


The Actuarial Profession
making financial sense of the future

Current Issues In Pensions
Andy Ashworth



Allowing for Swaps in Valuations

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Introduction

- Why pension schemes invest in swaps?
- What are interest rate and inflation swaps?
- How swaps are allowed for in actuarial valuation?

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History

- Funding bases typically smoothed funding level volatility
- Introduction of FRS17 and IAS19 increased focus on marking to market assets and liabilities
- Funding level volatility is a problem as deficits appear on balance sheet
- Increased focus on better matching assets and liabilities
- Create portfolio of assets that replicate liability cashflows

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Matching assets

- Historically bonds used to match pensioner cashflows
- Funding level volatility was not as important
- Equities used to match non-pensioner liabilities
- Funding level volatility is now more important
- Matching assets need to reduce funding level volatility
- Bonds are not long enough
- Capital markets create synthetic bonds called swaps
- Swaps can be tailored

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Bonds v swaps

Bonds

- Pay cash to bond issuer and receive coupons and nominal

Swaps

- Keep cash and
 - put in bank to earn LIBOR; or
 - invest in return generating assets
- At expiry, difference between accrued LIBOR and fixed payments is settled

Result

- If LIBOR is earned on cash then bond and swap produce same outcome
- Investment in bonds and swaps result in series of fixed or inflation linked payments

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Interest rate risk

- Measurement risk
- Exists because liabilities are periodically measured
- Real risk as matching assets to be purchased
- Defined by choice of funding basis (or expected matching asset)
 - Net dividend yield
 - Gilts
 - Corporate bonds
 - Annuity prices etc
- Sensitivity of assets and liabilities to changes in nominal rates
- Does not affect the size of expected benefit outgo

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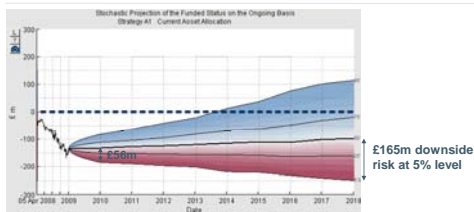


Inflation risk

- Measurement risk and actual risk
- Defined by choice of implied inflation
 - Implied by gilt yields
 - Implied by swap yields
- Sensitivity of assets and liabilities to changes in implied inflation
- Does affect the size of expected benefit outgo

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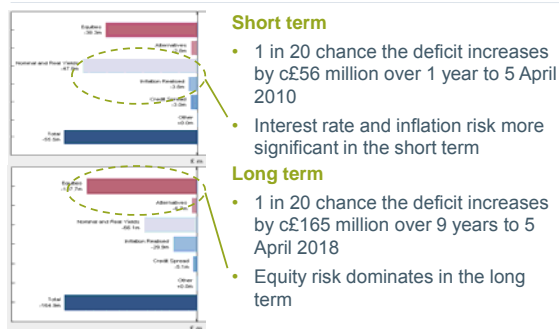
Sample scheme: asset and liability projection



- Familiar chart
- Gilt based liability measure
- 75% growth and 25% matching asset allocation
- Split the downside risk into its component parts

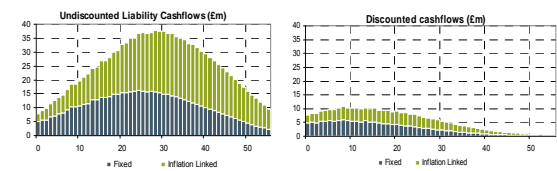
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Size of financial pension scheme risks



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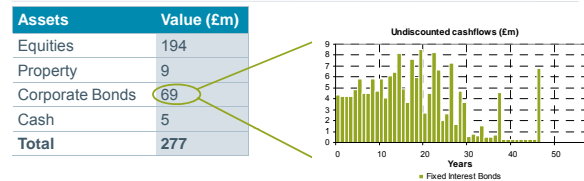
Pension scheme liabilities



- Approximately 50% of liabilities are inflation linked
- Duration of liabilities is 18 years
- Total present value £323 million

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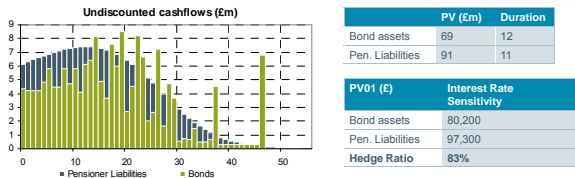
Pension scheme assets



- Corporate bonds are 25% of total assets (21% of liabilities)
- Corporate bonds offer some protection against interest rate risk
- Corporate bonds offer limited protection against unanticipated inflation risk as pension increases are typically capped

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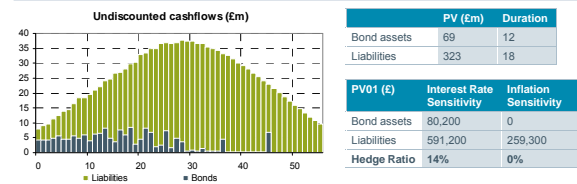
Pension scheme assets and pensioner liabilities



- PV01 = change in present value with a 0.01% change in interest rates
- Bonds provide a good match for pensioner cashflows
- Pensioner liabilities are 30% of liabilities
- Pensioner liabilities contribute to 16% of interest rate risk

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Pension scheme assets and liabilities



- Large mismatch between asset and liability cashflows
- Current bonds provide limited interest rate risk protection and no inflation risk protection

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What are swaps?

