Disagreement in the equity options market and stock returns*

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Abstract

We estimate investor disagreement from synthetic long and short stock trades in the equity options market. We show that high disagreement predicts low stock returns after positive earnings surprises and high stock returns after negative earnings surprises. These effects are symmetric for stocks, for which short sale constraints are less likely to be binding. For speculative high beta stocks, the negative effect is asymmetrically stronger. In the cross-section of all stocks and in the subset of 500 largest companies, high disagreement robustly predicts low monthly and weekly stock returns.

Key words: Disagreement, dispersion of beliefs, equity options, stock returns, earnings surprises

JEL classification: G12, G13, G14

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1. Introduction

What is the effect of investor disagreement on stock returns? From the risk perspective, disagreement represents the extra uncertainty for investors, and it should be associated with higher future stock returns (Harris and Raviv, 1993; Banerjee and Kremer, 2010). However, if pessimists are crowded out by short sale constraints, an increase in disagreement may lead to temporary stock price overvaluation by the optimists and to lower future stock returns (Miller, 1977; Scheinkman and Xiong, 2003). To date, the empirical literature is inconclusive as to which effect dominates. Most studies find a negative relation between disagreement and future stock returns (Diether, Malloy, Scherbina, 2002; Goetzmann and Massa, 2005; Yu, 2011). Others argue that these effects are driven by small, illiquid, and low credit-rated stocks (Sadka and Scherbina, 2007; Avramov et al., 2009), or that the effect is in fact positive (Doukas, Kim, and Pantzalis, 2006).

Recently, Hong and Sraer (2016) present a theoretical model that implies that, in the presence of short sale constraints and individual stock exposure to aggregate disagreement, the negative effect of disagreement on future stock returns is concentrated among the high beta stocks. Without any reliance on short sale constraints, Atmaz and Basak (2018) develop a theoretical model, in which disagreement can be associated with either lower or higher future stock returns. This is because investors whose beliefs are supported by cash-flow news become relatively wealthier and therefore contribute more to the average bias. This causes overreaction to news and a subsequent price correction. As a result, high disagreement leads to negative stock returns after positive cash flow news and to positive stock returns after negative cash flow news. Since prices are convex in news and react more to positive news than negative news, the model also suggests that the negative effect of disagreement on equity prices should be overall stronger.

In this paper, we test these theoretical predictions using a novel measure of investor disagreement based on synthetic stock exposures in the equity options market. We document three main results for the relation between investor disagreement and future stock returns. First, we provide empirical evidence supporting theoretical predictions of Atmaz and Basak (2018). We show that, for positive earnings surprises, high preannouncement disagreement predicts lower returns going forward; for negative earnings surprises, high preannouncement disagreement predicts higher returns going forward. Second, in line with Hong and Sraer (2016), we find that the negative effect of disagreement on future stock returns is stronger for high beta stocks and difficult to short sale stocks. Third, while the existing evidence suggests that disagreement affects mostly small and illiquid stocks (Sadka and Scherbina, 2007), we show that investor disagreement is negatively associated with future stock returns not only in a cross-section of all stocks but also in the subset of largest 500 companies. Overall, our findings suggest that the effects of disagreement on equity prices are multi-layered and more pervasive than suggested by the existing studies.

We draw these conclusions using a new measure of investor disagreement. Existing studies mostly rely on measures of disagreement that proxy for differences in investor information sets, such as the dispersion in analysts' forecasts (Diether, Malloy, and Scherbina, 2002) [1] or differences in opinions expressed on social media (Cookson and Niessner, 2019). In comparison, we estimate disagreement from investors' observable trades in the equity options market.

Several papers already point out that the standard measures of disagreement based on differences in investor information sets are a noisy proxy for disagreement because they are

[1] See also Nagel (2005), Doukas, Kim, and Pantzalis (2006), Sadka and Scherbina (2007), Avramov et al. (2009), Yu (2011), and Hong and Sraer (2016), among others.

agnostic about the fact that investors differ in the way they process information (e.g., Cookson and Niessner, 2019).[2] The literature also suggests that disagreement should best be studied using differences in investors' actual demand for stocks (Goetzmann and Massa, 2005; Koijen and Yogo, 2019). In the theoretical models, regardless of the source of disagreement, differences in investors' trading positions reflect the level of disagreement. The main novelty of this paper is to show that investor disagreement can be estimated from synthetic stock trades in the equity options market.

Estimating disagreement directly in the stock market is challenging. Investors differ in their initial endowments and hold different amounts of stocks for reasons beyond differences in beliefs. Even if we had detailed stock holdings data, we would first need to estimate the counterfactual stock holdings for the case of no disagreement (Goetzmann and Massa, 2005). In comparison, equity options are in a zero net supply and individual investors are not expected to trade options with each other when they are in perfect agreement (Buraschi and Jiltsov, 2006). This bypasses the need to estimate option holdings for the case of no disagreement. Importantly, unlike for individual stock holdings, extensive data on customer option trades is readily available.

We calculate our measure of disagreement as the extent to which customers' synthetic stock exposures offset each other. Our data cover opening and closing buy and sell options volume by investor type from two major options exchanges, the Chicago Board of Options Exchange (CBOE) and the International Securities Exchange (ISE). We start by defining synthetic positive stock exposure that customers take by buying call and writing put options on a given stock as *POS*. Similarly, we define synthetic negative exposure as *NEG*. To measure the extent to which synthetic

[2] The dispersion in analysts' forecasts has also been criticized on the grounds that individual investors rarely pay attention to analysts, that analysts forecasts are stale and subject to agency issues, and that dispersion in analysts' forecasts is subject to the compounding effects of uncertainty that analysts face when making their forecasts (Goetzmann and Massa, 2005; Doukas, Kim, and Pantzalis, 2006).

stock exposures offset each other, we express our measure of disagreement as the ratio of the minimum to the maximum of the absolute value of customers' positive *(POS)* and negative *(NEG)* stock exposure. By construction, our measure of disagreement is bounded on [0,1]. When disagreement is zero, all customers are taking one-sided bets, with liquidity providers taking the opposite side. When disagreement is one, positive exposure by some customers is entirely offset by the negative exposure of other customers.

Throughout our sample period, January 2005 to December 2013, we have on average 1,428 stocks per month. The monthly average for disagreement across all stocks is 0.33. In line with the general prediction of theoretical models, disagreement is positively correlated with stock turnover at 0.30. As predicted by agree to disagree models, where investors have different economic models that lead them to interpret news differently (Harris and Raviv, 1993; Kandel and Pearson, 1995), we also find that disagreement is much higher for large companies, for which publicly available information is typically much more abundant (disagreement is 0.48 on average for the largest 500 companies versus 0.33 for all companies).

Starting with return predictive regressions in the cross-section of all stocks, we first document that investor disagreement is negatively and significantly related to future monthly and weekly stock returns. Results hold in portfolio sorts and in Fama-McBeth regressions. Results are robust to controlling for other variables related to disagreement, such as the analysts' dispersion, stock turnover, as well as many other stock and option based control variables. Results are also robust to excluding at-the-money options and written calls, which may be used for trading on volatility or as an overlay to existing stock positions (Lakonishok et al., 2007).

The negative relation between investor disagreement and stock returns is remarkably strong. Regardless of the specification, *t*-statistic on investor disagreement in Fama-McBeth regression is always smaller than negative three. In portfolio sorts, the difference in annualized alphas between the high and low disagreement portfolios is negative 7.05% and significant with a *t*-statistic of negative 4.27.

Results also hold for the subset of largest 500 stocks. In Fama-McBeth regressions, the estimated coefficients on disagreement and the associated *t*-statistics are virtually the same as in the sample of all optionable stocks. In portfolio sorts, the estimated alpha is negative 5.53% and significant with a *t*-statistic of negative 2.75. This separates our measure from other proxies for disagreement in the literature, for which investor disagreement matters mostly for smaller and illiquid stocks (Sadka and Scherbina, 2007). Not surprisingly, we find that analysts' dispersion is not significant in the subsample of largest stocks.

The fact that our results hold for the largest companies has important implications for the identification of the economic channel linking disagreement to stock returns. Most of the existing evidence on the negative relation between disagreement and future stock returns is explained by the limited market participation model of Miller (1977). In the model, stocks are subject to short sale constraints. As pessimists are sidelined, optimists determine stock prices. An increase in disagreement then leads to temporary stock price overvaluations, followed by subsequent price corrections. Since our results also hold for a subset of largest companies, which are typically easier to borrow and sell short, this standard model of limited participation does not seem to fully explain our findings.

Hong and Sraer (2016) argue that short sale constraints are not always explicit in terms of transaction costs and the ability to borrow shares, but they can also arise from regulatory and self-imposed restrictions (e.g., mutual funds can only have long exposure to stocks). Using a general equilibrium framework, they show that, if either explicit or implicit short sale constraints exist, such constraints are more likely to be binding for stocks that have a high exposure to aggregate disagreement, i.e., high beta stocks (also known as speculative stocks). In times of high aggregate disagreement, high beta stocks then earn lower future stock returns than low beta stocks. As firm specific and aggregate disagreement are expected to co-move, and more so for high beta stocks that contribute the most to the aggregate disagreement, speculative high-beta stocks are also expected to be more sensitive to their company specific disagreement. [3]

Atmaz and Basak (2018) show that disagreement can be negatively related to future returns even in the absence of short sale constraints. In their dynamic model, dispersion of beliefs amplifies wealth transfers. After positive cash flow news, wealth is transferred from pessimists to optimists. Because of the positive wealth shock, optimists have a larger temporary price impact, pushing current prices up and lowering future stock returns. After negative news, wealth is transferred from optimists to pessimists, resulting in a lower current price and higher future stock returns. Because of price convexity in news, i.e. higher price reaction in response to positive news, the effect is expected to be stronger following positive news.

We test the implications of these models by analyzing stock price reactions after earnings announcements. To test the predictions of Atmaz and Basak (2018), we distinguish between positive and negative earnings surprises. In order to identify the role of short sale constraints, we build on the insight from Hong and Sraer (2016) and separate between high and low beta stocks.

We find support for both theoretical models. In line with Atmaz and Basak (2018), we show that an increase in disagreement leads to lower returns after positive earnings surprises and to

[3] In Hong and Sraer (2016) model, aggregate disagreement is defined as beta-weighted firm specific disagreement.

higher returns after negative earnings surprises. Consistent with the notion of convex relation between prices and news, the effect is asymmetric and it is overall stronger after positive news.

In line with Hong and Sraer (2016), we find that the negative effect is asymmetrically stronger among the high beta stocks. Meanwhile, both the positive and the negative effect are significant among the low beta stocks, for which the model of Hong and Sraer (2016) implies that short sale constraints are less likely to be binding.

