The Finsia Journal of Applied Finance
ISSUE 4 2013

7 Sequencing risk: The worst returns in their worst order
ANUP K BASU, BRETT M DORAN and MICHAEL E DREW SF Fin

14 What Australian investors need to know to diversify their portfolios
VITALI ALEXEEV and FRANCIS TAPON

21 Breach of continuous disclosure in Australia
ANGELA ANDERSEN, AARON GILBERT and ALIREZA TOURANI-RAD F Fin

Papers from the Melbourne Money & Finance Conference 2013

28 Measuring retirement savings adequacy in Australia
JOHN BURNETT, KEVIN DAVIS SF Fin, CARSTEN MURAWSKI, ROGER WILKINS and NICHOLAS WILKINSON

36 Restoring a level playing field for defined benefits superannuation
HAZEL BATEMAN and GEOFFREY KINGSTON

42 The problems with investment advice
TOM VALENTINE

47 Risk-on risk-off: Implications for investors in the Australian stock and bond markets
TARIQ HAQUE
Members of the JASSA Editorial Board

PROFESSOR MICHAEL DREW SF Fin (Chair)
Griffith University

ASSOCIATE PROFESSOR LAKSHMAN ALLES F Fin
Curtin University of Technology

DR BRUCE ARNOLD
University of New South Wales

DR JEAN CANIL
University of Adelaide

PROFESSOR CAROLE COMERTON-FORDE
University of Melbourne

PROFESSOR KEVIN DAVIS SF Fin (Managing Editor)
Australian Centre for Financial Studies, Monash University and University of Melbourne

MARION FAHRER F Fin (Editor)
Facom Consulting

PROFESSOR KIM HAWTREY SF Fin
BIS Shrapnel

DR ALEXANDRA HEATH
Reserve Bank of Australia

PROFESSOR KEVIN JAMESON F Fin
Macquarie University of Applied Finance Centre

PROFESSOR PAUL KOFMAN
University of Melbourne

AARON MINNEY F Fin
Challenger

PROFESSOR FARI MOSHIRIAN
University of New South Wales

DR MAURICE PEAT F Fin
University of Sydney Business School

DR ALIREZA TOURANI-RAD F Fin
Auckland University of Technology

Finisia representatives

RUSSELL THOMAS F Fin
CEO and Managing Director

CAROLINE FALSHAW A Fin
Manager, Corporate Affairs

Contributions to JASSA

The JASSA Editorial Board welcomes original, practical and topical articles on matters of interest to the securities, finance and banking industry across Australia, New Zealand and Asia.

Opinions and comment presented as Letters to the Editor are welcome. Correspondence in connection with JASSA should be addressed to: The Editor, JASSA via Finsia, or via m.fahrer@finsia.com

JASSA has a wide and varied readership throughout the financial services industry, the broader business community and institutions engaged in related academic studies.

JASSA is now included in EconLit, Social ScienceCitation Index, Scopus, ProQuest, Informit and EBSCOHost services.

As a not-for-profit professional association, Finisia will channel all royalties from reproduction of articles in these services into our Scholarships and Awards Fund that promotes the development of talent in the financial services industry. Authors who do not wish Finisia to retain any royalties pertaining to their published articles should contact Caroline Falshaw.

The Editorial Board favours articles written in a freely readable style, rather than formal scholarly work or highly technical papers. Authors should acknowledge this by minimising footnotes and appendices where possible.

Before submitting articles, intending contributors may contact:

Caroline Falshaw A Fin
Manager, Corporate Affairs
PO Box H99, Australia Square
Sydney NSW 1215 Australia
T > +61 2 9275 7900
E > membership@finsia.com

Visit our website at www.finsia.com for JASSA Author Guidelines and copy deadlines.

Articles will be submitted to a double-blind review process and may be returned to authors with suggestions for revision. Articles accepted for publication will be edited for style, clarity and length. The Editor will consult with authors as closely as possible about changes.

All original articles published in JASSA will be considered for the award of the annual JASSA Prize.

Subscription inquiries should be sent by email to: membership@finsia.com.

JASSA is the journal of FINSIA — Financial Services Institute of Australasia (ACN 066 027 389, ABN 96 066 027 389), Australia Square, Sydney NSW 2000. It was formerly published as the Journal of the Australian Society of Security Analysts, and then of the Securities Institute of Australia, now incorporated into Finisia. JASSA is published four times each year, providing an avenue for views and information on matters affecting the financial services industry. No part of the material published in JASSA may be reproduced without the permission of the author or authors and of the Institute.

Acknowledgement of the author or authors, Finisia and JASSA is required.

ISSN 0313-5934
Sequencing risk: The worst returns in their worst order
ANUP K BASU, BRETT M DORAN and MICHAEL E DREW SF Fin
For the first of the baby boomers turning 65 years of age, after a decade littered with financial shocks (dot.com bubble, sub-prime, global financial crisis, sovereign debt), sequencing risk can represent a significant threat to their retirement nest eggs. This paper takes an outcome-oriented approach to the problem, to provide practical insights into how sequencing risk works and the critical dependency of retirement outcomes on sequencing risk. Our analysis challenges the conventional wisdom that it is the accumulated average of investment returns that matter. We show, instead, that it is the realised sequence of returns which largely determines the sustainability of retirement incomes.

Breach of continuous disclosure in Australia
ANGELA ANDERSEN, AARON GILBERT and ALIREZA TOURANI-RAD F Fin
Given that disclosure is important for the efficient functioning of capital markets, this paper explores the impact of infringement of continuous disclosure by Australian listed firms. We observe a significantly negative market reaction for our sample firms around the day an infringement is announced. Our findings also provide partial evidence of an increase in spreads and a decrease in price informativeness following the announcement of a breach. Overall, our results indicate that the market considers the breach of continuous disclosure to be a relatively important incident.

What Australian investors need to know to diversify their portfolios
VITALI ALEXEEV and FRANCIS TAPON
An ASIC survey in 2008 showed that Australian investors do not diversify their portfolios sufficiently, with the average investor holding only 2.19 securities. To study this issue, we simulate portfolios using daily observations for all traded and delisted equities in Australia between 1975 and 2011. We calculate two measures of risk, including heavy tailed distributions to account for extreme events. For each risk measure, we recommend the number of portfolio holdings that result in a 90 per cent reduction in diversifiable risk for an average and a more conservative investor. We find that, on average, 24 to 30 stocks are sufficient to attain a well-diversified portfolio.
Measuring retirement savings adequacy in Australia

JOHN BURNETT, KEVIN DAVIS SF Fin, CARSTEN MURAWSKI, ROGER WILKINS and NICHOLAS WILKINSON

We present two new metrics to assess the adequacy of retirement savings and estimate these metrics for a representative sample of the Australian population aged 40 to 64. Our estimates support the widely held belief that most individuals are not ‘on track’ to achieve a comfortable standard of living in retirement, although couples appear better prepared than singles. We also estimate the relative expected contributions of the various ‘pillars’ of retirement income. The metrics presented here may provide a better way to communicate adequacy to individuals, and encourage increased saving.

Restoring a level playing field for defined benefits superannuation

HAZEL BATEMAN and GEOFFREY KINGSTON

After declining worldwide since the late 1980s, defined benefits plans will not recover their previous dominance in Australia because they can only be offered by large and stable organisations. Since 1992 Australia has had compulsory superannuation that is mostly privately managed. Several policy measures have unduly weakened defined benefits schemes, especially in the private sector. Rescinding these measures would revitalise defined benefits and produce a deeper market for privately managed lifetime annuities.

The problems with investment advice

TOM VALENTINE

The FoFA reforms were designed to improve the quality of financial and investment advice offered to the public. In particular, they sought to correct conflicted remuneration structures which led advisers to act in their own interests rather than those of their clients. However, the reforms did not confront some important problems in the industry — its fragmentation, horizontal integration and the need for improved education of advisers and investors.

Risk-on risk-off: Implications for investors in the Australian stock and bond markets

TARIQ HAQUE

Risk-on risk-off (RORO) effects were present in Australian and international financial markets from July 2007 to December 2012. This study shows that a risk-parity portfolio which combines both equities and bonds generates a higher Sharpe ratio than investing in either equities or bonds alone over a sample period incorporating both RORO and non-RORO periods.
This issue of JASSA includes a number of articles focusing on critical issues in relation to superannuation, retirement adequacy and financial advice. The second half of this issue also includes edited versions of several papers presented at the 18th Melbourne Money and Finance Conference — Financial Sector Evolution: Prospect and Determinants — held in July 2013. The conference was organised by the Australian Centre for Financial Studies and sponsored by ANZ, APRA, the Reserve Bank of Australia and Finsia. While not subject to the usual double-blind process, each of these papers was reviewed by a member of the Editorial Board and by me prior to publication.

The paper by Anup K Basu, Brett M Doran and Michael E Drew SF Fin highlights the extent to which sequencing risk can represent a threat to retirement nest eggs. It shows that it is the realised sequence of returns which largely determines the sustainability of retirement incomes not the accumulated average of investment returns, as suggested by conventional wisdom. The authors indicate that for those who are near retirement (or have recently retired), the dollar-weighted impact of a GFC-like event on their retirement nest egg can be much larger than that for younger generations. They find that even muted levels of bad volatility, occurring at the worst time, can have a significant impact on members’ retirement savings and it is not necessarily the magnitude of the negative return that matters, but its timing.

They also note that in order to improve retirement outcomes for members there is a need to ensure that the conversation about the management of sequencing risk, which often occurs during the critical retirement conversion phase, is brought forward to be at the heart of defined contribution plan design and governance.

Next, Vitali Alexeev and Francis Tapon examine the issue of how many stocks Australian investors need to hold to achieve a well-diversified portfolio. Noting that the average Australian investor only holds around two securities, as indicated in a recent ASIC survey, Alexeev and Tapon conclude that the size of a well-diversified portfolio for Australian investors depends on the measure of risk used, the changing correlations between stock returns across time and market volatility. They indicate that in periods of anticipated high market volatility characterised by large correlations among stocks, conservative investors will need to add a relatively large number of securities to their portfolios compared to periods when markets are fairly stable and average correlations are low. The authors find that, on average, 24 to 30 stocks are sufficient to achieve a well-diversified portfolio.

With disclosure being widely viewed as important for the efficient functioning of capital markets, the paper by Angela Andersen, Aaron Gilbert and Alireza Tourani-Rad F Fin explores the impact of infringement of continuous disclosure by Australian listed firms. The authors observe a significantly negative market reaction for sample firms around the day an infringement is announced and their findings also provide partial evidence of an increase in spreads and a decrease in price informativeness following the announcement of a breach. Overall, their results indicate that the market considers the breach of continuous disclosure to be a relatively important incident. After observing few breaches in the sample period, the authors suggest the continuous disclosure regime in Australia is functioning well.

The issue of retirement adequacy is taken up again in the first of the papers from the Melbourne Money and Finance Conference. The paper by John Burnett, Kevin Davis SF Fin, Carsten Murawski, Roger Wilkins and Nicholas Wilkinson presents two metrics (the consumption shortfall and the age gap) to assess the adequacy of retirement savings and estimates these metrics for a representative sample of the Australian population aged 40 to 64. The authors note that these estimates support the widely held belief that most individuals are not ‘on track’ to achieve a comfortable standard of living in retirement, and that couples appear better prepared than singles. With individuals often facing difficulties in understanding whether their pre-retirement savings behaviour will ensure adequate retirement consumption levels, the authors believe that the metrics presented in this paper may provide a better way to communicate adequacy to individuals, and encourage increased saving.
Hazel Bateman and Geoffrey Kingston focus on another important issue for policy makers in relation to retirement savings: they argue that there is a need to restore a level playing field for defined benefit funds. Bateman and Kingston believe that in the push for universal coverage of accumulation superannuation plans some valuable characteristics of defined benefits have been overlooked. They indicate these advantages include scope for efficiency gains in bargains between employers and employees, certainty and simplicity of retirement benefits, and better management of investment and longevity risk. Bateman and Kingston suggest that several policy measures have unduly weakened defined benefit schemes, especially in the private sector. They believe that rescinding these measures would revitalise defined benefit, and produce a deeper market for privately-managed, lifetime annuities.

The paper by Tom Valentine considers the adequacy of Future of Financial Advice (FoFA) reforms which are being implemented following widespread dissatisfaction with financial and investment advice. He says that while the reforms are a step in the right direction, they have not addressed some important fundamental problems — the fragmentation of investment advice, horizontal integration (that is, links between product providers and the advisory function), the educational requirements for advisers and attempts to educate the public on investment. He also believes that the reforms should be adjusted to limit (rather than discourage) leverage, and the distinction between retail and wholesale clients should be eliminated.

In the final paper, Tariq Haque explores the risk-on risk-off (RORO) paradigm and the implications for investors in the Australian stock and bond markets. Indicating that the effect of this paradigm is that diversification benefits are significantly diluted and equity-only or bond-only portfolios have significantly higher volatility, he says these effects were present in Australian and international financial markets from July 2007 to December 2012. Haque finds that a risk-parity portfolio which combines both equities and bonds generates a higher Sharpe ratio than investing in either equities or bonds alone over a sample period incorporating both RORO and non-RORO periods.

Finally, I am very pleased to announce that JASSA is now ranked as a ‘B’ journal in the Australian Council of Business Deans journal listing, and we hope that this will encourage many more submissions in the future from academics, policy makers and finance practitioners. Please note that the guidelines for submission to JASSA are available at www.finsia.com ■
SEQUENCING RISK: The worst returns in their worst order

The road to achieving a sustainable level of retirement income can be long and winding. An event such as the global financial crisis (GFC) impacts all investors; however, it does not necessarily affect everyone equally. For some, such as those who are near retirement (or have recently retired), the dollar-weighted impact of a GFC-like event on their retirement nest egg can be much larger than that for younger generations.

The term ‘sequencing risk’ is used in the world of finance to denote the impact of a large loss close to or just after retirement when the largest dollar balance is present in the portfolio. We define sequencing risk as the risk of experiencing returns in an unfavourable order. The risk is omnipresent in a portfolio which will experience multiple contributions and/or withdrawals (such as the cash flow profile of saving for retirement and subsequently drawing on these holdings to provide retirement income).

The famous English poet, Samuel Taylor Coleridge, once described poetry as ‘the best words in their best order’. We admire the economy of words in this phrase and have adapted it to our work on sequencing risk, and frame the risk as ‘the worst returns in their worst order’.

This study considers the Australian superannuation setting where around 80 per cent of all pension assets in Australia are held by defined contribution (DC) plans to consider the potential impact of sequencing risk on retirement outcomes.

**The plan member and summary statistics**

Understanding how sequencing risk can potentially impact retirement savings is best illustrated by example. We take a hypothetical plan member who commences work at the age of 24 on 1 January 2012, and works for 41 years to retire at the age of 65. A summary is provided in Table 1; it is this contribution profile that is employed throughout the study.

**TABLE 1: Key assumptions**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starting balance</td>
<td>$0</td>
</tr>
<tr>
<td>Starting salary</td>
<td>$41,552*</td>
</tr>
<tr>
<td>Salary growth rate</td>
<td>4% p.a.</td>
</tr>
<tr>
<td>Contribution rate</td>
<td>9% p.a.</td>
</tr>
<tr>
<td>Starting age</td>
<td>25 years**</td>
</tr>
<tr>
<td>Retirement age</td>
<td>65 years</td>
</tr>
<tr>
<td>Cumulative contributions</td>
<td>$373,319***</td>
</tr>
</tbody>
</table>

* Average MyCareer starting salary for all sectors as at end-April 2012.
** First contribution made at end of first year (i.e. 1 January 2013), final at end of year (i.e. 1 January 2053)
*** This is the total value of all contributions over 41 years.

While these key assumptions provide the contribution profile of our hypothetical investor, the study also requires return paths and, for this, we use history as a guide. We use nominal annual returns from the updated version of, Dimson et al. (2002) dataset, which is commercially available through Morningstar. Our sample is comprised of 112 years of annual returns (from 1900 to 2011) for Australian and US equities, bonds and cash.

For the first of the baby boomers turning 65 years of age, after a decade littered with financial shocks (dot.com bubble, sub-prime, global financial crisis, sovereign debt), sequencing risk can represent a significant threat to their retirement nest eggs. This paper takes an outcome-oriented approach to the problem, to provide practical insights into how sequencing risk works and the critical dependency of retirement outcomes on sequencing risk. Our analysis challenges the conventional wisdom that it is the accumulated average of investment returns that matter. We show, instead, that it is the realised sequence of returns which largely determines the sustainability of retirement incomes.
The study uses a typical balanced (or, target risk) fund, rebalanced annually (66 per cent growth; 34 per cent defensive). We derive the asset allocation design from the Annual Superannuation Bulletin released by the Australian Prudential and Regulation Authority (APRA) in 2012. The average default investment strategy in Australia as at 30 June 2011 had eight asset classes with one classified as ‘other’. The data we use is limited to six asset classes back to 1900 and, hence, we have a trade-off of long-run analysis to granularity in the mix of assets. In the literature the common approach to dealing with this is to create proxies for the assets which are not covered by the data (Basu and Drew 2009a; Basu et al. 2011). These proxies are outlined in Table 2 and the long-run 1900–2011 summary statistics of the derived asset allocation are provided in Table 3.

**TABLE 2: Asset allocation of the default strategy**

<table>
<thead>
<tr>
<th>Asset class</th>
<th>Australian default</th>
<th>Study’s default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian shares</td>
<td>29%</td>
<td>36%</td>
</tr>
<tr>
<td>International shares</td>
<td>24%</td>
<td>30%</td>
</tr>
<tr>
<td>Listed property</td>
<td>3%</td>
<td>-</td>
</tr>
<tr>
<td>Unlisted property</td>
<td>7%</td>
<td>-</td>
</tr>
<tr>
<td>Australian fixed interest</td>
<td>10%</td>
<td>16%</td>
</tr>
<tr>
<td>International fixed interest</td>
<td>6%</td>
<td>10%</td>
</tr>
<tr>
<td>Cash</td>
<td>8%</td>
<td>8%</td>
</tr>
<tr>
<td>Other assets</td>
<td>13%</td>
<td>-</td>
</tr>
</tbody>
</table>

**Notes to asset allocation design:**
1. Other assets is split into Australian and international shares at 7 per cent, respectively.
2. Listed and unlisted property are assumed to follow traits similar to fixed interest. The ratio of Australian to international is used to place 6 per cent of the combined 10 per cent in Australian and the remaining 4 per cent in international.
3. International fixed interest and international shares both use the US as a proxy.

