Biennial Convention 2009
Go for Gold
19–22 April 2009 • Sydney
Institute of Actuaries of Australia

Learning to Live with Longevity – Retirement Spending & Investment Implications

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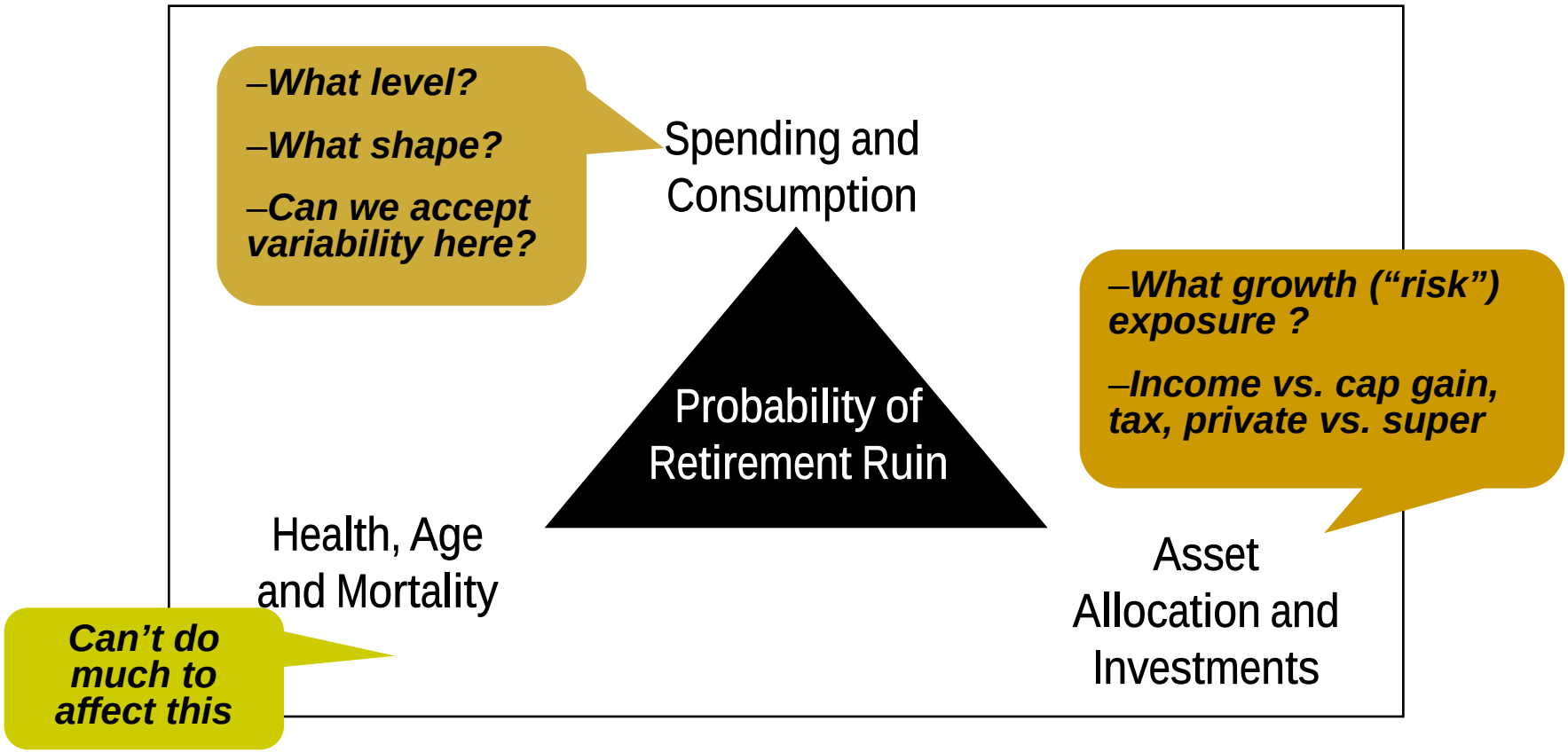
The retiree's challenge

- Take lump sum at retirement and convert to income to as far as possible match spending (or consumption) needs over an uncertain lifespan
- Evidence suggests that most current retirees face this challenge without accessing lifetime annuity and other financial products
- That is, they are armed with their accumulated savings (held in an "account-based pension"); other savings; the underpin of the age pension; and (hopefully) some good advice.

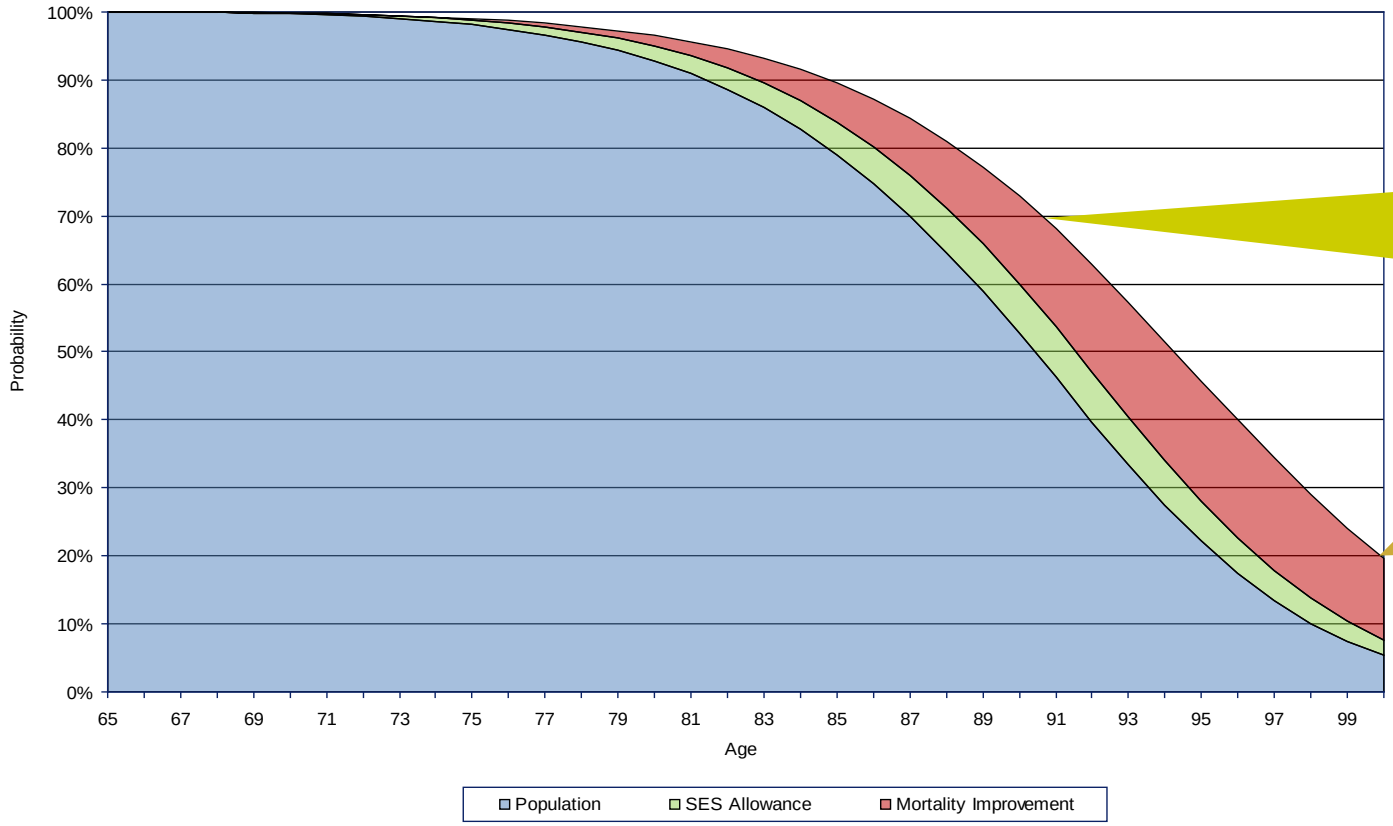
Retirement Finances Triangle



Source: Milevsky, Moshe A. and Robinson, Chris A. (2005)

