Why Do High Dispersion Stocks Earn Low Returns?
Evidence from Institutional Ownership

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Abstract

One of the most intriguing anomalies in the cross-section of stock returns is the dispersion effect, which documents a negative relation between stock returns and the dispersion of analysts' earnings forecasts. The literature has put forth difference-in-opinion in conjunction with short-sale constraint and analysts' self-censoring as plausible explanations. This paper offers a joint test to disentangle the two competing explanations. To address the endogeneity problem of using institutional ownership as a proxy for short-sale constraints, we exploit the exogenous variations in institutional ownership arising from the annual reconstitution of the Russell 1000 and 2000 indices. Focusing on a sample of firms at the bottom of the Russell 1000 index and those at the top of the Russell 2000 index, we find that the dispersion effect is significant only for the latter firms that exhibit high institutional ownership. We further find that the positive relation between the consensus forecast upward bias and the dispersion of analysts' earnings forecasts is stronger for firms with high institutional ownership. These findings are exactly opposite to those based on a general sample that does not take the endogeneity nature of institutional ownership into account. Our results as such suggest that analysts' self-censoring dominates short-sale constraints as the key determinant of the dispersion effect.

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1. Introduction

The dispersion effect refers to the intriguing anomaly in the cross-section of stock returns first documented by Diether, Malloy and Scherbina (henceforth DMS) (2002). Specifically, DMS (2002) find that stocks with higher dispersion in analysts' earnings forecasts earn lower future returns. The dispersion effect is anomalous because investors appear to be paying a premium, rather than asking for a discount, for bearing larger risk should the dispersion in analysts' earnings forecasts be interpreted as a proxy for risk.

DMS (2002) propose two plausible explanations to account for the dispersion effect: (i) the "difference-in-opinion" explanation, and (ii) the "self-censoring" explanation. The first explanation postulates that forecast dispersion is a proxy for different opinions among investors.

Due to short-sale constraints, pessimistic investors are prohibited from trading, making stock prices reflect only the optimistic views (Miller, 1977). This induces a greater upward bias in the prices of stocks with higher forecast dispersion, thereby resulting in lower future returns on these stocks. The second explanation postulates that the incentive structure of analysts induces them to self-censor unfavorable earnings forecasts to please managers (McNichols and O'Brien, 1997; Scherbina, 2005, 2008). DMS (2002) show that when analysts' earnings forecasts are more disperse, more pessimistic forecasts are self-censored, rendering a greater upward bias in the consensus earnings forecasts of higher dispersion stocks. If investors do not take this upward bias into account when making their investment decisions, they tend to overvalue stocks with higher forecast dispersion, which, in turn, leads to lower future returns on these stocks.

The literature thus far has put the most emphasis on the difference-in-opinion explanation for two reasons. First, the seminal work of DMS (2002) focuses on this story even though the evidence in their paper also lends support to the self-censoring explanation. Second, it is difficult to obtain data that contain analysts' incentives, while it is relatively easy to obtain proxies for short-sale constraints. However, the empirical tests for the difference-in-opinion explanation have produced mixed results. For example, Nagel (2005) uses institutional ownership as a proxy for short-sale constraints. He finds that the dispersion effect is more pronounced in a subsample of stocks with low institutional ownership, which is consistent with the difference-in-opinion story. Boehme et al. (2006) also find that stocks that are subject to high short-sale constraints and high forecast dispersion are more likely to be overvalued. On the other hand, Avramov et al. (2009) show that proxies for short-sale costs do not capture the dispersion effect. Scherbina (2008) and Hwang and Li (2016) are the two extant studies that focus on testing the self-censoring explanation. Scherbina (2008) estimates the extent of self-censoring based on the proportion of analysts who stop revising their annual earnings forecasts. She finds that this measure predicts negative earnings surprises and lower future returns. Using international data, Hwang and Li (2016) find that the dispersion effect is stronger among countries where the demand for analysts' services is greater, which supports the self-censoring explanation.

This paper aims to disentangle the difference-in-opinion explanation from the self-censoring explanation using institutional ownership[1] in the U.S. market. The idea is based on two salient characteristics of institutional ownership. First, institutional ownership is commonly used as a proxy for short-sale constraints in the literature (Asquith et al., 2005; Nagel, 2005). Stocks with high institutional ownership are less subject to short-sale constraints as institutional investors are important suppliers of shares for short selling. Stocks with *higher* institutional ownership should exhibit *weaker* dispersion effect if the underlying reason for the dispersion effect is the difference-in-opinion story. Second, institutional ownership is used as a proxy for demand for analysts' services (Frankel et al., 2006), which will affect the incentives of analysts to self-censor. Following Scherbina (2005), Hwang and Li (2016) model a situation in which the incentive structure of analysts induces them to either adjust their forecasts upward at a cost of losing reputation, or choose to issue no forecasts (i.e., self-censor) when receiving unfavorable signals about a firm's upcoming earnings. Hwang and Li (2016) show that with greater demand for analysts' services, analysts find the cost of reputational loss from adding an optimistic bias to be higher, thereby rendering self-censoring unfavorable forecasts more likely to be used. They further show that self-censoring induces a higher positive bias to the consensus forecast than adding an optimistic bias

[1] Other explanations for the dispersion effect include the parameter-risk explanation. Johnson (2004) argues that forecast dispersion is a proxy for idiosyncratic parameter risk. Because equity is a call option on a firm's assets, in the presence of leverage, expected equity returns decrease with dispersion. Avramov et al. (2009) find that leverage is irrelevant to the dispersion effect, and argue that the dispersion effect is a manifestation of the negative relationship between default risk and returns.

does. As such, the main prediction of Hwang and Li (2016) is that stocks with greater demand for analysts' services would have stronger dispersion effect. As the demand of analysts' services increases with an increase in institutional ownership (Frankel et al., 2006), *higher* institutional ownership should exhibit *stronger* dispersion effect if analysts' self-censoring is the driving force for the dispersion effect.

Based on these two features of institutional ownership, we start with a general sample that covers NYSE, AMEX, and Nasdaq stocks. We first form portfolios based on independent double sorting on the dispersion in analysts' earnings forecasts and institutional ownership. We find stocks with high dispersion earn substantially lower returns compared with those with low dispersion, confirming the dispersion effect. We further show that the spread in returns between high and low dispersion portfolios is a decreasing function of institutional ownership. Moreover, dispersion negatively predicts subsequent stock returns in the Fama-Macbeth style regressions only when institutional ownership is low. It loses statistical significance in a subsample of stocks with high institutional ownership. Thus, dispersion effect is stronger among stocks with lower institutional ownership in the general sample, which is in line with the findings of Nagel (2005).

These results seem to support the most popular difference-in-opinion explanation in the literature as low institutional ownership is associated with more binding short-sale constraints. Institutional ownership, however, are endogenous in nature. For example, if institutional investors are more informed, then stocks with low future returns (bad news) would attract fewer institutional investors, thereby resulting in low institutional ownership. This effect would be more significant in stocks with greater information asymmetry or uncertainty. Given that dispersion is a proxy for information asymmetry or uncertainty (Verrecchia, 1995; Barron et al. 1998), one would expect a much lower return for high dispersion (i.e., a greater dispersion effect) stocks that have low institutional ownership stocks. Therefore, any results that we obtained from comparing the dispersion effect between stocks with high and low institutional ownership may simply arise from comparing stocks with good and bad news and the information advantage of institutional investors towards stocks with high information asymmetry, which have nothing to do with the two explanations that we try to disentangle.

