium	↗ 1.25%
Nominal Gov. Bonds	144 082	Matching adjustment	- 224 692
Real Gov. Bonds ↘	993 300	Adjusted Best Estimate	↘ 1 843 302
Total ↘	1 425 463	Total	1 843 302





Conclusion

- Inflation risk not really adressed in this first Quantitative Impact Study on IORPs:
  - Accordind to technical specifications it acts like a risk mitigation mechanism

- Inclusion of this risk raises new issues and new challenges:
  - Risk premiums affecting bond prices and break-even inflation rates
  - Design of stress scenarios for inflation and interest rates risks
  - Inclusion of currency risk

- Tools are already available to adress some problematics:
  - Matching Adjustment Mechanism
  - Fisher equation

- There is a need for more QIS and more reflexion on monetary risk and its modelisation