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Investor Diversification and the Pricing of Idiosyncratic Risk

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Abstract

Theories predict that, due to investor under-diversification, idiosyncratic risk is positively priced in expected stock returns. Empirical studies based on various methodologies yield mixed evidence. This study circumvents the debate on methodological issues and traces the pricing of idiosyncratic risk to its economic source – investor under-diversification. Assuming that institutional investors tend to hold more diversified portfolios and thus care little about idiosyncratic risk relative to individual investors, we find that the positive relation between idiosyncratic risk and stock returns is significantly stronger (weaker) in stocks that are held and traded more by individual (institutional) investors. In addition, the pricing of idiosyncratic risk becomes weaker over time as institutional investors become more dominant in the US equity market.

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1. Introduction

Modern portfolio theory suggests that investors hold a portfolio of stocks to diversify idiosyncratic risk (Markowitz, 1952; 1959). Building on this principle, the capital asset pricing model (CAPM) predicts that all investors hold the market portfolio in equilibrium. As a result, only systematic risk is priced in equilibrium and idiosyncratic risk is not. The assumptions of the CAPM are however too simple to be true and hence, in reality, investors do not behave as predicted. For various reasons many investors do not hold well diversified portfolios.

Blume and Friend (1975) provide early evidence on investors' lack of diversification for their portfolios. Using income tax return data, they find that most U.S. investors hold only one or two stocks. Based on the Survey of Consumer Finances (SCF) data, Kelly (1995), and Polkovnichenko (2005) confirm the poor diversification of U.S. household portfolios. Families that have investments in stocks tend to hold individual stocks directly and the median number of stocks in their portfolios is only one or two most of the time. Moreover, families tend to hold a disproportionally large number of stocks of the companies which family members are working for. In a sample of more than 62,000 household investors from a U.S. brokerage house, Goetzmann and Kumar (2002) show that more than 25% of the investor portfolios contain only one stock, over half of the investor portfolios contain no more than three stocks, and less than 10% the investor portfolios contain more than ten stocks. Similarly, Calvet, Campbell, and Sodini (2007) find evidence of under-diversification in Swedish household portfolios. The proposed reasons for investors' lack of diversification include the presence of fixed transaction costs (Brennan, 1975; Bloomfield, Leftwich, and Long, 1977), limited investor attention on a subset of stocks (Merton, 1987), investors' preference for skewness (Kraus and

Litzenberger, 1976; Lim, 1989; Harvey and Siddique, 2000; Barberis and Huang, 2008), employees' loyalty toward their working company (Cohen, 2009), rank-dependent preferences (Polkovnichenko, 2005), investors' preference for downside protection and upside potential in constructing portfolios (Shefrin and Statman, 2000), investors' desire for portfolio insurance in the presence of margin and short-sale constraints (Liu, 2009), overconfidence (Odean, 1999), and information advantage (Van Nieuwerburgh and Veldkamp, 2009).

Theories assuming under-diversification predict a positive relation between idiosyncratic risk and expected returns. See, for example, earlier studies such as Levy (1978), Merton (1987) and more recently, Malkiel and Xu (2001), Barberis and Huang (2008), Boyle, Garlappi, Uppal, and Wang (2009) among others. Empirical evidence on the relation between idiosyncratic volatility and stock returns is however mixed. Douglas (1969) regresses mean annual returns on variances of annual returns in a single regression for a large sample of U.S. stocks for the period 1946-1963 and find a positive relation. Miller and Scholes (1972) point out that Douglas' empirical methods are subject to several sources of bias and misspecification and criticize his results as "deeply disturbing". In a subsequent study, Fama and MacBeth (1973) sort individual stock betas to form 20 portfolios in each period and regress equal-weighted portfolio returns on average beta and average idiosyncratic volatility of the stocks in the portfolios. To control for the cross-sectional correlations among residuals, they employ the later popular Fama-MacBeth method to construct test-statistics. They find that the time-series average coefficient estimate for idiosyncratic volatility is indistinguishable from zero and thus argue that idiosyncratic risk is not priced in cross-sectional returns.

This conclusion has been accepted for a long time until recently Malkiel and Xu (2001) employ very similar empirical methods to Fama and MacBeth (1973) on more recent data and find some positive pricing of idiosyncratic risk. More strikingly, Ang, Hodrick, Xing, and Zhang (2006) find that, in the cross-section of stocks, high idiosyncratic volatility in this month predicts abnormally low average returns in the next month. They describe this negative relation as "a substantive puzzle" because it is "inconsistent with any extant asset pricing theory". In a subsequent study, Ang, Hodrick, Xing, and Zhang (2009) further confirm this negative relation in stock markets in the US and other developed countries.[1]

Fu (2009) argue that the relation between stock returns and the lagged idiosyncratic volatility cannot be used to infer the relation between expected stock returns and idiosyncratic risk, because idiosyncratic volatility is time-varying and the lagged value is a poor estimate of the expected value. Improving the estimation by EGARCH models, he finds a significantly positive relation between expected idiosyncratic volatility and

[1] Ang et al.'s findings have generated much research interest. Bali and Cakici (2008) suggest that Ang et. al's results are sensitive to: (i) data frequency used to estimate idiosyncratic volatility, (ii) weighting schemes used to compute average portfolio returns, (iii) breakpoints utilized to sort stocks into quintile portfolios, and (iv) using a screen for size, price, and liquidity, and therefore are not robust. Fu (2009) and Huang, Liu, Rhee, and Zhang (2009) point out that Ang et al.'s results are driven by monthly stock return reversals. The negative relation between average return and the lagged idiosyncratic volatility disappears after controlling for the difference in the past-month returns. Boyer, Mitton, and Vorkink (2009) suggest that idiosyncratic volatility is a good predictor of expected skewness–-an explanatory variable of cross-sectional returns (Kraus and Litzenberger, 1976; Lim, 1989; Harvey and Siddique, 2000). The negative relation greatly reduces after controlling for expected skewness. Using the maximum daily return over the past month as a proxy for lottery-like stocks, Bali, Cakici, and Whitelaw (2009) confirm that investors' preference for those stocks helps to explain the negative relation between average returns and lagged idiosyncratic volatilities. Han and Kumar (2009) also find that the negative relation is more pronounced among stocks that retail investors like to speculate. Jiang, Xu, and Yao (2009) show that both high idiosyncratic volatility and low future returns are related to a lack of information disclosure among firms with poor earnings prospects. Investors underreact to earnings information in idiosyncratic volatility. George and Hwang (2009) suggest that the negative relation is more evident in stocks that are not covered by financial analysts. Similarly, Duan, Hu, and McLean (2009) suggest this negative relation is significant only in stocks with short sell constraint.

expected stock returns. Following his EGARCH method, Brockman, Schutte, and Yu (2009) find the positive relation in the stock markets of most other countries. Spiegel and Wang (2006) and Eiling (2006) also confirm the positive relation in U.S. stocks based on the EGARCH estimates of conditional idiosyncratic volatility. Inspired by the famous Roll's critique, Choi (2009) criticizes existing studies' use of the Fama-French three-factor model as the default asset pricing model in estimating idiosyncratic volatility and shows that the positive relation between conditional idiosyncratic volatility and stock returns disappears if some additional market returns are included to estimate idiosyncratic volatility. These markets include US corporate and Treasury bonds, real estate investment trusts, commodity futures, and foreign stocks and bonds.

