The Coupling of Momentum and Reversal

Abstract

This paper examines two hypotheses that explain short-term momentum and long-term reversal of momentum portfolios. Extant behavioral models suggest that momentum and reversal are coupled in individual stocks (the *coupling* hypothesis). Alternatively, the portfolio-level coupling of momentum and reversal can be driven by two distinct groups of stocks: one exhibits momentum without reversal and the other experiences reversal without momentum (the *decoupling* hypothesis). Using insider trading decisions as a proxy for firm-specific information to form subgroups among past winners and losers, we find strong evidence rejecting the *coupling* hypothesis. The results suggest that mispricing occurs prior to portfolio formation, which is corrected post-formation, both short and long terms.

Key words: Momentum, Reversal, Insider trading, Insider silence, Firm-specific information

1. Introduction

This paper examines two hypotheses that explain both short-term momentum and long-term reversal of momentum portfolios. Extant behavioral models (Barberis, Shleifer, and Vishny, 1998; Daniel, Hirshleifer, and Subrahmanyam, 1998; Hong and Stein, 1999) suggest that momentum and reversal are coupled in individual stocks. That is, a stock (of past winners or losers) exhibits momentum in the short term, which is reversed in the long term (the *coupling* hypothesis). Alternatively, the portfolio-level coupling of momentum and reversal emerges if some stocks exhibit short-term momentum without long-term reversal while other stocks experience long-term reversal without short-term momentum. In this case, short-term momentum and long-term reversal are decoupled in individual stocks (the *decoupling* hypothesis). The following example illustrates such a possibility.

Consider two past winner stocks, M and R, as shown in the chart below. Suppose stock M experiences short-term return of 8% and long term return of 0%, and stock R experiences short-term return of 0% and long-term return of –8%. Thus, M exhibits short-term momentum but no long-term reversal, R experiences long-term reversal but does not exhibit short-term momentum, and neither exhibits the coupling of momentum and reversal. Yet, an equal-weight portfolio of stocks M and R exhibits the pattern of coupling: short-term momentum of 4% (average of 8% and 0%) and long-term reversal of –4% (average of 0% and –8%).

Stocks / Portfolio	Short-term Return (%)	Long-term Return (%)	Coupling of Momentum / Reversal
M	8	0	No
R	0	– 8	No
MR (½ M + ½ R)	4	– 4	Yes

To test the coupling hypothesis against the decoupling hypothesis, we derive implications of the coupling hypothesis for stocks of past winners and losers. The coupling hypothesis posits that the short-term return of a stock is reversed in the long term. As such, the combined short-

and long-term return for *the stock* is equal to zero. This observation for individual stocks has implications for portfolios. First, for any subgroup of past winners or losers, there are significant short-term momentum and long-term reversal, and the combined short- and long-term return is equal to zero (Prediction 1). Second, stronger short-term momentum is associated with stronger reversal. Thus, if portfolio A exhibits higher short-term return than portfolio B, it has lower long-term return than portfolio B (Prediction 2).

We use firm-specific information to form subgroups among past winners and past losers. The focus on firm-specific information in this context is motivated by Jegadeesh and Titman (1993, JT thereafter), who interpret momentum returns as "consistent with delayed price reactions to firm-specific information" (JT, 1993, p. 67). Our proxy for firm-specific information is based on insider trading. The proxy is intuitive. If, as JT (1993) point out, momentum returns reflect firm-specific information, corporate insiders are best positioned to have foreknowledge about it and might have traded on it, to the legally permissible extent. Thus firm-specific information might be reflected in insider trading activity.

Relating insider trading to firm-specific information, conventional wisdom suggests that insiders buy shares on positive, and sell on negative, information. Thus, insider buying and selling activity would proxy for positive and negative firm-specific information, respectively. Accounting for the regulatory and litigation risk associated with insider trading, however, this view is incomplete, and one should also consider insiders' decision to keep silent (no trading). That is, insiders choose not to trade when expecting high litigation risk associated with insider trading. The concern for litigation risk is particularly acute for insider sales.[1] Thus, insiders would keep silent when they foresee large stock price drops in the future. This is because

[1] See Bettis, Coles, and Lemmon (2000), Ke, Huddart, and Petroni (2003), Cheng and Lo (2006, p. 821), Piotroski and Roulstone (2008), Rogers (2008, p. 1269), Lee, Lemmon, Li, and Sequeira (2012), among others.

shareholders and plaintiff lawyers launch securities class-action lawsuits following large stock price declines on the basis of Rule 10b-5, mostly alleging that corporate insiders had foreknowledge about the information that led to the price decline but failed to promptly disclose the information to the market.[2] In such cases, insiders' selling activity would be viewed as evidence that insiders had the foreknowledge about the adverse information and had traded upon it before disclosing to the market.[3] In this scenario, the best defense for insiders is not to sell, as lack of insider trading undercuts plaintiffs' allegation that insiders knew and traded on the information. Neither would they buy, given the adverse prospects. Thus, the high litigation risk associated with insider selling upon significant negative information induces rational insiders not to trade at all. This establishes a link between insider silence and negative firm-specific information (thus lower future returns).[4]

We form portfolios based on both past returns and past insider trading decisions and examine their future returns. Specifically, among past winners or losers we form "traded" and "silence" groups based on the existence of insider trading activity over the past six months. The "traded" groups consist of stocks (of past winners or losers) that insiders have traded in the past and the "silence" groups consist of stocks that no insider trading activity exists in the past.[5] We thus have four portfolios: traded winners, silence winners, traded losers, and silence losers.

[2] See O'Brien and Hodges (1991), Francis, Philbrick, and Schipper (1994), Skinner (1994), among others. For a recent example of securities class-action lawsuits following large stock price declines, see the case involving Yum! Brands: http://securities.stanford.edu/1050/YUM00_01/index.html.

[3] See Grundfest and Perino (1997), Niehaus and Roth (1999), Johnson, Nelson, and Pritchard (2007, p. 642), Rogers (2008), Rogers, Van Burskirk, and Zechman (2011, p.2157), among others.

[4] Several recent working papers find that insider silence is related to future returns, especially negative returns. Ma and Ukhov (2012) find that insider silence partially explains a broad set of return anomalies; Gao and Ma (2012) find insider silence predicts extreme negative future returns among heavily shorted stocks.

[5] We also examine the difference between cases involving insider net buying and selling. Their differences are, however, economically smaller than those between traded and silence portfolios. See Table 3 Panels C & D.

In this setting we form monthly portfolios from January 1989 to December 2006, and examine future returns that cover up to December 2011. We define the short and long terms as the 1st and the subsequent four (2nd to 5th years) years, respectively.[6] First we confirm the basic empirical regularity of significant short–term momentum profits, which are reversed in the long term. We then confirm that insider trading decisions (silence vs. traded) appear to be a sensible proxy for firm-specific information, since they are systematically related to future returns up to five years, a conclusion that holds among both past winner and loser groups.

Testing the two Predictions of the coupling hypothesis on the four portfolios (traded winners, silence winners, traded losers, and silence losers), we establish our main results. First, Prediction 1 of the coupling hypothesis is rejected. Specifically, none of the four portfolios exhibits the coupling of short-term momentum and long-term reversal. Among past winners, the silence winners exhibit no significant positive short-term returns (no momentum) but experience significant negative long-term returns (strong reversal), while the traded winners exhibit significant positive short-term returns (strong momentum) and significant positive long-term returns (no reversal). Thus, neither of the winner portfolios exhibits the coupling of momentum and reversal. Among past loser stocks, the silence losers exhibit significant negative short-term returns (strong momentum) and negative long-term returns (no reversal), while the traded loser stocks exhibit no significant negative short-term returns (no momentum) but experience strong positive long-term returns (strong reversal). Thus, neither of the loser portfolios exhibits the coupling of momentum and reversal. Further, in all four portfolios the null hypothesis is rejected that the combined short- and long-term return is equal to zero.

[6] In our main analysis the short and long terms are defined as the 1st year and the subsequent four (2nd to 5th) years, respectively. Our conclusions are robust to whether the short term is defined as six or 12 months and to whether the long term goes to two, three, four, or five years.

Second, Prediction 2 of the coupling hypothesis is rejected. Specifically, among past winners, the silence winners earn significantly lower short-term return than the traded winners, but the silence winners continue to earn lower return in the long term than the traded winners; among past losers, the silence losers earn significantly lower short-term return than the traded losers, but the silence losers continue to earn lower return in the long term than the traded losers.[7] The overall evidence thus rejects the coupling hypothesis and suggests that short-term momentum and long-term reversal are decoupled in individual stocks.

The decoupling evidence survives a battery of robustness checks. It holds in subsamples (1989-1997 and 1998-2006). It is robust to alternative methodologies of measuring abnormal returns (cumulative abnormal returns, buy-and-hold abnormal returns, or average monthly alphas after adjusting for risk factors), alternative windows to measure past insider trading activity (six or 12 months), and alternative windows to measure past returns (six or 12 months). It holds whether or not a month is skipped between the periods to measure past and future returns.

To alleviate the concern of data snooping and see whether the decoupling evidence holds in a broader sample over a longer time period, we take an alternative approach and find no evidence supporting the coupling hypothesis. Specifically, among past winners and losers, we form portfolios on their port-formation short term (1st year) returns and examine their returns in the long term (2nd to 5th years). Among both groups of past winners and past losers, there is no evidence that higher short-term returns are associated with lower long-term returns.

The paper contributes to the literature of return momentum (see related literature in Section 2) following the pioneering work of JT (1993). First, our paper is related to the literature that explores the cross-section of momentum returns, with one important deviation. The existing

[7] Further breaking down the traded stocks into cases with insiders net buying and net selling, heavy or light buying or selling does not reveal additional significant insights or alter the interpretation of our main results. See section 4 for more details.

literature examines winner-minus-loser portfolios grouped by stock characteristics.[8] Our paper studies individual subgroups of past winners and losers. By taking this microscopic approach we uncover a new set of empirical regularities, which reveal substantial heterogeneity among past winners and losers. Notably, the subgroups appear strikingly different from the winner-minus-loser portfolios. In particular, the well-documented phenomenon of short-term momentum and long-term reversal for momentum portfolios does not emerge in subgroups, suggesting that the coupling of momentum and reversal does not hold in individual stocks.

