- Time-Varying Risk Aversion and Investment Switching: Evidence from an Australian Superannuation Fund -

This research is undertaken collaboratively by researchers from the University of Sydney[1] and Aware Super[2]

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1. Motivations

- As the compulsory system continues to mature, ***deficiencies*** in trustee obligations become more apparent.
- Concerns around the industry's long-standing use of ***simple risk tolerance questionnaires***.
- More resources directed towards reviewing the ***validity*** of and ***refining*** methodologies for measuring risk attitudes.

- **This heightened industry focus serves as the core purpose for this research:**

To measure the accuracy of the three risk measures in predicting investment allocation and switching decisions during COVID-19.

2. Data

Survey and administrative data on ***3,305 subjects***, extracted in two waves:

- Wave 1 – First State Super (1,868 respondents) in ***February 2020*** (prior to COVID-19).
- Wave 2 – First State Super (494 respondents) and StatePlus (943 respondents) in ***July 2020*** (during COVID-19).

The survey design includes three data collection methods for eliciting risk attitudes:

1. ***Income Questions.***
2. ***Simulator Task.***
3. ***Self-Reported Risk Attitude.***

The survey responses are then matched with ***administrative reports*** of actual individual member behaviour.

The combination of stated and revealed preference data helps mitigate unobserved heterogeneity and validates results as risk aversion is measured in complementary ways.

3.1. Survey Design – Income Questions

Hypothetical questions regarding a member's choice between staying with their current "safe" job or moving to a new "risky" job with uncertain income potential.

- ***Example*** *– "suppose you have the opportunity to take a new job, with a 50-50 chance it will double your income and a 50-50 chance it will cut it by 10%. Would you take the new job?"*

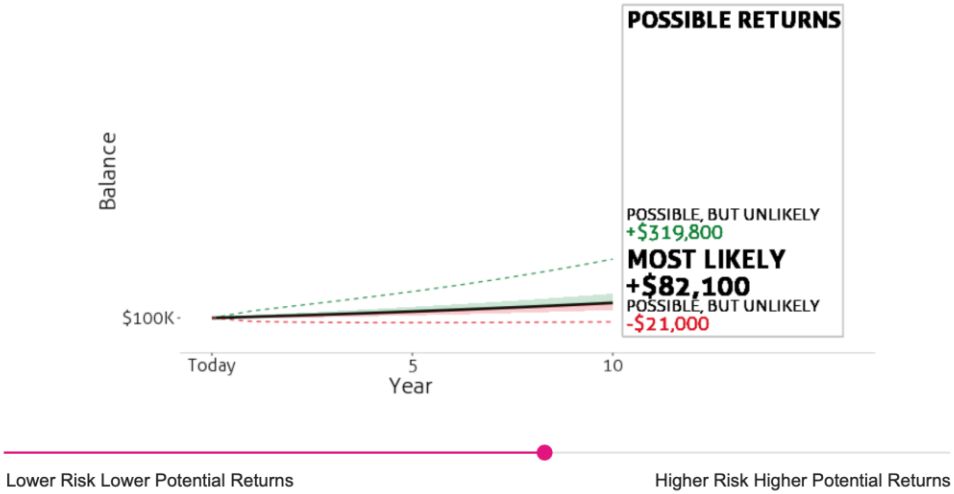
- If the member ***decided to switch*** to the new job, then an ***upper bound*** of constant relative risk aversion is obtained. Responses are then grouped into categories 1 to 6:

Response Category	Response
1	Would not take the new job.
2	Would take the new job, with a 50-50 chance it will ***double*** or cut your income by ***10%***.
3	Would take the new job, with a 50-50 chance it will ***double*** or cut your income by ***20%***.
4	Would take the new job, with a 50-50 chance it will ***double*** or cut your income by a ***third***.
5	Would take the new job, with a 50-50 chance it will ***double*** or cut your income in a ***half***.
6	Would take the new job, with a 50-50 chance it will ***double*** or cut your income by ***75%***.

