# Quality at a Reasonable Price: The Role of Investors' Portfolio Weights*

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## Abstract

*This paper explores whether signals from changes in investors' portfolio concentrations can be used to enhance the performance of portfolios based on value and quality at a reasonable price. Using data on all the more than a million investor portfolios participating in the Finnish stock market, I find that the information content of increases in average shareholder portfolio concentration can improve the performance of value and quality portfolios under certain conditions. Overall, the results show that portfolio concentration can be used as an additional signal to improve the performance of popular value- and quality-oriented investing strategies.*

## Keywords

*Quality at reasonable price, value investing, quality investing, portfolio concentration, portfolio weights, ownership concentration, stock returns.*

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## 1. Introduction

This paper explores whether shareholder portfolio holding data can be used to improve the performance of value portfolios. While quality variables, such as profitability, financial strength, and quality more generally (Novy-Marx, 2013, 2014; Piotroski, 2000; Li and Mohanram, 2016; Asness et al., 2014; respectively), have been shown to enhance the performance of value portfolios selected based on valuation multiples, portfolio concentration and ownership data have not been used in value studies or studies combining value and quality dimensions. This paper aims to fill the gap in the literature.

Previous empirical research finds that value stocks (e.g., high book-to-market) have performed better than growth stocks in the US (Fama and French, 1992; Lakonishok, Shleifer, and Vishny, 1994; La Porta, Lakonishok, Shleifer and Vishny, 1997) as well as internationally (Fama and French, 1998). Moreover, Piotroski (2000) shows that measures of financial strength can be used to separate winners from losers within portfolios of value stocks. Relatedly, Novy-Marx (2013, 2014) finds that quality variables (such as gross-profitability divided by total assets) can be used to improve the performance of value portfolios. Furthermore, Novy-Marx (2014) and Piotroski and So (2012) show that value and quality sorting strategies based on combined ranks (i.e., quality at a reasonable price) perform better than a 50/50 combination of value and quality portfolios.

In this paper, I consider the usefulness of investors' average portfolio weights (or portfolio concentration) in selecting value and quality stocks. Ekholm and Maury (2014) find that shareholder portfolio concentration is positively related to future firm performance. Their results are consistent with the idea that concentrated portfolios improve price efficiency which in turn improves managerial decision-making. The results on stock returns in Ivkovic et al. (2008) as well as Ekholm and Maury (2014) suggest that focused investors are more informed than more diversified investors and that information on portfolio concentrations can be a valuable signal on future stock performance. Thus, previous research would indicate that portfolio concentration data could be used to improve the selection of stocks within value and quality investing strategies.

Using data on investors' portfolio holdings in the Finnish market over the period 1996-2005, I employ the portfolio concentration index developed in Ekholm and Maury (2014) which is measured as the average portfolio weight of all shareholders in a firm. The portfolio concentration measure is used as a signal of confidence in the quality of a stock. Two main empirical approaches are employed in this paper. In the first approach, the portfolio concentration index is combined with a value portfolio. In the second approach, portfolio concentration data are combined with a portfolio formed based on combined value and quality ranks (or quality at a reasonable price).

The results show that information on changes in portfolio concentration can be valuable when used in combination with value-oriented investment strategies. First, portfolio concentration data can be used directly to select the best performing stocks within a value portfolio. Second, portfolio concentration can be used as a third variable in combination with value and quality variables to obtain higher stock returns. Moreover, portfolio performance is most reliably higher when the average portfolio concentration is calculated for larger (1% holdings), and presumably more informed, shareholders. In addition, I find that increases in corporate ownership concentration can be used as an alternative investment signal, although the portfolio performance using ownership concentration data is lower than the performance using information on portfolio concentrations. Taken together, the empirical findings in this

paper indicate that data on investors' portfolio holdings can be used as a signal that adds to the performance of investment strategies based on value as well as combinations of value and quality without increasing known portfolio risk.

This paper is related to two main strands in the literature. The first strand on investment research has shown that value portfolios (e.g., Fama and French, 1992) and portfolios that combine value and quality (e.g., profitability or financial strength) signals (e.g., Novy-Marx, 2013; Piotroski, 2000; Asness et al., 2014) have generated returns in excess of the market. Another strand in the literature studies the usefulness of holdings data for investment purposes. Regarding insider trades, Jaffe (1974), for example, finds that returns to stocks purchased slightly after insiders' purchases have become public information generate returns significantly higher than that of the market. Relatedly, Kallunki et al. (2009) find that insider selling is informative among those insiders that have the highest proportion of their wealth concentrated in insider stocks. More generally, Ekholm and Maury (2014) find that the average shareholder portfolio concentration is positively related to future profitability, valuations, and stock returns, which is consistent with both monitoring through the stock market and superior stock selection ability by more focused shareholders. While these previous papers consider the investment returns utilizing holdings data, they do not analyze whether holdings data can be useful as an additional signal that could complement value and quality sorts.

This paper contributes to the existing literature by showing that investor portfolio concentration can be useful in combination with stock selection based on quality at a reasonable price or pure value. The information that can be extracted from the average portfolio concentration measure (Average Weight Index) can be viewed as a summary measure of the confidence of (informed) investors in a particular stock. Thus, this paper extends the information set in the context of quality at a reasonable price that investors may be able utilize.

Although this paper uses data available on Finnish listed firms, the findings in this paper are likely to be relevant for international investors due to the following reasons. Firstly, information on holdings data and portfolio concentration could be obtained for other markets than the Finnish market used here. For example, data from 13F filings provided by Thomson Financial that cover institutional investors who manage more than $100 million could be obtained for US firms. These data could be used to calculate a proxy for the AWI (portfolio concentration) measure. Secondly, the findings in this paper indicate that also ownership concentration data, more accessible and easily computed, can be used to improve returns.

The paper proceeds as follows. Section 2 reviews previous research and presents the hypotheses. Section 3 describes the data set. Section 4 presents the empirical findings as well as offers alternative models and robustness tests. Section 5 concludes the paper.

## 2. Quality at a reasonable price and holdings data

In this section, I review previous literature on value and quality investing and discuss the usefulness of combining information on holdings data (especially shareholder portfolio concentration data) with value and quality investing strategies, also called quality at a reasonable price (Novy-Marx, 2014).

### 2.1. Value portfolios

Prior research finds that value stocks (e.g., high book-to-market stocks) outperform glamour stocks (or low book-to-market stocks) (Fama and French, 1992; Lakonishok, Shleifer and Vishny, 1994; Asness et al., 2015). Lakonishok et al. (1994) report that a

value-growth portfolio yields a 10% yearly return. Various explanations for the excess returns have been offered in the literature. Fama and French (1992) argue that value stocks are associated with financial distress, and thus the superior returns are a compensation for risk. However, studies have found that value portfolios are associated with lower risk (e.g., Haugen and Baker, 2009), which does not support the risk explanation based on market efficiency. The second explanation is mispricing. Haugen and Baker (2010) argue that the market tends to overreact to past information on firms' success and failure, which makes expensive stocks too expensive and relatively cheap stocks too cheap. La Porta et al. (1997) find that inexpensive stocks are associated with positive earnings surprises at subsequent quarterly earnings announcements.

### 2.2. Quality portfolios

Graham (2003) views stock quality as an important part of value investing.[1] Firm profitability is often used as a proxy for quality.[2] Haugen (1999) argues that the payoff to profitability is either zero or positive if markets are efficient or inefficient, respectively. Previous literature uses several measures for quality including profitability (such as ROA[3] and ROE) and financial strength. Novy-Marx (2013) introduces gross profitability divided by total assets as a measure of quality. Gross profitability can be viewed as the product of gross margin (which reflects pricing power) and asset turnover (which is a measure of capital productivity). High profitability, especially if it can be sustained, is also an indication of a firm's competitive advantage. Piotroski (2000) uses several proxies for financial strength (called the F-score) as a quality measure. The F-score is based on four measures of profitability, three measures of liquidity, and two measures that capture operating efficiency.

Measures of quality have been found to predict superior returns (Asness et al., 2014). Haugen and Baker (1996) report that profitability measures such as ROE and ROA are significantly positively related to future stock returns in the US and internationally. While Novy-Marx (2013) reports that high gross-profitability to assets is associated with superior stock returns, even higher returns are obtained when portfolios are formed based on both profitability and value.[4] Relatedly, Piotroski (2000) finds that investing in firms that are financially strong significantly improves the performance of value portfolios. In addition, Gompers et al. (2003) explore the relation between corporate governance quality and subsequent stock returns, and they find an 8.5% annual excess return for a good governance portfolio.[5] Overall, both value and quality strategies are designed to acquire productive assets cheaply.

