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Informed or speculative trading? Evidence from short selling before star and non-star analysts' downgrade announcements in an emerging market☆

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ABSTRACT

We examine informed vs. speculative trading among short sellers prior to analyst downgrades in China from March 2010 to August 2014. We do not find abnormal short selling in the days before downgrade announcements in the full sample. For the star (non-star) analyst subsample, however, we find significant (insignificant) abnormal short selling beginning 10 days prior to downgrade announcements. In addition, short sellers cut back their short positions when star analysts incorrectly upgrade. Hence, short sellers do not seem to know more than star analysts. With the timing of the short selling, our evidence indicates that star analysts might leak their research to certain short sellers before their downgrade announcements. Furthermore, we demonstrate that broker reputation and institutional investor ownership mitigate the relation between star analysts' downgrades and abnormal short selling. Our results are robust to different measures of abnormal short selling, abnormal returns, event windows, star analysts' impact, and endogeneity. Our overall findings suggest that short sellers are informed.

1. Introduction

Diamond and Verrecchia (1987) theorize that due to additional restrictions (e.g., margin and uptick rules), short sellers possess more information regarding the future downward stock price movements than do typical investors. The related literatures (e.g., Senchack and Starks, 1993; Desai et al., 2002; Christophe et al., 2010) report that short sellers are informed traders and thus offer support to Diamond and Verrecchia's model prediction. Specifically, Christophe et al. (2010) documents abnormal short selling in the three days prior to analyst downgrade announcements using NASDAQ data in 2000–2001, suggesting that some investors are informed traders in the context of short selling.

In contrast, Daske et al. (2005), Blau and Wade (2012), and Blau and Pinegar (2013) document that short sellers engage only in speculative trading and find no evidence of incrementally informed trading by short sellers. Specifically, Blau and Wade (2012)

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report that abnormal short selling occurs during both analyst downgrade and upgrade announcements using samples in NYSE and NASDAQ in 2005–2006. Obviously, abnormal short selling before analyst upgrade announcements is not consistent with the informed trading argument. Blau and Wade (2012) contends that short sellers engage in speculative trading only, not informed trading. Given the mixed evidence in the literature, it is unclear if short sellers engage in informed or speculative trading.

However, both groups of literature (e.g., Christophe et al., 2010; Blau and Wade, 2012) do not consider the heterogeneous nature of analysts. That is, the literature assumes analysts not different from each other. A parallel strand of literature (e.g., Loh and Stulz, 2011; Xu et al., 2013; Fang and Yasuda, 2014), shows that recommendations made by star analysts earn better returns and produce more firm-specific information than those of non-star analysts. Naturally, some analysts (e.g., star analysts) are endowed with better human capital than other analysts (e.g., non-star analysts). It is unclear how star analysts contribute to the relation between short seller informed vs. speculative trading and analyst downgrades.

The objective of this paper is to examine short seller informed vs. speculative trading and analyst downgrades in the emerging market of China. Specifically, we examine how star vs. non-star analysts moderate the relation. We contend that if speculative trading is the case, the abnormal short selling between star and non-star downgrade announcements will not be significantly different because short sellers' speculative trading will not rely on analysts' information. Hence, irrespective of star or non-star analyst downgrade announcements, the abnormal short selling should not be significantly different. In contrast, if short sellers engage in informed trading, we expect abnormal short selling to be significantly higher when star analysts make downgrade announcements than when non-star analysts do so. Given short sellers' informed trading and that the ability of star analysts is better than those of non-star analysts, the information provided by star analysts is more valuable to short sellers, resulting in higher abnormal short selling when star analysts make downgrade announcements than when non-star analysts do so.

To examine informed vs. speculative trading among short sellers, we follow the framework of Christophe et al. (2010) using the recent deregulation of short sales in China to study abnormal short selling prior to star and non-star analysts' downgrades from March 2010 to August 2014. Our new findings in China can help to settle the informed vs. speculative trading motivation behind short sellers. In addition, the literature focuses more on the US markets. With the exception of Choi et al. (2013, 2016) on the long side of stock trading, few studies examine informed vs. speculative trading in emerging markets, which generally have higher information opaqueness and poorer country-level governance than mature markets. We complement Choi et al. (2013, 2016) by studying short selling in an emerging market. Our results provide a reference for other emerging markets pursuing regulatory reforms (e.g., short selling deregulation) and analyst monitoring in a heterogeneous analyst labor market. If short sellers engage more in informed (speculative) trading, there is a need (no need) for regulatory reforms and analyst monitoring related to short selling.

In addition to its emerging market characteristics, the Chinese environment offers several unique features for our study. First, Chinese daily short selling data are publicly available. In the US, detailed short selling data are seldom available to the public and, when they are available, it is only for a short period. For instance, Christophe et al. (2010), through a special arrangement with NASDAQ, were able to use detailed short selling data from September 13, 2000 to July 10, 2001 (less than 10 months). In contrast, we are able to capture daily abnormal short selling data from when short selling was first permitted (March 31, 2010) to the most recent data available, with more than four years of data. Thus, our research offers a longer-term perspective than many of the studies that use US data.

Second, the cost of short selling is high in China. In addition to the typical uptick rule and minimum balances in trading accounts, short sellers in China must pay their brokers a sizable administrative fee on a relatively high percent of the value on the borrowed stocks. The high cost of short selling motivates short sellers to make short sales only after acquiring information from star analysts about downgrades. Thus, the Chinese environment fits the model of Diamond and Verrecchia (1987).

Third, China exhibits the characteristics of opaque markets with a poor information environment. Hence, different investors may engage in speculative and/or informed trading. There are demands for the services of star analysts in the information production process. We contend that star analysts, with superior human capital, are able to produce more firm-specific information (Xu et al., 2013). Accordingly, star analysts are more likely to move stock prices with their downgrades than non-star analysts. Thus, if short sellers engage in informed trading, they leverage star analysts' downgrades more than non-star analysts. In contrast, if short sellers only speculate, they are indifferent to star and non-star analyst downgrades. Thus, we can use the star vs. non-star analyst perspective to offer new insights into the informed vs. speculative trading among short sellers.

Our findings suggest that, if we do not consider the heterogeneous nature of analysts, analyst downgrades are not related to abnormal short selling in China. The findings of insignificant informed trading in China appear to be consistent with those of Blau and Wade (2012). However, after we partition the sample into star and non-star analyst subsamples, abnormal short selling in the 10 days before a star (non-star) analyst's downgrade announcement is negatively (not) correlated with stock price reactions on the announcement day. Our results are robust to alternative measures of variables and endogeneity and are not related to short sellers' stock picking ability. Further, we document that broker reputation and the presence of institutional investors as shareholders can mitigate the relation between star analyst downgrade announcements and abnormal short selling. Therefore, the results from the star vs. non-star analyst research design show support to the informed trading of short sellers in Diamond and Verrecchia (1987) and Christophe et al. (2010). Given that abnormal short selling occurs 10 days before star analysts' downgrade announcements, our findings seems to be consistent with the conjecture that star analysts might leak their information to some short sellers before their downgrade announcements.

We make three contributions to the literature. First, our findings complement the literature on informed trading by reporting results consistent with the literature in the star analyst downgrade subsample. Without distinguishing the star vs. non-star analyst downgrades, the findings are consistent with speculative trading. Hence, it is imperative to distinguish the impact of star vs. non-star

analysts. After recognizing the heterogeneous nature of analysts, we clarify that star analysts are better than non-star analysts in moving stock prices in downgrades. We contend that, in an emerging market, high information opaqueness pushes investors to rely more on star analysts' recommendations than those of non-star analysts, and short sellers leverage the information provided by star analysts to engage in informed trading. Second, our findings suggest that reputable brokerages and institutional investors can mitigate abnormal short selling prior to star analyst downgrades. Hence, we demonstrate the effectiveness of reputable brokerage and institutional investor monitoring, which corroborate the findings of star analysts and short sellers' informed trading in an emerging market. Third, our results provide useful information for emerging market regulators with respect to short sale deregulation and analyst monitoring.

