

NAKED SHORT SELLING: IS IT INFORMATION-BASED TRADING?

A Dissertation

by

HU LIU

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

August 2012

Major Subject: Accounting

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ABSTRACT

Naked Short Selling: Is it Information-Based Trading? (August 2012)

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Naked short selling occurs when a short seller fails to deliver shares on the settlement day. The business press and many corporate managers characterize it as abusive price manipulation, alleging that selling nonexistent shares causes a price decline regardless of fundamentals. To curtail the practice, the SEC issued regulations, first to restrain and later to prohibit all naked short selling (i.e., Reg. SHO in 2004 and its amendment in 2009). Contrary to allegations, I find that the naked short selling component of total short interest is significantly associated with accounting and market fundamentals, indicating proper information usage. Further, naked short interest is highly significant in predicting one-quarter ahead abnormal stock returns, and it dominates covered short interest when both measures are included. I also calculate returns from a zero-investment trading strategy that buys (sells) shares with low (high) levels of both covered and naked short interest. I find abnormal returns are approximately 3.9 times larger than when using only covered short interest. Empirical

evidence therefore indicates that recent actions by regulators to eliminate naked short selling are likely to impede arbitrage and thereby reduce market efficiency.

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TABLE OF CONTENTS

	Page
ABSTRACT	iii
ACKNOWLEDGEMENTS	v
TABLE OF CONTENTS	vi
LIST OF TABLES	vii
1. INTRODUCTION.....	1
2. BACKGROUND, REGULATIONS, AND RELATED LITERATURE	9
2.1 Naked Short Selling and Related Regulations	9
2.2 Prior Research on Short Selling	14
2.3 Do Naked Short Sellers Trade on Accounting Information?	15
3. RESEARCH DESIGN	18
4. SAMPLE SELECTION AND DESCRIPTIVE STATISTICS	24
4.1 Sample Selection	24
4.2 Descriptive Statistics	26
5. MULTIVARIATE ANALYSIS RESULTS.....	30
5.1 Is Naked Short Interest Information-driven?	30
5.2 Predictive Power on Future Returns.....	33
5.3 Abnormal Future Returns Based on Sorted Short Interests	36
5.4 Days a Firm Appears on the Threshold List	39
5.5 Robustness Tests	42
6. CONCLUSIONS.....	44
REFERENCES.....	46
VITA	50

LIST OF TABLES

Table 1	Sample Selection	25
Table 2	Descriptive Statistics	27
Table 3	Pearson and Spearman Correlations	29
Table 4	The Effect of Accounting and Market Information on Naked Short Interest and Covered Short Interest	31
Table 5	Naked and Covered Short Interest and Future Abnormal Stock Returns .	35
Table 6	One-Quarter Ahead Abnormal Returns Based on Current Quarter Covered Short Interest Quintiles and Naked Short Interest Quintiles	38
Table 7	Does “Days a Firm Appears on the Threshold List” Represent Information?	41

1. INTRODUCTION

The Securities and Exchange Commission (SEC) defines “naked short selling” as selling short without borrowing the securities to make delivery (SEC 2004). Naked short selling differs from “covered short selling” in which shares are borrowed and delivered to the buyer on the settlement date, which is three days after the trade date. Putniņš (2010) reports that between 1.5% and 5% of average trading volume on the main U.S. exchanges between 2004 and 2009 involved failures-to-deliver.¹ An intriguing aspect of naked short selling is that the shares traded do not exist (Christian et al. 2006). Selling “phantom” (paper) shares artificially increases the supply of shares in circulation, allegedly causing a decline in share price (Drummond 2006; SEC 2009). Critics argue that naked short selling is abusive and even illegal (Wherry 2003), and at least one organization, National Coalition Against Naked Shorting, has been organized to campaign against naked short selling. During the recent financial crises, the SEC expressed concern that naked short selling was associated with “sudden and unexplained” declines in stock prices that create questions about the underlying financial fundamentals of a given company as well as a crisis of investor confidence in the company without a “fundamental underlying basis” (SEC 2009). These concerns caused

This dissertation follows the style of *The Accounting Review*.

¹ A failure to deliver (FTD) is not always intentional and can arise from various processing errors, delays in obtaining physical stock certificates or human error in entering an incorrect stock symbol (Putniņš 2010). As a result, the SEC requires that the aggregate FTD for a given security must reach at least 10,000 shares before it is considered a threshold security. Consistent with prior research, we treat the total FTD as a proxy for abusive naked short selling.

the SEC (2009) to strengthen the “close-out” requirement of Reg. SHO in an attempt to eliminate naked short selling and to pass the Rule 10b-21, the “Naked” Short Selling Antifraud Rule, to increase the legal liability of naked short sellers (SEC 2008b).

In this study, I investigate the assumption by the media and SEC that naked short selling reduces share price without regard to firm fundamentals. Even though naked short selling clearly increases the number of shares in circulation, this does not mean that naked short selling is not based on fundamentals. The same can be said for covered short selling because shares are generally borrowed from index funds, or other investors, who do not actively trade those shares. And academic research on short selling provides reason to question the allegation that naked short selling is not based on fundamentals. First, theory argues that short sellers contribute to efficient price discovery by more fully impounding into stock prices the impact of pessimists (Miller 1977; Diamond and Verrecchia 1987; Lee 2001). Second, empirical research shows that short sellers (on average) are sophisticated traders who establish positions consistent with the predictive value of market and accounting fundamentals (Dechow et al. 2001, Drake et al. 2011). Motivated by the inconsistency between SEC efforts to eliminate all naked short selling and academic research showing that total short selling improves price discovery, I investigate whether naked short selling is significantly associated with accounting and market fundamentals. If naked short selling is trading without “a fundamental underlying basis,” naked short interest, a proxy for naked short selling, should not be associated with accounting and market fundamentals in a manner consistent with proper usage of this information.

To-date, researchers have not separately studied the association between the naked component of total short interest and fundamentals. Naked short interest constitutes a small portion of total short interest, so prior research has effectively studied the covered component. At the outset, it is not clear that the finding in prior research that total short interest properly reflects accounting and market fundamentals should not be extended to the naked component without testing. First, corporate managers and regulators argue that naked short selling is often used by shorts to manipulate stock prices and is not based on fundamentals (as discussed in the opening paragraph).² Second, naked short sellers may not be able to hold their positions long enough for information about fundamentals to be incorporated into share prices. The broker may close out a naked position by buying shares in the open market-- without seeking consent from the trader -- at, or shortly after, the settlement date to comply with SEC regulations. In addition, a broker may buy without client consent after the settlement date if a short squeeze occurs, and a stock with a high level of naked short interest is more vulnerable to a squeeze (Jickling 2005).³ Third, short sellers have to be highly informed to offset high arbitrage costs, but naked short sellers receive an involuntary zero-fee, zero-rebate equity loan from the buyer (Putniņš 2010). Lower trading costs

² Managers and regulators have institutional knowledge that should not be ignored. They do not provide any evidence, however, beyond the fact that naked short selling can create a rapid (and theoretically unlimited) increase in shares for sale. Covered short selling is slowed by the need to locate shares before selling.

³ A short squeeze occurs when buy orders from other investors push up share prices rapidly, forcing short sellers to put up additional collateral or cover their positions by buying stock (which would further increase prices). Regulation SHO (2004) requires that stocks with large “fail-to-deliver” positions (at least 10,000 shares) be included in a list that is published daily. Stocks on this “threshold list” are vulnerable to a short squeeze, as discussed by SEC specialist Jickling (2005). Foust (2005) describes instances where traders have reportedly made large purchases of stocks on the list.

mean that naked shorts can profit with a smaller information advantage than covered shorts. Fourth, naked short interest includes selling by market makers who take the opposite side of a customer's share purchase to allow a transaction in a thinly traded stock. The market maker is trading to provide liquidity – not because fundamentals suggest overvaluation. In fact, the purchaser may have information the stock is undervalued. For these reasons, the role of accounting and market fundamentals in naked short selling is ultimately an empirical question. To my knowledge, this study is the first to provide such evidence.