3.2. Survey Design – Simulator Task

A member is provided with a slider to place their self-reported position on the risk-return trade-off.

- The investment risk-return profiles vary from a very ***safe*** option (Option A) to the ***riskiest*** option (Option H).
- This method first sets the upper and lower CRRA bounds as integers, ***ranging from 1 to 8***, and then ***calibrates the distribution*** (mean and variance) of the log return rates of each option.



3.3. Survey Design – Self-Reported Risk Attitude

"Rate your preference when it comes to investment choices from your superannuation, from a scale of 0 (less risk, lower but more stable returns) to 10 (more risk, higher but more variable returns), or if you are not sure."

- Whilst this does not provide a direct CRRA measure, empirical literature proves a ***significant correlation*** between self-reported risk attitudes and CRRA measures exist (see for example, Dohmen et al., 2011).[1]

[1] Dohmen, T., Falk, A., Huffman, D., Sunde, U., Schupp, J., & Wagner, G.G. (2011). Individual Risk Attitudes: Measurement, Determinants, and Behavioural Consequences. *Journal of the European Economic Association, 9*(3), 522-550.

4.1. Results – Research Question 1

How does stated risk aversion vary by member characteristics? What was the impact of COVID-19 on member stated risk aversion?

KEY FINDINGS:

- Members (who, on average, were typically ***"essential"*** workers) exhibited ***less*** risk aversion during COVID-19.

- ***More risk averse*** if a member is:
  1. Female.
  2. Older.
  3. Low-income earner.
  4. Previously under Defined Benefit plans.

	Model 1	Model 2	Model 3
No. of Observations	**2,495**	**3,305**	**3,210**
Dependent Variable	Income CRRA	Simulator CRRA	Risk Attitude
Mean	4.923	4.173	4.410
During COVID-19	-0.330	-0.076	-0.069
	(-2.32)	(-0.92)	(-0.68)
	**		
Female	0.461	0.335	0.610
	(4.63)	(5.75)	(8.61)
	***	***	***
Age ≥ 55	0.976	0.333	0.495
	(6.73)	(3.93)	(4.78)
	***	***	***
Income in Accumulation Phase ≥ $78,000	-0.270	-0.159	-0.443
	(-2.17)	(-2.16)	(-4.95)
	**	**	***
Income in Pension Phase ≥ $41,600	-0.393	-0.076	-0.204
	(-2.32)	(-0.78)	(-1.72)
	**		*
Pension Phase (i.e., Decumulation Phase)	0.448	0.364	0.400
	(2.74)	(3.94)	(3.56)
	***	***	***
Previous Defined Benefit Member	0.823	0.614	0.572
	(4.92)	(6.30)	(4.83)
	***	***	***

Multivariate Regression. Note: * = 10%, ** = 5%, * = 1%.**

4.2. Results – Research Question 2A

How do member stated risk preferences impact on asset allocation decisions?

We test a sub-sample of '*active*' members, who construct their own portfolio by investing in a mix of investment options.

KEY FINDINGS:

- ***More risk averse*** members are more likely to allocate a higher percentage to ***defensive*** assets.
- ***Older and low-income earners*** are more likely to allocate a higher percentage to ***defensive*** assets.
- Members with ***higher balances*** are more likely to allocate a higher percentage to ***growth*** assets.

	Model 1	Model 2	Model 3
No. of Observations	**717**	**943**	**926**
Dependent Variable Mean	Growth Allocation 0.462	Growth Allocation 0.467	Growth Allocation 0.468
Income CRRA	-0.009 (-2.91) ***		
Simulator CRRA		-0.018 (-4.31) ***	
Risk Attitude			-0.022 (-6.11) ***
During COVID-19	0.034 (1.01)	0.017 (0.62)	0.019 (0.67)
Age ≥ 55	-0.065 (-2.33) **	-0.069 (-2.82) ***	-0.055 (-2.21) **
Income in Accumulation Phase ≥ $78,000	0.050 (2.51) **	0.037 (2.15) **	0.036 (2.07) **
Member Balance ≥ $250,000	0.033 (2.11) **	0.029 (2.15) **	0.025 (1.82) *

Multivariate Regression. Note: * = 10%, ** = 5%, *** = 1%.

