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Investor recognition and stock returns

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Abstract It is well established that investment fundamentals, such as earnings and cash flows, can explain only a small proportion of the variation in stock returns. We find that investor recognition of a firm's stock can explain relatively more of the variation in stock returns. Consistent with Merton's (J Finance 42(3):483–510, 1987) theoretical analysis, we show that (i) contemporaneous stock returns are positively related to changes in investor recognition, (ii) future stock returns are negatively related to changes in investor recognition, (iii) the above relations are stronger for stocks with greater idiosyncratic risk and (iv) corporate investment and financing activities are both positively related to changes in investor recognition. Our research suggests that investors and managers who are concerned with firm valuation should consider investor recognition in addition to accounting information and related investment fundamentals.

Keywords Investor recognition · Earnings · Stock returns · Firms' value

JEL Classifications G14 · M41 · G12

1 Introduction

Starting with Ball and Brown (1968), a large body of accounting literature explores the relation between accounting information and stock returns. The general conclusion emerging from research in this area is that accounting information

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explains a surprisingly low proportion of the variation in stock returns. In summarizing early evidence, Lev (1989) finds that earnings can explain no more than 10% of the variation in stock returns and concludes that earnings are of limited usefulness to investors. More recently, Liu and Thomas (2000) extend early research to incorporate changes in expectations of future abnormal earnings and are able to explain up to 30% of the variation in stock returns. Yet, the majority of the variation in stock returns remains unexplained by fundamental variables such as cash flows and earnings.

In this paper we investigate the ability of Merton's (1987) model of capital market equilibrium under incomplete information to explain the remaining variation in stock returns. Merton shows that, holding fundamentals constant, firm value is increasing in the degree of investor recognition of the firm. The key behavioral assumption invoked by Merton's (1987) model is that investors only use securities that they know about in constructing their optimal portfolios. If relatively few investors know about a particular security, then the only way for markets to clear is for these investors take large undiversified positions in the security. These investors then require higher expected returns to compensate them for the increased idiosyncratic risk associated with their positions. Merton refers to the number of investors who know about a security as the degree of 'investor recognition' for that security and models the resulting capital market equilibrium. The key predictions of his model are (i) security value is increasing in investor recognition, (ii) expected return is decreasing in investor recognition, (iii) the above two relations are increasing in the security's idiosyncratic risk, and (iv) financing and investing activities in the underlying firm are increasing in investor recognition. Our empirical results are uniformly consistent with these predictions and are both economically and statistically significant.

Our results make several contributions to existing research. First, our findings contribute to research on the determinants of stock returns. We show that investor recognition is an important determinant of expected returns and that innovations in investor recognition appear to be more important than earnings news in explaining contemporaneous stock returns. These results highlight the importance of investor recognition as a determinant of firm-level expected return news and contribute to the literature on the drivers of firm-level stock returns (e.g., Lev 1989; Roll 1988; Liu and Thomas 2000; Vuolteenaho 2002). The investor recognition hypothesis also explains Vuolteenaho's (2002) finding that expected return news is relatively more important in small firms. Vuolteenaho finds that the variance of cash flow news is greater in small firms, causing them to have increased idiosyncratic risk. Both Merton's (1987) theoretical analysis and our results confirm that the effect of investor recognition on expected returns is increasing in idiosyncratic risk.

Second, we reconcile conflicting evidence from previous research regarding the relation between investor recognition and future stock returns. Early research by Arbel et al. (1983) finds evidence of the predicted negative relation. More recent research by Chen et al. (2002) provides contradictory evidence of a positive relation between changes in investor recognition and future returns. We document that changes in investor recognition are positively autocorrelated over short horizons. We further show that Chen et al.'s evidence of a positive relation between changes in investor recognition and future stock returns is attributable to this positive autocorrelation combined with the positive relation between changes in investor recognition and contemporaneous stock returns. After controlling for autocorrelation in changes in investor recognition, we find that changes in investor recognition have the predicted negative relation with future stock returns.

Third, our results suggest that investor recognition is an important determinant of corporate financial policy. We find that changes in investor recognition are strongly related to contemporaneous and future corporate financing and investing activities. This evidence corroborates Brennan and Tamorowski's (2000) conclusions regarding the role of corporate investor relations activities as a tool for lowering the cost of capital in firms that are raising capital.

Finally, our results suggest that investor recognition may help explain a number of 'anomalies' in stock returns. Prior research shows that corporate financing and investing activities are negatively related to future stock returns (see Ritter 2003; Titman et al. 2004) and that short-horizon stock returns exhibit positive 'momentum' (Jegadeesh and Titman 1993). Investor recognition is related to each of these variables in such a way that their relations with future returns can be explained by the investor recognition hypothesis.

The remainder of the paper is organized as follows. Section 2 provides a more detailed description of the investor recognition hypothesis and develops our empirical predictions. Section 3 describes our data, Sect. 4 presents our results and Sect. 5 concludes.

2 Hypothesis development

The idea that neglected stocks earn a return premium over recognized stocks has been in existence for many years (e.g., Arbel et al. 1983). Merton (1987) develops an asset pricing model that explains this apparent pricing anomaly. The key difference between Merton's model and standard asset pricing models such as the CAPM is that Merton's model assumes that investors only know about a subset of the available securities, and that these subsets differ across investors. This assumption means that some stocks are known to relatively few investors. Investors in these 'neglected' securities must therefore hold undiversified portfolios and so require a return premium for bearing idiosyncratic risk. The key implications of the model are that (i) the value of a security is increasing in the number of investors who know about the security, and (ii) the expected return on a security is decreasing in the number of investors who know about the security; and (iii) the above two relations are stronger for securities with greater idiosyncratic risk. Merton refers to his model as a model of capital market equilibrium with incomplete information. Subsequent research generally refers to the model and its implications as the 'investor recognition hypothesis.'

Merton (1987) also provides an extension of his basic model that examines the impact of endogenizing the choice of investor recognition on a firm's investment and financing decisions. This extension indicates that changes in investor recognition will be positively correlated with corporate financing and investing activities. If exogenous events cause investor recognition of a firm's securities to increase, then the firm's cost of capital will fall and so its optimal level of financing and investing activities will increase. If exogenous events cause an increase in financing and investing activities, then the benefits from having a lower cost of capital will increase, so efforts to generate investor recognition of the firm's securities will increase.

Our empirical examination of the investor recognition hypothesis focuses on testing all four of the predictions identified above:

P1: Security value is increasing in investor recognition.
P2: Expected return is decreasing in investor recognition.
P3: The above two relations are stronger for securities with greater idiosyncratic risk.
P4: Financing and investing are increasing in investor recognition.

A number of previous studies provide empirical tests of subsets of these predictions. One line of research focuses on P1 by examining the impact of events that increase investor recognition on firm value. Events studied include exchange listings (Kadlec and McConnell 1994; Foerster and Karolyi 1999), initiation of analyst coverage (Irvine 2003), addition to stock indices (Shleifer 1986; Chen et al. 2004), reduction of the minimum unit of trading (Amihud et al. 1999), hiring of investor relations firms (Bushee and Miller 2005), increases in advertising expenditures (Grullon et al. 2004), and periods of unusual trading volume (Gervais et al. 2001; Kaniel et al. 2003). These studies generally find that events increasing investor recognition lead to increases in security value. We contribute to this literature by constructing a comprehensive measure of investor recognition and evaluating the relative importance of investor recognition in driving stock returns.

A second line of research focuses on P2 by examining the association between changes in investor recognition and future stock returns. The evidence from this research is mixed. Early research by Arbel et al. (1983) uses the number of institutional investors as a measure of investor recognition and finds evidence of the hypothesized negative relation between investor recognition and future stock returns. More recently, Chen et al. (2002) find evidence of a positive relation between the change in the number of institutional holders and future stock returns. This finding is inconsistent with the negative relation predicted by the investor recognition hypothesis. Using a similar methodology to Chen et al., Bodnaruk and Ostberg (2005) find evidence of the hypothesized negative relation using a sample of Swedish stocks.[1] We contribute to this literature by reconciling the inconsistent evidence in Chen et al. with the investor recognition hypothesis. We show that changes in investor recognition are positively autocorrelated. Since P1 predicts that changes in investor recognition are positively correlated with contemporaneous returns, it is important to control for this autocorrelation when evaluating the relation between changes in investor recognition and future stock returns. After

[1] In related research, Barber and Odean (2008) find that stocks that garner attention are disproportionately purchased by individual investors and subsequently earn poor returns.

controlling for autocorrelation, we find that changes in investor recognition are negatively related to future stock returns, as predicted by P2.

A third line of research focuses on the relation between idiosyncratic risk and future stock returns and is indirectly related to P3. This research focuses on estimating the unconditional association between idiosyncratic risk and future stock returns. The intuition behind this research is that since many investors hold undiversified portfolios, idiosyncratic risk should be priced. Results of this research are mixed. An early and influential study by Fama and MacBeth (1973) finds no role for idiosyncratic risk in explaining future stock returns. However, a more recent study by Malkiel and Xu (2004) finds evidence of the predicted positive relation between idiosyncratic risk and future stock returns. We contribute to this literature by providing more powerful tests of the hypothesized relation between idiosyncratic risk and stock returns. Intuitively, our P3 examines whether idiosyncratic risk is more strongly positively related to future stock returns in stocks that are held by relatively undiversified investors (i.e., in stocks with low investor recognition). Our results are strongly consistent with P3 and corroborate and extend the findings in Malkiel and Xu (2004).

Finally, to our knowledge there is no research that directly examines our P4. There are, however, numerous studies that examine the relation between corporate activities and future stock returns. Ritter (2003) summarizes the findings or a large body of evidence identifying a negative relation between corporate financing activities and future stock returns. Titman et al. (2004) document a negative relation between capital expenditures and future stock returns. Our predictions P4 and P2 combine to suggest that the investor recognition hypothesis may provide an explanation for the negative stock returns following these corporate financing and investing activities. P4 predicts that investor recognition is positively related to corporate financing and investing activities. P2 predicts that investor recognition is negatively related to stock future returns. These two predictions combine to generate the observed negative relation between corporate investing and financing activities and future stock returns.

3 Data and variable measurement

Our tests require that we develop an empirical proxy for the investor recognition construct developed by Merton (1987). Merton's model consists of a large number of investors with identical initial wealths and he defines investor recognition of a security as the fraction of investors who know about the security. There are several issues to consider in developing an empirical proxy for Merton's construct. First, we cannot directly observe how many investors 'know about' a particular security. We can, however, observe the number of institutional investors who own a security. It seems reasonable to argue that the number of investors who know about a security is increasing in the number of investors that own the security. We therefore use ownership of a security as a proxy for knowledge of a security.

A second issue arising in the construction of an empirical proxy for investor recognition is that Merton's model assumes that all investors have identical initial wealths. This assumption is almost certainly violated in practice. Merton notes that extending his model to the more realistic case of a non-uniform distribution of initial wealth changes the appropriate investor recognition construct from the proportion of investors who know about the security to the fraction of total wealth owned by investors who know about the security. It is difficult for us to measure the wealth levels of investors, but we can restrict our analysis to relatively wealthy investors. We do so by limiting our measure of investor recognition to investors filing Form 13F with the SEC.[2] 13F filings are required on a quarterly basis from all institutional investors with more than $100 million of securities under their discretion. We therefore use the proportion of 13F filers holding a long position in that security as our empirical proxy for investor recognition of a security.

A third issue that arises in measuring investor recognition is that Merton's model predicts that firm value will be influenced by a host of other factors, including the magnitude of the firm's future cash flows, the exposure of the security to common factors and the size of the firm. It is difficult to control for these factors (particularly expected cash flows) in the cross-section, but it is easier to control for changes in a given firm over time. Accordingly, we conduct our empirical tests using a changes specification. Testing our predictions in changes instead of levels should increase the power of our tests by reducing omitted variable problems related to these other factors. Thus, our empirical tests employ the change in the proportion of 13-F filers holding a security as a proxy for the change in the investor recognition of that security. This variable is identical to the measure employed by Chen et al. (2002) as a measure of differences in opinion. Following Chen et al., we refer to this variable as ΔBREADTH, denoting the change in the breadth of institutional ownership:

$$\Delta \mathrm{BREADTH}_{it} = \frac{\text{13F filers holding security i at time } t - \text{13F filers holding security i at time } t-1}{\text{Total number of 13F filers at time } t-1}$$

To ensure that our measure captures changes in the breadth of ownership rather than changes in the universe of institutions covered by our database, we compute this variable using only 13F filers that exist in our database in both quarters t and $t-1$.

