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# Optimal decisions in retirement planning

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(co-authored by Luke Strickland)

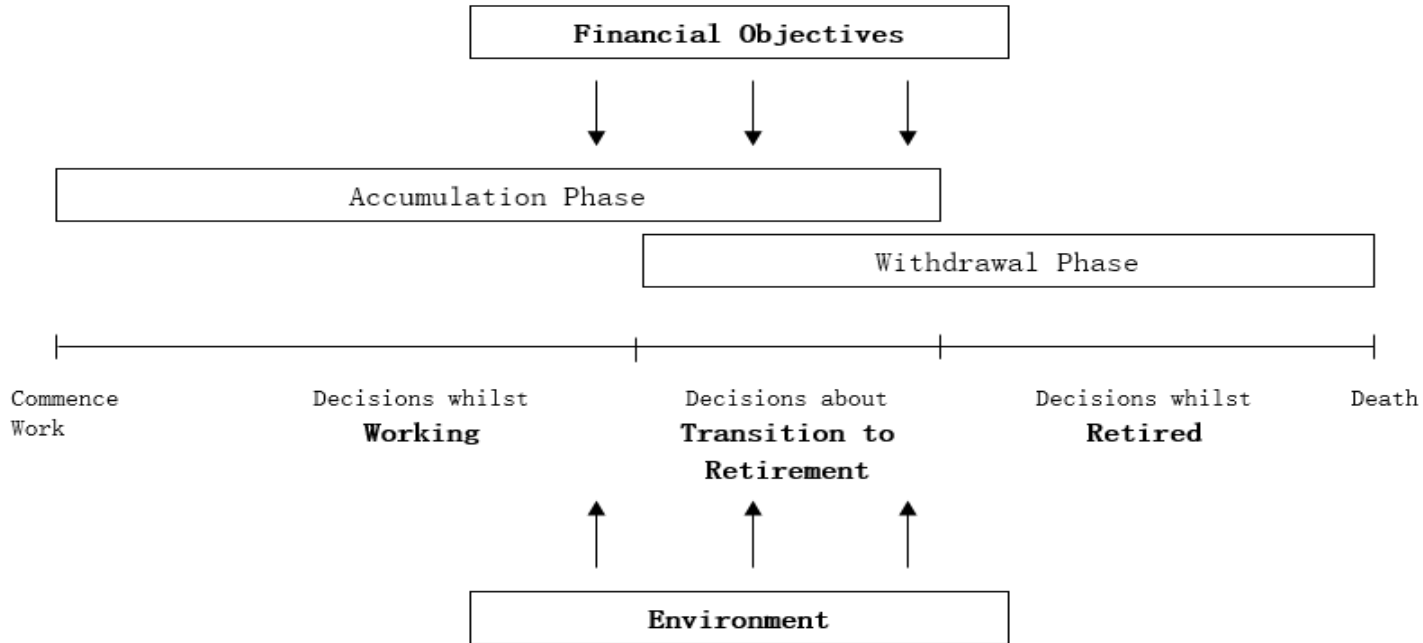
Presented at CSIRO RiskLab Seminar Series

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# Agenda

- Introduction to lifetime financial modelling
  - Control variables
  - Utility theory
- Our basic model
  - The effect of taxation
  - The effect of age pension
- Next steps

# A model of financial decision making



# Control Variables

- An individual has control of the following:
  - Asset allocation
  - Amounts to consume and save (given an income)
  - When and how to retire
  - Home purchase and sale
  - Etc.
- We will be focussing on the first two in this presentation

# A (very) brief introduction to stochastic dynamic programming

- Financial objective ( $V$ ) expressed as a function of **control variables** and **stochastic assumptions**
- The expectation of the financial objective ( $E[V]$ ) is maximized/minimized by selection of decision variables
- Decision making is initially undertaken at the maximum age (109) across relevant **state variables** and then recursively for younger ages until age 25

# Example – Constant Relative Risk Aversion

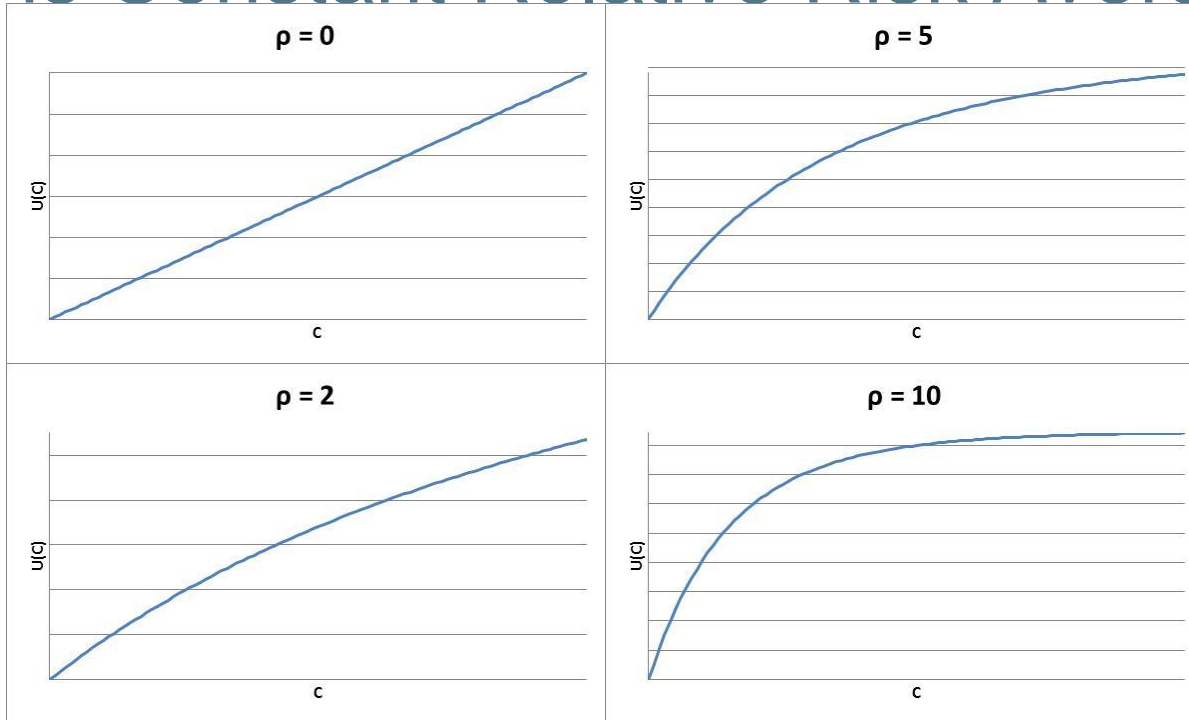
Age 110 (final year)

