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Quality investing in an Australian context

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Keywords

Mutual funds, active management, investment performance, fundamental analysis, quality, stock holdings

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Quality investing in an Australian context

Introduction

This study extends a US analysis (Gallagher et al. 2013) of quality as an investment style into the Australian market. The US research indicates that an asymmetric relationship between the DGTW¹-adjusted performance of high and low quality stocks (and funds) exists on average. Specifically, low quality stocks/funds (i.e. those in decile 10) significantly underperform their characteristic-matched benchmarks, though high quality stocks/funds do not generate outperformance on average. However, high quality stocks/funds outperform low quality stocks/funds during times of market stress. This paper investigates these issues in an Australian context using a similar definition of quality and data from 2000 to 2010.

There are a number of reasons why an Australian application is fruitful. Firstly, given an ageing population who will need stable investments to fund their retirement, an understanding of suitable post-retirement equity products is important. Second, Doran et al. (2012) suggest that “a single, poorly-timed negative return event (of around -20%) can raise the probability of [financial] ruin [of one’s superannuation] from 33% to 50% for average life expectancy” (pp. 5-6). Thus, research into equities with a focus on downside protection is important. Third, Money Management (2013) states that investors are moving away from the traditional defensive investment options such as cash and Government bonds due to declining interest rates and bond yields. As a result, Equity-Income funds have emerged as a viable defensive investment option. This study

¹ DGTW refers to the performance evaluation method developed by Daniel, Grinblatt, Titman and Wermers (1997) it involves assigning all stocks to one of 125 benchmark portfolios based on their size, book-to-market and momentum characteristics. Adjusted returns are calculated as the excess of each stock’s raw return, over the value-weighted raw return to its characteristic-matched benchmark portfolio.

investigates the role that active equity funds focusing on ‘quality’ investments could play in the construction of post-retirement products. Moreover, if a portfolio of high quality stocks outperforms a portfolio of low quality stocks in general then the fundamental variables included in the Quality score (hereafter Q-Score) are important measures for the Australian market. Furthermore, if high quality funds provide downside protection then funds exhibiting the characteristics that give rise to a high Q-Score (e.g. profitability, operating efficiency and financial stability) are of interest when i) identifying funds to invest in post-retirement, and ii) when constructing a fund-of-funds to meet post-retirement objectives.

There is a limited body of Australian literature pertaining to accounting ratios and the usefulness of Financial Statement Analysis (e.g. Habib, 2010; Houghton and Woodliff, 1987; Worthington, 1998; Worthington and West, 2004). The literature evaluates accounting metrics individually such as the asset growth effect (Bettman et al., 2011; Dou et al., 2012), profitability (Dou et al., 2012), leverage and liquidity effect (Gharghori et al., 2009). The use of a composite score to assess the quality of stocks, recognising that many financial ratios are correlated, and their performance is therefore valuable. There is a limited literature which investigates accruals quality and earnings management (e.g. Coulton et al., 2005; Gray et al., 2009; Kent et al., 2010; Oei et al. 2008). Furthermore there are only a handful of papers which explicitly consider the relationship between earnings/accruals and stock returns (Chia et al., 1997; Clinch et al., 2012; Cotter, 1996; Hodgson and Clarke, 2000; Loftus and Sin, 1997; Taylor and Wong, 2012). Hence, exploration of quality as an investment style is of interest. The Australian equity fund literature has also not investigated ‘quality’ as an investment

style; its focus has been on; i) manager trading (Fong et al., 2011; Pinnuck, 2003), ii) performance persistence (Humphrey and O'Brien, 2010) and iii) performance evaluation (Fong et al., 2008; Ghaghorri et al., 2007; Heaney, 2008). Furthermore, the quality characteristics of fund managers' holdings have not been analysed.

A Q-Score is constructed for the Australian market in a similar vein to Gallagher et al. (2013). Specifically, the Q-Score is an aggregate of eight fundamental accounting ratios; Return-on-Equity (ROE), Δ ROE, Return-on-Assets (ROA), Δ ROA, Operating Cash Flow (OCF), Δ Asset Turnover, Δ Shares Outstanding, Δ Total Equity. These metrics are selected based on a review of the Australian and international literature on accounting ratios and stock returns (see Gallagher et al., 2013: pp. 5-8 for a detailed discussion of academic papers supporting the inclusion of each metric).

The universe of stocks for which the required accounting and stock return data are available is divided into quintile portfolios. In contrast to the US analysis, a symmetric return relationship is identified whereby high (low) quality stocks outperform (underperform) on average². Specifically, the average DGTW-adjusted return to the portfolio of stocks containing the highest quality stocks (i.e. Quintile 5) is 6.37%, significant at the 5% level. Conversely, the lowest quality stocks underperform by 7.98%; this is also significant at the 5% level. The analysis is also repeated on a subset of stocks held by at least one mutual fund at the time of portfolio formation (March year t). The results are similar overall, although mutual funds appear to avoid the lowest quality stocks with an insignificant DGTW-adjusted return of -2.00% identified for

² In the US, an asymmetric relationship is detected as only low quality stocks significantly underperform on average

Quintile 1. Furthermore, low quality stocks are smaller, more volatile and more sensitive to market movements.

Upon conducting a two-way sort by first dividing stocks into one of three size groups (micro, small and large) and then on the basis of quality, it becomes clear that the result is primarily caused by small stocks. In particular, the highest quality tercile of small stocks generates a statistically significant average DGTW-alpha of 14.02%, while the high quality micro and large stocks generate average returns of 5.04% and 5.72%, which are significant at the 5% and 10% levels, respectively. If stocks are first sorted on size, the strong negative performance for the low quality stocks is not identified. Specifically, small and statistically insignificant positive alphas are determined for the low quality micro, small and large stocks.

Using a unique sample of stock holdings from Russell Investments for long-only Active Australian Equity Mutual Funds the quality analysis is applied to the funds' portfolios. A weighted-average Q-Score is calculated for each fund in March of year t . On an equal-weighted basis the top tercile of funds generates an average annual DGTW-alpha of 2.09%, which is weakly significant over April 2000-March 2010. Similarly, the bottom tercile of funds generates an average DGTW-alpha of 2.17%, which is significant at the 10% level. Statistically significant equally-weighted market-adjusted returns of approximately 4% are also determined for all three fund terciles. However, no statistically significant adjusted performance is detected when asset-weighting is used. This indicates that it is the smaller/boutique funds which are driving the outperformance

within the terciles. Overall, performance is comparable across the terciles, thus weak evidence of the quality return premium is identified at the fund level.

Furthermore, the size and style characteristics of the funds do not differ substantially across the Q-Score sorted fund terciles. Specifically, the average Asset and DGTW³ Size, Book-to-Market and Momentum values determined are similar. This is not surprising given that the overall level of quality of the sample of funds does not differ dramatically e.g. the average Q-Score for Tercile 1 (3) is 4.60 (8.29). Nonetheless, the results for the fund sample are interesting in the sense that, contrary to the US, statistically significant outperformance is generated by high quality funds in Australia. In the US, poor quality funds underperform, however high quality funds do not outperform.

The remainder of this paper is structured as follows; the next section discusses the extant literature, followed by the data and methodology sections, the results and finally the conclusion.

Previous literature

There are a limited number of studies in Australia which focus on Financial Statement Analysis and the use of accounting ratios. Recently, the emphasis has been on investigating which line items on the financial statements are the most informative (Barton et al., 2010; Habib, 2010). Earnings before Tax (EBT) and Net Income (NPAT)

³ In the US the DGTW portfolios are formed based on a five x five x five sort of stocks given their size, book-to-market and momentum characteristics i.e. 125 benchmark portfolios. Given the fact that there are less stocks listed on the ASX the DGTW portfolios are formed based on a five x four x three sort, resulting in 60 benchmark portfolios following Pinnuck (2003).

are determined to have the highest explanatory power in Australia based on the adjusted R^2 from a pooled regression of market-adjusted stock returns on each performance measure and its change, which also controls for industry and time effects. Interestingly, Worthington and West (2004) examine whether the trademarked variant of residual income known as economic value-added (EVA®) is more highly associated with stock returns than other common accounting metrics. The authors use relative information content tests which reveal that returns are more closely associated with EVA® than residual income, earnings and net cash flow, respectively. Previously, Worthington (1998) investigated financial statement analysis using mathematical programming techniques with respect to 30 Australian gold producers. The results indicate that simple ratios are unlikely to provide efficiency rankings similar to those obtained from multiple-input, multiple-output methodologies based on Data Envelopment Analysis. In addition, Houghton and Woodliff (1987) analyse 48 companies (12 failure and 36 non-failure cases) using five variables: the quick ratio, income, dividend policy, cash flow and leverage. The research focuses on both the usefulness of the ratios and whether decision makers are able to interpret them in order to predict firms with relatively higher EPS. The authors emphasise that the quick ratio plays a key role with respect to the successful firms. However, not one test subject significantly outperformed a random model with respect to predicting relative EPS.

In a similar vein, Cotter (1996) examines the relative ability of the accrual and cash flow accounting models to capture events which are relevant to the value of stock returns. She concludes that the relationship between stock returns and earnings is stronger than that for total cash flows for return intervals of between one to 10 years.

Furthermore, cash flows from operations and current accruals are able to recognise value relevant events in a timely manner, while non-current and non-operating accruals only become consistently relevant when longer return intervals are considered. Furthermore, Loftus and Sin (1997) examine the role of accruals in the relationship between stock returns and earnings for intervals of one to four years. The results suggest that accruals strengthen the association between stock returns and earnings and that they are more important for shorter intervals. Hodgson and Clarke (2000) indicate that a nonlinear relationship between stock returns and earnings (and stock returns and cashflows) exists. In addition, Chia et al. (1997) compare aggregated earnings and disaggregated earnings (cash from operations, accruals and non-current accruals) in terms of their association with stock returns. Disaggregated earnings are determined to have a stronger relationship with stock returns, even when using simple techniques such as linear regression.