To address the endogenous nature of institutional ownership, we utilize the annual Russell 1000/2000 index reconstitution to obtain exogenous variations in institutional ownership. The Russell 1000 and 2000 indices are two value-weighted indices of the first 1000 and the next 2000 largest U.S. listed stocks by market capitalization, respectively. Each June, Russell Investment will reconstitute the index based on the market capitalization of stocks. Firms cannot precisely manipulate their index assignment (Boone and While, 2015), making index assignment into either the Russell 1000 index or the Russell 2000 index locally random for stocks with market capitalization rankings around 1000. Due to the value-weighted nature, this random index assignment generates exogenous variations in institutional ownership for stocks with market capitalization rankings around 1000. Stocks that are assigned to the bottom of the Russell 1000 index receive much lower index weights than stocks that are assigned to the top of the Russell 2000 index. Many passive institutional investors directly track the Russell 1000 and 2000 indices, making them hold more stocks with higher index weights. Moreover, under the index performance benchmarking, active institutional investors overweight stocks with high index weights to reduce tracking errors. These give rise to exogenous variations in institutional ownership[2].

[2] These exogenous variations in institutional ownership are plausibly orthogonal to the information advantage of institutional investors as they are driven by index weights. Moreover, institutional ownership is highly correlated with market capitalization of stocks. The use of stocks around the 1000th ranking in market capitalization also ameliorates the potential impact of firm size.

We utilize these exogenous variations in institutional ownership by comparing the dispersion effect of stocks at the bottom of the Russell 1000 index that have low institutional ownership with that of stocks at the top of the Russell 2000 index that have high institutional ownership. We use 100 stocks on each side of the 1000th ranking[3]. We first establish the fact that, as in the general sample, the properties that stocks with higher institutional ownership have less binding short-sale constraints and have more analyst coverage remain valid in this subsample. We then perform the same portfolio and regression analysis that we have done with the general sample to this subsample of stocks. We find strikingly different results compared with those based on the general sample. In the portfolio strategy, we find significant dispersion effect for stocks with higher institutional ownership, but no dispersion effect for stocks with lower institutional ownership. Similarly, in the Fama-Macbeth style regressions, dispersion negatively predicts returns only when institutional ownership is high. These results suggest that after addressing the inference problem caused by the endogenous nature of institutional ownership, the dispersion effect is actually stronger for stocks with *higher* institutional ownership. These are in support of the analyst self-censoring story over the difference-in-opinion explanation for the dispersion effect.

We then follow Hwang and Li (2016) to test the relationship between dispersion and the bias in analysts' earnings forecasts. As shown in Hwang and Li (2016), a unique prediction of the self-censoring explanation is the positive dispersion-bias relationship. Self-censoring of analysts would induce a greater upward bias in stocks with higher analysts' forecasts dispersion than issuing a positively biased forecast does. Because the incentive of self-censoring is greater for stocks with greater institutional ownership, we expect the positive relation between upward bias in analysts'

[3] Stocks that are further away from the 1000th ranking differ substantially in market capitalization and thus their differences in institutional ownership may not be the results of index assignment. Furthermore, random index assignment is only valid for stocks around the 1000th ranking.

consensus forecasts and dispersion would be stronger in stocks with *higher* institutional ownership. Again, because of the information advantage of institutional investors, they are less likely to hold stocks with unfavorable prospects. This combined with the incentive of analysts to self-censor *only* unfavorable forecasts lead us to predict the dispersion-bias relationship to be stronger among stocks with *low* institutional ownership in the general sample wherein self-censoring is more likely to happen. This is indeed what we find in the general sample. The spread in forecasts bias between high and low dispersion stocks with low institutional ownership is 1.43% while that for stocks with high institutional ownership is *lower* at 1.04%. When we take care of the endogeneity problem of institutional ownership, we find the opposite. In the Russell sample, the spread in forecasts bias between high and low dispersion stocks with low institutional ownership is 0.82% while that for stocks with high institutional ownership is *higher* at 1.08%. The difference in the spread is statistically significant at 1% level for both samples. In regressions where size, book-to-market and momentum are controlled, we find dispersion positively predicts forecasts bias. The predictive power of dispersion is stronger among stocks with *higher* institutional ownership in the Russell sample but is stronger among stocks with *lower* institutional ownership in the general sample. Thus, when the endogenous nature of institutional ownership is taken care of, these results are in support of the analyst self-censoring story.

We contribute to three strands of the literature. First, we show that analyst self-censoring rather than the popular difference-in-opinion story is the more plausible explanation behind the dispersion effect. Also consistent with the self-censoring explanation, Hwang and Li (2016) find that the dispersion effect is indeed stronger in countries with more transparent information environments, more developed stock markets, greater capital openness, stronger investor protection, and more attention to earnings information, all of which are proxies for greater demand for analysts' services. Ours provide a mutually exclusive test of the two explanations and focuses on the U.S. market. Sadka and Scherbina (2007) show that high trading costs explain why stocks with high analyst disagreement are persistently overpriced, and that the dispersion effect is more prominent among illiquid stocks. They, however, do not address the driver of the dispersion effect. Avramov et al. (2009) find that the dispersion effect is especially strong among stocks with low credit ratings[4]. They argue the low return of high dispersion stocks is because investors pay a premium to hold financially distressed (low credit rating) stocks. Their results are robust to short-sale constraint and leverage argument for the dispersion effect but they did not consider the self-censoring incentive of analysts.

Second, we contribute to the literature that uses index reconstitution to study the impact of institutional investors. Ours highlights the importance to take care of the endogenous nature of institutional ownership even in the study of asset pricing. It has been a common practice to use institutional ownership as a proxy of short-sale constraints in explaining anomalies. Using the dispersion effect as an example, we show that failing to take the endogeneity of institutional ownership into account can result in misleading conclusions. Chang et al. (2015) employ the Russell index data to study the impact of stock market indexing on prices. Boone and White (2015) use the Russell index reconstitution as an exogenous shock to institutional ownership to identify the impact of institutional investors on firm transparency. Appel et al. (2016) document passive institutional investors improve corporate governance using the Russell index data. We are among the first to use the annual Russell 1000/2000 index reconstitution to conduct return anomaly studies.

[4] Only 35% of stocks in the Russell sample are rated. For those with credit rating, the average of credit rating of stocks at the bottom of the Russell 1000 index and at the top of the Russell 2000 index are quite similar, with mean of 9.97 and 10.07, respectively. The difference is neither statistically nor economically significant. The medians are both 10, which translates into a BBB- rating (lower number means higher rating).

Lastly, we contribute to literature on the incentives of analysts. McNichols and O'Brien (1997) finds analysts are reluctant to issue unfavorable investment decisions because of the fear of jeopardizing investment banking business. O'Brien, McNichols, and Lin (2005) documents that investment banking ties reduce the speed with which analysts convey unfavorable news. Ljungqvist et al. (2007) finds analysts' recommendation relative to consensus is positively associated with investment banking relationships but institutional investors can moderate the positive effect. Ours further show that the incentive structure of analysts is significant enough to distort information production in financial markets and bear negative consequences for stock market efficiency.

2. Data

We obtain analysts' forecasts data from the Institutional Brokers Estimate System (I/B/E/S). Dispersion (*DISP*) in analysts' earnings forecasts is calculated each month as the ratio of the standard deviation of analysts' current fiscal-year annual earnings-per-share forecasts to the absolute value of the mean forecast. We use the information reported in the I/B/E/S Summary History file following Diether et al. (2002). Analyst forecasts are adjusted historically for stock splits in the standard issue of I/B/E/S data, which renders these data unsuitable for the analysis of forecast dispersion. Forecasts bias (*BIAS*) is defined as the difference between analysts' consensus earnings-per-share forecast in the current month minus the corresponding actual earnings-per-share announced in the future, scaled by current month stock price.

