Should Owners of Nasdaq Stocks Fear Short-Selling?

At common levels, average market-adjusted returns tend to be near zero.

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Many market observers and participants believe that short sales of shares can drive prices down and by substantial amounts. For this reason, managers of firms whose shares are targeted by short-sellers frequently adopt complex strategies to thwart them (Lamont [2004]), and regulatory agencies have devised an extensive set of rules to constrain the practice of shorting.

It is surprising, therefore, that the only two studies of daily stock returns and the shorting of shares report a positive correlation between them. Boehmer, Jones, and Zhang [2005] and Diether, Lee, and Werner [2005] see their results as evidence that many short-sellers are contrarians who act primarily after share prices rise. Still, the positive association is puzzling.

Many short-sellers are not contrarian and are as likely to short a stock whose price is falling as one whose price is climbing, as long as they consider it overpriced. Also, the positive association implies, counterintuitively, that short sales do not lower unjustifiably high prices but merely stop those that have begun to rise above fair value from rising even more.

Clearly, this important empirical relation between short sales and stock returns warrants further attention. We examine a special Nasdaq dataset that identifies daily short sales and volume, among other important variables, for hundreds of stocks between September 2000 and July 2001. The dataset enables us to distinguish between shares shorted by dealers (or market makers) and shares shorted by their customers, so we can identify speculatively shorted shares.

Dealers and speculators are likely to have different motivations for short sales, and separate tests of their

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activities might reveal quite different correlations with stock returns. The ability to isolate speculative short sales by customers is useful for another reason; it is these sales that have attracted most of the condemnation over many decades, while dealer shorting has suffered little criticism to date. (This might be about to change, however, as Scannell [2006] reports that the Securities and Exchange Commission recently decided to consider new constraints on dealer shorting.)

The several types of tests we conduct probe the daily relation between market-adjusted returns and the percentage of volume represented by shares shorted speculatively by customers or shares shorted by dealers. For convenience, we often refer to market-adjusted returns as returns and to the volume percentages as simply speculative short-selling and dealer short-selling.

We have reached three conclusions about speculative short-selling in Nasdaq stocks that should prompt practitioners and academicians to reconsider whether the activity is the serious threat to stock prices that it has long been believed to be. First, the daily relation between returns and speculative short-selling depends heavily upon the level of the short-selling. When short-selling exceeds 10%, which occurs relatively infrequently, average returns are significantly negative. At the far more common and lower levels of short-selling, average returns tend to be near zero.

Second, even when the correlation of speculative short-selling with returns is statistically negative, the magnitude of the relationship is rather small, because returns fall on average only about 4 to 6 basis points for each percentage point of short-selling.

The third conclusion is that, for most stocks, the days of highest short-selling by speculators are typically not the days when returns reach their lowest levels.

Our test of short-selling by Nasdaq dealers produces an equally comforting conclusion. The relation between dealer short-selling and returns is essentially positive, as the top-performing stocks of the day typically post much higher levels of dealer short-selling than the poorly performing stocks.

Our explanation for this previously unknown but statistically strong association is that market makers short extensively when they receive numerous buy orders from customers seeking to establish long positions in a stock whose price is increasing. By contrast, dealers do not need to short many shares when they are executing customers' orders to buy if prices are falling and numerous other investors are eager to sell.

KEY FEATURES OF DATASET

Our data come from Nasdaq's Automated Confirmation Transaction Service (ACT), which processed the preponderance of transactions in Nasdaq stocks during our study period of September 14, 2000, through July 10, 2001. The dataset includes all processed trades (except odd-lot transactions) from the daily 9:30am-4:00pm sessions.[1]

We are unaware of any equally rich dataset dealing with the Nasdaq market from this or any other period, although Boehmer, Jones, and Zhang [2005] have an extensive dataset for short sales on the New York Stock Exchange. It is also important to recognize that, not long after 2001, the electronic communication systems such as Archipelago and Island began reporting their trades through other self-regulatory organizations. As a result, ACT files from later years cannot supply an equivalent to the comprehensive record of trading that our dataset represents for the sample period.