Most of the debates so far are on the methodological issues such as estimation of conditional idiosyncratic risk, weighting of portfolio returns, inclusion of return factors and control variables. We take a different approach by tracing the pricing of idiosyncratic risk to its economic source – investor diversification. Investors in reality are heterogeneous in the level of diversification for their portfolios. In general institutional investors tend to hold more diversified portfolios than individual investors do. If the positive relation between idiosyncratic risk and expected returns is driven by investor under-diversification, we expect to observe a stronger (weaker) relation in stocks that are held and traded by under-diversified (diversified) investors. In this study, we examine if returns of stocks that are held and traded more by institutional investors are less affected by their idiosyncratic risk compared to stocks that are held and traded more by individual investors. Following Fu (2009), we examine the contemporaneous relation between idiosyncratic volatility and stock returns to infer if idiosyncratic risk is indeed priced.

Our sample includes stocks traded on the NYSE, AMEX, and Nasdaq during the period of 1980-2007. In each month, we divide stocks into three equal-size groups based on their aggregate institutional ownership in the previous quarter-end and then sort stocks in each group into quintiles based on their expected idiosyncratic volatility. This procedure results in 15 portfolios in each month. For each tercile of institutional ownership (i.e., high, middle, low), we compute the monthly return spread between the highest idiosyncratic volatility portfolio and the lowest idiosyncratic volatility portfolio. They are, respectively, 5.37%, 2.65%, and 0.89% in equal-weighted portfolios (3.85%, 1.74%, and -0.56% in value-weighted portfolios) for the low, middle, and high tercile of institutional holdings. Stocks with high expected idiosyncratic volatility earn significantly higher returns than stocks with low expected idiosyncratic volatilities. But this relation is more significant in stocks held more by individual investors. For the stocks that are favored by institutional investors, we do not find robust evidence that higher idiosyncratic volatilities are associated with higher stock returns. We further examine the impact of institutional ownership on the relation between idiosyncratic volatility and individual stock return in the Fama-MacBeth regressions, which allow us to control for other known determinants of cross-sectional returns including size, book-to-market equity ratio, momentum, liquidity and its variability. The regression results confirm that low (high) institutional ownership strengthens (weakens) the positive relation between idiosyncratic risk and stock return. The differences are both statistically and economically significant. Moreover, our empirical results are robust to different measures of idiosyncratic risk and different measures of investor diversification.

Institutional ownership of public stocks has been increasing steadily in the U.S. equity markets. For example, Asquith, Pathak, and Ritter (2005) show that the median institutional ownership for NYSE and AMEX stocks increases from about 10% in 1980 to 55% in 2002. Using Thomson Financial 13f data, we confirm the increasing pattern of institutional ownership both for NYSE/AMEX stocks and Nasdaq stocks in an extended period. If the market is dominated by diversified investors who care little about idiosyncratic risk, we expect to see less pricing of idiosyncratic risk. This motivates our time-series analysis. In particular, we examine whether the time-series increase in aggregate institutional ownership is associated with a diminishing relation between idiosyncratic risk and expected return. We indeed find that the average return premium for idiosyncratic volatility decreases over time. This negative trend is more pronounced for stocks traded in the NYSE or AMEX and during the sub-period of 1980-1997.

The reminder of the paper proceeds as follows. Section 2 describes the data and key variables. Section 3 presents the empirical results of cross-sectional tests and Section 4 presents the empirical results of time-series tests. Section 5 concludes.

2. Data and Variables

Our sample includes stocks traded in the NYSE, AMEX, and Nasdaq during the period January 1980 to December 2007. Daily and monthly stock returns are obtained from the CRSP. We start the sample in 1980 to match the institutional ownership dataset – Thomson Financial's 13(f) reports. Institution investors in the U.S. are mandated to file 13(f) reports to the SEC within 45 days of the end of each calendar quarter. The reports detail all equity positions greater than 10,000 shares or $200,000 in market value.[2]

[2] The reporting institutions constitute the majority of institutional holdings. According to Sias, Starks, and Titman (2006), the total market value of the equity holdings of institutions filing 13(f) reports (and thus included in the database) accounts for about 90% of the Conference Board estimate of total institutional investor equity holdings.

Thomson Financial's 13(f) dataset summarizes key variables of institutional ownership and has 976,591 firm-quarter observations for 22,428 stocks for the period 1980-2007[3].

The key variable in our study is the influence of investor diversification on individual stocks. Motivated by empirical observations, we assume institutional investors such as mutual funds tend to hold better diversified portfolios than average individual investors. Hence, we measure the influence of institutional investors on each stock by the proportion of aggregate outstanding shares held by them. We note this measure as Institutional Ownership *(IO)*. The same measure has been used by previous studies such as Parrino, Sias, and Starks (2003), Sias, Starks, and Titman (2006) and Asquith, Pathak, and Ritter (2005). Microstructure literature suggests that security prices are determined by the trading of marginal investors. Although holding a stock can be considered a passive form of trading, we construct an alternative measure to capture the intensity of occurred trading by institutional investors. Implicitly we assume that the likelihood of institutional investors determining the stock price is higher if the intensity of institutional trading is higher for this stock. We measure the trading intensity by the ratio of institutional trading to the total trading volume on this stock. In particular, we follow Shu (2009) to compute the Fraction of Institutional Trading *(FIT),* where the numerator is the sum of absolute changes in institutional ownership from quarter to quarter and the denominator is the total trading volume of this stock within the quarter (from CRSP monthly return file)[4]. We

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[3] Among the 976,591 firm-quarter observations, 812,103 have matching CUSIPs in the CRSP data.

[4] This measure however suffers from two potential problems: (1) it does not capture round-trip trades by the same institutional within a quarter; and (2) it double-counts trades between institutional investors. The first problem leads to underestimation while the second problem leads to overestimation of institutional trading. Due to these concerns we stick to institutional holding as our primary measure and use the institutional trading measure to check robustness of results.

find a very positive correlation between these two variables of institutional investor influence.

The other key variable, idiosyncratic risk, is also measured in two different ways. In each month we regress daily excess returns of each individual stock on the Fama-French three factors, and compute the standard deviation of the regression residuals[5]. We require stocks to have at least 15 trading days (and return observations) during the month. This idiosyncratic volatility estimate can be viewed as ex-post realized idiosyncratic risk. Our second proxy for idiosyncratic risk follows Fu (2009), which is a one-month ahead idiosyncratic volatility predicted by EGARCH models. In each month, we regress all available past excess returns on the Fama-French monthly factors while imposing nine different EGARCH specifications on the time-series process of residuals[6]. The explicit functional forms of the EGARCH models are as follows:

$$R_{it} - r_t = \alpha_i + \beta_i (R_{mt} - r_t) + s_i SMB_t + h_i HML_t + \varepsilon_{it}, \quad \varepsilon_{it} \sim N(0, \sigma_{it}^2), \tag{1}$$

$$\ln \sigma_{it}^2 = a_i + \sum_{l=1}^{p} b_{i,l} \ln \sigma_{i,t-l}^2 + \sum_{k=1}^{q} c_{i,k} \left\{ \theta \left(\frac{\varepsilon_{i,t-k}}{\sigma_{i,t-k}} \right) + \gamma \left[\left| \frac{\varepsilon_{i,t-k}}{\sigma_{i,t-k}} \right| - (2/\pi)^{1/2} \right] \right\}. \tag{2}$$

The monthly return process is described by the Fama-French three-factor model as in Eq. (1). The conditional (on the information set at time *t*-1) distribution of residual ε_{it} is assumed to be normal with the mean of zero and the variance of σ_{it}^2. The conditional variance, σ_{it}^2, is assumed a function of the past *p*-period of residual variance and *q*-period of return shocks as specified by Eq. (2). Each model is employed independently for each individual stock. We choose the estimates from the specification that converges and yields

[5] Daily market, size, and book-to-market factors are obtained from Kenneth French's website http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/

[6] The nine EGARCH (p, q) specifications are (p=1,q=1), (p=1, q=2), (p=1, q=3), (p=2, q=1), (p=2, q=2), (p=2, q=3), (p=3, q=1), (p=3, q=2), and (p=3, q=3).

the lowest Akaike Information Criterion. We also require stocks to have at least 30 consecutive monthly returns to be eligible for the estimation.