We obtain quarterly institutional ownership data from Thomson Reuters, which keep track of the 13-F filings of professional money managers. Institutional investment manager with investment discretion over 100 million or more is required to file form 13-F with the SEC within

45 days at the end of a calendar quarter on the number of shares they hold of stocks. It includes investment advisers, banks, insurance companies, broker-dealers, pension funds etc. Institutional ownership is calculated as the ratio of the total shares held by institutional investor to total shares outstanding. We take the annual average as the institutional ownership measure we use in this paper. We do not use calendar year but treat July of year t to June of year t+1 as a whole year[5].

Monthly stocks return data for NYSE AMEX, and Nasdaq stocks is obtained from Center for Research in Securities Prices (CRSP) database and we trim 1% of the return on each tail to reduce the impact of data error on our results. Stock-level characteristics are obtained from the CRSP-COMPUSTAT merged database. $LOGMV_{i,t}$ is the natural log of market capitalization of stock *i* in month *t*. Market capitalization is calculated as the last trading day share price in the month times total shares outstanding. $LOGBM_{i,t}$ is the natural log of the book value of equity to the market value of equity (market capitalization). Book value is calculated as book value of stockholders' equity, plus balance sheet deferred taxes and investment tax credit (if available), minus the book value of preferred stock. Depending on availability, we use the redemption, liquidation, or par value (in that order) to estimate the book value of preferred stock. Stockholders' equity is the value reported by COMPUSTAT, if it is available. If not, we measure stockholders' equity as the book value of common equity plus the par value of preferred stock, or the book value of assets minus total liabilities (in that order). Previous fiscal year book value is paired with market capitalization in the current calendar year if portfolio is formed on or after June, otherwise the book value of the year before the previous fiscal year is used.

[5] The purpose of this is to match with the Russell index reconstitution, which we will talk in detail in Section 4. The primary reason being Russell reconstitutes their indexes on June each year.

We have two samples in this study. The general sample covers all NYSE, AMEX, and Nasdaq stocks with institutional ownership information from July 1984 to June 2007. The general sample is divided into five groups by institutional ownership. The second sample consists of 100 stocks in the bottom of the Russell 1000 index and another 100 stocks in the top of the Russell 2000 index each year. We obtain Russell 1000/2000 index constituents and index weight information from Russell Investment for 1984 to 2006. Stocks in the bottom of the Russell 1000 index have lower institutional ownership compared with those in the top of the Russell 2000 do. Lastly, we obtain the number of available shares from lenders from Markit to construct the proxy for short-sale constraint.

Table 1 lists the summary statistics for main variables in this study for both the general sample and the Russell sample, separated by institutional ownership. In the general sample, the mean of dispersion differs much more across the institutional ownership groups than that in the Russell sample. The same applies to forecasts bias, log market capitalization, and log of the book-to-market ratio. The differences in dispersion and bias are no longer significant in the Russell sample.

[Insert Table 1 Here]

3. The Dispersion Effect: The Role of Institutional Investors

3.1 Hypothesis Development

This paper aims to disentangle the difference-in-opinion explanation from the analyst self-censoring explanation using institutional ownership. The idea is based on two salient characteristics of institutional ownership. First, institutional ownership is commonly used as a proxy for short-sale constraint in the literature (Nagel, 2005; Asquith et al., 2005). Stocks with higher institutional ownership are less subject to short-sale constraints as institutional investors are important suppliers of shares to borrow for short selling. Since short-sale constraint is the driving force that explains the dispersion effect in the difference-in-opinion story, one would expect dispersion effect to be *weaker* among stocks with *higher* institutional ownership. Second, institutional ownership is also used as a proxy for the demand for analysts' services (Frankel et al., 2006). When analysts receive unfavorable signals about a firm's upcoming earnings, the incentive structure of analysts induces them to either adjust their forecasts upward at a cost of losing reputation or choose to issue no forecasts (i.e., self-censor) at another cost that has nothing to do with reputational loss. With greater demand for their services, analysts find the cost of reputational loss from adding an optimistic bias to be higher, thereby making self-censoring unfavorable forecasts more likely to be used (Hwang and Li, 2016). Thus, for stocks with *higher* institutional ownership, dispersion effect should be *stronger* under this scenario. Moreover, unlike the difference-in-opinion explanation, analyst self-censoring would generate upward biases in their earnings forecasts. There would be a unique positive prediction with respect to dispersion and forecasts bias (dispersion-bias relationship). As such, we establish the following two competing hypotheses.

Hypothesis 1 (Difference-In-Opinion): If the difference-in-opinion explanation is the driver of the dispersion effect, stocks with high (low) institutional ownership exhibit weaker (stronger) dispersion effect, and the dispersion-bias relationship does not exist.

Hypothesis 2 (Analyst Self-censoring): If the self-censoring explanation is the driver of the dispersion effect, stocks with high (low) institutional ownership exhibit stronger (weaker) dispersion effect, and the dispersion-bias relationship exists and is stronger (weaker) among high (low) institutional ownership stocks.

3.2 Institutional Ownership and the Dispersion Effect: the General Sample

We investigate whether institutional ownership plays a role in determining strength of dispersion effect using the general sample in this section.

3.2.1 Portfolio Strategy

At the end of each month, we sort stocks (with price over five dollars) in the general sample into five quintiles (D1 to D5) based on analysts' forecasts dispersion of this month. D1 contains stocks with the lowest dispersion while D5 consists of stocks with the highest dispersion in analysts' forecasts. The portfolios are rebalanced each month. At the same time, we sort stocks independently into five quintiles (I1 to I5) each month based on annual average institutional ownership[6]. I1 is the group of stocks with the lowest institutional ownership and I5 is the group of stocks with the highest institutional ownership. We end up with 25 (5X5) portfolios each month. We label our portfolios as I*D*. For example, I1D5 is a portfolio of stocks with the lowest institutional ownership (I1) and the highest dispersion in analysts' forecasts (D5). The dispersion effect is captured by a hedging portfolio that holds a long position in I*D1 and a short position in I*D5. Monthly portfolio return is calculated as the equal-weighted average of the returns of portfolio stocks.

Before presenting the results, we first verify that institutional ownership is indeed associated with less binding short-sale constraints and more analyst coverage. Short-sale constraint is defined as the supply of shares available for shorting times 1000 scaled by total number of shares outstanding for each stock in each month. A higher value means less binding in short-sale

[6] As mentioned in the data section, we treat July of year t to June to year t+1 as a whole year. Thus, for months prior to July of year t, we will use institutional ownership of July of year t-1 to June year t. We use the next year's institutional ownership for months on or after July.

constraints. Analyst coverage is the number of analysts who have issued fiscal year one earnings forecasts for the stock in each month. For each group formed by institutional ownership (I1 to I5), we calculate the monthly median level of short-sale constraints and analyst coverage and take the time-series average. Table 2 reports the time-series average. We see that short-sale constraints are most binding for stocks in I1 and the least binding for those in I5. The difference in short-sale constraints is statistically significant at 1% with a t-stat of 4.33. Analyst coverage is also an increasing function of institutional ownership, with the least number of analysts covering stocks in I1. The difference in analyst coverage between stocks in I1 and I5 is also statistically significant at 1%.

