Volatility and Insider Sales before Earnings Announcements

Yue Hu

The Hong Kong Polytechnic University

16902653r@connect.polyu.hk

This version: Jan 29, 2021

Abstract

I propose to use volatility to infer opportunistic insider sales. I argue that insider sales occurring when volatility is low are suspicious and that these suspicious sales are likely to be driven by insiders' private information for the following reasons. Suppose that insider sales are not driven by their private information. Insiders are expected to behave in the same way as uninformed investors. If uninformed investors sell stocks based on information, they shall acquire information from the market when the price is volatile; if uninformed investors speculate in the market, high volatility offers more opportunities to speculate. I test the argument with insider sales before quarterly earnings announcements in the China A-share market from 2008 to 2018. I find that insider sales that occur when volatility is low are more likely to be followed by ROE decline. This finding suggests that insider sales occurring when volatility is low are more likely to be associated with un-announced negative news. In sum, this paper offers a simple new method that screens out suspicious insider sales for regulators.

Keywords: Insider sale, Opportunism, Volatility, Earnings Announcement, Future ROE

JEL Classification: G14 M41 M48

1. Introduction

Mandatory seasonal earnings announcement provides information to outside investors and reduces the information advantage of insiders.[1] Knowing to-be-announced negative earnings news, insiders may exploit their information advantage and sell stocks. Such suspicion is fair, as prior studies document that insiders sell before firms get into trouble, such as bankruptcy (Seyhun and Bradley 1997) and accounting fraud (Summers and Sweeney 1998).

Unannounced earnings news is privy to insiders. To protect the market's fairness, regulators shall scrutinize insider sales that are likely driven by unannounced negative news. However, it is a non-trivial task to identify these suspicious transactions.[2] Because insiders also sell stocks for benevolent reasons. For example, they would sell to gain liquidity or diversify their portfolios (Ofek and Yermack 2000).

This study proposes a new approach to filter out these suspicious insider sales, to which regulators shall pay attention. I assume that insiders sell for profit. I develop the hypothesis based on the hypothetical scenario that insider sales are not driven by private information. Suppose insider sales are not driven by private information. Then, theoretically, insiders are expected to behave in the same way as uninformed investors. In a competitive market, the orders submitted by informed investors will affect the price. Uninformed investors update their beliefs and make trading decisions by studying the price changes (Grossman and Stiglitz 1980). Thus, if uninformed investors' trade is based on information, they need to acquire information from the market, then they are more likely to trade when volatility is high. It is also possible that uninformed investors do not trade on information; instead, they speculate in the market. If it is the case, high volatility leaves them more chances to speculate (Kumar 2009; Dorn and

[1] Throughout the paper, insiders refer to corporate insiders who hold stocks of the companies they work for.

[2] Suspicious insider sales refer to those are likely to be followed by negative news release, while opportunistic insider sales refer to those are followed by negative news release.

Huberman 2010).

To sum up, for uninformed investors, it appears more reasonable for them to trade when volatility is high. If insiders behave in the same way as uninformed investors, then insiders are expected to sell when volatility is high. In other words, if insiders sell stocks when volatility is low, their sales contradict the claim that they are uninformed when they sell, and therefore are suspicious. As such, I suspect that insider sales occurring when volatility is low are driven by unannounced negative news and hypothesize that low pre-insider-sale volatility signals negative post-sale news.

I test the hypothesis using insider sales before quarterly earnings announcements in China's A-share market, where the legal cost related to insider trading is low (Lian et al. 2011; Huang 2006). In jurisdictions with high legal costs, insiders do not dare to sell shortly before bad news release (Ke et al. 2003). I collect data from CSMAR ("China Stock Market and Accounting Research"). I match insider sales with quarterly earnings announcement dates. If there are multiple insider selling days before an earnings announcement date, I keep the first day in the sample. I calculate pre-sale volatility in a 20-trading-day window before insider sales. I choose the decline of accounting return, ROE, to proxy negative news. The sample consists of 7,045 insider sales in 11 years from 2008 to 2018. I find that when pre-sale volatility goes down, the probability of post-sale ROE decline goes up.

I conduct two sets of tests to validate volatility as an indicator of opportunistic insider sales. The first set of tests examines alternative explanations. The correlation between pre-sale volatility and post-sale ROE decline may be driven by pre-sale return. Prior studies show that insiders purchase stocks when the price goes down (Piotroski and Roulstone 2005; Rozeff and Zaman 1998). Besides, they document an improvement in accounting performance after their purchase (Piotroski and Roulstone 2005), suggesting that insiders' contrarian trading strategies are backed up with their superior information about unannounced earnings news. If contrarian

selling strategies are backed up with superior information, then insiders sell after the price goes up, and ROE increases after insider sales. Meanwhile, there is a mechanical link between pre-sale return and pre-sale volatility.[3] As such, the correlation between pre-sale volatility and post-sale ROE may be driven by pre-sale return. Another possibility is that the correlation between volatility and post-sale ROE is driven by trading volume. Because volatility positively correlates with trading volume (Karpoff 1987), a sudden increase in order flows suggests informed trades (Easley et al. 2002; Kyle 1985), and trading volume is an ex-post proxy of order flow. To account for the potential effects of pre-sale trading volume and pre-sale return, I examine whether pre-sale volatility predicts post-sale ROE decline after controlling for these two factors, respectively. I find that the main result that the probability of post-sale ROE decline is negatively associated with pre-sale volatility still holds. In addition, I find that neither pre-sale trading volume nor pre-sale return suggests whether ROE is going to decline after insider sales.

The second set of tests examines whether pre-sale volatility suggests post-sale negative earnings news, when the existing information set does not suggest so.[4] I restrict the existing information set to the financial statement.[5] To examine whether the pre-sale volatility has incremental power in predicting post-sale negative news, I classify all the observations into two subsamples based on whether the financial statement indicates negative earnings news. First, I partition all the observations into two subsamples based on the change in turnover. An

[3] The mechanical link refers to that price being volatile is equivalent to return being non-zero.

[4]The tests relate to studies discussing the information asymmetry and insider trades in the sense that less predictable post-sale bad news stands for higher information asymmetry between insiders and other investors, when insiders sell. The factors related to high information asymmetry between insiders and outsiders include but do not limit to, R&D expenditure (Aboody and Lev 2000), analyst following and new coverage (Frankel and Li 2004) and high absolute value of abnormal accruals (Aboody et al. 2005). I do not adopt these factors, because in this study, I focus on whether accounting performance is going to be poor, that is, negative change of performance; while these indicators speak to that future performance is of higher uncertainty, without pointing out in which direction that future performance is going to change.

[5] Because the financial statement information is accessible for every individual observation in the sample. Alternative information, like analyst forecast or management forecast, may be inaccessible for some observations in the sample.

increase in turnover predicts future improvements in profitability (Soliman 2008; Fairfield and Yohn 2001). For firms with improvement in turnover, ROE decline is less predictable. Second, I partition all the observations into two subsamples by considering whether there is a sign of upward earnings management. ROE decline is more predictable for firms with upward earnings management. I follow the rationale in Jansen et al. (2002) that upward earnings management causes turnover decrease and profit margin increase to identify firms with potential upward earnings management. The empirical results show that pre-sale volatility predicts post-sale ROE decline when the historical financial statement does not suggest so. This finding validates the usefulness of pre-sale volatility in identifying opportunistic insider sales.

The main analysis shows that when volatility is low, insider sales are more likely to be followed by negative earnings news. If the market also perceives that insider sales occurring when volatility is low are suspicious, then low pre-sale volatility would be associated with a larger price drop when insiders sell. In the additional analysis, I test the excess return on the day when insiders sell. I find that the excess return is lower when pre-sale volatility is low. This finding is consistent with that the market perceives that insider sales occurring when volatility is low are more likely to be followed by negative news.

My study shows a new approach to infer opportunistic insider sales. The new approach is conditional on the information that is observable when insiders sell, and hence can provide timely insights to regulators. The remaining of the paper is developed as follows. Section 2 is the literature review and hypothesis development. Section 3 introduces the empirical setting. Section 4 introduces data source, sample construction and descriptive statistics. Section 5 reports empirical findings. Section 6 is the additional analysis in stock return at the day insiders sell. Section 7 concludes the paper.