Most recently, Clinch et al. (2012) investigate whether there is evidence of the accrual anomaly in Australia. The results generally support the existence of the anomaly although returns to a hedged portfolio trading strategy are statistically significant only in the first year and the results are attributable to a limited number of firm-year observations in the extreme positive tail of returns. Taylor and Wong (2012) show that evidence of an accrual anomaly in Australia is sensitive to research design specifications such as the choice of total accruals measurement, the definition of abnormal returns, how outliers are treated and the use of value versus equal weighting of returns. Related literature indicates that other accounting anomalies such as the asset growth effect (Bettman et al., 2011; Dou et al., 2012), profitability (Dou et al., 2012),

leverage and liquidity effects (Gharghori et al., 2009) are not prevalent in the Australian equity market. Dou et al. (2012) determine that the existence of the profitability (ROA), asset growth and accrual anomalies is primarily driven by micro-capitalisation stocks.

Overall, the accounting literature has focused on profitability and financial stability metrics, though these have been studied individually. However, both the profitability metrics (ROA, accruals and operating cash flow) and the financial stability metrics (working capital/assets, leverage) are relevant to the Australian equity market. Accordingly, investigation into the relationship between stock returns and a composite measure is warranted. In addition there is support for the use of a non-linear approach.

Coulton et al. (2005) investigate earnings quality by focusing on ‘benchmark beaters’ which are Australian firms that report small profits and/or small increases in earnings, which may be considered indicative of upward earnings management. The authors use unexpected accruals to capture this ‘benchmark beating’ earnings management and the results show that the unusual kink around zero in the distribution of earnings levels or earnings changes is not caused by earnings management. Accruals quality has also been investigated in relation to corporate governance (Kent et al., 2010); the cost of capital (Gray et al., 2009) and earnings persistence (Oei et al., 2008). However, quality as an investment style has not been researched in Australia to our knowledge.

To date, the equity mutual fund literature has not explored whether fund managers hold quality stocks and whether high quality stocks are related to fund performance. Pinnuck (2004) finds strong evidence that fund managers prefer large, liquid and low volatility

stocks. Covrig et al. (2006) analyse the portfolio holdings characteristics of foreign and domestic fund managers in 11 developed markets including Australia. The authors conclude that “both groups of managers prefer stocks with high return on equity, large turnover, and low return variability. Domestic managers also favor firms that pay large dividends, have low financial distress and high growth potential, whereas foreign managers prefer to invest in corporations that are globally well known” (p. 407).

Recent Australian equity fund research relates to manager trading and trade performance. Fong et al. (2011) aggregate manager trades over time into trade packages and find that packages which use multiple brokers are associated with less follower trades. Furthermore, they generate higher positive adjusted returns than single-broker packages over horizons up to one year. Similarly, Pinnuck (2003) examines the performance of the individual trades of Australian fund managers determining that the stocks they buy realise abnormal returns whereas there is no evidence of abnormal returns for sell trades.

Furthermore, the extant equity fund literature focuses on performance persistence and evaluation. Humphrey and O’Brien (2010) find no evidence of performance persistence for Australian fund managers using the Carhart (1997) performance evaluation model. In addition, Fong et al. (2008) propose adjustments to the DGTW (1997) performance evaluation methodology. In particular, the characteristic benchmarks are updated monthly and neutrality to the S&P/ASX 300 is ensured. The modified benchmarks are characterised by statistically different and lower tracking error. Interestingly, Heaney (2008) empirically tests Berk and Green’s (2004) model of a superannuation fund

industry with a limited population of superior fund managers and a competitive investor market. Australian Morningstar Retail and Wholesale equity fund data from 1995-2005 is used and support for Berk and Green's (2004) predictions is found. Finally, Gharghori et al. (2007) indicate that investors chase funds that have performed well in the past and that cash flows to funds are persistent.

There is also a body of multi-sector fund research which concentrates on performance evaluation (Gallagher, 2003; Holmes and Faff, 2004), performance persistence (Bilson et al., 2005; Dempsey, 2009), fund ratings (Faff et al., 2007; Gerrans, 2006), asset allocation (Benson et al., 2007), time-changing alpha (Heaney et al., 2007) and tournament behaviour (Hallahan et al., 2008).

Data

The accounting data used to compute the Q-Score are sourced from the Aspect Financial database via FinAnalysis for all firms with financial year end data from January 1989- December 2008. Table 1 outlines how each signal is calculated⁴. The individual metric values are scaled by the population median for the prior fiscal year⁵. These scaled metric values are winsorised at the 1st and 99th percentiles.

INSERT TABLE 1

⁴ The variability metrics Sales Growth and ROA variability have not been included in the Australian analysis as they require a four year history of data which results in the overall Q-Score results only being able to be calculated robustly from 2002 onwards as the first year in which the variability metrics have data is 1995 and then seven years of data are required to compute the parameter estimates (i.e. 1995-2001). These parameter estimates are used to compute the Q-Score in March 2002, hence the first period of return analysis is from April 2002-March 2003 (whereas upon exclusion the return series commences in April 2000). Furthermore, the average β_1 and β_2 estimates for Sales Growth variability are 0 and thus this metric does not contribute to the Q-Score. Similarly, the ROA variability parameter estimates are very small and therefore they do not have a strong impact on the Q-Score either.

⁵ The results are similar when the individual metric values are scaled by the industry median for the prior fiscal year using the CRIF industry assignments instead of the population median.

Stock level data such as returns (which account for capitalisation changes and dividends) and market capitalisation are obtained from the Share Price and Price Relative (SPPR) database from Sirca Limited. Our excess return computation is based on the Daniel, Grinblatt, Titman and Wermers (DGTW) (1997) characteristic benchmark approach⁶. DGTW benchmarks are calculated by first sorting stocks into five groups based on size (market capitalisation as at December of the year prior), then into four groups based on book-to-market (for the prior fiscal year) and then into three groups based on momentum (for prior one year skip one month as at December of the year prior). Adjusted returns are thus calculated by subtracting the return to a stock's DGTW benchmark from its raw return. The sample consists of all stocks listed on the ASX which comprise the Aspect/SPPR/DGTW universe. Returns are computed from April 2000 to March 2010.

Financial firms are excluded given that certain metrics such as leverage and accruals are not consistent for firms in this sector (Taylor and Wong, 2012) i.e. stocks with GICS codes between 4000-4099 are excluded. If the GICS code is missing then the CRIF industry class code is used, and stocks classified as 18 to 22 (i.e. financial firms) are excluded. Furthermore, only Ordinary/Common Shares are included.

The mutual fund analysis is undertaken using a sample of managers from the Russell Investments research database, which contains monthly stock holdings for long-only Australian active equity fund managers. The dataset was constructed by Bennett et al.

⁶ The authors are grateful to Adrian Lee for providing valuable programming assistance to calculate the DGTW (1997) benchmarks for Australia.

(2012)⁷. The authors state that there is no minimum survival requirement for a fund to be included in their database, thus it is unlikely to exhibit survivorship bias. The authors also indicate that selection bias is minute, establishing this by comparing the performance of new funds and pre-existing funds. Bennett et al. (2012) provide a detailed discussion of the dataset.

INSERT TABLE 2

Table 2 provides descriptive statistics for the sample which contains stock holdings for 232 unique funds over 2000-2010. The average return presented for each year is the annualised mean monthly return. The funds' performance is strongest on an adjusted basis in 2007, with a DGTW-alpha of 3.65%. However, once the GFC sets in the funds underperform with mean alphas of -3.54% and -4.17% in 2008 and 2009, respectively. The average DGTW size quintiles, book-to-market quartiles and momentum terciles are similar across the sample period years. The funds prefer large stocks as the average size quintile is about four in every year. They also prefer stocks toward the growth end of the value-growth spectrum and stocks with moderate momentum. The number of stocks held is similar across the years ranging from 49 to 58. The value of assets under management is relatively stable throughout the sample period.

Methodology

In order to calculate a Q-Score for each stock the weights to be applied to each accounting metric must first be determined. This is achieved by using OLS regression.

⁷ The number of funds used in Bennett et al. (2012) and this study differs as the authors make various exclusions relevant to their analysis which are not made in this paper e.g. the removal of small-capitalisation funds.

Recently, Zhu (2012) indicates that the use of ratios with common divisors in a multivariate regression setting can lead to spurious test statistics, as the true confidence levels differ to the standard conventions. In this study, a number of the accounting ratios have been scaled by divisors which are correlated with each other, and the divisor of returns (the dependent variable). Therefore, to ensure the results and inferences made are not spurious, a univariate regression approach is employed. Specifically, the weights to apply to each metric and its square are ascertained by running a series of expanding-window univariate regressions as per Equation (1) below.

$$y = \beta_0 + \beta_1 x + \beta_2 x^2 + \varepsilon \quad (1)$$

where y represents DGTW alpha- the dependent variable, β_0 represents the intercept, β_1 represents the parameter estimate for the metric in question- x , β_2 represents the coefficient estimate for the squared value of the metric in question and ε represents the error term.

The standard financial year end month for Australia is June. However, there are still a considerable number of firms using a December financial year end. Therefore, portfolios are formed in March of each year t . This allows a three month gap prior to portfolio formation to ensure the accounting data are publicly available. DGTW-adjusted returns are thus computed from April of year t to March of year $t+1$. The annual DGTW-alpha values for each stock are regressed on the accounting metrics x and x^2 for the prior fiscal year.

Expanding regressions are run over 10 subsets commencing with a historical period of 1992-1998 and the parameter estimates obtained are then applied to the accounting metric values for 1999 as per Equation (2) below. The final regression uses a historical period of 1992-2007; the parameter estimates are applied to the metric values for 2008 to compute the Q-Score. The β_1 and β_2 parameter estimates for the 10 expanding regressions are not statistically significant for ACC, ATO, LEV or LIQ therefore these four metrics are omitted when computing the Q-Score.

$$Q-Score^8 = \sum_{i=1}^8 \beta_{1,i} Metric_i + \sum_{i=1}^8 \beta_{2,i} Metric_i^2 \quad (2)$$

where $\beta_{1,i}$ is the parameter estimate for metric i and $\beta_{2,i}$ is the parameter estimate for the square of metric i .

Raw and DGTW-adjusted returns for Q-Score portfolios are then examined over 10 periods; the first portfolio formation occurs in March 2000, based on the Q-Score for 1999, and returns are then examined from April 2000 to March 2001. The final portfolio formation occurs in March 2009 based on the Q-Score for 2008 and then returns are generated from April 2009 to March 2010.

