Over-the-counter delivery failures: Characteristics which predict naked short selling

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ABSTRACT

This research deals with the impact of naked short selling on small firms whose stock is traded "over the counter". Virtually all research into naked short selling has been conducted using data taken exclusively from the major exchanges. Existing research continues to focus on major exchanges even as regulators stress that small firms, in particular those trading over-the-counter, are the most vulnerable to manipulation. Using publically available information, this study has found that several variables including the average daily trading volume, the number of shares in float, and a firm's market capitalization can be used to identify firms which might be subject to a higher level of naked short selling as identified by post-trade delivery failures.

Keywords: Naked short selling, delivery failure, Over-the-Counter

INTRODUCTION

This research was conducted to discover if directly observable firm characteristics for stocks which trade over-the-counter can be used to predict the level of naked short selling. Generally speaking, stock traded directly between broker/dealers rather than via a formal exchange are termed "over-the-counter" or OTC. Often these firms are small and do not meet the listing requirements of a formal exchange, such as trading volume, market capitalization, or meeting required reporting standards. For OTC firms, the level of scrutiny by investors and regulators means a lack of readily available information needed for efficient price discovery. It is also specifically cited that the OTC market is most vulnerable to naked shorting due to the lack of market transparency (SEC, Jun 2004; Jickling, 2005; ShortTracker, 2012).

A significant body of research has been conducted concerning the impact of short selling on market quality as well as on the underlying ethics of its practice. In contrast, naked short selling, where a party sells a stock without first arranging to borrow from a valid owner, has received much less attention. Delivery failure of a U.S. traded stock occurs when it has been sold by a broker/dealer but is not legally transferred within a 3-day period specified by the body which handles the bulk of all transactions; the Depository Trust and Clearing Corporation (DTCC). By rule this failure results in the suspension of trading in that stock by the broker/dealer until such time as they make good on the trade.

Naked shorting has been illegal in the U.S. for many years, with regulators noting that it has only a negative impact on the market. In an attempt to root out this practice altogether, the U.S. Securities and Exchange Commission (SEC) implemented Regulation SHO (SEC 2004, July 28). After a lengthy pilot program and comment period. With the financial collapse in 2008, the SEC further enhance restrictions to Regulation SHO with the additional implementation of Rule 204 (SEC, 2009), strengthen the close-out requirements. The SEC was hoping to find the appropriate balance between allowing the important financial practice of short selling while at the same time eliminating the potential for naked shorting.

The impact of naked short selling comes by the inflation of a stocks "float", or the number of shares available for trading. By offering shares which are not held by valid owners, the naked short seller is saturating the market and driving the price lower. The analogy of trying to sell your house on a street where every other house is for sale shows the problem; your property will now suffer price competition from similar offerings. In turn the naked short seller, who nominally sold first when the market was higher, can now purchase your home at a deflated price and deliver it to complete their original sale. In terms of stock trading this is made possible by two important factors; the interchangeability of stock and the 3-day delivery period. Prior work by the authors has shown there is a significant economic impact of naked shorting for stocks listed on NYSE, NASDAQ, and AMEX exchanges. (Neuenschwander & Ziegler, 2014). Existing literature suggests that the OTC market would be more vulnerable to naked shorting given the increased lack of transparency, hence one should expect a higher economic impact on OTC stocks. However, being the first known study to explicitly measure OTC stocks and naked shorting, is limited to determining if firm characteristics exists which might predict the amount of naked short selling.

During our research we encountered the problem of poor information on a number of firms which can be found as trading in the OTC market. The lack of information on such simple ratios as price-to-book, cash-per-share, and debt-to-equity make it difficult to include these firms in our analysis. While the literature postulates a number of possible factors that might predict

shorting activity, often these were unavailable for the time period covered by this study. This is, of course, the precise problem for investors and regulators for knowing when a firm might be or have been the specific target of naked shorting. Avoiding a selection bias by studying only firms having sufficient data to fulfil our statistical criteria was difficult.

The paper outline follows next with a literature review of the background research, regulatory procedures, and potential characteristics posited by other studies. This is then followed with a complete review of all data gathering, processing, hypotheses to be tested, and statistical techniques employed. Results are then shown for each hypotheses and subsequent analysis pass conducted. Finally we state the limitations of this study, the potential for future research, and a conclusion based upon the results. A full bibliography is provided for all citations.