$$V_{110} = 0$$

Age  $x < 110$

$$V_x = \max \left[ E_x \left[ \frac{(C_x)^{1-\rho}}{1-\rho} \left( 1 - \frac{q_x}{2} \right) + E_x [V_{x+1}] (1 - q_x) \right] \right]$$

# What is Constant Relative Risk Aversion?



# Basic Model Assumptions

- Investment: Equity (ASX200) as risky asset and Government Bonds as defensive asset
- Age Pension and Taxation: Rules as they stand (including changes already announced).
- Individuals retire at age 65, earn \$85,000 pre-tax income, get access to pension at age 65
- The only retirement product considered is account based pensions
- Health states, mortality improvements are not allowed for
- No allowances for home ownership, bequests, family status

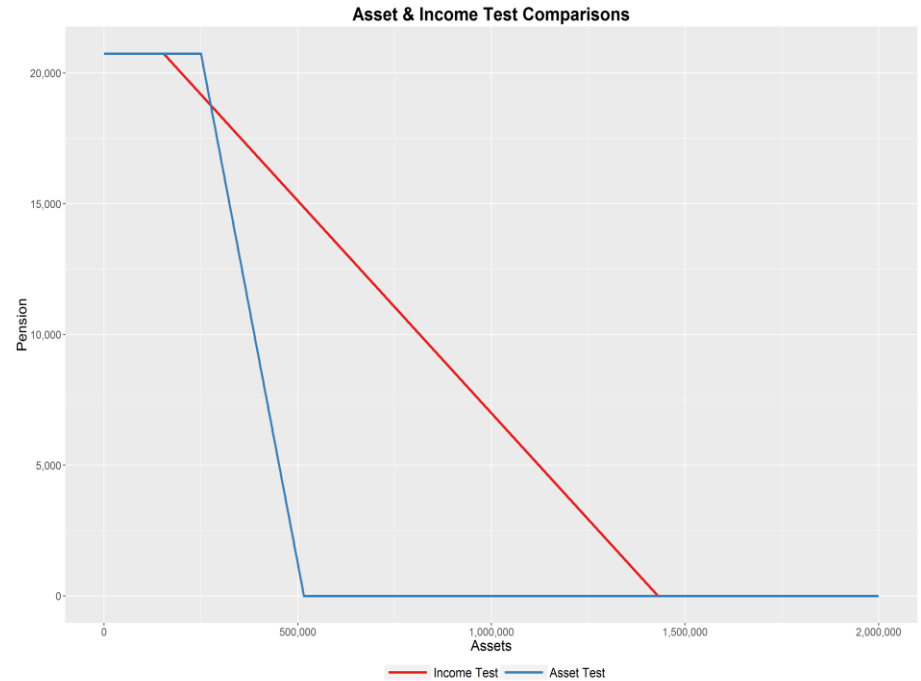


# Taxation Rules

- Income tax (including 2% Medicare levy)
- Concessional tax on super contributions and returns
- Concessional Contribution limits
- \$1.6m pension cap
- Minimum withdrawal limits