A fourth issue with our measure of investor recognition is that it makes the assumption that investors only know about securities that they hold. If an investor buys a security that they didn't previously own, it seems reasonable to argue that they only just learned about that security. But if an investor sells a security that they previously owned, it is a stretch to argue that they forgot about

[2] We also conducted our tests using an alternative measure of investor recognition that weights each institution by the total dollar amount of that institution's holdings. The total dollar amount of holdings serves as a proxy for the investable wealth of the institution. Results are qualitatively similar using this alternative measure. The drawback of this alternative measure is that our sample is restricted to large institutional investors who are required to file Form 13F with the SEC, so our measure of investor recognition is already biased in favor of large investors. Assuming that ownership by the smaller institutions in our sample is correlated with ownership by other smaller investors who are not included in our sample, equal weighting should provide a more representative measure of investor recognition.

that security.[3] Because the purchase of a security that was not previously owned is a cleaner measure of change in investor recognition, some of our tests decompose ΔBREADTH as $\Delta\text{BREADTH}_t = \text{IN}_t - \text{OUT}_t$, where IN_t (OUT_t) equals the fraction of 13F filers that have a zero (non-zero) holding of the stock at time $t-1$ and a non-zero (zero) holding in the stock at time t. Similar measures are employed by Avner et al. (1983) and Chen et al. (2002).

Data used in our analyses are obtained from several resources. Data on the 13F filers is obtained from the CDA/Spectrum 13F institutional transaction quarterly data, covering the period from 1982 through 2004. Stock return data are extracted from the CRSP monthly and daily return files, financial statement data are obtained from the COMPUSTAT quarterly files and analyst data is obtained from the I/B/E/S monthly summary files.

Tests of P1 and P2 require a measure of stock returns. We use size-adjusted returns, computed as the difference between the security's return and the return on the security's size-matched decile portfolio over the corresponding period. Size-matched portfolios are based on decile assignments of market capitalization for all NYSE/AMEX stocks. Tests of P3 require a measure of idiosyncratic security risk. We measure quarterly (annual) idiosyncratic risk as the square root of the sum over the prior 3 (12) months of monthly idiosyncratic risk measures. Following Brandt et al. (2005) and Campbell et al. (2001), the monthly measures equal the sum of daily squared excess returns. Excess returns are computed by subtracting the daily value-weighted industry return from the security's daily return. Industry classifications are based on Fama and French (1997). To facilitate interpretation of the results, our idiosyncratic risk measures are ranked into deciles and the ranks are normalized to range from −0.5 to 0.5. We refer to the resulting measure as 'Rank i-risk'.

To rule out the possibility that changes in investor recognition are driven by news about earnings, our empirical tests employ a series of variables that are designed to capture earnings news. We compute measures of earnings news over both quarterly and annual return measurement intervals and use both reported earnings obtained from Compustat and analysts' consensus forecasts of earnings obtained from I/B/E/S. The change in quarterly earnings ($\Delta\text{Earnings}_{\text{QTR}}$) is computed as the seasonal change in earnings before extraordinary items (COMPUSTAT data item 8) scaled by average total assets. The change in annual earnings ($\Delta\text{Earnings}_{\text{ANN}}$) is computed as the change between quarter t and $t-4$ in the trailing 12 month earnings before extraordinary items (COMPUSTAT data item 8) scaled by average total assets. Forecast errors are computed as actual reported earnings (per I/B/E/S) minus the consensus earnings forecast outstanding immediately prior to the announcement date, divided by price at the beginning of the corresponding return measurement interval. The quarterly (annual) forecast revision equals the change in the consensus

[3] Note, however, that the investor does not have to actually forget about the security for Merton's model to apply. The investor simply has to exclude the security from the set of securities in their investable universe. Institutional investors often restrict their investable universe using criteria such as market capitalization, index membership, exchange listing and liquidity. Thus, a security could experience a reduction in investor recognition because it undergoes a change in one or more of these criteria.

forecast of annual earnings between quarter t and quarter $t-1$ ($t-4$) scaled by price at the beginning of the corresponding return measurement interval. The quarterly (annual) revision in long-term growth equals the change in the consensus forecast of long-term EPS growth (per I/B/E/S) between quarter t and quarter $t-1$ ($t-4$).

Tests of P4 require measures of financing and investing activities. We measure the amount of financing raised during the period as the net cash flows received from financing activities (COMPUSTAT data item 113), scaled by average total assets. We measure 'new' investment during the period as capital expenditures (COMPUSTAT item 90) minus sale of property, plant, and equipment (COMPUSTAT item 83) plus acquisitions (COMPUSTAT item 94) minus depreciation and amortization (COMPUSTAT item 77), deflated by average total assets (COMPUSTAT item 44). We deduct depreciation and amortization to control for investment that simply maintains productive capacity. All data items are from the COMPUSTAT quarterly files, and we cumulate across the trailing four quarters to measure these variables over annual measurement intervals. We also follow the convention of winsorizing these variables at the 1st and 99th percentiles to mitigate the impact of extreme outliers.

4 Results

4.1 Descriptive statistics

Institutional ownership data is available on a quarterly basis. In order to study the effects of autocorrelation in ΔBREADTH, we conduct our empirical tests using ΔBREADTH measured over both quarterly and annual intervals (denoted $\Delta\text{BREADTH}_{QTR}$ and $\Delta\text{BREADTH}_{ANN}$, respectively). Our sample period is restricted to the 23-year period from 1982 to 2004 due to lack of institutional ownership data prior to 1982. We compute both quarterly changes and annual changes once every quarter, resulting in overlapping annual return measurement intervals.[4] For the entire sample with data available on both CDA/Spectrum and CRSP, we have a total of 457,651 quarterly observations and 409,756 annual observations. Panel A of Table 1 presents distributional statistics for ΔBREADTH using quarterly data. The mean value of ΔBREADTH is generally positive (overall mean of 0.10%) and the median value is generally zero. Panel B reports similar statistics for the annual return measurement interval, indicating that both the means and medians are generally positive. Overall, the results indicate that there has been a slight tendency for institutions to diversify their holdings over our sample period. Note that ΔBREADTH tends to be right skewed, indicating that a small number of stocks experience extremely large increases in institutional ownership.

Recall that in order for empirical tests of P2 to be well-specified, it is important to control for autocorrelation in ΔBREADTH. Table 2 provides statistics on autocorrelation in ΔBREADTH using both quarterly and annual measurement intervals.

[4] Our empirical tests control for the resulting serial correlation in investor recognition using the Newey–West technique with four quarterly lags.

Table 1 Descriptive statistics for quarterly and annual change in investor recognition

Year	*N*	Mean (%)	Q1 (%)	Median (%)	Q3 (%)	STD (%)
Panel A: Quarterly change in investor recognition ($\Delta BREADTH_{QTR}$)						
1982	10,847	0.16	−0.19	0.00	0.38	0.79
1983	12,030	0.10	−0.18	0.00	0.19	0.78
1984	14,067	0.12	−0.16	0.00	0.33	0.72
1985	14,438	0.21	0.00	0.00	0.31	0.97
1986	15,370	0.03	−0.14	0.00	0.15	0.85
1987	16,326	0.17	−0.13	0.00	0.26	0.78
1988	16,996	0.08	−0.12	0.00	0.25	0.65
1989	16,974	−0.05	−0.13	0.00	0.12	1.08
1990	16,855	0.17	−0.11	0.00	0.22	1.03
1991	16,905	0.05	−0.11	0.00	0.11	0.59
1992	17,744	0.14	−0.10	0.00	0.21	0.61
1993	19,376	−0.06	−0.20	0.00	0.10	0.71
1994	22,008	0.12	−0.11	0.00	0.21	0.87
1995	22,878	0.17	−0.08	0.08	0.27	0.59
1996	24,269	−0.05	−0.18	0.00	0.09	0.66
1997	25,674	0.20	−0.08	0.08	0.27	0.83
1998	26,345	0.13	−0.08	0.00	0.22	0.95
1999	25,790	0.16	−0.08	0.00	0.22	1.05
2000	25,819	0.10	−0.12	0.00	0.19	0.80
2001	25,146	0.02	−0.11	0.00	0.12	0.89
2002	24,238	0.08	−0.11	0.00	0.18	0.81
2003	23,528	0.15	−0.05	0.05	0.27	0.70
2004	24,028	0.12	−0.05	0.05	0.25	0.61
Overall	457,651	0.10	−0.11	0.00	0.21	0.81
Panel B: Annual Change in investor recognition ($\Delta BREADTH_{ANN}$)						
1982	9,348	0.38	−0.21	0.23	0.70	1.73
1983	9,988	0.74	0.00	0.22	1.26	1.90
1984	11,447	0.49	−0.19	0.20	0.83	1.63
1985	12,737	0.76	0.00	0.35	1.13	1.79
1986	13,177	0.79	0.00	0.34	1.04	2.02
1987	14,145	0.47	−0.16	0.16	0.64	1.70
1988	14,896	0.33	−0.15	0.15	0.58	1.40
1989	15,305	0.48	0.00	0.14	0.71	1.64
1990	15,412	0.12	−0.29	0.00	0.38	1.59
1991	15,484	0.39	−0.23	0.12	0.50	1.72
1992	15,634	0.43	−0.12	0.12	0.69	1.35
1993	16,880	0.27	−0.22	0.11	0.56	1.44
1994	18,829	0.10	−0.22	0.00	0.34	1.25
1995	20,547	0.50	−0.11	0.11	0.64	1.55
1996	21,276	0.25	−0.19	0.00	0.48	1.28
1997	22,729	0.30	−0.19	0.09	0.52	1.28

Table 1 continued

Year	*N*	Mean (%)	Q1 (%)	Median (%)	Q3 (%)	STD (%)
1998	23,206	0.64	−0.09	0.18	0.89	1.74
1999	23,131	0.35	−0.16	0.08	0.48	1.78
2000	22,931	0.58	−0.16	0.08	0.75	2.17
2001	23,000	0.36	−0.21	0.07	0.70	1.67
2002	22,731	0.18	−0.19	0.06	0.50	1.47
2003	22,218	0.47	−0.06	0.12	0.83	1.37
2004	22,225	0.61	0.00	0.29	1.04	1.26
Overall	409,756	0.43	−0.14	0.12	0.68	1.63

This table reports statistics on our measure of investor recognition for observations that are available on both CDA/Spectrum 13F institutional transaction quarterly database and CRSP tapes. Percentage quarterly change in investor recognition ($\Delta BREADTH_{QTR}$) in Panel A equals the difference in the number of institutions (13F filers) holding the firm's stock at the beginning and at the end of the quarter divided by the total number of institutions at the beginning of the quarter and multiplied by 100. Percentage annual change in investor recognition ($\Delta BREADTH_{ANN}$) in Panel B equals the difference in the number of institutions holding the firm's stock at the end of quarter $t-4$ and at the end of the current quarter divided by the total number of institutions at the end of quarter $t-4$, and multiplied by 100

Panel A of Table 2 reports the mean quarterly value of ΔBREADTH in event time for portfolios formed on the decile ranking of ΔBREADTH in event quarter *t*. The quarter *t* mean values of ΔBREADTH are 1.26% for the highest decile and −0.80% for the lowest decile. These numbers indicate that it is unusual for a given security to be added or removed by more than 1% of institutional investors during a single quarter. Perusing the corresponding values of ΔBREADTH for quarters $t-1$ and $t+1$ reveals strong evidence of positive first order autocorrelation in quarterly ΔBREADTH. Further perusal of quarters $t-4$ through $t+4$ suggests that autocorrelation persists at weaker levels well beyond one lead/lag.

Panel B of Table 2 replicates Panel A using the annual ΔBREADTH measurement interval in place of the quarterly measurement interval. This table also reveals evidence of autocorrelation that lasts for up to 3 years. In contrast to Panel A, however, the autocorrelation is not much stronger at one lead/lag than it is at three leads/lags. Figure 1 illustrates the autocorrelation in ΔBREADTH by plotting the mean values of ΔBREADTH in event time for the extreme quarter *t* deciles. The figure clearly demonstrates that ΔBREADTH exhibits strong positive first order autocorrelation using quarterly data and weaker positive higher order autocorrelations that extend out at least 3 years.

Panels C and D corroborate the results in Panels A and B using Pearson and Spearman correlation coefficients. Panel C highlights the high first order autocorrelations using quarterly changes (Pearson ≈ 12%, Spearman ≈ 7%). Panel C also indicates that the second order autocorrelations are weakly negative and the third and fourth order autocorrelations are positive. Panel D highlights the strong positive first order autocorrelations using annual data (Pearson ≈ 17%, Spearman ≈ 11%) and also indicates that these positive autocorrelations persist at higher orders.