LITERATURE REVIEW

Traders involved in naked short selling have often been viewed as a significant factor in the fall of stock prices. Specifically, short sellers have been blamed for the stock market crash of 1929 causing the great depression; "…it is the knowledge and the fear that security and commodity values can be knocked to perdition at will by the short sellers that deters people from investing" (Congressional Digest, 1932). CEO Richard Fuld of Lehman Brothers blamed the firm's failure in 2008 on naked short selling describing these traders as "rumor mongers" that created mistrust in the investment community leading to the company's collapse (Fuld, 2008). Regardless, naked shorting and the spread of rumors have been against the law since the creation of the SEC in the 1930's. However, it has been difficult to enforce laws against these activities. The chairman of the SEC, Christopher Cox in 2008 "admitted that the SEC did not historically bring enforcement action against those spreading false rumors" given the difficulty of identifying the individuals responsible for starting the rumor and proving they actually knew the claim was false (Palombo, 2010). In 1938, the SEC issued Rule 10a-1, known as the "Uptick Rule," to stop naked short selling from occurring (Alexander & Peterson, 1999). The regulation only allowed traders to make short sales when price of the stock was rising or on the "up-tick" higher. As result, short sellers would be prevented from piling on to a stock experiencing a decline creating further losses. In 2007, The Uptick Rule was eliminated after studies suggested that it was unnecessary and impeded market efficiency. However, the 2008 housing crisis brought on the implementation of SEC Rule 204 in order to require short traders to close open positions and prevent naked short sellers from closing positions at times that work to their advantage. Before the new regulation went into effect, the SEC followed a policy of monitoring stocks experiencing an inordinate amount of delivery failures and then suggesting the suspension of short trades after 13 trading days (SEC, 2004). Rule 204 specifically states "…a fail to deliver position at a registered clearing agency must immediately purchase or borrow securities to close out the fail to deliver position by no later than the beginning of regular trading hours on the settlement day following the day the participant incurred the fail to deliver position" (SEC, 2009).

While short sellers are viewed by the public as nefarious traders who manipulate the markets for personal greed (Sloan, 2010), the academia has taken the opposing view that traders who short stocks provide price discovery and market efficiency (Diamond & Verrecchia, 1987; Senchack & Starks, 1993; Arnold, Butler, Crack, & Zhang, 2005; Reed, 2007; Kolasinksi, Reed, & Thornock, 2010; Saffi & Sigurdson, 2010). In other words, short selling provides information, while often negative, which enables a stock's price to truly reflect future earnings. If negative

information is not communicated through stock sales, share prices would remain artificially high until earnings announcements cause the stock price to rapidly fall. The price decline could cause panic selling jeopardizing general market security. The investing public in turn would question the firm executives as to why they suppressed the information. In this scenario, the short seller is perceived by the market as performing a useful service, while simultaneously taking on financial risk for which they are rewarded.

In spite of the view by academia that short sellers provide market efficiency, the negative public perception of naked short selling persists. As a result, multiple academic studies have been conducted to determine the impact on returns of stocks experiencing naked short selling. A study by Stone in 2010 found "no evidence that stocks subject to naked short selling experience negative excess returns" after studying data gathered before the up-tick rule was enacted. Other research using data gathered prior to the 2008 market crisis found "abnormal returns are generally positive following such announcements" (Boulton & Brag-Alves, 2012). Both research studies used aggregated short sale data across many companies gathered prior to the new SEC regulations. These studies support the conclusion that naked short selling does not result in market inefficiency. Another study suggested that naked short sellers trade based on analysis of accounting data. (Liu, McGuire, & Swanson, 2012). Their findings suggest that the Rule 204 requirement of closing out naked short selling positions might impede market efficiency because their trades introduce information into the market. However, several studies suggest that naked short-selling is detrimental to targeted stocks. Analysis of data obtained after the implementation of Rule 204, the researchers considered whether naked short selling of specific stocks could be predicted. (Ziegler & Truitt, 2013). The study results indicated that market capitalization, institutional ownership, trading volume, insider ownership, listed options, and short interest were useful in predicting delivery failures which represents a surrogate for naked shorting. Another recent study considered whether publicly traded stocks which were naked short sold had price declines representing negative cumulative abnormal returns (Neuenschwander & Ziegler, 2014). The study results suggested naked short selling did in fact negatively impact stock prices.

Given the research above which suggests that naked short selling is still occurring in spite of Rule 204 and appears to negatively impact stocks, this study focuses on markets where stocks are more likely to be subject to naked-short selling. Specifically, this research considers stocks traded in the OTC market which is comprised of smaller companies not meeting the listing requirements for more formal exchanges as discussed earlier in the paper. Since the OTC market does not provide adequate price discovery information in real time, the OTC market is most vulnerable to naked shorting due to the lack of market transparency (SEC, Jun 2004; Jickling, 2005; ShortTracker, 2012). The study considered multiple data points for OTC stocks in order to build a model predicting firms likely to be subject to naked short selling. In considering appropriate variables, we reviewed previous research using relevant variables associated with OTC stock behavior. One study we considered compared earnings performance of firms that were cross listed on the OTC and other markets with those that were not cross listed used GAAP accounting components of operating income, assets, liabilities, equity and firm cash flows (Lang, Raedy, and Yaetman, 2003). Another paper by Luft & Levine (2004) studied how risk, return, and market microstructure for OTC securities are impacted by market capitalization and liquidity by looking at market capitalization, share volume traded & outstanding, and share price.

