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Does Disagreement Facilitate Informed Trading?

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Abstract

Using high-frequency disagreement data from the investor social network StockTwits, we find that greater unsophisticated disagreement facilitates informed buying *and* selling. During periods of overvaluation, the facilitating effect of disagreement on trading is dampened for informed buyers but is amplified for informed sellers. These findings are unexplained by sentiment, news, and retail order flow, and they remain when we measure disagreement overnight and disagreement of technical investors, which alleviates the concern that disagreement and informed trading respond to a common shock. These findings suggest that informed traders respond meaningfully but differently to valuation changes induced by unsophisticated disagreement.

I. Introduction

Trading in the presence of disagreement has long been thought to be a behavioral phenomenon. Indeed, most prior work on disagreement focuses on the behavior of less sophisticated traders (e.g., Antweiler and Frank (2004)), or proposes explicitly behavioral explanations for why disagreement leads to trading (e.g., Daniel, Hirshleifer, and Subrahmanyam (1998), Hong and Stein (1999), and Scheinkman and Xiong (2003)). However, this influential perspective is incomplete because it does not account for how *sophisticated* investors react to disagreement in equilibrium. Sophisticated investors trade more when stocks are undervalued and when there is more market liquidity (Peress and Schmidt (2020)). However, disagreement can simultaneously lead to more market liquidity and overvaluation if short selling is costly—effects that can oppose one another. It is, thus, an empirical

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question whether disagreement encourages or discourages trading by sophisticated investors.[1]

In this article, we consider how unsophisticated disagreement affects trading by an influential class of sophisticated investors: privately informed traders. To do so, we measure unsophisticated disagreement at the stock-day level using tweets by users on the investor social network StockTwits. We find that disagreement facilitates informed trading across two different classes of identifiable informed traders: activists who are informed buyers and short sellers who are informed sellers. Moreover, our tests shed light on the mechanisms that affect informed trading via an examination of the heterogeneity in how these informed traders respond to disagreement by mostly unsophisticated investors.

Unsophisticated investor disagreement can affect informed trading through two main channels. First, disagreement may lead to noise trading, creating greater scope for informed traders to buy or sell on their private information (e.g., Kyle (1985), Collin-Dufresne and Fos (2015)). If disagreement improves liquidity (e.g., Garfinkel (2009), Cookson and Niessner (2020)), it should encourage informed trading through this liquidity channel irrespective of whether the informed trader buys or sells. Second, investor disagreement can lead to overvaluation because pessimism is not fully incorporated into prices when short-selling is limited (Miller (1977), Diether, Malloy, and Scherbina (2002), and Berkman, Dimitrov, Jain, Koch, and Tice (2009)). If a stock is overvalued because of disagreement, this should matter for informed traders because informed traders care about trading profits. By contrast to the liquidity channel, this valuation channel affects informed buyers and sellers differently: informed buyers (e.g., activists) are discouraged by overvaluation, whereas informed sellers (e.g., short sellers) are attracted by it.[2] Even though both liquidity and valuation channels may be important, it is an empirical question which channel matters more for informed trading.

We begin by showing our core result that disagreement is positively related to informed trading for both activists and short sellers. This analysis is possible because the StockTwits disagreement measure and informed trading indicators are available at the daily frequency (see Cookson and Niessner (2020) for more details about the disagreement measure). We find that a 1-standard-deviation increase in investor disagreement is associated with a 2.3% increase in the likelihood of activist trading, relative to the sample mean. Relating to the competing mechanisms, this positive response is evidence that the liquidity mechanism is more important than the valuation mechanism for activist purchases. However, informed

[1] A segment of the literature considers disagreement in a rational expectations framework (e.g., Banerjee and Kremer (2010) and Banerjee (2011)), which is useful for understanding disagreement *among* sophisticated individuals. This perspective argues that disagreement ought to carry a risk premium, which in settings with sophisticated disagreement, can lead to greater expected returns (David (2008)). We take a conceptually distinct approach that studies how disagreement among *mostly unsophisticated* investors affects the trading decisions of informed traders.

[2] Although the Miller (1977) perspective has empirical support, the literature proposes two other possibilities for the price consequences of disagreement. Disagreement could command a risk premium (Varian (1985), Carlin, Longstaff, and Matoba (2014)), or idiosyncratic risk may be priced when investors are under-diversified (Boehme, Danielsen, Kumar, and Sorescu (2009)). In our setting, we use broad market tests and sample splits on short-selling costs to show that Miller (1977) is a more powerful mechanism for explaining returns and informed trading than these risk-based alternatives.

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sales respond nearly *three times as much* as informed purchases to investor disagreement—we estimate a 6.2% increase in the likelihood of a spike in short selling. This heterogeneity suggests that the valuation mechanism could also be important for informed trading. Such a mechanism could naturally lead to the heterogeneity we observe because overvaluation from disagreement discourages informed purchases while encouraging informed sales. Indeed, consistent with this idea, we find that activist purchases have *no* significant relation to disagreement when short selling is expensive.

An important empirical concern with the main test is that disagreement and informed trading could each be driven by an omitted factor (e.g., media coverage, corporate announcements, retail attention on social media) such that disagreement itself does not facilitate informed trading directly. To mitigate this concern, our main specifications control for traditional media coverage (capturing traditional news and major corporate announcements), social media attention, recent returns, and volatility. We also examine robustness by controlling for other factors that capture the direction of retail trade—retail order imbalances and social media sentiment. Our main findings hold irrespective of whether we control for these characteristics. In addition, we also find that the main findings hold if we consider only disagreement among self-proclaimed technical investors who do not trade on fundamental information. This test also mitigates reverse causality concerns because the factors that influence disagreement among technical investors are plausibly external to the fundamental motivators of informed trade.

Next, we investigate the liquidity and valuation mechanisms behind our main result. First, we verify in the broad sample of firm-day observations that disagreement has both liquidity and valuation effects. Specifically, we estimate that higher investor disagreement is associated with higher daily turnover and a contemporaneous spike in stock returns, followed by a reversion on the following day. A 1-standard-deviation increase in investor disagreement is associated with a 4.24% increase in daily turnover and 3.7% higher contemporaneous stock returns (with a negative return on the following day). Following the literature, we expect the valuation channel to be more pronounced in the subsample with high short-selling costs (Miller (1977)), and test this using Markit data on short-selling utilization as a proxy for the cost of short selling.[3] Consistent with an overvaluation effect, we find the positive relationship between investor disagreement and contemporaneous stock returns is amplified in the high utilization subsample relative to the low utilization subsample. The coefficient on disagreement at 1-day lag is negative and is 5 times larger in magnitude in the high utilization subsample.

Guided by this evidence of daily valuation effects of disagreement, we turn to evaluate heterogeneity in *informed trading* by short-selling costs, which provides a more precise test of the valuation mechanism. To do this, we split the sample at the median of short-selling utilization as well as short lending fees (proxied for by indicative fee measure from Markit being higher than 1%) to contrast stocks with high versus low short-selling costs. For the high short-selling costs subsample, we find that informed purchases have *no* relation to disagreement, while informed sales

[3]Utilization is defined as the ratio of the on-loan value divided by the total gross inventory value of the security.

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are strongly related to disagreement. By contrast, in the low short-selling costs subsample, we see the opposite pattern: Disagreement is strongly related to informed purchases, while the relation of informed selling to disagreement weakens. This heterogeneity by short-selling costs is novel evidence that the valuation mechanism is important for informed trading decisions. Beyond showing this mechanism is relevant, our finding of no effect on activist purchases when short selling is costly shows that, in some cases, the valuation channel is important enough for informed trading that it can completely offset the liquidity channel.

One possible concern with the main results, which employ contemporaneous measurement of disagreement and informed trading, is that disagreement responds to trading rather than the other way around.[4] To address this concern, we evaluate the relationship between *overnight* disagreement and informed trading. All of our main findings hold just as strongly given overnight measurement of disagreement. This evidence is useful because, in these specifications, disagreement occurs distinctly before trading activity, which helps to rule out the possibility that investor disagreement merely reflects a reaction to heightened trading activity.

Furthermore, the results are robust to alternative specifications, control variables, and subsample tests. First, in the case of activist trading, we can measure the intensive margin of informed trading. Even after conditioning on days when an activist trades, we find that disagreement predicts more activist trading. Second, our estimates are not sensitive to controlling for coverage in traditional news media, investor sentiment, and retail order imbalance. Thus, it is likely that the results are due to dispersion of opinion, not directional changes in sentiment. Finally, we obtain the same broad findings, even after focusing on observations in which there are at least 2 messages about a firm on a particular day, as well as only focusing on messages that were classified as "Bullish" or "Bearish" by the authors of the messages.

Finally, we note that facilitating the trading activities of activists and short sellers is important not only because it affects price efficiency but also because it can have real effects (e.g., Grullon, Michenaud, and Weston (2015), Back, Collin-Dufresne, Fos, Li, and Ljungqvist (2018)). To this end, we consider whether activists who face higher investor disagreement during their accumulation stages also tend to accumulate a greater stake in the underlying firm. Specifically, when investors exhibit low disagreement (bottom tercile) about the target firms, activist investors accumulate about 3.3% of shares outstanding during the prefiling 60-day period. In contrast, during events with high disagreement (top tercile), Schedule 13D filers accumulate about 6% of shares outstanding during the prefiling 60-day period. As activists have real effects on their target firms and greater effects when they acquire more of a stake in the firm, this finding suggests that disagreement may have important real effects through its effects on sophisticated and informed traders.

[4]This concern is less likely to be important for activist trading because these trades are unknown to other market participants. Indeed, activists have strong incentives to keep their trades private until they must disclose their trades for regulatory purposes. All of the activist trades we consider occur *prior* to the disclosure of the activist campaign. As activists accumulate their stakes in target firms, they have strong incentives to keep their purchases private until they are required to disclose their holdings and intentions. We validate this intuition using texts of tweets posted to StockTwits (see Figure 1), which show virtually no mention of activism in the prefile period, followed by a large spike in discussion of the topic.