Results

⁸ As a robustness test an alternative approach to aggregating the metrics included in the Q-Score is undertaken. In a similar vein to Piotroski (2000) a binary scoring system is used; if a stock's ROE, ΔROE , ROA, ΔROA and OCF is positive then indicator variables 1 to 5 equal one, zero otherwise and if a stock's ΔATO , ΔSH and ΔTE is negative then indicator variables 6 to 8 equal one, zero otherwise. The Q-Score is the sum of the eight indicator variables, therefore the Q-Score values range from 0 to 8. The average return results generated using this method are consistent with the results presented in this paper.

Univariate results

Table 3 presents average coefficient estimates for each metric based on the 10 expanding univariate regressions. Refer to Appendix A for a detailed summary of the coefficient estimates for each regression. Table 3 shows that the profitability metrics OCF, Δ ROA and to a lesser extent ROE and ROA have a strong positive relationship with DGTW-alpha. In general, the parameter estimate results are qualitatively similar to those for the US.

INSERT TABLE 3

Interestingly, OCF is characterised by a non-linear relationship with stock returns which follow a U-shape (indicated by the positive β_2 estimate of 29.30). This is consistent with the US results. The largest average negative β_1 estimate is -11.22 for Δ ATO, which is characterised by a slight inverted U-shape, thus large increases/decreases in asset turnover are not favourable e.g. if a dramatic increase in asset turnover is fuelled by a substantial fall in product price. In contrast, the parameter estimates for Δ ATO in the US ($\beta_1 = -0.30$, $\beta_2 = -3.11$) indicate that it does not have a strong relationship with alpha. Δ TE has a negative relationship with DGTW-alpha given its β_1 estimate of -4.84, which is consistent with Donaldson's (1961) Pecking Order Theory. In particular, if equity is considered a less preferred means to raise capital, by issuing new equity managers are signalling to investors that the firm is overvalued, thus an increase in TE leads to a decrease in stock returns.

Multivariate results for stock universe

Table 4 reports descriptive statistics for the universe of stocks sorted into quintiles based on their Q-Score in March of each year t .

INSERT TABLE 4

The average Q-Score for the low quality stocks is -25 compared to 12 for the high quality stocks. On average stocks in the lowest quality quintile perform particularly poorly with a DGTW-adjusted return of -7.98%, which is significant at the 5% level⁹. Conversely, stocks in the highest quality quintile outperform generating an average DGTW-adjusted return of 6.37%, which is significant at the 5% level. Stocks in the lowest quality quintile are more sensitive to market movements with an average beta of 1.45¹⁰. Market-adjusted returns are also presented as these are commonly referred to by industry participants, particularly when gauging fund performance, which is examined in a later section. The market-adjusted returns show a similar pattern to the DGTW-adjusted returns, although they are statistically insignificant¹¹. However, a paired sample t -test of the difference in means between Quintiles 1 and 5 reveals that the high quality stocks' market-adjusted returns are 19.95% higher on average than those for Quintile 1 and this difference is significant at the 10% level. In addition, the tracking

⁹ The quintile results are similar when the Aspect/SPPR/DGTW universe is limited to the top 500 stocks based on market capitalisation as at December year $t-1$. Furthermore, when the Top 10 stocks based on market capitalisation are removed the results are similar and more pronounced e.g. average DGTW-alpha for Quintile 1 (5) is -8.31% (14.45%), significant at the 5% (1%) level. The results are also consistent when only stocks with a June financial year end are used and returns are computed from October year t to September year $t+1$.

¹⁰ Beta is calculated based on the following regression model estimated over the prior 60 months: $y = \beta_0 + \beta_1 x + \varepsilon$ where y is the raw stock return and x is the S&P/ASX 300 return both x and y are in excess of the 30 day BAB rate.

¹¹ Furthermore, the pattern of excess returns computed using a one-factor CAPM and four-factor Carhart (1997) model are also consistent with the results presented in the paper. Specifically, the average CAPM (Carhart) alpha for Quintile 1 is -3.81% (-6.87%) and for Quintile 5 it's 3.19% (3.91%). Furthermore, a paired sample t -test of the difference in means between Quintiles 1 and 5 shows that using a CAPM model high quality outperforms low quality by 7.00% (10.78%) on average and this difference is significant at the 1% (5%) level.

error of the quality portfolios almost monotonically decreases moving from the low to the high quality end of the spectrum. Furthermore, there is a direct (inverse) relationship between size (volatility) and quality.

INSERT FIGURE 1

Figure 1 shows the performance of the Q-Score quintiles using the stock universe over portfolio formation years 2000-2009. Quintile 2 performs strongly in 2000 with an average DGTW-alpha of 19.84%. However, in the aftermath of the dot-com crash the lower quality quintiles perform very poorly with average returns of -25.21% and -10.23% for Quintiles 1 and 2, respectively. In contrast, the higher quality quintiles provide downside protection generating positive DGTW-alphas in 2001. High quality stocks perform very well in 2003, 2004 and 2005 generating average DGTW-alphas of 13.66%, 19.81% and 15.66%, respectively. In 2007 all quintiles outperform except for the lowest quality quintile which underperforms by 9.93%. Amid the GFC in 2008 only Quintiles 4 and 5 avoid negative returns with small positive DGTW-alphas of 0.79% and 0.95% determined. In 2009 Quintiles 1 and 2 recover strongly achieving alpha of 9.18% and 24.27%, respectively, whilst Quintile 5 underperforms slightly with a -2.47% DGTW-alpha.

INSERT TABLE 5

The analysis is also repeated on a subset of stocks which are held by at least one mutual fund in the Russell Investments universe in March of each year t ¹². Table 5 demonstrates that Australian mutual funds avoid the poorest quality stocks; the average Q-Score is -17 compared to -25 for the universe. Furthermore, the average excess return to Quintile 1 is an insignificant -2.00%. The mutual funds also hold larger stocks on average with the mean market capitalisation for each quintile falling above that for the universe.

INSERT FIGURE 2

Figure 2 shows the performance of the Q-Score quintiles using the subset of stocks which are held by at least one mutual fund as at March of year t over portfolio formation years 2000-2009. In general, the performance of this subset over time is similar to that for the universe.

INSERT TABLE 6

Table 6 provides returns for the Q-Score sorted stock quintiles in up versus down market months over April 2000 to March 2010. The DGTW-adjusted and market-adjusted performance of the quintiles does not vary greatly during up market months. However, on a DGTW-adjusted basis Quintile 1 (5) stocks perform the worst (best) using value-weighting (VW) or equal-weighting (EW). In particular, the return to Quintile 1 (5) is 0.07% (5.98%) using VW and -1.07% (4.37%) using EW. On a market-adjusted VW basis the Quintile 5 stocks perform stronger than Quintile 1, however the

¹² The active-weighting approach used in the US Quality paper has not been applied to the subset of stocks held by at least one mutual fund as it is problematic given the Australian market is concentrated and dominated by a number of large stocks.

average return for Quintile 2 is the highest at 9.13%. On an EW basis Quintiles 1 and 5 perform similarly and Quintile 2 performs the strongest with returns of 4.33%, 4.22% and 8.19%, respectively.

The downside protection offered by quality stocks is clear when examining the returns across the down market months. On a DGTW-adjusted VW basis Quintile 1 stocks underperform considerably with a mean return of -16.64% compared to Quintile 5 stocks which are the only group to avoid negative returns, achieving a small positive return of 1.51%. Similarly, on a market-adjusted VW basis Quintile 1 stocks perform very poorly with an average return of -17.60% compared to 6.02% for Quintile 5. On a DGTW-adjusted EW basis Quintile 1 stocks underperform with a return of -5.33%, compared to positive returns for the higher quality Quintiles 4 and 5 of 6.44% and 3.74%, respectively. Finally, on a market-adjusted EW basis Quintile 1 incurs a negative return of -4.25%, whilst all other quintiles avoid underperforming.

Multivariate results for stock universe by size category

All stocks are sorted into one of three size categories: micro (<70%), small (70-90%) or large (>90%) based on their December year $t-1$ market capitalisation following Dou, Gallagher and Schneider (2012)¹³. Table 7 provides average returns and characteristics for terciles of stocks within the three size group classifications.

INSERT TABLE 7

¹³ The average number of stocks in each tercile is similar to the average number in each quartile for Dou et al. (2012). Furthermore, the results are qualitatively similar when stocks are sorted into quartiles within each size group. The results are also qualitatively similar when the subset of stocks held by at least one mutual fund is used for the size breakdown analysis.

There are a greater number of micro stocks on average, followed by small and finally large stocks. The difference in size between the three groups is very clear e.g. the average size for the high quality micro stocks is \$3m compared to \$2012m for the high quality large stocks. Furthermore, the low quality micro stocks are very poor quality with an average Q-Score of -27, compared to -8 for the small stocks and 0 for the large stocks.

The highest quality tercile of stocks within each size group generates statistically significant positive DGTW-adjusted returns. The top quality micro stocks generate average alpha of 5.04%, which is significant at the 5% level. The highest quality small stocks perform the strongest with a statistically significant average DGTW-adjusted return of 14.02%. Finally, Tercile 3 within the large stock group generates an average DGTW-alpha of 5.72%, which is significant at the 10% level. Thus, the quality return premium identified at the stock level is pervasive across the size groups. The volatility measures for the micro stocks show a similar pattern- as quality increases, volatility monotonically decreases. Furthermore, the volatilities across the quality terciles are higher for micro stocks, followed by small and then large stocks. Within the small and large size groups the low quality stocks have higher volatilities than the high quality stocks.

In relation to beta the low quality micro stocks are the most sensitive to market movements with an average beta of 1.35. The market-adjusted returns across the size groups monotonically increase moving from the low to high quality terciles; however none of these returns are statistically significant. Across the size categories the tracking

error is higher for the micro stocks, followed by small and then large stocks. The low quality micro stocks have the highest tracking error at 7.13%. Whereas, the tracking error is relatively similar across the quality terciles within the small and large size groups.

