

Explaining the Annuity Puzzle in the Australian Context

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Background and purpose



What is the annuity puzzle?



What do we learn from literature?



Investigating optimal annuitisation in
Australian context



Implications for retirement solution
design

Overview

Background and purpose

- The aim is to contribute to the explanation of the annuity puzzle in the Australian context.
- Investigates why the actual demand on annuities to date has been lower than might have been expected.
- Explores the implications of the presence of Age Pension, retirees' drawdown behavior and retirees' preferences for optionality in accessing liquidity when alive and leaving bequests upon death.
- Implications for the design of longevity protection within retirement solutions that will add value and be taken up by members.

What is the annuity puzzle?

- **Economic theories** (Yaari, 1965) argue that it is optimal for retirees to annuitise significant portion of their retirement savings
- **Empirical studies** (Mitchell et al, 2011) reveal that voluntary take-up of annuities around the world has been much lower than what the economic theory predicts.
 - Voluntary annuitisation is rare in the UK, Sweden, Germany and Japan.
 - Substantial ‘voluntary’ annuitisation is observed in Chile and Switzerland with mandatory private saving policies for retirement and with government support their annuities offered are of “good value”, restrictions on lump-sum withdrawals, offer of inflation-indexed annuities, and the robust prudential regulation of providers.
- The disconnect between theory and practice has been dubbed the **‘annuity puzzle’** (Modigliani, 1986) and it remains an area of enquiry amongst academics and practitioners alike.
- In Australia, voluntary annuitisation is also low - **Retirement Income Review 2020:**
 - APRA data from 2020 indicating that “Of pension phase accounts, around 6% are invested in annuities”.
 - Mercer (2014) shows that the most common type of annuities in Australia are term annuities. 5% of Australian superannuation assets in the retirement phase being in term annuities, 1% in legacy Term Allocated Pensions and only 0.1% in life annuities.

Literature to explain annuity puzzle



PRICE LOADINGS



MARKET
INCOMPLETENESS



LIQUIDITY
CONSTRAINTS



BEQUEST MOTIVES



BEHAVIORAL
REASONS

Literature to explain annuity puzzle

Price loadings

- It might reduce the money's worth ratio (MWR) = EPV of annuity payouts/premium.
- Brown et al (2002) found MWR was 0.85 for a 65-year-old male when evaluated using population mortality tables in US 1999.
- However, Brown (2007) shows through analysis of survey data that even with MWR of 1 would still unlikely increase demand.
- Initial calculation using current Challenger annuity quote shows MWR close to 1.

Market incompleteness

- The inability of an annuity market to provide an income stream that matches individual optimal consumption paths.
- US lack of life annuity products with inflation protection. In Australia, despite the smaller number of providers there are both nominal and inflation-linked products available..
- US lack of combined annuity and long-term care product (Wu 2017). In Australia, lower need for long-term care product the Australian Aged Care and health care financing systems.

Literature to explain annuity puzzle

Liquidity constraints

- It could erode the attractiveness of annuities because individuals are not able to meet their temporal needs for liquidity with the payoffs.
- Beshears et al (2014) find individuals prefer annuities with a travel bonus to be paid in the holiday period than those without the bonus, controlling for the EPV.
- Peijnenburg et al (2015) finds when sizable out-of-pocket expenditures are incurred early in retirement, it may reduce the annuity demand.
- Sinclair and Smetters (2004) find lower optimal annuitization rates when health shocks lead to correlated risks of increased medical costs and reduced value of annuity from reduced life expectancy. This holds even in the presence of completely liquid annuities.
- Turra and Mitchell (2007) finds uncertainty regarding to size and timing of health care costs affects annuitisation.
- Age cared cost in Australia is subsidized by the Government with a means-tested structure. Based on ABS data, individual's probability of needing to access to aged care accommodation where an upfront lump sum contribution or commitment to Daily Accommodation Payment might be required is about 1% at retirement 67 and increases to 7% around age 82 and further increases to 33% once reached age 92.

Literature to explain annuity puzzle

Bequest motives

- Yaari (1965) predicts it is optimal for individuals to annuitise 100% of their retirement savings. One of the key assumptions is that investors place no value upon bequest. Empirical and academic evidence is mixed.
- Friedman and Warshawsky (1990) find that bequest motives can moderate demand for annuities.
- Brown (2007) observes that bequest motives can be typically separated from the optimal annuitization question.
- Brown (2007) also notes the lack of empirical evidence of retirees without children (hence expected to have less motivation to make bequests) annuitizing to a greater extent than retirees with children.

