CSIRO

How much superannuation is needed to have a comfortable or modest retirement

Zili Zhu and Thomas Sneddon

CSIRO Data61

CSIRO-Monash Superannuation Research Cluster

CSIRO Data61

Copyright and disclaimer

Important disclaimer

Modification History

30/October/2015: First draft is completed.

24/November/2015: Updated for publication.

Introduction

Currently, there has been much speculation about potential new policy changes on the superannuation and retirement income system, which has been further fuelled by the federal government's favourable response to the Financial Systems Inquiry in October 2015 [1]. In the current public debate, there seems to be no agreement on the minimum superannuation amount required for retirees to have a reasonable living standard throughout retirement. A clear consensus on the minimum superannuation amount is important as this can help inform individuals and the government by having an unambiguous target when setting superannuation contributions rates. Various discussion has focussed upon whether the figure of $1,000,000 superannuation saving, as suggested by a newspaper article [2], is inadequate or excessive for achieving a comfortable retirement [3]. This paper will suggest, through CSIRO retirement income modelling, various suitable targets for superannuation saving levels to support either a comfortable or modest retirement living standard. This analysis will provide some quantitative evidence to the current superannuation policy debate.

Assumptions of the Modelling Work

The CSIRO SUPA model is an econometric forecasting model based on the well-known Wilkie cascading model [4][5]. The SUPA model is calibrated by certain economic variables and mortality data from 1993 to 2015, a period selected as the longest most recent period for which the economy has been structurally consistent since the introduction of inflation targeting policy by the Reserve Bank of Australia in 1993. The SUPA model simulates future scenarios for the co-dependent seven major variables on the Australian economy that are relevant to superannuation: (1) price inflation; (2) wage inflation; (3) Australian stock market returns; (4) international stock market returns; (5) Australian bond returns; (6) international bond returns; and (7) Australian cash investment returns. Through a large number of simulations of probable future scenarios of these economic variables, the CSIRO SUPA model can be used to project a range of retirement outcomes achievable by an individual's superannuation fund. For calculating the required minimum superannuation amount for a certain living standard during retirement, the following assumptions are made:

- The retirement age of the individual is assumed to be 65 years old. The current government pension system's effect on the individual's retirement income is included in the modelling when calculating withdrawals from the superannuation account for maintaining the chosen living standard during retirement (see Appendix for details of pension income calculations).
- Individual mortality is projected by utilising the Lee-Carter mortality model as applied to Australian Bureau of Statistics mortality data of ages 65 to 109 years, and by including projection for longevity improvements based upon this model.
- The individual's superannuation account is assumed to be invested in a balanced portfolio consisting of 35% Australian equities, 25% international equities, 12% domestic bonds, 8% international bonds and 20% cash investments.
- It is assumed that investment earnings are tax at 15% of the annual earnings for superannuation accounts.
- The individual is assumed to withdraw (at the beginning of each year) from their retirement age onward an annual amount inflated (adjusted) in accordance with projected price inflation rate (CPI) until death. The annual income at the age of retirement for comfortable retirement is set at $42,861 (corresponding to the "comfortable retirement standard" figure of the latest ASFA retirement standard (June 2015 quarter) and the income set for modest retirement is $23,662 (corresponding to the "modest retirement standard" figure of the latest ASFA retirement standard (June 2015 quarter).

- The CSIRO SUPA model is calibrated to economic data from the Australian Bureau of Statistics and Thomson Reuters Datastream. The average returns for the projected future 45 year period are tabled below:

Table 1: Average annual returns of economic variables produced by SUPA model over 45 year period

Economic variable	Annual mean	Annual Standard Deviation
Price Inflation (%pa)	2.59%	1.36%
Wage Inflation (%pa)	4.13%	1.17%
Australian Equities Return (%pa)	9.69%	13.58%
International Equities Return (%pa)	6.40%	17.85%
Domestic Bonds Return (%pa)	5.46%	8.90%
International Bonds Return (%pa)	6.67%	7.13%
Cash Investment Return (%pa)	5.30%	2.23%

Modelling Results and Analysis

By using the calibrated SUPA model, we can generate detailed future scenario outcomes with regards to the seven key economic variables. For these scenarios, we can vary the starting superannuation fund level and the withdrawal rates from the retirement age to simulate the annual level of the superannuation fund balance throughout retirement and thereby assess the probability of an individual's funds outlasting their lifespan for a certain living standard during retirement.