INSERT FIGURE 3

Figure 3 shows the performance of the quality terciles within the micro size group subset over 2000-2009. In 2000 stocks of moderate quality i.e. those in Tercile 2 outperform substantially with an average DGTW-alpha of 14.62%. In 2001 the low-moderate quality micro stocks perform very poorly with Terciles 1 and 2 incurring average returns of -18.37% and -7.74%, respectively, compared to the highest quality stocks which generate an average return of 11.01%. All stock terciles achieve positive returns in 2007, although the low quality stocks performance is muted compared to Terciles 2 and 3. The lowest quality micro stocks underperform in 2008 by -5.55%, however they recover very strongly in 2009 with an average DGTW-alpha of 31.95%. Whereas, the highest quality micro stocks avoid underperforming amid the GFC in 2008, however in 2009 they underperform by -8.50%.

INSERT FIGURE 4

Figure 4 shows the performance of the quality terciles within the small size group subset over 2000-2009. Small stocks of moderate quality (Tercile 2) underperform in 2000 by -6.95%, Tercile 3 performs the strongest with an average DGTW-alpha of 17.06%. Small stocks in Tercile 3 perform particularly strongly in 2001, with a mean DGTW-alpha of 32.07%. All small stocks generate positive DGTW-alpha in 2007, in

2008 it is the high quality small stocks which perform the worst with an average alpha of -10.15%. However it is the top quality tercile which posts the strongest recovery in 2009 with an average DGTW-alpha of 57.18%.

INSERT FIGURE 5

Figure 5 shows the performance of the quality terciles within the large size group subset over 2000-2009. The highest quality large stocks underperform slightly in 2000. However, in 2001 it's the lowest quality large stocks which underperform slightly, whilst Tercile 2 stocks outperform significantly with an average DGTW-alpha of 12.23%. The highest quality large stocks outperform significantly in 2003, 2004 and 2005, whilst low quality stocks underperform in 2003 and 2004. In 2007 the high quality large stocks generate the highest average DGTW-alpha at 13.04%¹⁴. Low and high quality stocks avoid underperforming in 2008. However, Tercile 1 underperforms significantly in 2009, with an average alpha of -12.94% whilst stocks in Tercile 3 perform relatively better incurring an average alpha of -5.80%.

In summary, the average and time-series performance of stocks segregated based on quality and on size, and then quality indicate two key trends. Firstly, there is a quality return premium to stocks which are of high quality as measured by the Q-Score. Secondly, quality stocks have historically provided downside protection during crises such as the dot-com crash and to a lesser extent the GFC.

Multivariate results for mutual fund sample

¹⁴ In 2007 and 2008 no stocks are classified into Tercile 2, therefore return data for these two years is missing for Tercile 2.

The Russell Investments research database is used to test the performance of long-only Australian Active Equity fund managers segregated on the basis of portfolio quality. Table 8 provides return and portfolio characteristics of terciles which have been formed by sorting funds based on the weighted-average Q-Score for their portfolios in March of year t . The weight applied to each stock is its holding value as at March of year t . Returns are then examined for each tercile from April of year t to March year $t+1$. The average return to each tercile is computed each month using all funds which existed in that month. The annual return is then computed as the simple compound of these 12 monthly averages. Thus, the results are free from survivorship bias. Asset-weighted returns are calculated by weighting the return to each fund by its assets as at the end of the prior month.

INSERT TABLE 8

There are 204 unique funds for which Q-Scores can be computed over 2000-2009, whilst on average there are 33-36 funds in each tercile every month. The average Q-Scores do not differ substantially across the terciles- the mean Q-Score for Tercile 1 is 4.60 compared to 8.29 for Tercile 3. Furthermore, the average size of each fund is similar with average assets of \$1248m, \$1612m and \$1463m for Terciles 1, 2 and 3, respectively. Given that the Q-Scores and size for the terciles are similar is perhaps not surprising that the performance of the funds does not differ substantially across the terciles. On an equal-weighted basis the top tercile of funds generates an average annual DGTW-alpha of 2.09%, which is significant at the 10% level over April 2000-March 2010. Similarly, the bottom tercile of funds generates an average DGTW-alpha of 2.17%, which is significant at the 10% level. Furthermore, on an equally-weighted

market-adjusted basis the top tercile of funds generates an average annual return of 3.94%, significant at the 5% level. Tercile 2 also achieves significant market-adjusted performance of 3.52%. Finally, Tercile 1 generates a weakly significant average return of 3.70%. However, upon value-weighting by assets no statistically significant returns are identified across the terciles. Furthermore, the DGTW size quintile, book-to-market quartile and momentum terciles means for each tercile are very similar. It seems that Australian funds are quite homogeneous with respect to the quality of the stocks in which they invest.

Figure 6 shows the performance of the Q-Score sorted mutual fund terciles for portfolios formed in March of year t over 2000-2009. The returns presented are asset-weighted DGTW-alphas from April of year t to March of year $t+1$. In 2001 the top quality tercile provides some downside protection given the downturn following the dot-com crash with an average DGTW-alpha of 0.99% compared to -4.27% for the low quality funds. In 2007 all terciles generate positive returns- the return to Tercile 1 is 0.92%, compared to 3.55% and 0.34% for Terciles 2 and 3, respectively. Amid the GFC all terciles of funds underperform, the average DGTW-alpha is -6.23%, -2.98% and -5.72%, for Terciles 1, 2 and 3, respectively. The underperformance continues into 2009 for Terciles 2 and 3; however the low quality funds recover slightly with an average DGTW-alpha of 0.53%.

Thus, the quality effect at the fund level is weaker than at the stock level. The level of quality of the funds across the terciles is similar and thus similar performance is not surprising. In light of this, the fund analysis demonstrates that high quality mutual funds in Australia generate positive outperformance on a market-adjusted basis.

Conclusion

This paper provides an examination of Quality as an investment style in the Australian market over April 2000- March 2010. A symmetric relationship between DGTW-alpha and quality stocks is determined with stocks in the highest (lowest) quintile achieving (incurring) an average return of 6.37% (-7.98%) which is significant at the 5% level, over the sample period. Thus, a quality return premium exists in the Australian market. Furthermore, this result is pervasive throughout the market with high quality micro, small and large stocks all exhibiting a similar effect. Analysis of the performance of quality stocks in up versus down markets reveals the downside protection offered by quality stocks. In addition, quality stocks have historically provided security during financial market crises such as the tech crash and to a lesser extent the GFC.

This research has a number of implications for the wealth management industry within Australia. Firstly, the research emphasises that financial statement analysis (still) plays an important role within the Australian market in terms of stock picking and investment strategy development. Moreover, the Quality return premium identified confirms that the fundamental variables included in the Q-Score are important measures to consider

when analysing ASX listed stocks. This is a key takeaway for Self-Managed Super Fund investors as it provides a structured approach to analysis of stocks with the objective of generating returns and withstanding crisis environments. In relation to the development of suitable post-retirement products, (high) Quality appears to be an exploitable return generation avenue, which is characterised by a sound accounting foundation and a low level of risk (particularly relative to low quality stocks).

Furthermore, given the strong stock return results both on average and over time, including during crises, quality as an investment style appears relevant to retirees given the return/risk relationship apparent. Thus, this research provides a strong foundation for a Quality focused approach to post-retirement portfolio construction. Further research investigating how investment vehicles at the stock level could be used within a portfolio developed with post-retirement objectives is warranted.

The quality analysis is also extended to a sample of stock holdings for long-only Australian Active Equity Mutual Funds. The level of quality of the funds in the sample is similar and therefore the performance across Q-Score sorted fund terciles does not differ substantially. However, a key insight from the investigation is that high quality funds generate statistically significant DGTW-alpha (market-adjusted returns) of about 2% (4%) on an equally-weighted basis over the sample period. However, no statistically significant DGTW- or market-adjusted returns are identified when asset-weighting is

used. Thus, weak evidence that the return premium also exists at the fund level is determined.

In terms of the role that quality funds could play with regards to post-retirement investments, the evidence on the performance of the funds during financial crises is mixed. In 2001 the lowest quality tercile underperforms whilst the top two outperform, however in 2008 during the GFC all funds underperform. Given that funds in all terciles underperform in 2008 it appears that high quality funds are not a panacea to possible future market crises. Although, the Quality return premium identified is weaker at the fund level, it is worthwhile considering active equity funds along the dimensions highlighted as important indicators of Quality.

