

Retirement income, longevity risk and the state pension in Australia

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Introduction

- Many papers consider optimal retirement consumption, asset allocation and product allocation.
- This is a complex problem involving
 - Investment risk
 - Investor's level of risk aversion and time preferences
 - Longevity risk
- Differ in the type of assets and annuities, preferences of the retiree, and whether asset returns, interest rates and longevity are stochastic or not.

Literature: optimal annuitisation

Yaari 1965	Purchased life annuity (PLA) immediately
Merton 1983	PLA at 65 or wait till 85, don't PLA in interim
Milevsky 1998	PLA when mortality drag \geq equity risk premium
Kapur Orszag 1999	Gradual PLA with full annuity when mortality drag \geq equity risk premium
Milevsky Young 2002	Income draw-down (ELID) up to T then switch to PLA. ELID before T includes optimized asset mix. T depends on risk aversion and model parameters.
Blake et al 2003	Switch to PLA at a stochastic stopping time T. ELID before T includes optimized static asset mix. T depends on risk aversion and bequest utility.

Literature: mixing and switching

- Horneff et al 2006 Quantify the costs of gradual, partial and complete switching to annuities
- Horneff et al 2007 Compare draw-down strategies with part PLA at 65. Find part annuity with draw-down increases utility 25-50% for low-med risk averse vs full PLA
- Bateman Thorp 2008 Compare similar rules in the Australian context; find welfare is lower for legislated min draw-down rules vs. optimal path or a fixed % rule
- Milevsky Haung 2011 Closed form solution for optimal draw-down given longevity risk - consume in proportion to survival probability, adjust up for pension income.

Literature

- If the retiree can invest in a risky asset, partial annuitisation seems preferable to full annuitisation
- Factors affecting the optimal timing of annuitisation and optimal draw-down path include: investment risk, investor's risk aversion and time preferences
- No papers look at the impact of state pension on the optimal draw-down and annuitisation decision

This paper

- No past work explicitly considers how access to a state pension affects the optimal consumption strategy
- How the state pension affects optimal consumption is important in Australia as 80% of retirees receive a pension
- State pension provides *longevity protection* but requires supplementary consumption to provide adequate income
- **What is the optimal way to draw-down DC savings and annuitise in Australia, allowing for state pension entitlements?**

Model: draw-down and asset balance

- Three scenarios
 - Full annuitisation at age 65 (benchmark against which other programmes are compared)
 - 50% annuitisation at age 65, 50% assets in a DC fund, draw-down by 1 of 4 rules
 - 100% assets in DC fund, draw-down by 1 of 4 rules
- Compare with and without adjusting for the state pension

Model

- We simplify the problem by assuming a fixed real rate of return of 3% per annum
- Focus on longevity risk, using ALT 2009-2011
- Compute the expected lifetime utility from total of: ***draw-down + annuity income + state pension***
- Calculate utility for many levels of risk aversion
- Transform utility into an equivalent nominal annuity income stream for life (CEC) that can be compared to a nominal life annuity benchmark

Model: utility function

- Individual utility is given by

$$U = \sum_{t=0}^T p(65, t) \beta^t \frac{C_t^{1-\gamma}}{1-\gamma} + p(65, t-1) q(65+t) V(b_t)$$

- CRRA utility function, with γ between 0.5 and 7
- Utility from bequest is where $V(b_t) = \theta b_t$ is a constant related to the individual's level of risk aversion
- Kopczuk and Lupton (2006) calibrate θ as $23.8^{-\gamma}$
- Translate the utility value into equivalent nominal annuity for life (CEC) to compare to the annuity

Model: draw-down

Draw-down is calculated from one of the following rules:

1. The legislated minimum drawdown requirements for account based pensions
2. A fixed percentage (6%) of the outstanding account balance is withdrawn each period
3. A $1/T$ rule where the annual withdrawal is $1/T$; where $T = 109 - (x+t)$ is the number of years from current age to the oldest age (109) in the mortality table
4. A $1/e(x + t)$ rule; where $e(x + t)$ is expected number of years of life remaining at current age.

