NBER WORKING PAPER SERIES

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Working Paper 23274
http://www.nber.org/papers/w23274

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
March 2017

We are grateful to Karl Diether and Avanidhar Subrahmanyam as well as seminar participants at Brigham Young University for helpful comments. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

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NBER Working Paper No. 23274
March 2017
JEL No. G12,G14

ABSTRACT

Previously, academics have used the supply of information that arrives to market (e.g., macroeconomic announcements, earnings reports, or news releases) to study how information affects asset prices and anomalies, and for tests of market efficiency. In this paper, we instead use measures of institutional and retail demand for information. We show that institutional demand for information is associated with increased trading volume and significant price movements. Average returns and betas are higher on days with higher institutional demand for information. The magnitude of these effects is much larger than those associated with the supply of news. However, the impact of demand for information from retail investors, while statistically significant, is quite small in magnitude. We also show that higher institutional demand alleviates mispricing in the market. In particular, higher information processing by institutional investors dampens momentum and enhances long-term reversals. As such, when demand for information increases, the market becomes more efficient.

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1. Introduction

How information becomes incorporated into asset prices is one of the most fundamental issues in finance (Grossman and Stiglitz, 1976; Copeland, 1976). Not only does this impact market efficiency and whether price anomalies persist (La Porta, Lakonishok, Shleifer and Vishny, 1997; Engelberg, McLean, and Pontiff, 2016), but the arrival of information appears to be associated with a risk premium (Savor and Wilson, 2014; and Lucca and Moench, 2015). Intuitively, risk premia should accrue on days when the arrival of information generates systematic price movements. This has received much more attention recently by academics, and its effects have been confirmed empirically (e.g., Savor and Wilson, 2016) and investigated theoretically (Ai and Bansal, 2017; Andrei, Cujean, and Wilson, 2017).

To study the impact of information on asset prices, a natural place to start is with the *supply of information* that arrives to market, such as scheduled macroeconomic announcements, earnings reports, dividend announcements, or news releases (e.g., Beaver, 1968; Kalay and Loewenstein, 1985, among others). This is reasonable because market participants should update their beliefs about asset values when news arrives. But, people have limited attention (e.g., Kahneman, 1973, Hirshleifer and Teoh, 2003). Thus, only considering the supply of information might understate the effects that new information has on asset prices, risk premia, and anomalies that persist in financial markets. In addition, focusing on firm-specific news may overlook important information spillover from related firms.

In this paper, we characterize how *demand for information* on a stock affects its prices. We posit that when more demand arises, investors are paying closer attention and information in the market is more likely to have an effect. We consider both institutional and retail demand for information, and how they interact with the supply of information in the market. We measure demand shocks from institutions by using data from Bloomberg queries and constructing an abnormal institutional attention variable (AIA; Ben-Rephael, Da, and Israelsen, 2016). We measure demand shocks from retail investors by analyzing Google search activity and constructing a similar variable that captures shocks to retail attention (DSVI; Da, Engelberg, and Gao, 2011).

We begin by analyzing what drives institutional demand for information. Naturally, we find that when news is released about a particular firm, AIA for that stock is more likely to be positive. But, demand for information about a particular stock commonly arises when no news about that firm has been released. Instead, institutional demand for information on individual stocks also appears to be triggered by industry- and other aggregate news events. We show that industry-level news, news about large firms, and macroeconomic news (especially FOMC announcements) are all positively correlated with greater institutional demand for information about individual stocks. When general news arrives in the market, this is associated with increased demand for information about individual stocks and provides a channel through which systematic risk is transmitted across the market. Consistent with this, we show that the CAPM beta is roughly 28% higher on days with institutional demand for information on that stock.[1] In contrast, after controlling for institutional demand for information, the supply of news has no statistically significant effect on systematic risk.

This motivates us to examine whether demand for information is associated with a risk premium. We show this to be the case. Days in which there is a spike in demand for information are associated with a risk premium, even after controlling for both earnings announcement days and days with major news. In fact, the average daily risk premium that accrues on positive AIA

[1] This is also consistent with Peng and Xiong (2006) who show that limited investor attention leads to category-learning behavior, i.e., investors tend to process more market and sector-wide information than firm-specific information. Consequently, demand for firm-specific information likely coincides with that of aggregate information and carries systematic implications.

days is much larger than for days with a spike in the supply of information (16 vs. 5 basis points). Strikingly, these results are almost identical when we compare days with a demand shock with no supply of information to days with news, but no demand (14 vs. 4 basis points).

These findings are consistent with the notion that institutional demand for information on a stock without firm-specific news can be triggered by aggregate news and therefore results in a risk premium. Alternatively, the finding provides evidence that limited attention is likely present in the market: some news supply may take time before it is completely incorporated into prices and that the demand for information is an important driver of asset prices.

While spikes in retail attention are associated with a statistically significant average daily risk premium, its magnitude is low (1 basis point). We further investigate the interaction of institutional and retail demand for information and find that retail attention has very little impact on asset prices. On days when AIA is absent, retail demand for information does not command a risk premium. It is only when AIA is present that there is a relationship. This provides evidence that retail participation in the market has little permanent effect on prices, and certainly does not provide a countervailing effect in the market.

Finally, we study the impact of both the demand for information and its supply on mispricing following the methodology in Engelberg, McLean, and Pontiff (2016). We focus on two related and economically important anomalies that were present during our sample period: momentum (Jegadeesh and Titman, 1993) and long-term reversal (De Bondt and Thaler, 1985). While both anomalies accrue over relatively long holding periods, we examine whether they accrue proportionally more on some days than others. Ex ante, two competing hypotheses might be true. The first is that days with AIA might exacerbate momentum because institutional investors invest in assets with short-term trends to take advantage of retail investors who are paying less attention. The second is that when institutional investors demand and process information, they correct for mispricing, which makes the market more efficient and dampens momentum.

We find evidence of the latter: demand for information weakens momentum and enhances long-term reversal, which is consistent with Daniel, Hirshleifer, and Subrahmanyam (1998) who argue that mispricing can be exacerbated in the medium term, resulting in momentum, and corrected in the long term, resulting in reversals. By demanding and processing information, institutional investors help to correct mispricing, therefore enhance reversal by pushing the price to its fundamental value but dampen momentum by alleviating continuing overreaction. Retail demand for information and variables that parameterize the supply of information have no such effect in our sample.

Our paper makes several contributions to the literature on information and asset pricing. Our paper is the first to examine the impact of the demand for information on the risk premium. We find that the demand for information by institutional investors is of first-order importance in explaining when stocks earn a risk premium. Moreover, we find that institutional demand responds to both firm news and important industry and market news. This provides an intuitive link between the demand of information and systematic risk. When important industry, aggregate, or macroeconomic news arrives, institutional investors are more likely to demand and process information at the individual stock level, which results in transmission of systematic risk. Finally, we also contribute to the literature on anomalies. We show that when demand for information is high, stock prices become more efficient. In addition, the impact of information processing on anomalies varies depending on the nature of the anomaly.

The remainder of the paper is organized as follows. In Section 2, we describe the data and provide sample statistics. In Section 3, we analyze the determinants of the demand for information, and how demand and supply affect trading volume, price movements, firm betas, and risk premia. Section 4 analyzes momentum and long-term price reversals. Section 5 examines the role played by institutional ownership. Section 6 concludes.

2. Data and Sample Statistics

2.1 Sample Construction

Bloomberg provides data that include transformed measures of news reading and news searching activity on Bloomberg's terminals. The majority of Bloomberg terminal users are likely to be institutional investors who have both the incentives and financial resources to quickly react to important news about a firm (Ben-Rephael, Da and Israelsen, 2016). Based on data availability, our sample period ranges from February 2010-December 2015.[2] Following Da, Engelberg, and Gao (2011), we begin with the sample of Russell 3000 stocks. We then require stocks in our sample to satisfy the following conditions: (1) have measures of news-searching and news-reading activity on Bloomberg terminals and Google search engine; (2) have a share code of 10 or 11 in the Center for Research in Securities Prices (CRSP) database; (3) have stock prices greater than or equal to $5 at the end of the previous month; (4) have book-to-market information for the DGTW risk adjustment (Daniel, Grinblatt, Titman, and Wermers, 1997). After applying these conditions, we end up with 2,549 stocks and 1,949,960 day-stock observations.

