

The Information Content of Sudden Insider Silence*

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Abstract

This paper explores the information content of insider sudden silence. We show that routine-based insiders strategically choose to be silent when they possess private information not yet reflected in stock prices. Consistent with our hypothesis, insider silence following routine sell (buy) predict positive (negative) future abnormal return as well as earnings surprise. The return predictability of insider silence is stronger among firms with worse information environment and facing higher arbitrage costs, suggesting that investors underweight the information in insider silence. We also find that insider silence forecasts future firm fundamentals (e.g., ROA, cash flows, analyst revision) and sophisticated investors trade in the direction predicted by the information of insider silence in the following quarter. A long-short portfolio that exploits insiders' strategic silence behavior generates abnormal returns up to 10.4% annually.

Keywords: Insider Silence, Information Content, Underreaction, Return Predictability

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1 Introduction

The trades of corporate insiders¹ are among the most widely scrutinized activities in the stock market. Regulators, investment managers, media members, and academics continually parse these trades for signs of illicit behavior, and for signals about a company’s future prospects. This is because corporate insiders, by definition, know more about the internal operations and future prospects of the firm, and one would thus expect they have superior access to private information that outsiders do not have.

Previous literature on the information content of insider trades mostly focuses on their purchasing and selling transactions (Jaffe (1974); Seyhun (1988); Lakonishok and Lee (2001); Piotroski and Roulstone (2005); Cohen et al. (2012), etc.). This paper, however, takes a different perspective by investigating the information content of insider’s strategic silence - their sudden “no trade” behaviors. Insiders trade for multiple reasons. When their trades are driven by non-information reasons such as liquidity or diversification motives, their submitted trades are more likely to be routine-based, i.e., occur in the same month each year, to signal to outsiders that they are not trading on private information about the firm. Specifically, we hypothesize that when an insider who previously sell routinely on the same calendar month each year, but suddenly stopped doing so, her sudden silence following consecutive sell may signal some good news arising. This is because an insider who possesses good news about her firm has incentive to postpone her planned selling until the good news has been disclosed to the public. Similarly, the sudden silence following insiders’ consecutive purchase could convey bad information as the insider who routinely buy have incentive to purchase the firm’s shares later at a lower price when the bad news has already been incorporated into the stock price. Comparing with buying (selling) the stocks when the insiders possess good (bad) information, being silent offers them the opportunity to take advantage of their private information, and at the same being exempt from raising suspicion among the regulators. While Securities and Exchange Act of 1934 prohibits agents from trading securities when in possession of material nonpublic information², SEC rule 10b-5

¹Corporate insiders are officers with decision-making authority over the operations of the company, all members of the board directors, and beneficial owners of more than 10% of company’s stocks.

²There is some evidence showing that insiders appear to avoid trade before forthcoming news events

explicitly states that "there can be no liability for insider trading under Rule 10b-5 without an actual securities transaction".

Our empirical strategy for identifying insider sudden silence is simple and intuitive. Following Cohen et al. (2012), for each insider, we analyze his/her past trading history and look for consistent patterns in the timing of buy or sell. Specifically, if the insider sells in the same calendar month in two consecutive years in the past, we then look into his/her third year same month trades. If in this month, the insider continues to sell, then we group the insider's third year trade into "SSS" group. If the insider does not trade on this month, then we group the insider month into "SSN" group. Similarly, we define "PPP" and "PPN" for insiders that purchase on the same month in the previous two consecutive years, and continue to purchase or stop trading in the same month of the third year. Finally, we aggregate the insider-level silence measure to firm level by defining a firm-month dummy SSN (PPN) equal to 1 when at least one insider at this firm-month has a SSN (PPN) equal to 1 and 0 otherwise³.

Having grouped the insider-firm-month trades based on their past two year same month trading history and the current month trading (or no trading), we then proceed to examine the information content of the sudden silence measure. As corporate insiders are involved in daily operations of their firms, the information they possess is more likely related to firm fundamentals. As such, the insider sudden silence following routine sell may signal improving firm fundamentals, which is reflected in firm's rising earnings and cash flows. Similarly, silence following routine purchase could indicate deteriorating firm fundamentals. Using return on assets (ROA) and operating cash flow (scaled by lagged total assets) as proxy for firm profitability, we find evidence supporting this hypothesis. A firm experiences 0.37% to 0.65% improvement in its quarterly ROA following insider silence SSN. PPN also predicts decreases in firm's future ROA and cash flow, although the economic magnitude is smaller and only significant in some specifications.

After establishing that routine insider's sudden silence behavior is motivated by their

(Givoly and Palmon (1985)), takeover announcements (Seyhun (1992)), management forecasts of earnings (Noe (1999)), and earnings announcements (Park et al. (1995)).

³In our sample, there are only 414 firm-month observations with both SSN and PPN equal to 1. Setting these firm-months to either 0 or 1 doesn't affect our results.

private information related to firm fundamentals, we then examine whether market underreacts to the valuable information embedded in insider silence. We use Fama and MacBeth (1973) regression to show that, consistent with our hypothesis, insider silence following consecutive sells (buys) predicts future positive (negative) abnormal return up to 12 months. In the case of three-month ahead cumulative returns, if the stock falls into the SSN group, it predicts the coming three months cumulative return being 0.83% ($t=3.28$) higher. The coefficients on SSN increases almost monotonically with forecasting horizons, suggesting that the information contained in insider silence (SSN) is not short-lived and didn't get incorporated into stock prices in a timely fashion. The predictability of sudden silence following consecutive purchase (PPN) is weaker than that of SSN, and is significant only over the 3 months horizons using the full sample. A calendar-time portfolio strategy that long stocks that have SSN in the previous three month⁴ and short stocks that have PPN in the previous three month yields a value-weighted monthly Carhart (1997) four factor alpha of 56 basis points ($t=2.13$).⁵

We then proceed to examine what type of firm-specific information those insiders are withholding. Since it is typically unlikely for insiders to trade on a short term basis due to the "Short Swing" rule,⁶ we expect it is more likely for managers to be strategically silent for one of the most important news events of the firm – earnings announcements. Elliott et al. (1984), Ke et al. (2003) and Piotroski and Roulstone (2005) show that insiders do have superior knowledge about future earnings performance. We find that insider's sudden silence following consecutive sell predicts 0.22% ($t=2.72$) more positive 3-day earnings announcement cumulative abnormal return in the following quarter. The sudden silence following insider routine purchase, on the other hand, predicts a negative earnings announcement CAR of -0.05% ($t=-0.58$). The results support our hypothesis that routine insiders strategically choose to become silent to take advantage of their superior information about firms'

⁴We tried different versions by varying the holding window from 1 month to 12 month, and the results are qualitatively similar.

⁵We focus on common stocks that are listed on NYSE/Amex/NASDAQ, and we exclude those stocks that have price less than 1 dollar. We also try other versions of excluding stocks that have price less than 5, or market capitalization less than the NYSE bottom decile, the results are similar. Hence, our results are not driven by the small stocks.

⁶The "Short swing" rule of the 1934 Security Exchange Act enforces insiders to return any profit that is made from making round trading within 6 months to the firm.

future cash flow realizations.

Our finding that insider silence predicts future abnormal returns implies that investors fail to fully incorporate information embedded in the timing and pattern of routine insiders' trades in a timely fashion. If the return predictability of insider silence is truly driven by market underreacting to less salient signal, we would expect the return predictability to be stronger among firms with worse information environment. Indeed, we find that the return predictability of insider silence is more pronounced among firms with fewer analyst coverage and lower institutional ownership. We also find that the return predictability is stronger for firms that are more difficult to arbitrage, using firm size and idiosyncratic volatility as proxy for arbitrage costs. This suggests that frictions to arbitrage prevent arbitrageurs from incorporating the information of insider silence into stock prices efficiently.

Our paper hypothesizes that when facing private information, some routine insiders will choose to be silent instead of trading explicitly on the information for fear of litigation risks associated with insider trading. If this is true, increasing litigation risks should lead to more routine insiders being silent when possessing private information, and the information content of insider silence should be stronger. Using the passage of Sarbanes-Oxley Act in August 2002 as an exogenous shock to litigation risks associated with insider trading, we find evidence supporting our hypothesis. The predictability of insider silence for future firm profitability and returns increases significantly in the post-SOX period, with the effect being more pronounced for insider silence following routine purchases.

We also conduct several tests to examine how long insiders delay their previous routine trade, and how sophisticated investors and analysts respond to the insider silence signal. Our strategic silence hypothesis argues that insiders, who previously trade on a routine basis, may suddenly choose not to trade if they possess some private information of the firm. If this is indeed the case, we should see that the direction of insider's next trade following insider's sudden silence is consistent with the direction of previous routine trades, given that they do not permanently cancel their previous routine trade. Consistent with the hypothesis, we find 47.63% (47.23%) insiders delay their trades with same direction (cancel their trades).⁷ There are only 5.15% of insiders who execute an opposite direction of trades

⁷We define "cancel" as those insiders who do not trade for the subsequent 24 months following their

to their previous routine trades following the sudden silence. Importantly, the abnormal return following insider silence is concentrated in the period from insiders' sudden silence to their next trade, rather than the period from their next trade to 24 months after their sudden silence month. On the other hand, we are also interested in the question of whether other investors or agents in the financial markets are aware of this type of information embedded in insider silence. Indeed, we find hedge funds, who are among the most sophisticated investors in financial markets, increase their long positions by 0.035% ($t=2.50$) in the quarter after the insider sudden silence following consecutive sells. And security analysts also revise up their earnings forecast for firms with pending good news contained in SSN.

The predictive power of our insider sudden silence measure is robust to several alternative tests. Specifically, we examine the robustness of our main results from four perspectives. First, the subsample test using the data from 1997 to 2013 shows that the predictability of insider sudden silence is not driven by the small sample in the early years. Second, controlling for the existing insider-related predictors such as the opportunistic trades in Cohen et al. (2012), and the net insider demand in Lakonishok and Lee (2001), our results still retain. Third, we exclude the possibility that our silence measure is capturing the effect of known public mispricing signals, by controlling for the five anomaly variables studied in Fama and French (2008). Finally, we consider several alternative ways in the construction of our silence measure, and the results still hold.

This paper builds on the methodology developed by Cohen et al. (2012) in classifying insiders into routine and opportunistic based groups. The focus of their paper is to compare the information content contained in the routine and opportunistic insiders' trades. Doing so, they omit a large fraction of the information as conveyed through the inconsistency of insiders' trades. For example, if an insider continues to sell a firm's stock in March for the year 1998, year 1999, and year 2000, then based on Cohen et al. (2012)'s definition, this insider will be classified as a routine trader, and all her subsequent trades will be treated as uninformative. However, suppose this routine insider did not sell any stocks in March of 2001, then this sudden silence behavior following previous consecutive selling might signal arrival of good news in March 2001, so that she wants to postpone the planned sale until the sudden silence. Defining "cancel" using 12 months or 36 months generate similar results.

good news is released. Such information is not included in their sample, as by definition their research focuses on the trades submitted by insiders instead of their "no trade" behavior.

Our paper is also related to Jagolinzer (2009), who examines whether insiders trade strategically under SEC rule 10b5-1. This rule, enacted in October 2000, allows insider to prespecify the timing and amount of her trades when she does not possess material nonpublic information. Jagolinzer (2009) finds insiders tend to initiate sales plan before pending negative disclosures and terminate sales plan early when possessing pending positive news. Different from Jagolinzer (2009), we identify routine insider based on her actual trading history rather than relying on these trading plans. Moreover, our evidence in this paper pre-dates the existence of these plans, so our results are not driven by trades in these plans.

Gao et al. (2015) also look at the information content of insider silence, but their focus is quite different from ours. Their focus is on the information content of unconditional insider silence, as driven by the fear of litigation risk, while ours is on the sudden silence following insider consecutive trades. Besides, our insider silence measure, depending on the previous trading direction of the insiders, could contain both positive and negative news of the firm, while the insider silence in Gao et al. (2015) conveys only bad news. From a more practical perspective, our long-short strategy generates a value-weighted abnormal return of 0.56% per month, which is much larger than the 0.14% silence-sell spread monthly abnormal return as documented in Gao et al. (2015). As is also admitted by the authors, the main objective of their paper is to point out that insider silence is a more negative signal than insider selling, rather than developing a profitable trading strategy based on it.

This paper contributes to the insider trading literature by documenting the information content of insiders' sudden silence. The existing literature mostly focuses on the information content of insider purchase and sell, and very few papers investigate the absence of it – insider silence. We show in this paper that even routine insiders trade strategically. When they expect good news is on the way, they would postpone or cancel their routine sell. Similarly when they expect bad news is approaching, they would also delay or cancel their routine purchase.

Additionally, this paper relates to the growing evidence that prices underreact to low saliency signals (e.g., DellaVigna and Pollet (2007), Cohen and Frazzini (2008), Hirshleifer et al. (2013), Giglio and Shue (2014)). In the context of Mergers & Acquisitions, Giglio and Shue (2014) find investors underreact to the information about deal completion probability contained in the passage of time. This paper suggests that investors may underweight the information contained in the timing and patterns of insiders' routine trades.

This paper is also similar in spirit to several papers in accounting literature documenting the information contained in the timing of release of earnings report (Penman (1984), Chambers and Penman (1984), Bagnoli et al. (2002)). These papers find earnings announced later (early) than expected tend to convey bad (good) news. As with this paper, investors seem to not fully understand the implication of late reporters and price drift downward even after the actual earnings are announced.

The remainder of the paper is organized as follows. Section 2 of the paper briefly reviews the literature and develops our main hypotheses. Section 3 describes our data and presents summary statistics. Section 4 of this paper presents the main empirical results on the predictability of insider sudden silence for firm profitability and future returns, and the effect of firms' information environment and limits to arbitrage on insider silence predictability. We also examine the passage of Sarbanes-Oxley Act on the informativeness of insider silence. Section 5 conducts robustness checks on our main results. In Section 6, we conduct some additional analysis by examining what insiders do after their sudden silence and how sophisticated investors and analysts react to the signal in insider silence. Finally, Section 7 concludes the paper.

