Short-Sale Strategies and Return Predictability

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We examine short selling in US stocks based on new SEC-mandated data for 2005. There is a tremendous amount of short selling in our sample: short sales represent 24% of NYSE and 31% of Nasdaq share volume. Short sellers increase their trading following positive returns and they correctly predict future negative abnormal returns. These patterns are robust to controlling for voluntary liquidity provision and for opportunistic risk-bearing by short sellers. The results are consistent with short sellers trading on short-term overreaction of stock prices. A trading strategy based on daily short-selling activity generates significant positive returns during the sample period. (*JEL* G12, G14)

There is currently tremendous interest in short selling not only from academics, but also from issuers, media representatives, the Securities and Exchange Commission (SEC), and Congress. Academics generally share the view that short sellers help markets correct short-term deviations of stock prices from fundamental value. This view is by no means universally held, and many issuers and media representatives instead characterize short sellers as immoral, unethical, and downright un-American.[1] In an attempt to evaluate the efficacy of

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[1] For example, John Rothchild (1998) in the *Bear Book* said, "Known short sellers suffer the same reputation as the detested bat. They are reviled as odious pests, smudges on Wall Street, pecuniary vampires."

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short-sale rules, the SEC introduced new regulation governing short sales in US markets on 2 January 2005. Washington is also interested in short selling, and the Congressional Committee of Financial Services (22 May 2003) and the Senate Judiciary Committee (28 June 2006) have recently heard testimonies about short sellers and hedge funds.

Despite this interest, there is relatively little evidence in the academic literature on what short sellers actually do. In this paper, we study trading strategies used by short sellers of NYSE- and Nasdaq-listed stocks. Specifically, we examine the short-horizon relationship between short selling and previous and subsequent returns. We find that short-selling activity is strongly positively related to past returns. A five-day return of 10% results in an increase in short selling as a fraction of daily share volume of 3.71 (2.15) percentage points for NYSE (Nasdaq) stocks. We also find that short selling intensifies on days preceding negative returns. An increase in short-selling activity by 10% of share volume is associated with a future decline in returns by 0.94% (0.72%) per month on the NYSE (Nasdaq). A trading strategy that buys stocks with low short-selling activity and sells short stocks with high short-selling activity generates an abnormal return of roughly 1.39% (1.41%) per month for NYSE (Nasdaq) stocks. In sum, the results show that short sellers time their trades extremely well relative to short-term price trends.

How should we interpret the fact that short sellers as a group seem to be able to predict short-horizon abnormal returns? Does it mean that they have inside information about future fundamental values or are they capable of detecting when the current price deviates from the current fundamental value? The first alternative suggests that short sellers are either corporate insiders or are privy to advance release of material nonpublic information from the corporation. We find this hard to believe given how many restrictions are levied on trading by corporate insiders. Moreover, Regulation Fair Disclosure (Reg FD) is in effect during our sample period, which should limit the ability of outsiders to get advance access to material nonpublic information.

The second alternative suggests that market frictions (Miller, 1977; Harrison and Kreps, 1978; Diamond and Verrecchia, 1987; and Scheinkman and Xiong, 2003) or behavioral biases (DeBondt and Thaler, 1985; Barberis, Shleifer, and Vishny, 1998; Daniel, Hirshleifer, and Subrahmanyam, 1998; and Hong and Stein, 1999) may cause price to deviate from fundamental value in the short run, and that short sellers are exploiting these situations to their benefit. However, this interpretation requires that short sellers are more sophisticated than the average investor. Given the cost of short selling, short sellers are likely to be predominantly institutional traders. For example, Boehmer, Jones, and Zhang (2008) find that about 75% of all short sales are executed by institutions, while individuals represent less than 2% (the rest are specialists and others). Since many institutions are prevented from shorting (e.g., many mutual funds), the ones that may use short selling as part of their strategy tend to be more sophisticated. Thus, we conjecture that short sellers as a group are likely to be sophisticated traders.

