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How are shorts informed? Short sellers, news, and information processing[☆]

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ABSTRACT

We find that a substantial portion of short sellers' trading advantage comes from their ability to analyze publicly available information. Using a database of short sales combined with a database of news releases, we show that the well-documented negative relation between short sales and future returns is twice as large on news days and four times as large on days with negative news. Further, we find that the most informed short sales are not from market makers but rather from clients, and we find only weak evidence that short sellers anticipate news events. Overall, the evidence suggests that public news provides valuable trading opportunities for short sellers who are skilled information processors.

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1. Introduction

There is now overwhelming evidence that short sellers are informed traders. When short interest or short volume are high, future returns are predictably low (see, e.g., Senchack and Starks, 1993; Asquith, Pathak, and Ritter, 2005; Boehmer, Jones, and Zhang, 2008). Return predictability, however, suggests only that short sellers have an information advantage over other traders. In this paper, we ask *how* short sellers obtain that advantage.

To address this question, we combine a large archive of all corporate news events with a large panel of daily short selling. This unique combination allows us to comprehensively examine the relation between short selling and news events. We find that a substantial portion of short sellers' trading advantage comes from their ability to analyze publicly available information. In fact, while news events occur on only 22% of the days in our sample, these trading days account for over 45% of the total profitability from short selling.

Although our evidence suggests that short sellers obtain an information advantage via superior information processing, some commentators have suggested other ways that short sellers achieve an advantage. The Securities and Exchange Commission (SEC) suggested that short sellers spread “false rumors” in an effort to manipulate firms “uniquely vulnerable to panic.”¹ If this type of manipulation

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¹ Cox, C., 2008. What the SEC really did on short selling. The Wall Street Journal, 24 July.

were taking place, then it suggests that short sellers might initiate a trade and then spread rumors (see, e.g., van Bommel, 2003). In other words, we might expect to see short sellers trade before news events, even though the news events could turn out to contain false information.

We find little evidence to support the claim that short sellers' advantage comes from trading before information is released, even though short sellers have been shown to trade before the release of certain types of public information. For example, Karpoff and Lou (2010) show that short selling increases before the initial public revelation of firms' financial misrepresentation. Similarly, Christophe, Ferri, and Angel (2004) find evidence of informed short selling in the 5 days before earnings announcements.

In contrast, when we look at *all* corporate news events in the Dow Jones archive, we find that the trades of short sellers are similar to the trades of other market participants in the days leading up to a news release. Unconditionally, the ratio of short volume to total volume is 0.196 and this ratio falls by 0.019 on negative news days and rises by 0.022 on positive news days. However, during the days leading up to the news event, the ratio is the same or slightly *smaller* than the unconditional mean, irrespective of the news type. Moreover, during the days after a news event, the ratio is the same or slightly *larger* than the unconditional mean. The result suggests that, on average, short sellers trade on or after news release dates and they do not anticipate public news announcements.

Given that short sellers tend to trade on or after news events, we next ask whether these news events present profitable trading opportunities for short sellers. Interestingly, the extant theoretical literature provides mixed predictions on the role of news releases. On the one hand, a number of papers argue that news reduces information asymmetry (see, e.g., Korajczyk, Lucas, and McDonald, 1991; Diamond and Verrecchia, 1987). For example, if a firm announces a merger, investors who knew that the merger was likely no longer have an information advantage over those who did not. The news announcement therefore reduces the information asymmetry between informed and uninformed investors. Under this view, the trades of informed traders (short sellers) should be *less* profitable when they are initiated immediately following a news announcement.

On the other hand, several papers suggest that public news events can lead to differential interpretations by traders based on variation in the traders' skill (see, e.g., Kandel and Pearson, 1995). Rubinstein (1993) puts it succinctly: "In real life, differences in consumer behavior are often attributed to varying intelligence and ability to process information. Agents reading the same morning newspapers with the same stock price lists will interpret the information differently." Under this view, public news events present profitable trading opportunities for skilled information processors, which can explain not only high volume around news events (Kandel and Pearson, 1995) but also evidence of return predictability from "soft" information in news announcements (see, e.g., Engelberg, 2008; Demers and Vega, 2008). This suggests that news announcements should make the trades of informed traders (short