4.3. Results – Research Question 2B

How do member stated risk preferences impact on investment switching?

Only ***7.5%*** of the sample switched investment options during COVID-19.

KEY FINDINGS:

- ***Income CRRA model is statistically significant*** – it's design measures some degree of the tendency to deviate from the status quo.

- Members are ***more likely*** to make an investment switch if they are:
  1. Non-homeowners.
  2. Non-MySuper members.

	Model 1	Model 2	Model 3
No. of Observations	**1,377**	**1,839**	**1,784**
Log Likelihood	-346.716	-459.558	-444.586
Dependent Variable	Switch	Switch	Switch
Income CRRA	-0.010 (-3.28) ***		
Simulator CRRA		-0.0005 (-0.13)	
Risk Attitude			-0.003 (-0.97)
Homeowner	-0.072 (-3.70) ***	-0.054 (-3.26) ***	-0.052 (-3.07) ***
MySuper	-0.075 (-3.31) ***	-0.072 (-3.69) ***	-0.069 (-3.47) ***

Marginal Effects of Logit Estimates. Note: * = 10%, ** = 5%, * = 1%.**

4.4. Results – Research Question 2C

Conditional on switching, how do member risk preferences impact on the likelihood of a defensive switch?

Out of the members who switched during COVID-19, ***80%*** made a defensive switch.

KEY FINDINGS:

- All three models find that higher levels of risk aversion are associated with a higher likelihood of conducting a defensive switch.
- This is ***statistically significant*** in two out of the three models – suggests some usefulness in the risk measures in predicting member switching decisions.

	Model 1	Model 2	Model 3
No. of Observations	**109**	**139**	**134**
Log Likelihood	-45.313	-55.329	-54.531
Dependent Variable	Defensive Switch	Defensive Switch	Defensive Switch
Income CRRA	0.001 (0.09)		
Simulator CRRA		0.054 (2.71) ***	
Risk Attitude			0.047 (2.22) **
Retire With Debt	-0.243 (-3.45) ***	-0.139 (-1.98) **	-0.138 (-1.91) *

Marginal Effects of Logit Estimates. Note: * = 10%, ** = 5%, * = 1%.**

- Those who ***do not expect to retire with debt*** are more likely to make a defensive switch.

5. Conclusions and Contributions

1. Compares the predictive power of measurements of risk attitudes.

- To our knowledge, this is the first paper that ***compares*** three common methods of measuring risk attitudes and their ability to ***predict*** investment allocation and switching decisions.

- The risk measures predict that ***more risk averse*** members are ***more likely*** to:
  1. Invest a higher proportion in defensive assets.
  2. Not switch.
  3. Conditional on switching, make a defensive switch.

2. Provides empirical evidence of the impact of COVID-19 on risk attitudes.

- Our findings show that, ***despite significant market volatility during COVID-19***, average member risk aversion ***decreased***.

- This may be sensitive to the sample of predominately "***essential workers***," where lower labour income risk may have offset concerns surrounding volatility in the financial markets domain.

6.1. Appendix – Survey Design: Income Questions

Survey Design – Income Questions.

- We model a member's utility over their lifetime income, Y, where CRRA, γ, may differ across individuals:

$$U(Y) = \frac{Y^{1-\gamma}}{1-\gamma}$$

- Take, for example, members in ***Response Category 3***. By accepting the new job when the downside risk is 20%, but declining when it is one-third, these members reveal a risk aversion between 2.00 and 3.77.

