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LPI risk working party

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15 April 2019

LPI risk working party: Terms of reference

Column title	Column title
What research topic is the working party trying to address?	▪ Improving understanding and transparency around the assessment of the inflation sensitivity of LPI-linked liabilities ▪ Limited public research and general understanding to date has led to a divergence in methods
What industry representation has the working party got?	▪ Working party members from across the industry, including asset managers, insurers, investment consultants, pension actuaries and academics
What does the working party expect as its main output/deliverable?	▪ An audit of existing methodologies including worked examples to show their application and relative advantages and disadvantages ▪ A simple framework for use by all interested parties covering key aspects of the valuation of LPI-linked liabilities and the inflation sensitivity of resulting present values and cashflows ▪ A range of papers for different audiences covering data sources, models, approach to model parameterisation, practical implementation issues and key communication aspects

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Key industry players

Pensions Actuary	Investment consultant	Asset manager	Insurer	Trustees
Set valuation assumptions	Construct an investment strategy to hedge pension scheme liabilities	Implement benchmark designed by consultant or Actuary	Set up sufficient reserves	Oversee scheme delivering pensions as promised to members
Prepare and provide scheme summary information to third parties		Construct benchmark if required to do so	Structure capital to meet liabilities	Minimise amount and volatility of employer contributions

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Valuing the inflation sensitivity of LPI-linked liabilities

Binary approach

If expected inflation is above the cap, liability cashflows are assumed to behave like a fixed cashflow

If below the cap, liability cashflows are assumed to behave like a fully inflation-linked cashflow

Holding a reserve

There is an underlying cost of guarantee when inflation earned by assets is lower than the actual increases awarded to the liabilities

When actual inflation falls below the floor there is a cost, when actual inflation rises above the cap there is a negative cost. The inflation reserve held is the aggregate net cost

LPI assets

Ideally hedging instruments are LPI swaps

Limited supply (swaps, debt and property) and expensive

Difficult to match more esoteric LPI-linkages e.g. LPI(2.5,7)

Delta-hedging approach

Option-pricing models are used to estimate the value of the sensitivity of LPI benefits to changes in RPI

Inflation-linked assets bought to match the calculated inflation sensitivity

Mix of assets held regularly reviewed and rebalanced

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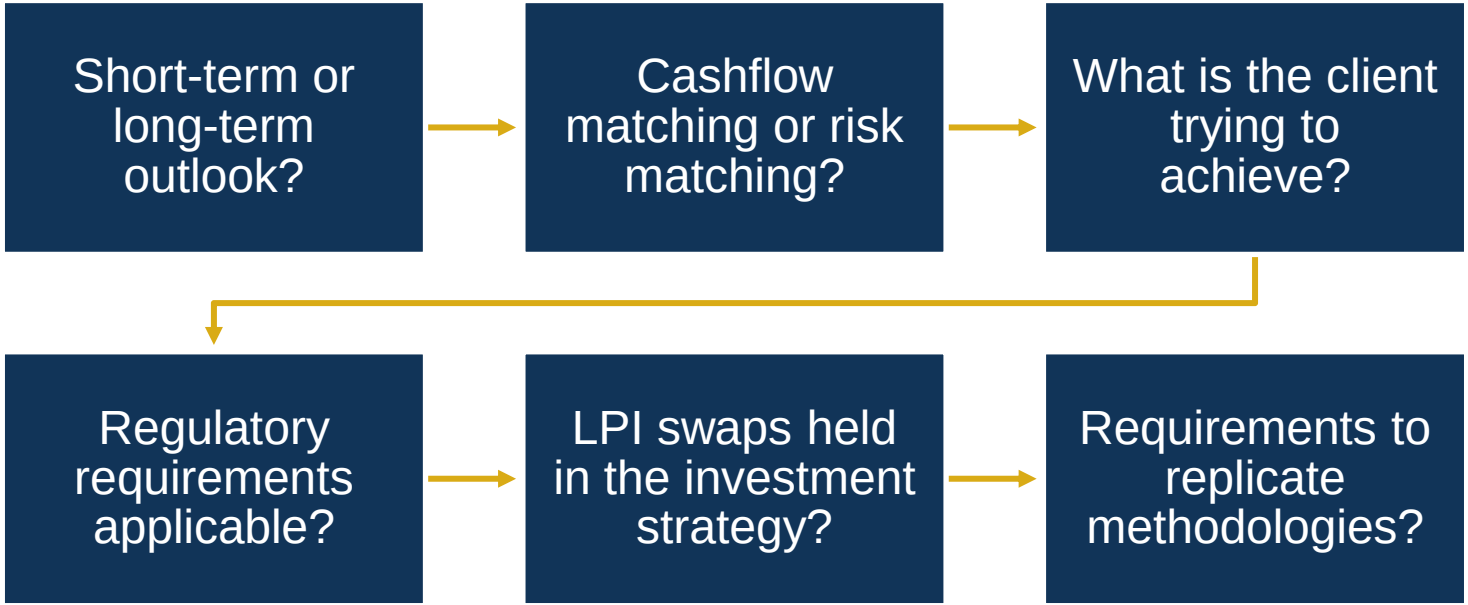
Reasons for picking a certain approach