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Indeed, consistent with such real effects, we find that the announcement returns and their treatment component (e.g., following Albuquerque, Fos, and Schroth (2022)) are greater for filings in which there was high disagreement in the 60-day prefiling period.[5]

Our article makes several contributions. First, our article contributes to the literature on the effects of investor disagreement on the trading environment. Trading by informed investors has traditionally been thought of as falling outside of disagreement models (Harris and Raviv (1993), Kandel and Pearson (1995), Hong and Stein (1999), and Xiong (2013)). For instance, Harris and Raviv (1993) assume that traders have access to common information but interpret market information differently. Hong and Stein (1999) assume that the same information diffuses gradually through the marketplace. Neither of these perspectives considers the actions of informed traders separately from those of uninformed traders. As we show, however, disagreement among the mostly uninformed has an important effect on informed trading across a variety of sophisticated investor types. This equilibrium response by informed traders provides a fuller understanding of the effects of disagreement and suggests modeling avenues for the interactions between sophisticated and unsophisticated market participants.[6]

Second, our results highlight an important tension between the valuation and liquidity effects of disagreement on informed trading. Notably, our results show that informed trading is not completely captured by a pure liquidity perspective like Kyle (1985), nor by a valuation-focused perspective like Miller (1977). To highlight the importance of this contribution, our findings relate to evidence in Fang, Madsen, and Shao (2025), which shows that noise trading is driven by retail attention from weekly recurring advertisements and that these spikes in noise trading facilitate informed trading, providing a test of noise trading models like Kyle (1985) and Collin-Dufresne and Fos (2016). Our findings relate to this work because the liquidity channel of disagreement has similar effects on informed trading as noise trading driven by attention. However, beyond liquidity effects, we show that disagreement exhibits an important overvaluation channel that discourages informed buyers and encourages informed sellers. Thus, our article emphasizes that informed traders balance an important tension between liquidity and valuation effects on their trading. Indeed, in the high utilization subsample, we find that disagreement bears *no* relation to informed purchases due to offsetting valuation and liquidity effects. Our findings are not well explained by a pure valuation perspective either. Indeed, the fact that disagreement facilitates informed trading

[5]Our findings could attract interest from the literature on the real effects of financial markets. Recent work has shown that disagreement affects real estate prices, the valuation of conglomerate firms, and security prices when assets are held in portfolios (Bailey, Cao, Kuchler, and Stroebel (2018); Reed, Saffi, and Wesep (2021); Huang, Hwang, You, and Yin (2020)).

[6]By connecting the actions of sophisticated investors with uninformed trades induced by disagreement, we provide a partial reconciliation between the large disagreement literature and the notion that sophisticated investors play an outsized role in shaping market outcomes (e.g., Koijen, Richmond, and Yogo (2024)). This is related to recent work that identifies uninformed trades by retail investors from Robinhood (e.g., Barber, Huang, Odean, and Schwarz (2022), Ozik, Sadka, and Shen (2021), Welch (2022), Glossner, Matos, Ramelli and Wagner (2025), and Eaton, Green, Roseman, and Wu (2022)). A unique feature of our setting is that both informed trading and disagreement can be observed explicitly.

highlights that, on average, the liquidity mechanism is more powerful than the valuation mechanism. This suggests that models of informed trading should incorporate both valuation and liquidity channels, rather than one in isolation.

Finally, our work relates to the growing literature on investor social media (Cookson and Niessner (2020), Pedersen (2022)), which primarily focuses on its information content and market consequences (Chen, De, Hu, and Hwang (2014), Farrell, Green, Jame, and Markov (2022)). For example, existing work employs StockTwits data on geography to identify distinct sources of information (Giannini, Irvine, and Shu (2018)), and related research uses social connections and sharing behavior to understand information frictions in financial markets (Chen and Hwang (2022); Cookson, Engelberg, and Mullins (2023)). Alternatively, other work uses StockTwits data to identify differences in investment philosophies or other ideologies (Cookson, Engelberg, and Mullins (2020)). Our work is closest to recent research on the market and informational consequences of social media and retail investors (e.g., Dessaint, Foucault, and Frésard (2024) and Eaton et al. (2022)). Our contribution is to study how privately informed investors—who are unlikely to participate in investor social media—react to disagreement on investor social media. This finding provides evidence that investor disagreement can spill over into decisions made by other market participants.

II. Data

A. StockTwits Data

We measure investor disagreement using data from the investor social network StockTwits. StockTwits was founded in 2008 as a social networking platform that enables investors to share their opinions about stocks. The website has a Twitter-like format, where participants post short messages and use "cashtags" with the stock ticker symbol (e.g., *"$AAPL"*) to link a user's message to a particular company. According to a website analytics tool, Alexa, StockTwits was ranked as the 505th most popular website in the U.S. as of June 2021. Its users are predominantly male, and the number of users on StockTwits with a graduate school degree is overrepresented relative to the educational attainment of users of other websites.

StockTwits provided us with the universe of messages posted between Jan. 1, 2010 and Dec. 31, 2018. In total, there are 144,641,361 messages posted by 487,265 unique users who mention 13,248 unique assets. For each message, we observe a user identifier and the message content. We also observe indicators for sentiment (bullish, bearish, or unclassified) and "cashtags" that link the message to particular assets. For more information about the data, please refer to Cookson and Niessner (2020), who perform a series of validation exercises for using StockTwits data to measure disagreement.

Following prior work, we restrict attention to messages that mention only one ticker to focus on sentiment that can be directly linked to a particular stock. Because it will be useful for our decomposition of disagreement into distinct types, we retain StockTwits messages posted by users who select an investment approach, a holding period, and experience in their profile information. Further, to facilitate the link to

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informed trading data, we focus on firms that are headquartered in the U.S. and thus make regular filings with the SEC. After these sampling restrictions, our final sample contains 22,475,108 messages posted by 68,284 unique users on 9,306 unique tickers.

We construct our disagreement measure by computing the standard deviation of expressed sentiment across messages for a given *firm* × *day*. Because the underlying sentiment variable is binary (−1 for a bearish sentiment and 1 for a bullish sentiment), the variance in the sentiment measure for firm i during time period t equals $1 - AVG_SENTIMENT_{it}^2$, where $AVG_SENTIMENT_{it}$ is the average sentiment of messages posted about firm i during time period t. Thus, our disagreement measure is

$$DISAGREEMENT_{it} = \sqrt{1 - AVG_SENTIMENT_{it}^2}. \tag{1}$$

The $AvgSentiment_{it}$ measure ranges from −1 (all bearish) to +1 (all bullish). This disagreement measure ranges from 0 to 1, with 1 signifying maximal disagreement. We apply the formula to firm-day observations that have nonzero messages. When there are no messages for a particular firm-day-group, it is not possible to compute the standard deviation of sentiment across messages. For this corner case, we maintain the assumption that non-posting means that traders do not wish to buy or sell in the near term. Accordingly, we normalize disagreement in the no-message case to 0, consistent with latent agreement, following the definition in Cookson and Niessner (2020). This choice regarding how to normalize the no-message case is consistent with the idea that minimal disagreement should correspond to minimal trading. Our tests consider robustness to this definition by excluding 0- and 1-message days from the analysis.

B. Data on Informed Trades

Our empirical tests rely on measuring informed trades from two types of sophisticated trades: activist investors on the precipice of an activist campaign and discrete increases in short-selling activity.

1. Activist Trades from Schedule 13D filings

We extract information on the timing and size of privately informed trades by activists from the mandated disclosure of beneficial ownership to the SEC. Specifically, Rule 13d-1(a) of the 1934 Securities Exchange Act requires investors to file their status with the SEC within 10 days of acquiring beneficial ownership of more than 5% of a voting class of a company's equity securities registered under Section 12 of the Securities Exchange Act of 1934. We refer to the date when the beneficial ownership crosses the 5% threshold as the "event date" and the date when the filing is sent to the SEC as the "filing date."

Information on trades executed by Schedule 13D filers is reported in Item 5(c). To quote from Item 5(c), filers have to "…describe any transactions in the class of securities reported on that were effected during the past 60 days or since the most recent filing of Schedule 13D, whichever is less,…" Thus, filers are required to

report the date, price, and quantity of all trades in the underlying security (common stock) executed during the 60 days that precede the filing date.

The sample of Schedule 13D filings with information on trades is constructed as follows:[7] First, we identify all Schedule 13D filings from 2010 through 2018. Next, we check the sample manually and identify events accompanied by information on trades. Because the trading characteristics of ordinary equities might differ from those of other assets, we retain only assets whose CRSP share codes are 10 or 11. We discard certificates, American Depositary Receipts, shares of beneficial interest, units, companies incorporated outside the U.S., Americus Trust components, closed-end funds, preferred stocks, and Real Estate Investment Trusts. We further exclude stocks whose prices are below $1 or above $1,000. Finally, we exclude Schedule 13D/A filings (i.e., amendments to previously submitted filings) that are mistakenly classified as original Schedule 13D filings. The final sample comprises the universe of all Schedule 13D filings that satisfy the above criteria from 2010 through 2018, which totals 1,409 events. During the sample period, an average of 157 events took place annually.

For each event, we extract the following information from the Schedule 13D filings in our sample: the CUSIP of the underlying security, the transaction date, the transaction type (purchase or sell), the transaction size, and the transaction price. In the vast majority of cases, transaction data are reported at a daily frequency. If the transaction data are reported more frequently than daily, we aggregate them to the daily level. Specifically, for each day, we calculate the total change in stock ownership and the average purchase price. The average price is the quantity-weighted average of transaction prices.