This study expands upon previous studies by considering the impact of naked short selling specifically on stocks sold in the OTC stock market which tend to offer reduced

transparency. We are expanding on previous literature surrounding naked short selling which has been focused on stocks which trade in highly regulated markets. Research related to these markets has been mixed as to whether stocks subject to naked short selling have been adversely impacted.

METHODOLGY

Data Gathering

The study period covers the entire year of 2015 which includes a total of 250 trading days. Data is gathered from many sources including (a) daily stock quotations, (b) daily delivery failures, (c) over-the-counter symbols and metrics on firm quality, and (e) firm financial data.

Daily stock quotations were acquired from EODData Corporation (EODData. 2016). For each stock this data gave the stock ticker symbol, the date, the stocks opening, closing, high, and low value, and its daily trading volume. For the study period, this totaled 1,975,060 records.

The daily delivery failure information was acquired from the SEC, made available via its website (SEC, 2016). For over-the-counter stocks, this totaled 300,806 records. The data includes date, ticker symbol, and number of shares failing to deliver for that day.

The firm "OTC Markets" (OTC Markets, 2016) makes available information on over-the-counter stocks and categorizes firms by quality, or "tier". There were 9,863 firms provided via their website.

Firm financial information was retrieved from the Yahoo! financial web site (http://finance.yahoo.com) using a custom written download program. Using the ticker symbols acquired from the OTC Markets data set for all over-the-counter firms, each firm's information was acquired. This yielded a total 9,663 records out of a possible 9,863 listed as over-the-counter. While approximately eleven data items per firm were sought, not all were available via the website. As discussed earlier, this affected the total number records available for statistical analysis.

As each data source was gathered, the records were then inserted into a relational database for field validation and query. Additional data items were computed using the information available and a single record for each firm was generated. The available items for the data set used in the statistical analysis include:

- Ticker symbol
- Market capitalization
- Enterprise value
- Price-to-book
- Revenue-per-share
- Total cash-per-share
- Total debt-to-equity
- Book value per share
- Current price per share
- Shares outstanding
- Share in float
- OTC Tier
- Security type
- Average daily trading volume
- Average daily price volatility (daily volatility = [High-Low]/Close)
- Average daily price at close
- Average daily stock delivery failures
- Minimum daily stock delivery failures

- Maximum daily stock delivery failures
- Average daily percent of delivery failures
- Annual percent of delivery failures (annual #fails / annual trading volume)
- Number of days the daily delivery failures exceeded 0.1% of daily trading volume
- Number of days the daily delivery failures exceeded 0.5% of daily trading volume
- Number of days the daily delivery failures exceeded 1% of daily trading volume
- Number of days the daily delivery failures exceeded 2% of daily trading volume
- Number of days the daily delivery failures exceeded 5% of daily trading volume
- Number of days the daily delivery failures exceeded 10% of daily trading volume
- Number of days the daily delivery failures exceeded 20% of daily trading volume

All monetary values are in U.S. dollars. The statistical software SPSS (v22) was used to analyze the final data set.

Variables and Analysis Method

The literature proposed a number of possible reasons that a stock would be sold short. It is these same stocks which, in theory, might exhibit increased delivery failures. In particular, over-the-counter firms are more illiquid stock as compared to those on a listing exchange. This can potentially generate problems with delivery in the prescribed 3-day time window. This, in turn, cannot be distinguished from delivery failures from abusive naked shorting, except by thorough analysis on a case-by-case basis. However, prior literature has posited than only a very small fraction of delivery failures are caused by mechanisms other than naked short selling (Fotak, Raman, & Yadav, 2009; Boulton & Braga-Alves, 2010; Stone, 2010). For this reason, delivery failures are a reasonable surrogate to indication the presence of naked short selling.

Our approach was to see if using binary logistic regression could differentiate between firms having more than 1% average delivery failures more than 5% of the possible trading days. The value of 1% average delivery failure was used due to prior studies conducted by the authors which showed that overall cumulative average return (CAR) is affected at even this level. Using the number of trading days above 5% is a mechanism to capture a short burst of naked shorting rather than an annual aggregate value. It is posited that an abusive naked short seller will attempt to drive the price down quickly and then exit quickly as well. At 250 days in the study period, this is 13 or more days of persistent naked shorting. If binary logit can work at this level it was felt that it could be used by regulators and trading professionals to quickly spot potential abuse.