2.2 Measures of the Demand for Information

Our two measures of demand for information are based on institutional and retail attention. In order to construct their own measure of attention, Bloomberg records the number of times news

[2] Bloomberg's historical attention measures begin on 2/17/2010. Historical data are missing for the periods of 12/6/2010 – 1/7/2011 and 8/17/2011 – 11/2/2011.

articles on a particular stock are read by its terminal users and the number of times users actively search for news about a specific stock. Searching for news requires users to actively type the firm's stock ticker symbol followed by the function "CN" (Company News). In contrast, users may read an article without initially realizing it refers to a specific firm. In order to place more emphasis on deliberate news seeking for a specific firm, Bloomberg assigns a score of 10 when users search for news and 1 when users read a news article. These numbers are then aggregated into hourly counts. Using the hourly counts, Bloomberg then creates a numerical attention score each hour by comparing the average hourly count during the previous 8 hours to all hourly counts over the previous month for the same stock. They assign a score of 0 if the rolling average is in the lowest 80% of the hourly counts over the previous 30 days. Similarly, Bloomberg assigns a score of 1, 2, 3 or 4 if the average is between 80% and 90%, 90% and 94%, 94% and 96%, or greater than 96% of the previous 30 days' hourly counts, respectively. Finally, Bloomberg aggregates up to the daily frequency by taking a maximum of all hourly scores throughout the calendar day. Bloomberg provides these latter transformed scores, but does not provide the raw hourly counts or scores.

The data appendix contains detailed instructions explaining how to download the data from the Bloomberg terminal.[3] Since we are interested in abnormal attention, and not just the level of attention, our abnormal institutional attention measure (*AIA*) measure is a dummy variable that takes a value of 1 if Bloomberg's daily maximum is 3 or 4, and 0 otherwise. This captures the right tail of the measure's distribution. In other words, an *AIA* equal to one indicates the existence of institutional investor attention shock on that stock during that day. The dummy variable allows easier interpretation of the differential impact of high vs. low institutional attention shocks on

[3] Please see the online data appendix at the authors' websites for detailed instructions on downloading the Bloomberg search data: http://kelley.iu.edu/abenreph/ , http://www3.nd.edu/~zda/ or http://kelley.iu.edu/risraels/

economic outcomes. Ben-Rephael et al. (2016) provide evidence that *AIA* facilitates the incorporation of information into prices.

Following Da et al. (2011), retail attention is measured using the daily Google Search Volume Index (*DSVI*). Abnormal *DSVI* (*ADSVI*) is calculated as the natural log of the ratio of *DSVI* to the average of *DSVI* over the previous month. To facilitate the comparison with *AIA* which is a dummy variable, we also create a dummy variable version of *ADSVI* following Bloomberg's methodology (*DADSVI*). Specifically, we assign *DSVI* on day *t* one of the potential 0, 1, 2, 3, or 4 scores using the firm's past 30 trading day *DSVI* values. For example, if *DSVI* on day *t* is in the lowest 80% of past *DSVI* values, it receives the score 0. Then, on day *t*, the dummy variable *DADSVI* is set to one if the score is 3 or 4, and 0 otherwise. In other words, a *DADSVI* of one indicates a spike in retail attention on that day.

2.3 Measures of the Supply of Information

Our two measures of the supply of information are based on general news and earnings announcements. We obtain news coverage of our sample stocks from RavenPack. To facilitate the economical comparison with *AIA* and *DADSVI*, we construct a dummy variable, denoted as *NDAY*, which is equal to one for stock *i* if a news article about the firm is published on the Dow Jones Newswire on day *t* and zero otherwise. Because we want to distinguish earnings announcements from other news, we set *NDAY* equal to zero on earnings announcement days. We obtain earning announcements dates from I/B/E/S. Similar to *NDAY*, we construct a dummy variable, denoted as *EDAY*, which is equal to one for stock *i* on days when the firm announces earnings and zero otherwise.

For each firm we calculate the value-weighted averages of *NDAY* and *EDAY* for other firms in the same (Fama French 48) industry, which we call *FF48_NDAY* and *FF48_EDAY*, respectively. In addition, we create two similar variables, *AGG_NDAY*, and *AGG_EDAY*, which capture the value-weighted averages of *NDAY* and *EDAY* using all firms in the sample on a given day.

Finally, we include several measures based on important macroeconomic news announcements. Because there are macroeconomic announcements almost every day, we limit ourselves to those that draw the most attention from institutional investors on Bloomberg terminals.[4] Those include announcements of nonfarm payroll (which we denote as *NFP*), the producer price index (*PPI*), the Federal Open Market Committee rate decision (*FOMC*), the "advance" forecast of the U.S. Gross Domestic Product (*GDP*), and the Institute for Supply Management Manufacturing Index (*ISM*). Announcement dates and times are all from Bloomberg. For each of these five announcements, we create dummy variables equal to one on announcement days and zero on other days. In addition to the five individual dummy variables, we also create the dummy variable *MACRO* which is set equal to one on days when at least one of the five announcement dummies is equal to one and zero otherwise.

In terms of timing, *NDAY* and *EDAY* are defined based on market trading hours. In particular, day *t* is a news day for firm *i* if the timestamp of the news article is between 4 p.m. on day *t*-1 and 4 p.m. on day *t*. Similarly, day *t* is an earnings announcement day for firm *i* if the firm

[4] For macro announcements, attention is measured based on Bloomberg's "relevance score" which represents the number of "alerts" set on Bloomberg Terminals for an economic event relative to all alerts set for the 130 macro events in the U.S. Users can choose to be alerted to different types of announcement events.

announces its earnings during the period from 4 p.m. on day *t*-1 to 4 p.m. on day *t*. The time stamps associated with earnings announcements are obtained from I/B/E/S.[5]

Other variables used in our analysis are constructed from Compustat and CRSP. Table 1 defines all of the variables used in this paper.

Insert Table 1 about here.

2.4 Summary Statistics

Panel A of Table 2 provides summary statistics. The average frequency of *AIA* across stocks is 0.088 in the full sample suggesting that the average stock in our sample experiences an information demand shock from institutional investors on 8.8% of all trading days. The average frequency of information demand shocks by retail investors is similar at 0.087.

Insert Table 2 about here.

Exploring the supply of information variables, for a typical firm in our sample, about one day out of four is a news day on average. Not surprisingly, firms have an average of four earnings announcement days per year.

Because we exclude stocks with prices less than $5, the typical firm is not small. The average (median) size is around 7.1 (1.4) billion. On average, $60 million dollars' worth of shares

[5] According to Michaely, Rubin, and Vedrashko (2014), these time stamps are very accurate and should result in very few misclassification errors at a daily frequency. Stock returns on day *t* are measured from the market close (4 p.m.) on day *t*-1 to the market close (4 p.m.) on day *t*. *AIA* and *DADSVI* on day *t* are measured during the 24 hours on that calendar day.

are traded per day for a given stock. Finally, the mean (median) daily return in our sample is 4.3 (5.7) basis points.

Panel B of Table 2 provides cross-tabulations for each pair of the four information supply and demand based on percentages of all day-stock observations as well as cross-tabulations including the dummy variables *DEMAND*, and *SUPPLY* which are set equal to 1 at least one of the corresponding demand or supply measures is equal to 1, and 0 otherwise. The bottom right cross tab shows that for a given stock, there is a demand shock on about 20% of all days and a supply shock on about 28% of all days. About 40% of the day-stock observations include either a supply or demand shock.

The four cross-tabs on the left examine *AIA.* There is a slightly positive relation between *AIA* and *DADSVI*. The correlation coefficient of *AIA* and *DADSVI* is only 3.2% and only 1.4% of day-stock observations include demand shocks by both institutional and retail investors. By contrast, the relation between *AIA* and information supply is stronger with correlation coefficients with *NDAY* and *EDAY* of 11% and 23%, respectively.

The second cross-tab on the left side shows that institutional demand shocks are more likely to come on days with and without (non-earnings-announcement) news and only about 16% of news days draw abnormal attention. The third cross tab on the left side shows that about 2/3 of earnings days coincide with institutional demand shocks. In the next section, we examine how each of these sub-cases is related to the risk premium.

The final cross-tab on the left shows that days with institutional demand shocks are split evenly between days with and without supply shocks.

The right column of cross tabs-examine pairs of the remaining three measures. There is a weak, positive relation between *DADSVI* and the supply measures. By construction, earnings days are orthogonal to news days.