The rest of this paper is organized as follows. Section 2 discusses the background, reviews the relevant literature and develops our testable hypotheses. Section 3 describes the data, defines the variables, and documents the research method. Section 4 presents and discusses the empirical results. Section 5 presents the study's conclusions.

2. Background, literature review, and testable hypotheses

2.1. Background

We discuss the backgrounds of short selling and star analysts in this section.

2.1.1. Short selling

China established the Shanghai and Shenzhen Stock Exchanges in 1990 as part of its effort to promote capital formation and economic development. In October 2005, the Chinese government revised the *Securities Law of the People's Republic of China* to permit short selling and adopted the *Administration Supervision of Securities Company and Regulations* to allow brokerages to execute short sales. Officially, short sales began on March 31, 2010 after the China Securities Regulatory Commission (CSRC) granted permission to short sell 90 A-share stocks. These 90 stocks represent the large firms that comprise the Shanghai Stock Exchange 50 Index and the Shenzhen Stock Exchange 40 Index. Similar to the US, investors need to follow an uptick rule when they short sell. It is illegal to short sell without borrowed stocks. Shortable stocks in 2011, 2012, 2013, and 2014 increased to 285, 288, 748, and 901, respectively.

However, not every investor is allowed to engage in short selling. Short sellers must meet several conditions. First, they must have trading accounts open for at least 18 months with a brokerage. Second, their brokerage accounts must have a minimum value of RMB500,000 (about US$80,000). Third, brokerages are obligated to assess an investor's trading experience, risk tolerance, and financial assets before they can approve the investor for short selling. Fourth, short sellers must pay a fee to their brokerages to borrow stocks. As of February 23, 2015, this fee amounts to an annual interest rate of 10.6% on the value of borrowed stocks.[1] Finally, the maximum length of the short selling period is six months, with a 50% margin. In a nutshell, the CSRC allows only sophisticated investors with high net worth to engage in short selling. Note that some institutional investors, such as mutual funds, wealth managers at insurance companies, and China's national social security funds, are not allowed to short sell, because of restrictions in their investment policy statements.

2.1.2. Star analysts

Xu et al. (2013) describe the star analyst selection procedure in detail, which we highlight here. Beginning in 2003, *The New Fortune*, the most authoritative financial magazine in China, began rating analysts every year by performance. The top five analysts in each industry are called star analysts in their respective industry. *The New Fortune* follows a procedure similar to that of the US All American Research Team, by sending surveys to institutional investors in all industries. The surveys do not pre-select any analysts. Instead, respondents add the names of their nominated analysts to the survey. Respondents can nominate one or more analysts. If two or more are nominated, respondents need to provide an explicit ranking. *The New Fortune* then tallies the scores and selects star analysts in each industry. Thus, there is a history of information about specific star analysts extending back to 2003, which allows the identification of new star analysts or analysts dropped from the rankings. To be selected as a star analyst, an analyst must provide outstanding research in China's opaque information environment as well as maintain good relations with institutional clients.

2.2. Literature review

There are two strands of literature related to the development of our testable hypotheses. The first strand is informed trading and speculative trading, and the second strand relates to star analysts. We discuss both strands below.

2.2.1. Informed vs. speculative trading

Irvine et al. (2007) report that institutional investors in the US earn abnormal profit from abnormally high buying five days before analysts' initial buy recommendations. These authors suggest that institutional investors use advanced information from analysts and engage in informed trading. Christophe et al. (2010) study short selling before analyst downgrades in the US and

[1] For instance, if an investor sells short a stock valued at RMB1,000,000 for a period of 1 week, the fee is RMB2038.5 (RMB1,000,000*10.6%*1/52).

document that abnormal short selling in the three days prior to downgrades is significantly related to negative stock price reaction to downgrade announcements. Nefedova (2012) examines potential information leakage of analyst recommendations to their elite clients, and finds that such clients, on average, buy more than other investors in the five days preceding analysts' initial buy recommendations, suggesting informed trading among clients of analysts. These studies suggest that some investors are informed and earn abnormal profit from such information. Analysts help these informed traders by providing early access to their research.

Kecskés et al. (2013) examine the relation between short sales in the equity market and credit rating. These authors report that short interest in a stock is predictive of future credit rating changes and the bond yield spreads of the firm, suggesting that equity short sellers are informed in the context of the bond market reaction. Lung and Xu (2014) report abnormal trading activity in the options market several days prior to the release of analysts' initiations. That is, informed traders recognize the content and timing of analysts' reports prior to their release. These authors generate additional evidence to support the notion that option traders are informed traders. Alexander et al. (2014) document that subsequent cumulative returns from earnings announcements are negatively related to abnormal short selling, suggesting informed trading by short sellers. Lin and Lu (2015) document that the predictive power of option-implied volatilities on stock returns more than doubles around analyst recommendations; they attribute their findings to informed trading among options traders. In the context of Chinese markets, Choi et al. (2013, 2016) document that institutional investors have a clear information advantage over retail investors in the long-side of stock trading. Choi et al. (2013, 2016) do not examine short sales, but their findings show that Chinese markets are susceptible to informed trading.

In contrast, Daske et al. (2005), Blau and Wade (2012), and Blau and Pinegar (2013) question findings of informed trading in the financial markets. Specifically, Daske et al. (2005) use data from the New York Stock Exchange for the period April 1, 2004 through March 31, 2005, and they do not find a significant increase in abnormal short selling prior to negative earnings announcements, casting doubt on the informed trading of short sellers. Blau and Wade (2012) find abnormal short selling before analyst downgrades as well as prior to analyst upgrades. They attribute their findings to the relation between short selling and downgrade announcement returns being speculative in nature. Overall, the evidence on short sellers and informed trading is mixed. Blau and Pinegar (2013) report that the significance of the relation between pre-earnings announcements and short selling vanishes when controlling for the non-earnings announcement ability of short sellers, suggesting that short sellers are not incrementally informed.

2.2.2. Star analysts

While many studies presume analysts are homogeneous, some emerging research has begun to recognize that analysts are heterogeneous. Desai et al. (2000) report that *Wall Street Journal* all-star analysts perform better than benchmarks after controlling for other performance attributes. Using stock price synchronicity as a measure of stock price informativeness, Xu et al. (2013) report that only star analyst coverage, as opposed to non-star analyst coverage, can lower stock price synchronicity in China. In addition, these authors document that star analysts, on average, have better experiences and smaller earnings forecast errors than non-star analysts. Fang and Yasuda (2014) report that star analyst recommendations have value. Specifically, a portfolio of star analysts' buy and sell recommendations earns, on average, 0.6% per month more than a portfolio of non-star analyst recommendations, on a risk-adjusted basis. In conclusion, the literature suggests that analysts are not homogeneous, and star analysts outperform non-star analysts. Thus, it is meaningful to distinguish the differential impacts of star and non-star analysts in various research questions.

2.3. Testable hypotheses

The literature on informed trading suggests that analysts play a role in informed trading. The question is whether star analysts have the ability to do so. We argue that star analysts have such ability for two reasons. First, Lang and Lundholm (1996) and Cheng et al. (2013) suggest that star analysts have access to senior executives and receive predictive information about future performance for the stocks they cover. In addition, Xu et al. (2013) find that star analysts have better experience and human capital in producing firm-specific information than non-star analysts. Second, star analysts are well known in their profession. They draw attention from non-star analysts and investors. Due to a herding effect among analysts, we expect some non-star analysts to follow star analysts' recommendations. Thus, star analyst recommendations can create price pressure even if their recommendations do not differ from those of non-star analysts (Stickel, 1995).