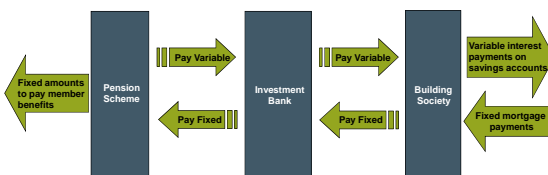
- Swaps are synthetic bonds
- Two parties enter into a contract with each other
 - One party pays a fixed amount
 - One party pays a variable amount
- A risk to one party is desirable by another
- Advantages over conventional bonds are
 - Duration
 - Leverage
 - Tailoring



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Example: Interest rate swap



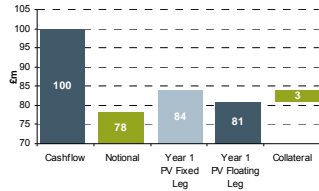
- Pension plan agrees to receive fixed amounts to match fixed liability cashflows in exchange for paying variable interest payments
- Investment Bank acts as 'Intermediary' between pension plan and Building Society

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Example: Interest rate swap

- Fixed liability cashflow of £100 million in 5 years time
- 5 year swap rate is 5% pa, LIBOR is 4% at outset
- Present value £78 million, discounted at fixed 5% pa
- 4 year swap rate is 4.5%

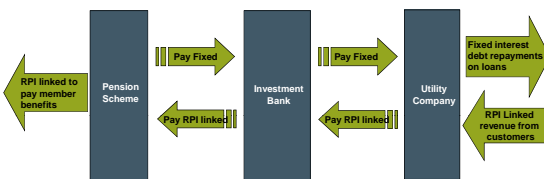


- Collateral covers mark to market value of swap
- Daily posting of collateral reduces counterparty risk
- Difference between fixed and floating leg exchanged in year 5

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Example: Inflation swap



- Pension scheme agrees to receive inflation (RPI) linked amounts to match inflation linked liability cashflows in exchange for fixed interest payments
- Investment Bank acts as 'Intermediary' between pension scheme and Utility Company

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Types of swap solutions

- Pooled swap funds
 - Pooled funds invest in cash and enter into swap agreements
 - Plan pays LIBOR and in return receives fixed (or inflation linked) return
 - Cash used to generate LIBOR
 - Cash also used as collateral
 - Range of funds or 'buckets' covering different years
 - Many funds are geared
- Segregated swap solution
 - Plan enters into swap agreements direct with an investment bank
 - 'Overlaid' on top of existing assets
 - Additional governance requirements

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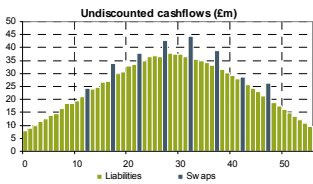
Risks with swaps

- Basis risk
- Effectively 'locked-in' to current yields (interest rates)
 - Similar to purchasing a bond (but more capital efficient)
 - Timing considerations – might there be a better price in the future?
- Generate LIBOR to honour its side of the swap agreement
 - Introduces the risk of not generating LIBOR
 - Leverage increases the risk of not generating LIBOR
- Counterparty risk: reduced by use of collateral
- Legal risk – contractual terms (ISDA agreement)
- Cost of amendment/unwinding swaps positions

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Swaps and liabilities



	PV (£m)	Duration
Swaps	69	18
Liabilities	323	18

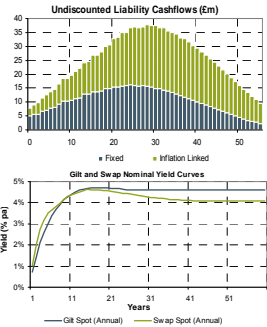
	PV01 (£)	Interest Rate Sensitivity	Inflation Sensitivity
Swaps	308,650	154,000	
Liabilities	591,200	259,300	
Hedge Ratio	52%	59%	

- Swaps are 2 x leveraged = notional 50% of total assets
- Swaps can be structured to match shape of the liabilities
- The interest rate risk protection is increased
- Introduce inflation risk protection via inflation swaps

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Valuations on different funding bases



Funding Basis	Adjustment
20 year gilt yield (4.70%)	+ 1.80%
Gilt yield curve	+ 1.96%
20 year swap yield (4.57%)	+ 1.93%
Swap yield curve	+ 2.20%

- All funding bases above have same present value £323 million
- Gilt and swap curves at 31 December 2009

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Impact of holding swaps

- Unrewarded interest rate or inflation risk can be removed
 - But assets still need to provide LIBOR (plus?) return
- Concentrates risks in rewarded areas, ie growth assets
- Counterparty risk needs to be managed with collateral
- Basis risk if liabilities not measured on swaps basis
- Swaps historically yield more than gilts (+ 0.2 – 0.3% pa), but not recently.....