A third alternative is that short sellers act as voluntary liquidity providers. According to this story, short sellers step in and trade when there is a significant and temporary buy-order imbalance in the market. As the buying pressure subsides, prices should revert to fundamental value and the short sellers can cover their positions at a profit. Under this interpretation, the trading patterns and predictability we observe are the direct result of short sellers receiving compensation for providing immediacy (e.g., Stoll, 1978; Grossman and Miller, 1988; and Campbell, Grossman, and Wang, 1993). This interpretation suggests that elevated levels of short selling should coincide with contemporaneous buy-order imbalances and be followed by reduced-order imbalances in the future.

A fourth explanation is that short sellers step in to provide additional risk-bearing capacity in periods of elevated uncertainty. If the uncertainty is caused by short-lived asymmetric information (e.g., Copeland and Galai, 1983; and Glosten and Milgrom, 1985) or if market makers require compensation for inventory risk (e.g., Ho and Stoll, 1981; Biais, 1993), then the elevated short selling should coincide with high intraday volatility and *wide* spreads. As the information becomes public, volatility and spreads should fall. By contrast, if the uncertainty is associated with differences of opinion (e.g., Varian, 1985; and Harris and Raviv, 1993), the elevated short selling should coincide with high intraday volatility and *low* spreads. In a market with wide dispersion in reservations values, limit orders posted by (nonstrategic) competing liquidity providers result in narrower spreads. As opinions converge, volatility should fall and spreads should widen.

While we find evidence that suggests short sellers use all the strategies mentioned above, past returns remain significant predictors of short-selling activity after controlling for order imbalances, volatility, and spreads. Perhaps more important is that higher short-selling activity predicts negative future abnormal returns after controlling for these same variables. In other words, we find evidence of informed trading by US short sellers.

It is worth pointing out that short sellers are not all alike. In our stock-level aggregate data on short sales, we clearly have some traders that speculate on prices reverting to fundamentals. However, we also have traders that use short sales to hedge a long position in the same stock, to conduct convertible or index arbitrage, traders who seek to hedge their option positions, etc. Many of the trading strategies involving short sales are based on relative valuations of securities (e.g., merger arbitrage), which reduces the likelihood that predictability will be found in a regression framework. These traders may or may not be selling short because they think the shorted stock is overvalued relative to current fundamentals. Their presence in the data will work against us finding that stock-level aggregate short sales predict abnormal negative returns. Yet, we do find predictability both in the regression analysis and in the portfolio analysis.

We are not the first to investigate whether short sellers are informed traders. There is a rather extensive literature studying the relationship between short-selling activity measured as a stock variable (short interest) and stock returns. While the earlier literature provided mixed evidence, there is growing

consensus that short sellers are informed.[2] For example, researchers find that high short interest predicts negative abnormal returns for NYSE/AMEX stocks (Asquith and Meulbroek, 1995) and for Nasdaq stocks (Desai et al., 2002), that predictability is strongest in stocks with low institutional ownership (Asquith, Pathak, and Ritter, 2005), that short sellers target companies that are overpriced based on fundamental ratios (Dechow et al., 2001), that short sellers targets firms with earnings restatements and high accruals (Efendi, Kinney, and Swanson, 2005; and Desai, Krishnamurthy, and Venkataramaran, 2006), anticipate downward analyst forecast revisions and negative earnings surprises (Francis, Venkatachalam, and Zhang, 2006), and that short sellers exploit both postearnings announcement drift and the accrual anomaly (Cao, Dhaliwal, and Kolasinski, 2006).