Model: draw-down

- Also calculate the pattern of draw-downs that optimises utility for retirees with different levels of starting wealth levels and risk aversion.
- This is done by choosing the path of C that maximises

$$U = \sum_{t=0}^T p(65, t) \beta^t \frac{C_t^{1-\gamma}}{1-\gamma} + p(65, t-1) q(65+t) V(b_t)$$

Draw-down rates: females

Age	Strategy			
	1	2	3	4
65	5.00%	6%	2.27%	4.55%
70	5.00%	6%	2.56%	5.62%
75	6.00%	6%	2.94%	7.25%
80	7.00%	6%	3.45%	9.80%
85	9.00%	6%	4.17%	13.89%
90	11.00%	6%	5.26%	20.41%
95	14.00%	6%	7.14%	28.57%
100	14.00%	6%	11.11%	37.04%
105	14.00%	6%	25.00%	0.00%
109	14.00%	6%	0.00%	0.00%

Model: annuity

- Specify life annuity purchase at age 65 with 50% or 100% of Super Account Balance
- Annuity rates are calculated on an actuarially fair basis. If interest is 3% p.a., \$1 p.a. mid-year for the rest of life costs a female \$15.61 upfront (and would cost an Australian male \$13.96 upfront)

Model: State pension entitlement

- Assets test thresholds at 1 July 2012 are:
 - \$192,500 / \$731,500 for a single home owner,
 - \$273,000 / \$1,086,000 for home owner couples,
 - \$332,000/ \$871,000 for non-home owner singles, and
 - \$412,500 / \$1,225,500 for non-home owner couples.
- Full pension at 1 July 2012 is \$733.70/fortnight for singles, and \$553.10/fortnight p.p. in a couple. The pension is reduced by \$1.50/fortnight per \$1,000 assets over the min threshold.
- Thresholds and pension amount are indexed, but we project in real dollars so don't index pension thresholds or amount.

