

# Does High Short Interest Lead Underperformance?

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**D**o short sales of a stock indicate that the stock will underperform in the future? This topic has been examined over the decades with no single conclusion. In a rising overall market, when the uncovered short-seller is exposed to unlimited potential losses and constrained by rules not encumbering the stock purchaser, the importance of short sales and short interest data is highlighted.

We examine Nasdaq stocks with *large* short interests. We argue that high short interest conveys negative information about stock price performance. The short-seller of the highly shorted stock delivers a credible negative opinion, *ceteris paribus*, on the stock being shorted. Our premise suggests that high short-selling activity is a precursor, on average, to subsequent stock price underperformance. After allowance for both firm size and transaction costs, we find that Nasdaq stocks with high short positions significantly underperform in the near and the long term.

Academic research and legislative investigation are not unanimous concerning the impact that short-sellers have upon securities markets or individual security prices. In congressional testimony, financial managers blame short-sellers for grave declines in firm value.<sup>1</sup>

Vu [1987] finds that increases in published short interests have no impact on stock prices. Woolridge and Dickinson [1994] and Brent, Morse, and Stice [1990] discover positive (albeit insignificant) returns for stocks

with increasing levels of short-selling activity. Conversely, Asquith and Meulbroek [1996] observe long-run underperformance for highly shorted NYSE and AMEX stocks, while Choie and Hwang [1994] observe negative, but insignificant, returns for a stock with an increasing level of short-selling.

If investors use published short-selling data to help them make their investment decisions, no tradable pattern will emerge in long-term stock prices characterized by the data. We believe, however, that investors are not fully using published short sales data in their investment choices, and that there is confusion over the use of the data.

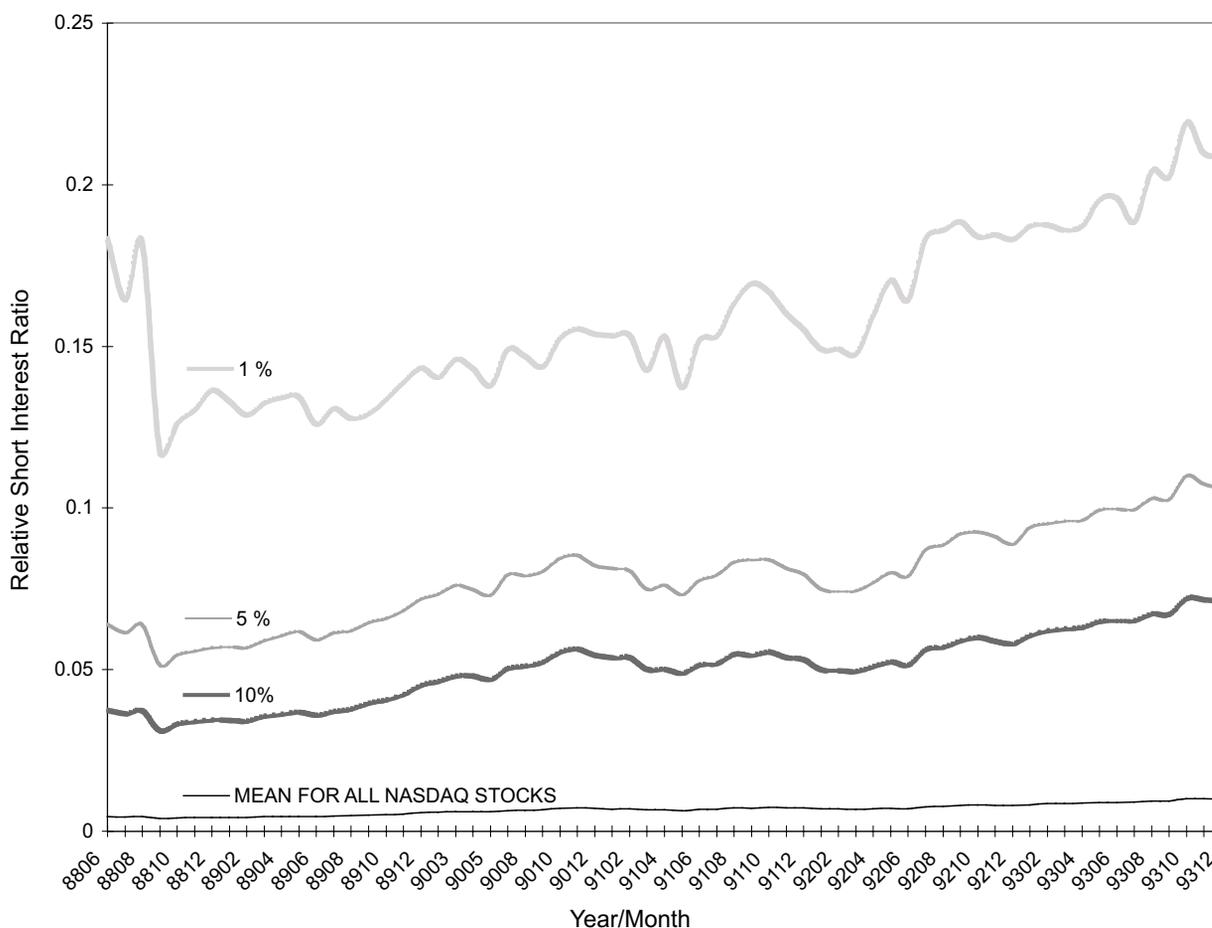
Our discoveries support this belief. We find that short-sellers of Nasdaq stocks with high short interests earn significant returns with their contrarian bets. Similar to stocks on the New York Stock Exchange and the American Stock Exchange, Nasdaq stock prices do not quickly incorporate short interest information. Accordingly, investors ought either take an outright short position in Nasdaq stocks with high short interest or, at a minimum, not include these stocks in their portfolios.

