Fair Value of Liabilities

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How Do We Define "Closest" Asset Match?

David Service & Jie Sun

Institute of Actuaries of Australia

Fair Value

- **Assets are OK**
  - **Normally a market**
- **No market for long tail claims liabilities**
- **Approach requires the "closest match" asset portfolio**
- **Use the discount rate implied by those assets to discount liability cashflows**

Ultimate Surplus

- **Project asset and liability cashflows**
- **When all liabilities extinguished what assets remain are the "ultimate surplus"**
- **"Closest match" defined by reference to this ultimate surplus**
- **Most important risk for insurance company is insolvency**
- **Insolvency = negative ultimate surplus**

"Closest Match"

- **With stochastic cashflows the probability of insolvency is always non-zero [unless infinite initial asset amount]**

- **As initial assets ⬆**

  probability of insolvency ⬇

- **Two variables**
  - **Probability of insolvency**
  - **Initial asset amount**

- **Need to fix one of these to produce a unique solution**

Closest Match is

The asset portfolio which, for a given probability of negative ultimate surplus, requires the lowest initial asset amount.

Liabilities

- **Long tail outstanding claims**
- **Runs off in 10 years**
- **Quarterly time intervals**
- **Experience run-off triangle shown in Appendix A**

Liability Model

- **Stochastic chain ladder (Renshaw & Verrall)**

- **Modelled as a GLM**

- **Log link function**

- **Gamma error distribution**

- **Linear predictor**
  - $\bigcirc + \mathfrak{S}_i + \Omega_i$

Asset Model

- **Asset Classes**
  - **90 day bank bills**
  - **10 year governemnt bonds**
  - **Australian equities : All Ordinaries Index**
- **Jon Carter's model**
  - **An expanded Wilkie type cascade structure**
  - **Fitted to the Australian markets**

Asset Portfolios

- **100% cash**
- **100% bonds**
- **100% equities**
- **Balanced – 30% cash, 30% bonds, 40% equities**

Probabilities of Insolvency

Initial Asset Amount	All Cash	All Bond	All Equity	Balanced
50000	100.00%	100.00%	97.33%	100.00%
60000	99.99%	100.00%	87.57%	99.96%
70000	96.90%	100.00%	67.78%	95.68%
80000	50.08%	99.37%	46.15%	62.09%
90000	4.27%	78.44%	27.98%	20.16%
100000	0.06%	36.22%	16.99%	3.42%
110000	0.02%	12.06%	9.48%	0.33%
120000	0.03%	3.42%	4.88%	0.02%
130000	0.01%	0.83%	3.02%	0.05%
140000	0.01%	0.10%	1.50%	0.01%
150000	0.04%	0.03%	0.93%	0.03%
160000	0.05%	0.02%	0.43%	0.04%
170000	0.05%	0.04%	0.21%	0.03%
180000	0.01%	0.00%	0.16%	0.01%

Probabilities of Insolvency
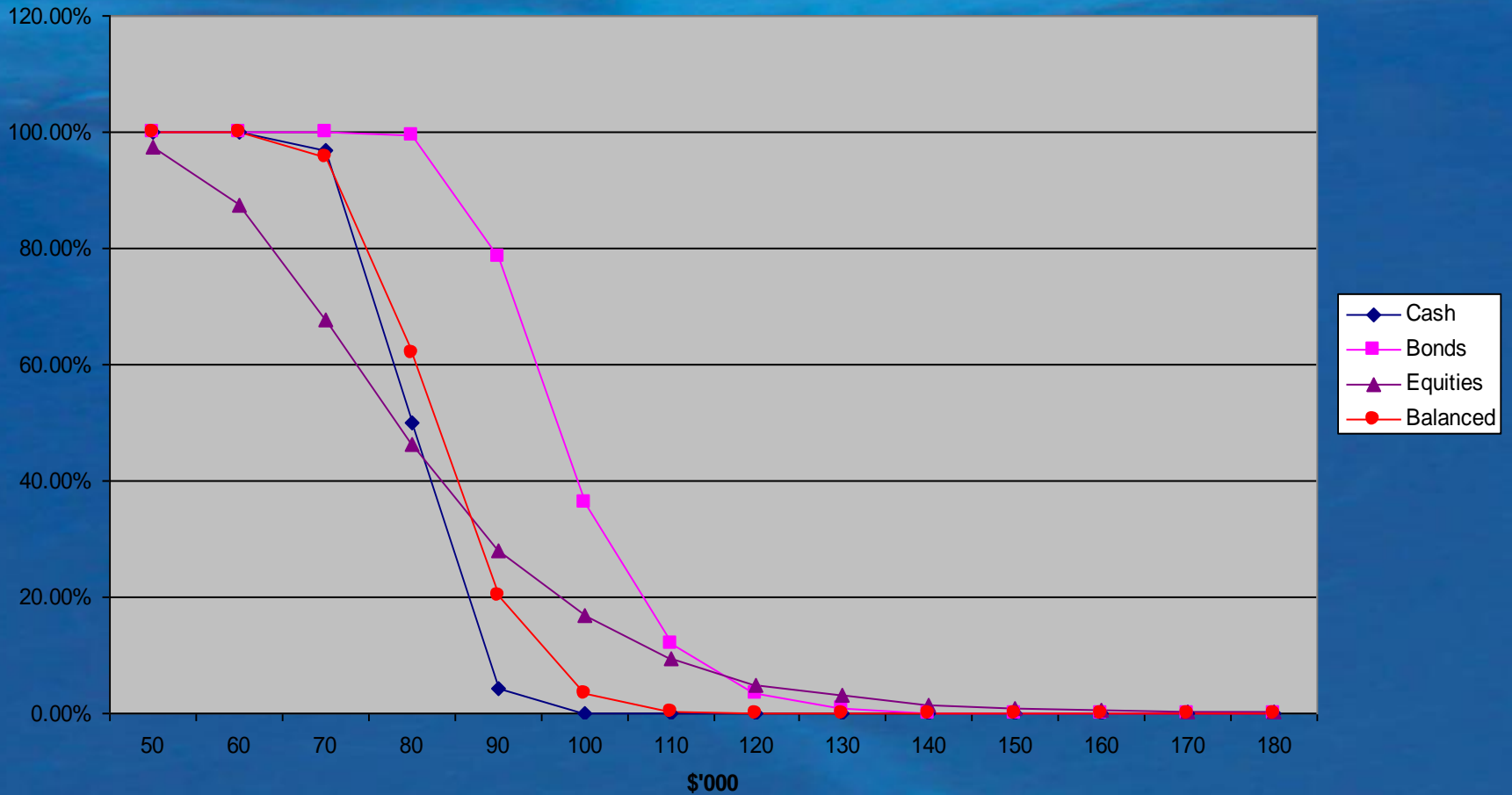
Further Research

- **Different asset models**
- **Different liability portfolios**
- **Complete interactions between asset and liability models**

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