3. Demand for Information, Systematic Risk, and the Risk Premium

3.1 Information Demand and Supply

We examine the relation between the demand for information and the risk premium. We first examine what drives institutional demand shocks. In Table 3, we regress *AIA* on measures of information supply at the firm, industry and macroeconomic level. Our firm-level measures are *NDAY* and *EDAY*. To capture important news at the industry level, we include the variables *FF48_NDAY* and *FF48_EDAY*. The variables *AGG_NDAY* and *AGG_EDAY* capture aggregate news and earnings announcements, placing more importance on larger firms. We also include either our five macroeconomic announcement dummy variables, *NFP*, *PPI*, *FOMC*, *GDP*, and *ISM*, or the combined *MACRO* dummy variable. Additionally, we include day-of-the-week dummies to capture seasonality in attention that been previously documented (DellaVigna and Pollet, 2009; Liu and Peng, 2015; and Ben-Rephael et al. 2016), and the retail attention measure, *DADSVI*. Finally, we include combinations of firm level characteristics and *AbsRet*. The table presents the results of these Logit panel regressions.

Insert Table 3 about here.

In general, we find firm- and industry-level news and earnings announcements to be related to greater institutional demand for information. The results suggest that in periods with more firm-level news and news about firms in the industry or the entire market, institutional investors are more likely to demand information for a stock. This is intuitive given that news about firms in an industry may have important implications for other firms in the industry.

Additionally, we find that when there is more news about large firms in the wider market, demand for information is more likely to be high. News about large firms may have systematic implications for other stocks, even when these firms are in different industries... Finally, in all cases, earnings news is more important for information demand than other news. Note, however, that the frequency of earnings announcements is significantly lower.

Focusing on macro news, the first three specifications include the *MACRO* dummy variable, while the final three include dummy variables for the five individual macroeconomic announcements. These events generally coincide with institutional demand shocks. The FOMC rate announcements seem to draw the most attention.

In sum, the collective evidence suggests that when there is news about other important firms in the industry, news about large firms in general, or macroeconomic news, institutional investors are more likely to demand information for a given stock. Hence, shocks in investor demand are related to news that is systematic in nature. This response of institutional demand to information provides a channel through which systematic risk is transmitted across the market.

3.2 Demand for Information, Trading Volume, Price Volatility and Firm Betas

In Table 4, we examine the impact of both information supply and information demand on trading volume and price movement. In particular, we expect information demand shocks to be associated with higher trading volume and larger price movements. The key point is to compare the economic magnitude across the different measures.

The first set of columns present coefficients for Fama MacBeth (1973) regressions of four abnormal volume measures on *AIA*, *DADSVI*, *NDAY* and *EDAY*. The first three measures – *AbnVol_63*, *AbnVol_126*, and *AbnVol_252* – measure the stock's abnormal trading volume calculated following Barber and Odean (2008) as the stock's daily volume divided by the previous 63-, 126-, and 252-day average trading volume, respectively. The fourth measure of abnormal trading volume, *DAVOL*, is a dummy variable that is equal to one if trading volume is abnormal and 0 otherwise. The measure is calculated using the same methodology used to create *DADSVI.*

For all four measures, earnings announcement days are associated with the most abnormal trading volume. Coefficients are about 3 times as large as those on *AIA*. However, since days with abnormal institutional investor attention are 6 times as common as earnings announcement days (see Table 2), *AIA* is associated with more aggregate abnormal trading volume for a given firm. Days with news and days with abnormal retail attention are also associated with higher abnormal volume, but the economic magnitude is relatively small.

Insert Table 4 about here.

The final three columns of the table measure the impact of information supply and demand shocks on price movement. We examine absolute returns (*AbsRet*), absolute DGTW adjusted returns (*AbsDGTW*), and squared returns (*Ret*^2). As was the case with abnormal volume, days earnings announcement days see the largest price movements. On average, prices move by 267 basis points. On days with an information demand shock by institutional investors, prices move by an additional 85 basis points. For all three measures, the next most important event is the supply of news. Finally, retail attention is also associated with more absolute price movement, but the economic magnitude is small, around 6-7 basis points.

We next examine whether systematic risk is higher on days with information demand shocks or information supply shocks. Specifically, estimate a time varying factor loading CAPM beta model for each stock using variations of the following model:

$$ERet_{it} = \alpha_i + \beta_{i1} \times MKTRF_t + \beta_{i2} \times MKTRF_t \times AIA_t + \beta_{i3} \times MKTRF_t \times DADSVI_t$$
$$+ \beta_{i4} \times MKTRF_t \times NDAY_t + \beta_{i5} \times MKTRF_t \times EDAY_t + \varepsilon_{it}$$

where *ERet* is the stock return minus the risk free rate (in basis points), and *MKTRF* is the market return minus the risk free rate (in basis points).

Insert Table 5 about here.

The first three specifications in Table 5 report the equally weighted cross-sectional means of firm level time-series regressions. Betas on days with no supply or demand shocks are about 1, on average. In the first specification, we interact the two information demand shock dummy variables with the market excess return. The table shows that CAPM beta is higher by about 0.28 (0.13) on days with information demand by institutional (retail) investors.

In the second specification, we include only interactions with information supply day measures. Betas are higher for both measures and statistically significant. However, as shown in specification 3, after controlling for information demand, the relations are no longer statistically significant.

In the final three specifications in Table 5, we estimate our model using panel regressions with stock-level fixed effects and standard errors clustered by date. The results are similar to those from the time-series regressions with two exceptions. First, the magnitudes are lower on the coefficients of the interaction terms. In particular, the CAPM beta is higher by about 0.16 (0.03) on days with information demand by institutional (retail) investors. Second, there is some evidence of a higher beta on earnings announcement days, as seen in specification 5. However, once we control for information demand, the coefficient estimate is no longer significant.

Overall, we confirm that not only is there more abnormal trading and absolute price movement on days with information demand shocks, there is also more systematic risk.

3.3 Demand for Information and the Risk Premium

Having established that AIA is associated with higher trading volume, price movement and beta loadings, we next explore whether days with AIA shocks are associated with a risk premium.

Insert Table 6 about here.

To explore this, in Table 6, we run Fama-MacBeth (1973) cross sectional regressions of daily stock returns on information supply and demand measures as well as various control variables, including 10 lags of returns, squared returns, trading volume, and *NDAY*. The first two specifications of Panel A present results using the information supply variables. News days are associated with an (additional) risk premium of about 5-6 basis points. This number is statistically significant at the 1% level and can be compared to the baseline premium of about 12 or 13 basis points on days with no news. We do not find a significant premium on days with earnings announcements.

In specifications 3 and 4, we examine the two information demand measures. We find that days with abnormal demand for information by institutional investors are associated with an additional risk premium of about 16 basis points per day. Based on the baseline risk premium, that suggests that an overall risk premium of about 30 basis points on these days. Interestingly, days with abnormal demand from retail investors are also associated with a positive return, however, the magnitude is only around 1 basis point.

Specifications 5 and 6 include all four measures of supply and demand. Once we account for all four measures, we confirm that days with information demand by institutional investors are associated with the highest risk premium.

To investigate the source of the impact of *AIA* on risk premiums, we divide *AIA* into two components: *PREDICTED_AIA*, which is defined as the fitted value of *AIA* based on the Logit model in specification 3 of Table 3, and *RESIDUAL_AIA*, which is equal to the difference in *AIA* and *PREDICTED_AIA*. *RESIDUAL_AIA* has a sample mean of 0.10 and standard deviation of 0.12 while *PREDICTED_AIA* has a sample mean and standard deviation of 0.00 and 0.28, respectively. Specification 7 of Panel A reports results of regressing returns on these two variables as well as lags of returns, returns squared and news. The results indicate that both *PREDICTED_AIA* and *RESIDUAL_AIA* are positively related to risk premiums.

Because there may be abnormal supply and demand on the same day (i.e., investors tend to demand information when there is news), we next examine the incremental impact of the four measures of supply and demand independent of each other. Because *AIA* appears to have the biggest impact on the risk premium, we further explore the interaction of *AIA* with the other three variables, *DADSVI*, *NDAY*, and *EDAY*. Recall, that all four are dummy variables. Thus, we focus on cases where one variable is equal to 1 and the other is equal to 0 and when both are equal to one. The relative frequencies of each of these cases can be seen in Panel B of Table 2.

We reports the results in Panel B, where we extend Panel A's analysis by including the interaction terms. The first two columns of Panel B examine the impact of the interplay between institutional and retail demand for information on the risk premium. As can be seen by the coefficients on the three interaction dummies, when there is abnormal institutional demand for information, but no abnormal retail demand, the risk premium is about 14 basis points higher than the baseline. By contrast, when there is no abnormal demand for information by institutional investors, but there is a retail demand shock, there is no additional risk premium. Only when abnormal retail attention is accompanied by institutional attention is there an additional premium of about 20 basis points per day. The 6 basis points difference is not statistically significant.