Based upon the literature, the impact of the following annual aggregated variables were tested against the binary dependent of persistent delivery failures:

- Market capitalization
- Enterprise value
- Price-to-book
- Revenue-per-share
- Total cash-per-share
- Total debt-to-equity
- Book value per share
- Average price per share
- Average daily trading volume
- Shares in float

Of the variables chosen, most are financial ratios with three, Market capitalization, Enterprise value, and Shares in float, being accounting or reported values. It is clear the first two establish different measures of firm size, whereas Shares in float is a surrogate to measure the number of shares potentially available for borrowing by legitimate short sellers. It should then generally be expected as float increases, the amount of delivery failures would decrease. In distinction, an increase in both float and delivery failures might imply targeting by naked short sellers by hiding large moves where many shares are tacitly available for trading. Subsequent runs were performed to look at all firms as a whole, split by market capitalization into five groups, and then another run with the data split by the indicator of firm quality.

Our data set was further reduced to limit firms having a market capitalization above $10,000USD and having an average daily price of at least $0.05USD. Firms below these thresholds are not good candidates for naked shorting simply because little money can be made by driving down the price further. This left a total of 5,192 possible firms.

STUDY FINDINGS AND DISCUSSION

Taking all firms as a single group and requiring all variables to be present for the binary logit, a total of 2,239 firms had the requisite data. The binary logit model results are indicated in Table 1. Of the independent variables, only the Shares in float and Average volume were significant, both to the 0.001 level. The explanatory power using the Nagelkerke R^2 was at 13.1%. While the predictive power is good for those experiencing persistent delivery failures, the model was unable to distinguish those which we not.

It was then considered that firm size might be a non-linear factor which if properly segregated, a more complete picture might emerge. We then created a grouping variable of market capitalization into five bins, auto-generated by SPSS. The results are outlined in Table 2. What is noticed by these results is that there is a large difference when ranking by market capitalization, with the Small and Medium size firms having a >90% prediction of persistent delivery failure when it exists. The Medium group had the Shares in float significant to the 5% level, the Average volume significant to the 0.001 level, and Book value per share significant to the .01 level. The Medium model had a Nagelkerke R^2 value of 30.2%.

An additional run was made with a firm split by a market quality ranking. The rank was performed by the firm OTC Markets: "The marketplace on which a company trades reflects the integrity of its operations, its level of disclosure, and its degree of investor engagement." (OTC Markets, 2016). It was considered that firms which were lower in quality might exhibit a higher level of delivery failure to the level of scrutiny. The results are indicated in Table 3. While all market quality tiers had a greater than 50% prediction rate, the Moderate level predicted greater than 90% when persistent delivery failures actually occurred. For the Moderate tier, only the significant variable was the Average volume and was significant at the 0.001 level. The Moderate model had a Nagelkerke R^2 value of 43.0%.

Taking all OTC stocks as a group, the independent variables provided low predictive power in determining what firms might experience naked shorting. When grouping the firms by market capitalization quintiles, the predictive power increased substantially, showing that Average volume and Shares in float where significant. Re-grouping by a surrogate for firm quality, however, provided no additional predictive power. Overall, the results for OTC delivery failure prediction are not as strong as for those listed on the major U.S. stock markets.

CONCLUSION

The focus of this study was to determine if observable firm characteristics for stocks sold in the over-the-counter market could be used to predict the level of naked short selling using failure-to-deliver as a surrogate. Many sources have suggested that it is the over-the-counter market which is most vulnerable to naked short activity, due to the lack of transparency and market information on these firms. A large daily variance in trading volume for a given over-the-counter stock would not necessarily trigger regulator investigation as the factors driving such volume would be generally unknown.

This study analyzed U.S. OTC stock transactions for the 250 trading days in 2015. A binary logistic regression model was developed using a dependent variable denoting persistent delivery failures, and independent variables suggested by the existing literature. Based upon prior work by the authors examining naked short selling in the major markets, data analysis was performed in three different groups. The first group contained all stocks, the second split the stocks into five groups by market capitalization, and the last split the stocks by an indicator of firm quality.