### 2.3. Portfolio concentration data and quality at a reasonable price

Ekholm and Maury (2014) introduce a firm-level portfolio concentration measure defined as the average portfolio weight of a firm's shareholders. They report that the portfolio concentration measure is positively related to future operational performance, valuation, and abnormal stock returns. The positive relation between portfolio concen-

[1] Novy-Marx (2013) notes that while trading on profitability utilizes a value philosophy, the strategy is a growth strategy measured by valuation ratios.
[2] For quality/value strategies, Novy-Marx (2014) finds that buying profitable value stocks exhibit the best returns.
[3] Return on assets (ROA) is often viewed in the strategic management literature as the measure that best reflects a firm's financial performance and competitive advantage (e.g., Dehning and Stratopoulos, 2003).
[4] Such strategies are also referred to as growth at reasonable price (GARP) or quality at reasonable price (QARP).
[5] However, Bebchuk et al. (2009) do not find abnormal returns for the governance portfolio for a later period, which they argue is consistent with a learning effect by the market.

tration and performance can arise due to superior information possessed by focused shareholders about the firm's prospects and due to informed shareholders' monitoring ability through the so-called exit and learning channels (see also Edmans, 2009). Similarly, Fich et al. (2015) find that monitoring activities are higher when institutions have invested a larger fraction of their portfolio in a firm. Relatedly, Ivkovic et al. (2008) report that individual shareholders with concentrated portfolios obtain higher returns themselves. Using mutual fund data, Kaperczyk and Seru (2007) find that more concentrated mutual funds outperform less concentrated funds. They also show that the outperformance is due to superior stock selection (but not market timing) by managers of concentrated funds.

Relatedly, information on insider trades (such as trades by officers, directors, and very large shareholders) may also be useful in predicting returns. Several studies report that investing in stocks shortly after the public announcement where insider buying exceeds insider selling with multiple insiders involved have yielded abnormal returns (e.g., Jaffe, 1974). Fidrmuc et al. (2006) report that the effect of insider trades on prices is stronger with more asymmetric information. Furthermore, Kallunki et al. (2009) report that trades by insiders whose wealth is highly concentrated in their firms provide the strongest signals about future returns.

Although previous research relates data on portfolio concentration to abnormal stock returns, the information on portfolio concentration has not been combined with investment strategies based on value and quality. The main focus in this paper is to explore how information on investor confidence derived from holdings data can be utilized to improve the returns of already profitable value investing strategies. It can be argued that signals from changes in holdings data can be especially useful in a contrarian setting when informed investors buy shares with relatively low valuations and high expected returns.

## 2.4. Hypotheses

The key hypotheses in this paper focus on how portfolio and ownership concentration data can be used to enhance the returns of value and quality portfolios. Increases in portfolio concentration (AWI) are likely to contain information about positive future prospects of a company as more concentrated portfolios tend to be more informed (see, e.g., Ivkovic et al., 2008; Ekholm and Maury, 2014). Besides the valuable information from increases in portfolio concentration, another potential benefit relates to a form of market monitoring. The so-called exit model predicts that that trading by informed blockholders leads to more informative stock prices and to better decisions by managers whose compensation typically is linked to the stock price (e.g., Edmans, 2009). More generally, Edmans and Holderness (2016) note that the concentration of a block in an investor's portfolio could matter as much as the fraction of shares held by the investor.

If shareholders with concentrated portfolios are more informed than dispersed shareholders and the market is slow to incorporate such information into prices, one should expect portfolio concentration information to be valuable. Alternatively, portfolio concentration is related to some risk factor (see Section 4.2.3). The first hypothesis can be stated as follows:

> **H1**: Using changes in a firm's average investor portfolio concentration as selection criteria should increase the performance of value and quality investment strategies.

The second hypothesis deals with the use of the more traditional dimension of ownership data: ownership concentration. As was the case for increases in portfolio con-

centration, increases in ownership concentration can reflect information advantages by blockholders (see, e.g., Demsetz, 1986) concerning future firm performance. Further, governance through trading (exit and learning) and direct intervention (or voice) could improve firm performance (see, e.g., Edmans, 2014). Ownership and governance can also be viewed a part of the "quality" variables. Changes in ownership variables can provide both information about future firm performance and information about firm governance.

Similarly to Hypothesis 1, to the extent that large shareholdings (and ownership concentration) are associated with better information about firms' prospects, one should expect increases in ownership concentration to be positively related to future stock returns if the market is slow to disseminate such private information. Alternatively, corporate ownership concentration is related to some risk factor. The second hypothesis can be expressed as follows:

**H2:** Using changes in ownership concentration as selection criteria should increase the performance of value and quality investing strategies.

## 3. Data

### 3.1. The Finnish Central Securities Depository (FCSD) and ownership variables

The Finnish Central Securities Depository (FCSD) data provides detailed information on holdings in Finnish listed firms (for institutional details, see Karhunen and Keloharju, 2001, and Keloharju and Lehtinen, 2015). Finnish individuals and institutions have to register their holdings in the book entry system. As Keloharju and Lehtinen (2015, p. 2) note, one limitation of the data set is that foreigners are partially exempted from registration as they can choose to register in a nominee name. If foreigners opt for nominee registration, their holdings are pooled together with other nominee holdings and cannot be studied separately.[6]

The FCSD data used here includes entries for more than 1.3 Million unique shareholders covering the period 1995 to 2006 and is similar to the data set used in Ekholm and Maury (2014).[7] In addition, since the focus lies on outside shareholdings, I use ownership data from the low voting share class, which typically is the more traded class. Following Ekholm and Maury (2014), I calculate portfolio concentration (which they call the Average Weight Index (AWI)) for each share and year in the following way. In the first step, the portfolio value in euros for each investor and year (as of December 31) is a calculated as the sum of the product of number of shares times price:[8] In the second step, portfolio concentra-

[6] When calculating the portfolio concentration measure, the effect of separate nominee registered foreigninvestors is thus missed. However, Ekholm and Maury (2014, p. 925) find similar results when using all investors and only private investors (presumably more accurate) to calculate the portfolio concentration measure.

[7] The sample period in this study is determined by the availability of the data to calculate the portfolio concentration measure. The data include 102,797,708 exchange transaction entries and 19,090,710 entries for mergers, splits, gifts, bankruptcies, IPOs, and other transactions not executed over an exchange. Each entry consists of 18 data fields, including information about both the shareholder and the transaction itself.

[8] Formally, $V = \sum_{i=1}^{M} H_i * P_i$, where *V* equals the portfolio value in euros, *Hi* equals the number of firm *i*'s shares in the portfolio, and *Pi* equals the euro price of firm *i*'s share, and *M* equals the number of different stocks in the investor's portfolio.

tion for each stock and year (as of December 31) is calculated. This firm-level portfolio concentration measure (AWI) equals the average of individual shareholders' weights held in a firm.[9] Thus, the portfolio concentration measures how important a stock is for its average shareholder.[10] In the empirical analysis, I use the change in AWI (ΔAWI) measured from year-end t-2 to t-1. The portfolio concentration measure is calculated for different categories of shareholders: all investors, investors with at least 0.1%, and investors with 1% of shares in a firm.

I also use a traditional ownership concentration measure: the Herfindahl index (HFI) as in, for example, Demsetz and Lehn (1985). The HFI measure is calculated as the sum of squared fractional ownership stakes in a firm for each firm and year (as of December 31).[11] The Herfindahl Index measures ownership concentration, and I consequently expect it to correlate positively with the monitoring power of large shareholders in a firm. The change in HFI (ΔHFI) as measured from year-end t-2 to t-1 is used in the analysis.

### 3.2. Accounting, valuation, and control variables

Historical records of accounting and valuation data for Finnish publicly traded firms (excluding banks and insurance companies) for the fiscal years 1996 to 2005 are provided by Balance Consulting. I use Return on Assets (ROA) defined as earnings before interest and taxes (EBIT) divided by average total assets during the year as a measure of firm quality. As the valuation measure, the book-to-market ratio defined as the book value of shareholders' equity divided by the market capitalization of the firm's shares is employed as in Fama and French (1992) and Novy-Marx (2013). Other variables used in the analysis are defined in Table 1. The sample used in the main analysis consists of an unbalanced panel that combines the FCSD shareholder register and the Balance Consulting firm-level data.

### 3.3. Return data and final sample

Dividend and split adjusted monthly stock and index returns for firms on the main list of the NASDAQ OMX Helsinki Stock Exchange for the calendar years 1996 to 2007 are provided by the Department of Finance at Hanken School of Economics. I use the OMX Helsinki Cap index as the market portfolio.[12] Monthly observations for the one month Euro Interbank Offered Rate (EURIBOR) from 1999 to 2007 and the one month Helsinki Interbank Offered Rate (HELIBOR) from 1995 to 1998 are retrieved from Kauppalehti Ltd. As an alternative to the one-factor model, I use the Carhart (1997) factors available for euro countries from Kenneth French's webpage.[13] The final sample that combines the FCSD register, accounting and valuation data for

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[9] Formally, $\text{portfolio concentration (AWI)} = \frac{\sum_{j=1}^{N} \frac{H_j * P}{V_j}}{N}$, where *AWI* equals the average weight, *Hj* equals the number of shares that investor *j* holds, *P* equals the euro price of the share, *Vj* equals the value in euros of investor *j*'s portfolio, and *N* equals the total number of shareholders in the firm. *P* is calculated as the Volume Weighted Average Price (VWAP) (for details, see Ekholm and Maury, 2014).

[10] It should be noted that the data set does not contain information on the entire portfolio holdings but only directly held Finnish stocks. Thus, indirect ownership through mutual funds, hedge funds, trust funds etc. is not covered by the concentration measure. However, focusing on directly held Finnish stocks should be a good enough proxy for the portfolio and ownership concentration measures.