Table 2: Minimum fund level for comfortable retirement lifestyle with given success probability

Success probability	99%	97.5%	95%	92.5%	90%	87.5%	85%	82.5%	80%
	$1,018,000	$921,000	$851,000	$804,000	$772,000	$741,000	$717,000	$694,000	$676,000

Table 2 provides the minimum fund level required at retirement age to support a comfortable retirement with a certain success probability. Here, "success probability" denotes the probability of the individual dying before their superannuation funds are exhausted. For example, according to the SUPA model, an individual requires $1,018,000 in superannuation at the retirement age 65 to have a 99% probability of not exhausting their entire superannuation funds during their lifetime, whilst maintaining a comfortable retirement lifestyle according to the ASFA retirement standard.

Table 3 Minimum fund level for modest retirement lifestyle with given success probability

Success probability	99%	97.5%	95%	92.5%	90%	87.5%	85%	82.5%	80%
	$86,000	$78,000	$73,000	$68,000	$66,000	$64,000	$62,000	$60,000	$58,000

Similarly, Table 3 above provides the minimum fund level required at retirement age to support a modest retirement for various degrees of probability of success. These fund balances are much lower as the modest retirement income commences at an annual $23,662 as opposed to the comfortable level's $42,861. In

essence, the low superannuation amounts required for the modest living standard are to supplement the government pension system which provides $20342 annually for eligible full pensioners.

In Figure 1 below, the required minimum superannuation amount is plotted as a function of the selected probability of success, for both the comfortable and modest standards of living during retirement. Clearly, the required minimum superannuation amount for a given living standard of retirement increases in response to an increased probability of success.

Given the large degree of uncertainty in estimating future investment returns and the required expenditure for a certain retirement standard, a more logic approach would be to provide the additional quantitative measure: the probability of success, when a minimum superannuation amount is cited for meeting a particular retirement living standard. For example, in the case of comfortable retirement requirement, if 95% success probability is regarded as the acceptable risk tolerance level, the simulation result suggests that $851,000 is a sufficient superannuation at retirement age to achieve a comfortable retirement, and there is only 5% chance of exhausting the superannuation fund during the retirement phase. For a modest retirement lifestyle, only $73,000 is needed to achieve this goal for the same probability of success.
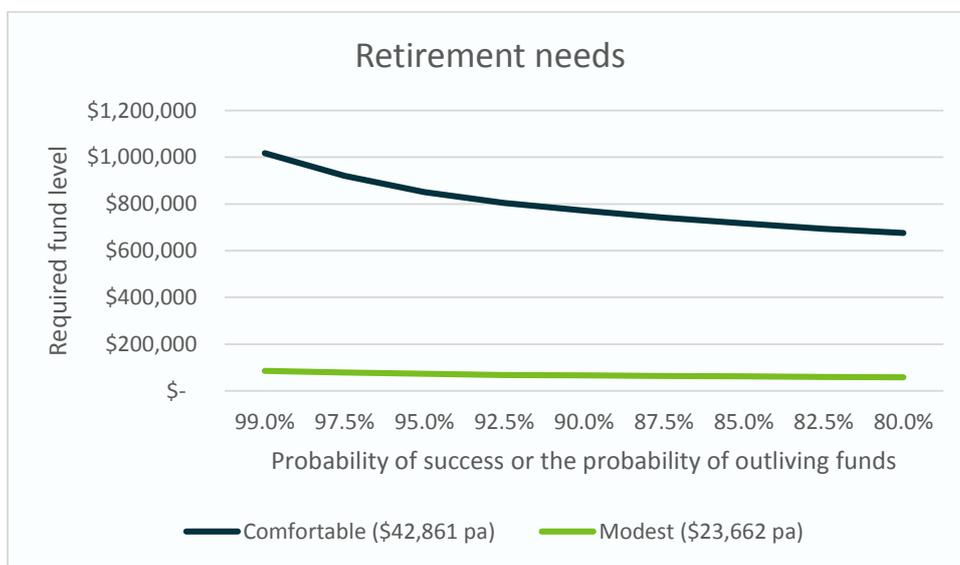