Behavioral reasons

- Survey study by Brown (2007)
- (US) individual does not seem to value the 'insurance' provided by life annuity and not understanding the risk of outliving savings.
- (US) vast majority of private annuity products sold in US include guarantees (e.g. 10-year guaranteed period)
- Risk sharing within couples. Dushi and Webb (2004) finds annuity demand should be higher for singles than couples. However, this explanation seem insufficient as it is not backed by observed behaviour (Brown 2007).

Literature to explain annuity puzzle

Behavioral biases – potential explanations

- **Complexity and financial literacy:** pointed to the power of default (Beshears et al 2006)
- **Mental accounting and prospect theory's loss aversion concept:** see annuity as a risky gamble, will I live long enough to receive this? Issue of choosing the “right” reference point when consumers use to evaluate gains and losses to evaluate annuity. (Butt et al, 2020).
- **Misleading Heuristics:** insurance is for bad events, maybe need to reframe annuity? “Outliving your savings is a bad event” but life annuities are providing you income for life.
- **Regret aversion:** desire to avoid regret, allows withdrawal with flexible periods? “what if I die next year, and I won't have anything back”, individual might inflate the probability in their decision-making process.
- **The illusion of control** (LIMRA International 2006), concern about entering into a long-term contract with an insurance company that may go bankrupt sometime during the life of the annuity contract.
- **Ambiguity aversion:** people do not know the relevant probabilities of survival, people discount the future (hyperbolic discounting model)

What is this literature telling us?

- Considering the Australian context, the three key areas to focus on are liquidity constraints, bequest motives and behavioral reasons.
- The life annuities that have been successful in member take-up were those with guaranteed period. It is reflective of individuals' needs to have the peace of mind that they or their beneficiaries are able to get the majority of their money back if they change their mind or pass away shortly after entering into the contract.

If the retirement solution design involves material allocation to longevity products, we need to consider withdrawal (liquidity access) and death benefits even though it may reduce the theoretical efficiency of such products.

Or focus on the tail end of longevity risk which allows a much smaller allocation to longevity products, so the rest of retirement savings are liquid and accessible by members at any time.

Explore alternative ways of managing longevity risk such as by providing drawdown guidance for members to draw down income sustainably. This might reduce the optimal allocation to life annuity without substantially increasing members' exposure to longevity risk.

Investigating in the Australian context

- The Retirement Income Review 2020 notes that:
 - retirees tend to self-insure against the risk of running out of assets by minimising consumption.
 - Low annuitisation rate is partly explained by “current framing of annuities and their complexity, perceived lack of value for money, and the role of the Age Pension in providing a constant income stream”.
 - Other factors noted as restricting demand for annuities are difficulties in making complex choices between different annuity products as argued in Orford Initiative, 2020, and low interest rates.
- Explores the implications of the presence of Age Pension, retirees’ drawdown behavior and retirees’ preferences for optionality in accessing liquidity when alive and leaving bequests upon death in annuitisation decision.
- Stochastic modelling of retirement outcomes and assesses the outcomes using the member default utility function (MDUF) framework with modifications to account for retirees’ needs for liquidity when alive in addition to the bequest motive. This is to deal with the potential impact of provision for Aged Care costs.
- MDUF is a comprehensive metric that is used to assess retirement outcomes after taking consideration of a range of factors including investment risk, mortality risk and retirees’ preferences. It recognises the risk averse nature (CRRA type) of retirees and is based on retirees’ preferences for:
 - Higher and less volatile income streams.
 - Higher and less volatile value of residual benefits, including access to capital, liquidity and bequests.
 - Optimising the trade-offs between income and residual benefits.

Modified MDUF

$$U_0 = \mathbb{E}_0 \left[\sum_{t=0}^T {}_t p_x^* \frac{c_t^{1-\rho}}{1-\rho} + {}_{t-1|} q_x^* \frac{b_t^{1-\rho}}{1-\rho} \left(\frac{\phi}{1-\phi} \right)^\rho \right]$$