**FIGURE 1: Wealth accumulation paths for two return paths: (1972–2011) and the reverse (2011–1972)**

**TABLE 3: Summary statistics for the returns of the default asset allocation strategy (1900–2011)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Summary statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>10%</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>11%</td>
</tr>
<tr>
<td>Skewness</td>
<td>0.08</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>3.38</td>
</tr>
</tbody>
</table>

**How sequencing risk impacts DC plan members**

With our cash flow and asset allocation profile established, we can start to draw some preliminary insights into how sequencing risk can impact retirement outcomes in a defined contribution plan. Illustrating a practical example of our definition that sequencing risk is an unfavourable order of returns, we show what a change in the ordering means to the outcome. Figure 1 below illustrates two possible paths for our member; the most recent 40-year path from 1972–2011 and the reversed order of returns (that is, 2011–1972).

When employing the outlined assumptions of this study, the actual historical path reaches a final outcome of $4 million, while the reversed order reaches $5.4 million, a 35 per cent increase in terminal wealth. The accumulation paths in Figure 1 use identical distributions i.e. the four moments of the distribution for both series are identical, however, the order in which they are experienced is reversed. Figure 1 highlights the importance of the order of returns to investors’ terminal wealth outcomes, a finding which corroborates that of Doran et al. (2012).

**Historical outcomes**

The dispersion of terminal wealth outcomes emphasises the point that returns are a crucial factor to the outcome. All of the paths are subject to the
same underlying assumptions around contributions yet the dispersion, as seen in Table 4, has a range of almost $5.4 million. The minimum balance of $1.4 million is around seven times the level of the final salary while the maximum, $6.7 million, is almost 34 times the final salary. The variations in terminal wealth outcomes are driven by the returns in these paths: both the underlying compounded return, and the order in which they are experienced. Further investigation in the subsequent sections of this study can help disentangle the two.

**TABLE 4: Summary statistics for the dispersion of terminal wealth outcomes**

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>$2.9m</td>
</tr>
<tr>
<td>Minimum</td>
<td>$1.4m</td>
</tr>
<tr>
<td>Maximum</td>
<td>$6.7m</td>
</tr>
<tr>
<td>Range</td>
<td>$5.4m</td>
</tr>
<tr>
<td>25th percentile</td>
<td>$2.5m</td>
</tr>
<tr>
<td>75th percentile</td>
<td>$4.4m</td>
</tr>
<tr>
<td>Mean</td>
<td>$3.4m</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>$1.4m</td>
</tr>
<tr>
<td>Skewness</td>
<td>0.83</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>2.60</td>
</tr>
</tbody>
</table>

*Note: Numbers in the table are rounded and should be used as a guide only.*

Total cumulative contributions for all of the paths represented in this paper are $373,319. A careful analysis of Figure 1 and Table 4 reveals that the cumulative contributions by the time of retirement are a fraction of the total portfolio value. Taking this further, we also observe the relationship between the portfolio size and the cumulative contributions over the life course. Figure 2 illustrates the cumulative contributions divided by the total portfolio value over the accumulation period. Figure 2 below tracks all of the 73 accumulation paths over the 40-year periods. The accumulation paths are segregated into two groups: (i) paths ending between 1939 and 1970 (both years inclusive); and (ii) paths ending between 1971 and 2011 (both years inclusive).

Figure 2 highlights the point at which the 50 per cent contribution-to-total portfolio size point is reached (solid black line intersecting 50 per cent on vertical axis). For all of the 40-year accumulation paths from 1900 to 2011, the range of outcomes is between 34 and 54 years of age (the 9th and 29th years of accumulation, respectively). It can be seen that, beyond this point, investment returns account for an increasingly large proportion of the portfolio balance; conforming to the portfolio size effect findings of Basu and Drew (2009a) and Basu et al. (2011).

While acknowledging the distribution of particular outcomes, one observation from Figure 2 is that in the final years of the accumulation phase (say, the last 10 from age 56), a rule of thumb can be applied such that contributions only account for about, on average, one-fifth (or 20 per cent, identified by the dashed line intersecting the vertical axis at 20 per cent) of the total portfolio balance.

**FIGURE 2: Total cumulative contributions as a percentage of total portfolio balance for all 40-year accumulation paths from 1900 to 2011 using the default strategy’s annual returns (n=73)**

![Figure 2](image-url)
The finding suggests that even muted levels of bad volatility, occurring at the worst time, can have a significant impact on members’ retirement savings. Indeed, it is not necessarily the magnitude of the negative return that matters, but its timing.

The findings suggest that there is something similar to the Pareto principle8 (‘the vital few and trivial many’) at play with sequencing risk; i.e. late in the accumulation phase around 80 per cent of the member’s final balance is attributable to returns, and 20 per cent to contributions.9 This provides further nuance to our understanding of sequencing risk, the worst returns in their worst order. The finding suggests that even muted levels of bad volatility, occurring at the worst time, can have a significant impact on members’ retirement savings. Indeed, it is not necessarily the magnitude of the negative return that matters, but its timing.

While the distribution of outcomes in Table 4 and Figure 2 can be related to sequencing risk, we cannot reject the possibility that the underlying compounded return also contributes to it. To examine this issue, we look at two historical return paths which result in similar terminal wealth outcomes. The 40-year paths ending in 1942 and 1978 produce identical terminal wealth outcomes of $1.9 million each for the member. However, when we look at the respective arithmetic and geometric returns of these paths, a different picture emerges. Table 5 illustrates these figures.

<table>
<thead>
<tr>
<th>Variable</th>
<th>1942</th>
<th>1978</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arithmetic return per annum</td>
<td>8.69%</td>
<td>9.04%</td>
</tr>
<tr>
<td>Geometric return per annum</td>
<td>8.36%</td>
<td>8.96%</td>
</tr>
<tr>
<td>Terminal wealth</td>
<td>$1.9m</td>
<td>$1.9m</td>
</tr>
</tbody>
</table>

While the annual rates of return experienced by each path are quite different, the final balances (that is, the total retirement nest eggs) are essentially the same. The 40-year accumulation path ending in 1978 has an arithmetic (geometric) return 71 (33) basis points per annum or 8.17 (3.95) per cent per annum greater than the 1942 path, yet the terminal wealth outcome is virtually identical (the final account balance of the lower return path, 1942, is higher than the 1978 final account balance by around $500). Sequencing risk is the key reason that the two accumulation paths converge to the same terminal wealth values. These findings are consistent with Milevsky and Abaimova (2008) and Neuman (2011) who conjectured that the sequence is at least as important as the underlying rate of return.

How bad can it get?

So far we have illustrated that the order of returns is a crucial component to the terminal wealth outcome for members. However, the fundamental question on sequencing risk still remains — how bad can it get? To answer this question, we employ an empirical bootstrap technique used by Dichev (2007), Dichev and Yu (2011) and Dvorak (2012). For each of the 73 different 40-year periods within our sample period, we resample returns without replacement to construct simulated 40-year investment horizons representing a reordered sequence of historical returns. We repeat this procedure 10,000 times.

The above bootstrap simulation results in an output consisting of 730,000 terminal wealth outcomes. Essentially, we are massaging the data in Figure 1 (which was an example of one shuffle-reversed order), shuffling this data 10,000 times to understand the distribution of possible outcomes. We sort these terminal wealth outcomes and provide a nonparametric illustration of key percentiles on a rolling 40-year basis in Figure 3. The actual terminal outcomes are illustrated by the thick black line, while the median is represented by the white line.10, 12

The most important point to note in Figure 3 is that for every cross-sectional point on the horizontal axis, the range of outcomes is entirely dependent on sequencing risk and not the rate of return; or any of the higher moments. The distributions of outcomes in Figure 3 have ranges well into the millions. Combining this range with the knowledge of total cumulative contributions representing $373,319, it is daunting to realise multiples of your total cumulative contributions can be added or subtracted from your balance solely by sequencing risk.

While the actual outcome in Figure 3 tends to track close to the median, it does have points at which the 7th and 92nd percentiles are achieved in the paths ending 1974 and 2000, respectively. These extremes highlight that the range of potential outcomes in Figure 3 are both plausible and realistic for members. This finding reiterates the importance of having the sequence of returns as an important consideration in the retirement income adequacy debate.

Concluding comments

Conventional wisdom suggests that, given a certain level of contributions, retirement wealth depends on the number of good and bad return periods experienced over a lifetime and the magnitude of those good and bad returns. In this paper, we have demonstrated that the retirement wealth of long-term investors with multiple cash flows is not only affected by the frequency and magnitude of good and bad returns, but also by the sequence in which those returns occur. Multi-period investors with identical average returns and volatilities over
their lifetime will confront vastly different retirement wealth outcomes if the periodic returns are experienced in different orders or sequences.

The findings in this paper suggest that the ordered vector of returns is a critical component to the underlying terminal wealth outcome. The literature shows that there are two possible ways of diluting the impact of sequencing risk: adopting a strategy that either reduces the portfolio size effect (by spreading dollar-weighted allocations more evenly over one’s investment life) or taking a whole-of-life approach to DC plan design (Ayres and Nalebuff 2010; Basu et al. 2011). Going back to Coleridge’s poetry analogy, investment markets do not afford the luxury of rearranging and reordering returns to find the perfect sequence. However, there is an opportunity to enhance retirement outcomes in DC plans through better understanding the uniqueness of the plans of individual members.

To improve retirement outcomes for members there is a need to ensure that the conversation about the management of sequencing risk, which often occurs during the critical retirement conversion phase, is brought forward to be at the heart of DC plan design and governance. Particularly during the critical conversion phase (popularly termed the ‘retirement risk zone’) say, the final 15 years of the accumulation period and the first decade of the distribution phase, many investors are unaware that it is not the average return of their investments, but the realised sequence of those returns that can largely determine the sustainability of their retirement income. With increasing numbers of baby boomers entering this phase, the sequence of returns risk is a current and significant challenge.

**FIGURE 3:** The default strategy’s annual returns are used to determine every 40-year accumulation path from 1900 to 2011. (These were reshuffled via a bootstrap method 10,000 times each to simulate 10,000 final portfolio balances; assumptions about wealth creation are illustrated in Table 1.)
References


Australian Prudential and Regulation Authority (APRA) 2012, Annual superannuation bulletin, June 2011.


Notes

1. This paper is an adaptation of an industry report, Sequencing risk: A key challenge to sustainable retirement income, published by Finisia in October 2012 (Basu et al., 2012) and is available online from http://www.finsia.com/docs/policy-research/sequencingrisk-a-key-challenge-to-creating-sustainable-retirement-income.pdf?sfvrsn=0.

2. This research was supported by a Finisia Research Grant: ‘How important is the order of returns? The impact of sequencing risk on retirement wealth outcomes in Australia’ administered by Griffith University. We acknowledge and thank Finisia for their support, particularly Russell Thomas (CEO), Angie Corkhill (Director, Member Relations and Policy), Samuel Bell (Manager, Policy), Deidre Grover (Senior Policy Advisor) and members of the Finisia Policy Advisory Council (30 May 2012, Sydney) and Finisia Managed Funds and Superannuation Advisory Group (20 June 2012, Melbourne). We also thank Robert Bianchi, Graham Bornholt, Peter Doran, Evan Reedman, Eduardo Roca, Troy Rieck, Adam Walk SF Fin and participants at the Griffith University NRP (Superannuation and Funds Management) Seminar on ‘Sequencing risk: the worst returns in their worst order’ (4 June 2012, Brisbane) for comments and discussion. We thank Prof Kevin Davis (Managing Editor, JASSA) and the helpful comments from an anonymous reviewer. Of course, any remaining errors are our responsibility. The views expressed herein are those of the authors and are not necessarily those of Finisia.

3. There is a myriad of contribution profiles and wage growth profiles which can be employed, such as gender and unemployment impacts (Merton, 1969; Davis 2007; Basu and Drew 2009b), however, we leave this to future research. We employ a simple 4 per cent per annum, which is made up of real wage growth and inflation (Byrne et al. 2006; Basu and Drew 2009a; Basu et al 2011). We also acknowledge the importance of contribution tax and contribution caps on superannuation outcomes. However, we have excluded taxes from our model to focus exclusively on the issue of sequencing risk, which is prevalent in the presence or absence of taxes. Our motivation is to provide baseline findings in the Australian setting that can be used by future researchers to advance the sequencing risk debate.

4. Nominal returns are used in the study and are common in the literature (Guo and Darnell 2005; Basu and Drew 2009a; Basu et al 2011). The results are also consistent in a confirmatory analysis with real returns in the appendix of the larger report published by Finisia, Sequencing risk: A key challenge to sustainable retirement income, (Basu et al. 2012).

5. The six asset classes being Australian and US equities, bonds and cash. We limit this to only five in our portfolio and remove international cash holdings (i.e. US cash) as this is not specifically listed in the APRA document.

6. Final salary is $199,495.

7. This rule of thumb is supported by the inflation-adjusted analysis presented in the full report, Sequencing risk: A key challenge to sustainable retirement income, (Basu et al. 2012), in which we use a 40 per cent (contributions), 60 per cent (returns) general rule.

8. The term ‘the Pareto principle’ and the associated quote ‘the vital few and the trivial many’ have been attributed to Joseph M Juran (1904–2008) based on the work of Vilfredo Pareto. For a discussion see: www.juran.com/index.html

9. We thank M Juran (1904–2008) based on the work of Vilfredo Pareto. For a discussion see: www.juran.com/index.html

10. This allows for the four moments to be held constant in simulation, which allows us to target the impact of sequencing risk better as opposed to Frank and Blanchett (2010) who conduct a Monte-Carlo simulation which equates the mean and standard deviation of returns without controlling for skewness and kurtosis.
11. Figure 3 is produced in a colour version in the full report; this is available through Finsia in the full report, *Sequencing risk: A key challenge to sustainable retirement income*, (Basu et al. 2012). See also http://www.finsia.com/docs/policy-research/sequencingrisk-a-key-challenge-to-creating-sustainable-retirement-income.pdf?sfvrsn=0

12. Retirement wealth ratios (RWRs) are also depicted in Figure 3. These illustrate what multiple of final salary the terminal wealth value has achieved (Basu and Drew 2009a, 2010; Antolin et al. 2010).

13. The challenges that sequencing risk may pose for public policy are formally acknowledged, particularly for the provision of the public pension. Potentially, sequencing risk fragments outcomes for members of DC plans and, as a result, this is problematic in terms of policy outcomes. It is submitted that this line of investigation is important and future researchers are encouraged to consider sequencing risk more formally through the lens of public finance. The importance of sequencing risk for self-managed superannuation funds (SMSFs) is also noted and this issue is left for future researchers.

14. Potentially, sequencing risk is not only borne by an individual. The problem for public policy arises when it is not just one individual who suffers a large loss on their retirement savings, but an entire cohort that endures the same loss. This is a realistic scenario with around 80 per cent of all Australians being enrolled in the default option and thus experiencing similar return paths with only minor differences between fund default strategies (Towers Watson 2012).
WHAT AUSTRALIAN INVESTORS NEED TO KNOW to diversify their portfolios

VITALI ALEXEEV, Lecturer, School of Economics and Finance, University of Tasmania
FRANCIS TAPON, Professor, Department of Economics and Finance, University of Guelph, and Partner, Investment Portfolio Design Ltd (InPoDe), Guelph, Ontario, Canada

An ASIC survey in 2008 showed that Australian investors do not diversify their portfolios sufficiently, with the average investor holding only 2.19 securities. To study this issue, we simulate portfolios using daily observations for all traded and delisted equities in Australia between 1975 and 2011. We calculate two measures of risk, including heavy tailed distributions to account for extreme events. For each risk measure, we recommend the number of portfolio holdings that result in a 90 per cent reduction in diversifiable risk for an average and a more conservative investor. We find that, on average, 24 to 30 stocks are sufficient to attain a well-diversified portfolio.

In the past 20 years many Australians have become share owners via privatisation of government organisations such as Qantas, CBA and Telstra and the demutualisation of companies such as AMP. Many have received shares through an inheritance or gift, and the growth of self managed super funds has also increased the number of household equity investors. However, a number of surveys (e.g. ASIC 2008), show that Australian investors do not diversify their portfolios sufficiently.

According to a report by the Australian Securities and Investments Commission in 2008, most (78 per cent) of Australian investors had heard the term diversification. Nevertheless, around half of investors (49 per cent) held only one type of investment (shares only) with the average number of holdings of 2.19 securities. What is even more telling is that a third (33 per cent) of share owners acquired their shares passively (as part of a demutualisation or had received shares through an inheritance or gift), while almost two-thirds (63 per cent) of share owners acquired the shares actively. One conclusion is that Australian investors, on average, own poorly diversified portfolios and leave themselves exposed to excessive diversifiable risk.

In this paper, we study the issue of optimal portfolio diversification for Australian investors using data between 1975 and 2011. Investors are faced with a dilemma: how many stocks should be included in a portfolio to reduce diversifiable risk to an optimal level. To provide an answer to this question we calculate two measures of risk using daily data including one that reflects extreme events. Previous academic research (Solnik (1974), Bird and Tippett (1986), Statman (1987), and Brands and Gallagher (2005)) has analysed the optimal portfolio sizes for an average investor.

We build on our predecessors’ contributions in three ways. First, we derive the average number of stocks required in a portfolio to reduce risk to a level where 90 per cent of the difference between the risk of an individual average stock and the risk of the market portfolio has been removed. For example, if the risk of an average stock is 40 per cent p.a. and the risk of the market portfolio is 20 per cent p.a., we find the number of stocks required such that the portfolio risk is 22 per cent. Second, we estimate upper confidence bands above the calculated average number of stocks, enabling us to show the (higher) number of stocks required to be 90 per cent confident that the risk target will not be exceeded. Third, we compare the year-by-year dynamic of required portfolio sizes.

Investors are often reminded that holding a number of uncorrelated securities in their portfolios is important for diversification. Of course, holding too many stocks is costly both in terms of transaction costs as well as the opportunity cost of monitoring a large diversified portfolio. Holding too few stocks exposes investors to unnecessary firm-specific risk. If it is possible to eliminate most diversifiable risk with a small portfolio, the need for the large portfolios held by equity funds is unjustified. Campbell et al. (2001), however, have shown that firm-specific risk in the US has grown over the past 30 years relative to the overall volatility of the stock market and that correlations between stocks have correspondingly decreased, reinforcing the advisability of larger portfolios. In contrast, when correlations between
stocks are very high, as during periods of market distress, selecting only a few stocks will align portfolio returns with those of the market, providing adequate diversification benefits under these conditions. We check whether these results also hold for Australia.