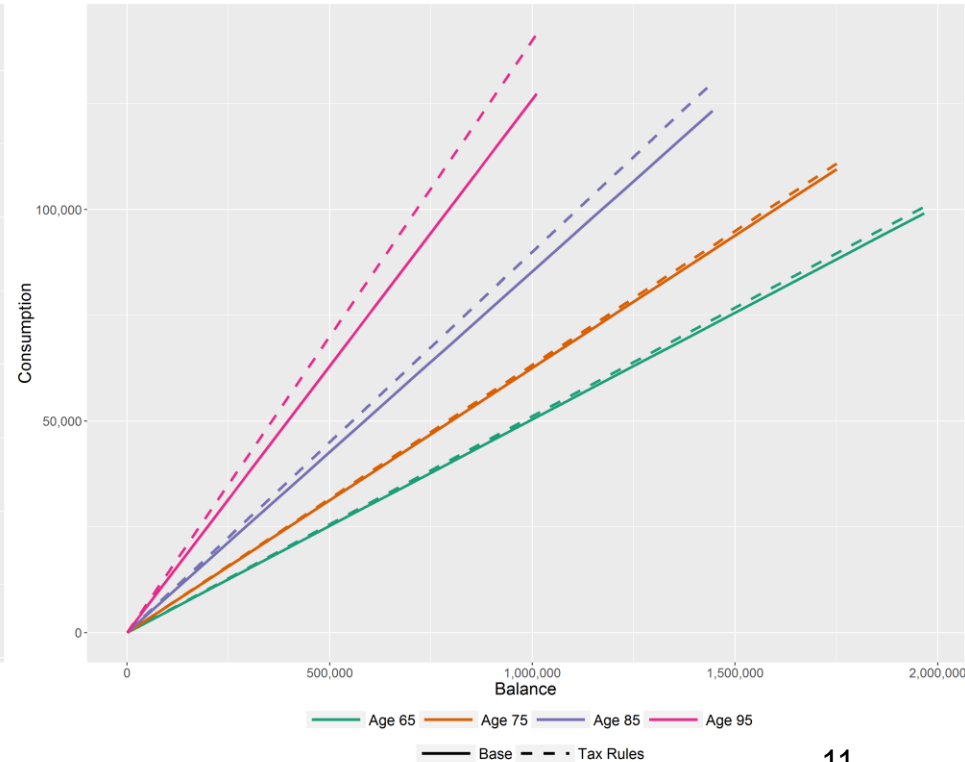
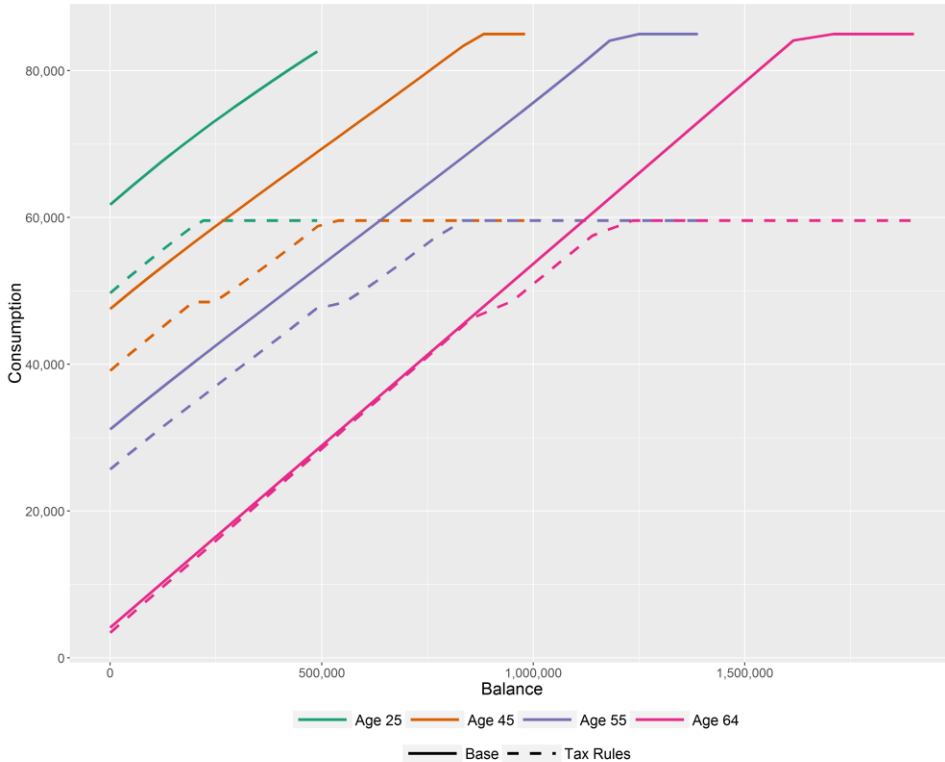
# Pension Rules

- Australian Pension rules
  - Income test
  - Asset Test
- Assumes single, homeowner



