An Experimental Survey of Investment Decisions for Retirement Savings

Hazel Bateman (UNSW), Jordan Louviere (UTS), Stephen Satchell (Cambridge), Susan Thorp (UTS)

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Motivation

- Increasing investment choice + more complex choice menus
- In 2007 Australian retail funds offered 97 choices on average, Australian industry funds 9 choices on average (APRA 2007)
- How do choice menus influence the choices made by retirement savers?

Aim

- Overall interest – what factors influence choices made by retirement savers?
- This paper - investigate the role of standard finance theory (mean-variance analysis) on choice from a menu of investment options
  - Impact of variations in net expected returns and portfolio volatility
  - Impact of personal and demographic characteristics

Outline

- Previous research
- Experimental design
- Some theory
- Estimated model and results
- Future work
Previous Research

- Number and characteristics of choice menus influence choices made, and therefore aggregate asset allocation (Benartzi and Thaler 2001), (Huberman and Jiang 2006), Brown et al 2006, Mitchell et al, Clark et al
- Plan design also important
- Personal characteristics are important
- Much relate to 401(k) plans – simple choice experiments, actual member and plan level data

Experimental Design

- Choice experiment
- Hypothetical amount to invest for retirement in one of 6 investment options – 5 varying proportions of cash and shares + RSA
- Options distinguished by expected rate of return, risk, fees
- Risk presented as a ‘range’ representing ‘likely worst case accumulation after 10 years’ and ‘likely best case accumulation after 10 years’
- 4 levels of risk for each option – min and max of bootstrapped distribution, 5-95th quantile range, 10-90th, 20-80th

Key Features

Investment options for you to consider for a $1000 contribution

<table>
<thead>
<tr>
<th>Key Features</th>
<th>100% Cash</th>
<th>75% Cash, 25% Shares</th>
<th>50% Cash, 50% Shares</th>
<th>25% Cash, 75% Shares</th>
<th>5% Cash, 96% Shares</th>
<th>RSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likely worst case accumulation after 10 yrs</td>
<td>$1400</td>
<td>$1050</td>
<td>$1050</td>
<td>$1700</td>
<td>$600</td>
<td>$1140</td>
</tr>
<tr>
<td>Expected (av) accumulation after 10 yrs</td>
<td>$1075</td>
<td>$915</td>
<td>$1050</td>
<td>$2250</td>
<td>$2500</td>
<td>$2500</td>
</tr>
<tr>
<td>Likely best case accumulation after 10 yrs</td>
<td>$1075</td>
<td>$915</td>
<td>$1050</td>
<td>$2250</td>
<td>$2500</td>
<td>$2500</td>
</tr>
<tr>
<td>Investment management fee (% pa)</td>
<td>1.75%</td>
<td>1.95%</td>
<td>2.20%</td>
<td>2.40%</td>
<td>2.20%</td>
<td>0%</td>
</tr>
</tbody>
</table>

1. Which investment option would you be most likely to choose? (tick one)

2. Which investment option would you be least likely to choose? (tick one)

Example of attribute levels

<table>
<thead>
<tr>
<th>Key Features</th>
<th>50% Cash, 50% Shares</th>
<th>100% Cash</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk – Level 1</td>
<td>$1100-$4000</td>
<td>$600-$15800</td>
</tr>
<tr>
<td>Risk – Level 2</td>
<td>$1350-$3400</td>
<td>$1000-$6250</td>
</tr>
<tr>
<td>Risk – Level 3</td>
<td>$1550-$3150</td>
<td>$1300-$5550</td>
</tr>
<tr>
<td>Risk – Level 4</td>
<td>$1750-$2800</td>
<td>$1700-$4300</td>
</tr>
<tr>
<td>Fees – Level 1</td>
<td>1.85%</td>
<td>2.20%</td>
</tr>
<tr>
<td>Fees – Level 2</td>
<td>2.60%</td>
<td>2.30%</td>
</tr>
<tr>
<td>Fees – Level 3</td>
<td>2.40%</td>
<td>2.40%</td>
</tr>
<tr>
<td>Fees – Level 4</td>
<td>2.30%</td>
<td>2.60%</td>
</tr>
</tbody>
</table>
Experimental Design

- Choice experiment
- Internet survey – via Pure Profile
- Explained background and presented each subject with 16 different tables of investment options – subject to choose ‘more likely’ and ‘least likely’
- Collected demographic and personal information
- Subjects scored AMP risk survey (2006 Custom Super)