Looking at all firms taken together, the model was able to predict a combined 65.5% of delivery failures with the Shares in Float and Average Volume significant to the 0.001 level. OTC stocks with higher trading volumes and increasing float tend to experience the greatest level of short selling which is indicated by the positive coefficients for those variables in the model. This finding is counter intuitive if delivery failures where simply due to low liquidity and the inability to transfer stock within the 3-day window. However, the study indicates that as transaction volume and available shares increase, the percentage of delivery failures increase as well. One possible reason is that naked short sellers can hide a significant volume of trading for those firms whose transaction volume is already high. The findings are then opposite to the conventional thinking that it is highly illiquid OTC stocks which are subject to naked short selling, as indicated by delivery failures.

Secondly, the data was segmented using a binning technique which categorized firms into five groups based on market capitalization. When each group was modeled, the medium group (group 3) firms appear to be most susceptible to delivery failures, with a prediction rate of 74%, having again both shares in float and average volume being significant. The reasons for targeting the mid-cap OTC firms is an open question. One possibility is that smaller firms lack the returns and larger firms cannot be as easily manipulated by a flood of trading. Future work should explore this finding more detail.

Finally, analysis was performed by segmented the data into three tiers as designated by the grading company OTC Markets. The Tier 1 firms represent the top quality having a relatively high market capital, SEC reporting, and achievement of certain financial standards. Tier 2 firms, also known as the "Venture Market", represents moderate quality requiring a firm to have only a minimum share price. Tier 3, or the "Pink Market", represents the lowest quality with no requirements for listing. Our initial thought was that firms with lower quality might be more susceptible to naked shorting since they would, in general, also have lower transparency. Looking at the three firm quality groups, each generally reflect the average delivery failure prediction rate when taking all firms together. This would indicate the grading of market quality is not a significant indicator of delivery failures. That said, the Tier 2 firms predicted at the combined 77.5% with average volume being significant to the 0.001 level. It is again not the

lower or larger firms, but rather the medium level firms which are subject to increased delivery failures.

The common factor for all significant findings is that average trading volume is a highly significant indicator of those firms which might experience increased delivery failures. In most cases as well, the more shares in float that are available, the delivery failures increase rather than decrease. This supports the notion that delivery failures are not simply caused by the difficulty of acquiring stock situs in a timely manner. Rather another mechanism, particularly naked short selling as posited in prior literature, which is driving these failures.

In comparison to stocks listed on the major U.S. exchanges, there is a decided weakness in identifying firm characteristics which predict delivery failures in OTC market. Given the OTC market contains a larger variety of firms, and in different phases of development, it is clear a single set of predictive characteristics would be difficult to classify. However, this research found that it is not the illiquid stocks, but rather the highly liquid stocks which show an increased rate of delivery failure, in contrast to the presuppositions of regulators. By itself, this is a useful result and should lead to continued research into why this is occurring.

LIMITATIONS AND FUTURE RESEARCH

The study contains a limited selection of stocks from the OTCBB market as it was difficult to find reliable data with complete information. Only stock transactions with complete records were used which opened the study to selection bias. Also, the logistic regression model had poor results using the Hosmer and Lemeshow; the most reliable test of over-all model fit most likely from the selection bias. However, the Omnibus Tests of Model Coefficients and classification tables provided reasonable evidence of model fit. In addition, our study only considered firms in the lower bound of FTD's of naked shorted stocks having more than 1% average delivery failures more than 5% of the possible trading days. Reducing the threshold percentages of delivery failures and possible trading days could result in a significant increase in the models predictive power.
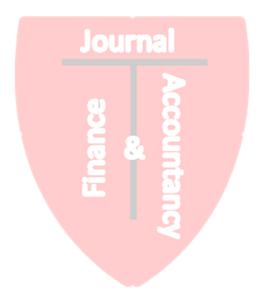
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APPENDIX

Table 1: Delivery failures occur >1% by volume for >5% of trading days

Dependent	0	1	% Predicted
0	573	541	51.4%
1	232	893	79.4%
Combined			65.5%

Table 2: Delivery failures occur >1% by volume for >5% of trading days by Market Capitalization grouping

Market Cap Group	Dependent	0	1	% Predicted
Very small	0	21	1	95.5%
	1	8	9	52.9%
Small	0	7	28	20.0%
	1	3	59	95.2%
Medium	0	28	35	44.0%
	1	10	100	90.9%
Large	0	158	17	90.3%
	1	55	40	42.1%
Very large	0	662	1	99.8%
	1	52	2	3.7%

Table 3: Delivery failures occur >1% by volume for >5% of trading days by Market Quality grouping

Market Quality Group	Dependent	0	1	% Predicted
Low	0	512	458	52.8%
	1	225	671	74.9%
Moderate	0	29	30	49.2%
	1	11	112	91.1%
Highest	0	59	26	69.4%
	1	32	74	69.8%