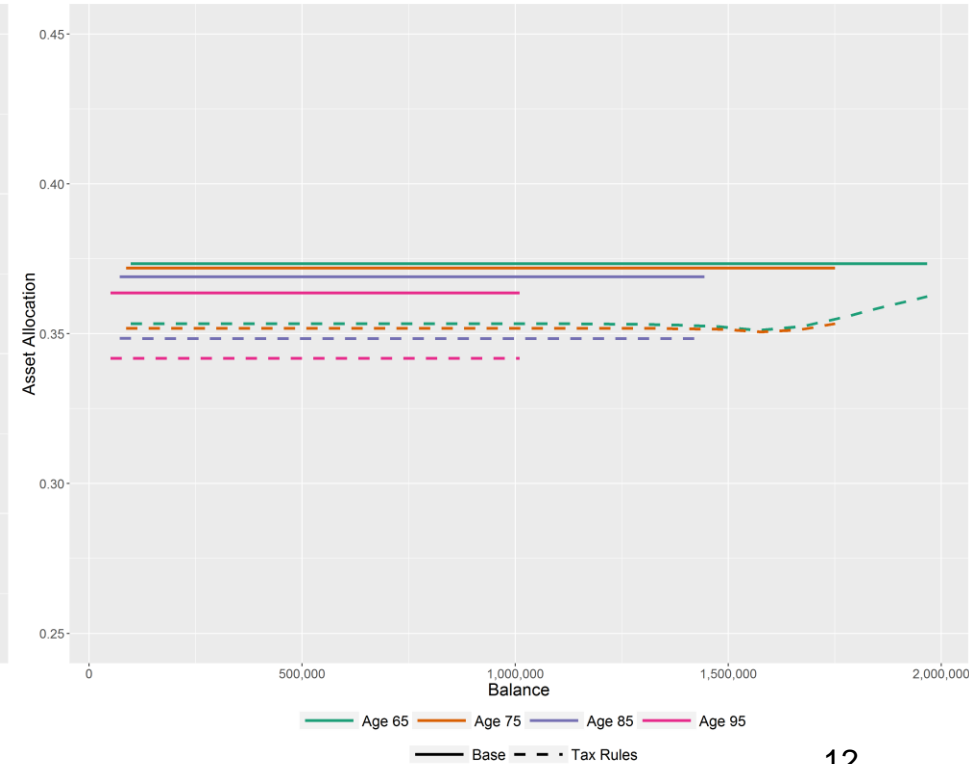
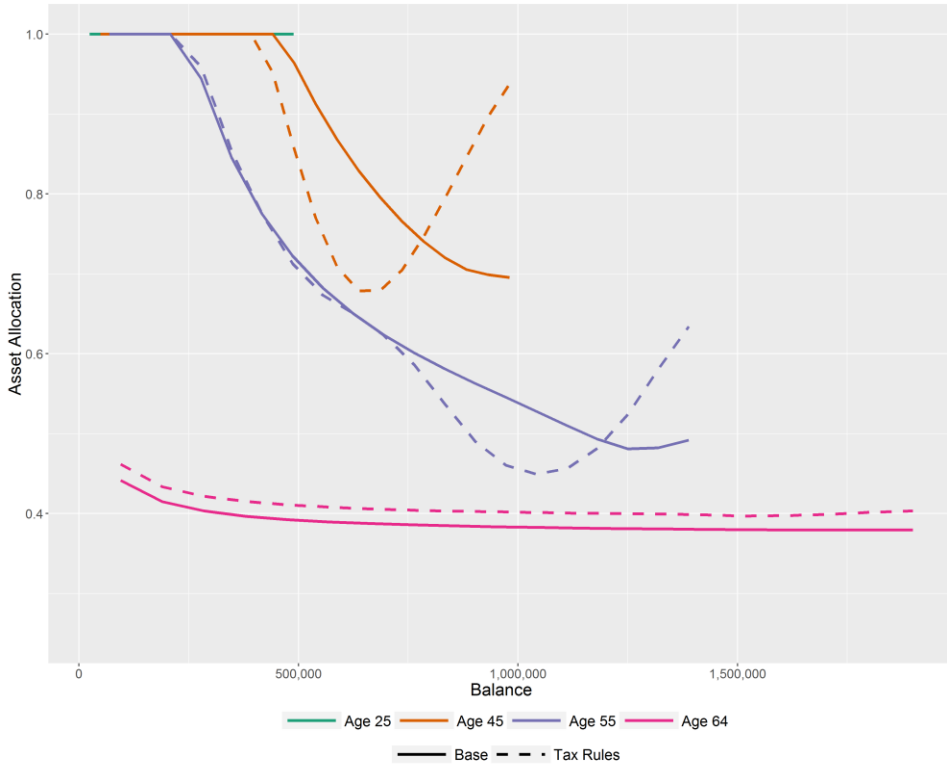
# Base Vs Tax rules – Consumption