For several reasons discussed in Christophe, Ferri, and Angel [2006], we believe that our ACT-based dataset is a more reliable tool for this empirical research than the short sales information recently released under the SEC's Regulation SHO, as prescribed in SEC Release No. 50103, File No. S7–23–03, of July 28, 2004.

ACT records are structured around a protocol of four reporting rules: 1) A market maker trading with a non-market maker must report the trade to ACT; 2) the seller in a trade between two market makers files the report; 3) the NASD member in a trade with a non-NASD member must report; and 4) the seller in a trade between two members is responsible for reporting. This protocol allows us to distinguish dealer-shorted shares from shares shorted by customers of the dealers.

A record indicates a short sale by the REPORT_SHORT field, which means the reporting entity has flagged the sale as short, or the CONTRA_SHORT field, which means the counterparty has indicated that the trade is short.

The other details in a record include the stock's ticker, time, number of shares, price, and numerous additional characteristics, such as whether ACT passed the record to the tape (i.e., the public record). This fact is important for trades conducted through an ECN. Each of those trades typically generates two records—because the ECN is technically the counterparty for both the buy and the sell sides—but ACT reports only one. We restrict our sample to only the transaction records that were reported

to the tape, whether they were executed through an ECN or another venue.

To distinguish between customer and dealer short sales, we use the daily file of quotations, which identifies the dealers who, during each day, were serving as market makers in a stock by actively posting bid and ask quotes. (We exclude trades reported by ECNs from our measure of dealer shorting.)

Note that, during the time of our sample, NASD rules required market makers to flag all their short sales as such (Nasdaq Trader Manual, revised January 2000), and the REPORT_SHORT field of our files reveals substantial shorting by dealers.[2] The category of short sales by customers thus includes all short sales that, according to reporting rules and trade records, were not made by dealers acting as market makers on the day of a trade.

For short sales by customers and by dealers, there is another distinction based on whether a sale was designated exempt from the Nasdaq Short Sale Rule (Rule 3350). This was, in our sample period, analogous to the uptick rule of the NYSE, although it used a bid test. Generally, the rule prohibited short sale at the bid if that was lower than the previous bid (NASD's Notices to Members, 94-68 and 94-83, and interpretations (IMs) to the rule in IM-3350 of NASD Manual).

Nasdaq exempted a few activities by customers; the primary one was a hedge transaction by a registered market maker on a qualified options exchange. In these cases, the CONTRA_SHORT field would show an X rather than an S. As for dealers, the designation of exempt was limited to short sales that the dealer—in bona fide market-making—executed at the prevailing inside bid following a downtick. An exempt trade by a market maker would be marked X in the REPORT_SHORT field; otherwise, the field would be marked S.

We are confident that a review of the fields, guided by ACT rules and the quotations file, can accurately fit the sample's large set of daily short sales into a 2-by-2 matrix, for dealers versus customers and for exempt versus non-exempt. This classification helps us to specify the variables of interest for our tests.

SPECIFICATION OF KEY VARIABLES

Customer non-exempt short sales form the foundation of our measure of speculative short activity. We do not consider customer exempt sales because the prospect of an eventual audit by Nasdaq most probably restricted those sales to permitted functions, which did not involve speculation. Further, we believe that the non-exempt trades entailed few (if any) transactions that the seller might properly have designated exempt but, for some reason, chose not to. Most of these sellers—especially options market makers who might be writing in- or at-the-money puts—would not want their hedging trades delayed by the tick rule.

Also, our sample data provide evidence that the exemption was used relatively frequently. Exempt sales produced more than 8.0% of all customer-shorted shares for one-fourth of the stocks and more than 3.5% for one-half of them, and 95 of every 100 stocks were subjects of some exempt transactions.

In distilling speculatively shorted shares from those sold in non-exempt customer trades, it is necessary to recognize that short sales can reflect several motivations. Like Asquith, Pathak, and Ritter [2005], we accept that three principal motivations are: 1) to speculate on later price changes, 2) to profit from long/short combinations of shares involved in a takeover attempt, and 3) to engage in arbitrage with the issuing firm's outstanding convertible bonds.