2. Literature Review and Hypothesis Development

Prior studies document that insiders sell stocks before unfavorable corporate events,

including bankruptcy (Seyhun and Bradley 1997), accounting fraud (Summers and Sweeney 1998), accounting restatement (Li and Zhang 2006), and future earnings decline (Ke et al. 2003). The findings suggest that insiders who have private information about unannounced negative news may opportunistically sell stocks to avoid future losses. Unannounced news is privy to insiders. To ensure the market's fairness, regulators shall scrutinize insider sales that are likely driven by unannounced negative news. However, it is a non-trivial task for regulators to identify these suspicious insider sales, because insiders also sell stocks for benevolent reasons. For example, insiders who receive more stocks or own more stocks in their portfolio have greater incentive to sell for portfolio diversification purposes (Ofek and Yermack 2000).

Prior studies offer several approaches to identify opportunistic insider sales. One approach is to examine insiders' trading records and find opportunistic insiders. For example, Cohen et al. (2012) identify routine inside traders from insiders' trading records. Specifically, they consider routine insiders as those who trade after receiving bonuses to diversify their portfolios. Because firms usually pay bonuses to their employees in the same calendar month, routine traders are expected to trade in the same calendar month. They classify insiders who trade in the same calendar month as routine traders and find that routine insiders are less opportunistic. In addition, Ali and Hirshleifer (2017) identify opportunistic insiders by focusing on the insiders' past pre-earnings-announcement trades because the benefit of exploiting information before earnings announcement is substantial. Specifically, those insiders who gained higher profit from past pre-earnings announcement trades are more likely to be opportunistic.

Another approach is to examine whether insiders take other actions when they sell. Because if it is the case, insider selling is probably a part of insiders' joint actions and, therefore, may be strategically planned. For example, Karamanou et al. (2017) focus on individuals with insider status in multiple firms. They argue that among insiders who sell stocks of one firm, those who buy stocks of other firms at the same time are more opportunistic than those who do

not.

I assume that insiders sell for profit and develop the hypothesis by considering the hypothetical scenario that insider sales are not driven by private information, which means insiders are uninformed when they sell. I argue that if insiders do not sell on private information, they are expected to behave in the same way as uninformed investors.

If uninformed investors trade based on information, then they shall first acquire information from the market. In a competitive market, the orders submitted by informed investors have information content and affect the price. Uninformed investors study the price to infer the information that informed investors have when the price changes (Grossman and Stiglitz 1980). Therefore, if uninformed investors trade after acquiring information from the market, they are expected to trade when volatility is high. The information acquisition perspective describes a case that uninformed investors study the market, update their beliefs, and then adjust their portfolios. It is also possible that uninformed investors simply speculate in the market. If it is the case, still, high volatility offers them more chance to speculate (Kumar 2009; Dorn and Huberman 2010).

To sum up, regardless of whether uninformed investors trade on information or not, they trade when volatility is high. Thus, if insider trades are not driven by their private information, they are expected to trade when volatility is high. Therefore, I suspect that insider sales occurring when volatility is low are driven by negative news that outside investors have not yet known.[6]

3. Empirical Setting

I test the hypothesis using insider sales before quarterly earnings announcements in

[6] This hypothesis is in a line with the implication of the "difference-in-opinion (DO)" model, which assumes that investors may not conditional on price to update their beliefs about future payoffs of the underlying assets. Banerjee (2011) predicts that in DO models, higher disagreement is accompanied with higher trading volume and lower volatility, implying a negative correlation between volatility and trading volume when investors do not condition on price.

China's A-share market, where the legal cost related to insider trading is low (Lian et al. 2011; Huang 2006). In jurisdictions with high legal costs, insiders do not dare to sell immediately before the bad news release. For example, Ke et al. (2003) find that in the U.S., insiders sell two years ahead of earnings decline and that it is rare that insiders sell two quarters before earnings decline.

3.1 Insider Trading Law and Enforcement in China

Insider trading is regulated in China. Article 47 of the Securities Law prohibits short-swing transactions of stakeholders with privileged information access: "Where a director, supervisor or senior manager of a listed company, or a shareholder who holds 5% or more of the shares of a listed company sells the shares of the company within six months of purchasing such shares, or repurchases the shares within six months of selling such shares, the gains therefrom, if any, shall belong to the company, and the board of directors of the company shall recover such gains."[7]

Besides, the Administrative Rule on Share Changes by Directors and Top Managers of Listed Companies issued by the CSRC ("China Securities Regulatory Commission") in April 2007 further specifies the restrictions on insider trades. Insiders must disclose their transactions within two trading days after the trading day that the transaction occurs through the stock exchange website. This Administrative Rule also sets the blackout period for insider trading before corporate announcements: insiders are not allowed to trade within 30 days before a scheduled company announcement and within ten days before earnings forecast announcements.[8][9]Article 180 of the Criminal Law specifies the criminal liabilities related to

[7] The Security Law (2005 revision) of People's Republic of China (in English) can be accessed via the website of the CSRC via the following link: http://www.csrc.gov.cn/pub/csrc_en/laws/rfdm/statelaws/201205/t20120525_210597.html. The Security Law was revised in 2014. The articles related to insider trading did not change during 2014's revision.

[8] Earnings announcement is one type of scheduled company announcement.

[9] In U.S., firms set blackout periods of insider trading via self-regulation (Bettis et al., 2000).

insider trading: inside traders can be sentenced up to 10 years in prison.[10]

Despite the established laws and regulations, the enforcement is weak. Comparing the enforcement in China with that in Australia, Huang (2006) notes that criminal liabilities are rarely imposed on the offenders and concludes that given the offenses, punishment to insider trading in China is lighter. Lian et al. (2011) document that in the total 57 cases of offenses from 2006 and 2010 as reported by the CSRC, the Shanghai Stock Exchange, and the Shenzhen Stock Exchange, 31 of them only received verbal condemnation. Besides, the investor protection in China is weak (Allen et al. 2005; Piotroski and Wong 2012). Overall, insiders have limited concerns about legal costs when they trade.

3.2 Regulation on Quarterly Earnings Announcement in China

For all the listed firms in China, the fiscal year ends on December 31. Regulators set deadlines, before which listed firms shall disclose financial statements. Per regulation, there are three earnings announcement deadlines in a calendar year t: April 30 for the annual report (Q4) of year t-1 and the first quarter report (Q1) in year t, August 31 for the semi-annual report (Q2) of year t and October 31 for the third quarter report (Q3) of year t (Figure 1). [11] Besides, firms should disclose the annual report of year t-1 no later than the first quarter report of year t. Along with the regulatory blackout period for insider trading, the earnings announcement deadlines leave a limited number of trading days on which insiders can lawfully trade before the firm announces the Q1 report.

[10] The Criminal Law of the People's Republic of China (in English) can be accessed via the following link: http://www.fdi.gov.cn/1800000121_39_2925_0_7.html

[11] Article 20 of the Administrative Measures on Information Disclosure by Listed Companies specifies the deadlines for firms to file seasonal financial statement. The Administrative Measures on Information Disclosure by Listed Companies (in English) can be accessed at the website of the Chinese Securities Investor Protection Fund via the following link: https://www.sipf.com.cn/NewEN/lawsandregulations/otherlawsandregulations/08/5084.shtml.

4. Data Source/Sample Construction/Descriptive Statistics

I download data from CSMAR. The China Listed Firm's Insider Trading Database in CSMAR includes shareholding change records disclosed by the Shanghai Stock Exchange and Shenzhen Stock Exchange. These records cover trades of directors, supervisors, senior executives, and their closely related family members. All of them are considered as insiders in the empirical analysis.

I first identify the trading days with net insider sales. Then, I match these insider selling days with the most subsequent quarterly earnings announcement dates. If an earnings announcement date is matched with multiple insider selling days, I only keep the first selling day in the sample. I define 20 trading days before the insider selling day as the pre-sale window and calculate pre-sale volatility as the average absolute raw return of the stock in the window (Figure 2 illustrates the timeline and the pre-sale window). I also calculate pre-sale return as the average raw return of the stock in the window, and calculate pre-sale volume as the average daily number of shares traded divided by the number of total outstanding shares in the window. To mitigate stock dividends' impact on insider sales, I exclude observations that the number of total outstanding shares changes during the pre-sale window from the sample.

