

Insider Trading Patterns[☆]

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Abstract

We analyze the information content of corporate insiders' trades after accounting for certain trading patterns. Insiders spread their trades over longer periods of time when they have a longer-lived informational advantage and when outside investors are less attentive. In contrast, they make isolated trades in short windows of time when their informational advantage is short-lived. Both isolated trades and trade sequences (those spread over multiple consecutive months) predict sizable abnormal returns; for sequences, these abnormal returns are manifest only following the completion of the sequence. The return patterns we identify continue to hold for a large group of insiders that would have been classified as "routine" traders by prior research, suggesting that informed insider trading may be even more widespread than previously thought.

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I. Introduction

Academic research has contributed toward our understanding of the scope and scale of informed insider trading. It has commonly been found that insider stock purchases are followed by positive abnormal returns, suggesting they are motivated by an informational advantage. However, the evidence with respect to stock sales in general has been mixed. Some researchers have uncovered evidence of informed trading under uncommon circumstances such as merger negotiations or accounting fraud. Recently researchers have turned their attention to predicting which trades are likely to be informed based on the previous trading behavior of the specific insider. This approach has uncovered stronger evidence that both the purchases and sales of subsets of insiders predict future returns. More recent work argues that at least some of insiders profitable stock sales result from their ability to trade quickly on public information.¹

In this paper, we move the literature forward by investigating insiders' trading patterns. Prior research on stock trading has largely ignored potential heterogeneity in insider trading patterns, and has therefore likely been handicapped in its ability to detect evidence of informed trading. This could cause researchers to underestimate the incidence or profitability of informed insider trading.² Most prior studies have typically used a uniform method to identify a trade (or trading period) and abnormal returns are measured across a uniform window following trades. However, recent work on informed stock option exercises highlights the importance of controlling for insiders' trading strategies in that related context, although the strategies explored there are unique to options (Cicero, 2009; Dhaliwal, Erickson, and Heitzman, 2009).

The intuition motivating our work is simple: we expect opportunistic insiders to trade so long

¹Examples of work in this area include Lorie and Niederhoffer (1968); Jaffe (1974); Finnerty (1976); Seyhun (1986, 1992, 1998); Chowdhury, Howe, and Lin (1993); Bettis, Vickrey, and Vickery (1997); Lakonishok and Lee (2001); Jeng, Metrick, and Zeckhauser (2003); Agrawal and Cooper (2008); Agrawal and Nasser (2012); Cohen, Malloy, and Pomorski (2012); Alldredge and Cicero (2014), among others.

²We do not try to distinguish between trades that are informed by private information and those that are informed by public information. The conclusions in this paper with respect to the duration of an insiders' informational advantage vis-a-vis outside investors should apply in either situation. As used throughout, the term "informed" is meant generally to represent both possibilities.

as they have an informational advantage. When insiders have short-lived information that will soon be revealed to the market, we expect them to engage in isolated, even singular trades. We call this pattern *isolated trading*. In contrast, we expect insiders with an informational advantage that can be maintained for longer (either because the market is inattentive to the trading, or because the type of information motivating the trades will not soon be disclosed) to exploit their advantage by engaging in an extended sequence of trades, perhaps over several months. We term this pattern *sequenced trading*.

For concreteness, consider two hypothetical firms where executives possess information that has not yet been incorporated into their stock price. At one firm, an executive knows that the firm is likely to miss its earnings in the near-term. At the other firm, an executive has been involved in negotiations with a key supplier that are not going well. This information has no near-term earnings implication, is not routine in nature, and will not be revealed to the market for six months or more. The trading patterns of these executives may differ. In order to benefit from her information, the executive at the former firm could sell shares immediately and will probably only be able to trade once before the negative information is incorporated into prices, either because the trading draws outside investors' attention to signals of earnings weakness or because the earnings are soon disclosed. In contrast, the executive at the latter firm may be able to spread trades over a longer period of time without the market inferring the unexpected announcement in the distant future (indeed, all other signs may point toward good performance in the near term).

Given the difference in the nature of the information animating isolated and sequenced trading patterns, we make two predictions with respect to the abnormal returns that we will observe following informed insider trading. We predict that isolated trades will be followed very quickly by abnormal returns that are negative (positive) for insider sales (purchases). In contrast, we predict that there will no abnormal returns following insider trades during a sequence, but that the completion of a sequence will be followed by abnormal returns similar to those observed for isolated trades.

We base most of our analysis on insiders' trades that would not be classified as "routine" according to prior research. Cohen et al. (2012) make a significant contribution by showing that both the purchases and sales of insiders who do not appear to trade for routine purposes in fact predict abnormal returns (they classify traders as routine if they trade in the same calendar month in three consecutive years). The trade months of these insiders they consider "routine" traders do not predict abnormal return when they are treated as independent observations. We first show that a large fraction of the remaining trades are sequenced. Under a definition allowing for no calendar-month-long breaks, sequence trade months make up approximately one-quarter of our samples and the sequences average about three months in length. Combining sales and purchases, there are 227,000 isolated trade months and 70,000 sequenced trade months. Trading days are also more frequent during sequenced trade months, accounting for about forty percent of overall trade days. In our samples, there are 558,000 trade days in isolated trading months, and 345,000 trade days in sequenced trading months.

Before examining abnormal return patterns, we examine the factors which predict whether or not trades were isolated or sequenced. We find that trade sequences are more likely in firms that are smaller, have lower book-to-market equity values, are followed by fewer analysts, and for which trading costs indicate more informed trading. To the extent that these factors proxy for the firm's information environment, these results suggest that a sequence of trades is more likely in firms where greater information asymmetry means that insiders can maintain an informational advantage for longer.

