

The Pension Fund Time Bomb

Presentation to UK ALMA

29 November 2005

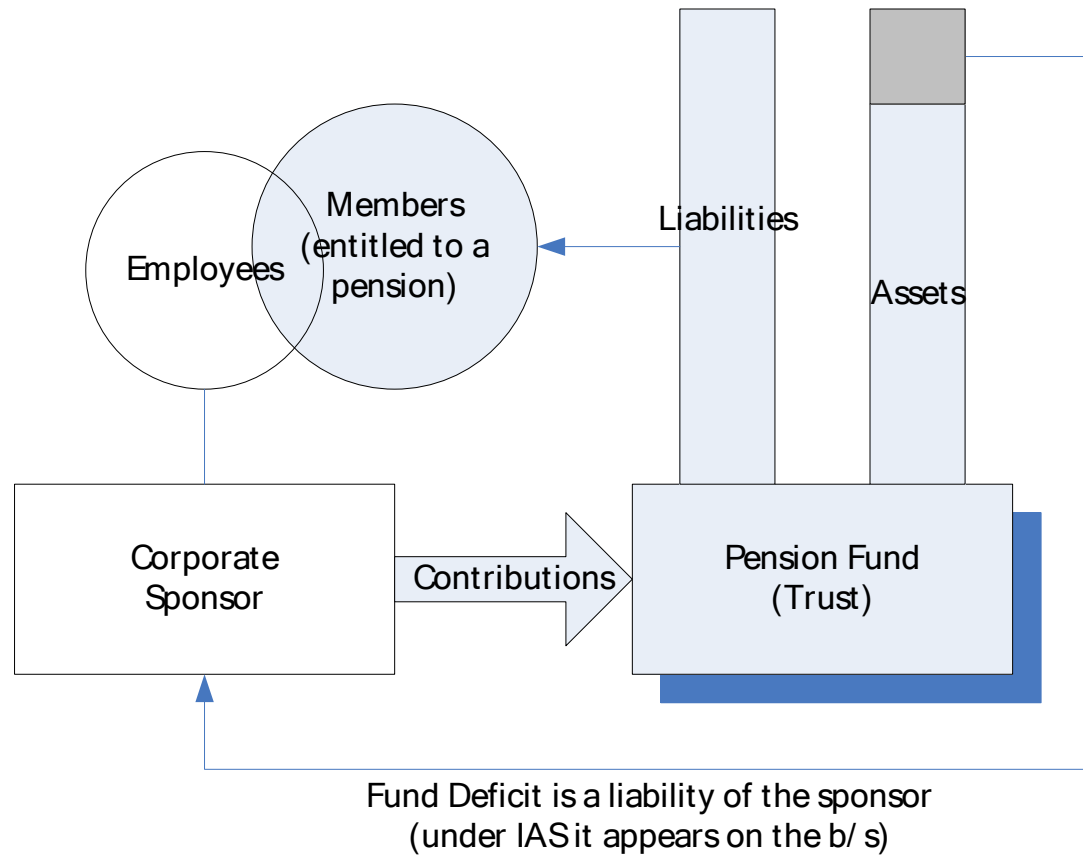
Norbert Schnadt

Barclays

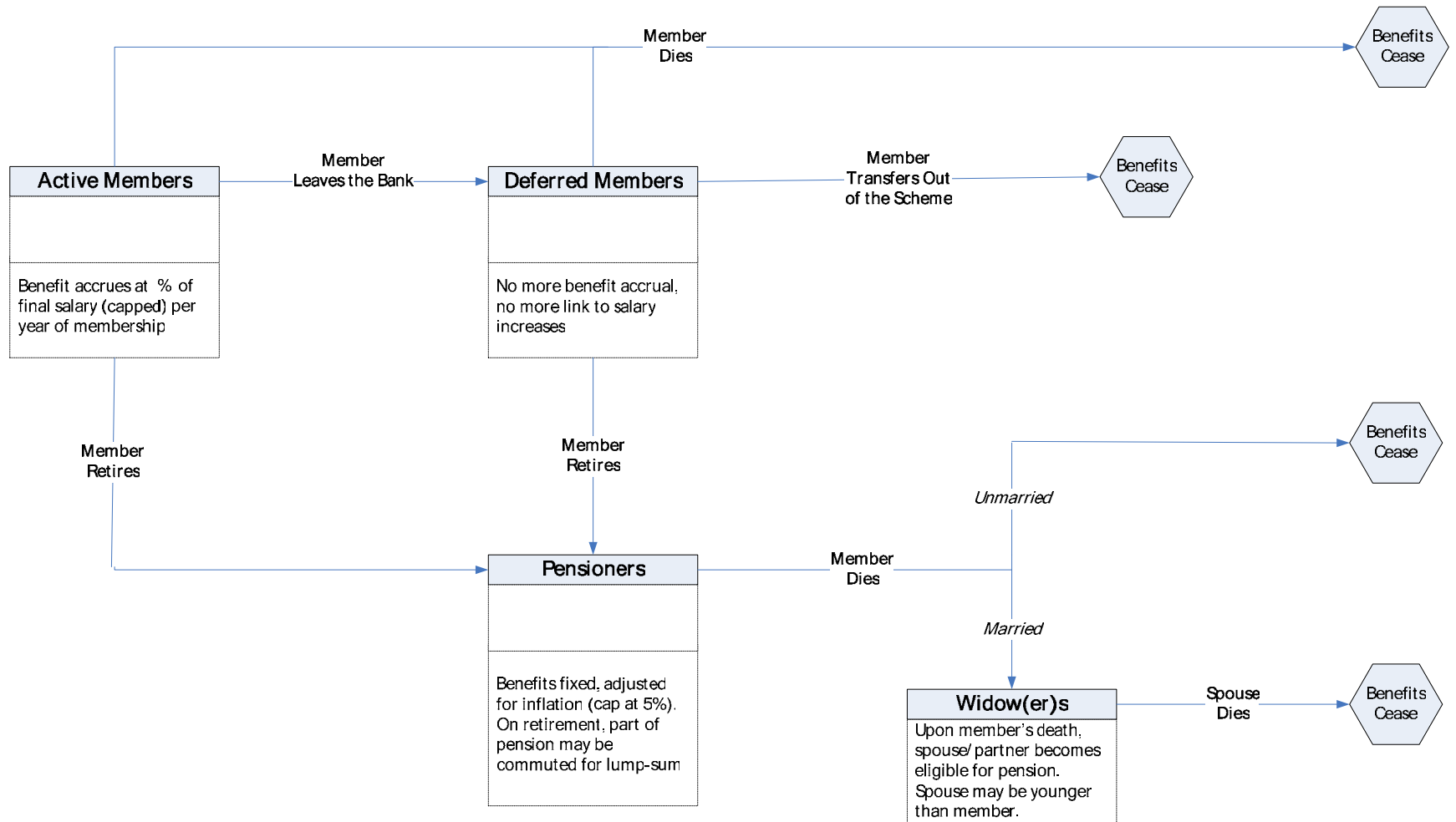
What I will cover

- ✓ DB 101
- ✓ Some Numbers
- ✓ Risks
- ✗ How to Manage the Risks – I'll leave this to you, the experts ...

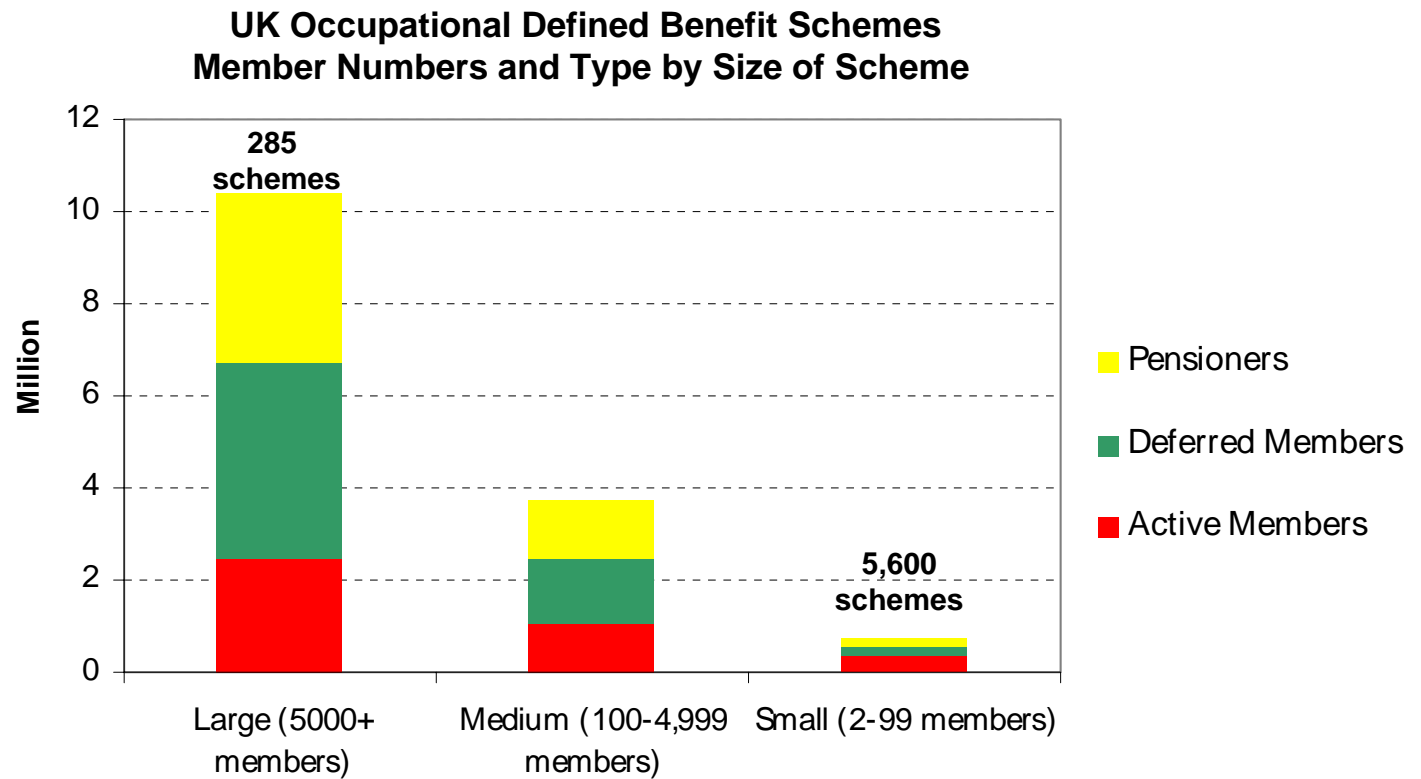
What is a Defined Benefit Pension Scheme?