I use fail-to-deliver data, collected by the stock exchanges and provided by the SEC via the Freedom of Information Act, to decompose total short interest into naked and covered components. This is done by aligning naked and total short interest on the same trading date, and calculating covered short interest by subtracting naked short interest from total short interest. I then regress naked short interest on independent variables that capture accounting and market fundamentals, including the value score of Piotroski (2000),⁴ capital expenditures, and sales growth.

I find that naked short interest is significantly and negatively associated with Piotroski's value score, which suggests that naked short positions are lower for firms with accounting fundamentals that are sound and improving. I find that naked short interest is positively and significantly associated with both capital expenditures and sales growth. Prior research shows that high capital expenditures and high sales growth tend

⁴ I rename the F-Score from Piotroski (2000) as value score to avoid confusion with the "fraud-score" from Dechow et al. (2011). A stock with a high value score indicates improving fundamentals. The value score has been shown to be useful in predicting future abnormal returns (Piotroski 2000; Piotroski and So, 2012). In an untabulated test, I find that the value score is predictive for my sample of firms.

to precede lower future returns. Naked short selling is also greater for smaller companies. Finally, naked short selling is lower for stocks where the consensus analyst forecast of earnings has increased over the past six months. Consistent with SEC concerns that naked short sellers trade solely on momentum, I find that naked short interest is negatively associated with stock momentum which suggests that naked short sellers are more likely to take positions in firms with negative stock price momentum. However, in supplemental analysis, I find evidence that suggests that naked short selling is based more on fundamental analysis than on stock momentum, a result which is contrary to the SEC concerns. In sum, naked short interest is significantly associated with accounting and market fundamentals in the direction showing proper usage of the information.

To provide a comparison to the use of accounting information in covered short selling, I regress covered short interest on the same set of explanatory variables. I find the use of financial statement information is consistent with naked short selling. Most importantly, I find the coefficient on the value score is negative and statistically significant; and the coefficients on capital expenditures and sales growth are both positive and statistically significant. In sum, empirical evidence directly refutes the claim that naked short selling lacks a fundamental underlying basis.⁵

To provide an alternative test of whether naked short selling captures predictive information, I regress one-quarter-ahead abnormal returns on naked and covered short

⁵ In the results section, I discuss the differences between naked and covered short selling. They do not arise from use of financial statement information and generally reflect the shorter investment horizon for naked short selling.

interest. I find that naked and covered short interest are each statistically significant with a negative association with future abnormal returns when included in separate models. However, when I include both measures in the same model, naked short interest remains significant, while covered short interest becomes insignificant. These results show that naked short interest not only has incremental predictive power over covered short interest, but it dominates covered short interest when both measures are used to predict future abnormal returns. The shorter investment horizon of naked short sellers could mean their positions are more likely to reflect recent information than are the positions held by covered shorts. Next, if naked short selling destroys firm value as alleged by critics, the current price would be too low and future returns should be positive as the market price corrects. Instead, the negative association between naked short interest and one-quarter ahead abnormal returns questions the claim that high naked short selling destroys firm value.

Prior literature suggests that investors can earn economically significant positive abnormal returns using a zero-investment trading strategy that mimics short sellers. One profitable strategy is to buy (short sell) companies with low (high) levels of total short interest. Boehmer et al. (2010) shows that significant returns can be earned trading companies falling in the top and bottom one (five) percent. I propose an alternative trading strategy that uses the distinction between covered and naked short selling. My primary motivation is to determine if the statistically significant relation between naked short interest and one-quarter-ahead returns in a regression model is economically important. I first sort companies into quintile levels by the level of covered short interest.

Within each quintile, I sort again into quintiles based on levels of naked short interest (i.e., nested sorting). I then investigate a strategy that buys firms in the lowest quintile of both covered and naked short interest and sells short firms in the highest quintile of both covered and naked short interest. The strategy earns an abnormal return of 3.76 percent over the next quarter, which greatly exceeds a return of less than one percent from using only the covered component of short interest. The substantial improvement in returns supports the finding that naked short selling captures important predictive information. This result is reinforced by the abnormal returns earned by a similar trading strategy that is based on reversed sorting sequence.

This study contributes to contemporary finance and accounting literatures in several ways. First, prior literature suggests that total short interest is significantly associated with market and accounting fundamentals in the direction consistent with proper usage of fundamentals to predict future returns (Drake et al. 2011). This study extends this finding to the naked and covered components of total short interest. We also show that the finding is robust to alternative measures of fundamentals. Second, we show that naked short selling provides information useful in predicting future returns. Separating total short interest into naked and covered components can increase profits from a zero-investment trading strategy that mimics trading by short sellers. Finally, the results in this study should be of considerable interest to regulators. While I do not attempt to refute the claim that naked short selling can be manipulative in some instances, I find consistent evidence across a wide range of tests showing that, on average, naked short selling is information based trading. This evidence is in stark

contrast to the SEC's stated assumptions about naked short selling and allows me to conclude that eliminating naked short selling is likely to impede arbitrage and thereby reduce market efficiency.

The rest of this paper proceeds as follows. Section 2 reviews naked and covered short selling, including regulations and relevant academic literature. Section 3 describes research methods. Section 4 presents descriptive statistics and the results of univariate tests. Section 5 presents multivariate results. Section 6 presents conclusions, including policy recommendations.

2. BACKGROUND, REGULATIONS, AND RELATED LITERATURE

2.1 Naked Short Selling and Related Regulations

Short selling is an investment method where an investor attempts to profit from stock price decreases. Short selling consists of covered and naked short selling. In a covered short sale, the short seller “locates” the security to be sold, borrows shares in the given security, sells those shares on day t , and delivers the shares to the buyer on the settlement day (day $t+3$). The seller then closes (or covers) her position by purchasing shares in the identical security later on the open market at a lower price, returning the shares to the lender, and realizing a profit. In contrast, the shares traded in a naked short sale do not exist (Christian et al. 2006). In a naked short sale, the seller does not borrow shares of a given security in time to deliver the shares to the buyer within the standard three-day settlement period. Consequently, a naked short seller fails-to-deliver (FTD) the shares of the given security to the buyer at the settlement date (SEC 2009).

Popular media and corporate managers claim that naked short selling ignores firms’ financial fundamentals and destroys firm value. A Forbes article, for example, claims that naked short selling caused a thousand companies to lose at least \$100 billion in the stock market (Wherry 2003). Patrick Byrne, CEO of Overstock.com, stated that “Naked short selling consists of persons selling (or colluding with others to sell) massive quantities of stock they neither own nor have arranged to borrow...with the intent to

manipulate downward the stock price of targeted companies ..., making tens (or hundreds) of millions of dollars engaging in this illegal conduct.”⁶

Recently, the SEC also expressed significant concerns about the implications of naked short selling. Consistent with media speculation, the SEC concerns focused on the premise that naked short sellers trade primarily on momentum and not based on the financial fundamentals of a given company. Specifically, the SEC expressed concern that naked short selling was associated with “sudden and unexplained” declines in stock prices that create questions about the underlying financial fundamentals of a given company as well as a crisis of investor confidence in the company without a “fundamental underlying basis” (SEC 2009). Furthermore, the SEC noted that naked short selling has additional negative effects on shareholders because it potentially deprives them of the benefits of ownership such as voting and lending (SEC 2008b).