Second, our main finding that short-term momentum and long-term reversal are decoupled in individual stocks speaks directly to extant behavioral models, specifically on the source of mispricing. The extant models, based on individual stocks, suggest that mispricing (among past winners or losers) occurs in the short term, which is reversed (corrected) in the long term.[9] Our paper shows a more linear pattern in returns over the short and long terms following portfolio formation. Further, both short- and long-term returns are systematically related to pre-formation firm-specific information. Our evidence then indicates that, if there is any mispricing in these stocks (of past winners and losers), it occurs prior to portfolio formation, and that the subsequent returns, during both short and long terms, represent a correction. Our evidence thus is consistent with JT's (1993) interpretation of momentum returns as "delayed price reactions to firm-specific information."

[8] This line of research examines the role characteristics, such as firm size and analysts following (Hong, Lim, and Stein, 2000), trading volume (Lee and Swaminathan, 2000), information uncertainty (Zhang 2006), firm performance (Sagi and Seasholes, 2007), analyst forecast dispersion (Verardo, 2009), credit risk (Avramov, Chordia, Jostova, and Philipov, 2007), and b/m ratio (Daniel and Titman, 1999; Asness, 1997) on the performance of winner-minus-loser portfolios. Chui, Titman, and Wei (2010) study the role of cultural difference in momentum profits. See also Conrad and Yavuz (2012). These firm and stock characteristics are conceptually distinct from firm-specific information as interpreted by JT (1993).

[9] The disposition effect model of Grinblatt and Han (2005) also allows for quick dissipation of momentum returns as the composition of trading changes but it does not call for negative cumulative returns at longer horizons. Recent work includes Vayanos and Woolley (2012). These models are also based on individual stocks.

In this regard our paper is related to the literature that examines both short-term momentum and long-term reversal (e.g., JT, 1993, 2001; Lee and Swaminathan, 2000, p.2039-41; Griffin, Ji, and Martin, 2003; Cooper, Gutierrez, and Hameed, 2004, p. 1353; Conrad and Yavuz, 2012; Antonio, Doukas, and Subrahmanyam, 2011; among others). These studies provide mixed evidence regarding the coupling of short-term momentum and long-term reversal. We add to this literature by providing sharper tests of the behavioral models and by drawing implications for the source of mispricing. Our empirical design allows sharper tests of the behavioral models by examining subgroups of past winners and losers. Going beyond casting doubt on the extant models, our evidence has direct implications for the source of mispricing. The extant models predict that mispricing occurs in the short-term, which is reversed in the long term. Our decoupling evidence suggests that the short-term return (momentum) does not represent mispricing. Instead, mispricing exists prior to portfolio formation, and returns over both the short and long terms represent correction of the mispricing.

Third, our evidence has implications for rational models of momentum.[10] Compared to behavioral models, rational models have been considered disadvantaged because they cannot explain the long-term reversal (e.g., JT, 2001, p. 711). Our decoupling evidence eliminates this disadvantage. At the same time, our evidence of the subgroups of past winners and losers poses new challenges to rational models of momentum. Specifically, such models should be able to identify a new risk factor that is systematically related to ex-ante insider trading decisions.

In Section 2 we discuss the related literature and our hypothesis. Section 3 describes the sample and data and confirms the basic empirical regularity on momentum and reversal for the

[10] An incomplete list of risk-based models include Conrad and Kaul (1998), Berk, Green, and Naik (1999), Johnson (2002), Ahn, Conrad, and Dittmar (2003), Pastor and Stambaugh (2003), Bansal, Dittmar, and Lundblad (2005), Sadka (2006), Sagi and Seasholes (2007), and Liu and Zhang (2008; 2011). Korajczyk and Sadka (2004) examine trading-related market frictions. Chordia and Shivakumar (2002) and Griffin, Ji, and Martin (2003) report mixed evidence on the role of macroeconomic variables in momentum.

time period we examine. In section 4 we present the main empirical results, followed by a battery of robustness checks in section 5. We provide supplementary evidence in section 6 by taking an alternative empirical experiment and conclude in section 7 with discussions on implications for relevant theories.

2. Literature and hypotheses

JT (1993) document that a portfolio strategy that buys stocks with high past returns and sells stocks with low past returns earns significant positive returns over the subsequent six to 12 months. This phenomenon appears pervasive and persistent. It is found in international markets (Rouwenhorst, 1998; Griffin, Ji, and Martin, 2003; Chui, Titman, and Wei, 2010), in other asset classes (Bhojraj and Swaminathan, 2006; Asness, Moskowitz, and Pedersen, 2009), and in industries (Moskowitz and Grinblatt, 1999). It survives the out-of-sample tests (Carhart, 1997; JT, 2001; Grundy and Martin, 2001; Chabot, Ghysels, and Jagannathan, 2009). Even more puzzling, the positive significant momentum profits in the first six to 12 months tend to reverse in the long term (e.g., JT, 1993; 2001).

It remains unclear why short-term momentum profits exist and why they reverse in the long term. Relevant theories roughly fall into two categories: rational and behavioral. Rational theories argue that the short-term momentum profits are due to cross-sectional variations in expected returns (Lo and MacKinlay, 1990; Conrad and Kaul, 1998) or due to time-variation in expected returns (Berk, Green, and Naik, 1999; Johnson, 2002; Chordia and Shivakumar, 2002; Sagi and Seasholes, 2007). Rational theories, however, cannot explain long-term reversal (JT, 2001; 2011). Other researchers (Barberis, Shleifer, and Vishny, 1998; Daniel, Hirshleifer, and Subrahmanyam, 1998; Hong and Stein, 1999) propose behavioral models that explain both short-term momentum and long-term reversal.

With no exception, these behavioral models are based on individual stocks, and argue that short-term momentum represents mispricing, which is reversed in the long term when the market corrects itself. These models imply that short-term momentum and long-term reversal are coupled in individual stocks (the *coupling* hypothesis). While the stock-level coupling certainly implies portfolio-level coupling, the reverse is not logically true and there is an alternative possibility. The portfolio-level coupling of momentum and reversal could arise when some stocks exhibit short-term momentum without long-term reversal while other stocks experience long-term reversal without short-term momentum. In this case, short-term momentum and long-term reversal are decoupled in individual stocks (the *decoupling* hypothesis).

To test the *coupling* hypothesis against the *decoupling* hypothesis, we derive two implications from the *coupling* hypothesis for stocks of past winners and past losers. The coupling hypothesis posits that the short-term return of a stock is reversed in the long term. As such, the combined short and long term returns for the stock is equal to zero (e.g., JT, 2001, p. 712). This observation has two predictions for any subgroup of past winners or losers.

Prediction 1: For any subgroup of past winners or losers, there are significant short-term momentum and long-term reversal, and the combined short- and long-term return equals to zero.

Prediction 2: If portfolio A exhibits higher short-term return than portfolio B, it has lower long-term return than portfolio B.

3. Sample and data

Our sample is based on all NYSE/Amex/NASDAQ common stocks (share code 10 or 11) covered in CRSP/Compustat merged database from January 1989 to December 2006, a total of 216 year/month cross-sections. Because we study event returns over the subsequent five years,

our sample period for portfolio formation ends in December 2006. The starting point of the sample period is determined by when insider trading data is available.

We apply the filters as in JT (2001). Specifically, we exclude stocks whose prior month-end price is lower than $5 and stocks that would be classified into the lowest NYSE market capitalization decile. We also exclude firms with missing or non-positive book value of equity. We obtain stock return data from CRSP and accounting data from Compustat. We follow Fama and French (1992) to construct firm size and B/M ratio, and JT (2001) to estimate past returns and form portfolios. Past return of month *j* is estimated as the buy-and-hold returns over the past six months (from month *j*-6 to *j*-1). We require that stock returns exist in each and every month of the past six months.

We obtain insider trading data from Thomson Reuters Insider Filing Data Feed. The Securities and Exchange Commission (SEC) mandates that 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 days (since August 2002). The database cleaning process largely follows recent studies (e.g., Rozeff and Zaman, 1998; Lakonishok and Lee, 2001; Piotroski and Roulstone, 2005; Sias and Whidbee, 2010).[11] Defined in equation (1), the net insider demand (NID) for month j is the total number of shares insiders buy minus the total number of shares insiders sell over the past six months, normalized by the total number of shares outstanding at the

[11] We follow the literature (e.g., Lakonishok and Lee 2001; Sias and Whidbee 2010) to "clean" the insider trading data. Specifically, we use the following filters. We delete duplicate and amended records and records with cleanse code of "S" or "A" are deleted. Transaction price must be available, and we delete records if the number of shares in a transaction is below 100. The transaction code is either "P" or "S" for stock transactions and "M" for options exercised. We delete transactions that involve more than 20% of total shares outstanding, and delete records if the transaction price is outside the 80%–120% range of the CRSP end-of-day stock price.

end of month j-1. Our main analyses are based on insider trading activity measured over the past six months, although the main results are robust to an alternative window of 12 months.

$$\text{NID}_j = \frac{\#\text{ shares insiders buy}_{j-6,j-1} - \#\text{ shares insiders sell}_{j-6,j-1}}{\#\text{ shares outstanding}_{j-1}} \quad (1)$$

We then use past returns and past insider trading decisions to form portfolios. Stocks with past six-month returns ranked in the top and bottom deciles are grouped in the "winner" and "loser" portfolios, respectively. Stocks with no insider trading activity (NID not defined) form the "silence" portfolio, stocks with any past insider trading activity form the "traded" portfolio, and the "buy" and "sell" portfolios consist of stocks with positive and negative NID, respectively. The intersection between NID and past returns then forms portfolios such as "silence" winners, "traded" losers, and so on. The portfolio returns start from month j.

All variables are defined with greater details in the Appendix.

Figure 1 presents, month by month from January 1989 to December 2006, the proportion of firms with insider net selling, net buying, and silence over the trailing six-month period. The proportion of insider silence is over 40% in the early time and generally follows a declining trend. The grand average of insider silence is 27.5%. Conditional on insider trading, insider net selling is more frequent than net buying.

