

Introducing the Member's Default Utility Function

VERSION 1

Creating a new paradigm in retirement planning

March 2017



Australian Institute of Superannuation Trustees



the voice of super



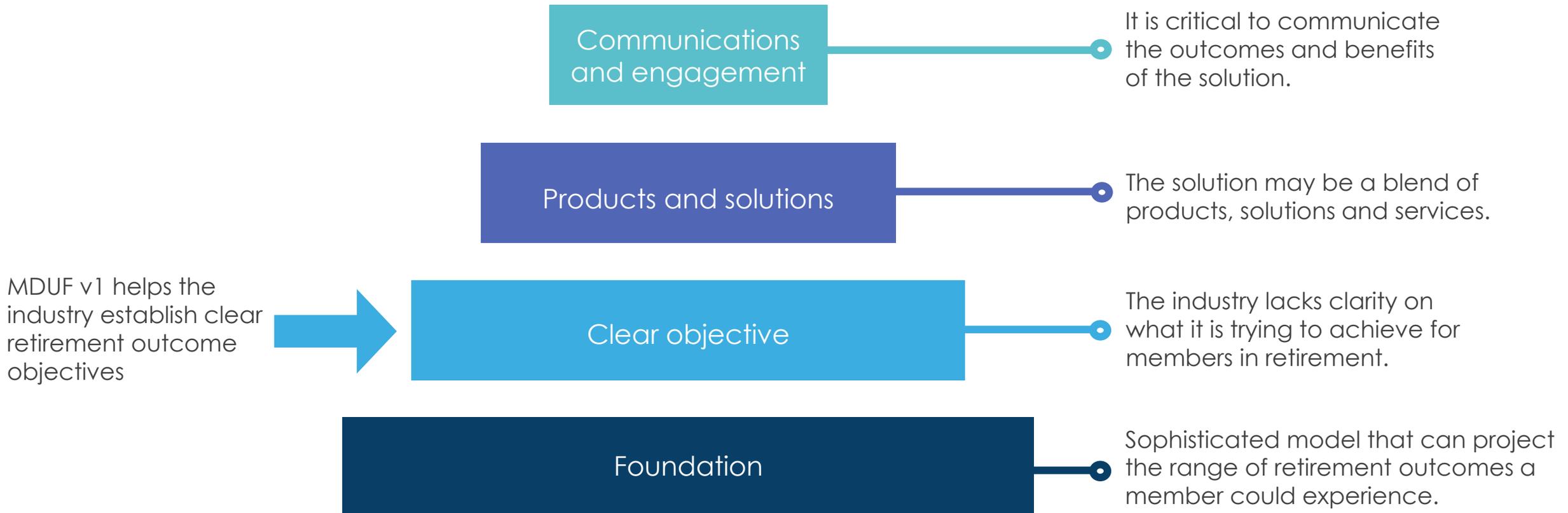
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Background

The retirement outcome challenge is considerable

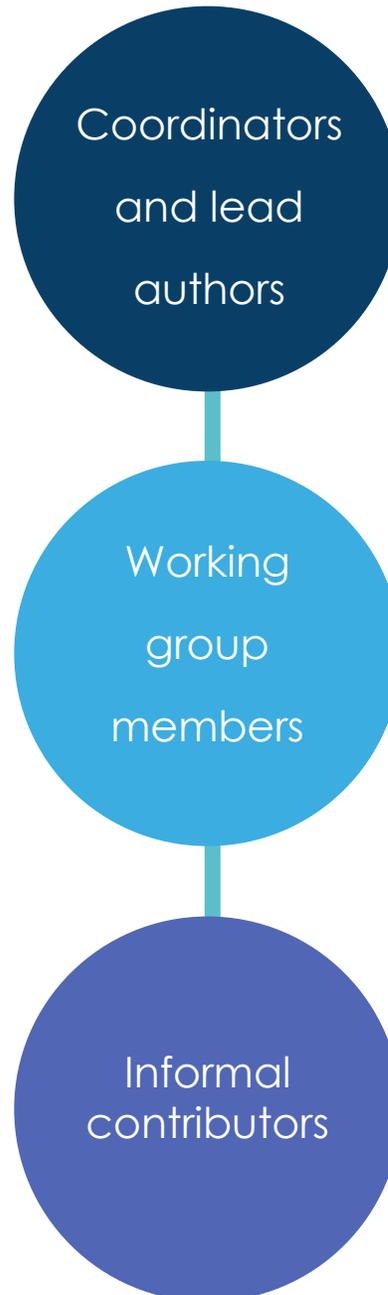
- Providing retirement outcome solutions is a hugely challenging and complex area
- You ignore the complexity at your member's expense



Background

A panel of academics and industry professionals was established to research and ultimately develop MDUF v1

The panel has over 200 years of combined relevant experience



- David Bell, Mine Wealth + Wellbeing
- Estelle Liu, Mine Wealth + Wellbeing
- Dr Adam Shao, Mine Wealth + Wellbeing

- Assoc. Prof. Anthony Asher, UNSW
- Nick Callil, Willis Towers Watson
- Prof. Geoff Kingston, Macquarie University
- Dr David Knox, Mercer
- David Schneider, 10E24
- Tim Unger, Willis Towers Watson
- Dr Geoff Warren, ANU

“Working group members have been contributors who also endorse the MDUF v1 as a sensible starting point when determining a set of preferences for Trustees to assume on behalf of those members whom they have little insight into.”