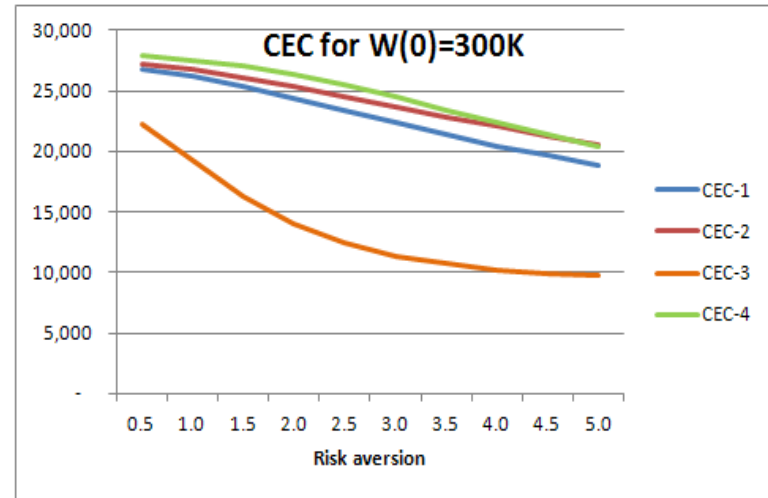
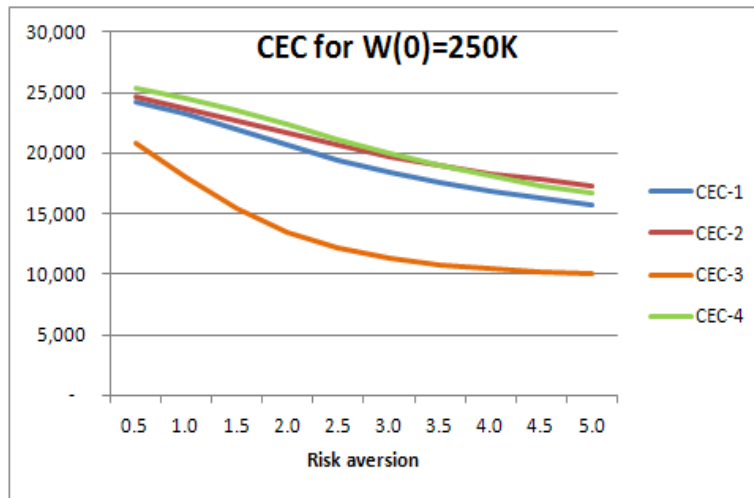
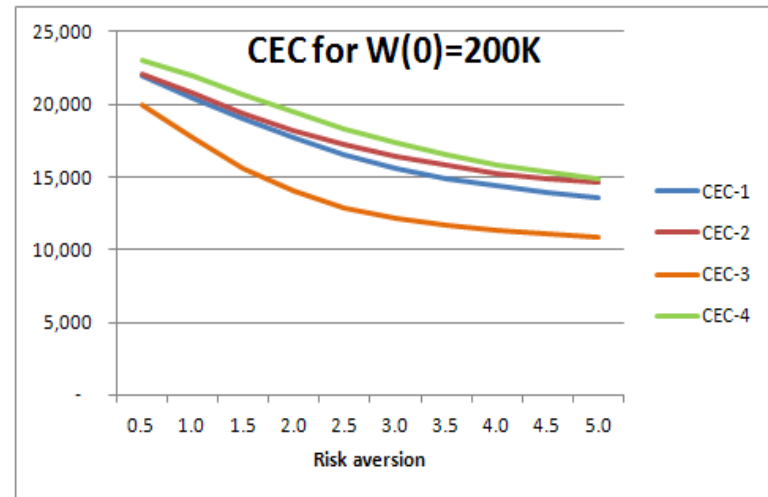
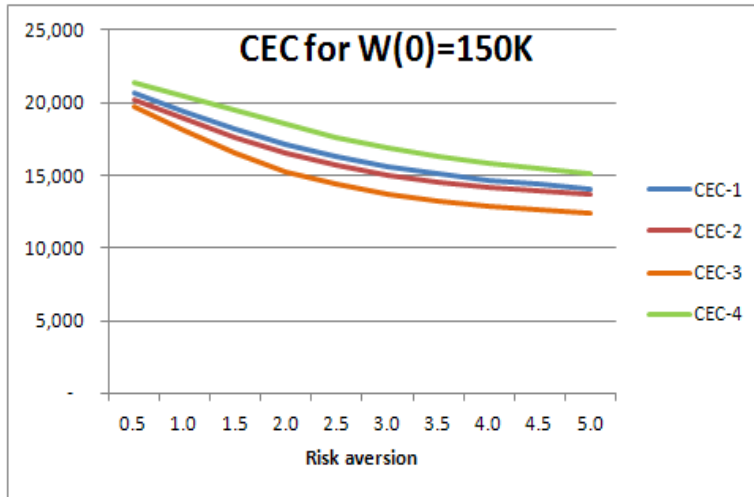
Steps

1. Start from super account balance at 65: $b(0)$
2. For any annuity purchased, deduct purchase price from $b(0)$ and add $\$A$ p.a. to each years future consumption
3. Calculate state pension $P(t)$ by comparing account balance plus deemed annuity assets to thresholds
4. Calculate consumption: $C(t)=\max(\text{draw-down} + A, P(t))$
5. Update a/c balance: $b(t+1)=(1+Int)*[b(t)-C(t)+P(t)]$
6. Compute the expected lifetime utility of consumption
7. Transform this utility level into a CEC value