Consumption Comparisons



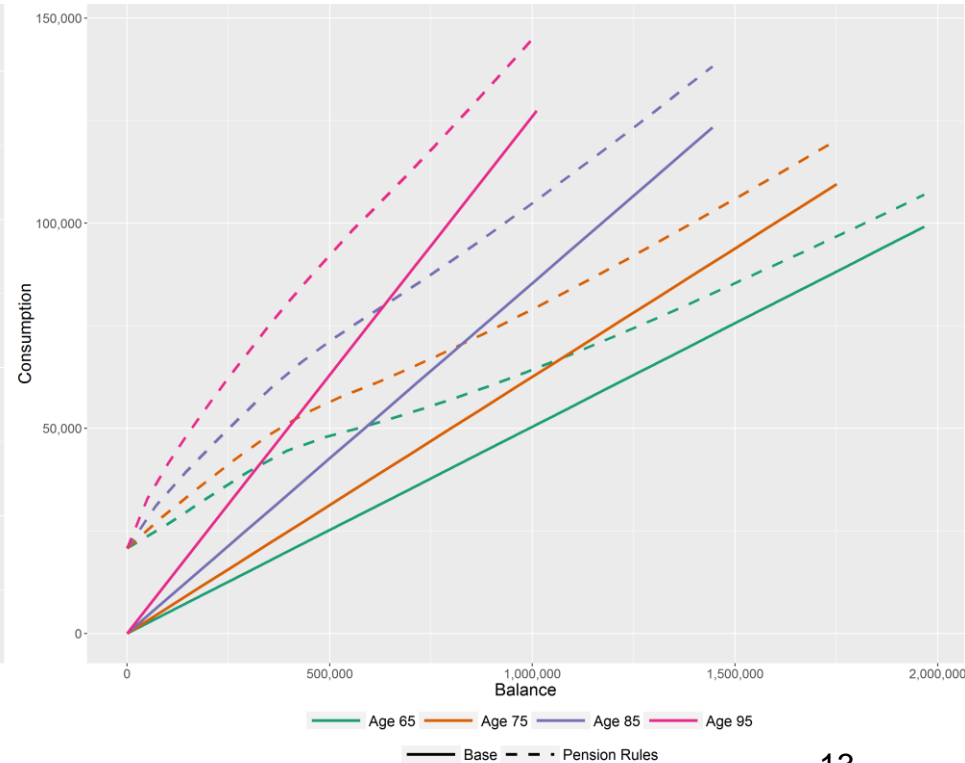
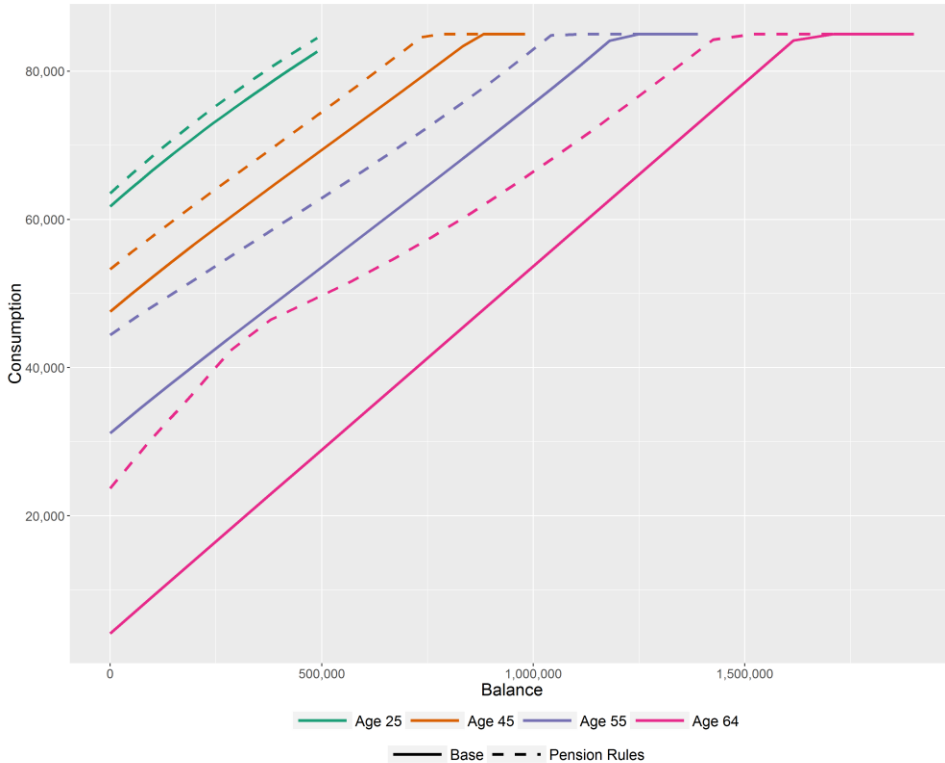
# Base Vs Tax rules – Asset Allocation