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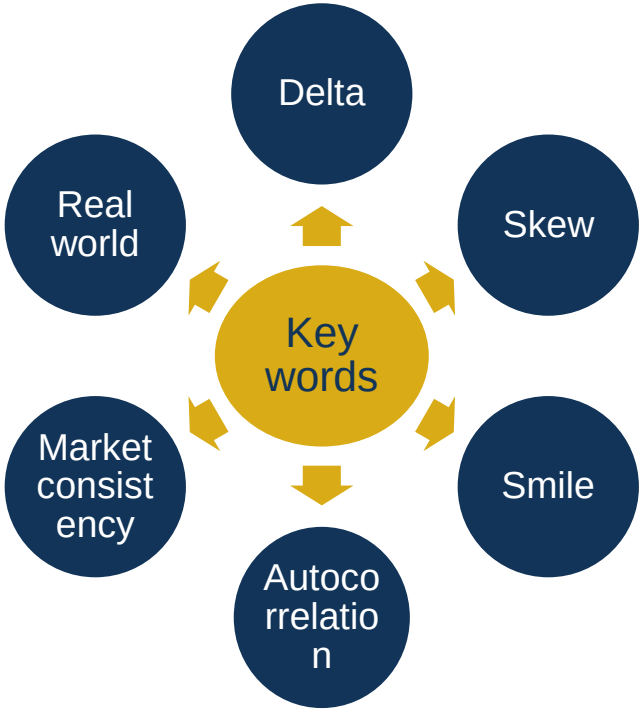
Jargon buster



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Market-consistent vs Real-world

Market-consistent

- Objective
- Good if you want to execute LPI swap trades
- Arguably unrealistic
- Increasingly difficult to calibrate
- Data must be paid for

Real-world

- Market-consistent arguably unrealistic, especially on floor. If so RW will achieve better hedge over longer-term
- Lack of data; hard to calibrate accurately
- Unclear how bad some simplifying assumptions are e.g. no skew or no autocorrelation
- More subjective exercise

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Key properties of the main models

	Market-consistent	Market-consistent	
	Real-world		

Property	Black	Jarrow-Yildrim	Typical commercial ESG	SABR
Market-consistency	Can be fitted to market prices but only one strike per term can be fitted	Can be fitted to market prices but only one strike per term can be fitted	Weak or strong	Strong
Stochastic interest rates		✓	✓	
Autocorrelation of LPI		✓	✓	✓
Skew	Could use different volatility assumptions for cap/floor		✓	✓
Multi-period	✓	✓	✓	

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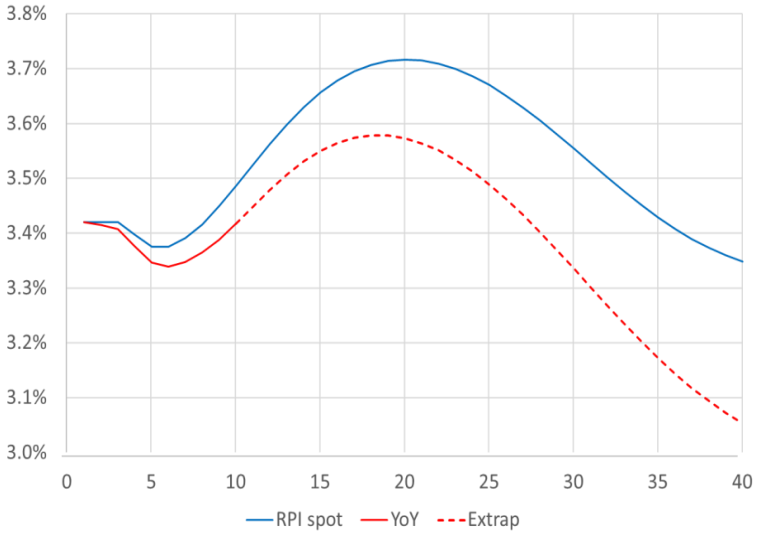
Autocorrelation of LPI

Effect of autocorrelation on spot LPI



- If zero autocorrelation these lines would be the same
- Higher blue line implies positive autocorrelation
- Impact on LPI curves is smaller because realised LPI volatility < realised RPI volatility
- But differences matter for another reason – calibrate LPI model to ZC RPI swaps or YoY RPI swaps?