We cannot directly identify the short sales that constitute the (non-speculative) arbitrage with convertible bonds, but we can completely eliminate those trades by the simple expedient of including in our sample only firms that reported no outstanding convertible debt between 1999 and 2001.

Our approach to short sales that might represent takeover-based investing is different, because many attempted acquisitions took rather a short time, and it is possible to identify the days they started and ended. Thus, rather than excluding from our sample any firm that attempted an acquisition, we simply remove from the dataset observations between the day the firm announced it was trying to acquire another and the day that effort was completed or cancelled.

These two sampling procedures produce, for every stock in our sample, a daily series of customer-shorted shares that are free of bond arbitrage shorting or trades related to takeovers and that deserve to be considered speculatively shorted shares. (We do acknowledge that our definition of speculative short-selling could include some cases of index arbitrage, but we are not aware of any screening technique that effectively identifies its occurrence.)

Because our tests involve interfirm and interday comparisons, we must normalize the number of shorted shares, which we do using the total trading volume, as in Boehmer, Jones, and Zhang [2005] and Diether, Lee, and Werner [2005]. Thus, the variable SPECVOL, which is daily spec-

ulative short-selling in a stock, is the percentage of its daily trading volume that is attributable to shares shorted that day by customers in non-exempt sales that are not connected with bond arbitrage or attempted takeovers.

The shares shorted by dealers in exempt trades very probably resulted solely from market-making, because the claim could well have been audited for abuse of the exemption. While we expect that most shares shorted by dealers in non-exempt trades were also related to market-making, it is possible that a meaningful number of these shares represented speculation. ACT records are silent on this point, but we test whether dealer-shorted non-exempt shares in a stock regularly have a substantial speculative component.

For each stock, we regress the daily number of those dealer-shorted shares against the daily number of shares shorted by speculating customers. The rationale for this approach is that some evidence of synchronicity between these two variables would emerge if dealers were speculating to any meaningful extent. The more-than-600 regressions uncover very little synchronicity, as almost all yield near-zero values for goodness of fit measures, and the coefficients for the speculatively shorted shares are either negative or positive but statistically insignificant. In our view, these tests (results available on request) strongly indicate that something other than speculation—i.e., market-making—accounted for the vast majority of the shares that dealers shorted through non-exempt transactions in the sampled stocks.

Therefore, we combine the shorted shares from exempt and non-exempt trades into one variable, total dealer-shorted shares. Normalizing as before means that the variable—dealer short-selling or DEALVOL—equals the percentage of daily trading volume represented by all shares shorted by dealers during the day.

We use market-adjusted returns in all our tests, unlike Boehmer, Jones, and Zhang [2005] and Diether, Lee, and Werner [2005]. who not adjust for market movements. The variable, MARET, is defined as $R_i-(\beta_i RM)$, where R_i is stock i's simple return on a day, β_i is i's estimated daily beta from January through August 2000, and RM is the day's return on the Nasdaq equally-weighted index. That index is appropriate for both the estimation of beta and the computation of market-adjusted returns because our sample includes many smaller stocks, and a relatively few larger issues dominate Nasdaq's value-weighted index. (The Center for Research in Security Prices is the source of all data on returns.)

This formulation of market-adjusted returns is appealing because of its simplicity, although we conduct tests using other specifications too. Tests using excess returns on stocks and the market index (i.e., adjusted for the daily risk-free rate, which was low in this period) generate results very similar to those we report here. Also providing similar results are tests of market-adjusted returns computed with both the estimated alphas and betas of the pre-September regressions. This is not surprising, as all the alphas are low, and the vast majority are statistically insignificant.

FORMATION OF SAMPLE

We draw the sample from over 3,000 U.S.-domiciled companies whose common shares were covered by Nasdaq's ACT from September 13, 2000, through July 10, 2001. To eliminate thinly traded shares, we start with only stocks that traded every day and had at least 50 trades per day on average in the sample period. Next, we delete all firms that, according to Compustat, had convertible debt outstanding in at least one fiscal year between 1999 and 2001.