We also construct firm characteristic variables that are known cross-sectional determinants of stock returns. They are market capitalization, book-to-market equity ratio, compounded return from the past six months, average turnover in the past 36 months and the coefficient of variation of past turnovers, employed respectively to control for the effects of size, value (vs. growth), momentum, and liquidity on stock returns. Summary statistics for these variables are reported in Panel A of Table 4. Panel B reports the correlations between these variables.

The pooled sample between 1980 and 2007 has 800,645 firm-month observations. The average monthly return (*Return (%))* is 1.40%. The average realized *(IVOL)* and expected idiosyncratic volatilities *(E(IVOL))* are 13.00% and 12.53%, respectively. The average institutional ownership (*IO)* is 32.73%, which means that about one-third of the outstanding shares for a typical stock are owned by financial institutions. The average fraction of institutional trading (*FIT*) is 50.30%. Later we show there is a large increase in institutional ownership and trading over time.

3. Empirical Findings from Cross-Sectional Tests

Markowitz (1952, 1959) demonstrates how investors can diversify away idiosyncratic risk of individual stocks without sacrificing expected return and concludes that investors should "put their eggs in different baskets". However, his suggestion is not always followed in reality, especially by individual investors. In this paper, we do not examine the underlying reasons for investor under-diversification, which has been done by many studies. Instead, we start from the fact that some investors under-diversify and empirically examine how under-diversification affects the equilibrium relation between idiosyncratic risk and expected returns.

Theories assuming under-diversification predict a positive relation between idiosyncratic risk and expected returns. The intuition is straightforward. If investors hold few stocks only, they would certainly take idiosyncratic risk into consideration when making portfolio allocation decisions. On the other hand, if investors hold well diversified portfolios as Markowitz suggests, they would care little about the idiosyncratic risk of a particular stock in their portfolio as it contributes little to the risk of the whole portfolio. An interesting question is who are the marginal investors that determine the price (and thus return) of a stock. We propose that the preference of investors who have big influence via both holding and trading dominates the pricing of this stock. Since institutional investors tend to hold more diversified portfolios than individual investors do, we propose that the pricing of idiosyncratic risk is less significant in stocks that are largely held and traded by institutional investors and is more significant in stocks that are largely held and traded by individual investors.

We study the cross-sectional relation between institutional ownership and the pricing of idiosyncratic risk in two ways, one by return analysis on portfolios sorted on institutional ownership and idiosyncratic volatility and the other by Fama-MacBeth regressions of individual stock returns on idiosyncratic volatility and other control variables.

3.1. Portfolio return analysis

In each month, we sort all stocks into terciles based on the percentage of institutional ownership *(IO)* as of the end of the last quarter.[7] We then divide stocks in each tercile into quintiles based on monthly idiosyncratic risk. We use two measures for idiosyncratic risk: realized idiosyncratic volatility *(IVOL)* and expected idiosyncratic volatility *(E(IVOL))*. Detailed estimation of these measures is provided in the previous section. This procedure results in 15 portfolios in each month. On average each portfolio has about 250 stocks. Table 1 reports the time-series medians of the cross-sectional median stock characteristics for each portfolio.

The percentage of institutional ownership ranges between 4.29% (the portfolio of stocks with the highest *IVOL* in the lowest *IO* tercile) and 60.18% (the portfolio of stocks with the second lowest *IVOL* in the highest *IO* tercile). But within each *IO* tercile, we do not find institutional ownership differs much across idiosyncratic risk quintiles. If any, the highest IVOL portfolios in each IO tercile tend to have slightly lower institutional ownership than the other four IVOL portfolios in their respective IO tercile. However, we find significant differences in IVOL between stocks that are favored by institutional investors and those not favored. In general, stocks held more by institutional investors tend to have lower idiosyncratic volatility.

The patterns on fraction of institutional trading *(FIT)* and expected idiosyncratic volatility *(E(IVOL))* are similar to those on *IO* and *IVOL*, respectively. It suggests high correlations between the two measures of institutional investor influence and the two measures of idiosyncratic risk. Not surprisingly, institutional investors trade significantly

[7] The composition of terciles remains almost same during the three months following 13(f) filings except for delisting of some firms.

more in stocks that they have a higher percentage of ownership and relatively more in stocks with lower idiosyncratic volatility.

Table 1 also shows two significant patterns of firm size across portfolios. Size is measured by market capitalization. In general, size is positively related to institutional ownership and negatively related to idiosyncratic volatility. Institutional investors prefer large stocks and large stocks tend to have lower idiosyncratic volatility. In addition, stocks favored by institutions have lower median book-to-market equity ratio, suggesting their preference for growth stocks.

Table 2 presents both equal- and value-weighted returns for portfolios formed on *IO* and *IVOL.* We also compute the difference in returns between the highest and lowest *IVOL* quintiles in each *IO* tercile. It works as if we long the portfolio of stocks with the highest *IVOL* and short the portfolio of stocks with the lowest *IVOL* and rebalance the portfolios monthly. A positive return spread indicates higher returns for higher *IVOL* stocks or equivalently, a positive relation between idiosyncratic volatility and average return. We also run time-series regressions of the hedging portfolio returns on the Fama-French three factors to estimate the alpha, which measures the excess return that is not explained by the market, size, and book-to-market factors.

Consistent with Fu (2009), we find a positive difference in returns between the highest and lowest *IVOL* portfolios. More importantly, institutional ownership has a significant influence on the return spread. In particular, the equal-weighted return spread between the highest and lowest *IVOL* quintiles drops from 5.37% for the low institutional ownership tercile to 0.89% for the high institutional ownership tercile. If value-weighted, the spread decreases from a statistically significant 3.85% to an insignificant -0.55%. We find consistent results based on the alphas estimated from the Fama-French three factor model. In sum, idiosyncratic volatility is positively related to returns of the stocks that are held more by individual investors while the relation is not obvious in stocks that are held more by financial institutions. The evidence lends support to the theories that argue the pricing of idiosyncratic risk being driven by investor under-diversification.

In Table 3, we replace *IVOL* by *E(IVOL)* to form portfolios and then compute portfolio returns. The results are qualitatively similar. We find positive pricing of idiosyncratic risk in stocks held more by individual investors but no significant relation between expected idiosyncratic risk and stock return in stocks that are favored by institutional investors.

3.2. Fama-MacBeth cross-sectional regressions

Although intuitive and economically meaningful, the portfolio sorting methodology is often limited by the appropriate dimensions of sorting. In particular, our previous results do not account for the widely documented effects on stock returns from other variables such as size, value (vs. growth), momentum, and liquidity. In order to better isolate the effect of investor diversification on the pricing of idiosyncratic risk, we employ the popular Fama-MacBeth regressions as in Fu (2009). In particular, we regress monthly stock returns on idiosyncratic volatility (*IVOL* or *E(IVOL)*), control variables including market capitalization, book-to-market equity ratio, past six-month return, mean and the coefficient of variation of past turnovers, and for the purpose of our tests, two interaction variables between idiosyncratic volatility and institutional ownership (or trading). The time-series average coefficients are reported and the time-series standard errors are used to evaluate the statistical significance.

We create four indicators to denote high or low institutional ownership or trading fraction. IO_{it}^{low} (FIT_{it}^{low}) is an indicator that equal one if the institutional ownership (trading) of stock i at t is in the lowest tercile of the distribution and zero otherwise. Simiarly, IO_{it}^{high} (FIT_{it}^{high}) is an indicator that equals one if the institutional ownership (trading) of stock i at t is in the highest tercile or zero otherwise. The variables of our interest are the interaction terms of idiosyncratic risk variables with these indicators.