To control further for short-sale constraints, we additionally split the sample by institutional ownership. Nagel (2005) shows that high institutional ownership relaxes short sale constraints. Consistent with his findings, we show that, among the low beta stocks, the positive effect of disagreement on future stock returns is the strongest in the sample of high institutional ownership stocks. Among the high beta stocks, the negative effect of disagreement on future stock returns is the strongest in the sample of low institutional ownership stocks.

We contribute to the vast literature on the effects of investor disagreement on asset prices (Diether, Malloy, Scherbina, 2002; Chen, Hong, and Stein 2002; Nagel, 2005; Goetzmann and Massa, 2005; Sadka and Sherbina, 2007, Yu, 2011). Our contribution is two-fold. First, we introduce a new measure of investor disagreement based on investor observable trades and show that it affects stock returns of all stocks and of largest and most liquid stocks. Second, we provide empirical support for a new channel through which disagreement affects returns, as postulated in the theoretical model of Atmaz and Basak (2018). In comparison to the existing literature, which mostly advocates negative effect of disagreement on stock returns (Diether, Malloy, Scherbina 2002; Chen, Hong, and Stein, 2002; Goetzmann and Massa, 2005; Sadka and Sherbina 2007), or argues that, in fact, the effect should be positive (Banerjee and Kremer, 2010; Doukas, Kim, and Pantzalis, 2006), we show that investor disagreement can be either positively or negatively related to future returns. The sign of the effect depends on the type of cash flow news and the likelihood that short sale constraints are binding.

Our work is also related to the study of disagreement in the options market. Buraschi and Jiltsov (2006) show that, absent financial intermediation, options open interest is related to dispersion of beliefs. They also show that dispersion of beliefs is related to implied volatility smile. Differently from Buraschi and Jiltsov (2006), we show that the part of options demand that is offset among customers, our measure of disagreement, is a strong predictor for stock returns. We also provide empirical support for several theoretical predictions relating disagreement to equity prices. In a recent paper, Andreaou et al. (2018) postulate that the dispersion of trading volume across moneyness levels can be viewed as a proxy for differences in expectations among investors. Our measure is fundamentally different. It takes into account the direction of trades, aggregates all option trades into synthetic stock positions, and it does not hinge on the fact that the decision to trade at a given strike price is endogenous to options liquidity and volatility of the underlying. In the last section, we show that our results are robust to controlling for their measure.

The rest of the paper is organized as follows. In Section 2, we motivate our approach to measuring investor disagreement in the equity options market. In Section 3, we present the data and the empirical measurements. In Section 4, we report the summary statistics. Main results on the relation between option disagreement and returns are reported in Section 5. In Section 6, we report further tests motivated by recent theoretical models. In Section 7, we provide robustness checks. Section 8 concludes.

2. Measuring disagreement

In principle, investor disagreement arises from differences in investor information sets and differences in the way investors process information (Hong and Stein, 2007). Ultimately, differences in investor beliefs manifest themselves in differences in investor demand for stocks.

This suggests that there are two approaches to measuring investor disagreement. The first approach relies on measures that are related to differences in investor information sets. This approach nests the most commonly used measures of disagreement, such as the dispersion in analysts' earnings forecasts (e.g., Diether, Malloy, Scherbina, 2002) and differences in opinions expressed on social media (Cookson and Niessner, 2019). The second approach relies on measuring investor disagreement from the observable trades in the stock market (Goetzmann and Massa, 2005). Each approach has its own set of limitations.

The first approach is agnostic about the fact that investors differ in their prior beliefs and the way they update their beliefs (Harris and Raviv, 1993; Kandel and Pearson, 1995). Measures based on differences in investor information sets therefore capture only part of investor disagreement. Cookson and Niessner (2019) estimate that differences of opinion across investment approaches account for half of the overall disagreement.

The second approach to measuring disagreement is devoid of the above critique. By revealed preferences, regardless of the source of disagreement, differences in investor stock positions capture investor disagreement. While theoretically appealing, estimating investor disagreement in the stock market is challenging. As stocks are in positive net supply and investors differ in their initial endowments, they hold different amounts of stocks even when they are in perfect agreement. An additional issue arises from the fact that individual stock exposures are not readily observable.

Goetzmann and Massa (2005) tackle these issues using information for a subset of individual stock holdings from a discount brokerage house. They measure disagreement as differences in trading positions of investors with similar characteristics.

In this paper, we propose an alternative approach to estimating disagreement from investors' observable trades. Our starting point is the observation that, when investors disagree, they can adjust their existing stock positions or hedge their views in the equity options market, or both. Buraschi and Jiltsov (2006) model this choice in a general equilibrium model. They show that, in the case of no disagreement, investors only hold stocks and no options. As investors start disagreeing, they partially adjust their existing stock positions and they hedge their beliefs by creating a synthetic stock exposure in the options market.

This suggests that, instead of relying on the actual stock exposures in the stock market, we can infer investor disagreement from the synthetic stock exposures in the equity options market. Moreover, measuring investor disagreement in the options market is devoid of the main challenge when estimating disagreement in the stock market. Unlike stocks, options are in zero net supply, and investors are not expected to trade options with each other when they are in perfect agreement, even if they differ in their initial endowments (Buraschi and Jiltsov, 2006). Moreover, detailed data on customer option trades is readily available.

3. Data and empirical measurements

In this section, we present the data and empirical measurement of disagreement in the equity options market. We also specify all control variables.

3.1 Main data and empirical measurements of disagreement

Our main data is the daily opening and closing trade data for equity options. The data run from 2005 to 2013 and cover all trades from the Chicago Board of Options Exchange (CBOE) and International Securities Exchange (ISE). Together, these two exchanges account for more than 60% of the total trading activity in the US equity options market.

For each call and put option series, trading volume is split into opening and closing volumes and aggregated by investor category (customers and firms). In particular, for each call and put option series and for each investor category, we have information on the open buy (OB), close buy (CB), open sell (OS), and close sell (CS) volumes.

To obtain implied volatilities and option deltas, we merge our options volume data with the OptionMetrics data. We eliminate options with less than 10 days to maturity. We also discard options with missing implied volatilities and the absolute value of option deltas greater than 0.98 or smaller than 0.02.

The literature distinguishes between three categories of option traders: customers, firms (proprietary desks), and market makes. As our focus is on individual investor disagreement, and firms often act as market makers, we base our measure of disagreement on customers' trades. Following the implications of the theoretical model of Buraschi and Jiltsov (2006), we define individual investor disagreement as the extent to which customers' synthetic stock exposures in the equity options market offset each other.

For a given stock, a synthetic positive exposure can be obtained by a long position in a call option and a short position in a put option. Similarly, a synthetic negative exposure (short exposure) can be obtained by a long position in a put option and a short position in a call option.

How much a given option contributes to the synthetic position depends on the options delta, that is, the sensitivity of an options price with respect to the stock price.

Using data on option trades of customers, we first calculate daily synthetic positive exposure for each stock by summing up delta-adjusted buy volume for call options and sell volume for put options across all maturities and moneyness levels:

$$POS = \sum \Delta^{Call}\left(OB^{Call} + CB^{Call}\right) + \Delta^{Put}\left(OS^{Put} + CS^{Put}\right) \tag{1}$$

where Δ is the absolute value of a delta for a particular call or put option. Similarly, we define daily synthetic negative exposure for each stock by summing up delta-adjusted buy volume for put options and sell volume for call options:

$$NEG = \sum \Delta^{Put}\left(OB^{Put} + CB^{Put}\right) + \Delta^{Call}\left(OS^{Call} + CS^{Call}\right) \tag{2}$$

In order to establish to what degree customers' positive and negative exposures offset each other, we take a ratio of the minimum to the maximum between the absolute values of positive and negative exposure. This forms our definition of daily disagreement:

$$Disagreement = \frac{\min\left(\left|POS\right|, \left|NEG\right|\right)}{\max\left(\left|POS\right|, \left|NEG\right|\right)} \tag{3}$$

By construction, investor disagreement is bounded on [0,1]. Disagreement equals zero when all customers take one-sided bets, and liquidity providers take the opposite side. Disagreement equals one when positive exposure by some customers is completely offset by the negative exposure of other customers.

When disagreement is below one, synthetic negative exposure exceeds synthetic positive exposure or synthetic positive exposure exceeds synthetic negative exposure, whereby liquidity providers (market makers and firms) absorb excess exposure. We define the signed residual as directional trades:

$$Directional = \left[1 - Disagreement\right] \times Sign, \text{ where } Sign = \begin{cases} 1, & if \ \ |POS| > |NEG| \\ -1, & otherwise \end{cases} \tag{4}$$

Directional is bounded on [-1,1], and it is similar in spirit to measures used in studies that examine whether signed options trading volume predicts returns (Pan and Poteshman, 2006; Hu, 2014).[4] We focus on the effects of investor disagreement, and we use directional as a control variable.

For end of month values of disagreement and directional, we take the average across the last 10 trading days within a given month. Averaging across the whole month leads to similar results.

3.2 Control variables

We employ three sets of control variables. The first set comprises variables related to investor disagreement:

- *Analysts' Forecast Dispersion (AnalystDis):* Defined as in Nagel (2005): Standard deviation of raw Institutional Brokers Estimates System (I/B/E/S) analysts' current fiscal year earnings per share forecasts (as in Diether, Malloy, Scherbina, 2002), scaled by firm total assets.
- *Stock Turnover (StockTurn):* Monthly stock volume divided by the total number of shares outstanding.

[4] To illustrate our measuring of disagreement and directional, consider three cases: (i) if synthetic positive exposure is 2 and synthetic negative exposure is -2, our measure of disagreement is 1 and our measure of directional is 0; (ii) if synthetic positive exposure is 2 and synthetic negative exposure is -1, disagreement is 0.5 and directional is 0.5; (iii) if synthetic positive exposure is 1 and synthetic negative exposure is -2, disagreement is 0.5 and directional is -0.5.

The second set of control variables includes other stock-related variables. Whenever applicable, end-of-month observations are defined as the average across the last 10 trading days in a given month.