Asset Allocation Comparisons



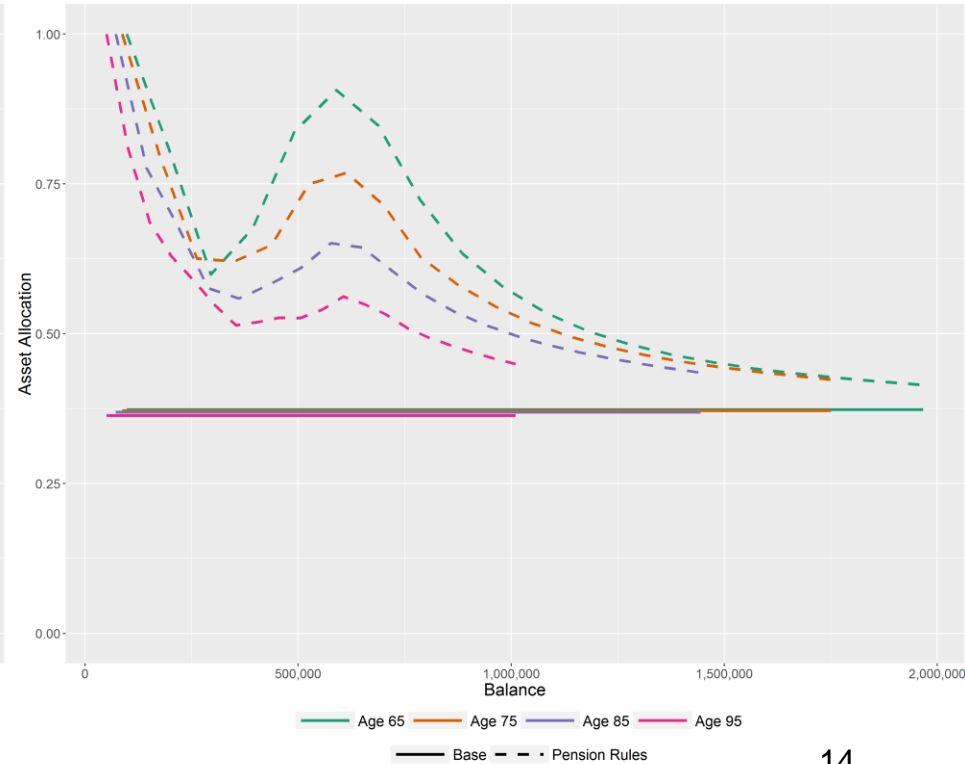
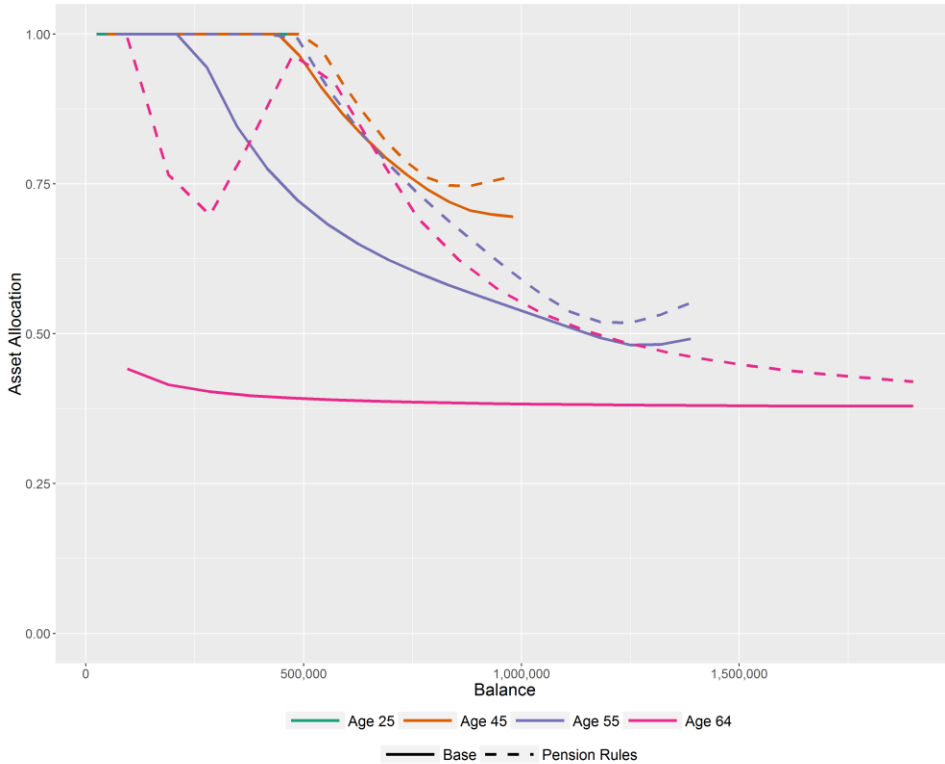
# Base Vs Pension rules – Consumption

Consumption Comparisons



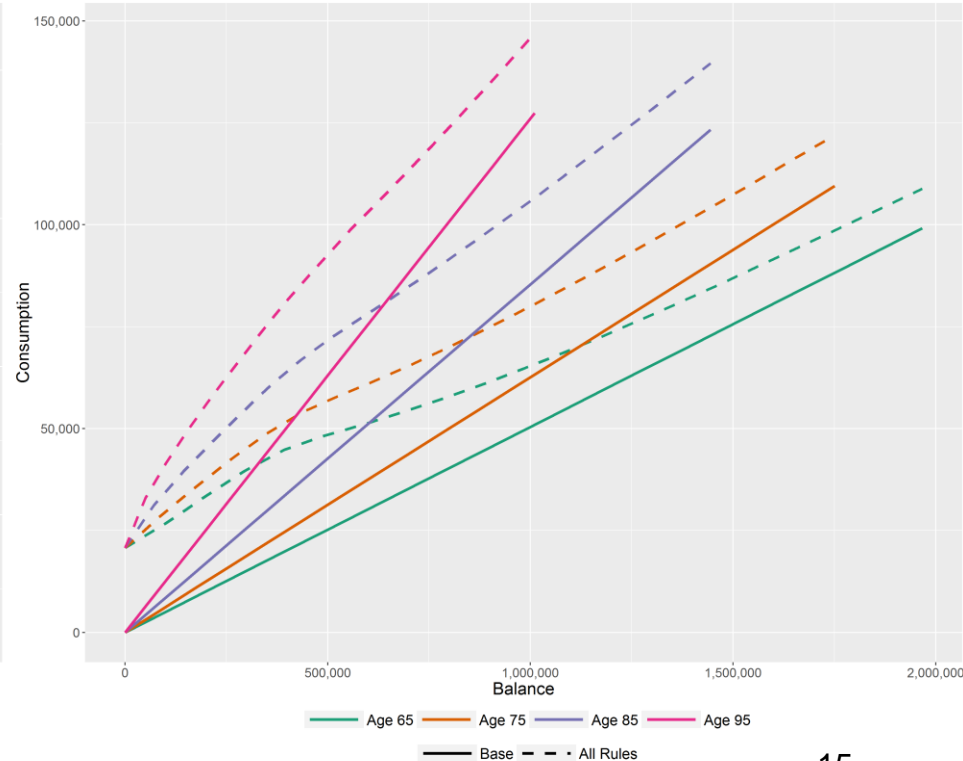
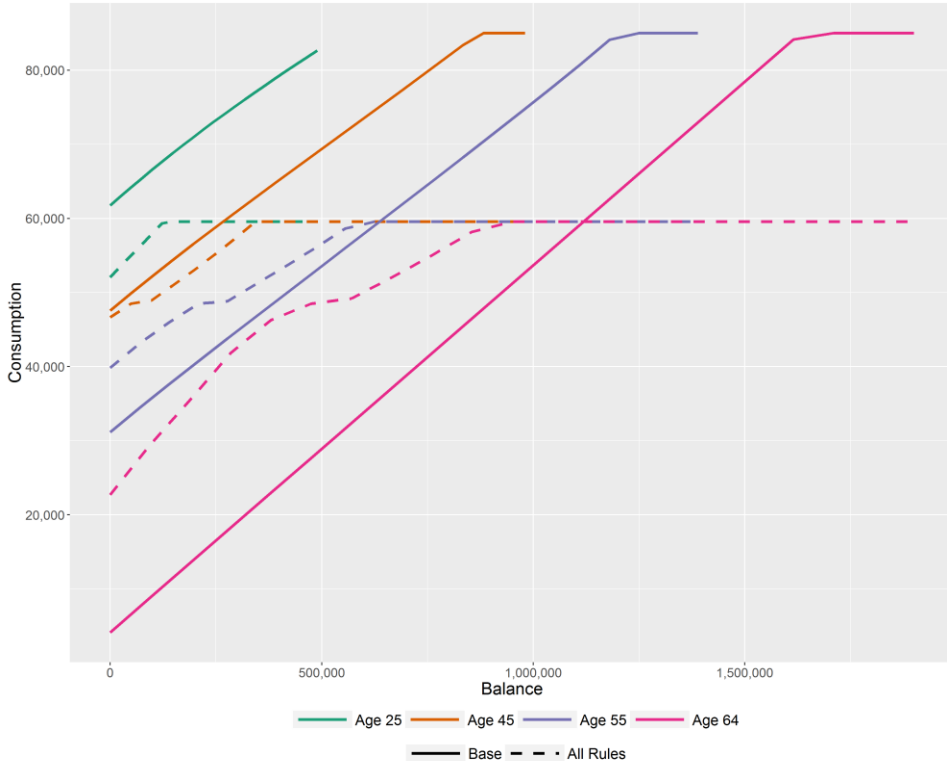
# Base Vs Pension rules – Asset Allocation