## OBJECTIVES OF SHORT-SELLERS AND COST OF SHORT SALES

There are three primary motivations for short-selling. Stocks are sold short in anticipation of a stock price decline; to postpone the taxation of and lock in a gain in the stock; and

## EXHIBIT 1

### Relative Short Interest Ratio June 1988–December 1993



in hedging or arbitrage activities. The second motivation, shorting against the box, is a practice virtually eliminated by the Taxpayer Relief Act of 1997. We focus on the first motivation, where a trader initiating a short position expects a price decline.

When the selling activities of this trader are unrestricted, the trader is free to bring his or her negative opinion to the market. The flow of information to the marketplace is, however, altered by costly institutional constraints on short sales.

These costly constraints take one of several forms.<sup>2</sup> First, the short-seller can rarely access all short sale proceeds. Second, SEC Rule 10a-1 (the uptick rule) provides that the short-seller must secure a buyer who will pay a price higher than the previous trade or a price equal to the previous trade if that were itself an increase.<sup>3</sup> Third, legal or contractual obligations prohibit short-selling by

certain institutional investors and corporate insiders. Fourth, infrequently traded or non-marginable stocks may not be available to the short-seller, and the short-seller is required to return the stock to the lender on demand in a so-called short squeeze. Finally, once a stock has been sold short, the seller is responsible for dividend payments on the stock.

Figlewski [1981] proposes that “the institutional structure of a financial market can influence the way it aggregates and reveals investors’ information.” Where information to the market is restricted, a less complete market is provided. Although investors adapt to whatever institutional constraints exist, the short-seller is constrained by the costs we have outlined. We hypothesize that the short-seller’s willingness to suffer these costs, especially for the highly shorted stock, portends subsequent underperformance.

## EXHIBIT 2

### Frequency Distribution of Elapsed Time in Months for Appearances in 90th Percentile Sample

Number of Months	Total Number of Months that Firms appear in 90th Percentile Sample		Elapsed Time from First Month to Last Month in 90th Percentile Sample	
	Frequency	Percent	Frequency	Percent
1	500	24.6%	500	24.6%
2	225	11.1%	141	6.9%
3	164	8.1%	110	5.4%
4	111	5.5%	70	3.4%
5	79	3.9%	60	3.0%
6 - 10	280	13.8%	252	12.4%
11 - 20	306	15.1%	342	16.8%
> 20	366	18.0%	556	27.4%

### SAMPLE SELECTION PROCEDURE AND SUMMARY INFORMATION

Most short sales studies use publicly reported data, such as that published in the *Wall Street Journal*; these data highlight substantial *absolute* short positions. Thus, earlier studies inadvertently focus upon larger firms with many shares sold short, but with modest *relative* short interest ratios. Smaller firms with substantial relative short positions are unmentioned.