Table 2 Mean reversion and autocorrelations in the change in investor recognition

Panel A: Mean quarterly change in investor recognition, by rank of $\Delta BREADTH_{QTR}$ in quarter t

Rank of $\Delta BREADTH_{QTR}$	Qtr $t-4$ (%)	Qtr $t-3$ (%)	Qtr $t-2$ (%)	Qtr $t-1$ (%)	**Qtr t (%)**	Qtr $t+1$ (%)	Qtr $t+2$ (%)	Qtr $t+3$ (%)	Qtr $t+4$ (%)
Lowest	0.22	0.25	0.31	0.15	**−0.80**	0.02	0.16	0.10	0.08
2	0.07	0.09	0.11	0.07	**−0.22**	0.07	0.10	0.07	0.06
3	0.05	0.05	0.06	0.05	**−0.11**	0.05	0.06	0.05	0.06
4	0.04	0.03	0.04	0.02	**−0.04**	0.05	0.05	0.04	0.03
5	0.03	0.03	0.04	0.04	**0.00**	0.04	0.04	0.03	0.05
6	0.04	0.04	0.01	0.03	**0.03**	0.03	0.04	0.05	0.03
7	0.04	0.04	0.04	0.03	**0.11**	0.04	0.04	0.04	0.06
8	0.07	0.08	0.05	0.05	**0.18**	0.06	0.06	0.08	0.08
9	0.15	0.13	0.11	0.13	**0.38**	0.13	0.09	0.11	0.12
Highest	0.34	0.33	0.28	0.43	**1.26**	0.30	0.16	0.20	0.20

Panel B: Mean annual changes in investor recognition, by rank of $\Delta BREADTH_{ANN}$ in year t

Rank of $\Delta BREADTH_{ANN}$	Year $t-3$ (%)	Year $t-2$ (%)	Year $t-1$ (%)	**Year t (%)**	Year $t+1$ (%)	Year $t+2$ (%)	Year $t+3$ (%)
Lowest	0.99	1.12	0.85	**−1.53**	0.33	0.60	0.47
2	0.36	0.36	0.29	**−0.37**	0.28	0.34	0.28
3	0.20	0.19	0.16	**−0.15**	0.19	0.23	0.21
4	0.15	0.14	0.12	**−0.03**	0.18	0.19	0.18
5	0.14	0.13	0.09	**0.05**	0.16	0.17	0.17
6	0.18	0.15	0.13	**0.16**	0.20	0.22	0.22
7	0.25	0.21	0.18	**0.29**	0.25	0.25	0.27
8	0.39	0.35	0.33	**0.54**	0.37	0.35	0.37
9	0.66	0.60	0.63	**1.16**	0.61	0.52	0.57
Highest	1.31	1.13	1.39	**3.35**	1.02	0.76	0.88

Panel C: Pearson (above diagonal) and Spearman correlation coefficients for quarterly changes in investor recognition

	$\Delta Breadth_{QTRt}$ (%)	$\Delta Breadth_{QTRt+1}$ (%)	$\Delta Breadth_{QTRt+2}$ (%)	$\Delta Breadth_{QTRt+3}$ (%)	$\Delta Breadth_{QTRt+4}$ (%)
$\Delta Breadth_{QTRt}$		11.54	−4.42	4.45	7.80
$\Delta Breadth_{QTRt+1}$	6.78		12.09	−6.02	4.81
$\Delta Breadth_{QTRt+2}$	−0.73	6.90		12.34	−6.59
$\Delta Breadth_{QTRt+3}$	4.00	−0.89	6.88		12.09
$\Delta Breadth_{QTRt+4}$	4.52	4.00	−1.04	6.72	

Table 2 continued

Panel D: Pearson (above diagonal) and Spearman correlation coefficients for annual changes in investor recognition

	ΔBreadth$_{ANNt}$ (%)	ΔBreadth$_{ANNt+1}$ (%)	ΔBreadth$_{ANNt+2}$ (%)	ΔBreadth$_{ANNt+3}$ (%)
ΔBreadth$_{ANNt}$		16.72	4.75	10.79
ΔBreadth$_{ANNt+1}$	10.67		17.90	4.70
ΔBreadth$_{ANNt+2}$	5.09	11.10		17.98
ΔBreadth$_{ANNt+3}$	9.08	5.29	11.13	

Panel A provides averages of ΔBREADTH$_{QTR}$ in quarters $t-4$ to $t+4$ by decile rankings of current quarter ΔBreadth$_{QTR}$. Panel B reports averages of ΔBREADTH$_{ANN}$ from years $t-3$ to $t+3$ by decile rankings of current quarter ΔBreadth$_{ANN}$. Panels C and D provides Pearson and Spearman correlation coefficients for quarterly and annual changes in investor recognition, respectively. Percentage quarterly change in breadth (ΔBREADTH$_{QTR}$) equals the difference in the number of institutions (13F filers) holding the firm's stock at the beginning and at the end of the quarter divided by the total number of institutions at the beginning of the quarter and multiplied by 100. Percentage annual change in breadth (ΔBREADTH$_{ANN}$) equals the difference in the number of institutions holding the firm's stock at the end of quarter $t-4$ and at the end of the current quarter divided by the total number of institutions at the end of quarter $t-4$, and multiplied by 100

In summary, ΔBREADTH exhibits strong autocorrelation using both the quarterly and annual measurement intervals. It is important to control for this autocorrelation when testing P2. Recall that P2 predicts that ΔBREADTH is negatively related to future returns. However, P1 predicts that ΔBREADTH is positively related to contemporaneous returns. The combination of P1 and positive autocorrelation in ΔBREADTH leads to the prediction of a positive relation between ΔBREADTH and future returns. The relation between ΔBREADTH and future returns is therefore predicted to be negative by P2, but this relation is likely to be confounded by the positive relation resulting from P1 in combination with positive serial correlation in ΔBREADTH. Thus, well-specified tests of P2 require controls for autocorrelation in ΔBREADTH. One existing study that fails to include such controls is Chen et al. (2002). Chen et al. find that firms with positive (negative) ΔBREADTH have higher (lower) stock returns over the next four quarters. They attribute this result to a combination of differences in investor opinions and short sales constraints. An alternative explanation is that positive autocorrelation in ΔBREADTH combines with P1 to generate the higher future stock returns. Our empirical tests (presented in Sect. 4.3) address this problem by controlling for future ΔBREADTH when testing for the relation between current ΔBREADTH and future returns.

4.2 Investor recognition and firm value

The first key prediction of Merton's model is that security value is increasing in investor recognition (our P1). We test this prediction by examining the relation between ΔBREADTH and contemporaneous changes in security value. We measure changes in security value using size-adjusted returns, as defined in Sect. 3. Table 3

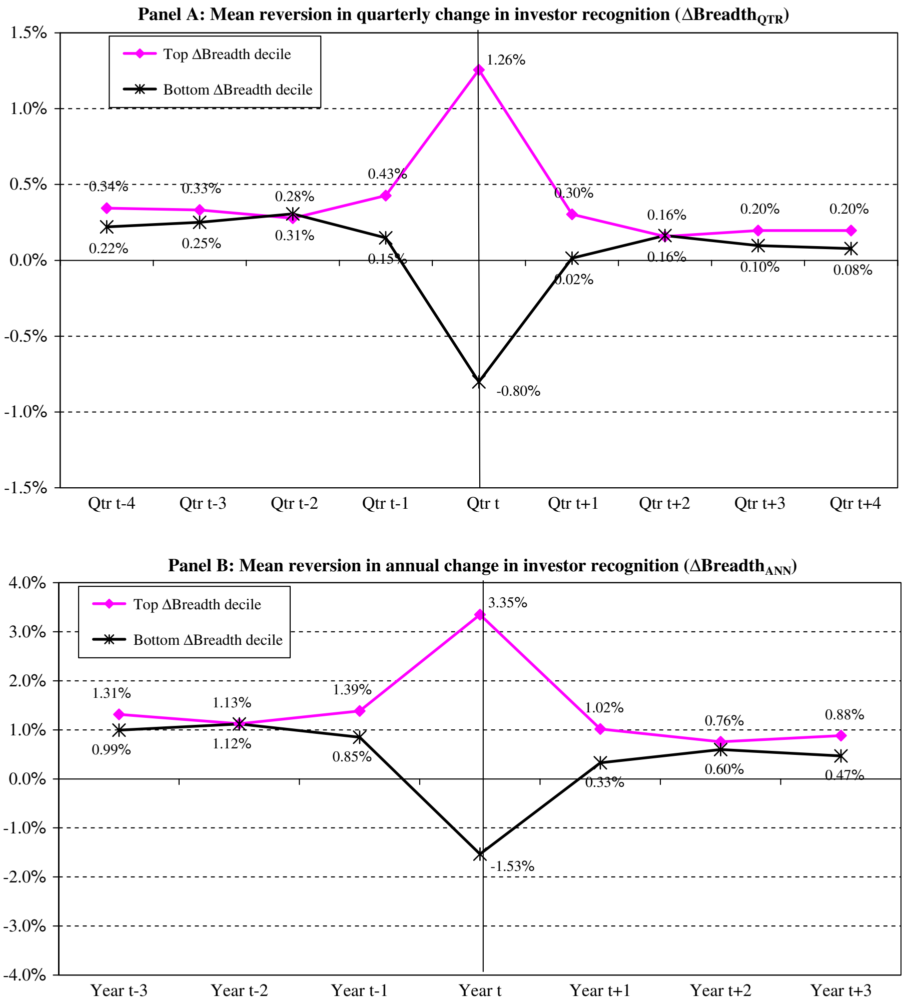


Fig. 1 Mean reversion in the change in investor recognition. (**a**): Mean reversion in quarterly change in investor recognition ($\Delta BREADTH_{QTR}$). (**b**): Mean reversion in annual change in investor recognition ($\Delta BREADTH_{ANN}$). (**a**) Depicts the average values of $\Delta BREADTH_{QTR}$ for the top and bottom quarter t decile rankings of $\Delta BREADTH_{QTR}$ in quarters t−4 to t+4. (**b**) Depicts the average values of $\Delta BREADTH_{ANN}$ for the top and bottom quarter t decile rankings of $\Delta BREADTH_{ANN}$ in years $t-3$ to $t+3$. Percentage quarterly change in breadth ($\Delta BREADTH_{QTR}$) equals the difference in the number of institutions (13F filers) holding the firm's stock at the beginning and at the end of the quarter divided by the total number of institutions at the beginning of the quarter and multiplied by 100. Percentage annual change in breadth ($\Delta BREADTH_{ANN}$) equals the difference in the number of institutions holding the firm's stock at the end of quarter $t-4$ and at the end of the current quarter divided by the total number of institutions at the end of quarter $t-4$, and multiplied by 100

reports average size-adjusted returns in event time for portfolios of firms formed on decile ranks of ΔBREADTH in period t. Panel A of Table 3 presents the results using quarterly measurement intervals for quarters $t-4$ through $t+4$. P1 predicts that average returns will be increasing in the rank of ΔBREADTH during quarter t.

Table 3 Average size-adjusted returns by ranks of change in investor recognition

Panel A: Mean quarterly size-adjusted returns by ranks of $\Delta BREADTH_{QTR}$

Rank of $\Delta BREADTH_{QTR}$	Qtr $t-4$ (%)	Qtr $t-3$ (%)	Qtr $t-2$ (%)	Qtr $t-1$ (%)	**Qtr t (%)**	Qtr $t+1$ (%)	Qtr $t+2$ (%)	Qtr $t+3$ (%)	Qtr $t+4$ (%)
Lowest	2.1	0.7	−1.1	−5.4	**−11.0**	−0.5	−0.2	−0.3	0.9
2	−0.2	−1.0	−2.3	−3.6	**−4.9**	−0.4	0.0	0.1	0.5
3	−1.1	−1.4	−2.3	−3.3	**−3.5**	0.0	0.1	0.4	0.3
4	−0.8	−1.4	−1.5	−1.6	**−1.8**	0.2	−0.3	0.2	0.2
5	−1.0	−1.1	−2.0	−2.4	**−2.7**	−0.7	−0.2	0.5	0.4
6	−1.1	−1.0	−0.6	−0.5	**−0.7**	−0.3	0.2	0.0	0.4
7	0.3	−0.2	−0.1	0.3	**0.0**	−0.3	0.1	0.4	0.3
8	0.5	0.6	1.1	1.4	**1.9**	0.4	0.4	0.2	0.1
9	2.2	2.3	3.1	4.3	**6.0**	0.9	0.6	0.1	0.3
Highest	4.1	5.4	6.8	9.9	**14.4**	1.2	0.5	0.5	−0.3
Highest–lowest	2.0	4.7	7.9	15.3	**25.4**	1.7	0.6	0.7	−1.2
t-Statistic	10.8	23.4	38.8	78.7	**138.4**	10.4	3.8	4.2	−6.6