2. Short-Selling Data

We employ Markit data on daily shares on loan as a fraction of shares outstanding to measure the short seller trading activity. Unlike informed activist trades, we are only able to observe the overall amount of short selling, not identifiable short positions by individual traders. For this reason, we focus on clear cases where daily short selling discretely increases for a firm on a given day. That is, we define an indicator variable SHORT INCREASE SPIKE if there is at least a 1 percentage point increase in the fraction of shares on loan from day $t-1$ to day t.[8]

In addition, we use the short-selling utilization information from Markit to split our tests by cases where short selling is costly (high utilization of shares in short selling) versus cases where short selling is not (low short-selling utilization). In line with prior literature (Muravyev, Pearson, and Pollet (2022)), we consider high utilization to be utilization above 60%.[9] These sample splits allow us to focus on cases where the valuation channel is more or less important. We also use stock lending fees as an alternative proxy for the cost of short selling, to show that our main results are robust to using a different cost of short-selling measure.

[7]See Collin-Dufresne and Fos (2015) for a detailed description of the procedure. Ye and Zhu (2020) use Schedule 13D data to study trading avenue choices made by informed traders.

[8]In Supplementary Material Table IA3, we show that our main results are robust to different cutoffs: 0.5 and 2 percentage point increases.

[9]In Supplementary Material Table IA4, we show that our main results are robust to different utilization cutoffs: 50% and 70%.

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Although short increase spike and utilization measures are related to short selling, they have distinct purposes in our empirical tests. SHORT INCREASE SPIKE is a proxy for informed selling by short sellers of firm i on date t, whereas high versus low UTILIZATION is a proxy for how expensive it is to take a short position in a stock. These measures capture different aspects of the trading environment, and though high shorting costs might discourage short selling by some less sophisticated investors, empirically, the two measures have a low correlation ($r = 0.0191$). This feature of our data indicates that it is relatively common for both high and low utilization stocks to experience spikes in short selling. Intuitively, this low correlation makes sense: high short-selling costs discourage the typical investor from taking a short position, but truly informed short sellers might still find it advantageous to trade on their information, even when it is expensive to borrow shares for short selling (see Engelberg, Evans, Leonard, Reed, and Ringgenberg (2025) for an example).

C. Summary Statistics

Table 1 reports summary statistics for all our variables. The full sample contains 15,743,814 firm-day observations. We report TURNOVER and RETURN in percentage units to facilitate exposition of the regression specifications. Consistent with the high degree of daily trading volume observed in other settings (e.g., Hong and Stein (1999)), the sample average of TURNOVER is 1.32%. The *Disagreement* measure ranges from 0 (complete agreement) to 1 (maximal disagreement), with a relatively small mean (0.054) that is driven by a large number of 0 disagreement days. These days in which disagreement is 0 are mostly driven by days with 0 or 1 messages in which disagreement is not possible. Naturally, when we drop these days from the sample, we observe a larger

TABLE 1

Summary Statistics

In Table 1, we report summary statistics for firm-day-level variables. The sample covers the 2010–2018 period when StockTwits data are available. All variables are defined in Table A.1. All potentially unbounded variables are winsorized at 0.1% and 99.9%.

	N	Mean	Std. Dev	Min	p25	Median	p75	Max
TURNOVER (%)	15,743,814	1.321	4.989	0.000	0.189	0.449	0.966	93.829
RETURN (%)	15,743,814	0.029	2.682	−17.403	−0.906	0.000	0.916	22.371
DISAGREEMENT	15,743,814	0.054	0.215	0.000	0.000	0.000	0.000	1.000
DISAGREEMENT| NUM. MESSAGES > 1	1,609,631	0.529	0.450	0.000	0.000	0.771	0.943	1.000
NUMBER OF MESSAGES	15,743,814	1.292	16.667	0.000	0.000	0.000	0.000	5769
HIGH UTILIZATION	15,743,814	0.466	0.499	0.000	0.000	0.000	1.000	1.000
Informed Trading Measures								
SHORT INTEREST SPIKE	8,866,632	0.667	8.149	0.000	0.000	0.000	0.000	100.000
ACTIVIST TRADE DUMMY								
… full sample	15,743,814	0.133	3.638	0.000	0.000	0.000	0.000	100.000
… 60 days before filing	55,958	37.282	48.356	0.000	0.000	0.000	100.000	100.000
ACTIVIST TURNOVER (%)								
… full sample	15,743,814	0.000	0.016	0.000	0.000	0.000	0.000	1.790
… 60 days before filing	55,958	0.090	0.260	0.000	0.000	0.000	0.047	1.790
EX-ACTIVIST TURNOVER (%)								
… full sample	15,743,814	−0.180	4.988	−1.500	−1.311	−1.051	−0.535	92.315
… 60 days before filing	55,958	−0.417	3.715	−1.500	−1.364	−1.085	−0.510	92.315

mean (0.529). Therefore, we consider the robustness of our findings to dropping days with 0 or 1 messages.

For each of the informed trading measures, informed trades are infrequent in the full firm-day panel, irrespective of the type of informed trade: 0.569% (high short increases) and 0.133% (informed activist trades) of firm-day observations correspond to a day with an informed trade. However, in the case of activist trading, we can focus on the prefile window to understand how likely informed trading is, conditional on being informed. We observe that 37.3% of days in the 60-day window prior to a Schedule 13D filing are days when the activist trades. Viewed this way, there is a high likelihood of informed trading during periods when traders are informed.

Before presenting our evidence on the relation between these informed trades and disagreement at the daily level, we present monthly evidence that activist trades and short-selling spikes are informed. To do this, we construct indicator measures for whether there was an informed trade (activist purchase or short-selling spike) in month t, and we relate these indicators in a monthly panel regression with next-month $t+1$ return as the dependent variable. The results from this exercise are reported in the Supplementary Material (Table IA.1). Consistent with these trades being informed (as opposed to generating short-term price pressure), activist trade in month t predicts roughly 1.5 percentage points greater stock return in the following month. Similarly, short selling is informed in the opposite direction; a short interest spike is associated with a between 0.2 and 0.3 percentage point reduction in next-month returns. These return results are similar if we look at the return in the next 2-month period, as well.

III. Disagreement and Informed Trading

In this section, we present our core findings on how disagreement facilitates informed trading and how liquidity versus valuation channels matter for disagreement's relationship with informed trade.

A. Empirical Strategy

Our empirical strategy is to recognize two features of the valuation channel: the asymmetry with respect to purchases versus sales and the importance of short sale constraints.

First, the valuation channel discourages informed purchases but encourages informed sales, while the liquidity channel encourages any type of informed trade. On this logic, we expect that sophisticated and informed selling ought to have a stronger relationship to disagreement than sophisticated and informed purchasing. Indeed, whether informed purchases respond positively or negatively to disagreement is an empirical question about whether valuation or liquidity is more important for informed traders.

Second, the valuation channel should be strongest when short sale constraints are most binding. For this reason, we consider sample splits between high versus low utilization stocks to provide deeper insight into how much valuation versus liquidity mechanisms matter for informed traders.

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We implement this empirical strategy by estimating the following panel regression:

$$Y_{it} = \alpha_i + \alpha_t + \beta DISAGREEMENT_{it} + X'_{it}\gamma + \varepsilon_{it}, \tag{2}$$

where Y_{it} is an indicator variable for informed trading on day t in firm i, $DISAGREEMENT_{it}$ is measured from 4:00PM on day $t-1$ to 4:00PM on day t, α_i are firm fixed effects, α_t are date fixed effects, and X is a vector of control variables (contemporaneous and lagged number of messages, lagged disagreement, lagged informed trade, media coverage, lagged volatility, and lagged cumulative abnormal returns). We separately consider specifications with an indicator of informed purchases (ACTIVIST TRADE DUMMY) and informed sales (SHORT INCREASE SPIKE) as the dependent variable. Our interest in these specifications is in contrasting how much informed purchases respond to disagreement with how much informed sales do.

In this specification, a first-order concern is that an omitted characteristic drives both disagreement and informed trading by activists and short sellers. For example, a major news event might generate both disagreement and informed trade, or in general, drivers of social media attention could lead to more disagreement and informed trade. To mitigate the concern that traditional news drives this relationship, we measure traditional media coverage via the Dow Jones News Wire at the firm-day level. To the extent that drivers of social media attention are not well captured by the media controls, we also directly measure social media attention by counting the number of messages at the firm-day level (in line with social media attention proxies developed in Cookson, Lu, Mullins, and Niessner (2024)). Because of the importance of this attention channel in driving informed trading (e.g., Fang et al. (2025)), we estimate our main specifications both with and without the attention control. In addition, we control for other well-known drivers of trading volume at the firm-day level, and could also be driving the informed trades—recent returns, recent volatility, and lagged trading activity. To the extent that we see similar findings with and without these control variables, this strategy bolsters our confidence that disagreement drives informed trading rather than reflecting some omitted background factor.

In a robustness exercise, we conduct an analogous test to our main specification that employs disagreement overnight as a predictor of informed trading on the next day. This overnight disagreement test also helps to alleviate reverse causality concerns that higher trading volume or short selling is driving disagreement among investors.

In addition, we consider an alternative specification that includes disagreement among investors who classify themselves as following a "technical" investment philosophy on StockTwits and who do not pay attention to fundamental information. Such disagreement is unlikely to reflect fundamental considerations that would usually comprise the informed trader's strategy. Thus, these tests enhance our confidence that disagreement (and not an omitted fundamental factor) drives informed trading.