[Insert Table 2 Here]

We next present our 5X5 portfolio strategy results. Table 3 reports the results. The hedging portfolio in I1D1-I1D5 (long in I1D1, short in I1D5) earns a monthly raw return of around 1.6%. It decreases to 1.13% per month when we look at I2D1-I2D5. It eventually decreases to 0.22% per month and is statistically insignificant when we look at I5D1-I5D5. With the null hypothesis being the difference-in-opinion story, we would expect dispersion effect to get stronger with higher institutional ownership since institutional ownership is associated with less binding short-sale constraints. In a one-sided t-test on the raw return between the dispersion effects in high and low institutional ownership stocks, we cannot reject the null hypothesis with probability one. The results are similar if we risk-adjust the return by CAPM, Fama-French three-factor (FF3) model or the four-factor (FF4) model including the momentum factor. These results are consistent with the null hypothesis that difference-in-opinion explains the dispersion effect.

[Insert Table 3 Here]

3.2.2 Fama-Macbeth Regression

We follow Fama-Macbeth (1973) to run the following cross-sectional regressions on stocks with the lowest level of institutional ownership (I1) and on stocks with the highest institutional ownership (I5), respectively.

$$RET_{i,t+1} = \beta_0 + \beta_1 DP_{i,t} + \beta_2 LOGMV_{i,t} + \beta_3 LOGBM_{i,t} + \beta_4 MOM_{i,t} + \varepsilon_{i,t+1}. \quad (1)$$

$RET_{i,t+1}$ is the return of stock *i* in month *t+1*. $DP_{i,t}$ is the rank of stocks in terms of dispersion at month *t*. It ranges from 0 to 4, with stocks in D1 has a value of 0 and stocks in D5 has a value of 4. $LOGMV_{i,t}$ and $LOGBM_{i,t}$ are defined in the data section. $MOM_{i,t}$ is the buy-and-hold return for the past six months for stock *i*.

Table 4 reports the regression results for subsamples consists of stocks with low and high institutional ownership, respectively.

[Insert Table 4 Here]

The coefficient on *DP* is significantly negative in column 1. This suggests higher dispersion in analysts' forecasts is indeed associated with lower subsequent returns after controlling for the impact of size, book-to-market, and momentum. For the subsample with high institutional ownership, we still obtain a negative coefficient on *DP*. The coefficient estimate, however, is no longer statistically significant. Thus, the regression results simply confirm our results in the portfolio strategy that dispersion effects exist among stocks with low institutional ownership but do not among stocks with high institutional ownership. These are consistent with the difference-in-opinion explanation behind the dispersion effect as lower institutional ownership is associated with more binding short-sale constraints.

4. The Dispersion Effect: the Russell Sample

Institutional ownership, however, is endogenous in nature. One most salient feature of institutional investors is they possess information advantage over ordinary investors. This informative advantage bears implications of asset returns (Gompers and Metrick (2001), Yan and Zhang (2009)). For example, if institutional investors are more informed, then stocks with low future returns (bad news) would attract fewer institutional investors hence have low institutional ownership. This effect would be more significant in stocks with greater information asymmetry or uncertainty. Given dispersion is a proxy for information asymmetry or uncertainty, one would expect a stronger dispersion effect among low institutional ownership stocks. This explanation is also consistent with the observation that the stronger dispersion effect in low institutional ownership group is mainly driven by the lower return of high dispersion stocks. Therefore, any results that we obtained from comparing dispersion effects among stocks with high and low institutional ownership may simply arise from comparing stocks with good and bad news and the information advantage of institutional investors towards stocks with high information asymmetry, which have nothing to do the two explanations we try to disentangle.

To address this endogeneity in institutional ownership, we make use of the exogenous variation in institutional ownership from the annual Russell 3000 index reconstitution. In what follows, we will first introduce the Russell 3000 index and then describe how it generates the exogenous variation in institutional ownership. We last test our hypotheses using the Russell sample.

4.1 Background of Russell 1000 and 2000 Indices

Russell Investment constitutes the Russell 3000 index that comprises of the Russell 1000 and 2000 indexes each year starting from 1984. Russell Investment ranks stocks traded in the U.S. by their end of May market capitalization in descending order to determine the membership of each index. Stocks rank between 1 and 1000 will be assigned to the Russell 1000 index. Stocks rank between 1001 and 3000 will be assigned to the Russell 2000 index. After the membership has been determined, Russell Investment calculates the index-weight of stocks by their end of June float-adjusted market capitalization. As the Russell 1000 and 2000 indexes are value-weighted, stocks in the bottom of the Russell 1000 index receive a very low index weight because they are the smallest stocks among the Russell 1000 index stocks. However, for stocks ranked below 1000 and are in the top of the Russell 2000 index, they receive a high index weight because they are the largest stocks among the Russell 2000 stocks. These differences in index weighting for stocks on each side of the 1001st ranking generate exogenous variation in institutional ownership either by passive institutional investors who directly track the index or by active institutional investors whose performances are benchmarked against these indexes. Figure 1 plots institutional ownership for stocks around the threshold (1001st) that determines the index membership. The horizontal axis is the difference between the ranking of a stock and 1001. Stocks to the left (negative distance) are those in the bottom of the Russell 1000 index while stocks to the right (non-negative distance) are those in the top of the Russell 2000 index. We see a clear discontinuity in institutional ownership from Figure 1. Institutional ownership is substantially lower for stocks in [-100, 0), i.e. the smallest 100 stocks in the Russell 1000 index. We therefore make use of these 100 stocks around each side of the cutoff. We obtain index membership data from Russell Investment from 1984 to 2006. Russell Investment changes its method for determining membership after 2006, making the data no longer suitable for research purposes. Specifically, instead of using the general sample, our focus here is on the 100 stocks at the bottom of the Russell 1000 index and the 100 stocks at the top of the Russell 2000 index. Stocks that are further away from the 1001st cutoff may be substantially different from those around the 1001st cutoff in unobservable characteristics that may confound our identification strategy. Comparing the magnitude of the dispersion effect on each side of the cutoff gauges the impact of institutional ownership on the dispersion effect. The impact is plausibly causal as the changes in institutional ownership are induced by the annual Russell 1000/2000 index reconstitution.

[Insert Figure 1 Here]

4.2 Portfolio Strategy

Just as what we did to the general sample, we perform the same analysis to the Russell sample. At the end of each month after reconstitution in year t (June of year t to May of year t+1)[7], we sort stocks (with price over five dollars) into five quintiles (D1 to D5) based on analysts' forecasts dispersion, irrespective of their index assignment. D1 contains stocks with the lowest dispersion while D5 consists of stocks with the highest dispersion in analysts' forecasts. Instead of sorting independently on institutional ownership, we label stocks in the bottom of the Russell 1000 index I1. These are the stocks with low institutional ownership. Stocks in the top of the Russell 2000 index are labelled I2, whose institutional ownership is relatively higher than those in I1. We end up with 10 (2X5) portfolios each month. The portfolios are rebalanced each month.

Before our analysis, we first verify that institutional ownership is indeed associated with less binding short-sale constraints and more analyst coverage in this subsample. We again measure short-sale constraint as the supply of shares available for shorting times 1000 scaled by total number of shares outstanding for each stock in each month. Analyst coverage is the number of

[7] This matches the strategy we used in the general sample. As assigning into the bottom of the Russell 1000 index means low institutional ownership from July of year t to June of year t+1, we calculate annual average institutional ownership for the general sample using July of year to June of year t+1 as a whole year.

analysts who have issued fiscal year one earnings forecasts in each month. For each group (I1 to I2), we calculate the monthly median level of short-sale constraints and analyst coverage and take the time-series average. Table 5 reports the group average. We see that short-sale constraint is more binding for stocks in I1 than for those in I2. The difference in short-sale constraint is statistically significant at 5% with a t-stat 2.38. Analyst coverage is also statistically higher for stocks in the top of the Russell 2000 index (I2).