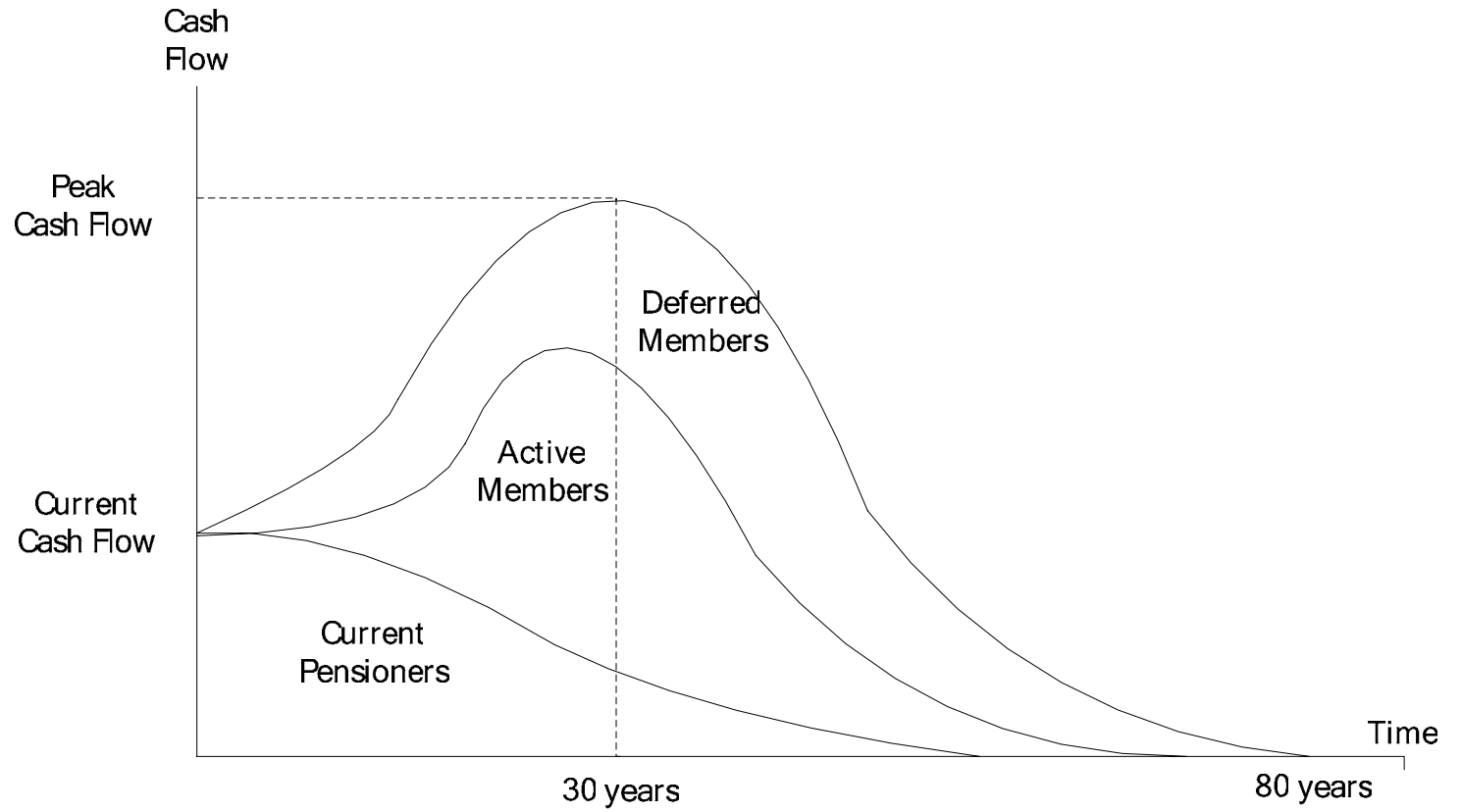
Types of Members



UK Defined Benefit Schemes: Membership Profile



Liabilities – Cash Flow Profile



Liabilities: “a surplus of definitions, a deficit of meaning” (FT)

- Funding
 - ▶ not really a valuation as such – analogous to asking, “what assets do I need to invest now to produce income/value sufficient to meet future liability cash flows?”
 - ▶ equivalent to discounting the liabilities at an assumed set of asset returns

- Buyout
 - ▶ the PV cost of having an insurer “buy” the pension liability and pay all future cash flows
 - ▶ Discount rate = gilts minus

- FRS17
 - ▶ Invented by accountants
 - ▶ PV calculation using “AA” bond rate (e.g. iBoxx Corporate Bond Index, >15 year)

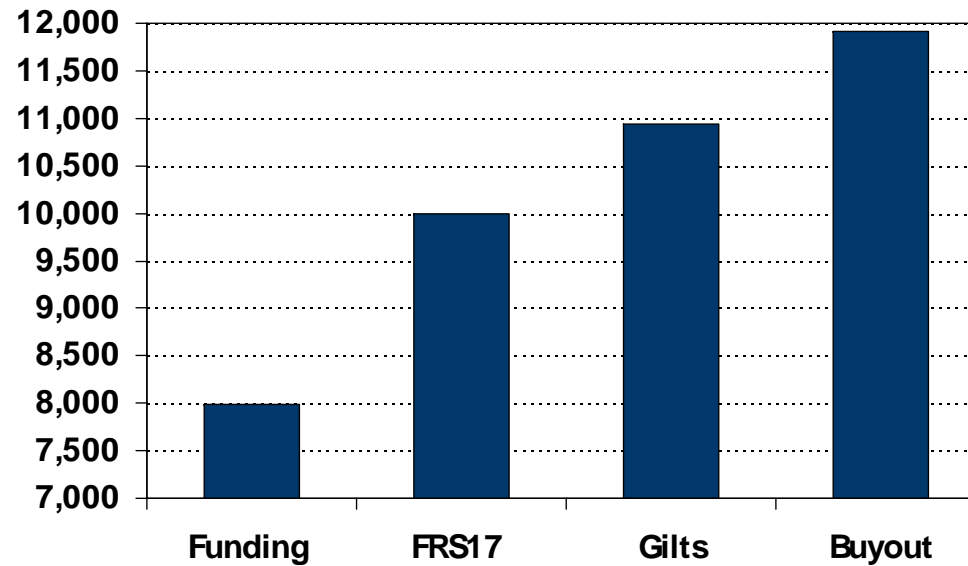
- PPF
 - ▶ Invented by the Pension Protection Fund
 - ▶ Smaller future cash flows – only those insured by PPF – but discounted at gilts – 50bp

Discount rates make a BIG difference

Discount Rates Under Different Valuation Bases

Funding	FRS17	Gilts	Buyout
6.35%	4.85%	4.30%	3.80%

Present Value of Pension Liabilities Under Different Valuation Bases



Source: UBS

The accounting and regulatory environment changed significantly in 2004



FRS/IAS have created visibility around pension costs and balance sheet impact

	Income Statement	Balance Sheet
SSAP24	<ul style="list-style-type: none"> ▪ P&L charge equal to ongoing service costs plus (minus) a variation amount which looks to spread the deficit (surplus) over the service lives of employees. ▪ Actuarial gains/ losses from year to year thus results in a lower/ higher P&L charge 	<ul style="list-style-type: none"> ▪ Stipulates few requirements for valuation of assets or liabilities. ▪ Scheme assets were taken at market value. ▪ Scheme liabilities (projected unit credit method) are calculated using weighted average of current market yields based on scheme asset allocation. ▪ Valuations are applied one year in arrears. Balance sheet also includes any difference between amounts paid into the scheme and amounts recognised in P&L.
FRS17	<ul style="list-style-type: none"> ▪ P&L charge includes regular service costs plus interest charge less expected return on scheme assets. ▪ Actuarial gains or losses do not impact income, but are included in statement of total recognised gains and losses (STRGL) 	<ul style="list-style-type: none"> ▪ Stipulates assumptions for valuation purposes. ▪ Scheme assets taken at market value. ▪ Scheme liabilities (projected unit credit method) are calculated using AA corporate bond rate. ▪ Actuarial gains and losses are recognised in the balance sheet valuation
IAS19	<ul style="list-style-type: none"> ▪ P&L charge includes regular service costs plus interest charge less expected return on scheme assets. ▪ Actuarial gains or losses which fall outside a specified corridor (10% of higher of assets or liabilities) are recognised in income, but spread over service lives of employees 	<ul style="list-style-type: none"> ▪ Stipulates assumptions for valuation purposes. ▪ Scheme assets taken at market value. ▪ Scheme liabilities (projected unit credit method) are calculated using AA corporate bond rate ▪ Actuarial gains/ losses are only recognised for balance sheet purposes if outside the corridor, introducing an element of smoothing vs FRS17.