- Dr Jack Ding, Milliman
- Wade Matterson, Milliman
- Craig McCulloch, Milliman
- Nicolette Rubinsztein, UniSuper

“Informal contributors have participated in the MDUF v1 Project but make no endorsement.”

Background

The essence of the MDUF v1

- Establish a sensible, well-researched set of assumed preferences for what a default member would prioritise in retirement
- Represent this as a metric (i.e. create a mathematical function, just like Replacement Rate or Shortfall Risk or Funded Ratio)
- Use this metric to “score” or assess the ability of different products or solutions to maximise the achievement of these preferences
- The project is called the Members Default Utility Function Version 1 or “MDUF v1”

Background

MDUF v1 can then be used in many ways, for instance

- Super funds could use MDUF v1 to help design their post-retirement solutions, and as a metric to assist prioritise internal capital and projects
- Policymakers could use MDUF v1 as a metric for informing the implications of policy changes
- Academics could use MDUF v1 in their academic research on retirement outcomes, thereby making it more relevant to industry
- MDUF v1 also has relevance to regulators, life companies, fund managers, industry bodies, fund ratings groups and financial planners

Establishing an objective

Why is it called a utility function?

- A utility function is simply a mathematical representation of an individual's preferences
- Academia has used utility functions for 100's of years and used utility functions to address retirement outcome problems for nearly 50 years
- You will shortly see that the MDUF v1 appears more complex than other functions – this is simply because it captures many preferences which we think a member values in retirement

Establishing an objective

Establish a sensible, well-researched set of assumed preferences for what a default member would prioritise in retirement

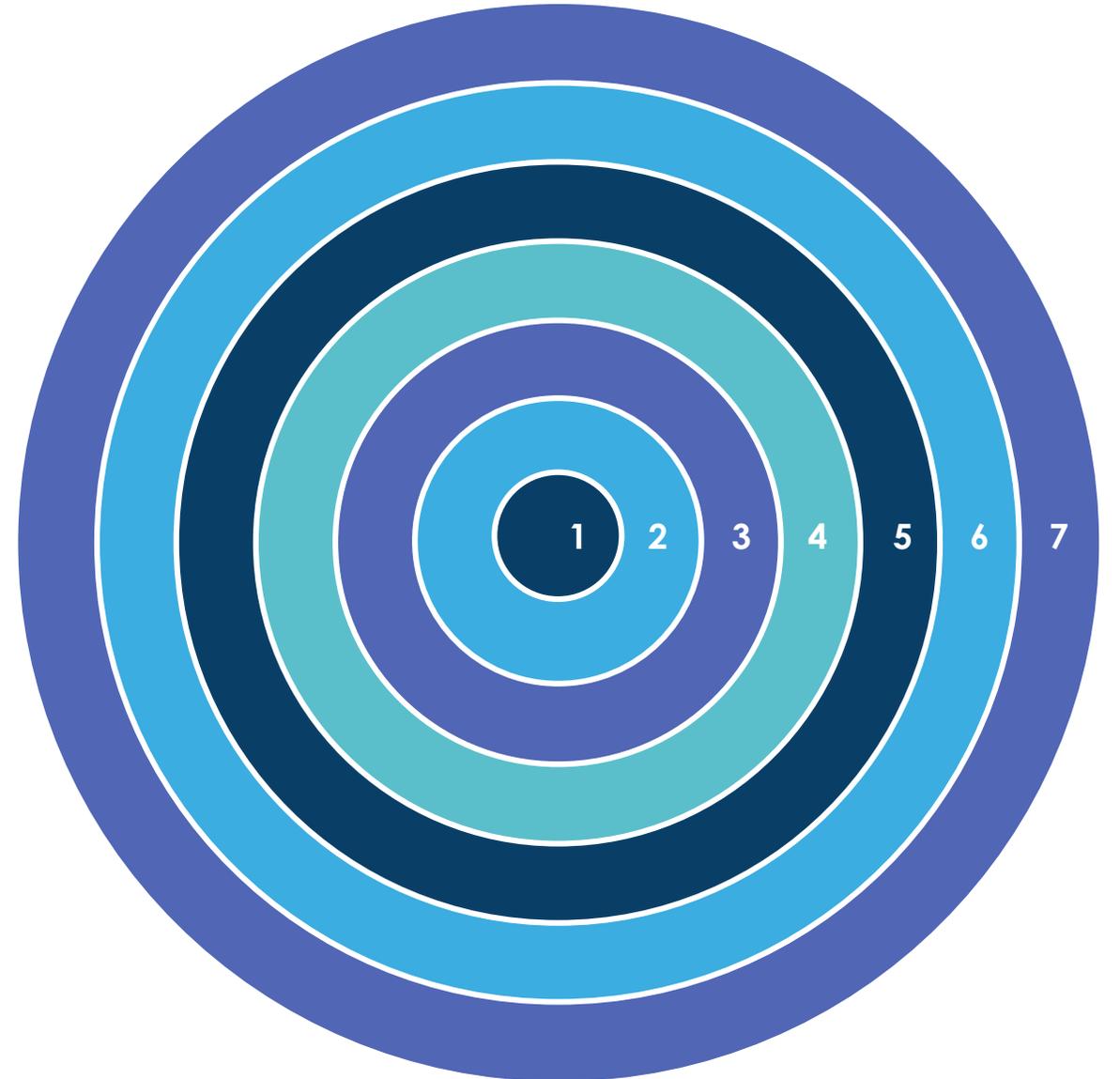
- What retirement outcome objective should super funds assume on behalf of default fund members, members they know little about?
- It is important that super funds have an objective which is highly credible and completely defensible (e.g. in front of regulators)
- The focus is on default fund members – advised members would go through a process of objective discovery