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APPENDIX A

Univariate Regression Results

Subset	β_1	Standard Error	t -statistic	p -value	β_2	Standard Error	t -statistic	p -value	Year β_1 & β_2 Applied to Metric Value
Return on Equity (ROE)									
1	15.49***	4.44	3.49	0.00	2.00	1.34	1.50	0.14	1999
2	14.99***	3.88	3.86	0.00	1.70	1.18	1.44	0.15	2000
3	13.22***	3.37	3.93	<.0001	1.32	1.04	1.28	0.20	2001
4	12.55***	3.03	4.14	<.0001	1.44	0.93	1.55	0.12	2002
5	12.61***	2.98	4.22	<.0001	1.29	0.92	1.40	0.16	2003
6	13.03***	2.70	4.82	<.0001	1.21	0.84	1.45	0.15	2004
7	11.55***	2.52	4.59	<.0001	1.23	0.77	1.59	0.11	2005
8	10.80***	2.35	4.60	<.0001	1.17*	0.71	1.65	0.10	2006
9	10.48***	2.17	4.83	<.0001	1.36*	0.65	2.11	0.04	2007
10	8.76***	1.97	4.45	<.0001	1.09*	0.59	1.86	0.06	2008
Change in ROE									
1	8.86**	4.35	2.04	0.04	-0.51	2.04	-0.25	0.80	1999
2	8.39**	3.86	2.18	0.03	-0.73	1.81	-0.40	0.69	2000
3	6.93**	3.39	2.05	0.04	-0.85	1.58	-0.54	0.59	2001
4	6.24**	3.02	2.07	0.04	-0.86	1.43	-0.60	0.55	2002
5	7.17**	2.93	2.44	0.01	-1.19	1.39	-0.86	0.39	2003
6	6.57**	2.66	2.47	0.01	-1.74	1.26	-1.38	0.17	2004
7	5.93**	2.52	2.35	0.02	-1.49	1.19	-1.24	0.21	2005
8	5.73**	2.35	2.44	0.01	-1.79	1.11	-1.61	0.11	2006
9	5.01**	2.15	2.34	0.02	-1.74*	1.02	-1.71	0.09	2007
10	4.20**	1.92	2.19	0.03	-1.64*	0.91	-1.80	0.07	2008
Return on Assets (ROA)									
1	-0.42	11.16	-0.04	0.97	-1.08	5.11	-0.21	0.83	1999
2	5.92	9.67	0.61	0.54	0.59	4.41	0.13	0.89	2000
3	13.13	8.52	1.54	0.12	3.86	3.83	1.01	0.31	2001
4	14.20*	7.49	1.90	0.06	4.26	3.42	1.25	0.21	2002
5	10.91	7.27	1.50	0.13	2.16	3.35	0.64	0.52	2003
6	11.83*	6.56	1.80	0.07	2.77	3.01	0.92	0.36	2004
7	11.71*	6.11	1.92	0.06	3.68	2.76	1.34	0.18	2005
8	12.25**	5.64	2.17	0.03	3.93	2.54	1.55	0.12	2006
9	12.47**	5.09	2.45	0.01	4.22*	2.28	1.85	0.06	2007
10	10.86**	4.56	2.39	0.02	3.74*	2.07	1.81	0.07	2008
Change in ROA									
1	29.39***	8.59	3.42	0.00	-0.74	8.45	-0.09	0.93	1999
2	28.04***	7.68	3.65	0.00	-2.52	7.65	-0.33	0.74	2000
3	24.59***	6.78	3.63	0.00	0.22	6.69	0.03	0.97	2001
4	22.26***	5.98	3.72	0.00	-0.98	5.99	-0.16	0.87	2002
5	19.50***	5.71	3.41	0.00	-4.03	5.80	-0.69	0.49	2003
6	16.91***	5.18	3.26	0.00	-5.39	5.29	-1.02	0.31	2004
7	13.66***	4.85	2.82	0.00	-5.99	4.95	-1.21	0.23	2005
8	12.80***	4.50	2.85	0.00	-6.10	4.57	-1.34	0.18	2006
9	11.30***	4.08	2.77	0.01	-5.24	4.11	-1.28	0.20	2007
10	9.19**	3.61	2.55	0.01	-4.38	3.62	-1.21	0.23	2008
Operating Cash Flow									
1	11.64	13.54	0.86	0.39	37.28**	16.63	2.24	0.03	1999
2	15.85	11.85	1.34	0.18	35.16**	14.50	2.42	0.02	2000
3	24.89**	10.57	2.36	0.02	36.87***	12.83	2.87	0.00	2001
4	26.91***	9.42	2.86	0.00	35.87***	11.47	3.13	0.00	2002
5	20.36**	9.17	2.22	0.03	30.61***	11.06	2.77	0.01	2003
6	20.14**	8.31	2.42	0.02	25.15**	9.86	2.55	0.01	2004
7	16.11**	7.83	2.06	0.04	21.31**	9.15	2.33	0.02	2005
8	17.54**	7.34	2.39	0.02	23.24***	8.44	2.75	0.01	2006
9	19.55***	6.67	2.93	0.00	24.08***	7.70	3.13	0.00	2007
10	19.08***	6.14	3.11	0.00	23.47***	7.00	3.36	0.00	2008

APPENDIX A- <i>Continued</i>									
Subset	β_1	Standard Error	t - statistic	p -value	β_2	Standard Error	t - statistic	p -value	Year β_1 & β_2 Applied to Metric Value
Accruals									
1	-1.21	14.52	-0.08	0.93	-10.37	21.02	-0.49	0.62	1999
2	0.23	12.79	0.02	0.99	-11.29	18.10	-0.62	0.53	2000
3	-3.41	11.58	-0.29	0.77	-12.84	16.44	-0.78	0.44	2001
4	-2.95	10.41	-0.28	0.78	-12.64	14.38	-0.88	0.38	2002
5	3.17	10.23	0.31	0.76	-3.36	14.00	-0.24	0.81	2003
6	3.95	9.37	0.42	0.67	1.27	12.56	0.10	0.92	2004
7	7.99	8.85	0.90	0.37	8.91	11.91	0.75	0.45	2005
8	7.99	8.31	0.96	0.34	5.17	11.21	0.46	0.64	2006
9	4.40	7.65	0.58	0.57	1.06	10.17	0.10	0.92	2007
10	4.47	6.96	0.64	0.52	1.51	9.18	0.16	0.87	2008
Asset Turnover (ATO)									
1	-5.48	3.64	-1.50	0.13	1.06	1.03	1.03	0.31	1999
2	-3.68	3.21	-1.15	0.25	0.82	0.91	0.89	0.37	2000
3	-2.30	2.89	-0.80	0.43	0.84	0.81	1.04	0.30	2001
4	-0.63	2.59	-0.24	0.81	0.52	0.72	0.72	0.47	2002
5	-2.36	2.57	-0.92	0.36	0.84	0.72	1.17	0.24	2003
6	-2.10	2.37	-0.88	0.38	0.77	0.66	1.17	0.24	2004
7	-2.71	2.29	-1.18	0.24	0.78	0.63	1.24	0.21	2005
8	-2.57	2.18	-1.18	0.24	0.84	0.60	1.39	0.17	2006
9	-2.02	2.05	-0.98	0.33	0.65	0.57	1.14	0.26	2007
10	-1.81	1.93	-0.94	0.35	0.59	0.54	1.09	0.28	2008
Change in ATO									
1	-16.76**	7.31	-2.29	0.02	5.44	3.58	1.52	0.13	1999
2	-13.46**	6.39	-2.11	0.04	4.91	3.12	1.57	0.12	2000
3	-13.76**	5.67	-2.43	0.02	6.11	2.72	2.24	0.02	2001
4	-12.31**	4.98	-2.47	0.01	5.69	2.41	2.36	0.02	2002
5	-11.37**	4.89	-2.32	0.02	4.59	2.38	1.93	0.05	2003
6	-10.27**	4.50	-2.28	0.02	4.06	2.20	1.85	0.06	2004
7	-10.93**	4.27	-2.56	0.01	3.93	2.09	1.88	0.06	2005
8	-8.89**	4.03	-2.20	0.03	3.47	1.97	1.76	0.08	2006
9	-7.07**	3.73	-1.90	0.06	3.03	1.85	1.64	0.10	2007
10	-7.36**	3.47	-2.12	0.03	3.00	1.72	1.74	0.08	2008
Leverage									
1	-5.60	7.57	-0.74	0.46	4.16	3.26	1.27	0.20	1999
2	-3.52	6.56	-0.54	0.59	3.06	2.86	1.07	0.29	2000
3	-0.31	5.93	-0.05	0.96	1.56	2.59	0.60	0.55	2001
4	0.30	5.35	0.06	0.96	1.37	2.34	0.59	0.56	2002
5	-5.16	5.24	-0.98	0.33	3.27	2.29	1.43	0.15	2003
6	-3.21	4.79	-0.67	0.50	2.56	2.09	1.23	0.22	2004
7	-4.67	4.60	-1.02	0.31	2.51	2.01	1.25	0.21	2005
8	-3.00	4.39	-0.68	0.50	2.14	1.93	1.11	0.27	2006
9	-2.25	4.12	-0.55	0.59	1.66	1.80	0.92	0.36	2007
10	-2.36	3.86	-0.61	0.54	1.65	1.69	0.98	0.33	2008
Liquidity									
1	0.37	6.87	0.05	0.96	-8.23	6.35	-1.30	0.20	1999
2	1.38	6.05	0.23	0.82	-7.54	5.61	-1.34	0.18	2000
3	3.47	5.42	0.64	0.52	-6.36	5.05	-1.26	0.21	2001
4	3.24	4.84	0.67	0.50	-5.52	4.54	-1.22	0.22	2002
5	1.60	4.71	0.34	0.73	-3.56	4.40	-0.81	0.42	2003
6	3.22	4.33	0.74	0.46	-3.00	4.03	-0.74	0.46	2004
7	3.19	4.11	0.78	0.44	-2.28	3.82	-0.60	0.55	2005
8	1.65	3.87	0.43	0.67	-3.50	3.61	-0.97	0.33	2006
9	1.17	3.57	0.33	0.74	-2.75	3.37	-0.82	0.41	2007
10	1.44	3.30	0.44	0.66	-2.46	3.16	-0.78	0.44	2008

APPENDIX A- Continued

Subset	β_1	Standard Error	t -statistic	p -value	β_2	Standard Error	t -statistic	p -value	Year β_1 & β_2 Applied to Metric Value
Change in Shares									
1	21.06***	7.28	2.89	0.00	-6.43***	2.12	-3.03	0.00	1999
2	15.49**	6.17	2.51	0.01	-5.12***	1.80	-2.85	0.00	2000
3	10.90**	5.45	2.00	0.05	-3.90**	1.58	-2.47	0.01	2001
4	8.77*	4.93	1.78	0.08	-3.17**	1.43	-2.22	0.03	2002
5	7.89	4.86	1.62	0.10	-3.30**	1.42	-2.32	0.02	2003
6	6.29	4.51	1.40	0.16	-2.91**	1.32	-2.21	0.03	2004
7	8.22*	4.28	1.92	0.06	-3.26***	1.26	-2.58	0.01	2005
8	6.27	4.07	1.54	0.12	-2.76**	1.20	-2.30	0.02	2006
9	5.45	3.77	1.45	0.15	-2.36**	1.12	-2.11	0.04	2007
10	5.31	3.48	1.53	0.13	-2.24**	1.04	-2.15	0.03	2008
Change in Total Equity									
1	-8.94***	2.42	-3.70	0.00	0.55**	0.24	2.32	0.02	1999
2	-7.39***	2.15	-3.43	0.00	0.40*	0.21	1.91	0.06	2000
3	-5.67***	1.88	-3.02	0.00	0.29	0.18	1.58	0.11	2001
4	-5.03***	1.72	-2.93	0.00	0.25	0.17	1.50	0.14	2002
5	-5.14***	1.69	-3.04	0.00	0.25	0.17	1.47	0.14	2003
6	-4.28***	1.56	-2.75	0.01	0.17	0.16	1.10	0.27	2004
7	-3.61**	1.47	-2.46	0.01	0.13	0.15	0.91	0.36	2005
8	-3.13**	1.37	-2.28	0.02	0.12	0.14	0.86	0.39	2006
9	-2.91	2.52	-1.15	0.25	0.08	0.25	0.32	0.75	2007
10	-2.28**	1.16	-1.96	0.05	0.11	0.12	0.94	0.35	2008

This table summarises the results from univariate regressions of DGTW-alpha on each metric value and its square. The regressions are run over expanding time periods- the first regression is run using the estimation period 1992-1998 (subset 1), the parameter estimates obtained are then used to calculate each metric's contribution to the Q-Score using the metric values for 1999. Returns are then examined from April 2000-March 2001. Essentially, this allows the predictive capability of the Q-Score constructed to be examined without the impact of any hindsight biases. The second regression is run using data from 1992-1999, the third from 1992-2000 and so on up to an estimation period of 1992-2007 (subset 10). Thus, the parameter estimates for each of the ten regressions are used on the associated metric values for the following year. Overall, the Q-Score is calculated for ten years ranging from 1999-2008 and the associated DGTW alpha is examined over ten periods from April 2000-March 2010. The regression model is as follows: $y = \beta_0 + \beta_1 x + \beta_2 x^2 + \varepsilon$.