One of our major sampling screens is occasioned by determining whether the absence of shorting in a stock reflects disinterest by short-sellers or reflects constraints on the shares in the equity-lending market (see Jones and Lamont [2002]). We deal with this problem by including only stocks whose customer-shorted shares (in non-exempt trades) represented at least 5% of volume on at least 10 days in the sample period. Another important criterion is that a stock must have traded every day from January 3 through August 30, 2000, the presample period for estimating the stocks' daily characteristic line with the equally weighted index.

To avoid the potentially distorting effects of low-priced stocks, we exclude any observation if the previous closing price was below $10. We also omit observations of any stock in a month of a split, according to CRSP.

Our final rule in sampling has to do with possible merger arbitrage. According to the Securities Data Corporation (SDC), several sampled firms engaged in at least one attempt at merger or acquisition, and SDC provides the dates of announcement and of either completion or withdrawal. For the firms involved, the intervals between those dates covered 1,970 days of observations, and we do not include them.

Our final dataset consists of 108,025 daily observations for 668 stocks over 206 days. Exhibit 1 presents the descriptive statistics. Panel A shows the sample of stocks is quite varied by size and by daily volume of trading, and that it includes stocks with heavy as well as light short-selling by speculators.

EXHIBIT 1

Statistics for Sampled NASDAQ Stocks: September 14, 2000-July 10, 2001

Panel A. Descriptive Statistics				
	Mean	**Standard Deviation**	**Minimum**	**Maximum**
Market Capitalization, in billions as of 9/14/2000	$3.55	$17.45	$.09	$363.93
Average Daily Volume, in Shares (000s)	1,199	4,028	42	45,660
Average SPECVOL	3.55%	1.95%	0.79%	15.30%
Average DEALVOL	23.50%	2.57%	15.92%	32.65%
Panel B. Observations in Selected Ranges of SPECVOL and DEALVOL				
SPECVOL	0%-5%: 81,498	5%-10%: 15,928	10%-15%: 5,629	Above 15%: 4,970
DEALVOL	0%-15%: 20,383	15%-%25: 45,404	25%-35%: 18,358	Above 35%: 23,880

Market capitalization equals number of shares times per-share price on September 14, 2000. Volume is number of shares traded on a day. SPECVOL is daily ratio of customer-shorted shares to volume. DEALVOL is daily ratio of dealer-shorted shares to volume. The sample includes 668 stocks and 108,025 observations.

Panel B reveals that speculative short-selling is 10% or lower quite frequently—i.e., in nine of every ten observations—while dealer short-selling is far higher, exceeding 25% in more than one-third of the observations.

REGRESSION ANALYSIS

Our first test follows Fama and MacBeth [1973]. It consists of 1) conducting a set of daily cross-sectional regressions of market-adjusted returns against short-selling, and 2) examining the means and t-statistics of the daily regression's coefficients.[3]

We use a spline-like regression equation in order to avoid imposing a single slope on the relation between short-selling and returns throughout the entire range of short-selling values. Rather, our equation allows the data to reveal whether the relation might be different at different levels of short-selling. We perform this test for short-selling by speculators and by dealers.

The cross-sectional equation relating market-adjusted returns (MARET) and short-selling by speculators on each day between September 14, 2000, and July 10, 2001, is:

$$MARET_i = \sum_{k=1}^{7} \gamma_k Sk_i + \varepsilon_i \qquad \text{for } i = 1,\ldots,N \qquad (1)$$

where k ranges from 1 to 7, and the variables S1i through S7i are binary. Each takes a value of 1 if stock i's SPECVOL falls within a specified range and 0 otherwise.

The ranges that ensure an adequate number of observations for each variable are:

S1 = 1 if (SPECVOL <= 2.5%)
S2 = 1 if (2.5% < SPECVOL <= 5.0%)
S3 = 1 if (5.0% < SPECVOL <= 7.5%)
S4 = 1 if (7.5% < SPECVOL <= 10.0%)
S5 = 1 if (10.0% < SPECVOL <= 12.5%)
S6 = 1 if (12.5% < SPECVOL <= 15.0%)
S7 = 1 if (15.0% < SPECVOL)

The coefficient, γ_k, represents the estimated link across all N stocks on any day between the market-adjusted return and the binary variable based on the k-th range of SPECVOL. With the intercept suppressed, each coefficient represents a difference from zero. Finally, Âi is the error term for the i-th stock.