- x : the retirement age assumed (65)
- T : the retirement planning horizon ($x+T$ is the maximum age to model, $x + T = 110$, $T = 45$)
- c_t : income in year t
- b_t : residual benefit in year t , this includes account-based pension balance, any death benefit or withdrawal benefit of retirement products.
- ${}_t p_x^*$: the modified probability of occurrence for the need of income streams, ${}_t p_x^* = {}_t p_x \times (1 - \theta)$, where θ is the probability of having the needs to access to capital when alive. ${}_t p_x$ is the probability of being alive at age $x+t$ conditional on being alive at age x (Mortality rates can be sourced from the Australian Life Tables 2015-17 by Australian Government Actuary).
- ${}_{t-1|} q_x^*$: the modified probability of occurrence for the need to access to capital, ${}_{t-1|} q_x^* = 1 - {}_t p_x^*$, ${}_{t-1|} q_x^*$ is the probability of dying or needing the access to capital to fund unexpected expenditure between age $x+t-1$ and $x+t$ conditional on being alive at age x .
- The modified expected number of years to receive income streams were reduced by 1 year for both male and female from 22 years for male and 24 years for female, respectively.
- ρ : level of risk aversion (5), and
- ϕ : strength of residual benefit motive (0.83).

Optimal annuitisation considering different drawdown behaviors



STATUTORY MINIMUM
DRAWDOWN

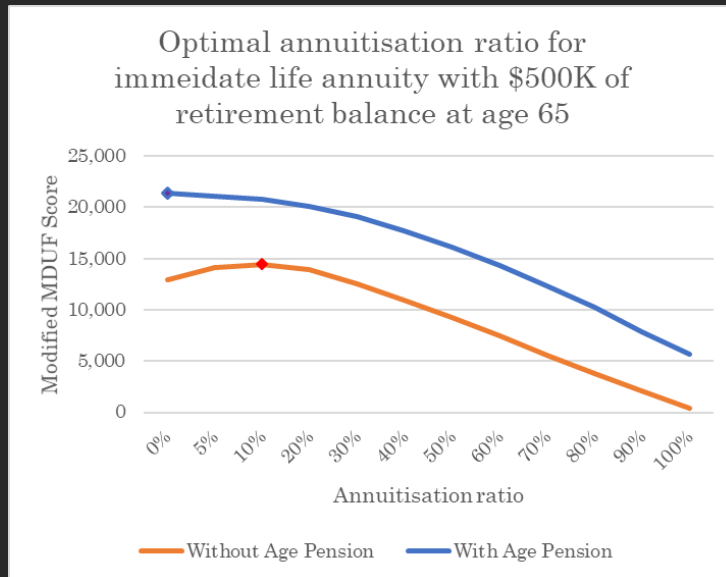


TARGET INCOME
STREAMS



RULE OF THUMB
DRAWDOWN
GUIDANCE

Statutory minimum drawdown

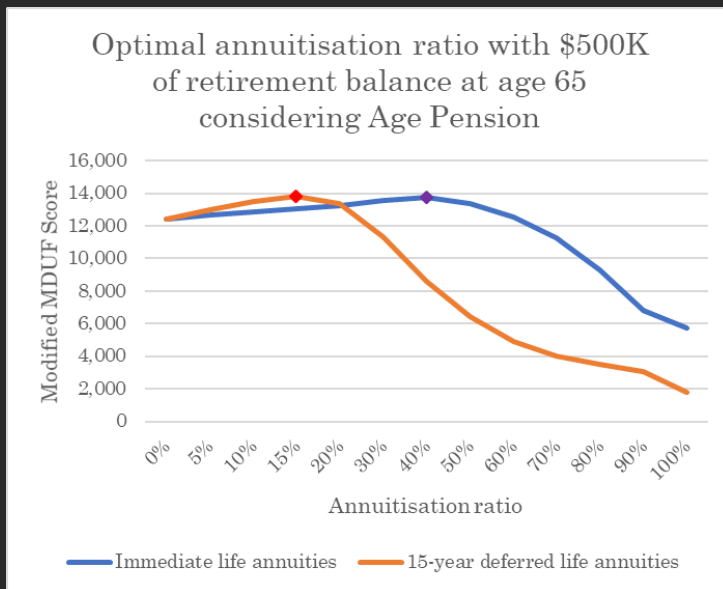


*comparable results under original MDUF

- Most Australian retirees with Account Based Pensions are currently drawing down their retirement balance at the statutory minimum levels.
- **Key results:**
 - The optimal annuitisation ratios for retirees are close to zero for retirees who are following the minimum drawdown rules in the presence of Age Pension. This is consistent across low, medium and high balance.
 - Even without the Age Pension, we found the optimal annuitisation ratios for immediate life annuities would be only 10% for this cohort.
 - The anchoring to the minimum drawdown levels will result in low risk of outliving retirement savings especially towards later retirement. This drawdown behaviour can then be considered as a form of self insurance against longevity risk. As a result, the mortality credit gained from purchasing life annuities would only be expected to add marginal benefit to the overall outcomes.
 - There are typically two groups of retirees who draw down at the statutory minimum levels.
 1. Some retirees especially those with higher balances could be making a conscious decision to draw down at the statutory minimum levels because they do not currently need higher income streams and wish to leave bequests.
 2. Others who draw down at the statutory minimum levels may be due to lack of understanding and guidance.

