

JUST HOW SAFE ARE 'SAFE WITHDRAWAL RATES' IN RETIREMENT?

Michael E. Drew¹, Adam N. Walk

Department of Accounting, Finance and Economics, Griffith University

Email: Michael.drew@griffith.edu.au and a.walk@griffith.edu.au

ARTICLE INFORMATION

Article History:

Submitted 14 July 2015,

Revision: 2 October 2015

Acceptance: 28 October 2015

Key words:

Account based pensions;

four percent rule; retirement income

JEL: G11, G23

ABSTRACT

This study considers one of the cornerstone questions in the retirement income debate; namely, what's a safe withdrawal rate for retirement? This question is of particular importance to Australia's superannuation system, which is characterised by having compulsory contributions during the retirement saving (or accumulation) phase, but no compulsory requirement to annuitise lump sums at the commencement of the retirement income (or distribution/decumulation) phase. As a result, many retirees face a classic asset–liability mismatch, the need to fund relatively short- and medium-term retirement spending needs with a long-term investment strategy. This study tests one of the most popular heuristics that have arisen from the safe withdrawal debate, specifically the 4% rule. Our findings question the validity of this approach using historical international return data.

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¹ We thank Luo Wang for research assistance. We also thank Samuel Bell, Associate Professor Robert Bianchi, Troy Rieck and participants at Finsia's Retirement Adequacy Roundtable (July 2013) for comments. We acknowledge the feedback from the editor, Dr Rakesh Gupta and the two anonymous reviewers that have improved the paper. We thank Finsia for their financial support as part of the 'Retirement Risk Zone' research campaign.

Introduction

This study considers one of the cornerstone questions in the retirement income debate; namely, what's a safe withdrawal rate for retirement? The much celebrated 4% Rule has become a popular heuristic that has provided a quick shortcut to 'solving' this most difficult of retirement planning problems.

The pioneering work in the field was contributed by Bengen (1994).² Using historical simulation, the study shows that the retirement portfolios of people who retired during the period 1926 through 1976 and withdraw 4% of the initial balanced portfolio value every year (adjusted for inflation) could be sustained for at least three decades.³ The second group of studies that provide support to the 4% Rule are known as the Trinity studies.⁴ These studies use a simple, but highly informative, approach to investigate withdrawal rates with respect to different asset allocations, and several time horizons. In their most recent paper, Cooley, Hubbard, and Walz (2011) consider an observation period from January 1926 through December 2009. This study suggests that retirees who plan to make annual inflation adjusted withdrawals should stay within the 4% to 5% range.⁵

As we entered the 21st century, the sequence of major events that have occurred in the first decade included: 9/11; the dot.com bubble; the sub-prime crisis and the GFC. This unfortunate succession of events across the early 2000s resulted in a level of wealth compression in investment portfolios not seen for many years. This period of heightened volatility underscored the importance of path dependency to the sustainability of retirement income (Basu and Drew, 2009; Basu, Doran and Drew, 2012). It has given rise to a far more critical assessment of the 4% Rule (and its variants).

The work of Spitzer, Strieter, and Singh (2007) and Spitzer (2008) has been important in developing a line of argument that suggests the 4% Rule may be an oversimplification of a complex process that involves the analysis of risk tolerance, asset allocation, withdrawal size and expected returns. Using a bootstrap approach, these studies examine a myriad of withdrawal rates finding that the fixed 4% rule is not always safe and that dynamic approaches to the withdrawal rate may assist the retiree. Harris (2009) finds that sequencing risk is a key determinant of the sustainability (or otherwise) of safe withdrawal rates, with rates varying in the range of two to four percent.⁶

² The seminal study of Bengen (1994) considered safe withdrawal rate for a US investor using year-on-year returns from 1925 for a 50/50 stock/bond portfolio. Bengen (1994) assumed half the portfolio was allocated to the S&P 500 and half in intermediate term government bonds.

³ The much celebrated 4% Rule has become a popular heuristic that has provided a quick shortcut to 'solving' this most difficult of retirement planning problems.⁴ Using a 30-year holding period, William Bengen (1994) calculated that a 4.1 percent withdrawal rate would allow the retiree to survive the worst market declines, hence the rise of the 4% Rule.

⁴ All three authors are Professors of Finance at Trinity University in San Antonio, Texas.

⁵ Cooley, Hubbard, and Walz (2011) note that for retirees who are willing to accept greater risk of portfolio ruin, portfolios with at least 50% allocated to stocks can provide a withdrawals rates upwards of seven percent.