[Insert Figure 1 about here]

Table 1 shows summary statistics of the sample and the subgroups sorted on past returns and past insider trading decisions. The group of past winners (losers) consists of stocks with trailing six-month buy-and-hold return in the highest (lowest) decile. The group "middle groups" include all stocks in the 2nd to 9th deciles. The average return over the trailing six months is 13.2%, and the average NID over the trailing six months is -0.336%, consistent with insiders on average being net sellers. The average six-month NID is also comparable to the literature. For

example, Sias and Whidbee (2010, p1551) estimate an average quarterly NID of -0.145%, roughly half of our six-month measure. Between past winners and past losers, NID is more negative for past winners than past losers, consistent with the literature that the contemporaneous correlation between net insider demand and stock returns are negative (e.g., Sias and Whidbee, 2010). Both past winner and loser stocks are relatively small and they have lower book-to-market values (JT, 2001). Among past winners or past losers, the "silence" groups have smaller sizes but higher B/M ratios than their corresponding "traded" groups. In addition, the "buy" groups are smaller firms with higher B/M ratios, consistent with the notion that insiders of larger firms tend to sell and insiders are contrarian (Seyhun, 1986; Piotroski and Roulstone, 2005). Insiders are more likely to net sell if their firms are growth firms than value firms (Rozeff and Zaman, 1998). The evidence on firm characteristics also suggests that we control for size and B/M when examining future returns.

[Insert Table 1 about here]

4. Results

We examine future returns of past losers and winners. We follow the literature (e.g., JT, 2001) and define the first year as the short term and the subsequent four (2^{nd} to 5^{th}) years as the long term. Our conclusions are robust to whether the short term is defined six or 12 months and to whether the long term is defined up to two, three, four, or five years.

4.1. Returns of past winners and losers

For stocks in the extreme deciles (and the middle decile), Panel A of Table 2 presents their time-series averages of equal-weight cross-sectional average annual returns for the first to fifth 12-month periods following portfolio formation.[12] The t-statistics in square brackets are

[12] Our sample also generates results very close to JT (2001, Table 5) when we follow their empirical strategy. For confirmation purpose only, these results are not reported but available upon request.

based on Newey-West standard errors. Loser stocks earn 8.06% in the first year following portfolio formation and a cumulative 67.91% over the subsequent four years; winner stocks earn 17.63% over the first year and 57.13% over the subsequent four years; and the winner-minus-loser portfolio earns 9.58% in the first year. Over the subsequent four years the returns are -5%, -7.57%, 2.64%, and -0.85%, respectively, resulting in a cumulative return of -10.78%. Although the cumulative returns over the 2nd to 5th years are not statistically significant (t-stat of -1.54, with Newey-West adjustment of 47 lags), the negative returns over the long term do reverse the short-term returns of 9.58% in the first year. This pattern is largely consistent with the prior literature (e.g., JT, 1993; 2001; Lee and Swaminathan, 2000, p. 2025).[13]

As past winners and losers have different characteristics such as size and B/M ratio, we examine returns of these portfolios after adjusting for size and B/M. The procedure is described in the Appendix. Panel B of Table 2 shows the results. For past loser stocks, their short-term abnormal returns are -3.23% (t= -2.68), followed by cumulative long-term abnormal returns of 12.26% (t= 3.27) over the subsequent four years, suggesting that there is short-term momentum and long-term reversal for past loser stocks. For past winners, the first-year abnormal returns are 4.03% (t= 2.00), consistent with the general pattern that past winners continue to perform well in the short term. There is, however, no reversal in the long term. Instead, the long-term return is a positive 7.95% (t= 1.87). The winner-minus-loser portfolio exhibits the coupling of short-term momentum of 7.26% (t= 2.78) and long-term reversal -4.30% (t= -1.09).

[Insert Table 2 about here]

4.2. Portfolios formed on past insider trading decisions

[13] Following the same approach we further confirm that the winner-minus-loser portfolio return for the 1965-1981 sample period is 11.43% (t-stat 4.13) with -12.60% (t=-2.43) over the subsequent four years; for the 1982-1998 sample period the short- and long-term returns are 11.56 (t=5.22) and -0.27 (t=-0.05), respectively; for 1965-1998 sample period the short- and long-term returns are 11.50 (t=6.48) and -6.44 (t=-1.55), respectively. These results are largely consistent with the prior literature (e.g., JT, 2001).

We now break down stocks of past winners and past losers by their insider trading decisions over the trailing six months and examine their future returns. Specifically, for past winners or losers, the "silence" portfolio consists of stocks that insiders do not trade over the past six months; the "traded" portfolio consists of stocks that insiders trade over the past six months; the "buy" and "sell" portfolios consist of stocks that insiders net buy and sell over the past six months, respectively. We call these portfolios silence winners, traded winners, and so on. With these portfolios we test the two Predictions of the coupling hypothesis. For ease of comparison we also present results for all winners and all losers.

We test Prediction 1 of the coupling hypothesis in column "Yr 1-5" of Table 3, which lists the time-series averages of equal-weight mean abnormal returns of the portfolios over the five years following portfolio formation. Note we define the 1st year and subsequent four years as the short and long terms, respectively. Panel A shows that for all past winner stocks, the five-year abnormal return is 11.98%, significant at the 5% level, a result that is not consistent with Prediction 1. This conclusion holds for the subgroups as well. Silence winners experience a significant five-year abnormal return of -8.25%, while traded winners earn a significant five-year abnormal return of 18.48%. The last two rows in Panel A test the differences between the silence and traded portfolios. Over the five-year period, silence winners significantly underperform traded winners, supporting our prior that insider silence is a proxy for negative information.

Column "Yr 1" of Panel A in Table 3 presents portfolio abnormal returns over the first year following portfolio formation. The significant momentum returns for the whole winner group (4.03%) is entirely driven by the traded winner portfolio, which earns a significant return of 5.52%. The difference between traded and silence winners is a significant -4.73%. Corroborating the evidence in column "Yr 1-5", this result shows that the difference between

silence and traded winners shows up as early as during the first year following portfolio formation. Further, by separating past winners into two groups that differ significantly in short-term momentum, we set the stage to test Prediction 2 of the coupling hypothesis.

Now that silence winners exhibit significantly weaker (less positive) short-term momentum returns than do traded winners, Prediction 2 of the coupling hypothesis implies that silence winners should have weaker reversal (less negative returns) than traded winners. That is, given the significant negative silence-traded spread in the short term, the silence-traded spread should be positive and significant in the long term. The results in column "Yr 2-5" of Panel A suggest the opposite. The silence portfolio continues to underperform by a significant -9.04% over the subsequent four years while the traded portfolio continues to earn a significant positive 12.96% over the same period, resulting in a significant difference of -22.00% (t-stat = –4.32). Lack of a positive silence-traded spread in the long term rejects Prediction 2.

Since the behavioral models do not specify at which time point reversal begins or ends, it is important to check whether our results hold for alternative definitions of the short and long terms. The last four columns of Panel A show the year by year abnormal returns over the subsequent four years. The silence-traded spread over each of the four years is negative and significant, suggesting that Prediction 2 is rejected regardless of whether the long term is defined as short as two years or as long as five years.[14]

Panel B of Table 3 presents results for the silence and traded loser stocks. As discussed in Table 2, past losers for our sample period (1989-2006) exhibit significant negative short-term returns and positive long-term returns. Thus, past losers as a whole exhibit the coupling of short-

[14] Splitting the first year into two six-month periods does not alter the conclusion. Specifically, silence winners earn 1.79% and -1.01% during the two six-month periods, respectively; traded winners earn 4.03% and 1.48% during the two six-month periods, respectively. The silence-traded spreads are -2.24% and -2.49% (both significant at the 1% level) during the two six-month periods, respectively. Unreported for brevity, the evidence on the two six-month periods suggests that the rejection of Prediction 2 is robust to whether the short term is defined as six or 12 months.

term momentum and long-term reversal. The combined return over the short and long terms, however, is a significant 9.02%, rejecting Prediction 1. This rejection also holds in the subgroups. Silence losers suffer a combined short and long term return of negative 11.91%, and traded losers earn a combined return of positive 17.45%, both significant at the 1% level. Further, silence losers exhibit a significant short-term return of negative 8.91% while the traded losers only exhibit a small insignificant negative return of 0.91% over the short term. The silence-traded spread is a significant negative 8.00%, setting the stage for testing Prediction 2 among past losers. According to Prediction 2, if traded losers exhibit weaker short-term momentum than silence losers, they should also have weaker reversal in the long term. The results in column "Yr 2-5" suggest the opposite. Silence losers, which exhibit strong short-term momentum, do not experience strong reversal. Instead, their returns continue to be negative. Traded losers, which exhibit weak short-term momentum, experience a strong positive return of 18.36% in the long term. The silence-traded spread in the long term is a significant negative 21.35%, rejecting Prediction 2 among past losers.

Once again, Prediction 2 is rejected among past losers regardless of how the long term is defined. As shown in the last four columns of Panel B in Table 3, the year by year silence-traded spreads over the subsequent four years are all negative and significant at the 1% level.[15]

[Insert Table 3 about here]

The evidence thus far rejects the two predictions of the coupling hypothesis implied in the extant behavioral theories. To see further the inter-temporal pattern in returns of past winners and losers, we draw the cumulative abnormal returns for the four portfolios as well as the all-winner and all-loser portfolios. Panel A (B) of Figure 2 plots the results for past winners (losers).

[15] Splitting the first year into two six-month periods, the silence-traded spreads among past losers are -3.14% and -4.87% (both significant at the 1% level) during the two six-month periods, respectively, suggesting that the rejection of Prediction 2 among past losers is robust to whether the short term is defined as six or 12 months.