FSA: regulatory capital treatment

- FSA had to respond to introduction of IAS in 2005, which puts pension deficits/surplus on to the balance sheet (equity) and also to impending introduction of Pensions Act proposals

- Proposed a temporary treatment that would operate for “at least 2 years” to allow accounting issues to settle down and the new pension regulations to be fully developed

- Basic approach :
 - ▶ Reverse out any liability/surplus under FRS/IAS for capital adequacy purposes

 - ▶ Regulatory capital requirement equal to the cash that is needed to pay into the scheme over and above normal contributions over the next five years

 - ▶ Normal contributions “should equate to the current service costs as defined by FRS17”

Pensions Act 2004 has altered the balance between Sponsor and Trustee

Previous Position	From Sep 2005
Trustee	Trustee
<ul style="list-style-type: none"> ▪ Appoint Actuary, in consultation with the Sponsor, and commission valuations ▪ Power to invest assets under the terms of the Trust Deed ▪ Set general investment framework, strategy and asset allocation ▪ Appoint investment managers, consultants and advisors. 	<ul style="list-style-type: none"> • All current responsibilities unchanged, and additionally: • Draw up Statement of Funding Principles with advice of Actuary and agreement of the Sponsor • Set assumptions with advice from Actuary and agreement of the Sponsor • Draw up Schedule of Contributions • Draw up Recovery Plan • Provide members with annual report on funding position
Actuary	Actuary
<ul style="list-style-type: none"> • Set assumptions in consultation and agreement with the Trustee and the Sponsor 	<ul style="list-style-type: none"> • Set assumptions which are consistent with the Statement of Funding Principles (in consultation and agreement with the Trustee and the Sponsor)
Sponsor	Sponsor
<ul style="list-style-type: none"> • Determine the level of contributions in consultation with the Actuary and the Trustee (subject to MFR minimum) • In consultation with the Actuary and Trustee, reduce any funding surplus by any means permitted by legislation 	<ul style="list-style-type: none"> • Agree a Schedule of Contributions with the Trustee which, at a minimum, is consistent with the legal commitment under the Statement of Funding Principles

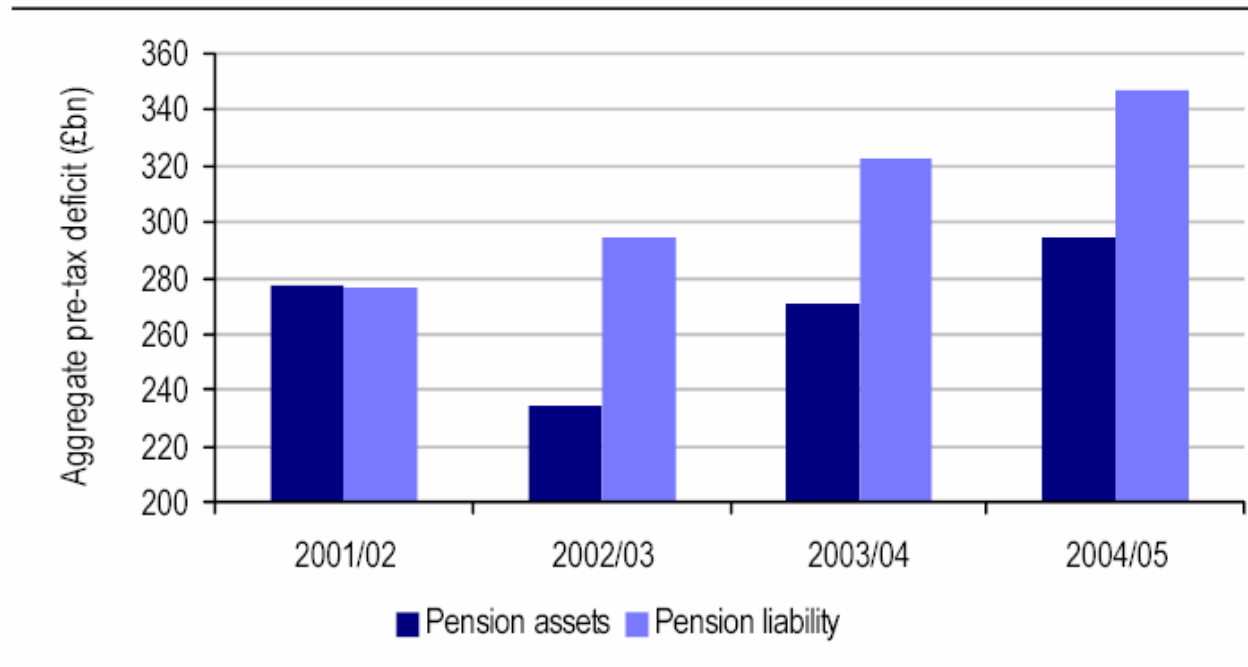
Pensions Regulator: proposed approach

- Consultation document released October 2005
- Regulation is aimed at protecting members – approach is scheme specific and risk based
- Recognition of employer covenant, membership profile, investment strategy, and so on
- Two “filters” will be applied to ascertain where regulatory intervention may be appropriate:
 - ▶ Funding Target (“technical provisions”)
 - expectation is that funding target should be within a range, defined by FRS17 and PPF valuation basis, expressed as a % of buyout value
 - trigger levels are likely to be in the region of 70% to 80% of buyout value
 - ▶ Length of recovery plan
 - Look more closely at schemes with long recovery plans or whose schedule of contributions is back-end loaded
 - Trigger level is likely to be 10 years

Some Numbers

FTSE 100: FRS17 Liabilities

Chart 1: FTSE 100 aggregate pension assets and liabilities



Source: Company accounts

“A pension fund with a company attached?”

(£m)	Gross liability 30-June-2005	Market Cap 30-June-2005	Gross liability (% of market cap)
FTSE 100	371,644	1,412,896	26
British Airways	13,079	3,055	428
ICI	9,255	3,117	297
Royal & Sun Alliance	5,171	2,570	201
BT Group	35,789	19,086	188
BAE SYSTEMS	15,184	9,548	159
National grid Group	16,252	14,040	116
Rolls-Royce	6,439	5,699	113
Sainsbury J	3,826	4,693	82
Marks & Spencer	4,805	5,927	81