In addition to the ability of star analysts to help some investors engage in informed trading (e.g., hedge funds and high net wealth retail investors), we argue that they also have motivation to do so. While star analysts command high compensation and have reputation capital, they realize the monitoring of their help in informed trading is weak because China has poor governance and a weak legal environment. Even if they are caught, the costs are low. For instance, in February 2012, CSRC levied a penalty against Ye Zhigang (a star analyst) for his role in informed trading. Ye was fined RMB1 million (equivalent to US$160,000), forfeited his illegal gain of RMB325,000 (equivalent to US$52,000), and could not participate in the securities business for five years. These penalties are low by US standards in the context of insider trading violations.

Overall, star analysts have the capability, and some also have the motivation, to engage in informed trading for the stocks they follow. Thus, they may help some investors engage in short selling prior to their downgrades. The findings of informed trading among Chinese institutional investors on the long side of stock trading in Choi et al. (2013, 2016) corroborate this conjecture.

In contrast, non-star analysts, on average, lack the ability to produce firm-specific information and receive less attention from the market; hence, they are not effective in moving stock prices in downgrades. Our first testable hypothesis is as follows:

H1. *Abnormally high short-selling prior to star (non-star) analyst downgrades is negatively (not) correlated with subsequent negative price reaction.*

H1 contends that, after weighing the costs and benefits, some star analysts leak their research to their clients to engage in short selling for the stocks they plan to downgrade. A natural extension is that if the cost to star analysts of their behavior is high, it can mitigate informed trading. It takes a long time for brokerages to build their reputations. Any disclosure of bad behavior from their analysts incurs a reputational capital loss for the brokerage, especially if the clients are prohibited by law from conducting short selling and thus cannot enlist help from analysts' downgrade announcements. For these clients with legal short selling bans, star analysts' help engaging in short selling certainty can create tension between the brokerage and these clients, which may affect the brokerage's reputation. We expect that when a brokerage is reputable, it pays more attention to its reputational capital, and vice versa; this is because the associated cost of reputation damage is greater for a reputable brokerage than for an average brokerage. In addition, a reputable brokerage has more resources and know-how to monitor analysts. Therefore, we conjecture that, for reputable brokerages, the extent of star analysts' involvement in informed trading by short sellers is lower, because these brokerages monitor their star analysts closely and effectively to maintain their reputations.

Similarly, for firms with a large numbers of institutional shareholders, we contend that the extent of analysts' involvement in short seller informed trading is lower for three reasons. First, institutional shareholders can monitor their firms' material information release closely, so the advantage of star analysts over non-star analysts in the information production process is less for these closely guarded firms. Second, some institutional shareholders, such as mutual funds, wealth managers at insurance companies, and China's social security funds, cannot engage in short selling. These institutions, as investors, use brokerages in their trading. Brokerages receive a significant portion of their revenues from institutions. To protect their own interests, these institutional shareholders are likely to pressure brokerages to discourage their analysts from helping short seller engage in informed trading. Third, in the star analyst selection process, only institutional investors can vote. *Ceteris paribus*, analysts will not upset institutional investors by helping other investors (short sellers) engage in short selling when institutional investors have a large ownership of the stock.

Overall, the relation between abnormal short selling prior to downgrades and subsequent negative price reactions is weaker for star analysts with reputable brokerage employers and for stocks with high institutional ownership. Our second testable hypothesis is as follows:

H2. *For star analysts employed by reputable brokerages and stocks with large institutional ownership, the relation between abnormal short selling prior to star analyst downgrades and subsequent stock price is less pronounced.*

3. Data, variable definitions, and research design

3.1. Data

We investigate short selling prior to analyst downgrade announcements from March 31, 2010 to August 31, 2014. The data for short selling, analyst downgrade announcements, analyst names, stock returns, and accounting were extracted from the China Security Market and Accounting Research Database. The initial sample has 4059 announcements. We delete 354 announcements because they are within 10 days of other downgrade announcements to screen out analyst herding. After matching the downgrade announcements with shortable firms, we have 1162 usable announcements. Then, we eliminate those announcements with missing accounting and financial information. Our final sample consists of 959 firm-level downgrade announcements, 151 of which were made by star analysts.

Star analysts are classified by *The New Fortune* magazine. We consider an analyst as a star analyst if that analyst is in the magazine's list before a downgrade announcement is made. All other analysts are classified as non-star analysts. Analyst recommendations have five levels: "strong buy," "buy," "hold," "sell," and "strong sell" with assigned values of 1–5, respectively. Thus, when an analyst has a new recommendation of 5 ("strong sell") from a previous recommendation of 3 ("neutral"), this is a downgrade. For a stock with more than one analyst downgrade within 10 days, we only use the first announcement to avoid analyst herding behavior. For a stock with several analyst downgrades on the same date and with at least one star analyst downgrade, we classify this as a star analyst downgrade.

3.2. Variable definitions and research design

We follow a similar framework as in Christophe et al. (2010) to construct an abnormal short selling variable, denoted by *ABSS(−10, −1)*, for an *i*th analyst downgrade announcement based on the 10-day average of daily abnormal short selling before an announcement. Specifically, we have the following:

$$ABSS(-10,-1) = SHORT(-10,-1) - SHORT\,NORM$$

where

ABSS(−10, −1)	=	Average of abnormal short selling during the 10 trading days prior to an analyst downgrade;
SHORT(−10, −1)	=	Average of daily shorted shares in the 10 trading days prior to an analyst downgrade announcement, divided by number of traded shares on the same day, times 1000.
SHORT_NORM	=	Average of normal daily short selling using the matching portfolio approach described in Christophe et al.

(2010). That is, we form 25 matching portfolios from all shortable stocks based on 5 quintiles of market capitalization and 5 quintiles of the book-to-market ratio, according to their values in the preceding year. For each downgraded stock, we find the closest matched portfolio based on market capitalization and the book-to-market ratio. Normal daily short-selling is the median value of the number of shorted shares of the stock making up the matched portfolio divided by the number of traded shares, times 1000.

We use downgrade announcement day abnormal returns, *AR(0)*, as a measure of the stock return reaction to the announcement. Specifically, this is actual return minus the median stock returns from the same matched portfolio in the construction of the *SHORT_NORM* variable. Similar to Christophe et al. (2004, 2010), we include cumulative abnormal returns in the 10 days prior to announcement, *CAR(−10, −1)*; 6-month cumulative returns prior to announcement, *MOM*; and the logarithm of the stock price on the announcement date, $Ln(P_0)$, as control variables. The base model is expressed as follows:

$$ABSS(-10,-1)_i = \alpha_i + \alpha_1 * AR(0)_i + \alpha_2 * CAR(-10,-1)_i + \alpha_3 * MOM_i + \alpha_4 * Ln(P_0)_i + \varepsilon_i \quad (1)$$

where ε is a random error term, and other variables are defined as above. If short sellers are informed traders and they receive tips from analysts, then they are able to anticipate the negative price impact of analyst downgrades. In Eq. (1), we use *AR(0)* to capture the anticipated effect of downgrade by the short sellers.[2] Thus, α_1 should be negative and significant to capture the negative correlation between abnormally high short selling and downgrade announcement negative stock return. $Ln(P_0)$ controls for the possible association between the stock price and short sellers' willingness to short the stock. *CAR(−10, −1)* controls the impact of the short-term price movement before an announcement on the willingness to short a stock, and *MOM* controls for the effect of long-term price movements of the stock on the willingness to short the stock. We also control for year and industry fixed effects. If H1 is valid, we expect that α_1 is negative and significant for the star analyst subsample and not for the non-star analyst subsample. If H2 is valid, we expect that α_1 is negative and significant for the subsample of star analysts employed by less reputable brokerages or firms with less institutional ownership.

