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THE VALUE OF MOMENTUM TO ACTIVE MANAGERS AND PLANNED SPONSORS IN AUSTRALIA

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We would like to thank Dr Katharina Schwaiger for useful advice on the Australian market, an anonymous referee for many helpful comments, and Maurice Peat (the editor) for encouraging us to research in this area.

In this paper we present some details of momentum investment hopefully of interest to fund managers and planned sponsors. The focus will be on momentum investment in Australia, but much of the discussion, and results, are applicable virtually everywhere. The academic literature considers many different types of momentum strategies, and we distinguish between academic and institutional momentum investment in section 2. In section 3, we discuss linkages between investor behaviour and momentum. We present information about the pattern of returns one might expect and market conditions that might help or hinder performance in section 4. Apart from being a style of investment, quantitative financial analysts (quants) also think of momentum as a factor; we shall discuss this briefly in section 5. We present some results in section 6 together with conclusions.

Momentum in Australian equities has been studied by several authors; good reviews of the literature can be found in Vanstone et al. (2012), Zhong et al. (2014), and Gaunt (2016), while a recent examination of the broad literature can be found in Subrahmanyam (2018). There is disagreement among authors as to whether momentum is a factor driving Australian stock returns; results appear to be sensitive to the samples of stocks used and time periods involved. A broad conclusion is that value-weighted portfolios, or a universe consisting of large stocks lead to the existence of momentum profits, but equally weighted portfolios, or a universe consisting of both small (outside the top 500) and large stocks does not yield momentum profits. This is likely due to the size premium dominating the momentum effect for small stocks in Australia.

Bird et al. (2017) explore both cross-sectional and time-series momentum in a multiple-country setting. They note the existence of a ‘July effect’, where a momentum strategy performs particularly poorly around the turn of the financial year (see also Zhong et al. 20 14, 2016). In particular, loser stocks tend to perform poorly in June and rebound in July, consistent with a tax-loss selling explanation (e.g. Ritter, 1988).

2 Definitions

We put forward several standard versions of momentum strategies, noting in passing that these can be elaborated in myriad different ways.

2.1 Cross-sectional momentum

Jegadeesh and Titman’s (1993) J x K trading model is the widely-used model to construct cross-sectional momentum (CSM) portfolios. Assuming a CSM strategy based on monthly returns is to be constructed, then the construction process is as follows.

- Sorting/formation period: First, at construction time t, all valid stock samples are ranked in a descending order based on their past J-month formation period cumulative returns (CR) and then sorted into one of the groups typically with an equal number of stocks.

- Holding period: In the next period of length K, (usually one period is omitted to avoid short-term reversal), the position is held, and returns are accumulated. Then one can take long-only, or long-short positions based on the investment context.

2.2 Time-series momentum

Moskowitz et al. (2002) propose the time-series momentum trading strategy (TSM) which varies from the CSM in the stock selection process. They argue that ‘rather than focus on the relative returns of securities in the cross-sectional framework, time-series momentum focuses purely on a security’s own past return’. Thus, whether an asset is classified as a ‘winner’ or ‘loser’ in the TSM portfolio construction methodology depends on its own past performance, rather than the CSM procedure which compares an asset’s performance with other assets. This is clearly explained by Bird et al. (2017) who suggest thresholds of plus or minus 5 per cent when constructing portfolios, although ‘winners’ are defined as stocks that have exhibited past returns above 0 per cent, and ‘losers’ are defined as stocks with negative past performance.

2.3 Relative strength portfolios

From a practical perspective, ‘relative strength’ portfolios, which typically rank stocks on the difference between the last recorded price and the average of the preceding k prices, are indistinguishable from CSM strategies. For instance, taking k = 2, it is straightforward to see that this becomes a momentum rule, albeit with a quadratic term in past returns.

Since we believe there is an important difference in portfolio construction involved, we reserve relative strength to mean portfolio construction techniques where the quantity invested is proportional to past absolute or benchmark relative returns. Readers will excuse a certain amount of algebra in clarifying what we mean by the above definition. Our version of relative strength follows the analysis of Lo and MacInlay (1990), Jegadeesh and Titman (1993), and Lewellen (2002).

Let \( r_t \) be the return to some long-only benchmark portfolio at time t with weight \( w_{t-1} \) being the weight to asset \( i \) in this portfolio. A relative strength weight \( w_{t, r} \) for portfolio \( r \) with vector of weights \( w_t \) at time \( t-1 \) can be defined for asset \( i \) as:

\[
\omega_{t, r, i} = \omega_{t-1, i} \left( \frac{r_{t-1} - r_{t-2}}{N} \right)
\]

In particular, if we set \( \omega_{t, r, i} = r_{t-1} \), \( \omega_{t, r, i} = E \left( \omega_{t, r, i} \right) \) can be shown to depend upon trend and positive autocorrelation.

It is interesting that versions of relative strength portfolios have been so popular with fund managers; cynically, one might say that one can charge active fees with relatively low research costs. The fact is that their success is determined by the size premium upon trend and autocorrelation as the above structures indicate.

2.4 Institutional momentum investment

While the strategies discussed above are those debated in the academic literature, they do not reflect a momentum portfolio as held by institutional investors. First, very few pension funds or insurance companies would invest assets in a 100 per cent long 100 per cent short portfolio although it is the case that some hedge funds and high net worth investors might. Without presenting data on this point, we expect the vast majority of money invested in momentum to be long only. Furthermore, the first stage ranking would not then lead to a value- or equally-weighted portfolio, but be subject to industry and stock constraints. It may possibly even be fed through an

\[
\omega_{t, r, i} = \omega_{t-1, i} \left( \frac{r_{t-1} - r_{t-2}}{N} \right)
\]
optimiser — on its own or as a sub-component in a portfolio construction — we call such portfolios institutional momentum portfolios. As such we can think of them as long-only portfolios, based on past ranking of returns, which could be overweighted or underweighted relative to appropriate benchmarks, in referring to ‘momentum’ without qualification or with the adjective academic, we mean the long-only definition and if we refer to ‘institutional momentum’ portfolios, we shall say so explicitly. Other reasons why there are few long-short momentum products invested in by institutional investors are: unbounded losses, limits to short-selling (e.g. Ali and Trombly, 2006; Gao and Leung, 2017) and lack of liquidity (e.g. see Sadka, 2006; Avramov et al., 2016; Garcia-Feijoó et al., 2018). The ‘paper profits’ espoused in prior academic research likely overstate the profitability of momentum strategies for institutional investors as the economic costs of short selling, and restricted investable universes due to benchmark and liquidity considerations present limitations to the textbook implementation of the strategy.

3. Behavioural issues and momentum

Momentum has also been considered as a behavioural phenomenon. For instance, Grinblatt and Han (2005) build a model in which investors are prone to mental accounting and treat the purchase price of stocks as their reference price in a present theory framework. As they are reluctant to sell losing stocks, there is a delayed reaction to negative news and continuation in the performance of losing stocks. In contrast, stocks that have risen in value from a purchase price are sold too quickly, underinvestment effect style behaviour, and prices are slow to reflect their fundamental upside value. Using past price and turnover rates, they construct ‘average reference prices’ for stocks, and find that stocks that exhibit extreme capital gains (overhang) — those for which the average investor is in the domain of gains (losses) — exhibit subsequent drift upwards (downward), which explains a large component of momentum trading profits. This effect is strongly related to the 52-week high effect (George and Hwang, 2004) in which, due to anchoring, investors sell stocks close to the 52-week high price. As this price does not reflect fundamental information about the value of the firm, this selling slows price drift towards fundamental value. Thus, stocks near the 52-week high generate positive returns on average, consistent with momentum trading. Battman et al. (2010) note that this trading strategy does not appear to generate economically significant returns in Australia.

Market-wide sentiment, or market states generally (Cooper et al., 2004; Asem and Tian, 2010; Garcia-Feijoó et al., 2018) also appears to be strongly related to momentum profitability. Antoniou et al. (2013) shows that the short-term momentum strategies, and the strategy, only generates reliably positive returns in periods of high-sentiment (similarly to other anomalies; Stambaugh et al., 2012). They attribute this effect to a cognitive dissonance among investors; poorly performing stocks tend to be overlooked when market participants are on average optimistic. This effect is particularly pronounced among small investors. Investor overconfidence provides another possible behavioural explanation for momentum profits. Daniel et al. (1998) present a model in which investors receive a private signal regarding the uncertain value of an asset (for example, because of its own peculiar (market) uncertainty analysis). If their private security analysis is later confirmed by the market reaction, they subsequently trade even more of the stock (e.g. in the case of a public signal that confirms their initial optimism, purchasing more of the stock when the price is outperforming because their overconfidence (or self- attribution bias) implies that they received a good private signal. This type of behaviour pushes upward moving stocks further up, and downward moving stocks further down, and is only subsequently reversed as people are slow to realise their initial optimism was ill-founded. Adedotun and Yan (2016) present empirical evidence that stocks traded by overconfident fund managers exhibit a greater level of momentum than those traded by less overconfident fund managers, and these trading profits subsequently reverse. Managers who describe themselves as behavioural typically justify this by being active momentum investors, although value strategies are sometimes included as well (following similar logic).