- *Market Capitalization (Size):* The natural logarithm of individual stock market capitalization.
- *Book-to-market (BM):* Total Common Equity (CEQ) plus Deferred Taxes & Invest Tax Credit (TXDITC) (if available) minus Preferred Stock – Redemption (PSTKRV), Liquidating (PSTKL) or Carrying Value (UPSTK), used in that order, divided by the market value of equity at the end of the fiscal year (PRCC F ×CSHO).
- *Return (Ret):* Monthly stock return.
- *Idiosyncratic Volatility (IdiosyncVol):* Standard deviation of a residual in a regression of stock returns on Fama-French-Carhart 4-factor model, using 60-day rolling windows.
- *Momentum (Mom):* Cumulative 12-month stock return over the risk free rate.
- *Effective Stock Spread (ESS):* Effective stock spread obtained from TAQ intra-day trading data. For a given trade k, the spread is defined as:

$$ESS_k = \frac{2\left|S_k^P - S_k^M\right|}{S_k^M},$$

where S_k^P is the stock price at which the trade transacted and S_k^M is the midpoint price at the time of the trade. The daily effective stock spread ESS is a dollar volume-weighted average across all trades in a given day.

- *Stock Order Imbalance (SOI):* Buy volume minus sell volume, scaled by total trading volume, where TAQ trades are signed using Lee and Ready (1991) algorithm.
- *Probability of informed trading (PIN):* Calculated as in Easley, Kiefer, O'Hara, and Paperman (1996), and based on the Lee and Ready (1991) algorithm signed stock trades.
- *Institutional Ownership (InstOwner):* Fraction of shares outstanding owned by institutions. The data on institutional ownership is from the Thomson Financial Institutional Holdings (13F) database.

The third set of control variables includes other options-related variables. Unless otherwise specified, these variables are calculated using the same data we use in the construction of our main variables, and end-of-month observations are obtained by taking the average across the last 10 trading days within a given month.

- *Open Interest:* Delta-adjusted daily open interest from OptionMetrics, summed over all options and scaled by the number of shares outstanding.
- *Options Order Imbalances (OOI):* Defined similarly to Hu (2014) as the difference between the delta-adjusted buy orders for puts and calls and the delta-adjusted sell orders for puts and calls, standardized by shares outstanding:

$$OOI = \frac{\sum\left(\Delta OB^{Call} + \Delta CB^{Call} + \Delta OB^{Put} + \Delta CB^{Put}\right) - \left(\Delta OS^{Call} + \Delta CS^{Call} + \Delta OS^{Put} + \Delta CS^{Put}\right)}{Shares\ Outstanding}$$

- *Put-Call Volume Ratio (PP):* Defined as in Pan and Poteshman (2006) as the opening buy volume for puts over the sum of the opening buy volume for puts and calls (using customers' orders only):

$$PP = \frac{\sum OB^{Put}}{\sum OB^{Put} + \sum OB^{Call}}$$

- *Options-to-Stock Volume (OS):* Defined as in Johnson and So (2012) as the total daily log option volume divided by the stock volume.
- *Effective Options Spread (EOS):* Effective option spread based on intra-day LiveVol/CBOE data. It is computed similarly to stock effective spread *ESS*, except that we first calculate effective spreads for each option series, and then we take the average across all option series on a given stock in a given day.
- *Implied Volatility (IVol):* The average of at-the-money call and put implied volatilities from the OptionMetrics volatility surface data for 30-day maturity options.
- *Call-Put Volatility Spread (CP-Vol-Spread):* Defined as in Cremers and Weinbaum (2010) as the difference between the at-the-money implied volatility for a call and a put, weighted by options open interest:

$$CP - Vol - Spread = \sum w_i \left(ImVol_i^{Call} - ImVol_i^{Put} \right)$$

- *Monthly Change in Call and Put Implied Volatility (CVol and PVol):* Defined as in An, Ang, Bali, and Cakici (2014): Implied volatility for a call (put) on the last day of a month minus the implied volatility for a call (put) from the previous month. It is based on OptionMetrics volatility surface data for 30-day maturity at-the-money options.
- *Implied Skew (ISkew):* Defined as in An, Ang, Bali, and Cakici (2014), and also based on OptionMetrics volatility surface data for 30-day maturity options: the difference between implied volatility for puts with an absolute delta closest to 0.2 and the average of implied volatilities for a call and a put with absolute deltas of 0.5.

4. Summary statistics

We start by reporting summary statistics in Table 1, and pairwise correlations for the main variables in Table 2. Panel A in each table is based on observations for all stocks, and Panel B reports the same statistics for the subset of largest 500 companies. The set of largest companies in a given year is based on the 500 highest market capitalization companies at the end of the previous year.

Across all stocks, the average for options disagreement is 0.33, with a standard deviation of 0.22. This suggests that, typically, one third of customers' positions in the options market is due to differences of opinion, and two-thirds of synthetic positions are due to directional views of customers as a group. The signed directional is on average slightly negative at -0.09, with a standard deviation of 0.41. This indicates that customer directional exposure substantially varies over time and across stocks, and investors use options more often to express negative views rather than positive views (see also Garleanu, Pedersen, and Poteshman, 2009). Correlation between disagreement and directional is 0.11.

As a confirmation that the two parts of customers' options trading capture different aspects, note that disagreement is negatively related to the probability of informed trading (correlation with PIN is -0.25), whereas directional is slightly positively correlated to PIN at 0.04. Similarly, disagreement is associated with lower effective spreads in stocks (correlation with ESS is -0.22), whereas directional is positively correlated with ESS at 0.07. As expected, both are positively related to the options open interest, and more so disagreement (correlations of 0.39) than directional (correlation of 0.05). Disagreement is also highly negatively correlated with options effective spreads (correlation with EOS of -0.48). This is expected as high disagreement is associated with low net order imbalances that liquidity providers need to absorb and thus lower inventory costs.

In line with the general prediction of theoretical models featuring dispersion of beliefs (e.g. Banerjee and Kremer, 2010; Atmaz and Basak, 2018), disagreement is positively correlated with stock turnover (correlation of 0.30). Disagreement is also positively correlated with company size at 0.33. For the largest 500 companies, the mean for disagreement is 0.48, in comparison to 0.33 for all stocks. Since information is typically much more abundant for the largest companies, this suggests that disagreement increases with the amount of public information. This is in line with the notion of agree to disagree models, whereby investors have different economic models that lead them to interpret news differently, and hence an influx of public information increases investor disagreement (Harris and Raviv, 1993; Kandel and Pearson, 1995).

The latter observation also reinforces our argument that disagreement based on investors' trades may be different from the measures for disagreement based on the dispersion of news that investors may use in forming their beliefs. In comparison to our measure of disagreement, analysts' dispersion exhibits much lower correlation with stock turnover.[5] The mean for analysts' dispersion is also lower (rather than higher) in the subset of largest companies. In addition, as noted above, our measure of disagreement is negatively related to the probability of informed trading, whereas analysts' dispersion is positively correlated with PIN.

Turning to our measure of directional trading, we see that, as expected, it is positively correlated with options order imbalances (correlation with OOI is 0.17 for all stocks and 0.29 for

[5] Nagel (2005) also finds low correlation between analysts' dispersion and stock turnover.

the subset of largest companies) and negatively correlated with put-call volume ratios (correlation with PP is -0.34 for all stocks and -0.35 for the subset of largest companies).

5. Stock return predictability

In this section, we examine how our measure of disagreement relates to future stock returns. As a starting point, we consider portfolio sorts. Then we turn to Fama and MacBeth (1973) regressions, where we control for the existing proxies for disagreement, and other control variables. We always present results separately for all stocks and for the subset of 500 largest companies.

5.1 Preliminary evidence: Portfolio sorts

At the end of each month, we assign stocks in five portfolios based on the level of disagreement. Then we calculate the equally weighted return for each portfolio in the following month. We regress the resulting time series for each portfolio on the four Fama-French-Carhart factors, and evaluate statistical significance using Newey and West (1987) *t*-statistics with three lags. In parallel, we present the same results based on our measure of directional.

Results are reported in Table 3, separately for all stocks in Panel A and the subset of 500 largest stocks in Panel B. We find that both measures, disagreement and directional, are important sorting variables for the cross-section of stock returns, but they predict returns with the opposite sign. Disagreement is negatively related to future returns. In contrast, directional predicts returns with a positive sign, consistent with Pan and Poteshman (2006) and Hu (2014).

Specifically, in the sample of all stocks, when we move from low disagreement to high disagreement portfolios, raw returns and alphas decrease monotonically, and the high minus low portfolio exhibits an annualized alpha of negative 7.05%, which is statistically significant with a *t*-statistic of negative 4.27. In contrast, for portfolios sorted on directional, raw returns and alphas increase monotonically, and the high minus low portfolios come with an annualized alpha of 5.59% and a *t*-statistic of 3.26.

We observe similar patterns in the sample of 500 largest stocks. The spread in raw returns are somewhat smaller, but the spread in alphas are almost the same, and remain statistically significant. When we sort on disagreement, the high minus low portfolio exhibits an annualized alpha of negative 5.53%, with a *t*-statistic of negative 2.75. When we sort on directional, the high minus low directional portfolio comes with an annualized alpha of 4.41% and a *t*-statistic of 2.19.

5.2 Fama-MacBeth regressions

Next, we apply the standard two-step Fama-MacBeth approach, with next month excess returns as a dependent variable, and *t*-statistics based on Newey and West (1987) with three lags. Results are reported in Table 4. Columns (1) – (4) are based on the sample of all stocks. In columns (5) – (6), we repeat results for the main specifications for the subsample of largest 500 stocks.

We first discuss results for the sample of all stocks. In line with the results on portfolio sorts, in the univariate regression, disagreement is negatively related to future returns, with a *t*-statistic of negative 3.06. When we add directional as a control variable, *t*-statistic on disagreement is negative 3.26, whereas the estimated coefficient on directional is positive and significant with a *t*-statistic of 3.15. The estimated coefficients suggest that a one standard deviation shock to disagreement results in a 25 basis points lower stock return in the following month. In the meantime, a one standard deviation shock to directional results in a return that is 27 basis points higher.

The effect of disagreement and directional hardly change with the addition of other frequently used measures for investor disagreement, the analysts' dispersion and stock turnover. The estimated coefficient on disagreement is significant with a *t*-statistic of negative 3.12, and the estimated coefficient on directional is significant with a *t*-statistic of 4.64. The alternative measures for disagreement are negatively related to future returns, although, besides our measure, only the analysts' dispersion is statistically significant with a *t*-statistic of negative 2.56.

Next, we control for other stock- and option-based variables. Again, we note that the regression coefficient on disagreement hardly changes and becomes even slightly more significant, with a *t*-statistic of negative 3.60, suggesting that the effect we are documenting cannot be explained by most common stock characteristics or frequently employed option-based measures. Besides disagreement, our measure of directional also remains positive and significant, with a *t*-statistic of 3.19. This is interesting because we control for previously employed measures of directional trading, such as options order imbalances (Hu, 2014) and put-call volume ratios (Pan and Poteshman, 2006). Both of these variables exhibit the expected sign, and are significant. However, they do not drive out significance of our directional trading measure.