[Insert Table 5 Here]

We next present our 2X5 portfolio strategy results. Table 6 reports the results. For the subsample of stocks with low institutional ownership (I1), the hedging portfolio in I1D1-I1D5 earns a monthly raw return of around 0.33% and is indistinguishable from zero statistically. However, for the subsample of stocks with high institutional ownership (I2), the hedging portfolio I2D1-I2D5 earns a raw return of 0.77% per month and is statistically different from zero. The one-sided t-test can reject the null hypothesis that dispersion effect is stronger among stocks with low institutional ownership, supporting the analyst self-censoring explanation instead.

[Insert Table 6 Here]

The results are similar if we risk-adjust the return by CAPM, Fama-French three-factor (FF3) model or the four-factor (FF4) model including the momentum factor, except for FF3, whose p-value is at 0.11. These results are obviously in contrast to what we found in the general sample. In the general sample, we find stronger dispersion effect for a subsample of stocks with low institutional ownership, which is most consistent with a view that difference-in-opinion explains the dispersion effect. However, in the Russell sample where the endogeneity of institutional ownership is controlled (the difference in institutional ownership is plausibly not due to the information advantage of institutional investors), we found strikingly different results. The results here are most consistent with the often-neglected analyst self-censoring explanation.

4.3 Fama-Macbeth Regression

We next follow Fama-Macbeth (1973) to run the cross-sectional regressions as in Equation (1) on stocks in the Russell sample with low level of institutional ownership (I1) and on those with high institutional ownership (I2), respectively.

Table 7 reports the regression results for subsamples consist of stocks with low and high institutional ownership, respectively.

[Insert Table 7 Here]

The coefficient on *DP* is significantly negative in column 2. This suggests higher dispersion in analysts' forecasts is associated with lower subsequent returns for stocks with higher institutional ownership. For the subsample with lower institutional ownership in column 1, we still obtain a negative coefficient on *DP*. The coefficient estimate, however, is not statistically significant. Thus, the regression results simply confirm our results in the portfolio strategy that dispersion effect exists among stocks with high institutional ownership but do not among stocks with low institutional ownership in the Russell sample. These are consistent with the analyst self-censoring explanation behind the dispersion effect.

Overall, our results in this section indicate that it is important to control the endogeneity of institutional ownership when assessing the role played by institutional ownership in explaining dispersion effect. Given our finding that dispersion effect is stronger with higher institutional ownership, we can reject the popular null hypothesis that difference-in-opinion explains dispersion effect. It is, however, the incentives of analyst to self-censor unfavorable forecasts that lead to the dispersion effect.

5. The Dispersion-Bias Relationship

There is a unique prediction in the analyst self-censoring story regarding the relationship between dispersion and analyst forecasts bias. The bias of analyst forecast should be increasing with dispersion such that stocks with higher dispersion earn lower subsequent returns. Thus, for the analyst self-censoring explanation to be valid, not only one should observe the dispersion-return relationship, a parallel result concerning the positive dispersion-bias relationship should also be observed in the data.

We have found the dispersion effect to be stronger for stocks in the top of the Russell 2000 index because these stocks have high institutional ownership. The high institutional ownership implies a higher demand for analysts' services, which in turn increases the incentive of analysts to self-censor. This should manifest in a larger spread in analysts' forecast bias across dispersion portfolios for stocks in the top of the Russell 2000 index.

We start by calculating the bias for each of the 2X5 portfolios formed with the Russell sample. *BIAS* is defined as the difference between analysts' consensus earnings-per-share forecast in the current month minus the corresponding actual earnings-per-share announced in the future, scaled by current stock price of the stock. For each portfolio, we first calculate the monthly median and then the time-series average of the median. Panel A of Table 8 reports the results.

[Insert Table 8 Here]

For the subsample of stocks with high institutional ownership (I2), the bias in analysts' forecasts increases from 0.06% for low dispersion portfolio (I2D1) to 1.14% in in the high dispersion portfolio (I2D5). The spread in bias is 1.08%. For the subsample with low institutional ownership (I1), the bias in analysts' forecasts increases from 0.09% for low dispersion portfolio (I1D1) to 0.91% in in the high dispersion portfolio (I1D5). The spread in bias is 0.82%, lower than that of high institutional ownership stocks. The difference in the spread is 0.26%, which is statistically different from zero with a p-value of 0.00. This first observation substantiates the stronger dispersion-bias relationship in the high institutional ownership stocks predicted by the analyst self-censoring explanation.

For the general sample, as institutional investors possess information advantage and as such, they are less likely to hold stocks with bad news. This combined with the incentive of analysts to self-censor only unfavorable forecasts, we would expect self-censoring more likely to happen among low institutional ownership stocks with high dispersion. Thus, we expect to observe stronger dispersion-bias relationship among stocks with lower institutional ownership in the general sample instead. This is indeed what we found. In Panel B, we report the general sample results. Stocks are divided into 5X5 portfolios based on institutional ownership and dispersion. The spread in bias for the low institutional ownership group (I1) is 1.43% while that for the high institutional group (I5) is lower as expected at 1.04%. The difference between the spread is statistically significant.

We next turn to regression analysis. We use the following pooled regression to test the dispersion-bias relationship following Hwang and Li (2016):

$$BIAS_{i,t} = \beta_0 + \beta_1 DP_{i,t} + \beta_2 LOGSIZE_{i,t} + \beta_3 LOGBM_{i,t} + \beta_4 MOM_{i,t} + \varepsilon_{i,t}. \quad (2)$$

$BIAS_{i,t}$ is the is the bias in the consensus forecast for stock *i* in month *t*. $DP_{i,t}$ is the rank of stocks in terms of dispersion at month *t*. It ranges from 0 to 4, with stocks in D1 has a value of 0 and stocks in D5 has a value of 4. Definitions of control variables are the same as those in Equation (1).

Table 9 reports the regression results. In both subsamples of stocks with low and high institutional ownership, we obtain the positive relationship between *DP* and *BIAS*. In the Russell sample, the magnitude of the coefficient on *DP* is larger in the subsample with high institutional ownership (0.444 vs. 0.355). This confirms the parallel prediction that among high institutional ownership stocks, the spread in analysts' forecasts bias is larger. We confirm the coefficient on *DP* in the subsample with higher institutional ownership is indeed higher statistically. The difference is significant at 1% level with a p-value 0.00. For the general sample, the results reversed. The predictive power of *DP* is stronger in the sub sample of stocks with low institutional ownership. This is in line with the information advantage of institutional investors.

[Insert Table 9 Here]

The stronger dispersion-return and dispersion-bias relationship in the subsample of stocks with high institutional ownership in the Russell sample reinforces that analyst self-censoring is the likely explanation behind the dispersion effect.

6. Conclusion

In this paper, we highlight the importance of taking care of the endogeneity of the institutional ownership in the empirical design. It has been a common practice to use institutional ownership as a proxy of short-sale constraints to explain anomalies. Using the dispersion effect as an example, we show that failing to taking the endogeneity of institutional ownership into account can distort conclusions. We provide a joint test of the two plausible explanations (analyst self-censoring vs. difference-in-opinion) on why stocks with high dispersion in analysts' forecasts earn low returns using institutional ownership data. Since the seminal work of DMS (2002), the extant literature has exclusively focused on the difference-in-opinion explanation. Although our initial results that dispersion effect is stronger when institutional ownership is low seem to be consistent with the popular difference-in-opinion explanation, our subsequent results show that the dispersion effect is actually stronger among stocks with higher institutional ownership after accounting for the endogeneity problem of institutional ownership, suggesting that the analyst self-censoring explanation is the driver of the dispersion effect.

Analysts are important information producers in financial markets. Our findings highlight the incentive structure of analysts is significant enough to distort information production in financial markets and bear negative consequences for market efficiency.