4. Reasons for apparent high returns and circumstances when momentum does well/badly

Here we discuss factors that might enhance or degrade momentum returns. As discussed earlier the outperformance of these portfolios depends upon trend and positive auto-correlation. High risk portfolios also depend upon cross-sectional volatility (CSV) which we define as:

\[
CSV_t = \sqrt{\frac{\sum \left( r_{it} - r \right)^2}{N_t - 1}}
\]

is the number of stocks available to invest at time \( t \).

When CSV is low the active return will not look much different from the benchmark, and long-short investing will return something close to zero. One attractive feature of CSV is that it can be forecasted so as to anticipate, to some extent, momentum performance. In ex-ante terms, poor momentum returns will occur when the true distribution for asset returns have virtually the same means and variances and common covariances and are stationary (e.g. Grant and Saltchul, 2016). Both CSV and TSP returns are strongly influenced by volatility. Intuitively, one can see that if the volatility of returns disrupts the overall trends in individual stocks, then one can lose money, either long or short. This has led to a whole series of volatility-adjusted momentum strategies in the academic literature, but some form of volatility adjustment is frequently used by practitioners as well.

Here we discuss the properties of CSV returns. Once the formation period returns are ranked we can create n quintiles, which are typically quintiles or deciles. What we hope to see ex-post is that quintile 1 will have the highest returns while quintile 5 (or 10 in the decile case) will have the lowest returns. An even more encouraging sign will be that the holding returns fall monotonicity. What one frequently sees in practice is that holding returns do fall on average while the skewness of the returns rises. This means that short-long momentum returns often are often positive but exhibit negative skewness; intuitively if you short something that is positively skewed the result is a negatively skewed return. The pattern we might expect to see with such a strategy is many months of small positive returns, with the occasional month of large negative returns. Such a strategy is not for the risk-averse. This connection with negative skewness leads to what is termed ‘momentum crashes’; there is a lucid discussion of this phenomenon in Australia by Gaunt (2016) and he lists in Table 2 the worst 15 months for a long-short Australian momentum portfolio taken over the last 40 years of monthly data. In 15 of the 18 cases, it is the losers doing well rather than the winners doing badly. The potential unlimited liability of the loser portfolios evidenced here is a further reminder of the unsuitability of academic momentum for institutional investment. We shall return to this point when we look at some data.

5. Momentum as a factor

Momentum is widely used as a factor in the construction of portfolios and assessment of risk. A long-short CSV momentum portfolio based on a wide universe is constructed following the methodology described in section 2.1, above. This becomes a factor in a linear factor model and a tilt towards momentum can be carried out by selecting or overweighting those stocks with a high exposure to the factor. The stocks considered for selection in the investment portfolio usually make up a subset of the universe used to build the factor.

Turning to such well-known models as the Fama-French model or the Carhart model, momentum is a key risk factor. These models are time-series based models and are typically used to compute exposure to momentum and other factors for portfolios of assets in the academic sphere. In commercial risk models, which are often cross-sectional in nature a firm-characteristic which proxies exposure to momentum is incorporated prior to the cross-sectional estimation of momentum returns. An obvious drawback at time \( t \) might be the ranking across the group of the formation return.

In certain situations, a universe of stock returns can be well-explained by a small number of factors in the sense that the total volatility of portfolio returns can be attributed to a small number of factors and idiosyncratic risk should be small. In these circumstances, investors can eliminate these factor risks if they wish to, by offsetting the risks by taking positions in specially-constructed factor portfolios. However, it is not generally true that this can be achieved in every market in every circumstance; we shall return to this point in the conclusion.

It should also be noted that institutional investors who use standard factor mimicking portfolios in their risk models will use ‘academic’ long-short portfolios to mimic the momentum factor; however, this is not to be confused with an institutional investment long-only portfolio.

6. Some results with Australian and US data

We now present some results. Table 1 shows monthly momentum quintile returns for a broad US market universe over the period from May 1995 to March 2018. Data are obtained from Ken French’s website using data on stocks sorted on past returns (12 months to two months prior) and size and held for one month. This is an example of a (\( 12 \times 1 \) ) CSV trading model, see section 2.1.

The return moments exhibit characteristics seen in many other studies; average returns are monotonic in size and skewness is generally decreasing in past returns, and kurtosis is monotonically decreasing. Thus, a long-only US momentum portfolio (i.e. holding stocks in the top quintile of past returns) would have averaged about 5.3 per cent per month, or 13.5 per cent annually. It has an approximate annualised Sharpe ratio slightly under 0.50 but is negatively skewed, and that tails relative to a normal distribution (although not excessively so).
6.2 Momentum investment opportunities in Australia

The one reliable source on investment returns to momentum is the MSCI Momentum Australia Index, which extends from May 1995 to the present. As always with such exercises, care should be taken in examining the index construction method. This is carefully described in the momentum index methodology document (MSCI, 2014). Essentially, it is a weighted combination of two relative strength strategies which are then transformed into a long-only portfolio. In comparison with Table 1, for example, it should be borne in mind that the portfolio construction is quite different.

We report its moments in Table 1 as well as for four other countries (Canada, Japan, the US and UK) constructed by an identical methodology. For the Australian momentum index, average returns rank third, while volatility is relatively low. Negative skewness is highest among Australian index returns. The broad conclusion of this is that momentum in Australia offers slightly above-average returns (within the group of countries considered), with occasional large losses.

Overall, there is nothing in these numbers to suggest that momentum investing in Australia is outstanding relative to other international momentum opportunities.

We now turn to Table 3, which lists the MSCI Australian Momentum, MSCI Australia, and ASX 200 Accumulation indexes over the same May 1995-March 2018 periods. We see immediately that MSCI Australia and the ASX 200 Accumulation index appear similar, except in the mean. We surmise that MSCI Australia is a capital gains index, while the ASX 200 Accumulation index includes dividends. Overall, it seems hard to make even a hypothetical case that investing in the momentum index would be beneficial relative to holding the ASX 200 Accumulation index. Table 3: MSCI Australia Momentum Index monthly return moments compared with other benchmarks.

It is worth asking what the MSCI Australian Momentum Index did on the six months listed in Table 2 of Gaunt (2016). We list below the six returns for the long side of Gaunt (which coincide with the MSCI index’s operation) together with the corresponding six values of the MSCI index.

Gaunt (2016, Table 3) explains that the poor performance of winning stocks in the month of April 2000 coincides with the peak of the dotcom crash. These stocks had experienced extreme positive returns — small stocks becoming midcaps — in the leadup to the crash and as such were likely not considered as constituents of the MSCI Index. The composition of the portfolio of recent winners clearly affects the performance of the strategy; restricting it to overweighting recent large winners as does the MSCI Index erodes the large paper profits but also appears to reduce the level of volatility. This may also go some way to reconciling the different reported results between momentum in large stocks only and momentum across the universe of listed stocks.

7. Conclusions

The motivation behind this paper was the scarcity of momentum products in Australia. We make a distinction between what we call institutional (long-only) momentum portfolios and academic momentum (long-short) portfolios. There are no momentum ETFs, operational in Australia at present. Such ETFs that are available involve multi-factor constructions. Individual managers do offer momentum products but many of these are consciously designed to give exposure to other factors, such as value or size. One explanation as to why such style investing is
less prevalent in Australia relative to other markets is the presence of ‘resource’ stocks. This presence means that style-decompositions of portfolio risk and return is less likely to work well (compared with other developed countries). We do not find compelling evidence that Australian momentum strategies work particularly well, which is consistent with the findings of prior literature.

References


Quantitative analysis of fund manager performance has been seen for some time as not being a reliable predictor of future performance, but there is a sizeable global industry that carries out qualitative analysis for investors that has as its objective the identification of superior fund managers. We have analysed the sustainability of the commonly used qualitative characteristics used to analyse Australian equity fund managers using cladistics analysis, and concluded that the characteristics commonly used are not a reliable indicator of superior or inferior performance.

Introduction

The unreliability of historical investment performance of fund managers as an indicator of future performance has been established for some time. Jones (2016) indicated that when they tested out of sample value added by mutual funds the predictability fell by 75 per cent, which is no great surprise given the analysis of Fama and French (2010) which concluded that outperformance was a matter of luck in the data they analysed, and Pfeiffer and Ewensly (2012) who found that mean reversion of managers’ performances dominated persistence. While these studies indicate quantitative analysis of fund managers’ outperformance as a predictive tool is unreliable there is still a very significant global industry that offers advice to investors on the qualitative aspects of fund managers. To quote an advisor from their website: “mutual fund analysis, both qualitative and quantitative, attempts to identify skillful active managers”, and another “this process involves three steps, including initial screening, quantitative analysis and qualitative analysis that is utilised to distinguish the most attractive mutual funds within an asset class and investment style”. Jenkinson et al (2016) used regression analysis to test what factors might be driving consultants’ recommendations on selecting fund managers for US institutional clients and whether the consultants’ recommendations added value. Jenkinson et al (2016) concluded that both past performance and what they described as ‘soft factors’ were important drivers of the consultants’ recommendations, but they then concluded that the consultants most likely did not add value from their manager selection process. One of the reasons that the consultants may not be able to add value is that the underlying drivers of superior and inferior performance by fund managers may not be stable. This paper tests the hypothesis that qualitative analysis of fund managers is predictive of future outperformance or underperformance using a technique that identifies consistency of characteristics that drive outperformance and underperformance of Australian equity fund managers over the period 2008–2016.