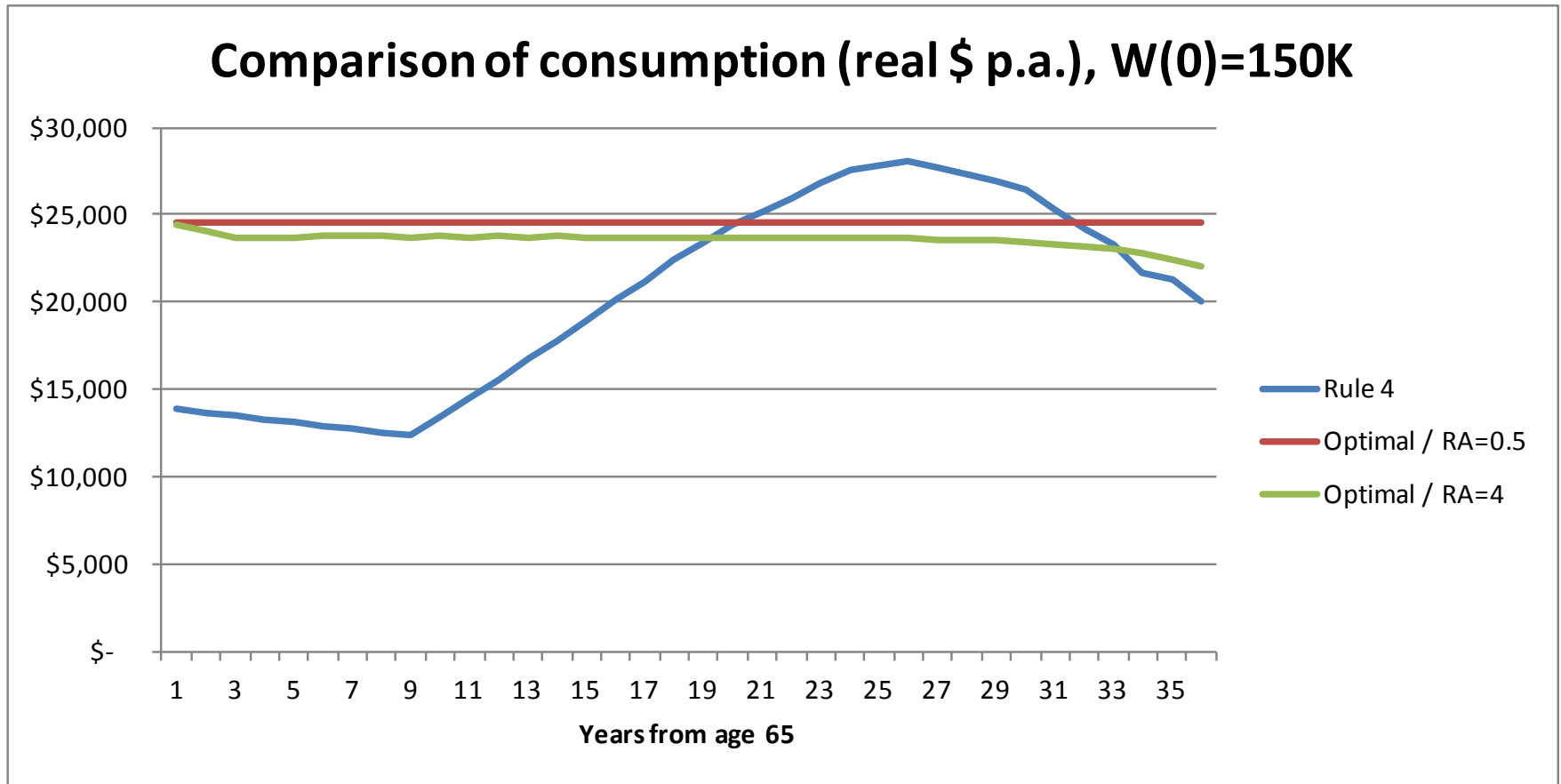
Results: CEC for standard draw-down

Wealth	Rule	0.5	1	1.5	2	2.5	3	3.5	4
\$150,000	1	20,619	19,378	18,197	17,153	16,287	15,600	15,068	14,659
	2	20,246	18,869	17,602	16,528	15,674	15,024	14,541	14,185
	3	19,711	18,026	16,510	15,277	14,343	13,664	13,179	12,830
	4	21,427	20,426	19,425	18,482	17,643	16,928	16,337	15,856
\$200,000	1	21,924	20,472	19,006	17,656	16,511	15,596	14,889	14,350
	2	22,051	20,724	19,411	18,216	17,204	16,392	15,763	15,280
	3	20,004	17,675	15,607	14,011	12,889	12,134	11,631	11,293
	4	23,056	21,922	20,699	19,474	18,335	17,339	16,507	15,832
\$250,000	1	24,295	23,169	21,923	20,649	19,447	18,390	17,508	16,796
	2	24,629	23,693	22,671	21,626	20,627	19,727	18,955	18,314
	3	20,822	17,996	15,437	13,494	12,177	11,326	10,777	10,417
	4	25,385	24,514	23,481	22,333	21,145	20,001	18,967	18,070