4. Results and discussion

4.1. Preliminary results

We plot abnormal short selling and abnormal returns 20 days before and after downgrade announcements for the full sample and star analyst and non-star analyst subsamples in Fig. 1 and 2. In Fig. 1, abnormal short selling of the full sample and non-star analyst subsample follow each other closely. In contrast, abnormal short selling of the star analyst subsample has its own profile, with a high level of abnormal short selling beginning eight days prior to an announcement. In Fig. 2, we observe similar patterns between the full sample and non-star analyst subsample. The star analyst subsample, however, exhibits a strong negative abnormal return on the announcement date, suggesting that star analysts have a greater impact than non-star analysts.

Table 1 reports the descriptive statistics of the variables. Overall, the star analyst subsample has the largest mean (0.054) and standard deviation (0.121) for the abnormal short selling variable, *ABSS(−10, −1)*, among the three groups. For announcement day abnormal returns, the star analyst subsample exhibits the smallest mean (−0.006) and standard deviation (0.022) among the groups. That is, the star analyst subsample has less dispersion, higher abnormal short selling, and smaller abnormal returns than the non-star analyst subsample.

We conduct univariate t-tests to examine the difference between star and non-star analysts in terms of abnormal short selling and abnormal return. The results are reported in Table 2. Ten days before downgrade announcement, abnormal short selling for the star analyst subsample is higher than that of the non-star analyst subsample, and the difference is significant at the 5% level. We find that the star analyst subsample shows significantly lower announcement day abnormal return than the non-star analysts at the 10% level. The univariate statistics offer preliminary support for H1.

4.2. Base results

Table 3 presents the multiple regression analysis of Eq. (1). In addition to partitioning the results with respect to star and non-star subsamples, we present a simplified model with only abnormal short selling and announcement day abnormal return. Among all six models, we find that only the coefficients (α_1) associated with *AR(0)* are negative and significant at the 10% and 1% levels for the star analyst subsample in Models (3) and (4), suggesting that abnormal short selling 10 days before a downgrade announcement is negatively correlated with announcement day abnormal returns in star analyst downgrades only. Interestingly, the coefficients associated with *CAR(−10, −1)* are not significant in Model (4), suggesting that abnormal short selling prior to an announcement is dominated by the level of abnormal return on the announcement day. In contrast, in Models (2) and (6), the only significant coefficients are those associated with *CAR(−10, −1)*, suggesting that short term price movement, not analyst (in the full sample) and non-star analyst downgrade announcements, explains the level of abnormal short selling. Overall, the results shown in Table 3

[2] It is noted that the timing of *ABSS(−10, −1)* and *AR(0)* appears not in logical order. *AR(0)* occurs later than *ABSS(−10, −1)*. However, Eq. (1) is not a prediction (or forecasting) model. Rather, it is a cross-section model across different earnings announcement. The objective of Eq. (1) is to explore if short sellers are able to engage in front running (by incurring higher abnormal short sales) in anticipated downgrade announcement. That is, we use *AR(0)* to capture the anticipation of downgrade announcement by short sellers.

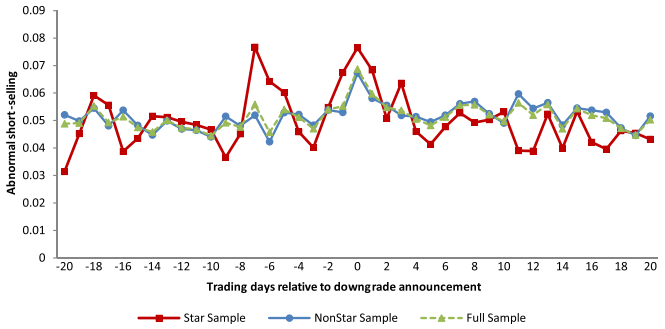

Fig. 1. Abnormal short selling around downgrade announcements (t=0).

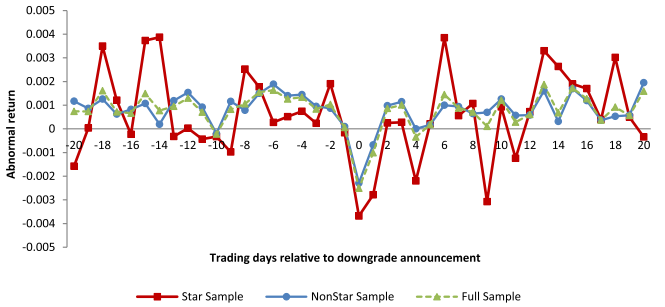

Fig. 2. Abnormal returns around downgrade announcements (t=0).

Table 1
Descriptive statistics.

Table 1 presents the descriptive statistics of the full, star analyst, and non-star analyst samples. *ABSS(−10, −1)*=The average of abnormal short selling during the 10 trading days prior to an analyst downgrade; *AR(0)*=the difference between the stock return minus the median stock return from a matched portfolio on the downgrade announcement date; *CAR (−10, −1)*=cumulative abnormal return in the 10 days prior to announcement; *MOM*=six months cumulative return prior to announcement; and LnP_0=logarithm of stock price on the announcement date.

	N			Mean			Median			Standard deviation		
	Full sample	Star analyst sub-sample	Non-star analyst sub-sample	Full sample	Star analyst sub-sample	Non-star analyst sub-sample	Full sample	Star analyst sub-sample	Non-star analyst sub-sample	Full sample	Star analyst sub-sample	Non-star analyst sub-sample
ABSS(−10, −1)	959	151	808	0.036	0.054	0.033	0.008	0.008	0.008	0.073	0.121	0.059
AR(0)	959	151	808	−0.003	−0.006	−0.002	0	0	0	0.025	0.022	0.026
CAR(−10, −1)	959	151	808	0.009	0.007	0.010	0.007	0.002	0.008	0.055	0.060	0.054
MOM	959	151	808	−0.078	−0.086	−0.076	−0.080	−0.080	−0.081	0.258	0.236	0.262
LnP_0	959	151	808	2.486	2.427	2.497	2.464	2.402	2.474	0.772	0.637	0.795

Table 2
Abnormal short selling and abnormal returns by star and non-star analysts around analyst downgrade announcements: univariate analysis of various event windows.

Table 2 reports some univariate t-test results from the difference between star and non-star analysts in terms of abnormal short selling (*ABSS*) and abnormal return (*CAR* or *AR*) for event windows of (−10, −1), (0), and (1, 10). P-values are in the parentheses. *, **, and *** indicate 10%, 5%, and 1% significance, respectively.

	(−10, −1)			(0)			(1, 10)		
	Star analyst sub-sample	Non-star analyst sub-sample	difference	Star analyst sub-sample	Non-star analyst sub-sample	difference	Star analyst sub-sample	Non-star analyst sub-sample	difference
Panel A: abnormal short selling									
ABSS	0.054	0.033	0.021**	0.077	0.041	0.035**	0.052	0.035	0.017
p-value			(0.036)			(0.023)			(0.108)
Panel B: abnormal return									
CAR/AR	0.007	0.010	−0.003	−0.006	−0.002	−0.004*	−0.001	0.006	−0.007
p-value			(0.512)			(0.075)			(0.109)

Table 3
Abnormal short selling and downgrade announcement abnormal return.
Table 3 presents the multiple regression analysis of the following equation: $ABSS(-10, -1)_i = \alpha_i + \alpha_1 * AR(0)_i + \alpha_2 * CAR(-10, -1)_i + \alpha_3 * MOM_i + \alpha_4 * Ln(P_0)_i + \varepsilon_i$; the variables are defined in Table 1. P-values are in the parentheses. *, **, and *** indicate 10%, 5%, and 1% significance, respectively.