To trace the dynamics of diversification benefits over the past 37 years we simulate random portfolios based on actual daily Australian equity returns over the period 1975 to 2011. At the start of each year we construct equally weighted random portfolios of different sizes ranging from portfolios consisting of only one security to a broad market portfolio including all actively traded securities at the time. We do this 10,000 times for each year and calculate the resulting returns over the year, such that for each of these different-sized portfolios and each year we are able to calculate hypothetical standard deviation (SD) and expected shortfall (ES) measures for that year. We focus on SD as our benchmark to be able to compare our results to the previous literature. The ES provides a downside risk measure that captures the extreme tail in the historical return distribution. It is calculated as the expected return (loss) in the set of outcomes where the return was in the worst one per cent of outcomes, and denoted by $ES_{1\%}$.

We measure diversifiable risk as the difference between the risk of an average security and market risk’ this represents 100 per cent of diversifiable risk. As portfolios grow in size from one stock to $n$ stocks, total risk is reduced but market risk remains. A ‘well-diversified’ portfolio is one where anywhere from 85 per cent to 95 per cent of diversifiable risk has been removed. In what follows, we use 90 per cent reduction in diversifiable risk as indicating a ‘well-diversified portfolio’.

We find that well-diversified portfolios aimed at limiting extreme losses measured by $ES_{1\%}$ are, on average, smaller in size (18 stocks), compared to when SD is used as a risk measure (24 stocks). We hypothesise that this is the consequence of the increased correlations between securities and the market in the lower tail of the return distributions. However, to achieve a well-diversified portfolio with 90 per cent confidence of achieving the target risk reduction, we find no difference in portfolio sizes between the two risk measures (38 stocks). We conclude that the size of a well-diversified portfolio for Australian investors depends on the measure of risk used, the changing correlations between stock returns across time and market volatility.

**Data and methodology**

Daily total returns (inclusive of dividends) on common stocks listed on the Australian Securities Exchange (ASX) from 1975 to 2011 are obtained from Datasync. To avoid survivorship bias we acquire the data for both active and subsequently delisted securities. For each of these years, we consider only securities which have traded at least 75 per cent of the trading days in a particular year. This is done to avoid unreasonably low correlations of some thinly traded stocks with the rest of portfolio holdings.

We construct portfolios by randomly drawing stocks without replacement from all available stocks on the ASX each year. We use equal weights to construct portfolios. Given that our sample includes non-surviving stocks, a stock in the chosen portfolio that does not survive during the year is replaced for the remainder of the year with a new randomly selected stock not already in the portfolio — using the proceeds from selling delisted stocks at the price prevailing on the day prior to delisting. For each portfolio of size $n$ we use 10,000 random draws. A unique equally weighted portfolio is constructed when all securities available in the market are included. We define it as the market portfolio.

We consider two risk measures. The first is standard deviation (SD), a well-accepted measurement of risk of a financial asset or portfolio. Another important risk measure is downside (or tail) risk. It accounts for deviations below a certain threshold, unlike SD, where positive and negative deviations from the expected level are penalised equally. One advantage of a downside risk measure is that it accounts, to some extent, for the asymmetries in returns during bull and bear markets. For this purpose, we use expected shortfall (ES) due to its well-behaved properties as opposed to the commonly used Value-at-Risk (VaR).

**Results**

Figure 1 displays the dynamic of diversifiable risk remaining for portfolios of various sizes between 1975 and 2011. Using SD as a measure of risk, a five-stock portfolio yields, on average, a 60 per cent to 70 per cent reduction in diversifiable risk and is thus not a well-diversified portfolio. On the other hand, a 40-stock portfolio exposes an investor to 2 per cent to 7 per cent of diversifiable risk. Looking at the year 1987 when a major crash occurred, an investor with a 10-stock portfolio was exposed to 18 per cent of diversifiable risk using SD as a risk measure, but the same 10-stock portfolio exposed this investor to 14 per cent of diversifiable risk using ES. Consequently, fewer stocks would be required for investors concerned with ES to achieve the same 18 per cent exposure to diversifiable risk.

In Figure 2 we trace the recommended portfolio sizes for the two risk measures to achieve a well-diversified portfolio on average (solid lines). The dotted lines show the recommended portfolio sizes for more conservative investors who require a higher level of assurance (that risk will not exceed the target level 90 per cent of the time instead of on average).
We conclude that in periods of anticipated high market volatility characterised by large correlations among stocks, conservative investors will need to add a relatively large number of securities to their portfolios compared to periods when markets are fairly stable and average correlations are low.

In Table 1 and Figure 2, we observe that between 2000 and 2006 the average investor needed to hold a higher number of stocks (SD: 27 to 30 stocks) compared to the periods 1987 to 1989 (SD: 14 to 18 stocks) and 2008 to 2010 (SD: 20 stocks). A similar trend is observed for more conservative investors. This is a consequence of higher average correlations among stocks in years 1987–89 (0.19) and 2008-10 (0.15) compared with years 2000-06 (0.05) in Figure 3.C.

The periods 1975–76 (oil crisis), 1987 (Black Monday), the bursting of the dot-com bubble following 2000, and the global financial crisis in 2008 were marked by a wide gap between average security SD and market SD (Figures 3.A and D). We note that correlations among stocks increase during market-wide crises (Figures 3.C and D) resulting in the lowest number of stocks required (Figure 3.D). Since we cannot predict crises ex ante, we propose a conservative approach by selecting a higher number of stocks from all past years (both crises and normal periods).

Average correlations among stocks in Australia have remained remarkably stable and low except in 1987, 1997–98 and rising post-2007, with the average correlation between 1975 and 2011 of 0.07 (Table 2 Panel B). As we mentioned previously, Campbell et al. (2001) find a different trend in average correlations for US equities. Average correlations among the US stocks prior to 1999 were declining, however, this trend reversed after 1999. We note that the higher the correlation among stocks, the lower the number of stocks needed for a well-diversified portfolio (Table 2 Panels A and B). When larger portfolios are needed (based on SD) we notice that the associated market volatility and correlations are lower than when required portfolios are smaller (Table 2 Panel C).

For example, portfolios of fewer than 21 stocks are needed in periods with an average correlation of 0.34 and an increased market volatility of 16.7 per cent. In contrast, larger portfolios of 25 stocks or more are needed in periods with an average correlation of 0.21 and a market volatility of 8.1 per cent. Since during crises fewer stocks are needed to achieve most diversification benefits, optimistic investors not expecting a crisis in the forseable future, should form a portfolio with a larger number of stocks. Conservative investors, preparing for the worst can get most diversification benefits with fewer stocks. If these investors base the size of their portfolios on past recommendations during normal periods, they will find that their portfolios are overdiversified.

In Table 2 Panel D we show the spread between the number of stocks required in a well-diversified portfolio for conservative investors (using SD) and for the average investor (defined as ∆n). Large spreads ( ∆n > 19) are associated with increased market volatility (16.9 per cent) and increased correlations (0.33). Spreads of fewer than 11 stocks

**FIGURE 1: Diversifiable risk remaining for portfolios of various sizes.** The panels below show the dynamic of diversifiable risk remaining for portfolios of various sizes.
stocks required for an average investor to attain a well-diversified portfolio decreases (18 to 22 stocks when risk is measured by $SD$ and 13 to 17 stocks when risk is measured by $ES_{1\%}$). Increased correlations among stocks coupled with increased market volatility and lower levels of idiosyncratic risk during market crashes make portfolio diversification easier to achieve with a small number of stocks. In the case of industry specific meltdowns, the market experiences high volatility. The average correlation among securities and with the market portfolio, however, is among the lowest and thus, more stocks are needed to get the desired level of diversification.

One interpretation of our findings is that the recommended number of stocks in a buy-and-hold portfolio to attain most diversification benefits, should not be based on results in periods when markets are in distress. Rather, Australian long-term investors should instead conservatively rely on historical results obtained during normal financial market periods opting for larger portfolios.

### Conclusion

The period 1975 to 2011 witnessed some significant events in Australian financial market history. We show that portfolio size required for adequate diversification is determined by the particular risk measure used and by market conditions influencing correlations among stocks.

On average, to remove 90 per cent of idiosyncratic risk, portfolios of around 24 stocks are needed. In the case of market crashes, we note increased market risk coupled with greatly increased average correlations among securities and with the market portfolio. During market crashes, the number of

(Figure 2: Recommended portfolio size to achieve a well-diversified portfolio. The solid dark line represents the number of stocks recommended for an average investor to achieve 90% reduction in diversifiable risk when $SD$ is used as a risk measure. For conservative investors portfolio size is depicted by the dashed dark line. Similarly, light solid and dashed lines depict recommendations for investors concerned with $ES_{1\%}$ as the risk measure. Shaded regions represent periods of crises and correspond to events of the 1973 oil crisis (1973–74), the 1979 oil crisis (1979–82), Black Monday (1987), the collapse of Long Term Capital Management (LTCM) in 1998, the dot-com bubble (2000–02) and the global financial crisis (2008).)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>90th percentile of number based on SD as a risk measure</td>
<td>95</td>
<td>90</td>
<td>80</td>
<td>70</td>
<td>60</td>
<td>50</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>Average number of stocks based on SD as a risk measure</td>
<td>100</td>
<td>90</td>
<td>80</td>
<td>70</td>
<td>60</td>
<td>50</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>Average number of stocks based on 1% Expected Shortfall (ES) as a risk measure</td>
<td>100</td>
<td>90</td>
<td>80</td>
<td>70</td>
<td>60</td>
<td>50</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>90th percentile of number based on ES as a risk measure</td>
<td>95</td>
<td>90</td>
<td>80</td>
<td>70</td>
<td>60</td>
<td>50</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>Number of stocks based on terminal Wealth Stanadard Deviation (TWSD)</td>
<td>100</td>
<td>90</td>
<td>80</td>
<td>70</td>
<td>60</td>
<td>50</td>
<td>40</td>
<td>30</td>
</tr>
</tbody>
</table>
We recommend, for an average investor, concerned with SD or (ES) as a measure of risk to hold 24 to 30 (15 to 21) stocks. These size recommendations are among the largest portfolio sizes over the period of our study, providing investors with a more conservative diversification strategy over longer investment horizons. We realise that these recommendations greatly exceed the average actual share holdings of ordinary Australians (two to three stocks). However, holding as few as five securities in a portfolio over 1997 to 2011 would have exposed investors to a considerable amount of diversifiable risk. This problem could be partly alleviated by holding market-wide ETFs which are becoming more popular with Australian investors.

**FIGURE 3: Australian equity market statistics.** In Panel A the solid line shows the annualised standard deviation of daily market returns based on the past 12 months’ returns. The dashed line represents the average security standard deviation. Similarly, statistics in Panel B are based on ES₁%. Panel C shows the average security correlation with the market portfolio (solid line) and the average correlation among securities (dashed line). Shaded regions are defined in Figure 1. Panel D compares the average idiosyncratic risk with the average correlation among stocks. We also include the rescaled recommended portfolio size, N/100, for an average investor concerned with SD as a measure of risk.

(A) Australia: Annualised standard deviations (SD) for the market portfolio and average security

(B) Australia: 1% expected shortfall (ES) for the market portfolio and average security

(C) Australia: Average correlation among securities and with the market portfolio

(D) Factors affecting sizes of well-diversified portfolios
TABLE 1: Recommended portfolio size to attain a well diversified portfolio on average (and 90% of the time)

<table>
<thead>
<tr>
<th>Year</th>
<th>SD</th>
<th>ES</th>
<th>Year</th>
<th>SD</th>
<th>ES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>22</td>
<td>16</td>
<td>1994</td>
<td>26</td>
<td>27</td>
</tr>
<tr>
<td>1976</td>
<td>22</td>
<td>17</td>
<td>1995</td>
<td>25</td>
<td>18</td>
</tr>
<tr>
<td>1977</td>
<td>24</td>
<td>21</td>
<td>1996</td>
<td>24</td>
<td>15</td>
</tr>
<tr>
<td>1978</td>
<td>25</td>
<td>20</td>
<td>1997</td>
<td>22</td>
<td>13</td>
</tr>
<tr>
<td>1979</td>
<td>27</td>
<td>21</td>
<td>1998</td>
<td>22</td>
<td>17</td>
</tr>
<tr>
<td>1980</td>
<td>25</td>
<td>19</td>
<td>1999</td>
<td>23</td>
<td>14</td>
</tr>
<tr>
<td>1981</td>
<td>23</td>
<td>18</td>
<td>2000</td>
<td>28</td>
<td>18</td>
</tr>
<tr>
<td>1982</td>
<td>23</td>
<td>19</td>
<td>2001</td>
<td>29</td>
<td>18</td>
</tr>
<tr>
<td>1983</td>
<td>22</td>
<td>18</td>
<td>2002</td>
<td>27</td>
<td>20</td>
</tr>
<tr>
<td>1984</td>
<td>21</td>
<td>20</td>
<td>2003</td>
<td>27</td>
<td>18</td>
</tr>
<tr>
<td>1985</td>
<td>22</td>
<td>19</td>
<td>2004</td>
<td>30</td>
<td>21</td>
</tr>
<tr>
<td>1986</td>
<td>22</td>
<td>17</td>
<td>2005</td>
<td>30</td>
<td>17</td>
</tr>
<tr>
<td>1987</td>
<td>18</td>
<td>13</td>
<td>2006</td>
<td>28</td>
<td>15</td>
</tr>
<tr>
<td>1988</td>
<td>16</td>
<td>14</td>
<td>2007</td>
<td>26</td>
<td>15</td>
</tr>
<tr>
<td>1989</td>
<td>14</td>
<td>10</td>
<td>2008</td>
<td>20</td>
<td>17</td>
</tr>
<tr>
<td>1990</td>
<td>21</td>
<td>28</td>
<td>2009</td>
<td>20</td>
<td>14</td>
</tr>
<tr>
<td>1991</td>
<td>25</td>
<td>28</td>
<td>2010</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>1992</td>
<td>25</td>
<td>26</td>
<td>2011</td>
<td>21</td>
<td>17</td>
</tr>
<tr>
<td>1993</td>
<td>26</td>
<td>25</td>
<td>Average</td>
<td>24</td>
<td>18</td>
</tr>
</tbody>
</table>

TABLE 2: Portfolio size results. Panel A provides the number of stocks required for a well-diversified portfolio for an average and a conservative investor. Panel B details average correlations among individual stocks ($\hat{\rho}_{ij}$), average correlations of stocks with the market ($\hat{\rho}_{im}$), average security SD ($\hat{\sigma}_{i}$) and market volatility ($\hat{\sigma}_{m}$). Panel C relates recommended number of stocks with market characteristics. We identify years with the largest and lowest recommended portfolio sizes (top and bottom 3rd of the sample) and estimate $\hat{\rho}_{im}$ and $\hat{\sigma}_{m}$ for these years only. Panel D is constructed similarly to Panel C but relies on the difference between the number of stocks required to assure conservative investors of the desired level of diversification 90% of the time and the portfolio sizes of average investors. This is the difference between the dashed and solid lines in Figure 2.

Panel A: Number of stocks in a well-diversified portfolio, 1975–2011

<table>
<thead>
<tr>
<th></th>
<th>on average</th>
<th>90% of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Based on SD</td>
<td>24</td>
<td>38</td>
</tr>
<tr>
<td>Based on ES_{90}</td>
<td>18</td>
<td>38</td>
</tr>
</tbody>
</table>

Panel B: Stock market statistics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$\hat{\rho}_{ij}$</td>
<td>0.07</td>
</tr>
<tr>
<td>$\hat{\rho}_{im}$</td>
<td>0.26</td>
</tr>
<tr>
<td>$\hat{\sigma}_{i}$</td>
<td>39.9%</td>
</tr>
<tr>
<td>$\hat{\sigma}_{m}$</td>
<td>10.4%</td>
</tr>
</tbody>
</table>

Panel C: Small vs Large portfolios and associated market characteristics

<table>
<thead>
<tr>
<th>Recommended n based on SD</th>
<th>Small (n &lt; 21)</th>
<th>Large (n &gt; 25)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\hat{\rho}_{im}$</td>
<td>0.34</td>
<td>0.21</td>
</tr>
<tr>
<td>$\hat{\sigma}_{m}$</td>
<td>16.7%</td>
<td>8.1%</td>
</tr>
</tbody>
</table>

Panel D: Difference ($\Delta n$) b/w average and 90th percentile recommended number of holdings

<table>
<thead>
<tr>
<th>Recommended based on SD</th>
<th>Small ($\Delta n &lt; 1$)</th>
<th>Large ($\Delta n &gt; 1$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta n$ based on SD</td>
<td>0.21</td>
<td>0.33</td>
</tr>
<tr>
<td>$\hat{\rho}_{im}$</td>
<td>7.5%</td>
<td>16.9%</td>
</tr>
<tr>
<td>$\hat{\sigma}_{m}$</td>
<td>7.5%</td>
<td>16.9%</td>
</tr>
</tbody>
</table>
Notes
1. Hereafter, referred to as portfolio size.
2. Our aim is not to exceed a target risk level 90 per cent of the time rather than achieving a set risk target. Randomly constructed portfolios with lowest estimated risk levels are beneficial to investors. Thus, we consider only the 90th percentile of risk measures of 10,000 randomly constructed portfolios for any given fixed number of stocks, n. This is in contrast with an average of risk measures of the same 10,000 random constructed portfolios for an average investor.
3. In Alexeev and Tapon (2012), four additional developed equity markets are discussed at length.
4. The number of actively traded stocks on the ASX has steadily increased from 1975 (145 stocks) to 2011 (1,562 stocks).
5. Refer to the difference between the dashed and solid lines in Figure 2.

References
BREACH OF CONTINUOUS DISCLOSURE in Australia

Given that disclosure is important for the efficient functioning of capital markets, this paper explores the impact of infringement of continuous disclosure by Australian listed firms. We observe a significantly negative market reaction for our sample firms around the day an infringement is announced. Our findings also provide partial evidence of an increase in spreads and a decrease in price informativeness following the announcement of a breach. Overall, our results indicate that the market considers the breach of continuous disclosure to be a relatively important incident.

As recently as July 2013, the Australian Securities and Investments Commission (ASIC) stated that it views ‘continuous disclosure by listed companies as the bedrock of market integrity. It is essential to two of ASIC’s priorities: fair and efficient markets and confident and informed investors’ (Price 2013). In the same speech, the ASIC Commissioner also noted that perceptions of inequalities in access to information remain a concern for retail investors, with the potential to undermine investor confidence.

Timely disclosure is recognised to be critical in maintaining the integrity of financial markets (Raykovski 2004) and improving investor confidence (Mayanja 2010). Financial market authorities have been entrusted to regulate corporate disclosure to ensure information is released to the market in a timely and accurate fashion. It has been argued, however, that requiring continuous disclosure is insufficient without suitable enforcement measures (Ferrell 2004; Mayanja 2010). An enforcement action by stock exchange regulators, therefore, identifies a situation where a firm has failed in its obligation to keep the market fully informed. This breach of continuous disclosure also represents a situation where the informational efficiency of the market has most likely been harmed. An important question that arises from such a situation, and which has not sufficiently been examined, is how the market reacts to such a breach of disclosure rules.