When we take both of these theories to the data, we find evidence in support of the second view. Several papers find that abnormal short selling unconditionally predicts lower future returns (see, e.g., Senchack and Starks, 1993; Asquith, Pathak, and Ritter, 2005; Boehmer, Jones, and Zhang, 2008). We also find that abnormal short selling leads to lower future returns, but we find that this effect is concentrated around news events. In particular, the predictability for future returns more than doubles on news days and quadruples on days with negative news. While a long-short trading strategy based on the level of short selling would have earned a return of 40% over our 2.5-year sample period, a long-short strategy that conditioned on short selling and news events would have earned 60%. Moreover, a strategy based on short selling and negative news would have earned an astonishing 180% during our 2.5-year sample period.

An alternative explanation for this result could be that some buyers make systematic mistakes around news events (Antweiler and Frank, 2006), and that these buyers' mistakes are reflected in market makers' offsetting short sales. To determine whether short sellers' trades are due to superior information processing or to offsetting positions, we exploit a unique feature of the short selling data, namely, exempt versus non-exempt trade marking, which allows us to distinguish market makers from non-market makers (clients). We find that clients' trades are particularly well informed, and that these trades are much more profitable in the presence of news events. In contrast, market makers' trades are not particularly well informed, and there is no differential impact in the presence of news. Thus, there appears to be little support for the claim that return predictability from shorts is greater on news days because of market makers offsetting short sales.

Another alternative explanation for our main result is that short sales are profitable on news days because news days provide short sellers with increased liquidity. This explanation, however, requires that the costs of short selling are *lower* around news announcements. However, we find little evidence that market liquidity improves on news days. For example, we find that bid-ask spreads actually increase by nearly 5% around news announcements, which is consistent with existing models of market maker behavior in the presence of informed traders (see, e.g., Glosten and Milgrom, 1985; Kyle, 1985). When coupled with our finding that the trades of short sellers are more than twice as profitable in the presence of news, the evidence is consistent with the idea that public news events present profitable trading opportunities for skilled information processors and short sellers are, on average, skilled at processing public news.

The remainder of this paper proceeds as follows. Section 2 discusses related literature. Section 3 describes the databases used in this study and presents our main hypotheses. Section 4 presents our analyses and findings. Finally, Section 5 concludes.

2. Related literature

The ideas in this paper relate to three distinct branches

extensive literature on the behavior of short sellers relative to other traders. Second, our paper contributes to a growing literature on how market participants respond to public news. Finally, this paper sheds light on an emerging debate on whether news increases or decreases information asymmetry. In this section, we first discuss prior papers that connect news to short selling. We then provide an overview of the relevant literature in each of these three branches.

Fox, Glosten, and Tetlock (2009) use news and short selling data to examine the role of short sellers from a regulator's perspective. Motivated by the intense scrutiny that short sellers receive from the press and lawmakers, they investigate whether short selling appears to be socially beneficial or harmful (and worthy of regulation). In addition, several extant papers look at short selling behavior in the context of a specific type of corporate news event. As such, these studies shed light on a subset of this paper's sample of news events. Karpoff and Lou (2010), for example, examine short sellers' positions in firms that are investigated for financial misconduct and find that short sellers generally anticipate public announcements of investigations. Christophe, Ferri, and Angel (2004) and Christophe, Ferri, and Hsieh (2010) focus on short sellers' trades around earnings announcements and analyst downgrades, respectively, and find evidence that short sellers are informed traders who can profit from these events. Similarly, Daske, Richardson, and Tuna (2005) and Boehmer, Jones, and Zhang (2010) look at short selling around management forecast announcements and earnings announcements. While Daske, Richardson, and Tuna (2005) find no evidence that short sale transactions concentrate prior to bad news events, Boehmer, Jones, and Zhang (2010) find some evidence of anticipation, and they show that a significant fraction of short sellers' information advantage comes from trading around these events. Finally, Nagel (2005) looks at the cash flow news implied by a vector auto regression and finds an asymmetric effect on returns, indicating that short sellers help incorporate news into prices when short selling is not constrained.