Specifications 3 and 4 examine the interplay between institutional demand and the supply of news. When there is the supply of information, but no institutional demand shock, the risk premium is about 4 basis points higher. Strikingly, when there is abnormal demand for information by institutional investors, but no news, the risk premium is 14 basis points higher; and the difference of 12 basis points is statistically significant. Moreover, the *AIA1_NDAY1* coefficient indicates that when there is both the supply of news and institutional demand, the additional risk premium is larger, at 20 to 21 basis points. However, this difference is not statistically significant than the case with only an institutional attention shock.

The final two specifications show that the additional risk premium when there is abnormal institutional attention is not driven by earnings announcements. While there is weak evidence of an additional premium when earnings announcements are accompanied by an attention shock, the statistically significant coefficients on the variable *AIA1_EDAY0* confirm that the most important determinant of the risk premium is not the supply of information, but the demand for information. In the next section, we examine whether information supply or demand help mitigate or exacerbate mispricing.

4. Demand for Information and Mispricing

To study the impact of both the supply of information and the demand for information on mispricing, we focus on two related and well-known “anomalies”: momentum, and long-term reversal. Daniel, Hirshleifer and Subrahmanyam (1998) propose a unified behavioral explanation of momentum and long-run reversal. In particular, overconfidence together with biased self-attribution could lead to these price effects. Given the recent body of literature on anomalies (e.g., Stambaugh, Yu and Yuan, 2015, Stambaugh and Yuan 2016, and Engberg, McLean and Pontiff, 2016), it is of interest to examine whether shocks in information demand by institutional investors aid in reducing mispricing.

To construct the momentum scores, for each stock in our sample and at the end of month *t*-1, we calculate the cumulative stock return during months *t*-12 to *t*-2. We then rank all stocks based on these cumulative returns, and transform the ranking to a continuous scale ranging between -1 and 1. A momentum score of 1 refers to the stock with the highest past return and -1 refers to the stock with the lowest past return. We call this continuous variable *Momentum*. Based on the momentum strategy, stocks with *Momentum* scores closer to 1 should continue to outperform stocks with *Momentum* scores closer to -1.

If the momentum effect is associated with overreaction, we would expect abnormal demand for information by institutional investors to mitigate this effect. In other words, we expect that on days when institutional investors are paying close attention, returns of stocks with high *Momentum* scores should have negative returns relative to stocks with low *Momentum* scores. Thus, a negative coefficient on the interaction between momentum and the supply/demand measure is consistent with the mitigation of mispricing. Table 7 provides estimates of these coefficients. The first two specifications examine information demand. The second two examine information supply, and the final two examine both.

Insert Table 7 about here.

Specifications 1 and 2 show that when there is an information demand shock by institutional investors, past winners have stock returns that are about 6 basis points lower than past losers. In contrast, retail investor demand doesn't seem to have an effect. Exploring the impact of information supply, the next two specifications show no statistically significant difference in returns for past winners and past losers. The final set of columns, which include all four measures, confirm the previous results. In fact, the coefficients on the interaction between *Momentum* and *AIA* are even slightly larger. Thus, of the four information supply and demand measures, only AIA has an impact on mispricing. In this case, its role is consistent with a reduction of overreaction. If momentum is driven by overreaction, and given that we find evidence that *AIA* reduces this overreaction, we next test whether *AIA* facilitates long-term reversals.

To examine the impact of information supply and demand on long-term reversal, we create a measure of long-term reversal that is analogous to the momentum measure. In particular, for each stock at the end of month *t*-1, we calculate cumulative returns for months *t*-60 through *t*-13 and rank each stock based on these returns. Since past long-term winners tend to *underperform* past long-term losers, we assign the stock with the highest past return a score of -1 and the stock with the lowest past return a score of 1. We name this continuous variable *Reversal* and repeat the analysis from Table 6, substituting *Reversal* for *Momentum*. Table 8 reports the results.

Insert Table 8 about here.

The first two specifications examine whether the demand for information helps reduce mispricing. The main estimates of interest are the coefficients on the interactions between *Reversal* and *AIA* and *DADSVI*. The positive and significant coefficients on the interaction with *AIA* provide evidence that institutional demand for information helps reduce mispricing. Specifically, when there is abnormal attention by institutional investors, past long term losers tend to outperform past long-term winners by about 8-9 basis points per day. We find some evidence that retail attention plays a similar role, though the results are economically weaker and only significant in one of the two specifications.

Specifications 3 and 4 show that the supply of information may reduce mispricing. In particular, on news days, past long-term losers outperform past long-term winners by about 2 basis points per day. However, as was the case with *Momentum*, once we control for all four measures of supply and demand in the last two columns, only *AIA* seems to matter.

5. Institutional Ownership, Risk Premium and Mispricing

In this section, we examine whether the results on the role of information supply and demand on the risk premium and mispricing vary based on the composition of a stock's shareholders. Specifically, each month, we split the stocks in our sample into two groups based on whether the institutional ownership is below median (denoted Low *InstOwn*) or above median (denoted High *InstOwn*). We then run the analyses on the risk premium, momentum, and long-term reversal. Table 9 provides these estimates.

Insert Table 9 about here.

Specifications (1) and (2) examine the risk premium for low and high institutional ownership stocks. Low *InstOwn* stocks have an additional risk premium of about 19 basis points on days with institutional demand shocks, while High *InstOwn* stocks have an additional risk premium of 12 basis points. The difference of 7 basis points is statistically significant. We further find that the effect of retail demand shocks on stock prices is about 2 basis points for Low *InstOwn* stocks, and basically 0 for the High InstOwn stocks. The difference between the two premium estimates is only marginally significant. Finally, the risk premium on news days is also larger for Low *InstOwn* stocks, with a premium of 6 basis points compared to 3 basis points for the high *InstOwn* stocks, and the difference is also statistically significant.

The next two specifications examine mispricing in the form of momentum. The role of *AIA* in reducing overreaction to past returns seems to be economically stronger for low institutional ownership. However, the difference between the two samples is not statistically significance. In contrast, focusing on *Reversal* (Specifications 5 and 6), we find that the difference in the effect of AIA between the low and high samples is statistically significant. In particular, on days with abnormal institutional attention, past long-term winners underperform winners by about 13 basis points in the Low *InstOwn* sample, compared to 4 basis points in the High *InstOwn* sample.

To recap, overall, the results indicate that information demand shocks are associated with larger risk premiums, reduce overreaction to past returns, and aid in reversion of stock returns are much stronger in stocks with low institutional ownership.

6. Conclusion

Understanding the relation between information and asset pricing is fundamentally important. Recent evidence suggests that the arrival of information is associated with a risk premium (Savor and Wilson, 2014; and Lucca and Moench, 2015).

Exploring this relation, researchers have focused on information supply measures such as scheduled macroeconomic announcements, earnings reports, and news releases. Since investors have limited attention (e.g., Kahneman, 1973), we argue that only considering the supply of information might understate the effects that new information has on asset prices. Consequently, we add to this growing literature by exploring the effect of investor demand for information.

As our main information demand measure, we use Ben-Rephael, Da and Israelsen (2016)'s abnormal institutional attention measure (AIA), which captures demand shocks from institutions by using data from news-reading and news-searching activity on Bloomberg Terminals.

Exploring the relation between the demand for information and information supply, we find that AIA responds to both firm-level news and important industry- and market-level news. This provides an intuitive link between the demand for information at the stock level and systematic risk. Consistent with that, we find that AIA is associated with higher trading volume, more price volatility and higher CAPM betas.

Motivated by these findings, we explore the relation between information demand and the risk premium and find that the demand for information is indeed associated with a risk premium. Importantly, this relation is much stronger than the effect of information supply.

Finally, we explore whether institutional investor demand for information is also associated with correction of mispricing. Focusing on two economically important anomalies, momentum and long-term reversal, we show that AIA weakens momentum and enhances long-term reversal, which is consistent with Daniel, Hirshleifer, and Subrahmanyam (1998).

In sum, our paper makes several contributions to the asset pricing literature. First, we show that demand for information plays an important role. Second, our results provide a channel through which systematic risk is transmitted across the market. Finally, we provide evidence that when demand for information is high, stock prices become more efficient.