Panel B: Mean annual size-adjusted returns by ranks of $\Delta BREADTH_{ANN}$

Rank of $\Delta BREADTH_{ANN}$	Year $t-3$ (%)	Year $t-2$ (%)	Year $t-1$ (%)	**Year t (%)**	Year $t+1$ (%)	Year $t+2$ (%)	Year $t+3$ (%)
Lowest	16.3	19.2	0.4	**−35.8**	3.9	8.6	4.6
2	6.4	4.5	−7.9	**−22.8**	4.6	6.8	3.5
3	0.6	−1.6	−6.3	**−15.5**	4.6	5.0	1.7
4	−1.3	−2.7	−6.3	**−10.6**	3.3	3.1	2.3
5	−0.2	−2.0	−5.0	**−7.9**	2.9	2.5	−0.2
6	0.4	0.8	−0.1	**−2.8**	0.6	1.8	1.7
7	3.2	1.8	3.2	**3.3**	1.0	1.5	1.6
8	3.7	5.6	8.8	**11.4**	0.6	0.8	2.5
9	8.0	8.4	16.9	**23.8**	1.2	0.8	3.2
Highest	10.5	10.7	26.0	**54.9**	0.3	−0.6	3.5
Highest–lowest	−5.7	−8.5	25.6	**90.7**	−3.6	−9.2	−1.1
t-Statistic	−8.4	−5.6	36.7	**115.7**	−6.4	−14.9	−1.7

Panel A reports the average quarterly size-adjusted returns for the top and bottom quarter-t decile rankings of $\Delta BREADTH_{QTR}$ in quarters $t-4$ to $t+4$. Panel B reports the average annual size-adjusted returns for the top and bottom quarter-t decile rankings of $\Delta BREADTH_{ANN}$ in years $t-3$ to $t+3$. Size-adjusted returns are computed as the difference between the return on a firm's size decile portfolio return and the return for the firm during $quarter_{t+k}$ or $year_{t+k}$. Size portfolios are determined based on decile assignment for all NYSE/AMEX firms. Percentage quarterly change in breadth ($\Delta BREADTH_{QTR}$) equals the difference in the number of institutions (13F filers) holding the firm's stock at the beginning and at the end of the quarter divided by the total number of institutions at the beginning of the quarter and multiplied by 100. Percentage annual change in breadth ($\Delta BREADTH_{ANN}$) equals the difference in the number of institutions holding the firm's stock at the end of quarter $t-4$ and at the end of the current quarter divided by the total number of institutions at the end of quarter $t-4$, and multiplied by 100. The t-statistics are adjusted using the Newey–West correction with four lags

The results are strongly consistent with this prediction, with returns increasing monotonically across ΔBREADTH deciles. Returns for the lowest ΔBREADTH decile are −11.0% and returns for the highest ΔBREADTH decile are 14.4%, giving a return spread across the extreme deciles of 25.4%.

The second key prediction from Merton's model is that expected return is decreasing in investor recognition (our P2). We test this prediction by examining the relation between ΔBREADTH and future size-adjusted returns. Inconsistent with P2, but consistent with the results in Chen et al., there is evidence of a weak positive relation between ΔBREADTH and stock returns over quarters $t+1$ through $t+3$. Recall, however, that ΔBREADTH is positively autocorrelated, and these results do not control for autocorrelation in ΔBREADTH. We will provide tests of P2 that implement such controls in Sect. 4.3. Finally, there is evidence of a strong positive relation between ΔBREADTH and stock returns over quarters $t-4$ through $t-1$, suggesting that investors are more likely to open a position in a security with strong recent past returns. This evidence is suggestive of a link between investor recognition and the well-known momentum effect in stock returns (see Jegadeesh and Titman 1993).

Panel B of Table 3 presents similar results to Panel A using the annual return measurement interval for both ΔBREADTH and returns. Consistent with P1, there is again evidence of a strong positive relation between ΔBREADTH and contemporaneous returns. Returns for the lowest ΔBREADTH decile are −35.8% and returns for the highest ΔBREADTH decile are 54.9%, giving a return spread across the extreme deciles of 90.7%.[5] Looking at future returns, we see that there is a weak negative relation with 1-year-ahead returns and a stronger negative relation with 2-year-ahead returns. This evidence is broadly consistent with P2. It appears that the effects of autocorrelation in ΔBREADTH on future returns are weaker in the annual data. There is also evidence of a strong positive relation between ΔBREADTH and stock returns over the prior year, but this relation turns negative back further than 1 year. Thus, investors appear to be attracted to stocks with large returns over the last four quarters. These relations are illustrated graphically in Fig. 2.

There are at least two potential limitations of the results in Table 3. First, there are no controls for contemporaneous news about firms' future cash flows. Merton's model holds future cash flows constant. In our empirical tests, however, it is possible that ΔBREADTH is correlated with cash flow news. This would be the case if, for example, investors are attracted to firms with positive cash flow news. Such a scenario would confound tests of P1, causing us to mistakenly attribute the relation between ΔBREADTH and contemporaneous stock returns to investor recognition instead of to cash flow news. Second, as mentioned above, there are no controls for autocorrelation in ΔBREADTH. This confounds the interpretation of tests of P2 concerning the relation between ΔBREADTH and future stock returns. We therefore use multiple regression analysis to test P1 and P2 while implementing controls for cash flow news and autocorrelation in ΔBREADTH.

[5] We have received numerous comments to the effect that the magnitude of this return seems too large to be plausible. To put it in perspective, we note that a direct sort on ex post realized returns for the annual period yields a return spread across extreme deciles of over 220%. Thus, the 90.7% spread for change in breadth is certainly large, but not implausibly so.

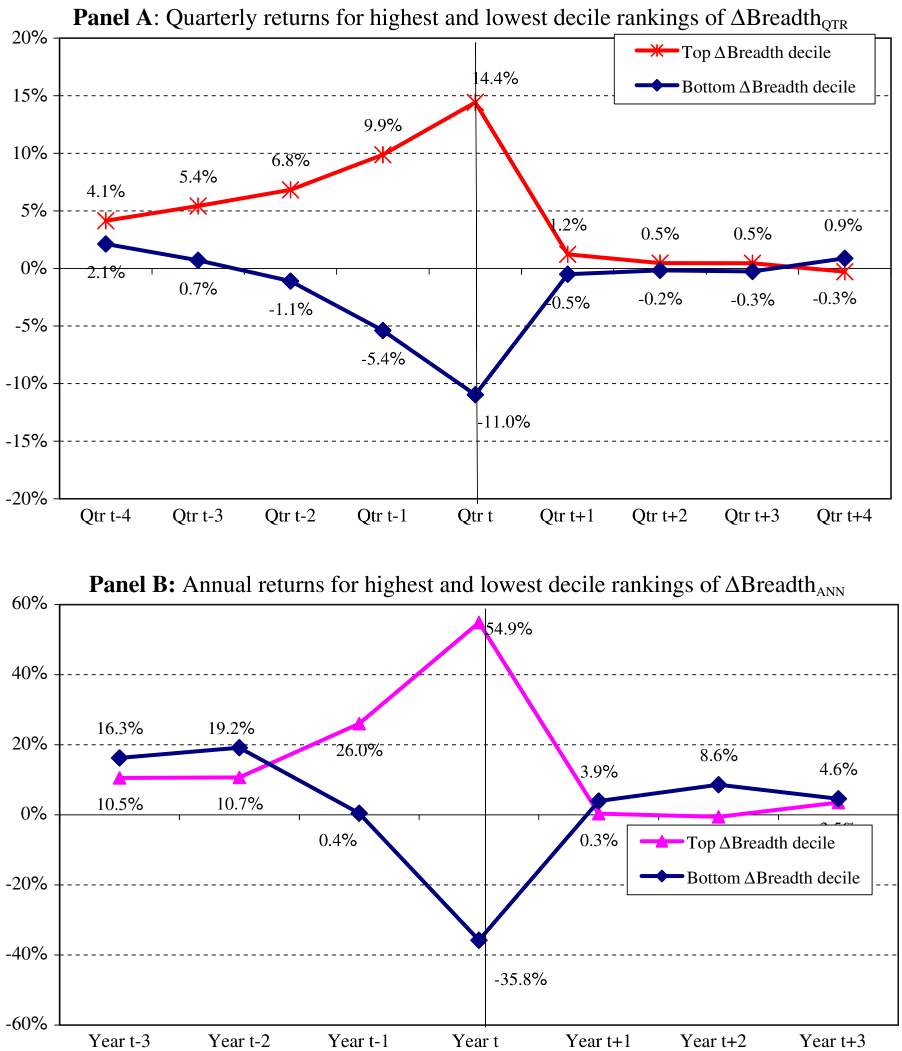


Fig. 2 Quarterly and annual size-adjusted returns for the highest and lowest decile rankings of the change in investor recognition. (**a**): Quarterly returns for highest and lowest decile rankings of $\Delta\text{Breadth}_{\text{QTR}}$. (**b**): Annual returns for highest and lowest decile rankings of $\Delta\text{Breadth}_{\text{ANN}}$. (**a**) depicts the average quarterly size-adjusted returns for the top and bottom quarter t decile rankings of $\Delta\text{BREADTH}_{\text{QTR}}$ in quarters $t-4$ to $t+4$. (**b**) Depicts the average annual size-adjusted returns for the top and bottom quarter-t decile rankings of $\Delta\text{BREADTH}_{\text{ANN}}$ in years $t-3$ to $t+3$. Size-adjusted returns are computed as the difference between the return on a firm's size decile portfolio return and the return for the firm during quarter$_{t+k}$ or year$_{t+k}$. Size portfolios are determined based on decile assignment for all NYSE/AMEX firms. Percentage quarterly change in breadth ($\Delta\text{BREADTH}_{\text{QTR}}$) equals the difference in the number of institutions (13F filers) holding the firm's stock at the beginning and at the end of the quarter divided by the total number of institutions at the beginning of the quarter and multiplied by 100. Percentage annual change in breadth ($\Delta\text{BREADTH}_{\text{ANN}}$) equals the difference in the number of institutions holding the firm's stock at the end of quarter $t-4$ and at the end of the current quarter divided by the total number of institutions at the end of quarter $t-4$ and multiplied by 100

Table 4 provides tests of P1 that control for cash flow news through regressions of stock returns on contemporaneous ΔBREADTH and proxies for cash flow news. We report results using both quarterly and annual return intervals. We also measure cash flow news using both earnings changes (e.g., Foster 1977) and analyst forecast revisions (e.g., Liu and Thomas 2000). Liu and Thomas demonstrate that incorporating information from both earnings surprises and analyst forecast revisions provides an effective proxy for cash flow news. Panel A of Table 4 presents results using quarterly returns and earnings changes. We follow previous research in using seasonally differenced quarterly earnings for both the current and preceding quarter as the proxy for cash flow news (e.g., Foster 1977). We include the preceding quarter because we measure stock returns over fiscal quarter intervals. During a fiscal quarter, earnings for the preceding quarter will typically be announced. In addition, it is possible that information will be released about earnings for the current quarter (e.g., management forecasts). We therefore expect both the current and preceding quarterly earnings changes to convey cash flow news during the current fiscal quarter. Panel B presents results using quarterly returns for the subsample of firms for which we have analysts' forecasts. For this sample we measure cash flow news using the earnings surprise announced during quarter *t* (Forecast Error), the change in the consensus analyst forecast of annual earnings per share between the beginning and the end of the quarter *t* (Revision in Annual Forecast) and the change in the long-term EPS growth forecast between the beginning and the end of the quarter (Revision in Long-Term Growth). All analyst forecast variables are measured on a per share basis and Forecast Error and Revision in Annual Forecast are deflated by price at the beginning of the quarter.

The results in Panels A and B of Table 4 confirm that the explanatory power of ΔBREADTH with respect to contemporaneous stock returns is incremental to our proxies for cash flow news. The first column reports results using a simple regression of returns on contemporaneous ΔBREADTH. The reported results are based on the time-series means of cross-sectional regressions by quarter, with *t*-statistics adjusted using the Newey–West correction. Consistent with P1 and the results in Table 3, ΔBREADTH is positive and highly significant in both Panels A and B. The second column of each panel reports results from regressions of returns on our proxies for cash flow news. Consistent with prior research, all proxies load with positive coefficients and are highly statistically significant. The third column of each panel reports results for multiple regressions containing both ΔBREADTH and our cash flow proxies. All variables remain of approximately the same magnitudes and significance levels as in the earlier regressions.