Australia represents an interesting setting within which to examine the impact of a breach of continuous disclosure. Australia introduced a very strict disclosure regime, incorporating both scheduled disclosures on a semi-annual basis and an ongoing requirement to disclose anything that would be expected to have an impact on the stock price. However, while the Continuous Disclosure Regime (CDR) was legislated in 1994, questions were raised regarding the impact of the regulations, in part as a result of weak enforcement (Raykovski 2004). In response, in 2004, ASIC was given the power to issue infringement notices, with associated financial penalties, as an alternative remedy to the existing civil and criminal penalties. These notices give ASIC the ability to address less egregious CDR breaches in a more timely manner and without the expense of a court case. It has been argued that this change would enable ASIC to enforce CDR more efficiently without the significant legal hurdles of court proceedings.

Since the regulatory change in 2004, ASIC has become more active in enforcing the CDR, with a number of infringement notices being issued. The active enforcement environment since 2004 creates a good setting within which to investigate the market impact of these alleged breaches.

To date, research on the CDR in Australia has been limited, and has not addressed the market impact of infringement announcements. Brown, Taylor and Walter (1999) find an increase in total disclosure following the legislating of CDR in Australia, but the increase was limited to smaller firms with little analyst following, and for firms that are likely to report ‘bad’ news. Overall, their results show little support for the notion that the enactment has improved corporate disclosure. Chan et al. (2007) examine the effect of introducing continuous disclosure on management
Our paper empirically investigates how the market reacts to the imposition of an infringement notice by ASIC for a breach of CDR between 2004 and June 2012. We identify a number of firms that have been issued with infringement notices within our sample period, a total of 19 firms; however, one firm is omitted from the sample as it was delisted shortly after the event date. An appendix provides an overview of the firms included in our sample.

**Background to the Continuous Disclosure Regime**

While Australia has had continuous disclosure rules written into the Australian Securities Exchange (ASX) listing rules for decades, it was only included in the Corporations Act in 1994 (Raykovski 2004). The law requires disclosure of security-related documents (prospectuses, investment statements, target statements and bidders’ statements), mandated semi-annual disclosure (interim financial reports, annual reports and accounts) and an ongoing requirement to immediately disclose to the market any other material information. The requirement for continuous disclosure was included in the Corporations Act to allow for stricter enforcement, however, questions were raised regarding the enforcement by ASIC following the 1994 enactment. Desai and Ramsay (2011) argue that one issue impeding the efficient working of the CDR was the difficulty in enforcing the law prior to 2004.

The Corporations Act, the principle source of penalties for a breach of the CDR, allowed ASIC to pursue either a criminal or civil case against the company. Prior to 2004, criminal penalties amounted to 200 penalty units or imprisonment for up to five years while civil penalties amounted to fines of up to $200,000. It was argued, however, that these processes were relatively slow and expensive, especially for minor infractions. As a result of reviews of the problems arising from the existing regulations, the Australian federal government enacted The Corporate Law Economic Reform Program (Audit Reform and Corporate Disclosure) Act 2004 (also known as CLERP 9), which strengthened the existing penalties and gave ASIC the ability to issue infringement notices. Infringement notices are an administrative penalty issued directly by ASIC, fining the company, but they are not an admission of guilt by the company and do not allow for further court action provided the firm accepts the notice and pays the fine (Raykovski 2004). Infringement notices were ultimately designed to allow for less serious breaches to be penalised. Since the introduction of the new regulation, ASIC has taken a hard line in enforcing the statute (Hsu 2009). However, considerable discretion remains within the rules as a result of legislated exemptions to the requirement to disclose information immediately, for instance where deals are incomplete. This is compounded by the fact that the requirement to disclose is adjudged on an objective basis, meaning incorrect interpretations of what needs to be continuously disclosed are still liable. As a result, ASIC and the ASX have both been active in working with companies to clarify the rules and provide ongoing detailed guidance as to how the rules are interpreted, such as the recently released ASX Guidance Note 8 (ASX 2013) and Continuous Disclosure: An Abridged Guide (ASX 2012b).

One question regarding the CDR is whether the market actually reacts following an enforcement action. Does tightening up requirements by issuing infringement notices actually reflect negatively on a firm?

**Hypotheses and methodology**

The market reaction to a breach of the CDR will provide an indication of the market’s view of continuous disclosure and, in particular, if a breach increases the perception of firm risk. A breach suggests that a company has poor disclosure practices, making their stock prices less informative to investors, who may in turn consider investing in such a firm to be more risky. This is referred to as ‘information risk’ and has been modelled in the literature as an additional premium that investors’ demand for bearing this risk component (Barry and Brown 1985 and 1986; Merton 1987). If a breach of the CDR matters, we would observe the effects of this increased information risk in a number of areas. The most obvious consequence is that investors would require a higher return as compensation for the risk. This would result in a decrease in the share prices of firms on the day of the announcement of a breach. Our first hypothesis is:

**H1:** Abnormal returns will be negative following a breach of CDR

To investigate the market reaction, we use the standard Brown and Warner (1985) event study methodology, with a pre-event period of 290 to 41 days to estimate our parameters. We calculate cumulative abnormal returns (CARS) over various windows around the day of a breach notice.
We found few breaches of continuous disclosure in our sample period. This suggests that the market is broadly complying with the CDR regime and it would appear to suggest that the regime is functioning well. It also provides support for the efforts of ASIC and the ASX in engaging actively with the market regarding the interpretation and application of the CDR.

We also investigate two additional variables that may be affected by an increase in information risk due to a breach of CDR, namely, trade execution costs and firm-specific risk. Trade execution costs, as measured by the bid-ask spread, are compensation for risks faced by liquidity providers, such as information asymmetry. Given a breach notice suggests an environment with more unpriced information, we would expect spreads to increase to cover the additional information risk (Welker 1995; Bessembinder and Venkataraman 2009). We estimate the average percentage bid-ask spread using closing quotes and then average over our sample windows.

**H2: Firms spreads will increase following a breach of CDR**

We also consider the zero-return metric, proposed by Lesmond et al. (1999) and Ashbaugh-Skaife et al. (2006). The zero-return metric measures the amount of price-sensitive information entering the market, where a higher percentage of zero-return days (days considered to be without significant information or trading) indicates less informationally efficient share prices. We estimate the spreads and zero-return metric over three, six and 12-month windows both before (PRE) and after (POST) the issuance of an infringement notice, and test for statistical difference in the two sub-periods. All data was collected from Thomson Reuters Datastream.

**H3: Firms specific information will be lower following a breach of CDR**

### Findings

#### Market reaction

We find significant negative results around the announcement of an infringement notice over all the event windows considered. Specifically, we observe an -3.69 per cent return on the announcement day building to a return of -4.88 per cent over the window (0, +3). This suggests that the Australian market may have taken a few days to fully incorporate the breach into stock prices. Announcements of a breach of continuous disclosure are not frequently received by the market, therefore the under-reaction on the event day when compared to CARs over (0, +3) may be due to the difficulty in determining the implications of a breach and the extent of its impact on information risk. However, the delay may also be due to low trading volumes over the sample period for some sample firms, which may have slowed the market’s ability to impound the information of the breach into the price.

**TABLE 1: Cumulative abnormal returns**

<table>
<thead>
<tr>
<th>Window</th>
<th>CAAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10, +10</td>
<td>-0.0229**</td>
</tr>
<tr>
<td>-3, +3</td>
<td>-0.0335***</td>
</tr>
<tr>
<td>-2, +2</td>
<td>-0.0321***</td>
</tr>
<tr>
<td>-1, +1</td>
<td>-0.0013*</td>
</tr>
<tr>
<td>0, +1</td>
<td>-0.0274**</td>
</tr>
<tr>
<td>0, +3</td>
<td>-0.0488***</td>
</tr>
<tr>
<td>0</td>
<td>-0.0369***</td>
</tr>
</tbody>
</table>

Note: *, **, *** indicates significance at the 10%, 5% and 1% level, respectively.

#### Trade execution costs

Although we expected trading costs to increase as a result of the higher information risk demonstrated by an infringement notice, we see little conclusive evidence of this. Table 2 demonstrates that spreads increase over all three windows. However, the t-test only indicates statistical significance at the 10% level in the six- and 12-month POST period, and not at all for the three-month window.

Refer to table 2 below.

#### Zero-return metric

Likewise, we see little conclusive evidence that the percentage of zero-return days has changed significantly. In Table 2 we observe significance only for the six-month window, although again, all the results are in the expected direction. The lack of statistical significance for both spreads and the zero-return metric measures may be the result of the size of the sample.

### Conclusion

The 2004 introduction of the infringement notice regime was in response to perceptions of weak enforcement of continuous disclosure, particularly for less serious breaches. The introduction of the infringement notice has given ASIC the ability to deal with breaches of continuous disclosure in a more timely and less expensive manner, ultimately allowing for greater enforcement. Our study demonstrates that investors in the market appear to value the more informationally efficient environment it promotes, as evidenced by the negative market reaction to the announcement of an infringement notice. This provides some support for the CDR in Australia.
### TABLE 2: Trade execution costs and zero return metrics (spread)

<table>
<thead>
<tr>
<th></th>
<th>3 months</th>
<th></th>
<th>6 months</th>
<th></th>
<th>12 months</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PRE</td>
<td>POST</td>
<td>PRE</td>
<td>POST</td>
<td>PRE</td>
<td>POST</td>
</tr>
<tr>
<td><strong>Panel A: Trade Execution Costs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>0.0655</td>
<td>0.0768</td>
<td>0.0678</td>
<td>0.0809</td>
<td>0.0640</td>
<td>0.0974</td>
</tr>
<tr>
<td>Median</td>
<td>0.0269</td>
<td>0.0292</td>
<td>0.0323</td>
<td>0.0289</td>
<td>0.0273</td>
<td>0.0346</td>
</tr>
<tr>
<td>St Dev</td>
<td>0.1142</td>
<td>0.1491</td>
<td>0.1199</td>
<td>0.1386</td>
<td>0.1229</td>
<td>0.1750</td>
</tr>
<tr>
<td>Min</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0020</td>
<td>0.0000</td>
<td>0.0029</td>
<td>0.0017</td>
</tr>
<tr>
<td>Max</td>
<td>0.4098</td>
<td>0.6233</td>
<td>0.4783</td>
<td>0.4876</td>
<td>0.5097</td>
<td>0.5578</td>
</tr>
<tr>
<td>Mean Diff</td>
<td></td>
<td></td>
<td>0.0131*</td>
<td></td>
<td>0.0335*</td>
<td></td>
</tr>
<tr>
<td>t-test</td>
<td></td>
<td></td>
<td>(0.8661)</td>
<td></td>
<td>(1.4182)</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>18</td>
<td></td>
<td>18</td>
<td></td>
<td>17</td>
<td></td>
</tr>
<tr>
<td><strong>Panel B: Zero-return Metrics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>0.3642</td>
<td>0.3898</td>
<td>0.3536</td>
<td>0.3955</td>
<td>0.3360</td>
<td>0.3404</td>
</tr>
<tr>
<td>Median</td>
<td>0.2937</td>
<td>0.2698</td>
<td>0.2738</td>
<td>0.2421</td>
<td>0.2381</td>
<td>0.2500</td>
</tr>
<tr>
<td>St Dev</td>
<td>0.3361</td>
<td>0.3755</td>
<td>0.3137</td>
<td>0.3670</td>
<td>0.2992</td>
<td>0.3203</td>
</tr>
<tr>
<td>Min</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0079</td>
<td>0.0079</td>
</tr>
<tr>
<td>Max</td>
<td>1.0000</td>
<td>1.0000</td>
<td>0.8968</td>
<td>1.0000</td>
<td>0.9127</td>
<td>0.9722</td>
</tr>
<tr>
<td>Mean Diff</td>
<td>0.0256</td>
<td></td>
<td>0.0419**</td>
<td></td>
<td>0.0044</td>
<td></td>
</tr>
<tr>
<td>t-test</td>
<td>(1.2941)</td>
<td></td>
<td>(2.1739)</td>
<td></td>
<td>(0.1885)</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>18</td>
<td></td>
<td>18</td>
<td></td>
<td>17</td>
<td></td>
</tr>
</tbody>
</table>

Note: Significance of the difference between PRE and POST samples is calculated using the matched-pairs t-test for means. PRE(POST) indicates either the 3, 6 or 12 months before (after) the announcement of an infringement notice. * indicates significance at the 10% level, ** indicates significance at the 5% level.

Notably, the infringement notices have served their purpose as enforcement is more common now; of the 19 breaches identified, all but two were infringement notices. Also, in support of comments made in a speech by the Commissioner of ASIC (Price 2013), we found few breaches of continuous disclosure in our sample period. This suggests that the market is broadly complying with the CDR regime and it would appear to suggest that the regime is functioning well. It also provides support for the efforts of ASIC and the ASX in engaging actively with the market regarding the interpretation and application of the CDR.
APPENDIX: Overview of sample companies

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Sector</th>
<th>Type</th>
<th>Date of announcement</th>
<th>Penalty ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astron</td>
<td>Materials</td>
<td>Infringement</td>
<td>18-Jul-06</td>
<td>66,000</td>
</tr>
<tr>
<td>Acuvax</td>
<td>Pharmaceuticals, biotechnology</td>
<td>Infringement</td>
<td>8-Dec-06</td>
<td>33,000</td>
</tr>
<tr>
<td>Avastra Sleep Centres</td>
<td>Pharmaceuticals, biotechnology</td>
<td>Infringement</td>
<td>12-May-06</td>
<td>33,000</td>
</tr>
<tr>
<td>BC Iron</td>
<td>Materials</td>
<td>Infringement</td>
<td>1-Mar-12</td>
<td>66,000</td>
</tr>
<tr>
<td>BioProspect</td>
<td>Pharmaceuticals, biotechnology</td>
<td>Infringement</td>
<td>8-Mar-12</td>
<td>33,000</td>
</tr>
<tr>
<td>Centrex Metals</td>
<td>Materials</td>
<td>Infringement</td>
<td>12-Mar-08</td>
<td>33,000</td>
</tr>
<tr>
<td>Chemeq</td>
<td>Pharmaceuticals, biotechnology</td>
<td>Breach</td>
<td>24-Dec-04</td>
<td>500,000</td>
</tr>
<tr>
<td>Citigold Corporation</td>
<td>Materials</td>
<td>Infringement</td>
<td>22-Sep-10</td>
<td>33,000</td>
</tr>
<tr>
<td>Commonwealth</td>
<td>Banks</td>
<td>Infringement</td>
<td>14-Oct-09</td>
<td>100,000</td>
</tr>
<tr>
<td>Leighton Holdings</td>
<td>Capital goods</td>
<td>Infringement</td>
<td>16-Mar-12</td>
<td>300,000</td>
</tr>
<tr>
<td>Navigator Resources</td>
<td>Materials</td>
<td>Infringement</td>
<td>15-Jun-12</td>
<td>33,000</td>
</tr>
<tr>
<td>Nufarm</td>
<td>Materials</td>
<td>Infringement</td>
<td>1-Dec-10</td>
<td>66,000</td>
</tr>
<tr>
<td>Q Technology Group</td>
<td>Technology, hardware and</td>
<td>Infringement</td>
<td>17-Feb-06</td>
<td>33,000</td>
</tr>
<tr>
<td></td>
<td>equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raw Capital Partners</td>
<td>Software and services</td>
<td>Infringement</td>
<td>1-Aug-07</td>
<td>33,000</td>
</tr>
<tr>
<td>Rio Tinto</td>
<td>Materials</td>
<td>Infringement</td>
<td>5-Jun-08</td>
<td>100,000</td>
</tr>
<tr>
<td>FYI Resources</td>
<td>Materials</td>
<td>Infringement</td>
<td>1-Aug-05</td>
<td>33,000</td>
</tr>
<tr>
<td>Sub-Sahara Resources NL</td>
<td>Materials</td>
<td>Infringement</td>
<td>29-Apr-08</td>
<td>33,000</td>
</tr>
<tr>
<td>Fortescue Metals Group</td>
<td>Materials</td>
<td>Breach</td>
<td>3-Mar-06</td>
<td>Ruling:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>no breach</td>
</tr>
</tbody>
</table>

Notes
1. Searches were conducted on the ASIC website, Factiva and other sources for notification of infringement notices. We took the announcement date as the first date where the details of the infringement notice were first disclosed.
2. Listing Rule 3.1 (ASX 2012a).
5. Penalties were set based on the size of the firm. For firms with a market capitalisation of less than $100 million, the fine is $33,000. For firms between $100 million and $1 billion, the fine is $66,000 and for firms with a market capitalisation of greater than $1 billion the fine is $100,000 AUD (Corporations Act 2001, s1317DAE(6)).
6. Information risk’ is the risk borne by an investor relating to the possible non-disclosure of information (Barry and Brown 1986).
7. Ashbaugh-Skaife et al. (2006) conclude that ZR is a better measure for the level of firm-specific information and outperforms the traditional measure of price synchronicity (Morck et al. 2000). We have performed the latter analysis as well and do not obtain any significant results comparing pre-post breach event.
8. To ensure the robustness of our results we investigated the potential for other confounding events within the period around the breach notice. With the exception of one company removed as it delisted soon after the event date, we found no announcements that we believed would impact our findings. More formal testing was not possible due to the sample size.
9. To control for the impact of small firms and thin trading, we investigate just the seven firms making up the Tier 2 and Tier 3 firms (the larger firms). The findings remain consistent albeit with greatly reduced power.
References


Bessembinder, H and Venkataraman, K 2009, Bid-ask spreads: Measuring trade execution costs in financial markets, David Eccles School of Business, University of Utah.


PAPERS FROM
THE MELBOURNE
MONEY & FINANCE
CONFERENCE 2013

Finsia acknowledges the contribution of the papers from the 18th Melbourne Money and Finance Conference to this issue of JASSA. The conference — Financial Sector Evolution: Prospect and Determinants — was held in July 2013 by the Australian Centre for Financial Studies.