Source: UBS

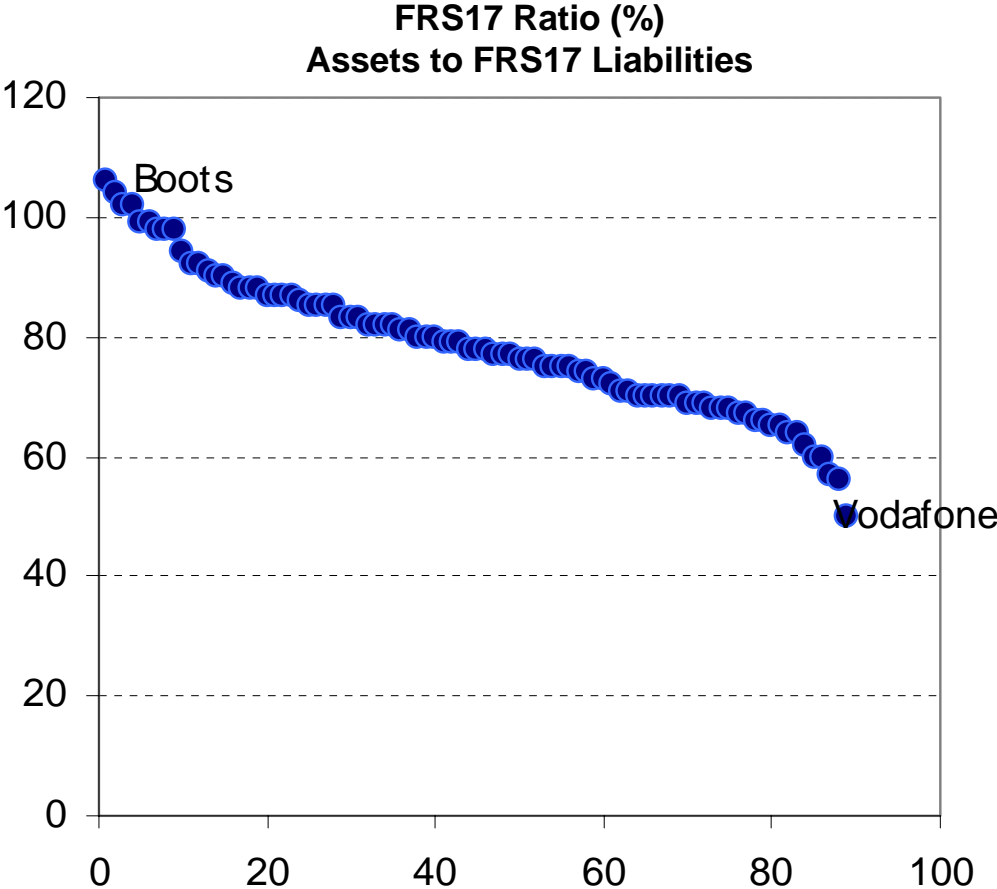
FTSE 100: FRS17 deficit

Chart 2: Changes in aggregate FTSE 100 pension deficit



Source: UBS estimates

Almost all FTSE 100 companies have an FRS17 deficit



Some deficits are significant relative to market capitalisation

Estimated deficit as at 30th June 2005

	Accounting data from	Deficit Pre-tax (£m)	Deficit % of market cap	Surplus / (deficit) at recent balance sheet dates (£m)			
				2004/ 05	2003/ 04	2002/ 03	2001/ 02
British Airways	Mar-05	(1,758)	(61.7)%	(1,682)	(1,306)	(1,261)	719
BAE SYSTEMS	Dec-04	(4,489)	(51.0)%	(4,261)	(3,032)	(3,125)	(704)
ICI	Dec-04	(1,266)	(42.0)%	(1,124)	(987)	(814)	(499)
Rolls Royce	Dec-04	(1,468)	(30.0)%	(1,398)	(1,456)	(1,839)	(580)
Royal & Sun Alliance	Dec-04	(727)	(29.8)%	(683)	(675)	(724)	(195)
BT Group	Mar-05	(5,058)	(26.1)%	(4,781)	(5,136)	(9,033)	(1,830)
ITV	Dec-04	(675)	(13.5)%	(640)	(397)	(381)	(108)
Whitbread	Mar-05	(379)	(13.4)%	(346)	(366)	(420)	(84)
Lloyds TSB	Dec-04	(3,376)	(12.8)%	(3,187)	(3,055)	(2,931)	433
Sainsbury J	Mar-05	(566)	(11.9)%	(494)	(680)	(876)	(368)
Marks & Spencer	Mar-05	(682)	(11.5)%	(654)	(646)	(1,250)	(389)

Source: UBS

FTSE 100 FRS17 deficit 2002 - 2005: drivers

(£m)	Aggregate 2002-05	2004/ 05	2003/ 04	2002/ 03
Opening aggregate deficit	(1,717)	(52,781)	(61,335)	(1,717)
Service cost	(21,496)	(7,575)	(7,035)	(6,868)
Interest cost on liability	(50,391)	(17,506)	(16,481)	(16,404)
Actual return/ (loss) on assets	32,545	28,518	38,878	(34,850)
Cash funding	28,675	10,896	11,666	6,113
Liability measurement changes				
Discount rate changes	(26,748)	(7,262)	(13,144)	(6,342)
Other assumption changes	(16,770)	(8,825)	(6,813)	(1,132)
Balancing figure	2,202	836	1,501	(134)
Closing aggregate deficit	(53,700)	(53,700)	(52,781)	(61,335)

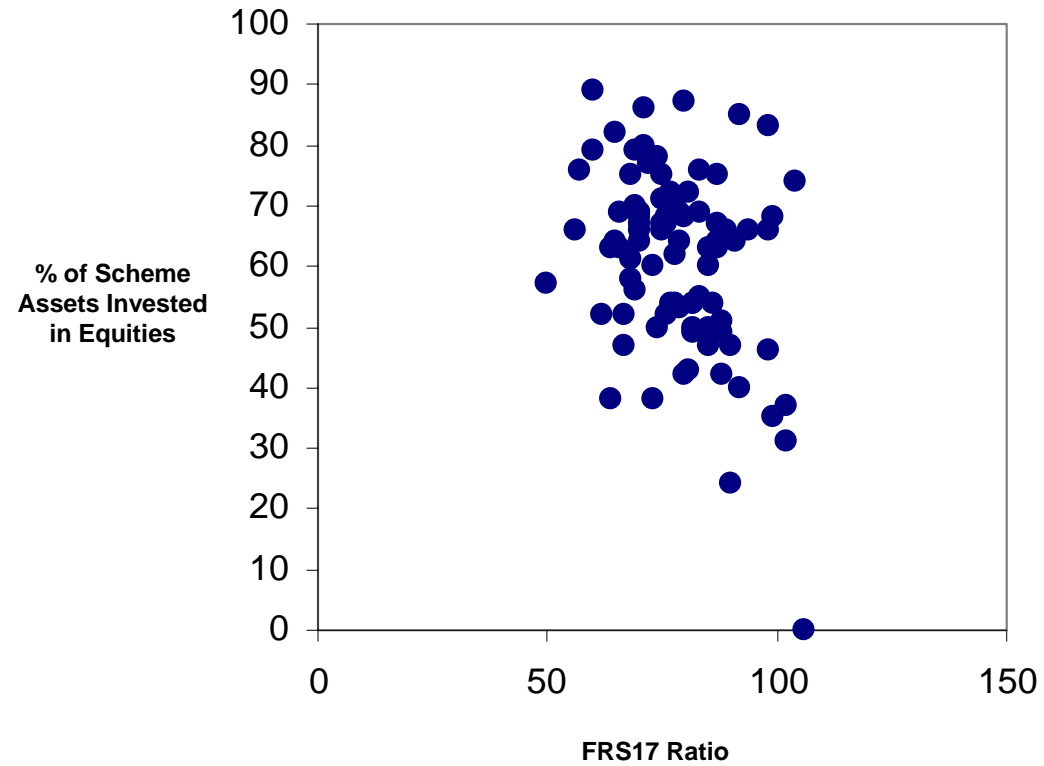
Source: UBS

Estimated* changes needed to eliminate FTSE100 aggregate deficit

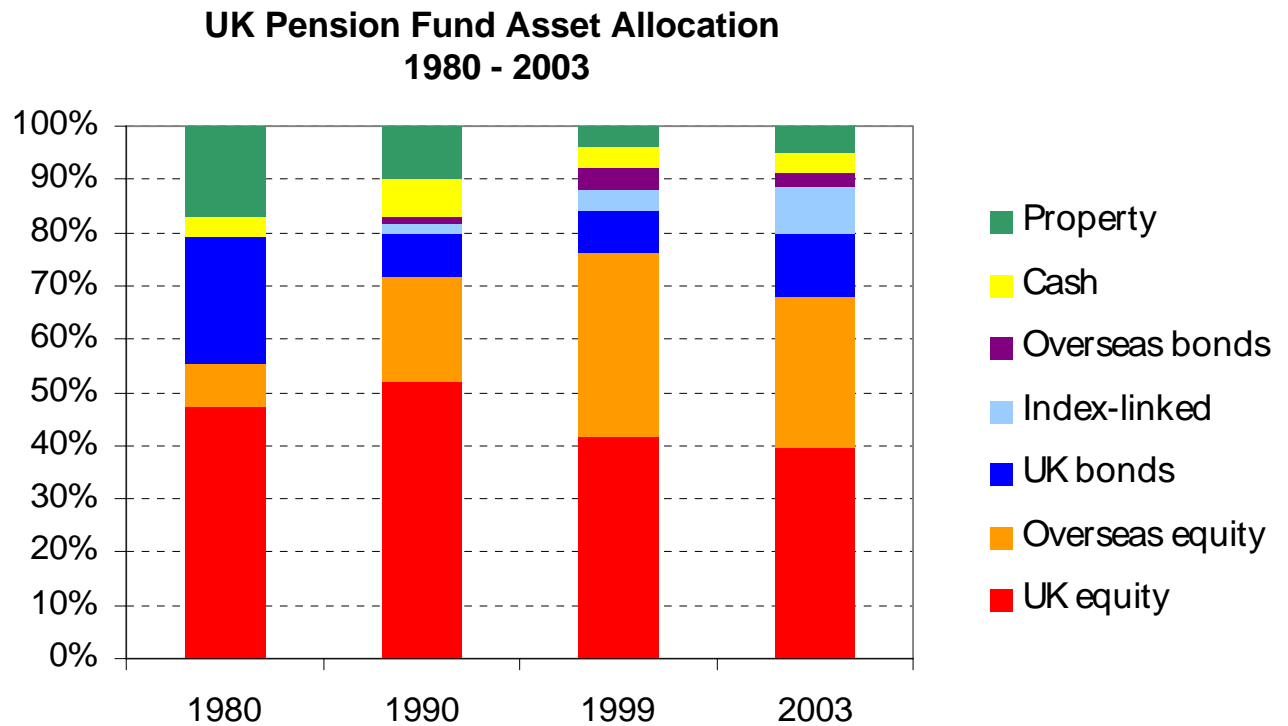
- Assuming “normal” investment returns and current contribution rate
8 years
- Increase in real discount rate
115bp
- Increase in equity markets
25% rise in FTSE 100 index to 6800
- This assumes no further rise in liabilities due to longevity ...
- ... and still leaves a number of schemes in deficit