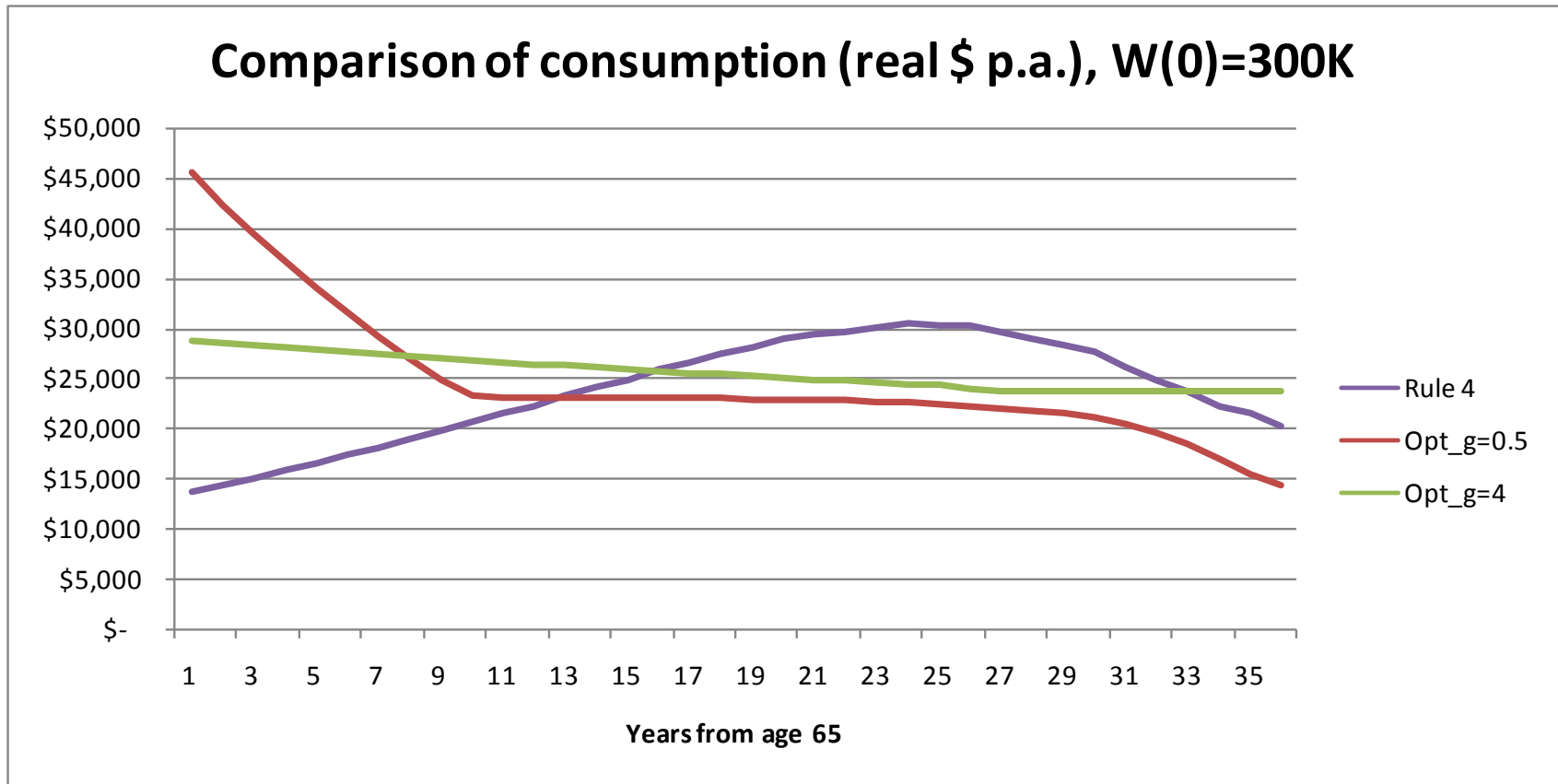
Results: CEC for standard draw-down



Results: CEC for optimal draw-down



Results: CEC for optimal draw-down



Results: change in utility from optimal

- Adopting the optimal path increases utility more if retiree is very risk averse

Wealth	Rule	Risk aversion							
		0.5	1	1.5	2	2.5	3	3.5	4
\$150,000	1	12.0%	11.7%	3.0%	15.9%	30.0%	43.6%	55.6%	65.6%
\$200,000	2	14.3%	13.1%	5.7%	21.6%	38.7%	54.6%	67.7%	77.7%
\$250,000	3	14.3%	12.4%	4.6%	19.4%	36.4%	53.3%	68.0%	78.7%
\$300,000	4	13.7%	11.3%	2.4%	14.5%	29.9%	47.3%	65.0%	80.7%