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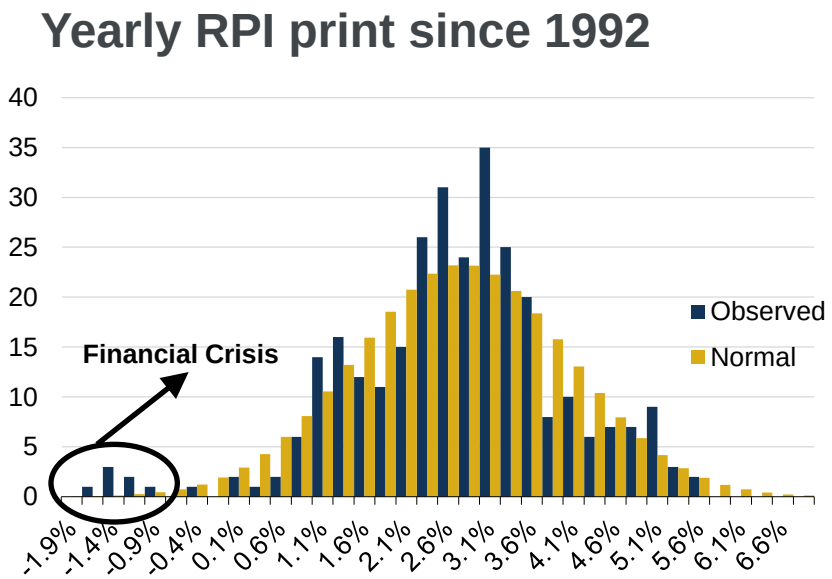
Skew



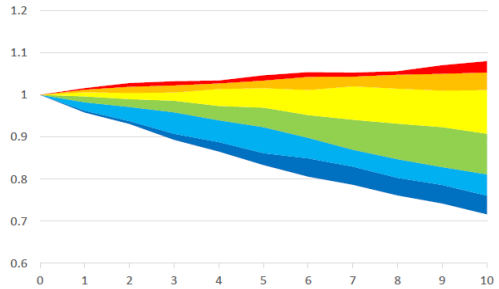
- Inflation targeted began in 1992
- Realised inflation broadly symmetric …
- … Other than blip reflecting Financial Crisis

Source: LPI risk working party

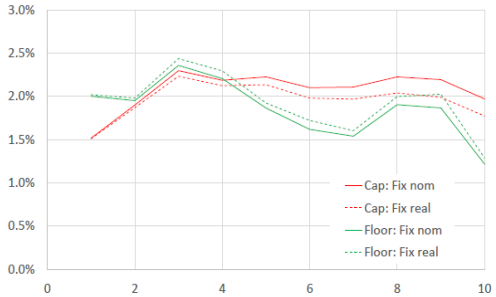
Calibrating the Black Model

- Burning cost analysis: LPI if historic inflation repeated itself?
- Re-running history of limited use
- Instead look at historic inflation outcomes relative to what was implied in gilt/ILG markets at the time, and scale to replicate current prices
- Little skew observed, and no material autocorrelation effects
- Analysis suggests volatility of 1.5-2.0%