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Table 1. Variable Definitions

Variable	Definition
Information Supply Variables	
NDAY	Dummy variable equal to one on news days for firm *i* and zero otherwise. News days are those on which an article about the firm appears on the Dow Jones Newswire, excluding earnings announcement days. News data are from RavenPack.
EDAY	Dummy variable equal to one on earnings announcement days for firm *i* and zero otherwise. Earnings announcement data are from I/B/E/S.
FF48_NDAY	The value-weighted average of *NDAY* for all other firms in the same Fama French 48 industry as firm *i*. Fama French 48 industry definitions are from Ken French's website. Value weights based on market capitalization are from CRSP.
FF48_EDAY	The value-weighted average of *EDAY* for all firms in the same Fama French 48 industry as firm *i*. Fama French 48 industry definitions are from Ken French's website. Value weights based on market capitalization are from CRSP.
AGG_NDAY	The value-weighted average of *NDAY* for all firms in the sample on day *t*. Value weights based on market capitalization are from CRSP.
AGG_EDAY	The value-weighted average of *EDAY* for all firms in the sample on day *t*. Value weights based on market capitalization are from CRSP.
NFP	Dummy variable equal to one on days with an announcement of the U.S. nonfarm payroll statistics by the Department of Labor, and zero otherwise. Announcement dates are from Bloomberg.
PPI	Dummy variable equal to one on days with an announcement of the U.S. Producer Price Index numbers by the Bureau of Labor Statistics, and zero otherwise. Announcement dates are from Bloomberg.
FOMC	Dummy variable equal to one on days with an announcement of the Federal Open Market Committee rate decision, and zero otherwise. Announcement dates are from Bloomberg.
GDP	Dummy variable equal to one on days with an announcement of the "advance" estimate of quarterly U.S. Gross Domestic Product by the Bureau of Economic Analysis, and zero otherwise. Announcement dates are from Bloomberg.
ISM	Dummy variable equal to one on days with an announcement of the Institute for Supply Management Manufacturing statistics by Bureau of Labor Statistics, and zero otherwise. Announcement dates are from Bloomberg.
MACRO	Dummy variable equal to one if at least one of *NFP*, *PPI*, *FOMC*, *GDP*, and *ISM* is equal to one, and zero otherwise.

Information Demand Variables

AIA	Bloomberg records the number of times news articles on a particular stock are read by its terminal users and the number of times users actively search for news for a specific stock. Bloomberg then assigns a value of 1 for each article read and 10 for each news search. These numbers are then aggregated into an hourly count. Using the hourly count, Bloomberg then creates a numerical attention score each hour by comparing past 8-hour average count to all hourly counts over the previous month for the same stock. They assign a value of 0 if the rolling average is in the lowest 80% of the hourly counts over the previous 30 days. Similarly, Bloomberg assigns a score of 1, 2, 3 or 4 if the average is between 80% and 90%, 90% and 94%, 94% and 96%, or greater than 96% of the previous 30 days' hourly counts, respectively. Finally, Bloomberg aggregates up to the daily frequency by taking a maximum of all hourly scores throughout the day. These are the data provided to us by Bloomberg. Since we are interested in abnormal attention, our *AIA* measure is a dummy variable that receives a value of 1 if Bloomberg's score is 3 or 4, and 0 otherwise. This captures the right tail of the measure's distribution.
ISM	Dummy variable equal to one on days with an announcement of the Institute for Supply Management Manufacturing statistics by Bureau of Labor Statistics, and zero otherwise. Announcement dates are from Bloomberg.
DADSVI	We follow Bloomberg's methodology and assign Google's daily search volume index (*DSVI*) on day *t* one of the potential 0, 1, 2, 3, or 4 scores using the firm's past 30 trading day *DSVI* values. For example, if *DSVI* on day *t* is in the lowest 80% of past *DSVI* values, it receives the score 0. *DADSVI* is equal to one on day *t* if the score is 3 or 4, and 0 otherwise.

Other Variables

Ret	CRSP's daily stock return, reported in basis points (i.e., times 10,000) for ease of presentation.
AbsRet	Absolute value of *Ret*.
Ret^2	*Ret* squared.
DGTW	CRSP's daily stock return minus the stock's benchmark portfolio daily return following Daniel, Grinblatt, Titman and Wermers (1997), reported in basis points.
AbsDGTW	Absolute value of *DGTW*.
AbnVol_63	The stock's abnormal trading volume calculated following Barber and Odean (2008) as the stock's daily volume divided by the previous 63-day average trading volume.

AbnVol_126	The stock's abnormal trading volume calculated following Barber and Odean (2008) as the stock's daily volume divided by the previous 126-day average trading volume.
AbnVol_252	The stock's abnormal trading volume calculated following Barber and Odean (2008) as the stock's daily volume divided by the previous 252-day average trading volume.
DolVol	The daily dollar trading volume in millions of dollars.
DAVOL	We follow Bloomberg's methodology and assign the daily trading volume (Vol) on day *t* one of the potential 0, 1, 2, 3, or 4 scores using the firm's past 30 trading day trading volume values. For example, if *Vol* on day *t* is in the lowest 80% of past *Vol* values, it receives the score 0. *DAVOL* is equal to one on day *t* if the score is 3 or 4, and 0 otherwise.
InstOwn	The percentage of shares held by institutional investors obtained from the Thomson Reuters CDA/Spectrum institutional holdings' (S34) database.
SizeInM	Stock's market capitalization, rebalanced every June, in millions of dollars.
LnSize	The log of the stock's average size in millions of dollars from day *t-27* to *t-6.*
LnBM	The natural logarithm of the firm's book-to-market ratio rebalanced every June following Fama-French (1992).
RF	The risk free rate of return from Ken French's website, reported in basis points.
ERet	The stock's daily return *(Ret)* in excess of the risk free rate (*RF*), reported in basis points.
MKTRF	The market return in excess of the risk free rate, reported in basis points, from Ken French's website.
Momentum	A continuous variable ranging between -1 and 1, indicating the relative ranking at the end of month t-1of the cumulative returns from month t-12 to month t-2. Firms are sorted and ranked based on past returns and rankings are rescaled such that the firm with the highest (lowest) past return has a Momentum value of 1 (-1). Stock returns are from CRSP.
Reversal	A continuous variable ranging between -1 and 1, indicating the relative ranking at the end of month t-1of the cumulative returns from month t-60 to month t-13. Firms are sorted and ranked based on past returns and rankings are rescaled such that the firm with the lowest (highest) past return has a Reversal value of 1 (-1).

Table 2. Summary Statistics

The table reports the summary statistics of our Abnormal Institutional Attention measure (*AIA*) and other selected variables from February 2010-December 2015. Our sample includes Russell 3,000 stocks with CRSP Share Codes 10 and 11, *AIA* and Google daily search volume data, book-to-market information, and end of previous month price of at least $5. This results in 1,949,960 day-stock observations across 2,549 unique stocks. All variables are defined in Table 1. In Panel A, *Num Firms* reports the number of unique firms. Mean, Median, and SD refer to the cross-sectional average, median, and standard deviation of the firms' time series averages. Panel B presents cross-tabulations between the four measures of information supply and demand as well as the measure *SUPPLY* which is equal to 1 if either *EDAY* or *NDAY* is 1, or zero otherwise, and the dummy variable *DEMAND*, which is equal to 1 if either *AIA* or DADSVI is 1, or zero otherwise. Percentages of the total number of day-stock observations are reported.