[11] $\text{HFI} = \sum_{j=1}^{N} \left( \frac{H_j}{\sum_{j=1}^{N} H_j} \right)^2$, where *Hj* equals the number of shares that investor *j* holds, and *N* equals the total number of shareholders in the firm. I calculate the Herfindahl Index using data on all shareholders.

[12] This index limits the weight of a single stock to 10%.

[13] Data available at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

Finnish firms (excluding banks and insurance companies) on the OMXH main list. The number of firms in the final analysis varies between 41 (year 1996) and 97 (year 2005), with a total of 126 different firms over the period. The number of observations available for each variable is displayed in Table 1.

Stock returns are measured by raw returns, market-adjusted returns (raw return - market portfolio return for the period), Jensen (1968) alpha, and Carhart (1997) alpha. In the main specifications, the return period is from May year *t* to April year *t*+1 to ensure that the information on holdings (measured from year-end *t*-2 to *t*-1) and accounting data (measured at end of *t*-1) are available to investors at the time of portfolio formation at end of April in year *t*.[14] Average equal-weighted returns and alphas are reported for the different portfolios. One benefit of equal weights is that such a strategy is easy to implement in practice.

I estimate Jensen (1968) alphas for each share and year as follows

$$R_t - R_{ft} = \alpha + \beta_t (R_{mt} - R_{ft}) + \varepsilon_t, \quad (1)$$

where $R_t$ is the return on a firm's share in month t, $R_{ft}$ is the risk-free rate in month t, and $R_{mt}$ is the market portfolio return.

The Carhart (1997) four factors are returns to zero investment portfolios that capture market, book-to-market, size, and momentum effects, respectively, and can be expressed as follows:

$$R_t - R_{ft} = \alpha + \beta_{MKT}MKT_t + \beta_{HML}HML_t + \beta_{SMB}SMB_t + \beta_{MOM}MOM_t + \varepsilon_t, \quad (2)$$

where $R_t$ is the return on a firm's share in month t and $R_{ft}$ is the risk-free rate in month t. MKT, HML, SMB, and MOM are the returns on the market, value, size, and momentum factors (for details see Carhart, 1997).

## 4. Empirical analysis

### 4.1. Empirical design

The research design used in the main analysis is as follows. First, each year firms are grouped into value and growth stock portfolios based on their book-to-market ratios following prior research (e.g. Fama and French, 1992, and Piotroski, 2000). Firms with book-to-market ratios in the highest quartile each year are considered value companies, while firms in the lowest quartile are labeled glamour stocks. Stock returns of value companies with above or equal to the median yearly change in portfolio concentration are reported. This research design builds on the one used in Piotroski (2000). In addition, the returns of glamour portfolios with equal or below median change in portfolio concentration are reported. This paper tries to improve portfolio performance with holdings data after the initial selection based value or the combination of value and quality has been made.

In the second specification, portfolio concentration data (ΔAWI above or below the median value) are combined with portfolios (high quartile and low quartile) formed based on combined value and quality ranks. This method follows Novy-Marx (2013, 2014) in which the sum of the combined (equally weighted) ranks of (gross) profitability divided by total assets (quality) and book-to-market (value) are related to stock returns.[15] Alternative methods and quality variables are discussed in Section 4.3.

[14] It should be noted that there are significant "search costs" involved in computing the AWI portfolio concentration measure. Hence, the information on individual shareholders portfolio concentrations (and possible trading profits) is likely to be available only to few investors.

[15] Each formation date at end of April each year, stocks are ranked according to their profitability and according to their book-to-market ratio. The sum of the two ranks is used to form the high and low quality and value quartile portfolios. For a discussion of the benefits of combined sorting, see Novy-Marx (2014).

*4.2.1. Main findings*

Table 1 shows descriptive statistics for variables used in the study. Spearman correlations for the main variables are displayed in Appendix 1. The correlations in Appendix 1 show that increases in portfolio focus (ΔAWI) are associated with higher future stock returns, and that increases in portfolio concentration tend to be positively correlated with value (book-to-market) and quality (ROA) characteristics in the same year. Regarding the level of portfolio concentration, Ekholm and Maury (2014) report that the average shareholder in the Finnish market holds approximately four stocks in their equity portfolio.

In Panel A of Table 2 returns for portfolios of firms with above median changes in portfolio concentration versus below median changes in portfolio concentration over a ten-year period are shown. Yearly portfolios with higher changes in portfolio concentration display higher average returns, and the difference between high and low concentration is statistically significant except for Carthart alpha.[16]

Panel B of Table 2 shows the returns to value and glamour stocks. The value portfolio, defined as the stocks with a book-to-market ratio in the top 25% each year, has returned 0.89 % p.a. in excess of the market index, whereas glamour stocks (book-to-market ratio in lowest 25%) have returned -9.33% p.a. on average. The Jensen alpha (abnormal return) in annual terms equals 2.12% and -9.64% for value and glamour stocks, respectively. Hence, value portfolios have outperformed glamour stocks during the studied period.

Panel C of Table 2 shows the returns to a value portfolio in which the yearly changes in portfolio concentration (ΔAWI) is above the median. The market-adjusted annual return equals 4.14%, and the Jensen alpha equals 4.88%. Thus, investing in value stocks in which the change in investors' portfolio concentration is above the median improves the investment returns compared with the pure value portfolio (shown in Panel B). For comparison, a portfolio consisting of glamour stocks with a change in the portfolio concentration below the median level has annual returns of as low as -11.54% and -9.58% using market-adjusted returns and the Jensen alpha, respectively. As shown in Panel C, the difference between value firms with ΔAWI above the median and glamour stocks with ΔAWI below the median equal a market-adjusted return and Jensen alpha of 15.68% and 14.46%, respectively (significant at the 1% level).[17] Taken together, results indicate that information on shareholder portfolio holdings can benefit value investors.

In Panel D of Table 2, stocks are sorted into quartiles based on their combined book-to-market (value) and return on assets (quality) ranks. A portfolio of stocks in the highest quartile based on the combined value and quality rank yields a market-adjusted return of 4.71% and a Jensen alpha of 4.96% in annual terms. A portfolio with the lowest combined value and quality rank has a market-adjusted annual return and Jensen alpha of -12.42% and -13.79%, respectively. Thus, a strategy combining quality and value yields returns that clearly exceed those of pure value strategies. The value portfolio that only includes stocks with changes in portfolio concentration above the median (Panel C) yields returns comparable to the combined value and quality strategy (Panel D).

Panel E of Table 2 shows the performance of a portfolio that includes stocks from the quarter with the highest combined value and quality rank that have changes in portfolio concentration above the median. The returns

[16] Pure quality strategies and quality combined with changes in portfolio concentration are displayed in Panels H and I of Table 6.

[17] Since the sample includes also smaller firms, the possibilities to take short positions may be limited.

to this portfolio formed based on signals from value, quality and changes in portfolio concentration equal 7.59% and 6.76% for market- adjusted returns and the Jensen alpha, respectively. A portfolio that goes long in this portfolio and shorts a portfolio of stocks in the lowest quarter of the value and quality ranks with ΔAWI values equal to or below the median produces a market-adjusted return of 22.28% and a Jensen alpha 20.85% in annual terms based on portfolio averages. Thus, a strategy that combines value, quality, and data on investor holdings yields higher returns than a strategy based on only value and changes in portfolio concentration (Panel C).

As an alternative to grouping stocks based on their yearly change in AWI, one can select only firms that experience positive yearly changes in AWI into the long portfolio each year and include stocks in the short portfolio that experience reductions in the ΔAWI. Panel F of Table 2 shows the returns to a portfolio of stocks sorted based on value and quality ranks with increases in ΔAWI. The returns to using this specification are higher, and statistically more significant, than those using ΔAWI quartiles in Table 2.

In sum, Table 2 shows that investor holdings data can be useful for enhancing the performance of value/quality strategies. The performance (measured by raw and market-adjusted returns, Jensen alpha, and Carhart alpha) of both pure value portfolios and portfolios combining value and quality can in certain situations be improved with information on investors' holdings (portfolio concentration). The best performance is obtained with a portfolio of stocks that is first selected on combined value and quality ranks and in the second step selected based on changes in investor portfolio concentration. Thus, the results gives support to Hypothesis 1 by showing that one can improve the performance of a quality and value ranked portfolio (e.g., Novy-Marx, 2013) by utilizing portfolio holdings data.

I also calculate the returns to portfolios in which the ΔAWI is calculated for a subset of shareholders that hold larger stakes. I use the thresholds 0.1% and 1% of outstanding shares. The results for these thresholds are shown in Panels A and B of Table 3. The results show that portfolios sorted first on value and quality ranks and then based on changes in larger shareholders' average portfolio concentration yield a market-adjusted return and a Jensen alpha of 10.01% (9.10%) and 8.87% (7.78%) for 1% (0.1%) shareholders, respectively. Panel B also shows that the difference in market-adjusted returns and Jensen's alpha between high and low ΔAWI within the value and quality high quartile are statistically significant at least at the 5% level for 1% shareholders (with the exception of Carhart returns), respectively. Taken together, the portfolios sorted based on data for larger shareholders tend to outperform portfolios based on portfolio concentration data for all and 0.1% shareholders.