If the widespread view that short-selling by speculators drives down prices is correct, the average daily values of the various gammas should be negative. This expectation also draws upon Miller's [1977] hypothesis that a constraint on speculative short-selling allows a stock's price to rise too high. Under this hypothesis, short-selling represents a shift in the supply curve for a share, which does not necessarily cause or accompany an offsetting shift in the demand curve.

Exhibit 2 presents the results of estimating Equation (1). The statistics reported in the column labeled "All Days" show that the coefficient is not statistically significant

EXHIBIT 2
Results of Daily Regressions for Investor Short-Selling

Categories of SPECVOL (%)	All Days	108 Days when NASDAQ Index Fell	98 Days when NASDAQ Index Was Unchanged or Rose
S1: SPECVOL<= 2.5	-0.09 (-0.99)	-0.20 (-1.72)	0.03 (0.20)
S2: 2.5 <SPECVOL<= 5.0	0.26 (1.92)	-0.10 (-0.64)	0.66** (3.21)
S3: 5.0 <SPECVOL<= 7.5	0.07 (0.48)	-0.39* (-2.30)	0.57* (2.46)
S4: 7.5 <SPECVOL<= 10.0	-0.16 (-1.09)	-0.51** (-2.71)	0.22 (1.00)
S5: 10.0 <SPECVOL<= 12.5	-0.67** (-3.96)	-0.85** (-3.95)	-0.47 (-1.78)
S6: 12.5 <SPECVOL<= 15.0	-0.61** (-3.88)	-0.63** (-3.59)	-0.58* (-2.18)
S7: 15.0 <SPECVOL	-0.89** (-6.65)	-0.78** (-4.52)	-1.00** (-4.88)
Number of Observations	108,025	57,529	50,496

*Results are the mean of the estimated coefficients for the category across the daily regressions and the mean's t-statistic (adjusted for first-order autocorrelation estimated with the full sample). * and ** indicate the mean is statistically different from zero in a two-tailed test at 5% and 1% level of significance, respectively.*

for any variable representing a level of SPECVOL below 10%. (The appropriate specification for the t-test, as noted, involves adjusting the t-value by the first-order autocorrelation in each coefficient's daily estimates.)

The coefficient for each variable representing a level of speculative short-selling at or above 10% is significant, however. Collectively, these results suggest that—once short-selling gets that high—returns fall, on average, approximately 4 to 6 basis points for each percentage point of short-selling.

The last two columns, which separate the days according to the performance of the Nasdaq's equally weighted index, suggest that the relations might be somewhat different in different market environments. First, on days the stock market is falling, the coefficients of S3 and S4 indicate that levels of SPECVOL as low as 5% have a negative association with market-adjusted returns. Second, on days the stock market is rising, the coefficients of S2 and S3 are positive, which suggests that moderate short-selling in the range of 2.5% to 7.5% might be directed at some stocks rising faster than the overall market.

To analyze dealer short-selling, we estimate:

$$MARET_i = \sum_{k=1}^{5} \delta_k Dk_i + \varepsilon_i \qquad \text{for } i = 1,\ldots,N \qquad (2)$$

where $D1_i$ through $D5_i$ are binary variables, taking a value of 1 if stock i's DEALVOL falls within a specified range and 0 otherwise. The ranges that ensure a reasonable number of observations in each category are:

D1 = 1 if (DEALVOL?< = 15.0%)
D2 = 1 if (15.0% < DEALVOL < = 20.0%)
D3 = 1 if (20.0% < DEALVOL < = 25.0%)
D4 = 1 if (25.0% < DEALVOL < = 30.0%)
D5 = 1 if (30.0% < DEALVOL)

The coefficients, δ_k, function the same way as those in Equation (1), and are interpreted also as differences from zero, with t-statistics adjusted for the first-order autocorrelation of each δ's daily estimates.