2 Literature and Hypothesis Development

2.1 Related Literature

Insiders are privy to private information. A large number of studies examine whether insiders' buy and sell transactions have any cross-sectional as well as time series forecasting ability for future stock returns (Lorie and Niederhoffer (1968), Jaffe (1974), Seyhun (1986),

Seyhun (1988), Rozeff and Zaman (1988), Lin and Howe (1990), Lakonishok and Lee (2001))⁸. The early studies usually don't differentiate among different types of insiders and examine the predictive power by aggregating insider trades at the firm level. The literature, in general, agrees that corporate insiders are informed and their trades contain information about future firm value, especially for insider purchases. For example, Jeng et al. (2003) take a performance-evaluation perspective and find that insider purchases earn abnormal returns of more than 6% per year, while insider sales do not earn significant abnormal returns. Lakonishok and Lee (2001) conduct a comprehensive analysis of insider trading both on cross sectional and aggregate stock return, and find insider purchases predict positive future stock return, while their selling transactions have weak or no predicative power.

More recently, researchers have started to take a more micro-level perspective on the informativeness of insider trading by examining the characteristics and trading behavior of individual insiders. Scott and Xu (2004), for example, argue that we could isolate information-driven insiders by conditioning on those insiders who trade a large fraction out of her total ownership in the firm. Cohen et al. (2012) developed a novel approach to tease out the informative insider trades based on the insider's previous trading history. They argue that insiders trade for multiple reasons and for those that trade on a routine basis—say trade on the same month for the previous consecutive three years—are more likely to trade for non-information reasons such as diversification and liquidity needs. Based on the past insider trading history, they classify all insiders into two groups: routine and opportunistic traders, and they find only opportunistic insider's trades predict future stock return. Ali and Hirshleifer (2016) identify opportunistic insiders based on the profitability of trades prior to quarterly earnings announcement and find these opportunistic trading is associated with various kinds of firm/managerial misconduct. Kelly (2014) find that insider sale at a loss relative to her reference price is a much more negative signal about future returns than a sale of stock at a gain. Since selling a stock at a loss is more painful due to the burst of utility, an insider who sells at a loss must have particularly negative information about future firm value.

⁸There is also a large literature examining whether allowing for insider trading is beneficial or harmful to the financial market. See Bhattacharya (2014) for an excellent review on this topic.

While the bulk of the insider trading literature focuses on the information content of insiders' transactions, a few papers exploit whether insider silence are also informative about future stock value. Marin and Olivier (2008) find that insider selling at the remote past and insider silence at the recent past predict stock market crashes. Their explanation is that the lack of insider selling reduces the informational content of prices and an increase in the risk premium required by uninformed investors, and hence lead to a crash. Gao et al. (2015) argue that insiders would not trade when possessing extremely bad news due to litigation risk concerns. Specifically, they find that insider buy minus silence spread is larger than the buy minus sell spread, and such pattern is stronger in firms with high litigation risks and poor information environment. To sum, though the literature has made tremendous progress in identifying the information content of insider trading, there still remains large room in investigating the information content of insider trades, especially the insider sell and silence⁹.

2.2 Hypothesis

Motivated by Cohen et al. (2012), this paper focuses on the information content of insiders' strategic silence behavior. Insiders trade for multiple reasons. When they trade for liquidity or diversification motives, or trade routinely just to signal that they do not have private information, their trades are more likely to occur on the same month of each year. We hypothesize that when these routine insiders suddenly stopped trading on a regular basis, one should expect their sudden silence contains certain information. Moreover, we could discern the information content based on the direction of insiders' previous routine trades. Suppose an insider sells her firm stocks in March for year 1998 and year 1999, but suddenly, this routine insider did not sell any stocks in March of 2000, then this sudden silence behavior following previous consecutive sell might signal some arrival of good news in March 2000, which makes her to cancel or postpone the planned sale until the good news is reflected in stock prices. Similarly, for a sudden silence after consecutive purchases, one might expect it

⁹A recent paper by Alldredge and Cicero (2015) find that some profitable insider selling is motivated by insiders' attentiveness to public information along the customer-supplier chain rather than genuine private information.

is some pending negative information that drives the insider to delay or cancel her routine purchases. Such information is not included in Cohen et al. (2012)'s classification, and is also quite different from the unconditional insider silence in Gao et al. (2015), which only contains bad news.

Even if the sudden silence of routine insiders contain value-relevant information about the firm, it may not necessarily predict future returns as long as investors could figure out the information content of insider sudden silence immediately. There are good reasons to believe that investors may fail to unravel this information quickly, however. Griffin and Tversky (1992) argues that investors tend to underreact to low salience signals. On the empirical sides, mounting evidence suggests that market underweight value-relevant information that are less salient, such as demographic-induced demand shocks for certain industries (DellaVigna and Pollet (2007)), corporate earnings announced on Friday (DellaVigna and Pollet (2007)), news about economically-linked firms (Cohen and Frazzini (2008)) and firms' predictable innovation ability (Hirshleifer et al. (2013); Cohen et al. (2013)). Silence or no news is, by definition, a less visible signal, and hence may well be ignored by investors in making forecast on firm value.

Based on the above reasoning, we propose the following two hypotheses:

Hypothesis 1: Insider silence following consecutive sell predict positive firm profitability and returns, while silence following consecutive purchase should predict negative firm profitability and returns in the future.

Hypothesis 2: The return predictability of insider silence should be more pronounced among the firms with poor information environment, when investors' attention is low and when arbitrage is more costly.

3 Data and Summary Statistics

Our sample is based on all NYSE/Amex/NASDAQ common stocks (share code 10 or 11), covered in CRSP/Compustat merged database from January 1988 to December 2013. The insider trading data is from Thomson Reuters Insider Filing Data Feed, where only

open-market transactions are considered.¹⁰ The Securities and Exchange Commission (SEC) mandates that all officers and directors, large shareholders (those who own 10% or more of the outstanding shares), and affiliated shareholders report their transactions to the SEC by the 10th of the month following the transactions (prior to August 2002) or within two business days (since August 2002). Our sample starts from 1988 because we need two years of consecutive same month trades to define sudden silence. We also do a subsample analysis based on the sample period from 1997 to get rid of the concern that in the early years, we have relatively small number of observations of insider silence. To make sure our results are not driven by microstructure-related issues, we exclude those stocks whose month end price is below \$1.¹¹ We also exclude those stocks with negative book value. The accounting variables and earnings announcement data is obtained from Compustat. Analyst forecast and recommendation data is from I/B/E/S and data on institutional holdings is from Thompson Reuters Financial.

Our empirical strategy for identifying insider sudden silence is simple and intuitive. Following Cohen et al. (2012), for each insider, we analyze his/her past trading history and look for consistent patterns in the timing of buy or sell.¹² Specifically, if the insider sells in the same month for the previous consecutive two years, we then look into his/her third year same month trades. If in this month, the insider continues to sell, then we group the insider's third year trade into "SSS" group. If the insider does not trade on this month, then we group it into "SSN" group. Similarly, we define "PPP" and "PPN" for insiders that purchase on the same month in the previous consecutive two years, and continue to purchase or stop trading in the same month of the third year.¹³ For example, if the insider K sold stock A on January 2000, January 2001, but did not trade on January 2002, then insider K and stock A will be grouped into SSN=1 category for month January 2002. Our method-

¹⁰We exclude records with cleanse code of "S" or "A". Open market purchases and sales are those with tranocode of "P" or "S". Following Sias and Whidbee (2010), private transactions with tranocode "K" and "J" prior to April, 1991 are taken as public transactions.

¹¹We tried various versions of excluding the small stocks, for example, excluding those with PRC_{i5} , or market capitalization less than the NYSE 10th percentile breakpoint, the results are similar.

¹²We consider all corporate insiders in our main empirical analyses. The result is similar if we only include officers and directors as corporate insiders.

¹³51% of SSN and 44% of PPN are from officers and directors. CEO comprises 14.8% and 16.3% of SSN and PPN, respectively.

ology is different from Cohen et al. (2012) mainly in two ways. First, we also condition on the sign of the trade in the definition of consecutive two year trades, while their definition of routine insider does not. For example, if insider K sell on March 2001 and then buy on March 2002, it will not be defined as consecutive trades in our case, but will be considered as consecutive trades in Cohen et al. (2012)'s version. Secondly, we focus on the no trade month, while theirs focus only on the trades of those insiders after they have been grouped into routine or opportunistic group. After defining the silence measure (SSN and PPN) at individual insider level, we aggregate the insider level measure to firm level by defining a firm-month dummy SSN (PPN) equal to 1 when at least one insider at this firm-month has a SSN (PPN) equal to 1 and 0 otherwise.¹⁴

Requiring the insider to buy or sell on the same month for consecutive two years results in a sample consisting of 15.38% of total insider transactions. Conditioning on the insiders consecutive same month sell, 66.93% of them stopped sell in the same month of the coming year, which is 26.95% of total consecutive trades observations. Conditioning on the insiders consecutive same month purchase, 66.02% of them suddenly stopped buying in the same month of the coming year, which is 36.05% of total consecutive trades observations. Notice here that we are not arguing that all insider sudden silence contains private information, as insiders could stop trading for many reasons. Instead, we are only arguing that part of these sudden silence behavior should be driven by information reasons.¹⁵

Table 1 shows the summary statistics of our whole sample. Among all the stocks, PPN and SSN accounts for 0.63% and 1.73% of the whole universe, respectively. The $\ln size$ and $\ln bm$ is the natural log of market capitalization and Book-to-Market ratio. In our whole sample from 1988 to 2013, the firms on average have $\ln bm$ value of -0.63. The $resid_{i,t}$ is the residual institutional ownership orthogonalized with respect to firm size, and $analyst_{i,t}$ is the number of analysts following the firm in the last fiscal year. On average, in our sample each firm has 9.1 analysts following it. Table 2 shows the number of SSN, PPN, SSS, PPP

¹⁴For insider sales, 74.2% of observations have only one insider becoming silent following routine selling within a firm-month. 81.1% of observations have only one insider becoming silent following routine purchasing within a firm-month.

¹⁵Insiders could stop selling when they no longer have any stock positions in the firm. However, we verified in our sample that the median insiders have 66,865 shares in the firm before their silence month, which is more than 4 times of the median insider trade size.

observations each year, together with the the percentage of sudden silence purchases and sells observations over total same month consecutive trades in the year. We can see that the number of observations is relatively small in the early years, but dramatically increase and then stabilize starting from 1997. Hence, in our robustness tests, we also include a version using the sample period from 1997 to 2013 only.

4 Empirical Results

In this section we examine the information content of insider silence by looking at its predictability for future firm fundamentals and stock returns. We also examine whether predictability varies with firms' information environment and the degree of limits to arbitrage as predicted by behavioral finance theories. Finally, we use the passage of Sarbanes-Oxley Act as an exogenous shock to litigation risk associated with insider trading and test whether the informativeness of insider silence become stronger after the passage of SOX.

4.1 Insider silence and firm fundamentals

Our hypothesis predicts that routine insiders choose to be silent for information-related reasons. As corporate insiders are involved in daily operations of their firms, the information they possess is more likely related to firm fundamentals. As such, insider silence following routine sell may signal improving firm fundamentals, which is reflected in firm's rising earnings and cash flows. Similarly, silence following routine purchase could indicate deteriorating firm fundamentals. In this section, we test our hypothesis by examining the predictability of insider silence for future firm profitability.

We conduct our test using the following regression specification:

$$Prof_{i,t+1} = a + bSSN_{i,t} + cPPN_{i,t} + dX_{i,t} + \epsilon_{i,t} \quad (1)$$

where we regress firm i 's profitability in quarter $t + 1$ ($Prof_{i,t+1}$) on the insider silence dummy SSN and PPN in quarter t , controlling for other predictors of profitability. We use both the return on assets (ROA) and operating cash flow (scaled by lagged total assets) as

proxy for profitability. SSN (PPN) is a dummy variable equal to one if the firm has any insider who sells (purchases) consecutively on the same calendar month for the previous two years, but did not trade on the same month this year. We aggregate SSN and PPN to firm-quarter level to align with the dependent variable, which is measured at quarterly frequency. Following Fama and French (2006) and Hou et al. (2012), we include lagged profitability from previous quarter and 4 quarters ago, the level of accrual in the previous fiscal year (Accrual), asset growth, a dummy indicating negative earnings (Negroe), dividends (scaled by total assets) (Div) and a non dividend-paying dummy (Ndiv). We also control for industry and/or quarter fixed effect in some specifications, where industry is defined at 2 digit SIC code level. Standard errors are double clustered at firm and quarter dimensions, following Petersen (2009).

The result is reported in Table 3. Consistent with our hypothesis, insider sudden silence indeed predicts firm profitability. Panel A presents the result when the dependent variable is return on assets. The coefficient on SSN is 0.0037 ($t=4.08$) in column (1). It means in the quarter following insider silence SSN, the firm experiences 0.37% improvement in its quarterly ROA. Similarly, the coefficient on PPN is negative, with a magnitude smaller than that of SSN. In column (2) and (3), we add industry and quarter fixed effect. The positive coefficient on SSN is not affected and actually increases to 0.0065 ($t=7.10$). The economic magnitude is also quite large. The mean and standard deviation of ROA in our sample is -0.16% and 5.2%. A firm experiences 0.65% improvement in its ROA in the quarter following insider silence SSN, which is about 12.5% of sample standard deviation. The coefficient on PPN, however, lose its power in predicting ROA with more stringent fixed effect controls. In panel B, we replace the ROA with the operating cash flow measure. Cash flow is more difficult to manipulate by managers, thus may reflect firm's underlying profitability better than ROA¹⁶. The coefficient on SSN in this case is about 0.015, and significant at 1% level under all specifications. On the other hand, the coefficient on PPN is negative but not significant, suggesting that the information contained in insider silence PPN is much noisier compared to SSN. As we will discuss later on, the asymmetry between SSN and PPN is

¹⁶Using cash flow based profitability measure also helps rule out the possibility that our finding is driven by earnings manipulation from managers to inflate the selling price for their subsequent sells.

to be expected given insiders' strong incentive to liquidate (rather than accumulate) their positions in own firm to avoid concentrated risk in a single company.