In response to concerns that naked short sales lack a fundamental basis, the SEC developed a series of regulations first to restrain, and later to prohibit, all naked short selling. In 2004, the SEC enacted Regulation SHO (Reg. SHO) with the intention, at least in part, of reducing short selling abuses (SEC 2004). Reg. SHO established clear “locate” and close-out” requirements designed to reduce abusive trading by naked short sellers. The locate requirement of Reg. SHO allows brokers and dealers to execute a short sale order on an equity security only if the broker and dealer documents that the short seller can borrow the security in question and verifies that the short seller is able to

⁶ Please see <http://www.overstock.com/naked-short-selling.html> for more of Patrick Byrne’s comments on naked short selling.

deliver the security by the settlement date (i.e., within three days) (SEC 2004). The close-out requirement of Reg. SHO rule requires that brokers and dealers to "close-out" (i.e., purchase securities of like kind and quantity) FTDs that persist for ten consecutive settlement days in threshold securities (SEC 2004).⁷

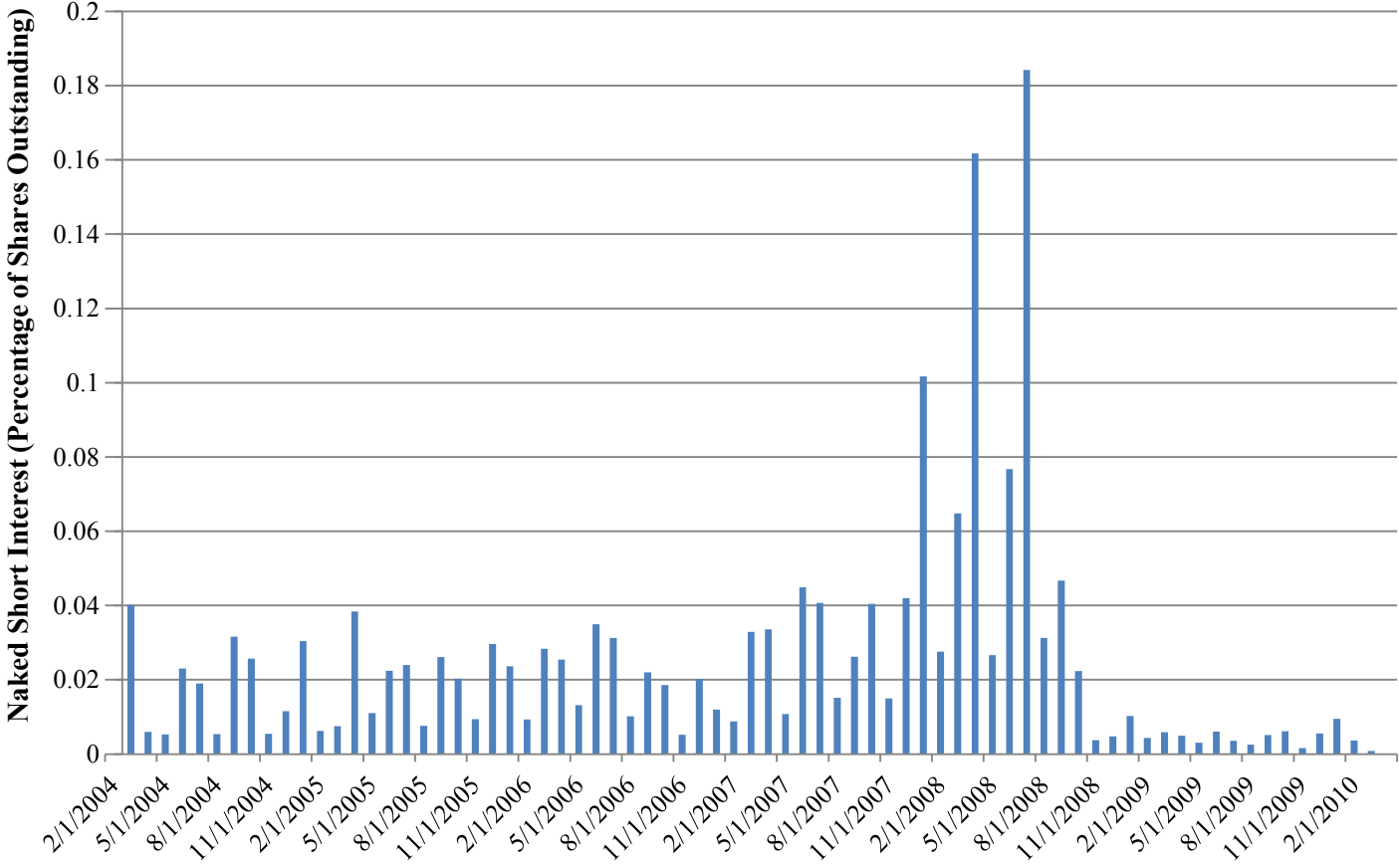
During the 2008 financial crisis, the SEC amended Reg. SHO in an effort to further restrict naked short selling. SEC Rule 204 of Reg. SHO was a temporary rule issued in October, 2008 (known at the time as Rule 204T) and made permanent in 2009 (SEC 2008a, 2009). Rule 204 amends the close out requirement of Reg. SHO and requires brokers and dealers to close FTDs on the day after the three-day settlement period ends. As a result, the close-out period is reduced from ten days to one day, making it extremely difficult to intentionally become involved in a naked short sale. In addition, the SEC issued Rule 10b-21, the "Naked" Short Selling Antifraud Rule, in 2008 which makes it illegal for short sellers to deceive brokers and dealers about their intention and ability to deliver securities by the settlement date and then fail to deliver the given securities (SEC 2008b).

In combination, SEC regulations create a significant disincentive for naked short sellers to participate in the equity markets. Figure 1 presents evidence of the effect of the 2008 SEC regulations issued in 2008. From 2004 to October, 2008 (when Rules 204 and 10b-21 became effective), naked short interest represented, on average, approximately

⁷ A threshold security is a security for which there is an aggregate FTD position for five consecutive settlement days at a registered clearing agency that is greater than or equal to 10,000 shares and is at least 0.5 percent of the issue's total shares outstanding (SEC 2004). Self-regulated organizations (e.g., NYSE or NASDAQ) are required to compile and distribute a list of threshold securities (SEC 2004).

two percent of total shares outstanding. However, after Rules 204 and 10b-21 became effective, naked short interest, on average, dropped well below two percent of total shares outstanding. Thus, the monthly analysis in Figure 1 suggests that the SEC has effectively limited naked short selling.

FIGURE 1
Naked Short Interest Over Time



2.2 Prior Research on Short Selling

Although the media and the SEC operate under the assumption that naked short sellers trade primarily on momentum and not accounting fundamentals, there is little academic evidence to support such an assumption. While prior research does not provide direct evidence on the information used by naked short sellers, it does provide both theoretical and empirical evidence on the benefits of total short selling (i.e., both covered and naked short selling) as well as some evidence on the benefits of naked short selling. From a theoretical perspective, Miller (1977) argues that constraining total short selling creates a speculative premium as more optimistic agents push stock prices upward. In addition, Diamond and Verrecchia (1987) predict that constraining total short selling will reduce the speed of prices adjustments to private information, especially bad news. Consistent with theoretical predictions, empirical evidence from the short selling literature suggests that short selling facilitates the price discovery process by moving stock prices toward firm fundamentals (Danielsen and Sorescu 2001; Jones and Lamont 2002; Lamont and Thaler 2003; Cohen et al. 2007). For example, Boehmer et al. (2008) find that stocks with high levels of short interest underperform stocks with low levels of short interest in the month after a new short position is taken, which suggests that short sellers are able to anticipate declines in stock prices.

Recent research that investigates the activities of naked short sellers also casts doubt on the validity of the SEC's assumption that naked short selling is based on momentum and not firm fundamentals. Specifically, recent research finds that naked short selling does not trigger stock price declines (Fotak et al. 2009; Stone 2010; Boulton

and Braga-Alves 2011). In fact, Stone (2010) finds that stocks subject to naked short selling outperform other stocks on the day of the trade. In addition, Fotak et al. (2009) examine financial institutions during the 2008 financial crisis and find evidence that suggests that naked short sellers react to publicly available information such as credit rating downgrades. In addition, the authors find evidence that is consistent with naked short selling reducing positive pricing errors, return volatility, and bid-ask spreads (Fotak et al. 2009). In combination, prior research suggests that total short selling, and specifically naked short selling, likely benefits the price discovery process.

2.3 Do Naked Short Sellers Trade on Accounting Information?

Although recent research suggests that naked short sellers play a key role in price discovery, prior research has not investigated whether naked short sellers trade on primarily on momentum and not on accounting fundamentals as suggested by the media and the SEC. The purpose of this study is to investigate whether naked short sellers trade based on accounting fundamentals. To the extent that I find that accounting fundamentals are associated with naked short selling, it would suggest that the SEC regulations that prohibit naked short selling are likely to reduce market efficiency.

