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Liability Driven Investment Competition

Christopher Nichols FFA
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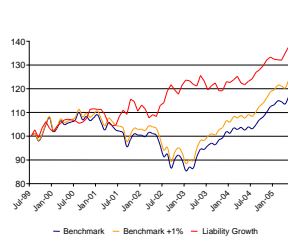

Liability Driven Investment

- Importance of interest rate risk

- Pragmatism versus perfection

- LDI Competition approach

Simplicity and availability

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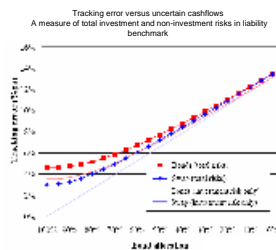
Importance of Interest Rate Risk

- Deficits caused by falling equity markets and interest rates and longevity increases

- Investment mandates were related to markets not liabilities

- So whilst investors beat the benchmark they failed against requirements

Source: Standard Life Investments

— Benchmark — Benchmark +1% — Liability Growth

The investment target did not match the liabilities

Pragmatism v's Perfection

Tracking error versus uncertain cashflows
A measure of total investment and non-investment risks in liability benchmark

Source: Watson Wyatt Ltd (LIABILITY DRIVEN BENCHMARKS FOR UK DEFINED BENEFIT PENSION SCHEMES, 21 June 05)

- Possible to devise an investment solution that aims to match out a set of projected liabilities

- As well as expensive, it is unnecessary and impractical

- Where non-investment risks are included it is not possible to produce an asset management strategy that takes away all risk

Avoid an over-engineered solution

Competition Outline

Pension Scheme Liabilities

☐ Fixed Increases (0%) ☐ LPI subject to 2.5% ☐ RPI Increases ☐ LPI subject to 5%
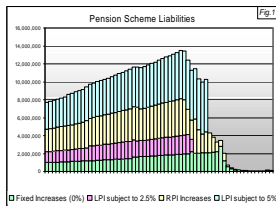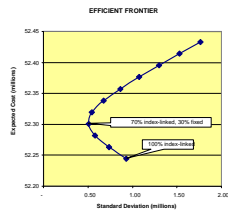
Our Aims:

- Seek a minimum risk position

- Pooled solution that hedges nominal, LPI and RPI risks

- Useable for schemes as small as £5m

Remember these liabilities are just forecasts

LPI liability hedging

EFFICIENT FRONTIER

- LPI swaps expensive (5bps)

- Pooled solution would therefore have high entry/exit costs e.g. 1% or more

- Alternative solution to back LPI:
  - Lowest risk portfolio consists of a blend of index-linked and fixed bonds (Munro 2000)
  - Floor risk under LPI means fixed offer a negatively correlated payoff to index-linked

- Allows us to recast LPI pension liabilities as nominal and RPI only

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Stage 1: Model LPI flows

Pension Scheme Liability Cashflows Recast

☐ Fixed + LPI (2.5%) ☐ RPI + LPI (5%)
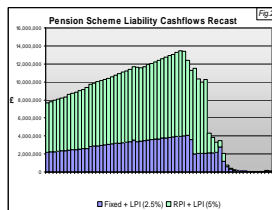
- LPI liabilities are remodelled as a combination of fixed and inflation-linked liabilities

- From time to time strategy will stray from LPI but this is acceptable given the potential for active return for a low level of risk relative to uncertain liabilities

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Simplifying the problem for an acceptable level of risk

Liability Managed Credit Funds

- Pooled corporate bond funds that meet pension fund needs
  - Target a certain modified duration / convexity or cashflows
  - Remove unwanted interest rate risk

- Continue to benefit from
  - Yield pick-up from investing in corporate bonds over gilts
  - Active credit management
  - No need to deal with complex legal documentation

- Flexible / simple to adjust as liabilities change

Corporate bond fund that helps clients hedge interest rate risk

Liability Managed Credit Funds

- Features
  - Year fund units available for each year out to 30 years

  - Earliest year fund matures on 7th December every year with new 30 year fund created so each fund has a different modified duration

  - Targeted maturity unit value of £1 at launch with units bought / sold discounted at swap rates

  - Unit prices progress over time as a result of:
    - Unwinding of discount / changes in swap curve
    - Credit spread
    - Alpha

Stage 2: Hedge fixed liabilities

Fig. 3

Fixed Liability Investments
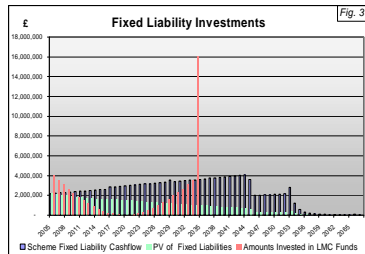
Liability:
- duration 18.2
- convexity 468

