
Actuarial valuations

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Agenda

Actuarial Valuations

- What are they?
- Statutory framework
- Basic principles
- Assumptions
 - discount rate
 - price inflation
 - mortality
- Funded Status

Actuarial Valuations

What are they?

Assessment of pension plan to:

1) Determine solvency of plan by comparing assets against accrued liabilities (“past service valuation”)

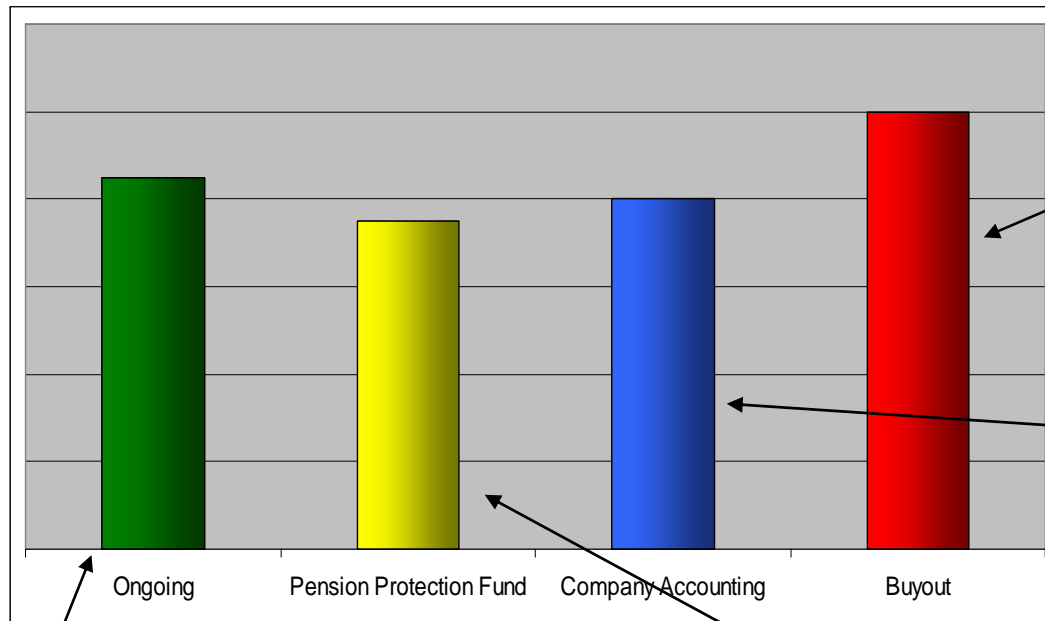
⇒ **Is there a surplus or deficit?**

2) Determine level of contributions to fund future benefits for in-service members (“future service valuation”)

⇒ **Expected cost of new benefits?**

- “Snap-shot” of financial position
- Different methods and assumptions can be adopted

Differing Liability Measures



Buyout Solvency

- Theoretical value if scheme bought out with insurer
- Conservative pricing

Company Accounting (IAS 19)

- Accounting method specified under international standard
- Figures appear in Company accounts

Ongoing (SSF) Valuation

- Help determine future funding requirements
- Comply with legislation and guidance from Pensions Regulator
- Method and assumptions agreed between Trustee and Company

Pension Protection Fund

- Based on PPF level of benefits only
- Method and assumptions specified by PPF Board

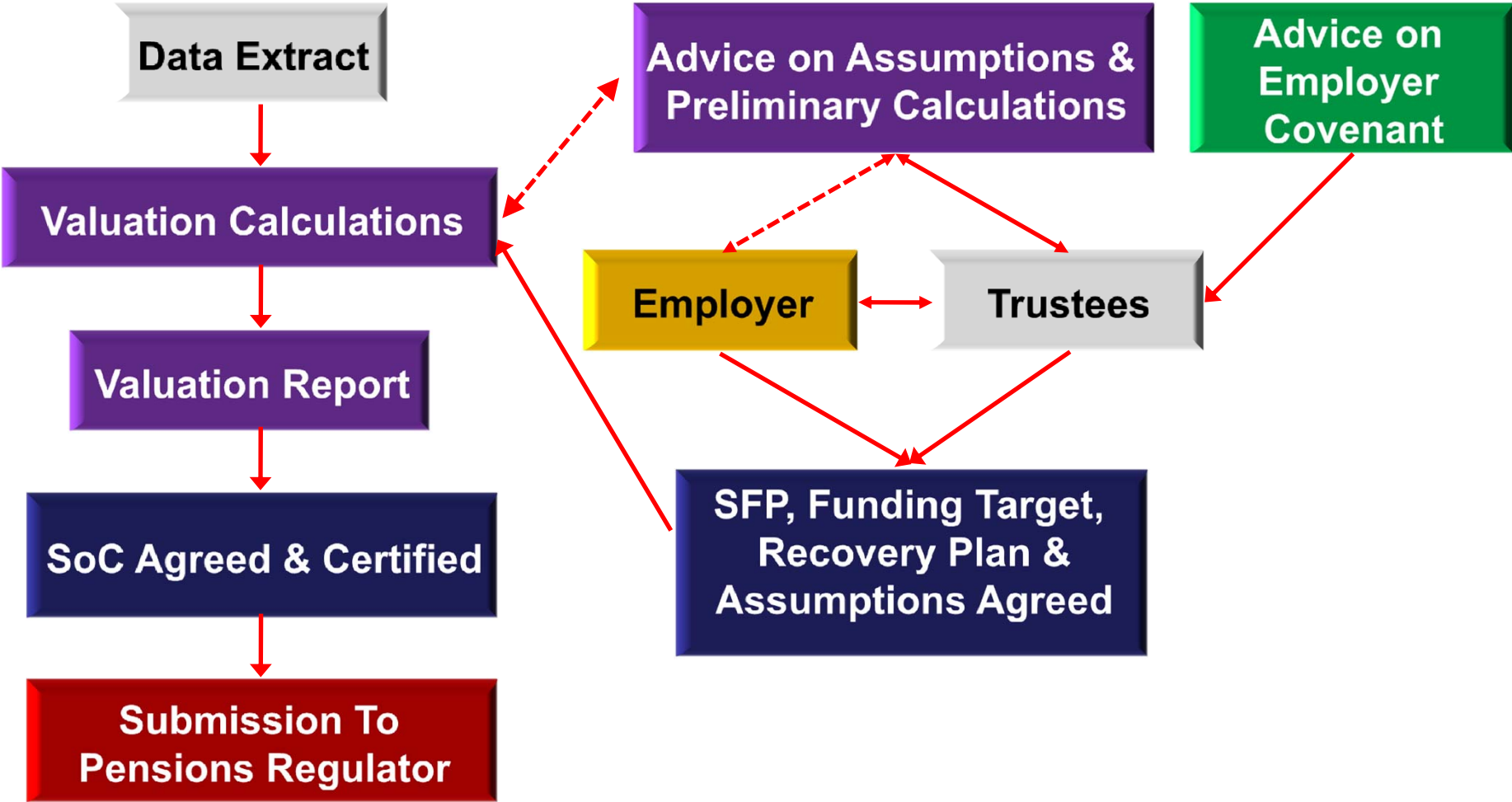
Scheme Specific Funding Regime

- Scheme Specific Funding came in to force in September 2005
- Funding framework provided by legislation and code of practice/guidance issued by Pensions Regulator
 - minimal level of prescription
 - negotiation between company and Trustee
- Statutory funding objective:
 - “sufficient and appropriate assets to cover the technical provisions”
- For BAE Systems schemes, joint contribution power or sole Trustee power
- In both situations Trustee must:
 - obtain actuary’s advice
 - consult the Company