Short sellers likely have significant incentives to incorporate all available information into trading decision because they face higher risk, regulation constraints, and greater trading cost compared with long traders, such as borrowing cost and holding cost. Consistent with this notion, Dechow et al. (2001) argue that a typical short seller takes a position based on fundamental analysis of firms. Drake et al. (2011) find that

total short interest is significantly associated with 11 future stock return indicators identified including accounting information such as total accruals, capital expenditures, and sales growth, which suggests that total short sales (i.e., both covered and naked short sales) are based on accounting fundamentals and are not purely driven by momentum based trading.

At the outset, it is not clear whether Drake et al.'s (2011) finding that total short selling is associated with fundamentals will translate to naked short sales. As discussed in detail above, naked short sales are fundamentally different than covered short sales because naked short sellers trade on "phantom" shares (Christian et al. 2006). Specifically, naked short selling differs from covered short selling on several dimensions. First, corporate managers and regulators argue that naked short selling is often used by shorts to manipulate stock prices and is not based on fundamentals. The SEC felt this assumption was accurate enough to use it as the basis for Rules 10b-21 and 204 (SEC 2008a; 2008b; 2009). Second, naked short sellers may not be able to hold their positions long enough for information about fundamentals to be incorporated into share prices. The broker may close out a naked position by buying shares in the open market-- without seeking consent from the trader -- at, or shortly after, the settlement date to comply with SEC regulations. In addition, a broker may buy without client consent after the settlement date if a short squeeze occurs, and a stock with a high level of naked short interest is more vulnerable to a squeeze (Jickling 2005). Third, short sellers have to be highly informed to offset high arbitrage costs, but naked short sellers receive an involuntary zero-fee, zero-rebate equity loan from the buyer (Putniņš 2010). Lower

trading costs mean that naked shorts can profit with a smaller information advantage than covered shorts. Fourth, naked short interest includes selling by market makers who take the opposite side of a customer's share purchase to allow a transaction in a thinly traded stock. The market maker is trading to provide liquidity – not because fundamentals suggest overvaluation. In fact, the purchaser may have information the stock is undervalued. In combination, the above arguments suggest that naked short sellers potentially trade solely on price momentum and ignore the underlying fundamentals of a firm.

3. RESEARCH DESIGN

To investigate whether naked short selling is based on accounting fundamentals, I examine the association between the level of naked short interest and several accounting and market-based fundamentals. Because the purpose of short selling is to earn profit from future negative abnormal stock returns, I focus on accounting indicators that prior research suggests are able to predict future stock returns. I extend the short interest model used by Drake et al. (2011) to include Piotroski's (2000) value score as well as several other variables to investigate whether naked short interest is associated with accounting indicators. The model is as follows:

$$\begin{aligned}
 \text{NakedShort}_{i,t} = & \alpha_1 + \beta_1 \text{VScore}_{i,t-1} + \beta_2 \text{Capex}_{i,t-1} + \beta_3 \text{SaleGrow}_{i,t-1} + \beta_4 \text{DivYld}_{i,t-1} \\
 & + \beta_5 \text{FREV}_{i,t} + \beta_6 \text{Momentum}_{i,t} + \beta_7 \text{Size}_{i,t-1} + \sum \beta_m \text{Industry}_m \\
 & + \sum \beta_n \text{Year-Qtr}_n + \varepsilon_{i,t}
 \end{aligned} \tag{1}$$

The dependent variable, NakedShort is the average daily naked short interest during the current quarter. To ensure that investors have time to form trades based on recently available accounting information from the financial statements, I measure NakedShort over the period that begins five trading days after the firm files its quarterly financial statements for quarter t-1 (i.e., the 10-Q) and ends on the last day of quarter t. Following prior naked short selling studies (Fotak et al. 2009; Devos et al. 2010), I use naked short interest to proxy for naked short selling, and define naked short interest as

the number of FTD shares on day t divided by two⁸ and deflated by common shares outstanding (SHROUT) on day t . Because a naked short selling transaction is not disclosed by the SEC until day $t+7$, I lead the FTD seven days to its original trading date and align it with the trading date of total short interest reported by Compustat. Total short interest ratio equals short interest (SHORTINT) deflated by common shares outstanding.⁹ To provide a more complete examination of information usage by short sellers, I also examine the association between covered short interest and accounting and market fundamentals. Covered short interest (CoveredShort) is defined as the difference between total short interest ratio and naked short interest ratio. I divided both NakedShort and CoveredShort by their respective standard deviations (StdNakedShort and StdCoveredShort) because the mean of NakedShort (CoveredShort) is above (just below) the 75th percentile, which suggests that both NakedShort and CoveredShort are highly skewed.¹⁰

To examine whether naked short sellers trade based on accounting fundamentals, I include several separate fundamentals that are commonly used in financial statement analysis. My first fundamental measure is Piotroski's (2000) F-score, which is the sum of nine indicator variables and is designed to be a composite measure of firms' financial strength. I rename F-Score to VScore (Value Score)¹¹ to differentiate it from the Fraud-

⁸ I lead FTD data by seven business days because the threshold list does not provide the amount of fail-to-delivers until the evening of $t+7$. I divide FTD by two because exchanges count every FTD twice (Fotak et al. 2010; Devos et al. 2010).

⁹ Unless otherwise noted, all data items are from Compustat and measured on a quarterly basis.

¹⁰ Inferences remain the same when I estimate Equation (1) using NakedShort and CoveredShort.

¹¹ The value score is divided by 100 to facilitate the interpretation of the coefficient.

Score used in Dechow et al. (2011). VScore is based on nine accounting fundamentals designed to capture three areas of a firm's financial strength: profitability, financial leverage/liquidity, and operating efficiency (Piotroski 2000). I use VScore as my proxy for accounting fundamental because its components are commonly used in financial statement analysis and prior research suggests that forecasts future returns after controlling for other known stock predictors such as size and book to market (Choi and Sias 2012; Fama and French 2006).

I calculate VScore at the end of quarter t-1 because I am interested in whether naked short sellers form their trades based on available accounting fundamentals. Following Piotroski (2000), each "good" signal contributes one point to the overall VScore while a "bad" signal does not contribute any points to the overall VScore. As a result, the VScore ranges from zero to nine points, with higher values representing firms with stronger fundamentals (Piotroski 2000). Specifically, a firm is given one point for each instance of a positive return-on-assets (quarterly income before extraordinary items (IBQ) scaled by total assets at the end of the quarter (ATQ)), positive operating cash flow (OANCFY scaled by ATQ), an increase in return-on-assets, negative total accruals (the difference between IBQ and operating cash flow scaled by ATQ), a decrease in debt (DLCQ plus DLTTQ scaled by ATQ), an increase in the current ratio (current assets (ACTQ) divided by current liabilities (LCTQ)), not issuing equity during the quarter, an increase in gross margin (gross margin is defined as (SALEQ – COGSQ) divided by total sales (SALEQ)), and an increase in asset turnover (sales (SALEQ) divided by average ATQ). If naked short selling is price manipulation without a fundamental

underlying basis, the coefficient on VScore should be insignificant. However, to the extent that naked short selling is information-based, the coefficient on VScore will be negative and statistically significant because naked short sellers are likely to avoid value firms and focus on glamour firms instead.

In addition to the composite measure of accounting fundamentals (VScore), I include firms' capital expenditures (CapEx) in quarter t-1 and firms' sales growth (SaleGrow) in quarter t-1. I define CapEx as the rolling sum of capital expenditures (CAPXY adjusted for each quarter) in the preceding four quarters divided by average total assets. SaleGrow is defined as the rolling sum of sales (SALEQ) for the preceding four quarters ending at fiscal quarter t-1 divided by the rolling sum of the preceding four quarters of sales ending in quarter t-5. Prior research suggests that high values of CapEx and SaleGrow are associated with firm growth and lower future returns (Beneish et al. 2001; Lakonishok et al. 1994). To the extent that naked short selling is pure price manipulation without fundamental underlying basis, I expect the coefficients on CapEx and SaleGrow to be insignificant. However, if naked short sellers trade based on accounting fundamentals, I expect positive and significant coefficients on CapEx and SaleGrow.