Subject profile – personal & demographic

- 819 individuals – 412 men, 409 women
- 63% partnered, 41% children, 67% tertiary educated
- 52% full time work, 21% part time, 5% full time students, 21% not working
- 24% professional, 10% management, 12% clerical, 12% service, 12% home duties, 5% unemployed, 7% retired, 4% trades
- 2/3 reported income at AWE or below
- 56% homeowners
- 20% investment properties, 68% investments/savings, 43% stocks/shares

Subject profile – attitudes to risk

AMP Risk Survey → scores 1 (low risk tolerance) – 5 (high)
- 0% scored 5 (aggressive), 4% → 4 (moderately aggressive), 76% → 3 (balanced), 18% → 2 (moderately conservative), 2% → 1 (conservative)
- 71% car insurance, 10% internet gambling

Note = 819 subjects x 16 choice sets = 13,104 records

What choices were made?

RSA: 237 (2%),
100% cash: 700 (5%), odds to RSAs = 2.95
75% cash/25% equities: 1411 (11%), odds ratio = 5.5
50% cash/50% equities: 2536 (19%), odds ratio = 9.5
25% cash/75% equities: 3920 (30%), odds ratio = 15
100% equities: 4300 (33%), odds ratio = 16.5

Total = 13104
Some Theory

Starting point is a mean-variance investor $i$ with expected utility function $V_i$:

$$V_i = \mu_i - \lambda_i \sigma_i^2$$

- $\mu_i$ = expected rate of return of $i$'s portfolio
- $\sigma_i$ = expected portfolio variance
- $\lambda_i$ = risk parameter

Some Theory (cont)

The utility for each cash/equity portfolio $(j)$ can be written as a function of the portfolio’s return and variance:

$$V_j = V(\theta_j) = \mu_s \theta_j + \mu_c (1 - \theta_j) - \phi_j - \lambda \left[ \theta_j^2 \sigma_s^2 + 2 \theta_j (1 - \theta_j) \sigma_s \sigma_c + (1 - \theta_j)^2 \sigma_c^2 \right]$$

- $\theta_j$ = proportion of portfolio allocated to stocks
- $\phi_j$ = fees deducted from returns
- $\mu_s$ = return to stocks
- $\mu_c$ = return to cash
- $\sigma_s^2$ = variance of stock returns
- $\sigma_c^2$ = variance of cash returns
- $\sigma_{sc}$ = covariance of stocks & cash

Some Theory (cont)

We are interested in the difference in utility between each of the five stock/cash options and the RSA (the reference portfolio):

$$\Delta V = (\mu_s \theta_j + \mu_c (1 - \theta_j) - \mu_r - \phi_j - \lambda \left[ \theta_j^2 \sigma_s^2 + 2 \theta_j (1 - \theta_j) \sigma_s \sigma_c + (1 - \theta_j)^2 \sigma_c^2 \right])$$

Estimated Equation

In testing the extent to which retirement savers follow mean-variance analysis when choosing an option from a menu of investment options, we ask subjects to nominate ‘most likely’ and ‘least likely’.

Estimate a conditional logit model:

$$\ln(P_{ij}/P_{ir}) = \beta' x_{ij} - \beta' x_{ir} = \beta' (x_{ij} - x_{ir})$$

or log odds of choosing option $j$ relative to option $r$ (reference option) = $f$ (net returns, portfolio volatility, personal characteristics – gender, age, income, education, employment, other investments, AMP risk survey)
Preliminary results

• Higher net returns increases the odds an option is chosen
  – (on average) a rise of 1bp increases odds ratio relative to RSA by 0.31

• Higher portfolio variance increases the odds an option is chosen
  – (on average) a 1bp rise in portfolio variance increases the odds ratio relative to RSA by 0.22

• Age, gender: not significant

• AMP risk score: interacts positively with net returns and variance

Conclusions and future work

• Pilot to understand methodology and possibilities
• For data from this experiment, only aggregate impacts considered so far – choice of separate options, individual variations
• Next step: design further choice experiments
• Interested in ‘framing’ issues – impact of representations of crucial information on choice (eg – risk represented by ‘ranges’, risk indicated graphically, qualitatively)
• Size of ‘bet’
• Number and character of investment options
• Retirement benefits – framed as investment or consumption replacement

Preliminary results

Education:
– less educated less responsive to higher fees (falling returns) and more attracted to higher risk
– University educated respondents behave like the theoretical mean-variance investor

Incomes:
Below $40,000 avoid high returns and high risk

Work Status:
Not working seek out higher returns and avoid risk

THANK YOU