Results: change in utility from annuitising

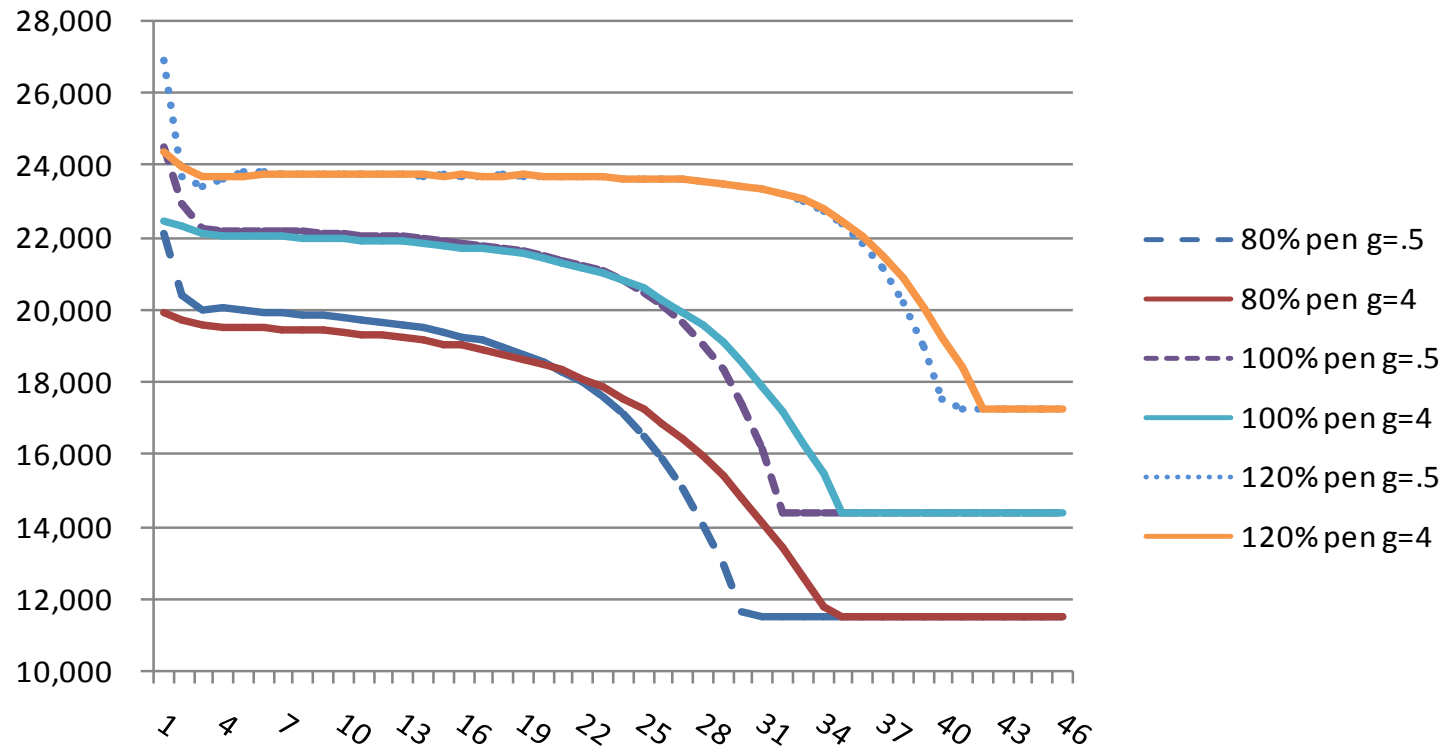
	Risk aversion							
Starting wealth: \$150,000	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
50% annuitisation & Rule 1	6.6%	6.0%	10.7%	23.9%	37.3%	49.4%	59.5%	67.7%
50% annuitisation & Rule 2	7.4%	6.8%	12.0%	26.3%	40.3%	52.4%	62.3%	70.0%
50% annuitisation & Rule 3	8.9%	8.6%	14.8%	31.9%	47.8%	60.8%	70.6%	77.9%
50% annuitisation & Rule 4	4.8%	4.3%	8.0%	18.5%	30.1%	41.4%	51.6%	60.4%
0% annuitise / switch to optimal from best of 1-4	12.0%	11.7%	3.0%	15.9%	30.0%	43.6%	55.6%	65.6%