In addition to accounting fundamentals, I also control for additional firm characteristics that naked short sellers likely consider. The media and SEC assume that naked short selling is based on momentum. Accordingly, I include stock momentum (Momentum) to investigate whether naked short sellers trade on accounting fundamentals after controlling for stock momentum. I define Momentum as the buy-and-

hold raw stock returns for the six-month period ending one month prior to the end of quarter t . Based on the SEC's statements, I expect a negative coefficient on Momentum because naked short sellers likely avoid firms with high momentum and invest in firms with low stock price momentum. I also include dividend yield (DivYld) to control for the additional costs that naked short sellers face when purchasing stock in firms that pay dividends. I define DivYld as dividends paid per share (DVPSXQ) during quarter $t-1$ divided by stock price (PRCCM) at the end of quarter $t-1$. Short sellers on the date of record are required to pay the dividend to the owner of the shares. Because the dividend increases the cost of holding short positions, I expect that naked short sellers are less likely to hold significant positions in firms with a high dividend yield. Accordingly, I expect a negative coefficient on DivYld. However, naked shorts have a shorter investment horizon than other investors (including covered short sellers) and are more likely to close out their position before the date of record. As a result, the dividend yield of a firm potentially may not influence whether a naked short seller will take a position in a given firm, which suggests that the coefficient on DivYld could be insignificant.

I also include analyst forecast revisions (FREV) to control for market-related news and expectations about a firm's future performance. I define FREV as the change in the analyst consensus earnings forecast for the preceding six-months divided by price at the end of month $t-1$. I expect a negative coefficient on FREV because Bernard and Thomas (1989) find that positive analyst forecast revisions are associated with positive future returns. I also control for firm size (Size) because anecdotal evidence suggests that short sellers are more likely to invest in smaller firms (Drummond 2006). I define

Size as the natural log of a firm's total assets at the end of quarter t-1. Finally, I also include industry fixed effects and time fixed effects to control for any differences in trading across different industries and time periods.

4. SAMPLE SELECTION AND DESCRIPTIVE STATISTICS

4.1 Sample Selection

Table 1 describes my sample selection process in detail. Consistent with prior research, I estimate naked short selling based on daily FTD data provided by the SEC (Devos et al. 2010; Fotak et al. 2009; Stone 2010) from March, 2004 to October, 2008. I begin my sample in March, 2004 because it is the first month that FTDs are available from the SEC. My sample concludes in October, 2008 because it is the month Rule 204 (at the time called Temporary Rule 204T) became effective, which allows me to examine whether media and SEC assertions that naked short selling lack fundamental basis were warranted.¹² To monitor naked short sales, the SEC compiles FTD data from stock exchanges on a daily basis and makes the data publicly available. To mitigate the likelihood that a FTD is unintentional, the SEC follows securities that have an aggregate FTD position that is greater than or equal to 10,000 shares for five consecutive days (SEC 2004).¹³

After obtaining FTD data from the SEC, I limit my sample to the intersection of Compustat, CRSP, and I/B/E/S and eliminate firm-quarter observations that do not have the data necessary to estimate the regressions in my main analysis. In addition, I exclude

¹² The time series analysis of naked short interest in Figure 1 suggests that naked short selling increased dramatically in 2008. To examine whether my results are driven primarily by naked short sales during the 2008 financial crisis, I replicate my analysis using firm-quarters from 2004 to 2007. Inferences remain the same.

¹³ In untabulated analysis, I require the aggregate FTD position for a firm to exceed 20,000 shares to further reduce the likelihood that an FTD is unintentional. Inferences remain the same.

financial institutions and other such regulated industries as public utilities, because they face different regulatory environments relative to the remaining Compustat population. I also eliminate observations with share codes (SHRCD from CRSP) other than 10 or 11 to retain firms with ordinary common shares as well as observations with share prices less than \$1.00. Finally, consistent with Edwards and Hanley (2010), I exclude IPO firms from my sample.¹⁴ My final sample consists of 2,687 firms and 30,027 firm-quarters.

TABLE 1.
Sample Selection

Selections	Number of Firms	Number of Observations
Firm-quarters with data from Compustat/CRSP/IBES/SEC	6,923	126,079
Delete: Observations in the financial services industry and other regulated industries	(1,928)	(34,988)
Delete: Observations missing variables needed for analysis	(1,954)	(46,323)
Delete: Observations with stock prices lower or equal to \$1.00	(39)	(824)
Delete: Observations later than October 2008	(315)	(13,917)
Final quarterly sample	2,687	30,027

¹⁴ IPO firms are automatically excluded from this sample because SaleGrow requires quarterly sales data of past eight consecutive quarters.

4.2 Descriptive Statistics

Table 2 reports the descriptive statistics of all variables used in my analysis.¹⁵ The mean (median) of NakedShort is 0.00014 (0.00001), which suggests that naked short interest represents approximately 0.014 percent of a firm's common shares outstanding.¹⁶ Since the mean of NakedShort is greater than its 75 percentile (0.00005), the distribution of NakedShort is skewed. The mean (median) of CoveredShort is 0.0609 (0.0442), which is slightly higher than the total short interest levels reported in Drake et al. (2011). However, this level is consistent with the increasing trend of short interest in recent years.

The mean of VScore is 0.0485 (median 0.050) over the sample period. The distribution of value score suggests that the sample firms are evenly distributed throughout the entire distribution and not concentrated on either end of the value spectrum. Mean CapEx is 0.0566, indicating that firms invest a modest portion of their total assets on new assets, while the mean of SaleGrow is 1.176, suggesting that most firms in this sample are growth firms. The mean (median) of DivYld is 0.002 (0.000), which indicates that, consistent with prior research (Blouin and Krull 2009; Liu and Kinney 2009), the majority of firms in my sample do not issue dividends. The mean (median) of one-quarter-ahead, characteristic-based benchmark returns¹⁷ is -0.00001

¹⁵ I winsorize (reset) all continuous variables at the 1st and 99th percentiles.

¹⁶ The mean (median) of NakedShort is lower than the mean (median) value reported in Boni (2006). However, this difference stems from a different sample composition as well as a different sample period.

¹⁷ Characteristic-based benchmark return is the abnormal return after adjusting for a benchmark return based on firm size, book-to-market ratio, and momentum. The characteristic-based benchmark return is calculated based on Daniel, Grinblatt, Titman, and Wermers (1997) and Wermers (2004). The DGTW benchmarks are available via at <http://www.smith.umd.edu/faculty/rwermers/ftp/site/Dgtw/coverpage.htm>.

TABLE 2
Descriptive Statistics

Variables	Observations	Mean	Q3	Median	Q1
NakedShort _t	30,027	0.00014	0.00005	0.00001	0
CoveredShort _t	30,027	0.06090	0.08347	0.04424	0.01930
VScore _{t-1}	30,027	0.04853	0.06	0.05	0.04
CapEx _{t-1}	30,027	0.05664	0.06514	0.03484	0.01900
SaleGrow _{t-1}	30,027	1.17594	1.23744	1.11388	1.03278
DivYld _{t-1}	30,027	0.00153	0.00229	0	0
FREV _t	30,027	-0.00974	0.00346	-0.00059	-0.01086
Momentum _t	30,027	0.04916	0.19395	0.03378	-0.12500
Size _{t-1}	30,027	6.60218	7.71274	6.54067	5.34744
AbReturn _{t+1}	30,027	-0.00001	0.10304	-0.00784	-0.11639

NakedShort_t is average daily naked short interest for the time period from five business days after a company files its 10K or 10Q to the end of the next quarter. Naked short interest is calculated as the number of failed-to-deliver (FTD) shares deflated by shares outstanding (SHROUT). FTD shares data are acquired from the SEC based on the Freedom of Information Act.

CoveredShort_t is average covered short interest for the time period from five business days after a company files its 10K or 10Q to the end of the next quarter. It is estimated by subtracting naked short interest from total short interest. Total short interest is the short interest ratio, calculated as short interest (SHORTINT) over common shares outstanding (SHROUT).