The two panels show a clear picture that short-term momentum and long-term reversal are decoupled in the four portfolios. Specifically, among past winners, the group of traded winners exhibits significant positive short-term returns (strong momentum) but experiences no negative long-term returns (no reversal), and the group of silence winners experiences negative long-term returns (strong reversal) but exhibits no significant short-term returns (no momentum). Similarly, among past loser stocks, the group of traded losers experiences significant positive returns in the long term (strong reversal) but exhibits no significant negative short-term returns (no momentum), and the group of silence losers exhibits significant negative short-term returns (strong momentum) but experiences no positive long-term returns (no reversal). This result is not consistent with the coupling hypothesis implied in extant models that explain both short-term momentum and long-term reversal. Instead, the pattern is consistent with the decoupling hypothesis.

[Insert Figure 2 about here]

For completeness, Panels C and D show results for the "buy" and "sell" portfolios and the spreads between the two. Both "buy" and "sell" winners earn significant short- and long-term returns, similar to the combined "traded" portfolio. The "buy" and "sell" portfolios of past losers also exhibit similar patterns as the "traded" losers, although the "buy" losers experience short-term momentum of -2.65% (significant at the 10% level). While these stocks ("buy" losers) appear to exhibit the coupling of short-term momentum and long-term reversal, the average portfolio size (46) is small. Thus they appear more the exception than the rule. In addition, the combined returns over the short and long terms are a significant 11.27%, rejecting Prediction 1. These results do not alter our main conclusions from the silence and traded portfolios. Furthermore, the buy-sell spreads are statistically less significant and economically smaller than

the silence-traded spreads. For instance, the silence-traded spread for past winners over the long term (2^{nd} to 5^{th} years) is -22% (significant at the 1% level) while the corresponding buy-sell spread is only -6.46% (significant at the 10% level). As such, our subsequent discussions mainly focus on the silence and traded portfolios.[16]

5. Robustness checks

In this section we conduct a battery of robustness checks. We first check that our main results are robust to alternative methodologies of measuring abnormal returns. We then analyze the subgroups, alter the window to measure insider trading activity, skip a month between the windows to measure past returns and future returns, and measure past returns over a window of 12 months. In general our main results hold.

5.1. Risk-adjusted average monthly alphas

In our main analysis we use cumulative abnormal returns over the 12-month periods. Since estimating long-term abnormal returns has long been cautioned (e.g., Barber and Lyon, 1997; Fama, 1998; Lyon, Barber, and Tsai, 1999), we check whether our results hold for alternative methods of measuring abnormal returns. To do so we estimate average monthly alphas estimated from the Fama and French (1993) three-factor model. Results are similar when we include the liquidity factors developed by Pastor and Stambaugh (2003) or Sadka (2006).[17] Specifically, following the formation of each portfolio, we form calendar time equal- and value-

[16] In unreported analysis, we further split the "sell" and "buy" portfolios each into two equal-size portfolios. The spreads between the two "sell" portfolios are very small for both short and long terms and for both winners and losers. The spreads between the two "buy" portfolios are relatively larger, especially over the long term. Specifically, past winner firms with heavy net insider buying experience long-term abnormal returns of 8.16% (significant at the 1% level), while that for firms with light net insider buying experience a return of 6.04% (not significant at the 10% level), and the difference between the two portfolios is not statically significant; past losers with heavy insider buying experience 19.26% (significant at the 1% level) abnormal returns in the long term, while those with light insider buying experience 8.38% (significant at the 1% level), and the spread is significant at the 5% level. These results suggest that information in insiders' trading activity also predicts returns, especially in the long term. These spreads are, however, in general relatively small compared to the corresponding silence-traded spreads.

[17] The Fama and French three factors and Pastor and Stambaugh liquidity factors are drawn from WRDS. The Sadka liquidity factor (up to 2010) is downloaded from Ronnie Sadka's webpage https://www2.bc.edu/~sadka/. We are grateful to them for making the data available.

weight portfolios of the stock returns over each of the 12-month periods and regress the excess returns on the Fama and French (1993) three factors. The alphas are the average abnormal monthly returns for each of the 12-month periods. The results are presented in Table 4.

The two panels of Table 4 are similarly structured as Panels A and B of Table 3. Since both value-weight and equal-weight results are similar, for simplicity our discussion focuses on Panel A (equal-weight) only. The results in general confirm those presented in Table 3, with minor exceptions discussed below. First, results on the average monthly alphas show significant positive short-term returns for past winners and significant negative short-term returns for past losers. The portfolio of all winners does not experience long-term reversal, while the portfolio of all losers does exhibit long-term reversal. These results show a similar picture as in Table 3. Second, the silence winner portfolio does not exhibit short-term momentum but experiences strong long-term reversal, while the traded winner portfolio exhibits strong momentum without any long-term reversal; the silence loser portfolio exhibits significant short-term returns (strong momentum) but experiences no positive returns in the long term (no reversal). The traded loser portfolio appears an exception: It experiences short-term momentum and long-term reversal, a piece of evidence showing the coupling phenomenon in a subgroup. The supportive evidence for the coupling hypothesis, however, is undercut by the strong rejection of Prediction 2 among past losers. Specifically, the silence-traded spread in the short term is a significant negative -0.72%, and the spread over the long term is not significant positive, but significant negative at -0.57%. Thus, while there is some evidence of coupling of momentum and reversal in a subgroup of past losers, it does not overturn the big picture that the coupling of momentum and reversal is by and large rejected.

[Insert Table 4 about here]

We conduct addition robustness checks on methodology by using buy-and-hold abnormal returns over the 12-month periods and find very similar results, which reject the coupling hypothesis. Unreported for brevity, these results are available upon request.

5.2. Subsamples of 1989-1997 and 1998-2006

It is well documented that performance of momentum strategy is time varying (e.g., JT, 2001; 2011). To see whether our main findings in Table 3 are stable over time, we divide our sample into two equal periods and conduct the same analysis as in Panels A & B of Table 3. Results are shown in Panels A-1 and A-2 (1989-1997) and B-1 and B-2 (1998-2006) of Table 5.

For the early time period 1989-1997, past winners earn significant short- and long-term positive returns, while past losers experience significant negative returns in the short term and positive returns in the long term. For the later time period 1998-2006, past winners experience insignificant returns in both short and long terms, while past losers experience no momentum but significant long-term reversal. Thus, the evidence shows that the performance of momentum portfolios is time varying.

For both time periods, our main conclusions hold based on the four portfolios formed on both past returns and past insider trading activity. For brevity our discussion focuses on the 1989-1997 period. For this period, the silence winner portfolio experiences small insignificant negative returns in both short and long terms while the traded winner portfolio experiences significant positive returns in both short and long terms; the silence loser portfolio exhibits strong short-term momentum but the long-term return is negative, while the traded loser portfolio exhibits a small (although statistically significant) short-term momentum effect (-2.37%) but experiences strong long-term reversal (19.74%). In both Panels A-1 and A-2, the silence-traded

spreads are significant negative for both short and long terms, directly rejecting Prediction 2. In summary, the evidence of both periods rejects the coupling hypothesis.

[Insert Table 5 about here]

5.3. Insider trading activity over the past 12 months

In the main tests we use a window of six months to measure past insider trading decisions. To alleviating concern of data mining, we check robustness by using a window of 12 months to measure insider trading decisions. Accordingly, we redefine the portfolios and examine their future returns. The results are presented in Table 6. With a longer window to measure insider trading activity, the probability of insider silence is reduced. So are the average numbers of stocks in the "silence" portfolios, which are reduced from 62 and 67 to 40 and 37 for past winners and losers, respectively. The smaller portfolio size could reduce statistical power. Nevertheless, the coupling hypothesis is rejected. Without going to the details, we simply reiterate the big picture in which short-term momentum and long-term reversal are decoupled: Silence winners exhibit no significant short-term returns (no momentum) but experience strong negative returns in the long term (strong reversal), while traded winners exhibit significant positive returns (strong momentum) but experience no negative returns in the long term (no reversal); silence losers exhibit significant short-term returns (strong momentum) but experience no positive returns in the long-term (no reversal), while traded losers exhibit no significant negative short-term returns (no momentum) but experience significant positive returns in the long term (strong reversal).

[Insert Table 6 about here]

5.4. Skipping a month between past and future returns

In the main analysis we do not skip a month between the time periods to measure past and future returns. The momentum literature also adopts a method that skips a month between the portfolio formation and holding periods to deal with the short-term reversal at the monthly level (Jegadeesh, 1990; Lehmann, 1990). For robustness we rerun our test as in Table 3 by redefining past returns over the past six months ending one month before the first month for future returns. The results are presented in Table 7, which clearly show that the two Predictions of the coupling hypothesis are strongly rejected. Thus, our main conclusions are robust to including or ignoring the return reversal in the very short term (weekly or monthly).

[Insert Table 7 about here]

5.5. Past returns over 12 months

In our main test we use six-month period to estimate past return and sort stocks into deciles. Researchers find that momentum profits exist by sorting on past returns measured over the past three to 12 months. We check the robustness by sorting stocks based on returns over the past 12 months. We then rerun the tests as in Table 3. The results are presented in Table 8. It is clear that our main findings are robust to alternative windows to measure past returns.

[Insert Table 8 about here]

6. Further evidence from an alternative approach

Since the behavioral models predict short-term momentum and long-term reversal for individual stocks, there are potentially unlimited number of ways to form subgroups to test the implied coupling hypothesis against the decoupling hypothesis. Our approach of using firm-specific information to form subgroups is motivated by JT (1993), who relate momentum to firm-specific information. To further alleviate concern of data snooping, we take an alternative approach that does not rely on any ex-ante variable to form subgroups. Instead, we form three

equal subgroups on realized short-term returns among past winners and past losers (total of six portfolios) and examine their long-term returns. Because this approach is not restricted by the insider trading database, we also examine a sample that goes back to 1965.

The two Predictions of the coupling hypothesis in this empirical experiment are as follows. Prediction 1: For any portfolio of past winners or past losers, the combined return over the short and long terms is equal to zero. Prediction 2: Since the high-low spread between the two portfolios with extreme first-year returns is (by construction) significant positive in the short-term, the high-low spread is significant negative in the long term. Our results are reported in Panels A (1989-2006) and B (1965-1988) of Table 9.

For the period of 1989-2006, the combined returns over the short and long terms for the six portfolios are all significantly different from zero, a result that rejects Prediction 1. Further, the high-low spread in the long term is -1.71% for past winners and 7.36% for past losers, neither statistically significant. These results do not support the coupling hypothesis. Similar conclusions hold in the time period 1965-1988, as shown in Panel B of Table 9.