Establishing an objective

Establish a sensible, well-researched set of assumed preferences for what a default member would prioritise in retirement

Creating legitimacy and high integrity for MDUF v1

- 1. Quality panel
- 2. Time (18 months)
- 3. Documentation of debates
- 4. Heavy citing of empirical research
- 5. Extensive testing
- 6. Feedback from regulators and policy makers
- 7. Academic publication (to come)



Establishing an objective

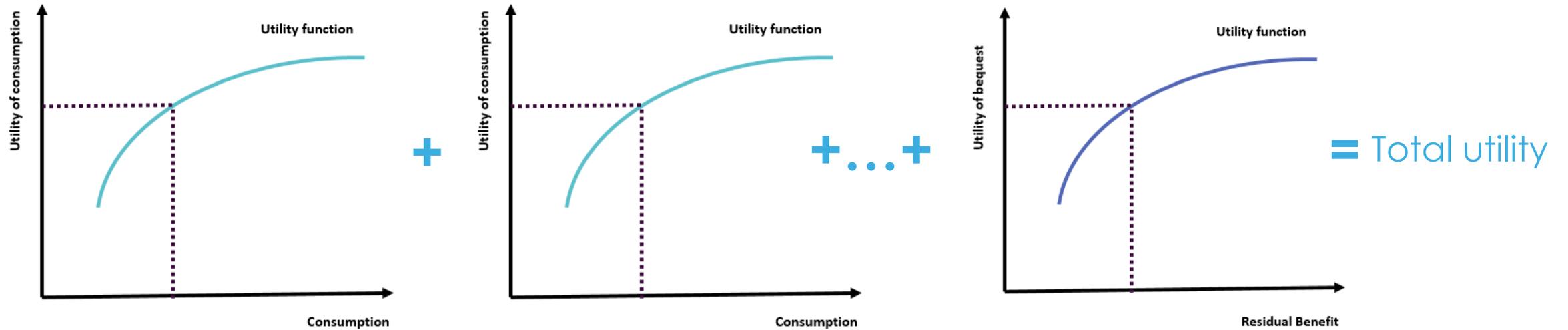
What is a sensible set of financial preferences for a super fund to assume on behalf of the members that we know little about?

The MDUF v1 accounts for the following considerations:

- Income stream not lump sum
 - A higher income stream is viewed more favourably
 - A more volatile income stream is viewed less favourably
 - Outliving one's retirement savings is a poor outcome
 - Residual benefit is valued
 - People are risk averse (the pain of an adverse outcome is greater than the joy of a positive outcome)
- MDUF v1 also accounts for the trade-off's between these issues

Establishing an objective

Calculating utility



MDUF v1 - a complex formula

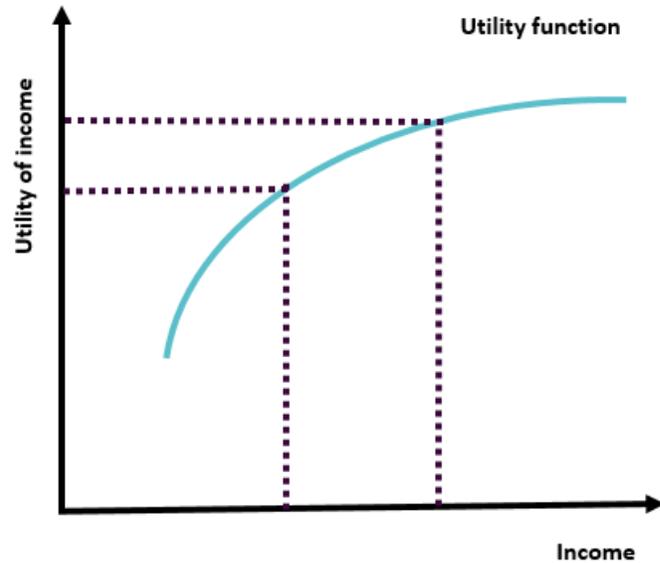
$$E_0 \left[\sum_{t=0}^T \left\{ {}_t p_x \left(\frac{c_t^{1-\rho}}{1-\rho} \right) + {}_{t-1|} q_x \left(\frac{b_t^{1-\rho}}{1-\rho} \left(\frac{\phi}{1-\phi} \right)^\rho \right) \right\} \right]$$

- T : time horizon
- c_t : consumption in year t
- b_t : level of wealth at time t which equals the amount of residual account value if the person dies between $t-1$ and t
- ${}_t p_x$: probability of being alive at age $x+t$ conditional on being alive at age x
- ${}_{t-1|} q_x$: probability of dying between age $x+t-1$ and $x+t$ conditional on being alive at age x
- ρ : level of risk aversion
- ϕ : strength of residual account motive