	Dependent variable=*ABSS(−10, −1)*					
	Full sample		Star analyst sub-sample		Non-star analyst sub-sample	
	(1)	(2)	(3)	(4)	(5)	(6)
AR(0)	−0.025	−0.020	−0.578*	−0.548***	0.022	0.020
	(0.913)	(0.918)	(0.084)	(0.006)	(0.913)	(0.913)
CAR(−10, −1)		0.225***		−0.087		0.279**
		(0.007)		(0.657)		(0.016)
MOM		0.045		0.031		0.043
		(0.111)		(0.479)		(0.146)
LnP_0		0.005		0.024		0.003
		(0.637)		(0.356)		(0.829)
Industry dummy	Control	Control	Control	Control	Control	Control
Year dummy	Control	Control	Control	Control	Control	Control
Intercept	−0.057***	−0.075***	−0.056**	−0.106**	−0.053**	−0.069**
	(0.000)	(0.004)	(0.033)	(0.011)	(0.012)	(0.011)
N	959	959	151	151	808	808
adj. R^2	0.112	0.125	0.166	0.169	0.098	0.113

support H1.

4.3. Do short sellers know more than star analysts?

Abnormal selling before a star analyst downgrade announcement may not be due to informed trading by short sellers. Short sellers may know more than star analysts through their own research or their networks with firm management. Hence, they may be able to identify forthcoming star analyst downgrades, causing them to engage in abnormal short selling. We conduct two additional tests to examine this possibility.

4.3.1. Comparing abnormal short selling in (−20, −11) and (−10, −1) windows

Christophe et al. (2010) suggest that if short sellers conduct their own research about a forthcoming downgrade, the level of abnormal short selling should gradually increase prior to the downgrade announcement, because it is unlikely that all short sellers act in the same time windows before an analyst downgrade announcement to execute their short sales. Thus, *ABSS(−20, −11)* and *ABSS(−10, −1)* should not exhibit significant differences if short sellers conduct their own research and correctly identify analyst downgrades. Conversely, if short sellers receive help from star analysts a few days before downgrade announcements, abnormal short selling would likely surge a few days before downgrades.

The univariate results in Table 4 indicate that, for the star analyst subsample, the mean *ABSS(−10, −1)* is 0.054 relative to a mean value of 0.033 for the *ABSS(−20, −11)*. This difference is significant at the 10% level. For a multivariate setting, we present the multiple regression results using the difference between *ABSS(−10, −1)* and *ABSS(−20, −11)* as the dependent variable in Table 5. The coefficient associated with *AR(0)* is negative and significant at the 5% level for the star analyst subsample only. Therefore, the results are not consistent with the notion that short sellers know more than star analysts.

Table 4
Abnormal short selling in (−10,−1) and (−20,−11) windows.
Table 4 presents the abnormal short selling in (−10, −1) and (−20, −11) windows with respect to full sample, star, and non-star analyst sub-sample. P-values are in the parentheses. * indicates 10% significant.

	Full sample		Star analyst sub-sample		Non-star analyst sub-sample	
	(1) (−20, −11)	(2) (−10, −1)	(3) (−20, −11)	(4) (−10, −1)	(5) (−20, −11)	(6) (−10, −1)
ABSS	0.033	0.036	0.033	0.054	0.033	0.033
ABSS (−10, −1)- ABSS (−20, −11)		0.003		0.021*		−0.001
p-value		(0.333)		(0.053)		(0.876)

Table 5
A regression analysis of the difference in abnormal short selling between (−10, −1) and (−20, −11) and downgrade announcement return.
Table 5 presents the multiple regression results using the difference of *ABSS(−10, −1)* and *ABSS(−20, −11)* as the dependent variable to replace *ABSS(−10, −1)* in Eq. (1). P-values are in the parentheses. *, **, and *** indicate 10%, 5%, and 1% significance, respectively.

	Dependent variable=*ABSS (−10,−1)- ABSS (−20,−11)*		
	(1) Full sample	(2) Star analyst sub-sample	(3) Non-star analyst sub-sample
AR(0)	−0.394 (0.150)	−0.815** (0.040)	−0.361 (0.242)
CAR(−10, −1)	0.266*** (0.000)	0.068 (0.724)	0.303*** (0.000)
MOM	0.031 (0.134)	0.051 (0.394)	0.027 (0.214)
LnP_0	−0.001 (0.877)	0.010 (0.359)	−0.002 (0.746)
Industry dummy	Control	Control	Control
Year dummy	Control	Control	Control
Intercept	−0.028 (0.225)	−0.046 (0.240)	−0.022 (0.402)
N	959	151	808
adj. R^2	0.093	0.133	0.084

Table 6
Future negative earnings surprises, analyst recommendations, and abnormal short selling.
Table 6 presents the results from a sample of firms with the negative earnings surprise announcements (i.e., realized earnings are less than analyst common consensus forecasts) after analyst recommendation change date. We examine analysts upgrade (*UP*) and downgrade (*DOWN*) recommendation announcements from star and non-star analysts before these negative earnings surprises. P-values are in the parentheses. * indicates 10% significant.

	recommendation before negative earnings surprise	N	*ABSS(−10, −1)*
star analyst sub-sample	*DOWN*	30	0.066
	UP	39	−0.007
	difference		0.073*
	p-value		(0.054)
non-star analyst sub-sample	*DOWN*	185	0.038
	UP	216	0.046
	difference		−0.008
	p-value		(0.662)

4.3.2. Abnormal short selling in analyst downgraded and upgraded stocks in the presence of negative earnings surprise

Analysts focus more on a firm's performance in the near future (e.g., six months). Given limited time and resources, it is natural that even star analysts may not perfectly forecast a covered firm's performance. In some cases, even if a firm performs poorly, analysts make upgrade recommendations prior to poor earnings announcement. If short sellers know more than star analysts, they should be able to identify these wrongly upgraded stocks and engage in abnormal short selling in these stocks. In contrast, if short sellers engage in informed trading and receive help from star analysts, we should observe high abnormal short selling only in star analysts' downgraded stocks and normal short selling in star analysts' wrongly upgraded stocks.

To conduct this examination, we identify a sample of firms with negative earnings surprise announcements (i.e., realized earnings are less than analysts' consensus forecasts) after the analyst recommendation change day and examine analyst upgrade (*UP*) and downgrade (*DOWN*) recommendation announcements from star and non-star analysts. The results are presented in Table 6. For the star analyst subsample, given the negative earnings surprise, there are 30 and 39 stocks downgraded and upgraded with abnormal short selling of 0.066 and −0.007, respectively. The difference is positive and significant at the 10% level, suggesting that short sellers are able to engage in a high level of abnormal short selling following star analyst downgrades, but not when star analysts have wrongly upgraded, despite these stocks having negative earnings surprises. In contrast, for the non-star analyst upgraded and downgraded stocks, the abnormal short selling levels are not significantly different.

Table 7
Abnormal short selling before star analyst upgrades.
Table 7 presents the multiple regression results using *ABSS(−10, −1)* as the dependent variable and the abnormal short selling in the full sample, star and non-star analyst sub-samples before star analyst upgrades. P-values are in the parentheses. *, **, and *** indicate 10%, 5%, and 1% significance, respectively.