Finally, we turn to the case of the largest 500 stocks. The estimated coefficient on disagreement as well as directional are almost identical to the case of all stocks. Both coefficients remain significant with *t*-statistics of negative 3.25 and positive 3.89. In comparison, many of the important control variables become insignificant when we move from the sample of all stocks to the sample of largest 500 stocks. Most notably, the analyst's dispersion is significant in the sample of all stocks, but it becomes insignificant in the sample of largest 500 stocks (*t*-statistic of 0.60).

5.3 Volatility bets and covered calls

One of the potential caveats of our measure of disagreement is the implicit assumption that investors use options exclusively to express directional views. While this is the predominant use of options according to Lakonishok et al. (2007), investors may also use options to trade on volatility bets, or they can use options as an overlay to their stock positions.

A typical volatility bet, a straddle, involves a simultaneous long (or short) position in at-the money calls and puts. To address the concern that volatility trades drive our results, we recalculate our measure of disagreement and directional by excluding at-the-money options. Following Bollen and Whaley (2004), we define at-the-money options as those with absolute values for deltas between 0.375 to 0.625.

Besides volatility trading, customers may also use options in combination with their existing positions in the underlying asset. Lakonishok et al. (2007) show that such combinations are rarely used by customers, except for perhaps covered calls, which involve a long position in the underlying and a short position in a call. Therefore, we also recalculate our measures of disagreement and directional by excluding at-the-money options as well as open-sell call trades.

In Table 5, we present results for portfolio sorts using these modified definitions for disagreement and directional. In Table 6, we repeat the main Fama-MacBeth results from Table 4. Qualitatively, all results are the same as in our original specification.

In portfolio sorts, when we exclude at-the-money options, disagreement is always negatively and significantly related to future returns, whereas directional is always positively and significantly related to future returns. Results are also similar when we additionally exclude open sell calls. The spread in alphas between high and low disagreement portfolio decreases slightly for all stocks and increases slightly for the largest 500 companies; both are significant with *t*-statistics of negative 4.37 and negative 3.05.

Like in portfolio sorts, in Fama-MacBeth regressions, results remain qualitatively the same. Only the estimated coefficient on directional in the sample of largest stocks becomes insignificant in the case of the most stringent filter. Our main variable of interest, disagreement, however, is always significant.

5.4 Weekly returns

One of the advantages of our measure is that we can calculate the level of disagreement at higher frequencies. In this section, we focus on weekly frequency. We recalculate disagreement as the average daily disagreement over the past week. The same approach is employed in the calculation of our directional measure and other control variables, whenever applicable.

For brevity, we only report results based on portfolio sorts in Table 7. Results for Fama-MacBeth regressions are qualitatively similar. Like in the case of monthly portfolio sorts, disagreement is negatively related to future returns, and directional is positively related to future returns, and results hold across all stocks as well as in the subsample of largest 500 stocks, when we use all option trades and when we exclude at-the-money options and trades to open short call positions.

In fact, results appear stronger at the weekly frequency than at the monthly frequency. This is true for our directional measure, where annualized alpha of the high minus low portfolio varies between 10.64% and 13.65%, with *t*-statistics between 6.21 and 7.41. Results also appear stronger for sorts on our disagreement measure, especially when we exclude at-the-money options and trades to open new short call positions. In this case, the high minus low portfolio alpha is negative

8.81% in the case of all stocks, and it is negative 10.02% in the case of largest 500 stocks. Both alphas are highly significant, with *t*-statistics of negative 5.05 and negative 4.45 respectively.

6. Why does disagreement predict returns?

In this section, we discuss our findings in the light of theoretical models linking investor disagreement to future returns. We also provide additional tests to better identify economic mechanisms behind our results.

6.1 Theory and empirical evidence

As discussed in the introduction, from the risk perspective, investor disagreement represents a form of uncertainty, which suggests that an increase in disagreement should be associated with higher returns going forward (Banerjee and Kremer, 2010). On the other hand, in models of limited participation featuring short sale constraints, an increase in beliefs dispersion leads to temporary stock price overvaluation by the optimists and to lower future stock returns (Miller, 1977; Scheinkman and Xiong, 2003).

Given that we find strong negative relation between disagreement and future stock returns, our results appear to be aligned with the limited market participation models; however, we also find that our results hold for the sample of largest 500 companies. Since large stocks are much easier to borrow and cheaper to sell short than small stocks, the limited participation models would suggest that results should be much stronger in the case of all stocks than in the case of largest stocks. Instead, we find that results are comparable across both samples. All our results are also robust to controlling for institutional ownership as a proxy for how difficult it is to borrow shares

(Nagel, 2005). Overall, the results suggest that physical short sale constraints are not the only mechanism through which disagreement affects stock prices.

Hong and Sraer (2016) argue that short sale constraints are not always explicit, but they can also arise from self-imposed restrictions or regulated limits. Mutual funds, the largest investors in the market, can only have long exposure to stocks. While such short sale constraints are difficult to measure, Hong and Sraer develop a testable theoretical prediction that circumvents the estimation of different types of short sale constraints. They show that, in a general equilibrium setup, short sale constraints are more likely to be binding for stocks that are more exposed to aggregate disagreement, i.e., high beta stocks (also known as speculative stocks). When aggregate disagreement increases and short sale constraints start binding, high beta stocks become overvalued relative to low beta stocks. Hong and Sraer use this as a motivation to explain why high beta stocks deliver lower risk-adjusted returns than low beta stocks.

We extend this intuition to suggest that high beta stocks are also more sensitive to firm specific disagreement. In the model, aggregate disagreement equals beta-weighted firm specific disagreement. Everything else equal, for high beta stocks, firm specific disagreement then co-moves more with the aggregate disagreement.[6] As firm specific disagreement co-moves with aggregate disagreement and short sale constraints are more likely to be binding for high beta stocks, we expect that an increase in firm specific disagreement should also lead to higher overvaluation and lower future returns of high beta stocks.

In contrast to the above theoretical models, which rely on short sale constraints to generate the negative effect of disagreement on stock returns, Atmaz and Basak (2018) develop a theoretical

[6] Similarly, stock specific illiquidity co-moves with market-wide illiquidity (Acharya and Pedersen, 2005).

model in which disagreement can lead to either positive or negative future stock returns in the absence of short sale constraints. In their dynamic model, dispersion of beliefs amplifies wealth transfers between the optimists and pessimists. After positive cash flow news, wealth is transferred from pessimists to optimists. As a result, optimists have a larger temporary price impact, which leads to temporary stock price overvaluations and to lower future returns. After negative cash flow news, wealth is transferred from optimists to pessimists. In the latter case, pessimists become relatively more important in determining stock prices, leading to lower current prices and higher future stock returns. The effects are asymmetric though, as stock price is convex in cash flow news, and we therefore expect a stronger effect after positive news than after negative news. In the next section, we test the predictions of these models.

6.2 Earnings surprises

The main insight from the theoretical model of Atmaz and Basak (2018) that we want to test is whether the relation between investor disagreement and future returns differs for positive and negative cash flow news. Following Hong and Sraer (206), we also want to explore whether the negative effect is stronger for high beta stocks.

Earnings announcements are the most natural place to test the joint predictions of these models. Using the standard approach of defining earnings surprises, we test how abnormal returns following earnings announcements relate to the pre-announcement disagreement.

For a firm-quarter observation to qualify for the initial sample, we require the following data: earnings per share, earnings per share lagged four quarters, earnings announcement date, and at least one earnings forecast. We only retain earnings forecasts made within 90 days of the earnings announcement. For all the qualifying earnings announcements, we also require non-missing stock price data.

We estimate cumulative abnormal return (CAR) following an earnings announcement day as the difference between a stock realized cumulative return and expected cumulative return. Expected return is estimated using CAPM, and value-weighted CRSP market index as a proxy for the market portfolio. We estimate CAPM betas similar to Hong and Sraer (2016). Each month, we use the past 12 months of daily returns to estimate the market beta of each stock by regressing a stock's excess return on the contemporaneous excess market return as well as five lags of the market return to account for the illiquidity of small stocks (Dimson, 1979). The market beta is then the sum of the six OLS regression coefficients. For each stock, we use the pre-estimated market beta for a month preceding the earnings announcement month to compute the expected return around the event window.

We define positive and negative cash flow news by imposing double criteria on earnings surprises. Specifically, following Battalio and Mendenhall (2005), we first construct two measures for earnings surprises: (i) forecast errors based on seasonal random walk (SRW) and (ii) analysts' forecast errors. Actual earnings and analysts' forecasted earnings are from the Institutional Brokers Estimate System (IBES) Detail file.

We define earnings surprise based on the seasonal random walk (SRW) as:

$$SUE_{i,q}^{SRW} = \frac{E_{i,q} - E_{i,q-4}}{P_{i,q}} \tag{5}$$

where $E_{i,q}$ is actual quarterly earnings per share for firm i for quarter q, $E_{i,q-4}$ is actual earnings per share for the same quarter of the prior year, and $P_{i,q}$ is share price 20 days prior to the earnings announcement.

We define earnings surprise based on the analysts' forecasts as actual earnings per share minus the average of analysts' forecasts, divided by share price 20 days prior to the earnings announcement:

$$SUE_{i,q}^{Analyst} = \frac{E_{i,q} - E_{i,q}^{Analyst}}{P_{i,q}} \tag{6}$$

Based on the two measures of earnings surprises, we then assign three dummy variables, *High*, *Medium*, and *Low*. A dummy variable *High* takes a value of one if a given earnings announcement is ranked among the top 20% of earnings surprises in that quarter based on both the SRW earnings surprise measure and the analysts' earnings surprise measure. A dummy variable *Low* takes a value of one if a given earnings announcement is ranked among the bottom 20% of earnings surprises in that quarter based on both the SRW earnings surprise and the analysts' earnings surprise. A dummy variable *Medium* takes a value of one if a given earnings announcement is ranked among the medium 40% of earnings surprises in that quarter based on both earnings surprise measures. If the rankings do not overlap between the SWR earnings surprise and the analysts' earnings surprise, we exclude those stock-announcements from the sample.