Overall, the evidence that insider silence (especially SSN) predicts future firm profitability supports our hypothesis that routine insider's sudden silence behavior is motivated by their private information related to firm fundamentals. If market underreacts to the valuable information embedded in insider silence, we should expect to see abnormal returns following insider silence. Moreover, the direction of return predictability should be the same as the fundamental predictability. We conduct such tests in the next section.

4.2 Return predictability of insider sudden silence

Our test employs Fama and MacBeth (1973) regressions of one-month-ahead to twelve-month ahead excess stock returns on firm-month dummies SSN and PPN indicating insider sudden silence following consecutive two year sell or purchase transactions. We run Fama-Macbeth regressions including all stocks, being it associated with insider trades or not. The standard errors are Newey-West adjusted when necessary.

$$r_{i,t+h}^e = a + bSSN_{i,t} + cPPN_{i,t} + dX_{i,t} + \epsilon_{i,t} \quad (2)$$

Here, $r_{i,t+h}^e$ is firm i 's excess return in month $t+h$, $SSN_{i,t}$ ($PPN_{i,t}$) is a dummy variable equal to one if month t is an insider silence month following consecutive two year sell (purchase). X include well-known determinants of cross-sectional stock returns, including size (log of market capitalization), book-to-market (log of book-to-market ratio), one-month lagged returns, and momentum (cumulative returns from month $t-12$ to $t-2$).

Table 4 presents the regression results. We can see that for all return horizons, insider silence following consecutive sells ($SSN=1$) strongly predicts positive returns in the future. For example, in the case of three-month ahead cumulative returns, if the stock falls into the SSN group, it predicts the coming three months cumulative return being 0.83% ($t=3.28$) higher. The coefficient on SSN increase almost monotonically with return horizons, suggesting that the information contained in insider silence (SSN) is not short-lived and didn't get reflected into stock prices in a timely fashion. The fact we see strong return predictability on SSN

beyond the first month following insider silence also alleviates the concern that our strategy is not implementable. Prior to 2002, insider trading reports to SEC could be delayed to the 10th day of the month following the insider trading month, so an investor implementing our strategy would have to wait until one month after the expected insider trading month to confirm an insider silence signal.

The predictability of insider silence following consecutive purchase (PPN=1) is weaker than that of SSN, and is only significant for the 3 months horizon. The coefficient means if the stock falls into the PPN group, it predicts that the coming three months cumulative return is -0.72% ($t=1.87$) lower. The weak predictability of PPN is partially due to the small number of observations in the early years as we show in table 2. In our robustness checks, we also include a version for the sample period starting from 1997, and the statistical significance is much larger. On the other hand, the weak return predictability of PPN compared to SSN is expected. The sudden silence of insider purchase as a proxy for bad information could be very noisy in the sense that routine buyers may become silent for many other reasons. Insiders may simply choose not to purchase own firm's stocks if they do not have enough liquidity in hand or they want to avoid concentrated risk in a single firm.¹⁷

In Figure 1 we plot the cumulative abnormal returns (CAR) up to 12 months following insider sudden silence month SSN and PPN. The abnormal return is calculated as monthly stock return minus its size, book-to-market and past 1-year return matched portfolio return. Consistent with the regression results in table 3, the monthly CAR following SSN continue to rise for the 12 months, and the monthly CAR following PPN decreases and then level off after the first six months, both exhibiting no reversals. The magnitude of 12 month cumulative abnormal return following SSN is 4.5%, and the number is -0.9% for PPN. The fact that we see no reversal suggests that the information being conveyed through the silence of routine insiders is important for firm fundamentals and eventually got incorporated into stock prices.

¹⁷The asymmetry of return predictability between SSN and PPN is similar to that between insider buy and sell transactions. Insiders typically have both human capital and financial wealth concentrated in a single firm. An insider's willingness to buy or stop selling additional shares would increase risk and thus should be very informative of coming positive news. But the willingness to sell or stop buying could be due to many other reasons.

Alternatively, we also use calendar time portfolio approach (Mitchell and Stafford (2000)) to analyze the returns of portfolios formed according to our firm level insider sudden silence measure. Specifically, for each month from January 1988 to December 2013, portfolios are formed based on previous insider sudden silence measure. At the end of each month t , we form two portfolios SSN (PPN) if the current firm month is the insider silence month following her consecutive two year sells (purchases). The portfolios are then held over months $t+1$ to $t+k$ ($k = 1, 3, 6$). Portfolio returns are equal weighted or value weighted across their constituent stocks. The average portfolio return for month t is the equal-weighted average month t returns of the strategy implemented in the prior month and the strategies formed in the prior k ($k = 1, 3, 6$) months. Panel A of table 5 presents the raw portfolio returns, risk-adjusted portfolio returns, and the characteristic-adjusted returns for the equal-weighted portfolios in the case of $k = 3$. The Cahart α is obtained by regressing monthly SSN (or PPN) portfolio return on Carhart (1997) four factors:

$$R_{i,t} = \alpha_i + bMktrf_t + cSMB_t + dHML_t + eUMD_t + \epsilon_t \quad (3)$$

The variable $Mktrf$ is the excess return of the value-weighted stock market index over the risk-free rate. SMB is the excess return on the portfolio of small stocks over big stocks. HML is the excess return on the portfolio of stocks with high book-to-market ratio over the portfolio of stocks with low book-to-market ratio. The variable UMD is the return on high-momentum stocks minus the return on low-momentum stocks, where momentum is measured over months $(-12, -2)$ ¹⁸. We compute the characteristic adjusted return by subtracting the stock's raw return by the return of the benchmark group to which the stock belongs to (see, e.g., Daniel et al. (1997)). The 5*5*5 benchmark groups are formed at the end of June of each year based on size, book-to-market ratio, and past one year return. The monthly benchmark returns and stock assignments are obtained from Russ Wermers's website¹⁹.

Consistent with the Fama-Macbeth regression results, SSN portfolio earns significant positive four factor alpha of 43.7 ($t=2.70$) basis points per month. The statistical significance

¹⁸The Fama-French three factor and momentum factor is retrieved from Kenneth R. French website: <http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/>

¹⁹<http://alex2.umd.edu/wermers/ftpsite/Dgtw/coverpage.htm>

of PPN alone is less stable, which is also consistent with our Fama-Macbeth regression results that the predictability of sudden silence following consecutive purchases is in general much weaker in the full sample. In untabulated results, we compare PPN with PPP portfolios, and find the spread is much more negative at -33.8 basis points per month. A long-short strategy that long stocks in the SSN group and short stocks in the PPN category yields a monthly 4-factor alpha of 50.9 ($t=2.19$) basis points. The characteristic-adjusted monthly abnormal return for the long-short portfolio is 63.8 ($t=2.59$) basis point. Panel B of table 5 shows both the value weighted and equal weighted monthly alpha of the long-short strategy (SSN - PPN) under different holding periods. The results are robust under different holding horizons for the equal weighted portfolios. The value-weighted return of long-short portfolio is also positive, though the statistical significance is much weaker. The difference between equal and value-weighted portfolio suggests our results are more pronounced in small stocks, which tend to have worse information environment and are more costly to arbitrage, consistent with hypothesis 2.

4.3 Insider silence and earnings announcement return

The results so far suggest that investors fail to fully incorporate the information contained in preceding insider sudden silence. If this is true, investors will be systematically surprised when the relevant information is subsequently disclosed to the market. In this section, we test the investor underreaction hypothesis by examining the short horizon returns around subsequent earnings announcement following insider sudden silence. We focus on earnings news instead of other news events because earnings announcement is one of the most high profile corporate events that catch investors' eyeball. Since it is difficult for insiders to trade strategically on short-term news given the "Short Swing" rule, insiders will more likely choose to be silent when possessing material future earnings-related information. Taken together, earnings announcement is a good setting to investigate our strategic silence hypothesis.

Specifically, we extract quarterly earnings announcement dates from Compustat and calculate three-day announcement period abnormal returns adjusted by CRSP value-weighted

market returns²⁰ (i.e., an event window $[-1, +1]$). We then regress the earnings announcement $CAR(-1,+1)$ on the dummy SSN and PPN and other control variables.

$$CAR(-1,+1)_{i,t} = a + bSSN_{i,t-1} + cPPN_{i,t-1} + dX_{i,t-1} + \epsilon_{i,t} \quad (4)$$

SSN is a dummy equal to one if in the quarter prior to the earnings announcement day t , there is any insider of the firm that has a sudden silence following consecutive two year selling behavior, namely there exists $SSN=1$ for the version defined in table 1 within the quarter before the earnings announcement month. We include lagged earnings announcement return, size, book-to-market ratio and past return as control variables. We also include industry and/or quarter fixed effect in some specifications. Standard errors are double clustered at firm and quarter level. Table 6 shows the regression results. As we can see, the coefficient on SSN is significantly positive under all specifications. With industry and quarter fixed effect in column 3, SSN predicts a 22.2 ($t=2.72$) basis points abnormal positive return in the 3-day earnings announcement window. PPN, consistent with our hypothesis, predicts negative abnormal CARs in the earnings announcement window, though it is not significant. Our previous Fama-Macbeth regression results show that SSN predicts 0.83% abnormal positive return in the future 3 month. This means about 27% of abnormal return following insider silence SSN is concentrated on the 3-day window around quarterly earnings announcement, which only represents 5% of all trading days. The fact that abnormal return following insider silence is concentrated on a few days makes our findings difficult to square with risk-based explanations (Porta et al. (1997))

Overall, the earnings announcement results are consistent with our Fama-Macbeth regression, and calendar time portfolio results. We find sudden silence following insider consecutive sells predicts positive earnings news, and to a less extent, silence following insider consecutive purchases predicts negative earnings surprise. Investors fail to unravel the information contained in insider sudden silence initially that they are systematically surprised when the relevant information is subsequently disclosed to the market via earnings announcement.

²⁰Our results are similar if we use size, book-to-market and past 1-year return matched portfolio return to calculate abnormal return.

4.4 The role of firms' information environment and limits to arbitrage

In this section, we examine the underlying mechanism of why insider sudden silence could predict future stock returns. If investors are fully rational and have unlimited capacity in analyzing all the value-relevant information, the information contained in insider's strategic silence behavior should be reflected in stock prices in a timely fashion. However, our evidence suggests that investors underweight this information in forecasting firm values. If this is true, we expect the return predictability results being stronger among firms with worse information environment, where investors are less likely to learn about the information embedded in insider silence through other sources such as analyst reports and media coverage.

In addition to firms' information environment, we also look at how the return predictability varies across our sample with different degree of arbitrage costs. The evidence indicates that sophisticated investors like arbitrageurs also failed to incorporate the information embedded in insider silence and bring stock price to full-information value. We thus expect that our results should be more pronounced among firms subject to greater limits to arbitrage.

We employ two variables that are commonly used in the literature to proxy for arbitrage costs in the stock market: idiosyncratic volatility (Pontiff (1996); Wurgler and Zhuravskaya (2002)) and firm size. Stocks' idiosyncratic volatility is calculated using weekly return (Wednesday to next Wednesday) during the previous year. We use institutional ownership (Boehmer and Kelley (2009)) and analyst coverage (Hong et al. (2000)) to proxy for firms' information environment. Note that institutional ownership here is the residual institutional ownership after being orthogonalized with respect to firm size (Nagel (2005)). Analyst coverage is the number of analysts following the firm during the previous fiscal year.

To test the prediction, we run Fama and MacBeth (1973) regression on subsamples splitted based on the sample median of residual institutional ownership, analyst coverage, idiosyncratic volatility and market capitalization. Panel A of Table 7 presents the subsample results for stocks sorted on information environment proxies. As we can see, in the short horizon of 1 month and 3 months, the return predictability of SSN is similar for the high IO and low IO group. However, in the longer horizons, SSN predicts much larger positive

return for the low IO stocks than the high IO sample. Specifically, SSN=1 predicts 1.75% ($t=3.75$) higher six-month ahead return for the subsample that has low residual institutional ownership, and only 0.98% ($t=1.83$) for the high IO stocks. Similarly, SSN in the low analyst coverage sample predicts 2.05% ($t=3.27$) increase in the six-month cumulative return, and only an insignificant 0.80% ($t=1.55$) increase for the high analyst coverage stocks. The coefficient on PPN across subsample is also consistent with our hypothesis, though the statistical significance is much weaker.

Panel B of Table 7 shows the Fama-Macbeth regression results when we split the sample based on two proxies for limits to arbitrage: firm size and idiosyncratic volatility. Let's first focus on firm size results. Although the coefficient on SSN is similar across two subsamples, the difference in coefficient is much larger for PPN that contains negative information. Specifically, insider silence following consecutive purchases predicts 1.45% ($t=2.00$) more negative six-month cumulative returns in small stocks, while the corresponding coefficient is 0.018% ($t=0.03$) for big stocks. The evidence is consistent with the idea that short-sales constraints reduce the adjustment speed of prices to negative information (Diamond and Verrecchia (1987)).

The results using idiosyncratic volatility as a proxy for limits to arbitrage is more striking. SSN=1 predicts 1.96% ($t=3.17$) increase in six-month ahead return for the subsample that has high volatility, and only 0.55% ($t=2.36$) for the low volatility subsample. PPN=1 predicts a decrease of 1.48% ($t=3.17$) in six-month ahead return for the high volatility subsample, and only an insignificant 0.55% ($t=0.85$) for the low volatility subsample.