While the above papers identify patterns in short selling around a handful of specific corporate news events, the current paper aims to uncover patterns in short sellers' trades around *all* types of corporate news events. Doing so allows us to speak more generally about short sellers' behavior around new releases of public information. In particular, using a list of all corporate news events, we can sort the universe of trading days into those with and without news and examine the differential performance of short sellers surrounding news events.

2.1. Short sellers' trading patterns

Several papers compare the trades of short sellers to the trades of other market participants. There are multiple dimensions over which trades can be compared. Much of the recent literature focuses on the profitability of trades, which, roughly speaking, can be measured using the performance of a stock's price after the initiation of a short sale. In one of the earliest articles to empirically

between short interest and returns and concludes that short positions are indicative of bearish opinions. Similarly, Boehme, Danielsen, and Sorescu (2006) show that when short selling is constrained and there are relatively diverse opinions, abnormally high short interest can precede negative future returns. Using transaction data at a higher frequency, Boehmer, Jones, and Zhang (2008) find that heavily shorted stocks significantly underperform lightly shorted stocks, especially stocks heavily shorted by non-program institutional traders; and Diether, Lee, and Werner (2008) show that not only do prices follow short selling, but short selling also follows prices, that is, short sellers tend to short after price run-ups. These results further indicate that short sellers could have an information advantage.² In sum, the above work establishes that the performance of short sellers' trades indicates that short sellers are informed traders. Our paper contributes to this literature by asking *how* short sellers come to enjoy an information advantage in the first place.

2.2. Public news

While a large literature examines volume and return phenomena around *specific* news events (e.g., earnings announcements, mergers, and dividend initiations and omissions), a more recent literature considers such phenomena around *any* corporate news event. Categorizing all *Wall Street Journal* stories between 1973 and 2001, Antweiler and Frank (2006) find that return responses vary widely across news categories, although they find evidence of overreaction (return reversal), on average. Also using a database of all news events, Tetlock (2011) finds evidence of even stronger return reversal following repeated news events, consistent with the idea that investors overreact to "stale" news stories. Several studies using comprehensive news databases examine whether well-known asset pricing anomalies are related to news. Chan (2003) considers the momentum anomaly among stocks with and without recent news and finds evidence of price momentum only among news stocks. Similarly, Vega (2006) finds more earnings momentum among stocks with high differences of opinion on news days.

More recently, researchers have asked whether the content of news stories contains value-relevant information. Tetlock, Saar-Tsechansky, and Macskassy (2008) and Engelberg (2008) show that, indeed, the qualitative content of the information contained in news stories can predict both earnings surprises and short-term returns. These findings support the idea that there is value-relevant or "soft" information in news stories that is not immediately impounded into prices.

To summarize, this literature highlights the importance of looking at more than one news category when

² A closely related dimension of research is whether short sellers' trades reveal information to other market participants. In other words, are short sellers' trades newsworthy in and of themselves? Senchack and Starks (1993) show that abnormally large short interest announcements have small but significant negative returns. Similarly, Aitken, Frino, McCorry, and Swan (1998) show that short sales are followed by price

assessing the behavior of short sellers. Moreover, it shows that the information content of news leaves room for traders with different information processing abilities to arrive at different conclusions about the value relevance of the news event. Our work builds on these findings by analyzing the universe of corporate news events in the U.S. over our sample period, and by asking whether, in our sample, information processing ability plays a role in the performance of short sellers' trades.

2.3. Public news and informed trading

There are two views regarding the relation between the trading patterns of skilled investors and the release of public news items such as the articles contained in the Dow Jones archive. Under the first view, public information does not provide traders with an information advantage; that is, managers who rely on public information (rather than generate private information) are low-skilled. Consistent with this view, Kacperczyk and Seru (2007) estimate managers' reliance on public information (RPI) as the *R*-squared of a regression of percentage changes in fund managers' portfolio holdings on changes in analysts' past recommendations and find that fund managers with low RPIs (low reliance on public information) perform better than fund managers with high RPIs (high reliance on public information).