In summary, the evidence generated in this alternative experiment reconfirms that in Table 3. That is, the stock-level coupling of short-term momentum and long-term reversal as implied in the extant behavioral theories does not appear to be supported in data.

[Insert Table 9 about here]

7. Conclusion

This paper examines two hypotheses that explain both short-term momentum and long-term reversal of momentum portfolios. The coupling hypothesis implied in extant behavioral models suggests that momentum and reversal are coupled in individual stocks. Alternatively, the portfolio-level coupling of short-term momentum and long-term reversal can be driven by two

distinct groups of stocks: one exhibits momentum without reversal and the other experiences reversal without momentum (the decoupling hypothesis). Using insider trading decisions as a proxy for firm-specific information to form subgroups among past winners and losers, we report a new set of empirical regularities, which reveal substantial heterogeneity among past winners and losers. Notably, the portfolios based on subgroups appear strikingly different from the winner-minus-loser portfolios. In particular, the well-documented phenomenon of short-term momentum and long-term reversal for winner-minus-loser portfolios does not emerge in subgroups, suggesting that the coupling of momentum and reversal does not hold in individual stocks.

The decoupling evidence calls into question extant behavioral models that predict both short-term momentum and long-term reversal in individual stocks. The new evidence can be interpreted as offering an alternative behavioral view regarding momentum returns. As the post-formation short-term and long-term returns are both systematically related to an ex-ante proxy of firm-specific information, the evidence indicates that, if there is any mispricing in these stocks (of past winners and losers), it exists prior to portfolio formation, and that the subsequent returns, during both short and long terms, represent correction of the mispricing. On the other hand, the decoupling evidence eliminates the disadvantages against rational models. Thus, it remains to be seen whether a particular rational model could explain the new evidence based on subgroups of past winners and losers.

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Table 1: Summary statistics

Past returns	Past NID	N	Past return	NID (%)	Size	B/M
All stocks		2302	0.132	-0.336	6.701	-0.786
Past winners	All	230	0.902	-0.670	5.929	-0.831
	Silence	62	0.954		5.685	-0.705
	Traded	168	0.878		6.024	-0.877
	Buy	30	0.943	0.139	5.666	-0.593
	Sell	138	0.868	-0.837	6.102	-0.944
Middle groups	All	1842	0.092	-0.298	6.806	-0.744
	Silence	482	0.087		6.547	-0.598
	Traded	1361	0.094		6.897	-0.793
	Buy	322	0.073	0.068	6.592	-0.567
	Sell	1039	0.103	-0.408	6.993	-0.872
Past losers	All	230	-0.320	-0.306	6.624	-1.090
	Silence	67	-0.323		6.459	-0.958
	Traded	163	-0.319		6.690	-1.144
	Buy	46	-0.321	0.092	6.596	-0.961
	Sell	116	-0.318	-0.462	6.722	-1.227

This table presents the time-series mean of cross-sectional equal-weight mean values of past return, NID, size and B/M. Monthly portfolios from January 1989 to December 2006 are formed on past returns and past insider trading decisions. Past winners (past losers) are stocks with returns over the past six months ranked in the top (bottom) decile. Middle groups include all remaining stocks. Stocks with no insider trading activity over the prior six-month period (NID not defined) form the "silence" portfolio; stocks with insider trading activity over the prior six-month period (NID defined) form the "traded" portfolio; stocks with positive and non-positive NIDs form the "buy" and "sell" portfolios, respectively. The first column lists the average number of stocks in the portfolio. All variables are defined in the Appendix.

Table 2: Returns of past winner and loser stocks

Portfolios	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 2 - 5
			Panel A: Raw returns			
Loser	8.06	16.29	17.84	17.22	16.55	67.91
	[2.05]	[3.57]	[3.26]	[3.32]	[3.77]	[9.23]
5	13.90	13.60	12.81	13.04	12.92	52.36
	[6.26]	[5.28]	[4.08]	[4.04]	[3.78]	[6.46]
Winner	17.63	11.29	10.27	19.86	15.70	57.13
	[3.83]	[2.74]	[2.39]	[3.45]	[3.11]	[6.35]
Winner - Loser	9.58	-5.00	-7.57	2.64	-0.85	-10.78
	[2.66]	[-1.50]	[-2.42]	[0.96]	[-0.25]	[-1.54]
			Panel B: Size and B/M adjusted returns			
Loser	-3.23	1.61	3.76	3.44	3.46	12.26
	[-2.68]	[0.91]	[2.15]	[1.91]	[3.05]	[3.27]
5	-0.36	-0.09	0.76	0.21	0.15	1.02
	[-0.39]	[-0.11]	[0.87]	[0.22]	[0.17]	[0.60]
Winner	4.03	0.40	-0.04	4.65	2.94	7.95
	[2.00]	[0.43]	[-0.03]	[3.21]	[1.41]	[1.87]
Winner - Loser	7.26	-1.20	-3.80	1.22	-0.52	-4.30
	[2.78]	[-0.56]	[-1.83]	[0.73]	[-0.20]	[-1.09]

Monthly portfolios are formed from January 1989 to December 2006, based on past returns. Panel A (B) presents the time-series average of the equal-weight cross-sectional average raw (adjusted) returns for the portfolios. The winner, 5, and loser portfolios include stocks with returns over the past six months ranked in the top, 5th, and bottom deciles, respectively. Returns in years 1 through 5 are the 12-month cumulative returns; column "Yr 2 – 5" refers to the cumulative returns over the four years from the 2nd to the 5th years following portfolio formation. The row "winner – loser" represents the return spread between the winner and loser deciles. The t-statistics in the square brackets are based on Newey-West standard errors with 11 lags for the annual returns and 47 lags for the four-year returns. All variables are defined in the Appendix.

Table 3: Returns of portfolios formed on past return and past insider trading decisions

Portfolios	N	Yr 1 - 5	Yr 1	Yr 2 - 5	Yr 2	Yr 3	Yr 4	Yr 5
Panel A: Past winners, silence vs. traded								
All	230	11.98[b]	4.03[b]	7.95[c]	0.40	-0.04	4.65[a]	2.94
Silence	62	-8.25[b]	0.79	-9.04[b]	-3.97[a]	-3.75[b]	0.51	-1.82
Traded	168	18.48[a]	5.52[b]	12.96[a]	1.86[b]	1.06	5.79[a]	4.25[c]
Silence-Traded		-26.73[a]	-4.73[a]	-22.00[a]	-5.84[a]	-4.81[a]	-5.29[a]	-6.07[a]
		[-5.10]	[-3.45]	[-4.32]	[-4.49]	[-3.56]	[-4.50]	[-4.51]
Panel B: Past losers, silence vs. traded								
All	230	9.02[b]	-3.23[a]	12.26[a]	1.61	3.76[b]	3.44[c]	3.46[a]
Silence	67	-11.91[a]	-8.91[a]	-3.00[c]	-4.20[b]	0.39	0.54	0.27
Traded	163	17.45[a]	-0.91	18.36[a]	4.04[b]	5.00[a]	4.63[b]	4.68[a]
Silence-Traded		-29.35[a]	-8.00[a]	-21.35[a]	-8.24[a]	-4.61[a]	-4.08[a]	-4.41[a]
		[-6.55]	[-7.63]	[-5.38]	[-5.51]	[-4.09]	[-3.32]	[-3.33]
Panel C: Past winners, buy vs. sell								
Buy	30	14.30[a]	6.67[a]	7.63[a]	-0.88	-0.63	5.34[a]	3.80[c]
Sell	138	19.57[a]	5.48[b]	14.09[b]	2.47[b]	1.41	5.95[a]	4.26[c]
Buy-Sell		-5.27	1.18	-6.46[c]	-3.35[a]	-2.04	-0.61	-0.46
		[-1.28]	[0.80]	[-1.75]	[-2.74]	[-1.33]	[-0.34]	[-0.26]
Panel D: Past losers, buy vs. sell								
Buy	46	11.17[a]	-2.65[c]	13.82[a]	3.46[b]	1.95	3.21[b]	5.21[a]
Sell	116	19.86[a]	-0.22	20.08[a]	4.28[c]	6.29[a]	5.33[a]	4.19[a]
Buy-Sell		-8.69[c]	-2.43[b]	-6.26	-0.82	-4.34[a]	-2.12	1.01
		[-1.95]	[-2.15]	[-1.62]	[-0.72]	[-2.97]	[-1.50]	[0.91]

Monthly portfolios are formed from January 1989 to December 2006, based on past returns and past insider trading decisions. Past winners (losers) are stocks with returns over the past six months ranked in the top (bottom) decile. Stocks with no insider trading activity over the prior six-month period (NID not defined) form the "silence" portfolio; stocks with insider trading activity over the prior six-month period (NID defined) form the "traded" portfolio; stocks with positive and non-positive NIDs form the "buy" and "sell" portfolios, respectively. Column "N" lists the average number of stocks in the portfolio. Returns in each year from 1 to 5 are the 12-month cumulative abnormal returns adjusted by size and B/M; columns "Yr 1 – 5" and "Yr 2 – 5" refer to the cumulative returns over the five (1^{st} to 5^{th}) and four (2^{nd} to 5^{th}) years following portfolio formation, respectively. The rows "silence-traded" and "buy-sell" represent the return spreads between the two corresponding portfolios. The t-statistics in the square brackets are based on Newey-West standard errors with 11, 47, and 59 lags for the annual, four-year, and five-year returns, respectively. Superscripts [a], [b], and [c] denote statistical significance at the 1%, 5%, and 10% levels, respectively. All variables are defined in the Appendix.