Panel C of Table 3 shows the performance of the combined value and quality portfolio when changes in ownership concentration (from year-end *t*-2 to *t*-1) measured with the Herfindahl index of all holdings is used instead of changes in portfolio concentration in the last sort.[18] One benefit with corporate ownership concentration data is that such data are easier to obtain and measure than data on investors' portfolio concentration. The value/quality portfolio containing stocks with above median yearly changes in ownership concentration has a market-adjusted annual return and a Jensen alpha of 7.00% and 6.35%, respectively. While the portfolio

[18] The results are very similar when the Herfindahl index is calculated for 0.1% or 1% shareholders only.

performance using ownership concentration is higher than that of the value/quality portfolio in Panel D of Table 2, the performance is not as high as for portfolios using portfolio concentration data for 0.1% and 1% shareholders, respectively (Panels A and B of Table 3), or increases or decreases in AWI (Panel E, Table 2). Overall, the results using changes in ownership concentration for sorting stocks give some support to Hypothesis 2, although the results are not conclusive as difference is not statistically significant.

The results from the Carhart (1997) asset pricing tests are not as consistent as those based on raw and market-adjusted returns. Panel E of Table 2 shows that the Carhart (1997) alpha for the high-low portfolio sorted based on portfolio holdings data equals 13.15%, though statistically significant at the 10% level. However, in Panel F of Table 2 the Carhart (1997) alpha for the high-low portfolio sorting on increases/decreases in the AWI variable equals 24.72% and is statistically significant at the 1% level. The reason for the lower significance of the results using the Carhart (1997) alpha in Tables 2 and 3 may lie in the momentum factor or in the relation between the momentum factor and AWI.

*4.2.2. Further evidence from multivariate analysis*

The positive relation between increases in AWI and portfolio performance measured by raw returns and market-adjusted returns obtained in Section 4.2.1 could be due to a correlation between AWI and other known return patterns. Following Piotroski (2000), I estimate a regression model for all, the group of high book-to-market firms (above the median), as well as for profitable value (above the median) firms. The model takes the following form:

$$\text{Return} = \text{Ln(Book-to-Market)} + \text{Ln(MVE)} + \text{ROA} + \text{Momentum} + \Delta\text{AWI} + \varepsilon, \quad (3)$$

where Return is the market-adjusted annual return for the period (May year t to April year t+1), Ln(Book-to-Market) is the natural logarithm of the Book-to-Market ratio, Ln(MVE) is the natural logarithm of the market capitalization of equity (both variables are measured at end of t-1)[19], Momentum is the past 6 month stock return directly prior to portfolio formation,[20] and ε is the error term.[21] Other variables are defined in Section 3.

The results from pooled OLS regressions in which standard errors control for firm clustering (see Petersen, 2009) are displayed in Panel A of Table 4.[22] Table 4 shows that the coefficient for changes in portfolio concentration (ΔAWI) for all, 0.1%, and 1% shareholdings is significantly positively related to one-year market-adjusted stock returns. The results are rather similar for portfolio concentration when estimated over all (columns 1-3), value (columns 4-6), and profitable value (columns 7-9) firms. Panel B further displays results using a firm fixed effects specification. The results using firm fixed effects are comparable to those using the pooled OLS specification. Taken together, the regressions indicate that the signal from changes in shareholders' portfolio concentration is not explained by previously known return patters. Thus, the regressions give support to the results from the portfolio approach in Section 4.2.1.

[19]Besides controlling for the size effect, market capitalization is an important control variable since the relation between market capitalization and portfolio concentration may be non-trivial as price increases also can increase portfolio concentration.
[20]I use the six month return directly prior to portfolio formation following Piotroski (2000), Mohanram (2005), and Piotroski and So (2012).
[21]To maintain sample size, the momentum variable is set equal to zero for missing observations. The regression model includes a dummy variable which is equal to one if the momentum data was available and zero otherwise.
[22]The results are qualitatively similar when Fama-Macbeth Newey-West standard errors that control for autocorrelation are used as in Piotroski and So (2012).

*4.2.3. Risk*

In this section, I discuss levels of risk-related measures for the various portfolios formed based on value, quality, and changes in portfolio concentration.[23] Standard deviations of raw yearly company-level stock returns are calculated for various strategies. To further explore whether higher portfolio performance is associated with a compensation for higher risk (e.g., Fama and French, 1992), I follow Mohanram (2005) and estimate CAPM betas (β). In addition, I measure the standard deviation of past 5-year ROA as a fundamental risk measure.

Panel A shows that CAPM β (column 2) is significantly lower for high portfolio concentration stocks (based on ΔAWI) than lower concentration stocks. The standard deviation of the 5-year ROA (column 3) is rather similar for concentrated and dispersed portfolios. The standard deviation of raw returns appears to be rather similar for concentrated and dispersed stocks (column 1). Panel B of Table 5 shows that the systematic risk measured by CAPM β and the standard deviation of the 5-year ROA are significantly lower for the value than for the glamour portfolio. Panel C shows that value firms with high ΔAWI values have lower risk levels compared with all value firms in Panel B. Similar risk patterns are found for portfolios sorted based on value and quality ranks in combination with ΔAWI for all or 1% shareholders (Panels E and F). Taken together, the results in Table 5 indicate that the portfolios associated with high stock performance (in Tables 2 and 3) generally exhibit lower risk than in the lower performance portfolios. The results in Table 5 support the mispricing explanation but not the explanation holding that return is a reward for risk.

## 4.3. Further analysis

This section discusses how the main results are affected by (i) the use of F-score as a quality variable, (ii) alternative partitions of the data based on firm size, share turnover, and analyst coverage, (iii) the timing of the use of portfolio concentration data (e.g., using ΔAWI in the first sorting stage versus the last stage), and (iv) pure quality sorting, as well as (v) alternative return periods and alternative timings of accounting data and stock returns periods.

*4.3.1. F-score as quality measure*

As an alternative to ROA, I consider Piotroski's (2000) F-score as a quality measure. The F-score measures firms' financial strength by using nine financial variables that can be grouped into three key areas: profitability, financial leverage/liquidity, and operational efficiency (see, Piotroski, 2000, for details). The aggregate of the nine binary variables is the F-score. Data used to calculate the nine binary variables that form the aggregate F-score are obtained from Thomson Financials except for the equity issue variable that is based on the year book Pörssitieto.

Panel A of Tables 6 shows the results for a portfolio that contains high book-to-market firms (Q4) with high F-score firms (Q4). Panel A of Table 6 also shows that partitioning the high F-score/value portfolio based on investor portfolio concentration (high increases in concentration) seems to improve the portfolio performance, although the statistical significance is varying.

*4.3.2. Alternative data partitions*

In this section, results controlling independently for firm size, share turnover (liquidity), and analyst coverage are discussed

[23]This section on risk measures complements the risk-adjusted portfolio performance analysis using Jensen (1968) alpha and Carhart (1997) four factor alphas in Section 4.2.1.

(for a discussion on partitions based on the information environment, see Piotroski, 2000).[24] I partitioned the sample into stocks with equal to or above median and below median firm size (measured by the market capitalization of the firm) each year. The main results are rather similar for large and small firms, although larger firms tend to exhibit somewhat higher portfolio performance for the sample stocks (Panels B and C).

Panels D and E of Table 6 show that portfolio performance of the long portfolio tends to be rather similar for stocks with high and low yearly share turnover (based on the median), while the high-low return tend to be higher for high liquidity firms. Panels F and G of Table 6 display portfolio performance based on the level of analyst coverage (above or below median). The results show that the portfolio performance is not especially sensitive to whether the number of analysts following the firm is high or low. Taken together, the results in Table 6 indicate that portfolio performance is not very significantly driven by size, liquidity or analyst coverage.[25]

*4.3.3. The timing of the use of portfolio concentration data*

The main specifications in Table 2 utilize portfolio concentration data for sorting in the last phase after having made value and quality sorts. Alternatively, one could use portfolio concentration data already in the first stage in which case the initial stock selection would be based on the combined ranks of ΔAWI and value (book-to-market) as well as on the combined ranks of ΔAWI, value, and quality (ROA). Though not reported in a table, the results indicate that the portfolio performance is higher when the portfolio holdings data is used in the last stage, or put differently, not included in the initial stock selection. For example, a long-short portfolio (high-low) using the combined ranks of ΔAWI, value, and ROA has lower performance than a portfolio initially selected on value and quality with a final screening that includes stocks with ΔAWI above the mean (Panel E, Table 2). Thus, the results indicate that holdings data should be used to complement value and quality in the final stage.

*4.3.4. Pure quality*

Panel H of Table 6 show returns to pure high and low quality (measured by ROA). The results show that pure quality did not significantly beat low quality. Portfolio concentration data is further combined with quality in Panel I, and the results show that changes in portfolio concentration did not perform as well as in the value and profitable value contexts.