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TABLE 2

Investor Disagreement and Informed Trading

In Table 2, we report results pertaining to the relationship between informed trading and disagreement among investors. In columns 1 and 2, the dependent variable is an indicator variable that equals 100 if there was activist trading for firm *i* on day *t*, and 0 otherwise. The sample covers the 60-day period prior to Schedule 13D filings during 2010–2018. In columns 2 and 3, the dependent variable is 100 if there was at least a 1% increase in fraction of shares on loan from day $t-1$ to t, and 0 otherwise. Controls include TURNOVER on day $t-1$, MEDIA, VOLATILITY$(t-5, t-1)$, CAR $(t-30, t-6)$, and CAR $(t-5, t-1)$. All variables are defined in Table A.1. All regressions include firm and date fixed effects where indicated. Heteroskedasticity-robust standard errors are double-clustered at the firm and date levels. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable			
	ACTIVIST TRADE DUMMY		SHORT INTEREST SPIKE	
	1	2	3	4
DISAGREEMENT (z)	1.0661***	0.8432***	0.0384***	0.0414***
	(0.201)	(0.202)	(0.006)	(0.006)
NUMBER OF MESSAGES (z)		2.3607***		−0.0330*
		(0.444)		(0.017)
ACTIVIST TRADE DUMMY ($t-1$)	0.4602***	0.4605***		
	(0.008)	(0.008)		
SHORT INTEREST SPIKE ($t-1$)			0.0295***	0.0295***
			(0.001)	(0.001)
TURNOVER ($t-1$)	0.3275***	0.2992***	0.3850***	0.3879***
	(0.065)	(0.067)	(0.019)	(0.019)
MEDIA	1.4557	1.2240	0.0905***	0.0925***
	(0.960)	(0.959)	(0.016)	(0.016)
VOLATILITY ($t-1$, $t-5$)	21.9818**	22.0313**	−1.6320***	−1.6391***
	(8.535)	(8.571)	(0.533)	(0.532)
CAR($t-1$, $t-5$)	8.7870***	8.6800***	−1.4334***	−1.4262***
	(2.887)	(2.868)	(0.114)	(0.114)
CAR($t-30$, $t-6$)	4.7827***	4.8508***	−0.2826***	−0.2797***
	(1.781)	(1.781)	(0.042)	(0.041)
Observations	55,029	55,029	8,614,152	8,614,152
R^2	0.413	0.413	0.037	0.037
DISAGREEMENT effect size	2.860%	2.262%	5.744%	6.193%
Mean	37.281	37.281	0.668	0.668
Firm FEs	Yes	Yes	Yes	Yes
Date FEs	Yes	Yes	Yes	Yes

B. Results on Informed Trading

Following the first part of our empirical strategy, we report the estimated relationships between disagreement and informed trading in Table 2.

Irrespective of whether we consider activist purchases or short-selling spikes, we estimate a positive and significant relationship between disagreement and informed trade. For informed purchases (column 1 Activist purchases), these results indicate that the liquidity channel is more important for informed trading than the valuation channel, on average. For example, during the 60-day window prior to a Schedule 13D filing, a standard deviation increase in disagreement is associated with a 0.84 percentage point greater likelihood that the activist purchases shares on that day. This coefficient reflects an increase of 2.262% of the baseline rate of activist trades during this 60-day window.[10] In columns 1 and 3, we run our main specification without the number of messages control, which proxies for investor

[10]The disagreement measure is constructed from the fully classified sample of StockTwits tweets from Cookson and Niessner (2020). We obtain similar findings if we restrict our attention to only self-classified messages. See Table IA.7 in the Supplementary Material.

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attention, and in columns 2 and 4, we add the controls. While the coefficients on Disagreement decrease slightly in size, they remain significant, suggesting that disagreement effects on informed trading are different from the effect of attention.

Because the different kinds of informed trades have different base rates, it is most informative to compare the economic magnitude relative to the base rate across columns. When drawing this comparison, we see that the economic magnitude of the disagreement coefficient is much greater for informed sales (column 4) versus informed purchases (column 2). Specifically, the disagreement coefficient is 2.3% of the likelihood of informed purchases, but 6.2% of the likelihood of a short interest spike. This pattern is consistent with the idea that the valuation channel discourages informed purchases but encourages informed sales.

While we control for contemporaneous media coverage in the last table, there might still be omitted fundamental events that drive both informed trading as well as disagreement among investors. To address this potential concern further, in Table 3 we repeat our analysis, but focus only on disagreement among investors who self-declare on StockTwits that they follow the "Technical" investment strategy. As we

TABLE 3

Informed Trading and Technical Investor Disagreement

In Table 3, we report results pertaining to the relationship between informed trading and disagreement among technical investors (investors who self-report their investment strategy to be "Technical" on StockTwits). In column 1, the dependent variable is an indicator variable that equals 100 if there was activist trading for firm i on day t, and 0 otherwise. The sample covers the 60-day period prior to Schedule 13D filings during 2010–2018. In column 2, the dependent variable is 100 if there was at least a 1% increase in fraction of shares on loan from day $t-1$ to t, and 0 otherwise. Controls include TURNOVER on day $t-1$, MEDIA, VOLATILITY($t-5, t-1$), CAR ($t-30, t-6$), and CAR ($t-5, t-1$). All variables are defined in Table A.1. All regressions include firm and date fixed effects. Heteroskedasticity-robust standard errors are double-clustered at the firm and date levels. * and *** indicate statistical significance at the 10% and 1% levels, respectively.

	Dependent Variable	
	Activist Trade Dummy	Short Increase Spike
	1	2
TECHNICAL DISAGREEMENT (z)	0.3098***	0.0318***
	(0.117)	(0.006)
TECHNICAL NUM MESSAGES (z)	0.7903***	−0.0135
	(0.263)	(0.009)
ACTIVIST TRADE DUMMY ($t-1$)	0.4602***	
	(0.008)	
SHORT INTEREST SPIKE ($t-1$)		0.0295***
		(0.001)
TURNOVER ($t-1$)	0.3406***	0.3868***
	(0.065)	(0.019)
MEDIA	1.8130*	0.1036***
	(0.959)	(0.016)
VOLATILITY ($t-1$, $t-5$)	23.3189***	−1.5921***
	(8.565)	(0.534)
CAR ($t-1$, $t-5$)	8.6493***	−1.4334***
	(2.875)	(0.114)
CAR ($t-30$, $t-6$)	4.7593***	−0.2807***
	(1.783)	(0.042)
Observations	55,029	8,614,152
R^2	0.412	0.037
DISAGREEMENT effect size	0.831%	4.757%
Mean	37.282	0.668
Controls	Yes	Yes
Firm FEs	Yes	Yes
Date FEs	Yes	Yes

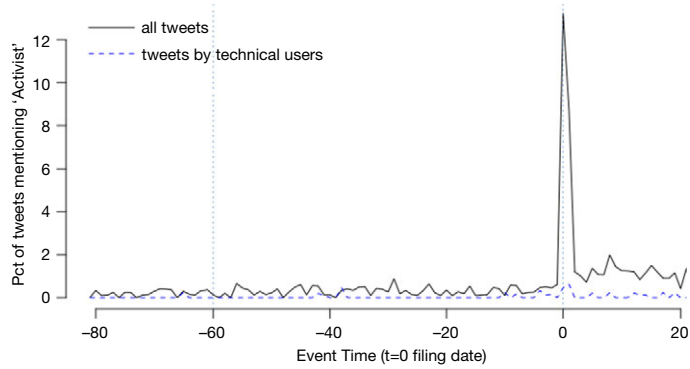
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FIGURE 1

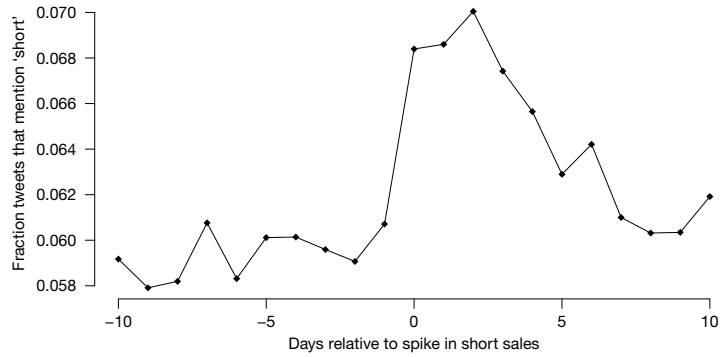
Informed Trading and StockTwits Messages About Them

Figure 1 presents two plots of the fraction of messages that refer to each of the informed trading events we study. Graph A presents mentions of "activist" for a window of $t = -80$ to $t = +20$ days around an activist's Schedule 13D filing. This shows the pre-trend for the whole prefiling period, prior to disclosure in the Schedule 13D filing. The continuous line shows the mentions in all tweets, and the dashed line shows the mentions in tweets written by investors that self-classify as having a Technical investment approach. Graph B presents mentions of "short" for a window of $t = -10$ to $t = +10$ days around short sale spike events.

Graph A. Mentions of "Activist" Around 13-D Disclosure Dates



Graph B. Mentions of "Short" Around Short Interest Spikes



confirm in Figure 1, technical investors are not likely to pay attention to fundamental events (like activist trading), which are the types of events that sophisticated investors tend to base their trading decisions on. In column 1, we regress Activist Trade Dummy and in column 2 Short Increase Spikes on disagreement among technical investors, and the number of messages among technical investors, as well as other controls included in Table 2. While the effects of disagreement are somewhat smaller – 0.831% and 4.747% for informed buying and selling, respectively—we still see the same pattern: Overvaluation channel lessens the effect of disagreement on informed buying but strengthens the effect on informed selling. Therefore, our main results are unlikely to be driven by omitted variables.

C. Liquidity and Valuation Channels

The main findings in the previous section show a strong empirical link between StockTwits disagreement and informed trading, and the relative magnitudes suggest

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that both valuation and liquidity mechanisms could be at play. In this section, we investigate these mechanisms more precisely. Specifically, we show how disagreement gives rise to both a liquidity channel and a valuation channel. This evidence takes the form of panel regressions that relate disagreement at the stock-day level to stock-day stock turnover and returns outcomes. We follow the format of the specifications in equation (2), but instead of informed trading proxies, we include outcome variables related to liquidity and valuation—daily turnover, illiquidity measures, or returns—in a broad panel of firm-day observations.