I construct a dummy variable to reflect whether future ROE goes down ($DownROE_q$) as a summary statistic to proxy upcoming bad news as at the point that insider sells. ROE is the accounting return for a firm. Unconditionally, ROE is expected to be persistent across time so that the sign of change in ROE is comparable across firms. To construct ROE decline, I calculate ROEs in the quarterly financial statements that are announced before and after insider sales (ROE_{q-1} and ROE_q, respectively). To test stock price change at the day insiders sell, I calculate the excess return as raw return minus value-weighted market return (*SellingExRet*).

I calculate change in ROE before insider sales ($DROE_{q-1}$) to control for ROE reversal. To calculate change in asset turnover, I calculate quarter-to-quarter growth in sales ($GSal_{q-1}$) and

quarter-to-quarter growth in net operating assets ($GNOA_{q-1}$), the former larger than the latter standing for an increase in turnover. In addition, I calculate quarter-to-quarter growth in total expense ($GExp_{q-1}$). Growth in expenses being lower than growth in sales stands for an increase in profit margin. I winsorize all the variables at top and bottom 1% of the distribution. There are 7,045 observations with no missing information in the sample.

Table 1 reports descriptive statistics. 48% of insider sales are followed by ROE declines. 42% of insider sales are accompanied with the negative excess return on the day transaction occurs. The mean and median of excess return at the insider selling days are positive (1.2% and 0.5%, respectively). The average (median) of quarter-to-quarter sales growth for these firms is 6.4% (0.7%), lower than the average (median) of quarter-to-quarter net operating asset growth that equals 8.1% (4.7%). The average (median) of quarter-to-quarter expense growth is 4.7% (0.4%). The average (median) market capitalization of these firms before insider sales is 6.48 (3.42) billion. The average (median) market-to-book ratio is 3.01(2.34).

Figure 3 shows the number of insider sales by quarter. The frequency of insider sales varies substantially across four quarters. On average, insiders sell about 35 days before firms announce Q1 report, 84 days before firms announce Q2 report, 51 days before firms announce Q3 report and 109 days before firms announce Q4 report. The frequency of insider sells varies across quarter: there are only 440 insider sales before firms announce Q1 report; by contrast, there are 2,544 insider sales before firms announce Q4 report. When assessing whether the finding is robust, I partition the pooled sample into subsamples by year, instead of by year-quarter.

5. Main Analysis

5.1 Pre-sale Volatility and Future ROE decline

First, I partition all the observations into four subgroups based on pre-sale volatility and then tabulate the frequency of ROE decline in each subgroup. Table 2 reports the results. As

Table 2 shows, in the pooled sample, when pre-sale volatility is very low (the 1st column), the frequency of ROE decline is 50%. The frequency of ROE decline goes down monotonically across these four subgroups as pre-sale volatility increases. When pre-sale volatility is very high (the 4th column), the frequency of ROE decline is 43%. The monotonicity holds for 6 out of 11 years in the sample (2010 and from 2014 to 2018).

In the multivariate analysis, I include the change in ROE before insider sales ($DROE_{q-1}$) as a control variable to account for ROE reversal. I estimate Equation 1 to examine the association between pre-sale volatility and the probability of post-sale ROE decline. If my hypothesis holds, then β_1 is expected to be negative.

$$Prob(DownROE_q = 1) = \beta_1 PreVol + \beta_2 DROE_{q-1} + Intercept + \epsilon \quad \text{Equation 1}$$

Table 3 reports the estimation results. For the pooled sample, the coefficient on *PreVol* is significantly lower than zero (-9.38 with standard error equaling 3.11), suggesting that insider sales that occur when volatility is low are more likely to be followed by ROE declines. Besides, the coefficient on change in ROE ($DROE_{q-1}$) is significantly positive, consistent with the mean-reverting property of ROE. I estimate Equation 1 for each year in the sample. As Table 3 shows, the coefficient on *PreVol* is negative in 8 out of 11 years, suggesting that the observation that lower pre-sale volatility is associated with a higher probability of post-sale ROE decline is robust.

5.2 Test on alternative explanations

5.2.1 Test on the alterative explanation based on pre-sale return

The association between pre-sale volatility and post-sale ROE decline may be driven by pre-sale return, for two reasons. First, pre-sale return mechanically relates to pre-sale volatility. Second, pre-sale return predicts post-sale ROE decline. For example, Piotroski and Roulstone (2005) find that insiders purchase stocks after the price goes down, and accounting performance improves after insider purchase. This finding implies that insiders adopt

contrarian buying strategy have superior information. In the context of insider sales, if insiders' contrarian selling strategy is backed up with superior information, then insider sales occurring after the price goes up would be followed by negative news. Meanwhile, several studies document that insiders manipulate earnings to facilitate their trading (Beneish and Vargus 2002; Sawicki and Shrestha 2008; Veenman et al. 2011; Xiao 2015). As such, it is possible that after selling stocks, insiders manipulate earnings downward so that they can buy stocks at a low price in the future. Meanwhile, the downward earnings management could be triggered by poor economic conditions (Elliott and Shaw 1988).[12] Thus, a negative return may trigger insiders to sell stocks out and to manipulate post-sale earnings downward, resulting in a positive association between pre-sale return and post-sale accounting performance.

Accordingly, I estimate Equation 2 to examine whether pre-sale volatility predicts post-sale ROE after controlling for pre-sale return. In Equation 2, $D(PreRet > 0)$ and $D(PreRet < 0)$ are dummy variables that indicate pre-sale return is positive and negative, respectively. If insiders' contrarian selling strategy is backed up with information about future accounting performance, then higher pre-sale return is associated with a higher probability of post-sale ROE decrease. Thus, β_2 is expected to be positive. Suppose a negative pre-sale return triggers insider sales and later downward earnings management. In that case, a lower pre-sale return is associated with a higher probability of post-sale ROE decrease. Thus, β_3 is expected to be negative.

$$Prob\big(DownROE_q = 1\big) = \beta_1 PreVol + \beta_2 PreRet \times D(PreRet > 0) + \beta_3 PreRet \times D(PreRet < 0) + \beta_4 DROE_{q-1} + Intercept + \epsilon \qquad \text{Equation 2.}$$

Table 4 reports the estimation results of Equation 2. As Table 4 shows, β_2 is insignificant, suggesting that the conjecture that insiders' contrarian selling strategy is associated with to-be-

[12] Elliott and Shaw (1988) find that firms write off assets during the sustained economic downturns.

announced bad news lacks empirical support. β_3 is also insignificant, suggesting that in the pooled sample, the conjecture that the negative pre-sale return triggers insider sales and future downward earnings management does not hold either. Besides, the coefficient on *PreVol* is significantly positive, suggesting that the probability of future ROE decline goes up as pre-sale volatility goes down after controlling for pre-sale return. Table 4 also reports the estimation result of Equation 2 for each individual year in the sample. The estimated signs of β_2 and β_3 are consistent with expectations for 6 out of 11 years, suggesting that the link between pre-sale return and the probability of future ROE decline is unclear.

There are three takeaways from Table 4. First, insider sales occurring when volatility is low are more likely to be followed by ROE declines. Second, the correlation between pre-sale volatility and post-sale ROE decline is not driven by pre-sale return. Third, pre-sale return does not provide additional information about the probability of future ROE declines.

5.2.2 Test on the alternative explanation based on pre-sale trading volume

One may also argue that the observed correlation between pre-sale volatility and the post-sale ROE is driven by pre-sale trading volume. This argument is fair from three aspects. First, volatility and trading volumes are positively correlated (Karpoff 1987). Second, a sudden increase in order flow signals informed traders' existence (Kyle 1985; Easley et al. 2002), and trading volume is an ex-post proxy of order flow. Third, the trading volume could also reflect the amount of price information that insiders can acquire from the market, because informed investors' information is impounded into the price via trading. This trading volume argument suggests that insider sales occurring when trading volume is low may be opportunistic. To account for this possibility, I include pre-sale trading volume as a control variable in Equation 3.

$$Prob(DownROE_q = 1) = \beta_1 PreVol + \beta_2 PreVolume + \beta_3 DROE_{q-1} + Intercept + \epsilon$$

Equation 3.

I report the estimation results in Table 5. The estimated coefficient on *PreVolume* is positive but insignificant for the pooled sample; across the 11 individual years during the sample period, the estimated coefficient is positive for 8 years. This finding suggests that low pre-sale trading volume does not signal negative post-sale earnings news. In contrast, the coefficient on *PreVol* is significantly negative. This finding suggests that if insiders sell stocks when volatility is low, then the firms for which they work are more likely to announce negative news after their sales, which is consistent with my suspicion.