Observation of the information provided by other fund manager research organisations would suggest there is a significant commonality across the industry as to qualitative factors that are analysed. From the information provided by the research organisation from which we sourced the qualitative and quantitative data, we determined a set of typical characteristics that are used to describe Australian equity fund managers processes and attributes. The characteristics used are:

**Methodology**

Our analysis is based on the hypothesis that if there is consistency in outperformance or underperformance then this must be primarily based on unique characteristics that can be shown to relate to managers with outperformance and managers with underperformance. We have used the qualitative database for Australian equity fund managers maintained by an international research business, together with their quantitative data for the same fund managers. The type of the information provided is shown in Table 1.

<table>
<thead>
<tr>
<th>Quality information provided</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment process</td>
<td>How the investment process works</td>
</tr>
<tr>
<td>Portfolio construction</td>
<td>The extent to which the portfolio might deviate from weightings in the appropriate index</td>
</tr>
<tr>
<td>Implementation</td>
<td>How the investment decisions are implemented</td>
</tr>
<tr>
<td>Business management</td>
<td>Strength of the business based on ownership and resources</td>
</tr>
<tr>
<td>ESG rating</td>
<td>The extent to which ESG is applied</td>
</tr>
</tbody>
</table>

### Table 1: Typical Qualitative Information Provided

#### Table 2: Fund Manager Characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cap bias</td>
<td>Portfolio has a focus on a particular market capitalisation sector</td>
</tr>
<tr>
<td>Boutique business</td>
<td>Fund manager is a boutique type business</td>
</tr>
<tr>
<td>Significant tracking error</td>
<td>Denoted by the research house</td>
</tr>
<tr>
<td>Quantitative bias</td>
<td>Initial quant screening, model forecasts and optimisation used</td>
</tr>
<tr>
<td>High portfolio turnover</td>
<td>Annual portfolio turnover of over 70 per cent</td>
</tr>
<tr>
<td>Broker input</td>
<td>Broker input is used in the research process</td>
</tr>
<tr>
<td>ESG process</td>
<td>An ESG Rating of more than 2 rated by research house</td>
</tr>
<tr>
<td>Concentrated portfolio</td>
<td>A portfolio consisting of 35 stocks or fewer</td>
</tr>
<tr>
<td>Allow shorting</td>
<td>Allow short position in the portfolio</td>
</tr>
<tr>
<td>Value bias</td>
<td>The portfolio has value bias as suggested by research house</td>
</tr>
</tbody>
</table>
IS QUALITATIVE ANALYSIS OF FUND MANAGERS A RELIABLE INDICATOR OF FUTURE RELATIVE RETURN? - cont

Based on the information provided by the research organisation, each manager was assigned the characteristics from Table 2 that were appropriate. The data for all managers was then used to undertake a logit regression analysis to determine the significance of each characteristic. As well, an alternative analysis using a cladistics process was then undertaken to identify the extent of common characteristics across managers and the stability of the key characteristics across time. The managers were separately analysed for those outperforming the relevant benchmark and those underperforming the relevant benchmark to identify consistency or inconsistency between these groups of managers.

Data

Our data covered 118 Australian equity managers and we used the performance for the ten years to December 2016 and the benchmarks indicated by each manager in the qualitative data we had available. We analysed the characteristics for managers outperforming and underperforming their benchmarks over three-year periods to allow for investment management processes that have an investment horizon longer than one year. The number of managers outperforming over the three-year periods is shown in Table 3 and it can be seen that the numbers vary even allowing for the commonality of years included in the consecutive three-year periods.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number Outperforming</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>38</td>
</tr>
<tr>
<td>2011</td>
<td>41</td>
</tr>
<tr>
<td>2012</td>
<td>37</td>
</tr>
<tr>
<td>2013</td>
<td>56</td>
</tr>
<tr>
<td>2014</td>
<td>83</td>
</tr>
<tr>
<td>2015</td>
<td>80</td>
</tr>
<tr>
<td>2016</td>
<td>62</td>
</tr>
</tbody>
</table>

Logit regression analysis

Using the characteristics in Table 2 and an additional characteristic for outperformance (0 = underperformance, 1 = outperformance), we ran a logit regression analysis for three year rolling periods and for the total period for which we had data and calculated the characteristic weights. The p values are summarised in Table 4.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Three years ending 2016</th>
<th>Three years ending 2015</th>
<th>Three years ending 2014</th>
<th>Three years ending 2013</th>
<th>Three years ending 2012</th>
<th>Three years ending 2011</th>
<th>Three years ending 2010</th>
<th>Three years ending 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.73</td>
<td>0.02</td>
<td>0.02</td>
<td>0.18</td>
<td>0.10</td>
<td>0.26</td>
<td>0.02</td>
<td>0.00</td>
</tr>
<tr>
<td>Cap bias</td>
<td>0.91</td>
<td>0.32</td>
<td>0.03</td>
<td>0.01</td>
<td>0.00</td>
<td>0.26</td>
<td>0.21</td>
<td>0.00</td>
</tr>
<tr>
<td>Value bias</td>
<td>0.32</td>
<td>0.02</td>
<td>0.13</td>
<td>0.30</td>
<td>0.94</td>
<td>0.74</td>
<td>0.26</td>
<td>0.07</td>
</tr>
<tr>
<td>Significant tracking error</td>
<td>0.00</td>
<td>0.79</td>
<td>0.40</td>
<td>0.28</td>
<td>0.71</td>
<td>0.37</td>
<td>0.71</td>
<td>0.53</td>
</tr>
<tr>
<td>Boutique business</td>
<td>0.71</td>
<td>0.72</td>
<td>0.13</td>
<td>0.46</td>
<td>0.36</td>
<td>0.52</td>
<td>0.11</td>
<td>0.85</td>
</tr>
<tr>
<td>Quantitative bias</td>
<td>0.47</td>
<td>0.89</td>
<td>0.21</td>
<td>0.11</td>
<td>0.16</td>
<td>0.89</td>
<td>0.01</td>
<td>0.27</td>
</tr>
<tr>
<td>Broker input</td>
<td>0.28</td>
<td>0.84</td>
<td>0.30</td>
<td>0.37</td>
<td>0.55</td>
<td>0.90</td>
<td>1.00</td>
<td>0.91</td>
</tr>
<tr>
<td>High portfolio turnover</td>
<td>0.27</td>
<td>0.77</td>
<td>0.93</td>
<td>0.75</td>
<td>0.68</td>
<td>0.44</td>
<td>0.65</td>
<td>0.75</td>
</tr>
<tr>
<td>Concentrated portfolio</td>
<td>0.27</td>
<td>0.65</td>
<td>0.12</td>
<td>0.64</td>
<td>0.17</td>
<td>0.99</td>
<td>0.72</td>
<td>0.05</td>
</tr>
<tr>
<td>ESG process</td>
<td>0.38</td>
<td>0.31</td>
<td>0.03</td>
<td>0.21</td>
<td>0.66</td>
<td>0.26</td>
<td>0.81</td>
<td>0.06</td>
</tr>
<tr>
<td>Allow shorting</td>
<td>0.51</td>
<td>0.91</td>
<td>1.00</td>
<td>0.18</td>
<td>0.10</td>
<td>0.26</td>
<td>1.00</td>
<td>0.37</td>
</tr>
</tbody>
</table>

The results in Table 4 indicate:

- for the three years ending 2016, a significant tracking error was indicative of outperformance
- for the three years ending 2012, a capitalisation bias was indicative of outperformance
- for the whole period 2010–2016, a capitalisation bias was indicative of outperformance

The logit regression analysis indicates the typical qualitative indicators are unstable indicators of outperformance of Australian equity managers. It needs to be appreciated that the weights assigned to the characteristics in the logit regression are derived from a distribution of weights as the analysis is considering several fund managers’ characteristics and performance, and unless the p value is very close to zero then the resultant weight for the aggregate will not be the same as the weight for individual managers. The consequence is that unless the p value for a characteristic in this analysis is close to zero, then the result is not indicative of outperformance for any particular manager. To overcome the inability of logit regression to identify outperforming managers, we will introduce an analysis adopted from evolutionary analysis that simply identifies if characteristics exist or not in an outperforming or underperforming manager.

