



The Actuarial Profession

making financial sense of the future

Communicating uncertainty

How policymakers can have a range of uncertainty explained to them

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Communicating uncertainty – how policymakers can have a range of uncertainty explained to them

- Choosing a central projection
- Best estimate v prudence
- Variants around the central
- Ensuring the message of variability is understood

Examples of where this is important – especially social security

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Components of a population projection

- Mortality – base and improvements
- Fertility
 - Importance depends on length and use of projection
- Migration
 - Can be important, especially in small territories
 - Need to consider scheme rules

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Choosing a central projection

What are the options

- Population projections
- Construct from analysis of experience
- Sound out relevant experts
- In respect of mortality...
 - Actuarial tables from financial services industry
 - International / overseas tables
 - Allowance for improvements

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Choosing a central projection

Population projections

- What segment and proportion of population does arrangement cover?
- Selection
- Amounts v lives
- Improvements suitable (if any!)

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Choosing a central projection

Analysis of experience

- Only for mortality? What about fertility, migration
- Data
 - not if new set up
 - nor if admin systems weak
 - statistical credibility
- Resources for analysis
- Improvements – how generate?

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Choosing a central projection

Financial services actuarial tables

- How applicable
 - Available for life insurance/pensions/both
 - Proportion of pop'n covered – selection
- Improvements – if not already included

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Choosing a central projection

Overseas/international tables

- UN / another country
- How applicable
 - To country as a whole
 - To members of arrangement being reviewed
- Political sensitivities
- Improvements – if not already included

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Best estimate v prudence

Best estimate projection

- Possible to say what this is for baseline?
- Even for future changes in mortality, fertility, migration
- Very politically sensitive
- Might “central” variant be better?

Prudent projection

- What is prudent in this respect?
- X% certain projection is on one side of result?

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Variants around central projection

Scenario testing

How many?

- Variables/assumptions to adjust – sensitivity analysis
- Different possible values to take in each case
- One each way is simple, but non-linearity
- Correlation between different factors

Could be very large number of results!

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Variants around central projection

Stochastic approaches

- Create range of outcomes
- Generate %age points

Great, but

- Vastly computationally intensive if model full social security or health arrangement
- How good are assumptions as to variability, including correlations?

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Variants around central projection