Framework Documents

Statement of Funding Principles	Policy to meet statutory funding objective Summarises assumptions and methodology
Actuarial Valuation Report	Results calculated by Scheme Actuary
Recovery Plan	Sets out how the deficit is expected to be removed
Schedule of Contributions	Contributions to be paid over recovery period
Summary Funding Statement	Annual information to members on funding position

Valuation Process



Basic Valuation Principles

Pension Scheme is a series of cashflows

- Benefit payments to members and dependants
- As specified in the rules

Liabilities - the value of the benefits already earned

1. Project benefits (ie. cashflows) payable based on service to valuation date
2. Place a 'value' on these benefits in current terms

Compare liabilities with the assets – is there a surplus or deficit ?

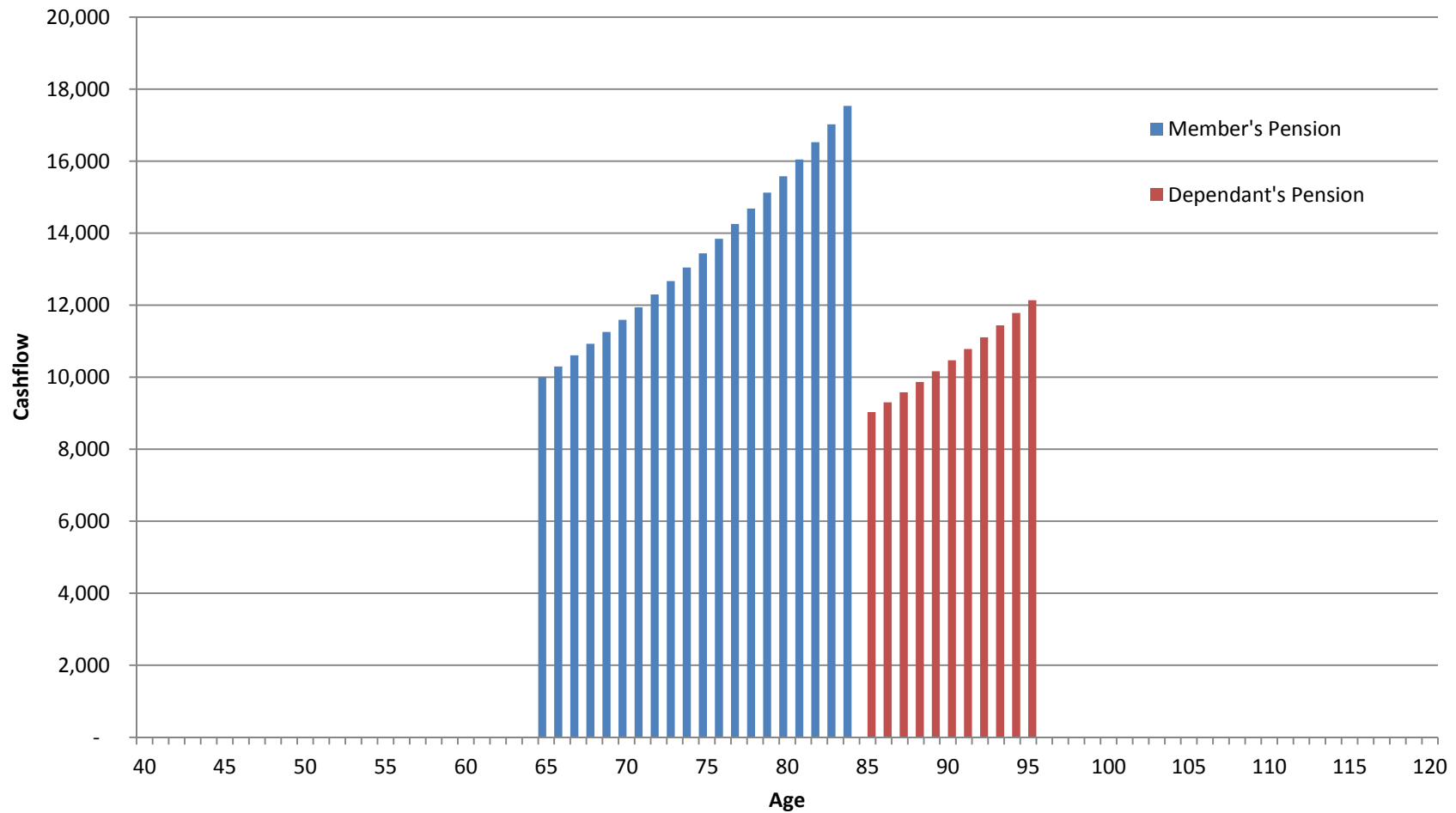
Basic Valuation Principles

Cashflow Uncertainty

- Single member – **size/profile** of cashflows variable
 - How long member remains in pensionable service?
 - Actual salary increases?
 - Actual inflation – before and after retirement?
 - Benefits taken at normal retirement date, early or late?
 - Pension commuted for tax-free cash?
- **Duration** of any cashflows depends on
 - How long the member lives for?
 - Whether member is survived by a dependant?