Using daily turnover as the dependent variable, we obtain the findings in Table 4, Panel A, columns 1–3. In columns 1 and 2, we estimate our specification without and with the number of messages control, and find that while both disagreement and attention play a role for turnover, the effects are distinct. In column 2, we estimate that a 1-standard-deviation increase in *DISAGREEMENT* for a given observation ($sd = 0.054$) is associated with 0.22 percentage points greater *TURNOVER*. In column 3, we find that disagreement at a 1-day lag does not predict stock turnover. Thus, we are confident that the estimates do not reflect persistent effects of disagreement and trading from previous days. This estimated magnitude is economically significant, representing approximately one-sixth of the average daily turnover, which equals 1.32%, and approximately 4.24% of the standard deviation of daily turnover.

These results on daily turnover are consistent with a liquidity channel in which disagreement reduces market illiquidity. To further highlight this liquidity channel, we replace turnover with a variety of explicit illiquidity measures from the literature (e.g., Amihud (2002) illiquidity, as well as different measures of spread and price impact). These results are reported in Table IA.2 in the Supplementary Material. Across most illiquidity measures (except the Price Impact measure), we find that greater disagreement corresponds to less market illiquidity.

Next, to establish the relevance of the valuation channel, we consider the relationship between disagreement and contemporaneous daily stock returns in an analogous specification. The results are reported in columns 4–6 of Table 4, Panel A. The results indicate that disagreement and contemporaneous stock returns are positively related, consistent with a valuation channel. Based on the estimate in column 5, a 1-standard-deviation increase in disagreement is associated with higher returns of approximately 9.6 basis points daily. This finding is consistent with Hong and Stein (1999), who posit that disagreement should lead to positive price pressure in the short term. Based on the results in column 6, this estimated coefficient is robust to including lagged measures of disagreement and the number of messages. Relative to the daily standard deviation of returns, these estimated coefficients reflect a similar economic magnitude as the turnover results: A standard deviation increase in disagreement is associated with an increase of 3.6% of a standard deviation in returns. The coefficient on lagged disagreement is negative and statistically significant in column 6. This finding is also important evidence of a valuation channel because it suggests that there is some reversion in returns after an initial increase coincident with high disagreement. Such a finding is consistent with the prediction of Miller (1977) model as short sale constraints ease.

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TABLE 4

Liquidity and Valuation Channels

In Table 4, we report results pertaining to the relationship between turnover, returns, and disagreement among investors. For Panel B, we split the sample into high and low utilization subsamples. Controls include TURNOVER on day $t-1$, MEDIA, VOLATILITY$(t-5,t-1)$, CAR $(t-30,t-6)$, and CAR $(t-5,t-1)$. All variables are defined in Table A.1. All regressions include firm and date fixed effects. Heteroskedasticity-robust standard errors are double-clustered at the firm and date levels. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Full Sample

	Dependent Variable					
	TURNOVER			RETURNS		
	1	2	3	4	5	6
DISAGREEMENT (z)	0.2617***	0.2151***	0.2115***	0.1064***	0.0956***	0.0991***
	(0.007)	(0.012)	(0.013)	(0.003)	(0.004)	(0.004)
NUMBER OF MESSAGES (z)		0.4119***	0.7752***		0.0958***	0.2143***
		(0.097)	(0.157)		(0.025)	(0.047)
DISAGREEMENT ($t-1$)			−0.0051			−0.0247***
			(0.005)			(0.002)
NUMBER OF MESSAGES ($t-1$)			−0.5294***			−0.1713***
			(0.100)			(0.036)
TURNOVER ($t-1$)	0.6301***	0.6212***	0.6313***	−0.0088***	−0.0108***	−0.0071***
	(0.014)	(0.014)	(0.014)	(0.001)	(0.001)	(0.001)
MEDIA	0.2194***	0.1913***	0.1703***	0.0493***	0.0428***	0.0371***
	(0.009)	(0.019)	(0.018)	(0.007)	(0.008)	(0.008)
VOLATILITY ($t-1$, $t-5$)	1.5271***	0.7445	1.8074***	−0.1741	−0.3560	0.0647
	(0.442)	(0.462)	(0.407)	(0.230)	(0.235)	(0.228)
CAR ($t-1$, $t-5$)	−0.0171	−0.2239**	−0.0828	−1.6777***	−1.7257***	−1.6783***
	(0.080)	(0.087)	(0.075)	(0.135)	(0.134)	(0.134)
CAR ($t-30$, $t-6$)	0.1779***	0.1283***	0.1606***	−0.1461***	−0.1577***	−0.1449***
	(0.028)	(0.029)	(0.026)	(0.031)	(0.031)	(0.031)
Observations	15,377,819	15,377,819	15,377,819	15,377,869	15,377,869	15,377,869
R^2	0.683	0.688	0.692	0.111	0.112	0.113
DISAGREEMENT effect size	5.25%	4.31%	4.24%	3.97%	3.56%	3.70%
Std. Dev	4.989	4.989	4.989	2.682	2.682	2.682
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Date FEs	Yes	Yes	Yes	Yes	Yes	Yes

Panel B. Stock Utilization Subsamples

	Dependent Variable: RETURNS					
	Subsample					
	HIGH UTILIZATION			LOW UTILIZATION		
	1	2	3	4	5	6
DISAGREEMENT (z)	0.1457***	0.1311***	0.1398***	0.0928***	0.0873***	0.0869***
	(0.010)	(0.010)	(0.010)	(0.003)	(0.004)	(0.005)
NUMBER OF MESSAGES (z)		0.1220***	0.2138***		0.0643*	0.1292**
		(0.026)	(0.041)		(0.034)	(0.057)
DISAGREEMENT ($t-1$) (z)			−0.0545***			−0.0092***
			(0.006)			(0.002)
NUMBER OF MESSAGES ($t-1$) (z)			−0.1429***			−0.0981**
			(0.029)			(0.039)
TURNOVER ($t-1$)	−0.0350***	−0.0486***	−0.0319***	−0.0115***	−0.0151***	−0.0068**
	(0.004)	(0.005)	(0.004)	(0.003)	(0.003)	(0.003)
MEDIA	0.0246	−0.0246	−0.0324	0.0552***	0.0520***	0.0487***
	(0.035)	(0.037)	(0.036)	(0.006)	(0.007)	(0.007)
VOLATILITY ($t-1$, $t-5$)	−0.1193	0.0230	0.1914	0.6903***	0.6797***	0.7466***
	(0.401)	(0.394)	(0.390)	(0.254)	(0.254)	(0.254)
CAR ($t-1$, $t-5$)	−1.0128***	−1.1088***	−1.1139***	−1.8868***	−1.8908***	−1.8856***
	(0.140)	(0.136)	(0.134)	(0.117)	(0.117)	(0.116)
CAR($t-30$, $t-6$)	−0.2231***	−0.2521***	−0.2433***	−0.1600***	−0.1609***	−0.1593***
	(0.043)	(0.044)	(0.042)	(0.030)	(0.030)	(0.030)
Observations	680,010	680,010	680,010	8,277,558	8,277,558	8,277,558
R^2	0.093	0.095	0.097	0.141	0.141	0.142
DISAGREEMENT effect size	5.31%	4.78%	5.10%	3.53%	3.32%	3.31%
Std. Dev	2.742	2.742	2.742	2.629	2.629	2.629
Firm FEs	Yes	Yes	Yes	Yes	Yes	Yes
Date FEs	Yes	Yes	Yes	Yes	Yes	Yes

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To provide further evidence on the valuation channel, we estimate the relation between returns and disagreement separately for stocks with a high fraction of shares on loan (high utilization) versus those with a low fraction of shares on loan (low utilization). These sample splits reveal whether the disagreement–return relationship is stronger in the presence of short sale constraints (high utilization stocks), as predicted by the Miller (1977) model. In line with Muravyev et al. (2022), we consider high utilization to be utilization above 60%. In Supplementary Material Table IA.4, we show that our main results are robust to different utilization cutoffs: 50% and 70%. The results from estimating the returns specification on these subsamples are reported in Panel B of Table 4. Consistent with the Miller hypothesis, we observe a stronger relationship between stock returns and disagreement in the high utilization subsample (columns 1–3) than we do in the low utilization subsample (columns 4–6). In the specifications that control for lagged disagreement and number of messages (columns 3 vs. 6), a standard deviation increase in disagreement is associated with 13.9 basis points greater return in the high utilization subsample, but only 8.7 basis points more return in the low utilization subsample. The difference in these coefficient estimates is highly statistically significant ($F = 145.93$, p-value < 0.0001). Moreover, the estimated coefficient on the lagged term $Disagreement_{t-1}$ is significant and negative in both subsamples, but its magnitude is more than 5 times greater in the high utilization channel (-5.45 basis points vs. -0.92 basis points). This evidence supports a valuation channel in which future returns are lower in the high utilization subsample.

D. Liquidity and Valuation Mechanisms for Informed Trading

To more precisely test this valuation mechanism, we appeal to the logic that the valuation channel is strongest when it is difficult to short-sell. Specifically, in Table 5, we present results from the same specifications separately for the high utilization subsample (columns 1 and 2 of Panel A) versus the low utilization subsample (columns 1 and 2 of Panel B). To ensure that our utilization definition is not driving the results, we also use lending fees as another proxy for short-selling constraints (columns 3 and 4 of Panels A and B). The lending fees on day t are proxied for by an indicative fee measure obtained from Markit data set, and high lending fees are defined over days $t-5$ to $t-1$ being greater than or equal to 1%. Under the valuation channel, the ex ante prediction is that disagreement will be less (more) related to informed purchases (sales) in the high short-selling constraint subsample (Panel A). This is precisely what we find. Referring to columns 1 and 3 of Panel A, activist purchases are unrelated to disagreement in the high utilization subsample, indicating that the valuation channel and the liquidity channel completely offset one another. Consistent with a valuation channel at play, columns 2 and 4 show that the relationship between disagreement and informed selling becomes much greater in the presence of short sale constraints, with a standard deviation increase in disagreement reflecting an increase in informed selling likelihood of 7.6% and 7% of the baseline rate. Panel C of the table presents these economic magnitudes together with tests for differences in coefficients across specifications.