A p value below 0.05 is usually regarded as significant.
The results in Table 5 suggest that the systemic characteristics are frequently common for both outperforming and underperforming managers and that there is no consistency across time as to specific characteristics for outperforming or underperforming managers. The inference from this result is that it is not possible to predict outperforming and underperforming managers on a three-year basis, using the systemic characteristics.

**Conclusion**

Both the logit regression analysis and the cladistics analysis indicate there is no consistency across the characteristics considered between outperforming and underperforming Australian equity fund managers. The cladistics analysis has for the first time provided a basis for analysis that can assess the relative importance of characteristics of fund managers on an individual manager basis. The analysis has clearly identified that the commonly used characteristics of Australian equity fund managers are unable to ascertain managers with sustainable outperformance or underperformance as a lot of the characteristics are common to both groups. This result brings into question the value of qualitative analysis in selecting Australian equity fund managers, and may well apply to other asset sector managers.

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HOUSEHOLD SPENDING PATTERNS IN RETIREMENT

This paper considers the relevance of the traditional assumption of constant real spending through retirement. Using measures of actual spending by retirees, including longitudinal data from the HILDA surveys along with ABS data, changes in household expenditure can be measured through retirement. The data indicate that there are two different types of spending that people will fund through their retirement. It also notes a ‘cohort effect’ in living standards for retirees.

Introduction

One of the biggest challenges in retirement income planning is understanding retiree spending patterns. It is hard enough for many retirees to understand their current expenses let alone predict how their spending will change over time. Drawing on the life cycle hypothesis of Modigliani, it is often assumed that retirees wish to maintain a constant level of expenditure, adjusted for inflation, throughout retirement. Actual behaviour differs from that. Many studies have highlighted that older retirees spend less than younger retirees, but what is not always clear is the path that the spending takes.

This is where the Household Income and Labour Dynamics of Australia Survey (HILDA) can be applied to shed more light on what actually happens. This paper utilises the HILDA survey to describe how household spending changes through retirement.
The traditional retirement planning approach follows the economics literature of Modigliani around the lifecycle hypotheses such as described in Ando and Modigliani (1963). The assumption is that because people prefer smooth spending patterns, then consumption in retirement should be maintained in real terms. Bengen’s (1994) well-known ‘4% rule’ follows this precisely. The rule recommends that a retiree spend:

4% of their initial wealth at retirement, increased in line with inflation every year after that.

The assumption of smooth consumption in real terms has been challenged by many, including Statman (2017), who observes that most people do not and probably cannot smooth their consumption.

Using US data, Blanchett (2014) measures the differences in spending across households of different (retirement) ages. He then imputes a growth rate for the change in spending at different ages. Graphically, this creates a retirement spending ‘smile’ that can be seen in Figure 1.

This chart measures the real rate of spending growth. While spending is stable in the first couple of years in retirement, Blanchett observes lower spending in real terms at older ages. For even older retirees (say 80+) there is no increase in spending, it just stops falling.

This observation of falling spending is consistent with another commonly used framework. Many models of retirement income (such as the representative version in Figure 2) look at retirement in three stages:

1. Active retirement living when retirees are healthy, seek to travel and enjoy a range of activities.
2. Passive retirement living when retirees reduce their levels of activity, due to either poorer health or a reduced availability of funds.
3. Frail living when the health of a retiree deteriorates often requiring part or full-time care.

The level of spending is lower in the passive phase, but there are different views on the cost of the frail phase to the retiree. Medical costs often rise dramatically, while other expenses typically fall in the final frail stage of life. Blanchett (2014) observes that there is limited change in total real spending at older ages. Figure 1 indicates that spending is no longer falling, with the rate of real change rising to zero. This is evidence that in the US the cost of the frail stage is no more than the cost of the passive stage. In Australia, more of the medical costs will be paid by the government, so it is likely that total household spending in Australia would be even lower in the frail stage.
Studies of spending patterns in Australia indicate a similar pattern of expenditure falling at advanced ages. For example, see Ding (2013), Clare (2014) or ACFS (2016). This paper seeks to address two issues in the pattern of spending at the household level over time. First, the observation that older retirees are currently spending less than younger retirees does not automatically mean that their spending has fallen over time. An alternative explanation is that there is a so-called ‘cohort effect’ (where behaviour or a characteristic is shared by people in a particular age group or ‘cohort’) and that it is necessary to look at the continuum of retiree spending, not just what they might be spending at a point in time. The traditional assumption that spending is maintained in real terms is consistent with the observation of older retirees spending less than a younger cohort if they had been spending less than the younger cohort at the same age. In other words, older retirees spending less than younger ones does is not necessarily evidence that they are slowing their spending. They might have started retirement with a lower spending level. Second, the paper examines whether there are different patterns for different categories of spending.

The Household Income and Labour Dynamics of Australia Survey (HILDA) is a panel survey of Australian households. It has been conducted since 2001 on a range of issues and tracks the members of a household over time. Data on expenditure that have been included since 2005 provide an indication of how household spending changes over time. The data on expenditure are not complete and their quality was reviewed by Wilkins and Sun (2010). They noted that regularly purchased items were relatively well measured, but items purchased irregularly (such as an overseas holiday) were problematic. As a result, the HILDA survey ceased to collect information on irregular purchases after 2010. Thus, we can only get a reliable estimate of spending on regular household items over time. To capture more ‘lumpy’ expenditure, we need an alternative measure such as the Household Expenditure Survey (HES) from the Australian Bureau of Statistics (ABS).

The HILDA survey

The composition of a household can change over time, so we need to adjust for this in the longitudinal data. We also want to be able to compare retired households of different ages to confirm that the HILDA data matches other observations that older people spend less than younger people. Households were thus grouped in the following way:

- Households were included when all members were retired (not working).
- Only single and couple households were considered because the sample size for larger retired households was too small.
- Households were matched for five-year periods. For example, only households that had two people in both 2010 and 2015 were included in that comparison. The data in HILDA from 2005 to 2016 enable seven overlapping comparisons.
- Households were grouped by age in the first year of comparison, using the younger member of a couple:
  - Aged 60-69
  - Aged 70-79
  - Aged 80+
- Expenditure was measured for those items which persisted across the 12 years (i.e. 2005 to 2016), ignoring the irregular items that were measured in a limited sample. The expenditure included is set out in Appendix A.
- Average expenditure was calculated for each household group. Real comparisons were made using the CPI level from June in each relevant year from the ABS.

The comparison in spending between 2011 and 2016 is provided by the box plots in Figure 3. Each pair represents the spending of the same household in 2011 and 2016 adjusted to 2011 prices. The boxes (which represent the 25th–75th percentile range) are relatively stable between the years. For the couples over 80, the range expands, but the sample size is small, with less than 30 households in the sample.

Observations of spending in retirement

The Household expenditure data in the HILDA survey
The pattern of needs and wants in retirement

The regular expenditure data collected in the HILDA survey cover most of the essential needs of a household. By tracking the spending across a range of households, we can track how the spending of retiree households changes over time. For example, we can see that retired single households in 2010, who were still living on their own in 2015, spent $14,734 in 2010 and $15,962 in 2015 on the HILDA expenditure categories. This was less than the age pension, but does not reflect the spending on the household on items not captured by the HILDA survey. The ABS measure of total spending was just over $27,000 for 2015–16 for a retired single household. In contrast, retired single households spent just under $22,000 in 2009–10 on average according to the ABS.

Constant needs, but declining wants

The regular expenditure data collected in the HILDA survey cover most of the essential needs of a household. By tracking the spending across a range of households, we can track how the spending of retiree households changes over time. For example, we can see that retired single households in 2010, who were still living on their own in 2015, spent $14,734 in 2010 and $15,962 in 2015 on the HILDA expenditure categories. This was less than the age pension, but does not reflect the spending on the household on items not captured by the HILDA survey. The ABS measure of total spending was just over $27,000 for 2015–16 for a retired single household. In contrast, retired single households spent just under $22,000 in 2009–10 on average according to the ABS.

But what about wants? Do retirees continue to spend the same on discretionary items throughout retirement?

The short answer is no. While HILDA does not have the data on luxury spending, ABS data show that the spending on luxury goods falls with age. Data are available from the ABS on total household spending in 2009–10 and 2015–16. Split across the same household/age groups, the fall in luxury spending can be seen in Figure 6.