In Panels C and D of Table 4, we repeat the analysis of Panels A and B using annual return measurement intervals. The explanatory power of both ΔBREADTH and our cash flow proxies increase at the annual return measurement interval, and ΔBREADTH continues to have significant incremental explanatory power over the cash flow news proxies. These results confirm that the relation between ΔBREADTH and contemporaneous stock returns does not arise because ΔBREADTH acts as a proxy for cash flow news. Rather, as predicted by Merton's model, it is consistent with a separate role for investor recognition in the determination of security values. Note also that the regression R^2s indicate that

Table 4 Regression analysis of quarterly and annual size-adjusted returns on contemporaneous change in investor recognition, measures of earnings news, and idiosyncratic risk

Panel A: Regressions using seasonal differences in quarterly earnings to measure cash-flow news

Intercept	−0.004 −1.6	0.005 2.6	−0.003 −1.3	−0.002 −0.9
$\Delta \text{Breadth}_{\text{QTR}t}$	7.043 15.3		6.671 14.9	11.379 21.0
Rank i-risk$_{\text{QTR}t}$				0.024 1.2
$\Delta \text{Breadth}_{\text{QTR}t} \cdot$ Ranki-risk$_{\text{QTR}t}$				22.118 16.5
$\Delta \text{Earnings}_{\text{QTR}t-1}$		0.565 14.7	0.505 14.2	0.478 13.1
$\Delta \text{Earnings}_{\text{QTR}t}$		0.787 14.0	0.717 14.5	0.651 13.8
R^2	4.4%	3.0%	6.9%	13.2%
Average quarterly N	2,747	2,747	2,747	2,747

Panel B: Regressions using forecast errors, quarterly forecast revisions, and quarterly revisions in long-term growth to measure cash-flow news

Intercept	−0.006 −1.5	0.017 6.2	0.004 0.9	0.010 2.0
$\Delta \text{Breadth}_{\text{QTR}t}$	8.361 15.3		7.638 14.4	10.819 18.1
Rank i-risk$_{\text{QTR}t}$				0.029 1.2
$\Delta \text{Breadth}_{\text{QTR}t} \cdot$ Ranki-risk$_{\text{QTR}t}$				19.039 13.4
ΔForecast Error$_{\text{QTR}t}$		1.008 8.2	0.902 8.2	0.873 8.9
Revision in Annual Forecast$_{\text{QTR}t}$		2.046 16.5	1.493 13.8	1.377 14.5
Revision in Long Term Growth$_{\text{QTR}t}$		0.090 9.1	0.058 7.0	0.051 7.8
R^2	10.4%	5.5%	13.8%	22.2%
Average quarterly N	1,710	1,710	1,710	1,710

Panel C: Regressions using annual differences in trailing-12-months earnings to measure cash-flow news

Intercept	−0.042 −4.4	0.031 4.1	−0.026 −2.1	−0.037 −3.4
$\Delta \text{Breadth}_{\text{ANN}t}$	12.867 11.1		11.274 9.2	18.509 9.9
Rank i-risk$_{\text{ANN}t}$				−0.051 −0.9
$\Delta \text{Breadth}_{\text{ANN}t} \cdot$ Ranki-risk$_{\text{ANN}t}$				35.305 8.1
$\Delta \text{Earnings}_{\text{ANN}t-1}$		0.028 0.1	−0.398 −0.5	0.347 6.4
$\Delta \text{Earnings}_{\text{ANN}t}$		1.609 3.8	1.647 2.8	1.000 6.2

Table 4 continued

R^2	12.2%	9.3%	18.1%	25.5%
Average quarterly *N*	2,478	2,478	2,478	2,478

Panel D: Regressions using forecast errors, annual forecast revisions, and annual revisions in long-term growth to measure cash-flow news

Intercept	−0.069	0.088	−0.010	−0.003
	−4.5	10.0	−0.6	−0.2
$\Delta \text{Breadth}_{\text{ANN}t}$	12.104		9.870	14.939
	9.3		7.5	9.6
Rank $\text{i-risk}_{\text{ANN}t}$				−0.006
				−0.1
$\Delta \text{Breadth}_{\text{ANN}t} \cdot \text{Ranki-risk}_{\text{ANN}t}$				24.933
				6.7
Forecast $\text{Error}_{\text{ANN}t}$		3.024	2.726	2.246
		6.4	6.4	6.5
Revision in Annual $\text{Forecast}_{\text{ANN}t}$		3.922	2.449	2.211
		15.6	10.9	13.1
Revision in Long Term $\text{Growth}_{\text{ANN}t}$		0.306	0.187	0.163
		10.6	11.8	11.9
R^2	24.0%	18.7%	32.0%	40.9%
Average quarterly *N*	1,376	1,376	1,376	1,376

This table reports mean coefficient estimates and *t*-statistics from quarterly regressions of size-adjusted returns on change in investor recognition, ranks of idiosyncratic risk, current and prior change in reported earnings (Panels A and C) and analyst forecast errors, forecast revisions, and revisions in long-term growth reported during the calendar quarter (Panels B and D). Variables in Panels A and B are measured over a quarter while variables in Panels C and D are measured over the prior four quarters. Percentage quarterly change in breadth ($\Delta \text{Breadth}_{\text{QTR}}$) equals the difference in the number of institutions (13F filers) holding the firm's stock at the beginning and at the end of the quarter divided by the total number of institutions at the beginning of the quarter and multiplied by 100. Percentage annual change in breadth ($\Delta \text{Breadth}_{\text{ANN}}$) equals the difference in the number of institutions holding the firm's stock at the end of quarter $t - 4$ and at the end of the current quarter divided by the total number of institutions at the end of quarter $t - 4$, and multiplied by 100. Quarterly (annual) idiosyncratic risk is the square root of the sum over the prior 3 (12) months of monthly idiosyncratic risk measures. The monthly measures equal the sum of the daily squared excess return, which equal the difference between the daily value-weighted industry return and the firm's daily returns. Industry classifications are based on Fama and French (1997). The idiosyncratic risk measures are ranked each quarter into deciles and the ranks are normalized to range from −.5 to +.5 (denoted Rank $\text{i-risk}_{\text{Qtr}t}$). Change in earnings in Panel A is computed as the seasonal change in earnings before extraordinary items (data #8) scaled by average total assets. Change in earnings in Panel C is computed as the change between quarters t and $t - 4$ in the trailing-12-months earnings before extraordinary items (data #8) scaled by average total assets. Forecast errors are computed as the actual reported earnings (per I/B/E/S) minus the consensus earnings forecast outstanding prior to the earnings announcement divided by price at the beginning of the period. The Quarterly (annual) revision in annual earnings forecast equals the change in the consensus annual earnings forecast between quarter t and quarter $t - 1$ ($t - 4$), scaled by price at the beginning of the period. The Quarterly (annual) revision in the long term growth equals the change in the consensus long term earnings growth forecast between quarter t and quarter $t - 1$ ($t - 4$). I/B/E/S data availability reduced the sample to 80 quarters (1985Q1–2004Q4) in Panels B and D. Size-adjusted returns are computed as the difference between the return on a firm's size decile portfolio return and the return for the firm during quarter_{t+k} or year_{t+k}. Size portfolios are determined based on decile assignment for all NYSE/AMEX firms. The *t*-statistics are adjusted using the Newey–West correction with four lags changes in investor recognition are even more important than cash flow news in explaining contemporaneous stock returns. In particular, the regressions in Panel D indicate that investor recognition explains 24.0% of the variation in contemporaneous annual returns, while cash flow news explains only 18.7%.

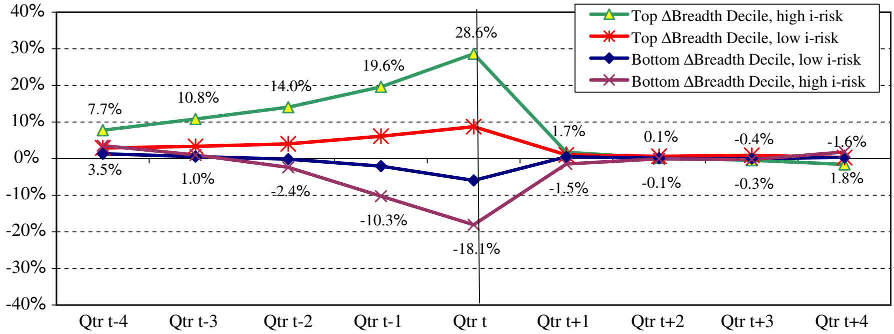
The final column of Table 4 provides us with our first tests of P3. Recall that the intuition behind P1 and P2 is that investors in neglected stocks will require a risk premium to compensate them for bearing idiosyncratic risk. Ceteris paribus, stocks with greater idiosyncratic risk will command a greater the risk premium, and so P3 predicts that P1 will hold more strongly for securities with greater idiosyncratic risk. The regressions in the final column of Table 4 include our measure of idiosyncratic risk (Rank i-risk) as both a main effect and an interactive effect with ΔBREADTH. If P1 holds more strongly for firms with greater idiosyncratic risk, then the coefficient on the interaction will be positive. Consistent with this prediction, the coefficient on the interaction is positive and highly statistically significant in all four panels of Table 4. Intuitively, this result says that increases in investor recognition cause much greater increases in firm value for stocks with higher idiosyncratic risk. Figure 3 provides a graphical illustration of the economic magnitude of this result. This figure replicates Fig. 2, after decomposing the high and low ΔBREADTH deciles into two equal halves around the median value of Rank i-risk. Thus, for each ΔBREADTH decile, we can separately track the return performance of the high idiosyncratic risk securities and the low idiosyncratic risk securities. The figure illustrates that contemporaneous returns are more than twice as pronounced for the high idiosyncratic risk subsamples on both the positive and negative sides. Thus, P3 is strongly supported for contemporaneous returns. We test P3 in the context of future returns in the next subsection.

4.3 Investor recognition and future returns

The second key prediction of Merton's model is that expected return is decreasing in investor recognition (our P2). We test this prediction by examining the relation between ΔBREADTH and *future* size-adjusted stock returns.[6] We have already seen preliminary evidence relating to this prediction in Table 3. Recall that the results in Table 3 reveal that the unconditional relation between ΔBREADTH and future returns is positive for the first three quarters, and then turns negative beyond three

[6] Merton's (1987) model predicts that there will be a negative relation between the level of investor recognition and expected returns. Strictly speaking, our changes specification should therefore focus on the relation between change in current period investor recognition and the *change* in expected returns for the future period relative to the current period. By focusing on levels of future realized returns, our analysis implicitly assumes that the current period expected return is a cross-sectional constant. To the extent that this approach results in a noisy measure of the change in expected return, it should reduce the power of our tests. Note that the alternative approach of using the change in realized returns as a proxy for the change in expected returns is not feasible, because the unexpected component of the current period realized return is related to the current period change in investor recognition through P1. Another approach to testing this prediction is to use a levels specification, but this involves an omitted variables problem (discussed earlier).

Panel A: Quarterly returns for top and bottom decile rankings of $\Delta Breadth_{QTR}$, by idiosyncratic risk



Panel B: Annual returns for top and bottom decile rankings of $\Delta Breadth_{ANN}$, by idiosyncratic risk

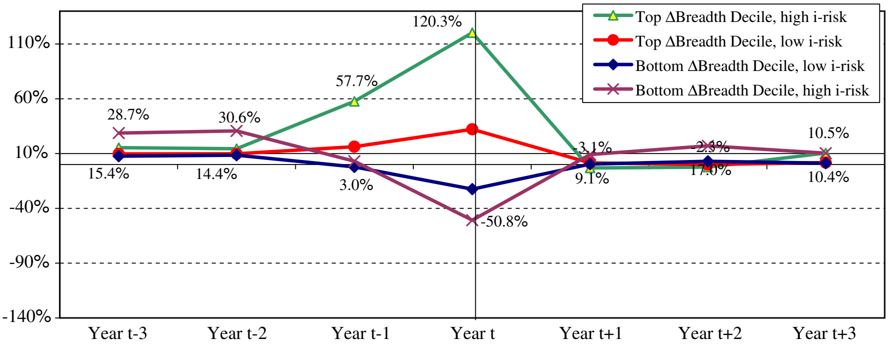


Fig. 3 Average quarterly and annual size-adjusted returns for the top and bottom decile rankings of change in investor recognition, by high and low idiosyncratic risk. (**a**): Quarterly returns for top and bottom decile rankings of $\Delta Breadth_{QTR}$, by idiosyncratic risk. (**b**): Annual returns for top and bottom decile rankings of $\Delta Breadth_{ANN}$, by idiosyncratic risk. (**a**) Depicts the average quarterly size-adjusted returns for the top and bottom quarter-t decile rankings of $\Delta BREADTH_{QTR}$ in quarters $t-4$ to $t+4$, stratified by high and low quarterly idiosyncratic risk. (**b**) Depicts the average annual quarterly size-adjusted returns for the top and bottom quarter-t decile rankings of $\Delta BREADTH_{ANN}$ in years $t-3$ to $t+3$, stratified by high and low annual idiosyncratic risk. Size-adjusted returns are computed as the difference between the return on a firm's size decile portfolio return and the return for the firm during $quarter_{t+k}$ or $year_{t+k}$. Size portfolios are determined based on decile assignment for all NYSE/AMEX firms. Quarterly (annual) idiosyncratic risk is the square root of the sum over the prior 3 (12) months of monthly idiosyncratic risk measures. The monthly measures equal the sum of the daily squared excess return, which equal the difference between the daily value-weighted industry return and the firm's daily returns. Industry classifications are based on Fama and French (1997). High (low) idiosyncratic risk are defined with respect to the quarterly median. Percentage quarterly change in breadth ($\Delta BREADTH_{QTR}$) equals the difference in the number of institutions (13F filers) holding the firm's stock at the beginning and at the end of the quarter divided by the total number of institutions at the beginning of the quarter and multiplied by 100. Percentage annual change in breadth ($\Delta BREADTH_{ANN}$) equals the difference in the number of institutions holding the firm's stock at the end of quarter $t-4$ and at the end of the current quarter divided by the total number of institutions at the end of quarter $t-4$, and multiplied by 100

quarters. However, the results in Table 3 are confounded by the failure to control for autocorrelation in ΔBREADTH. The tests in Table 5 remedy this problem.