Panel 2.A – Mean, Median and Standard Deviation

Variable	Mean	Median	SD
Num Firms	2,549		
AIA	0.088	0.066	0.089
DADSVI	0.087	0.094	0.040
NDAY	0.235	0.239	0.138
EDAY	0.015	0.016	0.005
Ret (in basis points)	4.25	5.69	24.03
DolVol	60.17	12.96	203.31
BM	0.607	0.520	0.795
LnBM	-0.820	-0.664	0.850
SizeInM	7,135	1,391	23,848
LnSize	7.381	7.197	1.534
InstOwn	0.602	0.637	0.189

Panel 2.B – Cross Tabulations (Percentages of Day-Stock Observations)

	AIA = 1		
DADSVI = 1	No	Yes	Total
No	80.5%	9.1%	89.6%
Yes	9.0%	1.4%	10.4%
Total	89.5%	10.5%	

	DADSVI = 1		
NDAY = 1	No	Yes	Total
No	66.0%	7.6%	73.7%
Yes	23.5%	2.8%	26.3%
Total	89.6%	10.4%	

	AIA = 1		
NDAY = 1	No	Yes	Total
No	67.5%	6.2%	73.7%
Yes	22.0%	4.3%	26.3%
Total	89.6%	10.4%	

	DADSVI = 1		
EDAY = 1	No	Yes	Total
No	88.3%	10.2%	98.5%
Yes	1.3%	0.3%	1.5%
Total	89.6%	10.4%	

	AIA = 1		
EDAY = 1	No	Yes	Total
No	89.0%	9.4%	98.5%
Yes	0.5%	1.0%	1.5%
Total	89.5%	10.5%	

	NDAY = 1		
EDAY = 1	No	Yes	Total
No	72.1%	26.3%	98.5%
Yes	1.5%	0.0%	1.5%
Total	73.7%	26.3%	

	AIA = 1		
SUPPLY = 1	No	Yes	Total
No	67.0%	5.1%	72.1%
Yes	22.6%	5.3%	27.9%
Total	89.6%	10.4%	

	DEMAND = 1		
SUPPLY = 1	No	Yes	Total
No	60.2%	11.9%	72.1%
Yes	20.3%	7.6%	27.9%
Total	80.5%	19.5%	

Table 3. Determinants of Institutional Demand

The table reports results from Logit panel regressions of the Abnormal Institutional Attention measure (*AIA*) from Bloomberg on information demand by retail investors (*DADSVI*), various measures of information supply and additional control variables. All variables are defined in Table 1. *DADSVI* is based on Google's daily Search Volume Index. The information supply measures include a news day dummy (*NDAY*) and an earnings announcement day dummy (*EDAY*). Also included are the value weighted average of *NDAY* for firm *i*''s (Fama French 48) industry (excluding firm *i*) (*FF48_NDAY*), and a similar measure using earnings announcements (*FF48_ENDAY*) as well as value weighted measures at the market level for news (*AGG_NDAY*) and earnings announcements (*AGG_EDAY)*. The first three specifications include a dummy variable indicating that that there was at least one of five major macroeconomic news announcements that day (*MACRO*). The last three specifications include individual dummy variables for each of the five macroeconomic news announcements: Nonfarm Payroll (*NFP*), Producer Price Index (*PPI*), the FOMC rate announcement (*FOMC*), the advance estimate for GDP (*GDP*), and the ISM Manufacturing index (*ISM*). Macroeconomic announcement dates are from Bloomberg. Additional control variables include the natural logarithm of the firm's market capitalization (*LnSize*); the natural logarithm of the firm's book-to-market ratio (*LnBM*); the stock's level of institutional ownership (*InstOwn*); the absolute return of the stock (*AbsRet*); and day-of-the week dummy variables *Tuesday*, *Wednesday*, *Thursday*, and *Friday*. Standard errors, clustered by stock, are reported in parentheses. Statistical significance at the 10%, 5%, and 1% level is indicated with *, **, and ***, respectively.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-2.847	-3.096	-7.766	-2.847	-3.095	-7.765
	(0.037) ***	(0.037) ***	(0.115) ***	(0.037) ***	(0.037) ***	(0.115) ***
DADSVI	0.242	0.219	0.195	0.243	0.219	0.195
	(0.014) ***	(0.014) ***	(0.014) ***	(0.014) ***	(0.014) ***	(0.014) ***
NDAY	0.896	0.898	0.484	0.896	0.898	0.484
	(0.021) ***	(0.021) ***	(0.013) ***	(0.021) ***	(0.021) ***	(0.013) ***
EDAY	3.216	2.779	2.748	3.218	2.782	2.752
	(0.027) ***	(0.029) ***	(0.030) ***	(0.027) ***	(0.029) ***	(0.030) ***
FF48_NDAY	0.218	0.227	-0.043	0.219	0.227	-0.043
	(0.066) ***	(0.068) ***	(0.042)	(0.066) ***	(0.068) ***	(0.042)
FF48_EDAY	0.798	0.874	0.684	0.798	0.873	0.685
	(0.075) ***	(0.076) ***	(0.076) ***	(0.075) ***	(0.076) ***	(0.076) ***
AGG_NDAY	0.758	0.667	0.946	0.760	0.669	0.948
	(0.077) ***	(0.078) ***	(0.062) ***	(0.077) ***	(0.078) ***	(0.062) ***
AGG_EDAY	1.287	1.212	1.390	1.402	1.311	1.507
	(0.212) ***	(0.214) ***	(0.223) ***	(0.211) ***	(0.212) ***	(0.222) ***
MACRO	0.043	0.012	0.000			
	(0.007) ***	(0.007)	(0.008)			
NFP				0.054	0.018	0.002
				(0.016) ***	(0.017)	(0.017)
PPI				0.059	0.064	0.074
				(0.012) ***	(0.012) ***	(0.013) ***
FOMC				0.100	0.054	0.034
				(0.016) ***	(0.017) ***	(0.018) *
GDP				-0.092	-0.084	-0.101
				(0.022) ***	(0.023) ***	(0.024) ***
ISM				0.030	-0.016	-0.035
				(0.012) **	(0.012)	(0.013) ***
Tuesday	-0.152	-0.146	-0.168	-0.157	-0.152	-0.175
	(0.009) ***	(0.009) ***	(0.009) ***	(0.009) ***	(0.009) ***	(0.009) ***
Wednesday	-0.253	-0.247	-0.278	-0.263	-0.258	-0.289
	(0.010) ***	(0.010) ***	(0.011) ***	(0.010) ***	(0.010) ***	(0.011) ***
Thursday	-0.302	-0.300	-0.353	-0.304	-0.305	-0.360
	(0.012) ***	(0.012) ***	(0.012) ***	(0.012) ***	(0.012) ***	(0.012) ***
Friday	-0.669	-0.657	-0.694	-0.670	-0.661	-0.699
	(0.011) ***	(0.011) ***	(0.011) ***	(0.011) ***	(0.011) ***	(0.012) ***
AbsRet		0.002	0.003		0.002	0.003
		(0.000) ***	(0.000) ***		(0.000) ***	(0.000) ***
LnSize			0.521			0.521
			(0.009) ***			(0.009) ***
LnBM			0.059			0.059
			(0.023) **			(0.023) **
InstOwn			0.598			0.597
			(0.108) ***			(0.108) ***
N OBS	1,949,960	1,949,960	1,949,960	1,949,960	1,949,960	1,949,960
Pseudo R Squared	0.103	0.124	0.231	0.103	0.124	0.231

Table 4. Information Supply and Demand, Trading Volume, and Stock Price Movements

The table reports results from Fama-MacBeth (1973) cross sectional regressions of various measures of trading volume ("*Volume Measures*") and stock price movements ("*Price Measures*") on measures of information supply, information demand and additional control variables. All variables are defined in Table 1. The two information demand measures are the Abnormal Institutional Attention measure (*AIA*) from Bloomberg and the abnormal retail attention dummy (*DADSVI*) based on Google's daily Search Volume Index. The two information supply measures are a news day dummy (*NDAY*) and an earnings announcement day dummy (*EDAY*). Additional control variables include the natural logarithm of the firm's market capitalization (*LnSize*); the natural logarithm of the firm's book-to-market ratio (*LnBM*); Ten lags of returns, squared returns, and trading volume. Standard errors estimated using the Newey-West adjustment with 10 lags are reported in parentheses. Statistical significance at the 10%, 5%, and 1% level is indicated with *, **, and ***, respectively.