	Dependent variable=*ABSS(−10, −1)*					
	Full sample		Star analyst sub-sample		Non-star analyst sub-sample	
	(1)	(2)	(3)	(4)	(5)	(6)
AR(0)	−0.187	−0.282	−0.264	−0.297	−0.115	−0.214
	(0.245)	(0.159)	(0.307)	(0.205)	(0.594)	(0.300)
CAR(−10, −1)		0.374***		0.218**		0.405***
		(0.000)		(0.042)		(0.000)
MOM		0.039		0.069		0.037
		(0.150)		(0.517)		(0.224)
LnP_0		0.001		0.009		0.001
		(0.928)		(0.771)		(0.900)
Industry dummy	Control	Control	Control	Control	Control	Control
Year dummy	Control	Control	Control	Control	Control	Control
Intercept	−0.037*	−0.051	0.034	−0.002	−0.046***	−0.056**
	(0.084)	(0.328)	(0.506)	(0.983)	(0.007)	(0.041)
N	1027	1027	154	154	873	873
adj. R^2	0.146	0.168	0.140	0.142	0.146	0.172

The results in Tables 4–6 are consistent with the notion that short sellers do not seem to know more than star analysts because when star analysts incorrectly upgrade a stocks, short sellers also cut back their short position.[3] Given the timing of the short selling (they increase their short positions before star analysts make their downgrade announcements), the evidence seems to be consistent with the conjecture that star analysts leak their research to some short sellers before their downgrade announcements.

4.4. Abnormal short selling before upgrades by star analysts

To demonstrate informed trading rather than speculative trading, we present additional evidence to document that, before upgrades by star analysts, there is no abnormal shorting. The results for abnormal short selling before upgrades by star analysts are presented in Table 7. The coefficients of *AR(0)* in all six columns are not significant, suggesting that before star analyst upgrade, there is no abnormal short selling in full sample and star analyst and non-star analyst sub-samples. Hence, the findings support the notion that, before star analysts downgrade, the abnormal shorting is informed trading.

4.5. Endogeneity

Our base results in Table 3 may suffer from endogeneity bias. Star analysts may anticipate forthcoming abnormal short selling and make downgrade recommendations. That is, *ABSS(−10, −1)* may be an explanatory variable in Eq. (1) that explains *AR(0)*. To mitigate the endogeneity concern, we use the long history of the star analyst roster to examine the impact of an analyst before and after the analyst's selection as a star analyst. Selection as a star analyst is an exogenous shock to the relation between *ABSS(−10, −1)* and *AR(0)*, and it can circumvent the endogeneity concern in Eq. (1). We estimate Eq. (1) using only samples of newly selected star analysts in the March 31, 2010 to August 31, 2014 period. The findings are presented in Panel A of Table 8. Before these analysts are selected as star analysts, the coefficient associated with *AR(0)* is not significant, suggesting that these analysts' downgrades do not correlate with abnormal short selling. After they are selected as star analysts, the same coefficient is negative and significant at the 1% level, indicating that their downgrades are negatively correlated with abnormal short selling. Therefore, it is unlikely our base results in Table 3 are due to endogeneity bias.

4.6. What happens when star analysts become non-star analysts[4]?

When star analysts become non-star analysts, do they no longer attract shorting before their recommendation changes? To operationalize this situation, we use three years after an analyst being selected as a star analyst. We consider that if a star analyst is

[3] Alternatively, even if short sellers know more than star analysts, they may choose not to go against star analysts because star analysts may influence stock prices in the short run, making short selling risky. We acknowledge an anonymous reviewer for pointing out this possibility.
[4] We sincerely thank an anonymous reviewer for suggesting this analysis.

Table 8
The impact of exogenous shock (when a non-star analyst being selected as a star analyst during the sample period) and star analyst not being selected again on abnormal short selling and downgrade announcement return.

Table 8 presents the results that address endogeneity concern. In Panel A, we estimate Eq. (1) using only samples of newly selected star analysts during March 31, 2010–August 31, 2014. Panel A of Table 8 shows the results before and after selection of a star analyst. Panel B of Table 8 shows the results of star analyst downgrades when these star analysts have not been selected as star analyst again in three years. P-values are in the parentheses. *, **, and *** indicate 10%, 5%, and 1% significant, respectively.

Panel A: when a non-star analyst being selected as a star analyst during the sample period

	(1) after selection as a star analyst	(2) before selection as a star analyst
AR(0)	−0.516*** (0.009)	0.343 (0.311)
CAR(−10, −1)	−0.080 (0.659)	0.300 (0.313)
MOM	0.024 (0.528)	0.054 (0.319)
LnP_0	0.024 (0.359)	0.020 (0.113)
Industry dummy Year dummy Intercept	Control Control −0.107** (0.013)	Control Control −0.100* (0.076)
N adj. R^2	151 0.168	175 0.129

Panel B: when a star analyst not being selected as a star analyst again in three years

	Dependent variable=*ABSS(−10, −1)*	
	(1) Within three years after an analyst being selected as a star analyst	(2) More than three years after an analyst being selected as a star analyst
AR(0)	−0.597*** (< 0.001)	−0.218 (0.593)
CAR(−10, −1)	−0.325 (0.328)	0.524 (0.209)
MOM	0.063 (0.245)	0.029 (0.706)
LnP_0	0.007 (0.718)	0.035 (0.498)
Industry dummy Year dummy Intercept	Control Control −0.044 (0.235)	Control Control −0.108 (0.238)
N adj. R^2	87 0.306	64 −0.079

not selected again as a star analyst in the next three years, he/she will become a non-star analyst. The results are presented in Panel B of Table 8. Column (1) shows that the coefficient of *AR(0)* is negative and significant, suggesting that the impact of a star analyst on abnormal short selling continues within three years of his/her selection as a star analyst. Column (2) reports that when a star analyst is not selected as a star analyst in more than three years, the coefficient of *AR(0)* will be insignificant. Thus, the findings suggest that star analysts attract short selling within three years of their selection, but the impact weakens over time (disappearing after more than three years).

Table 9
The impact of brokerage reputation.
Table 9 presents the impact of brokerage reputation on the relation between abnormal short selling and announcement return. We use the CSRC rating of brokerages as of July 14, 2010 to classify brokerages' reputation level. Among 98 brokerages, 12 of them are classified as AA level. We consider these 12 AA-rated brokerages having high reputation. P-values are in the parentheses. *, **, and *** indicate 10%, 5%, and 1% significance, respectively.

	Full sample		Star analyst sub-sample		Non-star analyst sub-sample	
	(1) Reputable brokerages	(2) Other brokerages	(3) Reputable brokerages	(4) Other brokerages	(5) Reputable brokerages	(6) Other brokerages
AR(0)	−0.016	−0.039	0.061	−0.470**	−0.244	0.020
	(0.972)	(0.787)	(0.945)	(0.029)	(0.667)	(0.920)
CAR(−10, −1)	0.326	0.180*	−0.038	−0.166	0.343	0.227*
	(0.179)	(0.095)	(0.899)	(0.529)	(0.206)	(0.081)
MOM	0.047	0.042	0.053	−0.007	0.009	0.044
	(0.414)	(0.224)	(0.715)	(0.894)	(0.893)	(0.236)
LnP_0	0.011	0.005	−0.003	0.040	0.015	0.003
	(0.518)	(0.654)	(0.931)	(0.194)	(0.489)	(0.820)
Industry dummy	Control	Control	Control	Control	Control	Control
Year dummy	Control	Control	Control	Control	Control	Control
Intercept	−0.116*	−0.066***	−0.055	−0.198**	−0.105	−0.062**
	(0.063)	(0.007)	(0.626)	(0.011)	(0.177)	(0.016)
N	246	713	60	91	186	622
adj. R^2	0.080	0.145	0.215	0.013	0.063	0.148

4.7. Impact of brokerage reputation and institutional investor ownership

4.7.1. Brokerage reputation

We use the CSRC rating of brokerages as of July 14, 2010 to classify the brokerage reputation level. The rating levels in descending order are AAA, AA, A, BBB, BB, B, CCC, CC, C, D, and E. These ratings are the outcome from a committee of representatives of CSRC, brokerage, mutual fund regulator, and security trade associations. The rating is primarily based on risk management, brokerage asset level, revenue, and compliance of a brokerage. The ratings are for the internal use of CSRC in regulatory procedures. CSRC considers AAA–C rated brokerages to be normal with AAA being the highest level of risk management and scale. D and E rated brokerages have either inadequate risk management or already under CSRC receivership. Among 98 brokerages, 12 are classified as AA level, which is the second highest among all eleven possible rating levels. We consider these 12 AA-rated brokerages as having a high reputation. The high vs. other reputation results for the base model (Eq. (1)) are presented in Table 9. Consistent with H2, we find that the coefficient associated with *AR(0)* is −0.470 and is significant at the 5% level for the other reputation brokerage and star analyst subsample (Model 4). The same coefficients in the other models are not significant.