We also use calendar time portfolio approach to test the effect of limit to arbitrage and information environment on the return predictability of insider silence. Table 8 reports the Carhart (1997) four factor alpha for subsamples partitioned by residual institutional ownership, analyst coverage, market capitalization and idiosyncratic volatility, respectively. Starting from January 1988 to December 2013, stocks are first sorted into two groups based on its information environment and limit to arbitrage proxies. In each group, we form portfolios based on preceding insider trading activity and hold for three months. Consistent with our hypothesis, the monthly abnormal return on the long-short portfolio that longs

stocks with SSN=1 and shorts stocks with PPN=1 is much stronger for stocks with low residual institutional ownership, low analyst coverage and high idiosyncratic volatility. For example, the monthly Carhart (1997) 4-factor alpha of long-short portfolio (SSN-PPN) is 0.78% ($t=2.58$) for the low residual institutional ownership group, but is only 0.18% ($t=0.62$) for the high institutional ownership group.

In sum, the subsample results support our hypothesis that investors underreact to the value-relevant information contained in routine insiders' strategic silence behavior. Insider silence following consecutive sell (purchase) predict more positive (negative) future returns among firms that are smaller, have higher idiosyncratic volatility, fewer analyst following and minimally held by institutional investors.

4.5 The effect of Sarbanes-Oxley Act on the information content of insider sudden silence

Our paper hypothesizes that when facing private information, some routine insiders will choose to be silent instead of trading on the information because doing so allows them to be exempt from raising suspicion among the regulators. In other words, insiders weigh the benefits of making more profits by explicitly trading on private information and the potential costs of being prosecuted by regulators. If this is true, increasing litigation risks should lead to more routine insiders being silent when possessing private information, and hence the information content of insider silence should be stronger. In this section, we present such a test based on the passage of Sarbanes-Oxley Act in August 2002.

The Sarbanes-Oxley Act of 2002 (SOX) is the most far reaching reforms of American business practices since the time of Franklin Delano Roosevelt. The Act mandated a number of reforms to enhance corporate responsibility, enhance financial disclosures and combat corporate and accounting fraud. SOX addresses the issue of insider trading disclosure in Section 403, which amends Section 16(b) of the Exchange Act of 1934. In addition to more timely disclosure of insider trades, the SOX also curtailed the use of Form 5 which has been used opportunistically by managers to trade on private information (Cheng et al. (2007)). Previous research provides evidence suggesting that managers' incentives and opportunities

to engage in opportunistic behavior have decreased after SOX. For example, Heron and Lie (2007) find that stock return patterns around option grants are less favorable to managers after SOX. Cohen et al. (2008) find a decrease in accrual-based earnings management after SOX. Brochet (2010) find that after SOX, insiders are less likely to sell shares immediately prior to negative stock returns and ahead of earnings news that falls short of analyst forecasts. In the wake of corporate scandals contemporaneous to the enactment of SOX, we expect insiders to be less prone to opportunistic trading because of increased scrutiny from investors, media, and regulators. This directly imply that on average insider silence should be motivated by private information to a greater extent after SOX. In addition, insider sales prior to negative news are more exposed to litigation and prosecution than purchases, so we expect insiders more likely to become silent when facing negative information after SOX.

To test whether the information content of insider silence increases after the passage of SOX, we construct a dummy variable *Post* equal to one for the time period after the passage of SOX. We then use insider silence *SSN* and *PPN* and their interaction with *Post* to predict future firm fundamentals and returns. The result is reported in Table 9. The dependent variables are next quarter return on assets (ROA) in column (1), operating cash flows in column (2), CAR (-1,+1) around next quarter's earnings announcement in column (3) and cumulative 3-month return in column (4). The coefficient of interest is the interaction between *SSN* (*PPN*) with the *Post* dummy. According to our hypothesis, the coefficient of *SSN*Post* should be significantly positive and the coefficient of *PPN*Post* should be significantly negative. As we can see, the results are generally consistent with our hypothesis. The coefficient of *SSN*Post* are positive and statistically significant when the dependent variable is ROA and cash flow. The economic magnitude is also quite large. For example, *SSN* predicts increase of future quarterly ROA by 0.42% in the pre-SOX period, while the number is 0.69% in the post-SOX era, which is 50% larger than the effect in pre-SOX period. When the dependent variable is earnings announcement and cumulative stock returns, the point estimate is economically large as it implies 100% increase relative to pre-SOX period, although statistically not significant.

The effect of SOX on the predictability of *PPN* is more pronounced, as predicted by our

hypothesis. The coefficients of PPN*Post are significantly negative for all four dependent variables. The PPN in the pre-SOX period, on the other hand, is positive. This suggests that insider silence following routine purchase contains bad news only in the post-SOX period. Overall, the variation of the informativeness of insider silence after SOX is consistent with our hypothesis that insiders choose to be silent when possessing private information out of litigation risk concerns.

5 Robustness Tests

5.1 Tests using more recent sample

We conduct several tests in this section to examine the robustness of our results. As shown in table 2, the number of insider sudden silence observations in the early years is very small, but increased dramatically starting from 1997. Hence, to guarantee that our results are not driven by the outliers in the early years, we rerun our calendar time portfolio and Fama and MacBeth (1973) regressions for the sample period of 1997-2013. Panel A of Table 10 shows that our baseline results using the more recent sample period. The results are in general much stronger. Specifically, the Fama-Macbeth regression indicates that SSN predicts 1.07% ($t=3.67$) increase and PPN predicts -0.98% ($t=2.03$) decline for the subsequent three months return, which is larger than the around 0.80% predictability in the whole sample version. Besides, for the more recent sample period, the return predictability of PPN is significant for the 3 and 6 months horizon, and the magnitudes are also much larger. Thus, our results indicate that the return predictability of insider sudden silence is not driven by the early year outliers. Using a more recent sample period helps us reduce the noise in the estimation, and generate stronger effect of insider sudden silence.

5.2 Controlling for other insider trading predictors

Next, we also want to check whether our results are simply driven by the known insider trading variables such as the opportunistic trades in Cohen et al. (2012), and the insider net purchase ratio that has been widely used in the previous literature (Lakonishok and

Lee (2001), Whidbee and Sias (2010), etc.). Though by construction, it is unlikely that our insider sudden silence measure and the opportunistic trade variable would overlap, as our identification focuses on the "no trade" activity following consecutive trades, while Cohen et al. (2012) focuses on the trades submitted by those opportunistic traders. However, it could still be the case that for those firm months with insider sudden silence, there also exist opportunistic insiders within the same firm that trades in the direction of our prediction. To exclude such possibility, we redo our Fama-Macbeth regression controlling for the opportunistic buy and opportunistic sell dummy at firm level following Cohen et al. (2012). The left hand side of Table 10 Panel B shows the results controlling for the opportunistic trades variable. Our result is not affected. The statistical power for PPN is still weak, however. In untabulated results using sample period of 1997 to 2013, the effect of PPN is significant at horizon of three and six months, and the magnitude is also larger.

On the other hand, since it is widely documented that insider net purchase positively predicts subsequent return, we want to guarantee that our silence measure is not capturing the effect of previous insider net demand. Specifically, if insiders buy (sell) too much in the previous six months that they no longer want to trade in the current month, and it so happened that those insiders have consecutive sells (buys) in the previous two years, then our insider silence effect may simply capture the effect of net insider demand documented in the previous literature. To exclude such possibility, we control for the insider net purchase ratio (NPR) defined following Lakonishok and Lee (2001). The NPR is calculated as

$$\frac{\#insider\ buy_{t-1,t-6} - \#insider\ sell_{t-1,t-6}}{\#Total\ transactions_{t-1,t-6}}.$$

The right side of Table 10 Panel B shows that controlling for the insider net purchase ratio of the firm, our results are still there. Specifically, SSN predicts an additional 88 basis points increase, and PPN predicts an additional 84.3 basis points decrease for the cumulative three months return after controlling for the insider net demand in the previous six months.

5.3 Controlling for other stock return predictors

We have shown in our main results that insider sudden silence following consecutive sell predicts future positive abnormal return, and insider sudden silence following consecutive purchases predicts future negative returns. However, if insiders become silent in response to the public mispricing signals such as accruals and profitability, then our insider silence measure might just capture the known effect of these anomaly variables in predicting future returns. For example, insiders who buy consecutively in the previous two years may stop purchasing after the firm experience abnormal increases in accruals in this year. Since firms with high accruals tend to have negative subsequent returns (Sloan (1996)), our insider sudden silence measure (PPN) may simply pick up the effect of accruals in predicting negative returns. To address this concern, we re-estimate our baseline Fama-Macbeth regression controlling for the five anomaly variables as in Fama and French (2008). If our insider sudden silence measure is indeed capturing these public information signals, then the predictability of insider sudden silence should disappear after controlling for them. However, Table 10 Panel C shows that controlling for net share issuance (NS), firm profitability (Y_B), momentum (already in the baseline regression), accruals (AcB) and asset growth (dA_A), our results are still there and even become stronger. Both SSN and PPN significantly predict future stock return for the period ranging from three to twelve months. Specifically, SSN predicts positive 73.6 basis points increase, and PPN predicts 102.1 basis points decrease for the subsequent three months return. Hence the information embedded in insider sudden silence is distinct from that conveyed by traditional anomaly variables.

5.4 Multiple insider silence within a firm-month

In our baseline results, we define firm-month dummy SSN or PPN equal to one when at least one insider within the firm become sudden silent following routine trades. Given the large noise contained in our silence measure, it is reasonable to believe that multiple insider silence at the same firm-month should be a stronger signal than single insider silence case. This is because information should be correlated across insiders within a firm while noise should not be. To test this, we add two additional dummies MSSN (MPPN) equal to 1 if the

firm has more than one insider becoming silent following routine trades at the same firm. We run Fama-Macbeth regression of future returns on these two dummies along with SSN and PPN. The result is reported in Appendix Table 2. Consistent with our hypothesis, the coefficient on MSSN is mostly positive and MPPN is negative. The economic magnitude is especially large for multiple insider silence following routine purchases. For example, the coefficient is -0.49% for PPN and -0.61% for MPPN when the dependent variable is cumulative 3-month returns. This implies that stock return decreases by -1.10% in future 3 months when more than one insider become silent following routine purchases compared to -0.49% in the single insider silence case. Due to the small sample of multiple insider silence case, however, the coefficients are mostly not significant.

5.5 Alternative insider silence measure

Finally, to guarantee that our results are not driven by the specific methodologies that we use to define insider silence, we also consider several variations in the construction of insider sudden silence measure. For example, we try to construct the sudden silence measure using previous three years trading history. In our baseline results, we define sudden silence as a no-trade month following previous two year consecutive same month trades. However, it is difficult to argue how many years are enough to classify whether an insider is routine or not. In other words, it might be the case that it just happened that the insiders trade on the same month for two years and there is no information content in the “silence” this year. On one hand, if requiring multiple years of same months same direction trades, one might result in very small sample size with sudden silence equal to one. On the other hand, if requiring too few years in defining “consecutive trade”, one might result in too much noise in the silence measure. Trading off these two, we consider adding one additional year in the construction of “consecutive” trades, and look at the information content of insider sudden silence following three years consecutive same month trades (SSSN, PPPN).

Appendix Table 3 and 4 show the Fama-Macbeth regression and calendar time portfolio alpha for this sudden silence measure defined based on three year consecutive trades. Since the sample size is especially small in the early years, we restrict our tests for the sample period

of 1998-2013. The results when defining silence using stricter criteria are stronger. Appendix table 2 shows that SSSN predicts 1.32% positive abnormal returns for the subsequent three months, larger than the 1.07% of SSN in Table 10. PPPN predicts 1.51% negative abnormal returns, compared with the 0.98% for PPN in Table 10. The calendar time portfolio alpha is also larger at 86.6 basis points per month, comparing with the 53.1 basis points under the two-consecutive-year version. Note that our three-consecutive-year version also helps us distinguish from the opportunistic trade in Cohen et al. (2012). This is because requiring the same month trades for three consecutive years will make the insider being automatically grouped into “routine” category based on the definition in Cohen et al. (2012). Thus, all subsequent activities of these insiders are treated as uninformative in their paper.

We also consider constructing our silence measure directly at the firm level, where we first aggregate all the insider trades at firm level each month, and then define SSN, and PPN based on the aggregated firm level insider trades. The results are then presented in Panel D of Table 10. Since we do not require consecutive trades at the individual insider level, the measure is much noisier now, but the results are still qualitatively similar.

Our results up to now is based on defining insider silence as zero trading following consecutive same month trades. However, routine insiders could simply cut down their normal trading volume but not completely be silent. This is more likely to happen when the private information they withhold is not so big and their diversification or liquidity needs is relatively strong. To examine whether our result is robust with respect to this alternative definition of insider silence, we construct a dummy variable SSD (PPD) equals to 1 if the firm has at least one insider who sells (purchases) consecutively on the same calendar month for the previous two years, but sells (buys) less than half of the volume of previous two selling (purchasing) on the same month this year.²¹ Appendix Table 5 reports the Fama-Macbeth regression results when we use SSD and PPD to predict future stock returns. As we can see, our results still hold for this alternative definition of insider silence.

²¹We tried different thresholds to define significant deviation from routine trading volume and find the results are quite similar.

6 Additional Evidence

6.1 The reaction of sophisticated investors and financial analysts

Our results on the return predictability of insider sudden silence raise the question of whether other investors or market participants in the financial markets are aware of the information embedded in sudden insider silence. In this section of the paper, we explore whether sophisticated investors (e.g., hedge funds) and security analysts are able to exploit the signal of insider silence.

We focus on the trading behavior of hedge funds in response to insider silence signal because hedge funds are among the most sophisticated investors in financial markets. Previous studies find that hedge funds are skilled at stock picking and market timing (Brunnermeier and Nagel 2004), are able to identify mispriced stocks (Jiao et al. (2015)), and their trades are more likely to be driven by information (Agarwal et al. (2013)). Thus the evidence that hedge funds change their positions in the direction predicted by the information content of insider silence would strengthen our previous return predictability results. To investigate the link between insider silence and hedge fund trading, we regress the change in quarterly hedge fund holding²² on insider silence dummy SSN and PPN and a set of control variables in the previous quarter. To make a comparison, we also look at how mutual funds trade in response to insider silence.