Unexpected inflation: index



LPI implied volatility

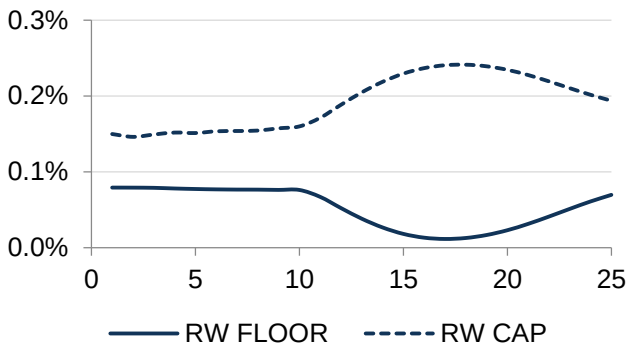


Source: LPI risk working party

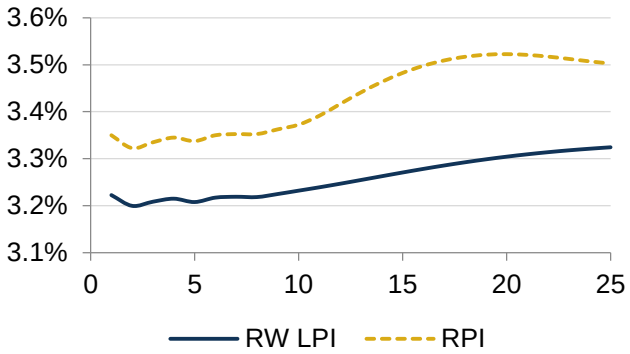
Black 1.8%

- Easy to explain, understand and replicate
- Data limitations in calibrating
- May miss important dynamics

Spot LPI(0,5) floor/cap values



Spot LPI(0,5) curve



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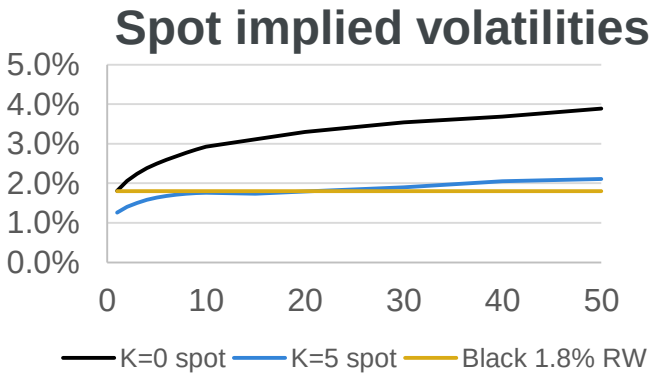
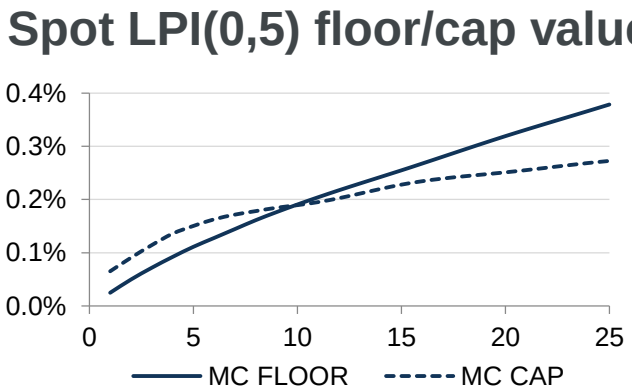
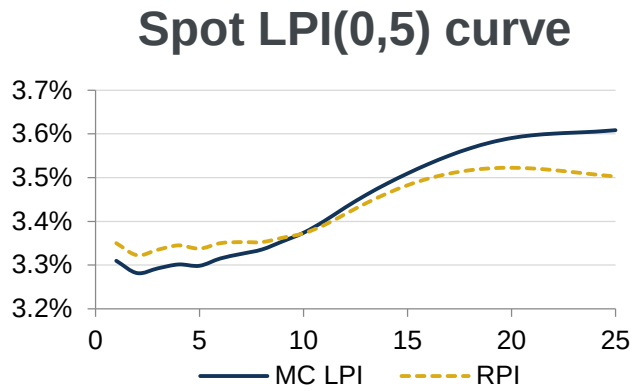
Source: LPI risk working party, Black Model with 1.8% vol, data shown as at 31 October 2017

SABR

- Fit parameters to LPI quotes from Banks at key tenors
- Highly flexible extrapolation/interpolation e.g. captures smiles
- Number of quotes reduced, dispersion between quotes increased (ADLT* criteria under Solvency II) – unrealistic?
- Historic RPI has much less skew than current pricing implies. Floor is “expensive”?







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Source: LPI risk working party, data shown as at 31 October 2017. ADLT = Active, Deep, Liquid, Transparent

How much impact does choice of model have?