Asset Allocation Comparisons



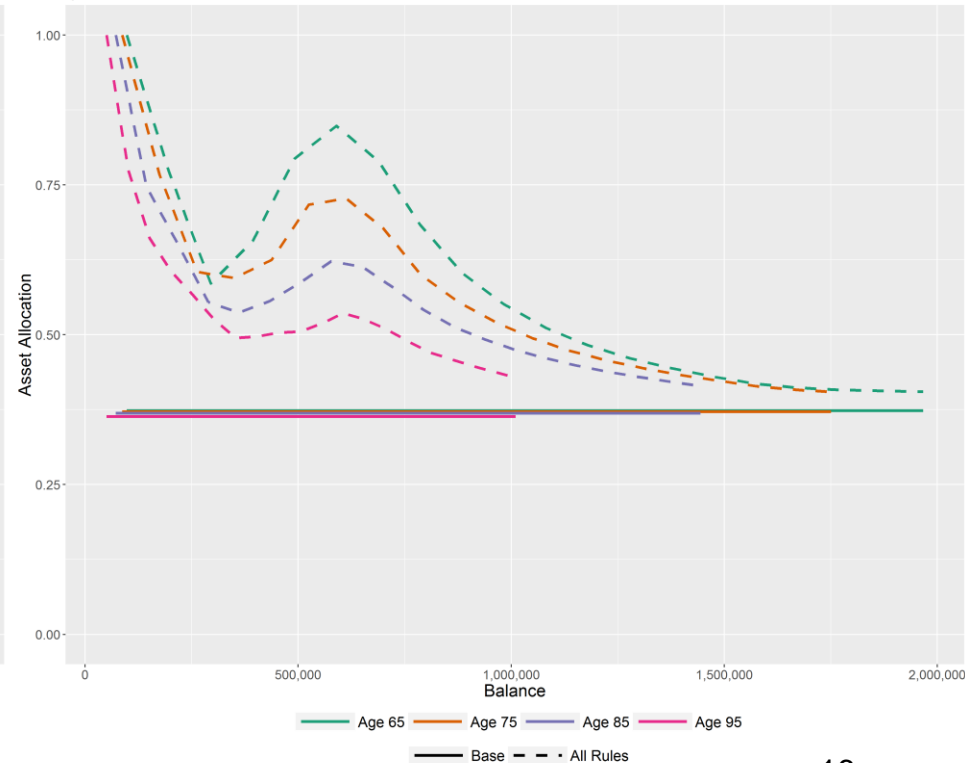
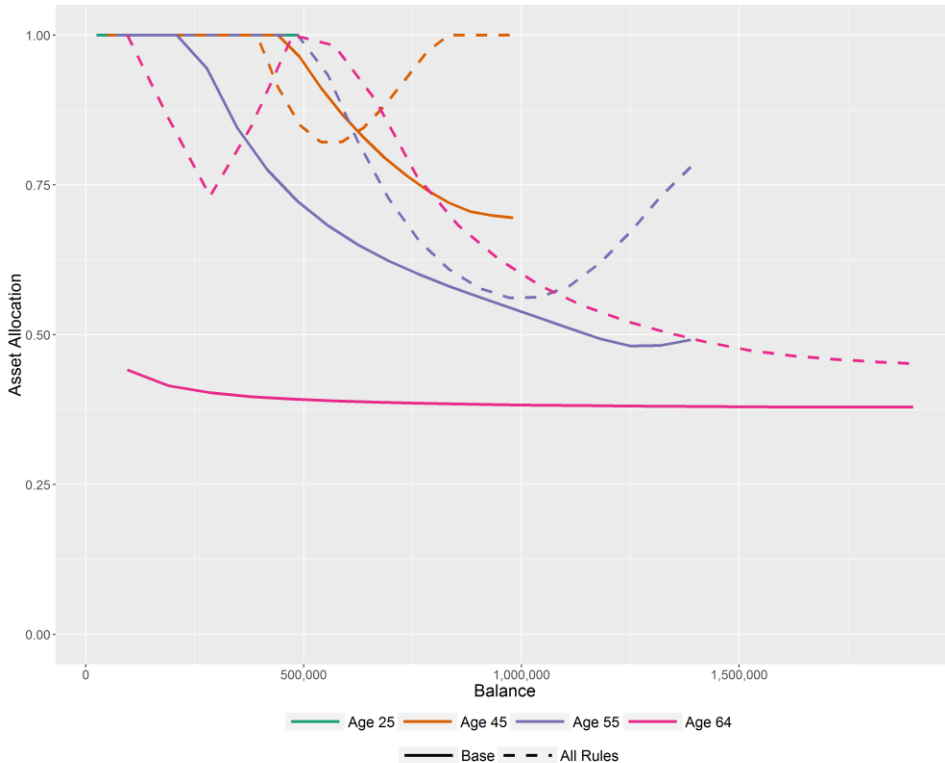
# Base Vs All rules – Consumption