Using data prepared monthly by the Historical Research Department at the NASD, we avoid this bias by employing a comprehensive report of all short-selling activity on the Nasdaq. Our sample includes data from June of 1988 through December of 1995.

We correct the sample for stock splits and stock dividends. For each month we calculate the relative short interest ratio; this is a firm's reported short interest divided by its shares outstanding. Firms are ranked according to these ratios. We then create monthly samples for firms in the highest 90th, 95th, and 99th percentiles. We believe the most information is provided by data on these most heavily shorted stocks. We assemble a "rolling" portfolio of only these stocks. Stocks that do not have returns data

available on the Center for Research in Security Prices (CRSP) tapes are excluded from the sample.

Exhibit 1 illustrates the monthly relative short interest ratio for all Nasdaq firms between June 1988 and December 1993. The relative short ratio increases over the period for the sample of all Nasdaq stocks and the most highly shorted stocks. The mean relative short interest for Nasdaq stocks doubles, from 0.425% in 1988 to 0.906% in 1993. The increase is comparable for the 90th percentile sample (roughly 450 firms in a given month), which increases from 3.48% in 1988 to 6.61% in 1993. Exhibit 1 illustrates the low overall short ratios for the average Nasdaq stock. A small subset of firms have a significant short position.

Exhibit 2 describes how frequently stocks appear in the 90th percentile sample. A total of 2,031 firms appear in the sample at least once; 3,642 Nasdaq stocks never appear during the sample period. Over 360 firms enter the sample for more than 20 of the 55 months.

Also illustrated in Exhibit 2 are the numbers of months that elapse from a firm's first entry to last exit from the 90th percentile sample. Over a fifth of the firms first enter and last appear in the sample over a period of two or more years. A number of firms enter the sample, exit,

## EXHIBIT 3

### Mean Market Value, Volume, Price, and Number of Market Makers for High Short Interest Stocks

#### Panel A: Firm Characteristics for all Nasdaq stocks

	Market Value (000s)	Volume	Price	Market Makers
Nasdaq stocks appearing in 90th percentile sample	182,923	77,664	12.988	14.737
Nasdaq stocks never in 90th percentile sample	74,003	26,539	11.270	8.993

#### Panel B: Firm Characteristics Based on Number of Appearances in 90th Percentile Sample

Number of Appearances in 90th Percentile Sample	Market Value (000s)	Volume	Price	Market Makers
1	111,715	77,061	12.042	12.583
2	147,836	86,710	10.969	14.376
3	131,513	69,419	13.278	13.299
4	162,172	82,913	11.417	15.337
5	161,274	80,938	12.325	15.479
6 - 10	149,245	89,104	13.083	15.892
11 - 20	214,533	94,738	13.927	17.107
> 20	269,299	131,009	14.262	18.967

and return at a later time. The average time from first to last appearance in the short sample is over 14 months; the median is 8 months.

Exhibit 3 compares stocks in the 90th percentile to other Nasdaq stocks. CRSP data are available for 1,570 firms in this sample. In Panel A, the average market value of equity of these stocks is \$182,923,000. The average for the remaining 3,642 Nasdaq stocks never included in the sample is \$74,003,000. The average daily trading volume of 77,664 shares is greater than the 26,539 average for other Nasdaq firms. The mean price is \$12.99; this is slightly higher than the average price of \$11.27 for those stocks not in the sample.<sup>4</sup> The average number of market makers is 14.737, compared to 8.993 for other Nasdaq stocks.

Panel B provides a review of security characteristics

based on the number of times a stock appears in the 90th percentile sample. Several patterns emerge. Market value of equity, volume, price, and number of market makers are all greatest for firms that are shorted most frequently. The measures for each of these are higher, on average, than the average for all Nasdaq stocks.