We test the predictions of Atmaz and Basak (2018) by running the following panel regression:

$$\begin{aligned} CAR[1,5]_{i,t} &= \alpha^{High} High_{i,t} + \alpha^{Medium} Medium_{i,t} + \alpha^{Low} Low_{i,t} \\ &+ \beta^{Dis\times High} Dis_{i,t-1} \times High_{i,t} + \beta^{Dis\times Medium} Dis_{i,t-1} \times Medium_{i,t} + \beta^{Dis\times Low} Dis_{i,t-1} \times Low_{i,t} \\ &+ Controls_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{7}$$

where $CAR[1,5]$ is the cumulative abnormal return for days 1 to 5 after the earnings announcement day, $Dis_{i,t-1}$ is the average disagreement measured over the 10 days preceding the earnings announcement, and $High$, $Medium$, and Low are dummy variables for earnings surprises described above. Since trading on volatility and hedging is common around earnings announcements, we use the measure of disagreement that excludes at-the-money options and open-sell calls (as in e.g., Table 6, columns 3 and 6).[7] All regressions include quarter fixed effects. Standard errors are clustered by firm and time.

Results are reported in Tables 8, 9, and 10. In each table, panel A reports results without additional control variables. In panel B, we add control variables from Table 4 that are available for the vast majority of earnings announcements.

We first discuss results reported in Table 8. In column (1) in Panel A, we report results for all earnings announcements. In line with the literature on the post-earnings announcement drift (e.g., Bernard and Thomas, 1989), we note that the estimated coefficient on the dummy *High* is positive, and the estimated coefficient on the dummy *Low* is negative. Next, we focus on our main variables of interest, the interactions between the preannouncement disagreement and the dummy variables capturing earnings surprises. As predicted by Atmaz and Basak, the estimated coefficient on the term *DIS x High* is negative, while the estimated coefficient on the term *DIS x Low* is positive. Both coefficients are significant. The effect is much stronger after positive earnings surprises. In absolute value, the estimated coefficient on *DIS x High* is twice the estimated coefficient on the interaction term *DIS x Low*. Within the model of Atmaz and Basak, this asymmetry can be explained by the convexity of price responses to cash flow news. When we control for the common

[7] Results are qualitatively similar for the original specification of disagreement.

stock and option characteristics in Panel B, the estimated coefficients on the interaction terms preserve their signs, but only the negative coefficient remains significant. This reinforces the notion that the effect is asymmetric and stronger after positive news.

In columns (2) – (4), we repeat results separately for the sample of *Low*, *Medium*, and *High* beta stocks. The model of Atmaz and Basak features no short sale constraints, and it thus applies best to a subsample of stocks for which short sale constraints are less likely to be binding. According to Hong and Sraer's model, short sale constraints are less likely to be binding for low beta stocks. Indeed, we find in column (2) that, for the subsample of low beta stocks, the negative coefficient on the term *DIS x High* and the positive coefficient on the term *DIS x Low* are of similar magnitude in absolute values and are both significant. Both coefficients retain their significance after including control variables. In comparison, for high beta stocks, for which short sale constraints are more likely to be binding, only the negative coefficient on *DIS x High* is strong and significant, whereas the estimated coefficient on *DIS x Low* is insignificant and can even flip the sign when we add control variables.

To explore further the role of short sale constraints, we consider conditioning on stock market beta and institutional ownership. Nagel (2005) shows that, when institutional ownership is high, more shares are available for borrowing, relaxing physical short sale constraints. We therefore expect the positive coefficient on the term *DIS x Low* to be the strongest in the subsample of low beta stocks and high institutional ownership. In comparison, the negative coefficient on the term *DIS x High* should be the strongest for high beta stocks and low institutional ownership. Results reported in Tables 9 and 10 confirm these conjectures. In Table 9, among the high beta stocks, the estimated coefficient on *DIS x High* is most negative and significant among the stocks with low institutional ownership. In Table 10, among the low beta stocks, the estimated coefficient on *DIS* *x Low* is most positive and significant among the stocks with high institutional ownership. Both results hold without additional control variables (Panel A) as well as with additional control variables (Panel B).

7. Robustness

We conduct several robustness checks. In the main analysis, we define disagreement as the average daily disagreement across the last ten days in a given month. In untabulated results, we verify that our results are qualitatively the same if we take the average across the whole month. Our results are also similar if we recalculate disagreement by imposing different filters on daily options volume[8].

In Section 6, we showed that disagreement leads to either high or low stock returns, depending on whether cash flow news is positive or negative. This result hinges on the use of our novel measure of investor disagreement. As noted in Table 4, the dispersion in analysts' earnings forecasts is negatively related to future stock returns only in the sample of all stocks, but not in the sample of largest stocks. Similarly, in untabulated results, we find that dispersion in analysts' earnings forecasts does not produce the different signs around the earnings surprises.

Finally, in a recent paper, Andreaou et al. (2018) postulate that the dispersion of trading volume across the options moneyness levels can be viewed as a proxy for differences in expectations among investors. While it is intuitive that higher dispersion of opinion may incentivize investors to trade options further away from the at-the-money strike price, the decision to trade at a given

[8] We used a filter of at least 50 contracts per day on a series level, and independently of at least 1000 contracts per day on a class level to focus on the more actively traded options.

strike price is endogenous to options liquidity, bid-ask spreads, and the volatility of the underlying. Our measure is fundamentally different and motivated by the theoretical model of Buraschi and Jiltsov (2006). It takes into account the direction of trades, aggregates all option trades into synthetic stock positions, and measures the degree to which customers synthetic stock positions offset each other. As such, it does not hinge on the choice of maturity or the strike price. Our measure is also not endogenous to volatility of the underlying stock. In Table 11, we repeat the main results from Table 4 while controlling for the dispersion of trading volume across options moneyness levels (*DisML*). We find that our results remain strong and significant in the sample of all stocks and in the subset of largest 500 companies.

8. Conclusions

We propose a novel measure for investor disagreement estimated from synthetic long and short stock exposures in the equity options market, and show that investor disagreement has a profound effect on equity prices.

In the cross-section of stocks, high disagreement leads to low stock returns of both small and large stocks. By focusing on earnings announcements, we also show that an increase in disagreement can lead to either higher or lower future stock returns. This depends on whether cash flow news is negative or positive. The negative effect after positive news is strongest among the stocks that are most susceptible to speculative overpricing, that is high beta stocks with low institutional ownership. The positive effect after negative news is strongest among the low beta stocks with high institutional ownership.

Overall, our results suggest disagreement plays an important role for equity prices, and that the effects of disagreement are most consistent with the new channels proposed by recent theoretical models featuring wealth transfers between the optimists and pessimists (Atmaz and Basak, 2018) and individual stock exposure to aggregate disagreement (Hong and Sraer, 2016).

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Table 1: Summary statistics

This table reports monthly summary statistics for all the variables used in the main empirical analysis, separately for all stocks (Panel A) and for the subset of largest 500 stocks (Panel B). All variables are defined in Section 2. The period is 2005 to 2013.

Panel A: All stocks

	Mean	Median	Min	Max	Stdev	N
Disagreement	0.33	0.33	0.00	1.00	0.22	182,646
Directional	-0.09	-0.08	-1.00	1.00	0.41	182,646
AnalystDis	0.21	0.04	0.00	414.52	1.74	143,300
StockTurn	1.71	1.07	0.00	351.56	3.07	182,646
Size	3.38	0.34	0.00	626.55	15.76	182,131
BM	0.62	0.53	-325.23	102.68	1.85	181,232
Ret	0.01	0.00	-0.97	15.77	0.17	181,972
IdiosyncVol	0.03	0.02	0.00	2.42	0.03	181,767
Mom	0.14	0.06	-1.00	98.57	0.76	176,993
ESS	0.01	0.00	0.00	0.73	0.02	182,568
SOI	-0.02	-0.01	-1.00	1.00	0.14	176,312
PIN	0.17	0.15	0.00	0.89	0.09	179,486
InstOwner	0.56	0.60	0.00	6.67	0.33	155,261
Open Interest	0.06	0.02	0.00	9.54	0.15	170,723
OOI	0.00	0.00	-0.08	0.10	0.00	182,646
PP	0.55	0.52	0.00	1.00	0.28	133,761
OS	0.10	0.05	0.00	18.74	0.17	171,662
EOS	0.16	0.14	0.00	1.48	0.10	182,569
IVol	0.47	0.41	0.02	2.97	0.25	182,646
CP-Vol-Spread	-0.01	-0.01	-2.17	2.00	0.07	180,793
Cvol	0.00	0.00	-1.72	1.81	0.02	182,638
Pvol	0.00	0.00	-1.75	1.81	0.02	182,638
ISkew	0.07	0.05	-1.25	2.22	0.09	182,646

Panel B: Largest 500 stocks

	Mean	Median	Min	Max	Stdev	N
Disagreement	0.48	0.49	0.00	1.00	0.19	50,836
Directional	-0.09	-0.09	-1.00	1.00	0.26	50,836
AnalystDis	0.02	0.00	0.00	3.69	0.08	44,216
StockTurn	2.25	1.70	0.00	232.44	2.66	50,836
Size	22.76	10.28	0.00	626.55	40.59	50,735
BM	0.51	0.41	-10.39	17.00	0.47	50,701
Ret	0.01	0.01	-0.87	2.60	0.10	50,734
IdiosyncVol	0.02	0.01	0.00	0.32	0.01	50,808
Mom	0.17	0.12	-0.99	32.93	0.47	50,383
ESS	0.00	0.00	0.00	0.33	0.01	50,833
SOI	0.01	0.00	-1.00	1.00	0.08	50,774
PIN	0.10	0.09	0.00	0.59	0.05	50,414
InstOwner	0.75	0.79	0.00	3.08	0.21	44,528
Open Interest	0.08	0.04	0.00	1.89	0.13	50,689
OOI	0.00	0.00	-0.03	0.02	0.00	50,836
PP	0.49	0.46	0.00	1.00	0.23	48,491
OS	0.13	0.08	0.00	14.37	0.19	50,701
EOS	0.10	0.09	0.02	0.94	0.06	50,834
Ivol	0.32	0.28	0.03	2.43	0.17	50,836
CP-Vol-Spread	-0.01	0.00	-1.59	1.65	0.03	50,769
Cvol	0.00	0.00	-0.27	0.21	0.01	50,836
Pvol	0.00	0.00	-0.24	0.21	0.01	50,836
Iskew	0.05	0.04	-0.57	0.87	0.05	50,836

Table 2: Correlations

This table reports monthly pair-wise correlations for disagreement, directional, dispersion in analysts' forecasts, and stock turnover with all the variables used in the main analysis, separately for all stocks (Panel A) and for the subset of largest 500 stocks per month (Panel B). All variables are defined in Section 2. The period is 2005 to 2013.