⁶ See Drew, Walk and West (2015) for a discussion on the role of unlisted asset classes (property) on sequencing risk.

Pfau (2010) conducted the first major study to examine the issue of safe withdrawal rates from a larger selection of countries. This study replicates the methodology of Bengen (2006) by using the Dimson, Marsh, and Staunton (2012) data from 1900 through 2008 for 17 developed countries. The analysis provides some interesting results finding that the 4% withdrawal rate is not safe when using the original Bengen (2006) maximum safe withdrawal rate criterion. The findings show that, even with the assumption of perfect foresight, the maximum safe withdrawal rate exceeds 4% in only 4 of the 17 countries, range between 4% and 2% in a further eight countries, and are less than 2% in five countries.

Data and method

In order to provide positive insights into what is, at its core, a normative question, our review of the literature suggests that it is prudent for researchers to investigate capital markets that have very, very long historical data series and, if possible, markets with different return distributions. For this reason, we have non-randomly selected five countries to stress test the 4% Rule. We ranked all 19 countries in the Dimson, Marsh and Staunton (2012) database in descending order based on their respective annualised performance (real accumulated returns) of stock returns for the period 1900 through 2011 (a total of 112 years) and those countries representing the key percentile levels (minimum; first quartile; median; third quartile and maximum) are selected to test safe withdrawal rates under different asset allocations and investment horizons (Table 1).⁷

Given the centrality of inflation (and its relationship to stocks, bonds and bills through time), we use real returns throughout the study. Specifically, instead of using nominal rates of return and then adjusting withdrawals each year for inflation, we elect to use real returns thereby avoiding the annual inflation adjustment. Annual withdrawal rates ranging from one percent through 10 percent (in increments of 100 basis points) are considered across investment horizons of 10, 20, 30, and 40 years. Given that Australians are living longer lives (and many Australians retire before 65 years of age), we argue it is important to include the 30 and 40 year horizons to provide positive insights into the robustness of safe withdrawal rates across longer horizons. We consider the Golden or 4% Rule for stock allocations ranging from 0% to 100% (in increments of 25%) for each of our representative countries (rebalanced annually, for brevity, we only report the 50:50 results in this paper) and report maximum safe withdrawal rates (or "SAFEMAX" as in Bengen, 2006).⁸ Finally, we assume that retirees make an initial withdrawal at the commencement of each year. That is, the initial withdrawal amount is equal to the specified withdrawal rate times the starting balance of the portfolio (Pfau, 2010).

⁷ As noted by Dimson, Marsh and Staunton (2012), The database contains annual returns on stocks, bonds, bills, inflation, and currencies for 19 countries from 1900 to 2011. The countries comprise two North American nations (Canada and the USA), eight euro-currency area states (Belgium, Finland, France, Germany, Ireland, Italy, the Netherlands, and Spain), five European markets that are outside the euro area (Denmark, Norway, Sweden, Switzerland, and the UK), three Asia-Pacific countries (Australia, Japan, and New Zealand), and one African market (South Africa). These countries covered 89% of the global stock market in 1900, and 85% of its market capitalisation by the start of 2012.

⁸ We examine safe withdrawal rates for five countries for the period 1900 through 2011. The long horizon nature of the DMS (2012) database allows for a range of overlapping retirement periods to be examined (specifically, 102 x 10 years; 92 x 20 years; 82 x 30 years; and 72 x 40 years) across varying asset allocations to stocks, bonds and bills for each country.

Table 1: Ranking of Annualised Performance (Stocks, real accumulated returns)

Ranking	Country	Annualised Performance (%)	Standard Deviation	Reward/Risk Ratio
#1	Australia	7.22	18.23	0.40
#2	South Africa	7.21	22.49	0.32
#3	United States	6.19	20.20	0.31
#4	Sweden	6.11	22.87	0.27
#5	New Zealand	5.76	19.66	0.29
#6	Canada	5.69	17.22	0.33
#7	United Kingdom	5.20	19.94	0.26
#8	Finland	5.01	30.41	0.16
#9	Denmark	4.85	20.90	0.23
#10	Netherlands	4.81	21.76	0.22
#11	Switzerland	4.13	19.73	0.21
#12	Norway	4.08	27.33	0.15
#13	Ireland	3.72	23.06	0.16
#14	Japan	3.62	29.78	0.12
#15	Spain	3.42	22.21	0.15
#16	France	2.87	23.45	0.12
#17	Germany	2.86	32.18	0.09
#18	Belgium	2.39	23.57	0.10
#19	Italy	1.68	28.99	0.06