Table 5 shows that pre-sale trading volume does not provide any additional insights about the probability of post-sale ROE declines, given pre-sale volatility. The conceptual difference between volatility and trading volumes suggests that the volatility and trading volume could diverge.[13] The result in Table 5 implies that when volatility is low, the high trading volume does not stimulate insiders to sell. This implication is reasonable. First, low volatility discourages insiders from speculating. Second, suppose insiders sell based on information acquired from the market. In that case, the low volatility suggests that the trading volume does not impound much information into the price; therefore, insiders could not adjust their expectations and, consequently, their portfolios.

5.3 Tests on the incremental power of volatility

For pre-sale volatility to be a useful indicator, it shall have power in predicting post-sale negative earnings news when the existing information set does not suggest so. I restrict the existing information set to the financial statement. To examine whether the pre-sale volatility has incremental power in predicting negative post-sale earnings news, I partition all the observations into two subgroups based on whether the financial statement suggests negative earnings news.

[13] Beaver (1968) argues that volatility captures the change of average expectation and that trading volume captures the change of individual investors' expectations.

First, I use change in turnover to partition all the observations. An increase in turnover predicts future profitability improvement (Soliman 2008; Fairfield and Yohn 2001). ROE decline is less predictable when firms have turnover improvements. I partition all the observations into two subgroups. The first subgroup includes 3,100 insider sales that occur after an increase in turnover, and the second subgroup includes 3,945 insider sales that occur after a decline in turnover. I estimate Equation 1 for these two subgroups, respectively. Table 6 Panel A reports the regression results for the first subgroup. The coefficient on *PreVol* is significantly negative (-7.16 with standard error equaling to 4.11). In contrast, as Table 6 Panel B shows, the coefficient of *PreVol* is insignificant for the second subgroup. These findings show that pre-sale volatility is useful in predicting post-sale ROE declines for insider sales after turnover increases.

In addition, I classify all the observations by the potential existence of upward earnings management. For firms with upward earnings management, future ROE decline is much more predictable. To identify firms with potential upward earnings management, I follow the rationale in Jansen et al. (2012) that upward earnings management would cause profit margin increase and turnover decrease. The first subgroup includes 1,663 firms that possibly manage earnings upward before insider sales, and the second subgroup includes all the remaining firms. I estimate Equation 1 for these two subgroups, respectively, and report the results in Table 7. As Table 7 Panel A shows, the coefficient on *PreVol* is insignificant for the pooled sample, suggesting that when post-sale ROE decline is predictable, pre-sale volatility does not provide additional insight about post-sale ROE decline. By contrast, the coefficient on *PreVol* is significantly negative (-8.43 with standard error equaling to 3.60) in Table 7 Panel B, suggesting that pre-sale volatility predicts post-sale ROE decline when the financial statement does not strongly suggest so.

Overall, the findings in Table 6 and 7 show that pre-sale volatility has incremental power

to predict post-sale ROE decline. These findings are consistent with that pre-sale volatility reflects opportunist insider sales are driven by negative news privy to insiders.

6. Additional Analysis of Selling-day Return

The main analysis of earnings announced after insider sales shows that pre-sale volatility reveals opportunistic insider sales. In the additional analysis, I test the excess return on the day that the insider sells. If the market also perceives that insider sales occurring when volatility is low are associated with un-announced negative news, then low pre-sale volatility would be associated with a large price drop on the day that insider sells. I examine whether the correlation between pre-sale volatility and selling-day excess return is positive by estimating Equation 4.

$$SellingExRet = \beta_1 PreVol + \beta_2 MtB + \beta_3 Log(MV) + Intercept + \epsilon \quad \text{Equation 4.}$$

Table 8 reports the estimation results.[14] The coefficient on *PreVol* is significantly positive for the pooled sample. During the sampling period, the coefficient on *PreVol* is positive for 10 out of 11 years. These findings suggest that the market also perceives that low pre-sale volatility means to-be-announced negative earnings news.[15]

It is worth noticing that the price drop at the insider selling day does not necessarily suggest insiders avoid economic losses. There are two possible channels behind the price drop, and given the current research scope, these two channels cannot be distinguished. [16] In the first channel, other investors do not know that they trade against insiders; instead, they sense some sale orders that are possibly submitted by investors with private information, and then they

[14]The coefficients in Table 8 equal the estimated coefficient times 100.

[15]Meulbroek (1992) studies illegal insider trades from SEC and finds that stock price changes at the day that insiders trade, suggesting that the market detects informed insider trades.

[16] Specifically, differentiating between these two channels relies on data about (1) the time that insiders submit their sales order, (2) their ask prices, (3) their sell prices, and (4) the time that the disclosures of their sales are publicly available.

lower purchase price to protect themselves[17]. In the second channel, outside investors learn that insider sales in the market from post-sale disclosure and the stock price goes down when outside investors anticipate that insider sales are followed by poor future performance. If the second channel is the dominating channel, then Table 8 suggests that opportunistic insiders avoid larger losses by selling stocks, equivalent to that they gain from selling.[18]

7. Conclusion

I argue that insider sales occurring when volatility is low are suspicious. Because when volatility is low, there is limited price information that can stimulate insiders to sell, and there is limited space for insiders to speculate. Using insider sales before quarterly earnings announcements in China, I find that insider sales occurring when volatility is low are more likely to be followed by ROE declines. Further tests rule out alternative explanations and validate pre-sale volatility in signaling post-sale ROE decline. These results are consistent with the suspicion that insider sales occurring when volatility is low are likely to be driven by unannounced negative news, suggesting that pre-sale volatility indicates insiders' opportunism when they sell stocks.

Overall, this study proposes a new approach to detect opportunistic insider sales. This new approach can be generally applied to all insider sales, including those made by insiders who do not have historical trading records. Besides, it relies on the information set that is available when sales occur, hence generating timely insights for regulators to screen out suspicious transactions.

This study's limitation is that it narrowly defines opportunistic insider sales as sales that

[17] This explanation is consistent with studies like Copeland and Galai (1983) and Glosten and Milgrom (1985) that propose bid-ask spread as an outcome when market makers make tradeoff between expected loss when trading with informed traders and expected gain when trading with uninformed traders.

[18]The predictable return after insider trades reflects the economic loss that other investors suffer and is interpreted as insider trading profit (Jeng et al. 2003).

are followed by immediate bad news release, without considering the latency between insider sales and bad news release. It would also be interesting to examine whether pre-sale volatility predicts post-sale poor performance with latency. The answer could speak to whether it is worth paying continuous attention to firms of which insiders engage in these suspicious sales. Such exploration would be particularly meaningful in jurisdictions with high legal costs because high legal costs tend to make opportunistic insiders strategically plan their sales on a longer horizon. Future studies can work in this direction and provide insights to local regulators.

References

Aboody, D., J. Hughes, and J. Liu. 2005. Earnings quality, insider trading, and cost of capital. *Journal of accounting research* 43 (5):651-673.

Aboody, D., and B. Lev. 2000. Information asymmetry, R&D, and insider gains. *The Journal of Finance* 55 (6):2747-2766.

Ali, U., and D. Hirshleifer. 2017. Opportunism as a firm and managerial trait: Predicting insider trading profits and misconduct. *Journal of Financial Economics* 126 (3):490-515.

Allen, F., J. Qian, and M. Qian. 2005. Law, finance, and economic growth in China. *Journal of Financial Economics* 77 (1):57-116.

Banerjee, S. 2011. Learning from prices and the dispersion in beliefs. *The Review of Financial Studies* 24 (9):3025-3068.

Beaver, W. H. 1968. The information content of annual earnings announcements. *Journal of accounting research*:67-92.

Beneish, M. D., and M. E. Vargus. 2002. Insider trading, earnings quality, and accrual mispricing. *The Accounting Review* 77 (4):755-791.

Bettis, J. C., J. L. Coles, and M. L. Lemmon. 2000. Corporate policies restricting trading by insiders. *Journal of Financial Economics* 57 (2):191-220.

Cohen, L., C. Malloy, and L. Pomorski. 2012. Decoding inside information. *the Journal of Finance* 67 (3):1009-1043.

Copeland, T. E., and D. Galai. 1983. Information effects on the bid‐ask spread. *The Journal of Finance* 38 (5):1457-1469.

Dorn, D., and G. Huberman. 2010. Preferred risk habitat of individual investors. *Journal of financial economics* 97 (1):155-173.