Panel A: All stocks

	Disagreement	Direction	AnalystDis	StockTurn
Disagreement	1.00	0.11	-0.05	0.30
Directional	0.11	1.00	0.03	0.07
AnalystDis	-0.05	0.03	1.00	0.03
StockTurn	0.30	0.07	0.03	1.00
Size	0.33	0.01	-0.03	0.01
BM	-0.08	-0.02	-0.04	-0.04
Ret	0.04	-0.11	0.00	0.11
IdiosyncVol	-0.03	0.08	0.16	0.17
Mom	0.07	0.02	-0.01	0.09
ESS	-0.22	0.07	0.14	-0.17
SOI	0.08	-0.06	-0.04	0.07
PIN	-0.25	0.04	0.11	-0.20
InstOwner	0.04	-0.05	-0.10	0.26
Open Interest	0.39	0.05	0.05	0.47
OOI	-0.03	0.17	0.00	-0.08
PP	-0.48	-0.34	-0.01	-0.20
OS	0.33	0.04	0.06	0.12
EOS	-0.48	-0.02	0.04	-0.16
IVol	-0.09	0.09	0.16	0.24
CP-Vol-Spread	-0.03	0.01	-0.04	-0.11
Cvol	-0.04	0.04	0.00	-0.06
Pvol	-0.01	0.04	0.00	-0.04
ISkew	-0.13	-0.11	-0.01	-0.03

Panel B: Largest 500 stocks

	Disagreement	Direction	AnalystDis	StockTurn
Disagreement	1.00	0.22	0.04	0.27
Directional	0.22	1.00	0.03	0.09
AnalystDis	0.04	0.03	1.00	0.10
StockTurn	0.27	0.09	0.10	1.00
Size	0.35	0.06	-0.05	-0.10
BM	-0.06	-0.01	-0.05	0.06
Ret	0.02	-0.16	0.01	-0.02
IdiosyncVol	0.17	0.06	0.12	0.45
Mom	0.06	0.04	0.10	0.01
ESS	-0.02	0.03	0.16	-0.07
SOI	-0.03	-0.03	-0.02	-0.02
PIN	-0.12	-0.02	0.14	-0.01
InstOwner	-0.07	0.02	-0.03	0.18
Open Interest	0.46	0.13	0.14	0.59
OOI	0.00	0.29	-0.01	-0.06
PP	-0.48	-0.35	0.00	-0.15
OS	0.41	0.10	0.09	0.16
EOS	-0.53	-0.09	-0.02	-0.15
IVol	0.16	0.04	0.14	0.57
CP-Vol-Spread	-0.03	0.04	-0.02	-0.10
Cvol	-0.03	0.06	-0.02	-0.11
Pvol	-0.03	0.06	-0.02	-0.11
ISkew	-0.13	-0.13	0.02	0.14

Table 3: Preliminary evidence: Monthly portfolio sorts

This table reports results for portfolio sorts based on the disagreement measure and the directional measure, separately for all stocks (Panel A), and for the subsample of 500 largest stocks (Panel B). Portfolio returns are equally weighted average of monthly returns for all stocks assigned to a given portfolio. Portfolio alphas are evaluated using four Fama-French-Carhart factors and Newey-West t-statistics with three lags. The period is 2005 to 2013.

Panel A: All stocks

Disagreement	Raw Ret	Alpha	t-stat	**Directional**	Raw Ret	Alpha	t-stat
Low	11.58	1.67	1.69	Low	6.22	-3.09	-3.46
2	11.37	1.49	1.54	2.00	7.38	-1.85	-2.04
3	9.25	-0.49	-0.43	3.00	8.15	-1.48	-1.32
4	8.71	-0.97	-0.92	4.00	10.20	0.26	0.25
High	4.14	-5.38	-4.37	High	13.13	2.50	1.60
High-Low	-7.44	-7.05	-4.27	High-Low	6.90	5.59	3.26

Panel B: Largest 500 stocks

Disagreement	Raw Ret	Alpha	t-stat	**Directional**	Raw Ret	Alpha	t-stat
Low	10.34	3.41	2.31	Low	7.20	0.24	0.23
2	10.35	3.11	2.75	2.00	6.77	-0.52	-0.48
3	9.83	2.10	1.84	3.00	7.22	-0.94	-0.57
4	6.50	-1.76	-1.23	4.00	9.80	1.32	0.83
High	6.65	-2.12	-1.13	High	12.72	4.65	2.78
High-Low	-3.69	-5.53	-2.75	High-Low	5.52	4.41	2.19

Table 4: Fama-McBeth monthly return predictive regressions

This table reports two-step Fama-McBeth monthly return regressions, with next month stock excess returns as a dependent variable, and t-statistics based on Newey-West correction with three lags. All variables are defined in Section 2. The period is 2005 to 2013.

	All stocks				500 largest stocks	
	(1)	(2)	(3)	(4)	(5)	(6)
Disagreement	-0.0099***	-0.0116***	-0.0116***	-0.0113***	-0.0101***	-0.0111***
	(-3.06)	(-3.26)	(-3.12)	(-3.60)	(-3.09)	(-3.25)
Direction		0.0065***	0.0079***	0.0054***	0.0101***	0.0078***
		(3.15)	(4.64)	(3.19)	(3.97)	(3.89)
AnalystDis			-0.0039**	-0.0044**	0.0389	0.0201
			(-2.56)	(-2.35)	(0.98)	(0.60)
StockTurn			-0.1345	-0.1298	0.4469	0.2463
			(-0.40)	(-0.33)	(0.63)	(0.39)
log(Size)				-0.0006		-0.0005
				(-0.70)		(-0.59)
BM				-0.0001		-0.0014
				(-0.04)		(-0.56)
Ret(t)				0.0006		0.0022
				(0.07)		(0.20)
Ret(t-1)				0.0021		-0.0158
				(0.23)		(-1.36)
IdiosyncVol				-0.0533		-0.0779
				(-0.61)		(-0.63)
Mom				-0.0017		-0.0014
				(-0.37)		(-0.29)
ESS				1.6280		6.6529**
				(1.03)		(2.22)
SOI				0.0138		0.0364*
				(1.23)		(1.95)
PIN				-0.0044		0.0025
				(-0.30)		(0.12)
InstOwner				0.0006		-0.0069*
				(0.20)		(-1.73)
Open Interest				0.0045		-0.0094
				(0.46)		(-1.12)
OOI				1.1938**		1.1235
				(1.98)		(1.02)
PP				-0.0041*		0.0010
				(-1.85)		(0.36)
OS				-0.0017		0.0077
				(-0.31)		(1.02)
EOS				-0.0117		-0.0388**
				(-1.07)		(-2.12)
ImVol				0.0017		0.0006
				(0.13)		(0.04)
CP-Vol-Spread				0.0214		-0.0213
				(0.71)		(-0.50)
Cvol				0.0485		-0.0518
				(0.33)		(-0.24)
Pvol				-0.0683		0.2424
				(-0.56)		(1.32)
Iskew				-0.0317*		-0.0157
				(-1.95)		(-0.70)
Adj. R-squared	0.00	0.00	0.03	0.10	0.05	0.16
N cross-sectional stocks	1,428	1,428	1,137	930	401	379

Table 5: Monthly portfolio sorts: No at-the-money options and open sell calls

This table reports results for portfolio sorts based on the disagreement measure and the directional measure, separately for all stocks (Panel A), and for a subsample of 500 largest stocks (Panel B). Portfolio returns are equally weighted average of monthly returns for all stocks assigned to a given portfolio. Portfolio alphas are evaluated using four Fama-French-Carhart factors and Newey-West t-statistics with three lags. The period is 2005 to 2013.

Panel A: All stocks

No at-the-money options

Disagreement				**Directional**			
	Raw Ret	Alpha	t-stat		Raw Ret	Alpha	t-stat
Low	11.43	1.64	1.55	Low	7.38	-1.92	-2.00
2	11.96	2.20	2.12	2.00	6.41	-3.06	-2.76
3	8.96	-0.98	-0.88	3.00	8.85	-0.90	-0.83
4	8.43	-1.31	-1.18	4.00	9.23	-0.48	-0.43
High	4.34	-5.25	-4.59	High	13.23	2.65	1.83
High-Low	-7.09	-6.89	-4.32	High-Low	5.85	4.57	2.83

No at-the-money options, no open sell calls

Disagreement				**Directional**			
	Raw Ret	Alpha	t-stat		Raw Ret	Alpha	t-stat
Low	11.95	1.91	1.80	Low	6.36	-2.79	-2.66
2	11.17	1.14	1.02	2.00	7.92	-1.47	-1.32
3	9.65	-0.32	-0.24	3.00	9.17	-0.59	-0.51
4	7.32	-2.16	-2.24	4.00	9.36	-0.74	-0.56
High	4.98	-4.38	-3.71	High	12.02	1.58	1.25
High-Low	-6.96	-6.29	-4.37	High-Low	5.66	4.37	3.35

Panel B: Largest 500 stocks

No at-the-money options

Disagreement				**Directional**			
	Raw Ret	Alpha	t-stat		Raw Ret	Alpha	t-stat
Low	10.59	3.79	2.56	Low	6.89	-0.06	-0.06
2	9.27	1.85	1.76	2.00	7.12	-0.58	-0.48
3	8.47	0.60	0.43	3.00	8.55	0.26	0.17
4	8.50	0.61	0.55	4.00	8.68	0.48	0.30
High	6.93	-2.07	-1.07	High	12.51	4.67	2.94
High-Low	-3.65	-5.86	-2.75	High-Low	5.61	4.74	2.41

No at-the-money options, no open sell calls

Disagreement				**Directional**			
	Raw Ret	Alpha	t-stat		Raw Ret	Alpha	t-stat
Low	10.44	3.53	2.43	Low	6.51	-1.06	-0.88
2	10.50	3.00	2.49	2.00	7.64	0.02	0.01
3	9.85	2.14	1.61	3.00	9.61	1.41	0.89
4	6.46	-1.55	-1.07	4.00	8.65	0.57	0.37
High	6.41	-2.45	-1.51	High	11.21	3.70	2.86
High-Low	-4.03	-5.97	-3.05	High-Low	4.70	4.76	2.79

Table 6: Fama-McBeth monthly return predictive regressions: No at-the-money options and open sell calls

This table reports two-step Fama-McBeth monthly return regressions, with next month stock excess returns as a dependent variable, and t-statistics based on Newey-West correction with three lags. Columns 1 and 4 repeat results from Table 3. In columns 2 and 5, disagreement and directional are calculated without at-the-money options. In columns 3 and 6, disagreement and directional are calculated without at-the-money options and open sell calls. All variables are defined in Section 2. The period is 2005 to 2013.