* *UBS estimates*

Most schemes are invested at least 50% in equities, irrespective of FRS17 ratio

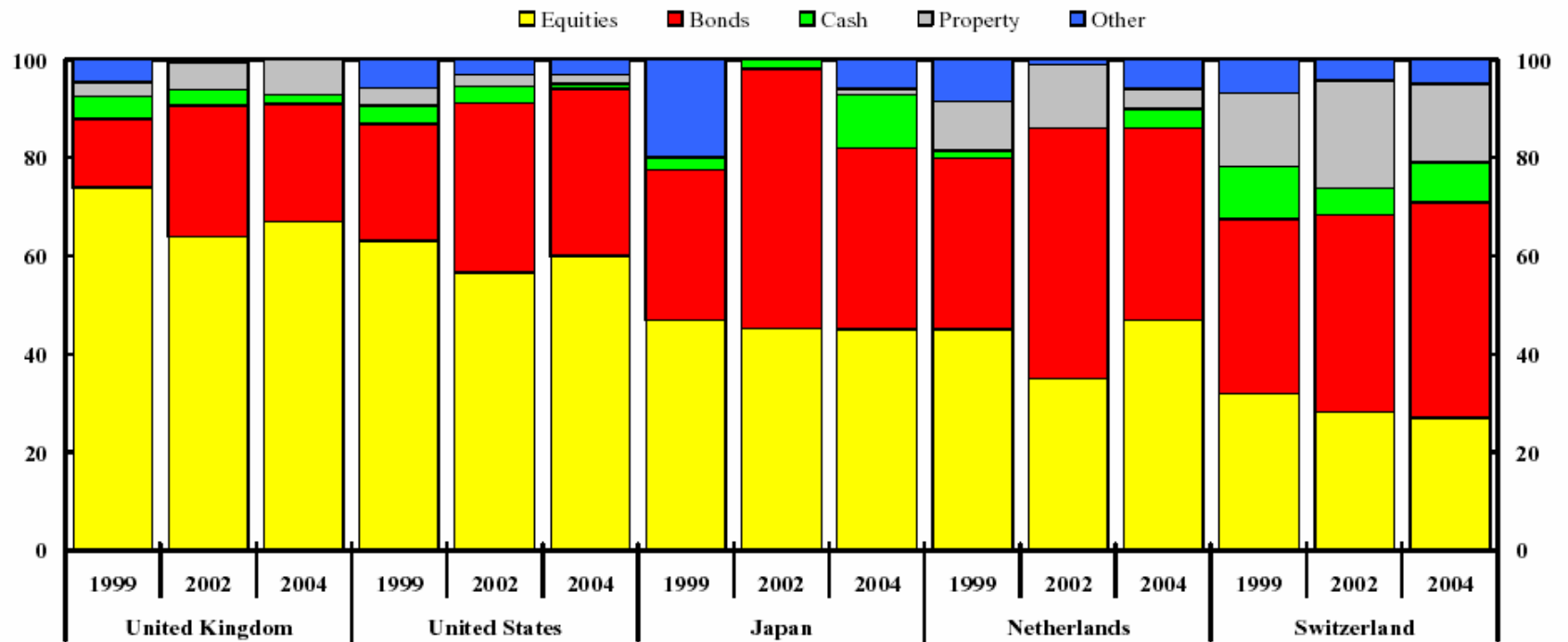


Asset Allocation - UK Pension Funds



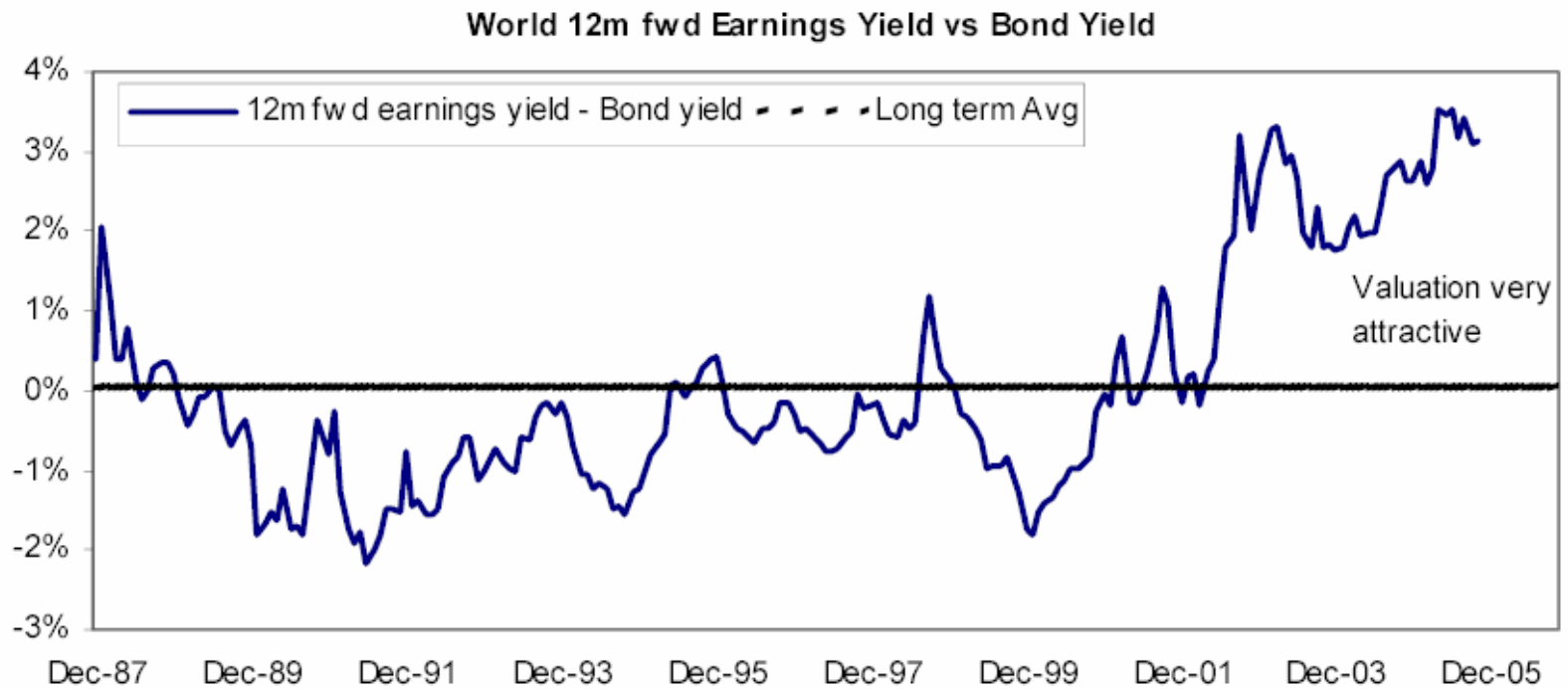
Source: Watson Wyatt

Asset Allocation – the global picture



Sources: Watson Wyatt; International Financial Services, London.

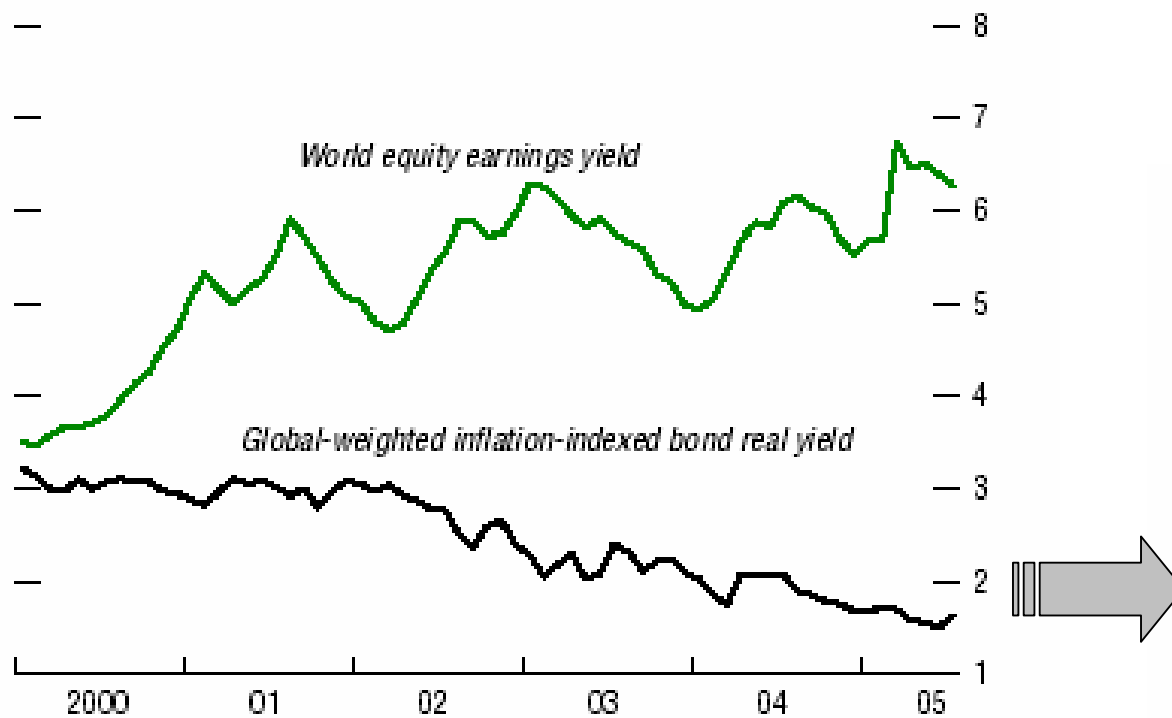
Bonds or Equities? It's a no-brainer, right?