Understanding Longevity risk

Couple aged 65 – Joint Life Survival Probabilities



73% chance that at least one of our 65-year-old couple will reach age 90

One in five chance that one or both of the couple will celebrate their 100th birthday

Life Expectancy at age 65 (ALT + Improved + SES Adjustment) → Male = 87 and Female = 90

Easy to understate longevity - tools beyond life expectancy are important

Risk exposures - longevity risk

- Risk exposure differs for the provider of retirement product (e.g. an annuity) and a self annuitising retiree
- Note that annuity provider includes the government as provider of the age pension

Aspect of longevity risk	Annuity provider	Self-Annuitising Retiree
Parameter uncertainty (e.g. wrong mortality rates today)	✓✓✓	✓
Parameter uncertainty – tomorrow (i.e. wrong mortality improvement rates)	✓✓✓	✓
Random outcome risk (i.e. binary outcome in each year - die or survive)	✓	✓✓✓

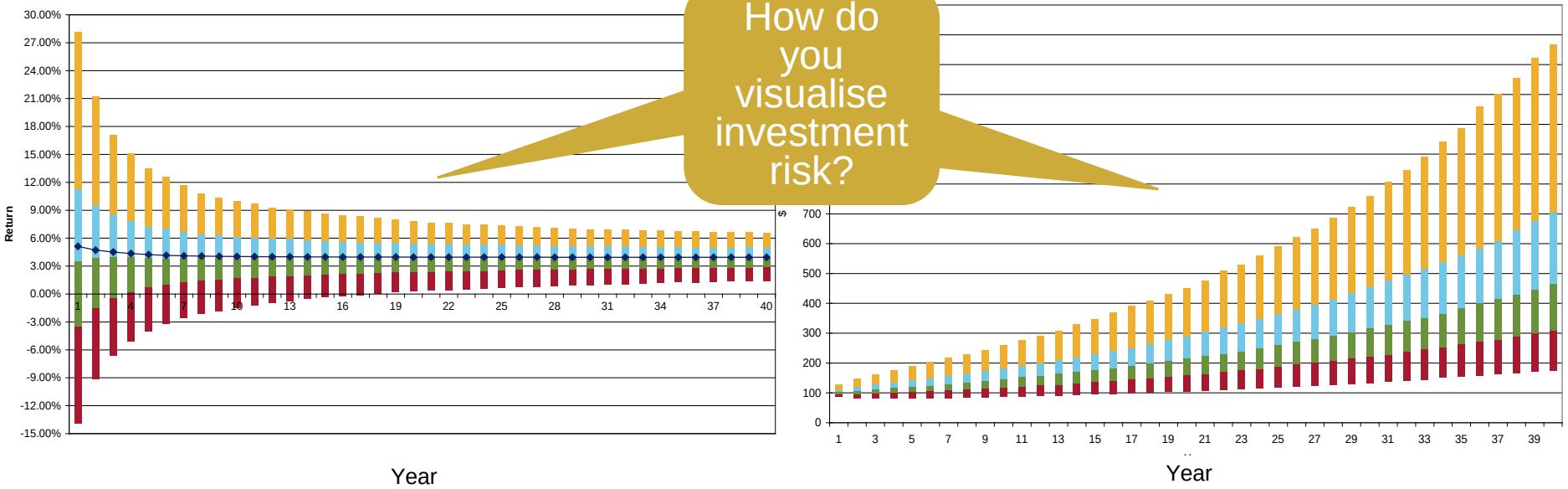
Source: Adapted from Rawlinson, M & Cater, D. (2008)

Understanding Investment Risk

Average real return (deflated at AWE)

Value of $100 over time (deflated at AWE)

How do you visualise investment risk?



- **It's easy to allow "long term average" to cloud actual (dollar) impact**
- **Retirees don't "eat" average returns!**

Risk exposures – investment risk

- Risk exposure differs for the provider of retirement product (e.g. an annuity and a self annuitising retiree

Aspect of investment risk	Annuity provider	Self-Annuitising Retiree
Parameter uncertainty today (e.g. wrong μ, σ, ρ)	✓✓✓	✓
Parameter uncertainty – tomorrow (i.e. wrong changes in distribution over future	✓✓✓	✓
Random outcome risk (i.e. realised return outcome in each year over retirement period - “good” or “poor”)	✓	✓✓✓

Source: Adapted from Rawlinson, M & Cater, D. (2008)

Modelling Risk

We examine strategies by considering a newly retired couple both aged 65, assumed to be in "good" health, choosing to self-annuitise and with the following initial circumstances:

–Total superannuation lump sum of $520,000 rolled over into an account-based pension

– Homeowners

– No other assets apart from their account-based pension

– Will apply for the Government age pension (based on assets test, the couple is likely to have access to substantial age pension)

Assets Test (Homeowners) 20 March 2009	For Full Pension	For No Pension
Single	$171,750	$555,750
Couple	$243,500	$882,500

Income Strategies

- Retirees need to consider spending over retirement period (aside from one-offs/short term items) inclusive of age pension
- While any number of any strategies are available, three broad approaches are:
  - decreasing “real” income;
  - increasing “real” income; and
  - flat “real” income
- There are arguments for each and each may be appropriate for particular retirees

Income Strategies (cont.)

Income Strategy	Argument For
Decreasing “real”	Highest expenditure occurs in “active” years soon after retirement (higher start level)
Increasing “real”	Higher medical /accommodation costs may occur in advanced old age (lower start level)
Flat “real”	Compromise of (1) and (2)

Income Modeling – Flat/Fixed "real"

- We assume the couple elect to receive a flat "real" income of $50,761 pa (Sept 2008 ASFA/Westpac "**comfortable**" level for couple)
  - Income reduces to 75% on first death
- "Real" here refers to income stream indexed at AWE
  - This income stream, paid up until both of couple die, is defined as
    - age pension effectively indexed at AWE
    - related discussion on whether CPI or AWE should be deflator for mandatory benefit projections

