

The Actuarial Profession
making financial sense of the future

2006 Pensions Convention

The top 10 papers every scheme actuary should know about

Charles Cowling
4 – 6 June
St Andrews Bay, Fife

Top 10 Papers?



- Actuaries, pension funds and investment**– Arthur, Randall (1989)
- The financial theory of defined benefit pension schemes** - Exley, Mehta, Smith (1997)
- Pensions, funding and risk** - Chapman, Gordon, Speed (2001)
- Reinventing pension actuarial science**– Bader, Gold (2002)
- Note on the relationship between pension assets and liabilities**– Speed, Bowie, Exley, Jones, Mounce, Ralston, Spiers, Williams (2003)
- Principles of Corporate Finance**– Brealey, Myers (2003)
- Essentials of corporate bonds for pensions actuaries**– Forman, Freeman, Marshall, McKinlay (2003)
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Actuaries, pension funds and investment

Arthur, Randall (1989)



Key lessons

- The importance of asset / liability matching
- The implications of mismatching
- Performance measurement
- The sponsoring employer
- Investment objectives

Actuaries, pension funds and investment

Arthur, Randall (1989)



Further Reading

- Objectives and methods of funding defined benefit pension schemes** – McLeish, Stewart (1987)
- A realistic approach to pension funding** - Thornton, Wilson (1992)

On the risk of stocks in the long run

Bodie (1995)



Key lessons

- Measure risk by the cost of insuring against that risk
- The cost of insuring against a fall in stock values increases with time
- Put-call parity
- The riskiness of equities (stocks) increases with time (as does the expected return)
- Investment implications for individuals

On the risk of stocks in the long run

Bodie (1995)



Further reading

- Lifetime Portfolio Selection by Dynamic Stochastic Programming: The Continuous Time Case – Merton (1969)
- Principles of Corporate Finance – Brealey, Myers (2003)
- Financial Calculus An introduction to derivative pricing – Baxter, Rennie (1996)
- Derivatives The Theory and Practice of Financial Engineering – Wilmott (1998)
- The Pricing of Options and Corporate Liabilities – Black, Scholes (1973)
- Theory of Rational Option Pricing – Merton (1973)
- International Pension Swaps – Bodie, Merton (2002)
- On the Time Dimension of Personal Investing – Bodie (2005)

The financial theory of defined benefit pension schemes

Exley, Mehta, Smith (1997)



Key lessons

- Pension schemes and corporate finance
- Measure assets (and liabilities) at market value
- A blueprint for pricing and hedging liabilities
- Bonds are the best match for pension liabilities
- Link between equity returns and salary growth is spurious
- Allocation of fund assets to bonds/equities has no material impact on economic cost of the liabilities
- Pension liabilities should be priced relative to bonds (term structure models of interest rates)
- View company and pension scheme as a single economic entity
- Shareholder value is enhanced by pension fund investment in bonds

The financial theory of defined benefit pension schemes

Exley, Mehta, Smith (1997)



Further reading

- Risk and reward in corporate pension funds – *Treynor (1972)*
- Corporate pension funding policy – *Sharpe (1976)*
- Executive compensation, pension funding, signalling and taxation – *Scholes (1979)*
- The tax advantages of pension fund investment in bonds – *Black (1980)*
- Taxation and Corporate Pension Policy – *Tepper (1981)*
- Pension funding and corporate valuation – *Miller, Merton, Scholes (1981)*
- What are corporate pension liabilities? – *Bulow (1982)*
- Optimal funding and asset allocation rules for defined benefit pension plans – *Harrison, Sharpe (1983)*

The price of actuarial values

Gordon (1999)



Key lessons

- Modern finance theory
- Application to UK pension schemes
- Actuarial myths

"Modern finance theory is not practical"
"Modern finance theory is invalid because it is based on unrealistic assumptions"
"Investing the assets of a DB pension scheme in equities reduces company cost"
"Equities are the best match for salary-related liabilities"
"Risk premiums need to be allowed for when valuing long-term liabilities"
"In the long term ..."
"Smoothed values are a good thing"
"Risk can be diversified over time"
"The pension scheme investment success story"
"Paying pensions with new money means we can ignore the short term"

The price of actuarial values

Gordon (1999)



Further reading

- Pension fund asset valuation and investment – *Dyson, Exley (1995)*
- Actuaries and derivatives – *Kemp (1997)*
- Pensions, funding and risk - *Chapman, Gordon, Speed (2001)*

Reinventing Pension Actuarial Science

Bader, Gold (2002)



Key lessons

Corporate finance principles:

- \$1million of bonds has the same value as \$1million of equities
- A fair trade of a marketed security or portfolio must occur at a market price
- All parties to market transactions are entitled to full current information on the market prices of the relevant assets and liabilities
- A liability is valued at the price at which a reference security trades in a liquid and deep market. A reference security (or portfolio) has cash flows that match the liability in amount, timing and probability of payment
- Risks are borne and rewards are earned by individuals not by institutions

Actuarial violations of corporate finance principles

- Transferring risk to future generations
- Underpricing pensions in compensation decisions
- Actuarial / accounting processes biasing investment decisions
- Hypothetical actuarial gains concealing real economic losses
- Concealing risk by smoothing
- Extended amortization