Figure 1 Minimum amounts of superannuation at various levels of probability of success.

Summary

The objective of this study is to use the CSIRO SUPA model to calculate the minimum superannuation fund balance that is needed to maintain a comfortable or modest retirement lifestyle. The conclusions from this study are reached from the simulation results generated from the CSIRO SUPA model which is based on a well-known Wilkie model. The underlying assumptions of this study are detailed here, and the CSIRO SUPA model is an open and transparent analytic tool available in the public domain. The quantitative outcomes generated from the SUPA model can help inform the current superannuation policy debate. The study has produced a range of suitable superannuation targets for desired retirement standards and according to risk tolerances expressed as the probability of success in not exhausting the superannuation fund during retirement phase.

It should be noted that the calculated minimum required superannuation amounts by the SUPA model are in the same order of magnitude as the often quoted $1M in [2] for a comfortable retirement lifestyle. However, if a lower probability of success is accepted, the minimum superannuation amounts can be much smaller. For example, if 80% is accepted as the probability of success, the minimum requirement in superannuation saving is $676,000. A reader can choose their own acceptable probability of success to determine the minimum superannuation amount for achieving the desired retirement lifestyle. We have provided a range of the required superannuation balance levels for given probabilities of success in this paper.

It should also be noted that the output from the SUPA model relies on forecasted economical scenarios, which in turn are determined by the historical economical data used to calibrate the model. The output from the SUPA can vary when a different set of historical data is selected, however, the magnitude of the forecasted superannuation amounts are not expected to change significantly.

Appendix: Calculation of pension income and base assumptions

A table outlining the policy settings employed (current to 30 June 2015 to match the SUPA investment model parameter calculation) is provided below (CPA 2015). Each threshold and pension rate within the below parameters is assumed to increase annually with price inflation, except for the full pension rate (which may be either increasing with purely price inflation or increasing by price inflation but maintaining a level above 27.7% of average male weekly ordinary time earnings (the current policy in place)). The pension income due to an individual within a given year is assessed as the lesser of the pension income due under the income test or under the assets test. The calculations of the pension income due are also provided below.

Table 4 Income test parameters:

Income test parameters	
Deeming: lower rate threshold (increases with price inflation)	$48,600.00
Deeming: lower rate	1.75%
Deeming: upper rate	3.25%
Full pension rate (increases with either current policy or solely price inflation)	$782.20
Maximum pension rate threshold (increases with price inflation)	$162.00
Reduction rate	$0.50
Cut-off limit (increases with price inflation)	$1,882.40

For the first year of retirement, the pension income due under the income test is a simple calculation based on three post-retirement income levels:

1. for those with an income of less than $162.00 per fortnight, the full pension rate of $782.20 per fortnight ($20,337.20 per annum) is due;
2. for those with an income of between $162.00 and $1,882.40 per fortnight, the pension due per fortnight is $782.20 LESS $0.50 for every dollar above $162.00 of income; and
3. for those with an income of above $1,882.40 per fortnight, no pension is due.