#### PRICE PERFORMANCE OF HIGHLY SHORTED NASDAQ SHARES

We examine the overall returns to portfolios of stocks appearing in the 90th, 95th, and 99th percentiles. Portfolio holding-period returns are calculated by forming an equally weighted portfolio and holding the portfolio (with no interim rebalancing) for the one-month,

## EXHIBIT 4

### Cumulative Percentage Returns and Net-of-Size Portfolio Returns for High Short Interest Nasdaq Portfolios

	Event Period (in months relative to short interest date)					
	(-12, -1)	(-1)	(0)	(+1)	(+1, +12)	(+1, +24)
90th Percentile	-9.61% (0.006)	-1.33% (0.198)	-1.09% (0.286)	-1.78% (0.077)	-19.38% (0.000)	-32.02% (0.000)
Net-of-Size Portfolio	-0.23% (0.863)	-0.23% (0.522)	-0.01% (0.985)	-0.58% (0.089)	-5.85% (0.000)	-8.67% (0.000)
95th Percentile	-10.83% (0.003)	-1.67% (0.121)	-1.53% (0.155)	-1.85% (-0.089)	-19.04% (0.000)	-31.11% (0.000)
Net-of-Size Portfolio	-4.03% (0.014)	-0.82% (0.050)	-0.65% (0.128)	-0.85% (0.057)	-6.50% (0.099)	-9.15% (0.000)
99th Percentile	-1.67% (0.683)	-1.65% (0.188)	-1.55% (0.222)	-1.80% (0.149)	-23.37% (0.000)	-34.12% (0.000)
Net-of-Size Portfolio	-0.90% (0.694)	-1.68% (0.007)	-1.43% (0.031)	-1.59% (0.012)	-17.05% (0.000)	-19.20% (0.000)

Two-tailed p-values for whether mean log return differs from zero are in parentheses.

## EXHIBIT 5

### Subsequent-Year Returns of High Short Interest Portfolios By Number of Appearances in Sample

	Number of Appearances							
	1	2	3	4	5	6 to 10	11 to 20	> 20
90th Percentile	-28.10% (0.000)	-28.51% (0.000)	-22.44% (0.000)	-36.98% (0.000)	-23.43% (0.000)	-28.10% (0.001)	-22.16% (0.000)	-16.13% (0.000)
Net-of-Size Portfolio	5.78% (0.306)	-1.87% (0.670)	-2.16% (0.649)	-7.27% (0.119)	-1.61% (0.654)	-10.27% (0.001)	-6.55% (0.000)	-6.15% (0.000)
95th Percentile	-23.55% (0.001)	-29.60% (0.000)	-17.03% (0.006)	-15.84% (0.089)	-23.16% (0.000)	-18.51% (0.000)	-27.30% (0.000)	-12.92% (0.001)
Net-of-Size Portfolio	3.12% (0.664)	-7.94% (0.102)	6.21% (0.256)	-0.77% (0.914)	-9.65% (0.035)	0.58% (0.845)	-14.54% (0.000)	-3.85% (0.015)
99th Percentile	-24.65% (0.013)	-27.54% (0.008)	-18.09% (0.115)	-10.27% (0.152)	-12.63% (0.066)	-30.21% (0.001)	-27.20% (0.000)	-20.30% (0.000)
Net-of-Size Portfolio	-3.39% (0.740)	-0.89% (0.926)	-17.48% (0.088)	-11.75% (0.045)	-9.73% (0.156)	-21.91% (0.000)	-21.00% (0.000)	-17.74% (0.000)

Two-tailed p-values for whether mean log return differs from zero are in parentheses.

one-year, and two-year windows surrounding the month of heavy short interest. We examine 55 portfolios, corresponding to short interest reported monthly from June of 1988 through December of 1993. Month zero begins when monthly short interest information is collected, 5 business days before the 15th of the month.