Establishing an objective

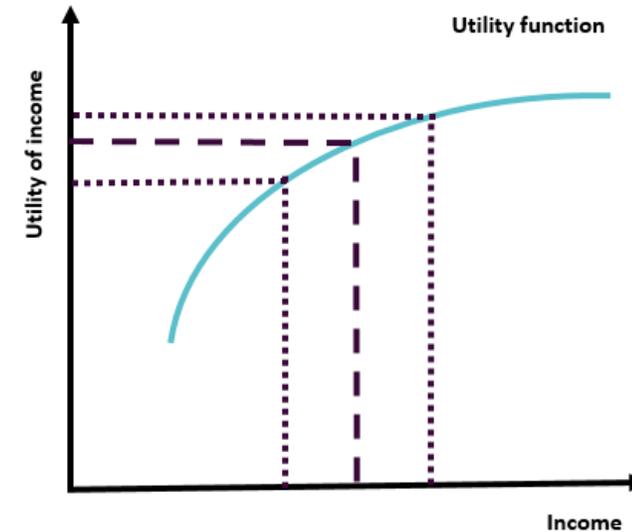
How MDUF v1 captures preferences

1. Higher income generates greater utility



We can see in the chart above that higher income (shifting across to the right) generates greater utility.

2. People are risk averse

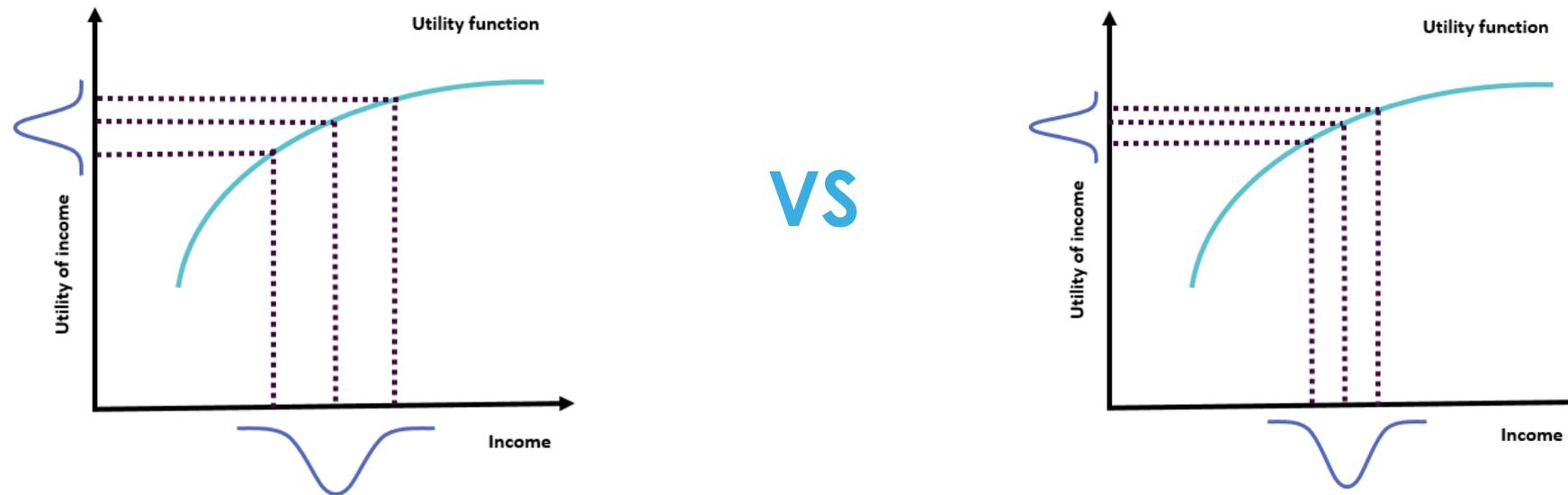


The increase in utility from a higher level of income is less than the loss of utility from an equally sized drop in income. This can be marginally identified along the vertical axis of the chart above. This is due to the curved nature of the MDUF v1. This design feature is supported by substantial empirical research.

Establishing an objective

How MDUF v1 captures preferences

3. People prefer low rather than high volatility income streams

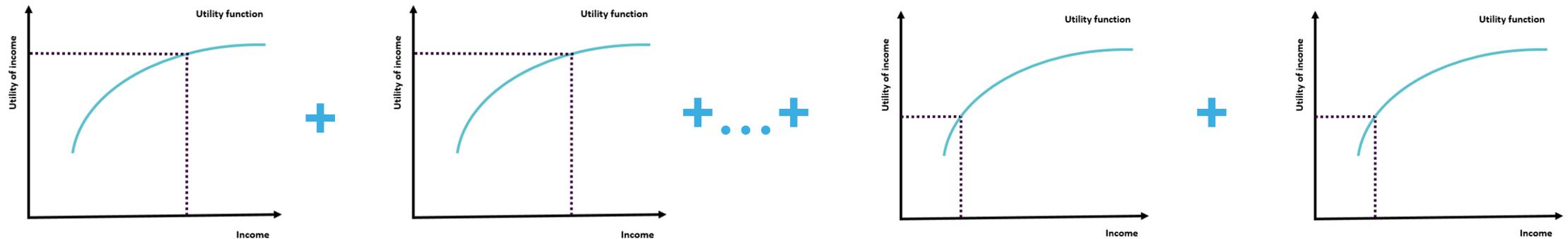


The chart on the right represents a less volatile income stream – the distribution of income is narrower in the right chart compared with the left (we assume the two distributions have the same mean level of income). We have already identified (in (2) above) that, through the MDUF v1, lower income experiences are ‘penalised’ more heavily relative to higher income scenarios. As the distribution of income scenarios widens the size of this relative penalty becomes larger. The overall expected (or average) utility, the probability weighted sum of utility across all possible outcomes, is therefore lower when, all else equal, volatility is greater.