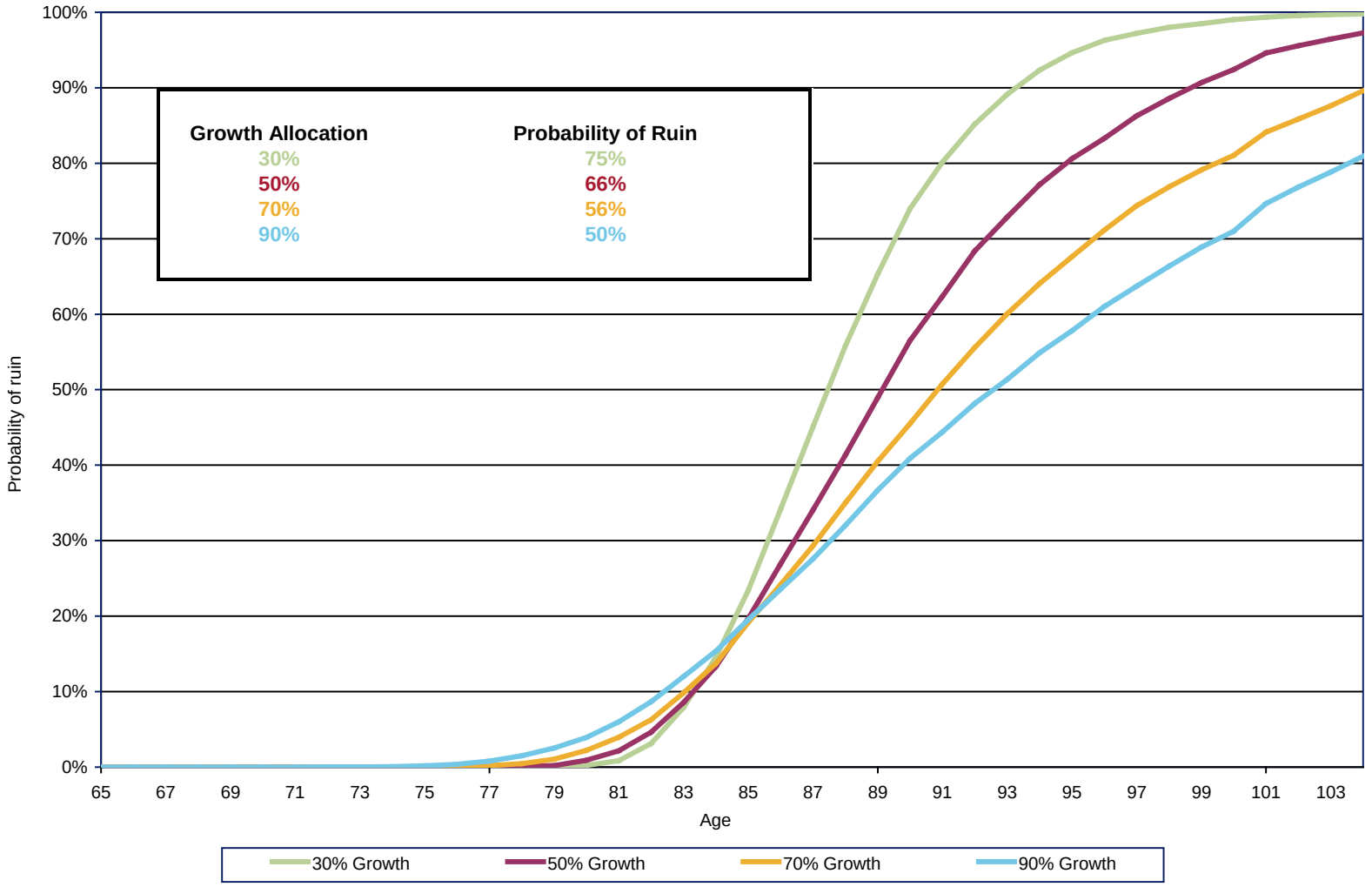
TARGET INCOME

  - IAAust working group recommended AWE (shares workforce productivity gains with retirees)

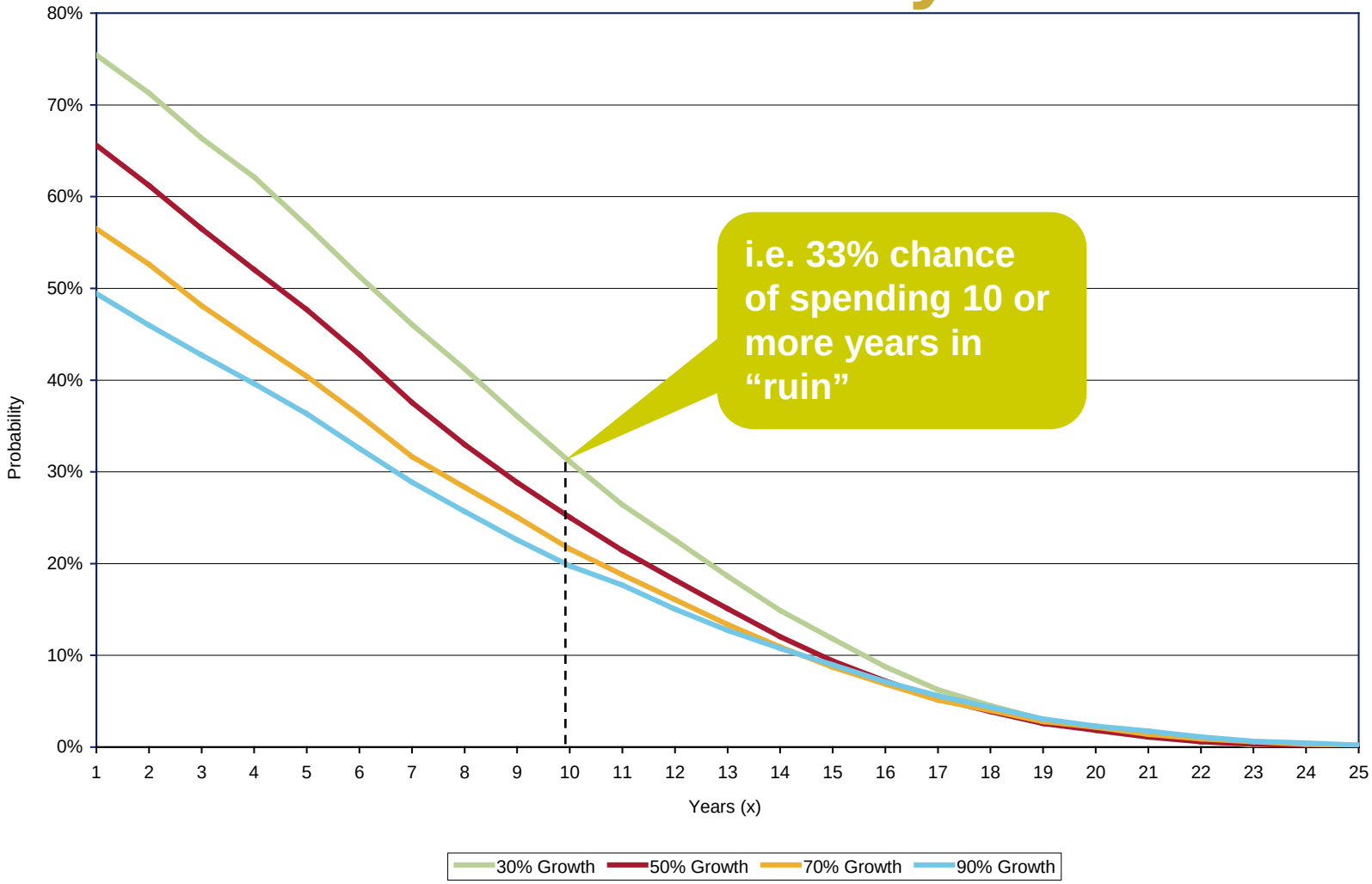
Risks and Risk Metrics

Risk	"Fixed Income" strategy	Risk Metric
Running out of money before death - "ruin"	✓	Pr (Ruin)
Income not matching target income (Prior to ruin)	✗	n/a

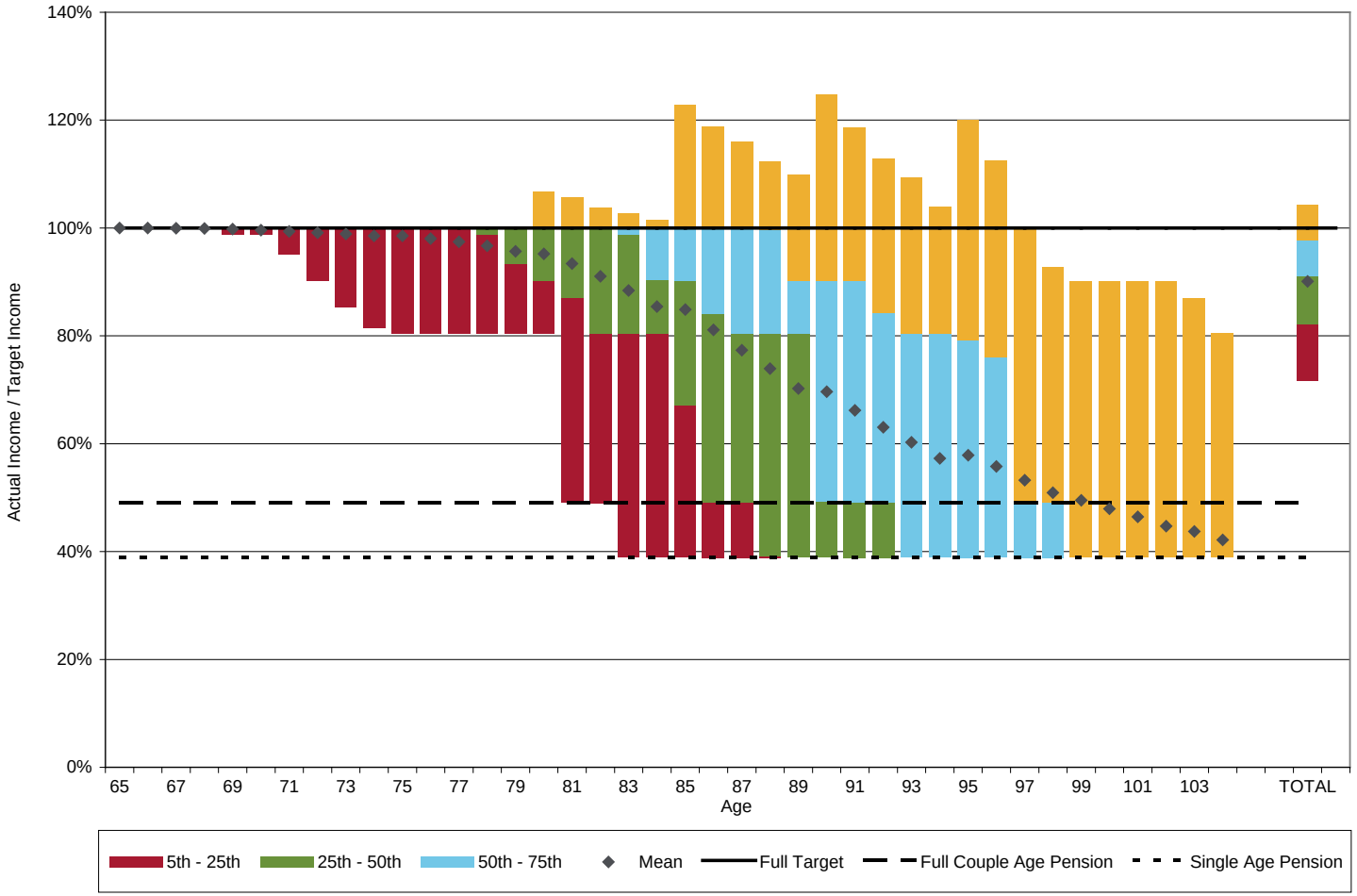
Fixed Income Risk of “Ruin"