These studies use monthly stock-specific short interest data. These data are disclosed by exchanges around the middle of each month and consist of the number of shares sold short (a stock variable) at a particular point in time. There are two main problems with using monthly short interest data. The first problem is that monthly short interest data do not permit a researcher to discern whether or not a high level of short interest means that short selling is more expensive, which is the prerequisite for the overreaction story as proposed by Miller (1977). To remedy this shortcoming of the literature, several authors have relied on proxies for short-sale constraints or demand (Chen, Hong, and Stein (2002)—breadth of ownership, Diether, Malloy, and Scherbina (2002)—analyst disagreement, Nagel (2005)—institutional ownership, and Lamont (2004)—firm's actions to impede short selling), and even the actual cost of borrowing stock (D'Avolio, 2002; Geczy, Musto, and Reed, 2002; Jones and Lamont, 2002; Mitchell, Pulvino, and Stafford, 2002; Ofek and Richardson, 2003; Ofek, Richardson, and Whitelaw, 2004; Cohen, Diether, and Malloy, 2007; and Reed, 2007) to investigate if short-sale constraints contribute to short-term overreaction in stock prices, and if short sellers are informed. The general conclusion reached by this literature is that short-sale costs are higher and short-sale constraints are more binding among stocks with low market capitalization and stocks with low institutional ownership. The literature also finds that high shorting demand predicts abnormally low future returns both at the weekly and monthly frequency.

The second problem is that the monthly reporting frequency does not permit researchers to study short-term trading strategies. Recent evidence suggests that many short sellers cover their positions very rapidly. For example, Diether (2008) finds that almost half the securities lending contracts they study are closed out in two weeks (the median contract length is 11 trading days). Also note that if a trader sells a stock short in the morning, he can cover the position with a purchase before the end of the day without ever having actually to

[2] For the earlier literature, see, e.g., Figlewski (1981); Brent, Morse, and Stice (1990); and Senchack and Starks (1993).

borrow the stock. This suggests that even securities lending data truncate the holding period of short sellers.[3] The notion that short sellers focus on short-term trading strategies is consistent with our finding that short sales represent on average 23.9% of NYSE and 31.3% of Nasdaq (National Market) reported share volume. By comparison, average monthly short interest for the same period is about 5.4 days to cover for NYSE stocks and 4.4 days to cover for Nasdaq stocks. Hence, it is important to study short-selling activity at a higher frequency. This is our main contribution to the literature.

Previous studies of short selling have sought to test whether short sellers time their trades well relative to future returns. However, as far as we know, no one has previously examined how short sales relate to past returns. This is puzzling, since the main argument for stricter short-sale regulation is that short sellers exacerbate downward momentum. Without evidence on how short sellers trade relative to past returns, it is impossible to determine whether short sellers actually have any impact on momentum. Our second contribution to the literature is to examine how short sellers react to past returns.

We use the regulatory tick-by-tick short-sale data for a cross-section of more than 3,800 individual stocks. While our data permit an intraday analysis of short selling, we aggregate short sales for each stock to the daily level for the purpose of this study. Our paper is the first study of daily short selling to cover both Nasdaq and NYSE stocks. This is our third contribution to the literature.

Our final contribution is that we rely on a very comprehensive data set. It includes all short sales executed in the United States, regardless of where the trade is printed (the AMEX, the Boston Stock Exchange, the Chicago Stock Exchange, the NASD, Nasdaq, the National Stock Exchange, the Philadelphia Stock Exchange, or NYSE) for all NYSE- and Nasdaq-listed stocks. The complete coverage is clearly important as we find that more than 50% (23%) of Nasdaq (NYSE) short sales are reported away from the primary listing venue during our sample period. By contrast, other authors who study daily short sales rely on samples that do not cover all short sales for a particular stock. Christophe, Ferri, and Angel (2004) focus their analysis on customer short sales that are subject to Nasdaq's short-sale rules and are reported to Nasdaq's Automated Confirmation Transaction Service (ACT). Boehmer, Jones, and Zhang (2008); and Daske, Richardson, and Tuna (2005) focus their analysis on orders entered through NYSE's SuperDOT system that are subject to NYSE's Uptick Rule. According to Boehmer, Jones, and Zhang (2008), NYSE SuperDOT captures about 70.5% of all NYSE reported volume. However, they acknowledge that it is uncertain whether this trading system captures an equally large proportion of short-sale volume. Moreover, as mentioned, we find that 23% of the total short-sale volume for NYSE-listed stocks is printed away from the NYSE, which suggests that the coverage in these two studies is incomplete.

[3] Jones (2004) finds that such "in-and-out shorting" represented about 5% of daily volume in the early 1930s.

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