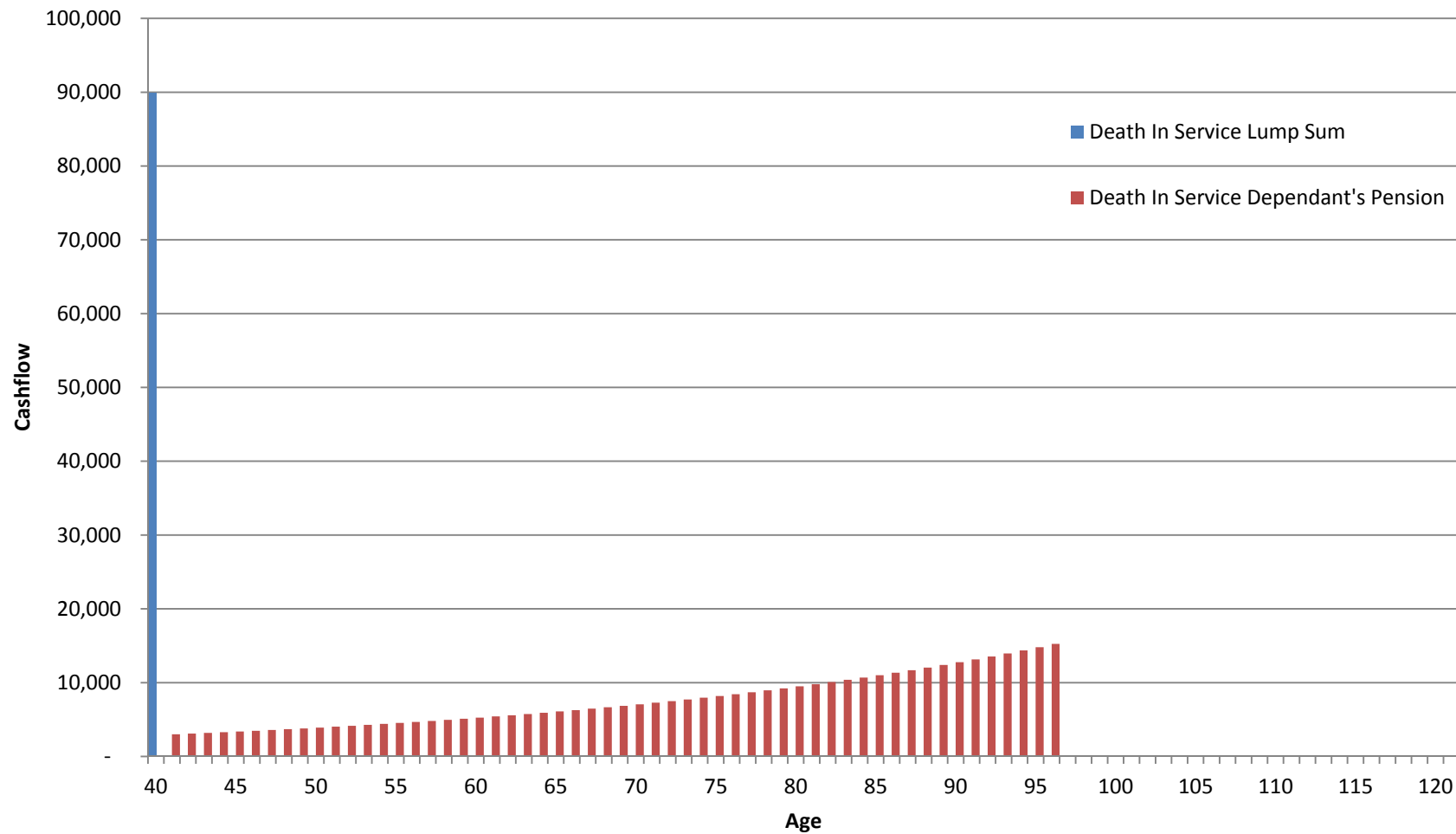
Basic Valuation Principles (40 year old – scenario 1)

Example: Pension from NRD until death (age 85) then spouse's pension until death (age 95).



Basic Valuation Principles (40 year old – scenario 2)

Example: Dies in service immediately.



Assumptions for Projected Cashflows

Economic

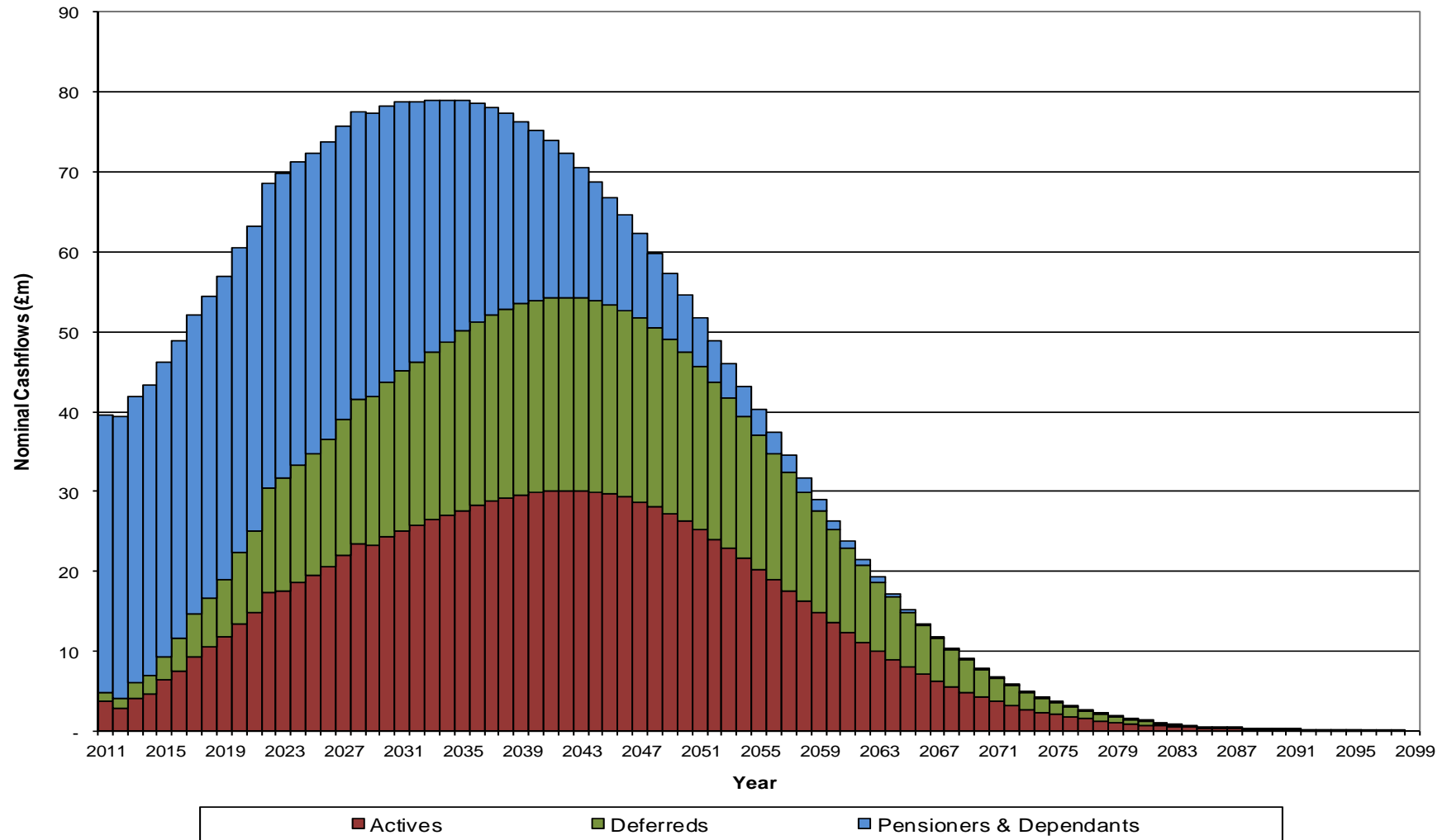
- **Price inflation (RPI/CPI)**
- Pension increases in payment
- Pension increases in deferment
- Salary growth

Demographic

- **Mortality**
- Proportions married
- Age gap between husband and wife
- Withdrawal and retirement patterns
- Proportion of pension taken as cash



Example Scheme Projected Future Cashflows



Discount Rate

What does it do?