Easley, D., S. Hvidkjaer, and M. O'hara. 2002. Is information risk a determinant of asset returns? *the Journal of Finance* 57 (5):2185-2221.

Elliott, J. A., and W. H. Shaw. 1988. Write-offs as accounting procedures to manage perceptions. *Journal of accounting research*:91-119.

Fairfield, P. M., and T. L. Yohn. 2001. Using asset turnover and profit margin to forecast changes in profitability. *Review of Accounting Studies* 6 (4):371-385.

Frankel, R., and X. Li. 2004. Characteristics of a firm's information environment and the information asymmetry between insiders and outsiders. *Journal of accounting and economics* 37 (2):229-259.

Glosten, L. R., and P. R. Milgrom. 1985. Bid, ask and transaction prices in a specialist market with heterogeneously informed traders. *Journal of financial economics* 14 (1):71-100.

Grossman, S. J., and J. E. Stiglitz. 1980. On the impossibility of informationally efficient markets. *The American economic review* 70 (3):393-408.

Huang, H. 2006. *International securities markets: insider trading law in China*. Vol. 3: Kluwer Law International BV.

Jansen, I. P., S. Ramnath, and T. L. Yohn. 2012. A diagnostic for earnings management using changes in asset turnover and profit margin. *Contemporary accounting research* 29 (1):221-251.

Karamanou, I., G. Pownall, and R. Prakash. 2017. Inferring Bad News from Insider Sales. *Available at SSRN 2355984*.

Karpoff, J. M. 1987. The relation between price changes and trading volume: A survey. *Journal of Financial and quantitative Analysis*:109-126.

Ke, B., S. Huddart, and K. Petroni. 2003. What insiders know about future earnings and how they use it: Evidence from insider trades. *Journal of Accounting and Economics* 35 (3):315-346.

Kumar, A. 2009. Who gambles in the stock market? *The Journal of Finance* 64 (4):1889-1933.
Kyle, A. S. 1985. Continuous auctions and insider trading. *Econometrica: Journal of the Econometric Society*:1315-1335.
Li, O. Z., and Y. Zhang. 2006. Financial restatement announcements and insider trading. *Available at SSRN 929539*.
Lian, P., K. Wang, and C. Zhang. 2011. An Examination of China's Regulations on Insider Trading of Unlocked Restricted Stocks: Citeseer.
Ofek, E., and D. Yermack. 2000. Taking stock: Equity‐based compensation and the evolution of managerial ownership. *The Journal of Finance* 55 (3):1367-1384.
Piotroski, J. D., and D. T. Roulstone. 2005. Do insider trades reflect both contrarian beliefs and superior knowledge about future cash flow realizations? *Journal of Accounting and Economics* 39 (1):55-81.
Piotroski, J. D., and T. Wong. 2012. Institutions and information environment of Chinese listed firms. In *Capitalizing China*: University of Chicago Press, 201-242.
Rozeff, M. S., and M. A. Zaman. 1998. Overreaction and insider trading: Evidence from growth and value portfolios. *the Journal of Finance* 53 (2):701-716.
Sawicki, J., and K. Shrestha. 2008. Insider trading and earnings management. *Journal of Business Finance & Accounting* 35 (3‐4):331-346.
Seyhun, H. N. 1998. *Investment intelligence from insider trading*: MIT press.
Seyhun, H. N., and M. Bradley. 1997. Corporate bankruptcy and insider trading. *The Journal of Business* 70 (2):189-216.
Soliman, M. T. 2008. The use of DuPont analysis by market participants. *The Accounting Review* 83 (3):823-853.
Summers, S. L., and J. T. Sweeney. 1998. Fraudulently misstated financial statements and insider trading: An empirical analysis. *Accounting Review*:131-146.
Veenman, D., A. Hodgson, B. Van Praag, and W. Zhang. 2011. Decomposing executive stock option exercises: Relative information and incentives to manage earnings. *Journal of Business Finance & Accounting* 38 (5‐6):536-573.
Xiao, G. 2015. Trading and earnings management: Evidence from China's non-tradable share reform. *Journal of Corporate Finance* 31:67-90.

Figure 1. Announcement Deadlines in Calendar Year (t).

Figure 1 lists deadlines for quarterly earnings announcements in a calendar year, Year(t). For all listed firms in China, fiscal year ends at December 31. Listed firms report quarterly report after Q1 or Q3 ends, semi-annual report after Q2 ends and annual report after Q4 ends.

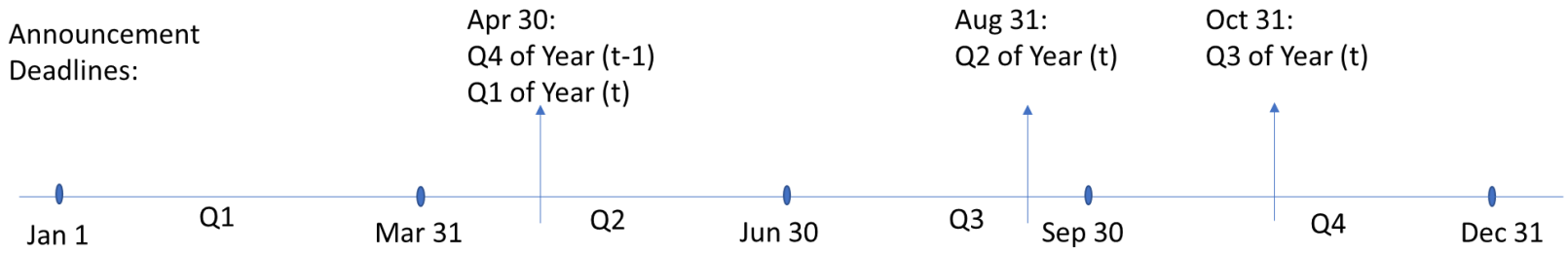


Figure 2. Pre- and post-sale Windows used to calculate return-based measures

Figure 2 shows the pre-sale and post-sale window for each insider-sale observation. Insider sales occur between the announcement of financial report for quarter q-1 and the announcement of financial report for quarter q. If there are more than one insider-selling day before quarterly earnings announcement, $T_{EA(q)}$, I only keep the earliest selling day in the sample. Insider sales occur between the announcement of financial report for quarter q-1 and the announcement of financial report for quarter q.

T_{Trd} : Insider selling day
$T_{EA(q)}$: The day when firms announces report of quarter q

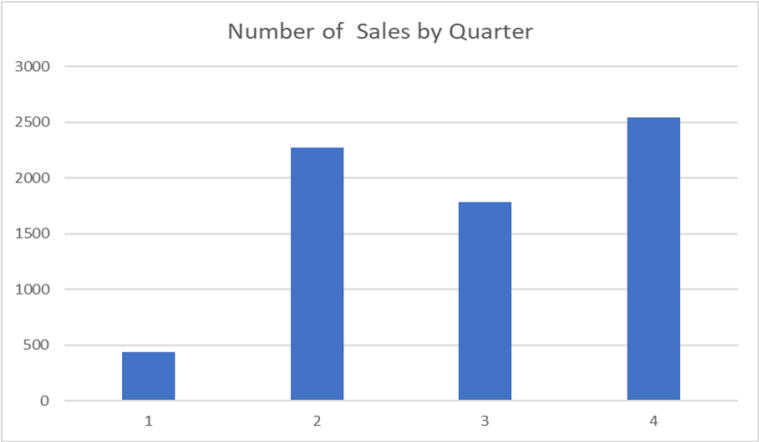
Table 1 Descriptive Statistics

Table 1 reports the descriptive statistics of key variables for the pooled sample. The pooled sample includes 7045 observations from 2008Q1 to 2018Q4. Insider sales occur between the announcement of financial report for quarter q-1 and the announcement of financial report for quarter q. $DownROE_q$ is a dummy variable, which equals one if ROE_q is lower than ROE_{q-1}, and equals zero if otherwise. ROE_q , ROE_{q-1} and ROE_{q-2} are ROEs of quarter q, q-1 and q-2 respectively. $DROE_q$ and $DROE_{q-1}$ are changes in ROE for quarter q and q-1 respectively. *PreVol*, *PreRet* and *PreVolume* are average volatility, return and trading volume in the pre-sale window. *SellingExRet* is excess return at the day when insiders sell, and *NegSellingExRet* is a dummy variable, which equals one if *SellingExRet* is negative and equals zero if otherwise. $GSal_{q-1}$ is the sales growth from quarter q-2 to quarter q-1. $GNOA_{q-1}$ is the growth of net operating assets from quarter q-2 to quarter q-1. $GExp_{q-1}$ is the growth of total expense from quarter q-2 to quarter q-1.*MtB* is the market-to-book ratio before insider sells, and *MV* is the market capitalization before insider sells (in billion RMB). The details about how to calculate variables are in Appendix 1. All the variables are winsorized at top and bottom 1%.