Stochastic approach

$q_t(x)$ ($q(x)$ at year t) stochastic

$$q_t(x) = q'_t(x) * [A(t) + B(t) * (0.5 - U(t))]$$

$q'_t(x)$ is the PMA medium cohort $q(x)$ in year t

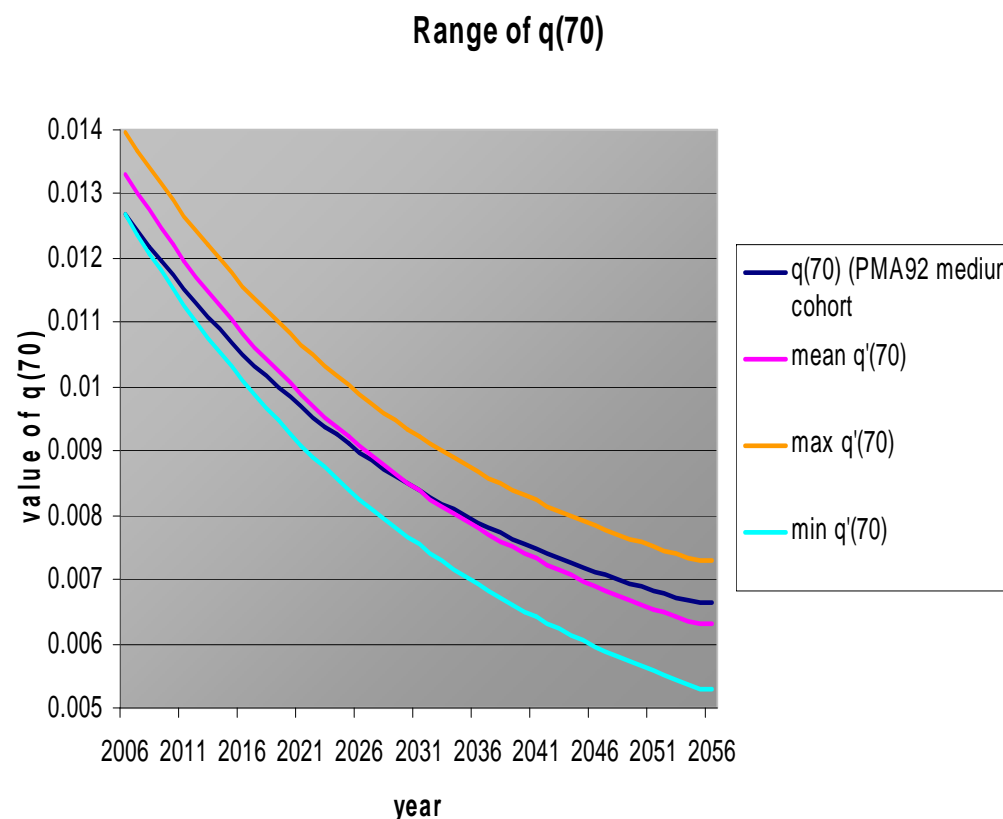
$A(t)$ is a scaling factor

$$A(0) = 1.05, A(50) = 0.95$$

$B(t)$ is a variability factor

$$B(0) = 0.1, B(50) = 0.3$$

$U(t)$ is a Uniform(0,1) distribution



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Variants around central projection

Stochastic approach

What happens if a pension scheme runs off rather than buys out

“Medium sized” scheme

- about 1,000 members
- about £35 million assets

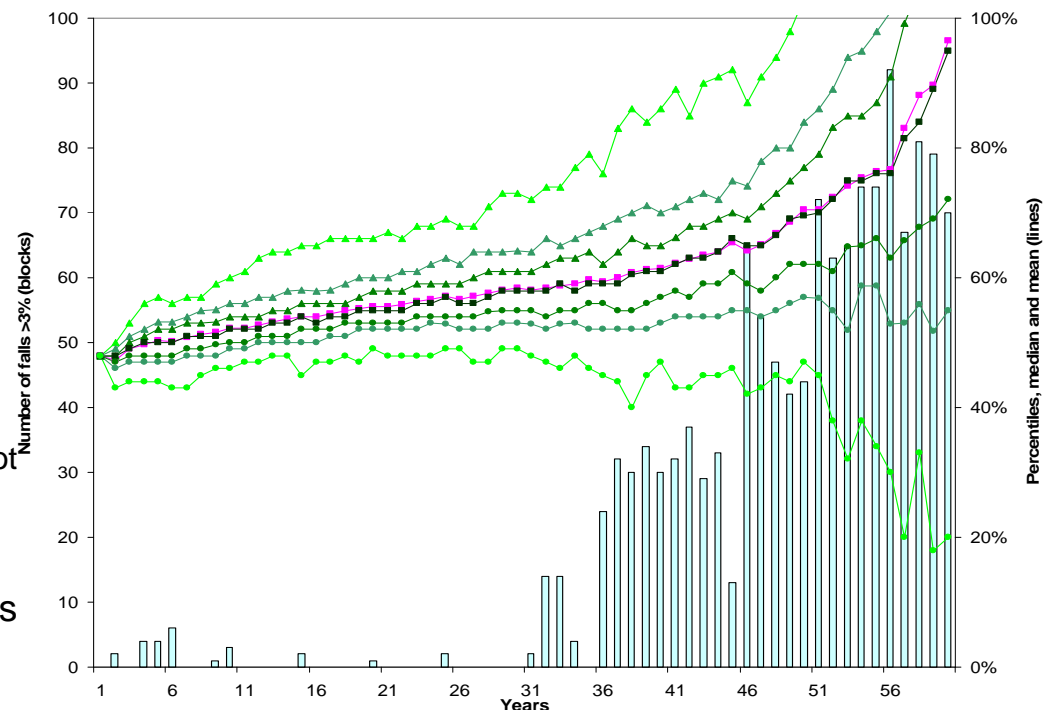
Scheme underfunded against buy-out

– control by

- regular (annual) actuarial valuations
- adjust level of benefits for members not yet retired at start of wind-up

Key output

– how often do members suffer benefit cuts



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Variants around central projection

- Lots of numbers
- Or charts?
- Variants, not %age points of outcomes
- %age points depend on crucially assumptions: how accurate are they?

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Variants around central projection

GAD QR as at April 2000 Table 8.2 – pensioner support ratio

	2001	2010	2020	2030	2040	2050	2060
Principal projection	3.3	3.1	3.2	2.7	2.5	2.5	2.4
	Fertility variants						
Low	3.3	3.1	3.2	2.6	2.3	2.3	2.2
High	3.3	3.1	3.3	2.8	2.6	2.7	2.7
	Migration variants						
Low	3.3	3.1	3.2	2.6	2.3	2.4	2.3
High	3.3	3.1	3.3	2.8	2.6	2.6	2.5
	Mortality variants (strictly mortality improvements)						
Low	3.3	3.1	3.3	2.8	2.6	2.7	2.7
High	3.3	3.1	3.2	2.6	2.3	2.3	2.2
Constant Improvement	3.3	3.1	3.2	2.6	2.3	2.2	2.0