*4.3.5. Alternative timings of accounting data and stock returns, and stock return sub-periods*

Panels A-C of Appendix 2 show the returns for portfolios based on combined value and quality ranks for high and low changes in portfolio concentration over the portfolio formation sub periods 1997-2000, 2001-2003, and 2004-2006. For these sub-periods, the returns are consistently higher for the high value, quality, and high change in portfolio concentration than for the low portfolio. Although, there are variations in the return levels between the time periods, the pattern for the difference between the high and low portfolios is rather consistent which gives support to the conclusions regarding the results in Table 2 estimated for the full period.

I also consider different lags when using historical accounting data. First, I consider

[24]Each year, observations were independently sorted into large/small, high/low liquidity, and high/low analyst following. Due to this sorting, portfolios can have unequal number of observations.

[25] Piotroski (2000) finds that value stocks that are smaller and associated with higher asymmetric information tend to have higher returns in the US.

lagging the book value of equity (t-2) and Return on Assets one year (t-2), while using the market value of equity from year-end (t-1). In the specifications with longer lags for accounting data, I measure stock returns over the period February$_t$-January$_{t+1}$. Though not shown in a table, the results are not very sensitive to how the book equity value or ROA are lagged. The results using these lags are very similar to the main results.

## 5. Summary and conclusion

This paper explores whether information on investors' equity portfolio concentration can be beneficial to value investors. Using data on more than a million investor portfolios in the Finnish stock market over a ten-year period, I find that data on changes in average investor portfolio concentration in firms, a proxy for investor confidence, can under certain conditions improve the performance of value portfolios and portfolios based on combined value and quality ranks. The results show that the performance of a quality at reasonable price strategy could be most reliably increased with portfolio concentration data when increases in portfolio concentration was calculated for larger (1% shareholders), and presumably more informed, shareholders. In addition, the results show that increases in ownership concentration can be used as an additional signal to obtain improved portfolio performance of value oriented strategies, although the portfolio concentration seems to be a better signal than ownership concentration. Overall, the results indicate that it is possible to increase the performance of value/quality-style portfolios by using data on shareholders' portfolio holdings without increasing portfolio risk. Future research could further explore, for example, how investor characteristics and other corporate governance variables could be incorporated into the fundamental analysis of firms.

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Table 1. Descriptive Statistics
This table shows descriptive statistics for variables used in the study. The sample covers Finnish listed firms (excluding banks and insurance companies). Value portfolios are formed at the end of April in year t+1 during a ten-year period (1997-2006). Accounting and valuation variables are measured at end of year t-1 (1996-2005). The change in AWI (average weight index) for all, 0.1%, and 1% shareholders is measured from year-end t-2 to t-1, respectively. The change in HFI is the change in the Herfindahl index of all shareholdings in a firm from year-end t-2 to t-1. ROA is defined as earnings before interest and taxes (EBIT) divided by total assets in year t-1. Book-to-market is the book value of shareholders' equity divided by the market capitalization of the firm's shares in year-end t-1. Analyst coverage is the number of analysts following a firm. F-score is the Piotroski (2000) measure of financial strength. Momentum is the 6 month stock return prior to portfolio formation. CAPM beta is the beta coefficient. MVE is the market capitalization of a firm's equity. Trading volume is the trading volume for the year. Stdev ROA is the five-year standard deviation of annual ROA. Stock returns are measured over the period May year t to April year t+1 and defined in section 3.3. The number of observations varies due to data availability. The total number of firms is 126.

| | Mean | Standard Deviation | Min. | Max. | Observations |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| ΔAWI | -0.0082 | 0.0367 | -0.2141 | 0.1825 | 696 |
| ΔAWI_0.1% | -0.0003 | 0.0570 | -0.3938 | 0.4229 | 696 |
| ΔAWI_1% | -0.0013 | 0.0943 | -0.4311 | 0.7107 | 696 |
| ΔHFI | -0.0045 | 0.0608 | -0.3640 | 0.4821 | 696 |
| ROA (%) | 9.4514 | 9.4972 | -32.6000 | 61.0000 | 740 |
| Book-to-Market | 0.6972 | 0.4749 | 0.0145 | 3.7761 | 740 |
| Analyst coverage | 6.2679 | 6.8014 | 0.0000 | 50.0000 | 698 |
| F-score | 6.0685 | 1.5645 | 1.0000 | 9.0000 | 569 |
| Momentum (6 months) | 0.1447 | 0.3279 | -0.9575 | 3.1200 | 706 |
| CAPM beta | 0.7823 | 0.7175 | -1.7012 | 3.9329 | 740 |
| MVE (TEuro) | 1901274 | 13400000 | 1679 | 223000000 | 740 |
| Trading volume (MEuro) | 1575 | 12176 | 0 | 155407 | 740 |
| Stdev ROA (5 year) | 5.2009 | 6.3875 | 0.1817 | 51.9944 | 734 |
| Raw return (12 month buy and hold return, May-April) | 0.1175 | 0.4513 | -0.9813 | 2.7872 | 740 |
| Market-adjusted returns (12 month buy and hold return, May-April) | -0.0304 | 0.4034 | -1.2407 | 2.3230 | 740 |
| CAPM alpha (monthly data, May-April ) | -0.0030 | 0.0296 | -0.1328 | 0.0981 | 740 |
| Carhart four factor alpha (monthly data, May-April ) | 0.0001 | 0.0409 | -0.2068 | 0.1823 | 740 |

Table 2. Investment Returns to Value, Quality, and Portfolio Concentration
This table shows the average annual investment returns in percentage to investing strategies using data on Finnish listed OMXH main list firms (excluding banks and insurance companies) over a ten-year period. Portfolios are formed in the end of April in year t each year (1997-2006). Accounting and valuation variables are measured at end of year t-1. The change in AWI (average weight index) is measured from year-end t-2 to t-1. Stock returns are measured over the period May year t to April year t+1 if not otherwise specified. Panel A shows returns for portfolios based on above median and below median changes in portfolio concentration. Panel B shows returns for high book-to-market quartile (value) firms and low book-to-market quartile (glamour) firms. Panel C shows returns for high book-to-market and low book-to-market firms controlling for change in AWI. Panel D shows returns for high and low quartile portfolios formed based on the combined book-to-market and ROA rank (profitable value). Panel E splits the portfolios in Panel D based on changes in AWI (above or below median change). Panel F shows returns for the combined book-to-market and ROA rank that are based on increases in AWI or decreases in AWI.

| Strategy | Description of Strategy | Raw return (12 month buy and hold return, May-April) | Market-adjusted returns (12 month buy and hold return, May-April) | CAPM alpha (monthly data (x12), May-April) | Carhart four factor alpha (monthly data (x12), May-April) | Obs. |
|---|---|---|---|---|---|---|
| | | (1) | (2) | (3) | (4) | (5) |
| Panel A. Concentrated vs. dispersed | | | | | | |
| Concentrated | High ΔAWI quartile rank (Q3, Q4) | 16.51% | 0.61% | -0.15% | -1.21% | 345 |
| Dispersed | Low ΔAWI quartile rank (Q1, 2) | 10.22% | -5.74% | -5.48% | 0.64% | 351 |
| High-Low | | 6.29%* | 6.35%** | 5.33%** | -1.85% | 696 |
| Panel B. Value stocks vs. glamour stocks | | | | | | |
| Value | High BM (Q4) | 15.83% | 0.89% | 2.12% | 4.07% | 181 |
| Glamour | Low BM (Q1) | 5.47% | -9.33% | -9.64% | 3.18% | 188 |
| Value-Glamour | Value-Glamour | 10.35%** | 10.22%** | 11.76%*** | 0.89% | 369 |
| Panel C. Value stocks by high and low ΔAWI | | | | | | |
| Concentrated Value | High BM (Q4) & high ΔAWI (Q3,Q4) | 18.54% | 4.14% | 4.88% | 5.61% | 84 |
| Dispersed Glamour | Low BM (Q1) & low ΔAWI (Q1,Q2) | 5.08% | -11.54% | -9.58% | 11.01% | 90 |
| High-Low | High-Low | 13.46%** | 15.68%*** | 14.46%*** | -5.40% | 174 |
| Concentrated – Dispersed Value | High ΔAWI - low ΔAWI within high BM portfolio | 2.63% | 5.46% | 4.02% | -5.05% | 174 |
| Panel D. Profitable value | | | | | | |
| Profitable Value | High BM & ROA rank (Q4) | 20.13% | 4.71% | 4.96% | 5.72% | 170 |
| Unprofitable Glamour | Low BM & ROA rank (Q1) | 2.09% | -12.42% | -13.79% | -7.39% | 192 |
| High - Low | High-Low | 18.04%*** | 17.13%*** | 18.75%*** | 13.11%** | 362 |
| Panel E. Profitable value & high/low ΔAWI | | | | | | |
| Profitable Value, Concentrated | High BM & ROA rank quartile (Q4) + high ΔAWI quartile rank (Q3, Q4) | 22.21% | 7.59% | 6.76% | 8.67% | 94 |
| Unprofitable Glamour, Dispersed | Low BM & ROA rank quartile (Q1) + low ΔAWI quartile rank (Q1, Q2) | 0.35% | -12.69% | -14.09% | -4.48% | 95 |
| High-Low | High-Low | 21.86%*** | 20.28%*** | 20.85%*** | 13.15%* | 189 |
| Concentrated – Dispersed Profitable Value | High ΔAWI - low ΔAWI within high BM and ROA portfolio | 1.33% | -4.38% | 2.26% | 6.38% | 165 |
| Panel F. Increases and decreases in AWI | | | | | | |
| Profitable Value, Increased Concentration | High BM and ROA rank (Q4) and ΔAWI >0 | 21.61% | 12.57% | 8.11% | 11.46% | 82 |
| Unprofitable Glamour, Increased Dispersion | Low BM and ROA rank (Q1) and ΔAWI <=0 | -0.95% | -16.91% | -17.46% | -13.26% | 112 |
| High-Low | High-Low | 22.56%*** | 29.48%*** | 25.57%*** | 24.72%*** | 194 |
| Increased Concentration – Increased Dispersion within Profitable Value | Positive ΔAWI - negative ΔAWI within high BM & ROA portfolio | 6.21% | 17.84%*** | 8.04%** | 11.89%* | 165 |

*, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels based on two-sample t-tests, respectively.