Liability Managed Credit Fund Assets:
- duration 18.2
- convexity 442

Methodology:
Start with PV of liabilities; Skew for duration match; Barbell to convexity match

Thoughts on inflation-linked pension liability projections

- Three elements to inflation in liability projections:
  - Projected Salary (inflation +)
  - Projected RPI / LPI
  - Experienced salary & RPI

- Are inflation assumptions priced within swap or government markets valid?
- Typically we see 2.5% flat, or an attenuated assumption, used
- So PV of liabilities changes due to realised inflation ≠ expected but is only loosely connected to market expectations of future inflation

- Precise hedge using market breakevens could therefore introduce funding volatility

Seeking a practical solution to actual inflation risks

Stage 3: Hedge inflation-linked liability

- Inflation linked assets typically lack duration and convexity compared to liabilities:

    Liabilities:
    - modified duration 17.0 (exposure to real yields)
    - convexity 447

    Inflation Linked Bond Fund
    - typical duration 9
    - convexity 139

- Approach 1: use conventional bonds, swaps and inflation swaps
    - Ideal for large schemes where actuarial assumptions really are mark-to-market
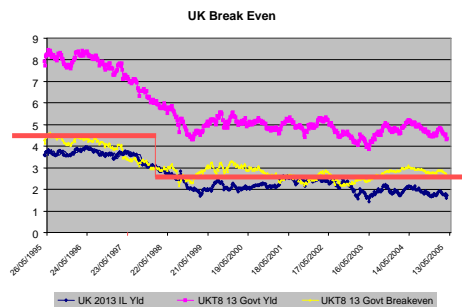   - Inflation swaps typically quite expensive

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Approach 2: Inflation yield beta
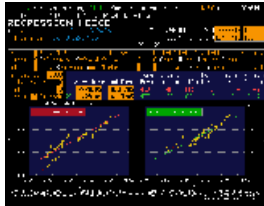
- Use a pooled inflation-linked fund

- Add a duration and convexity overlay in nominal space:

    - Yield regression shows opportunity to use nominal bonds to provide this overlay

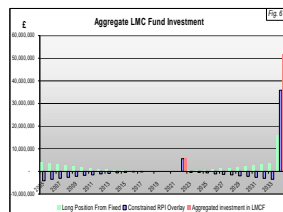   - Beta of 0.5 (nominal to real) means buying half as much duration in nominal space as in real

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UK Inflation Expectations

Stage 3: Hedge inflation-linked liability

Aggregate LMC Fund Investment (Fig 4)

£ chart

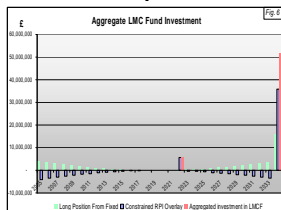Long Position From Fixed · Constrained RPI Overlay · Aggregated investment in LMCF

- Create duration extension & convexity overlay using long,short position in LMCF units with zero net PV
- Can only short to the extent the fund was long units from the Fixed Liability investment
- Fund with the overlay now has
  - duration 17
  - convexity 673
- "Immunised" position

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Overall liability hedging solution

Inflation-linked bond fund

+

Aggregate LMC Fund Investment (Fig 4)

£ chart

Long Position From Fixed · Constrained RPI Overlay · Aggregated investment in LMCF

- Pension liabilities' characteristics matched by duration and convexity
- Ability to outperform other solutions by having
  - Cost effective blend of fixed and RPI assets to hedge LPI
  - LMC Funds
  - Inflation-linked bond fund
- Potential rewards offset the relative risks versus uncertain liabilities

Pragmatic pooled solution hedging interest and inflation risk

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Results

- Quality of Match
  - Large moves in real and/or nominal yields
- Costs
  - Entry/Exit
  - Ongoing
- Returns
  - Liabilities plus 16bps credit spread & 68bps alpha target
  - Tracking Error of 1.85%
- Risk
  - Credit spread widening
  - Yield beta volatility
  - Non-investment risk
- Flexibility

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Questions?

Single investment fund

Align interest rate sensitivity of A and L

Combine the Liabilities

– **Interest rate protection for individual liability profiles**

– **Market risk/return through allocation to average 'A' rated credits**

– **Active risk/return through active credit management**

Active Management

Combined return is divided fairly according to investors' liability shapes

$$L = \sum_{d}^{all\_years} P_{d=t,l}.(number\_of\_term\_d\_in\_issue)$$

$where...$

$$P_{d=t,l} = P_{d=t+1,l=t} \cdot \frac{\alpha_{d=t,l} \cdot (1 - \frac{x_r}{100})^{l-t+1} \cdot (1 + x_l)^{\frac{d=t+1}{365}}}{\alpha_{d=t+1,l=t} \cdot (1 - \frac{x_r}{100})^{l-t}}$$

Distribute Returns

An adaptable pooled credit product