TABLE 5

Disagreement and Informed Trading: Short-Selling Constraints

In Table 5, we report results pertaining to the relationship between informed trading and disagreement among investors, separately for high and low short-sale constraints. In columns 1 and 3, the dependent variable is an indicator variable that equals 100 if there was activist trading for firm *i* on day *t*, and 0 otherwise. The sample covers the 60-day period prior to Schedule 13D filings during 2010–2018. In columns 2 and 4, the dependent variable is 100 if there was at least a 1% increase in fraction of shares on loan from day $t-1$ to t, and 0 otherwise. Panel A reports results for observations with high short sale constraints: high utilization or high lending fees, Panel B for low short sale constraints: low utilization and low lending fees, and Panel C the difference in effect sizes. Controls include TURNOVER on day $t-1$, MEDIA, VOLATILITY$(t-5,t-1)$, CAR $(t-30,t-6)$, and CAR $(t-5,t-1)$. All variables are defined in Table A.1. All regressions include firm and date fixed effects. Heteroskedasticity-robust standard errors are double-clustered at the firm and date levels. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable			
	Activist Trade Dummy	Short Increase Spike	Activist Trade Dummy	Short Increase Spike
	1	2	3	4
Panel A. High Short Sale Constraints	HIGH UTILIZATION		HIGH FEES	
DISAGREEMENT (z)	0.0035	0.0936***	0.0084	0.0449***
	(0.191)	(0.018)	(0.105)	(0.010)
NUMBER OF MESSAGES (z)	−4.6590	−0.0076	3.6889	0.0147
	(3.433)	(0.017)	(3.297)	(0.030)
ACTIVIST TRADE DUMMY ($t-1$)	0.3320***		0.3623***	
	(0.045)		(0.044)	
SHORT INTEREST SPIKE ($t-1$)		0.0207***		0.0135***
		(0.003)		(0.004)
Observations	1481	640,522	1430	621,583
R^2	0.662	0.070	0.617	0.067
Mean	36.290	1.230	37.512	0.639
Panel B. Low Short Sale Constraints	LOW UTILIZATION		LOW FEES	
DISAGREEMENT (z)	0.9934***	0.0231***	0.9774***	0.0247***
	(0.234)	(0.005)	(0.233)	(0.006)
NUMBER OF MESSAGES (z)	3.2030***	−0.0114	3.0488***	−0.0268**
	(0.776)	(0.008)	(0.704)	(0.012)
ACTIVIST TRADE DUMMY ($t-1$)	0.4614***		0.4609***	
	(0.009)		(0.009)	
SHORT INTEREST SPIKE ($t-1$)		0.0276***		0.0282***
		(0.002)		(0.002)
Observations	43,602	7,800,485	43,534	7,979,453
R^2	0.430	0.040	0.433	0.040
Mean	37.473	0.637	37.708	0.672
Panel C. Difference in Effect Sizes	High Minus Low Utilization		High Minus Low Fees	
HIGH UTILIZATION/FEE DIS effect size (%)	0.010	7.610	0.022	7.032
LOW UTILIZATION/FEE DIS effect size (%)	2.651	3.624	2.588	3.958
Difference in the coefficients	−2.641*	3.986**	−2.566	3.073*
	(1.414)	(2.020)	(1.992)	(1.642)

Turning to the low utilization subsample in Panel B, the relationship between disagreement and informed purchasing strengthens in economic magnitude (going from 0.01% and 0.02% in Panel A to 2.7% and 2.6% in Panel B), whereas the relationship between disagreement and informed selling weakens (going from 7.6% and 7% to 3.6% and 3.9% in Panel B). Taken together, these findings show that disagreement facilitates both informed purchases and informed sales, on average, and that the overall response of informed trading to disagreement reflects both liquidity and valuation channels. Viewed through the lens of the high versus low utilization sample splits, both channels have an economically important effect on informed trading.

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For convenience, Panel C of Table 5 presents pairwise tests of differences in coefficients for high versus low short-selling utilization (high minus low). For informed buys, the economic magnitude in the low utilization sample is greater by 2.64 percentage points and is statistically significant at the 10% level. For informed sales, the economic magnitude is smaller by 3.99 percentage points and is statistically significant at the 5% level. These shifts in the economic effect size are consistent with there being an important valuation channel at play.

IV. Robustness and Implications

In this section, we present several robustness exercises and supplemental results that point to the implications of our main findings.

A. Overnight Disagreement and Informed Trading

A first-order concern about relating informed trading to investor disagreement is that the two measures are contemporaneous to one another. It is, thus, difficult to tell whether disagreement facilitates informed trading or whether the trading generates disagreement. In the case of activists, the context makes us more confident that those who express disagreement are unaware of informed trading. However, other kinds of trading may be more easily monitored by market participants (e.g., short selling).

To refine our interpretation, we consider specifications that replace the *DISAGREEMENT* measure with the sub-daily measure $DISAGREEMENT\ NIGHT_{it}$ (the standard deviation of StockTwits message sentiment from the overnight period about firm i, i.e., from 4:00PM on day $t-1$ to 9:00AM of day t). Similar to the *DISAGREEMENT* measure, we replace one of the control variables, the number of messages, with the number of messages during the night. We do this to ensure that the variation in the *DISAGREEMENT* measure is not purely reflecting differences in attention. The coefficient of interest is the coefficient on $DISAGREEMENT\ NIGHT_{it}$, which occurs distinctly prior to the informed trades on date t.

Empirically, StockTwits investors seem to be relatively unaware of the actions of informed traders across both measures of informed trade. In support of this, we plot the fraction of mentions of "activist" and "short" in an event window around when these trades are disclosed to the market in Figure 1. In each case, the event window exhibits a spike on the day of the disclosure and a few days following. This confirms that StockTwits users pay attention to the actions of informed traders, but also highlights that StockTwits users do not anticipate these trades. Although the activist trades typically take place weeks before their disclosure, with the broader market unaware, there is some contemporaneous attention to short selling, which is immediately observable to market participants. Thus, particularly to highlight the differential response of buyers versus sellers to disagreement, it is helpful to evaluate whether disagreement that precedes informed trades predicts informed trading.

Table 6 presents the results of this *overnight disagreement* specification. Analogous to our main findings, we estimate that disagreement overnight facilitates informed trading the next day, irrespective of whether we consider activist

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TABLE 6

Overnight Disagreement and Informed Trading: Short-Selling Constraints

In Table 6, we report results pertaining to the relationship between informed trading and disagreement among investors, separately for high and low short-sale cost samples. In columns 1 and 3, the dependent variable is an indicator variable that equals 100 if there was activist trading for firm *i* on day *t*, and 0 otherwise. The sample covers the 60-day period prior to Schedule 13D filings during 2010–2018. In columns 2 and 4, the dependent variable is 100 if there was at least a 1% increase in the fraction of shares on loan from day $t-1$ to t, and 0 otherwise. Panel A reports results for observations with high short sale constraints: high utilization or high lending fees, Panel B for low short sale constraints: low utilization and low lending fees, and Panel C the difference in effect sizes. Controls include TURNOVER on day $t-1$, MEDIA, VOLATILITY$(t-5, t-1)$, CAR $(t-30, t-6)$, and CAR $(t-5, t-1)$. All variables are defined in Table A.1. All regressions include firm and date fixed effects. Heteroskedasticity-robust standard errors are double-clustered at the firm and date levels. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent Variable			
	Activist Trade Dummy	Short Increase Spike	Activist Trade Dummy	Short Increase Spike
	1	2	3	4
Panel A. High Short Sale Constraints	HIGH UTILIZATION		HIGH FEES	
DISAGREEMENT – NIGHT (*z*)	0.002	0.0686***	0.0044	0.0300***
	(0.132)	(0.017)	(0.070)	(0.006)
NUMBER OF MESSAGES – NIGHT (*z*)	−4.6823	−0.0150	2.3165	0.0083
	(6.513)	(0.015)	(3.597)	(0.029)
ACTIVIST TRADE DUMMY ($t-1$)	0.3713		0.3644***	
	(0.477)		(0.044)	
SHORT INTEREST SPIKE ($t-1$)		0.1454***		0.0135***
		(0.012)		(0.004)
Observations	1,481	640,522	1,430	621,583
R^2	0.662	0.07	0.617	0.067
Mean	36.290	1.230	37.512	0.639
Panel B. Low Short Sale Constraints	LOW UTILIZATION		LOW FEES	
DISAGREEMENT – NIGHT (*z*)	1.0278***	0.0087*	0.9932***	0.0063
	(0.242)	(0.005)	(0.243)	(0.005)
NUMBER OF MESSAGES – NIGHT (*z*)	3.8763***	−0.0111*	3.7908***	−0.0213**
	(0.926)	(0.007)	(0.939)	(0.010)
ACTIVIST TRADE DUMMY ($t-1$)	0.3450***		0.4611***	
	(0.064)		(0.009)	
SHORT INTEREST SPIKE ($t-1$)		0.5768***		0.0282***
		(0.025)		(0.002)
Observations	43,602	7,800,485	43,534	7,979,453
R^2	0.430	0.039	0.433	0.040
Mean	37.473	0.637	37.708	0.672
Panel C. Difference in Effect Sizes	High Minus Low Utilization		High Minus Low Fees	
HIGH UTILIZATION/FEE DIS effect size (%)	0.006	5.577	0.012	4.698
LOW UTILIZATION/FEE DIS effect size (%)	2.743	1.365	2.634	0.938
Difference in the coefficients	−2.737**	4.212***	−2.622**	3.761*
	(1.257)	(1.521)	(1.291)	(1.9795)

purchases or informed short selling. In addition, consistent with our main findings, the economic magnitudes of informed sales response to disagreement are greater than the analogous magnitudes for informed buys. In addition, the evidence of a difference between high and low short-selling costs is somewhat stronger in terms of statistical significance. These findings highlight that our general conclusions about whether disagreement facilitates informed trading and the relative weight of valuation versus liquidity channels are not driven by the contemporaneous measurement of disagreement and informed trade.