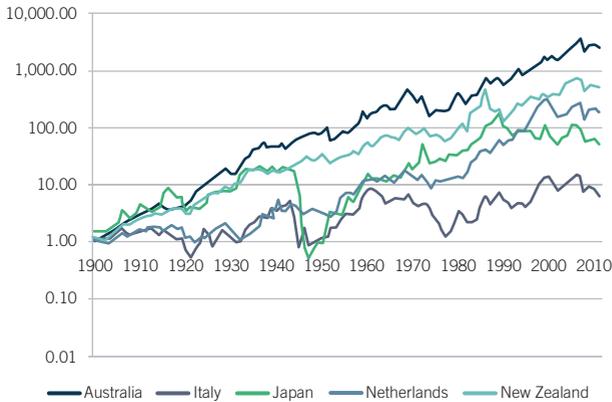
Source: DMS (2012)

We have highlighted (bold and underline) five countries: Australia (“AUS”); New Zealand (“NZL”); Netherlands (“NLD”); Japan (“JPN”); and Italy (“ITA”), in the table as they represent annualised performance levels that most closely correspond to key percentiles in the distribution of the annualised performance of stock markets over the long run.⁹

Figure 1 shows the evolution of \$1 invested in each of these countries over the full length of the data set (note the logarithmic scale on the y-axis).

⁹ We use the standard three-letter country codes defined in ISO 3166-1 interchangeably throughout this study, part of the ISO 3166 standard published by the International Organization for Standardisation (“ISO”).

Figure 1: Evolution of \$1 invested in 1900 (n=5, logarithmic scale base=10)



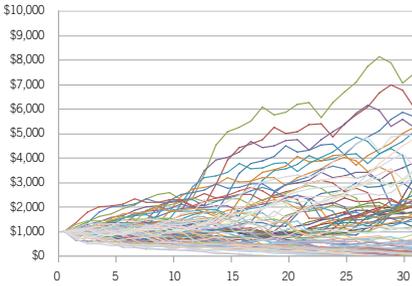
Results

Turning specifically to the 30 year planning horizon, we report SAFEMAX results (that is, the maximum withdrawal rate that ensured portfolio survivability) for a 50:50 growth/defensive asset allocation (Figure 2). Even with the stellar performance of Australian equities historically, we find success for the 4% Rule in the shortest of timeframes, with horizons greater than a decade exposing the hypothetical investor to some chance of ruin (SAFEMAX for Australia is estimated at 2.96%, some 100 basis points below the golden rule).

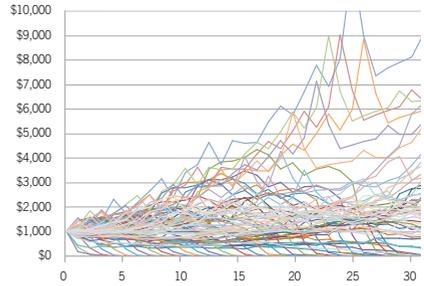
For completeness, we also report SAFEMAX results for New Zealand (3.64%), the Netherlands (3.19%), Japan (0.24) and Italy (0.89). A wider range of asset allocations, investment horizons and payout rates are provided in the full report (Drew and Walk, 2014).

Figure 2: Heat maps of SAFEMAX results (50:50, 30 Years)

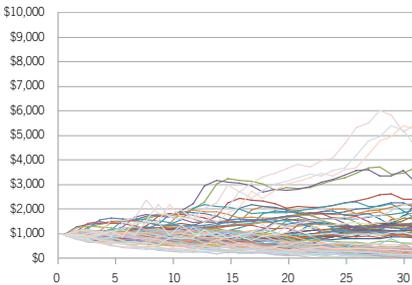
AUS 4% (SAFEMAX100 2.96)



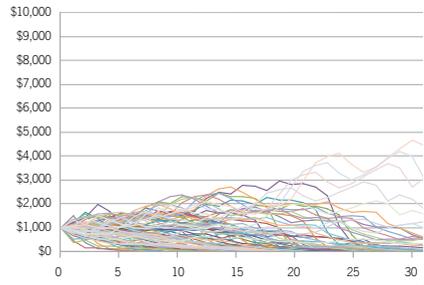
JPN 4% (SAFEMAX100 0.24)



