



Joint Colloquium of the IACA, PBSS and IAAHS Sections of the International Actuarial Association

Westin Copley Place Hotel, Boston, U.S.A. – 4-7 May 2008

Modelling and Managing Risk **(IPT7 – Risk Management & Risk Sharing)**

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Areas of interest

- Pension plan risks
- Risk linkages
- The broader context
- Words of caution...

What risks do pension plans face?

- **Market/economic risk**
- **Demographic risk**
- **Credit risk**
- **Liquidity risk**
- **Operational/project/strategic risk**

Market/economic risk

- Risk inherent from exposure to capital markets and economic conditions
- Direct
 - through assets held (equities, bonds etc)
- Indirect
 - through liabilities (interest rates, inflation etc)

Modelling market risk

- **Deterministic**
 - Single assumption set
 - Scenario testing
- **Stochastic**
 - Bootstrapping (historical)
 - Returns-based (forward-looking)
 - Factor-based (forward-looking)
- **Co-movement**

Demographic risk

- Longevity risk
 - Estimate of average bad
 - Estimate of average good, luck bad
- Dependent benefit risks
- Withdrawal risks

Modelling demographic risk

- Need to model mortality experience...
- ...and project mortality improvements
 - Projections typically deterministic...
 - ...often with margins...
 - ...but stochastic methods available
- Volatility also relevant for other risks

Credit Risk

- For pension plans, risk is sponsor insolvency risk
- Single, undiversified risk
- Also risk if benefits insured/bought out...

Modelling credit risk

- Need to model likelihood of insolvency...
- ...and likely extent of recoveries
- Many models exist
 - Z-Score
 - Contingent claim
 - Other rating agency approaches

Liquidity risk

- Risk that assets cannot be realised when needed
- Suddenly very relevant!
- Should not be too big an issue for pension schemes...
- ...although beware large investments in illiquid asset classes (private equity, hedge funds etc...)

Modelling liquidity risk

- Cash flow modelling is the only way...
- ...allowing for uncertainty in flows
- Stochastic
- Worst case scenario
 - for assets...
 - ...and liabilities

Operational risk

- “Obvious” risks
 - e.g. fire, fraud, human error, system failure
- Agency risks
 - e.g. manager/trustee conflict of interest
- Behavioural bias
 - e.g. anchoring, representativeness

Modelling operational risk

- Easier to prevent than to model
- Careful analysis of systems...
- ...and design to avoid failures...
- ...but beware unintended consequences

Risk interaction

- Modelling individual risks helpful...
- ...but key risks missed if interaction ignored
- For example...

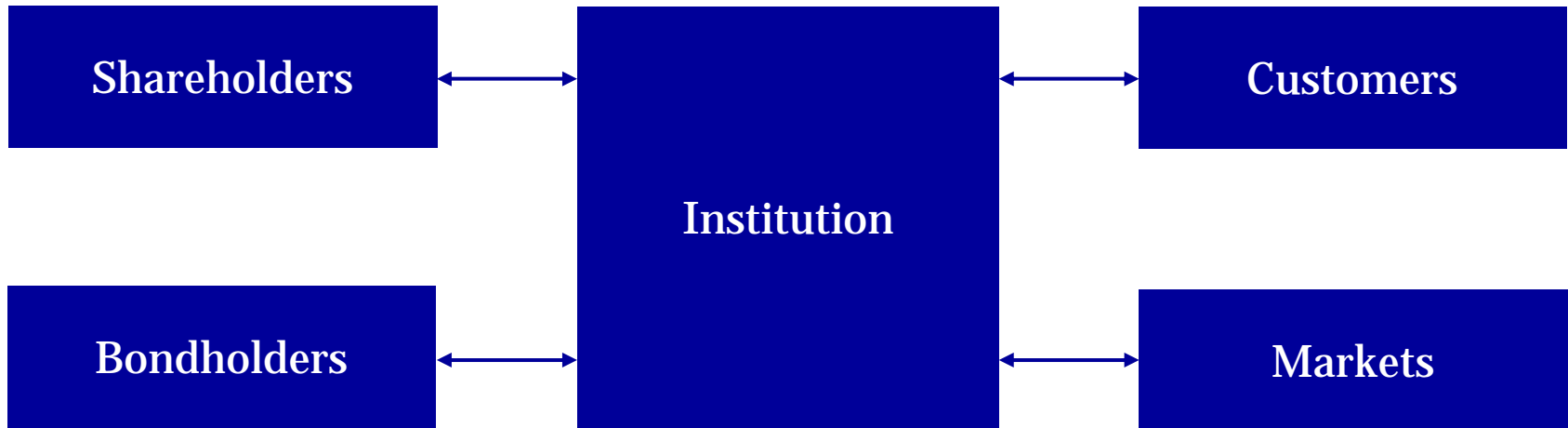
Example 1: market and demographic risks

- Early leavers/early retirements
- More likely when economy suffering
- Model variable demographics consistently with market/economic assumptions

Example 2: market and credit risks

- Sponsor insolvency more likely in economic downturns
- Large potential differences between firms
- Crucial consideration when assessing
 - strength of employer covenant
 - fair price for insurance

Broader context



- Insights into recognising risk in other institutions...
- ...and into managing those risks

Risks affecting other financial institutions

- Life insurers
- Non-life insurers
- Banks

Managing (pension plan) risk

- Investment strategy
- Capital
- Volume of business
- Risk transfer
 - non-capital market
 - capital market
- Enterprise risk management

Words of caution

- Garbage in garbage out
- Hard to model the not-yet-seen
- No immunity from behavioural biases
- Do not let modelling over-ride common sense



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