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Figure 1 **Intuitional Ownership around the Russell 1000/2000 Index Cutoff**

This figure displays institutional ownership of stocks around Russell 1000/2000 index cutoff for the years 1984 to 2006. Russell index data is provided by Russell Investment. Institutional ownership is calculated from 13-F filings data from Thompson Reuters. Distance is the relative position to the 1001st stock in the Russell 1000/2000 index. Stocks in the Russell 1000 have negative distance while stocks in the Russell 2000 have non-negative distance. The dots in the figure represents sample mean of 20 non-overlapping bins on each side of the cutoff. The curves represent a third-order polynomial fit.

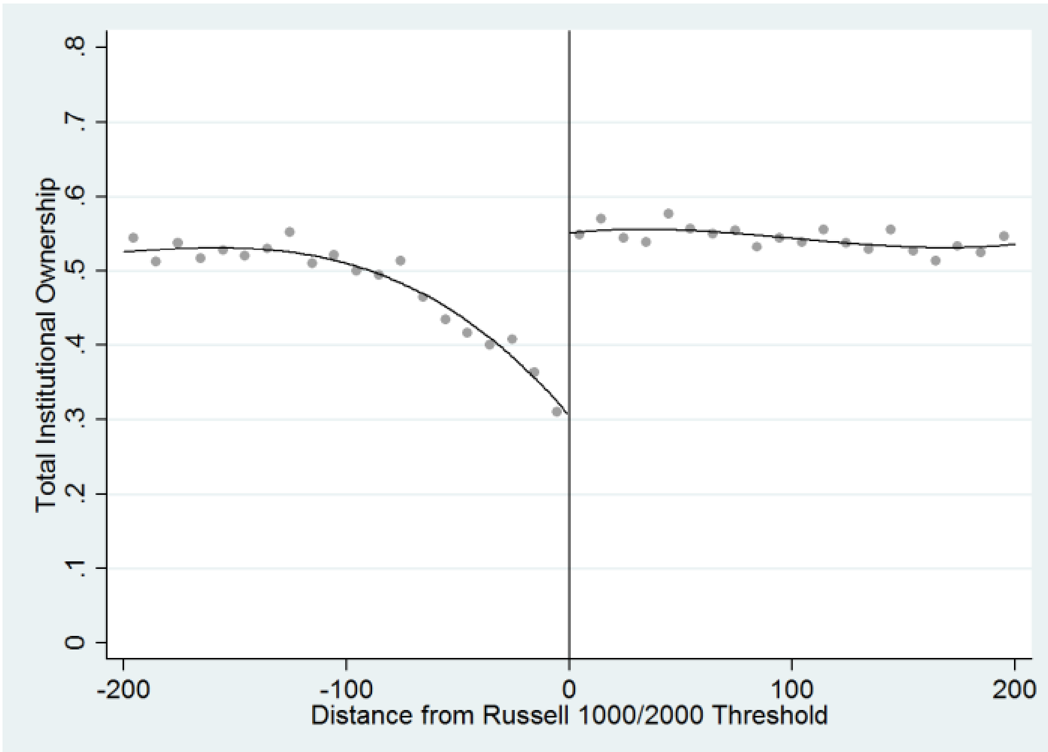

Table 1 **Summary Statistics**

We have two samples in this study. The general sample covers all NYSE, AMEX, and Nasdaq stocks from July 1984 to June 2007. The general sample is divided into five groups by institutional ownership. We report the summary statistics for the group with the lowest institutional ownership (IO) and the highest. The second sample consists of 100 stocks in the bottom of the Russell 1000 index and another 100 stocks in the top of the Russell 2000 index each year from 1984 to 2006. Dispersion (*DISP*) in analysts' earnings forecasts is calculated each month as the ratio of the standard deviation of analysts' current fiscal-year annual earnings-per-share forecasts to the absolute value of the mean forecast. Forecast bias (*BIAS*) is defined as the difference between analysts' consensus earnings-per-share forecast in the current month minus the corresponding actual earnings-per-share announced in the future, scaled by current stock price of the stock. *LOGMV* is the natural log of market capitalization. Market capitalization is calculated as the last trading day share price in the month times total shares outstanding. *LOGBM* is the natural log of the book value of equity to the market value of equity (market capitalization). Book value is calculated as book value of stockholders' equity, plus balance sheet deferred taxes and investment tax credit (if available), minus the book value of preferred stock. Depending on availability, we use the redemption, liquidation, or par value (in that order) to estimate the book value of preferred stock. Stockholders' equity is the value reported by COMPUSTAT, if it is available. If not, we measure stockholders' equity as the book value of common equity plus the par value of preferred stock, or the book value of assets minus total liabilities (in that order). Previous fiscal year book value is paired with market capitalization in the current calendar year if portfolio is formed on or after June, otherwise the book value of the year before the previous fiscal year is used. . ***, **, * corresponds to significance at 1%, 5%, and 10% respectively.

Panel A General Sample

Lowest IO				Highest IO				Diff	t-stat
	N	MEAN	STD		N	MEAN	STD		
DISP	109636	0.19	0.96	DISP	129730	0.13	1.03	0.06***	14.27
BIAS	103050	0.02	0.09	BIAS	126968	0.01	0.05	0.01***	26.48
SIZE	109636	12.21	1.36	SIZE	129730	13.84	1.26	-1.63***	-310
BM	109636	-7.73	0.85	BM	129730	-7.85	0.89	0.12***	33.3

Panel B Russell Sample

Low IO (Russell 1000)				High IO (Russell 2000)				Diff	t-stat
	N	MEAN	STD		N	MEAN	STD		
DISP	17764	0.16	1.11	DISP	20115	0.15	0.83	0.01	1.61
BIAS	17189	0.01	0.13	BIAS	19447	0.01	0.09	0.00	-0.87
SIZE	17764	13.63	0.90	SIZE	20115	13.41	0.81	0.22***	24.21
BM	17764	-7.77	0.95	BM	20115	-7.85	0.94	0.08***	8.12

Table 2 **Institutional Ownership, Short-Sale Constraint and Analyst Coverage: the General Sample**

At the end of each month, we divide all stocks in the general sample into five portfolios based on annual average institutional ownership. I1 (I5) includes stocks with the lowest (highest) institutional ownership. For each group, we first calculate the monthly median of short-sale constraint and analyst coverage and then calculate the time-series average. Short-sale constraint is defined as the supply of shares available for shorting times 1000 scaled by total number of shares outstanding for each stock in each month. A higher value means less binding in short-sale constraints. Analyst coverage is the number of analysts who have issued fiscal year one earnings forecasts for the stock in each month. ***, **, * corresponds to significance at 1%, 5%, and 10% respectively.

	Low IO **I1**	**I2**	**I3**	**I4**	High IO **I5**	**DIFF**
Short-Sale Constraint	31.26	62.53	77.47	89.01	104.49	73.23***
t-stat						4.33
Analyst Coverage	3.11	4.67	6.22	8.47	10.70	7.59***
t-stat						49.07

Table 3 **Institutional Ownership and the Dispersion Effect: the General Sample**

At the end of each month, we first divide all stocks in the general sample into five groups based on forecast dispersion. D1 (D5) includes stocks with the lowest (highest) dispersion. We then independently form five groups of stocks based on annual average institutional ownership. I1 (I5) includes stocks with the lowest (highest) institutional ownership. We end up with 25 (5X5) portfolios. IaDb represents a stock selected from group Ia and Db. After being assigned to portfolios, stocks are held for one month. I*D1-I*D5 is the hedge portfolio that holds a long position in stocks of I*D1 and a short position in stocks of I*D5. The monthly return (in percentage) of each portfolio is calculated as the equal-weighted average of the returns of all of its stocks. N is the average number stocks for each portfolio. Newy-West t-statistics is reported. ***, **, * corresponds to significance at 1%, 5%, and 10% respectively.