Research offers no guidance on the likely signs of the estimated δ, because short-selling by dealers has never been the subject of empirical analysis. No quantitative information about these activities has been available until Nasdaq released the ACT-based dataset. Practical considerations, however, indicate that the relation of returns to DEALVOL *probably is not negative.* Dealers' short-selling is related to market-making, and market maker activities as providers of liquidity should not dampen price in the way that speculative short-selling is expected to do.

But should the relation between DEALVOL and returns be positive? We believe the answer is yes, and base

EXHIBIT 3

Results of Daily Regressions for Dealer Short-Selling

Categories of DEALVOL (%)	All Days	108 Days when NASDAQ Index Fell	98 Days when NASDAQ Index Was Unchanged or Rose
D1: DEALVOL<= 15	-0.80** (-4.51)	-2.49** (-16.96)	1.07** (5.43)
D2: 15 <DEALVOL<= 20	-0.49* (-2.15)	-2.62** (-14.57)	1.86** (7.01)
D3: 20 <DEALVOL<= 25	-0.18 (-0.79)	-2.36** (-14.21)	2.21** (8.03)
D4: 25 <DEALVOL<= 30	0.27 (1.27)	-1.62** (-9.43)	2.34** (9.65)
D5: 30 <DEALVOL	0.58** (3.50)	-0.97** (-7.39)	2.30** (11.57)
Number of Observations	108,025	57,529	50,496

** and ** indicate the mean is statistically different from zero in a two-tailed test at 5% and 1% level of significance, respectively.*

our view on an account of the behavior of market makers in Griffin, Harris, and Topaloglu [2003]. Analyzing Nasdaq trades from May 2000 through February 2001, they find that increases in a stock's price prompt institutions to make surprisingly quick purchases of shares and prompt individuals to make almost as quick sales.

We think that institutions and individuals probably transact in unequal volume, and that an imbalance in supply of and demand for a stock would often follow its increase in price. Dealers would accommodate this imbalance through a substantial number of shorted shares. Their actions would shift the supply curve of shares to meet the unanticipated upward shift in demand, and a stock's ratio of dealer-shorted shares to trading volume would be relatively high on days of rising prices.

We further propose that, on days a stock's price falls and many investors seek to unload stocks, dealers would not need to sell short to meet the relatively few buy orders, and thus the percentage of dealer-shorted shares to volume would tend to be low. In general, then, DEALVOL should be lower for more poorly performing firms than for those that do well (or at least do not have substantially negative returns).

Exhibit 3 presents the results of the regressions of Equation (2). The test of all days shows that market-adjusted returns rise monotonically with the level of dealer short-selling. In the second column (days of a falling stock market), the average returns typically become less negative as the level of dealer short-selling rises; the only exception is the small difference (0.13 of 1%) between the coefficients for D1 and D2.

In the final column, the average returns rise steadily from one to the next category of dealer short-selling until D5, whose coefficient is very close (within 0.04 of 1%) to that of D4. Taken together, these three results suggest that dealer short-selling is quite unlike speculative short-selling, because relatively large amounts of dealer short-selling on a day are associated with relatively higher market-adjusted returns.

Several analyses not reported here (results available on request) indicate that our test results are robust across alternative specifications and sampling procedures. Tests with different but related versions of MARET yield results very similar to these. Results of regressions with a dataset including the 1,970 observations that might have been influenced by attempts at acquisition/merger do not differ meaningfully from those in Exhibits 2 and 3, which is not surprising, because merger-based investing often has a speculative dimension.

Finally, regression analysis of a combined equation (including the binary variables S1–S7 as well as D1–D5) generally confirms the conclusions based on the separate equations.