We gratefully acknowledge the support of the generous sponsors:

ANZ, APRA, Reserve Bank of Australia and Finsia — The Financial Services Institute of Australasia
MEASURING RETIREMENT SAVINGS ADEQUACY in Australia

JOHN BURNETT, Senior Consultant, Towers Watson
KEVIN DAVIS SF Fin, Professor, The University of Melbourne and Research Director, Australian Centre for Financial Studies, and Professor of Finance, Monash University
CARSTEN MURAWSKI, Senior Lecturer, Department of Finance, The University of Melbourne
ROGER WILKINS, Associate Professor, Melbourne Institute for Applied Economic and Social Research, The University of Melbourne
NICHOLAS WILKINSON, Consultant, Towers Watson

We present two new metrics to assess the adequacy of retirement savings and estimate these metrics for a representative sample of the Australian population aged 40 to 64. Our estimates support the widely held belief that most individuals are not ‘on track’ to achieve a comfortable standard of living in retirement, although couples appear better prepared than singles. We also estimate the relative expected contributions of the various ‘pillars’ of retirement income. The metrics presented here may provide a better way to communicate adequacy to individuals, and encourage increased saving. An earlier version of this paper was presented to the 2013 Australian Centre for Financial Studies’ Melbourne Money and Finance Conference. 1

It is widely believed that most Australians do not currently have sufficient savings to fund their retirement, and that for the foreseeable future even retirees who have contributed to superannuation throughout their working lives will rely substantially on the age pension (Australian Government 2010).

But, how do we best determine whether there is a shortfall in retirement savings and how large it is? What observable individual characteristics (current age, wealth, income etc.) are best able to explain likely consumption shortfalls? How will alternative measures of shortfall influence individuals and induce increases in savings? This article is part of a larger project seeking to provide answers to such questions.

We use two measures to assess adequacy of retirement savings, the consumption shortfall and the age gap. The metrics are computed with an extended version of an algorithm initially developed for the MoneySmart retirement calculator (ASIC 2013). We use this algorithm to estimate the adequacy of retirement savings of 5,124 individuals (single and in relationships) between ages 40 and 64 using data from the HILDA survey of the Australian population (Wooden and Watson 2007). Alternative projections are produced taking into account different potential sources of retirement income.

Our analysis supports the view that retirement savings are grossly inadequate and that most Australians will continue to be dependent on the age pension in retirement. Even when we take into account the age pension, mandatory and voluntary superannuation and other private savings and investments, we expect 95.8 per cent of singles and 88.1 per cent of couples to receive the age pension either partly or fully at some stage during retirement. We also expect the age pension to contribute 66.7 per cent and 34.9 per cent of the target consumption level during retirement for singles and couples, respectively.

Retirement savings targets
Economists envisage rational individuals saving at a rate which generates sufficient wealth at retirement to enable a smooth consumption pattern over both working years and retirement. The reality is somewhat different. Individuals form (and dissolve) households with others. Future income is unknown and uncertain, and returns on accumulated wealth are also uncertain. The age of retirement is sometimes flexible and sometimes involuntary; time of death is unknown, and private wealth available for retirement may be supplemented by government benefits (age pension) in amounts determined by complex eligibility and means-testing rules. The ability of most individuals to adequately assess the rate of savings required at any stage of their life cycle to achieve some target retirement savings amount is, at best, open to question (Skinner, 2007). Moreover, persuasive evidence exists that individuals are subject to a range of severe behavioural biases, which
Compulsory, tax-advantaged, superannuation is one response to the perceived inadequacy of savings for retirement (and consequent government budgetary costs) arising from such factors. But since achieving adequate retirement consumption levels is still heavily dependent on voluntary savings, individuals still face the problem of understanding whether their pre-retirement savings behaviour puts them ‘on track’ to meet such a target. And, while it is possible to develop techniques for answering that question, given behavioural biases, the effectiveness of such information in influencing savings behaviour is likely to depend on how it is presented (‘framed’).

A related measure is the ‘replacement wealth ratio’ (an income stream in retirement) based on calculating the number of years at which the target level of consumption can be maintained, after private wealth is run down. A replacement wealth ratio between 6 and 8 is considered adequate (Basu and Drew 2010). Both the income replacement ratio and the replacement wealth ratio are based on estimates of pre-retirement income, however, which on the one hand is difficult to forecast, particularly for younger employees, and on the other hand may not be a good index of consumption during retirement.

We adopt an alternative approach by developing metrics based on retirement wealth needed for achieving a specified level of retirement consumption for an assumed post-retirement life expectancy, independent of pre-retirement income levels. This is both simpler and arguably provides for a more tangible estimate of target level of retirement wealth required for individuals unsure of their likely final pre-retirement income. In practice, the linking of age pension support to private wealth means that there is some range of private retirement savings consistent with achieving the target retirement income, with lower levels implying larger age pension support. But there is some lower bound to this range below which there will be a retirement savings gap such that the target income cannot be achieved for the full period of retirement.

Target retirement income levels used are the ‘comfortable’ targets provided under the ASFA Retirement Standard of $38,339 and $52,472 for singles and couples, respectively (ASFA 2012). In comparison, in 2010 mean household income of retirees in Australia was at $32,031 for singles (median $21,000) and $54,330 for couples (median $41,156).

We use current wealth and forecast accumulation from savings and returns on wealth to compute an expected retirement savings amount. Where this amount is above the lower bound, the target income can be met with varying levels of dependence upon the age pension (including none) during the retirement phase as private wealth is run down. Where retirement savings are below the lower bound, the shortfall can be presented using (at least) two metrics. The ‘consumption shortfall’ is the difference between the level of consumption that can be sustained until life expectancy and the target level of consumption. The alternative metric is based on calculating the number of years at which the target level of consumption can be maintained before private wealth is exhausted, at which point consumption must be reduced to the level of the (full) age pension until the predicted age of death. The ‘age gap’ is the predicted number of years in that latter state.

These two metrics may give somewhat different results because of the different post-retirement consumption patterns (and mortality) assumed. Hence, we also examine the correlation between the two metrics and identify causes of difference. We also assess the relative importance of the ‘four pillars’ of retirement savings (compulsory super, voluntary super contributions, the age pension, and other voluntary savings) in determining financial
well-being in retirement.6 Finally, we assess whether available indicators of current household financial position provide good indicators of likely retirement outcomes.

**Forecasting retirement target shortfalls**

We estimate expected savings at an assumed retirement age of 65 using extensions to a proprietary algorithm developed by Towers Watson for the MoneySmart calculator made available for public use by ASIC.7 The extensions enable incorporation of additional information on individual circumstances that is available in the HILDA Survey. Calculation of retirement target consumption shortfalls proceeds as follows. Data inputs used are current real and financial assets (and liabilities), wage and salary income (w), age, and household details such as marital status and home ownership. Specific forecasting assumptions are made about rates of return on assets (\(r = 6.4\%\) p.a. net of investment tax and asset-based fees prior to retirement; 6.5\% p.a. net of asset-based fees after retirement), price inflation (\(i = 2.5\%\) p.a.), real income (wage and salary) growth (\(f = 1\%\) p.a.),\(^8\) compulsory superannuation contributions (\(sg\)) and voluntary savings rates (\(s\)) based on current levels in the HILDA survey data, allowing for contributions tax (\(t\)) and administration/insurance costs (\(c\)) where applicable.

The forecasting model is non-stochastic, and retirement savings (\(K\)) evolve prior to retirement according to a process of the generalised form:\(^9\)

\[
K_{t+1} = K_t \left(1 + r \right) + \left( sg + s \right) w_t \left(1 - t \right) - c \left(1 + r/2 \right)
\]

where \(w_{t+1} = (1 + i) (1 + f) \) \(w_t\). Once the assumed retirement age of 65 is reached, age pension eligibility is calculated in that year and in each subsequent year, in line with both income and assets means test requirements. The resulting part or full pension income is assumed available for consumption in addition to the assumed use of private wealth. Since the assets test treats home ownership differently to other assets, this is taken into account and current status as a renter or homeowner is assumed to be maintained until retirement. It is also assumed that home ownership is maintained until death and bequeathed to descendants. The assumed retirement consumption pattern is maintained in real terms.

The ‘consumption shortfall’ metric (expressed in a 2010 dollar value)\(^{10}\) calculates the difference between the level of consumption that can be achieved and the target level of consumption if maintained until death.

The ‘age gap’ metric assumes that individuals immediately commence consuming at the target rate upon retirement (if accumulated wealth permits), drawing down private wealth and using whatever age pension income is available to them. They continue to do so until private wealth is exhausted and they are forced to revert to a lower level of consumption equal to the full age pension amount. The difference between the age at which that occurs and death (assumed to be life expectancy in this case) is the age gap metric.\(^{12}\)

Because this involves a different rundown of private wealth compared to the saving shortfall metric, and thus has different implications for age pension income receipts, these two measures will not be perfectly correlated.

The assumptions built into the forecasting model can be varied to test the sensitivity of the conclusions to the various input parameters.\(^{13}\)

**The HILDA Survey**

The input data comes from the HILDA Survey, a household panel study that commenced in 2001 with a nationally representative sample of 13,969 respondents in 7,682 households (Wooden and Watson 2007; Summerfield et al. 2012). The unit record data are supplied with sample weights (which are used in this paper) to enable population inferences to be made from the HILDA sample.

Information is collected on a wide range of topics, including labour market and education activity, retirement intentions and behaviour, income, expenditure, health and disability, subjective well-being and personal relationships. Importantly for this study, the HILDA Survey also collects detailed information on household assets and debts every four years (2002, 2006 and 2010) in 11 asset and seven debt categories giving estimates of household net worth, and components, such as the home, other property, superannuation, equity investments, businesses and bank accounts.

We use data collected in 2010 (Wave 10) and report results for the 5,124 individuals between age 40 and 64, residing in 3,519 households. Appendix 1 provides information on the sample characteristics.

**Results**

We provide four alternative projections of retirement savings shortfalls with each successive projection taking into account additional potential sources of retirement funds. The first projection considers only mandatory superannuation. In the second projection we add voluntary superannuation contributions, while the third projection also takes into account the age pension.

Finally, we add other investment assets to the pool of assets in the fourth projection. This information typically is not included in estimates of retirement savings due to unavailability of data, but is available from the HILDA Survey (see Table 1). This last
projection provides our primary results, while differences between the outcomes of the alternative projections provide information on the relative contributions of the various pillars.

We only report results for ages between 40 and 64. Projections of retirement savings for individuals younger than 40 years of age are likely to be much less reliable because of greater uncertainty about future earnings, household composition, home-ownership status and wealth accumulation.

**Consumption shortfall results**

First, we examine consumption shortfalls, the difference between the level of consumption that can be sustained until life expectancy and the target level of consumption. Including investment assets as well as compulsory and voluntary super and the age pension in the pool of assets available to fund consumption during retirement (projection 4), we estimate a median shortfall of $12,167 for singles (31.7 per cent of the comfortable level) but -$702 (1.3 per cent) for couples. Some 78.9 per cent of singles and 48.6 per cent of couples will have retirement consumption levels below the target consumption levels, and 95.8 per cent and 88.1 per cent, respectively, are expected to receive the age pension either partly or fully at some stage during retirement. Even taking into account a wide array of sources of private retirement income which include superannuation and other investment assets, the age pension is expected to fund 66.7 per cent of singles’ consumption and 34.9 per cent of couples’ consumption during retirement.

To examine the relative contributions of the various ‘pillars’ of retirement savings we compare the four projections (see Figure 1). The median consumption shortfall in the first projection, which only takes into account mandatory superannuation, is $32,086 for singles and $31,887 for couples, or 60.8 per cent and 60.8 per cent of the target income level, respectively. Adding voluntary superannuation contributions improves the shortfalls immaterially to $31,911 and $31,597, or 60.2 per cent and 60.2 per cent of the target income level. In the projection that takes into account mandatory and voluntary superannuation, only 5.1 per cent of singles and 15.1 per cent of couples would be able to reach target consumption levels.

Introducing the age pension (projection 3) reduces the consumption shortfall significantly to $14,572 (38.0 per cent of target income) for singles and $7,477 (14.2 per cent of target income) for couples. In this projection, 89.2 per cent of singles and 68.4

---

**FIGURE 1**: Consumption shortfall (A) Estimates by projection basis and marital status. (B) Percentage expected to receive the age pension. (C) Estimated percentage contribution of the age pension.

**A. Estimates of consumption shortfall**

<table>
<thead>
<tr>
<th></th>
<th>Singles</th>
<th>Couples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Mandatory super</td>
<td>-32,086</td>
<td>-31,887</td>
</tr>
<tr>
<td>2. Mandatory + voluntary super</td>
<td>-31,911</td>
<td>-31,597</td>
</tr>
<tr>
<td>3. Mandatory super + age pension</td>
<td>-14,572</td>
<td>-7,477</td>
</tr>
<tr>
<td>4. Mandatory super + age pension + other assets</td>
<td>-12,167</td>
<td>+702</td>
</tr>
</tbody>
</table>

**B. Percentage of HH receiving AP**

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>99.5%</td>
<td>98.2%</td>
<td>95.8%</td>
<td>98.1%</td>
</tr>
<tr>
<td>2</td>
<td>74.6%</td>
<td>53.9%</td>
<td>66.7%</td>
<td>34.9%</td>
</tr>
</tbody>
</table>

**C. Percentage contribution of age pension**

Additional statistics are available in Table 2 in the Appendix.
Comparisons and correlations

Finally, we consider the relation between our two metrics across the alternative projections as well as the relation between our metrics and key financial figures, using the Spearman rank correlation. All correlations reported are significant at the p<0.001 level.

The correlation between the consumption shortfall in the first projection and projections two, three and four is 0.998, 0.953 and 0.711, respectively. The correlation between the age gap metric in the first projection and projections two, three and four is 0.998, 0.984 and 0.7727, respectively. Adding private savings to available retirement wealth affects not just the predicted aggregate outcomes, but also ‘reshuffles the pack’ somewhat; ignoring this variable leads to different predictions about who will face shortfalls.

The correlation between the income shortfall metric in projection four and the age gap metric in this projection is 0.971. Both metrics thus provide very similar predictions, suggesting that the choice between them for provision of information to individuals about retirement savings adequacy is likely to depend on behavioural considerations.

We also consider the correlation between the adequacy metrics and three key household financial

Age gap results

If we only take into account superannuation (projections 1 and 2), the median age gap indicates that half of singles in our sample are expected to run out of savings 20 years or more before they are expected to die, and 13 years or more in case of couples, assuming that they consume at the target consumption level from the beginning of retirement. Some 94.0 per cent of singles and 80.7 per cent of couples are expected to run out of savings before life expectancy.

Including the age pension, the median age gap remains at -20 years for singles but reduces to -6 years for couples. And, when we add investment assets, the gap improves to -17 years for singles and +4 years for couples. In the last projection, 76.1 per cent of singles and 41.9 per cent of couples run out of savings before life expectancy.

FIGURE 2: Age gap (A) Age gap metric by projection basis and marital status. (B) Proportion of households in the sample expected to have a negative age gap for each projection basis. Additional statistics are available in Table 3 in the Appendix.
variables: current household disposable income; current household superannuation balance; and current household net worth. The correlation between the consumption shortfall in projection four and these three financial variables is 0.582, 0.706 and 0.750, respectively (with very similar figures for the age gap metric).17

Discussion
Our analyses support the widely held belief that retirement savings in the pre-retirement Australian population are grossly inadequate and that Australians will continue to be heavily dependent on the age pension to fund consumption during retirement.18 In the projection that takes into account superannuation and other private savings, about nine out of 10 Australians are expected to receive the age pension either partly or fully at some stage during retirement, and the age pension will contribute about 42 per cent of the target consumption level during retirement on average. But including private savings does ‘reshuffle’ the pack somewhat in terms of predicting which individuals will face shortfalls. This variable is thus an important addition to information requirements for such predictions (and one which most other analyses, including those of super funds drawing only on their available member data have been unable to include).

Using our age gap measure, we find that about half of the population is expected to run out of savings before reaching their life expectancy. Our two metrics give very similar predictions about retirement outcomes for any individual (relative to the population generally). We also find that financial variables such as current household income, superannuation balance or net worth are not necessarily good ‘proxies’ of, or substitutes for, the adequacy of retirement savings.

To the extent that individuals are unaware of the extent of likely shortfalls and the consequences for retirement well-being, the question arises as to which of the metrics proposed here (or potentially others) are most likely to have an impact, and influence subsequent savings behaviour. This is an empirical question and warrants further investigation. Information provision of this sort is potentially one important addition to other measures to promote retirement savings such as pension age eligibility, promoting appropriate investment strategies and taxes.

We provide four alternative projections of retirement savings shortfalls with each successive projection taking into account additional potential sources of retirement funds. The first projection considers only mandatory superannuation. In the second projection we add voluntary superannuation contributions, while the third projection also takes into account the age pension.
Notes
1. This article uses data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The survey was initiated and is funded by the Australian Government Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA), and is managed by the Melbourne Institute of Applied Economic and Social Research (Melbourne Institute). The findings and views based on these data should not be attributed to either FaHCSIA or to our employers.
2. Strictly, the terminology should refer to a cash flow, because some part of the post-retirement funds received and used for consumption is a running down of the capital amount available.
3. We use the ASFA levels from December 2012, deflated to 2010 dollars. In this article, all dollar figures are expressed in 2010 AUD, unless stated otherwise.
4. These figures were computed using 2010 HILDA data.
5. An objective for future research is to consider which metric may provide more effective signals to individuals in the pre-retirement phase about inadequacies in their current savings plans if target retirement incomes are to be met.
6. Our ordering of the four ‘pillars’ for our projections is different from that used in public policy discussions, where the age pension is normally seen as the first pillar. We adopt a different ordering to accommodate means testing of pensions in our projections.
7. The MoneySmart calculator enables individuals to input personal financial details and obtain output on likely shortfalls in retirement consumption in the form discussed above. The calculator is available at www.moneysmart.gov.au.
8. This is also relevant for calculating pension amounts given the linking of the full pension to 25 per cent of average weekly earnings.
9. The contribution rate is 9 per cent of wage and salary income increasing progressively in future years to 12 per cent, in line with current government legislation.
10. Annual steps are used, with additions to wealth (or subtractions in the retirement phase) occurring mid-year, apart from government co-contributions where the end of the year is adopted.
11. This ensures consistency between individuals retiring at different points in time and comparability against retirement income targets based on current costs of living.
12. For couples, the age gap is calculated twice, first using the life expectancy of one member, then the other.
13. Determining the sensitivity of the shortfall metrics to the various assumptions, including policy parameters, is the subject of ongoing work.
14. All statistics reported in this section are sample median unless stated otherwise.
15. The Spearman Rank correlation is a nonparametric measure of association. A value of close to 1 implies that the ranks of two variables are similar (technically, that one variable can be described by a monotonic function of the other variable), whereas a value close to 0 indicates that there is no relation between the two variables.
16. It is important to note, however, that the behaviour assumed in the estimations of the age gap does not maximise age pension receipts.
17. Higher values of each financial wealth variable reduce the size of the gap (i.e. make it a less negative number) — hence giving rise to positive correlations.
18. Our assumption of retirement age 65 means that the results reported are optimistic given that average retirement age in Australia at present is significantly below 65, while the increase in pension eligibility age to 67 and consequent effect on retirement age would tend to work in the opposite direction.