***, ** and *, indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 1. Individual Quality Metrics

Table 1 details the 12 accounting metrics across three categories- profitability, operating efficiency and financial health which are considered for inclusion in the Q-Score. All individual metric values are scaled by the population median for the prior fiscal year.

Category	Signal	Measurement
Profitability	Return-on-Equity ^a (ROE)	$\frac{\text{NPAT before Abnormals}_t (\text{NPAT})}{(\text{Shareholders' Equity}_{t-1} - \text{Outside Equity Interests}_{t-1} (\text{TE}))}$
	Change in ROE ^b (ΔROE)	$\text{NPAT}_t - \text{NPAT}_{t-1} / ((\text{TE}_{t-1} + \text{TE}_{t-2}) * 0.5)$
	Return-on-Assets ^c (ROA)	$\text{NPAT}_t / \text{Total Assets}_{t-1} (\text{TA})$
	Change in ROA ^d (ΔROA)	$\text{NPAT}_t - \text{NPAT}_{t-1} / ((\text{TA}_{t-1} + \text{TA}_{t-2}) * 0.5)$
	Operating Cash Flow ^e (OCF)	$\frac{\text{Net Cash Flow from Operations}_t}{((\text{TA}_t + \text{TA}_{t-1}) * 0.5)}$
	Accruals ^f (ACC)	ACC = Earnings – OCF Where Earnings = $\text{NPAT}_t / ((\text{TA}_t + \text{TA}_{t-1}) * 0.5)$
Operating Efficiency	Asset Turnover ^g (ATO)	$\text{TR}_t / \text{TA}_{t-1}$
	Change in ATO ^h	$\text{TR}_t - \text{TR}_{t-1} / ((\text{TA}_{t-1} + \text{TA}_{t-2}) * 0.5)$
Financial Health	Leverage ⁱ (LEV)	$\text{Non-Current Debt}_t / \text{TE}_t$
	Liquidity ^j (LIQ)	$\text{Working Capital} / \text{TA}_t$ Where Working Capital = $\text{Current Assets}_t - \text{Current Liabilities}_t$
	Change in Shares Outstanding ^k (ΔSH)	$\text{SH}_t - \text{SH}_{t-1} / \text{SH}_{t-1}$
	Change in TE ^l (ΔTE)	$\text{TE}_t - \text{TE}_{t-1} / \text{TE}_{t-1}$

^a Bird and Casavecchia (2007); Chen and Zhang (2007); Zhang (2000)

^b Bird and Casavecchia (2007)

^c Dou et al. (2012)

^d Bird and Casavecchia (2007); Fairfield and Whisenant (2000); Piotroski (2000)

^e Chia et al. (1997)

^f Chia et al. (1997); Clinch et al. (2012); Cotter (1996); Loftus and Sin (1997); Taylor and Wong (2012)

^g Bird and Casavecchia (2007); Soliman (2008)

^h Bird and Casavecchia (2007); Piotroski (2000); Soliman (2008)

ⁱ Houghton and Woodliff (1987)

^j Houghton and Woodliff (1987)

^k Donaldson (1961); Myers and Majluf (1984)

^l Donaldson (1961); Myers and Majluf (1984)

Table 2. Descriptive statistics for mutual fund sample.

Table 2 presents summary statistics for a sample of 232 Australian Active Equity Mutual Funds over 2000-2010. Raw Return is the annualised average monthly raw fund return. The average raw return is first calculated for each fund whereby each stock's raw return is weighted by its holding value as at the end of the prior month. The average across all funds is then calculated per month and weighted by a fund's assets as at the end of the prior month. DGTW Alpha is the annualised average adjusted return for each fund, whereby the return to each stock held has been adjusted by the return to one of 60 benchmark portfolios with the same Size, Book-to-Market and Momentum characteristics. Stocks are first sorted into five groups based on size, then four groups based on book-to-market and finally three groups based on momentum. Size Quintile is the asset-weighted (AW) average size quintile, B/M Quartile is the AW average book-to-market quartile and MOM Tercile is the average AW momentum tercile to which the stocks held by a fund fall into. The mean for each fund is first calculated by weighting each stock's quintile, quartile and tercile value by its holding value as at the end of the prior month. No. Stocks is the average number of stocks held each year. The AW mean No. Stocks held is first calculated for each month and then the equal-weighted average of these monthly values is calculated each year. Assets is the AW average of assets as at the end of the prior month across each year.

Year	Raw Return (%)	DGTW Alpha (%)	Size Quintile	B/M Quartile	MOM Tercile	No. Stocks	Assets (\$m)
2000	8.19	2.08	3.95	1.04	1.12	53	1314
2001	13.53	0.67	3.97	1.12	1.30	54	1977
2002	-7.24	-2.53	3.97	1.22	1.21	56	3115
2003	15.74	-0.90	3.96	1.37	1.04	56	1283
2004	27.78	2.71	3.96	1.27	0.74	54	1121
2005	22.10	1.61	3.96	1.52	0.96	49	1725
2006	26.23	2.02	3.97	1.65	1.26	50	2402
2007	21.64	3.65	3.96	1.27	1.20	52	2081
2008	-40.14	-3.54	3.97	1.54	1.35	55	1441
2009	43.62	-4.17	3.98	1.35	1.42	58	1162
2010	3.08	1.22	3.97	1.07	0.96	58	1494

Table 3. Quality signal parameter estimates.

Table 3 presents mean values of the coefficient estimates for the eight quality signals included in the Q-Score. The annual DGTW Alpha for each stock in the Aspect/SPPR/DGTW universe is regressed on the metric value for the stock as well as the metric value squared in order to capture any non-linear relationships, as per the following model: $y = \beta_0 + \beta_1 x + \beta_2 x^2 + \varepsilon$. Alpha is measured over April year t to March year $t+1$ and the metric values are for the fiscal year ending in year $t-1$. The regressions are run over ten rolling time periods; the first of which is 1992-1998 and the last estimation period is 1992-2007. The average of the ten coefficient estimates is provided- refer to Appendix A for a detailed summary of the estimates.

Metric	β_1	β_2
Return-on-Equity	12.35	1.38
Δ ROE	6.50	-1.25
Return-on-Assets	10.29	2.81
Δ ROA	18.76	-3.52
Operating Cash Flow	19.21	29.30
Δ Asset Turnover	-11.22	4.42
Δ Shares Outstanding	9.57	-3.55
Δ Total Equity	-4.84	0.24

Table 4. Returns and characteristics of stocks by Q-Score sorted quintile portfolios.

Table 4 reports the mean values of returns and stock characteristics over the sample period for the stocks comprised in quintile portfolios formed by sorting the universe of Aspect/SPPR/DGTW stocks, into equally-weighted portfolios in each year t based on their Q-Scores. Quintile 1 (5) contains stocks with the lowest (highest) values of the Q-Score. The Q-Score has been computed as the aggregate of 8 accounting metrics; ROE, Δ ROE, ROA, Δ ROA, OCF, Δ ATO, Δ SH and Δ TE. All of the individual metrics have been scaled by the median value for each metric's population, in the previous fiscal year. The DGTW alpha for each stock in the Aspect/SPPR/DGTW universe is regressed on the metric value for each stock as well as the metric value squared in order to capture any non-linear relationships, as per the following model: $y = \beta_0 + \beta_1 x + \beta_2 x^2 + \varepsilon$. The regressions are run over expanding time periods - the first regression is run using the estimation period 1992-1998, the parameter estimates obtained are then used to calculate each metric's contribution to the Q-Score using the metric values for 1999. The Q-Score for 1999 is then merged with the mutual fund holdings as at March of 2000, and alpha is examined from April 2000-March 2001. The means are obtained by value-weighting the returns and characteristics for each stock in the quintile by its market capitalisation as at December of year $t-1$. No. of Stocks is the average number of stocks contained in each quintile portfolio over the sample period. Size is the mean market capitalisation of each stock in the portfolio, as at December of year $t-1$. Q-Score Value is the mean Q-Score per quintile portfolio over the sample period. Raw Return is the average unadjusted buy-and-hold return from April of year t to March of year $t+1$ to the stocks in the portfolio. The annual returns are calculated by compounding the monthly SPPR returns for each stock. DGTW alpha is the mean excess annual return to the stocks in each portfolio over the sample period whereby each stock's raw return is adjusted by the return on an appropriate DGTW benchmark portfolio. Raw Return Volatility is the mean annualised standard deviation of the unadjusted monthly returns from April of year t to March of year $t+1$ for each stock in the portfolio. DGTW Alpha Volatility is the average annualised standard deviation of the DGTW adjusted monthly returns from April of year t to March of year $t+1$ for each stock in the portfolio. DGTW Benchmark Volatility is the mean annualised volatility of the monthly returns from April of year t to March of year $t+1$ for each stock's DGTW benchmark portfolio. Beta is the average beta in March of year t for each stock in the portfolio, where beta has been calculated based on the following model run over the prior 60 months: $y = \beta_0 + \beta_1 x + \varepsilon$ where y is the raw stock return and x is the S&P/ASX 300 return, both x and y are in excess of the 30 day BAB rate. N.B. there are a number of missing beta values, so the mean No. of Stocks in each quintile is only 92 for this variable. Market Adjusted Return is the average annual raw return in excess of the return on the S&P/ASX 300. Tracking Error is the average of the square root of the squared monthly deviations of the raw return minus the return on the S&P/ASX 300. Idiosyncratic Volatility is the standard deviation of the error term over the prior 60 months based on the same regression used to calculate Beta. The t -statistics are in parentheses below the average returns reported.