Table 3. Investment Returns to Value, Quality, and Portfolio Concentration Using Alternative Specifications of Portfolio Concentration
This table shows the investment returns in percentage to investing strategies using data on Finnish listed OMXH main list firms (excluding banks and insurance companies) over a ten-year period. Portfolios are formed in the end of April in year t each year (1997-2006). Accounting and valuation variables are measured at end of year t-1. The change in AWI (average weight index) is measured from year-end t-2 to t-1. Stock returns are measured over the period May year t to April year t+1. Panel A shows returns for high and low quartile portfolios formed based on the combined book-to-market and ROA rank that are based on changes in AWI (above or below median change) using data on 0.1% shareholdings only. Panel B shows returns for high and low quartile portfolios formed based on the combined book-to-market and ROA rank that are based on changes in AWI (above or below median change) using data on 1% shareholdings only. Panel C shows returns for the combined book-to-market and ROA rank portfolio for increases in HFI (Hefindahl index of all shareholdings) or decreases in HFI.

| Strategy | Description of Strategy | Raw return (12 month buy and hold return, May-April) | Market-adjusted returns (12 month buy and hold return, May-April) | CAPM alpha (monthly data (x12), May-April ) | Carhart four factor alpha (monthly data (x12), May-April ) | Obs. |
|---|---|---|---|---|---|---|
| | | (1) | (2) | (3) | (4) | (5) |
| Panel A. Profitable value & ΔAWI for 0.1% shareholders | | | | | | |
| Profitable Value, Concentrated | High BM and ROA rank & ΔAWI (0.1%) rank (Q4) | 24.06% | 9.10% | 7.78% | 8.69% | 92 |
| Unprofitable Glamour, Dispersed | Low BM and ROA rank & ΔAWI (0.1%) rank (Q1) | -0.48% | -14.46% | -13.77% | -3.19% | 97 |
| High-Low | High-Low | 24.54%*** | 23.57%*** | 21.55%*** | 11.87%* | 189 |
| Concentrated – Dispersed Profitable Value | High ΔAWI_0.1% - low ΔAWI_0.1% within high BM & ROA portfolio | 2.34% | 6.47% | 3.62% | 7.72% | 165 |
| Panel B. Profitable value & ΔAWI for 1% shareholders | | | | | | |
| Profitable Value, Concentrated | High BM and ROA rank & ΔAWI (1%) rank (Q4) | 27.55% | 10.01% | 8.87% | 7.46% | 97 |
| Unprofitable Glamour, Dispersed | Low BM and ROA rank & ΔAWI (1%) rank (Q1) | 1.36% | -13.98% | -13.41% | -1.29% | 95 |
| High-Low | High-Low | 26.19%*** | 23.98%*** | 22.28%*** | 8.75% | 192 |
| Concentrated – Dispersed Profitable Value | High ΔAWI_1% - low ΔAWI_1% within high BM & ROA portfolio | 14.73%*** | 12.56%** | 9.41%** | 9.14% | 165 |
| Panel C: Profitable value & increases/decreases in HFI | | | | | | |
| Profitable Value, Increased Own. Concentration | High BM and ROA rank, and Δ HFI >0 | 23.75% | 7.00% | 6.35% | 8.06% | 94 |
| Unprofitable Glamour, Increased Own. Dispersion | Low BM and ROA rank, and Δ HFI <=0 | 1.25% | -11.71% | -12.20% | -3.89% | 99 |
| High-Low | High-low | 22.51%*** | 18.72%*** | 18.55%*** | 11.95%* | 193 |
| Increased Own. Concentration – Increased Own. Dispersion within Profitable Value | Positive ΔHFI - low ΔHFI within high BM & ROA portfolio | 4.25% | 6.81% | 5.39% | 3.45% | 170 |

*, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels based on two-sample t-tests, respectively.

Table 4. Multivariate analysis
This table shows regressions of market-adjusted stock returns on book-to-market, ROA, size, momentum, and change in AWI. The sample consists of Finnish listed OMXH main list firms (excluding banks and insurance companies) over a ten-year period. Columns 1-3 show regressions on all firms, columns 4-6 value firms (above median), and columns 7-9 profitable value (above median) firms. Market-adjusted returns are measured over the period May year t to April year t+1. Accounting and valuation variables are measured at end of year t-1 (1996-2005). The change in AWI (average weight index) is measured from year-end t-2 to t-1 and is calculated for all (ΔAWI), 0.1% shareholders ΔAWI_0.1%, or 1% shareholders (ΔAWI_1%) depending on the model. Panel A uses a pooled OLS model, while Panel B uses a firm fixed effects model. Robust standard errors that control for firm clustering (Petersen, 2009) are in parentheses below the coefficient estimates.

| | All firms | | | Value | | | Profitable value | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| | | | | Panel A: OLS | | | | | |
| Ln(Book-to-market) | 0.106*** | 0.116*** | 0.112*** | 0.170*** | 0.183*** | 0.194*** | 0.0991 | 0.113* | 0.116* |
| | (0.0246) | (0.0239) | (0.0244) | (0.0632) | (0.0627) | (0.0603) | (0.0651) | (0.0628) | (0.0676) |
| Ln(MVE) | 0.0106 | 0.00965 | 0.0101 | 0.0213 | 0.0149 | 0.0175 | 0.0176 | 0.0138 | 0.0164 |
| | (0.00929) | (0.00917) | (0.00920) | (0.0151) | (0.0149) | (0.0148) | (0.0129) | (0.0129) | (0.0129) |
| ROA | 0.00342 | 0.00369 | 0.00362 | 0.00961*** | 0.0100*** | 0.00870** | 0.00482 | 0.00451 | 0.00576 |
| | (0.00252) | (0.00255) | (0.00248) | (0.00359) | (0.00362) | (0.00401) | (0.00489) | (0.00487) | (0.00553) |
| Momentum | 0.0204 | 0.0321 | 0.0488 | -0.114 | -0.0880 | -0.0485 | 0.0525 | 0.0628 | 0.0920 |
| | (0.0553) | (0.0558) | (0.0553) | (0.0834) | (0.0826) | (0.0821) | (0.0924) | (0.0915) | (0.0890) |
| ΔAWI | 1.671*** | | | 2.029*** | | | 1.858*** | | |
| | (0.517) | | | (0.571) | | | (0.567) | | |
| ΔAWI_0.1% | | 0.896*** | | | 1.531*** | | | 1.053*** | |
| | | (0.241) | | | (0.358) | | | (0.306) | |
| ΔAWI_1% | | | 0.482*** | | | 0.725** | | | 0.505** |
| | | | (0.171) | | | (0.304) | | | (0.223) |
| Intercept | -0.112 | -0.112 | -0.121 | -0.271 | -0.212 | -0.243 | -0.201 | -0.164 | -0.214 |
| | (0.117) | (0.116) | (0.116) | (0.177) | (0.176) | (0.176) | (0.173) | (0.171) | (0.176) |
| Observations | 669 | 669 | 669 | 345 | 345 | 345 | 334 | 334 | 334 |
| R2 | 0.059 | 0.052 | 0.049 | 0.100 | 0.112 | 0.092 | 0.056 | 0.056 | 0.046 |
| | | | | Panel B: Firm fixed effects | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Ln(Book-to-market) | 0.161* | 0.177** | 0.191** | 0.500*** | 0.486*** | 0.534*** | 0.448*** | 0.461*** | 0.483*** |
| | (0.0879) | (0.0835) | (0.0869) | (0.104) | (0.109) | (0.101) | (0.113) | (0.118) | (0.117) |
| Ln(MVE) | -0.131 | -0.124 | -0.114 | 0.128 | 0.107 | 0.149* | 0.0174 | 0.0223 | 0.0390 |
| | (0.0877) | (0.0860) | (0.0882) | (0.0832) | (0.0865) | (0.0854) | (0.0887) | (0.0901) | (0.0895) |
| ROA | -0.00305 | -0.00228 | -0.00207 | 0.00964* | 0.00963* | 0.00911 | 0.00890 | 0.00861 | 0.0103 |
| | (0.00410) | (0.00418) | (0.00415) | (0.00513) | (0.00513) | (0.00622) | (0.00623) | (0.00639) | (0.00752) |
| Momentum | -0.101* | -0.0978* | -0.0722 | -0.208** | -0.189** | -0.164* | -0.0255 | -0.0169 | 0.0175 |
| | (0.0580) | (0.0581) | (0.0593) | (0.0912) | (0.0836) | (0.0856) | (0.111) | (0.112) | (0.107) |
| ΔAWI | 1.631*** | | | 1.253** | | | 1.629** | | |
| | (0.596) | | | (0.567) | | | (0.623) | | |
| ΔAWI_0.1% | | 0.967*** | | | 1.149*** | | | 1.045*** | |
| | | (0.278) | | | (0.378) | | | (0.354) | |
| ΔAWI_1% | | | 0.491** | | | 0.467 | | | 0.515* |
| | | | (0.206) | | | (0.323) | | | (0.275) |
| Observations | 669 | 669 | 669 | 345 | 345 | 345 | 334 | 334 | 334 |
| R2 | 0.140 | 0.137 | 0.132 | 0.167 | 0.180 | 0.166 | 0.165 | 0.174 | 0.165 |
| #Firms | 120 | 120 | 120 | 83 | 83 | 83 | 88 | 88 | 88 |