	All stocks			**500 largest stocks**		
	Original	No ATM options	No ATM options and open sell calls	Original	No ATM options	No ATM options and open sell calls
	(1)	(2)	(3)	(4)	(5)	(6)
Disagreement	-0.0113***	-0.0091***	-0.0079**	-0.0111***	-0.0116***	-0.0134***
	(-3.60)	(-2.96)	(-2.38)	(-3.25)	(-3.31)	(-4.37)
Directional	0.0054***	0.0036***	0.0025**	0.0078***	0.0060***	0.0019
	(3.19)	(2.62)	(2.25)	(3.89)	(4.00)	(0.94)
AnalystDis	-0.0044**	-0.0044**	-0.0045**	0.0201	0.0206	0.0209
	(-2.35)	(-2.35)	(-2.37)	(0.60)	(0.61)	(0.63)
StockTurn	-0.1298	-0.1485	-0.1155	0.2463	0.2512	0.4106
	(-0.33)	(-0.38)	(-0.30)	(0.39)	(0.39)	(0.65)
log(Size)	-0.0006	-0.0007	-0.0008	-0.0005	-0.0003	-0.0003
	(-0.70)	(-0.83)	(-1.06)	(-0.59)	(-0.36)	(-0.37)
BM	-0.0001	-0.0000	-0.0001	-0.0014	-0.0014	-0.0017
	(-0.04)	(-0.02)	(-0.03)	(-0.56)	(-0.57)	(-0.68)
Ret(t)	0.0006	0.0001	0.0006	0.0022	0.0011	0.0026
	(0.07)	(0.01)	(0.07)	(0.20)	(0.11)	(0.23)
Ret(t-1)	0.0021	0.0019	0.0024	-0.0158	-0.0155	-0.0146
	(0.23)	(0.21)	(0.27)	(-1.36)	(-1.33)	(-1.27)
IdiosyncVol	-0.0533	-0.0567	-0.0529	-0.0779	-0.0761	-0.0435
	(-0.61)	(-0.64)	(-0.60)	(-0.63)	(-0.62)	(-0.36)
Mom	-0.0017	-0.0017	-0.0016	-0.0014	-0.0016	-0.0014
	(-0.37)	(-0.39)	(-0.35)	(-0.29)	(-0.34)	(-0.29)
ESS	1.6280	1.6529	1.6667	6.6529**	6.5068**	6.5043**
	(1.03)	(1.05)	(1.05)	(2.22)	(2.16)	(2.18)
SOI	0.0138	0.0155	0.0158	0.0364*	0.0381**	0.0383**
	(1.23)	(1.36)	(1.39)	(1.95)	(2.08)	(2.03)
PIN	-0.0044	-0.0036	-0.0031	0.0025	0.0028	0.0045
	(-0.30)	(-0.25)	(-0.21)	(0.12)	(0.14)	(0.22)
InstOwner	0.0006	0.0006	0.0011	-0.0069*	-0.0065	-0.0058
	(0.20)	(0.22)	(0.36)	(-1.73)	(-1.64)	(-1.47)
Open Interest	0.0045	0.0044	0.0039	-0.0094	-0.0090	-0.0101
	(0.46)	(0.45)	(0.41)	(-1.12)	(-1.07)	(-1.22)
OOI	1.1938**	1.3526**	1.4233**	1.1235	1.4419	1.5090
	(1.98)	(2.28)	(2.37)	(1.02)	(1.40)	(1.40)
PP	-0.0041*	-0.0042**	-0.0036*	0.0010	0.0005	0.0003
	(-1.85)	(-1.96)	(-1.81)	(0.36)	(0.18)	(0.09)
OS	-0.0017	-0.0016	-0.0011	0.0077	0.0080	0.0091
	(-0.31)	(-0.30)	(-0.21)	(1.02)	(1.06)	(1.24)
EOS	-0.0117	-0.0085	-0.0084	-0.0388**	-0.0376**	-0.0402**
	(-1.07)	(-0.77)	(-0.76)	(-2.12)	(-2.07)	(-2.11)
ImVol	0.0017	0.0017	0.0001	0.0006	0.0033	0.0021
	(0.13)	(0.12)	(0.01)	(0.04)	(0.22)	(0.14)
CP-Vol-Spread	0.0214	0.0235	0.0252	-0.0213	-0.0213	-0.0162
	(0.71)	(0.77)	(0.83)	(-0.50)	(-0.50)	(-0.39)
Cvol	0.0485	0.0390	0.0343	-0.0518	-0.0374	-0.0821
	(0.33)	(0.26)	(0.23)	(-0.24)	(-0.17)	(-0.38)
Pvol	-0.0683	-0.0609	-0.0437	0.2424	0.2185	0.2716
	(-0.56)	(-0.48)	(-0.35)	(1.32)	(1.17)	(1.46)
Iskew	-0.0317*	-0.0333**	-0.0342**	-0.0157	-0.0224	-0.0205
	(-1.95)	(-2.02)	(-2.05)	(-0.70)	(-1.04)	(-0.94)
Adj. R-squared	0.10	0.10	0.10	0.16	0.16	0.16
N cross-sectional stocks	930	928	923	379	379	379

Table 7: Weekly portfolio sorts

This table reports results for portfolio sorts based on the disagreement measure and the directional measure, separately for all stocks (Panel A), and for the subsample of 500 largest stocks (Panel B). Portfolio returns are equally weighted average of weekly returns for all stocks assigned to a given portfolio. Portfolio alphas are evaluated using four Fama-French-Carhart factors and Newey-West t-statistics with three lags. The period is 2005 to 2013.

Panel A: All stocks

Disagreement	Raw Ret	Alpha	t-stat	Directional	Raw Ret	Alpha	t-stat
Low	14.31	3.95	3.14	Low	6.54	-3.42	-3.04
2.00	13.29	2.92	2.36	2.00	6.09	-3.98	-3.52
3.00	12.02	1.78	1.52	3.00	11.44	1.13	0.86
4.00	10.63	0.39	0.30	4.00	13.89	3.43	2.27
High	8.54	-1.66	-1.05	High	20.83	10.23	6.34
High-Low	-5.77	-5.61	-3.27	High-Low	14.30	13.65	7.41

No at-the-money options, no open sell calls

Disagreement	Raw Ret	Alpha	t-stat	Directional	Raw Ret	Alpha	t-stat
Low	15.08	4.75	3.81	Low	6.67	-3.28	-2.94
2.00	15.96	5.50	3.50	2.00	7.49	-2.67	-2.21
3.00	12.34	2.04	1.46	3.00	12.14	1.73	1.31
4.00	10.50	0.19	0.14	4.00	15.41	4.79	2.78
High	6.17	-4.07	-3.00	High	17.83	7.35	4.70
High-Low	-8.91	-8.81	-5.05	High-Low	11.16	10.64	6.21

Panel B: Largest 500 stocks

Disagreement	Raw Ret	Alpha	t-stat	Directional	Raw Ret	Alpha	t-stat
Low	12.86	5.05	3.59	Low	6.50	-1.25	-1.04
2.00	11.47	3.35	2.88	2.00	8.02	-0.55	-0.46
3.00	11.50	2.97	2.50	3.00	10.45	1.68	1.25
4.00	11.41	2.58	1.76	4.00	13.41	4.53	3.16
High	9.73	0.25	0.14	High	18.58	9.79	4.86
High-Low	-3.13	-4.80	-2.22	High-Low	12.08	11.03	4.82

No at-the-money options, no open sell calls

Disagreement	Raw Ret	Alpha	t-stat	Directional	Raw Ret	Alpha	t-stat
Low	15.09	7.38	4.71	Low	6.77	-1.41	-1.02
2.00	11.57	3.20	2.43	2.00	7.24	-1.47	-1.18
3.00	13.28	4.76	3.70	3.00	11.79	2.86	2.00
4.00	10.39	1.51	1.23	4.00	13.64	4.89	3.30
High	6.78	-2.65	-1.56	High	17.64	9.32	4.97
High-Low	-8.31	-10.02	-4.45	High-Low	10.87	10.74	4.75

Table 8: Earnings surprises: Main panel regressions

This table reports panel regression results of cumulative abnormal returns over the five days after the earnings announcement on the dummy variables denoting high, medium, and low earnings surprise, and the interaction terms between the dummy variables and the pre-announcement disagreement. All regressions include quarter fixed effects. Panel A does not include additional control variables. Panel B includes DIR, ESS, ESO, log(Size), BM, IdiosyncVol, SOI, StockTurn, and PIN as additional control variables. Standard errors are clustered by time and firm and reported in parentheses below the estimated coefficients. The period is 2005 to 2013.

Panel A: No additional control variables

	Cumulative abnormal returns [1,5]			
	All stocks	**Low beta stocks**	**Medium beta stocks**	**High beta stocks**
	(1)	(2)	(3)	(4)
High	0.0128***	0.0120***	0.0132***	0.0131***
	(4.02)	(3.97)	(3.24)	(2.97)
Medium	0.0003	0.0004	0.0009	-0.0022
	(0.28)	(0.37)	(0.48)	(-0.79)
Low	-0.0097***	-0.0144***	-0.0084**	-0.0086***
	(-5.08)	(-5.30)	(-2.22)	(-2.72)
Dis x High	-0.0272***	-0.0274**	-0.0151	-0.0336**
	(-2.93)	(-2.35)	(-1.38)	(-2.34)
Dis x Medium	0.0014	-0.0012	0.0039	0.0039
	(0.44)	(-0.28)	(0.77)	(0.52)
Dis x Low	0.0129**	0.0306***	0.0086	0.0066
	(2.04)	(3.31)	(0.71)	(0.66)
Fixed effects	Quarter	Quarter	Quarter	Quarter
Clustered errors	Firm/Time	Firm/Time	Firm/Time	Firm/Time
Adj. R-squared	0.01	0.02	0.01	0.02
N	46,594	15,427	15,515	15,652