	N	Mean	Std	Q1	Median	Q3
$DownROE_q$	7045	0.48	0.50	0.00	0.00	1.00
ROE_q	7045	2.4%	3.3%	0.8%	2.1%	3.8%
ROE_{q-1}	7045	2.3%	2.7%	0.8%	1.9%	3.4%
ROE_{q-2}	7045	2.3%	3.3%	0.8%	2.1%	3.6%
$DROE_q$	7045	0.1%	3.2%	-1.0%	0.1%	1.2%
$DROE_{q-1}$	7045	0.0%	3.3%	-1.2%	0.0%	1.1%
SellingExRet	7045	1.2%	3.2%	-0.9%	0.5%	2.7%
NegSellingExRet	7045	0.42	0.49	0.00	0.00	1.00
PreVol	7045	2.2%	0.9%	1.6%	2.1%	2.7%
PreRet	7045	0.4%	0.7%	-0.1%	0.3%	0.7%
PreVolume	7045	3.1%	2.6%	1.3%	2.4%	4.2%
$GSal_{q-1}$	7045	6.4%	45.4%	-18.1%	0.7%	21.2%
$GNOA_{q-1}$	7045	8.1%	21.0%	-1.0%	4.7%	12.7%
$GExp_{q-1}$	7045	4.7%	42.4%	-18.9%	0.4%	20.1%
MtB	7045	3.01	2.31	1.45	2.34	3.78
MV	7045	6.48	9.35	1.70	3.42	6.98

Figure 3. Number of Insider Sales before Quarter q's report

Figure 3 shows the number of insider sales in the pooled sample before announcing quarter q's financial report . The pooled sample includes 7045 insider sales from 2008 to 2018.



The number of days between selling day (T_{Trd}) and next earnings announcement $T_{EA(q)}$

	Q1	Q2	Q3	Q4
Mean	34.6	84.4	50.9	109.1
Median	35	89	52	116

Table 2. Univariate Analysis: Pre-Sale Volatility and Future Decline of ROE

Table 2 report the frequencies of firms with ROE declines after insider sales ($DownROE_{q=1}$) in four subgroups partitioned based on pre-sale volatility (*PreVol*): very low/low/high/very high. The first row reports the result for the pooled sample, which including 7045 observations from 2008 to 2018, and the following rows report the results for each individual year in the sample. The details about how to calculate variables are in Appendix 1

Year	Very Low	Low	High	Very High	No. Sales
Pooled	50%	49%	48%	43%	7045
2008	59%	59%	63%	62%	245
2009	48%	38%	45%	43%	499
2010	53%	48%	40%	37%	413
2011	53%	55%	58%	54%	457
2012	42%	48%	49%	40%	563
2013	42%	52%	49%	44%	909
2014	52%	50%	49%	45%	1042
2015	53%	43%	43%	38%	708
2016	56%	53%	44%	44%	887
2017	49%	45%	44%	42%	602
2018	53%	51%	49%	48%	720

Table 3. Multivariate Analysis on the Link between Pre-Sale Volatility and ROE

Table 3 reports the estimation results of Equation 1. When estimating the coefficients for the pooled sample, I control for the fixed effect of year. The robust standard errors are reported in the parentheses. ***, ** and * stands for p-value smaller than 0.01, 0.05 and 0.1 respectively.

$$Prob(DownROE_q = 1) = \beta_1 PreVol + \beta_2 DROE_{q-1} + Intercept + \epsilon \quad \text{Equation 1}$$

PreVol is pre-sale volatility. Insider sales occur between the announcement of accounting report for quarter q and the announcement of accounting report for quarter q-1. $DownROE_q$ is a dummy variable, which equals one of ROE_q is lower than ROE_{q-1} and equals zero if otherwise. $DROE_{q-1}$ is the change in ROE for quarter q-1. Details about how to calculate these variables are in Appendix 1.

	Pooled	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
PreVol	-9.38***	15.11	-9.94	-24.96	1.26	6.09	-2.85	-7.73	-14.93*	-25.23***	-4.80	-3.73
	(3.11)	(14.92)	(12.43)	(15.59)	(16.00)	(12.74)	(9.07)	(9.15)	(7.82)	(7.95)	(10.45)	(8.91)
$DROE_{q-1}$	16.70***	21.49***	10.18***	14.57***	28.45***	17.30***	21.30***	22.66***	16.16***	11.35***	19.50***	15.73***
	(1.19)	(5.16)	(2.60)	(5.18)	(5.39)	(4.37)	(4.02)	(3.73)	(3.29)	(2.99)	(4.12)	(3.68)
Intercept		0.03	-0.06	0.32	0.18	-0.30	-0.07	0.08	0.35	0.43***	-0.14	0.10
		(0.53)	(0.32)	(0.38)	(0.33)	(0.26)	(0.22)	(0.18)	(0.27)	(0.16)	(0.21)	(0.21)
N	7,045	245	499	413	457	563	909	1,042	708	887	602	720
Pseudo R2	4.48%	6.87%	2.94%	4.35%	8.19%	3.98%	4.60%	4.69%	5.14%	3.11%	4.31%	3.44%
Log Likelihood	-4658	-152.8	-331.8	-271.5	-288.6	-371.9	-599.3	-688.1	-461.2	-595.6	-396.4	-481.9

Table 4. Controlling for Pre-Sale Return about future ROE

Table 4 reports the estimation results of Equation 2. When estimating the coefficients for the pooled sample, I control for the fixed effect of year. The robust standard errors are reported in the parentheses. ***, ** and * stands for p-value smaller than 0.01, 0.05 and 0.1 respectively.

$$Prob(DownROE_q = 1) = \beta_1 PreVol + \beta_2 PreRet \times D(PreRet > 0) + \beta_3 PreRet \times D(PreRet < 0) + \beta_4 DROE_{q-1} + Intercept + \epsilon \qquad \text{Equation 2}$$

Insider sales occur between the announcement of accounting report for quarter q and the announcement of accounting report for quarter q-1. $DownROE_q$ is a dummy variable, which equals one of ROE_q is lower than ROE_{q-1} and equals zero if otherwise. *PreVol* is pre-sale volatility. *PreRet* is pre-sale return. *D(PreRet>0)* is a dummy variable, which equals to one if *PreRet* is positive and zero if otherwise. *D(PreRet<0)* is a dummy variable, which equals to one if *PreRet* is negative and zero if otherwise. $DROE_{q-1}$ is the change in ROE for quarter q-1. The details about how to calculate these variables are in Appendix 1.

	Pooled	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
PreVol	-10.71***	11.36	-5.83	-19.68	27.18	1.35	-2.01	-12.08	-27.36***	-23.22**	-3.84	-8.07
	(3.66)	(15.23)	(14.53)	(17.48)	(18.11)	(15.12)	(10.63)	(11.65)	(9.99)	(9.89)	(14.51)	(10.28)
PreRet×D(PreRet>0)	2.12	-30.71	-27.91	69.84	67.53*	-91.39**	27.51	70.42*	-56.17	12.41	14.02	-16.66
	(11.13)	(36.68)	(62.85)	(46.75)	(36.41)	(44.96)	(40.50)	(42.20)	(35.69)	(36.31)	(34.73)	(27.82)
PreRet×D(PreRet<0)	4.50	25.38	-16.58	-15.95	-94.93***	21.46	-3.49	16.60	27.97**	-7.05	-3.19	16.72
	(6.01)	(24.55)	(20.67)	(24.37)	(34.98)	(25.74)	(17.14)	(18.14)	(13.67)	(19.79)	(28.37)	(20.13)
$DROE_{q-1}$	16.67***	21.40***	10.21***	14.66***	29.07***	17.63***	21.30***	21.89***	16.23***	11.34***	19.39***	15.64***
	(1.19)	(5.21)	(2.59)	(5.22)	(5.37)	(4.42)	(4.01)	(3.69)	(3.32)	(2.99)	(4.15)	(3.66)
Intercept		-0.09	-0.07	0.33	0.10	-0.38	-0.05	0.14	0.46*	0.42**	-0.13	0.11
		(0.54)	(0.33)	(0.38)	(0.33)	(0.27)	(0.22)	(0.19)	(0.27)	(0.17)	(0.22)	(0.21)
N	7,045	245	499	413	457	563	909	1,042	708	887	602	720
Pseudo R2	4.49%	7.21%	3.15%	4.66%	9.48%	4.53%	4.63%	5.15%	5.61%	3.13%	4.33%	3.51%
Log Likelihood	-4658	-152.2	-331.1	-270.6	-284.6	-369.8	-599.1	-684.8	-458.9	-595.5	-396.4	-481.5