Generally, the proportion of spending on irregular items is lower for older households. With a sustained level of regular essential spending and lower spending on irregular items, the total level of spending of retirees falls as they get older. These aggregate data do not distinguish between a desired drop in consumption and a decline due to lack of funds. Whether by design or forced through affordability, the decline in spending is quarantined to discretionary items. Retirees maintain their spending on needs.
FIGURE 6: REGULAR NEEDS AND OTHER HOUSEHOLD SPENDING, BY AGE AND HOUSEHOLD 2009–10 AND 2015–16

**A. Single households 2009–10**
- Aged 60-69: $25,000, 37% Regular, 28% Other spending
- Aged 70-79: $26,000, 31% Regular, 31% Other spending
- Aged 80+: $27,000, 25% Regular, 53% Other spending

**B. Couple households 2009–10**
- Aged 60-69: $40,000, 57% Regular, 14% Other spending
- Aged 70-79: $44,000, 46% Regular, 45% Other spending
- Aged 80+: $50,000, 35% Regular, 65% Other spending

**C. Single households 2015–16**
- Aged 60-69: $30,000, 47% Regular, 53% Other spending
- Aged 70-79: $35,000, 42% Regular, 58% Other spending
- Aged 80+: $40,000, 46% Regular, 54% Other spending

**D. Couple households 2015–16**
- Aged 60-69: $60,000, 59% Regular, 41% Other spending
- Aged 70-79: $70,000, 55% Regular, 45% Other spending
- Aged 80+: $80,000, 51% Regular, 49% Other spending

**Implications for retirement planning**

Expenditure in retirement can take one of (at least) two forms. One type of expenditure is a consistent amount (adjusted for inflation) that can be used for regular, everyday needs. This will be sustained through time. They also have irregular spending on items that they could potentially do without. As they get older, many retirees will spend less on wants, while continuing their spending on everyday needs.

Financial planning for retirement involves making sure that finances will be available to meet all the expenditure desired by retirees. With two different forms of expenditure, it is likely that the best plans will involve different ways to generate the cash flow required for the different expenditure. One approach would be to use a secure layer of income to meet spending ‘needs’ through retirement, along with a flexible approach to other income to pay for the various wants as they are consumed across retirement. This would align with the pattern of expenditure that is observed in households over time.

The following expenditure items have been included from the HILDA surveys, represented as regular needs in this paper:

- Household groceries
- Alcohol
- Tobacco
- Meals out
- Women’s clothing and footwear (included in total clothing and footwear in 2005)
- Men’s clothing and footwear (included in total clothing and footwear in 2005)
- Children’s clothing and footwear (included in total clothing and footwear in 2005)
- Telephone and internet charges
- Utilities (electricity, gas, other heating, water)
- Health practitioners
- Private health insurance
- Other insurance
- Pharmaceuticals
- Motor vehicle repairs
- Public transport and taxis
- Education

The HILDA measure of home repairs and renovations was considered and excluded from the final calculations. Overall, the change in average spending was similar, but some cohorts were impacted by extremely large renovation costs in particular years which were not matched in subsequent years for that cohort.

1. I would like to acknowledge contributions from Jeremy Cooper and Arman Haqani as well as suggestions from co-workers at Challenger and an anonymous reviewer that improved the paper. Any residual fault remains with the author.

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Ding, J. 2013, ‘Australian retirees’ choices between consumption, age pension, bequest and housing’, 1 April. Available at: https://ssrn.com/abstract=2494969 or http://dx.doi.org/10.2139/ssrn.2494969


4. Abstract

While overall geared investments have declined fourfold since the GFC, leveraged investments are still a potential investment to make or recommend by financial advisers and retail investors. This research examines whether gearing is a strategy likely to yield the returns expected, and under what conditions.

Following the methodology of Basu et al (2013), we model 413 geared and non-geared ASX200 market portfolios from 1976 to 2017 under the most common product conditions to simulate actual historical performance returns. We find that under the portfolio construction assumptions made, gearing increases investment risk dramatically and the volatility of path dependant returns highlights this. Gearing is also shown to increase sequence risk at the start of the investment horizon. Given the state of retirement savings for many, the levels of financial illiteracy and the evidence of difficulty in predicting market, we conclude gearing is a low efficacy strategy for most investors. Indeed, it is clear that the facilitators (lenders, brokers, etc.) always 'get paid first' and, with the exception of complete market collapse, do not share the capital risk.

Introduction

Coupled with financial literacy, the move from state to self-funded retirement, increased longevity and a desire to live a more active and affluent life in retirement (Steiber and Kohli, 2017), the job of the investor is increasingly challenging and the need to accumulate a large retirement nest egg is clear. The risk in this scenario is manifested as sequencing risk (Basu et al., 2013; Drew et al., 2014; Stoltz et al., 2014), with the sequence, or order, of returns over an investor’s lifetime as impactful as the investments made (Vora and McGinnis, 2000). There are managers and professional advice (Bodie and Crane, 1997). However, for many reasons, retirement planning can get off track. This can lead to investors seeking a higher investment return through strategies such as gearing.

Investment theory tells us that gearing strategies increase the magnitude of returns, both positively and negatively. With investment returns reliant on external events such as regulation and macroeconomics, negative return ‘events’ can sabotage a lifetime of savings if they occur close to retirement: this is referred to as the retirement risk zone (Basu et al, 2004).
some strategies to avoid sequenc- 
ing risk and to reduce the risk on investment assets exposed to leveraging. This paper examines gearing in the context of equity investment and seeks to model the impact of this on investment performance by modelling long-term post-performance. Making assumptions around investment parameters, we examine the performance of 413 geared portfolios over the March 1976 to July 2017 period. Underpinning this approach is that the majority of investors and financial advisers are not active investors and thus will usually adopt a naïve or passive approach. Indeed, evidence suggests that few in the market, including investment professionals (analysts, investment managers, etc.), are able to predict movements in the market and the ongoing passive versus active debate continues to underscore this (Berk and Van Binsbergen, 2015; Cremers et al., 2016; Jankinsen, Jonas, & Martinez, 2016; T. Kim, 2017).

We find that, under the portfolio construction assumptions made, gearing increases investment risk dramatically and the volatility of path-dependent returns highlights this. Gearing is also shown to increase sequence risk at the start of the investment horizon. This suggests that gearing should be the domain of the sophisticated investor and/or only on marginal levels of capital, the loss of which would not compromise either liquidity or the capital accumulation targets of the client. Given the state of retirement savings for many, the levels of financial literacy and the evidence of difficulty in predicting market, we conclude gearing is a low efficacy strategy for most investors. Indeed, it is clear that the facilitators (lenders, brokers, etc.) always ‘get paid first’ and, with the exception of complete market collapse, do not share the capital risk.

The remainder of this paper is set out as follows. The next section provides a brief overview of the relevant literature followed by portfolio construction and data in section three. The fourth section presents the results with discussion in section five. Section six concludes.

2.0 Background literature

Margin leading has been in decline in Australia since the GFC, with a high at December 2007 of approximately 41.13% and down to around $11.4b in December 2017 (RBA, 2017). This is largely due to investor sentiment, concerns about the efficacy of the strategy (given its use in advice scandals), risk of margin calls, and financial advisers being reluctant to recommend the strategy (basically due to liability, PI insurance). Only 34 per cent of advisers suggest gearing is a ‘safe’ investment strategy (Faherty, 2011; Pokrajac, 2012; Purnell, 2013), yet it is still a pursued investment strategy.

Despite potentially protracted behaviour at different times, it is rare that firms associated with margin lending products or advice actually broke the law. The regulation around gearing broadly mirrors the regulation around other loan products in that the main concern is that the client is ‘suitable’ for the financial advice profession (Pi insurance). Only 34 per cent of advisers suggest gearing is a ‘safe’ investment strategy (Faherty, 2011; Pokrajac, 2012; Purnell, 2013), yet it is still a pursued investment strategy.

Data and portfolio construction

Data is obtained from DataStream for Australian market variables from 1976 to 2015 and credit data is obtained from the RBA Bulletin Statistics. Portfolios are formed for a five-year investment period at February 1976 to July 2017 with a one month forward roll, resulting in 413 portfolios with the last portfolio starting in July 2010. End of month data is used to calculate the monthly returns with interest rates and fees applied to the end of month balance — thus we assume no tracking error. Following consultation with practitioners, the geared portfolios are constructed with an upfront $100,000 capital investment and $100,000 debt (50 per cent leverage). A long position is taken with no ongoing contributions, and all returns reinvested, and returns are calculated based on the performance of ‘the market’ — i.e. the ASX All Ords Index. All gearing and exit fees are applied, however a 1.5 per cent management expense ratio (MER) is applied as well as an annual lending fee of $500 and a monthly fee of $10 on an interest only credit facility with interest compounded daily and charged monthly based on RBA lending rate data over the sample period. No adjustments for inflation or taxation are applied. Margin calls are tracked on a loan to value ratio (LVR) of 70 per cent, however are not executed — i.e., the portfolios are allowed to run. This provides a reasonable approximation of a typical geared facility, and this should be kept in mind as one considers the outcomes of the modelling.