References
Association of Superannuation Funds of Australia (ASFA) 2012, The ASFA Retirement Standard (December 2012), Association of Superannuation Funds of Australia.
Institute of Actuaries of Australia 2012, Australia's longevity tsunami — what should we do?, Institute of Actuaries of Australia.
Hajkowicz, S, Cook, H and Littleboy, A 2012, Our future world — Global megatrends that will change the way we live, The 2012 Revision, CISRO, Australia.
TABLE 1: Summary statistics of key input variables. This table displays summary statistics of key input variables used in the estimation of the adequacy metrics.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Statistic</th>
<th>Median</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (0: male; 1: Female)</td>
<td>1.00</td>
<td>0.53</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>51.0</td>
<td>51.1</td>
<td>7.0</td>
<td></td>
</tr>
<tr>
<td>Married (0: not married; 1: married/de facto)</td>
<td>1.00</td>
<td>0.77</td>
<td>0.42</td>
<td></td>
</tr>
<tr>
<td>Unemployed (0: not unemployed; 1: unemployed)</td>
<td>0.00</td>
<td>0.02</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>Retired (0: not retired; 1: retired)</td>
<td>0.00</td>
<td>0.12</td>
<td>0.33</td>
<td></td>
</tr>
<tr>
<td>Household disposable income</td>
<td>83,151</td>
<td>92,879</td>
<td>65,495</td>
<td></td>
</tr>
<tr>
<td>Gross annual wage/salary</td>
<td>36,000</td>
<td>45,093</td>
<td>53,226</td>
<td></td>
</tr>
<tr>
<td>Recieves Age Pension (0: no; 1:yes)</td>
<td>0.00</td>
<td>0.17</td>
<td>0.38</td>
<td></td>
</tr>
<tr>
<td>Age Pension share of HH income</td>
<td>0.00</td>
<td>0.08</td>
<td>0.23</td>
<td></td>
</tr>
<tr>
<td>Employer super contributions (%)</td>
<td>9.00</td>
<td>9.67</td>
<td>3.94</td>
<td></td>
</tr>
<tr>
<td>Voluntary super contributions</td>
<td>5.34</td>
<td>10.25</td>
<td>18.38</td>
<td></td>
</tr>
<tr>
<td>Household super balance</td>
<td>1200,000</td>
<td>229,073</td>
<td>347,653</td>
<td></td>
</tr>
<tr>
<td>Household investments assets(^1)</td>
<td>51,210</td>
<td>332,497</td>
<td>777,384</td>
<td></td>
</tr>
<tr>
<td>Household non-investments assets(^2)</td>
<td>25,000</td>
<td>39,362</td>
<td>61,978</td>
<td></td>
</tr>
<tr>
<td>Household home value</td>
<td>420,000</td>
<td>484,506</td>
<td>475,922</td>
<td></td>
</tr>
<tr>
<td>Household net worth</td>
<td>620,084</td>
<td>951,730</td>
<td>1,219,696</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\)Mandatory contributions only \(^2\)Mandatory + voluntary contributions

TABLE 2: Consumption shortfall

<table>
<thead>
<tr>
<th>Scenario</th>
<th>p25</th>
<th>Median</th>
<th>Mean</th>
<th>p75</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Super only(^1)</td>
<td>-37,595</td>
<td>-32,086</td>
<td>-24,291</td>
<td>-27,871</td>
<td>14,273</td>
</tr>
<tr>
<td>Super only(^2)</td>
<td>-37,595</td>
<td>-31,911</td>
<td>-23,800</td>
<td>-27,510</td>
<td>14,739</td>
</tr>
<tr>
<td>Super(^1) + Age pension</td>
<td>-19,596</td>
<td>-14,572</td>
<td>-7,786</td>
<td>-11,644</td>
<td>11,557</td>
</tr>
<tr>
<td>Super(^2) + Age pension + Other assets</td>
<td>-18,481</td>
<td>-12,167</td>
<td>-2,305</td>
<td>-4,670</td>
<td>28,613</td>
</tr>
<tr>
<td>Couples</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Super only(^1)</td>
<td>-44,150</td>
<td>-31,887</td>
<td>-15,191</td>
<td>-25,232</td>
<td>28,228</td>
</tr>
<tr>
<td>Super only(^2)</td>
<td>-44,020</td>
<td>-31,597</td>
<td>-14,195</td>
<td>-24,597</td>
<td>28,703</td>
</tr>
<tr>
<td>Super(^1) + Age pension</td>
<td>-18,120</td>
<td>-7,477</td>
<td>8</td>
<td>23,942</td>
<td>22,706</td>
</tr>
<tr>
<td>Super(^2) + Age pension + Other assets</td>
<td>-11,699</td>
<td>702</td>
<td>23,942</td>
<td>21,963</td>
<td>76,929</td>
</tr>
</tbody>
</table>

\(^1\)Mandatory contributions only \(^2\)Mandatory + voluntary contributions

TABLE 3: Age gap

<table>
<thead>
<tr>
<th>Scenario</th>
<th>p25</th>
<th>Median</th>
<th>Mean</th>
<th>p75</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Super only(^1)</td>
<td>-23</td>
<td>-20</td>
<td>-16</td>
<td>-17</td>
<td>8</td>
</tr>
<tr>
<td>Super only(^2)</td>
<td>-23</td>
<td>-20</td>
<td>-15</td>
<td>-17</td>
<td>9</td>
</tr>
<tr>
<td>Super(^1) + Age pension</td>
<td>-23</td>
<td>-20</td>
<td>-12</td>
<td>-15</td>
<td>11</td>
</tr>
<tr>
<td>Super(^2) + Age pension + Other assets</td>
<td>-22</td>
<td>-17</td>
<td>-1</td>
<td>-10</td>
<td>15</td>
</tr>
<tr>
<td>Couples</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Super only(^1)</td>
<td>-19</td>
<td>-13</td>
<td>-5</td>
<td>-10</td>
<td>11</td>
</tr>
<tr>
<td>Super only(^2)</td>
<td>-19</td>
<td>-13</td>
<td>-4</td>
<td>-10</td>
<td>12</td>
</tr>
<tr>
<td>Super(^1) + Age pension</td>
<td>-17</td>
<td>-6</td>
<td>8</td>
<td>-4</td>
<td>15</td>
</tr>
<tr>
<td>Super(^2) + Age pension + Other assets</td>
<td>-11</td>
<td>4</td>
<td>19</td>
<td>4</td>
<td>16</td>
</tr>
</tbody>
</table>

\(^1\)Mandatory contributions \(^2\)Mandatory + voluntary contributions
After declining worldwide since the late 1980s, defined benefits plans will not recover their previous dominance in Australia because they can only be offered by large and stable organisations. Since 1992 Australia has had compulsory superannuation that is mostly privately managed. In addition, several policy measures have unduly weakened defined benefits schemes, especially in the private sector. Rescinding these measures would revitalise defined benefits, and produce a deeper market for privately managed lifetime annuities. An earlier version of this paper was presented to the 2013 Australian Centre for Financial Studies’ Melbourne Money and Finance Conference.

In defined benefits superannuation plans, retirement benefits are calculated partly by reference to the salaries of plan members. Since the late 1980s these schemes have declined worldwide relative to defined contributions (accumulations) superannuation. By June 2012 defined benefit balances in Australia stood at just 21 per cent of accumulation plan balances and these schemes will not recover their previous dominance here. The main reason is that defined benefits can only be offered by large and stable organisations. With compulsory superannuation in Australia since 1992, which is (mostly) privately managed, accumulation plans are the only viable options for the small- and medium-sized enterprises which are our main employers. By the same token, several policy measures since the late 1980s have weakened defined benefits, especially in the private sector. Rescinding these measures would revitalise defined benefits, with a by-product being a deeper market for privately-managed lifetime annuities.

One adverse tilt of the playing field was the introduction in 1988 of 15 per cent taxes on superannuation fund earnings and employer contributions. Next, the mid-1990s saw ownership of surpluses in defined benefit plans being shifted from plan sponsors to all ‘stakeholders’ in the enterprise, including plan members. A trustee seeking to repay fund surplus to an employer became effectively obliged to use part of the surplus for the purpose of enhancing employee benefits. Moreover, after 1995, enterprises were no longer allowed to claim a refund of the 15 per cent tax on employer contributions when they drew down surpluses. These measures made defined benefits more expensive to operate. They also discouraged over-funding of a defined benefit plan, which serves the dual purpose of protecting members and buffering financial shocks to a business. Yet another tilt of the playing field during this period was compulsory vesting of employer-funded benefits accrued in defined benefit plans over and beyond the percentage of salary mandated by the superannuation guarantee. Most defined benefit plans have involved higher employer contributions than the prevailing compulsory rate of employer contributions.

At the same time, defined contribution plans have been encouraged, both in Australia and worldwide. Two factors were particularly important in Australia: the introduction of mandatory superannuation in the form of a compulsory employer contribution and the increasing concern about public sector deficits. The latter led to a large-scale transition, starting over 25 years ago, from defined benefit pensions largely funded on a pay-as-you-go basis to defined contribution plans paying lump sums at retirement. For new entrants, only the military and the judiciary retain publicly-funded defined benefit pensions (Bateman and Piggott 2011). Internationally, the trend (most prevalent in the United States and the United Kingdom) has been driven by the move to market-based accounting changes and an increased regulatory burden as well as funding pressures due to the long-term decline in interest rates, along with increasing longevity (Broadbent et al. 2006; OECD 2011).

Of course, no particular type of fund is unambiguously dominant. However, in the case of large and stable enterprises, defined benefits offer several appealing features that can be shared by...
Defined benefits simplify decisions faced by people saving for retirement. The notion of a target replacement rate remains popular. Accumulations superannuation requires non-trivial calculations to translate a lump sum into an equivalent flow of income for the duration of a household’s retirement, particularly when estimating the volatility of that flow (i.e. not just its expected level.) Defined benefits, by contrast, typically delegate such decisions and calculations to the plan sponsor. This eases the computational burden on households.

Employers and long-serving employees. Defined benefit plans cross-subsidise long stayers at the expense of job switchers: long stayers enjoy better vesting of their benefits, and often also enjoy ‘back-loading’ whereby the benefit formula delivers a higher internal rate of return to them. Loyal and farsighted people therefore become more likely to self-select for job vacancies. Benefits that are strongly linked to final salaries motivate employees to strive for promotion, thereby becoming more productive. A maximum span for contributing to a defined benefit plan (typically 30 years) helps to motivate timely retirements on the part of elderly employees with declining productivity. Finally, risk-averse employees may accept substantially lower salaries in exchange for a retirement benefit promising a measure of income replacement for the duration of a household’s retirement.

Defined benefits plans ease the burden on taxpayers. They are particularly suitable vehicles for providing private retirement benefits in the form of lifetime annuities, thereby lightening the burden of providing public longevity insurance. Current policy does little to discourage ‘double dipping’ whereby lump sum retirement benefits that have been accumulated in a tax-concessional environment end up being used for things such as extensions to a family home whose residents claim the age pension. Indeed, even when defined benefits were more popular in Australia, it was often possible to commute the benefits to lump sums, and this option was often exercised by retiring workers.

Defined benefits facilitate the sharing of investment risk across different cohorts of the population. Take the ‘retirement risk zone’ that spans the last few years of working life and the first several years of retirement. An accumulation fund member, accepting the conventional industry advice to maintain a high lifelong exposure to growth assets, runs the risk of events such as the global financial crisis while traversing the retirement risk zone. They could end up scrimping and saving rather than making the most of the active period of retirement. Harmer (2009 p. 15) noted: ‘Age pension applications in December 2008 were around 50 per cent higher than the number recorded in October of the same year’. Retirees and taxpayers alike were the losers.

Defined benefits simplify decisions faced by people saving for retirement. The notion of a target replacement rate remains popular. Accumulations superannuation requires non-trivial calculations to translate a lump sum into an equivalent flow of income for the duration of a household’s retirement, particularly when estimating the volatility of that flow (i.e. not just its expected level.) Defined benefits, by contrast, typically delegate such decisions and calculations to the plan sponsor. This eases the computational burden on households.

For these reasons we propose rolling back the policy changes late last century that tilted the playing field against defined benefits. In doing so, we are not advocating a universal return to defined benefits, but rather a policy shift to remove the barriers to the provision of defined benefit plans by large and stable firms at their discretion. As we have argued previously, within the context of defined contributions, workers could be gradually allowed to build up accounts taxed only in retirement and at the marginal income tax rate of the retired worker. This would gradually remove two tax disincentives from building up surpluses in defined benefit funds: the 15 per cent tax on employer contributions, and the 15 per cent tax on fund earnings. Surpluses could again become a tax-efficient source of financial slack to large enterprises, thereby promoting financial stability of the economy as a whole. The Superannuation Industry Supervision Act 1993 could be changed so as to confer on sponsors clear ownership of surpluses in defined benefit funds. Finally, a short stayer with an enterprise could be entitled to vesting of employer-financed benefits only up to the level where the benefit would have stood had they been in an accumulation fund paying the minimum compulsory employer contribution.

We would not envisage a big difference from these rollbacks in the short term. Rather, they would promote stronger and more numerous defined benefit plans in the long term, and could be seen as part of a long-term effort to promote lifetime private annuities in Australia.

Defined benefits in decline
Broadbent et al. (2006) and Turner and Hughes (2008) comment on the decline in defined benefits around the world. The former paper examines Australia, Canada, the United Kingdom and the United States. The latter paper considers the same group except that Ireland replaces Australia. In all
The Australian Prudential Regulation Authority (2007) indicated that 82 per cent of members belonged to defined benefit funds in 1982–83. Twenty years later, less than 2 per cent of members belong to ‘pure’ defined benefit funds. At June 2012, only 30 of the 352 large (APRA regulated) superannuation funds were ‘pure’ defined benefit funds, while only 17 per cent of superannuation assets of large superannuation funds were held by so-called defined benefit members (see Table 1 which summarises Table 16 in Australian Prudential Regulation Authority (2012)).

Turner and Hughes emphasise that new regulations (adopted internationally) have also made life more difficult for sponsors of defined benefit plans. Compliance has become more expensive. The rise of the ‘stakeholder’ perspective on enterprises saw surpluses treated as being jointly owned by plan sponsors and beneficiaries rather than sponsors alone. Increasing concerns about tax expenditures saw limits on permissible overfunding. The time given to a sponsor to amortise a deficit tended to shorten. Accounting rules changed. For example, there was a shift to mark-to-market principles for valuing corporate assets and liabilities. As a consequence, sponsors of defined benefits faced increased volatility in their earnings statements. This was at odds with the well-known preference, by managers and shareholders alike, for smooth earnings.\(^2\)

The decline of defined benefits in Australia followed a similar timetable to the declines in Canada, Ireland, the US and the UK. Moreover, the reasons were similar. The biggest difference was our introduction in 1988 of a 15 per cent tax on employer contributions and fund earnings.\(^3\) Accumulation plans can readily pass on the new taxes to members. By contrast, the short-term incidence of a tax on established defined benefit plans falls largely on plan sponsors. They naturally considered closing down plans to new members, and the legal and industrial consequences of shifting employees into new schemes, generally accumulation ones. Continued threats to the stability of our front-end superannuation taxes suggest that allowing new employees to join existing defined benefit plans looks increasingly courageous.

The Occupational Superannuation Standards Act (1987), replaced by the Superannuation Industry (Supervision) Act (1993), raised the bar for the vesting of benefits arising from employer and employee contributions. This made defined benefits more expensive to operate, as short stayers no longer cross-subsidised other plan members to the same extent.

In the mid-1990s, further regulatory changes created adverse consequences for sponsors of defined benefit plans.\(^4\) One was the introduction of maximum deductible contributions whereby tax deductions allowed for employer contributions were capped. Another involved a push by unions to ensure part of any repaid fund surplus was used to upgrade employee benefits, via the Industrial Relations Commission rather than the regular courts.\(^5\) The government chose not to intervene, instead allowing the new industrial case-law to stand. The SIS Act instituted new hurdles for employers seeking to repay fund surpluses to shareholders. In 1995 funds became legally ineligible for a rebate of the 15 per cent tax on employer contributions if they repaid fund surpluses to stakeholders, even though the 1988 15 per cent tax on fund earnings was already actively discouraging fund surpluses.

Turner and Hughes emphasise that new regulations (adopted internationally) have also made life more difficult for sponsors of defined benefit plans. Compliance has become more expensive. The rise of the ‘stakeholder’ perspective on enterprises saw surpluses treated as being jointly owned by plan sponsors and beneficiaries rather than sponsors alone. Increasing concerns about tax expenditures saw limits on permissible overfunding. The time given to a sponsor to amortise a deficit tended to shorten. Accounting rules changed. For example, there was a shift to mark-to-market principles for valuing corporate assets and liabilities. As a consequence, sponsors of defined benefits faced increased volatility in their earnings statements. This was at odds with the well-known preference, by managers and shareholders alike, for smooth earnings.\(^2\)

The decline of defined benefits in Australia followed a similar timetable to the declines in Canada, Ireland, the US and the UK. Moreover, the reasons were similar. The biggest difference was our introduction in 1988 of a 15 per cent tax on employer contributions and fund earnings.\(^3\) Accumulation plans can readily pass on the new taxes to members. By contrast, the short-term incidence of a tax on established defined benefit plans falls largely on plan sponsors. They naturally considered closing down plans to new members, and the legal and industrial consequences of shifting employees into new schemes, generally accumulation ones. Continued threats to the stability of our front-end superannuation taxes suggest that allowing new employees to join existing defined benefit plans looks increasingly courageous.

The Australian Prudential Regulation Authority (2007) indicated that 82 per cent of members belonged to defined benefit funds in 1982–83. Twenty years later, less than 2 per cent of members belong to ‘pure’ defined benefit funds. At June 2012, only 30 of the 352 large (APRA regulated) superannuation funds were ‘pure’ defined benefit funds, while only 17 per cent of superannuation assets of large superannuation funds were held by so-called defined benefit members (see Table 1 which summarises Table 16 in Australian Prudential Regulation Authority (2012)).

Stronger Super (Australian Treasury 2010b) considered the sorry state of defined benefit funds. It noted the decline in defined benefits over the past three decades. It noted also that APRA had taken a ‘rather “light touch” enforcement role’ (p. 176).

### Table 1: Structure of retirement benefits, Australia, $ million

<table>
<thead>
<tr>
<th>Year (June)</th>
<th>Accumulation</th>
<th>Defined benefit</th>
<th>Hybrid</th>
<th>Accumulation</th>
<th>Defined benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>71,164</td>
<td>35,216</td>
<td>56,108</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>179,375</td>
<td>24,262</td>
<td>147,689</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>270,480</td>
<td>49,585</td>
<td>225,152</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>357,037</td>
<td>57,870</td>
<td>379,925</td>
<td>654,995</td>
<td>139,838</td>
</tr>
<tr>
<td>2012</td>
<td>340,721</td>
<td>63,630</td>
<td>513,080</td>
<td>758,958</td>
<td>158,473</td>
</tr>
</tbody>
</table>

Source: Australian Prudential Regulation Authority (2012), Table 16.