Fixed Income Severity of "Ruin"



Fixed Income: actual / target income ratio



Reactions / observations:

- Risk levels high in absolute terms:
  - model and parameter dependent
  - main interest is in shifts/ relativities
  - “ruin” itself may not be bad – just not too much!
- Investment strategy has little impact in event of early death
  - “growth good; more growth better” conclusion must be handled with caution…
    - Retiree comfort level a consideration
    - False safety of “conservative” investment approach evident

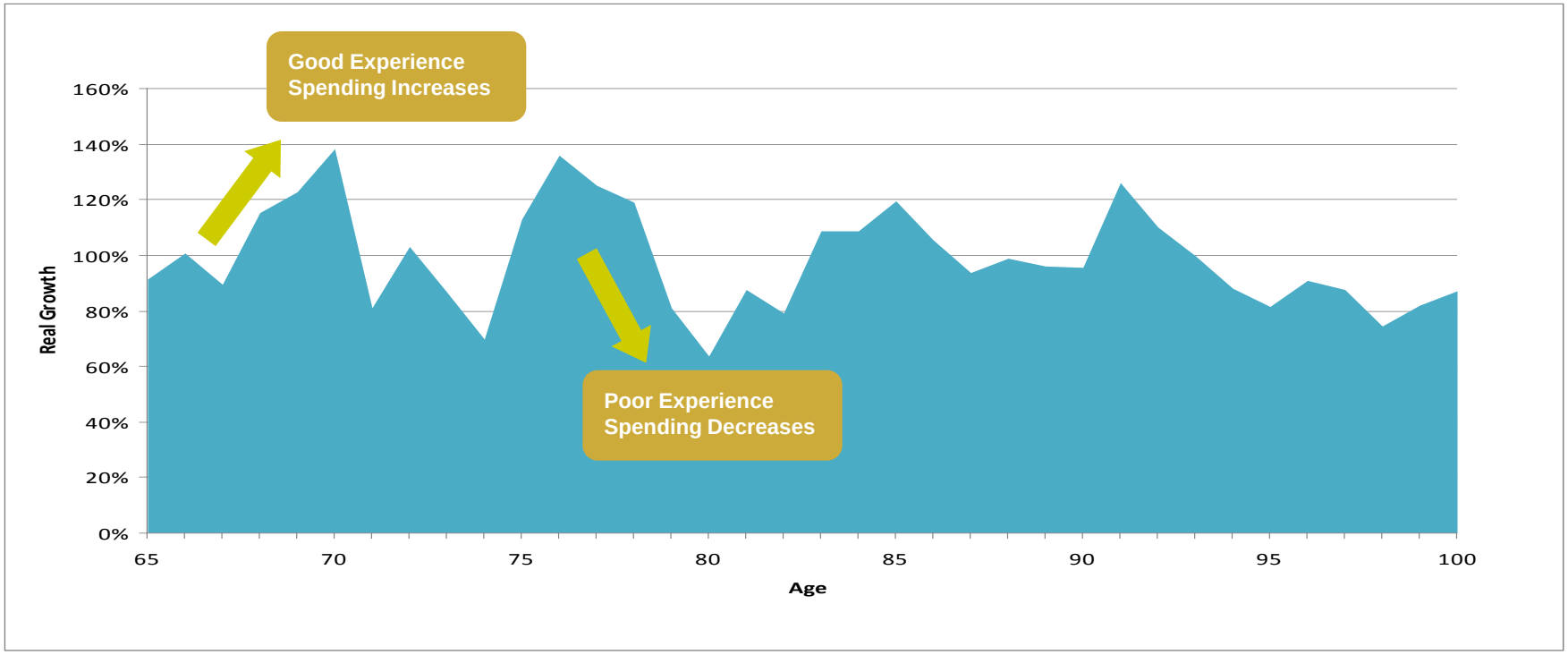
Variable Income

- Under fixed strategy, retirees:
  - maintain spending level even when “ruin” is imminent
  - do not increase spending even when account “balloons”
- Humans do not generally behave in this way
  - 1991 – 2007: evidence of “overspending”
  - Current (early 2009) environment: retirees “cutting back” spending
- Vanguard (2008 a and b) research
  - Few retirees have a formal spending program
  - “living expenses”, “rule of thumb” and “gut feel” popular
- Further insights gained by modelling:
  - unstructured retiree spending behaviour
  - spending “rules” as may be followed by some retirees / planners

Variable Income Model

Concept behind a variable income model is simple:

- Investors change their withdrawals / spending in line with the investment performance of their retirement portfolio
- Good experience allows the retiree to increase withdrawals; poor experience causes the retirees to reduce withdrawals



Behavioural Income Model

The level of spending in any year is driven (directly or indirectly) by the spending and investment return experience in the period from retirement up to the prior year. Specifically:

- in the first year of retirement retirees are assumed to draw the target level of retirement income
- each subsequent year, the (real) income drawn is adjusted based on the experience up to the prior year. The adjustment process is described by three parameters:
  - ***lookback period*** – the period (up to and including the prior year) over which the investor considers past investment return experience. For example an investor with a short horizon might consider only the experience in the one year prior. A longer horizon investor will consider 3 or 5 years, or may consider all experience back to date of retirement.
  - ***adjustment rate –*** a rate (a percentage between 0 and 100%) reflecting the willingness of the investor to adjust income based on the investment return experience over the lookback period. A 100% adjustment rate reflects "complete" flexibility in incomes, whereas a lower rate reflects more reluctance. Investors may have direct adjustment rates for upwards and downwards income adjustments.
  - ***adjustment limit*****:** the maximum percentage that the investor will vary their income from the initial (target) income. These limits reflect the maximum departure from an initial living standard that the investor is prepared to accept. Again, upwards and downwards limits may differ.

Variable income - formula in year *i* (*i* = 1,2,3…) is:

$$S_i = S_{i-1}\{1+(R_{i,I}-1)\alpha\} \text{ if } R_{i,I} \geq 1$$

$$= S_{i-1}\{(1+(R_{i,I}-1)\beta)\} \text{ if } R_{i,I} < 1$$

subject to: max of $S_0(1+U)$
min of $S_0(1-L)$

where:

$R_{i,I} = \prod_{j=I}^{i-1} \frac{G_j^a}{G_j^t}$ is the adjustment ratio over the lookback period *I*

G_j^a, G_j^t are growth factors (real value of $1) accumulated over year j at the actual and long-term mean real returns for the relevant investment strategy respectively.