Table 5 reports results from regressions of period $t+1$ size-adjusted stock returns on period $t+1$ ΔBREADTH, period t ΔBREADTH and period $t-1$

Table 5 Regression analysis of period $t + 1$ size-adjusted returns (next quarter in Panel A and next year in Panel B) on period $t - 1$, period t, and period $t + 1$ change in investor recognition, and idiosyncratic risk

Panel A: Regressions using quarterly measures (dependent variable is size-adjusted returns at quarter $t + 1$)

Intercept	0.001	−0.005	−0.004
	0.6	−1.7	−1.4
$\Delta \text{Breadth}_{\text{QTR}t-1}$		−0.029	−0.121
		−0.2	−0.7
$\Delta \text{Breadth}_{\text{QTR}t}$ (*prior quarter*)	0.375	−0.989	−1.100
	1.4	−3.2	−3.4
$\Delta \text{Breadth}_{\text{QTR}t+1}$ (*contemporaneous*)		9.635	12.307
		9.1	11.3
Rank $\text{i-risk}_{\text{QTR}t}$			−0.019
			−1.2
$\Delta \text{Breadth}_{\text{QTR}t-1} \cdot$ Rank $\text{i-risk}_{\text{QTR}t-1}$			−0.505
			−1.2
$\Delta \text{Breadth}_{\text{QTR}t} \cdot$ Rank $\text{i-risk}_{\text{QTR}t}$			−2.341
			−1.9
$\Delta \text{Breadth}_{\text{QTR}t+1} \cdot$ Rank $\text{i-risk}_{\text{QTR}t+1}$			23.481
			8.8
Average quarterly N	4,010	4,010	4,010
R^2	0.2%	5.2%	9.8%

Panel B: Regressions using annual measures (dependent variable is size-adjusted returns in year $t + 1$)

Intercept	0.033	−0.013	−0.016
	3.2	−1.2	−1.3
$\Delta \text{Breadth}_{\text{ANN}t-1}$		−1.654	−1.287
		−4.3	−4.3
$\Delta \text{Breadth}_{\text{ANN}t}$ (*prior year*)	−0.634	−2.958	−2.668
	−1.2	−5.0	−4.9
$\Delta \text{Breadth}_{\text{ANN}t+1}$ (*contemporaneous*)		14.887	19.969
		8.6	11.0
Rank $\text{i-risk}_{\text{ANN}t}$			0.020
			0.4
$\Delta \text{Breadth}_{\text{ANN}t-1} \cdot$ Rank $\text{i-risk}_{\text{ANN}t-1}$			−3.331
			−2.8
$\Delta \text{Breadth}_{\text{ANN}t} \cdot$ Rank $\text{i-risk}_{\text{ANN}t}$			−5.350
			−3.4
$\Delta \text{Breadth}_{\text{ANN}t+1} \cdot$ Rank $\text{i-risk}_{\text{ANN}t+1}$			36.739
			7.7
Average quarterly N	2,977	2,977	2,977
R^2	0.4%	12.6%	19.9%

Table 5 continued

Panel A (B) of this table reports mean coefficient estimates and t-statistics from quarterly regressions of one-quarter-ahead (1-year-ahead) size-adjusted returns on prior, current, and next period measures of the change investor recognition and their interactive terms with idiosyncratic risk. The requirement of variable leads and lags reduced the sample size to 90 quarters in Panel A (1982Q2–2004Q3) and 84 quarters in Panel B (1983Q1–2003Q4). Size-adjusted returns are computed as the difference between the return on a firm's size decile portfolio return and the return for the firm during quarter_{t+k} or year_{t+k}. Size portfolios are determined based on decile assignment for all NYSE/AMEX firms. Quarterly (annual) idiosyncratic risk is the square root of the sum over the prior 3 (12) months of monthly idiosyncratic risk measures. The monthly measures equal the sum of the daily squared excess return, which equal the difference between the daily value-weighted industry return and the firm's daily returns. Industry classifications are based on Fama and French (1997). The idiosyncratic risk measures are ranked each quarter into deciles and the ranks are normalized to range from −.5 to +.5 (denoted Rank i-risk). Percentage quarterly change in breadth ($\Delta\text{Breadth}_{\text{QTR}}$) equals the difference in the number of institutions (13F filers) holding the firm's stock at the beginning and at the end of the quarter divided by the total number of institutions at the beginning of the quarter and multiplied by 100. Percentage annual change in breadth ($\Delta\text{Breadth}_{\text{ANN}}$) equals the difference in the number of institutions holding the firm's stock at the end of quarter $t - 4$ and at the end of the current quarter divided by the total number of institutions at the end of quarter $t - 4$, and multiplied by 100. The t-statistics are adjusted using the Newey–West correction with four lags

ΔBREADTH (accordingly, the variable $\Delta\text{BREADTH}_{\text{QTR}t+1}$ in the regression results presented in Table 5 represents the *contemporaneous* change in our investor recognition measure, while $\Delta\text{BREADTH}_{\text{QTR}t}$ represents the prior quarter change, relative to the size-adjusted returns). Recall that P2 predicts that there will be a negative relation between $\Delta\text{BREADTH}_t$ and future stock returns. We therefore predict that $\Delta\text{BREADTH}_t$ will load with a negative coefficient. We include ΔBREADTH for periods $t - 1$ and $t + 1$ to control for autocorrelation in ΔBREADTH.

In order to illustrate the importance of controlling for autocorrelation, the first column of Panel A (quarterly data) and Panel B (annual data) of Table 5 reports results from simple regressions of period $t + 1$ returns on period t ΔBREADTH. Without controls for autocorrelation, the coefficient on $\Delta\text{BREADTH}_t$ is positive and marginally significant using quarterly data and negative and insignificant using annual data. These results are broadly consistent with the results we observed in Table 2 and Fig. 2 and with the results reported in Chen et al. (2002). The second column adds controls for the autocorrelation by incorporating ΔBREADTH for period $t - 1$ (two periods ago relative to return) and ΔBREADTH for period $t + 1$ (contemporaneous relative to return) in the regression. Recall that ΔBREADTH for time t influences returns at $t + 1$ through both the direct effect of Merton's hypothesis (high ΔBREADTH implies low expected return) and indirectly through the autocorrelation in ΔBREADTH (high period t ΔBREADTH implies high ΔBREADTH at period $t + 1$ which implies high return at $t + 1$). To test for the former effect, we need to control for the latter one which we do by incorporating in the regression the period $t + 1$ (contemporaneous) ΔBREADTH.

Consistent with P1, ΔBREADTH for period $t + 1$ loads with a significantly positive coefficient. Moreover, consistent with P2, ΔBREADTH for period t now loads with a significantly negative coefficient. The change in results between columns 1 and 2 illustrates the importance of controlling for autocorrelation in ΔBREADTH in tests of P2. These results lead us to conclude that that the positive correlation between ΔBREADTH and future returns in Chen et al. (2002) is likely to be driven by autocorrelation in ΔBREADTH rather than their 'differences of opinion' explanation.

The final column of Table 5 provides comprehensive tests of P3. P3 predicts that both P1 and P2 will hold more strongly for securities with greater idiosyncratic risk. Recall that Table 4 provides evidence in support of P3 with respect to P1. The final column of Table 5 simultaneously tests P3 with respect to both P1 and P2. This is accomplished by including interactions for idiosyncratic risk (Rank i-risk) with $\Delta\text{BREADTH}_{t-1}$,$\Delta\text{BREADTH}_t$ and $\Delta\text{BREADTH}_{t+1}$.[7] P3 predicts that the coefficient on the $\Delta\text{BREADTH}_{t+1}$ interaction will be positive (relating to P1) and the coefficient on the $\Delta\text{BREADTH}_t$ interaction will be negative (relating to P2). The results are supportive of these predictions in both the annual and quarterly data. We have already seen that P3 holds with respect to P1 in Table 4, so our current discussion focuses on tests of P3 with respect to P2.

For the quarterly regressions in Panel A of Table 5, the coefficient on the interactive term "$\Delta\text{Breadth}_{\text{QTR}t} \cdot \text{Rank i-risk}_{\text{QTR}t}$" is negative and marginally statistically significant ($t = -1.9$). Note, however, that the relatively low statistical significance is attributable to a high standard error rather than a lack of economic significance. The coefficient on the main effect for $\Delta\text{Breadth}_{\text{QTR}t}$ is −1.100, while the coefficient on the interaction is −2.341. Recall that the Rank i-risk is based on decile rankings that are scaled to range between −0.5 and +0.5, so the coefficient magnitudes suggest that the sensitivity of future returns to $\Delta\text{Breadth}_{\text{QTR}t}$ is highly dependent on Rank i-risk. For example, the lowest Rank i-risk decile has an implied $\Delta\text{Breadth}_{\text{QTRt}}$ coefficient of $-1.100 + 0.5 \cdot 2.341 = 0.070$, while the highest Rank i-risk decile has an implied $\Delta\text{Breadth}_{\text{QTR}t}$ coefficient of $-1.100 - 0.5 \cdot 2.341 = -2.271$. The results for the annual regressions in Panel B of Table 5 indicate that the coefficient on the interactive term "$\Delta\text{Breadth}_{\text{ANN}t} \cdot \text{Rank i-risk}_{\text{ANN}t}$" is negative and both economically and statistically significant. Note that as with the quarterly data, the magnitude of the coefficient on the interactive term (−5.350) is about twice the coefficient on the main effect (−2.668), highlighting the importance of Rank i-risk in determining the strength of the negative relation between ΔBREADTH and future returns. The economic significance of these results is quite striking. For a security in the lowest Rank i-risk decile (Rank i-risk = −0.5), the coefficient on ΔBREADTH will be approximately zero, indicating that a change in ΔBREADTH has no effect on expected return. But for a security in the highest Rank i-risk decile (Rank i-risk = 0.5), the coefficient on ΔBREADTH will be approximately −5. This means that an increase in ΔBREADTH of 0.01 (i.e., attracting an additional 1% of existing institutional investors) reduces a security's expected return by 0.05 (i.e., the expected return goes down by 5% of security

[7] We also include a main effect for Rank i-risk in period t. For brevity, we omit main effects for Rank i-risk in periods $t - 1$ and $t + 1$, because Rank i-risk is very highly autocorrelated. Including these additional variables has no material effect on the other regression coefficients.

price). In summary, the results in Table 5 are uniformly consistent with P3 and are highly economically significant.

The results in Table 5 corroborate and extend recent research by Malkiel and Xu (2004). That paper documents evidence of a positive relation between idiosyncratic risk and future stock returns. They argue that these results arise because undiversified investors demand a premium for holding idiosyncratic risk. Our results show that as ΔBREADTH increases (i.e., investors in a given stock become more diversified), the idiosyncratic risk premium falls, and this effect is more pronounced for stocks with high idiosyncratic risk.

Table 6 reports an additional set of tests that are designed to further discriminate between the differences of opinion hypothesis advanced by Chen et al. (2002) and the investor recognition hypothesis advanced in this paper. Under Chen et al.'s differences of opinion hypothesis, high ΔBREADTH indicates that informed investors think that a stock is worth holding at its current price, and thus constitutes a positive signal for expected returns. Under the investor recognition hypothesis, high ΔBREADTH indicates that more investors know about a security, thus driving its risk premium lower and hence its expected returns lower. Chen et al. attempt to discriminate between their hypothesis and the investor recognition hypothesis by decomposing ΔBREADTH into IN–OUT (as defined in Sect. 3). They argue that under the investor recognition hypothesis, if an investor decides to add a new security, it is quite likely to signal that the investor did not previously know about the security. However, if an investor decides to sell out of an existing security, it is harder to argue that this signals the investor 'forgot' about that security. Recall that IN_t measures new investors opening a position in the stock during period t and OUT_t measures existing investors closing a position in the stock during period t. Thus, following Chen et al.'s logic, the investor recognition hypothesis predicts that the negative relation between ΔBREADTH and expected returns is driven by the IN component of ΔBREADTH. Chen et al. regress future stock returns on IN and OUT and find that the coefficients are positive and of similar magnitudes across these two components. They interpret this evidence as consistent with their differences of opinion hypothesis and inconsistent with the investor recognition hypothesis.