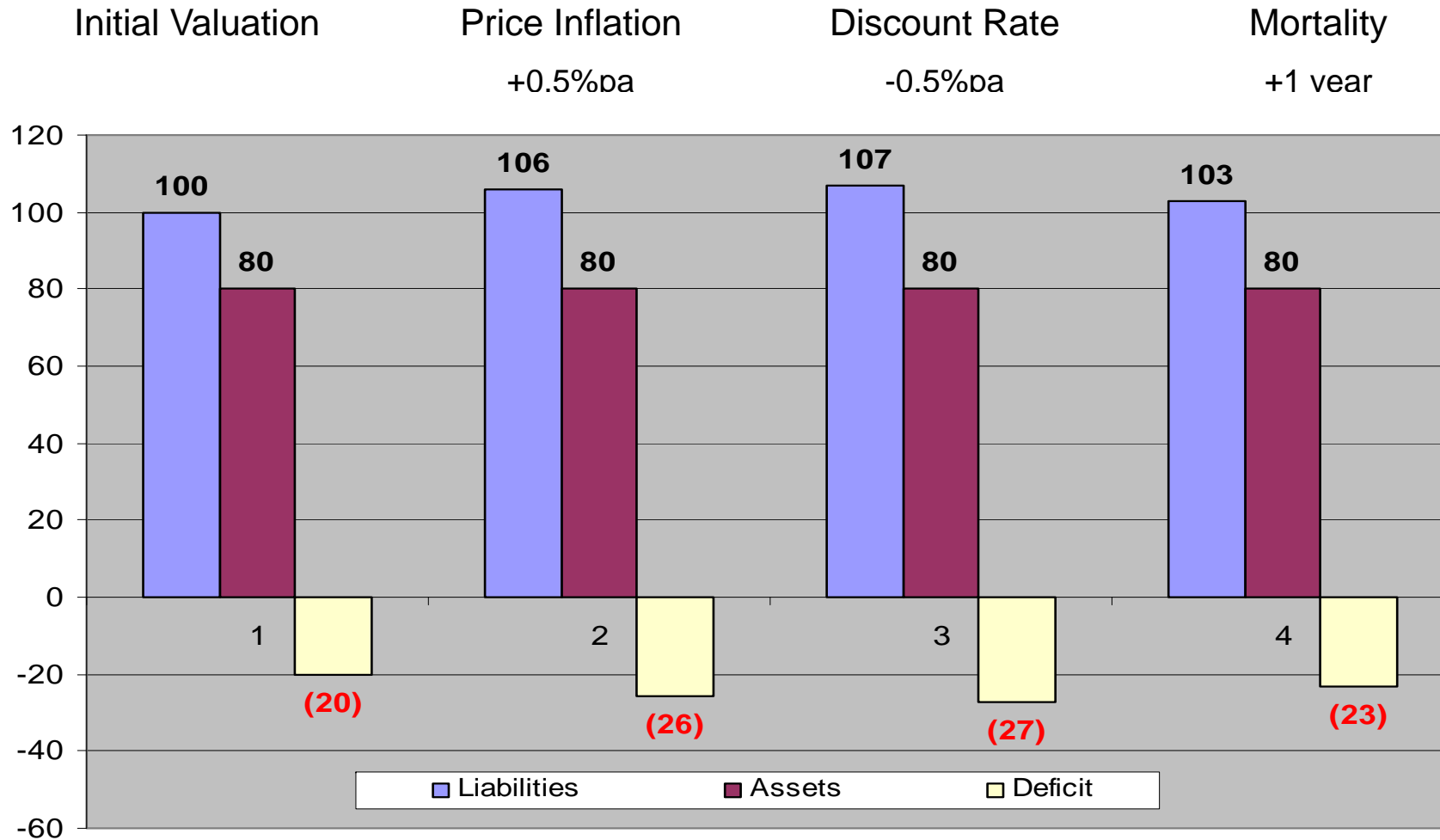
- Assets are a 'market value' at valuation date
- Need to translate benefit cashflows into comparable number
- 'Discount rate' converts future benefit cashflows into present value (ie. expressed in today's value terms)
- Present value of benefit cashflows ('liabilities') represents how much money the scheme needs today to meet the accrued benefits – assuming the valuation assumptions are borne out in practice !!

Key Assumptions:

- i) Discount Rate
- ii) Price Inflation
- iii) Mortality

used future
Present
factor
calculate
received amount
period
estimate
value

Illustration of Sensitivity



Discount Rate

Framework

- Discount rate effectively assumption for future investment returns
- Key assumption with widest range of possible outcomes
- For scheme specific funding liabilities must be a prudent estimate
 - discount rate is critical to overall level of prudence
 - lower discount rate higher value of liabilities
- Strength of employer covenant important in determining what is prudent
 - less prudent assumptions lead to greater reliance on sponsor
 - increase likelihood of larger cash contributions in future