Under the alternative view, the public release of information presents trading opportunities for skilled processors of information; that is, when news is released, traders with superior information processing skills can convert this news into valuable information for trading (Kandel and Pearson, 1995). Earnings announcements, for example, are often accompanied by lengthy documents and conference calls that are scrutinized by information processors. Those traders who show exceptional skill in converting such data into value-relevant information are rewarded with superior returns on event-driven trades. Evidence consistent with this view comes from studies that attempt to look at the textual content of news and firm announcements. Specifically, Tetlock, Saar-Tsechansky, and Macskassy (2008), Engelberg (2008), Demers and Vega (2008), and Feldman, Govindaraj, Livnat, and Segal (2009) all show that the content of corporate news predicts returns, which is consistent with the view that information processing skills can generate superior returns.

Our paper sheds light on the above debate by finding additional evidence in support of the second view by showing that trades occurring after the release of news stories can be more profitable than trades in non-news periods.

3. Hypotheses and methodology

3.1. Hypothesis development

In this section, we formalize many of the ideas introduced in the beginning of the paper. Our first set of hypotheses concerns the timing of trades, while the second set concerns

hypotheses that aim to explore the source of short sellers' profitability.

The timing of trades is one of the areas in which short sellers can differ from other traders. Prior research finds some evidence that short sellers trade before public information is released (see, e.g., Karpoff and Lou, 2010; Christophe, Ferri, and Angel, 2004). Similarly, the Securities and Exchange Commission has suggested that short sellers spread "false rumors" in an effort to manipulate firms. Furthermore, in the popular press, there have been allegations of insider trading by well-known hedge funds such as SAC Capital Advisors and Galleon.^{3,4} Although there are many possible channels through which short sellers' trades could be profitable, our first set of hypotheses seeks to empirically test whether the timing of short sales is different than that of other trades. We refer to this as the *Anticipation* hypothesis. Formally:

H1. In the presence of news events, short sellers trade before other traders.

This hypothesis is an alternative to the null hypothesis that there is no difference in timing.

We next turn to the profitability of short sellers' trades around news events. The literature is split as to whether news events increase or decrease asymmetric information, thereby increasing or decreasing the profitability of informed trades. On the one hand, many papers model news events as points in time associated with reduced information asymmetry (see, e.g., Korajczyk, Lucas, and McDonald, 1991; Diamond and Verrecchia, 1987). If news events do indeed reduce asymmetric information, the trades of informed traders (e.g., short sales) should be *less* profitable on news days. On the other hand, other papers suggest that public news events are subject to differential interpretations by traders (see, e.g., Rubinstein, 1993; Kandel and Pearson, 1995). Under this view, public information events present profitable trading opportunities for skilled information processors, and thus, the trades of informed traders (e.g., short sellers) should be *more* profitable after news days. This discussion leads to the following set of hypotheses, which we call the *Profitability* hypotheses:

H2_a. Short sales are less profitable after news announcements.

H2_b. Short sales are more profitable after news announcements.

These hypotheses rest against the backdrop of the null hypothesis, which states that short sales are as profitable after news events as they are at other times.

Since our empirical work finds that short sales are more profitable after news events, we also explore *why* profitability increases. While the literature finds that news events create trading opportunities for informed

³ E.g., Rothfeld, M., Pulliam, S., Bray, C., 2011. Fund titan found guilty—Rajaratnam convicted of insider trading; Jurors cite tapes: 'Just a lot of evidence.' The Wall Street Journal, 12 May.

⁴ Our approach is not designed to detect specific instances of insider trading, but rather, it is designed to examine the average trading

traders (see, e.g., Engelberg, 2008; Demers and Vega, 2008), other potential explanations exist. The first alternative explanation posits that some buyers make systematic mistakes around news events (see, e.g., Antweiler and Frank, 2006), and that these mistakes are reflected in market makers' offsetting short sales. We formalize this idea in our third set of hypotheses, which we call the *Uninformed counterparty* hypotheses:

H3. The profitability of short sales comes from market makers' offsetting trades.

This hypothesis rests against the null hypothesis that the profitability of short sales comes equally from market maker and non-market maker trades.

Another alternative explanation relates to liquidity. Given the increase in volume around news events, news events could provide a trading opportunity for those traders for whom liquidity is an important factor in a trade's profitability. As a result, the perceived profitability of short sales around news events could have nothing to do with information; rather, short sellers could simply be trading around news events because news events create liquidity, which allows them to execute profitable trades. This relation between news events and liquidity is the basis for our fourth and final set of hypotheses, which we call the *Liquidity* hypotheses:

H4. The profitability of short sales around news events is due to the increased liquidity that news events provide.