*, **, and *** indicate statistical significance based on robust standard errors that control for firm-level clustering at the 10, 5, and 1 percent levels, respectively.

Table 5. Risk
This table shows mean values of risk-related measures for stocks in various portfolios sorted based on information on value, quality, and portfolio concentration. The sample consists of Finnish listed OMXH main list firms (excluding banks and insurance companies) over a ten-year period. Portfolios are formed in the end of April in year t each year (1997-2006). The change in AWI (average weight index) is measured from year-end t-2 to t-1. Column 1 shows standard deviation of annual raw returns for individual stocks $May_t$-$April_{t+1}$. Column 2 shows CAPM β for the portfolios using monthly returns $May_{t-1}$-$April_t$. Column 3 shows average standard deviations of past 5-year (t-4 - t) ROA for stocks in portfolios. Q4 is the highest quarter and Q1 is the lowest quarter each year, respectively. Panels A, C and E use data on all shareholders to calculate AWI in a firm, whereas Panel F uses data on at least 1% shareholdings to calculate AWI.

| Strategy | Description | Standard deviation of raw annual returns | CAPM β (systematic risk) | Standard deviation of 5-year ROA | Observations |
|---|---|---|---|---|---|
| | | (1) | (2) | (3) | (4) |
| Panel A. Concentrated vs. dispersed | | | | | |
| Concentrated | High ΔAWI quartile rank (Q3, Q4) | 0.4160 | 0.7305 | 4.9954 | 345 |
| Dispersed | Low ΔAWI quartile rank (Q1, 2) | 0.4559 | 0.8058 | 5.1657 | 351 |
| High-Low | High ΔAWI quartile rank (Q3, Q4) | -0.0398 | -0.0753 | -0.1703 | |
| Panel B. Value stocks vs. glamour stocks | | | | | |
| Value | High BM rank (Q4) | 0.3540 | 0.5833 | 3.9194 | 181 |
| Glamour | Low BM rank (Q1) | 0.5536 | 1.0317 | 7.6372 | 188 |
| Value-Glamour | High-Low | -0.1996 | -0.4484*** | -3.7178*** | |
| Panel C. Value stocks by high and low ΔAWI | | | | | |
| Concentrated Value | High BM rank (Q4) & high ΔAWI (Q3, Q4) | 0.3318 | 0.5728 | 3.7903 | 84 |
| Dispersed Glamour | Low BM rank (Q1) & low ΔAWI (Q1, Q2) | 0.5199 | 1.0384 | 7.4729 | 90 |
| High-Low | High-Low | -0.1881 | -0.4656*** | -3.6826*** | |
| Panel D. Profitable value | | | | | |
| Profitable Value | High BM & ROA rank (Q4) | 0.3529 | 0.6014 | 4.2606 | 170 |
| Unprofitable Glamour | Low BM & ROA rank (Q1) | 0.5252 | 0.9552 | 7.5974 | 192 |
| High - Low | High-Low | -0.1723 | -0.3537*** | -3.3368*** | |
| Panel E. Profitable value and concentration | | | | | |
| Profitable Value, Concentrated | High BM & ROA rank (Q4) & high ΔAWI (Q3, Q4) | 0.3678 | 0.5882 | 4.2428 | 94 |
| Unprofitable Glamour, Dispersed | Low BM & ROA rank (Q1) & low ΔAWI rank (Q1, Q2) | 0.5671 | 0.9422 | 7.8770 | 95 |
| High-Low | High-Low | -0.1993 | -0.3540*** | -3.6342*** | |
| Panel F. Profitable value and concentration (1% shareholders) | | | | | |
| Profitable Value, Concentrated | High BM & ROA rank (Q4) & high ΔAWI_1% (Q3, Q4) | 0.3682 | 0.5822 | 4.0832 | 97 |
| Unprofitable Glamour, Dispersed | Low BM & ROA rank (Q1) & low ΔAWI_1% (Q1, Q2) | 0.5411 | 1.0457 | 7.3131 | 94 |
| High-Low | High-Low | -0.1729 | -0.4635*** | -3.2298*** | |

*, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels based on two-sample t-tests for columns 2 and 3, respectively.

Table 6. Investment Returns to Value, Quality, and Portfolio Concentration Using Alternative Data Partitions
This table shows the investment returns in percentage to investing strategies using data on Finnish listed OMXH main list firms (excluding banks and insurance companies) over a ten-year period. Portfolios are formed in the end of April in year t each year (1997-2006). Accounting and valuation variables are measured at end of year t-1. The change in AWI (average weight index) is measured from year-end t-2 to t-1. Stock returns are measured over the period May year t to April year t+1. Panel A shows the returns to portfolios ranked by value and F-score with and without ΔAWI screens. Panels B and C split the portfolios into large and small firms based on median market value of equity (MVE). Panels D and E split the portfolios in Panel D based on median liquidity measured by share turnover in euro). Panels F and G split the portfolios based on the number of analysts following the firm (above or below median). Panel H and I show returns for pure quality and quality combined with data on changes in portfolio concentration, respectively.

| Strategy | Description | Raw return (12 month buy and hold return, May-April) | Market-adjusted returns (12 month buy and hold return, May-April) | CAPM alpha (monthly data (x12), May-April) | Carhart four factor alpha (monthly data (x12), May-April) | Observations |
|---|---|---|---|---|---|---|
| | | (1) | (2) | (3) | (4) | (5) |
| Panel A. Combined value and F-score rank | | | | | | |
| Quality cheaply | High BM & F-score rank quartile (Q4) | 19.40% | 3.57% | 4.64% | 3.43% | 137 |
| Low quality expensively | Low BM & F-score rank quartile (Q1) | 3.18% | -12.04% | -10.63% | -3.03% | 148 |
| High-Low | | 16.22%*** | 15.61%*** | 15.27%*** | 6.46% | 285 |
| Quality cheaply, concentrated | High BM & F-score rank quartile (Q4) + high ΔAWI quartile rank (Q3, Q4) | 22.52% | 11.85% | 8.90% | 7.47% | 71 |
| Low quality expensively, dispersed | Low BM & F-score rank quartile (Q1) + low ΔAWI quartile rank (Q1, Q2) | 2.82% | -10.72% | -8.89% | 8.40% | 78 |
| High-Low | | 19.70%* | 22.57%*** | 17.79%*** | -0.93% | 149 |
| Concentrated – Dispersed Cheap F-score | High ΔAWI (Q3, Q4)-low ΔAWI (Q1, Q2) within High BM & F-score rank quartile (Q4) | 6.47% | 17.18%*** | 8.84% | 8.37% | 137 |
| Panel B. Profitable value & high/low ΔAWI for large firms | | | | | | |
| Profitable Value, Increased Concentration | High BM & ROA rank quartile (Q3, Q4) + high ΔAWI quartile rank (Q3, Q4) | 26.55% | 9.80% | 7.16% | 2.82% | 30 |
| Unprofitable Glamour, Increased Dispersion | Low BM & ROA rank quartile (Q1, Q2) + low ΔAWI quartile rank (Q1, Q2) | -9.05% | -20.08% | -15.74% | 1.78% | 47 |
| High-Low | | 35.60%*** | 29.88%*** | 22.90%*** | 1.05% | 77 |
| Panel C. Profitable value & high/low ΔAWI for small firms | | | | | | |
| Profitable Value, Increased Concentration | High BM & ROA rank quartile (Q3, Q4) + high ΔAWI quartile rank (Q3, Q4) | 20.18% | 6.56% | 6.58% | 11.41% | 64 |
| Unprofitable Glamour, Increased Dispersion | Low BM & ROA rank quartile (Q1, Q2) + low ΔAWI quartile rank (Q1, Q2) | 9.55% | -5.45% | -12.47% | -10.61% | 48 |
| High-Low | | 10.63% | 12.01% | 19.05%*** | 22.01%** | 112 |
| Panel D. Profitable value & high/low ΔAWI for high liquidity | | | | | | |
| Profitable Value, Increased Concentration | High BM & ROA rank quartile (Q4) + high ΔAWI quartile rank (Q3, Q4) | 26.49% | 8.81% | 4.78% | -3.42% | 23 |
| Unprofitable Glamour, Increased Dispersion | Low BM & ROA rank quartile (Q1) + low ΔAWI quartile rank (Q1, Q2) | -6.93% | -16.27% | -17.82% | 2.77% | 60 |
| High-Low | | 33.42%** | 25.08%** | 22.60%** | -6.19% | 83 |