4.0 Results

4.1 Geared portfolio v market portfolio (non-geared returns)

The average geared portfolio value at the end of 60 months is $218,803.39 (based on a $200,000 investment) with a resultant annualised net return on the initial capital investment of approximately 3.4 per cent (refer to Table 1). The maximum end value was over $660,000 representing a 35 per cent plus return, while the minimum portfolio end balance was $53,983, which represents a more than 100 per cent loss of capital. Furthermore, 54 per cent of the portfolios end up with a positive return (of over $200,000), with 46 per cent resulting in a negative overall return. This highlights the significant range of outcomes based on a contrarian approach to the timing of the initial investment. This compares to the average performance of market portfolios (no gearing) of $141,666 which is superior to the net average of the geared portfolios (only $100,000 was invested for the non-geared market portfolios). While the maximum performance is inferior, it is important to note that no non-geared portfolio suffers a 100 per cent loss of capital, with the minimum end value being just over $60,000 on an initial $200,000 investment. Indeed the average annualised return on the non-geared portfolios is approximately 7 per cent; double that of the geared portfolios, in terms of range of portfolio outcomes. 86 per cent of non-geared portfolios produced a positive return (end balance greater than $100,000).
TABLE 1: DESCRIPTIVE STATISTICS

<table>
<thead>
<tr>
<th>Description</th>
<th>Average geared portfolio</th>
<th>Weakest end portfolio (net of loan)</th>
<th>Strongest end portfolio (net of loan)</th>
<th>Market portfolio (non geared, $100k initial inv)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>218,803.39</td>
<td>59,223.73</td>
<td>191,734.28</td>
<td>141,366</td>
</tr>
<tr>
<td>Maximum</td>
<td>563,150.55</td>
<td>100,000.00</td>
<td>599,851.59</td>
<td>415,365</td>
</tr>
<tr>
<td>Minimum</td>
<td>51,983.92</td>
<td>51,983.92</td>
<td>100,000.00</td>
<td>60,425</td>
</tr>
<tr>
<td>Range</td>
<td>511,166.63</td>
<td>48,016.08</td>
<td>399,851.59</td>
<td>354,940</td>
</tr>
<tr>
<td>Median</td>
<td>106,233.84</td>
<td>63,354.58</td>
<td>151,627.19</td>
<td>133,377</td>
</tr>
<tr>
<td>Std Deviation</td>
<td>82,357.69</td>
<td>32,367.49</td>
<td>101,578.22</td>
<td>49,538</td>
</tr>
<tr>
<td>Calls made</td>
<td>3</td>
<td>75</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

NOTES: This table contains descriptive statistics for the 413, 60 month geared portfolios that are formed across the 1973 to 2017 period.

PANEL A: DISPERSION OF RATES OF RETURN BY QUINTILES

<table>
<thead>
<tr>
<th>Quintile 1 (best performing)</th>
<th>Quintile 2</th>
<th>Quintile 3</th>
<th>Quintile 4</th>
<th>Quintile 5 (worst performing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of portfolios</td>
<td>83</td>
<td>82</td>
<td>82</td>
<td>83</td>
</tr>
<tr>
<td>Average end value</td>
<td>239,667.98</td>
<td>143,489.70</td>
<td>107,180.81</td>
<td>75,485.50</td>
</tr>
<tr>
<td>Number of margin calls</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>26</td>
</tr>
<tr>
<td>Minimum below $200k</td>
<td>62</td>
<td>69</td>
<td>82</td>
<td>83</td>
</tr>
<tr>
<td>Winners (value end&gt;$200k)</td>
<td>83</td>
<td>82</td>
<td>60</td>
<td>0</td>
</tr>
<tr>
<td>Losers (value end&lt;$200k)</td>
<td>0</td>
<td>0</td>
<td>22</td>
<td>83</td>
</tr>
<tr>
<td>Max portfolio value (at end)</td>
<td>563,150.55</td>
<td>165,393.76</td>
<td>124,152.68</td>
<td>89,973.67</td>
</tr>
<tr>
<td>Min portfolio value (at end)</td>
<td>165,566.38</td>
<td>124,233.78</td>
<td>90,662.90</td>
<td>61,525.39</td>
</tr>
<tr>
<td>Range of portfolio values</td>
<td>297,584.37</td>
<td>41,489.78</td>
<td>33,489.78</td>
<td>28,448.29</td>
</tr>
<tr>
<td>Median portfolio value</td>
<td>212,358.95</td>
<td>142,678.24</td>
<td>108,233.84</td>
<td>76,822.28</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>86,326.12</td>
<td>12,918.53</td>
<td>10,065.23</td>
<td>7,771.85</td>
</tr>
</tbody>
</table>

NOTES: This table contains descriptive statistics for the 413, 60 month geared portfolio and non-geared portfolios that are formed across the 1973 to 2016 period split into quintiles based on end value of the portfolio.

These results highlight the significant increase in variance in returns that gearing introduces to investment outcomes. Figure 1, below, illustrates the outperformance of non-geared portfolios, and that the potential returns in a portfolio have a high degree of variation depending on when the portfolio was initiated (more on this below), as well as that the long-term returns from gearing are relatively poor.

FIGURE 1: ALL POSSIBLE PORTFOLIO RETURNS

NOTES: This figure presents portfolio performance for geared (blue) and non-geared (orange) portfolios based on the year and month of first investment.
4.2 The time dimension

The dimension of time suggested in Figure 1 is also worthy of further investigation. The best performing portfolios (Quintile 1) illustrate a relatively consistent upward trend in performance with most volatility to the upside. Of particular note is the variance in returns in the first few months of each quintile (the left hand side of each panel) and how this escalates from Quintile one to five. This provides evidence to suggest the emergence of sequence risk at the start of the distribution.

**FIGURE 2: GEARED PORTFOLIO RETURN PATHS BY QUINTILE**

<table>
<thead>
<tr>
<th>Panel A: Quintile 1 Returns (Best)</th>
<th>Panel B: Quintile 2 Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portfolio Quintiles - One</td>
<td>Portfolio Quintiles - Two</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel C: Quintile 3 Returns</th>
<th>Panel D: Quintile 4 Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portfolio Quintiles - Three</td>
<td>Portfolio Quintiles - Four</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel E: Possible returns of Quintile 5 (worst performing portfolios)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portfolio Quintiles - Five</td>
</tr>
</tbody>
</table>

**NOTES:** The above figure represents all of the possible portfolio value movements across the investment period for each of the geared portfolios, with quintile one being the highest performer and quintile 5 the lowest performer.

**FIGURE 3: NON-GEARED PORTFOLIO RETURN PATHS BY QUINTILE**

<table>
<thead>
<tr>
<th>Panel A: Quintile 1 Returns (Best)</th>
<th>Panel B: Quintile 2 Returns</th>
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<tbody>
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<tbody>
<tr>
<td>Portfolio Quintiles - Five</td>
</tr>
</tbody>
</table>

4: P-value of 0.05 for the pooled group and P-value of 0.00 for quintile 5 utilising OLS regression.

Figure 3. below, illustrates this further with the quintile time data presented for the non-geared portfolios. Statistical analysis confirms the difference in initial portfolio variance with the standard deviation of returns in the first 12 months being on average 48% higher across the geared portfolios and 55% greater in quintile five (weakest performer). Furthermore, the variance in the first 12 months is a statistically significant predictor of geared portfolio end value (and particularly strongly for the quintile five group), but not for the non-geared portfolio. Thus, gearing of portfolios (as per the parameters utilised here) introduces sequence risk at the start of the investment horizon.
The final element of the time dimension is the distribution of portfolio returns over the 1976 to 2016 period. The heat map in Table 5 illustrates the pattern of returns over this period and highlights a degree of clustering of performance with the worst performing periods being those that occur around major market corrections (1987, 2001, and 2007/8). This reinforces the view that where gearing is used, an actively monitored and managed approach needs to be taken and caution should be applied as markets accelerate and indicators (e.g., 200-day moving average, P/E ratios, Shiller P/E, technical and fundamental analysis, etc.) suggest the market is expensive or overvalued. This is easy to say with the sharpened perception of hindsight, but very difficult to predict moving forward, once again highlighting the risk of gearing for the average investor. Clustering of performance is further illustrated in Table 6 which heat maps the excess return of the geared portfolios over the non-g geared. This suggests that periods of sustained, multi-year market out-performance is required for gearing outperformance to persist.

5.0 Discussion

5.1 The bank always wins

When it comes to geared investment portfolios, it is clear that there is one winner: the lender. The payments to the provider of the loan capital are paid irrespective of performance (via asset sell down or collateral if need be). This perspective is clearly illustrated in the following table, where the average bank interest, MER, and end value (start value of $200k) are provided in directly comparable form. The table shows that the returns to product providers are relatively stable across the quintiles and exceed the return to investors in all but the first quintile once the base loan and investment capital is acquitted. Table B, above, illustrates that regardless of the performance of the portfolio, the bank receives a total of greater than $46,619 over five years, and even more when the balance of the investment has higher volatility. Even in the worst performing quintile, while the investors lost an average of around $70,000 over five years, the bank received $56,221 in interest alone. When we consider the cumulative effects of interest, MER, and other fees, on a poorly performing portfolio it is clear that the bank does not suffer from the investment performance, but the investor suffers greatly.

Furthermore, given the interest rate on margin loans is typically 350 to 600 basis points above the cash rate (plus fees) and lenders share little of the investment risk, the most likely ‘winner’ from this strategy is the financial institution, not the individual client seeking an investment strategy to deliver above-market returns over the long term. We note the example of ‘more equitizable’ models that exist in other domains of finance such as the equity and outcome sharing models found in Islamic finance (Ismail and Achmad, 2000; Smale and Ismail, 2011; Usman, 1999; Vogel and Hayes, 1998) that may provide a fairer distribution of outcomes.