Source: Bridgewater

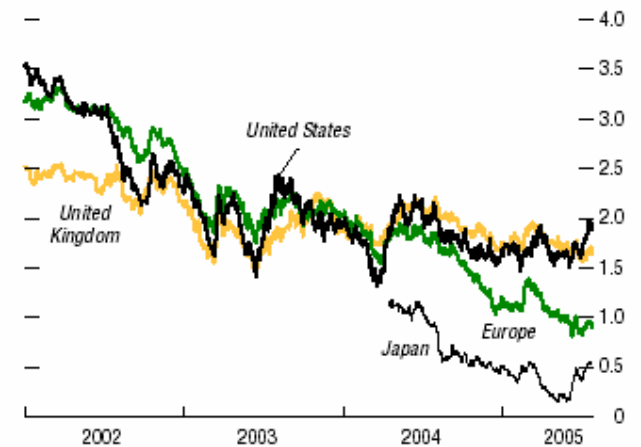
Real yields continue to decline, driven in part by pension fund demand

Figure 2.6. Global Equity Yields Versus Real Bond Yields
(In percent)



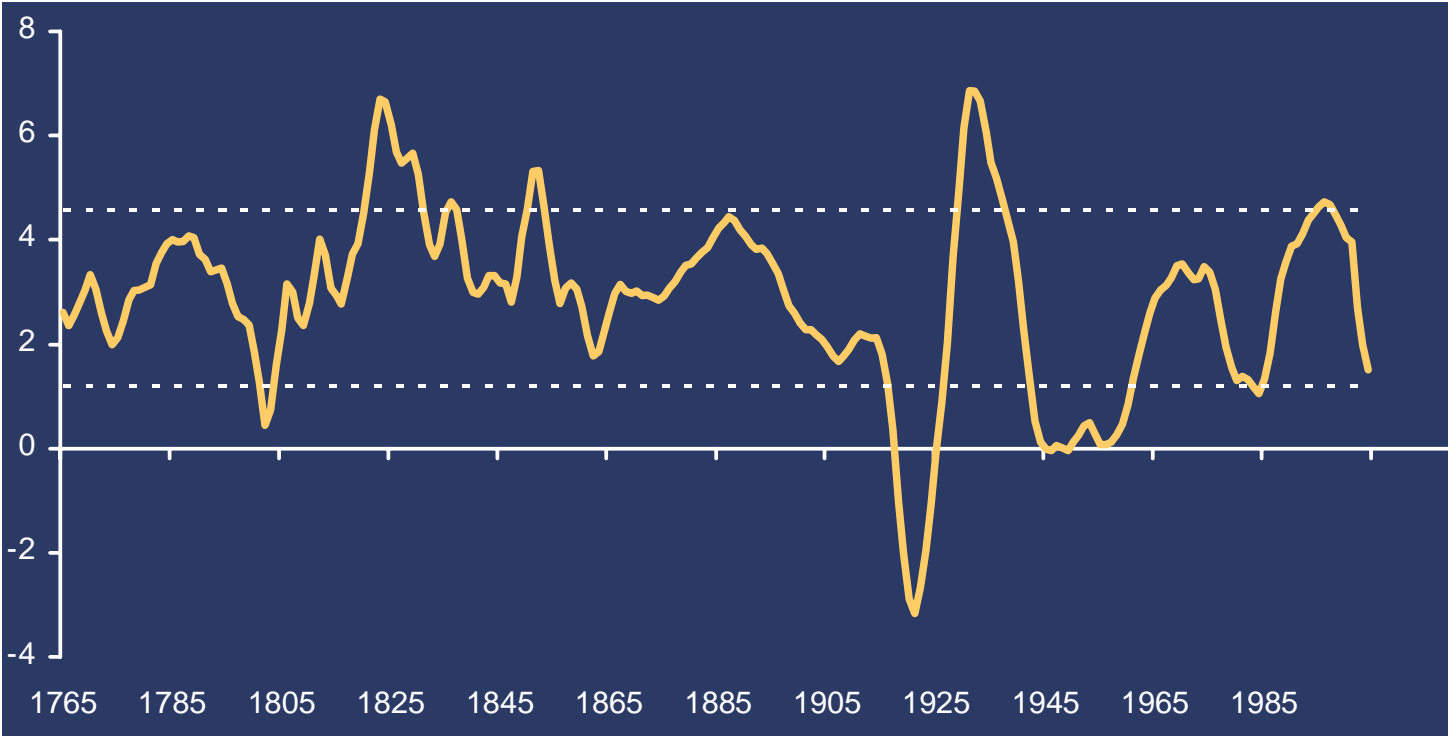
Source: Barclays Capital.

Figure 2.2. Inflation-Indexed Bond Yields
(In percent)



Source: Bloomberg L.P.

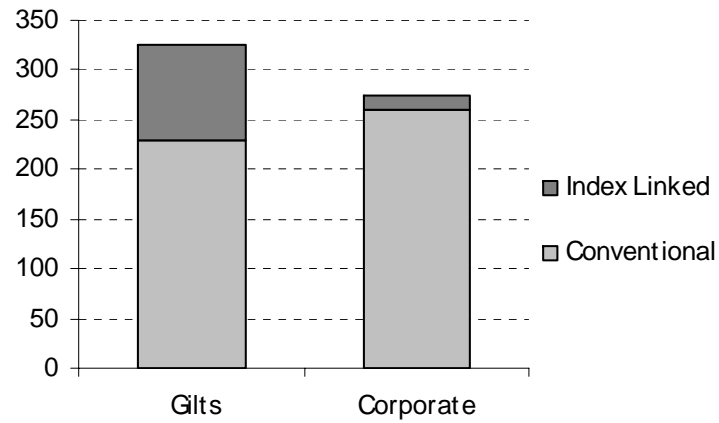
UK Consol real yields (1.15% vs long run average of 2.8%)



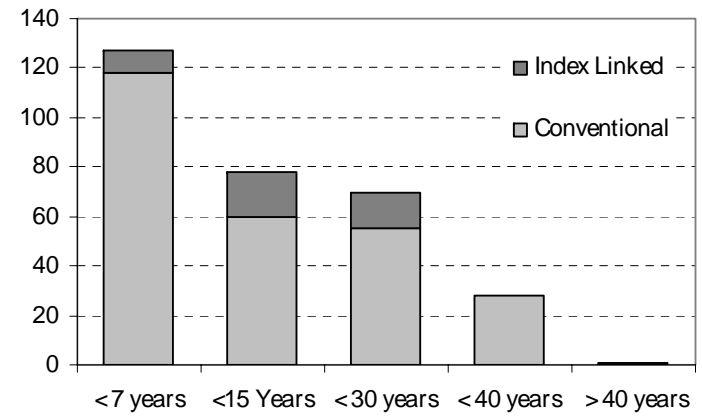
Risks

Ultra long, index-linked issuance remains small ...