Table 4: Evidence of monthly alphas

Portfolios	Yr 1 - 5	Yr 1	Yr 2 - 5	Yr 2	Yr 3	Yr 4	Yr 5
Panel A: Equal-weight portfolio							
Panel A1: Past winners							
All	0.11	0.28[b]	0.06	-0.13	-0.18	0.36[b]	0.16
Silence	-0.29[b]	-0.00	-0.34[b]	-0.53[b]	-0.53[b]	-0.03	-0.30[c]
Traded	0.23[b]	0.40[a]	0.18	0.00	-0.07	0.45[a]	0.29[b]
Silence - Traded	-0.52[a]	-0.40[a]	-0.53[a]	-0.54[a]	-0.46[a]	-0.48[a]	-0.59[a]
	[-6.12]	[-3.08]	[-6.24]	[-3.96]	[-3.62]	[-4.11]	[-4.54]
Panel A2: Past losers							
All	-0.06	-0.77[a]	0.12	-0.08	0.22	0.09	0.19
Silence	-0.48[a]	-1.29[a]	-0.29[c]	-0.66[b]	-0.14	-0.23	-0.19
Traded	0.11	-0.56[b]	0.28[b]	0.15	0.35[b]	0.22	0.33[b]
Silence - Traded	-0.59[a]	-0.72[a]	-0.57[a]	-0.80[a]	-0.50[a]	-0.46[a]	-0.52[a]
	[-7.21]	[-7.19]	[-6.16]	[-6.21]	[-3.67]	[-3.45]	[-4.22]
Panel B: Value-weight portfolio							
Panel B1: Past winners							
All	0.21[b]	0.47[a]	0.17	0.14	-0.09	0.43[a]	0.24
Silence	-0.16[c]	-0.12	-0.14	-0.26	-0.36[b]	0.11	-0.23
Traded	0.28[b]	0.60[a]	0.20	0.19	-0.04	0.46[a]	0.29[c]
Silence - Traded	-0.43[a]	-0.73[a]	-0.34[a]	-0.44[b]	-0.32	-0.35[c]	-0.52[a]
	[-3.66]	[-4.02]	[-2.64]	[-2.07]	[-1.51]	[-1.84]	[-2.81]
Panel B2: Past losers							
All	-0.03	-0.58[b]	0.14	0.17	0.39[a]	0.11	0.10
Silence	-0.37[a]	-0.80[a]	-0.26[b]	-0.24	-0.16	-0.14	-0.29
Traded	0.03	-0.52[b]	0.22[b]	0.26	0.52[a]	0.15	0.16
Silence - Traded	-0.40[a]	-0.28[b]	-0.48[a]	-0.50[a]	-0.68[a]	-0.29[c]	-0.45[a]
	[-5.17]	[-2.08]	[-5.44]	[-3.21]	[-4.21]	[-1.94]	[-2.90]

Monthly portfolios are formed from January 1989 to December 2006, based on past returns and past insider trading decisions. Past winners (losers) are stocks with returns over the past six months ranked in the top (bottom) decile. Stocks with no insider trading activity over the prior six-month period (NID not defined) form the "silence" portfolio; stocks with insider trading activity over the prior six-month period (NID defined) form the "traded" portfolio. The row "silence-traded" represents the return spreads between the two portfolios. Column "N" lists the average number of stocks in the portfolio. "Yr 1 – 5" refers to the whole five-year period following portfolio formation; "Yr 2 – 5" refers to the four-year period from 2nd to 5th year; and "Yr 1" through "Yr 5" refer to the 1st to 5th years, respectively. Panel A (B) presents the average monthly alphas for the portfolios from regressing the calendar-time equal-weight (value-weight) monthly excess returns on Fama and French (1993) three factors. Superscripts [a], [b], and [c] denote statistical significance at the 1%, 5%, and 10% levels, respectively. All variables are defined in the Appendix.

Table 5: Robustness by subsamples

Portfolios	N	Yr 1 - 5	Yr 1	Yr 2 - 5	Yr 2	Yr 3	Yr 4	Yr 5
Panel A-1: Past winners, 1989 – 1997								
All	223	16.65[b]	3.22[a]	13.43[b]	0.74	0.55	5.62[b]	6.52[c]
Silence	67	-2.22	-0.24	-1.98	-2.71[b]	-2.32	1.78	1.27
Traded	156	23.26[a]	4.80[a]	18.46[b]	2.03[c]	1.38	6.86[a]	8.19[b]
Silence-Traded		-25.48[a]	-5.04[a]	-20.44[a]	-4.74[a]	-3.70[b]	-5.07[a]	-6.92[a]
		[-5.27]	[-2.96]	[-3.34]	[-4.90]	[-2.04]	[-4.80]	[-2.91]
Panel A-2: Past losers, 1989 – 1997								
All	223	8.00	-4.75[a]	12.75[b]	-0.19	4.57[c]	5.28[c]	3.09[a]
Silence	74	-11.68[a]	-9.70[a]	-1.98	-5.42[a]	1.66	2.14	-0.36
Traded	149	17.37[a]	-2.37[b]	19.74[a]	2.42[c]	5.88[b]	6.72[b]	4.72[a]
Silence-Traded		-29.05[a]	-7.34[a]	-21.72[a]	-7.84[a]	-4.22[a]	-4.58[a]	-5.08[b]
		[-6.75]	[-7.09]	[-5.28]	[-5.20]	[-2.85]	[-2.82]	[-2.24]
Panel B-1: Past winners, 1998 – 2006								
All	237	7.31[c]	4.84	2.48	0.07	-0.64	3.69[b]	-0.64
Silence	56	-14.29[a]	1.81	-16.10[a]	-5.24[c]	-5.18[c]	-0.77	-4.91[a]
Traded	180	13.70[b]	6.24	7.46[b]	1.69	0.74	4.72[a]	0.30
Silence-Traded		-27.98[a]	-4.42[b]	-23.56[a]	-6.93[a]	-5.93[a]	-5.50[a]	-5.21[a]
		[-3.80]	[-2.09]	[-3.93]	[-2.95]	[-3.11]	[-2.84]	[-4.42]
Panel B-2: Past losers, 1998 – 2006								
All	237	10.04[a]	-1.72	11.76[a]	3.41	2.95	1.59	3.82[c]
Silence	60	-12.13[a]	-8.12[a]	-4.01[c]	-2.97	-0.88	-1.06	0.90
Traded	177	17.52[a]	0.55	16.98[a]	5.67[c]	4.13	2.53	4.65[b]
Silence-Traded		-29.66[a]	-8.67[a]	-20.99[a]	-8.64[a]	-5.01[a]	-3.59[b]	-3.75[a]
		[-4.86]	[-4.82]	[-4.16]	[-3.77]	[-3.24]	[-2.04]	[-2.82]

Monthly portfolios are formed from January 1989 to December 2006, based on past returns and past insider trading decisions. Panels A and B focus on the earlier (1989-1997) and later (1998-2006) time periods, respectively. Stocks with no insider trading activity over the prior six-month period (NID not defined) form the "silence" portfolio; stocks with insider trading activity over the prior six-month period (NID defined) form the "traded" portfolio. Column "N" lists the average number of stocks in the portfolio. Returns in each year from 1 to 5 are the 12-month cumulative abnormal returns adjusted by size and B/M; columns "Yr 1 – 5" and "Yr 2 – 5" refer to the cumulative returns over the five (1^{st} to 5^{th}) and four (2^{nd} to 5^{th}) years following portfolio formation, respectively. The row "silence-traded" represents the return spreads between the two portfolios. The t-statistics in the square brackets are based on Newey-West standard errors with 11, 47, and 59 lags for the annual, four-year, and five-year returns, respectively. Superscripts [a], [b], and [c] denote statistical significance at the 1%, 5%, and 10% levels, respectively. All variables are defined in the Appendix.

Table 6: Robustness by NID of past 12 months

Portfolios	N	Yr 1 - 5	Yr 1	Yr 2 - 5	Yr 2	Yr 3	Yr 4	Yr 5
Panel A: Past winners, silence vs. traded								
All	230	11.98[b]	4.03[b]	7.95[c]	0.40	-0.04	4.65[a]	2.94
Silence	40	-17.85[a]	0.52	-18.37[a]	-5.41[b]	-6.48[a]	-2.34	-4.14[b]
Traded	190	17.24[a]	4.99[b]	12.26[b]	1.50[c]	0.97	5.67[a]	4.11[c]
Silence-Traded		-35.09[a]	-4.46[a]	-30.63[a]	-6.91[a]	-7.45[a]	-8.02[a]	-8.25[a]
		[-4.51]	[-3.25]	[-3.98]	[-3.42]	[-4.01]	[-4.38]	[-3.40]
Panel B: Past losers, silence vs. traded								
All	230	9.02[b]	-3.23[a]	12.26[a]	1.61	3.76[b]	3.44[c]	3.46[a]
Silence	37	-37.07[a]	-15.61[a]	-21.46[a]	-9.81[a]	-3.78[c]	-3.44	-4.43[b]
Traded	192	16.84[a]	-0.93	17.77[a]	3.61[c]	4.98[a]	4.49[b]	4.70[a]
Silence-Traded		-53.91[a]	-14.68[a]	-39.23[a]	-13.42[a]	-8.76[a]	-7.93[a]	-9.13[a]
		[-5.87]	[-7.72]	[-5.49]	[-5.45]	[-6.07]	[-3.50]	[-4.83]

Monthly portfolios are formed from January 1989 to December 2006, based on past returns and past insider trading decisions. Past winners (losers) are stocks with returns over the past six months ranked in the top (bottom) decile. Stocks with no insider trading activity over the prior 12-month period (NID not defined) form the "silence" portfolio; stocks with insider trading activity over the prior 12-month period (NID defined) form the "traded" portfolio; Column "N" lists the average number of stocks in the portfolio. Returns in each year from 1 to 5 are the 12-month cumulative abnormal returns adjusted by size and B/M; columns "Yr 1 – 5" and "Yr 2 – 5" refer to the cumulative returns over the five (1^{st} to 5^{th}) and four (2^{nd} to 5^{th}) years following portfolio formation, respectively. The row "silence-traded" represents the return spreads between the two portfolios. The t-statistics in the square brackets are based on Newey-West standard errors with 11, 47, and 59 lags for the annual, four-year, and five-year returns, respectively. Superscripts [a], [b], and [c] denote statistical significance at the 1%, 5%, and 10% levels, respectively. All variables are defined in the Appendix.