Tables 5 and 6 present the regression results. In Table 5 we investigate the effect of institutional ownership *(IO)* on the relation between idiosyncratic risk and expected return. We then replace *IO* by *FIT* and the results are reported in Table 6. Confirming the findings of Fu (2009), we find significantly positive coefficient estimates for *IVOL* and *E(IVOL)* in all model specifications. Moreover, we find significantly positive coefficient estimates for the interaction variables of $IVOL_t{*}IO_{it}^{low}$, $E(IVOL_t){*}IO_{it}^{low}$, $IVOL_t{*}FIT_{it}^{low}$, and $E(IVOL_t){*}FIT_{it}^{low}$, significantly negative coefficient estimates for $IVOL_t{*}IO_{it}^{high}$ and $E(IVOL_t){*}IO_{it}^{high}$, and negative but not significant coefficient estimates for $IVOL_t{*}FIT_{it}^{high}$ and $E(IVOL_t){*}FIT_{it}^{high}$. The findings suggest that the positive pricing of idiosyncratic risk is significantly stronger in stocks that are held and traded more by individual investors, is significantly weaker in stocks that are held more by financial institutions, and is arguably weaker in stocks that are traded more by financial institutions. In general, the evidence further confirms the findings from portfolio analysis.

4. Empirical Findings from Time-Series Tests

Institutional ownership of public stocks has been increasing in the U.S. equity markets in the past decades (Friedman, 1996; Bennett, Sias, and Starks, 2003; Asquith, Pathak, and Ritter, 2005; Blume and Keim, 2008). Similar to previous studies, we find that the median institutional ownership for NYSE and AMEX stocks increased steadily from about 20% in

1980 to 67% by the end of 2006. The median institutional ownership of Nasdaq stocks also increases from almost nil to 37% during this time period. Given that the market dominance of diversified investors who care little about idiosyncratic risk has risen so dramatically, we expect to see less pricing of idiosyncratic risk as time goes by. In particular, we expect that the time-series increase in aggregate institutional ownership has weakened the positive relation between idiosyncratic risk and expected return.

To conduct this test while controlling for the changes in idiosyncratic risk and institutional ownership brought by new firms entering the market (Fink, Fink, Grullon and Weston, 2009; Irvine and Pontiff , 2009; Fama and French, 2004), we construct a new sample in which stocks that appear in the 13F dataset are included for their lifetime. If a stock is dropped from the 13F reports in a particular quarter, it is retained in the sample and we assume that institutional ownership during that quarter is zero. By doing this, we effectively exclude all U.S. stocks that have not been held by institutions during the sample period. Since the purpose of this test is to determine whether changes in institutional ownership produce subsequent changes in the idiosyncratic risk premium, it makes sense to focus our attention on the subsample of stocks in which institutional ownership changes actually occur.

We estimate the idiosyncratic risk premium in each month t by fitting cross-sectional regressions of the form:

$$R_{it} = b_{0t} + b_{1t} Ln(ME_{it}) + b_{2t} Ln(BE/ME)_{it} + b_{3t} \operatorname{Re}t_{it}(-2,-7) + b_{4t} Ln(Turn_{it}) + b_{5t} Ln(CVTurn_{it}) + b_{6t} IVOL_{it} \tag{3}$$

The monthly idiosyncratic risk premium is captured by the coefficient b_{6t}. IRP_q is the median of the coefficients of these three months in quarter q. We match quarterly observations with aggregate institutional ownership measures for the U.S. market. *Average (Median)* IO_{q-1} is the average(median) fraction of institutional ownership for all stocks in the quarter preceding quarter q. Since according to theory, changes in investor diversification produce subsequent changes in the idiosyncratic risk premium, we lag our institutional ownership measures by one quarter. The series run for 111 quarters, from the first quarter in 1980 to the third quarter in 2007.

Panel A in Table 7 presents simple statistics for the quarterly series. The mean IRP_q is 0.25. This means that in general, investors are willing to bear an additional 0.25% for each additional percentage point of idiosyncratic volatility. The mean of means institutional ownership is 24.69%, while the mean of medians is 29.50%.

Figure 1.a. illustrates the evolution of median institutional ownership and the idiosyncratic risk premium for US stocks. Similar to what has been documented in Asquith, Pathak, and Ritter (2005) we observe a clear upward trend in median institutional ownership over the sample period. The quarterly idiosyncratic risk premium is much more volatile and to appreciate the series' low frequency movements we plot not only the series but also its forward-looking four-quarter moving average. We observe that this series declines from 1980 to the late 1990s. From that point onwards, the series becomes more erratic and a trend is harder to appreciate. We conjecture that the erratic behavior in the idiosyncratic risk premium is the result of profound changes in stock return volatility for US firms, especially those firms traded in the Nasdaq. Schwert (2002) shows that the volatility in Nasdaq markets behaves abnormally since 1998; he hypothesizes that volatility in the Nasdaq, which is made up by smaller firms with more growth options than the S&P 500 firms, has become unusually erratic mostly due to the introduction of new information technologies in the last decade. To better observe the

relation between diversification and the idiosyncratic risk premium we break the sample into Nasdaq and NYSE/AMEX firms, if the unusual volatility in Nasdaq is causing the erratic behavior of the idiosyncratic risk premium, we expect the negative relation between institutional ownership and the idiosyncratic risk premium to be more evident in the NYSE/Amex firms. Further, we break down the sample period into two, 1980-1997 and 1998-2007. If new technologies and more growth options have affected the idiosyncratic risk premium after 1998, the negative relation between diversification and the idiosyncratic risk premium should be more evident in the earlier part of the series.

Figure 1.b illustrates the relation between median institutional ownership and the idiosyncratic risk premium for NYSE/AMEX firms. In this figure the positive trend in institutional ownership and the negative trend in the idiosyncratic risk premium are very clear. The erratic behavior the idiosyncratic risk premium post 1998 also appears in this series, but softened. Figure 1.c illustrates the relation between median institutional ownership and the idiosyncratic risk premium for Nasdaq firms. A linear trend in the idiosyncratic risk premium for these firms is hard to identify.

Panel B presents linear trend coefficients for the series. We obtain these coefficients by regressing the variables of interest against a time dummy. We find a negative trend in the idiosyncratic risk premium for the full sample. As expected, this trend becomes much stronger between 1980 and 1997. The trend coefficient for 1980-1997 is -0.62 x10^{-4} (*t-statistic* of -4.30) while for the entire sample period is -0.10x10^{-4} (*t-statistic* of -1.08). For firms traded in the NYSE/AMEX, the idiosyncratic risk premium has a negative and significant trend during the full period which becomes even stronger between 1980 and 1997. The linear trend coefficient for NYSE/AMEX firms in the 1980-1997 subperiod is -0.62x10^{4} (*t-statistic* of -3.54) while for the full period is about half, -0.32x10^{4} (*t-statistic* of -3.14).

Panel C presents Pearson correlations coefficients of IRP_q with $Average\ IO_{q-1}$ and IRP_q with $Median\ IO_{q-1.}$ The two series show a negative correlation, although not statistically significant. This correlation becomes much stronger for NYSE/AMEX stocks during the 1980-1997 sub-period. The correlation between IRP_q and $Average\ IO_{q-1}$ for the subsample is -0.40, and between IRP_q and $Median\ IO_{q-1}$ is -0.39, both coefficients are statistically significant at the 1% level.

In conclusion, the times-series analysis confirms our main result from the cross-sectional analysis. It shows that investor diversification has had a negative effect on the idiosyncratic risk premium in the US, particularly during the 1980s and most of the 1990s.