Quintile Portfolios	No. of Stocks	Size (\$m)	Q-Score Value	Raw Return (%)	DGTW Alpha (%)	Raw Return Volatility (%)	DGTW Alpha Volatility (%)	DGTW Benchmark Volatility (%)	Beta	Market Adjusted Return (%)	Tracking Error (%)	Idiosyncratic Volatility (%)
P1 (Low)	158	55	-24.99	-3.80 (-0.36)	-7.98** (-2.45)	63.56	59.47	22.14	1.45	-14.84 (-1.04)	6.54	20.49
P2	159	243	-6.00	-5.14 (-0.47)	3.28 (0.72)	56.64	51.51	20.99	1.24	-16.18 (-1.30)	5.79	14.94
P3	159	704	0.84	5.85 (0.71)	0.82 (0.35)	38.16	32.72	18.00	1.21	-5.19 (-0.43)	3.65	10.89
P4	159	682	5.06	9.44 (1.40)	2.75 (1.66)	27.42	25.26	13.90	0.88	-1.60 (-0.15)	2.14	7.16
P5 (High)	159	1911	12.03	16.15** (2.34)	6.37** (2.44)	27.83	22.11	14.20	1.03	5.11 (0.48)	2.82	7.06

Statistical significance at the 1%, 5% and 10% levels is indicated by ***, ** and *, respectively.

Table 5. Returns and characteristics of Q-Score sorted quintile portfolios for stocks held by mutual funds.

Table 5 reports the mean values of returns and stock characteristics over the sample period for quintile portfolios formed by sorting stocks in the Aspect/SPPR/DGTW universe which are held by at least one mutual fund in March of year t , into equally-weighted portfolios based on their Q-Scores. Quintile 1 (5) contains stocks with the lowest (highest) values of the Q-Score. The Q-Score has been computed as the aggregate of 8 accounting metrics; ROE, Δ ROE, ROA, Δ ROA, OCF, Δ ATO, Δ SH and Δ TE. All of the individual metrics have been scaled by the median value for each metric's population, in the previous fiscal year. The DGTW alpha for each stock in the Aspect/SPPR/DGTW universe is regressed on the metric value for each stock as well as the metric value squared in order to capture any non-linear relationships, as per the following model: $y = \beta_0 + \beta_1 x + \beta_2 x^2 + \varepsilon$. The regressions are run over expanding time periods - the first regression is run using the estimation period 1992-1998, the parameter estimates obtained are then used to calculate each metric's contribution to the Q-Score using the metric values for 1999. The Q-Score for 1999 is then merged with the mutual fund holdings as at March of 2000, and alpha is examined from April 2000-March 2001. The means are obtained by value-weighting the returns and characteristics for each stock in the quintile by its market capitalisation as at December of year $t-1$. No. of Stocks is the average number of stocks contained in each quintile portfolio over the sample period. Size is the mean market capitalisation of each stock in the portfolio, as at December of year $t-1$. Raw Return Volatility is the mean annualised standard deviation of the unadjusted monthly returns from April of year t to March of year $t+1$ for each stock in the portfolio. Q-Score Value is the mean Q-Score per quintile portfolio over the sample period. Raw Return is the average unadjusted buy-and-hold return from April of year t to March of year $t+1$ to the stocks in the portfolio. The annual returns are calculated by compounding the monthly SPPR returns for each stock. DGTW Alpha is the mean excess annual return to the stocks in each portfolio over the sample period whereby each stock's raw return is adjusted by the return on an appropriate DGTW benchmark portfolio. DGTW Alpha Volatility is the average annualised standard deviation of the DGTW adjusted monthly returns from April of year t to March of year $t+1$ for each stock in the portfolio. DGTW Benchmark Volatility is the mean annualised volatility of the monthly returns from April of year t to March of year $t+1$ for each stock's DGTW benchmark portfolio. Beta is the average beta in March of year t for each stock in the portfolio, where beta has been calculated based on the following model run over the prior 60 months: $y = \beta_0 + \beta_1 x + \varepsilon$ where y is the raw stock return and x is the S&P/ASX 300 return both x and y are in excess of the 30 day BAB rate. N.B. there are a number of missing beta values, so the mean No. of Stocks in each quintile is only 53 for this variable. Market-Adjusted Return is the average annual raw return in excess of the return on the S&P/ASX 300. Tracking Error is the average of the square root of the squared monthly deviations of the raw return minus the return on the S&P/ASX 300. Idiosyncratic Volatility is the standard deviation of the error term over the prior 60 months based on the same regression used to calculate beta. The t -statistics are in parentheses below the average returns reported.

Quintile Portfolios	No. of Stocks	Size (\$m)	Q-Score Value	Raw Return (%)	DGTW Alpha (%)	Raw Return Volatility (%)	DGTW Alpha Volatility (%)	DGTW Benchmark Volatility (%)	Beta	Market Adjusted Return (%)	Tracking Error (%)	Idiosyncratic Volatility (%)
P1 (Low)	70	216	-17.07	-8.39 (-0.82)	-2.00 (-0.50)	60.37	54.70	21.22	1.50	-19.42 (-1.44)	6.40	17.49
P2	71	706	-0.55	2.57 (0.31)	-1.57 (-0.39)	38.38	33.27	18.09	1.19	-8.47 (-0.71)	4.77	11.31
P3	71	673	3.51	10.14 (1.47)	4.04 (1.54)	28.19	25.37	14.96	0.86	-0.90 (-0.08)	2.54	7.29
P4	71	961	6.55	12.32* (1.90)	5.39*** (3.80)	26.18	23.39	13.59	0.95	1.29 (0.12)	2.40	6.78
P5 (High)	71	2092	13.24	17.48** (2.40)	6.92* (2.09)	27.56	21.29	13.99	1.05	6.44 (0.59)	3.12	7.03

Statistical significance at the 1%, 5% and 10% levels is indicated by ***,** and *, respectively.

Table 6. Performance of quality quintiles in up versus down markets.

Table 6 presents annualised average monthly returns for Q-Score sorted quintiles of stocks in the Aspect/SPPR/DGTW universe over April 2000- March 2010. The S&P/ASX 300 is used as the market index and the risk free rate is the 30 Day Bank Accepted Bill rate. Up (Down) market months are those when the S&P/ASX 300 return is greater (less) than the risk free rate. Returns Value-Weighted (VW) by a stock's market capitalisation as at the end of the month prior and Equally-Weighted (EW) returns are provided. DGTW-Adj. is the average monthly excess return whereby each stock's return has been adjusted by the return to one of 60 benchmark portfolio's assigned based on a stock's size, book-to-market and momentum characteristics. Mkt-Adj. is the average monthly return in excess of the return on the S&P/ASX 300 Index.

Q-Score Quintile	<i>Up Market Months</i>				<i>Down Market Months</i>			
	DGTW- Adj. VW (%)	DGTW- Adj. EW (%)	Mkt-Adj. VW (%)	Mkt-Adj. EW (%)	DGTW- Adj. VW (%)	DGTW- Adj. EW (%)	Mkt-Adj. VW (%)	Mkt-Adj. EW (%)
1	0.07	-1.07	0.61	4.33	-16.64	-5.33	-17.60	-4.25
2	5.22	2.96	9.13	8.19	-2.11	1.58	-3.98	6.92
3	2.12	2.69	5.64	6.90	-0.64	1.98	-3.72	12.01
4	1.79	1.71	0.39	2.11	-1.44	6.44	3.88	12.75
5	5.98	4.37	5.11	4.22	1.51	3.74	6.02	6.64

Table 7. Returns and characteristics of Q-Score sorted tercile portfolios within size groups.

Table 7 reports the mean values of returns and stock characteristics over the sample period for stocks in the Aspect/SPPR/DGTW universe which are classified into one of three size groups; micro (<70%), small (70-90%) or large (>90%) based on their market capitalisation as at December of year $t-1$. Then within each size group tercile portfolios are formed by sorting stocks into equally-weighted portfolios based on their Q-Scores as at March year t . Tercile 1 (3) contains stocks with the lowest (highest) values of the Q-Score. The means are obtained by value-weighting the returns and characteristics for each stock in the tercile by its market capitalisation as at December of year $t-1$. No. of Stocks is the average number of stocks contained in each quintile portfolio over the sample period. Size is the mean market capitalisation of each stock in the portfolio, as at December of year $t-1$. Raw Return Volatility is the mean annualised standard deviation of the unadjusted monthly returns from April of year t to March of year $t+1$ for each stock in the portfolio. Q-Score Value is the mean Q-Score per quintile portfolio over the sample period. Raw Return is the average unadjusted buy-and-hold return from April of year t to March of year $t+1$ to the stocks in the portfolio. The annual returns are calculated by compounding the monthly SPPR returns for each stock. DGTW Alpha is the mean excess annual return to the stocks in each portfolio over the sample period whereby each stock's raw return is adjusted by the return on an appropriate DGTW benchmark portfolio. DGTW Alpha Volatility is the average annualised standard deviation of the DGTW adjusted monthly returns from April of year t to March of year $t+1$ for each stock in the portfolio. DGTW Benchmark Volatility is the mean annualised volatility of the monthly returns from April of year t to March of year $t+1$ for each stock's DGTW benchmark portfolio. Beta is the average beta in March of year t for each stock in the portfolio, where beta has been calculated based on the following model run over the prior 60 months: $y = \beta_0 + \beta_1 x + \varepsilon$ where y is the raw stock return and x is the S&P/ASX 300 return both x and y are in excess of the 30 day BAB rate. N.B. there are a number of missing beta values, so the mean No. of Stocks in each quintile is only 53 for this variable. Market-Adjusted Return is the average annual raw return in excess of the return on the S&P/ASX 300. Tracking Error is the average of the square root of the squared monthly deviations of the raw return minus the return on the S&P/ASX 300. Idiosyncratic Volatility is the standard deviation of the error term over the prior 60 months based on the same regression used to calculate beta. The t -statistics are in parentheses below the average returns reported.