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Swaps and actuarial valuations

- New territory for most Scheme Actuaries
- Scheme Actuaries need to work together with Investment Consultants
- Hedging strategies need integrated advice
- Synthetic assets have advantages over traditional assets
- Synthetic assets do introduce new risks
- Assets have same expected return irrespective of funding basis

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Practical issues

- Complex to carry out – technology moves on
- Costs more to carry out valuation
- Complex for Trustees to understand
- Difficult to roll forward yield curve valuations
- Reflect current investment strategy

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Practical issues

- What to do if triggers in place to invest in swaps
- Swaps basis may reflect eventual target
- Upward sloping yield curve results in liabilities growing at slower rate in the short term compared to average yield
- Mark to market value of swaps may be negative
- What is expected return on swap value?
 - current swap rate at liability duration?
 - expected fair value swap rate?

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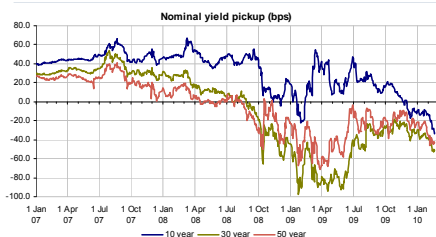
More practical issues

- Which swap curve to use
- Use Scheme's LDI manager's swap curve
- Compare against other managers to ensure consistency
- How to extend swap curve – flat past 50?
- Clients may perceive swaps basis is more expensive
- Rough checks of change in yield => change in liabilities are not as simple
- Using a single point may miss big changes in yield curve shape
- Negative swap spreads at longer durations

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Nominal swap spreads

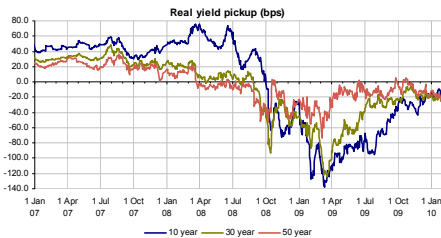


- Nominal swaps yielding less than fixed interest gilts at longer durations

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Real swap spreads



- Real swaps yielding less than fixed interest gilts at longer durations

Case study 1

- Discount rate is weighted average of 3 points on yield curve
 - 50% of yield at liability duration
 - 25% of yield at liability duration + 10 years
 - 25% of yield at liability duration - 10 years
 - Discount rate will approximate some changes to shape of yield curve
- + Easy to value and carry out annual updates
- Reduction in liability hedge due to basis risk

Case study 2

- Scheme Actuary wants to reflect inflation curve in benefit projection
 - Value liabilities using swap curve + margin
 - Margin is calculated by considering
 - Expected return of assets
 - Prudence applied to expected return
 - 100% funded \neq 100% in matching assets due to margin
- + Accurate reflection of economic cost of liabilities
- More difficult to calculate and carry out annual updates

Case study 3

- Value liabilities on swap curve
 - Trustees agree to target 80% of swap liabilities
 - Remaining 20% earned through investment returns
 - Basis can be constructed in the following ways
 - Swap yield curve + margin
 - Swap yield + margin
 - Gilt yield curve + margin
 - Gilt yield + margin
 - Different bases will create different interest rate risks
- + Funding basis targeting swaps liabilities
- Significant basis risk if invested in swaps

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Case study 4

- Previous valuation basis was swaps + margin
 - Constructed as gilts + 0.3% + margin
 - Basis risk as swaps spread fell
 - Current valuation Trustees concerned about cost of swaps basis
 - Scheme Actuary calculates margin from expected return on assets
 - Value of technical provisions same with gilts or swaps basis
- + Accurate reflection of economic cost of liabilities
- More difficult to calculate and carry out annual updates

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Final thoughts

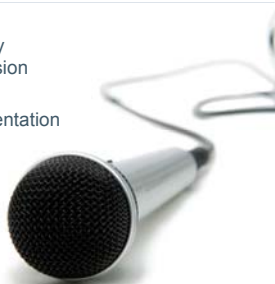
- Mark to market increased focus on liability risk management
- Volatility exists as liabilities are measured periodically
- Investment Consultants and Scheme Actuaries need to work together
- Critical to ensure risk management strategies achieve desired goal
- Use of swaps will increase as risk management focus increases

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