Establishing an objective

How MDUF v1 captures preferences

4. Running out of savings is a poor outcome



The charts above consider a lifetime of income for an individual who exhausts their retirement savings and lives off the Age Pension for the remaining years of their life. MDUF v1 penalises this possible outcome because, as explained in (2), the additional utility generated from a higher level of income is less than the loss of utility which comes from experiencing some years solely on the Age Pension.

Establishing an objective

MDUF v1 captures preferences which are not considered by other metrics

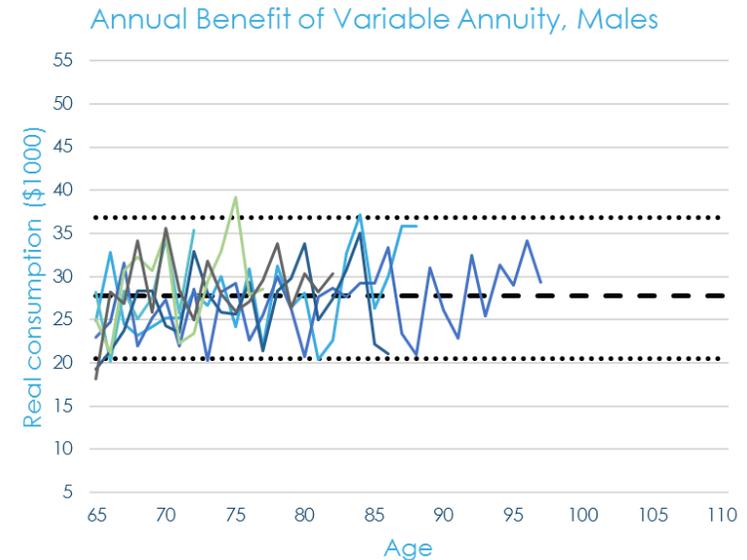
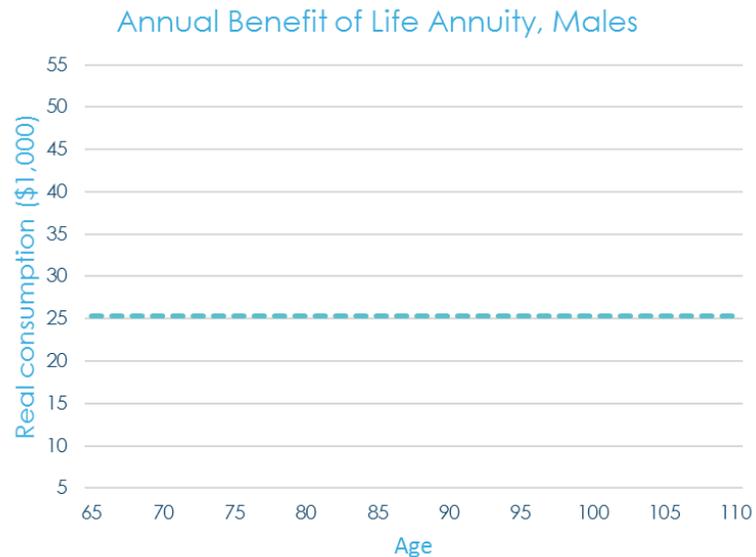
- Existing retirement outcome metrics are flawed
- MDUF v1 recognises the importance of the income experience (level and variability) while placing a value on any residual benefit

Statistic	Income	Income volatility	Longevity risk (outliving)	Residual benefit	Risk aversion
Replacement rate	Considered	Ignored	Ignored	Ignored	Ignored
Shortfall risk	Not explicitly	Ignored	Considered	Ignored	Ignored
Funded ratio	Considered	Not explicitly	Ignored	Ignored	Ignored
MDUF v1	Considered	Considered	Considered	Considered	Considered

Establishing an objective

Implications (conceptual) of the MDUF (v1)

- We view the following two income streams as producing equivalent expected utility