Notes: Numbers in the right-hand column are estimates. Defined benefit assets include defined benefit members who may also have an accumulation component. Entities with four members or less are excluded.
In the push for universal coverage of accumulation superannuation plans, some valuable characteristics of defined benefits have been overlooked. These advantages include scope for efficiency gains in bargains between employers and employees, certainty and simplicity of retirement benefits, and better management of investment and longevity risk. As mentioned at the outset, we are not advocating an across-the-board move back to defined benefits. Rather, we advocate the restoration of a level playing field, by reversing a number of policy measures that were introduced over the past quarter of a century.

having concerned itself primarily with ensuring that minimum requisite benefits⁶ are covered, rather than actual vested benefits. Yet minimum requisite benefits are typically less than actual vested benefits and are not reported to plan members.

The Super System Review (Australian Treasury 2010a), in line with an argument put to it by the Institute of Actuaries of Australia, noted: ‘the current focus in the SIS Act on solvency and minimum requisite benefits does not help trustees who undertake the process of negotiating higher employer contributions’ (p. 177). Following the conventional view of Australia’s official family, however, the Review said without comment or explanation that ‘it is desirable that large surpluses not be created” (p. 177).

Stronger Super recommended that APRA issue a prudential standard that focused on the protection of vested benefits rather than minimum requisite benefits. The review responded that it did ‘agree in principle’ (p. 43). The review recommended also that the SIS Act be amended so that a defined benefit fund which is technically insolvent yet not on track to restore solvency should be barred from accepting contributions stipulated by the superannuation guarantee. The review responded: ‘The Government notes the recommendation’ (p. 44). The government is starting to address these matters with the development of prudential standards on defined benefit matters.⁷

Options analysis of ‘stakeholder’ defined benefits
A number of analytical contributions decompose the balance sheets of standard defined benefit funds into an exchange of options between members and the plan’s sponsor.⁸ Assets less liabilities constitute the surplus of the fund. In effect, the sponsor grants members a put option on the risky assets underlying the scheme, insuring members against investment risk. The ‘put’ is in the money whenever the surplus is negative. A run of low returns generally obliges the employer to make extra contributions.⁹ Effectively, members grant the sponsor a call option on the surplus. The ‘call’ is in the money whenever the surplus is positive, making the scheme cheaper to operate; a run of high returns on fund investments entitles the sponsor to a contributions holiday or a return of the scheme’s surplus.

‘Stakeholder’ defined benefits grant members a share of surpluses without removing downside protection. Retirement benefits become call options on the sponsor that are ‘in the money’ whenever the surplus is positive. Plans modified in this way become more expensive to operate (see Figure 1).

In Figure 1 the horizontal axis measures the market value of the assets underlying the scheme. The vertical axis measures the present value L of retirement benefits owed to members of the scheme, also known as its projected benefit obligation. Retirement benefits are ordinarily unaffected by market fluctuations in asset values, hence the invariance (in principle) of the schedule DB with respect to assets in the DB fund. If the surplus is always maintained at zero, the call C and the put P will both have zero value.

Now consider ‘stakeholder’ defined benefits whereby members participate in surpluses. The sponsor is worse off. Members are better off, but without gaining one-for-one from rises in the prices of risky assets. The associated payoff profile is roughly analogous to that of a collar whereby investors go long in a risky underlying asset and a put, and short in an out-of-the-money call. Bateman (1997) investigates designs for accumulation funds with investment risk managed by collars. She found that such strategies are surprisingly conservative; expected lifetime returns are surprisingly low. That is, investors forego valuable upside if they pay for put protection partly by selling out-of-the-money calls.

Restoring a level playing field
Within the context of accumulations superannuation, we have previously argued for a new kind of superannuation account.¹⁰ It would co-exist with the familiar accounts paying lump sums to retirees. These new accounts would be reserved for the purchase of life annuities. Like existing accounts, they would be subject to contribution limits. But these limits would initially be low, to protect the budget in the short term. Unlike existing accounts, the new accounts would be tax free until retirement, at which point their annuity payments would be subject to the regular personal tax scale. Progressive back-end
which benefit from the current 15 per cent taxes on employer contributions and fund earnings.

The SIS Act could be amended so as to restore a limited measure of cross-subsidisation of defined benefit funds by short stayers. Specifically, employers could be granted the option of vesting employer contributions on behalf of new members who end up with less than 10 years' service — at the amount the departing member would have received had his employer benefit been limited to the amount mandated by the superannuation guarantee over the relevant period.

We could roll back the mid-1990s measures designed to encourage ‘stakeholder’ defined benefits and discourage fund surpluses. In particular, the SIS Act could be amended so as to grant full ownership of surpluses to shareholders. It could also be amended to ensure independent trustees with actuarial qualifications on the boards of trustees of defined benefit schemes. Finally, maximum deductible contributions could be increased.

In the push for universal coverage of accumulation superannuation plans, some valuable characteristics of defined benefits have been overlooked. These

FIGURE 1: Options analysis of ‘stakeholder’ defined benefits

![Diagram showing the options analysis of 'stakeholder' defined benefits]
advantages include scope for efficiency gains in bargains between employers and employees, certainty and simplicity of retirement benefits, and better management of investment and longevity risk. As mentioned at the outset, we are not advocating an across-the-board move back to defined benefits. Rather, we advocate the restoration of a level playing field, by reversing a number of policy measures that were introduced over the past quarter of a century. □

Notes
1. Bateman and Kingston would like to thank the Australian Research Council for research support under DPT120102239, and Kingston would like to thank the Centre for International Financial Regulation for research support under ED45. We would also like to thank Shauna Ferris for helpful discussions.

2. Australia has partly followed this trend. The Australian equivalent of the international accounting standard IAS19 is AASB119 which became mandatory for private sector company financial reporting periods commencing 1 January 2005 or later. Prior to AASB119 the cash contributions paid to a plan were reported as an expense but there was no need to recognise the funded status of the plan on the balance sheet. Effective 1 January 2013, there was a tightening up of the relevant accounting standard. Enterprises must immediately recognise all actuarial gains and losses as part of ‘other comprehensive income’ — i.e. outside the profit and loss’ (KPMG 2011).

3. This policy drew inspiration from New Zealand, where there has historically been strong support for the notion that lower taxes on income from capital represent unacceptable ‘tax concessions’, even in the case of households with modest lifetime resources. However, there are signs New Zealand is reconsidering this philosophy. Another distinctive factor in the case of Australia was large-scale closure of defined benefit plans to new members in the public sector, starting in the late 1980s, owing to concerns about levels of public sector debt.


5. Trahair (1994) details three major cases.

6. Minimum requisite benefits refer to minimum benefits arising from the superannuation guarantee (Ferris 2006).

7. See, for example, APRA (2013).

8. See, for example, Blake (2000).

9. The qualification ‘generally’ is necessary if only because remarkably, Unisuper is not legally obliged to make additional contributions in the event of a shortfall (Ferris 2006).


References


Broadbent, J, Palumbo, M and Woodman, E 2006, ‘The shift from defined benefit to defined contribution pension plans — implications for asset allocation and risk management’, manuscript.


THE PROBLEMS with investment advice

TOM VALENTINE, Director, UBSS Research Foundation

The Future of Financial Advice reforms were designed to improve the quality of financial and investment advice offered to the public. In particular, they sought to correct conflicted remuneration structures which led advisers to act in their own interests rather than those of their clients. However, the reforms did not confront some important problems in the industry — its fragmentation, horizontal integration and the need for improved education of advisers and investors.

Recently there has been considerable discussion about a package of reforms to investment advice Future of Financial Advice or (FoFA) which is being implemented following widespread dissatisfaction with the performance of the industry. This paper considers whether the reforms are adequate to deal with the causes of this dissatisfaction. First, the paper identifies the desirable characteristics of investment advising. It then outlines the FoFA reforms and it considers any further reforms that appear to be necessary.

This paper is limited to the financial advice given to individual clients and does not venture into the area of advice given to businesses. Of course, individuals vary in many respects, such as their income, wealth, age, marital status, number and age of children, and objectives.

While the paper may appear to reflect negatively on the investment advice industry, it is important to recognise that the industry provides a vital service to investors. This is particularly relevant in Australia where many investors run self-managed superannuation funds (SMSFs) as an important component of their retirement savings. Proprietors of such funds bear the investment risk they create. Also, defined benefit funds are becoming increasingly uncommon and contributors to industry or public superannuation funds also bear investment risk.

The problem with this situation is that many investors make poor decisions which reduce their retirement income. These poor decisions arise from:

> A lack of knowledge of investment vehicles and institutions, and a general lack of financial and investment literacy.

> Time constraints which prevent investors from devoting sufficient time to managing their investments.

> Considerable evidence that investors are irrational in making investment choices — they are ‘loss averse’, they resist realising losses and they are distracted by irrelevant characteristics of investment products.

Recognition of the third characteristic led to the emergence of behavioural finance theory (see Bloomfield 2008; Valentine et al. 2011, pp. 251–2).

A desirable approach to investment advice

The time horizon and investment objectives

Investment advice should be tailored to the client’s situation. This means that a ‘one-size-fits-all’ approach is unlikely to be the correct approach. It is unlikely that there are any two individuals who have exactly the same characteristics in the areas mentioned in the previous section of the paper. Also, people have different objectives and preferences with respect to their investment choices. For example, they have different target retirement dates, different expectations for the level of their retirement income and different levels of wealth that they wish to pass onto their families. Advice should take account of these differences; that is, it should be tailored to each individual.

In addition, people often have subsets of their investment portfolios that are intended to be held for different purposes. The major objective of saving is to provide for retirement, but people also save for shorter-term targets such as a holiday, a deposit for buying a house or a car. Investors will also want to hold funds to meet unexpected emergency needs. The funds held for each of these aims should be treated differently. For example, funds accumulated for short-term objectives should be invested in more liquid assets than funds intended for the provision of retirement income.
This discussion raises an important general point — the appropriate choice of assets for an investor depends on the time horizon of that investor. Consequently, an investment adviser should attempt to establish the appropriate time horizon for the separate elements of a client’s portfolio by an objective analysis of the appropriate strategy for the client in conjunction with discussion with the client. Bateman and Kingston (2012) quote results from a simulation done by Viceira (2001) which illustrates this point very clearly.

Risk profiling
It is often asserted that advisers should adjust their advice to fit their clients’ ‘risk profile’. That is, a client who is unable to bear risk should not be put into investments which yield a high average return, but highly variable short-term returns. An extreme case is where the client is ‘loss averse’. That is, they are uncomfortable with an investment which produces a negative return in any period. It appears that many investors do suffer from loss aversion (see Valentine 2012). The accepted industry tool for measuring risk attitudes is the risk-profiling questionnaire.

However, it appears that this approach adds very little value to the advisory approach. The arguments in support of this view are as follows:

> It is not clear that a ‘risk profile’ exists for most investors. For example, loss aversion is a singularity in any such profile. It implies that an investor will prefer an asset which has a low average return to any other asset with a much higher average return which produces an occasional negative return.

> It is not clear that investors understand their own attitudes to risk. All advisers have encountered situations where investors present themselves as willing to bear risk in order to obtain a higher return but who reveal themselves as loss averse in a falling market.

> Most risk questionnaires are short term (that is, they offer respondents choices for one year), whereas the most significant investment decisions cover many decades.

A desirable approach
In view of these problems, it would be desirable if the advisory process took the following form:

> Initially the adviser should establish the important characteristics of the client such as age, income, net worth and investment objectives, and important subsets of investments.

> The adviser should discuss investment alternatives with the client to obtain information on their basic attitudes to investment and borrowing.

> The adviser should then provide suggestions for each of the pockets of assets identified for the client. Each of these suggestions should be explained and information on the historical volatility of returns over the relevant time horizon provided. The client should be required to acknowledge that they have received this advice.

Education of investors
An important element of this process is to educate investors about what they should do in their long-term best interests. For example, a client who is not close to retirement or loss averse, but who is contributing to a self-managed superannuation fund should be advised to adopt a portfolio of assets which yields high average returns over long periods even though these assets suffer an occasional year of negative returns. Shares and property are the obvious candidates.

ASIC could improve the quality of investment advice by improving the informational content of Product Disclosure Statements (PDSs). Gallery et al. (2013) discuss some proposals in this regard. They also report the results of a survey which indicates that advisers do not have a high opinion of the usefulness of PDSs. They doubt that clients use them in making investment decisions and that advisers make extensive use of them. However, Gallery et al. (2013) doubt that shortened PDSs will reduce the problems. Also, the FoFA requirement that advisers justify their recommendations is subject to similar problems. Clients will often not understand or be able to evaluate these justifications.

It would also be desirable if Australian managed funds were required to report regularly on measures of the risk inherent in their portfolios. There appears to be a low level of interest in such measures in Australia as compared to, for example, the United States. Two risk-based measures that could be used are the Sharpe index and Jensen’s alpha (see Valentine and Scott 2012, pp. 166–9).

Investment advisers are often criticised for recommending tax-effective products. It is argued that in considering these products insufficient attention is given to their basic soundness. There are certainly examples that provide support for these views. A return to the artificial products of earlier times is certainly not recommended, although it may be desirable to consider special arrangements to encourage entrepreneurial projects. Nevertheless, as part of meeting a client’s needs, an adviser must ensure that he/she does not pay any more tax than necessary.

The FoFA reforms
Bateman and Kingston (2012) provide a comprehensive summary of the FoFA reforms. While most of the FoFA reforms were introduced on 1 July 2013, there are still some issues to be
resolved, for example, restricted licences, tax agents, grandfathering and vertical integration. A last-minute addition to the reforms was that the descriptions ‘financial planner’ or ‘financial adviser’ can only be used by those who are appropriately licensed.

A major component of the reforms is the introduction of a statutory fiduciary duty for advisers to act in the best interests of their clients rather than in their own interests. This makes formal a requirement that has been assumed to hold for many years but may have been unenforceable in the absence of this formal requirement. Advisers must make ‘reasonable inquiries’ of their clients to ensure that they understand their position within reasonable constraints.

A large part of this commitment is the banning of remuneration structures which create conflicts of interest, that is, incentives to ignore the client’s interests in making recommendations (see ASIC Regulatory Guide 246). FoFA prohibits:

- incentive payments from providers based on the volume of business written;
- ‘soft-dollar payments’ (for example, conference support over $300);
- asset fees on geared investments and trailing commissions.

However, trailing commissions and incentive payments for business written already in existence have been grandfathered, that is, they can continue into the future.

The way in which investment advisers have been remunerated has the possibility of creating conflicts of interest. Prior to the recent reforms, a system of commissions was in place and this had a number of counterproductive impacts. First, it encouraged advisers to recommend some very risky investments which paid a high commission simply because they were risky.

Second, the opportunity of increasing commissions (paid on funds under management or FUM) induced some advisers to over-gear their clients’ investments. This magnifies any losses incurred and increases the probability that investors will be forced to liquidate their positions at a time when a large loss has been recorded. That is, they do not have the alternative of trading out of their difficulties. The move to higher leverage became more pronounced in the run-up to the global financial crisis.

Third, advisers did not direct clients’ attention to attractive alternatives because this did not generate commissions for the advisers. For example, given the tax advantages provided to home ownership in Australia, the purchase of a home is a good way to provide for retirement. Also, paying off mortgages as rapidly as possible is a good way of using any free funds that become available because the return earned (the interest saved) is tax free.

Retail clients must be given an annual disclosure of fees paid and receive an opt-in (renewal) opportunity every two years (see ASIC Regulatory Guide 245). Such clients must receive, every year, a fee disclosure statement (FDS) which provides a summary of the fees to be paid by the client and the services that the client will receive. Fines can be assessed against individuals or firms not satisfying this requirement.

A ‘retail client’ is most simply defined as one who is not a wholesale client. The latter category includes business owners, professional investors etc., but also includes an individual who has earned $250,000 p.a. (gross) in the past two years or has net assets larger than $2.5m. This requires a certificate from an accountant. The rationale for this exemption is unclear. A person can hold a responsible and well-paid position without possessing any financial sophistication. Many of them are excessively focused on tax minimisation.

Advisers must also justify their recommendations, demonstrating that these are in the interests of the client. Advisers are still required to provide a Financial Services Guide (FSG) when personal advice is offered. Personal advice is given when the adviser has considered at least one of the objectives, financial position or needs of the client, or might reasonably have been expected to do so. Also, a Statement of Advice (SOA) must be provided when recommendations are made. As a result, it appears that the FoFA reforms have added to the complexity and volume of paperwork surrounding the provision of investment advice. This could act as an incentive for clients not to access the available information and it imposes higher compliance costs on the adviser.

The FoFA model will cause a shift towards upfront fees, although asset fees can still be charged so long as the assets do not result from gearing. Also, it appears that ‘success fees’ can still be charged, that is, fees based on the return earned on the recommended portfolio. If so, this could create an incentive to recommend over-gear or otherwise risky portfolios which could yield very high returns. An upfront fee could have the unintended consequence of deterring many investors from seeking professional advice although they are seriously in need of it.

Insurance will continue to be sold on a commission basis (including trailing commissions) although disclosure must be made of these commissions. This could be a problem — Valentine and Scott (2012, pp. 17-19) argue that the generous commissions available on insurance may induce advisers to recommend that clients over-insure themselves.
Buying a house is the most important investment that most households make. However, advice on choosing real estate (from a real estate agent) or financing it (from a mortgage broker) is not included in financial advice. It would be desirable for these activities to be integrated with other forms of investment advice. For example, it is unlikely that real estate agents mention the role of diversification to investors. The relatively new ability of SMSFs to purchase property (doing so through a bare trust owned by the fund) has created some pressures for mortgage brokers to learn something about these funds. Recently, ASIC expressed some concern about real estate agents giving advice on the purchase of properties by SMSFs.

Educational requirements

There is also the question of advisers’ required level of educational qualifications. This matter is currently under discussion. There was a proposal for advisers to undergo an annual exam, but this idea has been put on hold by ASIC until the regime change occurred. Such a test is likely to be based on the details of financial advice. However, there seems little reason why less should be required of investment advisers than, say, accountants. Advisers’ education should include a solid academic grounding in the theory of investment and asset markets.