Table 7: Robustness by skipping a month

Portfolios	N	Yr 1 - 5	Yr 1	Yr 2 - 5	Yr 2	Yr 3	Yr 4	Yr 5
Panel A: Past winners, silence vs. traded								
All	230	11.46[b]	3.49[c]	7.97[c]	0.28	0.11	4.89[a]	2.69
Silence	59	-10.30[b]	-0.02	-10.28[b]	-4.53[a]	-4.14[b]	0.50	-2.11
Traded	171	18.04[a]	4.99[b]	13.05[a]	1.81[c]	1.31	6.06[a]	3.88[c]
Silence-Traded		-28.34[a]	-5.01[a]	-23.33[a]	-6.34[a]	-5.45[a]	-5.55[a]	-5.99[a]
		[-5.04]	[-3.37]	[-4.26]	[-4.66]	[-3.57]	[-4.15]	[-4.80]
Panel B: Past losers, silence vs. traded								
All	230	9.37[b]	-3.14[a]	12.51[a]	1.82	3.66[b]	3.37[c]	3.66[a]
Silence	70	-9.75[a]	-8.27[a]	-1.48	-3.39[b]	0.42	0.55	0.94
Traded	160	17.53[a]	-0.88	18.41[a]	4.08[b]	4.92[a]	4.61[a]	4.81[a]
Silence-Traded		-27.28[a]	-7.39[a]	-19.89[a]	-7.47[a]	-4.50[a]	-4.06[a]	-3.87[a]
		[-5.93]	[-8.16]	[-4.95]	[-5.27]	[-3.84]	[-3.35]	[-3.17]

Monthly portfolios are formed from January 1989 to December 2006, based on past returns and past insider trading decisions. Past winners (losers) are stocks with returns over the past six months ranked in the top (bottom) decile. One month is skipped between past return portfolio formation and future return prediction. Stocks with no insider trading activity over the prior six-month period (NID not defined) form the "silence" portfolio; stocks with insider trading activity over the prior six-month period (NID defined) form the "traded" portfolio; Column "N" lists the average number of stocks in the portfolio. Returns in each year from 1 to 5 are the 12-month cumulative abnormal returns adjusted by size and B/M; columns "Yr 1 – 5" and "Yr 2 – 5" refer to the cumulative returns over the five (1^{st} to 5^{th}) and four (2^{nd} to 5^{th}) years following portfolio formation, respectively. The row "silence-traded" represents the return spreads between the two portfolios. The t-statistics in the square brackets are based on Newey-West standard errors with 11, 47, and 59 lags for the annual, four-year, and five-year returns, respectively. Superscripts [a], [b], and [c] denote statistical significance at the 1%, 5%, and 10% levels, respectively. All variables are defined in the Appendix.

Table 8: Robustness by past returns measured over 12 months

Portfolios	N	Yr 1 - 5	Yr 1	Yr 2 - 5	Yr 2	Yr 3	Yr 4	Yr 5
Panel A: Past winners, silence vs. traded								
All	230	7.31	1.58	5.73	-0.85	0.45	4.55[b]	1.57
Silence	54	-18.81[a]	-2.47	-16.34[a]	-6.85[a]	-4.99[b]	0.32	-4.83[b]
Traded	176	14.15[b]	3.08[c]	11.06[b]	0.87	1.76	5.49[a]	2.94
Silence-Traded		-32.96[a]	-5.55[a]	-27.41[a]	-7.72[a]	-6.74[a]	-5.17[a]	-7.77[a]
		[-5.15]	[-4.33]	[-4.08]	[-4.69]	[-3.90]	[-2.89]	[-4.98]
Panel B: Past losers, silence vs. traded								
All	230	11.69[a]	-1.20	12.89[a]	1.70	3.33[c]	3.47[b]	4.39[a]
Silence	77	-5.70[b]	-6.04[a]	0.34	-3.71[b]	0.90	1.24	1.91
Traded	153	20.25[a]	1.30	18.96[a]	4.43[b]	4.40[b]	4.57[a]	5.55[a]
Silence-Traded		-25.95[a]	-7.33[a]	-18.62[a]	-8.13[a]	-3.51[a]	-3.33[a]	-3.64[a]
		[-6.23]	[-7.75]	[-4.84]	[-5.38]	[-2.74]	[-2.89]	[-3.83]

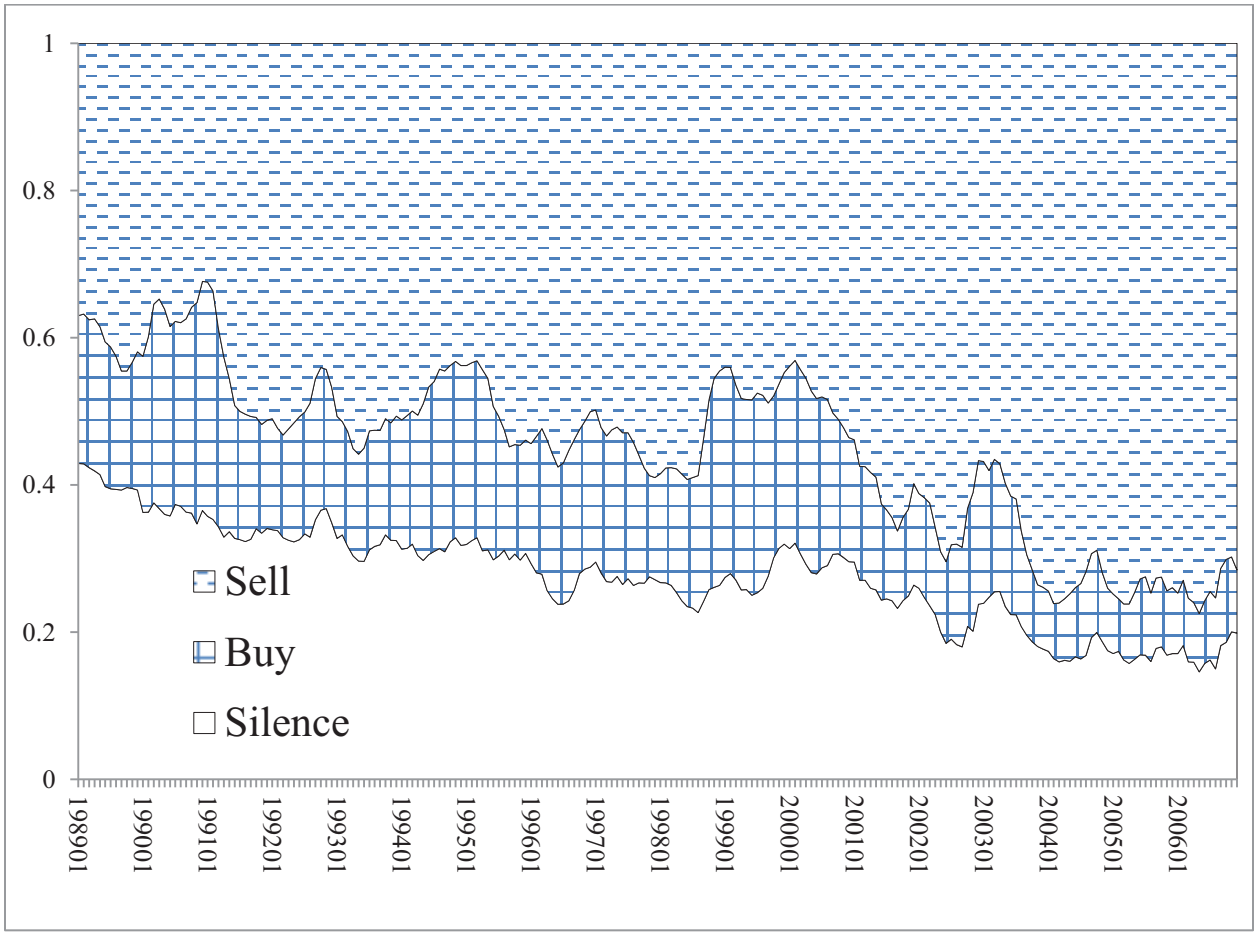
Monthly portfolios are formed from January 1989 to December 2006, based on past returns and past insider trading decisions. Past winners (losers) are stocks with returns over the past 12 months ranked in the top (bottom) decile. Stocks with no insider trading activity over the prior six-month period (NID not defined) form the "silence" portfolio; stocks with insider trading activity over the prior six-month period (NID defined) form the "traded" portfolio. Column "N" lists the average number of stocks in the portfolio. Returns in each year from 1 to 5 are the 12-month cumulative abnormal returns adjusted by size and B/M; columns "Yr 1 – 5" and "Yr 2 – 5" refer to the cumulative returns over the five (1^{st} to 5^{th}) and four (2^{nd} to 5^{th}) years following portfolio formation, respectively. The row "silence-traded" represents the return spreads between the two portfolios. The t-statistics in the square brackets are based on Newey-West standard errors with 11, 47, and 59 lags for the annual, four-year, and five-year returns, respectively. Superscripts [a], [b], and [c] denote statistical significance at the 1%, 5%, and 10% levels, respectively. All variables are defined in the Appendix.