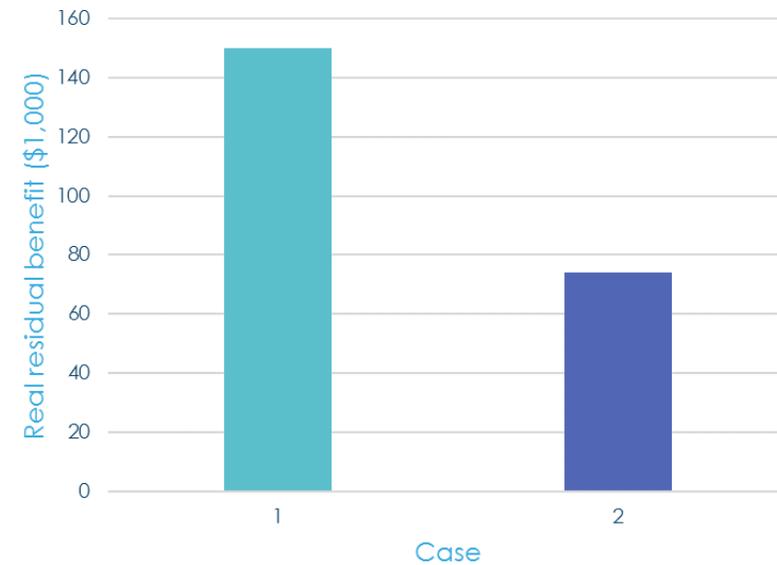
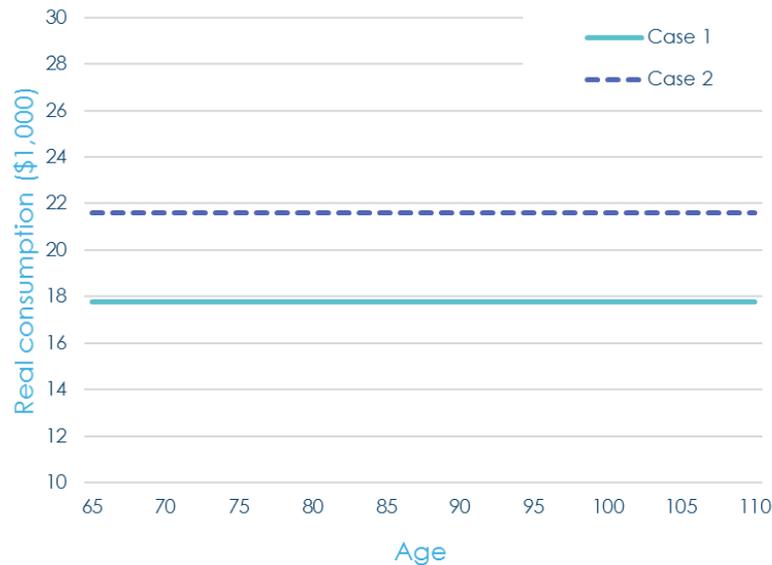
We can see in the chart above a life annuity with a guaranteed, inflation-indexed income stream.

This chart is of an income stream which is guaranteed for life but the income payments have some variability. The investor is being rewarded for this higher volatility through a higher expected outcome (dashed line). The two dotted lines represent 95% confidence interval (so only 5% of yearly income experiences should lie outside of this range). The coloured lines represent some randomly simulated income streams.

Establishing an objective

Implications (conceptual) of the MDUF (v1)

- We view the following two combinations of income streams and residual benefit profiles as producing equivalent expected utility



Both “products” produce a guaranteed level of income for life and provide a pre-determined fixed residual benefit at death.

Applications of the MDUF v1

1. Compare alternative solutions

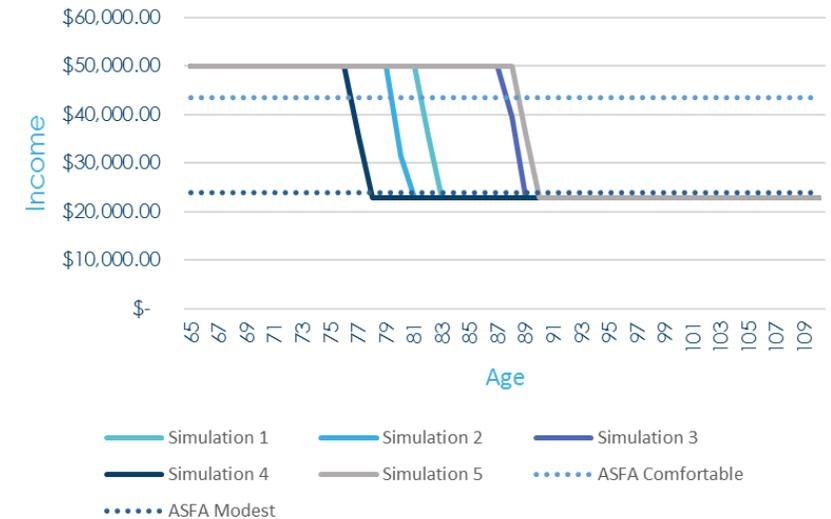
- Step 1: Calculate expected utility of proposed candidate solutions

Simulation techniques are commonly used to calculate the expected utility of outcomes.

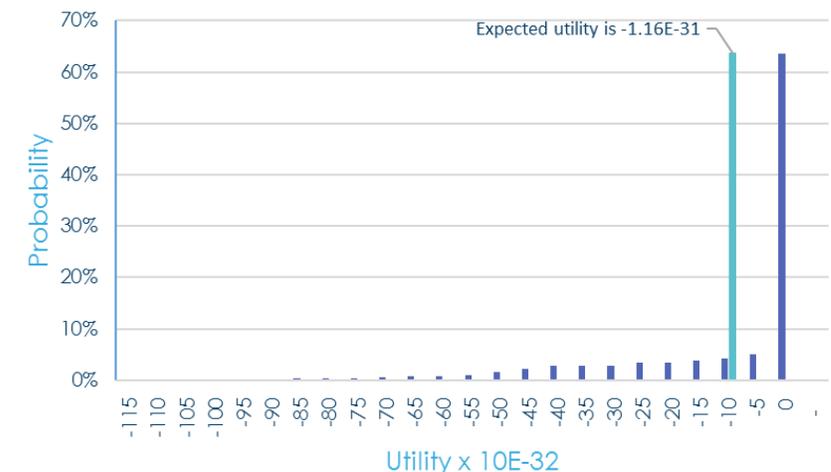
In the top chart we simulate scenarios (in this case 5 at a time) for lifetime income for an account based pension following a retirement strategy that targets a constant level of income (in conjunction with any Age Pension entitlement).