5. Conclusion

Modern portfolio theory suggests that investors hold diversified portfolios to shirk idiosyncratic risk. The CAPM further predicts that in equilibrium all investors hold the market portfolio and only systematic risk is priced and idiosyncratic risk is not. Diversification, though taught as a rule of thumb for investment, is not always adopted by investors in real life. For a multitude of reasons many individual or household investors do not hold well diversified portfolios. Theories that acknowledge the violation of the diversification assumption predict a positive relation between idiosyncratic risk and expected returns. The empirical existence of this relation has been debated almost since the time that Markowitz first proposes the portfolio theory. Perplexingly, articles finding a positive relation are about as many as articles finding no relation or even a negative relation.

Most of the debates so far are on the methodological issues such as estimation of conditional idiosyncratic risk, weighting of portfolio returns, inclusion of return factors and control variables. In this study we take a different approach and trace the pricing of idiosyncratic risk to its economic source – investor diversification. We know that investors differ widely in their diversification levels and that in general financial institutions hold better diversified portfolios than individual investors. Hence, if investor under-diversification leads to a positive relation between idiosyncratic risk and expected returns, the relation should be stronger (weaker) in stocks that are dominated by individual (institutional) investors. We find evidence to support this hypothesis.

We conduct our tests in a sample of stocks traded on the NYSE, AMEX, and Nasdaq during the period of 1980-2007, and included in the SEC 13(f) reports. These stocks are held and traded by financial institutions in different degrees. We perform cross-sectional and time-series tests and they both confirm that the positive pricing of idiosyncratic risk is more pronounced when the influence of institutions on stock prices is less significant. We test the cross-sectional relations between institutional ownership, idiosyncratic volatility, and expected returns using a portfolio sorting method and through Fama-MacBeth regressions. We find that stocks with high expected idiosyncratic volatility earn significantly higher average returns. More importantly, this relation is stronger for stocks dominated by individual investors. For the stocks dominated by institutional investors, we do not find robust evidence that higher idiosyncratic volatilities are associated with higher returns. Institutional investors are known to have an increasing importance in the US equity market. Our time-series tests suggest that the average return premium for idiosyncratic volatility decreases over time. The evidence is consistent with the hypothesis that investor diversification plays an important role for the pricing of idiosyncratic risk. Our study contributes to the literature by first documenting an empirical link between investor diversification and the pricing of idiosyncratic risk.

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Table 1
Characteristics of portfolios sorted by institutional ownership and idiosyncratic risk

This table shows the times series medians of the cross-sectional median stock characteristics for 15 portfolios sorted on institutional ownership and idiosyncratic volatility. The sample includes stocks traded in the NYSE, AMEX, and Nasdaq during 1980-2007. In each month, we first sort stocks into thirds based on institutional ownership as of the end of the last quarter and then divide each third into quintiles based on monthly idiosyncratic volatility. Institutional ownership (IO) is the proportion of outstanding shares held by financial institutions. Idiosyncratic volatility (IVOL) is the standard deviation of regression residuals from the Fama-French three-factor model, adjusted to the monthly magnitude. The fraction of institutional trading (FIT) is the proportion of total trading involving institutions. The estimation of FIT follows Shu (2009). E(IVOL) is the one-month ahead expected idiosyncratic volatility estimated by EGARCH models. The estimation of E(IVOL) follows Fu (2009). Size is measured as the market capitalization in millions of US dollars as of the last June. BE/ME is the ratio of book-value of equity at last fiscal year-end divided by the market capitalization of last June. The median number of stocks in each portfolio is 244. We obtain institutional ownership data from Thomson Financial's 13(f) reports, return data from CRSP, and financial data from the CRSP/COMPUSTAT merged database.

	IO (%)					IVOL (%)				
Institutional	Idiosyncratic volatility quintile					Idiosyncratic volatility quintile				
ownership	low	2	3	4	high	low	2	3	4	high
Low	6.23	6.69	6.36	5.75	4.29	5.01	8.79	12.96	18.92	31.71
Middle	28.36	28.21	27.50	26.61	24.72	4.13	6.64	9.44	13.21	21.04
High	58.60	60.18	59.50	57.69	54.27	4.02	5.66	7.32	9.54	14.09
	FIT (%)					E(IVOL) (%)				
Institutional	Idiosyncratic volatility quintile					Idiosyncratic volatility quintile				
ownership	low	2	3	4	high	low	2	3	4	high
Low	16.87	12.39	9.17	7.61	5.55	6.89	9.52	12.71	15.30	19.16
Middle	48.69	45.86	36.60	29.35	23.63	5.85	7.88	9.89	12.02	14.97
High	72.92	72.80	66.98	54.49	43.88	6.14	7.11	8.22	9.78	12.15
	Size (in USD millions)					BE/ME				
Institutional	Idiosyncratic volatility quintile					Idiosyncratic volatility quintile				
ownership	low	2	3	4	high	low	2	3	4	high
Low	8.20	5.36	3.64	2.55	1.31	0.94	0.83	0.70	0.68	0.71
Middle	37.55	19.54	12.29	8.66	4.47	0.82	0.74	0.70	0.67	0.69
High	156.37	112.69	70.20	42.47	24.03	0.61	0.58	0.59	0.53	0.52

Table 2
Average returns of portfolios sorted by institutional ownership and idiosyncratic volatility

This table shows the times series mean portfolio returns for 15 portfolios sorted on institutional ownership and idiosyncratic volatility. The sample includes stocks traded in the NYSE, AMEX, and Nasdaq during 1980-2007. In each month, we first sort stocks into thirds based on institutional ownership as of the end of the last quarter and then divide each third into quintiles based on monthly idiosyncratic volatility. The definition of variables is presented in Table 1. Return spread is the difference in portfolio returns between the highest and lowest idiosyncratic volatility quintiles. FF-3 factor alpha is the intercept estimated from the time-series regression of monthly return spreads on the Fama-French three factors. Panel A shows the results based on equal-weighted returns and Panel B shows the results based on value-weighted returns.

Panel A: Equal-weighted portfolio return

Institutional Ownership	Idiosyncratic volatility quintile low	2	3	4	high	Return Spread	t-value (spread)	FF-3 factor alpha	t-value (alpha)
Low	0.30	0.13	0.12	0.86	5.67	5.37	7.22	4.04	7.33
Middle	0.61	0.74	0.90	1.46	3.26	2.65	4.77	1.41	4.28
High	0.85	1.18	1.39	1.68	1.74	0.89	2.10	-0.07	-0.24

Panel B: Value-weighted portfolio returns

Institutional Ownership	Idiosyncratic volatility quintile low	2	3	4	high	Return Spread	t-value (spread)	FF-3 factor alpha	t-value (alpha)
Low	0.85	0.92	1.13	1.33	4.71	3.85	4.31	2.68	4.41
Middle	0.87	1.30	1.31	1.30	2.61	1.74	2.40	0.52	1.08
High	1.08	1.40	1.45	1.45	0.52	-0.56	-1.05	-1.33	-1.83

Table 3
Average returns of portfolios sorted by institutional ownership and expected idiosyncratic volatility

This table shows the times series mean portfolio returns for 15 portfolios sorted on institutional ownership and expected idiosyncratic volatility. The sample includes stocks traded in the NYSE, AMEX, and Nasdaq during 1980-2007. In each month, we first sort stocks into thirds based on institutional ownership as of the end of the last quarter and then divide each third into quintiles based on monthly expected idiosyncratic volatility. The definition of variables is presented in Table 1. Return spread is the difference in portfolio returns between the highest and lowest expected idiosyncratic volatility quintiles. FF-3 factor alpha is the intercept estimated from the time-series regression of monthly return spreads on the Fama-French three factors. Panel A shows the results based on equal-weighted returns and Panel B shows the results based on value-weighted returns.