Discount Rate

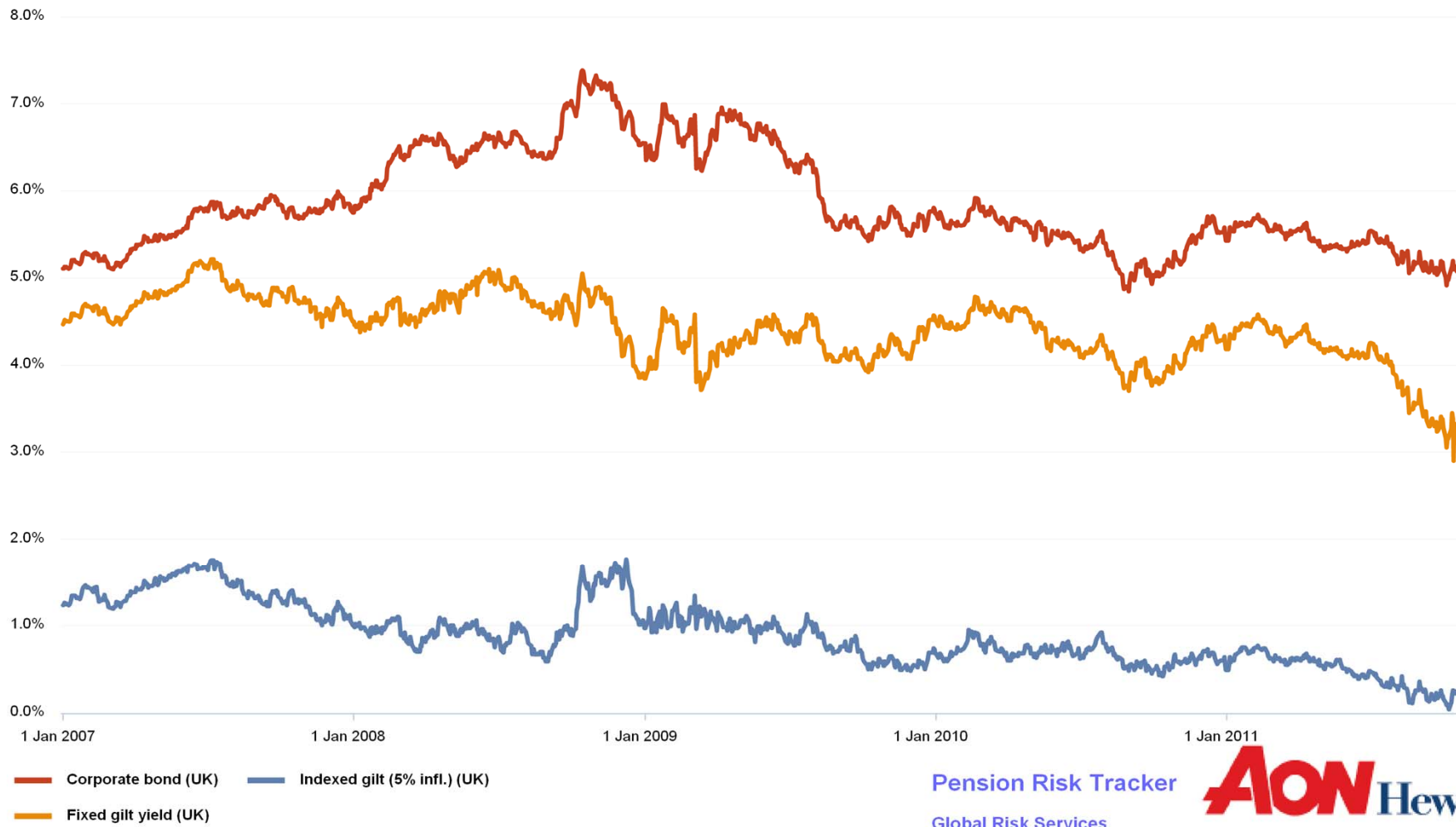
Bond Yields

- Return or “yield” on government bonds (gilts) provides a “risk-free” reference for setting discount rate
- Bonds are essentially a form of loan with a given maturity date

Out-performance

- Discount rates typically include allowance for expected out-performance of scheme assets above gilt yields
- No certainty to future asset returns particularly from equities or other growth assets
- Prudent to deduct margin from best estimate return for valuation purposes
- Significant amount of overall prudence will normally be within discount rate

Bond Yields

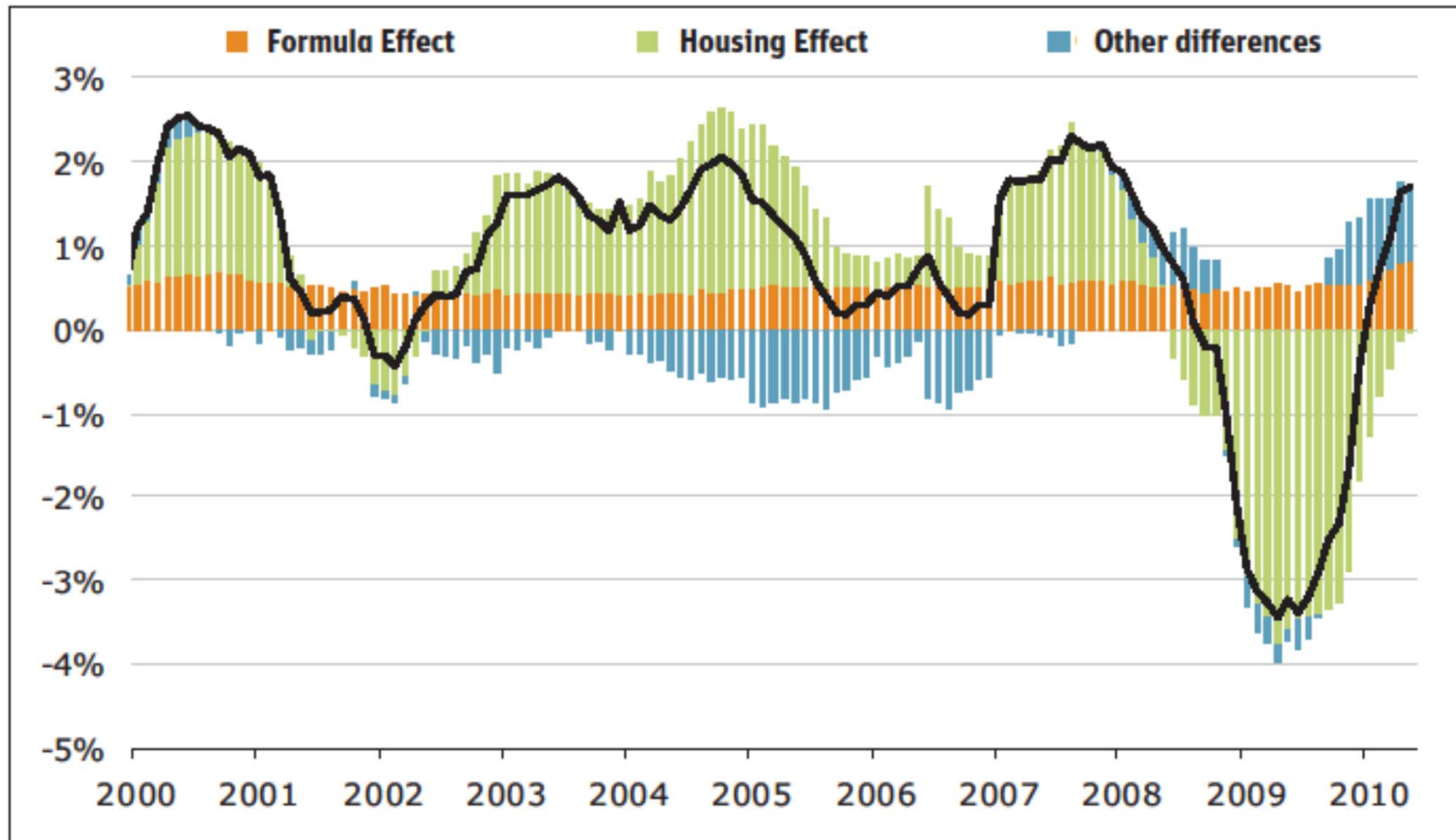


Price Inflation

Relevance

- Inflation key factor affecting pension schemes cashflow, can influence:
 - salary growth
 - deferred revaluation
 - pension increases in payment
- Different price inflation measures
 - Retail Price Index (RPI)
 - Consumer Price Index (CPI)
- Valuation inflation assumption is long-term **future** rate of expected inflation
 - current RPI and CPI values not used