Table 11 presents the results of this test. Column 1 and 2 shows the results when the dependent variable is quarterly change in hedge fund holdings. The results suggest that hedge funds do exploit the information in insider silence, especially for the good news contained in SSN. The coefficients on SSN is 0.035 ($t=2.50$) in column 2. Hedge funds significantly increase their long positions on a stock that has pending good news contained in insider silence following consecutive sell. The economic magnitude is also quite large, as it means hedge funds' long position increases by 50% relative to the sample mean following SSN. The coefficients on PPN are similar in magnitude to that on SSN when we only include quarter fixed effect, with a coefficient of -0.03 ($t=-1.79$), but lose significance when we include both

²²We thank Wenxi Jiang for providing hedge fund holdings data to us.

firm and quarter fixed effect. This is consistent with our return predictability results that SSN is a less noisy signal about future firm value and has stronger predictive power for future stock returns than PPN.

Column 3 and 4 of Table 11 reports the regression results when the dependent variable is quarterly change in mutual fund holdings. In sharp contrast, we find that mutual funds trade in the opposite direction predicted by the information contained in insider silence. The coefficient on SSN is negative and significant, indicating mutual funds decrease their position in stocks with pending good news as predicted by SSN. The coefficient on PPN is positive, though not significant. Our result on mutual fund trades in the opposite direction to insider silence echoes the finding in Edelen et al. (2016) that institutional investors (particular mutual funds) tend to trade contrary to anomaly prescriptions.

In Table 12, we examine whether security analysts are able to discern the information content of insider sudden silence. Given their strong incentives to generate more accurate earnings forecast for covered stocks, analysts should revise up (down) their earnings forecast for stocks with SSN (PPN). Moreover, analysts could also upgrade (downgrade) their recommendations on these firms when the good (bad) news contained in insider silence deserve such actions. To test this, we regress analyst annual EPS forecast revision (scaled by book value per share) on insider silence dummy SSN and PPN in the previous quarter. We control for lagged forecast revisions, size, book-to-market, past 1-year return and industry/quarter fixed effect in some specifications. As we can see from panel A of Table 12, the coefficient on SSN is significantly positive under all specifications, suggesting analysts indeed revise their earnings forecast upward for firms associated with SSN. The coefficient on PPN is also negative, though it is only significant when we control for industry and quarter fixed effect. In panel B, we also examine whether insider silence could predict announcement returns around analyst recommendation changes. Consistent with the forecast revision results, SSN predicts significantly more positive cumulative abnormal returns (CAR) around next quarter's recommendation change. The point estimates suggests that stocks with SSN in the previous quarter experience 10 to 14 basis point more positive 3-day CAR. The coefficient on PPN is also negative but not significant.

6.2 How long do insiders delay their routine trades?

After documenting the information content of insider silence following their previous consecutive trades, we are also interested in how long those insiders delay their previous “routine” trades. Our strategic silence hypothesis predicts that insiders, who previously trade on a routine pattern, may suddenly choose not to trade if they possess some private information of the firm. If this is indeed the case, we should see that the direction of insider’s next trade following insider’s sudden silence is consistent with the direction of previous consecutive trades, given that they do not cancel their routine trades. Insiders, on the other hand, could also permanently cancel their routine trades if they believe that the performance of the firm is going to be continuously sluggish or outperforming. Despite the delay of the trades and permanent cancel of the trades, one should see few observations of opposite sign of trades following their sudden silence, which is not consistent with our story.²³

The top left panel of Table 13 shows the summary statistics of the length of delay for individual insiders²⁴ that have sudden silence. We define “cancel” as those insiders who do not trade for the subsequent 24 months following their sudden silence. We choose 24 months because we believe that it is less likely for the insiders to still follow the same trading pattern after two years’ silence. However, our results are similar if defining “cancel” using 12, 36, 60 months. Consistent with the hypothesis, we find 47.63% insiders delay their trades with same direction, and 47.23% of insiders permanently cancel their trades.²⁵ There are only 5.15% insiders who execute a trade opposite to the direction of their previous routine trades following sudden silence. Insiders on average delay their previous routine purchases by a mean of 6.04 months (median of 4 months), and delay their previous routine sells by a mean of 6.51 months (median of 5 months) following the sudden silence month. These numbers

²³An insider who wants to execute a trade opposite to her previous routine trades doesn’t need to delay the trades.

²⁴Note here that the summary statistics is based on the individual insider level sudden silence, which is different from the firm level silence measure used in the previous tests. We use insider level sudden silence measure because the length of delay is more straight forward and easy to understand at the individual insider level comparing to the firm level.

²⁵Since we also define insiders who do not trade for other reasons (such as leaving the firm or no longer have enough shares to sell) as canceling their trades, our estimation of the percentage of cancel is an over-estimation.

are consistent with our previous results that calendar time portfolio and Fama-Macbeth regression results are strongest in the horizon of 3 months to 6 months.

Besides, our hypothesis also predicts that once the insiders resume their routine trades, the information embedded in their previous silence should already be reflected in the stock price. Hence, one should see the abnormal return as predicted by PPN or SSN comes mostly from the period between insiders' sudden silence to their next trade month, rather than the period after their next trade. The top right and the two bottom panels show that this is indeed the case. The top right panel shows the average size and book to market adjusted monthly abnormal return for the period from the silence month (exclusive) to insiders' next trade month (exclusive), the next trade month, and the period from the next trade month (exclusive) to the 24 months after the sudden silence month. We follow Fama and French (1993) to construct the size and book to market benchmark portfolios. At the June of each year, we independently construct the NYSE breakpoints for size and book to market ratios, and form equal weighted 10*5 size and BM portfolios that hold for the subsequent 12 months. The monthly adjusted abnormal return is then the return of the stock minus the portfolio return of the size and book to market category that it fall into. We can see that the average monthly abnormal return is -0.81% from the formation to next trade period, but is only -0.39% from the next trade to 24 months end period for the case of PPNP (the insider continues the sudden silence of PPN with a purchase later), the difference of 0.41% ($t=3.79$) is statistically significant. For the case of SSNS (the insider continues the sudden silence of SSN with a sell), the average monthly abnormal return is 1.26% from the formation to next trade period, but is only 0.28% from the next trade to 24 months end period, the difference of 0.97% ($t=17.69$) is also statistically significant.²⁶

For the case of permanent cancel, we calculate the average monthly abnormal return for the subsequent 24 months. Consistent with the predictions of our hypothesis, SSNN has a subsequent average monthly abnormal return of 0.31% ($t=7.00$), and PPNN has subsequent

²⁶The mean abnormal returns following insider silence conditional on their subsequent trade in the same direction is larger in absolute magnitude than the unconditional abnormal return following insider silence. This is to be expected because our insider silence measure is quite noisy and insider may become silent for reasons unrelated to private information. However, when we observe insiders resume their routine trades following a period of silence, the silence is more likely to be motivated truly by private information.

average abnormal return of -1.30% ($t=13.74$). The much rare case of SSNP and PPNS are not consistent with our story, and the return predictability also differs from the implications of our story. Though SSNP and PPNS is not the focus of this paper, the results in Table 13 seems to indicate that those insiders' behaviors are more consistent with the contrarian story that is widely documented in the previous literature (Lakonishok and Lee (2001); Piotroski and Roulstone (2005)). Insiders in general are contrarian traders that they buy (sell) the firm stocks when there is strong decline (increase) in the stock return, and after their transactions, the return of the firm then increase (decline). We also show the results using the raw return and the market adjusted return in the bottom two panels of Table 13, and the results are consistent.

7 Conclusion

This paper examines the information content of insider's strategic silence following their consecutive same month trades. Insiders trade for multiple reasons, and the non-informative trades as driven by liquidity or diversification motives are more likely to be routine based. We hypothesize that when a routine insider suddenly stopped trading, in contrast to his/her previous trading pattern, this sudden silence may contain value-relevant information about the firm. Consistent with our hypothesis, we find that insider silence following her consecutive sell predicts positive abnormal return, and to a lesser extent, the sudden silence following consecutive purchase predicts negative return. A long-short strategy exploiting the strategic behavior of insider silence yields a value weighted four-factor alpha between 0.50% to 0.86% per month.

To investigate what specific information is embedded in insider's sudden silence behavior, we look at the predictability of insider silence for firm fundamentals and earnings announcement day returns. The results indicate that insider silence signals valuable information about firm's future operating performance and investors fail to incorporate the information contained in insider silence in a timely fashion. They are systematically surprised when the information is disclosed to the market subsequently via earnings announcement.

We also look at whether the return predictability of insider silence varies across firms with

different information environment and arbitrage costs, as predicted by behavioral finance theories. We find that our results are more pronounced in firms facing worse information environment and higher degree of limits to arbitrage. Looking into the questions on how long insiders delay their routine trades and how sophisticated investors respond to it, we find that around half of the insiders delay their trades by 4 to 6 months following their sudden silence, and the other half of the insiders directly cancels their routine trades. The abnormal return as predicted by insider sudden silence is concentrated in the period from the silence month to their next trade month. Sophisticated investors such as hedge funds are able to exploit the information as they increase their long positions in stocks with pending good news as predicted by insider silence signal. Our results are robust with respect to the sample period used, controlling for other insider trading predictors and several well-known mispricing signals, and alternative insider silence measure.

Our findings contribute to the insider trading literature by documenting that the absence of insider trading also contains value-relevant information. The existing literature mostly focuses on the information content of insider's purchasing and selling transactions, with few papers investigating the absence of it – insider silence. We show in this paper that even routine insiders may trade strategically. When they expect good news is on the way, they would postpone or cancel their routine sell. Similarly when they expect bad news is approaching, they would also delay or cancel their routine purchase. Taken together, these results indicate that investors fail to unravel the information embedded in the insiders' strategic silence behavior.

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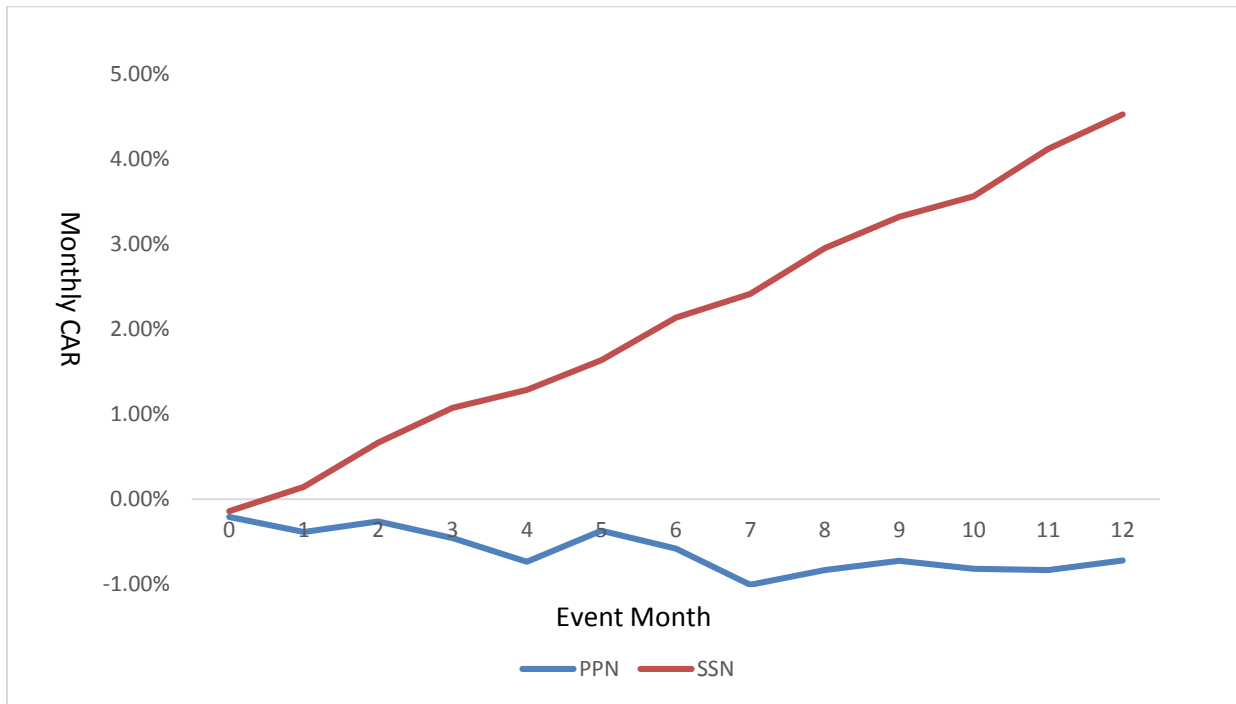
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Figure 1: Cumulative Abnormal Return Following Insider Sudden Silence



This figure plots the cumulative abnormal return following insider sudden silence month. SSN (PPN) is a firm-month dummy that equals to one indicating insider sudden silence following consecutive two year selling (purchasing). Abnormal return is calculated as monthly stock return minus its Size, Book-to-Market and past 1-year return matched portfolio return (Daniel, Grinblatt, Titman, and Wermers (1997)). The sample runs from 1988 to 2013.