The null hypothesis is that the profitability of short sales around news events is not a result of the liquidity that news events provide.

3.2. Data

To test the hypotheses developed above, we employ two main databases. The first database contains information on short sales, while the second contains news articles from the Dow Jones archive.

3.2.1. Short sales

Information on short sales comes from the NYSE Trade and Quote (TAQ) Regulation SHO database. Regulation SHO was adopted by the SEC in June of 2004 to establish new rules governing short sales in equity transactions and to evaluate the effectiveness of price test restrictions on short sales. As one consequence of Regulation SHO, transaction-level short sales data were publicly disclosed. The Regulation SHO database covers the period January 3, 2005 through July 6, 2007 and contains data for all short sales that were reported to the NYSE for NYSE-listed and traded securities during this period.⁵ The database contains the stock ticker, the date and time of the transaction, the number of shares traded, and the execution price. While the data allow us to observe the opening of short positions, they do

⁵ The vast majority of trades in the database are for NYSE-listed securities. Occasionally, securities that are not listed on the NYSE do trade on the NYSE, and these trades also appear in the Regulation SHO

not contain information on the covering of these short positions. Thus, like other papers, we are constrained by the lack of information on short-covering transactions. In addition, the data also include an indicator that denotes whether a transaction was exempt from price test rules. One of the reasons a short sale transaction could be classified as exempt is that it was made by market makers engaged in bona fide market making activity. The exempt indicator has thus been used to separate trading by market makers from trading by non-market makers (see, e.g., Evans, Geczy, Musto, and Reed, 2009; Christophe, Ferri, and Angel, 2004; Boehmer, Jones, and Zhang, 2008; Chakrabarty and Shkilko, 2011).⁶ However, when Regulation SHO was implemented, a group of randomly selected stocks was chosen to be part of a pilot study for which the exempt/non-exempt classification was no longer required. We exclude these pilot firms when using the exempt indicator variable in our analyses (i.e., Tables 6 and 7).⁷

For the purposes of our analysis, we aggregate the transaction data to the daily level, and we use the TAQ master files to add CUSIPs to the database. We then use the Center for Research in Security Prices (CRSP) Daily Stock Event file to add PERMNOs to the database. Finally, we add returns, closing bid price, closing ask price, total volume, and shares outstanding from CRSP. Using these data, we calculate the Amihud (2002) illiquidity measure defined as $10^7 \times |ret_{it}|/volume_{it}$, where $volume_{it}$ is the dollar volume, and we calculate the daily bid-ask spread as a percentage of the closing mid-price.

In addition, we add information on the daily volume-weighted rebate rate for equity loans in each stock over the sample period. The rebate rate for an equity loan is the rate at which interest on collateral is rebated back to the borrower. Thus, the rate is inversely related to the cost of shorting a stock. Our data on rebate rates come from a proprietary database on equity loan transactions as described in Kolasinski, Reed, and Ringgenberg (2011). The data are compiled by a third-party provider that is both a market maker in the equity loan market and a data aggregator for major equity lenders.

3.2.2. Dow Jones archive

To compile our sample of news events, we use the Dow Jones archive as in Tetlock (2010). This archive contains all Dow Jones News Service stories and *Wall Street Journal* stories over our 2005–2007 sample period. Each observation in the news database is a news item; each news item includes at least one subject code and Dow Jones's designation of the corporations that are mentioned in an article and are the subject of the story. Table 1 displays an example article and the associated entry in the Dow Jones archive. The database contains subject codes that identify

⁶ For example, National Association Of Securities Dealers (NASD) Notice to Members 06-53 notes that "Rule 5100(c)(1) provides an exception to the bid test for short sales by a market maker registered in the security in connection with bona fide market making activity."

⁷ Details regarding the Regulation SHO pilot study, including a list of firms involved, are available on the SEC Web site: <http://www.sec.gov/rules/other/34-50104.htm>. Our results are robust to the inclusion of the

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