Target income streams

- This type of drawdown behaviour reveals retirees' stronger preference for income stability from one period to another. The downside of this type of draw down behaviour is the higher risk of outliving savings at some point in retirement.
- **Key results:**
 - A member with \$500,000 balance at retirement can target a constant real income level to achieve a certain living standard such as the ASFA Comfortable level. The optimal annuitisation ratio in the presence of Age Pension is **40% for immediate life annuities and 15% for 15-year deferred life annuities** both purchased at age 65.
 - This result shows that for retirees who have stronger preference over income stability and achieving a certain living standard it is necessary to pool longevity risk rather than self-insure it. In addition to the partial longevity protection provided by the Age Pension, allocating a certain level to life annuities in either immediate or deferred forms is expected to add value to these retirees' overall outcomes.



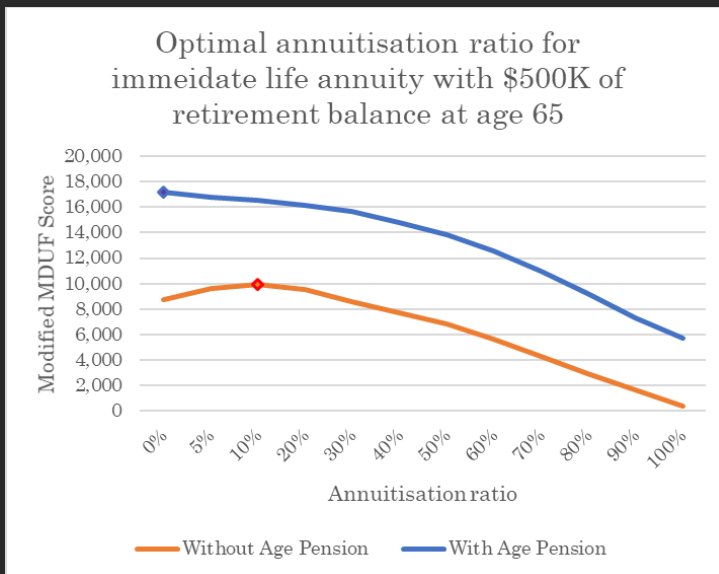
*comparable results under original MDUF

Rule of thumb drawdown

- By providing retirees with some form of drawdown guidance which aims to provide more sustainable income streams, retirees could potentially be more comfortable to draw down at a higher level in early retirement to enjoy a better living standard without necessarily increasing the risk of outliving their savings towards later retirement.

- **Key results:**

- We consider a simple rule of thumb drawdown rule developed by De Ravin et al. (2019) and found comparable results to the minimum drawdown rules. i.e. optimal allocation to life annuities is low in the presence of the Age Pension.
- This result is not surprising considering that the Rule of Thumb drawdown is designed to provide sustainable income streams and integrate with the Age Pension, which to some degree helps to address longevity risk.
- Optimal dynamic drawdown rates combined with additional longevity protection may further enhance the retirement outcomes.



*comparable results under original MDUF

Implication for retirement solutions design

- The research identifies three key components that contribute to the annuity puzzle in the Australian context. They are:
 - The anchoring behavior towards the minimum drawdown levels as a form of self-insurance for longevity risk;
 - the Age Pension entitlement as an existing combination of portfolio put option and life annuity; and
 - the revealed preference on liquidity/bequest.
- Implications to the design of retirement solutions focusing on longevity protection in addition to Age Pension:

Who chose to drawdown the minimum

Some retirees especially those with higher balances who made a conscious decision to draw down at the statutory minimum levels because they do not currently need higher income streams and wish to leave bequests. These members have low risk of outliving retirement savings as their drawdown behavior is considered as a form of self insurance against longevity risk. Thus limited role for longevity products.

Who can be guided to drawdown more sustainably

Some retirees who draw down at the statutory minimum levels or at much higher level due to lack of further guidance can be provided with drawdown guidance which aims to provide higher and sustainable income streams. This helps improve members income while managing longevity risk to some extent. Any additional allocation to longevity products may receive less resistance considering it is a small allocation.