I1 **Dispersion**	**I1D1** **Low**	**I1D2** **2**	**I1D3** **3**	**I1D4** **4**	**I1D5** **High**	**I1D1-I1D5** **DIFF**
RAW	**1.07**	**0.92**	**0.65**	**0.14**	**-0.53**	**1.60**
t-stat	4.20	3.54	2.33	0.47	-1.58	5.55
CAPM	**0.66**	**0.49**	**0.22**	**-0.30**	**-0.96**	**1.62**
t-stat	2.48	1.80	0.78	-1.01	-2.76	5.53
FF3	**0.61**	**0.45**	**0.19**	**-0.37**	**-0.98**	**1.59**
t-stat	2.33	1.63	0.66	-1.26	-2.89	5.61
FF4	**0.66**	**0.46**	**0.24**	**-0.35**	**-0.90**	**1.56**
t-stat	2.41	1.57	0.81	-1.08	-2.42	5.18
N	100	83	89	100	121	

I2 **Dispersion**	**I2D1** **Low**	**I2D2** **2**	**I2D3** **3**	**I2D4** **4**	**I2D5** **High**	**I2D1-I2D5** **DIFF**
RAW	**1.26**	**1.17**	**0.85**	**0.76**	**0.13**	**1.13**
t-stat	5.35	5.14	3.46	2.90	0.38	4.44
CAPM	**0.86**	**0.76**	**0.43**	**0.34**	**-0.30**	**1.16**
t-stat	3.52	3.21	1.75	1.28	-0.90	4.48
FF3	**0.82**	**0.74**	**0.40**	**0.31**	**-0.34**	**1.16**
t-stat	3.41	3.10	1.65	1.13	-1.04	4.67
FF4	**0.86**	**0.78**	**0.45**	**0.35**	**-0.31**	**1.17**
t-stat	3.33	3.09	1.79	1.16	-0.85	4.33
N	95	96	97	98	107	

I3 Dispersion	I3D1 Low	I3D2 2	I3D3 3	I3D4 4	I3D5 High	I3D1-I3D5 DIFF
RAW	**1.39**	**1.27**	**1.15**	**1.03**	**0.67**	**0.72**
t-stat	5.65	5.25	5.06	4.03	2.13	3.54
CAPM	**0.99**	**0.87**	**0.74**	**0.61**	**0.26**	**0.73**
t-stat	3.83	3.49	3.12	2.38	0.84	3.66
FF3	**0.97**	**0.82**	**0.71**	**0.57**	**0.24**	**0.74**
t-stat	3.75	3.30	2.92	2.19	0.72	3.53
FF4	**1.06**	**0.89**	**0.78**	**0.60**	**0.25**	**0.81**
t-stat	3.77	3.41	3.04	2.17	0.69	3.43
N	94	99	99	100	101	

I4 Dispersion	I4D1 Low	I4D2 2	I4D3 3	I4D4 4	I4D5 High	I4D1-I4D5 DIFF
RAW	**1.47**	**1.36**	**1.42**	**1.32**	**1.07**	**0.40**
t-stat	6.54	6.41	6.37	5.21	4.15	1.92
CAPM	**1.08**	**0.99**	**1.01**	**0.93**	**0.65**	**0.42**
t-stat	4.60	4.37	4.40	3.64	2.47	2.00
FF3	**1.07**	**0.95**	**1.00**	**0.91**	**0.62**	**0.44**
t-stat	4.53	4.17	4.29	3.43	2.25	2.08
FF4	**1.16**	**1.03**	**1.07**	**0.98**	**0.66**	**0.51**
t-stat	4.59	4.25	4.39	3.48	2.38	2.33
N	101	103	102	101	87	

I5 Dispersion	I5 Low	I5 2	I5 3	I5 4	I5 High	I5 DIFF
RAW	**1.69**	**1.60**	**1.55**	**1.53**	**1.46**	**0.22**
t-stat	8.10	7.28	6.85	6.23	5.13	1.04
CAPM	**1.31**	**1.21**	**1.16**	**1.12**	**1.07**	**0.24**
t-stat	5.85	5.17	5.02	4.51	3.82	1.13
FF3	**1.29**	**1.21**	**1.15**	**1.12**	**1.02**	**0.28**
t-stat	5.83	4.98	4.88	4.13	3.40	1.17
FF4	**1.39**	**1.30**	**1.22**	**1.17**	**1.03**	**0.37**
t-stat	5.81	5.08	4.92	4.20	3.49	1.55
N	104	112	106	94	76	

One-Sided t test:
H0: Group 1 > Group 5? (Difference-in-Opinion)

	RAW	CAPM	FF3	FF4
DID	1.38	1.39	1.32	1.20
p-value	(1.00)	(1.00)	(1.00)	(1.00)

Table 4 **Institutional Ownership and the Dispersion Effect: the General Sample**

This table presents the results of Fama-MacBeth (1973) cross-sectional regressions: $RET_{i,t+1} = \beta_0 + \beta_1 DISP_{i,t} + \beta_2 LOGMV_{i,t} + \beta_3 LOGBM_{i,t} + \beta_4 MOM_{i,t} + \varepsilon_{i,t+1}$ for the general sample. The dependent variable *RET* is monthly stock return. *DISP*, *LOGMV*, *LOGBM*, and *MOM* are defined in Table 1. We run the regression separately for stocks with the lowest institutional ownership (I1) and stocks with the highest institutional ownership (I5), respectively. Newy-West t-statistics is reported. ***, **, * corresponds to significance at 1%, 5%, and 10% respectively.

	General Sample	
	Low IO (I1)	High IO (I5)
DP	**-0.369*** **	**-0.075**
	(-5.64)	**(-1.59)**
LOGBM	0.557***	-0.027
	(5.42)	(-0.25)
LOGMOV	0.02	-0.156***
	(0.43)	(-3.17)
MOM	0.535**	-0.094
	(2.14)	(-0.34)
Intercept	5.208***	3.534***
	(4.87)	(3.12)
Adjusted R2	0.040	0.045
N. of Months	276	276
OBS	109636	129730

Table 5 **Institutional Ownership, Short-Sale Constraint and Analyst Coverage: the Russell Sample**

Stocks in the bottom of the Russell 1000 are labeled I1 and have low institutional ownership. Stocks in the top of the Russell 2000 index are labelled I2 and have high institutional ownership. For each group, we first calculate the monthly median of short-sale constraint and analyst coverage and then calculate the time-series average. Short-sale constraint is defined as the supply of shares available for shorting times 1000 scaled by total number of shares outstanding for each stock in each month. A higher value means less binding in short-sale constraints. Analyst coverage is the number of analysts who have issued fiscal year one earnings forecasts for the stock in each month. ***, **, * corresponds to significance at 1%, 5%, and 10% respectively.

	Low IO **I1**	High IO **I2**	**DIFF**
Short-Sale Constraint	56.07	98.51	42.44**
t-stat			2.38
Analyst Coverage	7.57	7.70	0.13*
t-stat			1.79

Table 6 **Institutional Ownership and the Dispersion Effect: the Russell Sample**

At the end of each month, we first divide all stocks into five groups based on forecast dispersion. D1 (D5) includes stocks with the lowest (highest) dispersion. Institutional ownership is determined by index assignment, with stocks in the bottom of the Russell 1000 index labelled I1 and those in the top of the Russell 2000 index labelled I2. Stocks in I1 have lower institutional ownership compared with those in I2. We end up with 10 (2X5) portfolios. IaDb represents a stock selected from group Ia and Db. After being assigned to portfolios, stocks are held for one month. I*D1-I*D5 is the hedge portfolio that holds a long position in stocks of I*D1 and a short position in stocks of I*D5. The monthly return (in percentage) of each portfolio is calculated as the equal-weighted average of the returns of all of its stocks. N is the average number stocks for each portfolio. Newy-West t-statistics is reported. ***, **, * corresponds to significance at 1%, 5%, and 10% respectively.