As mentioned earlier in this paper, an alternative explanation for Chen et al.'s results is that the positive relation between $\Delta BREADTH_t$ and future returns results from autocorrelation in $\Delta BREADTH_t$. Recall from Fig. 1 that mean reversion in ΔBREADTH is approximately symmetrical for positive and negative innovations. Thus, if positive autocorrelation in ΔBREADTH is driving the positive unconditional relation between ΔBREADTH and future returns, we expect this relation to be symmetrical for both IN and OUT. In contrast, the investor recognition hypothesis predicts that after controlling for autocorrelation in ΔBREADTH, the negative relation between ΔBREADTH and future returns will be primarily attributable to IN as opposed to OUT.

Table 6 begins by reporting regressions similar to those in Chen et al. The first column reports regressions of future returns on IN and OUT without controlling for autocorrelation in ΔBREADTH. Similar to the results in Chen et al., the quarterly results in Panel A reveal a significant relation that is approximately symmetrical across IN and OUT (note that the sign of the coefficient on OUT is reversed relative

Table 6 Regression analysis of period $t + 1$ size-adjusted returns on the decomposed (IN and OUT) period $t - 1$, period t, and period $t + 1$ change in investor recognition

Panel A: Regressions using quarterly measures of IN_{QTR} and OUT_{QTR}		
Intercept	0.000	−0.006
	0.1	−2.3
IN_{QTRt-1}		−1.425
		−7.6
IN_{QTRt}	0.634	−2.818
	2.5	−6.3
IN_{QTRt+1} (*contemporaneous*)		12.924
		11.5
OUT_{QTRt-1}		−1.785
		−6.1
OUT_{QTRt}	−0.741	−0.024
	−2.4	−0.1
OUT_{QTRt+1} (*contemporaneous*)		−7.104
		−6.6
R^2	0.3%	6.2%
Average Quarterly *N*	4,651	4,651
Panel B: Regressions using annual measures of IN_{ANN} and OUT_{ANN}		
Intercept	0.032	−0.004
	3.7	−0.4
IN_{ANNt-1}		−4.049
		−8.2
IN_{ANNt}	−0.517	−10.729
	−1.1	−6.4
IN_{ANNt+1} (*contemporaneous*)		20.966
		9.0
OUT_{ANNt-1}		−1.965
		−5.6
OUT_{ANNt}	0.178	0.248
	0.3	0.7
OUT_{ANNt+1} (*contemporaneous*)		−4.638
		−6.2
R^2	0.6%	15.3%
Average Quarterly *N*	3,346	3,346

Panel A (B) of this table reports mean coefficient estimates and *t*-statistics from quarterly regressions of one-quarter-ahead (1-year-ahead) size-adjusted returns on prior, current, and next period decomposed measures of the change investor recognition. The requirement of variable leads and lags reduced the sample size to 90 quarters in Panel A (1982Q2–2004Q3) and 84 quarters in Panel B (1983Q1–2003Q4). Our measure of investor recognition, $\Delta Breadth_t$, is decomposed to $\Delta BREADTH_t = IN_t - OUT_t$ where IN_t (OUT_t) equals the fraction of 13F filers in both period $t - 1$ and period t that have a zero (non-zero) holding in the stock in the prior period and a non-zero (zero) holding in the stock in the current period. Percentage quarterly change in breadth ($\Delta Breadth_{QTR}$) equals the difference in the number of institutions (13F filers) holding the firm's stock at the beginning and at the end of the quarter divided by the total number of institutions at the beginning of the quarter and multiplied by 100. Percentage annual change in breadth ($\Delta Breadth_{ANN}$) equals the difference in the number of institutions holding the firm's stock at the end of quarter $t - 4$ and at the end of the current quarter divided by the total number of institutions at the end of quarter $t - 4$, and multiplied by 100. Size-adjusted returns are computed as the difference between the return on a firm's size decile portfolio return and the return for the firm during $quarter_{t+k}$ or $year_{t+k}$. Size portfolios are determined based on decile assignment for all NYSE/AMEX firms. The *t*-statistics are adjusted using the Newey–West correction with four lags to that on ΔBREADTH, because ΔBREADTH = IN − OUT). The annual results in Panel B are insignificant. The results in the second column of Table 6 include controls for autocorrelation in ΔBREADTH and tell a very different story, one that is uniformly consistent with the predictions of the investor recognition hypothesis. Recall from Table 5 that after controlling for autocorrelation in ΔBREADTH, there is a significantly negative coefficient on $\Delta BREADTH_t$ using both quarterly and annual data. The results in Table 6 show that this negative coefficient is entirely attributable to IN_t. IN_t is negative and highly significant in both the quarterly and annual regressions, while OUT_t is insignificant. Furthermore, the positive coefficient on $\Delta BREADTH_{t+1}$ from Table 5 is much stronger for IN_{t+1} than for OUT_{t+1}. In other words, the positive association between ΔBREADTH and contemporaneous returns is much stronger for IN than for OUT and the negative relation between ΔBREADTH and future returns is much stronger for IN than for OUT. These results are uniformly consistent with the investor recognition hypothesis.

4.4 Investor recognition and real corporate activities

The fourth key prediction from Merton's model is that corporate financing and investing activities are positively related to changes in investor recognition (our P4). Recall that the intuition behind this prediction is that the increased valuation and lower expected return accompanying an increase in investor recognition lead to a reduction in the cost of capital, making new financing and investing activities more attractive. An important research design issue in developing tests of P4 is the specification of the lag between changes in investor recognition and changes in firms' financing and investing activities. It is possible that it could take managers several quarters to implement changes in their firms' real activities. Rather than speculating as to the length of this implementation period, we examine financing and investing activities for a wide interval surrounding periods of extreme changes in investor recognition.

Empirical results for tests of P4 are presented in Table 7. This table reports the mean values of our corporate financing and investing variables for portfolios formed on decile ranks of ΔBREADTH. Our corporate financing and investing variables are constructed using data from the statement of cash flows. Corporate financing activity is measured as net cash from financing activities, while corporate investing activity is measured as capital expenditures plus acquisitions less depreciation and sales of property and equipment. Both variables are deflated by average total assets. We report results using both quarterly and annual measurement intervals. For the quarterly measurement interval, firms are ranked into deciles based on the magnitude of ΔBREADTH in quarter t, and corresponding mean values of financing and investment are reported for quarters $t-4$ through $t+4$. For the annual measurement interval, firms are ranked into deciles based on the magnitude of ΔBREADTH in year t, and corresponding mean values of financing and investment are reported for years $t-3$ through $t+3$.

Panel A of Table 7 reports results for our financing variable. Consistent with P4, there is strong evidence of a positive contemporaneous relation between financing

Table 7 Averages of financing and investment variables by ranks of change in investor recognition

Ranking of ΔBreadth	Mean quarterly financing by ranks of $\Delta Breadth_{QTR}$									Mean annual financing by ranks of $\Delta Breadth_{ANN}$						
	Qtr $t-4$ (%)	Qtr $t-3$ (%)	Qtr $t-2$ (%)	Qtr $t-1$ (%)	**Qtr t (%)**	Qtr $t+1$ (%)	Qtr $t+2$ (%)	Qtr $t+3$ (%)	Qtr $t+4$ (%)	Year $t-3$ (%)	Year $t-2$ (%)	Year $t-1$ (%)	**Year t (%)**	Year $t+1$ (%)	Year $t+2$ (%)	Year $t+3$ (%)
Panel A: Financing by ranks of change in investor recognition																
Lowest	2.07	2.06	1.80	1.67	**0.51**	0.66	0.71	0.67	0.60	10.33	11.02	10.42	**2.41**	1.69	2.08	2.14
2	2.08	2.25	2.02	1.86	**1.15**	1.35	1.51	1.41	1.27	9.72	10.12	8.79	**3.56**	3.89	4.33	4.40
3	1.86	1.56	1.84	1.58	**1.15**	1.51	1.44	1.35	1.48	7.75	7.80	7.26	**4.28**	5.22	5.03	4.63
4	2.37	2.72	2.33	2.25	**2.02**	2.16	2.13	2.18	2.02	9.00	8.58	7.89	**6.20**	5.59	5.70	4.62
5	2.18	2.10	2.25	2.16	**1.96**	2.26	2.26	1.99	2.14	7.78	8.23	7.72	**7.23**	7.28	6.41	5.84
6	2.22	2.12	2.26	2.32	**1.89**	2.07	2.03	2.32	2.23	7.73	7.37	7.20	**6.30**	6.40	5.89	4.43
7	2.07	1.98	1.97	1.89	**1.80**	1.87	2.02	1.90	1.66	8.22	7.38	8.03	**6.82**	6.91	5.92	4.98
8	1.95	1.91	1.99	1.96	**1.87**	2.00	1.81	1.75	1.75	8.05	7.52	7.81	**7.60**	6.51	5.34	4.31
9	1.98	2.00	1.94	2.11	**2.02**	1.83	1.75	1.55	1.52	7.42	7.43	7.87	**8.53**	6.14	4.35	3.39
Highest	1.51	1.76	1.96	2.00	**3.46**	2.12	1.58	1.39	1.19	7.53	6.68	7.13	**10.99**	5.41	2.87	1.67
Highest–Lowest	−0.56	−0.30	0.17	0.34	**2.95**	1.46	0.88	0.72	0.59	−2.80	−4.33	−3.29	**8.58**	3.72	0.79	−0.48
t-Statistic	−6.2	−3.4	1.9	3.9	**34.4**	19.6	12.5	10.5	8.7	−9.9	−16.5	−13.5	**42.9**	21.7	4.6	−2.6

Table 7 continued

Ranking of ΔBreadth	Mean quarterly investment by ranks of $\Delta Breadth_{QTR}$									Mean annual investment by ranks of $\Delta Breadth_{ANN}$						
	Qtr $t-4$ (%)	Qtr $t-3$ (%)	Qtr $t-2$ (%)	Qtr $t-1$ (%)	**Qtr t (%)**	Qtr $t+1$ (%)	Qtr $t+2$ (%)	Qtr $t+3$ (%)	Qtr $t+4$ (%)	Year $t-3$ (%)	Year $t-2$ (%)	Year $t-1$ (%)	**Year t (%)**	Year $t+1$ (%)	Year $t+2$ (%)	Year $t+3$ (%)
Panel B: Investment by ranks of change in investor recognition																
Lowest	0.88	0.86	0.79	0.75	**0.60**	0.52	0.45	0.40	0.35	4.54	4.67	4.23	**2.26**	0.88	1.11	1.48
2	0.63	0.56	0.50	0.45	**0.43**	0.32	0.29	0.28	0.24	3.48	3.07	2.39	**0.99**	0.36	0.66	1.18
3	0.36	0.37	0.32	0.22	**0.22**	0.13	0.11	0.06	0.08	2.62	1.97	1.61	**0.75**	0.32	0.71	0.88
4	0.23	0.27	0.24	0.22	**0.16**	0.20	0.18	0.21	0.19	1.65	1.47	1.10	**0.59**	0.25	0.41	0.50
5	0.17	0.13	0.15	0.12	**0.06**	0.06	0.04	0.02	0.02	1.63	1.22	1.18	**0.85**	0.66	0.71	0.74
6	0.20	0.22	0.25	0.21	**0.20**	0.14	0.14	0.13	0.11	1.95	1.67	1.54	**1.53**	1.33	1.13	1.17
7	0.42	0.37	0.37	0.38	**0.38**	0.37	0.33	0.27	0.28	2.55	2.32	2.05	**2.06**	1.81	1.49	1.52
8	0.49	0.51	0.52	0.51	**0.51**	0.50	0.46	0.42	0.39	3.29	2.90	2.91	**2.99**	2.61	2.35	2.10
9	0.73	0.71	0.73	0.74	**0.74**	0.76	0.73	0.70	0.67	3.75	3.61	3.56	**3.92**	3.81	3.18	2.88
Highest	0.84	0.87	0.91	0.93	**1.00**	1.04	1.05	1.00	0.95	4.59	4.21	4.12	**4.96**	5.14	4.16	3.53
Highest–lowest	−0.05	0.01	0.13	0.18	**0.40**	0.53	0.60	0.60	0.60	0.05	−0.46	−0.11	**2.70**	4.25	3.05	2.06
t-Statistic	−1.9	0.5	5.1	7.5	**16.3**	21.7	24.8	25.0	25.2	0.5	−4.7	−1.2	**32.2**	52.7	36.4	22.7