Some retirees who have stronger preference for income stability

Some retirees who prefer to target a dollar drawdown amount rather than following a percentage drawdown rule have higher risk of outliving savings in retirement. These members especially in the mid to high balance cohorts with lower entitlement to Age Pension are likely to need higher allocations to longevity products. We need to consider withdrawal and death benefits, or focus on the tail end of longevity risk which allows a much smaller allocation to longevity products.

Future research



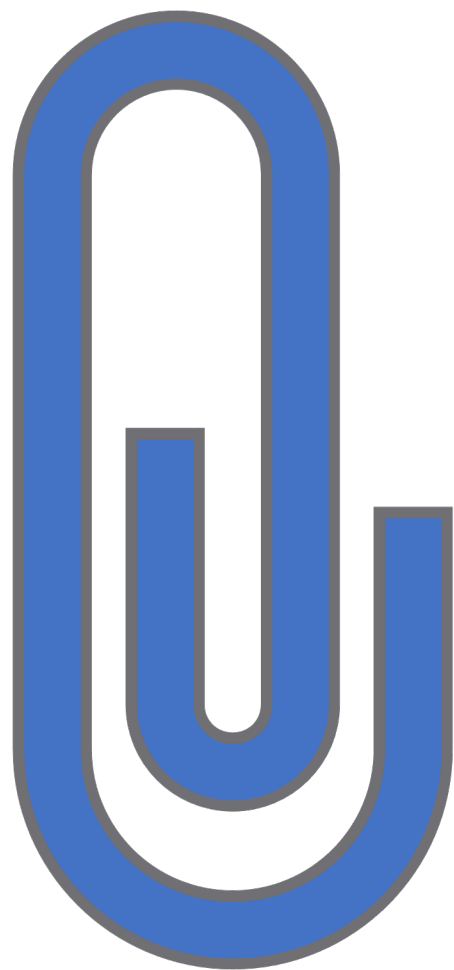
Consider other annuitisation strategy such as deferred purchase of life annuity.



Compare the results considering other forms of investor's utility and preferences



Experiential studies to reveal degree of members' preferences on liquidity and bequest



Appendix

Key assumptions

The member retires at 65, own their family home and has a partner who has the same amount of retirement asset as the member.

Retirement asset is invested in a typical (70/30) balanced fund. An effective exposure to Growth of 70% is maintained when life annuities are purchased. e.g. if purchase 30% of life annuities, then the rest of the retirement asset will be invested in 100% growth.

Real risk-free asset return is 0%, real expected equity return is 5% with volatility of 15%.

CPI of 2.5% and AWOTE of 3.5% (deflator)

Life annuities provides CPI-indexed income streams with death benefit

Modified MDUF parameters

Parameter	Assumption	Description
Risk aversion level	5	<p>A higher risk aversion parameter value reflects that the individual is more risk averse. In most academic literature and relevant studies, the choice of the risk aversion parameter normally falls within the range of one to ten.</p> <ul style="list-style-type: none"> A risk aversion parameter of one reflects an individual who is close to risk neutral. Risk neutral individuals do not seek compensation for taking risk as long as the alternative provides the same expected outcome. A risk aversion parameter of ten reflects individual that is highly risk averse. Highly risk averse individual prefers not to take on risk unless they are compensated sufficiently well. <p>A risk aversion parameter of five is the most common choice in most academic literature and relevant studies.</p>
Strength of residual benefit motive	0.83	<p>A higher value of the strength of residual benefit motive parameter reflects that the individual has a stronger preference to leave residual benefits for the purpose of bequest and access to capital/liquidity. The choice of the strength of residual benefit motive parameter is between zero and one.</p> <ul style="list-style-type: none"> A strength of residual benefit motive parameter of zero reflects an individual who does not have any preference to leave residual benefit. These individuals prefer to maximise the level of income streams they receive without valuing the flexibility to have access to capital or ability to leave bequest. A strength of residual benefit motive parameter of one reflects an individual that prefers not to utilise capital to fund retirement expenses but rather to hold all savings in their accounts to fully serve as contingent funds (access to capital/liquidity) when needed or set aside as bequest. <p>A strength of residual benefit motive parameter of 0.83 is the most common choice in most academic literature and relevant studies. The choice of this parameter reflects an individual placing some value on residual benefit but overall placing a lower value of the residual benefit than the long-term income streams. This is consistent with previous members survey studies.</p>

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