I1 Dispersion	**I1D1 Low**	**I1D2 2**	**I1D3 3**	**I1D4 4**	**I1D5 High**	**I1D1-I1D5 DIFF**
RAW	**1.20**	**1.05**	**1.43**	**0.86**	**0.87**	**0.33**
t-stat	4.16	3.31	5.19	2.93	2.69	0.99
CAPM	**0.78**	**0.67**	**1.00**	**0.44**	**0.47**	**0.31**
t-stat	2.65	2.06	3.51	1.53	1.43	0.91
FF3	**0.74**	**0.71**	**1.00**	**0.38**	**0.46**	**0.28**
t-stat	2.55	2.09	3.67	1.22	1.37	0.81
FF4	**0.83**	**0.79**	**1.16**	**0.42**	**0.59**	**0.24**
t-stat	2.75	2.22	4.39	1.28	1.68	0.66
N	13	13	14	14	17	

I2 Dispersion	**I2D1 Low**	**I2D2 2**	**I2D3 3**	**I2D4 4**	**I2D5 High**	**I2D1-I2D5 DIFF**
RAW	**1.44**	**1.04**	**1.12**	**0.91**	**0.68**	**0.77**
t-stat	6.36	3.87	4.16	2.75	2.13	2.82
CAPM	**1.07**	**0.66**	**0.74**	**0.52**	**0.33**	**0.73**
t-stat	4.32	2.35	2.59	1.51	1.02	2.64
FF3	**1.02**	**0.66**	**0.70**	**0.47**	**0.35**	**0.68**
t-stat	4.47	2.29	2.50	1.34	1.01	2.44
FF4	**1.10**	**0.76**	**0.74**	**0.53**	**0.34**	**0.76**
t-stat	4.31	2.51	2.46	1.45	0.94	2.61
N	15	16	15	15	15	

One-Sided t test:
H0: Group 1 > Group 2 (Difference-in-Opinion)

	RAW	**CAPM**	**FF3**	**FF4**
	-0.43	-0.43	-0.40	-0.52
p-value	(0.08)	(0.09)	(0.11)	(0.06)

Table 7 **Institutional Ownership and the Dispersion Effect: the Russell Sample**

This table presents the results of Fama-MacBeth (1973) cross-sectional regressions: $RET_{i,t+1} = \beta_0 + \beta_1 DISP_{i,t} + \beta_2 LOGMV_{i,t} + \beta_3 LOGBM_{i,t} + \beta_4 MOM_{i,t} + \varepsilon_{i,t+1}$ for the Russell sample. The dependent variable *RET* is monthly stock return. *DISP*, *LOGMV*, *LOGBM*, and *MOM* are defined in Table 1. We run the regression separately for stocks with the low institutional ownership (I1) and stocks with the high institutional ownership (I2), respectively. Newy-West t-statistics is reported. ***, **, * corresponds to significance at 1%, 5%, and 10% respectively.

	Russell Sample	
	Low IO (I1)	High IO (I2)
DP	**-0.099**	**-0.150*** **
	(-1.29)	**(-2.75)**
LOGBM	0.350**	0.316**
	(2.23)	(2.59)
LOGMV	0.298	-0.387
	(1.45)	(-1.16)
MOM	0.498*	1.313***
	(1.73)	(4.88)
Intercept	-0.23	9.142**
	(-0.09)	(2.19)
Adjusted R2	0.048	0.050
N. of Months	276	276
OBS	17764	20115

Table 8 **Institutional Ownership, Forecast Dispersion and Forecast Bias**

At the end of each month, we first divide all stocks in the Russell (General) sample into five groups based on forecast dispersion. D1 (D5) includes stocks with the lowest (highest) dispersion. Institutional ownership is determined by index assignment for the Russell sample, with stocks in the bottom of the Russell 1000 index labelled I1 and those in the top of the Russell 2000 index labelled I2. Stocks in I1 have lower institutional ownership compared with those in I2. For the general sample, stocks are independently sort based on institutional ownership into 5 groups from I1 to I5. Stocks in I1 have the lowest institutional ownership. We end up with 10 (2X5) portfolios in the Russell sample and 25 (5X5) portfolios in the general sample. IaDb represents a stock selected from group Ia and Db. *BIAS* is defined as the difference between analysts' consensus earnings-per-share forecast in the current month minus the corresponding actual earnings-per-share announced in the future, scaled by current stock price of the stock. For each portfolio, we first calculate the monthly median and then the time-series average of the median.

Panel A: The Russell Sample

Dispersion	D1 (Low)	D2	D3	D4	D5 (High)	DIFF
I1 (Low)	0.09%	0.14%	0.23%	0.38%	0.91%	0.82%
I2 (High)	0.06%	0.13%	0.29%	0.53%	1.14%	1.08%
					DID	**0.26%**
					H0	DID=0
					p-value	0.00

Panel B: The General Sample

Dispersion	Low	2	3	4	High	DIFF
I1 (Low)	0.14%	0.17%	0.30%	0.57%	1.57%	1.43%
I2	0.08%	0.10%	0.23%	0.53%	1.45%	1.37%
I3	0.04%	0.10%	0.24%	0.51%	1.29%	1.26%
I4	0.03%	0.09%	0.24%	0.43%	1.08%	1.05%
I5 (High)	0.01%	0.10%	0.17%	0.37%	1.05%	1.04%
					DID	**-0.39%**
					H0	DID=0
					p-value	0

Table 9 **Institutional Ownership, Forecast Dispersion and Forecast Bias**

This table reports the results of the following pooled regression: $BIAS_{i,t} = \beta_0 + \beta_1 DISP_{i,t} + \beta_2 LOGMV_{i,t} + \beta_3 LOGBM_{i,t} + \beta_4 MOM_{i,t} + \varepsilon_{i,t+1}$ for the Russell sample and the general sample. We run the regression separately for stocks with the low institutional ownership and stocks with the high institutional ownership, respectively. The *t*-statistics (in parentheses) are calculated based on standard errors clustered at stock-level. ***, **, * corresponds to significance at 1%, 5%, and 10% respectively.

	Russell Sample		Full Sample	
	Low IO (I1)	High IO (I2)	Low IO (I1)	High IO (I5)
DP	**0.355*** **	**0.444*** **	**0.526*** **	**0.299*** **
	(7.82)	**(9.42)**	**(19.01)**	**(12.64)**
BM	-0.606***	-0.792***	-0.426***	-0.134***
	(-4.50)	(-7.65)	(-14.67)	(-5.84)
SIZE	0.065	0.190**	0.252***	0.332***
	(0.60)	(2.25)	(4.42)	(8.40)
MOM	-0.787***	-0.366***	-1.202***	-0.911***
	(-5.71)	(-3.45)	(-7.84)	(-10.97)
Intercept	9.181***	12.368***	7.583***	4.873***
	(6.16)	(8.16)	(13.04)	(10.72)
Chi-2 (DP(I1)≠DP(I2))	12.37		414.30	
p-value	0.00		0.00	
Adjusted R2	0.085	0.110	0.096	0.064
OBS	17,189	19,447	103,050	126,968