Size Group	Q-Score Tercile	No. Stocks	Size (\$m)	Q-Score Value	Raw Return (%)	DGTW Alpha (%)	Raw Return Volatility (%)	DGTW Alpha Volatility (%)	DGTW Benchmark Volatility (%)	Beta	Market Adjusted Return (%)	Tracking Error (%)	Idiosyncratic Volatility (%)
Micro	1	142	2	-26.74	8.20 (0.43)	2.45 (0.59)	72.37	67.58	28.77	1.35	-2.84 (-0.14)	7.13	24.16
Micro	2	246	3	-2.96	11.76 (1.03)	0.65 (0.15)	63.34	59.61	24.98	1.11	0.72 (0.05)	5.70	19.59
Micro	3	167	3	11.47	34.27* (2.09)	5.04** (2.27)	54.45	52.12	23.32	0.93	23.23 (1.24)	4.66	16.43
Small	1	54	24	-8.26	-4.69 (-0.58)	1.09 (0.34)	54.19	50.93	19.41	1.23	-15.72 (-1.36)	5.17	15.66
Small	2	62	28	4.12	9.62 (1.14)	4.94 (1.40)	38.32	37.14	16.12	0.93	-1.42 (-0.11)	3.51	10.59
Small	3	43	26	13.74	21.03* (2.09)	14.02** (2.36)	38.35	36.32	17.34	1.00	9.99 (0.73)	3.58	11.67
Large	1	24	819	-0.18	0.55 (0.06)	1.35 (0.45)	34.05	29.14	17.12	1.20	-10.49 (-0.90)	3.62	9.47
Large	2	36	834	4.55	11.41 (1.50)	3.54 (1.73)	27.99	24.62	14.62	0.89	-7.02 (-0.59)	2.06	7.11
Large	3	27	2012	11.24	14.64* (2.09)	5.72* (1.93)	26.23	20.26	14.18	1.05	3.60 (0.34)	2.71	6.68

Statistical significance at the 1%, 5% and 10% levels is indicated by ***,** and *, respectively.

Table 8. Returns and characteristics for Q-Score sorted tercile portfolios of mutual funds.

Table 8 presents average returns and characteristics for tercile portfolios formed by sorting a sample of Australian Active Equity Mutual Funds based on the weighted-average Q-Score for their portfolios in March of each year t over 2000-2009. The Q-Score for each stock held by a fund is weighted by the stock's holding value as at March year t . Funds are then sorted into terciles and returns are measured over April year t to March year $t+1$. Monthly returns for each fund are calculated as the average of the return to the stocks contained in the portfolio, weighted by a stock's holding value as at the end of the month prior. Average tercile returns are calculated for each month and then the annual return presented is the time-series mean of these 12 monthly returns, thus the results are free from survivorship bias. Asset-Weighted (AW) and Equal-Weighted (EW) results are provided. No. Funds is the time-series mean of the average number of funds in each tercile portfolio over the 12 months of each return accumulation period. Q-Score Value is the time-series AW mean of the average Q-Score in March year t for funds in each tercile. Assets is the time-series AW average assets of funds in each tercile portfolio over the 12 months of each return accumulation period. Raw Return is the average annual raw fund return. DGTW-Adj. Return is the average adjusted fund return whereby the return to each stock held has been adjusted by the return to one of 60 benchmark portfolios with the same Size, Book-to-Market and Momentum characteristics. Stocks are first sorted into five groups based on size, then four groups based on book-to-market and finally three groups based on momentum. Size Quintile is the time-series AW mean of the average size quintile, B/M Quartile is the time-series AW mean of the average book-to-market quartile and MOM Tercile is the time-series AW mean of the average momentum tercile for funds in each tercile portfolio, computed over the 12 months of each return accumulation period. The means for each fund each month are first calculated by weighting each stock's quintile, quartile and tercile value by its holding value as at the end of the prior month. t -statistics are provided in parentheses below the mean returns.

Tercile	No. Funds	Q-Score Value	Assets (\$m)	Raw Return AW (%)	Raw Return EW (%)	DGTW-Adj. Return AW (%)	DGTW-Adj. Return EW (%)	Market-Adj. Return AW (%)	Market-Adj. Return EW (%)	Size Quintile	B/M Quartile	MOM Tercile
1	33	4.60	1248	11.13 (1.36)	14.74 (1.74)	-0.33 (-0.27)	2.17* (1.90)	0.09 (0.06)	3.70* (1.93)	3.89	1.35	1.15
2	36	7.04	1612	13.67* (1.94)	10.84* (2.00)	1.11 (1.19)	1.61 (1.75)	2.63 (1.83)	3.52** (2.51)	3.98	1.35	1.13
3	35	8.29	1463	12.78 (1.71)	14.80* (1.93)	0.06 (0.06)	2.09* (2.11)	1.75 (1.62)	3.94** (3.22)	3.97	1.32	1.19

Figure 1. Average DGTW-adjusted return by Q-Score sorted quintiles for stock universe.

Figure 1 demonstrates the Daniel, Grinblatt, Titman and Wermers (DGTW)-adjusted return to each Q-Score sorted quintile over 2000 to 2009. The universe comprises stocks listed on the ASX for which SPPR, Aspect and DGTW data is available. The quintiles are formed in March of each year_t based on the Q-Score for the prior year, and buy-and-hold returns are computed from April of year_t to March of year_{t+1}. E.g. the return for 2000 is the return from April 2000 to March 2001. The weight applied to each stock's return is its market capitalisation as at December of Year_{t-1}. Quintile 1 (5) contains low (high) quality stocks.

Figure 2. Average DGTW-adjusted return by Q-Score sorted quintiles for a subset of stocks held by at least one mutual fund as at March year t .

Figure 2 demonstrates the Daniel, Grinblatt, Titman and Wermers (DGTW)-adjusted return to each Q-Score sorted quintile over 2000 to 2009. The sample comprises stocks listed on the ASX for which SPPR, Aspect and DGTW data is available and which are held by at least one mutual fund in March of year t . The quintiles are formed in March of each year t based on the Q-Score for the prior year, and buy-and-hold returns are computed from April of year t to March of year $t+1$. E.g. the return for 2000 is the return from April 2000 to March 2001. The weight applied to each stock's return is its market capitalisation as at December of Year $t-1$. Quintile 1 (5) contains low (high) quality stocks.

Figure 3. Average DGTW-adjusted returns to Q-Score sorted terciles formed using micro stocks over 2000-2009.

Figure 3 demonstrates the Daniel, Grinblatt, Titman and Wermers (DGTW)-adjusted return to each Q-Score sorted tercile over 2000 to 2009. The sample is micro stocks listed on the ASX for which SPPR, Aspect and DGTW data is available. Stocks are classified as micro if their market capitalisation for December year_{t-1} is less than the 70th percentile. The terciles are formed in March of each year_t based on the Q-Score for the prior year, and buy-and-hold returns are computed from April of year_t to March of year_{t+1}. E.g. the return for 2000 is the return from April 2000 to March 2001. The weight applied to each stock's return is its market capitalisation as at December of Year_{t-1}. Tercile 1 (3) contains low (high) quality stocks.

Figure 4. Average DGTW-adjusted returns to Q-Score sorted terciles formed using small stocks over 2000-2009.

Figure 4 demonstrates the Daniel, Grinblatt, Titman and Wermers (DGTW)-adjusted return to each Q-Score sorted tercile over 2000 to 2009. The sample is small stocks listed on the ASX for which SPPR, Aspect and DGTW data is available. Stocks are classified as small if their market capitalisation for December year_{t-1} is between the 70th and 90th percentiles. The terciles are formed in March of each year_t based on the Q-Score for the prior year, and buy-and-hold returns are computed from April of year_t to March of year_{t+1}. E.g. the return for 2000 is the return from April 2000 to March 2001. The weight applied to each stock's return is its market capitalisation as at December of Year_{t-1}. Tercile 1 (3) contains low (high) quality stocks.

Figure 5. Average DGTW-adjusted returns to Q-Score sorted terciles formed using large stocks over 2000-2009.

Figure 5 demonstrates the Daniel, Grinblatt, Titman and Wermers (DGTW)-adjusted return to each Q-Score sorted tercile over 2000 to 2009. The sample is large stocks listed on the ASX for which SPPR, Aspect and DGTW data is available. Stocks are classified as large if their market capitalisation for December year_{t-1} is greater than the 90th percentile. The terciles are formed in March of each year_t based on the Q-Score for the prior year, and buy-and-hold returns are computed from April of year_t to March of year_{t+1}. E.g. the return for 2000 is the return from April 2000 to March 2001. The weight applied to each stock's return is its market capitalisation as at December of Year_{t-1}. Tercile 1 (3) contains low (high) quality stocks.

Figure 6. Average DGTW-adjusted returns to mutual funds sorted into terciles based on the average Q-Score for their portfolios over 2000-2009.

Figure 6 demonstrates the Daniel, Grinblatt, Titman and Wermers (DGTW)-adjusted return to each Q-Score sorted fund tercile over 2000 to 2009. The sample is long-only active Australian equity funds. Firstly, in March of each year_t the weighted-average Q-Score is computed for each fund based on the holding value of each stock as at March of year_t. The funds are then ranked into terciles based on their average Q-Score. The mean returns are calculated from April of year_t to March of year_{t+1}. All funds with holdings data available in a given quarter are included in the calculation of the mean annual return for that year. Therefore, the results are free from survivorship bias as the mean return is calculated on a quarterly basis and then the annual mean is the compound of these four mean returns. Tercile 1 (3) contains low (high) quality funds.