VScore_{t-1} is F-Score based on Piotroski (2000) for fiscal quarter t-1 deflated by 100. F-Score is a composite measure of nine variables, with each variable converted to a 0 or 1: Return-on-Assets (ROA), Change in ROA, Operating Cash Flow (OANCFY) scaled by total assets (ATQ), Total Accrual scaled by ATQ, Change in Debt (DLCQ+DLTTQ scaled by ATQ), Change in Liquidity (Current Ratio), Equity Offer (a binary variable, equal to 1 if the firm does not issue new stocks during the quarter and 0 otherwise), Change in Gross Margin Ratio, and Change in Asset Turnover Ratio.

CapEx_{t-1} is capital expenditures, calculated as the rolling sum of capital expenditures (CAPXY) for the preceding four quarters ending at fiscal quarter t-1 divided by average total assets.

SaleGrow_{t-1} is sales growth, calculated as the rolling sum of sales (SALEQ) for the preceding four quarters ending at fiscal quarter t-1 divided by the rolling sum of sales for the preceding four quarters ending on quarter t-5.

DivYld_{t-1} is dividend yield, equal to dividends per share (DVPSXQ) for quarter t-1, divided by stock price (PRCCM) at the end of quarter t-1.

FREV_t is forecast revision, calculated as the change in the analyst consensus earnings forecast for the preceding six-months divided by price at the end of month t-1.

Momentum_t is stock momentum, equal to the buy-and-hold raw stock return for the six-month period ending one month prior to the end of quarter t.

Size is the natural log of (lagged) ATQ at the end of quarter t-1.

AbReturn_{t+1} is characteristic-based, benchmark-adjusted, buy-and-hold returns for quarter t+1, calculated based on Daniel et al. (1997) and Warmers (2004).

Year to-date variables, such as CAPXY, PRSTKCY, and OANCFY are adjusted to reflect information for the latest quarter.

(-0.00784). The remaining descriptive statistics of the remaining variables are similar to prior studies.

Table 3 present univariate correlations for the sample with Pearson (Spearman) correlations reported above (below) the diagonal. Consistent with both naked and covered short sellers targeting similar firms, I find a positive correlation between NakedShort and CoveredShort. Although the correlation between NakedShort and CoveredShort is significantly different from zero, it is also far less than one (i.e., perfect correlation) suggesting that naked short interest differs significantly from covered short interest. Consistent with naked short sellers trading based on accounting fundamentals, NakedShort is negatively (positively) correlated with VScore (CapEx and SaleGrow). Finally, I also find a negative correlation between NakedShort and Momentum, which is consistent with the SEC's assumption that naked short sellers trade on momentum.

TABLE 3
Pearson and Spearman Correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
NakedShort _t (1)		0.497	-0.124	0.069	0.102	-0.028	-0.072	-0.074	-0.165	-0.034
CoveredShort _t (2)	0.422		-0.080	0.113	0.110	-0.068	-0.039	-0.084	-0.087	-0.031
VScore _{t-1} (3)	-0.066	-0.060		0.043	-0.014	0.080	0.192	0.197	0.254	0.019
CapEx _{t-1} (4)	0.066	0.093	0.083		0.113	-0.051	0.017	0.022	0.056	0.006
SaleGrow _{t-1} (5)	0.099	0.120	0.054	0.098		-0.123	0.071	0.058	-0.101	-0.007
DivYld _{t-1} (6)	-0.077	-0.132	0.132	0.097	-0.147		0.030	-0.026	0.315	0.005
FREV _t (7)	-0.039	-0.081	0.242	-0.003	0.206	0.068		0.291	0.135	0.073
Momentum _t (8)	-0.045	-0.074	0.210	0.029	0.109	0.040	0.485		0.049	0.039
Size _{t-1} (9)	0.012	-0.021	0.252	0.159	-0.047	0.444	0.162	0.096		0.027
AbReturn _{t+1} (10)	-0.030	-0.031	0.024	0.019	0.015	0.037	0.043	0.040	0.055	

Correlation coefficients in bold indicate two-tailed statistical significance levels of 5% or lower. Pearson correlations are reported in the upper triangle and Spearman in the lower triangle. The variables are described in Table 2.

5. MULTIVARIATE ANALYSIS RESULTS

5.1 Is Naked Short Interest Information-driven?

Table 4 presents the results of equation (1), which examines the determinants of short interest. The first column of Table 4 presents results for determinants of naked short interest while the results for the determinants of covered short interest are reported in the second column. In both columns, I do not report the coefficients for industry and time fixed effects for the sake of brevity. All standard errors are clustered by firm (Petersen 2009).¹⁸

The results in column (1) suggest that naked short interest is associated with accounting fundamentals. Specifically, the coefficient on VScore is negative and significant (t-statistic = 7.62), which suggests that naked short sellers are less likely to take positions in firms with strong accounting fundamentals. In addition, the coefficients on CapEx and SaleGrow are positive and significant (t-statistics = 3.78 and 5.94 respectively), indicating that naked short sellers are aware of the implications of high levels of capital expenditures and sales growth (i.e., lower returns in the future) and increase their positions accordingly. Overall, the above results are consistent with naked short sellers trading based on accounting information, contrary to claims made by media and the SEC.

The results in column (1) also verify the SEC's assumption that naked short

¹⁸ I also conduct robustness tests by clustering on both time and firm (Gow et al. 2010), and using indicator variables to control for industry fixed effects. Results are similar.

TABLE 4
The Effect of Accounting and Market Information on
Naked Short Interest and Covered Short Interest

Variables	Predictions	(1) StdNakedShort_t (normalized)	(2) StdCoveredShort_t (normalized)
Intercept	?	0.21336‡ (4.90)	1.07953* (1.94)
VScore _{t-1}	?	-0.98506‡ (7.62)	-1.99939‡ (4.55)
CapEx _{t-1}	?	0.40407‡ (3.78)	2.24568‡ (6.65)
SaleGrow _{t-1}	?	0.08416‡ (5.94)	0.33758‡ (8.99)
DivYld _{t-1}	-	1.25281 (1.06)	-13.47815‡ (2.72)
FREV _t	-	-0.11473* (1.69)	-0.0177 (0.07)
Momentum _t	-	-0.02447† (2.29)	-0.10148‡ (3.46)
Size _{t-1}	-	-0.02660‡ (12.09)	-0.02438† (2.43)
Industry Dummies		Yes	Yes
Time Dummies		Yes	Yes
Cluster on		Firm	Firm
Observations		30,027	30,027
Adj. R ²		0.0753	0.0834

*, †, and ‡ indicate two-tailed statistical significance at 10%, 5% and 1% levels, respectively, with *t*-statistic reported in parentheses. *StdNakedShort* and *StdCoveredShort* are normalized by dividing by their own standard deviations. The remaining variables are described in Table 2.

sellers trade on stock price momentum. The coefficient on Momentum is negative and significant (t-statistic = 2.29), which suggests that naked short sellers are more likely to take positions in firms with poor stock momentum. To examine whether naked short

sellers are more likely to base their trades on fundamental analysis or stock momentum, I compare the coefficients on VScore and Momentum. I find that the coefficient on VScore is significantly larger (i.e., more negative) than the coefficient on Momentum (F-statistic = 6.52), suggesting that naked short sellers more likely trade on accounting fundamentals rather than purely on stock price momentum. Finally, I find negative and significant coefficients on Size and FREV (t-statistics = 12.09 and 1.69, respectively), suggesting that naked short sellers are less likely to take positions in larger firms as well as firms with increasing analyst expectations.