TESTS OF HIGH SPECULATIVE SHORT-SELLING AND LOW RETURNS

Another way to assess the daily association of speculative short-selling and market-adjusted returns is to determine whether short-selling reaches high levels and returns tend to be low on the same days, which is the focus

EXHIBIT 4

Analysis of Highest Decile by Investor Short Selling and Lowest Decile by Market-Adjusted Returns

Highest Decile of Every Stock's Daily SPECVOL		Lowest Decile of Every Stock's Daily MARET	
Panel A: Basic Statistics			
Number of Observations	11,322	Number of Observations	11,088
Mean Observed SPECVOL (%)	14.40	Mean Observed MARET (%)	-8.53
Mean Observed MARET (%)	-0.68	Mean Observed SPECVOL (%)	4.18
Panel B: Mean Differences and t-statistics			
Observed MARET less Stock's Median MARET (%)	-0.46** (-10.07)	Observed SPECVOL less Stock's Median SPECVOL (%)	1.97** (39.07)
Observed MARET less Cutoff for Stock's Lowest Quartile of MARET (%)	2.16** (47.06)	Observed SPECVOL less Cutoff for Stock's Highest Quartile of SPECVOL (%)	-0.69** (-13.69)
Observed MARET less Cutoff for Stock's Lowest Decile of MARET (%)	4.90** (101.87)	Observed SPECVOL less Cutoff for Stock's Highest Decile of SPECVOL (%)	-5.17** (-90.53)
Panel C: Percentage of Observations in Key Quantiles			
Observed MARETs below Median MARET	55%	Observed SPECVOLs above Median SPECVOL	53%
Observed MARETs in Lowest Quartile of MARET	28%	Observed SPECVOLs in Highest Quartile of SPECVOL	27%
Observed MARETs in Lowest Decile of MARET	11%	Observed SPECVOLs in Highest Decile of SPECVOL	12%

** and ** indicate the mean is statistically different from zero in a two-tailed test at 5% and 1% level of significance, respectively.*

of some additional tests. A salient feature of these tests is that the stocks' own experience and performance in the sample period serve to identify the high and low values. Thus, a stock's return is low if it lies within the lowest decile of daily returns that the stock posted from September 2000 through July 2001; similarly, a stock's short-selling is high if its value is among the highest 10% of the stock's daily short-selling percentages in the period. The number of days for a decile varies from 20 to 22, depending on ties in the ranked values.

These tests have two other key characteristics. First, they approach the issue from both directions by considering 1) the returns among the observations drawn from the highest deciles of short-selling across all the stocks as well as 2) the short-selling in the observations drawn from all the stocks' lowest deciles of returns. Second, the testing evaluates both returns and short-selling in terms of differences from median and other important cutoff points in the sample distributions of the stocks' MARET and SPECVOL. For this reason, it is fair to say that the tests examine whether a stock's return tends to be low, relative to its usual performance, on days its speculative short-selling is high in terms of its typical level.

The first results in Exhibit 4 analyze the market-adjusted returns (MARET) on the 11,322 observations of the firms' highest deciles of recorded daily SPECVOL during the sample period. Panel A reveals that the mean SPECVOL for these observations is a strong 14.40%, although the mean observed MARET is rather small, at −0.68%.

Panel B reports a mean difference of −0.46% between a stock's MARET on these days of especially high SPECVOL and its median MARET during the entire sample period. By contrast, the observed MARET exceed their stocks' cutoffs for the lowest quartile (decile) of the sample period, on average, by a positive 2.16% (4.90%).

Panel C reports that only low percentages of the observed MARETs are in their stocks' lowest quartiles or

lowest deciles of daily returns. Quite clearly, the market-adjusted returns of the sampled stocks did not tend to be low, as judged by their usual performance, on the days short-selling reached comparatively high levels for the firms during this period.

The right-hand side of Exhibit 4 focuses on the levels of SPECVOL reached in the 11,088 observations of the lowest deciles of the stocks' recorded MARET. Panel A reports that the mean MARET for these cases is quite low, at −8.53%, and that the mean SPECVOL is 4.18%, which exceeds the average for the overall sample of 3.55% (see Exhibit 1).

Panel B shows that, on average, a stock's SPECVOL on days of especially low returns exceeded its median SPECVOL within the entire sample period by 1.97% but fell below its stock's cutoff points for the highest quartile and decile of SPECVOL by 0.69% and 5.17%, respectively.

Panel C indicates that relatively low percentages of the observed SPECVOLs landed in their stocks' highest quartiles or deciles of daily short-selling values during the overall sample period. We interpret these results as evidence that relatively low values of market-adjusted returns occurred on many days when speculative short-selling was not, comparatively speaking, at high levels.