4.7.2. Institutional ownership

We present the results of the impact of institutional ownership in Table 10. The descriptive statistics are partitioned into a full sample and star and non-star analyst subsamples in Panel A. The statistics show that some firms constitute as much as nearly 70% institutional shareholders (*INIHold*). The mean and median are 9.97% and 5.83%, respectively, for the full sample. When comparing star and non-star subsamples, both the mean and median for the star subsample are less than those of the non-star subsample.

The regression results in Panel B of Table 10 mirror those in Table 9. We use the median value of institutional ownership to split the sample into high vs. low institutional ownership within the full sample and star and non-star analyst subsamples. We find a negative and 5% significant coefficient associated with *AR(0)* only for the low institutional ownership and star-analyst subsamples in Model (4). The same coefficients in the other models are not significant. The results in Tables 9 and 10 support H2.

4.8. Robustness checks and additional analyses

We conduct a number of robustness checks and additional analyses on our base findings in Table 3, and we present the results in Table 11. For brevity, Panels A–E of Table 11 contain only the key explanatory variables.

4.8.1. Different methods for calculating the matched portfolio to measure abnormal short selling

Abnormal short selling levels change when we use alternative measures of normal short selling. We use two alternative measures of normal short selling to obtain robust results. The first measure uses the market value of outstanding shares to calculate the market capitalization and market-to-book ratio of the shortable stock in forming the matched portfolio. The second measure uses the median value from the daily short selling level of downgraded stocks for the preceding 1-year period as the normal short selling level.

Table 10
The impact of institutional ownership.

We present the results for the impact of institution ownership Table 10. The descriptive statistics are partitioned into full sample, star and non-star analyst sub-samples in Panel A. Panel B reports the regression results. We use the median value of institutional ownership to split the sample into high vs. low institutional ownership within full sample, star and non-star analyst sub-samples. P-values are in the parentheses. *, **, and *** indicate 10%, 5%, and 1% significance, respectively.

Panel A: descriptive statistics

Variable (%)	N	Mean	Median	Standard deviation	Minimum	Q1	Q3	Maximum
INIHold	959	9.972	5.830	13.061	0.113	3.200	10.220	69.598
INIHold_Star	151	9.372	5.690	11.611	0.130	2.970	10.170	68.960
INIHold_Nonstar	808	10.084	5.925	13.318	0.113	3.255	10.220	69.598

Panel B: regression analysis

	Full sample		Star analyst sub-sample		Non-star analyst sub-sample	
	High institutional ownership (1)	Low institutional ownership (2)	High institutional ownership (3)	Low institutional ownership (4)	High institutional ownership (5)	Low institutional ownership (6)
AR(0)	−0.054	0.150	−0.141	−1.732**	−0.245	0.409
	(0.873)	(0.272)	(0.646)	(0.028)	(0.522)	(0.133)
CAR(−10, −1)	0.129***	0.366*	−0.322	0.416	0.212***	0.310*
	(0.006)	(0.051)	(0.329)	(0.277)	(0.000)	(0.058)
MOM	0.083*	0.025	0.068	0.095	0.088	0.006
	(0.095)	(0.290)	(0.615)	(0.203)	(0.163)	(0.726)
LnP_0	−0.002	0.011	−0.003	0.023	−0.010	0.014
	(0.906)	(0.479)	(0.933)	(0.457)	(0.700)	(0.361)
Industry dummy	Control	Control	Control	Control	Control	Control
Year dummy	Control	Control	Control	Control	Control	Control
Intercept	−0.063	−0.073	0.043	−0.077	−0.035	−0.082
	(0.132)	(0.104)	(0.797)	(0.568)	(0.540)	(0.101)
N	478	481	75	76	404	404
adj. R^2	0.121	0.130	0.388	0.083	0.110	0.125

Panel A presents the new results using the two alternative measures of abnormal short selling. Similar to Table 3, we find only the star analyst sub-sample has statistically significant coefficients for *AR(0)* in Models (2) and (5).

4.8.2. Using market return to calculate abnormal return

We follow Christophe et al. (2010) and calculate abnormal returns using the matched portfolio approach. Some literature uses actual returns minus market returns as abnormal returns. Hence, we use the Shanghai and Shenzhen Stock Exchange composite index and the value-weighted A-share return as the market returns to calculate the values of *AR(0), CAR(−10, −1),* and *MOM* variables. The alternative results in Panel B of Table 11 exhibit findings similar to those in Table 3.

4.8.3. Using different windows to calculate abnormal short selling and cumulative abnormal returns

Different event windows may impact the results. Hence, we use alternative windows of (−10, −8), (−7, −5), and (−4, −1) in calculating abnormal short selling and cumulative abnormal returns. The results of different combinations of *ABSS(−10, 8), ABSS(−7, 5)*, and *ABSS(−4, −1)* and *CAR(−10, 8), CAR(−7, 5),* and *CAR(−4, 1)* are presented in Panel C of Table 11. Again, we find that only coefficients associated with *AR(0)* are negative and significant at the 1%, 5%, or 10% levels for the star analyst subsamples in Models (4)–(6).

4.8.4. Using the extent of announcement day drop to replace announcement day return

The method used to measure downgrade announcement returns may also change the results. Hence, we construct a dummy variable, *BigDownDummy*, to capture a large decrease in the downgrade recommendation. *BigDownDummy* has a value of 1 if the downgrade is two or more levels and zero otherwise.

In addition, we use the actual recommendation level change, *RECchange*, to capture the extent of the analyst downgrade. For instance, if an analyst changes from “neutral” to “strong sell,” the change is 2 (5–3). Hence, the modified Eq. (1) becomes

Table 11
Robustness check on the relation between abnormal short selling and downgrade announcement return.

Table 11 Panels A–E report the results from a variety of robustness check on our based results in Table 4. For brevity, Panels A–E contain only the key explanatory variables. Panel A uses two different methods to calculate abnormal short selling. They are: (a) using the total number of outstanding shares to calculate market capitalization and book-to-market ratio of a stock in the matching portfolio; and (b) using the median value from daily short selling level during the year as the normal short selling level. Panel B uses two different market returns to calculate announcement day abnormal return. They are: (a) Shanghai and Shenzhen 300 market index; and (b) value weighted market index from all A-share stocks. Panel C uses different windows to calculate abnormal short selling and cumulative abnormal returns before downgrade announcement. They are: (−10, −8), (−7, −5), and (−4, −1). Panel D uses alternative measures of downgrade announcement return; where *BigDownDummy* is a dummy variable with a value of one if the downgrade is two or more levels and it is zero otherwise; and *RECchange* is the actual recommendation level change. Panel E incorporates star analyst ranking into Eq. (1). We assign a value of "1"–"5" for top ranked star analyst to fifth ranked star analyst, respectively, and called the variable *StarRank*. For easy interpretation, we use −1**StarRank*. We then modified Eq. (1) as follows to capture the impact of highly ranked star analysts: $ABSS(-10,\ -1)=\gamma_0+\gamma_1*AR(0)+\gamma_2*AR(0)*(-StarRank)+\gamma_3*(-StarRank)+\gamma_4*CAR(-10,\ -1)+\gamma_5*MOM+\gamma_6*LnP_0+\mu$; P-values are in the parentheses. *, **, and *** indicate 10%, 5%, and 1% significant, respectively.