To provide a complete examination of information usage by short sellers, I also examine whether covered short sellers trade on accounting fundamentals. The results of this analysis are presented in column (2) of Table 4 and suggest that covered short sellers trade on accounting fundamentals. Specifically, the coefficient on VScore is negative and significant (t-statistic = 4.55) while the coefficients on CapEx and SaleGrow are positive and significant (t-statistics = 6.65 and 8.99, respectively). Consistent with prior research (Jegadeesh and Titman 1993), the coefficient on Momentum is negative and significant (t-statistic = 3.46) suggesting that covered short sellers are more likely to take positions in firms that have negative price momentum. However, consistent with the results in column (1), I find that the coefficient on Momentum is significantly less pronounced (i.e., less negative) than the coefficient on VScore (F-statistic = 4.33). This result suggests that covered short sellers are more likely to take trading positions based on accounting fundamentals rather than stock price momentum. Finally, the coefficients on Size and DivYld are negative and significant (t-statistics = 2.43 and 2.72,

respectively), which suggests that covered short sellers are more likely to invest in smaller firms as well as firms that do not pay dividends. In sum, the results in column (2) confirm and extend findings of Drake et al. (2011) by showing that covered short interest is information driven. Overall, the results in Table 4 suggest that both naked and covered short selling are associated with accounting and market fundamentals in a manner that is consistent with information-based trading. The finding that naked short sales are associated with accounting fundamentals contradicts the assumptions made by the media and SEC that naked shorts trade without a “fundamental underlying basis.” However, the results also highlight differences in the information usage of naked and covered short sellers. Specifically, naked shorts avoid taking positions in firms with increasing analyst expectations. In contrast, covered shorts are more likely to establish a position in a company that doesn’t pay a cash dividend.

5.2 Predictive Power on Future Returns

The results in Table 4 are consistent with both naked and covered short sellers trading based on accounting and market information. To provide an alternative test of whether naked short selling captures predictive information, I examine whether naked and covered short interest has predictive power for future abnormal returns. Accordingly, I estimate the following model:¹⁹

¹⁹ As a robustness test, I include VScore, CapEx, SaleGrow, FREV, MOMENTUM, and current quarter raw returns as control variables. Inferences remain the same.

$$\begin{aligned} \text{AbReturn}_{i,t+1} = & \alpha_0 + \beta_1 \text{StdNakedShort}_{i,t} + \beta_2 \text{StdCoveredShort}_{i,t} + \sum \beta_m \text{Industry}_m \\ & + \sum \beta_n \text{Year-Qtr}_n + \varepsilon_{i,t} \end{aligned} \quad (2)$$

$\text{AbReturn}_{i,t+1}$ is firm i 's one-quarter ahead characteristic-based abnormal return, calculated following Daniel et al. (1997) and Warmers (2004). To estimate equation (2), I restrict my sample to firms with positive naked short interest (i.e., I exclude firms with zero short interest). To the extent that naked short selling creates a crisis of confidence that destroys firm value, as suggested by the SEC (SEC 2009), future returns should be positive as the market corrects to the firm's true value. Accordingly, I expect the coefficient on StdNakedShort will be positive. However, to the extent that naked short sellers trade based on accounting fundamentals that predict future poor performance, I expect the coefficient on StdNakedShort to be negative.

Table 5 presents the results of my estimation of equation (2). In all columns, I do not report the coefficients for industry and time fixed effects for the sake of brevity. All standard errors are clustered by firm (Petersen 2009).²⁰ Table 5, column (1) examines whether naked short interest is associated with future stock returns. The coefficient on StdNakedShort is negative and significant (t-statistic = 3.10), which is consistent with naked short sellers trading on accounting fundamentals that predict poor performance in the future. In column (2), I replace naked short interest with covered short interest. The coefficient on StdCoveredShort is negative and significant (t-statistic = 2.01), which is consistent with prior findings that high total short interest predicts lower returns

²⁰ I also correct biased standard errors by clustering on both time and firm (Gow et al. 2010), and using indicator variables to control for industry fixed effects. Inferences remain the same.

(Boehmer et al. 2010) and high total short interest levels combined with analysts' buy recommendations predict lower returns in the future (Drake et al. 2011).

TABLE 5
Naked and Covered Short Interest and Future Abnormal Stock Returns

Variables	Predictions	(1) AbReturn _{t+1}	(2) AbReturn _{t+1}	(3) AbReturn _{t+1}
Intercept	?	0.0504 (1.62)	0.05298* (1.73)	0.051 (1.62)
StdNakedShort _t (normalized)	?	-0.006‡ (3.10)		-0.006‡ (2.59)
StdCoveredShort _t (normalized)	?		-0.003† (2.01)	0 (0.14)
Industry Dummies		Yes	Yes	Yes
Time Dummies		Yes	Yes	Yes
Cluster on		Firm	Firm	Firm
Observations		19,801	19,801	19,801
Adj. R ²		0.0154	0.0147	0.0153

*, †, and ‡ indicate two-tailed statistical significance at 10%, 5% and 1% levels, respectively, with t -statistic reported in parentheses. *StdNakedShort* and *StdCoveredShort* are normalized by dividing by their own standard deviations. The remaining variables are described in Table 2.

Table 5, column (3) examines whether naked short interest is associated with future abnormal returns after controlling for covered short interest. The shorter investment horizon of naked short sellers suggests that their positions are more likely to reflect recent information than the positions held by covered shorts. As a result, I expect that the coefficient on *StdNakedShort* will remain significant after controlling for covered short interest. Consistent with this expectation, the coefficient on

StdNakedShort remains negative and significant (t-statistic = 2.59) while the coefficient on StdCoveredShort is insignificant (t-statistic = 0.14). This result indicates that the predictive power of naked short interest on future abnormal returns dominates that of the covered short interest. Overall, results in Table 5 suggest that naked short selling is information-based and is in contrast to popular claims that naked short selling destroys firm values.

5.3 Abnormal Future Returns Based on Sorted Short Interests

Recent research suggests that investors can earn economically significant returns using a zero-investment trading strategy based on total short interest. For example, Boehmer et al. (2010) develop a strategy in which a potential investor buys (sells short) companies with extremely low (high) levels of total short interest (Boehmer et al. 2010). In addition, Drake et al. (2011) develop a zero-investment strategy where a potential investor buys (sells short) firms with sell (buy) analyst recommendations and with low (high) short interest. To examine whether the results in Table 5 translate to a profitable trading strategy, I develop a trading strategy based on the level of covered short interest as well as the level of naked short interest. To the extent this strategy yields profitable returns, it will provide evidence on the role naked short sellers play in the price discovery process. I first sort companies into quintile levels by the level of covered short interest. Within each quintile, I sort again into quintiles based on levels of naked short interest. I then investigate a zero-investment trading strategy in which a potential

investor buys (sells short) firms with low (high) levels of both naked and covered short interest.

The second column of Table 6 presents average abnormal returns after sorting on current quarter covered short interest only. The abnormal return of the lowest covered shorts quintile is a positive and insignificant 0.248 percent and the abnormal returns of the highest covered shorts quintile is a negative and significant 0.720 percent. Thus, an investor that buys (sells short) firms with covered short interest in the lowest (highest) quintile earns an average return of 0.968 percent each quarter. The results in this column suggest that a strategy based on covered short interest alone does not produce economically significant abnormal returns.

The third through the seventh column report abnormal returns of each of the 25 portfolios sorted by both covered and naked short interest. To examine the incremental predictive power of naked short interest, I examine the results of a trading strategy that purchases firms in the lowest quintile of both naked and covered short interest and sells short firms in the highest quintile of both naked and covered short interest. The results suggest that a trading strategy based on both naked and covered short interest earns an abnormal return of 3.76 percent per quarter, which is approximately 3.9 times greater than the return of less than one percent (0.968 percent) from a zero-investment strategy that uses only the covered component of short interest. The significant returns earned by the above trading strategy are consistent with naked short sellers being sophisticated

TABLE 6
One-Quarter Ahead Abnormal Returns Based on Current Quarter Covered Short Interest Quintiles and Naked Short Interest Quintiles