Causes of Differences in CPI vs RPI



Inflation Assumption for Valuations

- Long-term future rate of inflation that is important
- A reference point is market 'implied' rate of RPI inflation

Market Implied RPI

- Derived from difference between yields on fixed interest and index-linked government bonds
- Adjustment may be made for supply/demand issues or inflation risk premium
- As per discount rates, inflation assumption term dependent
- Adjustment required to obtain CPI assumption from RPI

Pension Liabilities

Financial assumptions in isolation:

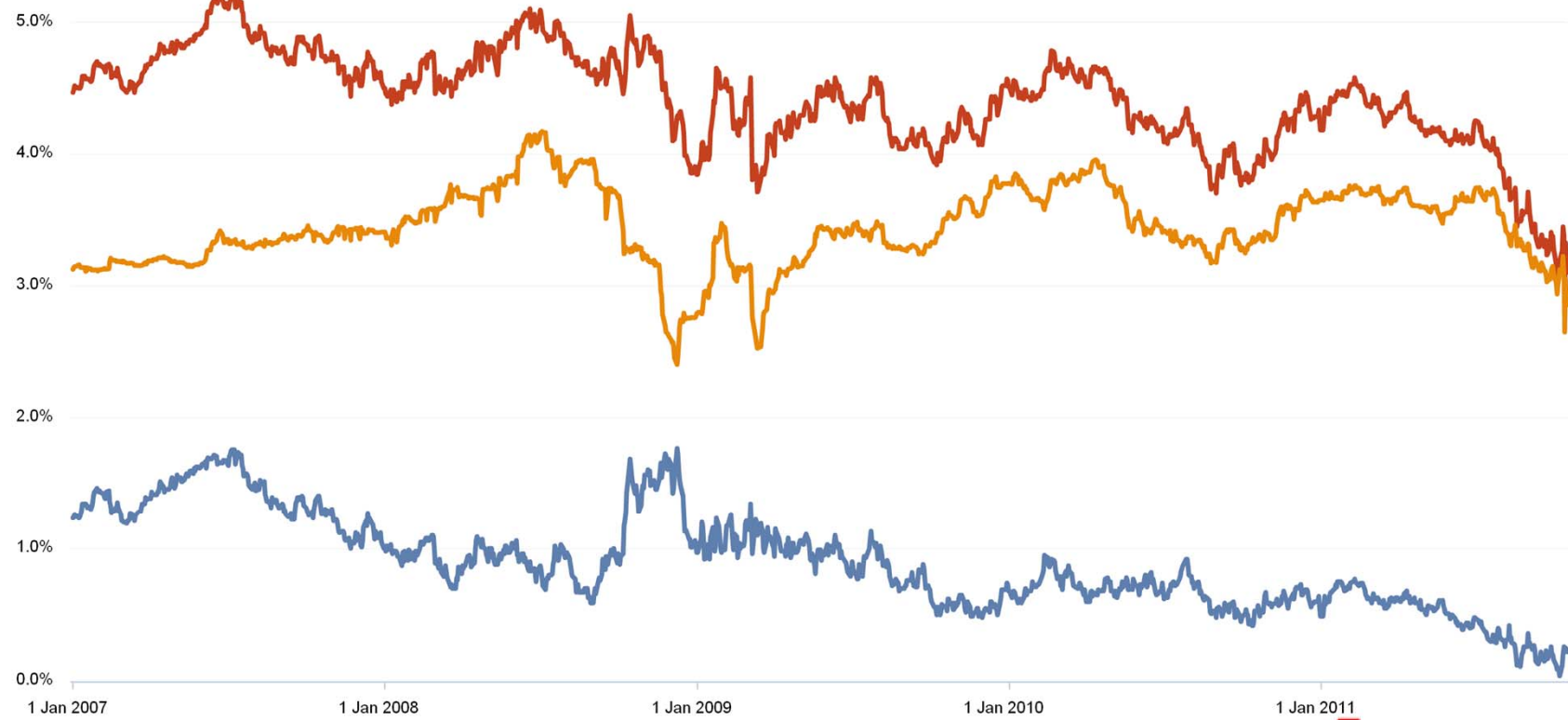
- Decrease in discount rates increases value of liabilities
- Increase in inflation increases value of liabilities

However, relationship between main financial assumptions important

- Nominal discount key to benefit payments which are fixed
- Real (net of inflation) discount rate key to benefit payments which are linked to inflation

Position complicated by other effects such as caps for revaluation and pension increase etc.

Bond Yields & Market Implied Inflation



— Fixed gilt yield (UK) — Indexed gilt (5% infl.) (UK)
— Implied inflation (UK)