5.3 Gearing increases sequence risk

Gearing is well-known as a tool to increase the risk of losses as well as potential gains magnified in line with increased market exposure, relative to the amount of personal capital invested. Gearing simultaneously increases the market risk the investor is exposed to as well as interest rate risk given that the cost of a margin loan has the potential to reflect interest rate trends.

The above tables and graphs illustrate that gearing can produce positive investment returns over the long term, but this is a result of timing in the market, than the time of entry into the market. Thus, the benefits of long-term exposure to risky assets are negated through the magnified importance of when the investment begins. As practitioners in the funds management industry are well aware, an attempt at timing the market is a futile task. For the average accumulating investor this risk does not seem to be adequately compensated with above market returns.

5.2 High volatility out-weighs potential returns

This research has found that gearing increases the volatility of returns and introduces or accentuates a range of risks in relation to capital, liquidity, timing and providers (third parties). We con- clude that while the lure of higher returns is strong, the risk associated with gearing is substantial. Gear- ing seems to impact on these risks while introducing an additional cost hurdle that the underlying investments must meet before delivering returns to investors. Figure 4 highlights this, showing the volatility in geared portfolio performance over time when portfolio performance is ranked in deciles. We suggest that the high volatility in such portfolios, on balance, is not acquired by the potential for excess net investor returns.

6.0 Concluding Remarks

In the retail space, margin lending is somewhat out of vogue, with a

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5 Further research is required to determine the statistical properties and causal roles of these variables.
marked decrease in product usage post GFC and caution exhibited by advisers due to higher profile failures that involved (usually heavy) gearing. The strategy is however, never far away from the pages of the media and product marketing machines and thus in this paper we seek to examine the efficacy of gearing for retail investors.

Analysing the performance of 413, 60-month geared portfolios from the 1973 to 2017 period, we conclude that when the theory of gearing meets the reality of market parameters of time-periods and usually underperforms the non-gearing market portfolio. Notably, we conclude that when the theory of gearing meets the reality of market parameters of time-periods and usually underperforms the non-gearing market portfolio. Notably, we conclude that when the theory of gearing meets the reality of market parameters of time-periods and usually underperforms the non-gearing market portfolio. Notably, we conclude that when the theory of gearing meets the reality of market parameters of time-periods and usually underperforms the non-gearing market portfolio.

We conclude that gearing should be utilised with the utmost caution by retail investors and their advisers and in a way that does not put essential capital at risk, while also being actively monitored and managed.

We note again the evidence that this (active management) is often not a successful strategy. Thus, this is not a suitable strategy in our view, for the majority of retail investors. Advisers (and product providers) should be diligent in explaining the potential risks and love returns that such strategies expose investors to and ensure the BID is met in accordance with such advice.

As noted above, we adopt a particular set of parameters in constructing our geared portfolios. While this aims to take a ‘median’ position, different parameters may lead to different outcomes. This also represents opportunities for further research as well as investigating the market parameters of time-periods related to better gearing outcomes, and understanding client financial literacy in relation to these strategies including the behavioural outcomes. This findings should be of interest to, further complicating timing risks and retirement planning (Busu et al., 2013). This is because if sequencing risk is introduced at the start of the investment term (i.e., a large loss occurs), the time required for recovery is long, and can impact the retirement plans of investors. In situations where gearing is part of the retirement planning strategy, sequencing risk is also introduced at the end of the investment term, where a negative return has the potential to eliminate the positive returns of the previous half decade, simply because of the geared nature of the portfolio.

We conclude that gearing should be utilised with the utmost caution by retail investors and their advisers and in a way that does not put essential capital at risk, while also being actively monitored and managed. We note again the evidence that this (active management) is often not a successful strategy. Thus, this is not a suitable strategy in our view, for the majority of retail investors. Advisers (and product providers) should be diligent in explaining the potential risks and love returns that such strategies expose investors to and ensure the BID is met in accordance with such advice.

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HOW ACADEMIC RESEARCH CAN INFORM DEFAULT SUPERANNUATION FUND DESIGN AND INDIVIDUAL FINANCIAL DECISION-MAKING

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Introduction

The dominance of defined contribution superannuation plans require fund members to make several decisions requiring a high level of financial expertise and participation. Most members do not have the expertise to make such decisions; hence, the onus falls on fund providers to offer default products that make the “best” decision for their members. In this paper, we demonstrate mathematical tools that can assist in determining optimal decisions for members with various characteristics. We provide a specific example, in a simplified setting, showing that allowing for realistic elements like social security and tax has a material impact on optimal decisions. Finally, we discuss how such models might be used in the development of default options that better cater to the needs of members.

Some decisions are constrained, such as the Superannuation Guarantee (SG) contribution requirements and the minimum withdrawal requirements in the post-retirement phase. Other decisions are influenced by taxation and social security rules, such as the age pension, and concessional contribution and balance caps. Even allowing for this, significant decisions, particularly in terms of investment strategy, are required of individuals, who in many cases are not sufficiently financially literate to make appropriate decisions (Agniew et al. 2013). Given this gap between decisions required and the ability of individuals to make them, the importance of default arrangements becomes vital. Research suggests that, in the absence of appropriate qualifications or advice, people will tend to allow default arrangements to make decisions on their behalf. For example, this can be expressed in terms of choice of fund and/or investment (Butt et al. 2018) or in terms of withdrawals at the minimum level required by legislation (Snaddon et al. 2016). Recent regulatory reforms in this space have also been minor, for example see ASIC (2014). Furthermore, superannuation calculators are mostly deterministic with respect to investment returns and therefore do not adequately inform individuals of the risks underlying the decisions they are making. The objective of this study is to compare financial decision-making structures in Australia with academic literature on optimal decision-making. There is a mountain of academic research in this area, although little evidence that it has had any significant impact on defaults and other means of making financial decisions, particularly when considering the interaction between these decisions and their associated taxation and social security systems. The treatment of the academic research will be broad and non-mathematical in nature, with sample references from the authors’ and broader academic research provided for those interested in exploring further.
Savings system design in Australia

For most Australians, superannuation and equity in the family home comprise their two largest asset holdings. However, for the purposes of funding retirement, utilisation of equity in the family home is still relatively small (De Silva et al., 2016). (For the remaining analysis in this paper we will assume equity in the family home is not used to fund consumption, although references to academic studies allowing for this are provided later in the paper.) Funding retirement is hence largely through the drawdown of superannuation savings and receipt of the means-tested age pension.

The vast majority of Australians currently drawdown superannuation through the use of an allocated pension (APRA 2017), which combined with defined contribution arrangements in the accumulation phase, means individuals must make investment strategy decisions at all points of the savings cycle.

Although the CIPR reforms may impact this in future, there is still significant uncertainty in what the product design and regulatory environment will look like under these reforms; see for example Unisuper’s decision to “pause the development of (their) FlexChoice” CIPR in June 2017 (Unisuper 2017).

A number of MySuper products utilise basic lifecycle investment strategies (Chant et al. 2014), although these are largely limited to reductions in investment risk as an individual becomes closer to retirement age. Some exceptions exist, such as QSuper, whose MySuper product reduces risk both with age and also as superannuation balance increases.

Optimal financial decision-making in academic literature

The starting point for making an optimal decision is a financial objective. While this objective can be expressed in terms of asset accumulation, given the assumed purpose of saving is to fund future consumption it is therefore more coherent to express this in terms of consumption over the lifecycle. The objective may be expressed in a number of ways, such as the probability of achieving a consumption goal or expected shortfall compared to a consumption goal. However, coherency issues mean it is more appropriate and more common to express the objective in a utility framework (Butt and Khemka 2015).

Utility measures the level of “satisfaction” an individual obtains from consumption and is expressed as a function of consumption. For an individual who is risk averse, the increase in utility from an $X increase in consumption is smaller than the rise in utility from an $X decrease in consumption. A commonly used utility function is an isoelastic function, which assumes an individual has constant relative risk aversion (CRRA). A key property of the CRRA utility function is that, without the presence of external labour income, individuals will utilise the same investment strategy regardless of the level of wealth being invested (Samuelson 1969). Utility over the lifecycle is calculated by summing the utilities obtained from periodic consumption. An obvious implication of this is that an individual must balance utility from current consumption with utility from future consumption.

A individual makes optimal decisions when those decisions maximise their expected utility over the lifecycle. In this paper the only decisions considered are consumption and asset allocation of the individual. The mathematical approach used to determine these optimal decisions is called dynamic programming (Rust, 1996). This approach breaks decisions into time points (typically annually) and states. A state is an individual factor that might impact decision-making. In this paper the only state considered is the superannuation balance of the individual. The model is solved recursively and stochastic assumptions are made on consumption over the decision point and another. In particular, it is necessary to set stochastic assumptions for the returns of the asset classes to be considered for investment.