Panel A: Equal-weighted portfolio returns

Institutional			*E(IVOL)* quintile			Return	t-value	FF-3 factor	t-value
Ownership	low	2	3	4	high	Spread	(spread)	alpha	(alpha)
Low	0.70	0.50	0.33	0.86	4.69	3.99	5.87	2.99	5.54
Middle	1.06	1.00	1.07	1.08	2.76	1.70	3.54	0.72	2.37
High	1.21	1.31	1.32	1.34	1.67	0.46	1.36	-0.34	-1.70

Panel B: Value-weighted portfolio returns

Institutional			*E(IVOL)* quintile			Return	t-value	FF-3 factor	t-value
Ownership	low	2	3	4	high	Spread	(spread)	alpha	(alpha)
Low	1.02	0.81	0.80	1.00	2.78	1.77	2.45	0.88	2.10
Middle	1.02	1.11	1.33	0.63	2.04	1.03	1.99	0.10	0.28
High	1.19	1.22	1.31	1.25	1.25	0.06	0.16	-0.54	-1.25

Table 4
Descriptive statistics for the pooled sample: April 1980 to December 2007

Panel A of this table reports the pooled descriptive statistics of stocks owned and traded by financial institutions as reported to the SEC in form 13F from the first quarter of 1980 to the fourth quarter of 2007. Panel B presents the time series means of the cross-sectional Pearson correlations among these variables. Return(%) is the monthly raw dividend and split-adjusted return in percentage terms. Ln(ME) and Ln(BE/ME) are the natural logarithms of market value of equity and book-to-market ratio estimated as in Fama and French (1992.) Market value of equity is the product of monthly closing price and the number of shares outstanding as of the last June. Book-to-market ratio is the fiscal year-end book value of equity divided by the calendar year-end market value of equity. (IVOL) is (realized) idiosyncratic volatility. To estimate IVOL in every month, we regress the excess daily returns of each stock on the Fama-French three factors. The monthly idiosyncratic volatility of the stock is the standard deviation of the regression residuals times the square root of the number of observations in the month. E(IVOL) is the one-month-ahead expected idiosyncratic volatility estimated by EGARCH models following the model specifications in Fu(2009.) Return(-2,-7) is the compounded gross return for months t-7 to t-2. TURN is the average stock turnover and CVTURN is the coefficient of variation of turnovers in the past 36 months. To control for the potential effect of extreme values and coding errors on coefficient estimates we replace the smallest and largest 0.5% of the ME, BE/ME, IVOL, E(IVOL), Return(-2, -7), TURN, and CVTURN with their next smallest or largest values. We delete observations with monthly returns greater than 300%. We test the hypothesis Prob > |t| under H0: ρ=0 on the average correlation coefficients. t-statistics for these tests are reported in parentheses underneath each coefficient.

Panel A: Descriptive statistics for the pooled sample

Variable	N	Mean	σ	Q_1	Median	Q_3	Skewness
Return (%)	862,625	1.40	16.19	-5.91	0.29	7.12	2.43
IVOL (%)	862,625	13.00	11.11	6.09	9.63	15.84	2.83
E(IVOL) (%)	862,625	12.53	9.46	6.83	9.99	15.04	3.34
IO (%)	862,625	32.73	26.74	8.84	26.77	52.87	0.59
FIT (%)	800,645	50.30	73.54	14.33	36.89	64.61	10.72
Ln(ME)	862,625	5.05	2.06	3.53	4.88	6.43	0.32
Ln(BE/ME)	862,625	-0.43	1.05	-0.97	-0.40	0.10	0.75
Return(-2, -7)	861,463	1.08	0.40	0.88	1.05	1.23	2.92
Ln(TURN)	862,625	1.68	1.03	1.01	1.69	2.36	-0.23
Ln(CVTURN)	862,624	4.14	0.47	3.83	4.13	4.43	0.15

Panel B: Cross-sectional simple correlations

	IVOL	E(IVOL)	IO	FIT	Ln(ME)	Ln(BE/ME)	Return(-2, -7)	Ln(TURN)	Ln(CVTURN)
Return	0.09	0.06	0.00	0.01	-0.00	0.03	0.03	-0.02	-0.003
	(6.91)	(6.23)	(0.64)	(2.32)	(-0.51)	(5.23)	(4.07)	(-2.71)	(-0.69)
IVOL		0.52	-0.31	-0.23	-0.45	-0.05	-0.15	0.11	0.29
		(166.08)	(-86.60)	(-64.51)	(-92.65)	(-8.55)	(-13.26)	(16.01)	(49.67)
E(IVOL)			-0.25	-0.21	-0.38	-0.13	-0.07	0.18	0.27
			(-56.38)	(-64.55)	(-83.41)	(-27.39)	(-6.30)	(27.88)	(64.21)
IO				0.37	0.65	-0.17	0.04	0.31	-0.46
				(48.58)	(400.09)	(-23.51)	(7.46)	(44.87)	(-88.11)
FIT					0.29	-0.02	-0.01	-0.25	-0.14
					(42.93)	(-6.80)	(-1.86)	(-51.50)	(-37.52)
Ln(ME)						-0.22	0.04	0.17	-0.59
						(-30.85)	(5.26)	(28.04)	(-83.98)
Ln(BE/ME)							0.06	-0.15	0.14
							(9.29)	(-27.32)	(31.99)
Return(-2, -7)								-0.01	0.04
								(-1.04)	(5.59)
Ln(TURN)									-0.12
									(-21.80)

Table 5
Influence of institutional ownership on the relation between idiosyncratic volatility and expected returns

This table presents the time-series averages of cross-sectional regression coefficients using the standard Fama and MacBeth (1973) methodology. The t-statistic is the average slope divided by its time-series standard error. The sample consists of all stocks owned and traded by financial institutions as reported to the SEC in form 13F from the first quarter of 1980 to the fourth quarter of 2007, descriptive statistics for the pooled sample are shown in Table 4. The dependent variable, Return(%),is the monthly raw dividend and split-adjusted return in percentage terms. Ln(ME) and Ln(BE/ME) are the natural logarithms of market value of equity and book-to-market ratio. ($IVOL_t$) is (realized) idiosyncratic volatility. E($IVOL_t$) is the one-month-ahead expected idiosyncratic volatility estimated by EGARCH models as in Fu(2009.) Return(-2,-7) is the compounded gross return for months t-7 to t-2. TURN is the average stock turnover and CVTURN is the coefficient of variation of turnovers in the past 36 months. $IVOL_t * IO_{it}^{low}$ captures the effect of low institutional ownership on the relation between idiosyncratic volatility and expected returns; where IO_{it}^{low} is an indicator that takes the value of one if the institutional ownership of stock i at the quarter-end before month t is in the lowest tercile and zero otherwise. $IVOL_t * IO_{it}^{high}$ captures the effect of high institutional ownership on the relation between idiosyncratic volatility and expected returns; where IO_{it}^{high} is an indicator that takes the value of one if the institutional ownership of stock i at the quarter-end before month t is in the highest tercile and zero otherwise. We delete observations with monthly returns greater than 300%. To control for the potential effect of extreme values and coding errors on coefficient estimates we replace the smallest and largest 0.5% of the ME, BE/ME, IVOL, E(IVOL), Return(-2, -7), TURN, and CVTURN with their next smallest or largest values. This substitution has no effect on inference. The last column reports the average R-squares of the cross-sectional regressions.