Table 1: Summary Statistics

Variable	Labels	N	Mean	Median	Min	Max	Q1	Q3	STD
Ret_1yr	Past year return	1437634	17.27%	13.73%	-4.83	23.43	-11.74%	40.45%	57.03%
Ret_1m	Past month return	1437570	1.63%	0.31%	-0.90	24.00	-6.25%	7.50%	17.70%
Ret_lead1	Future one month return	1430630	1.04%	0.02%	-0.98	13.50	-6.48%	7.22%	16.56%
Cret_m3	Cumulative three months return	1430749	3.14%	2.49%	-2.30	13.59	-9.98%	15.20%	28.72%
Cret_m6	Cumulative six months return	1430787	6.32%	5.88%	-4.15	17.32	-12.15%	24.04%	40.60%
Cret_m12	Cumulative twelve months return	1430818	13.06%	12.76%	-4.49	20.41	-13.19%	38.85%	57.26%
LnSize	Natural log of market capitalization	1437820	5.29	5.14	1.30	10.58	3.78	6.67	2.03
LnBM	Natural log of BM ratio	1437820	-0.63	-0.54	-3.23	1.25	-1.12	-0.06	0.85
Resid_ior	Residual institutional ownership	1429133	0.91%	-1.12%	-46.18%	51.05%	-13.07%	14.66%	20.29%
Totalvol	Total Volatility	1396242	0.64%	0.37%	0.03%	4.78%	0.17%	0.78%	0.80%
Coverage	Analyst coverage	1034292	9.10	6	1	69	3	13	8.70
PPN	Sudden silence following purchases	1437820	0.63%	0	0	1	0	0	7.92%
PPP	Consecutive purchases	1437820	0.36%	0	0	1	0	0	5.96%
SSN	Sudden silence following sells	1437820	1.73%	0	0	1	0	0	13.03%
SSS	Consecutive sells	1437820	0.97%	0	0	1	0	0	9.80%

This table shows the full sample summary statistics from 1988 to 2013. PPN, PPP, SSN, SSS are defined using insiders' previous two year and current year trading information. Among all the insider trades, 13.8% have consecutive two year same month purchase or selling history. Pooling the sudden silence variable with all the stock month observations shows that SSN represents 1.73% of the whole sample, and PPN represents 0.63% of the whole sample (SSN represents 2.67% of the sample, and PPN represents 0.96% of the sample for period 1997-2013). The Insize and lnbm is the natural log of market capitalization and book-to-market ratio. Resid_ior is the residual institutional ownership orthogonalized w.r.t. to market size. Analyst coverage is the number of analysts following the firm on June each year.

Table 2: Distribution of Insider Sudden Silence Trades by Year

Year	PPN	PPP	SSN	SSS	PPN%	SSN%
1988	10	16	0	0	38.46%	0.00%
1989	11	17	0	0	39.29%	0.00%
1990	17	32	0	0	34.00%	0.00%
1991	64	16	0	0	79.01%	0.00%
1992	51	0	1	3	87.93%	1.72%
1993	0	0	9	1	0.00%	90.00%
1994	14	4	24	0	32.56%	55.81%
1995	25	10	34	7	30.49%	41.46%
1996	34	17	52	10	26.77%	40.94%
1997	138	58	179	44	29.55%	38.33%
1998	665	313	1296	412	21.98%	42.84%
1999	880	401	1404	404	25.01%	39.90%
2000	1149	489	1156	371	31.89%	32.08%
2001	1089	470	1173	375	30.64%	33.01%
2002	784	432	1308	482	23.20%	38.71%
2003	840	360	1527	696	22.71%	41.28%
2004	617	304	1550	765	17.19%	43.18%
2005	541	339	2125	1156	12.11%	47.58%
2006	651	363	2677	1444	12.01%	49.37%
2007	631	388	2623	1390	11.74%	48.80%
2008	646	403	2929	1087	11.61%	52.64%
2009	995	407	2018	978	20.36%	41.29%
2010	931	334	1473	933	22.86%	36.16%
2011	506	324	1410	1006	14.56%	40.56%
2012	503	318	1766	1440	11.88%	41.71%
2013	661	338	2036	1802	12.97%	39.95%

This table shows the number of firm-month with insider sudden silence observations, and the percentage of sudden silence measure SSN and PPN over total same month consecutive trades in the previous two years. For example, there are 138 firm-months of PPN observations in year 1997, and these 138 observations accounts for 29.55% of the total same month consecutive trades (do not require the same month consecutive trades are on the same direction) defined using year 1996 and 1995 trade observations.

Table 3: Insider Silence and Firm Profitability

Panel A: Predicting Quarterly ROA			
	(1)	(2)	(3)
SSN	0.0037*** (4.08)	0.0042*** (4.54)	0.0065*** (7.10)
PPN	-0.0024** (-1.99)	-0.0022* (-1.80)	0.0008 (0.52)
ROA (-1)	0.0767*** (2.61)	0.0699** (2.53)	0.0688** (2.52)
ROA (-4)	0.0365** (2.51)	0.0341** (2.45)	0.0335** (2.44)
Accural	-0.0005 (-0.41)	-0.0005 (-0.45)	-0.0005 (-0.44)
Asset growth	-0.0000 (-0.48)	-0.0000 (-0.53)	-0.0000 (-0.52)
Negroe	-0.0413*** (-16.12)	-0.0389*** (-17.08)	-0.0385*** (-17.46)
Div	0.0573*** (4.26)	0.0659*** (4.22)	0.0649*** (4.22)
Ndiv	-0.0083*** (-10.89)	-0.0085*** (-10.13)	-0.0079*** (-9.96)
Fixed effect	No	Industry	Industry and Quarter
Ave.R-sq	0.071	0.077	0.081
N.of Obs.	274728	264779	264779

Panel B: Predicting Quarterly Operating Cash Flow

	(1)	(2)	(3)
SSN	0.0142*** (5.56)	0.0156*** (5.89)	0.0157*** (7.15)
PPN	-0.0007 (-0.31)	-0.0009 (-0.38)	-0.0009 (-0.40)
CF (-1)	0.1708*** (3.17)	0.1612*** (2.97)	0.1611*** (2.95)
CF (-4)	0.1238*** (3.44)	0.1149*** (3.31)	0.1133*** (3.30)
Accural	0.0029 (0.14)	0.0026 (0.13)	0.0028 (0.14)
Asset growth	0.0002 (0.13)	0.0002 (0.12)	0.0002 (0.13)
Negroe	-0.0573*** (-6.29)	-0.0558*** (-6.54)	-0.0561*** (-6.55)
Div	0.1392*** (2.92)	0.1647*** (3.13)	0.1606*** (3.08)
Ndiv	-0.0122*** (-5.94)	-0.0131*** (-5.87)	-0.0127*** (-5.99)
Fixed effect	No	Industry	Industry and Quarter
Ave.R-sq	0.287	0.313	0.319
N.of Obs.	248011	239005	239005

This table reports the regression results of quarterly ROA and cash flow (scaled by lagged total assets) on insider sudden silence dummy SSN and PPN in the previous quarter. In panel A, the dependent variable is return on assets (ROA), defined as income before extraordinary items over lagged total assets. In panel B, the dependent variable is operating cash flow, defined as cash flow from operations scaled by lagged total assets. SSN (PPN) is a firm-month dummy variable equal to one if the firm has any insider who sells (purchases) consecutively on the same calendar month for the previous two years, but did not trade on the same month this year. Standard errors are double clustered at firm and quarter level and we include industry and quarter fixed effect as indicated. The sample period runs from 1988 to 2013. 1%, 5%, and 10% statistical significance is indicated with ***, **, and *, respectively.

Table 4: Fama-Macbeth Regression of Return on Insider Sudden Silence

	1 st month	2 nd month	3 rd month	Cumulative 3 months	Cumulative 6 months	Cumulative 12 months
Past month return	-3.047 (7.05)***	-0.515 (1.46)	0.574 (1.75)*	-3.051 (4.81)***	-2.972 (3.37)***	0.830 (0.69)
Past year return	0.740 (4.42)***	0.603 (3.82)***	0.358 (2.33)**	1.674 (3.84)***	2.108 (2.41)**	0.310 (0.21)
Price	0.000 (1.00)	0.000 (1.55)	0.000 (1.62)	0.000 (1.75)*	0.000 (1.93)*	0.001 (1.81)*
LnSize	0.005 (0.12)	-0.003 (0.05)	-0.000 (0.01)	0.006 (0.04)	-0.039 (0.17)	-0.220 (0.53)
LnBM	0.435 (4.58)***	0.428 (4.40)***	0.390 (3.79)***	1.247 (4.34)***	2.238 (4.08)***	3.491 (3.21)***
SSN	0.210 (1.43)	0.375 (2.95)***	0.248 (2.11)**	0.833 (3.28)***	1.290 (3.20)***	2.324 (3.66)***
PPN	-0.145 (0.62)	-0.356 (1.58)	-0.238 (1.09)	-0.719 (1.87)*	-1.044 (1.47)	-0.989 (0.81)
Intercept	1.170 (3.08)***	1.154 (2.99)***	1.182 (2.99)***	3.472 (2.86)***	7.210 (3.11)***	15.425 (3.54)***
<i>N</i>	1,430,380	1,422,708	1,414,564	1,430,499	1,430,537	1,430,568

This table reports the Fama-Macbeth regressions of returns on firm-month dummies SSN (sudden silence following consecutive sell) and PPN (sudden silence following consecutive purchases) in the prior month, over 1988 to 2013 sample period. The dependent variable is future 1st month, future 2nd month, future 3rd month, future cumulative three months, future cumulative 6 months, and future cumulative 12 months returns. SSN is a dummy variable that equal to one if the firm has any insider who sells consecutively on the same calendar month for the previous two years, but did not trade on the last month. Similarly, PPN is a dummy variable equal to one if the firm has any insider who purchases consecutively on the same month for the previous two years, but did not trade on the last month. LnSize and LnBM are the natural logarithms of the firm market capitalization and book-to-market ratio. Past Month (Year) returns are the return of the given firm over the prior month (year, excluding the prior month t-1). *T*-statistics are Newey-West adjusted, and are shown below the estimates in parentheses; 1%, 5%, and 10% statistical significance is indicated with ***, **, and *, respectively.

Table 5: Portfolio Returns based on Insider Sudden Silence

Panel A: Equal Weighted Portfolios Returns for 3 Months Holding Horizon, 1988-2013

	PPN	SSN	SSN-PPN
Raw Return	0.821	1.276	0.455
t-stat	(2.48)**	(3.05)***	(1.65)*
Carhart Alpha	-0.072	0.437	0.509
t-stat	(-0.38)	(2.70)***	(2.19)**
DGTW-Adj.Return	-0.375	0.263	0.638
t-stat	(-1.89)*	(1.72)*	(2.59)***

Panel B: SSN-PPN portfolio for Different Holding Horizons, 1988-2013

	EW			VW		
	1 m	3 m	6 m	1 m	3 m	6 m
Raw Return	0.499 (1.32)	0.455 (1.65)*	0.316 (1.30)	0.159 (0.34)	0.365 (1.09)	0.046 (0.17)
Carhart Alpha	0.582 (1.67)*	0.509 (2.19)**	0.368 (1.93)*	0.400 (0.93)	0.564 (2.13)**	0.122 (0.58)
DGTW Adj.	0.777 (2.19)**	0.638 (2.59)***	0.481 (2.22)**	0.284 (0.68)	0.292 (1.12)	0.01 (0.04)

This table shows the monthly returns and factor-adjusted alphas (in %) to buy and sell portfolios that follow the insider sudden silence. Each month j from January 1988 to December 2013, portfolios are formed on preceding insider trading activity and hold for three months. Stocks in the SSN category in month t (those firms that have insiders sell on month $t-12$, $t-24$, but did not trade on month t) are held from month $t+1$ to $t+i$ ($i=3$ in Panel A, and $i=1, 3, 6$ in Panel B), and similarly for “PPN”. Portfolio returns are equal or value weighted across their constituent stocks. We focus on common stocks that are listed on NYSE/Amex/NASDAQ, and we exclude those stocks that have price less than \$1. The overall portfolio return for month j is the equal-weighted average month- j returns of the strategy implemented in the prior month and strategies formed up to *three* months earlier. Columns “SSN-PPN” in Panel A shows the return to a long/short portfolio that long in stocks with “SSN” and short in stocks with “PPN”. Panel B focuses on the return spread of “SSN-PPN” portfolios across different holding windows. 1%, 5%, and 10% statistical significance is indicated with ***, **, and *, respectively.

Table 6: Insider Sudden Silence and Earnings Announcement Return

	Dependent Variable: CAR (-1, +1)		
	(1)	(2)	(3)
SSN	0.2219*** (2.78)	0.2734*** (3.51)	0.2216*** (2.72)
PPN	-0.0541 (-0.56)	-0.0350 (-0.38)	-0.0498 (-0.58)
Lagged CAR	2.2089*** (8.55)	2.1751*** (8.59)	2.1787*** (8.13)
LnSize	0.0119 (0.99)	0.0242* (1.93)	0.0290** (2.36)
LnBM	0.2511*** (7.93)	0.2641*** (8.66)	0.2702*** (9.77)
Past month return	-0.1566 (-0.81)	-0.3023* (-1.79)	-0.3726** (-2.14)
Past year return	0.0568 (1.25)	0.0733* (1.94)	0.0555 (1.43)
Fixed effect	No	Industry	Industry and Quarter
Ave.R-sq	0.001	0.003	0.004
N.of Obs.	387911	387911	377287

This table shows the regression results of three-day cumulative abnormal return (in %) around quarterly earnings announcement on insider sudden silence dummy SSN and PPN in the previous quarter. SSN (PPN) is a dummy variable that equals one if in the quarter prior to the earnings announcement, there is any insider of the firm that has a sudden silence following consecutive two year selling (buying) behavior. Abnormal return is calculated as daily stock return minus return on the CRSP value-weighted portfolio. Standard errors are double clustered at firm and quarter level and we include industry and quarter fixed effect as indicated. The sample period runs from 1988 to 2013. 1%, 5%, and 10% statistical significance is indicated with ***, **, and *, respectively.