	Volume Measures				*Price Measures*		
Variable	*AbnVol_63*	*AbnVol_126*	*AbnVol_252*	*DAVOL*	*Abs(Ret)*	*Abs(DGTW)*	*Ret^2*
Intercept	1.134	1.133	1.151	1.151	217.020	215.680	10.371
	(0.023) ***	(0.025) ***	(0.027) ***	(0.027) ***	(2.560) ***	(2.210) ***	(0.405) ***
AIA	0.457	0.454	0.465	0.465	85.210	80.030	8.873
	(0.012) ***	(0.013) ***	(0.013) ***	(0.013) ***	(1.810) ***	(1.630) ***	(0.467) ***
DADSVI	0.052	0.051	0.050	0.050	6.980	6.410	1.738
	(0.005) ***	(0.005) ***	(0.005) ***	(0.005) ***	(0.680) ***	(0.610) ***	(0.206) ***
NDAY	0.125	0.126	0.125	0.125	14.540	13.940	2.203
	(0.005) ***	(0.005) ***	(0.005) ***	(0.005) ***	(0.490) ***	(0.480) ***	(0.149) ***
EDAY	1.721	1.644	1.593	1.593	277.460	275.820	36.195
	(0.053) ***	(0.048) ***	(0.046) ***	(0.046) ***	(8.280) ***	(7.900) ***	(1.750) ***
LnSize	-0.025	-0.026	-0.030	-0.030	-16.530	-18.100	-1.280
	(0.003) ***	(0.003) ***	(0.003) ***	(0.003) ***	(0.290) ***	(0.220) ***	(0.055) ***
LnBM	0.006	0.005	0.000	0.000	-6.190	-7.470	-0.666
	(0.002) ***	(0.002) **	(0.003)	(0.003)	(0.420) ***	(0.380) ***	(0.060) ***
10 Lags of Returns?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10 Lags of Squared Returns?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10 Lags of Volume?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10 Lags of NDAY?	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 5. Information Supply and Demand and Betas

The table reports results from regressions of daily excess stock returns on excess market returns and on interactions of excess market returns with measures of information supply and information demand. All variables are defined in Table 1. Excess return (*ERet*) is measured relative to the risk free rate (*RF)*. Both the market excess return (MKTRF) and the risk free rate are from Ken French's website. The two information demand measures are the Abnormal Institutional Attention measure (*AIA*) from Bloomberg and the abnormal retail attention dummy (*DADSVI*) based on Google's daily Search Volume Index. The two information supply measures are a news day dummy (*NDAY*) and an earnings announcement day dummy (*EDAY*). The first set of columns include cross-sectional means from time-series regressions at the firm level. The second set columns include estimates from panel regressions. For the panel regressions, stock fixed effects are included and standard errors (reported in parentheses) are clustered by date. Statistical significance at the 10%, 5%, and 1% level is indicated with *, **, and ***, respectively.

	CS Means of TS Regressions			Panel Regressions		
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	1.510	1.582	1.563	0.539	0.194	0.538
	(0.665) **	(0.661) **	(0.670) **	(0.885)	(0.913)	(0.885)
MKTRF	1.056	1.074	1.049	1.115	1.147	1.119
	(0.016) ***	(0.012) ***	(0.017) ***	(0.014) ***	(0.013) ***	(0.016) ***
*MKTRF*AIA*	0.285		0.278	0.162		0.160
	(0.132) **		(0.133) **	(0.018) ***		(0.017) ***
*MKTRF*DADSVI*	0.122		0.133	0.030		0.029
	(0.041) ***		(0.038) ***	(0.008) ***		(0.008) ***
*MKTRF*NDAY*		0.091	0.060		0.004	-0.018
		(0.037) **	(0.037)		(0.009)	(0.011) *
*MKTRF*EDAY*		0.352	0.184		0.111	0.050
		(0.202) *	(0.197)		(0.040) ***	(0.045)
Stock Fixed Effects?	---	---	---	Yes	Yes	Yes

Table 6. Information Supply and Demand and the Risk Premium

The table reports results from Fama-MacBeth (1973) cross sectional regressions of daily returns on measures of information supply, information demand and additional control variables. All variables are defined in Table 1. The two information demand measures are the Abnormal Institutional Attention measure (*AIA*) from Bloomberg and the abnormal retail attention dummy (*DADSVI*) based on Google's daily Search Volume Index. Additionally, the variables *PREDICTED_AIA* and *RESIDUAL_AIA* are the fitted and residual values, respectively, from the model in specification 3 of Table 3. The two information supply measures are a news day dummy (*NDAY*) and an earnings announcement day dummy (*EDAY*). Panel A reports the information supply and demand main effects. Panel B also includes the interaction terms between *AIA* and *DADSVI*, *NDAY* and *EDAY*, respectively. Consider, for example, the interaction between *AIA* and *NDAY*. We focus on the following three cases: *AIA* equals to 0 and the other dummy variable equals to 1 (denoted as *AIA0_NDAY1*); *AIA* equals to 1 and the other dummy variable equals to 0 (denoted as *AIA1_NDAY0*); and *AIA* equals to 1 and the other dummy variable equal to 1 (denoted as *AIA1_NDAY1*). Additional control variables include the natural logarithm of the firm's market capitalization (*LnSize*); the natural logarithm of the firm's book-to-market ratio (*LnBM*). When indicated, we also control for ten lags of returns, squared returns, and trading volume. Standard errors estimated using the Newey-West adjustment with 10 lags are reported in parentheses. Statistical significance at the 10%, 5%, and 1% level is indicated with *, **, and ***, respectively.

Panel 6.A – Information Supply and Demand Main Effects

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept	11.899	12.482	13.643	14.622	14.611	15.089	1.339
	(4.632) **	(4.058) ***	(4.814) ***	(4.180) ***	(4.802) ***	(4.168) ***	(1.713)
NDAY	5.019	5.944			3.929	4.698	
	(0.512) ***	(0.524) ***			(0.436) ***	(0.465) ***	
EDAY	-2.478	-1.430			-11.143	-9.912	
	(8.379)	(8.298)			(8.327)	(8.216)	
AIA			15.661	15.948	14.883	14.986	
			(2.099) ***	(1.944) ***	(2.028) ***	(1.862) ***	
DADSVI			1.339	1.267	1.335	1.219	
			(0.571) **	(0.567) **	(0.556) **	(0.552) **	
PREDICTED_AIA							113.398
							(14.326) ***
RESIDUAL_AIA							4.657
							(1.421) ***
LnSize	-1.008	-0.925	-1.283	-1.308	-1.539	-1.439	
	(0.364) ***	(0.380) **	(0.392) ***	(0.400) ***	(0.394) ***	(0.399) ***	
LnBM	-0.551	-0.352	-0.524	-0.336	-0.585	-0.372	
	(0.469)	(0.397)	(0.468)	(0.398)	(0.465)	(0.397)	
10 Lags of Returns?	No	Yes	No	Yes	No	Yes	Yes
10 Lags of Squared Returns?	No	Yes	No	Yes	No	Yes	Yes
10 Lags of Volume?	No	Yes	No	Yes	No	Yes	Yes
10 Lags of NDAY?	No	Yes	No	Yes	No	Yes	Yes

Panel 6.B –Information Supply and Demand Interaction Terms

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	14.690	15.161	14.704	15.083	14.339	14.799
	(4.809) ***	(4.177) ***	(4.799) ***	(4.169) ***	(4.822) ***	(4.190) ***
DADSVI			1.316	1.200	1.316	1.198
			(0.559) **	(0.556) **	(0.553) **	(0.551) **
AIA0_DADSVI1	0.640	0.483				
	(0.416)	(0.425)				
AIA1_DADSVI0	14.096	14.280				
	(1.977) ***	(1.799) ***				
AIA1_DADSVI1	20.092	19.618				
	(4.340) ***	(4.493) ***				
NDAY	3.906	4.675			3.769	4.513
	(0.434) ***	(0.462) ***			(0.435) ***	(0.464) ***
AIA0_NDAY1			3.618	4.391		
			(0.393) ***	(0.418) ***		
AIA1_NDAY0			14.167	14.347		
			(2.165) ***	(1.964) ***		
AIA1_NDAY1			19.614	20.617		
			(2.794) ***	(2.663) ***		
EDAY	-11.188	-10.266	-10.721	-9.646		
	(8.375)	(8.250)	(8.311)	(8.189)		
AIA0_EDAY1					14.995	16.069
					(9.786)	(9.730) *
AIA1_EDAY0					16.425	16.540
					(2.063) ***	(1.908) ***
AIA1_EDAY1					-6.895	-5.119
					(10.055)	(10.033)
LnSize	-1.538	-1.439	-1.541	-1.429	-1.516	-1.414
	(0.394) ***	(0.399) ***	(0.395) ***	(0.400) ***	(0.396) ***	(0.401) ***
LnBM	-0.586	-0.364	-0.612	-0.392	-0.607	-0.385
	(0.464)	(0.396)	(0.465)	(0.396)	(0.464)	(0.396)
10 Lags of Returns?	No	Yes	No	Yes	No	Yes
10 Lags of Squared Returns?	No	Yes	No	Yes	No	Yes
10 Lags of Volume?	No	Yes	No	Yes	No	Yes
10 Lags of NDAY?	No	Yes	No	Yes	No	Yes