Reinventing Pension Actuarial Science

Bader, Gold (2002)



Further reading

- Is the Pension Benefit Guaranty Corporation the FSLIC of the nineties – *Bodie (1992)*
- On the management of financial guarantees – *Bodie, Merton (1992)*
- What the Pension Benefit Guaranty Corporation can learn from the Federal Savings and Loan Insurance Corporation – *Bodie (1996)*
- Pension deficits – an unnecessary evil – *Bader (2004)*
- Pinched Promises – *Kosterlitz (2005)*
- On Asset-Liability Matching and Federal Deposit and Pension Insurance – *Bodie (2005)*
- Through the Looking Glass: Adventures in Pension Land – *Belt (2006)*
- Reforming the defined-benefit pension system in the United States – *Wilcox (2006)*

Note on the relationship between pension assets and liabilities

Speed, Bowie, Exley, Jones, Mounce, Ralston, Spiers, Williams (2003)



Key lessons

- Response to Myners
- Greater transparency to trustees and sponsors on the relationship between assets and liabilities
- Liability Benchmark Portfolio (LBP)
- Monitor assets against LBP
- Measure risk against LBP

Note on the relationship between pension assets and liabilities

Speed, Bowie, Exley, Jones, Mounce, Ralston, Spiers, Williams (2003)



Further reading

Clearance Statements, Guidance from the Pensions Regulator (*April, 2005*)

Funding Defined Benefits, Code of Practice - The Pension Regulator

How the Pensions Regulator will regulate the funding of defined benefits (*May, 2006*)

Essentials of corporate bonds for pensions actuaries

Forman, Freeman, Marshall, McKinlay (2003)



Key lessons

- Sterling bonds are issued by a wide variety of issuers
- Corporate bonds offer higher expected returns than gilts but with various risks
- Risk profile is asymmetric
- Swaps can provide longer durations than the physical market
- Investment grade corporate bonds are closely correlated with gilts

Essentials of corporate bonds for pensions actuaries

Forman, Freeman, Marshall, McKinlay (2003)



Further reading

Equity Gilt Study – Barclays Capital (*2005*)

Pension fund asset allocation

Bianco, Cooper (2003)



Key lessons

Analysts are beginning to look at the pension scheme assets and liabilities as assets and liabilities of the company

Three key principles beginning to emerge:

1. Treat pension deficits as corporate debt
2. Fund pensions fully – through borrowings if necessary
3. Investing pension fund assets in bonds maximises shareholder value

Catalysts for change

Analysis by equity analysts (as well as bond analysts and credit rating agencies) is getting a lot better

Pension fund asset allocation

Bianco, Cooper (2003)



Further reading

JP Morgan, ABN Amro, Merrill Lynch, Moody's, Standard & Poors

Credit Rating Criteria – *Standard & Poors (2004)*

Study of Potential Claims on the PPF – *Standard & Poors (2005)*

Did pension plan accounting contribute to a stock market bubble?

Coronado, Sharpe (2003)

Do a firm's equity returns reflect the risk of its pension plan? – *Jin,*

Merton, Bodie (2004)

Funding Defined Benefit Pension Schemes

Cowling, Gordon, Speed (2004)



Key lessons

Actuaries should use a solvency measure to value liabilities

- Funding advice should disclose the broad impact of priority rules
- Funding objectives should be well-defined
- Funding targets should be described unambiguously in terms of solvency
- Highlight if contributions are insufficient to maintain solvency
- Reserve fully for options
- Consider reliance to be placed on company covenant
- Full disclosure of amortisation methods
- Disclose projected solvency position at next valuation
- Advise on contributions only up to next valuation

Funding Defined Benefit Pension Schemes

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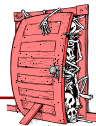
Further reading

Should Trustees be more like bankers? - *Greenstreet (2005)*

Sponsor Covenant Working Party Final Report – *Gordon, Evans, Freeman, Forrester, Hall, McKay, Shellswell (2005)*

Financial aspects of longevity risks

Richards, Jones (2004)



Key lessons

Greatest private-sector exposure to longevity risk is in companies with large DB schemes – big surprises in store?

Some longevity assumptions are dangerously out of date

Better disclosure of mortality assumptions

Longevity now dominant risk for immediate annuities

Uncertainty over projections of future mortality

Financial impact of uncertainty

Mortality differentials

Asset backing implications

Mortality projections and cohort effects

Financial aspects of longevity risks

Richards, Jones (2004)



Further reading

CMIB Report No 17 – *Continuous Mortality Investigation Bureau (1999)*

CMIB Working Paper No 1 – *Continuous Mortality Investigation Bureau (2002)*

CMIB Working Paper No 3 – *Continuous Mortality Investigation Bureau (2004)*

Longevity in the 21st Century – *Willets, Gallop, Leandro, Lu, MacDonald, Miller, Richards, Robjohns, Ryan, Waters (2004)*

The Cohort effect: Insights and Explanations – *Willets (2004)*

How long do people expect to live? Results and implications *O'Brien, Fenn, Diacon (2005)*

The importance of year of birth in two-dimensional mortality data – *Richards, Kirkby, Currie (2005)*

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