Similarly, in Table 3, we show that disagreement among technical investors has a strong relationship to activist buying a short-selling spikes. While these results

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are less likely to be driven by omitted fundamental variables, there is still the reverse causality concern. Therefore, in Supplementary Material Table IA.6, we replicate the results by focusing only on messages by technical investors written overnight. We find that the results are quantitatively similar (even though we start to lose power as we cut our sample quite a bit by only looking at the overnight messages by a select group of investors).

B. Intensive Margin of Informed Trading

One aspect of the main measures of informed trading is that they are indicator measures for whether the sophisticated investor took a position on that day. Such measurement naturally leads one to wonder if there is something special about the days that generate informed trading. To evaluate this possibility, we focus on activist trading because the Schedule 13D disclosures reveal *how much* the activist trades in addition to whether they trade on a given day. Using this intensive margin measurement, we construct a measure ACTIVIST TURNOVER that reflects the fraction of shares acquired by the activist in the target firm on a given day (restricting the sample to the 60-day window before disclosure of the activist campaign).

Using this measure, we estimate how disagreement relates to the intensive margin of informed trading by restricting to days in which the activist made at least one purchase. Table 7 reports the results. For reference, column 1 repeats the extensive margin specification. In column 2, we observe a positive and significant relationship of the intensive margin of activist purchasing. Moreover, the economic

TABLE 7

Effects of Investor Disagreement on Activist Trading

In Table 7, we report results pertaining to the relationship between activist trading and disagreement among investors. In column 1, the dependent variable is an indicator variable that equals 100 if there was activist trading for firm *i* on day *t*, and 0 otherwise. The sample covers the 60-day period prior to Schedule 13D filings during 2010–2018. In column 2, the dependent variable is ACTIVIST TURNOVER for firm *i* on day *t*, multiplied by 100. The sample covers days on which activists trade during the 60-day period prior to Schedule 13D filings during 2010–2018. Controls include TURNOVER on day $t-1$, MEDIA, VOLATILITY$(t-5, t-1)$, CAR $(t-30, t-6)$, and CAR $(t-5, t-1)$. All variables are defined in Table A.1. All regressions include firm and date fixed effects. Heteroskedasticity-robust standard errors are double-clustered at the firm and date levels. *** indicates statistical significance at the 1% levels.

	Activist Trade Dummy 1	ACTIVIST TURNOVER 2
DISAGREEMENT (z)	0.8432***	0.0426***
	(0.202)	(0.004)
NUMBER OF MESSAGES (z)	2.3607***	0.0399***
	(0.444)	(0.012)
ACTIVIST TRADE DUMMY ($t-1$)	0.4605***	
	(0.008)	
ACTIVIST TURNOVER ($t-1$)		0.1499***
		(0.015)
Observations	55,029	20,479
R^2	0.413	0.429
DISAGREEMENT effect size	2.262%	17.694%
Mean	37.282	0.241
Controls	Yes	Yes
Firm FEs	Yes	Yes
Date FEs	Yes	Yes

magnitude is quite a bit stronger than the extensive margin estimate: A standard deviation increase in disagreement is associated with an increase of activist turnover of 17.7% of the average shares traded.

C. Other Robustness

We have performed several other robustness tests to account for alternative explanations of our finding.

First, one concern is that, in the case where there are zero messages or one message, the disagreement measure is automatically 0. In Supplementary Material Table IA.8, we present the main result table without observations in which there are zero messages or only one message about the firm on a given day on StockTwits, and we find very similar results to our main specifications.

A second class of robustness concerns is that the disagreement measure may not reflect pure dispersion of opinion, but directional sentiment and or the directional trading of retail investors. The Supplementary Material accounts for this possibility by controlling for average sentiment on StockTwits (Table IA.9) and controlling for retail trader imbalance using the retail trade classification of Boehmer, Jones, Zhang, and Zhang (2021) (Table IA.10). Neither of these controls changes the estimates in a quantitatively meaningful fashion.

D. Direct Observation of the Liquidity Channel

Next, we use activist setting to show more explicitly the link to liquidity. In this setting, we have the special feature where the activist is truly privately informed about their intentions to engage in activism. By contrast, short sellers may rely on signals that other sophisticated market participants also use. Unlike these market participants, informed activist trading is largely uncorrelated with other traders' information. This allows us to decompose overall stock turnover into the turnover due to activists and the remainder of (uninformed) ex-activist turnover.

We calculate EX-ACTIVIST TURNOVER by regressing turnover on activist turnover and taking the residual. The results are reported in Table 8, which reports ex-activist turnover as a percentage by multiplying it by 100. For column 1, we focus on the $[t-60, t-1]$ period prior to Schedule 13D filings. We estimate that greater investor disagreement leads to higher ex-activist trading.[11]

The results reported in columns 2 and 3 show that the relationship between investor disagreement and ex-activist trading differs between days when activist investors trade and the days on which they do not trade. Specifically, for activist trading days (column 2), the relationship between disagreement and ex-activist trading on days when activists trade is *stronger* than the relationship between disagreement and ex-activist trading on days when activists do not trade (0.8432 vs. 0.1141). The difference in these coefficient estimates is highly statistically significant ($F = 77.37$, p-value < 0.0001). Overall, the results are consistent with

[11] These results are robust to using an alternative measure of ex-activist turnover: total turnover minus activist turnover.

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TABLE 8

Investor Disagreement on Ex-Activist Turnover

In Table 8, we report the relationship between ex-activist trading and disagreement among investors. The dependent variable, EX-ACTIVIST TURNOVER, is calculated by regressing TURNOVER on activist turnover and taking the residual, and is multiplied by 100. In column 1, the sample covers the 60-day periods prior to a Schedule 13D filing. In column 2, the sample covers days during the 60-day periods prior to Schedule 13D filings, during which some activist turnover occurs. In column 3, the sample covers days during the 60-day periods prior to Schedule 13D filings, during which no activist turnover occurs. Controls include TURNOVER on day $t-1$, MEDIA, VOLATILITY$(t-5, t-1)$, CAR $(t-30, t-6)$, and CAR $(t-5, t-1)$. All variables are defined in Table A.1. All regressions include firm and date fixed effects. Heteroskedasticity-robust standard errors are double-clustered at the firm and date levels. * and *** indicate statistical significance at the 10% and 1% levels, respectively.

	Dependent Variable: EX-ACTIVIST TURNOVER		
	Sample		
	60-Day Period 1	Days With Activist Trading 2	Days Without Activist Trading 3
DISAGREEMENT (z)	0.4590***	0.8432***	0.1141*
	(0.053)	(0.094)	(0.061)
NUMBER OF MESSAGES (z)	2.7805***	2.4599***	3.5376***
	(0.466)	(0.410)	(0.824)
ACTIVIST TURNOVER ($t-1$)	−0.5589***	−0.7649***	−0.2288
	(0.119)	(0.180)	(0.147)
Observations	55,029	20,479	34,525
R^2	0.362	0.440	0.539
DISAGREEMENT effect size	12.359%	16.871%	4.279%
Std. Dev	3.714	4.998	2.667
Controls	Yes	Yes	Yes
Firm FEs	Yes	Yes	Yes
Date FEs	Yes	Yes	Yes

the idea that activist investors trade on days when uninformed investors react especially strongly to investor disagreement. Because ex-activist trading activity is, by construction, the fraction of daily turnover that is uncorrelated with activist trading activity, this finding provides further evidence consistent with the liquidity channel.

E. Real Effects of Disagreement: Activist Stakes in Target Firms

We conclude this section by presenting a result that connects the disagreement and trading results to a potential real effect. This test focuses on the eventual stakes that activists acquire, which are important because greater stakes lead to greater effort on the part of the activist investor (e.g., Back et al. (2018)).

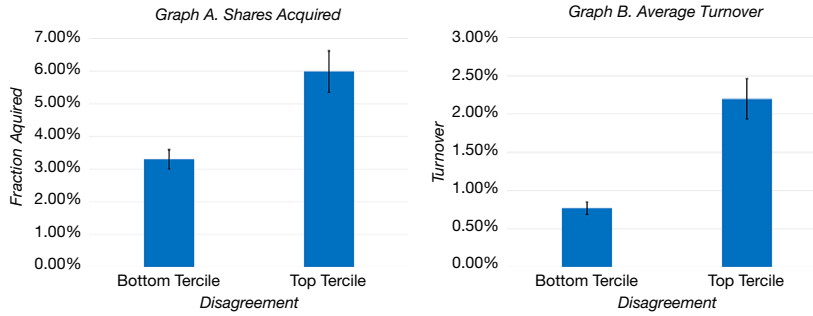
For this test, we consider whether activists who target firms that face greater disagreement in their prefiling periods also acquire greater stakes in their target firms. Using raw data at the event level, we illustrate this relationship by focusing on the mean acquisition stake of activists by comparing whether a targeted firm exhibited low or high levels of disagreement (bottom and top terciles) in the prefiling period. Consistent with the facilitation of activism by disagreement, Graph A of Figure 2 shows that activists acquire significantly higher numbers of shares when shareholder disagreement about a target firm is high. Specifically, when shareholders of target firms exhibit below-median disagreement, activist

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FIGURE 2

Shares Acquired and Investor Disagreement

Graph A of Figure 2 plots the fraction of shares outstanding acquired by a focal activist investor during the 60-day period prior to a Schedule 13D filing. Graph B plots the average turnover during the 60-day period prior to a Schedule 13D filing. The *x*-axis represents the average level of disagreement during those 60 days. The level of disagreement is divided into 3 terciles, and we plot the bottom tercile and the top tercile levels of disagreement. The standard error bars represent confidence intervals at the 95% level.



investors accumulate about 3.3% of shares outstanding.[12] In contrast, during events with above-median levels of messages, Schedule 13D filers accumulate about 6% of shares outstanding. This finding indicates that, when investor disagreement increases, activist investors purchase larger fractions of shares outstanding and therefore are likely to devote more time and energy to activism (Back et al. (2018)).