Panel A: Fama MacBeth regressions where idiosyncratic risk proxy is *IVOL*

Model	N	Ln(ME)	Ln(BE/ME)	Ret(-2,-7)	Ln(Turn)	Ln(CVTurn)	$IVOL_t$	$IVOL_t * IO_{it}^{low}$	$IVOL_t * IO_{it}^{high}$	$\overline{R^2}$
1	233						0.13	0.10		0.05
							(5.06)	(8.59)		
2	233						0.19		-0.12	0.05
							(8.38)		(-6.66)	
3	233	0.31	0.56				0.16	0.09		0.06
		(7.60)	(8.58)				(6.53)	(7.12)		
4	233	0.37	0.54				0.23		-0.11	0.06
		(9.04)	(8.37)				(9.72)		(-5.77)	
5	233	0.28	0.48	1.82	-0.56	-0.50	0.20	0.08		0.08
		(7.24)	(8.57)	(7.73)	(-6.13)	(-5.58)	(8.56)	(6.60)		
6	233	0.33	0.47	1.83	-0.52	-0.52	0.26		-0.10	0.08
		(8.48)	(8.38)	(7.88)	(-5.51)	(-5.99)	(11.43)		(-5.55)	

Panel B: Fama MacBeth regressions where idiosyncratic risk proxy is *E(IVOL)*

Model	N	Ln(ME)	Ln(BE/ME)	Ret(-2,-7)	Ln(Turn)	Ln(CVTurn)	E(IVOL$_t$)	E(IVOL$_t$) * IO_{it}^{low}	E(IVOL$_t$) * IO_{it}^{high}	$\overline{R^2}$
1	233						0.08	0.09		0.03
							(4.27)	(7.73)		
2	233						0.14		-0.09	0.03
							(7.22)		(-5.84)	
3	233	0.17	0.55				0.11	0.08		0.04
		(3.73)	(8.26)				(6.09)	(7.10)		
4	233	0.20	0.54				0.164		-0.08	0.04
		(4.65)	(8.15)				(9.06)		(-5.05)	
5	233	0.12	0.49	1.22	-0.53	-0.55	0.14	0.07		0.06
		(2.70)	(8.48)	(5.13)	(-5.62)	(-5.98)	(9.62)	(6.54)		
6	233	0.15	0.48	1.23	-0.52	-0.55	0.19		-0.07	0.06
		(3.49)	(8.37)	(5.20)	(-5.34)	(-6.24)	(11.72)		(-4.63)	

Table 6
Influence of institutional trading on the relation between idiosyncratic volatility and expected returns

This table presents the time-series averages of cross-sectional regression coefficients using the standard Fama and MacBeth (1973) methodology. The t-statistic is the average slope divided by its time-series standard error. The sample consists of all stocks owned and traded by financial institutions as reported to the SEC in form 13F from the first quarter of 1980 to the fourth quarter of 2007, descriptive statistics for the pooled sample are shown in Table 4. The dependent variable, Return(%),is the monthly raw dividend and split-adjusted return in percentage terms. Ln(ME) and Ln(BE/ME) are the natural logarithms of market value of equity and book-to-market ratio. ($IVOL_t$) is (realized) idiosyncratic volatility. E($IVOL_t$) is the one-month-ahead expected idiosyncratic volatility estimated by EGARCH models as in Fu(2009.) Return(-2,-7) is the compounded gross return for months t-7 to t-2. TURN is the average stock turnover and CVTURN is the coefficient of variation of turnovers in the past 36 months. $IVOL_t * FIT_{it}^{low}$ captures the effect of low institutional trading on the relation between idiosyncratic volatility and expected returns; where FIT_{it}^{low} is an indicator that takes the value of one if the institutional trading of stock i at the quarter-end before month t is in the lowest tercile and zero otherwise. $IVOL_t * FIT_{it}^{high}$ captures the effect of high institutional trading on the relation between idiosyncratic volatility and expected returns; where FIT_{it}^{high} is an indicator that takes the value of one if the institutional trading of stock i at the quarter-end before month t is in the highest tercile and zero otherwise. We delete observations with monthly returns greater than 300%. To control for the potential effect of extreme values and coding errors on coefficient estimates we replace the smallest and largest 0.5% of the ME, BE/ME, IVOL, E(IVOL), Return(-2, -7), TURN, and CVTURN with their next smallest or largest values. This substitution has no effect on inference. The last column reports the average R-squares of the cross-sectional regressions.

Panel A: Fama MacBeth regressions where idiosyncratic risk proxy is *IVOL*

Model	N	Ln(ME)	Ln(BE/ME)	Ret(-2,-7)	Ln(Turn)	Ln(CVTurn)	$IVOL_t$	$IVOL_t * FIT_{it}^{low}$	$IVOL_t * FIT_{it}^{high}$	$\overline{R^2}$
1	226						0.15	0.06		0.05
							(6.35)	(5.03)		
2	226						0.18		-0.02	0.05
							(7.36)		(-1.02)	
3	226	0.28	0.53				0.18	0.05		0.06
		(6.36)	(7.90)				(7.61)	(3.99)		
4	226	0.34	0.52				0.21		-0.01	0.06
		(7.87)	(7.92)				(8.67)		(-0.51)	
5	226	0.26	0.46	1.84	-0.42	-0.56	0.22	0.04		0.08
		(6.57)	(7.90)	(7.43)	(-4.55)	(-6.28)	(9.63)	(3.36)		
6	226	0.32	0.44	1.81	-0.45	-0.60	0.24		-0.01	0.08
		(8.27)	(7.80)	(7.35)	(-4.83)	(-6.54)	(10.32)		(-0.56)	

Panel B: Fama MacBeth regressions where idiosyncratic risk proxy is *E(IVOL)*

Model	N	Ln(ME)	Ln(BE/ME)	Ret(-2,-7)	Ln(Turn)	Ln(CVTurn)	E($IVOL_t$)	E($IVOL_t$) * FIT_{it}^{low}	E($IVOL_t$) * FIT_{it}^{high}	$\overline{R^2}$
1	226						0.10	0.05		0.03
							(5.53)	(4.37)		
2	226						0.13		-0.02	0.03
							(6.33)		(-1.27)	
3	226	0.13	0.53				0.12	0.05		0.04
		(2.79)	(7.74)				(7.18)	(4.08)		
4	226	0.18	0.51				0.15		-0.02	0.04
		(3.98)	(7.83)				(8.02)		(-1.07)	
5	226	0.10	0.47	1.26	-0.44	-0.60	0.15	0.04		0.06
		(2.21)	(7.86)	(5.03)	(-4.59)	(-6.60)	(10.98)	(3.16)		
6	226	0.15	0.46	1.24	-0.46	-0.62	0.18		-0.01	0.06
		(3.51)	(7.87)	(4.96)	(-4.88)	(-6.73)	(10.39)		(-0.80)	

Table 7
Time- series results on institutional ownership and the idiosyncratic risk premium

This table presents time series tests performed on institutional ownership and the idiosyncratic risk premium. We estimate the idiosyncratic risk premium on each month t by fitting cross-sectional regressions of the form:

$$R_{it} = b_{0t} + b_{1t} Ln(ME_{it}) + b_{2t} Ln(BE/ME)_{it} + b_{3t} \mathrm{Ret}_{it}(-2,-7) + b_{4t} Ln(Turn_{it}) + b_{5t} Ln(CVTurn_{it}) + b_{6t} IVOL_{it}$$

IRP_q is the median of the coefficient estimates b_{6t} in quarter q. Average (Median) IO_{q-1} is the average(median) fraction of institutional ownership for all stocks that have been included in the 13F reports between the first quarter of 1980 and the third quarter of 2007 in quarter q-1. If a stock does not appear in the 13F reports in a particular month, it is assumed that institutional ownership is zero. N is number of quarters in the series. Panel A presents simple statistics for the quarterly series. Panel B presents linear trend coefficients for the series. We obtain these coefficients by regressing the variables of interest against a time dummy. The reported coefficients are magnified 10,000 times (i.e. $x10^4$). The values in parentheses are t-test statistics for the existence of a linear trend in the series. Panel C presents Pearson correlations coefficients of IRP_q with Average IO_{q-1} and IRP_q with Median IO_{q-1}. The values in parentheses are p-values for the correlation coefficient being statistically different from zero.