Pension Risk Tracker
Global Risk Services



Mortality

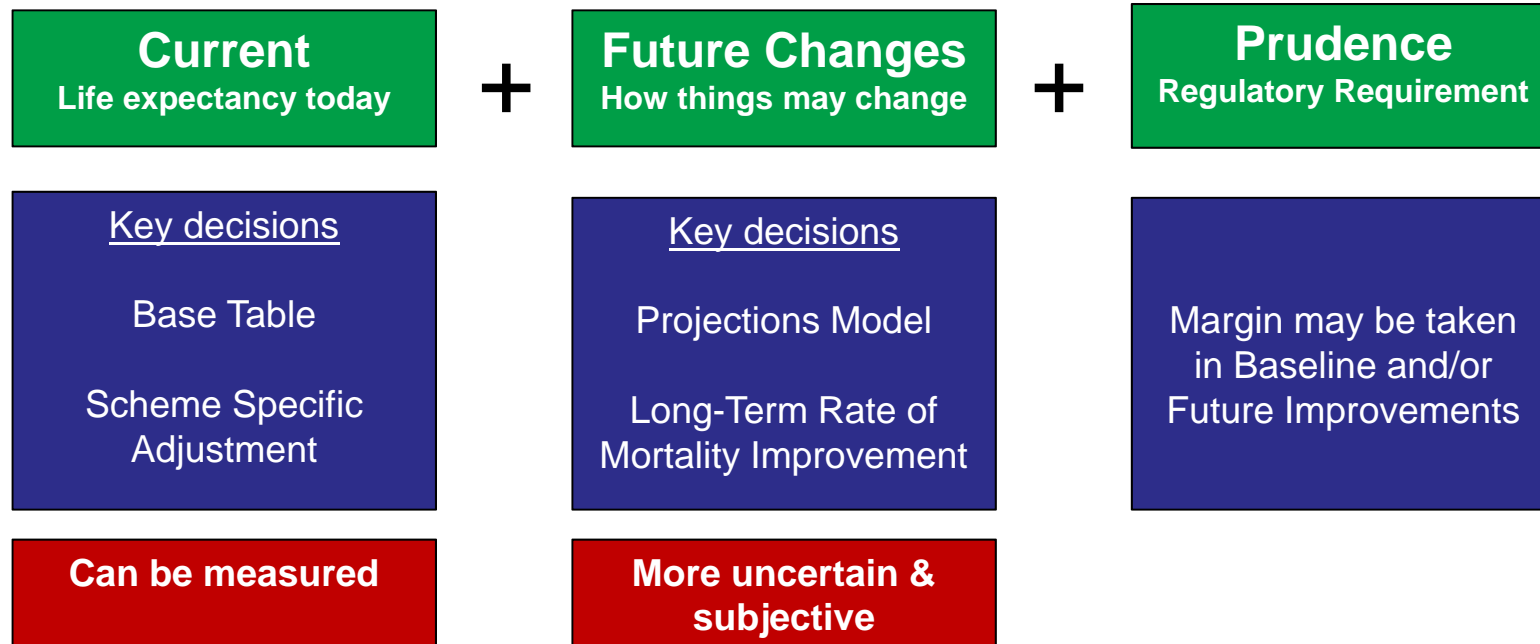


- Wide variety of factors affect people's life expectancy
- Lot of factors are linked (eg. occupation and where you live)
- Many are proxies for underlying causes

Mortality

Different Components & Risk

- Life expectancy / mortality assumptions typically most important demographic assumption



Mortality – Current Rates

Scheme Experience

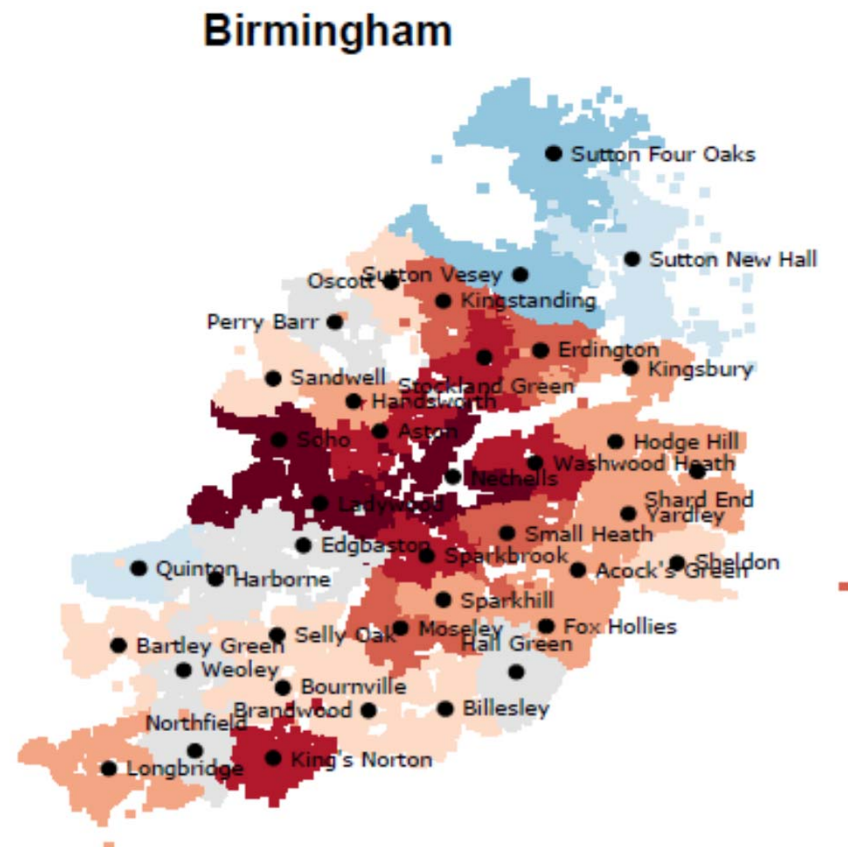
- Large schemes can use actual mortality experience of pensioners
 - bigger scheme gives more reliable information
- Experience analysis typically weighted by pension amount

Postcode Profiling

- Use postcodes in mortality investigations— previously insurers and now pension schemes
- Studies of census and pension scheme data show life expectancy varies significantly by postcode
- Postcode does not impact life expectancy but indicates underlying factors
- Derive mortality assumptions by estimating directly mortality experience that might be expected

Postcode Variation

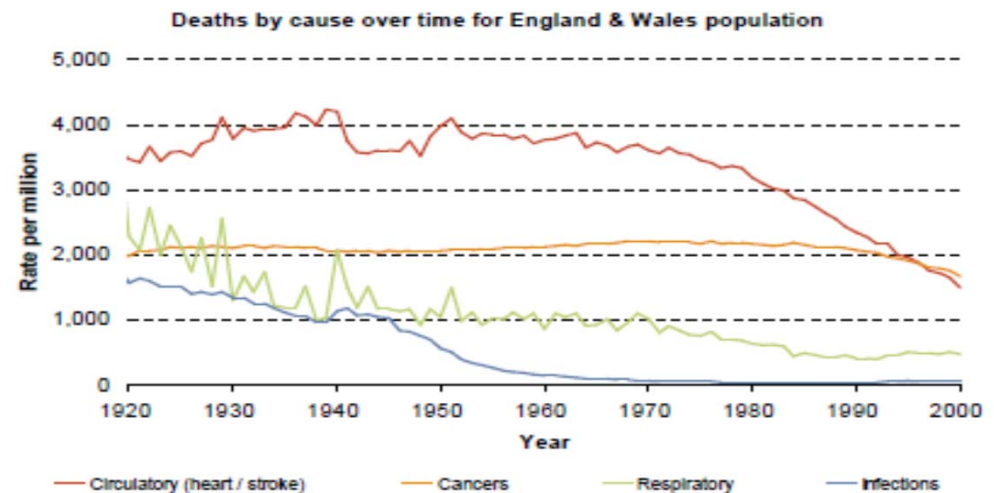
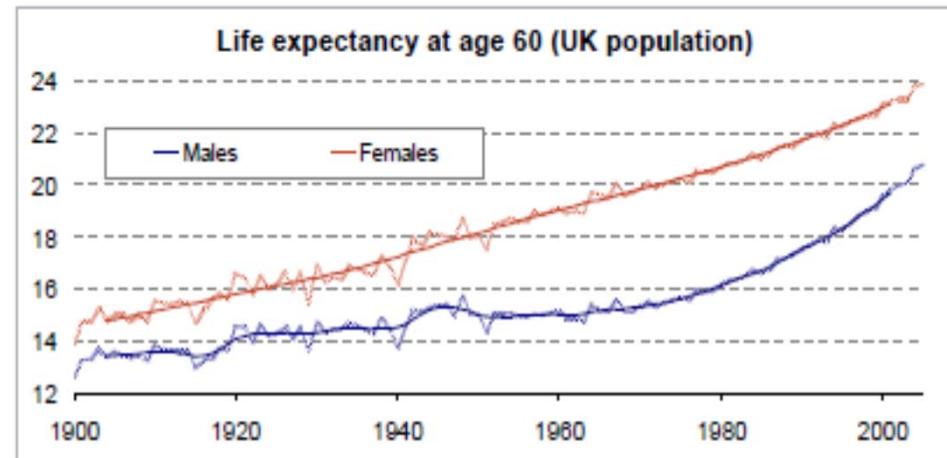
- Mortality rates can vary hugely in relatively small areas
- Graph shows mortality rates between local authority wards in Birmingham.
 - darkest red areas are 150% of the national average mortality rate
 - darkest blue areas are 75% of the national average mortality rate