Table 5. Controlling for the Potential Implication of Pre-Sale Trading Volume about future ROE

Table 5 reports the estimation results of Equation 2. Panel A reports the estimation results when I use ranked *PreVol* and ranked *PreVolume* as independent variables. Specifically, I rank *PreVol* and *PreVolume* from 0 to 3 for the pooled sample and for each individual year. Panel B reports the estimation results when I use the level of *PreVol* and the level of *PreVolume* as independent variables. When estimating the coefficients for the pooled sample, I control for the fixed effect of year. The robust standard errors are reported in the parentheses. ***, ** and * stands for p-value smaller than 0.01, 0.05 and 0.1 respectively.

$$Prob(DownROE_q = 1) = \beta_1 PreVol + \beta_2 PreVolume + \beta_3 DROE_{q-1} + Intercept + \epsilon \qquad \text{Equation 3}$$

PreVol is pre-sale volatility. *PreVolume* is pre-sale volatility. Insider sales occur between the announcement of accounting report for quarter q and the announcement of accounting report for quarter q-1. $DownROE_q$ is a dummy variable, which equals one of ROE_q is lower than ROE_{q-1} and equals zero if otherwise. $DROE_{q-1}$ is the change in ROE for quarter q-1. The details about how to calculate these variables are in Appendix 1.

	Pooled	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
PreVol	-12.84***	21.23	-15.58	-29.89*	-14.72	9.18	-10.82	-10.84	-17.04**	-33.93***	-36.25**	16.74
	(3.78)	(16.36)	(14.20)	(17.84)	(21.63)	(17.23)	(11.19)	(10.58)	(8.20)	(11.27)	(16.06)	(11.93)
PreVolume	1.94	-5.97	3.28	2.91	6.28	-1.34	3.70	2.07	2.79	4.30	12.82***	-9.86***
	(1.20)	(5.84)	(4.05)	(5.05)	(5.83)	(4.81)	(3.16)	(3.61)	(3.15)	(3.72)	(4.88)	(3.75)
$DROE_{q-1}$	16.68***	21.75***	10.20***	14.46***	28.62***	17.34***	21.49***	22.62***	16.18***	11.15***	19.34***	15.56***
	(1.19)	(5.19)	(2.61)	(5.19)	(5.41)	(4.38)	(4.06)	(3.72)	(3.31)	(2.96)	(4.21)	(3.67)
Intercept		-0.02	-0.06	0.33	0.35	-0.33	-0.01	0.08	0.29	0.45***	0.08	-0.10
		(0.53)	(0.32)	(0.38)	(0.36)	(0.28)	(0.22)	(0.18)	(0.28)	(0.17)	(0.22)	(0.22)
N	7,045	245	499	413	457	563	909	1,042	708	887	602	720
Pseudo R2	4.51%	7.15%	3.04%	4.41%	8.38%	3.99%	4.70%	4.71%	5.22%	3.23%	5.15%	4.11%
Log Likelihood	-4657	-152.3	-331.5	-271.3	-288	-371.9	-598.6	-687.9	-460.8	-594.8	-392.9	-478.6

Table 6. Conditional on Change in Turnover

Table 6 reports the estimation results of Equation 1. Panel A reports the estimation results for the subgroup with an increase in turnover at quarter q-1($GSal_{q-1}>GNOA_{q-1}$). Panel B reports the estimation results for the subgroup with a decrease in turnover at quarter q-1($GSal_{q-1}<GNOA_{q-1}$). When estimating the coefficients for the pooled sample, I control for the fixed effect of year. The robust standard errors are reported in the parentheses. ***, ** and * stands for p-value smaller than 0.01, 0.05 and 0.1 respectively.

$$Prob(DownROE_q = 1) = \beta_1 PreVol + \beta_2 DROE_{q-1} + Intercept + \epsilon \qquad \text{Equation 1}$$

Insider sales occur between the announcement of accounting report for quarter q and the announcement of accounting report for quarter q-1. $DownROE_q$ is a dummy variable, which equals to one of ROE_q is lower than ROE_{q-1} and equals to zero if otherwise. *PreVol* is pre-sale volatility. $DROE_{q-1}$ is the change in ROE for quarter q-1.

Panel A. Subsample of firms with an increase in turnover

	Pooled	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
PreVol	-7.16*	-25.12	-16.46	-28.68	-18.89	8.36	1.26	-1.66	3.21	-19.38	-13.18	-18.59
	(4.11)	(25.58)	(18.67)	(19.40)	(23.59)	(19.71)	(13.60)	(13.00)	(12.91)	(11.89)	(16.73)	(14.71)
DROE	17.00***	25.84***	18.40***	13.48	38.02***	28.90***	18.94***	23.39***	18.90***	2.87	14.46**	17.59***
	(2.23)	(8.23)	(6.09)	(8.89)	(12.57)	(5.99)	(7.14)	(5.63)	(6.77)	(3.91)	(6.89)	(6.33)
Intercept		1.23	0.14	0.51	0.62	-0.25	0.04	0.06	0.09	0.81***	0.17	0.72**
		(0.90)	(0.48)	(0.47)	(0.53)	(0.42)	(0.33)	(0.27)	(0.43)	(0.24)	(0.32)	(0.35)
N	3,100	103	231	220	205	230	386	505	225	394	306	295
Pseudo R2	3.13%	8.66%	5.79%	3.65%	9.14%	7.33%	2.60%	3.64%	4.80%	0.58%	1.76%	3.47%
Log Likelihood	-2054	-61.43	-150.8	-146.9	-121.3	-147.2	-257.7	-334	-145.6	-259.8	-208.2	-189.1

Panel B. Subsample of firms with a decrease in turnover

	Pooled	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
PreVol	-2.48	34.70*	-6.55	-17.40	14.22	2.65	-7.04	-13.41	-25.70**	-19.76*	1.64	5.46
	(3.46)	(19.23)	(16.38)	(26.10)	(20.36)	(16.96)	(12.23)	(12.95)	(10.47)	(11.17)	(13.22)	(11.20)
DROE	12.77***	21.89***	5.90**	13.85**	21.35***	9.07*	18.26***	18.95***	11.64***	12.17***	19.62***	9.54**
	(1.35)	(7.38)	(2.78)	(5.94)	(5.92)	(4.98)	(4.92)	(5.13)	(3.66)	(3.41)	(5.13)	(4.20)
Intercept		-0.59	-0.25	0.02	-0.19	-0.42	-0.13	0.07	0.50	0.00	-0.39	-0.37
		(0.68)	(0.43)	(0.63)	(0.42)	(0.34)	(0.29)	(0.26)	(0.35)	(0.24)	(0.27)	(0.27)
N	3,945	103	231	220	205	230	386	505	225	394	306	295
Pseudo R2	2.62%	7.26%	1.27%	3.92%	5.29%	1.24%	3.69%	3.56%	3.72%	3.01%	5.21%	1.38%
Log Likelihood	-2599	-89.39	-177.6	-123.9	-165.2	-220	-338.5	-352.5	-308.6	-319.2	-186.6	-285

Table 7. Conditional on Upward Earnings Management

Table 7 reports the estimation results of Equation 1. Panel A reports the estimation results for the subgroup of firms that are likely to have potential upward earnings management. Panel B reports the estimation results for the subgroup of the other firms. I assess whether firms are likely to have potential upward earnings management based on the rationale in Jansen et al. (2012) that upward earnings management would increase profit margin ($GSal_{q-1}>GExp_{q-1}$) and decrease asset turnover ($GSal_{q-1}>GNOA_{q-1}$). When estimating the coefficients for the pooled sample, I control for the fixed effect of year. The robust standard errors are reported in the parentheses. ***, ** and * stands for p-value smaller than 0.01, 0.05 and 0.1 respectively.

$$Prob(DownROE_q = 1) = \beta_1 PreVol + \beta_2 DROE_{q-1} + Intercept + \epsilon \qquad \text{Equation 1}$$

Insider sales occur between the announcement of accounting report for quarter q and the announcement of accounting report for quarter q-1. $DownROE_q$ is a dummy variable, which equals to one of ROE_q is lower than ROE_{q-1} and equals to zero if otherwise. *PreVol* is pre-sale volatility. $DROE_{q-1}$ is the change in ROE for quarter q-1.