Solving dynamic programming models can involve complicated calculus and significant computing power. In particular, introducing non-linear components such as the age pension means test and increasing the number of decisions made at a given time, affects the reliability of the optimisation. Furthermore, introducing additional state variables increases the computing time exponentially; known as the “curse of dimensionality” (Rust, 1996).

Examples of optimal decisions

In this section we present examples of optimal decisions from dynamic programming models with a variety of characteristics. The starting point is the authors’ previous work (Khemka and Butt, 2017), although some minor changes are made to assumptions, including allowing for the age pension eligibility age to be 67. An individual with the following characteristics is assumed:

• until age 67 earns a salary package of $85,000 in real terms and then retires immediately;
• until age 67 contributes a minimum of 0 per cent of their salary package to superannuation and consumes the remainder;
• from age 67 onwards withdraws from their superannuation (in allocated pension form) for consumption and has mortality probability equivalent to the male rates in the Australian Life Tables 2010–12 (Australian Government Actuary, 2014);
• has mortality probability equivalent to the male rates in the Australian Life Tables 2010–12 (Australian Government Actuary, 2014);
• experiences CRRA utility with a risk aversion parameter of $5; and
• discounts future utility to allow for the probability of being alive but not for intertemporal consumption preferences (Yaari, 1987).

The individual makes decisions on each birthday on consumption and asset allocation for the coming year. Decisions are made based on current age and superannuation balance only. As per the initial setting of Khemka and Butt (2017), the choice of assets is between Australian equities and a risk-free asset only, using a real return basis. Equity returns are independent from year to year and distributed according to the daily, rolling actual returns on the S&P/ASX200 Accumulation Index from 1 July 1992 to 31 December 2017, deflated by average weekly earnings. The geometric mean real return on equities is 6.2 per cent per annum, with standard deviation of 14.4 per cent per annum. See Khemka and Butt (2017) for further information.

Results here are not surprising. As can be seen in Figure 1A, optimal equity allocation decreases as age and balance increases, until the cessation of work where the Samuelson (1969) rules apply. (An increase/decrease in the risk aversion parameter would lead to a decrease/increase in the post-retirement equity allocation although the remainder of the Figure 1A structure would remain.) This is consistent with the QSuper MySuper product structure. Figure 1B shows that, for pre-retirement, contributions increase as age increases and balance decreases, showing the need to sacrifice current spending if the superannuation balance is relatively small. Figure 1C shows that, for post-retirement, the withdrawal rate is a fixed proportion of the superannuation balance, which increases with age. This is consistent with the allocated pension minimum drawdown rules. We now introduce Australian social security and tax rules. Not that the impact of the age pension on optimal decisions has previously been investigated by Hulley et al. (2013), with recent changes to means tests investigated by Andreasson and Shavleskar (2017a). Changes made to the above model are:

• a minimum contribution rate of 8.68 per cent (equivalent to the 9.5 per cent SG rate but expressed in terms of the whole salary pack- age) is applied until age 67;
• personal income taxes and Medicare Levy at the 2017/18 rates are applied to the non-superannuation income; concessional contribution tax of 15 per cent is applied to the first $25,000 of contributions every year; and
• the age pension and means tests at the 2017/18 rates are applied for ages 67 and over (the transfer balance cap is not considered as it is outside the bounds of our investigation).

Comparisons between scenarios require reviewing both changes in scale and colour of the figures. Optimal equity allocation results in Figure 2A are much higher than those in Figure 1A, which can be attributed to the age pension acting as a risk-free ‘investment’ allowing additional investment risk to be taken with the superannuation balance. Contribution rates pre-retirement, in Figure 2B, are lower than those of Figure 1B, except where the minimum SG is required. This is because the availability of the age pension necessitates a lower balance for the same level of retirement consumption. Withdrawal rates in Figure 2C are slightly higher than in Figure 1C, particularly at older ages, as the presence of the means-tested age pension makes it optimal to draw down the superannuation balance at a slightly faster rate in order to receive a higher age pension amount.
Figures 2A and 2C also indicate a non-linearity in the impact of balance on the optimal equity allocation and withdrawal rate post-retirement. These impacts are easier to view when isolated to a specific age. We now present equity allocation and withdrawal rate percentages at age 67 in Figure 3.

What is most interesting is the distortive effect of the age pension on the optimal decisions across different balance levels. Looking first at equity allocation, where the balance is just above the maximum level at which the full age pension is available, we can see the distortion in how the age pension affects the optimal allocation. The higher equity allocation and withdrawal rates in the presence of the age pension, as described above, can also be seen in Figure 3.
pension is received, individuals reduce equity allocation from 100 per cent to a minimum of 90 per cent. This is as a result of the upside gain of risky investment being reduced at these balance levels. If investment performance is good, the increase in balance is offset by the reduction in age pension receipt. However, there is no corresponding increase in age pension receipt upon poor investment performance as the age pension cannot exceed the full age pension amount. Hence there is reduced incentive for equity investment at these balance levels. Where the balance is just below the level at which no age pension is received, individuals increase equity allocation back up to 100 per cent. Complementary to above, this is because the downside loss of risky investment has been reduced due to the increase in age pension receipt, without a reduction in upside gain as the age pension cannot decrease below zero. A similarly distortive effect can be observed on withdrawal rates. At balances where the means tests do not apply the withdrawal rate trends to a level of around 4.6 per cent of balance, which is the withdrawal rate without the age pension. However, this increases to a maximum of 9.6 per cent at the balance at which no age pension is received, due to the benefit of additional age pension received as balance decreases. Kinks are observed in the withdrawal rate at the maximum balance where the full age pension is received, as well as at the switch point between the application of the income test and the asset test. Throughout these results, we have assumed a risk aversion parameter of 5. However, this is an arbitrary choice. Academic literature demonstrates the varieties of, and difficulties in measuring, risk aversion across individuals (Dohmen et al., 2011). Figure 4 shows the impact of different risk aversion parameters on the results at age 67 of the tax and social security scenario. While the basic shape of the results is maintained for each risk aversion

**Figure 2A:** Superannuation Equity Allocation (by Age and Balance) — with Tax and Social Security

**Figure 2B:** Contribution Rate (by Age and Balance) as a Percentage of Salary — with Tax and Social Security

**Figure 2C:** Contributions Rate (by Age and Balance) as a Percentage of Salary — with Tax and Social Security

**Figure 3:** Results at Age 67 (by Balance) Across Both Social Security and Tax (SST) Scenarios

**Figure 4:** Impact of Different Risk Aversion Parameters on Results at Age 67 of the Tax and Social Security Scenario

*Note:* The left vertical line represents the maximum balance at which the full age pension is received and the second, that balance beyond which no age pension is received.
The left vertical black line represents the maximum balance at which the full age pension is received and the second, that balance beyond which no age pension is received. The purpose of this paper is to introduce readers to the academic motives, which is included in the Member's Default Utility Function (MDUF) promoted by the Australian Institute of Superannuation Trustees (AIST, 2018). The only exception is at very low balance levels, where for rho > 2 no initial increase in withdrawal rate is observed due to there being no reduction in equity allocation from the 100 per cent maximum at any balance level. This is offset by there being a much greater increase in withdrawal rate as balance increases while the means test applies.

Conclusions

The purpose of this paper is to introduce readers to the academic literature on optimal decision-making and compare this to financial decision-making structures in Australia. It can clearly be seen that the level of risk aversion held by an individual has a significant impact on, in particular, optimal equity allocations. Superannuation funds must consider the likely preferences of their default members in designing default options, and should also consider the implications of tax and social security arrangements in setting any structures that automatically change asset allocations with balance and other factors.

Furthermore, individuals may not have CRRA preferences and other utility approaches could be considered. For example, prospect theory (Kahneman and Tversky, 1979), sets a target level of consumption and assumes a kink in the utility curve at the target point, where losses in utility below the target are particularly severe. Utility can also be extended to allow for bequest motives, which is included in the Member’s Default Utility Function (MDUF) promoted by the Australian Institute of Superannuation Trustees (AIST, 2018).

More broadly, we pose the question of the possible design of ‘smart’ options in future. These might elicit risk preferences from individuals automatically or ‘prod’ individuals into optimal decisions across different stages of their lifecycle. This could include not just the impact of tax and social security (in particular the age pension) as described in this paper, but might also include other elements from the academic literature. Examples are decisions between multiple asset classes (Khemka and Butt, 2017), decisions on housing and home equity release (Andréasson and Shevchenko, 2017b), and the impact of health states and availability of long term care products (Shao et al., 2017). We would expect this research to be of particular benefit in the design of CIPR structures to best meet the needs of individuals.

References


FIGURE 4: RESULTS AT AGE 67 (BY BALANCE) FOR RISK AVERSION (RHO) PARAMETERS 2, 5, 8 — WITH TAX AND SOCIAL SECURITY

NOTE: The left vertical line represents the maximum balance at which the full age pension is received and the second, that balance beyond which no age pension is received.