Although no salary income is earned in retirement, the individual's superannuation fund balance is deemed to earn the income upon which the income test assessment is made. Under current policy settings, for the first year (after which the $48,600.00 threshold, $782.20 full pension rate and $162.00 maximum pension rate threshold all increase with price inflation) the individual is deemed to earn 1.75% per annum on the first $48,600.00 in their fund balance and 3.25% per annum on the remaining fund balance. For example, an individual with $100,000.00 in their fund is deemed to have an income of $(1.75\% \times 48,600) + (3.25\% \times 51,400) = \$2,521.00 \; per \; annum$ or $\left(\frac{2,521}{26}\right) = \$96.96 \; per \; fortnight$ and is therefore entitled to a pension of $782.20 per fortnight under the income test.

Table 5 Assets test parameters:

Assets test parameters	
Upper limit of no income tax (increases with price inflation)	$18,200.00
Low income tax rate	19.00%
Upper limit of low income tax rate (increases with price inflation)	$37,000.00
Middle income tax rate	32.50%
Upper limit of middle income tax rate (increases with price inflation)	$80,000.00
High income tax rate	37.00%
Upper limit of high income tax rate (increases with price inflation)	$180,000.00
Highest income tax rate	45.00%
Maximum pension rate threshold (increases with price inflation)	$205,500.00
X in reduction rate ($x per $y above threshold)	$1.50
Y in reduction rate ($x per $y above threshold)	$1,000.00
Part pension rate threshold (increases with price inflation)	$779,000.00

For the first year of retirement, the pension income due under the assets test is also a simple calculation based on three post-retirement levels (although the calculation of the assets figure is fairly complex):

1. for those with assessable assets valued at less than $202,000.00 in total, the full pension rate of $776.70 is due;
2. for those with assessable assets valued at more than $202,000.00 but less than $771,750.00 in total, the pension due per fortnight is $776.70 LESS $1.50 for every $1000.00 in assets value above $202,000.00; and
3. for those with assessable assets valued at more than $771,750.00 in total, no pension is due.

It is assumed for the purposes of this paper that the individual's only assessable asset is their superannuation account, and therefore their pension under the assets test is based only on this account balance. As an example, in the first year an individual who has accumulated a total of $300,000.00 in superannuation is entitled to a pension of $782.20 - \left(1.5 \times \left(\frac{300,000-205,500}{1,000}\right)\right) = 782.20 - 141.75 = $640.45\ per\ fortnight$ under the assets test. Additionally, their pension income under the income test would be $689.72\ per\ fortnight$ $(782.20 - 0.5 \times ((\frac{(1.75\%\times48,600)+(3.25\%\times251,400)}{26}) - 162.00))$ so they would receive $640.45\ per\ fortnight$ as the lesser of the pension income due under the two tests.

References

[1]: The Australian Government 2015, *Improving Australia's Financial System: Government response to the Financial System Inquiry*. Available from:

<http://www.treasury.gov.au/~/media/Treasury/Publications%20and%20Media/Publications/2015/Government%20response%20to%20the%20Financial%20System%20Inquiry/Downloads/PDF/Government_response_to_FSI_2015.ashx>. [23 October 2015].

[2]: Liew, R 2015, 'Superannuation alert: $1 million isn't enough to retire in comfort', *The Sydney Morning Herald* 20 April. Available from: <http://www.smh.com.au/business/the-economy/superannuation-alert-1-million-isnt-enough-to-retire-in-comfort-20150419-1modsc.html>. [23 October 2015].

[3]: Australian Institute of Superannuation Trustees 2015, *Super Reality Check: Busting the $1 million retirement myth*. Available from:

 <https://www.aist.asn.au/media/15000/2015_Retirement_Incomes_Paper_FINAL_FOR_RELEASE.pdf>. [23 October 2015].

[4] Wilkie, A. D. 1995, 'More on a stochastic asset model for actuarial use', *British Actuarial Journal*, vol. 1, pp. 777-964.

[5] Wilkie, A.D. 1986, 'A stochastic investment model for Actuarial Use', *Transactions of the Faculty of Actuaries*, vol. 39, pp. 341–403.