| Strategy | Description | Raw return (12 month buy and hold return, May-April) | Market-adjusted returns (12 month buy and hold return, May-April) | CAPM alpha (monthly data (x12), May-April) | Carhart four factor alpha (monthly data (x12), May-April) | Observations |
|---|---|---|---|---|---|---|
| Panel E. Profitable value & high/low ΔAWI for low liquidity | | | | | | |
| Profitable Value, Increased Concentration | High BM & ROA rank quartile (Q3, Q4) + high ΔAWI quartile rank (Q3, Q4) | 20.83% | 7.20% | 7.40% | 12.58% | 71 |
| Unprofitable Glamour, Increased Dispersion | Low BM & ROA rank quartile (Q1, Q2) + low ΔAWI quartile rank (Q1, Q2) | 12.84% | -6.56% | -7.71% | -16.91% | 35 |
| High-Low | | 7.99% | 13.75%* | 15.11%*** | 29.49%*** | 106 |
| Panel F. Profitable value & high/low ΔAWI for firms with high analyst coverage | | | | | | |
| Profitable Value, Increased Concentration | High BM & ROA rank quartile (Q 3, Q4) + high ΔAWI quartile rank (Q3, Q4) | 25.00% | 11.47% | 7.34% | -0.88% | 26 |
| Unprofitable Glamour, Increased Dispersion | Low BM & ROA rank quartile (Q1, Q2) + low ΔAWI quartile rank (Q1, Q2) | -3.04% | -14.37% | -15.33% | -7.05% | 47 |
| High-Low | | 28.04%** | 25.84%** | 22.67%** | 6.17% | 73 |
| Panel G. Profitable value & high/low ΔAWI for firms with low analyst coverage | | | | | | |
| Profitable Value, Increased Concentration | High BM & ROA rank quartile (Q3, Q4) + high ΔAWI quartile rank (Q3, Q4) | 20.75% | 20.75% | 6.62% | 13.49% | 60 |
| Unprofitable Glamour, Increased Dispersion | Low BM & ROA rank quartile (Q1, Q2) + low ΔAWI quartile rank (Q1, Q2) | 3.27% | 3.27% | -13.53% | -1.43% | 45 |
| High-Low | | 17.48%* | 17.48%** | 20.15%*** | 14.91% | 105 |
| Panel H. High vs. low quality stocks | | | | | | |
| High Quality | (ROA Q4) | 10.72% | -4.05% | -5.08% | 2.03% | 180 |
| Low Quality | (ROA Q1) | 5.24% | -9.60% | -10.30% | -8.71% | 194 |
| High-Low | | 5.48% | 5.55% | 5.22% | 10.74%** | 374 |
| Panel I. Quality by high and low ΔAWI | | | | | | |
| Profitable, concentrated | Profitable (ROA Q4), concentrated (high ΔAWI quartile rank (Q3, Q4)) | 17.63% | 2.36% | -1.55% | -2.63% | 91 |
| Unprofitable, dispersed | Unprofitable (ROA Q1), dispersed (low ΔAWI quartile rank (Q1, Q2)) | 4.29% | -10.89% | -11.30% | -7.00% | 116 |
| High-Low | | 13.34%** | 13.24%** | 9.75%* | 4.37% | 207 |

*, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels based on two-sample t-tests, respectively.

Appendix 1. Spearman Correlation Analysis
This table shows spearman correlations for main variables used in the study. The sample covers Finnish listed firms (excluding banks and insurance companies). Accounting and valuation variables are measured at end of year t-1 (1996-2005). The change in AWI (average weight index) for all, 0.1%, and 1% shareholders is measured from year-end t-2 to t-1, respectively. The change in HFI is the change in the Herfindahl index of all shareholdings in a firm from year-end t-2 to t-1. ROA is defined as earnings before interest and taxes (EBIT) divided by total assets in year t-1. Book-to-market is the book value of shareholders' equity divided by the market capitalization of the firm's shares in year-end t-1. Stock returns are measured over the period May year t to April year t+1 (see Section 3.3 for details). The number of firms is 126. The number of observations varies due to data availability (see Table 1).

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ΔAWI | 1.0000 | | | | | | | | |
| 2 | ΔAWI_0.1% | 0.4239* | 1.0000 | | | | | | | |
| 3 | ΔAWI_1% | 0.2676* | 0.4783* | 1.0000 | | | | | | |
| 4 | Δ HFI | 0.1923* | 0.1360* | 0.1396* | 1.0000 | | | | | |
| 5 | ROA | 0.0295 | 0.0387 | 0.0096 | -0.0500 | 1.0000 | | | | |
| 6 | Book-to-Market | 0.1121* | 0.0125 | 0.0664* | 0.0522 | -0.3895* | 1.0000 | | | |
| 7 | Raw return (12 month buy and hold return, May-April) | 0.1616* | 0.0710* | 0.0754* | 0.0885* | -0.0267 | 0.1166* | 1.0000 | | |
| 8 | Market-adjusted returns (12 month buy and hold return, May-April) | 0.1785* | 0.1309* | 0.1195* | 0.0350 | 0.0057 | 0.1459* | 0.7964* | 1.0000 | |
| 9 | CAPM alpha (monthly data), May-April ) | 0.1614* | 0.0996* | 0.0511 | 0.0319 | -0.0123 | 0.1776* | 0.7636* | 0.7885* | 1.0000 |
| 100 | Carhart four factor alpha (monthly data, May-April ) | 0.0351 | 0.0289 | 0.0198 | 0.0125 | 0.0647* | 0.0698* | 0.3461* | 0.4871* | 0.6479* |

*Indicates significance at the 10 % level.

Appendix 2. Investment Returns to Value, Quality, and Portfolio Concentration Using Sub-Periods
This table shows the investment returns in percentage to value investing strategies using data on Finnish listed OMXH main list firms (excluding banks and insurance companies). Portfolios are formed at the end of April in year t+1 during a ten-year period (1997-2006). Accounting and valuation variables are measured at end of year t-1 (1996-2005). The change in AWI (average weight index) is measured from year-end t-2 to t-1. Stock returns are measured over the period May year t to April year t+1. Panels A through C show returns for high/low quartile portfolios formed based on combinations of book-to-market, ROA, and ΔAWI for the sub periods 1997-2000, 2001-2003, and 2004-2006.

| Strategy | Description | Raw return (12 month buy and hold return, May-April) | Market-adjusted returns (12 month buy and hold return, May-April) | CAPM alpha (monthly data (x12), May-April ) | Carhart four factor alpha (monthly data (x12), May-April ) | Observations |
|---|---|---|---|---|---|---|
| | | (1) | (2) | (3) | (4) | (5) |
| Panel A. Combined B/M, ROA rank & high/low ΔAWI, period 1997-2000 | | | | | | |
| Profitable Value, Concentrated | High BM & ROA rank quartile (Q4) + high ΔAWI quartile rank (Q3, Q4) | 6.86% | 3.60% | 2.82% | 10.71% | 38 |
| Unprofitable Glamour, Dispersed | Low BM & ROA rank quartile (Q1) + low ΔAWI quartile rank (Q1, Q2) | -16.21% | -20.18% | -23.25% | 6.83% | 38 |
| High-Low | | 23.07%** | 23.78%** | 26.08%*** | 3.88% | 76 |
| Panel B. Combined B/M, ROA rank & high/low ΔAWI, period 2001-2003 | | | | | | |
| Profitable Value, Concentrated | High BM & ROA rank quartile (Q4) + high ΔAWI quartile rank (Q3, Q4) | 28.33% | 17.00% | 11.32% | 19.08% | 32 |
| Unprofitable Glamour, Dispersed | Low BM & ROA rank quartile (Q1) + low ΔAWI quartile rank (Q1, Q2) | 12.39% | 6.61% | 2.49% | 8.72% | 34 |
| High-Low | | 15.95% | 10.39% | 8.83% | 10.37% | 66 |
| Panel C. Combined B/M, ROA rank & high/low ΔAWI, period 2004-2006 | | | | | | |
| Profitable Value, Concentrated | High BM & ROA rank quartile (Q4) + high ΔAWI quartile rank (Q3, Q4) | 38.37% | 1.38% | 6.92% | -8.45% | 24 |
| Unprofitable Glamour, Dispersed | Low BM & ROA rank quartile (Q1) + low ΔAWI quartile rank (Q1, Q2) | 9.91% | -28.83% | -23.47% | -42.68% | 23 |
| High-Low | | 28.46%** | 30.21%** | 30.39%*** | 34.23%** | 47 |

*, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels based on two-sample t-tests, respectively.