Response Category	Downside Risk of Risky Job		Bounds on CRRA		Average CRRA
	Accepted	Rejected	Lower	Upper	
1	None	10%	7.53	∞	7.53
2	10%	20%	3.77	7.53	5.65
3	20%	1/3	2.00	3.77	2.88
4	1/3	50%	1.00	2.00	1.50
5	50%	75%	0.30	1.00	0.65
6	75%	None	0.00	0.30	0.15

$$0.5\,\frac{2^{1-\underline{\gamma}_3}}{1-\underline{\gamma}_3} + 0.5\,\frac{(1-\frac{1}{3})^{1-\underline{\gamma}_3}}{1-\underline{\gamma}_3} = \frac{1^{1-\underline{\gamma}_3}}{1-\underline{\gamma}_3} \rightarrow \underline{\gamma}_3 = 2.00$$

$$0.5\,\frac{2^{1-\overline{\gamma}_3}}{1-\overline{\gamma}_3} + 0.5\,\frac{(1-20\%)^{1-\overline{\gamma}_3}}{1-\overline{\gamma}_3} = \frac{1^{1-\overline{\gamma}_3}}{1-\overline{\gamma}_3} \rightarrow \overline{\gamma}_3 = 3.77$$

Average of 2.00 and 3.77 = 2.88.

6.2. Appendix – Survey Design: Simulator Task

We selected Option A and H to have median 1-year returns of ***2.5% and 7.5%,*** respectively.

Option	Return	Mean Log Return
A	0.0250	0.0247
B	0.0320	0.0315
C	0.0390	0.0383
D	0.0461	0.0451
E	0.0533	0.0519
F	0.0605	0.0587
G	0.0677	0.0655
H	0.0750	0.0723

To calibrate this measure, the ***log standard deviation of Option E*** (found by the coefficient of variation) is ***fixed*** (given Australian households typically exhibit a ***moderate*** degree of risk aversion).

The other log standard deviations then follow from the set CRRA parameters, ranging from 1 to 8.

Option	Mean Log Return	Standard Deviation of Log Returns	CRRA Value
A	0.0149	0.0005	8.00
B	0.0262	0.0401	7.50
C	0.0374	0.0622	6.50
D	0.0487	0.0851	5.50
E	0.0600	0.1135	4.50
F	0.0687	0.1368	3.50
G	0.0774	0.1742	2.50
H	0.0862	0.2555	1.00

6.2. Appendix – Survey Design: Simulator Task

Assuming a current member balance of $100,000 and a 10-year investment horizon, the following CRRA parameter derivation is summarised to the respondent in the table below:

Option	Self-Reported Investment Strategy	CRRA Value
A	Possible, but unlikely return range = **+$15,650** to **+$16,500** Most likely return = **+$16,050**	8.00
B	Possible, but unlikely return range = **-$3,300** to **+$74,500** Most likely return = **+$29,900**	7.50
C	Possible, but unlikely return range = **-$8,000** to **+$129,700** Most likely return = **+$45,400**	6.50
D	Possible, but unlikely return range = **-$13,000** to **+$204,400** Most likely return = **+$62,700**	5.50
E	Possible, but unlikely return range = **-$21,000** to **+$319,800** Most likely return = **+$82,100**	4.50
F	Possible, but unlikely return range = **-$27,300** to **+$443,700** Most likely return = **+$98,800**	3.50
G	Possible, but unlikely return range = **-$39,800** to **+$681,500** Most likely return = **+$116,900**	2.50
H	Possible, but unlikely return range = **-$63,900** to **+$1,451,400** Most likely return = **+$136,700**	1.00

6.3. Appendix - Correlation Between Risk Measures

Correlation between risk measures.

	Income CRRA	Simulator CRRA	Self-Reported Risk Attitude
Income CRRA	1.00	-	-
Simulator CRRA	0.26	1.00	-
Self-Reported Risk Attitude	0.32	0.48	1.00

- Positive pairwise correlations indicate some consistency across the three risk measures.
- All three risk measures are distinct from each other and cannot be considered equivalent.