In the bottom chart we calculate the utility of each of these individual simulations (i.e. calculate the utility of each year of retirement income as well as the utility value assigned to any residual benefit at death). The total utility of each simulated scenario is used to populate the histogram of utility outcomes. The average of these outcomes is an estimate of expected utility. A solution with higher expected utility is, all else equal, regarded as superior.

Possible paths of retirement income for account based pension with a \$500,000 retirement balance



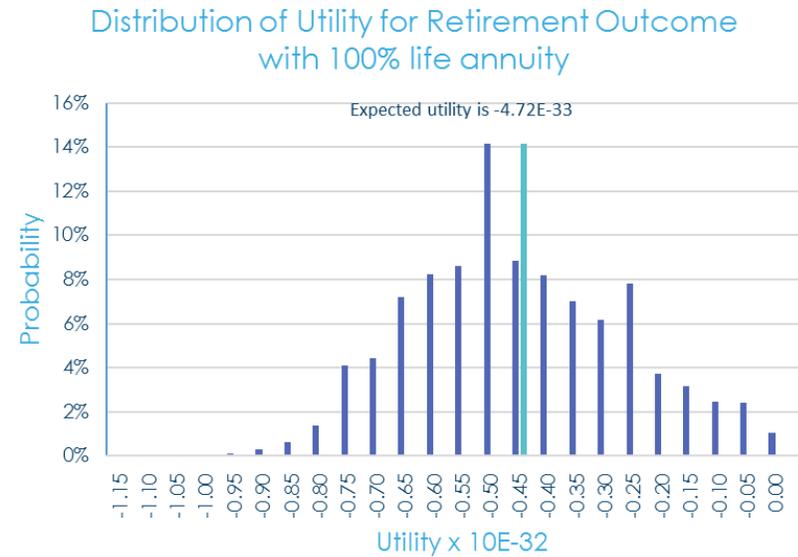
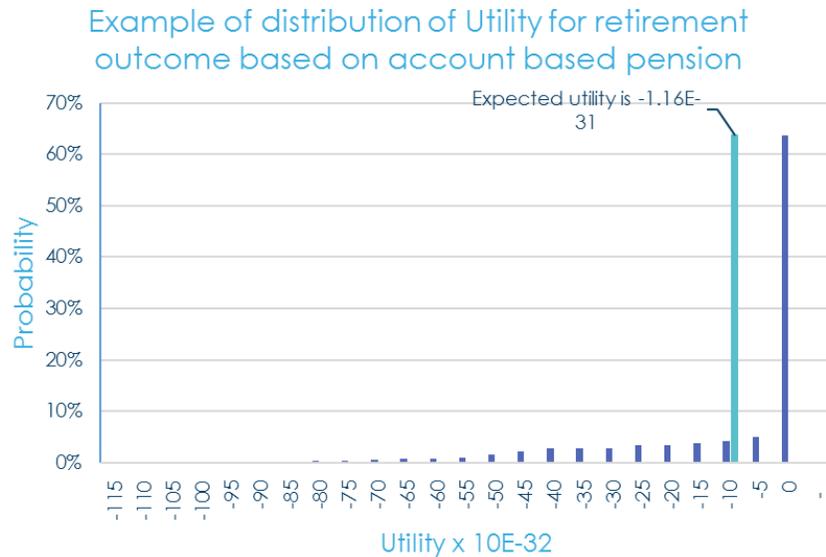
Distribution of utility for retirement outcome above