Panel A: Simple summary statistics of the times series

Variable	N	Mean	std	P25	Median	P75	skewness
IRP_q	111	0.25	0.29	0.05	0.20	0.44	0.84
Average IO_{q-1}	111	24.69	9.48	18.75	24.09	28.95	0.61
Median IO_{q-1}	111	29.50	7.98	23.68	29.33	34.00	0.40

Panel B: Linear trend coefficients

	All firms		NYSE/AMEX firms		NASDAQ firms	
	1980-2007	1980-1998	1980-2007	1980-1998	1980-2007	1980-1998
IRP_q	-0.10	-0.62	-0.32	-0.62	0.047	-0.43
	(-1.08)	(-4.30)	(-3.14)	(-3.54)	(0.46)	(-2.65)
Average IO_{q-1}	26.60	23.60	31.70	37.10	31.60	26.70
	(52.65)	(42.84)	(59.77)	(56.44)	(51.67)	(55.97)
Median IO_{q-1}	31.00	26.10	45.50	46.40	32.00	27.50
	(36.88)	(39.09)	(78.83)	(52.61)	(35.97)	(65.61)

Panel C: Pearson correlation coefficients

	All firms		NYSE/AMEX firms		NASDAQ firms	
	Correlation of *Median IRP_q* with					
	1980-2007	1980-1998	1980-2007	1980-1998	1980-2007	1980-1998
Average IO_{q-1}	-0.06	-0.41	-0.30	-0.40	0.08	-0.29
	(0.54)	(<0.001)	(0.001)	(<0.001)	(0.43)	(0.013)
Median IO_{q-1}	-0.05	-0.43	-0.28	-0.39	0.08	-0.28
	(0.58)	(<0.001)	(0.002)	(<0.001)	(0.42)	(0.017)

Figure 1
Institutional ownership and the idiosyncratic risk premium during 1980-2007

Figure 1.A: All firms

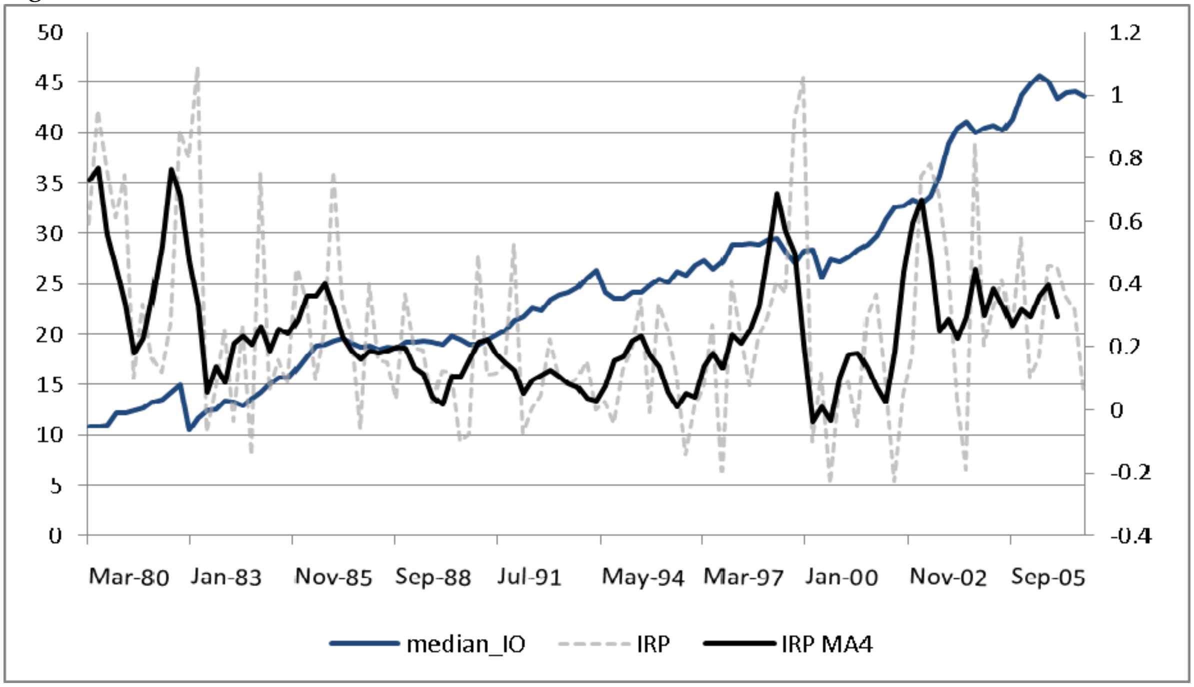

Figure 1.B: NYSE/AMEX firms only

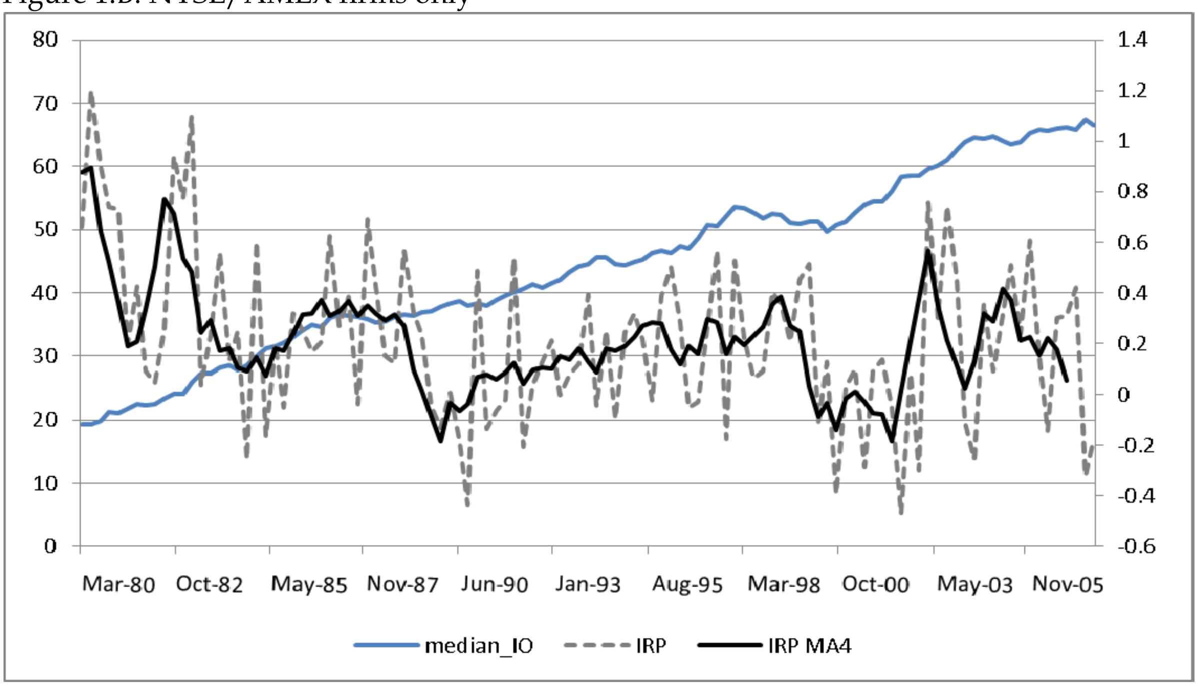

Figure 1.C: Nasdaq firms only