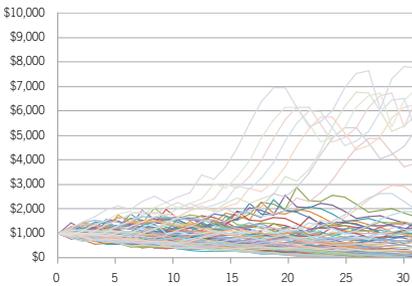
NZL 4% (SAFEMAX100 3.64)



ITA 4% (SAFEMAX100 0.89)



NLD 4% (SAFEMAX100 3.19)



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Australia heat map

Payout	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
10yrs	100%	100%	100%	100%	100%	100%	98%	93%	86%	82%
20yrs	100%	100%	100%	98%	88%	67%	53%	40%	29%	21%
30yrs	100%	100%	99%	82%	60%	37%	27%	17%	7%	5%
40yrs	100%	100%	93%	58%	40%	28%	17%	7%	4%	1%

New Zealand heat map

Payout	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
10yrs	100%	100%	100%	100%	100%	100%	100%	96%	94%	84%
20yrs	100%	100%	100%	100%	92%	71%	46%	32%	26%	11%
30yrs	100%	100%	100%	88%	52%	29%	16%	10%	6%	1%
40yrs	100%	100%	100%	58%	32%	10%	3%	3%	0%	0%

Netherlands heat map

Payout	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
10yrs	100%	100%	100%	100%	100%	100%	100%	99%	85%	70%
20yrs	100%	100%	100%	100%	82%	55%	42%	33%	20%	12%
30yrs	100%	100%	100%	70%	43%	22%	13%	9%	6%	4%
40yrs	100%	100%	96%	42%	17%	3%	0%	0%	0%	0%

Japan heat map

Payout	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
10yrs	94%	92%	92%	91%	91%	91%	89%	85%	84%	78%
20yrs	84%	82%	80%	80%	75%	68%	55%	43%	28%	18%
30yrs	76%	71%	68%	62%	57%	44%	26%	11%	10%	7%
40yrs	67%	50%	49%	47%	42%	28%	14%	11%	8%	6%

Italy heat map

Payout	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
10yrs	100%	99%	95%	95%	93%	86%	80%	76%	67%	64%
20yrs	100%	89%	82%	53%	49%	41%	36%	27%	15%	5%
30yrs	95%	85%	43%	24%	18%	12%	7%	4%	1%	1%
40yrs	86%	49%	18%	10%	1%	0%	0%	0%	0%	0%

Discussion

Our results confirm that whatever you think you need as superannuation nest egg, it is almost certainly going to be less than you actually need. The conversation is a difficult one in that, for many investors, their focus is on the asset side (particularly, the return portion) of the equation, not the liability side. We posit that the first challenge in tipping the scales in the retiree's favour is to get the framing right, moving from a 'pot of gold' (asset) mindset to an 'income replacement' focus (liability).

It's time for a difficult conversation. Let's assume (somewhat heroically) that a couple has a retirement nest egg of \$1m today. How can we begin to assist retirees with framing reasonable expectations given different starting balances?

The Association of Superannuation Funds of Australia ("ASFA") has developed the ASFA Retirement Standard benchmarks that estimate the annual budget needed by Australians to fund either a comfortable or modest standard of living in retirement. It is updated quarterly to reflect inflation, and provides detailed budgets of what singles and couples would need to spend to support their chosen lifestyle. We argue that these benchmarks are a critical component to improving the framing of retirement income decisions. The ASFA Retirement Standard (June Quarter 2013) shows that, in general, a couple looking to achieve a 'comfortable' retirement needs a budget of \$56,406 a year, while those seeking a 'modest' retirement lifestyle need a budget of \$32,656 a year (ASFA, 2013).¹⁰

For the purposes of providing a practical perspective to the safe withdrawal debate, we can consider (on a \$1m starting balance), a real income requirement of 3.27% (that is, 3.27% of \$1m = \$32,700 p.a. for 30 years) for a modest income level; and a 5.64% for a comfortable income (5.64% of \$1m = \$56,400 p.a. for 30 years).

We can consider the ASFA benchmarks as forming a retirement income channel through which retirees are attempting safe passage (in this case, safe passage is avoiding portfolio ruin). Even if we exclude the countries with the lowest safe withdrawal rate results (Japan and Italy), the results on a starting balance of \$1m for a couple suggest that the ASFA modest range is vastly more sustainable than the comfortable equivalent. Even at this withdrawal rate, history suggests that a couple would still face somewhere between a 10 to 30 percent chance of portfolio ruin for a 30 year horizon. As a form of 'ready reckoner', we include in the table below different starting points, and their safe withdrawal equivalent percentage.