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Variants around central projection

GAD QR as at April 2000 Table 8.3 – contribution rate (price uprating)

	2001	2010	2020	2030	2040	2050	2060
Principal projection	19.1%	18.4%	16.4%	16.4%	15.4%	14.9%	14.9%
	Fertility variants						
Low	0.0%	0.0%	0.0%	+0.2%	+0.5%	+0.9%	+1.5%
High	0.0%	0.0%	0.0%	-0.2%	-0.5%	-0.8%	-1.2%
	Migration variants						
Low	0.0%	+0.2%	+0.4%	+0.6%	+0.6%	+0.5%	+0.5%
High	0.0%	-0.2%	-0.3%	-0.5%	-0.5%	-0.4%	-0.4%
	Mortality variants (strictly mortality improvements)						
Low	0.0%	-0.1%	-0.3%	-0.5%	-0.8%	-0.9%	-0.9%
High	0.0%	+0.1%	+0.3%	+0.5%	+0.8%	+0.9%	+1.0%
Constant Improvement	0.0%	+0.1%	+0.3%	+0.6%	+1.0%	+1.5%	+2.0%

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Variants around central projection

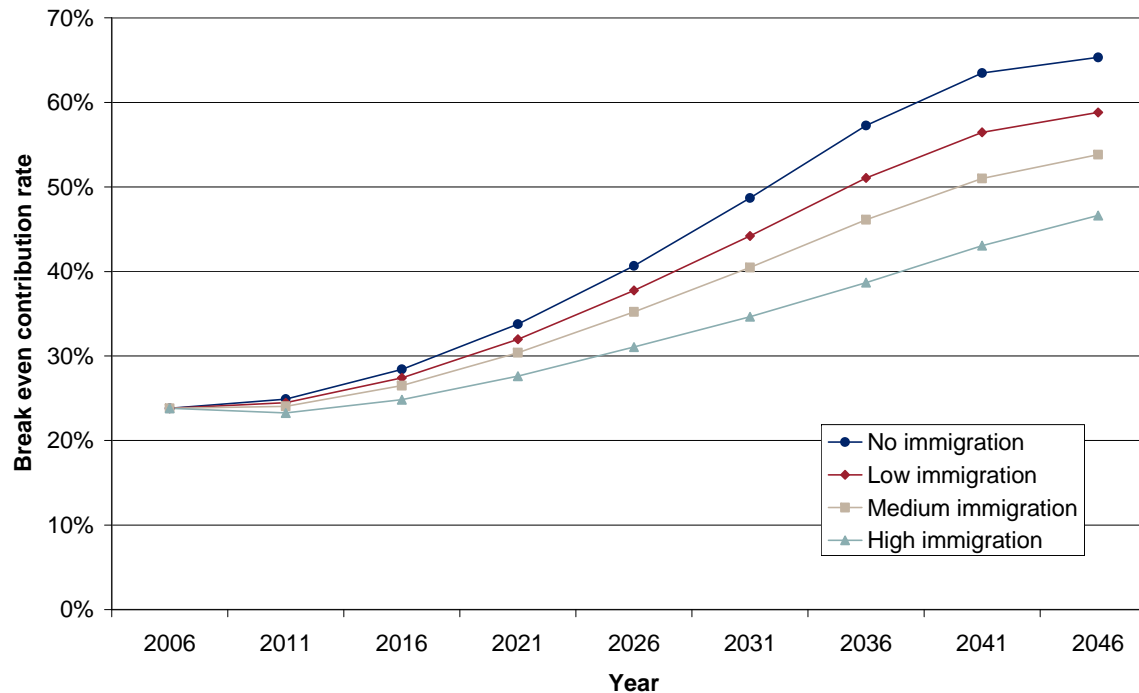
GAD QR as at April 2000 Table 8.4 et seq – contribution rate

	2001	2010	2020	2030	2040	2050	2060
Principal projection – price uprating	19.1%	18.4%	16.4%	16.4%	15.4%	14.9%	14.9%
	<i>Different uprating</i>						
Earnings uprating	0.0%	+2.1%	+4.8%	+7.7%	+9.8%	+10.9%	+12.1%
	<i>Different entitlement</i>						
Low			0.0%		-0.1%		-0.1%
High			0.0%		+0.1%		+0.1%
	<i>Different employment</i>						
Higher at old ages							‘small’ effect
Higher unemployment							+0.2%

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Variants around central projection

Social security scheme in territory with variable migration – contribution rate



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Ensuring the message of variability is understood

We'd like your input!