

Tower 42, Old Broad Street, London

Run-off simulations

Stephen Richards

18th May 2010

Some elements to longevity risk

- Model risk
- Basis risk

Other elements to longevity risk

- Trend risk — uncertainty even if model is known
- Individual risk — who happens to die when
- Concentration risk — not all lives are financially equal
- How can we quantify each of these?

Full portfolio simulation

1. Simulate a trend scenario
2. Simulate lifetime of each pensioner
3. Calculate value of pension paid in (2)
4. Calculate total simulated portfolio cost
5. Repeat (1)–(4) 10,000 times (say)

Simulating a lifetime



Source: Longevity Ltd (2009).

Isolating components of risk

- Switch on and off various risks to isolate effect
- Stepwise approach like analysis of surplus

Isolating components of risk

Deviation from median value for selected risk percentiles

Trend risk is dominant for this large portfolio

Trend risk	Measure	$\frac{1}{2}\%$	5%	95%	$99\frac{1}{2}\%$
No	Lives	−0.20%	−0.12%	0.13%	0.20%
	Amounts	−0.51%	−0.32%	0.31%	0.50%
Yes	Lives	−3.25%	−2.01%	1.85%	2.88%
	Amounts	−3.61%	−2.21%	2.02%	3.12%

Source: Richards and Currie (2009), large portfolio in Table 9.

Isolating components of risk

Deviation from median value for selected risk percentiles

Individual risk is as important as trend risk for this small portfolio

Trend risk		Measure	$\frac{1}{2}\%$	5%	95%	$99\frac{1}{2}\%$
No	Lives		−2.09%	−1.31%	1.30%	2.02%
	Amounts		−4.98%	−3.25%	2.90%	4.52%
Yes	Lives		−7.25%	−4.33%	3.77%	5.73%
	Amounts		−8.31%	−5.19%	4.66%	7.23%

Source: Richards and Currie (2009), small portfolio in Table 11.

Conclusions and questions

- Full-portfolio simulation enables identification of risk elements



References

LONGEVITAS LTD **2009** *Survival of the fittest*, A4 handout

RICHARDS, S. J. AND CURRIE, I. D. **2009** *Assessing longevity risk and annuity pricing with the Lee-Carter model*, Faculty of Actuaries Sessional Meeting Paper, February 2009