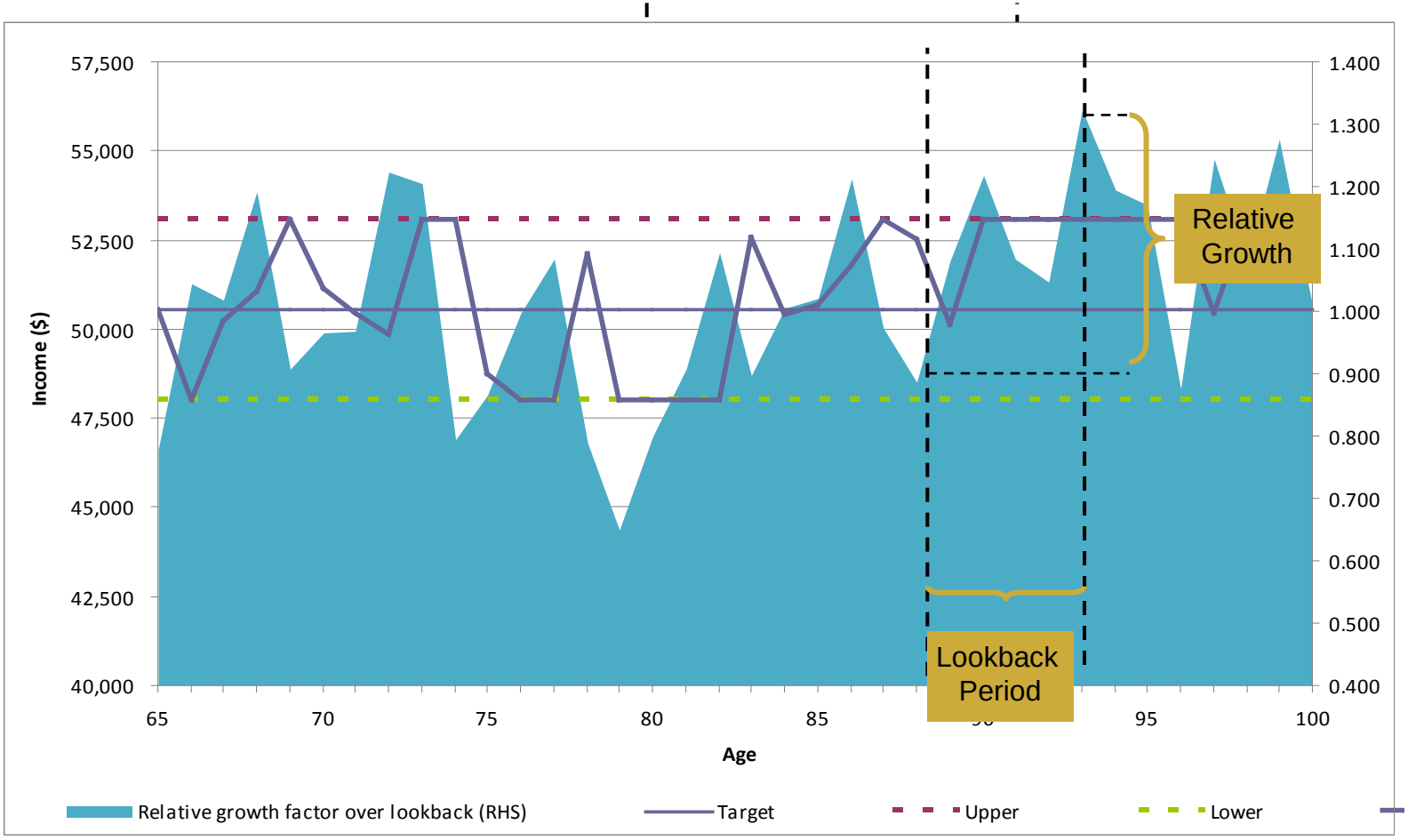
α, β are upwards and downwards adjustment rates

U, L are upper and lower adjustment limits

For $i < I$ – i.e. within the first *I* years, the adjustment factor $R_{i,I}$ is determined using the growth factors over the first *i* years rather than the lookback period.

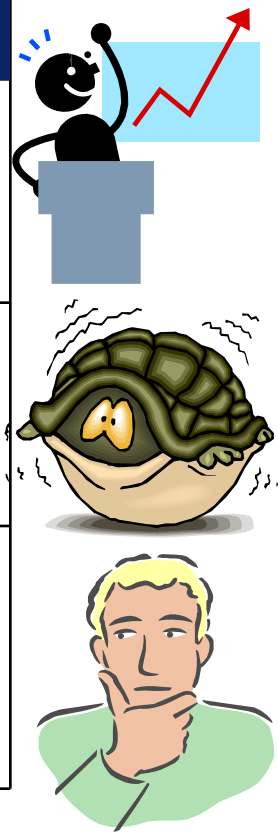
I.e. adjust last year's income by α, β % of relative growth over lookback subject to the limits.

Behavioural Income Model



Retiree Spending Profiles

Investor	Look back Period	Adjustment rates (upwards/ downwards)	Adjustment limits (upper/lower)	Description
'Aspirational'	1	100% / 40%	25% / 10%	Attuned to recent past; quick to adjust lifestyle to recent good investment experience and will take adjust fully for these; slower and more reluctant to adjust to poor experience
'Cautious'	3	100% / 100%	10% / 20%	More reflective on long term history; accepts fully adjustments resulting from either good or poor experience; however, limits adjustment to lifestyle in either direction
'Analytic'	Infinite (i.e. at all times, looks back to start of retirement period	40% / 40%	15% / 15%	Long term perspective on investment experience; slow to adjust lifestyle resulting from either good or poor experience; however, tolerant of wide deviations from target lifestyle if circumstances warrant



Account Based Spending Rules

- Minimum drawdown for account-based pension
- Fixed percentage rules – e.g. 4% of account balance (indexed to inflation?)
- "1/t" rule: draw 1/t each year where t is years until fixed age (e.g. 105)
- "$1/e^{0}_{x}$ rule": as "1/t" above, but draw based on life expectancy
- Respread account based on lifetime annuity recalculated each year

Age		Minimum
0	to 54	0%
55	to 64	4%
65	to 74	5%
75	to 79	6%
80	to 84	7%
85	to 89	9%
90	to 94	11%
95	and above	14%

Life Expectancy Spending (cont.)

We model Life expectancy (LE) spending. The key points to note about this approach are:

- Unlike behavioural income model, it does not target a specific level of income.
  - The interaction of the age pension with the variable amount drawn can produce an income higher or lower than the "target" income.
- As an example, the income in year 1 is calculated as follows:

Husband's drawdown = 390,000 / 22

\+ Wife's drawdown = 130,000 / 25

\+ Age pension = 14,119 (with the Assets Test applying in this case)

- This gives an income of year 1 of around $37,000 compared to our target of $50,561.
- On the other hand, this approach delivers a higher income at advanced ages (as life expectancy approaches zero)

Risks and Risk Metrics

Risk	"Fixed Income" strategy	Variable Income strategies	"Risk" Metric
Running out of money before death - "ruin"	✓	✓	Pr (Ruin)
Income not matching target income	✗	✓	Goodness of Fit

Goodness of Fit

$$\text{Goodness of fit} = 1 - \sqrt{\frac{\sum_i (\text{shortfall}_i)^2}{\sum_i (\text{target}_i - \text{max age pension}_i)^2}}$$

where target_i is the target income in year i, shortfall_i is the shortfall of actual to target income in year i, and the sum is over all years up to death of both retirees.

