

# A Brief History of Actuarial Thought on Investment Strategy

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# Introduction

- Today's focus is on history of actuarial thought and practice in **investment strategy for British life offices**
  - Aim to highlight some notable historical developments in areas topical for today's insurance investment thinking
1. Actuaries and Investment Liquidity
  2. Actuaries and Equities
  3. Actuaries and Yield Curve Risk (probably not today)

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# Actuaries and Investment Liquidity

## Bailey and his Investment Principles (1862)

- Bailey's *On the Principles on which the Funds of Life Assurance Societies should be Invested* was the first actuarial paper on asset-liability management (1862)
- He set out five investment principles that were liability-aware and generally highly conservative and risk-averse
- But they recognised the opportunities as well as the constraints created by the nature of life assurance liabilities

## Bailey and Liability Liquidity (I)

- “(Life assurers) engage to pay fixed sums of money at periods generally long distance from the time when the contracts are entered into...the probable amount of demands on their resources can be calculated from time to time within not very wide limits...unlike banks, they are not exposed to sudden or unusual demands on their resources in times of panic and financial difficulty”.
- i.e. life assurers have a unique **long-term illiquid liability profile**

## Bailey and Asset Liquidity

- “The much larger proportion (of life office assets) may be safely invested in securities that are *not readily convertible*; and it is desirable...that it should be so invested, because such securities, being unsuited to private individuals and trustees...*command a higher rate of interest rate in consequence.*”
- i.e. an **illiquidity premium exists** and can be accessed by life assurers due to their illiquid liability profile
- Resonates strongly with 21<sup>st</sup> century actuarial thinking:
  - Solvency II matching adjustment
  - Increasing insurance investment in illiquid alternative asset classes such as infrastructure and loans

## 19<sup>th</sup> century Life Office Asset Allocation

- By 1890, ~75% of life office assets were invested in illiquid assets
  - Mortgages, loans, property.
  - Remainder in long-term government bonds and debentures
- Allocation to illiquid liabilities fell from 75% to 35% between 1890 and 1920 due to a variety of economic, political and insurance reasons:
  - Liquidity liability profile of life assurers changed (increase in surrenders)
  - Life assurers agreed to support government debt sales during World War 1 (40%+ in government bonds by 1920)
  - Fall in value of agricultural land decreased attractiveness and scale of mortgage market

# 2

## Actuaries and Equities



# Actuaries and Equities

- In 1920, British life offices' asset allocation to equities was <2%
- By 1950, it was >20%
- What happened?
- Inflation, high interest rates and bond price volatility during and following First World War
  - “The effects of the War in matters of finance have taught us...that it may be safer to have a proportion of our investments...in first-class ordinary shares, rather than entirely on a fixed monetary payment such as is given by gilt-edged investments.”
- *Falls* in long-term interest rates to historical lows in 1930s (Great Depression) to late-1940s (Dalton ‘cheap money’ era) was a more fundamental challenge for life offices:
  - “If the assets are invested, no matter how safely, to provide a yield less than that assumed in the calculation of premium rates, the ‘soundness’ of the investments is somewhat illusory.” Pegler, 1948

# Equity Investment: Creating a new actuarial orthodoxy

- In 1920s, three thinkers were particularly important in establishing a new actuarial orthodoxy of material equity investment by life offices
  - E.L. Smith (U.S. economist and asset manager)
  - J.M. Keynes (arguably the most important economist of 20<sup>th</sup> century, and also Chairman of National Mutual from 1921 to 1938)
  - H.E. Raynes (Chief Actuary of Legal & General in 1920s)

# Edgar Lawrence Smith

- In 1924, Smith published ground-breaking empirical analysis of long-term equity and bond returns in U.S. (1866-1922)
- Concluded that both income and capital appreciation of equities consistently exceeded that of bonds over long investment horizons
  - In both high inflation and low inflation environments
- Never advocated equity investment in context of insurance business and fixed liabilities (actually advised against it!)
- ...but his work was highly influential for Keynes and Raynes.

## Keynes, Raynes and life office equity allocations

- “The arguments in favour of holding a certain proportion of ordinary shares...are to be found in the advantage of spreading the fund between assets such as bonds, expressed in money values, and assets representing real values...the second reason is the fact they are undoubtedly under-valued relatively to bonds after making all due allowance for risk.”
  - Keynes, 1928, National Mutual Chairman’s Speech.
- **Diversification, inflation hedging, long-term risk-adjusted returns**
- In 1928, Raynes published a paper with a U.K. version of Smith’s empirical U.S. analysis
- Reached the same statistical conclusions as Smith and the same conclusions for life office asset allocation as Keynes

# Equities and Asset-Liability Management (1)

- Keynes and Raynes made little to no comment on setting equity allocation with reference to liability structure
- George Recknell, Actuary at National Mutual, in 1937 suggested the guaranteed component of with-profit liabilities should be matched with bonds, and the residual assets invested in equities / property:

“Concerning the percentage of ordinary shares which should be purchased there was something to be said, as a very rough rule, for investing on more or less conventional lines to the extent of the funds needed to support the contractual liabilities, while leaving the surplus free to invest in ordinary shares and real estate.”

## Equities and Asset-Liability Management (2)

- In 1957, a more ambitious equity allocation strategy was proposed by Anderson and Binns:
- “Suppose  $k$  is the maximum depreciation on present market values which is envisaged. Estimate the value of a function we shall call the ‘remainder’  $R$ , i.e. the excess of the total assets at market value over the liabilities...It can then be argued that  $R / k$  can safely be invested in equities provided the balance of the fund is reasonably matched”
- $k = 1$  is matching as per Recknell
- $k < 1$  implies backing some fixed liabilities with equities
  - Risk of failing to meet fixed liabilities if equities fall by more than  $k$  before they can be switched into matching bonds
  - A frequent rebalancing of equity allocation according to the formula is very similar to a modern ‘**portfolio insurance**’ strategy
    - Relates to dynamic replication, option pricing ideas

# 3

## Actuaries and Yield Curve Risk

# Duration as an Asset-Liability Management Concept

- Redington's 1952 immunization paper is the seminal moment in history of actuarial thought on interest rate risk management
  - If can't cashflow match, equate asset duration with liability duration
- Duration was defined as a statistical metric earlier (1937 by U.S. economist Macaulay), but this was used solely in empirical analysis of bond price behaviour and not as an asset-liability management concept



# Historical Thinking in Interest Rate Management

- (Heuristic) actuarial thinking on duration-matching significantly pre-dates Redington (1952), for example:
- “Regarding the office as a closed fund, owing to the incidence of future income it will be found that assets should be made to mature at rather later dates than corresponding liabilities. Then should interest rates fall, the future income will be accumulated at a lower interest rate of interest, but this would be compensated by the appreciation shown by the assets at the time that the corresponding liabilities fall due (and vice versa if interest rates go the other way).”
  - J.D. Binns in Discussion, Murray (1937)
- This is the duration-matching / immunisation concept, i.e. set assets such that their value has the same sensitivity as the liability value to changes in rates

# References

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