Panel A. Subsample of firms with potential upward earnings management

	Pooled	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
PreVol	-8.69	46.28	-3.64	31.00	13.94	19.20	-2.55	-38.65*	-16.02	-22.62	-23.43	8.73
	(6.18)	(31.81)	(24.17)	(39.26)	(36.27)	(29.63)	(18.28)	(20.45)	(14.93)	(15.11)	(20.77)	(17.90)
DROE	8.17***	28.49**	1.64	11.02	20.92**	2.92	12.74**	13.53**	9.25*	7.91*	10.35*	5.77
	(1.77)	(12.12)	(3.55)	(8.91)	(9.93)	(6.35)	(6.44)	(6.89)	(5.57)	(4.50)	(5.45)	(6.22)
Intercept		-0.85	-0.03	-0.85	-0.22	-0.59	-0.11	0.89**	0.43	0.28	0.33	-0.17
		(1.16)	(0.62)	(1.00)	(0.69)	(0.57)	(0.42)	(0.41)	(0.52)	(0.33)	(0.42)	(0.41)
N	1,663	59	136	83	102	126	219	217	201	215	131	174
Pseudo R2	1.92%	8.32%	0.12%	3.03%	4.28%	0.39%	1.93%	2.60%	1.59%	1.72%	2.77%	0.62%
Log Likelihood	-1130	-32.48	-94.03	-55.78	-67.20	-86.22	-148.8	-144.6	-137.1	-146.3	-88.28	-119.8

Panel B. Subsample of firms with potential upward earnings management

	Pooled	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
PreVol	-8.43**	2.84	-9.88	-36.95**	-3.70	1.60	-2.75	1.25	-14.22	-24.19**	3.37	-5.69
	(3.60)	(17.70)	(14.37)	(17.45)	(18.07)	(14.39)	(10.39)	(10.23)	(9.20)	(9.45)	(11.86)	(10.37)
DROE	20.11***	19.35***	16.98***	15.38**	31.43***	23.99***	24.56***	24.43***	18.39***	13.18***	23.34***	18.99***
	(1.53)	(5.61)	(4.04)	(6.48)	(6.41)	(4.61)	(4.77)	(4.29)	(4.23)	(4.11)	(5.30)	(4.60)
Intercept		0.35	-0.07	0.57	0.36	-0.14	-0.04	-0.13	0.35	0.45**	-0.30	0.18
		(0.62)	(0.37)	(0.41)	(0.38)	(0.30)	(0.25)	(0.21)	(0.31)	(0.19)	(0.23)	(0.24)
N	5,382	186	363	330	355	437	690	825	507	672	471	546
Pseudo R2	5.73%	6.09%	5.62%	5.12%	9.79%	6.52%	5.74%	5.28%	6.48%	3.77%	5.06%	4.84%
Log Likelihood	-3507	-119.1	-233.2	-214	-220.2	-281.2	-448.9	-539.9	-323.2	-448.2	-306.2	-360.1

Table 8. Pre-sale Volatility and Excess Return at the Days when Sales Occur

Table 8 reports the estimation results of Equation 6. When estimating the coefficients for the pooled sample, I control for the fixed effect of year. The coefficients on Table 7 equal the estimated coefficients times 100. The robust standard errors are reported in the parentheses. ***, ** and * stands for p-value smaller than 0.01, 0.05 and 0.1 respectively.

$$SellingExRet = \beta_1 PreVol + \beta_2 MtB + \beta_3 Log(MV) + Intercept + \epsilon \quad \text{Equation 4}$$

Insider sales occur between the announcement of accounting report for quarter q and the announcement of accounting report for quarter q-1. *SellingExRet* is excess return at the day when insiders sell. *PreVol* is pre-sale volatility. *MtB* is the market-to-book ratio before insider sales, and *Log(MV)* is the log of market capitalization before insider sales. The details about how to calculate these variables are in Appendix 1.

	Pooled	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
PreVol	31.36***	22.30	21.73	2.32	19.48	66.69***	-6.82	10.38	42.54***	28.77**	87.05***	36.66**
	(5.61)	(27.87)	(21.03)	(26.82)	(23.51)	(23.28)	(15.49)	(16.39)	(14.63)	(14.07)	(18.70)	(16.53)
MtB	0.02	-0.00	-0.05	0.05	0.18***	0.00	-0.11	0.04	0.01	-0.05	0.14*	0.02
	(0.02)	(0.17)	(0.08)	(0.06)	(0.05)	(0.07)	(0.07)	(0.05)	(0.06)	(0.05)	(0.08)	(0.06)
Log(MV)	-0.06	-0.33	0.04	-0.00	-0.20*	-0.03	0.07	-0.03	0.17	-0.30**	-0.09	-0.08
	(0.04)	(0.28)	(0.15)	(0.16)	(0.12)	(0.12)	(0.14)	(0.12)	(0.18)	(0.13)	(0.13)	(0.11)
Intercept		7.93	0.14	1.13	4.51*	0.51	0.38	1.39	-3.57	7.36**	1.02	1.54
		(6.26)	(3.32)	(3.40)	(2.68)	(2.54)	(2.92)	(2.49)	(4.20)	(3.01)	(3.02)	(2.52)
N	7,045	245	499	413	457	563	909	1,042	708	887	602	720
R-squared	0.01	0.01	0.00	0.00	0.02	0.02	0.00	0.00	0.01	0.02	0.07	0.01

Appendix 1. Variable Definition

For insider sales occur between the announcement of financial report for quarter q-1 and the announcement of financial report for quarter q, the definition and calculation of related variables are as follows:

Variable	Definition
$DownROE_q$	Dummy variable, which equals one if ROE_q is lower than $ROE_{q-1,}$ and equals zero if otherwise.
ROE_q	ROE of quarter q. It equals net income of quarter q divided by the average total asset of quarter q, which equals average of the ending balance of total assets for quarter q and the ending balance of total assets for quarter q-1.
ROE_{q-1}	ROE of quarter q-1. It equals net income of quarter q-1 divided by the average total asset of quarter q-1, which equals average of the ending balance of total assets for quarter q-1 and the ending balance of total assets for quarter q-2.
ROE_{q-2}	ROE of quarter q-2. It equals net income of quarter q-2 divided by the average total asset of quarter q-2, which equals average of the ending balance of total assets for quarter q-2 and the ending balance of total assets for quarter q-3.
$DROE_q$	Change in ROE for quarter q. It equals ROE_q minus ROE_{q-1}
$DROE_{q-1}$	Change in ROE for quarter q-1. It equals ROE_{q-1} minus ROE_{q-2}
PreVol	Pre-sale volatility. It equals the average of the absolute return in the pre-sale window.
PreRet	Pre-sale return. It equals the average of the raw return in the pre-sale window.
PreVolume	Pre-sale trading volume. It equals the average of the number shares traded divided by the number of shares outstanding in the pre-sale window.
SellingExRet	Excess return at the day when insiders sell. It equals the raw return minus the market return.
NegSellingExRet	Dummy variable. It equals one if *SellingExRet* is negative, and zero if otherwise.
$GSal_{q-1}$	Quarter-to-quarter growth in sales for quarter q-1.
$GNOA_{q-1}$	Quarter-to-quarter growth in net operating asset for quarter q-1. Net operating assets equal to operating assets minus operating liabilities, with operating assets equaling total assets minus cash minus held-for-trading investments and operating liabilities equaling total liabilities minus long term debt and the short-term portion of long-term debt.
$GExp_{q-1}$	Quarter-to-quarter growth in total expenses for quarter q-1. Total expenses equal to revenue minus net income.
MtB	Market-to-book ratio before insider sells. It equals to the opening price of the stock at the insider selling day times the number of outstanding shares divided by book value of equity for quarter q-1.

MV	Market capitalization before insider sells (in billion RMB). It equals to the opening price of the stock at insider selling day times the number of outstanding shares.