We measure returns in two ways; we compute holding-period returns, and we measure a size-adjusted return. The earliest studies of short sales use only market model-adjusted returns to provide a relative performance indicator. Other work, however, questions the power and specification of traditional market modeling and encour-

## EXHIBIT 6

### Cumulative Percentage Returns of High Short Interest Nasdaq Portfolios Subsequent to Last Appearance in High Short Interest Sample

Sample	(+1)	(+1, +12)
90th Percentile	-3.57% (0.007)	-24.90% (0.000)
Net-of-Size Portfolio	-0.64% (0.476)	6.70% (0.013)
95th Percentile	-3.02% (0.046)	-20.34% (0.000)
Net-of-Size Portfolio	-0.19% (0.871)	7.43% (0.041)
99th Percentile	-2.83% (0.156)	-24.48% (0.000)
Net-of-Size Portfolio	-1.35% (0.422)	-3.41% (0.510)

Two-tailed p-values for whether mean log return differs from zero are in parentheses.

ages the adoption of more statistically sound measures (see Barber and Lyon [1997] and Kothari and Warner [1997]). These better measures include the size-adjusted returns we provide.

Size-adjusted returns are calculated by partitioning the highly shorted sample and all Nasdaq stocks into market value deciles at the time of each of the 55 announcements. Net-of-size portfolio returns are calculated as the difference between the highly shorted portfolio return and its associated decile portfolio.<sup>5</sup>

We report mean absolute portfolio returns in Exhibits 4–7. Since stock returns approximate a lognormal distribution, we calculate two-tailed p-values, in parentheses, for whether the mean log return differs from zero.

Cumulative percentage returns to the holder of the high short interest portfolios are given in Exhibit 4. The measures are raw returns from investing in highly shorted stocks *after* the NASD publishes short interest. Our results indicate that a naive investor owning the 90th percentile portfolio generates a mean return of -19.38% and -32.02% over the following 12 and 24 months. The size-adjusted

return echoes this underperformance with negative returns of -5.85% and -8.67%. The 95th percentile portfolio exhibits similar negative performance.

Consistent with the costly short sales hypothesis, the 99th percentile portfolio displays the most dramatic decline. These stocks exhibit returns of -19.20% relative to the size adjusted portfolio over the two succeeding years. All the one-year and two-year returns in Exhibit 4 are negative and significantly different from zero.

The returns on high short interest portfolios are larger in absolute value than the cost of a typical round-trip transaction. In their study of individual investors, Barber and Odean [2000] estimate round-trip transaction costs of about 3%. Keim and Madhavan [1998] estimate significantly lower transaction costs for institutional investors. This implies a profitable short-selling strategy. Yet measuring the profitability of a shorting strategy against only these costs ignores dividend payments and other restrictions on the short-seller. The precipitous declines in value that we find are, at a minimum, a clear discouragement of owning the highly shorted stock.

Exhibit 5 provides one-year (+1, +12) returns for subsets of the high short interest portfolio based on the number of times the stock appears in the portfolio. The returns are generally negative and significant for the one-year period subsequent to entering the high short interest portfolio, regardless of the number of times that the firm appears.

The results in Exhibit 5 do not temper the conclusion that, *ceteris paribus*, highly shorted stocks are bad bets for the long purchaser. Rather, they merely illustrate that these poor bets do not significantly underperform relative to one another according to the frequency of their appearance in the highly shorted samples.

Exhibit 6 provides the mean returns for portfolios after the last time a stock appears in the sample. Note that the casual observer is not aware that short interest is about to fall. Subsequent to the last time a stock appears in the sample, the stock returns are again negative, but the performance of highly shorted stocks subsequent to their last appearance is not significantly different, on average, from their size-adjusted portfolio. Comparing Exhibit 6 to Exhibit 4 tells us this.

Stock portfolios generally underperform subsequent to appearing in the highly shorted samples. Once the short interest decreases, however, the portfolios no longer underperform relative to similar-sized stocks. This suggests that at the time short-sellers unwind their positions in these stocks, stock prices are no longer high enough

## EXHIBIT 7

### Share Price Performance for High Short Interest Stocks (90th Percentile Sample) Based on Prior One-Year Performance

	(+1)	(+1, +12)
Low Return Prior to High Short Interest	-7.42% (0.001)	-48.32% (0.000)
Net-of-Size Portfolio	-1.64% (0.073)	-3.18% (0.231)
Medium Return Prior to High Short Interest	-1.44% (0.144)	-15.61% (0.000)
Net-of-Size Portfolio	-0.75% (0.034)	-7.08% (0.000)
High Return Prior to High Short Interest	0.67% (0.506)	-3.39% (0.188)
Net-of-Size Portfolio	0.39% (0.334)	-6.12% (0.000)

Two-tailed p-values for whether mean log return differs from zero are in parentheses.

to justify the relatively high transaction costs of a short sale.