Consumption Comparisons



# Base Vs All rules – Asset Allocation

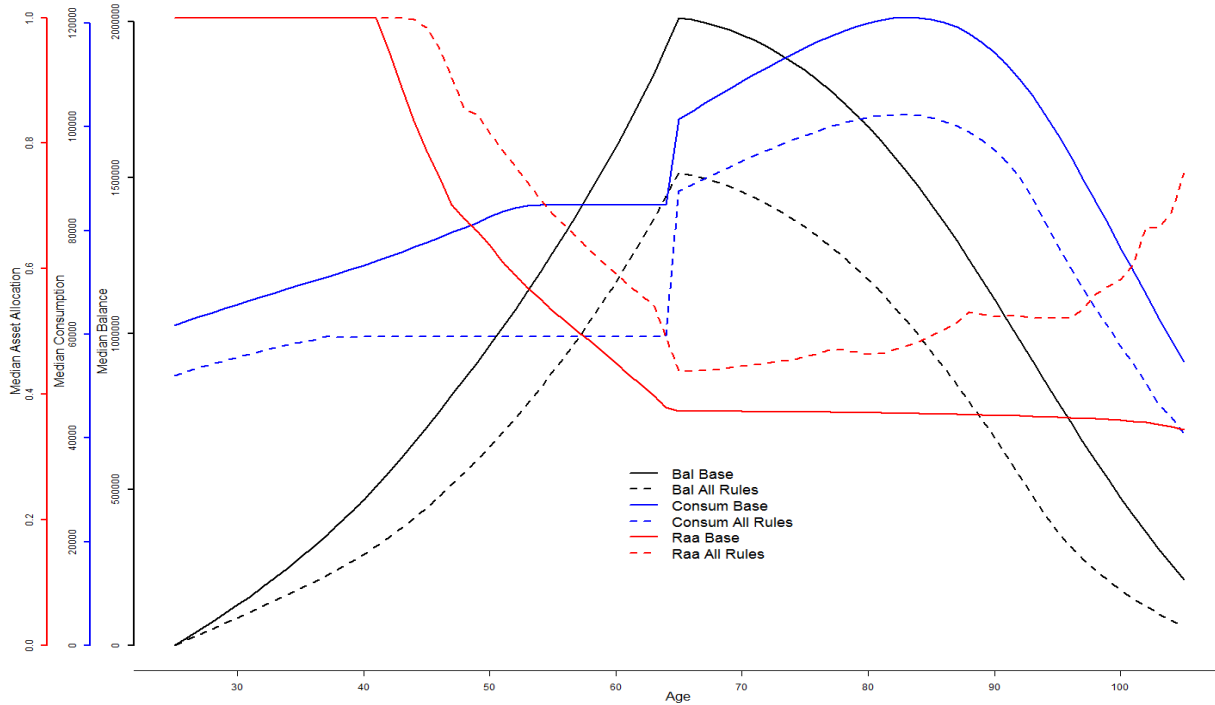
Asset Allocation Comparisons





# Base Vs All rules – Projection

Projection Comparisons



# Next Steps

- Allow for pension access age of 67 and vary retirement ages to analyse outcomes
- Make retirement a decision variable
- Investigate alternative utility structures
- Relax assumptions
  - Health states and mortality improvement
  - Family status
  - Home ownership, etc.