Results: change in utility from annuitising

	Risk aversion							
Starting wealth: \$200,000	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
50% annuitisation & Rule 1	6.4%	6.0%	11.4%	25.9%	40.8%	54.2%	64.9%	73.2%
50% annuitisation & Rule 2	5.8%	5.3%	10.0%	22.7%	35.9%	48.0%	58.0%	66.1%
50% annuitisation & Rule 3	11.1%	11.2%	19.3%	40.5%	58.4%	71.5%	80.3%	86.3%
50% annuitisation & Rule 4	4.3%	4.0%	8.0%	19.3%	32.2%	45.0%	56.3%	65.7%
0% annuitise / switch to optimal from best of 1-4	14.3%	13.1%	5.7%	21.6%	38.7%	54.6%	67.7%	77.7%

Results: Changing the state pension

Comparison of consumption (real \$ p.a.), $W(0)=150K$



Results

- Decreasing draw-down in line with survival probability delivers highest utility in many cases, as predicted by Milevsky and Huang 2011
- The second best strategy is to draw-down in line with remaining life expectancy each year
- For the average retiree, allowing for state pension entitlement can affect the choice of draw-down and how to annuitise
- Optimal level of annuitisation depends upon the draw-down strategy and whether or not pension entitlements are taken into account

Results

- The optimal programme depends on
 - Retiree's risk appetite: high risk appetite makes high upfront withdrawal attractive, especially when there is a state pension
 - Retiree's time preference: higher SDR makes front loading strategies more attractive
- The cost of adopting a suboptimal draw-down strategy exceeds the cost of annuitizing too much
- 100% annuitisation is rarely optimal; partial annuitisation is preferable to full annuitisation.

Extensions

- Incorporate pension income test
 - Might reduce attractiveness of annuities relative to draw-down
- Solve for optimal level of annuitisation (rather than 0%, 50% and 100%)
- Include deferred annuity option
 - Retirees with lower risk aversion will postpone annuitizing wealth.
 - E.g. Deferring annuitisation from age 65 to age 80 delivers utility gains of 11% (Horneff et al 2008).

Questions

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