Conventional vs Index Linked Issuance: Gilts vs Non-Gilts

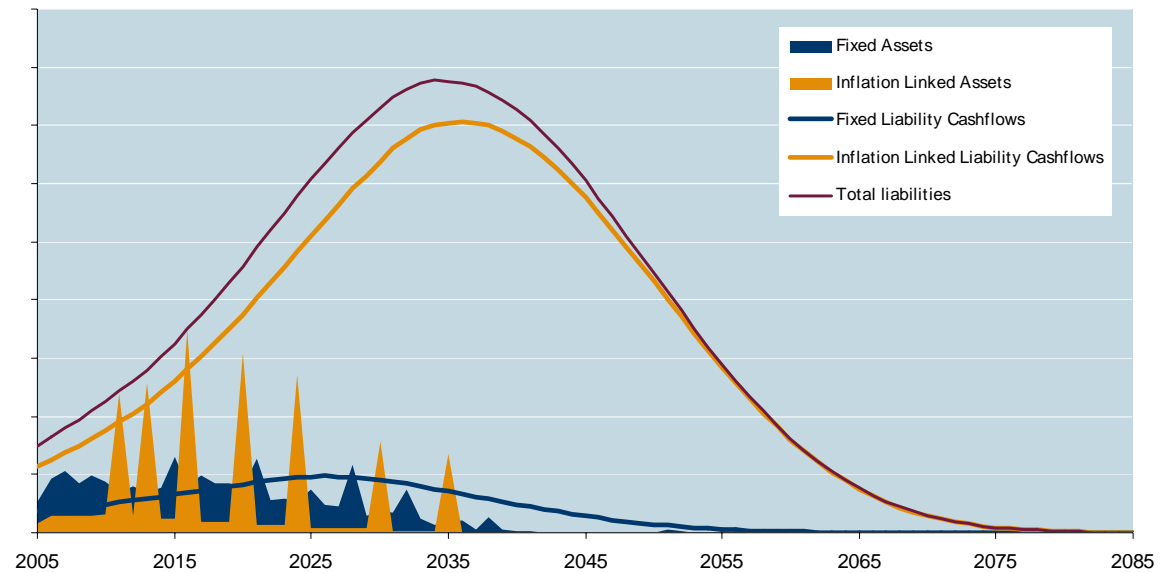


Tenor of Outstanding UK Government Debt



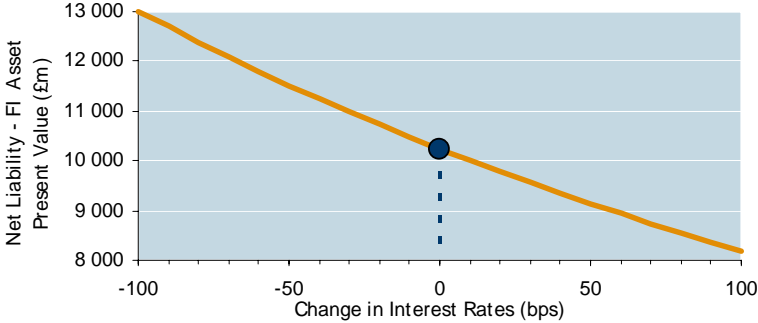
So duration mismatches are significant (and essentially unrewarded)

**“Typical Scheme”:
Liability Cashflows vs Bond Cashflows**

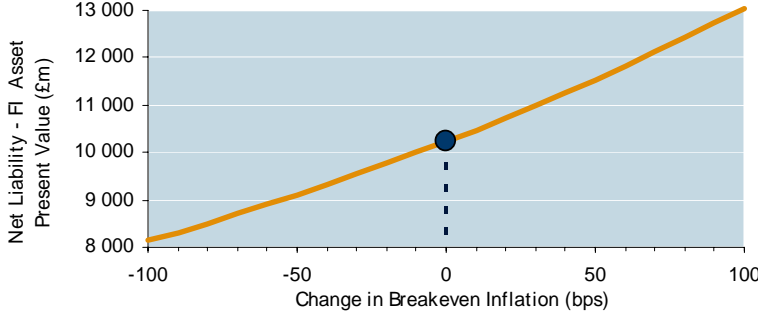


Market risk sensitivity to each of the risk factors in isolation can be quantified as the impact on net assets (in PV terms) due to a specific move in that factor.

Interest Rate Sensitivity



Inflation Rate Sensitivity



Equity Sensitivity



What sort of volatility could we observe between funding valuations?

**UK Long-term Real Interest Rates
1998 to 2005**



- UK real interest rates have trended downwards since 1998
- They have, however, been quite volatile, with average annual volatility of 30bp
- We can calculate 1 standard deviation forward-looking risk from real rates over 3 year horizon as:

$$\text{Vol (bp)} * \sqrt{3} * \text{PV01} = \text{Impact}$$

Equates to c. 10% of value of liabilities

**International Equity Returns
1998 to 2005 (2005 = 100)**



- International equity returns fluctuate significantly
- Volatility of equity returns is approx. 15% - 20% p.a.
- We can calculate 1 standard deviation forward looking risk from equity returns over 3 year horizon as:

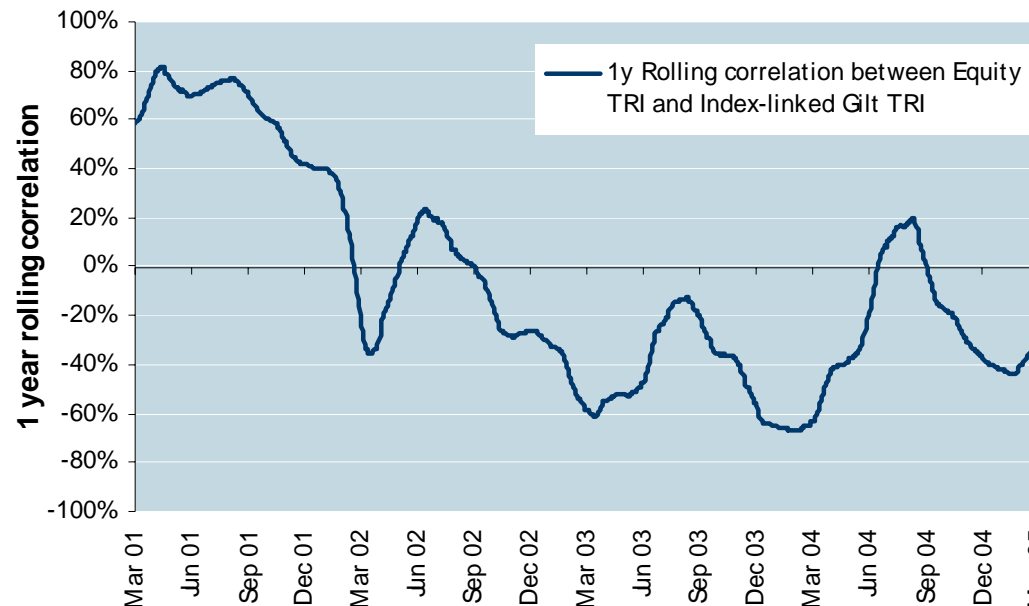
$$\text{Vol (\%)} * \sqrt{3} * \text{PV01} = \text{Impact}$$

Equates to c. 13% of value of liabilities

The impact of movements in real rates and equities depends on how they are correlated. Historically, this correlation has been unstable.

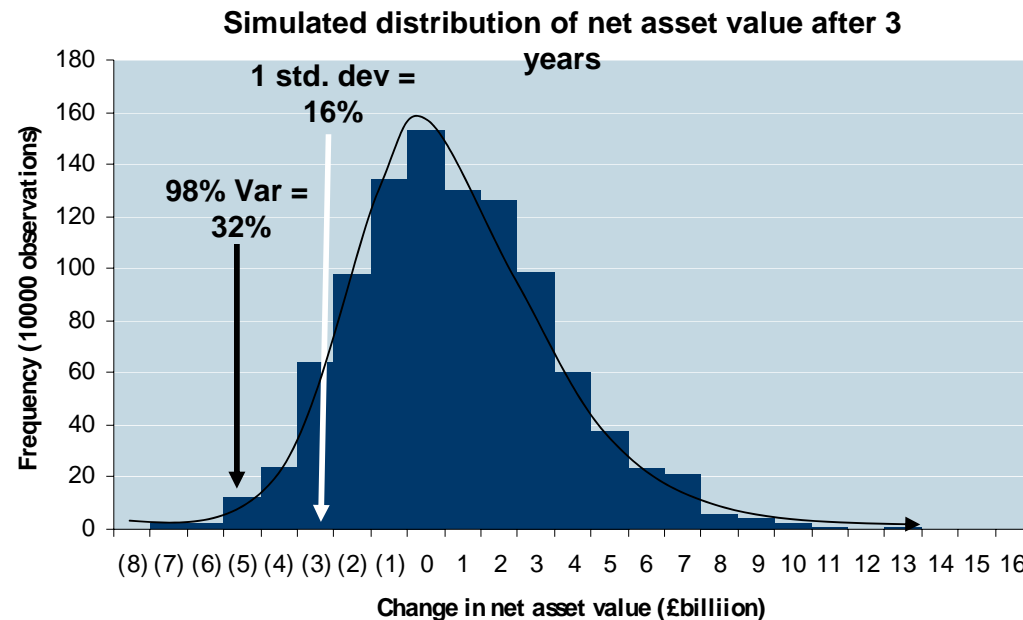
- The correlation between real interest rates and equity returns has varied significantly over time, and cannot be characterised as historically stable
- Whilst the relationship may have tended to be positive during the 80s and 90s, leading to a view that equity related movements are an offset to (real) interest rate movements, this relationship has tended to be negative during the 2000s.