Mortality – Future Improvements

Key Drivers Mortality Improvement

- Reduction in infectious and respiratory diseases in first half of 20th century
- Reduction in heart disease over second half of 20th century
- Smoking patterns had large recent impact
- Falling cardiovascular deaths will make cancer treatments primary drive for future



Mortality – Future Improvements

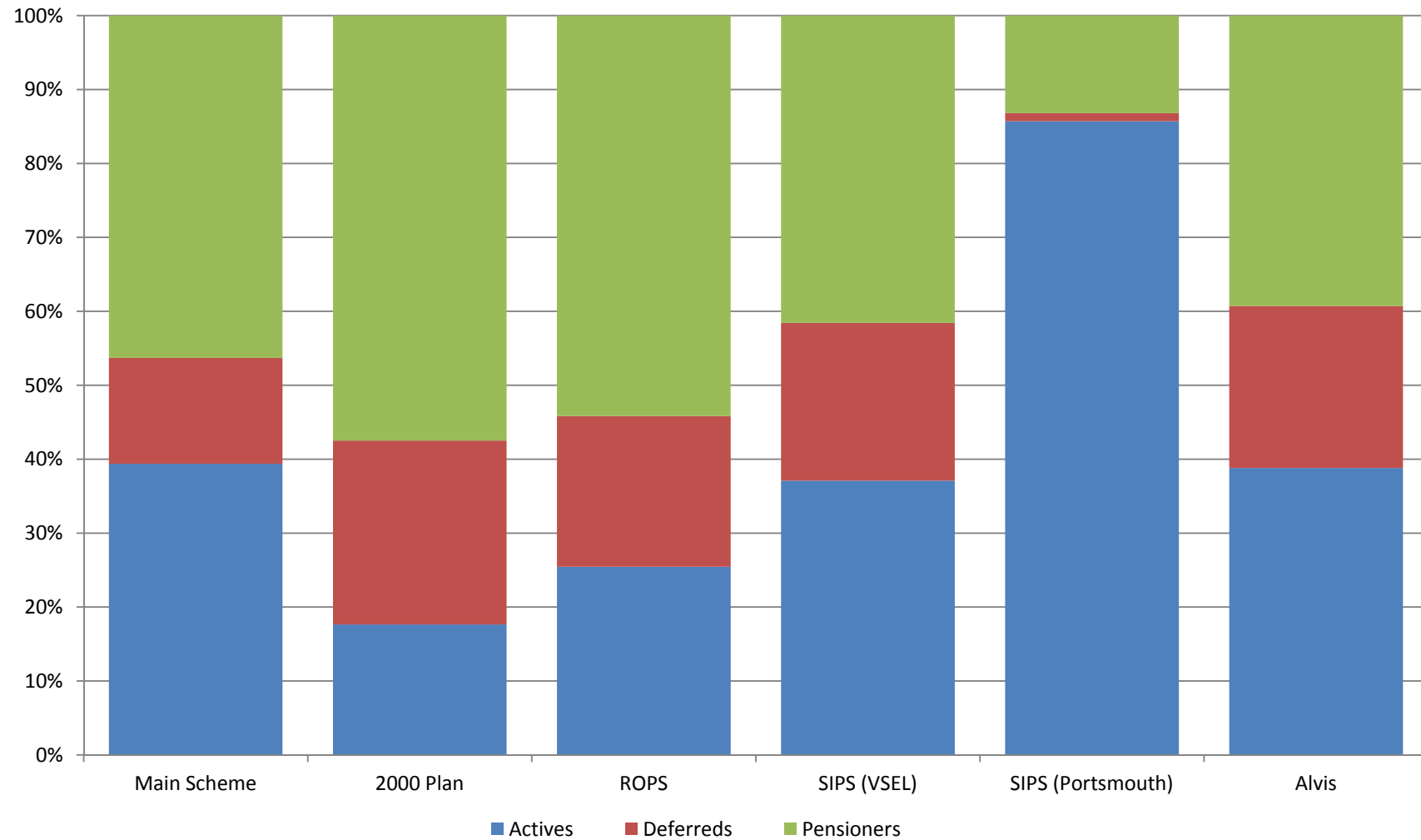
- Allowance for future mortality improvements is a difficult area
- Approach now being adopted:
 - use of recent rates of improvement and blending these to a longer term trend rate
- Improvement model has 3 main inputs:
 - initial rate of improvements
 - long-term rate of improvements
 - speed & pattern of convergence to long-term rates

Funded Position

- Latest completed valuation positions assessed under the statutory Scheme Specific Funding regime
- For Main Scheme, 2000 Plan and ROPS valuations currently in progress

£m	Main Scheme	2000 Plan	ROPS	SIPS (VSEL)	SIPS (Ports)	Alvis
Last Formal Valuation Date	5 Apr 2008	31 Mar 2010	31 Dec 2007	31 Mar 2010	31 Mar 2010	5 Apr 2009
Liabilities	9,806	3,695	1,045	1,321	91	219
Assets	7,412	3,008	942	1,035	75	137
Surplus / (Deficit)	(2,394)	(687)	(103)	(286)	(16)	(82)
Funding Level	76%	81%	90%	78%	82%	63%

Liability Profiles



Note: Liability profiles as at last formal actuarial valuation

Illustrative Asset Returns