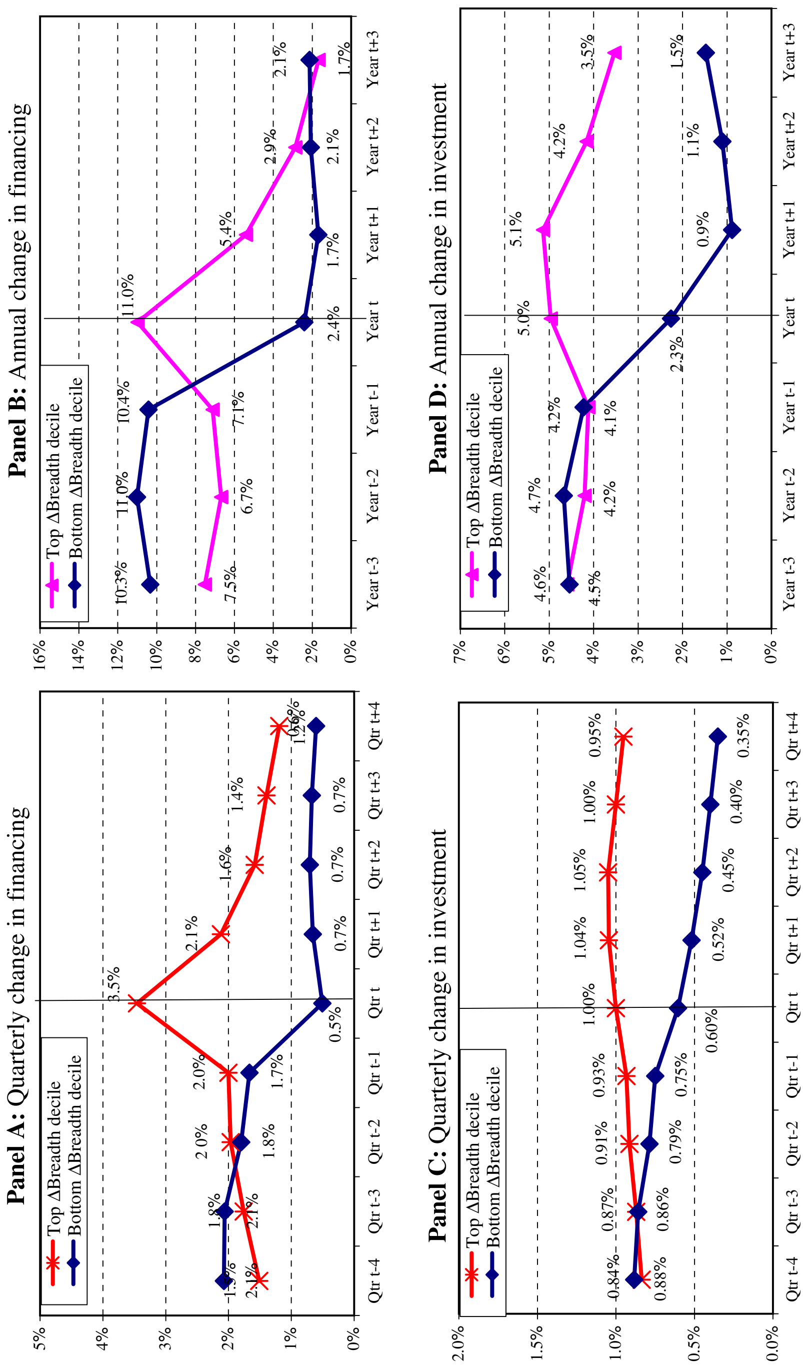
This table reports averages of financing (Panel A) and investment (Panel B) variables in quarters $t-4$ to $t+4$, and in years $t-3$ to $t+3$ by quarterly and annual decile rankings of ΔBreadth. Compustat data requirement reduced the sample size to 204,541 quarterly and 188,757 annual observations in Panel A and 210,931 quarterly and 186,156 annual observations in Panel B, for the period 1988–2004. Quarterly (annual) financing is measured as the quarterly (trailing-12-months) sum of Cash Flows from Financing Activities (Compustat data #113), scaled by average Total Assets (Compustat data #44). Quarterly (annual) investment is calculated as the quarterly (trailing-12-months) sum of capital expenditure plus acquisitions, less depreciation and sales of property plant and equipment, scaled by average total assets (Compustat data item (90 + 94 − 77 − 83)/average 44). Percentage quarterly change in breadth ($\Delta BREADTH_{QTR}$) equals the difference in the number of institutions (13F filers) holding the firm's stock at the beginning and at the end of the quarter divided by the total number of institutions at the beginning of the quarter and multiplied by 100. Percentage annual change in breadth ($\Delta BREADTH_{QTR}$) equals the difference in the number of institutions holding the firm's stock at the end of quarter $t-4$ and at the end of the current quarter divided by the total number of institutions at the end of quarter $t-4$, and multiplied by 100

Fig. 4 Quarterly and annual financing and investment for the highest and lowest decile rankings of the change in investor recognition. (**a**): Quarterly change in financing. (**b**): Annual change in financing. (**c**): Quarterly change in investment. (**d**): Annual change in investment. This figure reports averages of financing (**a** and **b**) and investment (**c** and **d**) variables in quarters $t-4$ to $t+4$, and in years $t-3$ to $t+3$ for the highest and lowest quarterly and annual decile rankings of ΔBREADTH. Compustat data requirement reduced the sample size to 204,541 quarterly and 188,757 annual observations in (**a**) and (**b**) and 210,931 quarterly and 186,156 annual observations in (**c**) and (**d**), for the period 1988–2004. Quarterly (annual) financing is measured as the quarterly (trailing-12-months) sum of Cash Flows from Financing Activities (Compustat data #113), scaled by average Total Assets (Compustat data #44). Quarterly (annual) investment is calculated as the quarterly (trailing-12-months) sum of capital expenditure plus acquisitions, less depreciation and sales of property plant and equipment, scaled by average total assets (Compustat data item (90 + 94 – 77 – 83)/average 44). Percentage quarterly change in breadth ($\Delta \text{Breadth}_{QTR}$) equals the difference in the number of institutions (13F filers) holding the firm's stock at the beginning and at the end of the quarter divided by the total number of institutions at the beginning of the quarter and multiplied by 100. Percentage annual change in breadth ($\Delta \text{BREADTH}_{ANN}$) equals the difference in the number of institutions holding the firm's stock at the end of quarter $t-4$ and at the end of the current quarter divided by the total number of institutions at the end of quarter $t-4$, and multiplied by 100

and ΔBREADTH in both the quarterly and annual data. Using quarterly (annual) data, the spread in financing between the high and low ΔBREADTH portfolios in period *t* is 2.95% (8.58%) with a corresponding *t*-statistic of 34.4 (42.9). These results are clearly both highly statistically and economically significant. There is also weaker evidence that ΔBREADTH is related to future financing activities. Figure 4 provides a graphical illustration of the financing data from Table 7 for the extreme investor recognition deciles. The figure clearly shows evidence of a positive relation in period *t* that gradually fades over the next 2 years. This evidence suggests that managers respond very quickly to increases in investor recognition, immediately raising new financing.[8]

Panel B of Table 7 and Fig. 4c and d report corresponding results using the investment variable in place of the financing variable. The results are broadly consistent with those in Panel A, with two notable exceptions. First, the contemporaneous relation between ΔBREADTH and investment is considerably weaker than that for financing. Using quarterly (annual) data, the spread in investment between the high and low ΔBREADTH portfolios is 0.40% (2.70%) with a corresponding *t*-statistic of 16.3 (32.2). Second, there is much stronger evidence of a positive relation between ΔBREADTH and *future* changes in investment. Figure 4d illustrates that this positive relation extends for at least 3 years beyond the ΔBREADTH ranking year. The story that emerges from Table 7 and Fig. 4 is that firms immediately raise new financing in response to increases in investor recognition, and then gradually invest the proceeds over the next several years. This story is intuitively appealing, since it indicates that when the cost of capital is relatively low, firms raise enough new financing to cover their investment opportunities for the next several years.

[8] In unreported tests we decompose our financing variable into debt and equity financing and examine how each of these financing components relates to changes in investor recognition. We find that both debt and equity financing exhibit the relations documented for total financing, and that the relations are slightly stronger for debt financing. These results indicate that the relations documented in Table 7 are not mechanically related to the increased shares outstanding arising from equity issuances.


Panel A: Quarterly change in financing
Top ΔBreadth decile
Bottom ΔBreadth decile
Panel B: Annual change in financing
Top ΔBreadth decile
Bottom ΔBreadth decile
Panel C: Quarterly change in investment
Top ΔBreadth decile
Bottom ΔBreadth decile
Panel D: Annual change in investment
Top ΔBreadth decile
Bottom ΔBreadth decile

Overall, the results in Table 7 confirm that investor recognition is positively related to both financing and investing. In addition to confirming P4, these results provide a potential explanation for why previous research has found that both financing and investing are negatively related to future stock returns (e.g., Ritter 2003; Titman et al. 2004). Previous research refers to these results as stock return 'anomalies', because they are difficult to reconcile with market efficiency. The investor recognition hypothesis provides a potential explanation for these anomalies. Merton's model links both financing and investment to contemporaneous changes in investor recognition and provides an explanation as to why investor recognition has a negative relation with expected returns. Financing and investing could simply be proxies for investor recognition, thus explaining their negative relation with future returns. Unfortunately, empirical tests of this conjecture are problematic, because all we have to work with is ΔBREADTH, which is itself a noisy proxy for investor recognition. It is unreasonable to expect ΔBREADTH to completely subsume these other variables in predicting future stock returns. It is likely that each of measures provides incremental information about the underlying investor recognition construct.[9] Finally, we note that the strong contemporaneous relation between quarterly changes in investor recognition and stock returns is consistent with the idea that managers engage in premeditated investor relations activities to boost their stock prices when they raise new financing. It typically takes at least a quarter to arrange for new financing, so we would not expect to see firms raising new financing so quickly in response to exogenous changes in investor recognition.

5 Conclusions

This paper provides evidence suggesting that investor recognition is more important than accounting information in explaining the variation in stock returns. Consistent with Merton's (1987) theoretical analysis, we find that (i) security value is increasing in investor recognition, (ii) expected return is decreasing in investor recognition, (iii) the above two relations are increasing in a security's idiosyncratic risk, and (iv) financing and investing activities are increasing in investor recognition.

Our research has implications for the large body of existing research on the role of cash flow news versus expected return news in explaining cross-sectional variation in security returns (e.g., Roll 1988; Campbell 1991; Vuolteenaho 2002). We identify investor recognition as an important determinant of expected return news and we show that changes in investor recognition appear to be as important as earnings surprises in explaining security returns. Our findings suggest that changes in investor recognition should be a particularly important determinant of stock returns for firms with relatively uncertain future payoffs, because idiosyncratic risk is greater in such stocks.

[9] In unreported empirical tests, we find that ΔBREADTH, investment and external financing each have incremental explanatory power with respect to future returns.

Our research also has implications for the large body of literature documenting 'anomalous' determinants of expected returns. We have already shown that investor recognition is related to financing and investment in such a way that investor recognition provides a potential explanation for the negative returns following these activities. Investor recognition also has the potential to explain a number of other anomalies. For example, Sloan (1996) and Richardson et al. (2004) show that accruals are negatively related to future returns. Accruals basically represent investments in operating assets, and so increased investor recognition should lead to increased investment in accruals. As a second example, Jegadeesh and Titman (1993) show that stock returns are positively autotcorrelated over measurement intervals of 3–12 months. Since changes in investor recognition are also positively autocorrelated over measurement intervals of 3–12 months, autocorrelation in investor recognition could drive momentum in stock returns. As a final example, Lakonishok et al. (1994) find that fundamental to price ratios (e.g., book-to-market, earnings-to-price) are positively related to future stock returns. Increased investor recognition will lead to higher security values and lower expected returns, thus inducing a negative relation between fundamental to price ratios and future returns. The challenge for future research in this area is to determine how much of the return predictability of these 'anomalies' is attributable to investor recognition.

Our research leaves several questions unanswered. Foremost among these are the determinants of investor recognition. What factors cause investors to be cognizant of some securities, but not others?[10] Figure 2 suggests that investors tend to recognize stocks with strong recent price performance. The evidence in Table 7 suggests that firms raising new financing engage activities that increase investor recognition. In fact, one can argue that a primary role of investment bankers is to enhance investor recognition of their clients' securities. A second question concerns the measurement investor recognition. Our ΔBREADTH measure provides one potential proxy that performs well in empirical tests. But this measure has limitations and can likely be improved upon. The application of factor analysis to a broad range on investor recognition proxies offers one potential avenue for improvement.

Finally, our research highlights the value of corporate investor relations activities that increase investor recognition. We show that such activities have the potential to unlock large amounts of value and substantially lower the cost of capital. As such, our research provides additional evidence supporting Brennan and Tamorowksi's (2000) claim that investor relations activities are an important determinant of value creation.

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[10] It is possible that the results in our paper are due to correlated omitted variables associated with the determinants of investor recognition, rather than to investor recognition per se. We view this possibility as remote, because we test four unique implications of the investor recognition hypothesis and find strong support for all four. It would be an extraordinary coincidence if the underlying determinants also happened to explain all four of these predictions.

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