Table 7: The Role of Firms' Information Environment and Limits to Arbitrage

		Panel A: Insider silence and Firms' Information Environment					
		Cumulative 3 months		Cumulative 6 months		Cumulative 12 months	
		Var. < median	Var. > median	Var. < median	Var. > median	Var. < median	Var. > median
IO	SSN	0.803 (2.18)**	0.776 (2.88)***	1.748 (3.75)***	0.893 (1.83)*	3.120 (3.85)***	1.584 (2.48)**
	PPN	-0.956 (2.24)**	-0.809 (1.60)	-1.148 (1.52)	-1.541 (1.67)*	-1.200 (0.97)	-1.965 (1.26)
Coverage	SSN	1.130 (2.34)**	0.806 (2.54)**	2.054 (3.27)***	0.800 (1.55)	2.172 (2.59)***	2.516 (2.68)***
	PPN	-0.578 (1.18)	0.078 (0.17)	-0.696 (0.85)	0.542 (0.73)	-1.114 (0.88)	-0.204 (0.16)

		Panel B: Insider silence and Limits to Arbitrage					
		Cumulative 3 months		Cumulative 6 months		Cumulative 12 months	
		Var. < median	Var. > median	Var. < median	Var. > median	Var. < median	Var. > median
Market cap	SSN	0.664 (2.01)**	0.806 (3.29)***	1.289 (2.30)**	1.215 (2.97)***	2.170 (2.59)**	1.898 (2.59)**
	PPN	-0.693 (1.57)	-0.312 (0.73)	-1.451 (2.00)**	0.018 (0.03)	-1.171 (0.94)	0.072 (0.07)
Volatility	SSN	0.257 (1.33)	1.595 (3.87)***	0.552 (2.36)**	1.975 (3.17)***	0.857 (2.32)**	3.308 (2.88)***
	PPN	-0.287 (0.85)	-1.076 (1.75)*	-0.546 (0.85)	-1.476 (1.56)	-1.044 (1.17)	-0.481 (0.29)

This table reports the subsample Fama-Macbeth regressions of returns on indicators of SSN and PPN in the prior month, over our 1988 to 2013 sample period. We sort all the firms into two groups each year based on the June market capitalization, idiosyncratic volatility, residual institutional ownership, and analyst coverage. The idiosyncratic volatility is estimated using the weekly stock return (Wed. to Wed.) in the past year. The residual institutional ownership is institutional ownership orthogonalized w.r.t. to firm size. The analyst coverage is the number of analysts covering the firm for the last fiscal year. The dependent variable is cumulative three, six, and twelve months ahead returns. SSN (PPN) is

a dummy variable equal to one if the firm has any insider who sells (purchases) consecutively on the same month for the previous two years, but did not trade on the last month. Size and BM are the natural logarithms of the firm characteristics market equity and book-to-market. Past Month (Year) Returns are the return of the given firm over the prior month (year, excluding the prior month). *T*-statistics are Newey-West (1987) adjusted, and are shown below the estimates in parentheses; 1%, 5%, and 10% statistical significance is indicated with ***, **, and *, respectively.

Table 8: Returns to Insider Sudden Silence Portfolios – Conditional on Information Environment and Arbitrage Costs

Panel A: Subsample splitted by Residual Institutional Ownership		
		SSN-PPN
Res_IOR ≤ median	Alpha	0.78
	<i>t-stat</i>	(2.58**)
Res_IOR > median	Alpha	0.18
	<i>t-stat</i>	(0.62)
Panel B: Subsample splitted by Analyst Coverage		
		SSN-PPN
Coverage ≤ median	Alpha	0.50
	<i>t-stat</i>	(1.95*)
Coverage > median	Alpha	0.40
	<i>t-stat</i>	(1.39)
Panel C: Subsample splitted by Firm Size		
		SSN-PPN
Size ≤ median	Alpha	0.43
	<i>t-stat</i>	(1.40)
Size > median	Alpha	0.50
	<i>t-stat</i>	(1.81*)
Panel D: Subsample splitted by Idiosyncratic Volatility		
		SSN-PPN
Volatility ≤ median	Alpha	0.32
	<i>t-stat</i>	(1.10)
Volatility > median	Alpha	0.66
	<i>t-stat</i>	(1.75*)

Each month j from January 1988 to December 2013, stocks are first sorted into two groups based on information environment and arbitrage cost proxies, and then SSN and PPN portfolios are formed on preceding insider trading activity and held for three months. Stocks in the SSN category in month t (those firms that have insiders sell on month $t-12$, $t-24$, but did not trade on month t) are held from month $t+1$ to $t+i$ ($i=3$ in Panel A, and $i=1, 3, 6$ in Panel B), and similarly for “PPN” portfolios. Portfolio returns are value weighted across their constituent stocks. We focus on common stocks that are listed on NYSE/Amex/NASDAQ, and we exclude those stocks that have price less than \$1. The overall portfolio return for month j is the equal-weight average month- j returns of the strategy implemented in the prior month and strategies formed up to *three* months earlier (we require at least 10 stocks for each portfolio formed on the previous three months). These monthly portfolios are then regressed on the Fama and French (1993) three-factor model. 1%, 5%, and 10% statistical significance is indicated with ***, **, and *, respectively.

Table 9: The Effect of Sarbanes-Oxley Act on the Information Content of Insider Silence

	(1)	(2)	(3)	(4)
	ROA	Cash Flow	Earnings CAR (-1, +1)	Cum 3-month Return
SSN	0.0042*** (3.48)	0.0098*** (2.98)	0.1141 (0.67)	0.4416 (0.58)
SSN*Post	0.0027** (2.34)	0.0059* (1.71)	0.1415 (0.74)	0.3652 (0.41)
PPN	0.0042** (2.05)	0.0034 (1.16)	0.1718 (1.55)	0.3424 (0.39)
PPN*Post	-0.0081*** (-2.86)	-0.0078* (-1.80)	-0.3554*** (-3.00)	-2.5554** (-2.51)
Fixed effect	Industry, Quarter	Industry, Quarter	Industry, Quarter	FM
Controls	Yes	Yes	Yes	Yes
Ave.R-sq	0.263	0.313	0.004	0.107
N.of Obs.	264487	239012	377287	1,430,499

This table reports the effect of Sarbanes-Oxley Act on the predictability of insider silence for future firm profitability and returns. SSN (PPN) is a firm-month dummy variable equal to one if the firm has any insider who sells (purchases) consecutively on the same calendar month for the previous two years, but did not trade on the same month this year. We aggregate SSN and PPN to firm-quarter level in column (1) to (3). Post is a dummy equal to one for time period starting from the last quarter of 2002 and zero otherwise. We run panel regression and control for industry and quarter fixed effect from column (1) to (3) and cluster standard errors are firm and quarter level. We run Fama-Macbeth (1973) regression in column (4). Coefficients on control variables are omitted. 1%, 5%, and 10% statistical significance is indicated with ***, **, and *, respectively. The sample period is from 1988 to 2013.

Table 10: Robustness

Panel A: Subsample Tests Using More Recent Period 1997-2013						
	1 st month	2 nd month	3 rd month	Cum 3 months	Cum 6 months	Cum 12 months
SSN	0.219 (1.74)*	0.390 (2.69)***	0.457 (3.35)***	1.065 (3.67)***	2.057 (4.49)***	3.190 (3.72)***
PPN	-0.300 (1.39)	-0.270 (1.43)	-0.426 (1.95)*	-0.983 (2.03)**	-1.644 (1.81)*	-2.344 (1.55)

Panel B: Controlling for other insider trading predictors								
	Controlling for Oppbuy and Oppsell				Controlling for NetBuy			
	1 st month	Cum 3 months	Cum 6 months	Cum 12 months	1 st month	Cum 3 months	Cum 6 months	Cum 12 months
SSN	0.187 (1.26)	0.819 (3.23)***	1.238 (3.05)***	2.209 (3.63)***	0.240 (1.64)	0.880 (3.49)***	1.318 (3.30)***	2.298 (3.75)***
PPN	-0.157 (0.67)	-0.734 (1.91)*	-1.082 (1.52)	-1.117 (0.89)	-0.191 (0.81)	-0.843 (2.23)**	-1.180 (1.71)*	-1.146 (0.98)

Panel C: Controlling for Anomaly Variables				
	1 st month	Cum 3 months	Cum 6 months	Cum 12 months
SSN	0.154 (1.06)	0.736 (2.98)***	0.958 (2.56)**	1.659 (3.27)***
PPN	-0.17 (0.67)	-1.021 (2.38)**	-1.854 (2.08)**	-2.218 (1.66)*

Panel D: Insider silence measure constructed at firm level						
	1 st month	2 nd month	3 rd month	Cum 3 months	Cum 6 months	Cum 12 months
SSN	0.100 (0.91)	0.180 (1.29)	0.311 (2.51)**	0.585 (2.55)**	1.027 (2.68)***	1.728 (2.69)***
PPN	-0.391 (1.82)*	-0.218 (1.07)	-0.221 (1.05)	-0.854 (1.71)*	-1.229 (1.42)	-2.073 (1.43)

This table reports Fama-Macbeth regression of future stock returns on insider silence measure under different specifications. The dependent variable is future 1st month, future 2nd month, future 3rd month, future cumulative three months, future cumulative 6 months, and future cumulative 12 months returns. Panel A reports the results for the more recent sample period from 1997 to 2013. Panel B reports the coefficient estimates for SSN, PPN controlling for the other insider trading predictors, with the left table controlling for the opportunistic buy and opportunistic sell following Cohen et al. (2012), and the right table controlling for the previous six months net purchase ratio following Lakonishok and Lee (2001). Panel C shows the results controlling for the five well-known anomalies – net share issuance (NS), firm profitability (Y_B), momentum (already in the baseline regression), accruals (AcB) and asset growth (dA_A), following Fama and French (2008). Panel D displays the estimates in which our silence measure directly defined at the firm level, where we aggregate the all insiders' shares first each month, and then define silence following the previous construction method. *T*-statistics are Newey-West adjusted, and are shown below the estimates in parentheses; 1%, 5%, and 10% statistical significance is indicated with ***, **, and *, respectively.

Table 11: Predicting Change in Hedge Fund and Mutual Fund Holdings

	Change in HF holding		Change in MF holding	
	(1)	(2)	(3)	(4)
SSN	0.0332** (2.36)	0.0350** (2.50)	-0.0796*** (-3.47)	-0.1182*** (-4.17)
PPN	-0.0300* (-1.79)	-0.0191 (-0.94)	0.0209 (0.80)	0.0295 (0.99)
LnSize	0.0060*** (8.03)	-0.0039 (-0.58)	0.0274*** (23.74)	-0.0232 (-1.32)
LnBM	0.0034 (1.53)	0.0142*** (2.65)	-0.0241*** (-6.95)	-0.0416*** (-3.76)
Past month return	0.1182*** (7.43)	0.1078*** (4.23)	0.5656*** (23.11)	0.5424*** (9.48)
Past year return	-0.0000 (-0.01)	-0.0048 (-0.82)	0.2707*** (22.37)	0.2614*** (9.24)
Fixed Effect	Quarter	Firm and Quarter	Quarter	Firm and Quarter
Ave.R-sq	0.013	0.034	0.026	0.049
N.of Obs.	394709	394382	465792	465380

This table shows the regression results of change in quarterly hedge fund and mutual fund holding (in %) on insider silence dummy SSN and PPN in the previous quarter. Hedge fund (Mutual fund) holding is the total shares held by hedge funds (mutual funds) at each quarter over shares outstanding. SSN (PPN) is a dummy variable equal to one if the firm has any insider who sells (purchases) consecutively on the same calendar month for the previous two years, but did not trade on the same month this year. Standard errors are double clustered at firm and quarter level. The sample runs from 1988 to 2013 for mutual fund sample and from 1991 to 2012 for hedge fund sample. 1%, 5%, and 10% statistical significance is indicated with ***, **, and *, respectively.

Table 12: Insider Silence and Analyst Reactions

Panel A: Predicting Analyst Forecast Revisions			
	(1)	(2)	(3)
SSN	0.2775*** (5.93)	0.2716*** (5.91)	0.1551*** (3.93)
PPN	-0.0246 (-0.25)	-0.1133 (-1.20)	-0.2100** (-2.33)
Frev (-1)	0.0288* (1.82)	0.0272* (1.70)	0.0277* (1.74)
LnSize	0.2630*** (20.53)	0.2810*** (21.02)	0.2502*** (17.42)
LnBM	0.7181*** (14.38)	0.7497*** (15.88)	0.7389*** (15.31)
Past month return	1.6596*** (7.08)	1.6851*** (7.08)	1.8420*** (6.89)
Past year return	0.2696*** (5.92)	0.2813*** (6.08)	0.2949*** (5.55)
Fixed effect	No	Industry	Industry and Quarter
Ave.R-sq	0.024	0.028	0.035
N.of Obs.	322182	318708	318708

Panel B: Predicting Analyst Recommendation CAR

	(1)	(2)	(3)
SSN	0.1410*** (2.62)	0.1287** (2.46)	0.1045* (1.99)
PPN	-0.0493 (-0.40)	-0.0103 (-0.09)	-0.0694 (-0.58)
LnSize	-0.0671*** (-3.69)	-0.0688*** (-3.85)	-0.7009*** (-11.36)
LnBM	0.1469*** (3.66)	0.1936*** (4.80)	0.1068** (2.63)
Past month return	-0.0345 (-0.13)	-0.0551 (-0.20)	-0.9282*** (-3.49)
Past year return	0.2599*** (4.78)	0.2478*** (4.50)	0.1245* (1.90)
Fixed effect	No	Industry	Industry and Quarter
Ave.R-sq	0.001	0.002	0.060
N.of Obs.	253773	253743	252906

This table shows the regression results of analyst EPS forecast revision (scaled by book value per share) (in %) (Panel A) and recommendation CAR (-1, +1) (Panel B) on insider silence dummy SSN and PPN in the previous quarter. In panel A, the dependent variable is the quarterly change in analysts' consensus forecast on annual EPS scaled by book value per share in the end of last fiscal year. In panel B, the dependent variable is 3-day CAR around analyst recommendation change. SSN (PPN) is a dummy variable equal to one if the firm has any insider who sells (purchases) consecutively on the same calendar month for the previous two years, but did not trade on the same month this year. Standard errors are double clustered at firm and quarter level. The sample runs from 1988 to 2013 in panel A and from 1993 to 2013 in panel B. 1%, 5%, and 10% statistical significance is indicated with ***, **, and *, respectively.