Applications of the MDUF v1

1. Compare alternative solutions

- Step 2: Compare utility of proposed candidate solutions



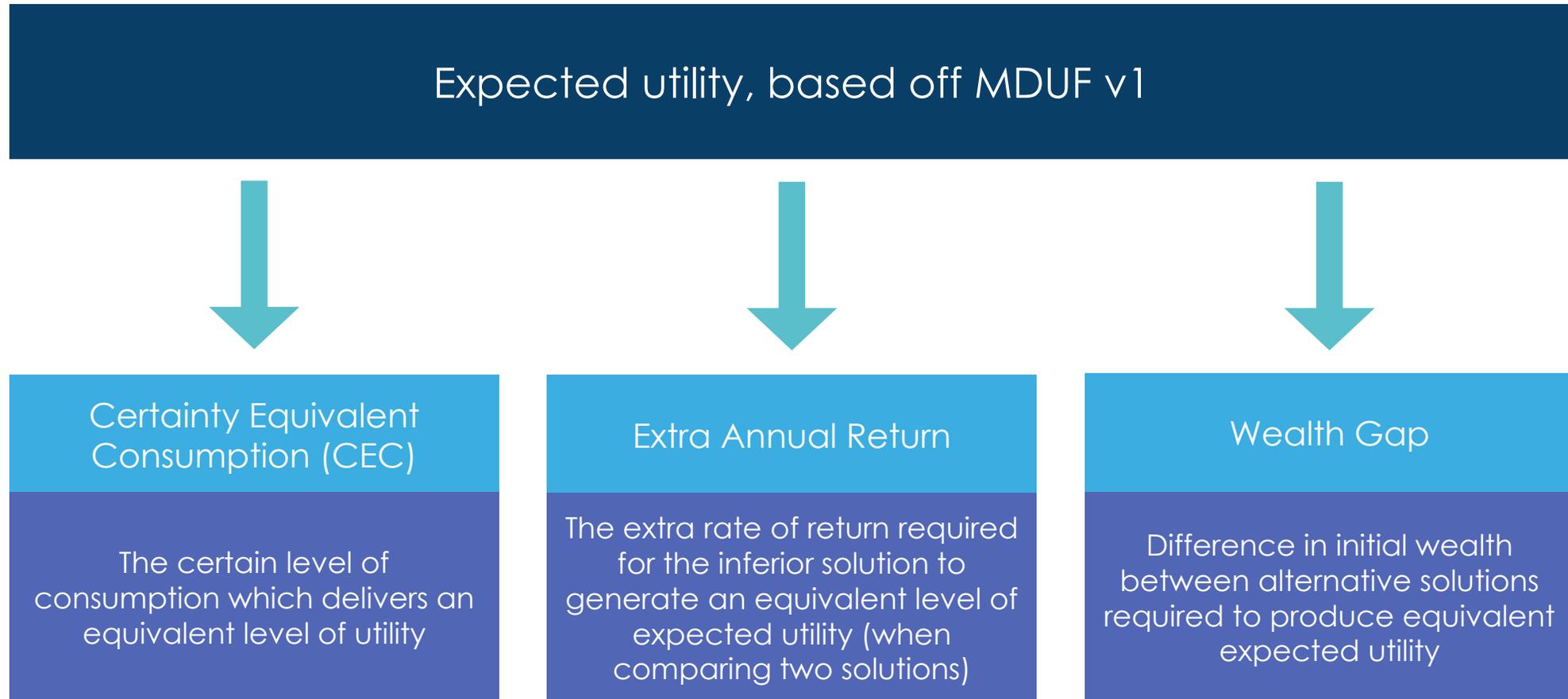
When comparing solutions we look for the one with the highest expected utility. Somewhat awkwardly utility is a negative number. So in this case the life annuity has the highest utility, so all else equal we would prefer this solution out of the two.

Note the account based pension is the same as the one detailed in the previous slide.

Applications of the MDUF v1

2. Quantify the cost / benefit of competing solutions

- The measure of expected utility can be converted into other measurements which make it more useful and understandable



Applications of the MDUF v1

2. Quantify the cost / benefit of competing solutions

- The measure of expected utility can be converted into other measurements which make it more useful

Benefit measure	1. Account based pension and age pension	2. Account based pension, age pension and life annuity
Wealth gap	\$776K	\$876K
Extra annual return	6.36%	7.04%

In the above example we estimate the expected utility for three different situations. We use these to calculate wealth gap and extra annual return metrics for two different comparisons (all for an individual retiring with \$500k and utilising an account-based pension and acting to optimally maximise utility).

The base case strategy (using an account-based pension and pretending the Age Pension does not exist) is compared against:

1. A strategy that allows for the Age Pension (in effect generating an estimate of the value of the Age Pension)
2. A strategy that allows for the Age Pension and also makes use of a life annuity

Applications of the MDUF v1

2. Qualify the cost / benefit

- Some important inferences can be made from the previous table
 - We can estimate the value of the Age Pension (for a single person and homeowner with \$500,000 in super at retirement) to be worth \$776,000. For this person to achieve the same expected utility in a system with no Age Pension they would have to achieve a 6.36% pa (risk free) higher return
 - By using a combination of different retirement product solutions optimally an extra \$100,000 of benefit can be realised. This is equivalent to finding an extra 0.68% pa of returns (risk free)

Applications of the MDUF v1

3. Estimate society-wide benefits

- If the average welfare gap is multiplied by the relevant population size then the society-wide benefit of a product / service / policy change can be estimated
 - Note that the welfare gap may differ across individuals
- This has significant application for policymakers (current policy estimation techniques do not readily capture the benefits of lower volatility and place no value on residual benefits)
 - For instance it would challenge the basis of some of the calculations in The “Murray” Financial System Inquiry

Applications of the MDUF v1

4. Estimate the value of non-investment aspects such as regular financial advice

- The MDUF (v1) allows one to estimate the benefits of product and also non-product based services
- Examples include assessing the benefits of investment advice and personalised strategies
- As most super fund initiatives involve a cost the MDUF (v1) has the ability to provide a broader estimation of the benefits of competing business proposals

Collaboration

- This work is a good example of collaboration
- We commit to making this work available for industry to use
- To assist we are pleased to announce that AIST and ASFA have both agreed to act as custodians of this work. This means they will be working hard to provide platforms for sharing this research.



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Conclusion

Working with industry

- A key starting point, currently missing in the super industry, is establishing the preferences they assume on behalf of their members
- A diverse, highly respected group of industry professionals has established a set of sensible preferences and then reflected these into a metric – the MDUF v1
- These preferences can then be used for many purposes, most notable fund / product design and policy considerations
- We believe that the MDUF v1 represents a leap forward for the industry and we are hoping for sustained uptake amongst super funds, ratings groups, academics, industry bodies, policymakers and regulators
- Thank you to all panel members for their involvement in this work

Conclusion

Where to for super funds?

- The MDUF v1 provides a clear, mathematical representation of a sensible set of objectives