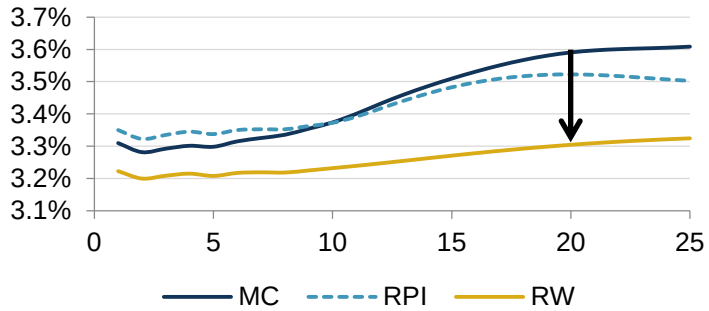
Valuation changes (curves)

- Lower valuation moving from MC to RW
- At 20 year duration, c30bps fall in LPI(0,5) increase assumption
- This results in c6% decrease in PV

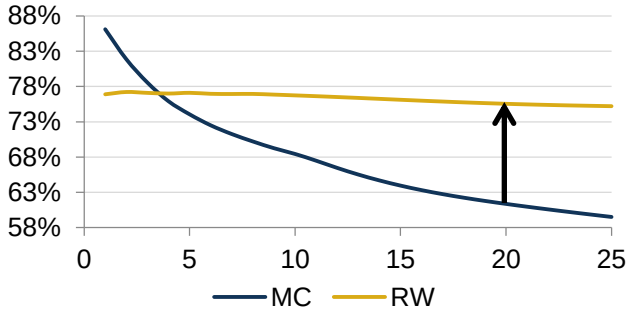
Delta changes (inflation sensitivity)

- Higher inflation sensitivity (lower volatility) moving from MC to RW
- At 20 year duration, c14% increase in assumed LPI(0,5) delta (61% to 76%). Relative increase is higher (76%/61%-1) = 25%
- This results in c18% increase in IE01

LPI(0,5) spot curves



LPI(0,5) spot deltas



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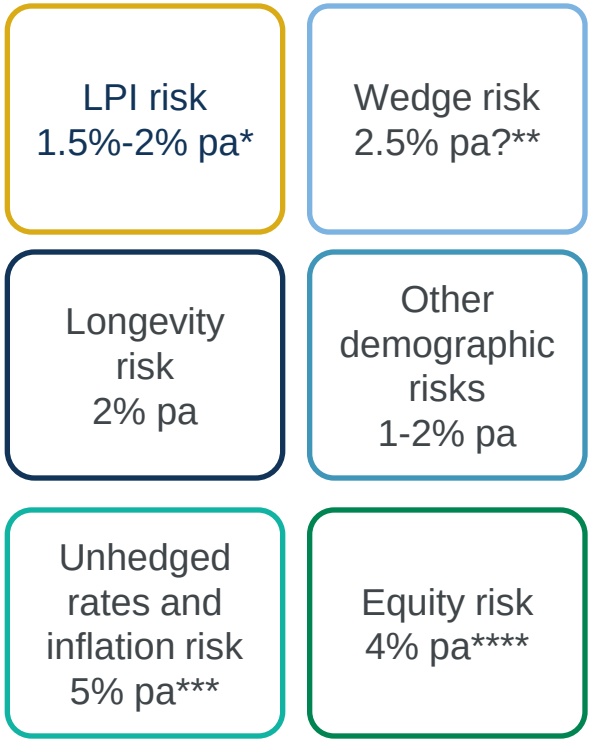
LPI risk isn't the whole story



LPI risk

- Model risk and practical issues e.g. non-continuous rebalancing
- Similar size to longevity risk for a well-funded scheme with 100% LPI-linked benefits
- Other "small" risks in schemes include wedge risk, longevity risk and other demographic risks

Impact on investment strategy

- Usually neglected in a traditional ALM analysis
- These small risks diversify investment risk which could make investment risk more attractive (same return pick-up for a smaller increase in overall risk)
- But may result in a breach of risk budgets if previously unappreciated or hidden

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* If 100% LPI, ** if 50% CPI, *** if 50% hedged **** if 25% equity

Key takeaways & planned future work

Key takeaways

- Pros and cons of different approaches (market consistent vs real world)
- Potentially large impact on valuation and hedging strategy
- Developed method (Burning cost analysis) to calibrate Black model
- Data limitations mean model uncertainty and resulting LPI risk

Planned future work

- Further work on impact of choice of model on resulting inflation sensitivity e.g. JY model
- Guidance around calibration of key model assumptions
- Worked simple examples of key models and outputs (cashflows and risk ladders)
- Production of simple guide to LPI risk

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Questions

Comments

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