Panel A: using a different matched portfolio in calculating abnormal short selling

	Using the total number of outstanding shares to calculate market capitalization and book-to-market ratio of a stock in the matching portfolio			Using the median value from daily short selling level of the downgraded stocks during the year as the normal short selling level		
	(1) Full sample	(2) Star analyst sub-sample	(3) Non-star analyst sub-sample	(4) Full sample	(5) Star analyst sub-sample	(6) Non-star analyst sub-sample
AR(0)	−0.052	−0.403**	−0.014	−0.025	−0.195**	−0.006
	(0.791)	(0.021)	(0.939)	(0.497)	(0.045)	(0.828)
CAR(−10, −1)	0.236***	−0.107	0.300***	0.188***	0.153	0.199***
	(0.005)	(0.575)	(0.007)	(0.000)	(0.204)	(0.003)
other variables	...	...	...	...	...	...
N	959	151	808	959	151	808
adj. R^2	0.125	0.107	0.120	0.063	0.043	0.058

Panel B: using market return to calculate announcement day abnormal return

	Using Shanghai and Shenzhen 300 market index			Using value weighted market index from all A-share stocks		
	(1) Full sample	(2) Star analyst sub-sample	(3) Non-star analyst sub-sample	(4) Full sample	(5) Star analyst sub-sample	(6) Non-star analyst sub-sample
AR(0)	−0.076	−0.445**	−0.057	−0.108	−0.495**	−0.091
	(0.635)	(0.037)	(0.722)	(0.521)	(0.025)	(0.585)
CAR(−10, −1)	0.201**	0.008	0.240*	0.203**	−0.024	0.244*
	(0.028)	(0.958)	(0.058)	(0.032)	(0.891)	(0.064)
other variables	...	...	...	...	...	...
N	959	151	808	959	151	808
adj. R^2	0.128	0.167	0.114	0.128	0.168	0.114

Panel C: using different windows to calculate abnormal short selling and cumulative abnormal returns

	Full sample			Star analyst sub-sample			Non-star analyst sub-sample		
	(1) *ABSS(−10, −8)*	(2) *ABSS(−7, −5)*	(3) *ABSS(−4, −1)*	(4) *ABSS(−10, −8)*	(5) *ABSS(−7, −5)*	(6) *ABSS(−4, −1)*	(7) *ABSS(−10, −8)*	(8) *ABSS(−7, −5)*	(9) *ABSS(−4, −1)*
AR(0)	−0.072	−0.029	0.046	−0.796**	−0.505*	−0.550***	−0.029	0.020	0.072
	(0.469)	(0.891)	(0.868)	(0.032)	(0.078)	(0.000)	(0.831)	(0.908)	(0.778)
CAR(−10, −8)	0.529***			−0.418			0.623***		
	(0.001)			(0.211)			(0.003)		
CAR(−7, −5)		1.226***			0.301			1.429***	
		(0.001)			(0.185)			(0.002)	
CAR(−4, −1)			0.132			0.293			0.039
			(0.344)			(0.598)			(0.814)
other variable	...	...	...	...	...	...	...	...	...
N	959	959	959	151	151	151	808	808	808
adj. R^2	0.134	0.142	0.100	0.212	0.170	0.123	0.123	0.152	0.083

Panel D: using alternative measures of downgrade announcement return

	(1) Full sample	(2) Star analyst sub-sample	(3) Non-star analyst sub-sample	(4) Full sample	(5) Star analyst sub-sample	(6) Non-star analyst sub-sample
BigDownDummy	0.002	0.062*	−0.005			
	(0.808)	(0.063)	(0.663)			
RECchange				0.007	0.079***	−0.002
				(0.444)	(0.005)	(0.857)
CAR(−10, −1)	0.235***	−0.083	0.302***	0.233***	−0.099	0.301***
	(0.003)	(0.658)	(0.001)	(0.003)	(0.592)	(0.001)
Other variables	...	...	...	...	...	...
N	959	151	808	959	151	808
adj. R^2	0.124	0.123	0.120	0.125	0.153	0.120

Panel E: the impact of highly ranked star analysts

	Dependent variable=*ABSS(−10, −1)*	
	estimated coefficients	p-value
AR(0)	−2.297**	0.024
AR(0)×(-StarRank)	−0.552*	0.058
-StarRank	−0.015**	0.037
CAR(−10, −1)	−0.145	0.374
Other variables	...	...
N	151	
adj. R^2	0.2100	

$$ABSS(-10,-1)_i = \beta_0 + \beta_1 * BigDownDummy_i \ (or\ RECchange_i) + \beta_2 * CAR(-10,-1)_i + \beta_3 * MOM_i + \beta_4 * Ln(P_0)_i + \delta_i, \quad (2)$$

where δ is a random error term and other variables are defined as above. β_1 should be positive for the star analyst subsample if H1 is valid. The findings in Panel D of Table 11 show that the estimated β_1 is positive and significant for the star analyst subsample only. The results in Panel D are similar to those in Table 3.

4.8.5. Incorporating star analyst ranking

The New Fortune magazine selects the top five analysts in each industry each year. If star analysts can move the market with their downgrades, we expect the higher-ranked star analysts to have a greater impact. We assign values of "1" for top-ranked star analysts to "5" for fifth-ranked star analysts and call the variable *StarRank*. For easy interpretation, we use −1**StarRank*. We then modify Eq. (1) as follows to capture the impact of high-ranked star analysts:

$$ABSS(-10,-1)_i = \gamma_0 + \gamma_1 * AR(0)_i + \gamma_2 * AR(0)_i * (-StarRank)_i + \gamma_3 * (-StarRank)_i + \gamma_4 * CAR(-10,-1)_i + \gamma_5 * MOM_i + \gamma_6 * Ln(P_0)_i + \mu_i, \quad (3)$$

where μ is a random error term. According to H1, we expect that γ_1 is negative and significant. If the star analyst is influential, then γ_2 and γ_3 will be negative and significant. The results for Eq. (3) are presented in Panel E of Table 11. As expected, the γ_1–γ_3 estimates are negative and significant at the 5% or 10% levels for the star analyst subsample. Hence, the findings corroborate our base results in Table 3. Overall, the findings in Panels A–E of Table 11 are qualitatively the same as those in Table 3. Our base results are robust to alternative measures of variables and different event windows.

5. Summary

We examine short seller informed trading in China. Specifically, we study short selling prior to analyst downgrades in a sample of Chinese stocks. We do not find abnormal short selling in the days before downgrade announcements in the full sample, which appears to be consistent with short seller speculative trading. After we partition the full sample with respect to star and non-star analyst subsamples, we report significant abnormal short selling in the ten-day period preceding downgrade announcements in the star analyst subsample, suggesting informed trading by short sellers. In addition, we find that short sellers engage in less short selling when star analysts incorrectly upgrade a stock, suggesting short sellers do not know more than star analysts. Together with the timing of short sellers' abnormal short selling, the evidence is consistent with the conjecture that star analysts leak their research to some short sellers before they make their downgrade public. Our results are robust to several measures of abnormal short selling, abnormal returns, event windows, star analysts' impact, and endogeneity. In the highly opaque investing environment of China, star analyst downgrades receive more attention than those from non-star analysts. Further, we document that brokerage reputation and

institutional investor ownership can mitigate the relation between star analyst downgrades and abnormal short selling.

Our findings have implications for regulators in emerging markets in terms of short seller informed trading and analyst monitoring. For instance, regulators should pay attention to the extent of abnormal short selling levels and closely monitor star analysts to lower the extent of informed trading. In addition, given the limited resources of regulators, they should steer their efforts toward stocks with lower institutional ownership and/or stocks covered by star analysts employed by less reputable brokerages.

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