In Graph B of Figure 2, we also show that this period of higher disagreement is associated with greater overall stock turnover. Consistent with the liquidity mechanisms we have highlighted throughout the article, high disagreement appears to be a useful signal about greater trading volume.

Do higher activist stakes lead to real effects on firm value? We next investigate whether stock prices reflect such effects. Specifically, in Figure 3 we show the relationship between disagreement during the 60-day window and the price reaction to activism campaign announcements (as measured using buy-and-hold abnormal returns around Schedule 13D filing date). Graph A shows that when disagreement is high, Schedule 13D filings receive more positive abnormal returns. Consistent with Back et al. (2018), this finding is an important addition to Figure 2, where we show that disagreement leads to larger activist stake.

Furthermore, we evaluate the relationship between disagreement and the *treatment component of abnormal returns*, which is structurally estimated by

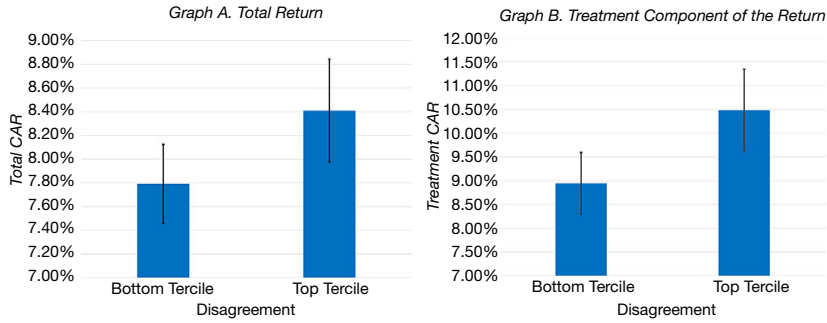
[12]Our measure of shares accumulated only counts shares acquired after date $t-60$. Since activists can begin the 60-day period with a nonzero position, they often accumulate less than 5% shares outstanding before crossing the 5% threshold. For example, suppose an activist owns 3% of shares outstanding on Mar. 1. During the following 60 days the activist accumulates 2%, crossing the 5% threshold on Apr. 30. If the activist files a Schedule 13D 8 days later on May 8 (within 10-day disclosure period), disclosing a 6.5% position in the stock, our measure of percent shares outstanding accumulated equals 3.5%: 2% in the 60 days before the threshold-crossing date and an additional 1.5% before the filing date.

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FIGURE 3

Returns and Investor Disagreement

Graph A of Figure 3 plots the average buy-and-hold stock return around Schedule 13D filing date in excess of the Fama–French 3-factor model, which is estimated from 360 days through 60 days before the filing date. The abnormal return is calculated from 30 days prior to the filing date to 10 days afterward. Graph B uses plots the treatment component of the average buy-and-hold stock return around Schedule 13D filing date. The treatment component of the abnormal return is calculated using Albuquerque et al. (2022) methodology. The *x*-axis represents the average level of disagreement during those 60 days. The level of disagreement is divided into 3 terciles, and we plot the bottom tercile and the top tercile levels of disagreement. The standard error bars represent confidence intervals at the 95% level.



Albuquerque et al. (2022) who model the choice between passive investment and activist investment (13G vs. 13D filings). In Graph B of Figure 3, we restrict attention to this treatment component (a proxy for the real impacts of activism). Consistent with the real impacts of disagreement, we find that disagreement is positively associated with the treatment component of abnormal returns.

V. Conclusion

This article studies how a particular class of sophisticated investors—informed traders—respond to shareholder disagreement. We find that greater investor disagreement facilitates informed trading by activists and short sellers. These findings are unexplained by sentiment, news, and retail order flow, and they remain when we measure disagreement in the overnight period as well as among technical investors, which alleviates concern that disagreement and informed trading respond to a common shock. When short selling is costly, the effect of disagreement is dampened for informed buyers but is amplified for sellers.

Our findings show that disagreement has important effects on both the timing and intensity of informed trading through two distinct mechanisms. On one side, disagreement generates trading by uninformed investors and therefore opens up trading opportunities for informed investors. On the other side, disagreement increases valuation, particularly when short selling is costly, and therefore discourages informed buyers and encourages informed sellers.

Overall, our results highlight the importance of informed and sophisticated market participants to a full understanding of the effects of disagreement in financial markets. Based on our findings, more research is needed to incorporate sophisticated investors' actions into market equilibrium in settings dominated by the actions of behavioral agents.

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Appendix

TABLE A.1

Variable Definitions and Data Sources

Variable	Description
ACTIVIST TRADE DUMMY	Is an indicator variable that takes the value of 100 if there was activist trading for firm *i* on day *t*. Activist trading is defined following the procedure in Collin-Dufresne and Fos (2015). Data source: Schedule 13D filings.
ACTIVIST TURNOVER	Is the number of shares acquired by activist investors for firm *i* on day *t* divided by the number of shares outstanding for firm *i* on day *t* multiplied by 100. The variable is winsorized at the 0.1% and the 99.9% levels. Data source: Schedule 13D filings.
EX-ACTIVIST TURNOVER	Is calculated by regressing turnover on activist turnover for firm *i* on day *t*, taking the residual, and multiplying it by 100. The variable is winsorized at the 0.1% and the 99.9% levels. Data source: Schedule 13D filings.
SHORT INTEREST SPIKE	Is an indicator variable that takes the value of 100 if there was at least a 1% increase in fraction of shares on loan for firm *i* from day *t*1 to *t*. Fraction of shares on loan is calculated as the number of shares on loan divided by the number of shares outstanding. Data source: Markit.
DISAGREEMENT	Is defined as $Disagreement_{it} = \sqrt{1 - AvgSentiment_{it}^2}$, where $AvgSentiment_{it}$ is the average sentiment of messages posted on StockTwits about firm *i* on StockTwits about firm *i* between 4:00PM on day $t-1$ and 4:00PM on day *t*. Sentiment is coded as either −1 for "Bearish" or + 1 for "Bullish." DISAGREEMENT is normalized in the no-message case to 0, consistent with latent agreement, following the definition in Cookson and Niessner (2020). Data source: StockTwits.
NUMBER OF MESSAGES	Is the number of messages posted on StockTwits about firm *i* between 4:00PM on day $t-1$ and 4:00PM. on day *t*. Data source: StockTwits.
TECHNICAL DISAGREEMENT	Is the disagreement among investors who self-declare their Approach (investment strategy) to be "Technical." Data source: StockTwits.
TECHNICAL NUM MESSAGES	Is the number of messages posted on StockTwits about firm *i* between 4:00PM on day $t-1$ and 4:00PM on day *t* by investors who self-declare their Approach (investment strategy) to be "Technical." Data source: StockTwits.
DISAGREEMENT - NIGHT	Is the disagreement about firm *i* using messages that were posted between 4:00PM on day $t-1$ and 9:00AM on day *t*. Data source: StockTwits.
NUMBER OF MESSAGES - NIGHT	Is the number of messages posted on StockTwits about firm *i* between 4:00PM on day $t-1$ and 9:00AM on day *t*. Data source: StockTwits.
TURNOVER	Is the number of shares traded for firm *i* on day *t* divided by the number of shares outstanding for firm *i* on day *t* multiplied by 100. The variable is winsorized at the 0.1% and the 99.9% levels. Data source: CRSP.
RETURNS	Is the close-to-close raw return for firm *i* on day *t* multiplied by 100. The variable is winsorized at the 0.1% and the 99.9% levels. Data source: CRSP.
MEDIA	Is an indicator variable that takes the value of 1 if company *i* had at least one story on Dow Jones News Wire on day *t*. Data source: Ravenpack News Analytics.
VOLATILITY ($t-1$, $t-5$)	Is the standard deviation of returns over days $t-5$ to $t-1$. Data source: CRSP.
CAR ($t-1$, $t-5$)	Is the cumulative abnormal return over days $t-5$ to $t-1$. Abnormal returns are calculated as the raw return minus the value-weighted market return. Data source: CRSP.
CAR ($t-30$, $t-6$)	Is the cumulative abnormal return over days $t-30$ to $t-6$. Abnormal returns are calculated as the raw return minus the value-weighted market return. Data source: CRSP.
HIGH UTILIZATION	Is an indicator variable that takes the value of 1 if the average short-selling utilization over days $t-5$ to $t-1$ was greater than or equal to 60%, in line with prior literature (e.g., Muravyev et al. (2022)). Short-selling utilization is defined as the ratio of the on-loan value divided by the total gross inventory value for firm *i* on day *t*. Data source: Markit.
LOW UTILIZATION	Indicator variable that takes the value of 1 if the average short-selling utilization over days $t-5$ to $t-1$ was less than 60%. Data source: Markit.
HIGH FEES	Is an indicator variable that takes the value of 1 if the average lending fee over days $t-5$ to $t-1$ was greater or equal to 1%. The lending fees on day *t* are proxied for by an indicative fee measure. Data source: Markit.
LOW FEES	Is an indicator variable that takes the value of 1 if the average lending fee over days $t-5$ to $t-1$ was less than 1%. Data source: Markit.

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Supplementary Material

To view supplementary material for this article, please visit http://doi.org/10.1017/S0022109025101762.

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