We finally consider whether short sales are associated with locking in gains (independent of year-end tax planning) or merger-related arbitrage activity.<sup>6</sup> If short sales are used predominantly to lock in gains, then there should be little information in transactions following price run-ups. To test this premise, we partition into quintiles the set of all Nasdaq stocks based on returns for the one-year period prior to each short sales report.

In Exhibit 7, we examine the one-year cumulative return for stocks subsequent to appearance in the highly shorted sample, based on the stock's *prior* one-year performance. "Low return prior to high short interest" stocks are those appearing in the lowest quintile, "medium..." in the middle three quintiles, and "high..." in the highest quintile.

Net-of-size portfolio returns for the three groups of stocks are similar. Returns for the highly shorted stock portfolios are most negative for those securities that exhibit the lowest return prior to appearing in the high short interest sample. Even the stocks in the highest quintile of pre-short interest returns, however, experience a return

6.12% less than a portfolio of similar-size stocks. This suggests that the highly shorted stock will underperform, independent of its price behavior prior to becoming one of the most heavily shorted Nasdaq stocks.

## CONCLUSION

A popular opinion among investors is that a heavily shorted stock is a prime candidate for a coming upward move since short-sellers will ultimately unwind their positions and purchase the stock. We demonstrate that this hope is illusory for portfolios of high short interest Nasdaq stocks. Our results imply that short-sellers are sophisticated investors; they appear to act on superior information. Returns are large and negative subsequent to high short interest, but not different from those of similar-sized stocks after short activity declines and short-sellers unwind positions.

Our empirical evidence would suggest that investors refrain from purchasing stocks with high short interest. At a minimum, short interest activity should be but a factor in the review process of the equity portfolio. The data suggest also a profitable strategy of shorting the most heavily shorted stocks after their first appearance in the high short interest sample, and covering these short positions in one to two years. The activity is most promising for stocks that have exhibited price declines prior to exhibiting heavy short interest.

The results provided in this study do not necessarily demand that an investor go short to guarantee the optimal performance of a portfolio. The costs of short-selling vary dramatically across investors, according to the investor's ability to access short-selling proceeds and the dividend requirements of the shorted stocks. It would not be wise to purposefully ignore short-selling data. Our results further imply that the axiom holding that the heavily shorted stock is a good bet may well be correct—provided the bet is in the right direction.

## ENDNOTES

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<sup>1</sup>See "Short-Selling Activity in the Stock Market" [1991].

<sup>2</sup>Short sales restrictions exist on most exchanges worldwide and range up to an outright ban in some countries. McDonald and Baron [1973] report that short-selling prohibitions date back to "the tulip bubble" of 1610 in Holland.

<sup>3</sup>This rule was extended to the Nasdaq in June 1994. The SEC is also examining the creation of a reporting requirement (similar in spirit to the 13-D) for investors who are highly short in a given stock.

<sup>4</sup>We also calculate beta for the subset of firms on CRSP with sufficient daily returns. Beta is calculated using the CRSP equal-weighted index (Combined Nasdaq, NYSE, and AMEX) from day -185 to day -31 prior to the first time a stock appears in the 90th percentile sample. The mean (median) beta for firms in the 90th percentile sample is 1.417 (1.389), which is significantly higher than Nasdaq stocks not in the 90th percentile sample, 1.2154 (1.1793).

<sup>5</sup>We also calculated an additional size-adjusted return as the difference between the return of the highly shorted stock and a control stock. The control stock is the stock on the CRSP tapes with the closest market value among the set of Nasdaq stocks never appearing in the 90th percentile portfolio. For the most part, the net-of-size portfolio returns reported here are similar in size and significance to the net of control stock portfolio returns.

<sup>6</sup>In an unreported set of tests, we find that December short-selling does not drive our results. If December short sales were important, we would observe significant short-selling in December followed by a January reversal. This is not observed. Coupled with this study's other findings, this is intuitive. It is unlikely that a highly shorted stock, declining over the longer term in value, would be a meaningful candidate for shorting against the box at year's end.

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