Table 13: Conditional Results on the Length of Delay

TYPE	NOBS	# of Months Delayed					Average Size and BM Adjusted Monthly Excess Return				
		Mean	Median	Q1	Q3	Std.	Formation to Next trade	Next trade	Next trade to End	Before - After	
PPNP	8142	6.04	4	2	9	5.745	-0.81%	-0.07%	-0.39%	-0.41%	(3.79***)
PPNS	2006	8.98	7	3	14	6.781	1.66%	2.33%	-0.24%	1.89%	(6.75***)
PPNN	9398						-1.30% (13.74***)				
SSNS	23162	6.51	5	2	9	5.639	1.26%	2.55%	0.28%	0.97%	(17.69***)
SSNP	1377	8.40	7	3	12	6.164	-3.38%	-2.63%	0.44%	-3.89%	(15.17***)
SSNN	21642						0.31% (7.00***)				

TYPE	NOBS	Average Monthly (Ret - VWRETD)				Average Monthly (Raw return - Risk free rate)					
		Formation to Next trade	Next trade	Next trade to End	Before - After	Formation to Next trade	Next trade	Next trade to End	Before - After		
PPNP	8142	-0.28%	-0.11%	0.26%	-0.54%	(5.07***)	0.04%	-0.24%	0.81%	-0.79%	(6.81***)
PPNS	2006	2.44%	3.09%	0.38%	2.03%	(7.23***)	2.91%	3.49%	0.78%	2.16%	(7.49***)
PPNN	9398						-0.074% (1.08)				0.41% (5.62***)
SSNS	23162	1.63%	3.15%	0.52%	1.09%	(20.37***)	2.46%	4.27%	0.93%	1.56%	(25.93***)
SSNP	1377	-3.56%	-3.16%	1.18%	-4.73%	(18.01***)	-4.45%	-3.88%	2.14%	-6.67%	(21.05***)
SSNN	21642						0.72% (18.23***)				1.06% (25.07***)

This table shows the length of delay of insider sudden silence (SSN, PPN) at the individual insider level. Each month from 1988 to 2013, we define insider silence based on previous two years' consecutive same month insider trading. The sample in this table includes only insiders firm monthly observations with SSN and PPN, and we look into the number of month gaps and abnormal return between insider's sudden silence month (formation month) and their next trading month (next trade month). The top left panel shows the mean and median distributions for the number of months delayed for trading. The top right hand side shows the average monthly excess return adjusted by size and B/M from the month following the silence month to month before their next trading month, insider's next trading month, and from the month following their next trading month to the 24 months after insider's sudden silence month. Each June, we independently form decile size portfolios based on the June market capitalization and quintile portfolios based on last December's B/M ratio using NYSE breakpoints. In the bottom left panel, abnormal return is calculated by subtracting VWRED from the raw portfolio return. The bottom right panel displays the raw return minus the risk free rate.

Appendix Table 1: Determinants of Insider Sudden Silence

	SSN=1			PPN=1		
	Coefficient	t-stat	p-value	Coefficient	t-stat	p-value
LnSize	0.129	20.33	0.00%	-0.006	-0.45	65.53%
Past year return	-0.413	-23.60	0.00%	0.033	3.21	0.13%
LnBM	-0.313	-17.02	0.00%	0.002	0.53	59.74%
Inst.Ownership	0.689	21.79	0.00%	-0.999	-13.97	0.00%
ln (# of analyst)	0.292	20.28	0.00%	-0.048	-1.84	6.61%
ROA	0.973	8.13	0.00%	0.249	1.33	18.36%
GP	0.483	18.80	0.00%	-0.086	-2.19	2.86%
Accural	0.068	1.95	5.05%	-0.206	-1.71	8.67%
Asset Growth	0.001	1.92	5.39%	-0.152	-5.44	0.00%
N	917882			917882		

This table presents results of the maximum likelihood estimates of the logit model for the sample period 1988–2013. In the left (right) panel, the dependent variable is a dummy SSN (PPN) equal to 1 if the firm has any insider who sells (purchases) consecutively on the same calendar month for the previous two years, but did not trade on the same month this year. The logit also includes year dummies, which are not reported.

Appendix Table 2: Fama-Macbeth Regression – Multiple Insider Silence within firm-month

	1 st month	2 nd month	3 rd month	Cumulative 3 months	Cumulative 6 months	Cumulative 12 months
Past_month_return	-3.048	-0.514	0.574	-3.051	-2.974	0.825
	(7.05)***	(1.46)	(1.75)*	(4.81)***	(3.38)***	(0.69)
Past_year_return	0.740	0.603	0.358	1.675	2.109	0.313
	(4.42)***	(3.82)***	(2.34)**	(3.84)***	(2.42)**	(0.22)
Price	0.000	0.000	0.000	0.000	0.000	0.001
	(1.00)	(1.54)	(1.63)	(1.75)*	(1.93)*	(1.81)*
LnSize	0.006	-0.003	-0.000	0.006	-0.040	-0.221
	(0.12)	(0.06)	(0.01)	(0.04)	(0.17)	(0.53)
LnBM	0.435	0.429	0.390	1.247	2.239	3.495
	(4.58)***	(4.41)***	(3.79)***	(4.34)***	(4.08)***	(3.22)***
SSN	0.223	0.344	0.228	0.802	1.182	2.038
	(1.44)	(2.54)**	(1.94)*	(3.13)***	(2.92)***	(3.50)***
PPN	-0.069	-0.317	-0.131	-0.488	-0.929	-0.737
	(0.28)	(1.36)	(0.51)	(1.15)	(1.30)	(0.58)
MSSN	-0.066	0.195	-0.029	0.079	0.516	1.420
	(0.31)	(1.07)	(0.16)	(0.24)	(1.18)	(1.57)
MPPN	-0.311	-0.148	-0.106	-0.610	-0.419	-1.934
	(1.10)	(0.54)	(0.39)	(1.27)	(0.57)	(1.93)*
Intercept	1.169	1.156	1.182	3.473	7.212	15.434
	(3.07)***	(2.99)***	(2.99)***	(2.85)***	(3.11)***	(3.54)***
R ²	0.03	0.03	0.03	0.03	0.03	0.03
N	1,430,380	1,422,708	1,414,564	1,430,499	1,430,537	1,430,568

This table reports the Fama-Macbeth (1973) regressions of returns on dummies indicating insider silence month following consecutive trades, over our 1988 to 2013 sample period. The dependent variable is future 1st month, 2nd month, 3rd month, cumulative 3, 6, and 12 months returns. SSN (PPN) is a dummy variable equal to one if the firm has at least one insider who sells (purchases) consecutively on the same calendar month for the previous two years, but did not trade on the same month this year. MSSN (MPPN) is a dummy variable equal to one if the firm has more than one insider who sells (purchases) consecutively on the same calendar month for the previous two years, but did not trade on the same month this year. LnSize and LnBM are the natural logarithms of the firm market capitalization and book-to-market ratio. Past Month (Year) Returns are the return over the prior month (year, excluding the prior month). *T*-statistics are Newey-West (1987) adjusted, and are shown below the estimates in parentheses; 1%, 5%, and 10% statistical significance is indicated with ***, **, and *, respectively.

Appendix Table 3: Fama-Macbeth Regression – Insider Silence Defined Using 3 Consecutive Years of Trades

	1 st month	2 nd month	3 rd month	Cumulative 3 months	Cumulative 6 months	Cumulative 12 months
Past month return	-2.502 (3.85)***	-0.612 (1.15)	0.716 (1.47)	-2.460 (2.72)***	-2.405 (1.89)*	0.476 (0.27)
Past year return	0.493 (1.94)*	0.388 (1.62)	0.131 (0.57)	0.988 (1.50)	0.852 (0.66)	-1.432 (0.65)
Price	0.000 (0.13)	0.000 (0.26)	0.000 (0.12)	0.000 (0.22)	0.000 (0.09)	-0.000 (0.19)
LnSize	-0.047 (0.75)	-0.050 (0.74)	-0.049 (0.67)	-0.141 (0.80)	-0.304 (0.93)	-0.696 (1.21)
LnBM	0.328 (2.40)**	0.331 (2.36)**	0.281 (1.88)*	0.936 (2.32)**	1.572 (2.07)**	2.023 (1.44)
SSSN	0.429 (1.97)**	0.344 (1.32)	0.568 (2.20)**	1.323 (2.79)***	2.459 (3.00)***	4.065 (2.93)***
PPPN	-0.942 (2.64)***	-0.611 (1.55)	0.067 (0.18)	-1.507 (1.78)*	-1.411 (1.09)	-2.505 (1.07)
Intercept	1.256 (2.36)**	1.202 (2.21)**	1.246 (2.23)**	3.662 (2.12)**	7.465 (2.19)**	16.191 (2.54)**
<i>N</i>	844,627	839,503	834,106	844,673	844,698	844,719

This table reports the Fama-Macbeth (1973) regressions of returns on dummies indicating insider silence month following consecutive trades, over our 1998 to 2013 sample period. The dependent variable is future 1st month, 2nd month, 3rd month, cumulative 3, 6, and 12 months returns. SSSN (PPPN) is a dummy variable equal to one if the firm has any insider who sells (purchases) consecutively on the same calendar month for the previous three years, but did not trade on the same month this year. LnSize and LnBM are the natural logarithms of the firm market capitalization and book-to-market ratio. Past Month (Year) Returns are the return over the prior month (year, excluding the prior month). *T*-statistics are Newey-West (1987) adjusted, and are shown below the estimates in parentheses; 1%, 5%, and 10% statistical significance is indicated with ***, **, and *, respectively.

Appendix Table 4: Calendar Portfolio Results – Insider Silence Defined Using 3 Consecutive Years of Trades

Panel A: Equal Weighted Portfolios Returns for 3 Months Holding Window, 1998-2013

	PPPN	SSSN	SSSN-PPPN
Raw Return	0.491	1.175	0.684
t-stat	(1.26)	(2.34)**	(1.66)*
Carhart Alpha	-0.258	0.608	0.866
t-stat	(-0.93)	(3.15)***	(2.61)***
DGTW-Adj.Return	-0.559	0.404	0.963
t-stat	(1.83)*	(2.28)**	(2.52)***

Panel B: SSSN-PPPN portfolio for Different Holding Window, 1998-2013

	EW			VW		
	1 m	3 m	6 m	1 m	3 m	6 m
Raw Return	0.856	0.684	0.416	-0.1147	0.191	-0.157
	(1.69)*	(1.66)*	(1.07)	(0.20)	(0.42)	(0.38)
Carhart Alpha	0.913	0.866	0.558	0.06	0.465	0.017
	(2.15)**	(2.61)***	(1.76)*	(0.12)	(1.23)	(0.05)
DGTW Adj.	1.307	0.963	0.574	0.107	0.175	-0.04
	(2.70)**	(2.52)***	(1.64)*	(0.20)	(0.45)	(0.11)

Each month j from January 1998 to December 2013, portfolios are formed on preceding insider trading activity and hold for i ($i=1, 3, 6$) months. Stocks in the SSSN category in month t (those firms that have insiders sell on month $t-12, t-24, t-36$, but did not trade on month t) are held from month $t+1$ to $t+i$ ($i=3$ in Panel A, and $i=1, 3, 6$ in Panel B), and similarly for “PPPN” portfolio. Portfolio returns are equal or value weighted across their constituent stocks. We focus on common stocks that are listed on NYSE/Amex/NASDAQ, and we exclude those stocks that have price less than \$1. The overall portfolio return for month j is the equal-weight average month- j returns of the strategy implemented in the prior month and strategies formed up to *three* months earlier in Panel A. The table shows the raw returns and standard deviations, with their Carhart 4-factor alpha, and DGTW adjusted excess returns. Columns “PPPN-SSSN” in Panel A shows the equal weighted portfolio return spread between the “SSSN” and “PPPN” portfolios. Panel B reports the “SSSN-PPPN” portfolio return across different holding windows. 1%, 5%, and 10% statistical significance is indicated with ***, **, and *, respectively.

Appendix Table 5: Fama-Macbeth Regression – Defining Insider Silence as Deviation from Previous Routine Trades

	1 st month	2 nd month	3 rd month	Cumulative 3 months	Cumulative 6 months	Cumulative 12 months
Past_month_return	-3.048	-0.516	0.574	-3.053	-2.976	0.824
	(7.05)***	(1.46)	(1.75)*	(4.82)***	(3.38)***	(0.69)
Past_year_return	0.740	0.604	0.358	1.675	2.110	0.317
	(4.42)***	(3.83)***	(2.33)**	(3.84)***	(2.42)**	(0.22)
Price	0.000	0.000	0.000	0.000	0.000	0.001
	(1.00)	(1.55)	(1.62)	(1.75)*	(1.93)*	(1.81)*
LnSize	0.006	-0.003	-0.001	0.005	-0.042	-0.226
	(0.12)	(0.07)	(0.01)	(0.04)	(0.18)	(0.54)
LnBM	0.435	0.429	0.390	1.248	2.242	3.501
	(4.59)***	(4.42)***	(3.80)***	(4.35)***	(4.09)***	(3.23)***
SSD	0.160	0.375	0.246	0.780	1.225	2.440
	(1.10)	(3.05)***	(2.29)**	(3.56)***	(3.60)***	(3.88)***
PPD	-0.194	-0.425	-0.251	-0.853	-0.916	-1.280
	(0.87)	(1.94)*	(1.31)	(2.06)**	(1.27)	(1.08)
Intercept	1.170	1.157	1.183	3.477	7.223	15.459
	(3.07)***	(3.00)***	(3.00)***	(2.86)***	(3.12)***	(3.55)***
R ²	0.03	0.03	0.03	0.03	0.03	0.03
N	1,430,380	1,422,708	1,414,564	1,430,499	1,430,537	1,430,568

This table reports the Fama-Macbeth (1973) regressions of returns on dummies indicating insider silence month following consecutive trades, over the 1988 to 2013 sample period. The dependent variable is future 1st month, 2nd month, 3rd month, cumulative 3, 6, and 12 months returns. SSD (PPD) is a dummy variable equal to one if the firm has at least one insider who sells (purchases) consecutively on the same calendar month for the previous two years, but sells (buys) less than 1/2 volume of either of previous two selling (purchasing) on the same month this year. LnSize and LnBM are the natural logarithms of the firm market capitalization and book-to-market ratio. Past Month (Year) Returns are the return over the prior month (year, excluding the prior month). *T*-statistics are Newey-West (1987) adjusted, and are shown below the estimates in parentheses; 1%, 5%, and 10% statistical significance is indicated with ***, **, and *, respectively.