¹⁰ For a more detailed view of the expenditure components in the ASFA Retirement Standard (and the methodological approach, see: <http://www.superannuation.asn.au/resources/retirement-standard>)

Table 2: Withdrawal rates equivalents for varying starting values

Starting Balance	ASFA Modest \$32,656	ASFA Comfortable \$56,406
\$250,000	13.06%	22.56%
\$500,000	6.53%	11.28%
\$750,000	4.35%	7.52%
\$1,000,000	3.27%	5.64%
\$1,250,000	2.61%	4.51%
\$1,500,000	2.18%	3.76%

In short, holding a 50:50 portfolio over 30 years, the highest SAFEMAX100 rate we report in this study is from New Zealand at 3.64%. This suggests that even using the BEST result from our sample, a couple with a starting balance of \$1.5m would, using history as a guide, still face some probability of portfolio run. We again acknowledge the limitations of the 4% Rule, particularly its deterministic nature. In the real world, retirees face an array of expenses, the frequency of which range from well-known (such as utility bills, insurance costs, general living expenses) to some which are stochastic or random in nature (for instance, major unanticipated health events).

However, the 4% Rule can be used as a very helpful heuristic for retirees (a mental shortcut to assist in our understanding the challenge of income planning). Like many shortcuts they can provide imperfect answers to help us better understand complex problems. As noted by Scott, Sharp, and Watson (2009), the 4% Rule imposes an opportunity cost on retirees and is therefore inefficient. We would certainly echo their view. The 4% rule helps us initially engage cognitively in the retirement income problem which, as we have seen from this study, is simultaneously complex and dynamic in nature.

Retirement income planning: the next steps

We have limited skills in forecasting whether or not the retiree gets the 'bad' draw out of the cosmic investing world. We know that if the sequence of returns is against us (particularly when the largest amount of our nest egg is at risk) and the timing is wrong, the reality is that some investor is going to get the worst outcome.

However, there are many levers that can be coordinated to tip the scale in the favour of the retiree, including more dynamic approaches to the:

- **Withdrawal rate** (mortality updating, regular mid-point reviews and updating of the cash flow profile of retirees);
- **Asset allocation** (our results suggest that going defensive doesn't necessarily work and can potentially lock in a bad outcome; being judicious about selling expensive assets through time and not being a forced seller due to liquidity needs; liability-driven investment);
- **Planning horizon** (working longer and phased retirement results in saving more and shortening the income period; aged care costs; medical expenses; bequest motive);
- **Fees and after-tax management** (we need to start to think of the fee debate as something more than an expense, but rather a budget to assist retirees in managing their asset-liability mismatch. After all, retirees live on after fee, after-tax outcomes);
- **Scenario testing** (we need to regularly update our retirement expectations, that is, the liability we need to meet and the asset base with which we must achieve this, can be informed by a range of simulation techniques).
- **Risk management** (our findings highlight that a tail event in the early stages of the income phase almost ensures portfolio ruin. We insure for a range of events in our life – home and contents, life and disability – why would we not insure against tail events late in our accumulation phase and early in the income phase?).
- **Investment governance** (we need to ensure that we have trustees that can understand the asset-liability mismatch faced by retirees. As we have seen, the mismatch is a multi-dimensional problem; a complex interplay between market risk, longevity risk, and inflation risk. This requires more than, "did we beat peers" or "can we pick stocks?" We need to break our current obsession with the return characteristics of the asset side of the equation and move the fiduciary focus to liability management).

We acknowledge that this is not an exhaustive list. However, these are some of the key levers that our research findings suggest can fall within the gambit of 'known knows'.

The days of searching for the retirement income silver bullet are over. In this study, the Golden or 4% Rule works for favourable sequences of returns (let's be honest, everything works in such markets), ignores asset values of the day and is decoupled from the dynamic nature of the asset-liability mismatch faced by many Australians. However, the 4% Rule does present us with an opportunity to form a baseline which can dramatically improve our framing of expectations of what's possible in retirement.

For the future, we need to move from a silver bullet approach (such as the 4% Rule) and instead employ a veritable arsenal of weapons (based on dynamism: withdrawal rates; asset allocation; planning horizon; fees and after-tax management; scenario testing; risk management; investment governance) to assist retirees in managing and mitigating the asset-liability mismatch in retirement.

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