The goodness of fit measure:

- lies between 0 and 1; 1 for perfect fit to target income; = 0 for no income (so that income = max age pension at all times)

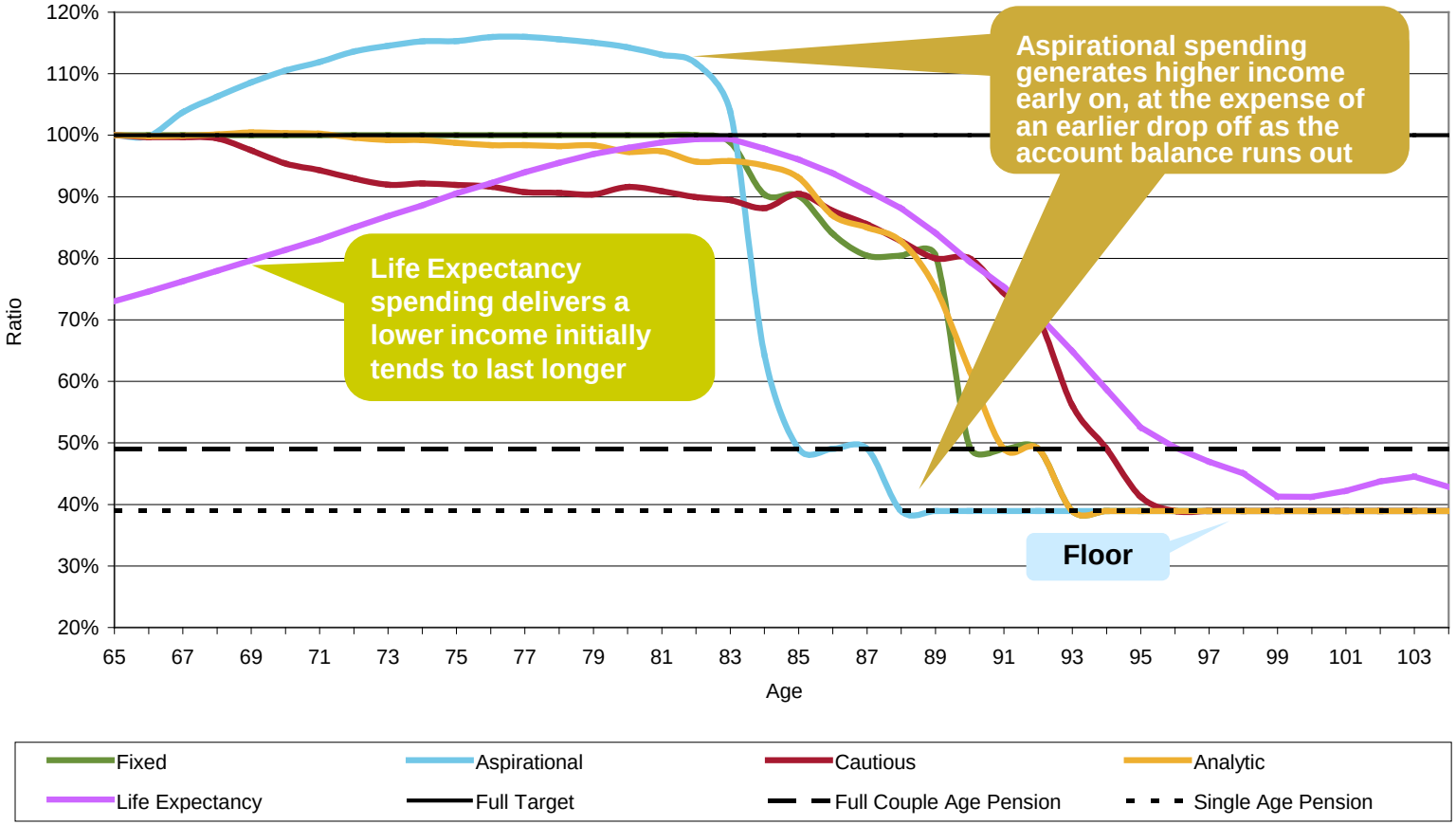
- reflects retiree's presumed risk aversion, in the sense that for the same aggregate income shortfall, smaller, more frequent shortfalls are favoured relative to larger, less frequent ones

Intuitively, the goodness of fit measure can be regarded as the "average" proportion of target income in excess of age pension delivered allowing for downside (but not upside).

Note that even a "fixed" income approach does not however achieve a perfect goodness of fit score, due to the shortfall arising when retirees run out of money before death.