SUMMARY

We have examined the daily association between market-adjusted returns and the percentages of trading volume attributable to shares shorted by dealers or by speculating customers of those dealers. Our dataset is an unusually detailed and informative file of trading records provided by Nasdaq for the period from September 2000 through July 2001.

The tests support four conclusions about short-selling and returns on Nasdaq stocks. When short-selling exceeds 10%, which occurs infrequently, average market-adjusted returns are significantly negative. At the more common lower levels of short-selling, average market-adjusted returns tend to be near zero.

Even when the correlation of market-adjusted returns and short-selling is negative, the magnitude of the relationship is rather small. For many stocks, days of high speculative short-selling are not typically days of unusually low market-adjusted returns.

Finally, high levels of short-selling by Nasdaq dealers are more common for stocks posting relatively higher market-adjusted returns than for poorly performing shares.

ENDNOTES

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[1]Despite the obvious value of our dataset, it does have two limitations. First, ACT does not identify purchases that cover or reverse short sales. Second, ACT records do not indicate whether a seller transacting through the Small Order Execution System (SOES) is shorting. Because SOES handled only about 2% of all Nasdaq transactions in 2000–01, there are probably not many missed short sales. (See Nasdaq's website, www.marketdata.nasdaq.com, for more details.)

[2]Pages 3-4 of Chapter 9 in the Nasdaq Trader Manual (revised 2000) state the rule:

> Under revisions to NASD Rule 6130(d)(6) implemented in 1997, Market Makers that are exempt from the rule now must mark their ACT reports to denote when they have relied on a short-sale rule exemption, and thus must denote all short sales—both exempt and nonexempt—as short sales. Accordingly, if you effect a non-exempt short sale (e.g., a short sale during an up bid or a short sale at least 1/16 above a point on a down bid, assuming a spread of 1/16), you must mark your ACT report as a short sale. If you effect a short sale in reliance on an exemption to the rule, you must mark your ACT report as an exempt short sale.

[3]The t-statistics are adjusted according to the technique of Chakravarty, Gulen, and Mayhew [2004], which calls for multiplying the standard error by the square root of $([1 + \rho]/[1 - \rho]]$, where ρ = correlation (estimate for day t, estimate for day t − 1).

REFERENCES

Asquith, P., P. Pathak, and J. Ritter. "Short Interest, Institutional Ownership, and Stock Returns." *Journal of Financial Economics*, 78, (2005), pp. 243-276.

Boehmer, E., C. Jones, and X. Zhang. "Which Shorts are Informed?" Working paper, Texas A&M University, 2005.

Chakravarty, S., H. Gulen, and S. Mayhew. "Informed Trading in Stock and Options Markets." *Journal of Finance*, LIX(2004), pp. 1235-1257.

Christophe, S., M. Ferri, and J. Angel. "Short-Selling and the Weekend Effect in Stock Returns." Working paper, George Mason University, 2006.

Diether, K., K. Lee, and I. Werner. "Can Short-sellers Predict Returns? Daily Evidence." Working paper, Ohio State University, 2005.

Griffin, J., J. Harris, and S. Topaloglu. "The Dynamics of Institutional and Individual Trading." *Journal of Finance*, 58 (2003), pp. 2285-2320.

Jones, C., and O. Lamont. "Short Sale Constraints and Stock Returns." *Journal of Financial Economics*, 66 (2002), pp. 207-239.

Lamont, O. "Go Down Fighting: Short Sellers vs. Firms." Working paper, Yale University, 2004.

Miller, E. "Risk, Uncertainty, and Divergence of Opinion." *Journal of Finance*, 32 (1977), pp. 1151-1168.

NASD Manual, Notice to Members 94-68 and NTM 94-83 and Interpretations. Available at www.nasd.com.

Nasdaq Trader Manual,NASDAQ Stock Market Inc. 1998, with revisions in 2000.

Scannell, K. "SEC Weighs Tougher Stance on Naked Short-Selling." *Wall Street Journal*, July 12, 2006, p. C3.

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