A framework for advice was discussed earlier. It was based on the premise that advice should be tailored to the individual needs of each client. In addition, it should be supplemented by:


Leverage (at a moderate level) is likely to be appropriate for investors with a long time horizon. Therefore, the FoFA control which forbids the payment of commissions on leveraged assets creates some difficulty in this area. It may be better to consider subjecting lending to a maximum leverage ratio as a way of controlling excessive gearing. However, advisers should ensure that the portfolio is diversified and it should not involve a very high degree of leverage. If these conditions are not met, there is always a non-zero probability of a catastrophic loss occurring at some point over the life of the portfolio.

Remaining problems

Horizontal integration

A major conflict of interest in the industry is the fact that product providers (for example, banks and insurance companies) own investment advisory services. This means that the organisation can receive both a margin on the product and a commission from individual clients. It is likely that such services will recommend the products of their parents. That is, they are actually distribution networks rather than advisory companies. The advisers are largely marketers, but this allows their parents to adopt a form of remuneration that avoids significant reliance on commissions, which gives them a competitive advantage over independent and independently owned firms. It appears that opportunities for obtaining truly independent advice are diminishing. Many larger advisory firms are considering the adoption of the vertically integrated model, that is, creating platforms. The competitive advantage is enhanced by the decision to allow platform holders to pay an extra 0.2 per cent of assets on the platform to licensees.

Fragmentation of the industry

Another problem is that organisations that provide what is essentially investment advice are not part of the same regulatory regime as investment advisers. Such organisations include real estate agents, insurance brokers, mortgage brokers and dealers in such assets as art, antiques, coins and stamps. It is generally believed that investment advice should be based on an overall view of the client’s portfolio rather than be directed towards individual assets. Also, if some parts of the investment advice industry are heavily regulated and other parts are lightly regulated, business is likely to shift into the lightly regulated area.

However, the new rules require advisers to justify their recommendations.
Conclusion
The FoFA reforms are a step in the right direction. However, they have not addressed some important fundamental problems — the fragmentation of investment advice, horizontal integration (that is, links between product providers and the advisory function), the educational requirements for advisers and attempts to educate the public on investment. And, in the short term, FoFA should be adjusted to limit (rather than discourage) leverage, and the distinction between retail and wholesale clients should be eliminated.

References
Risk-on risk-off (RORO) effects were present in Australian and international financial markets from July 2007 to December 2012. This study shows that a risk-parity portfolio which combines both equities and bonds generates a higher Sharpe ratio than investing in either equities or bonds alone over a sample period incorporating both RORO and non-RORO periods. An earlier version of the paper was presented to the 2013 Australian Centre for Financial Studies’ Melbourne Money and Finance Conference.

Risk-on risk-off is a state of financial markets in which many market participants are either risk averse and sell off risky assets such as equities to buy safe assets such as bonds (‘risk-off’), or less risk-averse and willing to invest in risky assets such as equities by selling off safe assets such as bonds. The RORO paradigm is a relatively new interpretation of financial market behaviour. It assumes that, as well as normal times, there are periods in which investors are either very risk averse and buy safe assets such as bonds funded by the sale of risky assets such as shares, or less risk averse and buy riskier assets such as shares funded by the sale of bonds. The RORO phenomenon occurs when investors are uncertain about economic recovery and hence oscillate easily between risk-on and risk-off if good or bad news is received about a future recovery (Oliver 2013). Such economic conditions appear to have been present in the world economy from July 2007 onwards, covering the period of the global financial crisis and then the eurozone crisis (HSBC Global Research 2010 and 2012; Oliver 2013).

Risk-on risk-off is a state of financial markets in which many market participants are either risk averse and sell off risky assets such as equities to buy safe assets such as bonds (‘risk-off’), or less risk-averse and willing to invest in risky assets such as equities by selling off safe assets such as bonds. The RORO paradigm is a relatively new interpretation of financial market behaviour. It assumes that, as well as normal times, there are periods in which investors are either very risk averse and buy safe assets such as bonds funded by the sale of risky assets such as shares, or less risk averse and buy riskier assets such as shares funded by the sale of bonds. The RORO phenomenon occurs when investors are uncertain about economic recovery and hence oscillate easily between risk-on and risk-off if good or bad news is received about a future recovery (Oliver 2013). Such economic conditions appear to have been present in the world economy from July 2007 onwards, covering the period of the global financial crisis and then the eurozone crisis (HSBC Global Research 2010 and 2012; Oliver 2013).

The implications of RORO for investors
Returns to risky or risk-on assets become strongly positively correlated during risk-off and risk-on states as investors switch between safe and risky assets. Returns to safe or ‘risk-off’ assets also become strongly positively correlated during ‘risk-off’ and ‘risk-on’ states. The correlation between risky asset returns and safe asset returns, however, becomes more negative in ‘risk-on’ or ‘risk-off’ states as portfolio shifts cause equity and bond prices to move inversely.

An important implication of the RORO paradigm is the lack of diversification options within an asset class in such a period, which makes returns within an asset class more volatile. One way to alleviate this problem is to have exposure to both bonds and equities, which is illustrated later in this paper via the risk-parity portfolio. From an equity-only manager’s point of view, a key consideration then involves forecasting when risk-on or risk-off phases might occur and altering stock market exposure accordingly.

Risk-on risk-off also affects active managers because stock returns in such periods are dominated by macroeconomic and not firm-specific factors. Picking undervalued or overvalued stocks then becomes more difficult. Finally, strategies such as the carry trade and long/short strategies also have exposure to the RORO factor as there are risk-on and risk-off currencies and risk-on and risk-off sectors (HSBC 2012).
Determining RORO and non-RORO periods

Figure 1 shows the average correlations for weekly local currency returns for a set of government bonds (US, UK, Japanese, Australian and European Monetary Union 10-year government bonds) and for a set of equity market indices (ASX 500, Russell 2000, Nikkei 225, Eurostoxx 50, Dax 30 and the S&P/ASX 200). The sample period is from April 2002 to April 2013 and the correlations are calculated using a rolling 52-week window. Using local currency returns (rather than conversion back into Australian dollar returns) implicitly assumes that risk-on risk-off is a global phenomenon that affects all developed markets simultaneously.

Intra-stock correlations rose significantly around October 2008 when the global financial crisis hit and have only recently returned to pre-crisis levels. Intra-bond correlations have risen over time and stayed at very high levels since the global financial crisis. This is because the central banks of the United States, the United Kingdom and the European Central Bank have all pursued similar interest rate policies during this time, in order to stimulate economic growth.

Figure 2 below shows the risk-on, risk-off and non-RORO periods in our sample, based on a cumulative summation technique (described below) starting at zero. If a risk-off period is identified, the cumulative sum is reduced by one and if a risk-on period is identified, the cumulative sum is increased by one. If a non-RORO period is observed, the cumulative sum remains unchanged.

We define a ‘normal’ or ‘non-RORO’ week to occur when either or both the average intra-bond correlation and the average intra-equity correlation falls below their respective long-term averages. A ‘risk-on risk-off’ or ‘RORO’ week occurs when both intra-equity and intra-bond correlations exceed their long-term average over the full sample period. A ‘RORO’ week is then classified as either ‘risk-on’, when the average return to our equity indices exceeds the average return to our bond indices, or ‘risk-off (where the average return to bonds exceeds the average return to equities). Out of a total of 578 weeks from April 2002 to April 2013, 225 are RORO and 353 are non-RORO. Within the RORO weeks, there are 115 risk-on and 110 risk-off.

In our sample period, normal or non-RORO conditions apply from April 2002 to February 2007. From February 2007 to June 2009, the market is essentially risk-off as investors try to interpret the early information on the sub-prime crisis (February 2007 to January 2008 and then react to the Lehman Brothers collapse on 15 September 2008) and the implications of this for financial markets.

**Figure 1:** Rolling correlations within bonds and stocks. The figure shows the average correlation between the bonds in our sample (Ave_Correl_Weekly_Bonds) and the average correlation between the equity indices (Ave_Correl_Weekly_Stocks) in our sample where the correlations are calculated on a rolling window of 52 weeks.
Returns to risky or risk-on assets become strongly positively correlated during risk-off and risk-on states as investors switch between safe and risky assets. Returns to safe or ‘risk-off’ assets also become strongly positively correlated during ‘risk-off’ and ‘risk-on’ states. The correlation between risky asset returns and safe asset returns, however, becomes more negative in ‘risk-on’ or ‘risk-off’ states as portfolio shifts cause equity and bond prices to move inversely.

From that point markets switch into a ‘risk-on’ phase that lasts until the end of April 2011. This period coincides with a series of interest rate cuts around the world to stimulate economic growth as well as various quantitative easing strategies being implemented in the United States and the United Kingdom. Thereafter, a series of risk-off weeks begins, culminating in a low for cumulative risk in mid-August 2011. This period pertains to worries about the extent of the eurozone crisis and worries about the US defaulting on its debt due to protracted debt ceiling negotiations (Lee 2012). From that point, there is some volatility in ‘risk-on’ and ‘risk-off’ in response to ongoing uncertainty associated with the eurozone crisis. Finally, from December 2012 onwards, the markets seem to have stabilised and we appear to have entered more normal market conditions.

The performance of the Australian equity and bond markets during RORO vs non-RORO periods

Table 1 shows the average returns and standard deviation of returns for the S&P/ASX 200 and an Australian Government Bond Index in non-RORO, risk-on and risk-off periods. Also shown are corresponding statistics for a portfolio with equal weights in bonds and equities, a levered and unlevered risk-parity portfolio, and the Sharpe ratio. The risk-parity portfolio is constructed as follows. At the end of each year from 2001 to 2012, the variance-covariance matrix is constructed based on weekly returns to equities and bonds in the preceding 12 months. From this matrix the contribution of bonds and equities to the standard deviation of the portfolio can be determined, assuming a weight \( W_1 \) for bonds and a weight of \( W_2 = 1 - W_1 \), for equities. An optimiser is then used to calculate the weights for bonds and equities such that they contribute equally to the riskiness of the portfolio. This optimisation determines the weights of bonds and equities in the risk-parity portfolio for the upcoming year.

The risk-parity portfolio tends to be significantly overweight in bonds relative to equities and has an average allocation to bonds of 81 per cent in our sample and a relatively low expected return. The use of leverage (often via derivatives contracts) can boost the expected return to this portfolio and we illustrate this using a mild leverage ratio of 20 per cent.

FIGURE 2: Cumulative risk-off risk-on indicator. The series below (‘Cumulative_Risk_On’) is calculated as follows: the series starts at zero and is either increased by one if a ‘risk-on’ period has been identified for the next period, or decreased by one if a ‘risk-off’ period has been identified for the next period, or remains unchanged if the next period is a non-RORO period.
The effect of the RORO paradigm is that diversification benefits are significantly diluted and equity-only or bond-only portfolios have significantly higher volatility.

Table 1 shows that over the full sample, the unlevered risk-parity and levered risk-parity portfolio have the highest Sharpe ratio. While the S&P/ASX 200 generates the highest excess return (excluding the levered risk-parity portfolio) it also has the lowest Sharpe ratio. The portfolio of Australian government bonds has a much higher Sharpe ratio compared to equities although still lower than that of the risk-parity portfolio. In non-RORO periods, these results continue to hold.

The table shows the annualised returns to various series, in percentages and annualised standard deviations. All series are downloaded from the Morningstar Database. S&P/ASX200 is the ASX200 Accumulation Index. ASX_GOV_BOND is the Morningstar Australian Government Bond Index. EQUAL WEIGHTED is a portfolio that is an equally weighted combination of ASX200 and ASX_GOV_BOND. UNLEVERED RISK-PARITY is an unlevered risk-parity portfolio such that bonds and equities contribute equally to the riskiness of the portfolio. LEVERED RISK-PARITY is the same as the unlevered risk-parity portfolio but uses 20 per cent leverage to boost the expected returns to the portfolio. The risk-free rate used to compute the Sharpe ratio is the annualised yield on 90-day bank accepted bills.

Table 1 suggests that the risk-parity portfolio generates a respectable Sharpe ratio in all of the risk-on, risk-off and non-RORO periods. As one would expect, equities perform very well in risk-on periods (generating 84.7 per cent p.a.) but also very poorly in risk-off periods (losing 92.7 per cent p.a.). Bonds perform very well in risk-off periods (generating 19.65 per cent p.a.) and poorly in risk-on periods, but not too badly compared with the performance of equities in risk-off periods. Based on the sample period used, the results suggest that a risk-averse Australian investor should overweight their portfolio to bonds relative to equities in both RORO and non-RORO periods. This makes intuitive sense given the uncertain economic conditions around the world in the recent times that have coincided with RORO.

### TABLE 1: Descriptive statistics for equity and bond indices, an equally weighted portfolio of equities and bonds, an unlevered and levered risk-parity portfolio for non-RORO and RORO periods

<table>
<thead>
<tr>
<th></th>
<th>ASX200</th>
<th>ASX_GOV_BOND</th>
<th>EQUAL WEIGHTED</th>
<th>UNLEVERED RISK-PARITY</th>
<th>LEVERED RISK-PARITY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FULL SAMPLE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>7.91</td>
<td>6.41</td>
<td>7.16</td>
<td>7.21</td>
<td>8.63</td>
</tr>
<tr>
<td>Std dev</td>
<td>16.30</td>
<td>2.94</td>
<td>7.75</td>
<td>2.82</td>
<td>3.38</td>
</tr>
<tr>
<td>Sharpe ratio</td>
<td>0.48</td>
<td>2.16</td>
<td>0.92</td>
<td>2.54</td>
<td>2.54</td>
</tr>
<tr>
<td><strong>Non-RORO</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>14.24</td>
<td>5.94</td>
<td>10.09</td>
<td>7.98</td>
<td>9.54</td>
</tr>
<tr>
<td>Std dev</td>
<td>11.74</td>
<td>2.70</td>
<td>5.78</td>
<td>2.84</td>
<td>3.40</td>
</tr>
<tr>
<td>Sharpe ratio</td>
<td>1.21</td>
<td>2.18</td>
<td>1.74</td>
<td>2.79</td>
<td>2.79</td>
</tr>
<tr>
<td><strong>RORO</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>-2.03</td>
<td>7.15</td>
<td>2.56</td>
<td>6.01</td>
<td>7.21</td>
</tr>
<tr>
<td>Std dev</td>
<td>21.56</td>
<td>3.29</td>
<td>10.08</td>
<td>2.79</td>
<td>3.35</td>
</tr>
<tr>
<td>Sharpe ratio</td>
<td>-0.10</td>
<td>2.16</td>
<td>0.25</td>
<td>2.14</td>
<td>2.14</td>
</tr>
<tr>
<td><strong>Risk-on</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>84.72</td>
<td>-4.81</td>
<td>39.95</td>
<td>6.44</td>
<td>7.76</td>
</tr>
<tr>
<td>Std dev</td>
<td>14.27</td>
<td>2.60</td>
<td>7.08</td>
<td>2.66</td>
<td>3.19</td>
</tr>
<tr>
<td>Sharpe ratio</td>
<td>5.93</td>
<td>-1.87</td>
<td>5.63</td>
<td>2.41</td>
<td>2.42</td>
</tr>
<tr>
<td><strong>Risk-off</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>-92.71</td>
<td>19.65</td>
<td>-36.53</td>
<td>5.55</td>
<td>6.63</td>
</tr>
<tr>
<td>Std dev</td>
<td>20.73</td>
<td>3.05</td>
<td>9.90</td>
<td>2.92</td>
<td>3.52</td>
</tr>
<tr>
<td>Sharpe ratio</td>
<td>-4.47</td>
<td>6.44</td>
<td>-3.69</td>
<td>1.88</td>
<td>1.87</td>
</tr>
</tbody>
</table>
These facts are reflected in Figure 3, which shows the value of $1 invested in each of the five portfolios analysed here over the full sample period. The levered and unlevered risk-parity portfolios perform most strongly over this period.

The figure also shows the major risk-off and risk-on periods identified in Figure 2, that is, risk-off from February 2007 to June 2009, risk-on from June 2009 to April 2011 and risk-off from April 2011 to August 2011.

**Conclusion**

This study has highlighted the significance of the RORO paradigm in Australia. The effect of the RORO paradigm is that diversification benefits are significantly diluted and equity-only or bond-only portfolios have significantly higher volatility.

In a RORO world one technique that may help investors is to use a risk-parity approach which combines both bonds and equities so that both equities and bonds contribute equally to the riskiness of the portfolio. This approach almost invariably overweights bonds due to their lower volatility. Leverage may be used to boost returns if desired but this leads to other risk factors associated with taking on leverage. Another strategy could involve forecasting of risk-off and risk-on periods through analysis of macroeconomic variables such as the term structure of interest rates and the PE ratio of the stock market as a whole.
Notes

1. I would like to thank Kevin Davis and David Robinson for providing valuable comments on an earlier draft of this paper. Of course any errors in this manuscript are my own responsibility.

2. In this context, risky assets are such things as equities, commodities or speculative currencies and safe assets are bonds or safe-haven currencies such as the US dollar or Japanese yen.

3. As we have five bond indices, this means calculating a 5x5 correlation matrix based on the 52 weeks of data in our window and then averaging the 10 entries in the lower triangle of that matrix.

4. HSBC Global Research (2010, 2012) presents an augmented version of this methodology to determine risk-on and risk-off periods using data on exchange rates and commodities in addition to bonds and equities. In this study, all data is from Datastream and uses the weekly Total Return series for each equity or bond index. Data on the AFMA Australian Fixed Interest Index is used as a Total Return Index for 10-year Australian Government bonds was unavailable.

5. This methodology implies that for any point in our sample the determination of whether it is RORO or non-RORO is based on past, current and future data. This weakness can be overcome by comparing current intra-bond and intra-stock correlations with their average values based on past observations only.

6. This depiction of risk-off and risk-on matches fairly closely with the timelines presented in HSBC (2010).


9. See for example Saft (2013) and Lefeuvre and Oberg (2013).

10. These annualised figures are obtained by multiplying the weekly average return and weekly standard deviation (both in per cent) by 52 and $\sqrt{52}$ respectively. The annualised Sharpe ratio is the weekly Sharpe ratio multiplied by $\sqrt{52}$.


12. Assuming bonds have weight $w_b$ and variance $\sigma_b^2$ and equities have weight $w_e$ and variance $\sigma_e^2$ and the covariance between bonds and equities is $\gamma_{be}$, the contribution of bonds to portfolio volatility is $\sigma_p w_b^2 + \gamma_{be} w_b w_e$ and the contribution of equities to portfolio volatility is $\sigma_p w_e^2 + \gamma_{be} w_b w_e$, where $\sigma_p = \sqrt{\sum w_i^2 \sigma_i^2 + \sum_2 w_i \gamma_{ij} w_j}$ is portfolio volatility.

References


HSBC Global Research, 2010, Risk on — risk off: the full story. This is available from HSBC on request.

HSBC Global Research, 2012, Risk on — risk off: Fixing a broken investment process. This is available from HSBC on request.