Table 7. Information Supply and Demand and Momentum

The table extends the analysis conducted in Table 6 by including the interaction of our information supply and demand variables with *Momentum*. As defined in Table 1, *Momentum* is a continuous variable ranging between -1 and 1, indicating the relative ranking at the end of month *t*-1 of the cumulative returns from month *t*-12 to month *t*-2; where 1 (-1) refers to the highest (lowest) past return. Standard errors estimated using the Newey-West adjustment with 10 lags are reported in parentheses. Statistical significance at the 10%, 5%, and 1% level is indicated with *, **, and ***, respectively.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	14.343	15.698	12.589	13.729	15.300	16.272
	(4.700) ***	(4.151) ***	(4.539) ***	(4.036) ***	(4.687) ***	(4.137) ***
AIA	15.164	15.540			14.457	14.719
	(2.070) ***	(1.941) ***			(2.009) ***	(1.866) ***
DADSVI	1.307	1.273			1.256	1.200
	(0.557) **	(0.558) **			(0.540) **	(0.538) **
NDAY			4.893	5.793	3.863	4.557
			(0.513) ***	(0.528) ***	(0.417) ***	(0.462) ***
EDAY			-335.562	-324.333	-343.575	-332.303
			(256.649)	(250.909)	(256.146)	(250.526)
Momentum	3.102	2.791	2.420	2.229	2.975	2.715
	(1.014) ***	(0.791) ***	(1.116) **	(0.859) ***	(1.017) ***	(0.801) ***
*Momentum*AIA*	-6.447	-5.683			-7.539	-6.608
	(2.665) **	(2.352) **			(2.638) ***	(2.318) ***
*Momentum*DADSVI*	-0.351	-0.325			-0.480	-0.449
	(1.295)	(1.230)			(1.256)	(1.190)
*Momentum*NDAY*			0.000	0.027	0.376	0.477
			(0.917)	(0.830)	(0.851)	(0.781)
*Momentum*EDAY*			560.260	545.269	560.285	545.280
			(430.843)	(421.270)	(430.325)	(420.823)
LnSize	-1.360	-1.418	-1.083	-1.057	-1.615	-1.560
	(0.383) ***	(0.390) ***	(0.360) ***	(0.372) ***	(0.386) ***	(0.389) ***
LnBM	-0.453	-0.324	-0.519	-0.397	-0.571	-0.422
	(0.448)	(0.392)	(0.453)	(0.394)	(0.446)	(0.391)
10 Lags of Returns?	No	Yes	No	Yes	No	Yes
10 Lags of Squared Returns?	No	Yes	No	Yes	No	Yes
10 Lags of Volume?	No	Yes	No	Yes	No	Yes
10 Lags of NDAY?	No	Yes	No	Yes	No	Yes

Table 8. Information Supply and Demand and Long Term Reversal

The table extends the analysis conducted in Table 6 by including the interaction of our information supply and demand variables with *Reversal*. As defined in Table 1, *Reversal* is a continuous variable ranging between -1 and 1, indicating the relative ranking at the end of month *t*-1 of the cumulative returns from month *t*-60 to month *t*-13; where 1 (-1) refers to the lowest (highest) past return. Standard errors estimated using the Newey-West adjustment with 10 lags are reported in parentheses. Statistical significance at the 10%, 5%, and 1% level is indicated with *, **, and ***, respectively.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	12.715	13.801	10.522	11.624	13.281	14.047
	(4.585) ***	(4.031) ***	(4.402) **	(3.926) ***	(4.548) ***	(4.004) ***
AIA	15.088	15.471			14.334	14.486
	(1.952) ***	(1.812) ***			(1.855) ***	(1.706) ***
DADSVI	1.335	1.272			1.370	1.266
	(0.590) **	(0.580) **			(0.572) **	(0.565) **
NDAY			4.464	5.617	3.358	4.354
			(0.469) ***	(0.503) ***	(0.429) ***	(0.464) ***
EDAY			174.772	173.431	162.903	162.364
			(269.937)	(265.709)	(270.679)	(265.972)
Reversal	-1.358	-1.065	-0.641	-0.504	-1.657	-1.363
	(0.700) *	(0.620) *	(0.767)	(0.677)	(0.728) **	(0.652) **
*Reversal*AIA*	8.607	8.365			7.792	7.623
	(2.096) ***	(1.997) ***			(1.975) ***	(1.845) ***
*Reversal*DADSVI*	2.334	1.743			2.351	1.748
	(1.360) *	(1.322)			(1.310) *	(1.274)
*Reversal*NDAY*			1.720	1.661	0.648	0.752
			(0.755) **	(0.755) **	(0.723)	(0.714)
*Reversal*EDAY*			-422.949	-414.149	-429.099	-419.491
			(335.879)	(330.777)	(336.570)	(330.964)
LnSize	-1.169	-1.163	-0.843	-0.812	-1.361	-1.273
	(0.374) ***	(0.390) ***	(0.350) **	(0.376) **	(0.373) ***	(0.387) ***
LnBM	-0.749	-0.544	-0.796	-0.591	-0.823	-0.603
	(0.465)	(0.400)	(0.466) *	(0.399)	(0.463) *	(0.399)
10 Lags of Returns?	No	Yes	No	Yes	No	Yes
10 Lags of Squared Returns?	No	Yes	No	Yes	No	Yes
10 Lags of Volume?	No	Yes	No	Yes	No	Yes
10 Lags of NDAY?	No	Yes	No	Yes	No	Yes

Table 9. Institutional Ownership, Information Demand, and Asset Pricing

The table repeats the main specifications from the analysis conducted in Tables 6, 7, and 8 after splitting the sample into firms with Low and High levels of Institutional Ownership (*InstOwn*) as measured at the end of the previous quarter. As defined in Table 1, *Momentum* is a continuous variable ranging between -1 and 1, indicating the relative ranking at the end of month *t*-1 of the cumulative returns from month *t*-12 to month *t*-2; where 1 (-1) refers to the highest (lowest) past return. *Reversal* is a continuous variable ranging between -1 and 1, indicating the relative ranking at the end of month *t*-1 of the cumulative returns from month *t*-60 to month *t*-13; where 1 (-1) refers to the lowest (highest) past return. Standard errors estimated using the Newey-West adjustment with 10 lags are reported in parentheses. Statistical significance at the 10%, 5%, and 1% level is indicated with *, **, and ***, respectively.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
InstOwn Low/High?	Low	High	Low	High	Low	High
Intercept	16.513 (3.896) ***	10.925 (5.027) **	16.911 (3.911) ***	13.013 (4.925) ***	15.128 (3.806) ***	11.093 (4.712) **
AIA	18.783 (2.213) ***	11.975 (2.063) ***	18.857 (2.256) ***	11.896 (2.055) ***	15.906 (2.217) ***	12.732 (1.979) ***
DADSVI	2.372 (0.790) ***	0.297 (0.766)	2.395 (0.785) ***	0.354 (0.761)	1.946 (0.782) **	0.482 (0.830)
NDAY	6.314 (0.684) ***	3.280 (0.596) ***	6.155 (0.682) ***	3.008 (0.607) ***	5.427 (0.668) ***	3.398 (0.613) ***
EDAY	-6.403 (8.622)	-3.313 (10.541)	-19.730 (118.335)	-102.204 (268.655)	102.203 (266.382)	17.664 (39.662)
Momentum			2.801 (0.884) ***	2.575 (0.855) ***		
*Momentum*AIA*			-7.897 (3.425) **	-3.978 (2.614)		
*Momentum*DADSVI*			-1.710 (1.714)	1.103 (1.502)		
*Momentum*NDAY*			-0.980 (1.086)	-0.054 (0.990)		
*Momentum*EDAY*			330.143 (182.693) *	111.038 (576.667)		
Reversal					-0.904 (0.818)	-1.768 (0.622) ***
*Reversal*AIA*					12.862 (3.726) ***	4.344 (2.242) *
*Reversal*DADSVI*					1.375 (1.811)	0.546 (1.553)
*Reversal*NDAY*					0.031 (1.181)	0.668 (0.892)
*Reversal*EDAY*					-309.033 (340.171)	30.605 (51.536)
LnSize	-1.686 (0.389) ***	-0.828 (0.494) *	-1.734 (0.382) ***	-1.026 (0.479) **	-1.420 (0.391) ***	-0.939 (0.456) **
LnBM	-0.448 (0.455)	-0.253 (0.463)	-0.483 (0.440)	-0.287 (0.448)	-0.924 (0.491) *	-0.370 (0.448)
10 Lags of Returns?	Yes	Yes	Yes	Yes	Yes	Yes
10 Lags of Squared Returns?	Yes	Yes	Yes	Yes	Yes	Yes
10 Lags of Volume?	Yes	Yes	Yes	Yes	Yes	Yes
10 Lags of NDAY?	Yes	Yes	Yes	Yes	Yes	Yes