Variable Income: Actual Target Income

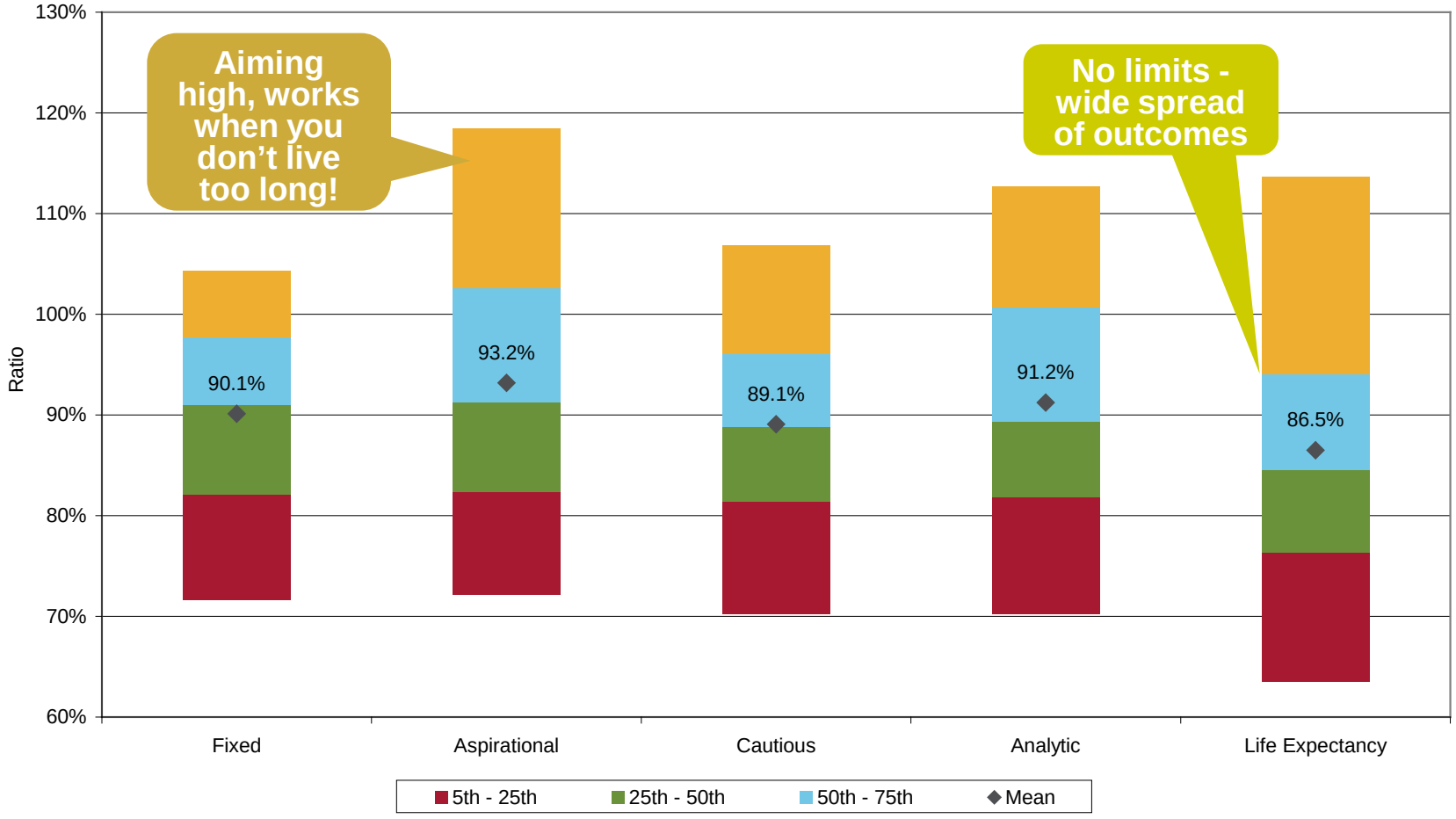
70% growth



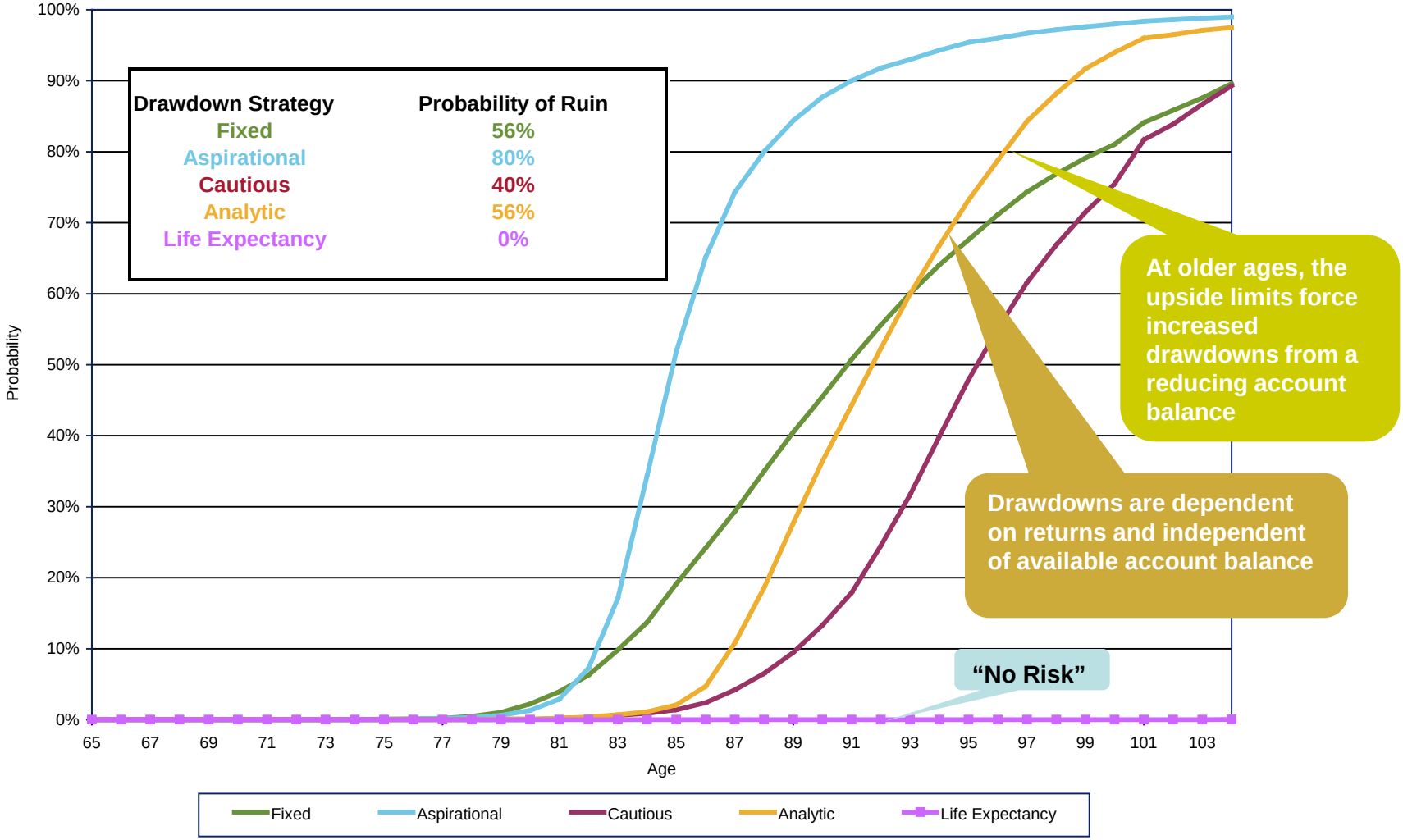
Variable Income:

Aggregate Actual / Target Income

70% Growth



Variable income: Probability of Ruin



Results Summary

Investment Mix (growth %)	Spending Behaviour	Average Aggregate Income	Pr(Ruin)	Median Goodness of Fit Index*
30%	**Fixed**	1,092,000	76%	51%
	Aspirational	1,114,000	89%	41%
	Cautious	1,087,000	68%	53%
	Analytic	**1,121,000**	76%	51%
	Life Expectancy	1,027,000	**0%**	**55%**
50%	**Fixed**	1,113,000	67%	55%
	Aspirational	**1,168,000**	85%	45%
	Cautious	1,107,000	54%	58%
	Analytic	1,154,000	66%	56%
	Life Expectancy	1,078,000	**0%**	**59%**
70%	**Fixed**	1,174,000	56%	67%
	Aspirational	**1,205,000**	80%	47%
	Cautious	1,165,000	40%	66%
	Analytic	1,189,000	56%	62%
	Life Expectancy	1,138,000	**0%**	63%
90%	**Fixed**	1,180,000	53%	**70%**
	Aspirational	**1,245,000**	74%	50%
	Cautious	1,173,000	38%	68%
	Analytic	1,229,000	47%	68%
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Aspirational generally delivers higher incomes, LE lowest

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Significant risk reduction from cautious approach

LE = "No Risk"

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Cautious still provides similar fit to other more risky approaches

Aspirational consistently "fails" due to high adjustment limits and higher risk of ruin

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Consistent results across growth mixes

Observations

- Flexibility in income can “absorb” variability in returns
  - more palatable if retiree commits in advance to flexible spending pattern and accepts consequences of poor (and good) returns
- Investment strategy robust to variable spending rules
- Can behavioural modelling be used to show benefit of good /dangers of bad spending patterns?
- Retirees unlikely to obey any spending rules ?

The Rediscovery of the Age Pension

- Typical scenario:
  - asset test applies early on where retiree asset are ‘large’
  - Income test applies from about 10 years post-retirement
- Income test buffer effect reduces ruin risk

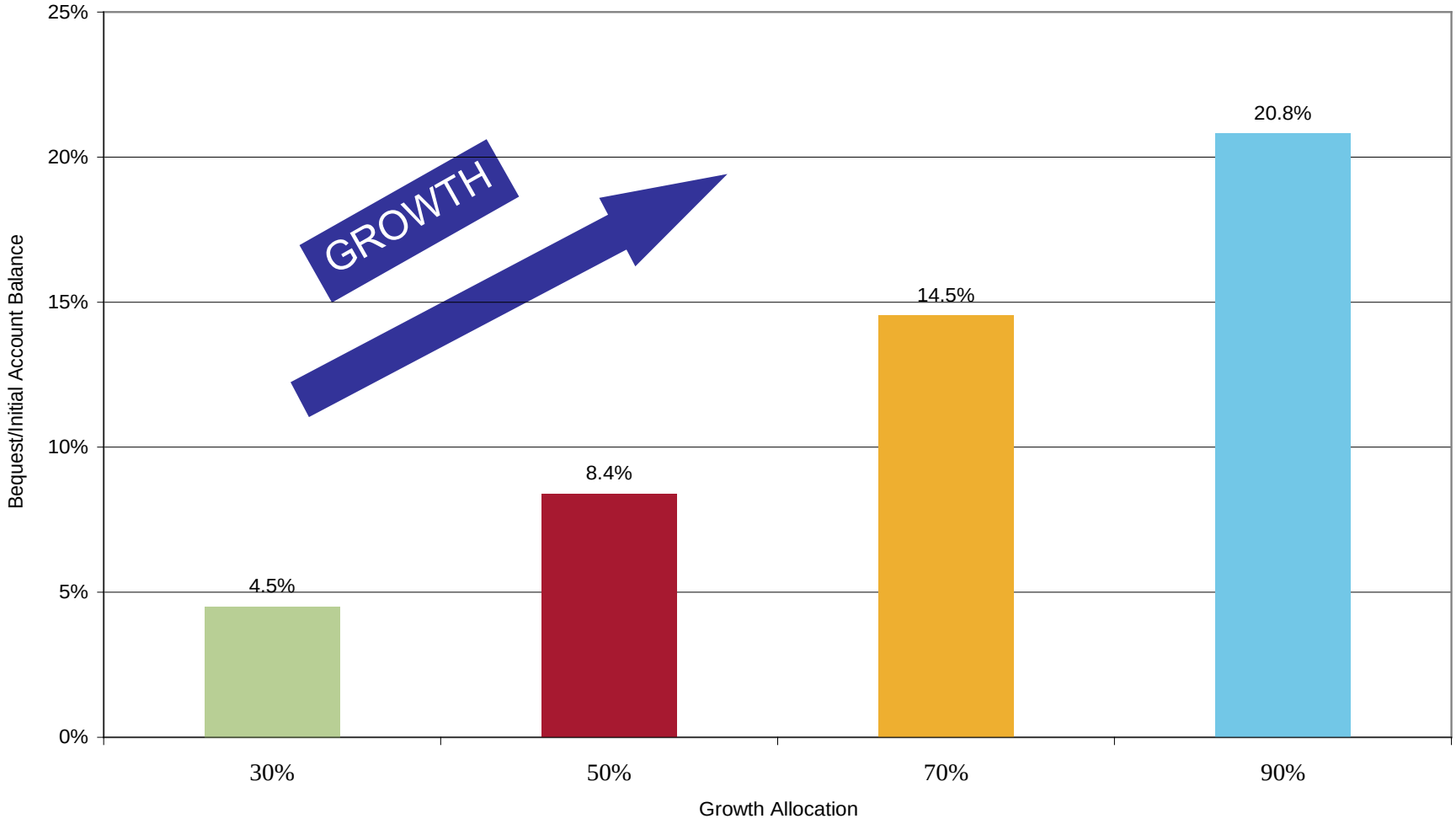
	Target income	Drawdown	Age Pension
Base	50,000	39,723	10,277
Downside	45,000	31,389	13,611
	(-10%)	- 8,333 (-21%)	3,333 (+32%)