Table 9: Evidence from sort on short-term returns

Portfolio	Yr 1 return	N	Yr 1 - 5	Yr 1	Yr 2 - 5	Yr 2	Yr 3	Yr 4	Yr 5
				Panel A: Period 1989 - 2006					
W - L	All		2.96	7.26[a]	-4.30	-1.20	-3.80[c]	1.22	-0.52
Winner	All	230	11.98[b]	4.03[b]	7.95[c]	0.40	-0.04	4.65[a]	2.94
Loser	All	230	9.02[b]	-3.23[a]	12.26[a]	1.61	3.76[b]	3.44[c]	3.46[a]
Winner	Low	76	-36.55[a]	-46.69[a]	10.15[b]	-0.38	1.32	6.11[a]	3.10
	Med.	77	8.05[b]	2.92[c]	5.13	-0.78	-0.78	4.66[a]	2.01
	Hi	77	64.07[a]	55.63[a]	8.44	2.27	-0.78	3.21[c]	3.74
	Hi - Low		100.62[a]	102.33[a]	-1.71	2.65	-2.10	-2.90[c]	0.64
Loser	Low	76	-46.90[a]	-56.22[a]	9.32[a]	-0.09	3.12	2.56	3.72[b]
	Med.	77	9.60[b]	-1.52	11.12[a]	1.82	3.50[b]	2.48	3.32[a]
	Hi	77	64.48[a]	47.80[a]	16.68[a]	3.23	4.84[a]	5.26[a]	3.35[a]
	Hi - Low		111.38[a]	104.01[a]	7.36	3.32	1.71	2.70	-0.37
				Panel B: Period 1965 - 1988					
W - L	All		4.98	8.85[a]	-3.87	-1.02	-0.33	-0.20	-2.33[c]
Winner	All	156	-2.61[c]	3.14[a]	-5.75[a]	-2.25[a]	-1.06	-0.85	-1.60[b]
Loser	All	156	-7.59[c]	-5.71[a]	-1.88	-1.23	-0.73	-0.65	0.73
Winner	Low	52	-41.77[a]	-34.43[a]	-7.34[a]	-5.95[a]	0.06	-0.75	-0.69
	Med.	52	-0.30	2.06[b]	-2.36	-1.34	0.54	0.11	-1.67[b]
	Hi	52	34.59[a]	41.53[a]	-6.94[b]	0.86	-3.69[a]	-1.76	-2.34[c]
	Hi - Low		76.36[a]	75.96[a]	0.40	6.81[a]	-3.75[a]	-1.01	-1.65
Loser	Low	51	-50.04[a]	-42.42[a]	-7.61	-5.21[a]	-2.02	-1.65	1.26
	Med.	52	-5.31[c]	-5.33[a]	0.02	-0.25	-0.02	-0.34	0.63
	Hi	52	32.45[a]	30.37[a]	2.09	1.89[b]	-0.11	0.05	0.25
	Hi - Low		82.49[a]	72.79[a]	9.70[b]	7.10[a]	1.91	1.70	-1.01

Monthly portfolios are formed from January 1989 to December 2006 (Panel A) and January 1965 to December 1988 (Panel B), based on past returns and year 1 returns. Past winners (losers) are stocks with returns over the past six months ranked in the top (bottom) decile. The row "W – L" refers to the winner-minus-loser portfolio. Within the "winner" and "loser" stocks, stocks are further sort into three equal groups ("low," "med.," and "hi") by their year-1 cumulative abnormal returns. Column "N" lists the average number of stocks in the portfolio. Returns in each year from 1 to 5 are the 12-month cumulative abnormal returns adjusted by size and B/M; columns "Yr 1 – 5" and "Yr 2 – 5" refer to the cumulative returns over the five (1^{st} to 5^{th}) and four (2^{nd} to 5^{th}) years following portfolio formation, respectively. The rows "Hi - Low" represent return spreads between the two corresponding portfolios. The t-statistics in the square brackets are based on Newey-West standard errors with 11, 47, and 59 lags for the annual, four-year, and five-year returns, respectively. Superscripts [a], [b], and [c] denote statistical significance at the 1%, 5%, and 10% levels, respectively. All variables are defined in the Appendix.

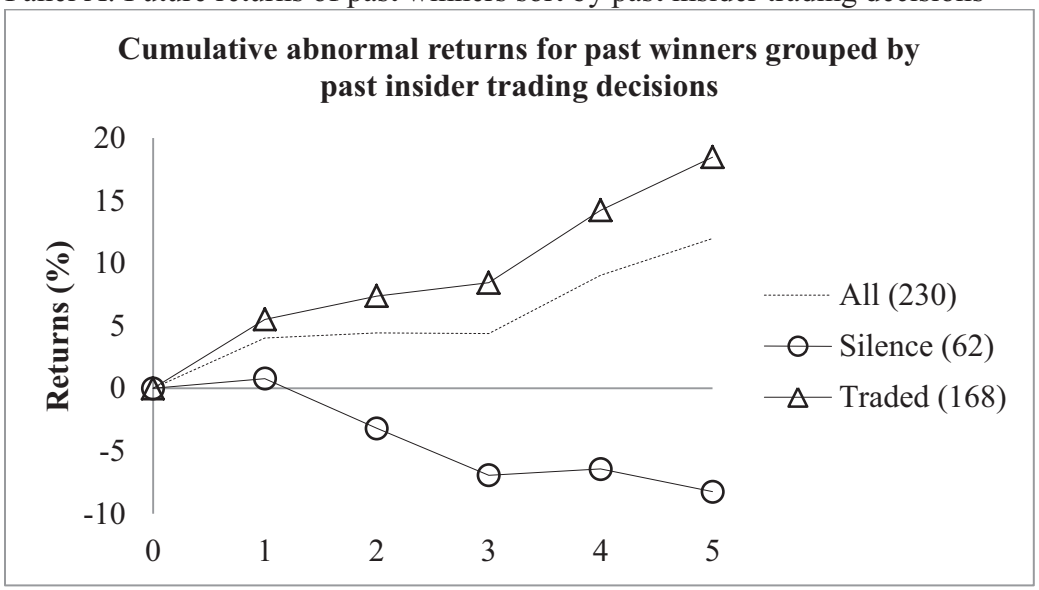
Figure 1: Insider buying, selling, and silence



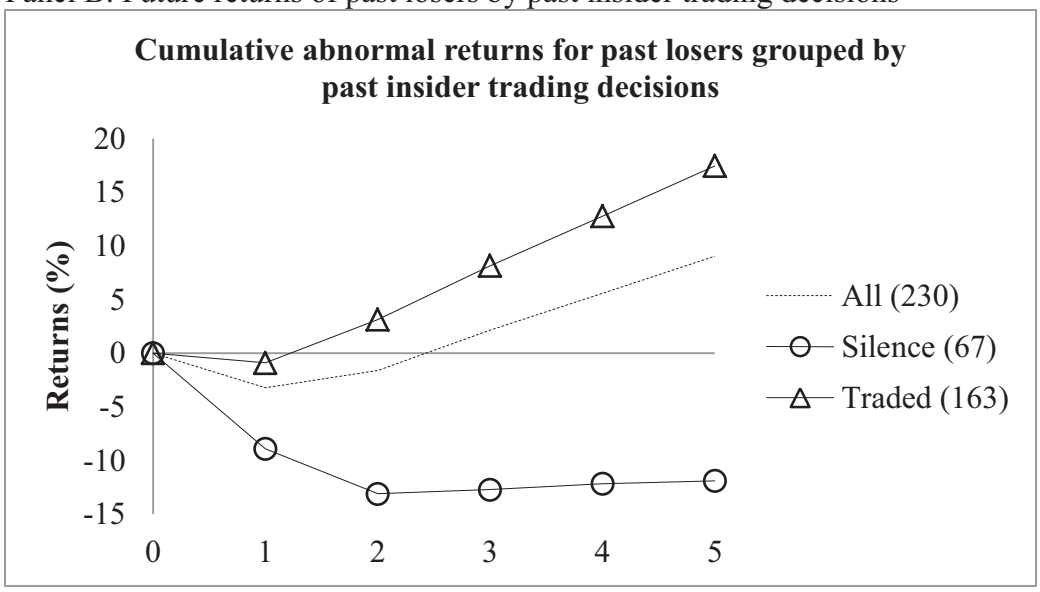
Every month from January 1989 to December 2006, we calculate the cross-sectional proportion of firms with insider net selling (sell), net buying (buy), and no trading (silence). Stocks with no insider trading activity over the prior six-month period (NID not defined) form the "silence" portfolio; stocks with positive and non-positive NIDs form the "buy" and "sell" portfolios, respectively. NID is defined in the Appendix.

Figure 2: Future returns by past insider trading decisions

Panel A: Future returns of past winners sort by past insider trading decisions



Panel B: Future returns of past losers by past insider trading decisions



Panels A and B show the cumulative abnormal returns over the subsequent five years of portfolios formed on past insider trading decisions for past winners and past losers, respectively. Stocks with no insider trading activity over the prior six-month period (NID not defined) form the "silence" portfolio; stocks with insider trading activity over the prior six-month period (NID defined) form the "traded" portfolio The dashed line shows the cumulative abnormal returns for the portfolios of all past winners or past losers. Average portfolio size is shown in parentheses within the legend.

Appendix

The data sources are the Center for Research in security Prices (CRSP), Compustat, Thomson Reuters Insider Filing Data Feed. Time t in Compustat refers to fiscal year end in calendar year t. The main variables are defined below.

Firm characteristics

MC: Market capitalization, the natural log of price times number of shares outstanding at the end of June of year t, from CRSP.

B/M: Book to market ratio, the natural log of the ratio of the book value of equity to the market value of equity. Book value B is total assets (Compustat item AT) for year t-1, minus liabilities (LT), plus balance sheet deferred taxes and investment tax credit (TXDIC) if available, minus preferred stock liquidating value (PSTKL) if available, or redemption value (PSTKRV) if available, or carrying value (PSTK). Market value M is price times share outstanding at the end of December of t-1, from CRSP.

Past return: The buy-and-hold return from month j-6 to j-1, where j-1 is the month of portfolio formation and j is the first month of forecasted stock returns. This variable is monthly rebalanced.

Insider trading variable

NID: Net insider demand, NID of month j is defined as the number of shares that insiders buy minus the number of shares that insiders sell over the past six months, normalized by the total number of shares outstanding at the end of month j-1. For robustness we also vary the measuring window from one month to 12 months.

Future return variable

Future return: We construct abnormal returns adjusted by size and B/M. Specifically, at the end of June of year t, we independently form NYSE size and book–to–market (B/M) quintiles to extract the breakpoint values, and assign AMEX and NASDAQ stocks to the 5 x 5 portfolios according to their size and B/M values. The equal–weight portfolio return serves as the benchmark return for the stock in the same size and B/M portfolio for the months starting from July of year t to June of year t+1. Portfolio assignment is rebalanced every year. The monthly abnormal return for a stock is its raw return minus the benchmark portfolio return. The monthly abnormal returns are then accumulated by 12-month periods. If a stock is delisted before the holding period, the delisting return is used for the delisting month, and returns of the months after delisting are replaced with the benchmark portfolio returns.