Panel B: Additional control variables				
	Cumulative abnormal returns [1,5]			
	All stocks	**Low beta stocks**	**Medium beta stocks**	**High beta stocks**
	(1)	(2)	(3)	(4)
High	0.0110***	0.0118***	0.0128***	0.0098***
	(5.28)	(3.06)	(3.64)	(3.65)
Medium	0.0004	0.0001	0.0009	-0.0017
	(0.38)	(0.06)	(0.52)	(-0.56)
Low	-0.0087***	-0.0144***	-0.0081*	-0.0064
	(-3.50)	(-4.01)	(-1.84)	(-1.48)
Dis x High	-0.0245***	-0.0289**	-0.0127	-0.0282**
	(-3.47)	(-2.49)	(-1.40)	(-2.41)
Dis x Medium	0.0018	-0.0002	0.0046	0.0038
	(0.62)	(-0.05)	(1.04)	(0.47)
Dis x Low	0.0078	0.0271**	0.0089	-0.0022
	(0.95)	(2.51)	(0.65)	(-0.18)
Directional	-0.0010	-0.0015	-0.0004	-0.0008
	(-1.10)	(-1.44)	(-0.27)	(-0.46)
ESS	-0.2108	-0.6606	0.5748	-0.3047
	(-0.36)	(-0.88)	(0.53)	(-0.36)
ESO	-0.0037	0.0003	0.0062	-0.0183**
	(-0.54)	(0.04)	(0.80)	(-2.02)
log(Size)	-0.0003	-0.0003	-0.0001	-0.0008
	(-0.60)	(-0.97)	(-0.36)	(-1.79)
BM	0.0022*	0.0009	0.0031*	0.0019
	(1.84)	(0.55)	(1.74)	(1.42)
IdiosyncVol	0.0214	0.0573	-0.2715*	0.0810
	(0.27)	(0.48)	(-1.91)	(0.96)
SOI	0.0008	-0.0024	0.0017	0.0003
	(0.12)	(-0.25)	(0.20)	(0.03)
Turnover	0.0419	0.0611	0.1338*	0.0212
	(0.73)	(0.57)	(1.80)	(0.28)
PIN	-0.0092	0.0159	-0.0384**	0.0042
	(-0.73)	(1.30)	(-2.16)	(0.17)
Fixed effects	Quarter	Quarter	Quarter	Quarter
Clustered errors	Firm/Time	Firm/Time	Firm/Time	Firm/Time
Adj. R-squared	0.01	0.02	0.02	0.02
N	44,032	14,638	14,638	14,756

Table 9: Earnings surprises: Additional results – High beta stocks

This table reports panel regression results for the subsample of high beta stocks of cumulative abnormal returns over the five days after the earnings announcement on the dummy variables denoting high, medium, and low earnings surprise, and the interaction terms between the dummy variables and the pre-announcement disagreement. All regressions include quarter fixed effects. Panel A does not include additional control variables. Panel B includes DIR, ESS, ESO, log(Size), BM, IdiosyncVol, SOI, StockTurn, and PIN as additional control variables. Standard errors are clustered by time and firm and reported in parentheses below the estimated coefficients. The period is 2005 to 2013.

Panel A: No additional control variables

	Cumulative abnormal returns [1,5]		
	Low InstOwner	**Medium InstOwner**	**High InstOwner**
	(1)	(2)	(3)
High	0.025***	0.003	0.005
	(3.07)	(0.94)	(1.14)
Medium	-0.003	-0.008	0.003
	(-0.50)	(-1.62)	(0.73)
Low	-0.005	-0.007	-0.013
	(-1.19)	(-1.33)	(-1.46)
Dis x High	-0.049**	-0.023	-0.015
	(-2.25)	(-1.24)	(-0.97)
Dis x Medium	0.010	0.015	-0.007
	(0.80)	(1.10)	(-0.55)
Dis x Low	0.002	0.014	0.005
	(0.14)	(0.86)	(0.21)
Additional controls	No	No	No
Fixed effects	Quarter	Quarter	Quarter
Clustered errors	Firm/Time	Firm/Time	Firm/Time
Adj. R-squared	0.03	0.02	0.02
N	5,410	4,762	4,972

Panel B: Additional control variables

	Cumulative abnormal returns [1,5]		
	Low InstOwner	**Medium InstOwner**	**High InstOwner**
	(1)	(2)	(3)
High	0.0196***	0.0024	0.0031
	(4.01)	(0.61)	(0.64)
Medium	-0.0016	-0.0085	0.0019
	(-0.29)	(-1.43)	(0.48)
Low	-0.0033	-0.0035	-0.0106
	(-0.65)	(-0.56)	(-1.29)
Dis x High	-0.0397**	-0.0248	-0.0098
	(-2.53)	(-1.14)	(-0.65)
Dis x Medium	0.0084	0.0176	-0.0035
	(0.65)	(1.10)	(-0.29)
Dis x Low	-0.0059	0.0005	-0.0037
	(-0.39)	(0.03)	(-0.16)
Additional controls	Yes	Yes	Yes
Fixed effects	Quarter	Quarter	Quarter
Clustered errors	Firm/Time	Firm/Time	Firm/Time
Adj. R-squared	0.03	0.03	0.02
N	4,944	4,520	4,815

Table 10: Earnings surprises: Additional results – Low beta stocks

This table reports panel regression results for the subsample of low beta stocks of cumulative abnormal returns over the five days after the earnings announcement on the dummy variables denoting high, medium, and low earnings surprise, and the interaction terms between the dummy variables and the pre-announcement disagreement. All regressions include quarter fixed effects. Panel A does not include additional control variables. Panel B includes DIR, ESS, ESO, log(Size), BM, IdiosyncVol, SOI, StockTurn, and PIN as additional control variables. Standard errors are clustered by time and firm and reported in parentheses below the estimated coefficients. The period is 2005 to 2013.

Panel A: No additional control variables			
	Cumulative abnormal returns [1,5]		
	Low InstOwner	**Medium InstOwner**	**High InstOwner**
	(1)	(2)	(3)
High	0.015***	0.009**	0.008
	(2.80)	(1.99)	(1.53)
Medium	-0.002	0.001	0.002
	(-0.77)	(0.25)	(1.01)
Low	-0.012***	-0.003	-0.029***
	(-3.44)	(-0.63)	(-2.92)
Dis x High	-0.045*	-0.015	-0.013
	(-1.95)	(-0.95)	(-0.73)
Dis x Medium	0.005	0.000	-0.009
	(0.63)	(-0.01)	(-1.20)
Dis x Low	0.035*	-0.018	0.075**
	(1.65)	(-0.69)	(2.47)
Additional controls	No	No	No
Fixed effects	Quarter	Quarter	Quarter
Clustered errors	Firm/Time	Firm/Time	Firm/Time
Adj. R-squared	0.02	0.02	0.03
N	5,330	5,017	4,789

Panel B: Additional control variables			
	Cumulative abnormal returns [1,5]		
	Low InstOwner	**Medium InstOwner**	**High InstOwner**
	(1)	(2)	(3)
High	0.0158**	0.0088	0.0092
	(2.30)	(1.54)	(1.60)
Medium	-0.0035	0.0002	0.0031
	(-1.35)	(0.09)	(1.27)
Low	-0.0117**	-0.0056	-0.0312***
	(-2.40)	(-0.95)	(-2.94)
Dis x High	-0.047**	-0.0174	-0.0192
	(-2.04)	(-0.97)	(-1.15)
Dis x Medium	0.0089	0.0016	-0.0129*
	(1.11)	(0.30)	(-1.75)
Dis x Low	0.0325	-0.0178	0.074**
	(1.38)	(-0.72)	(2.35)
Additional controls	Yes	Yes	Yes
Fixed effects	Quarter	Quarter	Quarter
Clustered errors	Firm/Time	Firm/Time	Firm/Time
Adj. R-squared	0.02	0.02	0.04
N	4,964	4,816	4,590

Table 11: Fama-McBeth monthly return predictive regressions: Additional tests

This table reports two-step Fama-McBeth monthly return regressions, with next month stock excess returns as a dependent variable, and t-statistics based on Newey-West correction with three lags. All variables are defined in Section 2. The period is 2005 to 2013.

	All stocks		500 largest stocks	
	(1)	(2)	(3)	(4)
Disagreement	-0.0113***	-0.0111***	-0.0111***	-0.0095***
	(-3.60)	(-3.20)	(-3.25)	(-2.73)
Directional	0.0054***	0.0054***	0.0078***	0.0082***
	(3.19)	(3.18)	(3.89)	(4.02)
AnalystDis	-0.0044**	-0.0041**	0.0201	0.0203
	(-2.35)	(-2.22)	(0.60)	(0.62)
StockTurn	-0.1298	0.0682	0.2463	0.2922
	(-0.33)	(0.17)	(0.39)	(0.45)
log(Size)	-0.0006	-0.0005	-0.0005	-0.0004
	(-0.70)	(-0.70)	(-0.59)	(-0.44)
BM	-0.0001	-0.0011	-0.0014	-0.0016
	(-0.04)	(-0.67)	(-0.56)	(-0.61)
Ret(t)	0.0006	0.0004	0.0022	0.0021
	(0.07)	(0.05)	(0.20)	(0.20)
Ret(t-1)	0.0021	0.0012	-0.0158	-0.0150
	(0.23)	(0.14)	(-1.36)	(-1.29)
IdioVol	-0.0533	-0.0547	-0.0779	-0.0706
	(-0.61)	(-0.62)	(-0.63)	(-0.58)
Mom	-0.0017	-0.0018	-0.0014	-0.0015
	(-0.37)	(-0.39)	(-0.29)	(-0.33)
ESS	1.6280	2.0969	6.6529**	6.9840**
	(1.03)	(1.28)	(2.22)	(2.31)
SOI	0.0138	0.0115	0.0364*	0.0330*
	(1.23)	(0.96)	(1.95)	(1.88)
PIN	-0.0044	-0.0060	0.0025	0.0017
	(-0.30)	(-0.40)	(0.12)	(0.08)
InstOwner	0.0006	-0.0006	-0.0069*	-0.0075*
	(0.20)	(-0.21)	(-1.73)	(-1.86)
Open Interest	0.0045	0.0024	-0.0094	-0.0097
	(0.46)	(0.27)	(-1.12)	(-1.10)
OOI	1.1938*	1.2791**	1.1235	1.0600
	(1.98)	(2.12)	(1.02)	(0.94)
PP	-0.0041*	-0.0040*	0.0010	0.0013
	(-1.85)	(-1.77)	(0.36)	(0.45)
OS	-0.0017	-0.0019	0.0077	0.0076
	(-0.31)	(-0.34)	(1.02)	(0.99)
EOS	-0.0117	-0.0153	-0.0388**	-0.0396**
	(-1.07)	(-1.38)	(-2.12)	(-2.11)
ImVol	0.0017	0.0015	0.0006	0.0038
	(0.13)	(0.12)	(0.04)	(0.26)
CP-Vol-Spread	0.0214	0.0190	-0.0213	-0.0272
	(0.71)	(0.63)	(-0.50)	(-0.64)
Cvol	0.0485	0.0656	-0.0518	-0.1060
	(0.33)	(0.47)	(-0.24)	(-0.51)
Pvol	-0.0683	-0.0975	0.2424	0.2773
	(-0.56)	(-0.81)	(1.32)	(1.56)
Iskew	-0.0317*	-0.0308*	-0.0157	-0.0172
	(-1.95)	(-1.79)	(-0.70)	(-0.76)
DisML		-0.0167		-0.0294
		(-0.65)		(-1.36)
Adj. R-squared	0.10	0.11	0.16	0.16
N cross-sectional stocks	930	919	379	377