- Age pension = negative/ uncorrelated, lifetime, inflation-protected asset
  - Allows retirees to pursue more aggressive investment/spending strategies

Inheritance Prospects

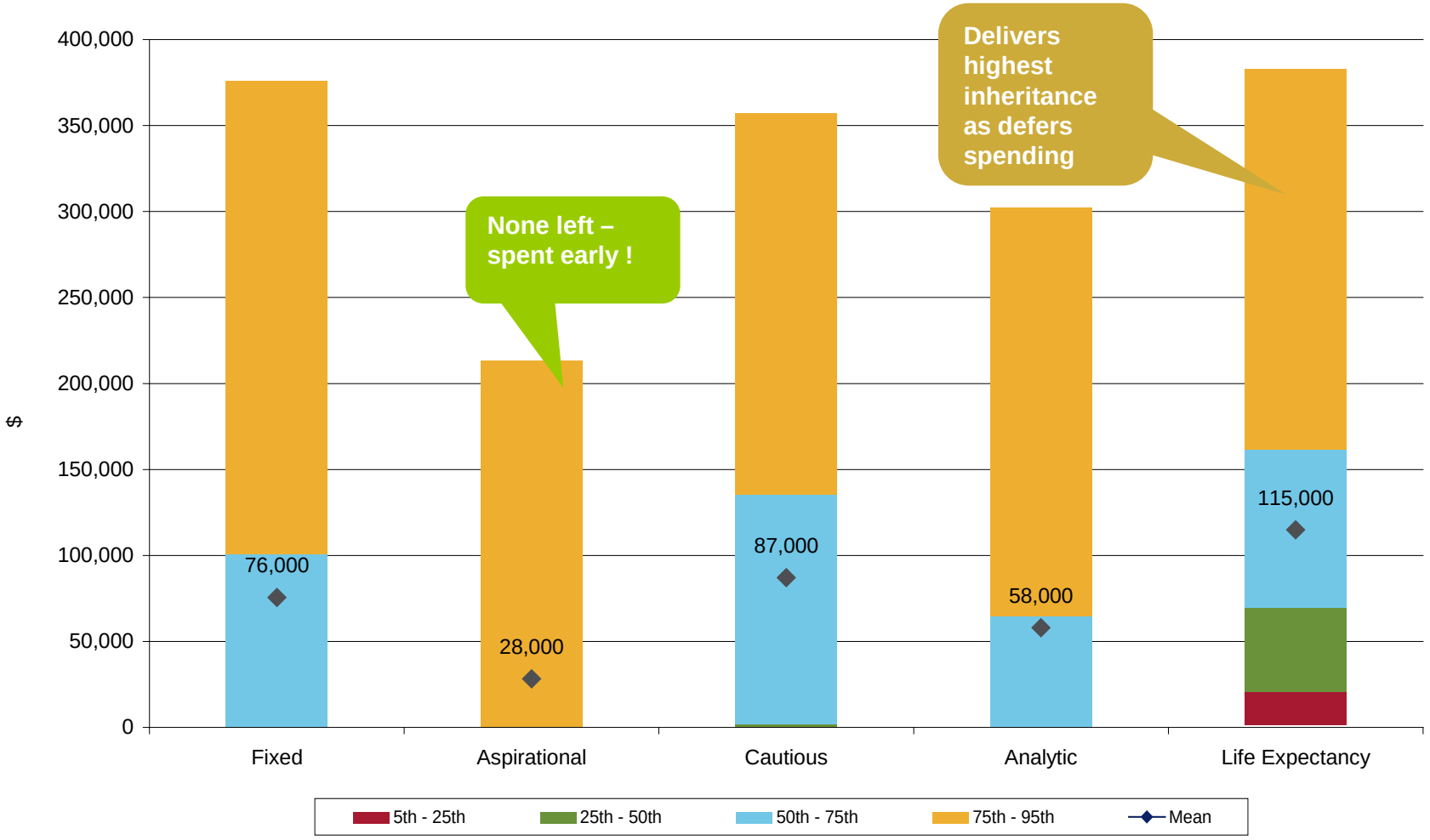
- Retirees may have a bequest objective as part of their financial plan
- Arguably, a collective shift away from this due to:
  - general community move away from intergenerational sharing of wealth
  - Increased longevity – less money to hand on
  - Greater well being in old age: more uses for wealth
- Policy perspective: assets left behind *waste* scarce tax concessions intended for retirement enjoyment

Growth Allocation reduces “risk” of inheritance



Real Inheritance Amounts

70% Growth



Why not annuitise?

- Framing hypothesis (Brown et al, 2008)
  1. Consumption frame: focus on end result of investment - consumption
  2. Investment frame: focus on investment characteristics
- Applied to annuity:
  1. " can spend $x per month for life. When you die, no more payments"
  2. " your investment earns $x per month until you die. Can withdraw earnings only, not investment. When you die, investment is worth nothing."
- Research results: 72% of respondents (aged over 50) preferred annuity in consumption frame; 21% in investment frame.

Discussion / Questions

- Please use the microphone !

Appendix 1: Mortality Assumptions

- Base Mortality: ABS Life Tables, Australia 2005-2007
- Socio-economic status (SES) allowance: 75% of base rates at age 60 rising to 95% of table at age 100 and over
- Mortality Improvement: 25-year improvement factors in Australian Life Tables 2000 -02 (Australian Government Actuary)

Appendix 2: Asset Model

Watson Wyatt Global Asset Model as at 31 December 2008.

Summary statistics for the portfolios included in this presentation:

Asset class	Year 1		Year 10		10-year annualized	
	Arithmetic average	Standard deviation	Arithmetic average	Standard deviation	Median	Standard deviation
Consumer Price Inflation (CPI)	1.0%	1.5%	2.5%	1.7%	2.1%	0.8%
Average Weekly Earnings (AWE)	2.5%	1.9%	4.1%	2.6%	3.6%	1.5%
30% Growth	5.8%	7.1%	6.9%	4.6%	6.3%	1.5%
50% Growth	6.8%	11.4%	7.7%	6.9%	7.0%	2.4%
70% Growth	7.8%	15.8%	8.5%	9.4%	7.6%	3.4%
90% Growth	8.8%	20.2%	9.3%	12.0%	8.2%	4.3%

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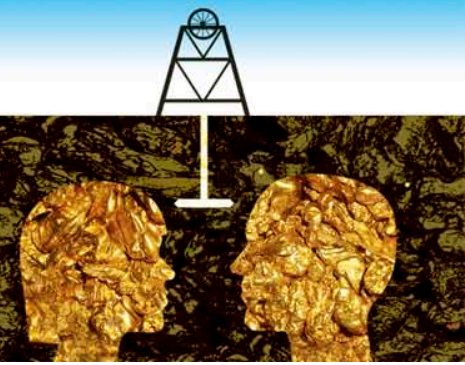

Thanks

- While I am listed as author and presenter, there are many hands involved in this piece of work
- Many thanks to:
  - Hadas Danziger and Jeff Chee for their input into all parts of this presentation, in particular the modelling challenges
  - Marina Vairo and Priscilla Blanche for numerous drafts
  - David McNeice for a thorough peer review