1 year rolling correlation between equity total returns and index-linked gilts - 2001 to 2005



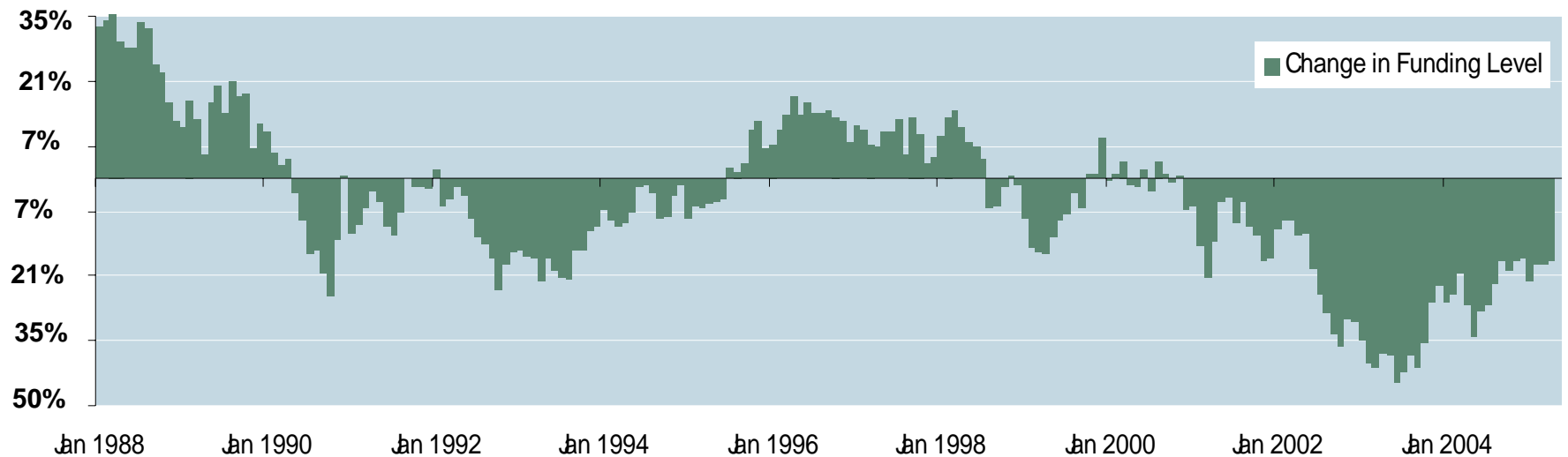
Putting it all together in a VaR

- 10,000 simulations (based on historical volatilities and correlation) to derive a probability distribution for future net asset value
- A one std deviation adverse change in net assets over 3 years is equivalent to 16% of liabilities
- A 98% adverse move over 3 years is equivalent to 32% of liabilities
- The 98% VaR is still less than the most extreme adverse change in net assets based on historical movements



Recent history shows that the VaR was exceeded in 2003/2004

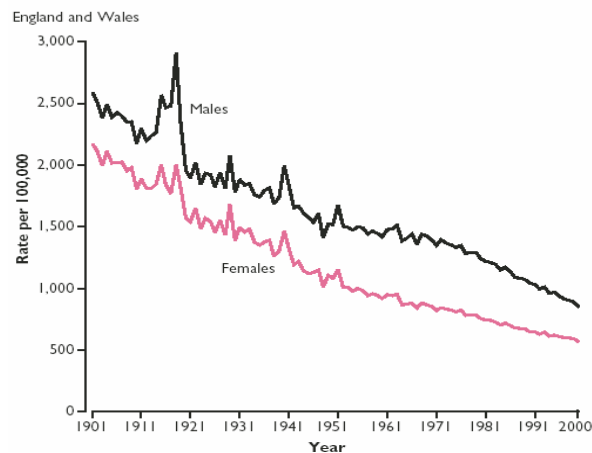
- Based on an assumed asset/liability profile for a representative scheme (FRS17 ratio = 85%, 50/50 in equities and bonds) the graph depicts the total change in net assets as measured over a rolling 3 year horizon between Jan 88 and Mar 05, expressed as % of liabilities .



Mortality rates have been improving, at an accelerating pace for some groups

- Mortality rates have been improving in Britain (and globally) since records began
- In the last 20 years, this trend has accelerated, particularly amongst certain age groups. Between 1960 and 2001, the rate of mortality improvement for males aged 50-65 was 2%; the current rate of improvement for a man born in 1930 is nearly 4%
- Average life expectancy for UK male aged 65 is now 19.4 years, as against 14.0 years in 1981 (nearly 40% higher).
- This trend is expected to continue, although it is not certain for how long, with continued medical advances on the one hand being counter-balanced by factors such as epidemics and obesity on the other hand.

Mortality rates have been falling for over a century



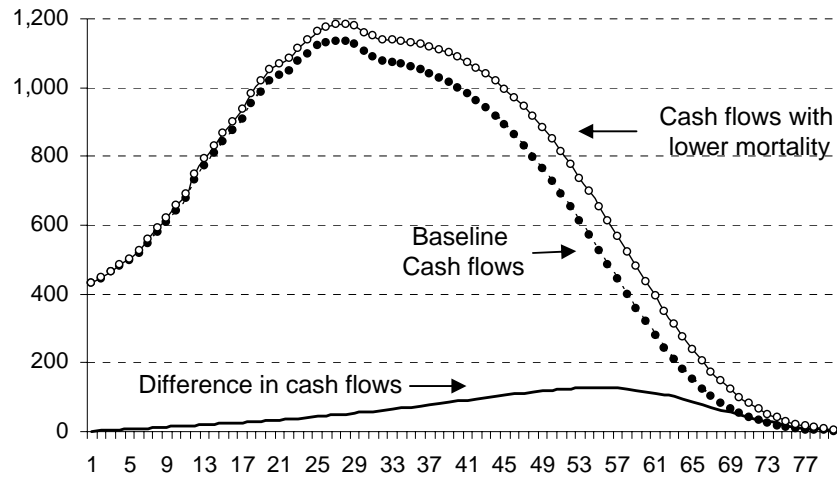
... and life expectancy has been increasing, particularly for older age groups

Year	Life Expectancy at 65 (years)	Relative to Current Level (2005 = 100)
1981	14.0	72.2
1991	15.9	82.0
2001	18.6	95.9
2005	19.4	100
2011	20.1	103.6
2021	21.0	108.3
2031	22.0	113.4

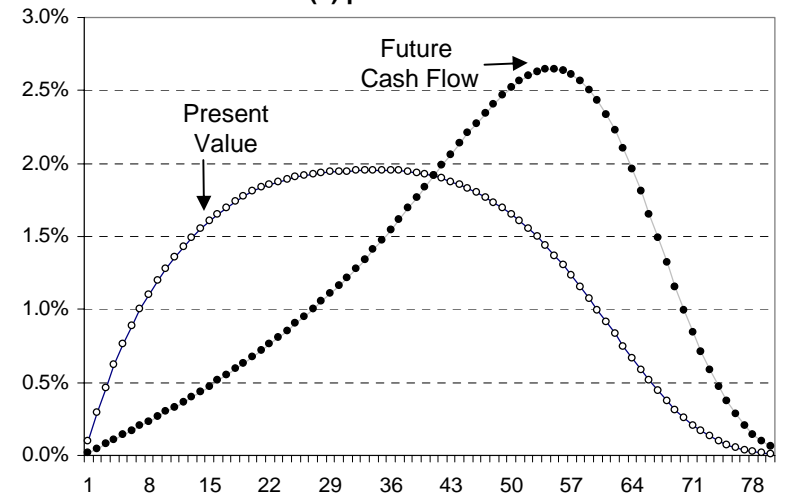
Source: Government Actuary's Department

The impact of increased longevity on the liability profile and PV

The impact of lower mortality rates on future cash flows



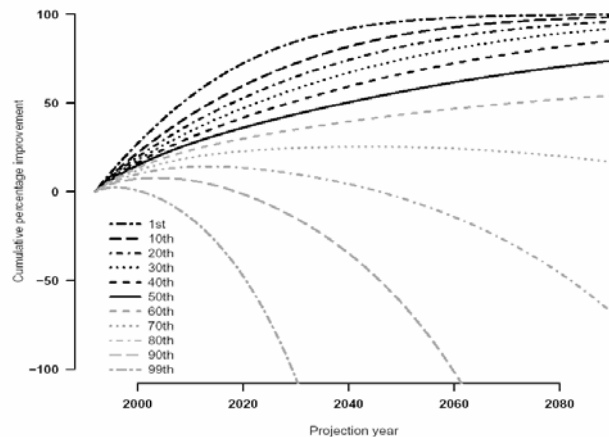
Contribution of lower mortality rates on (i) future cash flows and (ii) present value of liabilities



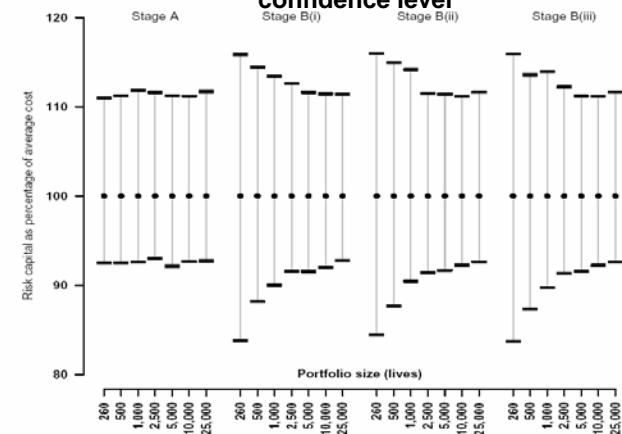
Stochastic mortality

- The CMI has recently published a working paper outlining new methodologies being developed for modelling future mortality rates on a probabilistic basis
- These rely on statistical techniques which can (i) provide information about the level of uncertainty (volatility) around the central estimate and (ii) incorporate cohort-type effects (i.e. population heterogeneity) in a simple manner
- These probabilistic models can then be used to simulate the distribution of future mortality experience and so too the risk capital than an insurer (or pension fund) might require to cover this volatility at a specified confidence level
- The CMI paper contains a worked example for a representative portfolio of lives. Based on the specific data used in the study, it finds that a risk capital requirement of 11% is needed at the 95% confidence level.

Future mortality improvements can be treated as a random variable and slotted into percentiles



.... these can be used to derive the risk capital for a portfolio of lives to cover volatility up to a specified confidence level



Tick, tick, tick ...