Covered Short Interest	Average Abnormal Returns	Naked Short Interest Level					
		Low	2	3	4	High	Low – High
Low	0.248% <i>(3,958)</i>	0.885%* <i>(789)</i>	0.814% <i>(793)</i>	0.376% <i>(793)</i>	-0.273% <i>(793)</i>	-0.560% <i>(790)</i>	1.444%
2	0.335% <i>(3,961)</i>	0.512% <i>(789)</i>	1.189%† <i>(793)</i>	0.483% <i>(794)</i>	-0.137% <i>(793)</i>	-0.372% <i>(792)</i>	0.884%
3	0.122% <i>(3,962)</i>	1.135%* <i>(790)</i>	0.560% <i>(794)</i>	1.144%* <i>(793)</i>	-0.622% <i>(794)</i>	-1.608%† <i>(791)</i>	2.743%†
4	-0.063% <i>(3,961)</i>	0.369% <i>(789)</i>	0.753% <i>(793)</i>	-0.286% <i>(794)</i>	-0.573% <i>(793)</i>	-0.576% <i>(792)</i>	0.945%
High	-0.720%† <i>(3,959)</i>	-0.291% <i>(789)</i>	-0.699% <i>(793)</i>	-0.040% <i>(794)</i>	0.315% <i>(789)</i>	-2.873%‡ <i>(794)</i>	2.582%‡
Low - High	0.248% - (-0.720%) =0.968%†				0.885% - (-2.873%) = 3.76%‡		

†, and ‡ indicate two-tailed statistical significance at 5% and 1% levels, respectively. Number of observations is reported in parentheses and in italic.

users of accounting and market information and suggests that the level of naked short interest contains information about future returns. The results further suggest that SEC regulations that eliminate naked short selling likely harm the price discovery process.²¹

In combination, the results in Tables 3 through 6 offer a potential explanation to Boehmer et al. (2010)'s finding that steady and reliable negative (positive) abnormal returns only exist in extremely high (low) total short interest levels.²² Stocks with extremely low total short interest levels are not likely to have naked short interest, which suggests that the stocks will earn positive abnormal returns in the future. In contrast, stocks with extremely high short interest levels are also likely to have high levels of naked short interest, which suggests that these stocks will produce negative abnormal returns in the future.

5.4 Days a Firm Appears on the Threshold List

SEC Rule 204 places significant restrictions on naked short sellers (SEC 2009). The SEC identifies abusive naked short selling based on the magnitude and duration of the FTD (SEC 2009). In terms of magnitude, the SEC argues that a firm is subject to intentional naked short selling if FTDs exceed 10,000 shares. In terms of duration, the

²¹ To validate the results in Table 6, I replicate my zero-investment trading strategy after sorting into quintiles first based on naked short interest and then based on covered short interest. Following a zero-investment strategy that buys (sells shorts) firms with naked short interest in the lowest (highest) quintile earns an average return of 1.896 percent each quarter. A strategy based on both covered and naked short interest yields 2.571 percent each quarter.

²² I replicate key results of Boehmer et al. (2010) using the monthly sample set that creates the main sample of this paper. I successfully replicate their hedge returns based on top and bottom one percent sorting on total short interest, but fail to reach their results based on top and bottom five and ten percent total short interest sorting.

SEC argues that FTDs that remain open for a long period of time reflect intentional short selling (SEC 2009). Consequently, Rule 204 requires short sellers to close out their position on the day following the end of the three day settlement period (i.e., day $t+4$). Equation (1) is based on the magnitude of an FTD and ignores the duration aspect of the SECs definition. In this section, I use days a firm appears on the threshold list as an alternative measure of naked short selling and test whether it indicates information usage. Specifically, I regress number of days a firm appears on the threshold list during a quarter ($Onlistq$) on accounting and market information based variables in equation (1) using a truncated negative binomial regression.

Table 7 present results of this regression. Consistent with the results in Table 4, coefficients on accounting and market information-based variables such as $VScore$ and $Momentum$ ($CapEx$ and $SaleGrow$) are negative (positive) and significant. In combination, these results reinforce my earlier findings and suggest that that naked short selling is information-based.

TABLE 7
Does “Days a Firm Appears on the Threshold List” Represent Information?

<u>Variables</u>	<u>Predictions</u>	<u>Onlistq_t (>10)</u>
Intercept	?	2.307‡ (5.34)
VScore _{t-1}	?	-3.533‡ (6.92)
CapEx _{t-1}	?	0.571† (2.47)
SaleGrow _{t-1}	?	0.077‡ (3.02)
DivYld _{t-1}	?	6.282 (1.37)
Frev _t	?	-1.003‡ (5.52)
Momentum _t	?	-0.145‡ (4.92)
Size _{t-1}	?	-0.111‡ (11.76)
Industry Dummies		Yes
Time Dummies		Yes
Cluster on		Firm
Observations		9,157

†, and ‡ indicate two-tailed statistical significance at 5% and 1% levels, respectively, with *t*-statistic reported in parentheses. OnlistQ is days a firm appears on the threshold list during current quarter *t*. The remaining variables are described in Table 2.

5.5 Robustness Tests

StdNakedShort and StdCoveredShort are both calculated as the average short interest for the period from five business days after the last 10-K and 10-Q filing to the end of the current quarter. This definition assumes that short sellers cannot obtain any detailed accounting information before firms file their most up-to-date financial reports. Because it is possible that naked and covered short sellers could access financial information earlier, I construct two alternative specifications of naked and covered short interest to examine the robustness of my results. In the first alternative specification, I measure naked (covered) short interest as the average naked (covered) short interest over the last month of the current quarter. This definition assumes that the majority of firms finish filing their financial statements just before the last month of quarter t (except for some non-accelerated filers). Inferences remain the same.

The second alternative specification measures naked (covered) short interest as the average naked (covered) short interest over the entirety of the current quarter. This specification assumes that investors use historical data to guide their trading decisions and update their strategies based on such information as management forecasts, analyst forecast and recommendation revisions, earnings announcements, and detailed financial reports after filing that emerge throughout the period. Inferences remain the same except that VScore is no longer associated with covered short interest.

I also rank the original naked and short interest data by deciles and use decile ranks as the dependent variables. Inferences do not change except that both dividend yield and momentum are no longer significant in naked short interest regression. Finally,

I replicate the results in Table 5 after measuring future abnormal returns from quarter $t+1$ to quarter $t+2$. Inferences remain the same.

6. CONCLUSIONS

Popular media and corporate managers blame naked short selling for causing stock price declines and destroying values. Based on concerns that naked short selling manipulates prices without a fundamental underlying basis, the SEC issued rules to restrain and ban the naked short selling. This paper investigates whether naked short sellers trade based on accounting and market fundamentals.

I use fail-to-deliver data made available by the SEC to decompose total short interest into naked and covered components. The most important finding of this paper is that naked short interest is significantly associated with accounting and market information based measures in the direction that are consistent with proper usage of information. Specifically, naked short interest is negatively associated with variables that predict positive future returns and positively associated with variables that predict lower future returns. I also find evidence that suggests that naked short selling is based more on fundamental analysis than on stock momentum, a result which is contrary to the SEC concerns. In addition, I find that naked short interest is negatively associated with future abnormal returns, which suggests that naked short sellers are able to identify firms with poor performance in advance of other market participants. I also develop a zero-investment strategy that buys (sells short) shares with low (high) levels of both covered and naked short interest. I find that abnormal returns based on the investment strategy using both components of short interest are about 3.9 times larger than using only covered short interest, which suggests that naked short sellers aide in the price discovery process. Although I cannot rule out concerns that naked short sellers manipulate prices,

my combined results suggest that concerns that naked short selling lacks a fundamental underlying basis are unfounded.

This study contributes to contemporary finance and accounting literatures in several ways. First, prior literature suggests that total short interest is significantly associated with market and accounting fundamentals in the direction consistent with proper usage of fundamentals to predict future returns (Drake et al. 2011). This study extends this finding to the naked and covered components of total short interest. We also show that the finding is robust to alternative measures of fundamentals. Second, we show that naked short selling provides information useful in predicting future returns. Separating total short interest into naked and covered components can increase profits from a zero-investment trading strategy that mimics trading by short sellers. Finally, the results in this study should be of considerable interest to regulators. While I do not attempt to refute the claim that naked short selling can be manipulative in some instances, I find consistent evidence across a wide range of tests showing that, on average, naked short selling is information based trading. This evidence is in stark contrast to the SEC's stated assumptions about naked short selling and allows me to conclude that eliminating naked short selling is likely to impede arbitrage and thereby reduce market efficiency.

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