Isolated trades are more likely than sequences to be followed by an immediate earnings surprise. This finding further highlights the fact that information with valuation consequences is revealed much sooner after isolated trades. Finally, we find that sequenced trades are more likely to be executed (or reported to the SEC) on Fridays. DellaVigna and Pollet (2009) show evidence that investor inattention on Fridays leads to more extended post-earnings announcement drift. Investors may be similarly inattentive to the trades of insiders on Friday. In addition, since the information

animating a sequence of trades has less immediacy, insiders have more flexibility to time their trades for the day of the week when investors are least attentive.

An analysis of the returns following insider trades over the period 1986–2011 strongly suggest that insiders are opportunistic when they engage in both isolated trades and trade sequences. As we predict, in the month following isolated insider stock sales, we find significant negative abnormal returns of between 60 and 120 basis points; in contrast, we find no significant abnormal returns in the month immediately following individual sequenced stock sale months.³ This suggests that isolated insider sales are more likely to precede information that is quickly incorporated into market prices. We find a similar pattern with insider purchases: isolated trade months are followed by positive returns of between 130 and 150 basis points while individual sequenced trade months are followed by abnormal returns of between 40 and 90 basis points. Overall, estimates of monthly abnormal returns following isolated insider stock sale (purchase) months are –60 to –100 basis points (60 to 150 basis points) greater in magnitude than those following individual trade months that are sequenced.

Upon closer examination, we find that trade sequences also predict future returns. In line with our predictions, while insider trades *during* a sequence do not predict near-term abnormal returns, we find significant abnormal returns *following the completion* of sequences. This suggests that the overall trade sequence was indeed motivated by an informational advantage regarding firm value. In the three months following the completion of a sequence of insider sales (purchases), we find negative (positive) abnormal returns of between 150 and 200 basis points (200 and 300 basis points). To give an idea of just how informative completed sequenced trades are, a long-short portfolio (sequenced buys *minus* sequenced sales) formed and held for a month, after waiting one month to confirm the end of a sequence, earns abnormal returns of 171 basis points per month ($t = 6.90$, 22.6% annualized).

³The low end of this range is based on univariate tests, and the high end is based on results of multivariate regressions.

Throughout our analysis we present results for the full set of insiders required to report their trades, and also for just the trades of top executives. While a broad cross-section of insiders may have access to short-lived information that is soon revealed to the market, senior executives are more likely to be privy to the kind of information that will take longer to be revealed (e.g. a change in strategic direction, potential loss of a major customer, etc.). In most of our analysis, we find more pronounced abnormal returns following sequenced trades by firms' most senior executives.⁴ For example, a long-short portfolio of stocks formed the month after the end of trade sequences by senior executives and held for a month (sequenced buys *minus* sequenced sales) earns abnormal returns of 237 basis points per month ($t = 4.15$, 32.5% annualized).

Finally we consider whether, once insiders' trading patterns are accounted for, there is actually evidence of opportunistic behavior among the group of insiders previously thought to trade only for routine purposes. Once we account for trade sequences, we find compelling evidence that these traders also engage in opportunistic trading on average. Isolated purchases and sales, as well as purchase and sale sequences, continue to predict sizable abnormal returns among this subsample. As we discuss in Section IV.C, these results are easily masked if each trade month is treated as an independent observation. A rule for identifying "routine" traders based on trade frequency naturally picks up more sequence traders because they trade more frequently, and the higher proportion of intra-sequence trade months biases abnormal return tests toward zero. These results highlight the importance of accounting for insiders' trading patterns, expand the set of insiders that should be considered possibly informed traders, and demonstrate a need for more accurate methods of identifying those insiders who trade their stock for reasons other than an informational advantage.

This paper contributes to our understanding of how insiders structure their trading behavior to maximize their utility. It supports an argument that, on average, insiders take advantage of prof-

⁴Senior executives include the chief executive officer, chairman of the board, chief financial officer, president, chief operating officer, and general counsel.

itable trading opportunities and manipulate their trading strategies to optimize these opportunities. It points toward future analyses that consider different factors that would impact insiders' trading strategies under different conditions. Candidate factors include the ex-ante likelihood a particular stock will be inefficiently priced for an extended time, insiders' ability to delay or mask the revelation of information, the probability of being detected as an informed trader, and the size of profits to be made relative to the insiders' wealth.

The findings of this paper are also useful for regulators and investors who wish to understand the trading behavior of informed investors, either to identify those who violate legal prohibitions, or to update their beliefs about the value of firms' publicly traded securities. It should also inform the design of future research that attempts to uncover evidence of informed trading in yet-to-be identified contexts, or that uses indicators of informed insider trading as an input on a related research topic. What we show is that not all informed insider trading will look the same. The patterns of informed trading and the time at which trading profits are realized depend upon the nature of the insiders' informational advantage.

The rest of our paper is arranged as follows. In section II, we provide further background from the insider trading literature, describe our sample selection, and discuss our key methodologies. In section III, we explore the determinants of insider trading patterns. In section IV, we present the results of our empirical analysis of returns following isolated and sequenced trades. We conclude in section V.

II. Background, Data and Methodologies

A large body of research has examined the information content of insider trades. In early studies, abnormal returns following both insider purchases and sales suggested they were informed transactions (Lorie and Niederhoffer, 1968; Jaffe, 1974; Finnerty, 1976; Seyhun, 1986, 1992; Chowdhury et al., 1993; Bettis et al., 1997; Seyhun, 1998). However, follow-on studies that controlled for additional risk factors suggested that it was only insider purchases at small firms

that were informed (Lakonishok and Lee, 2001; Jeng et al., 2003). More recently, Cohen et al. (2012), used a screen based on an executive's previous trading history to identify "routine" and "opportunistic" trades, and show that both stock sales and purchases in the latter group are more likely to predict abnormal returns.

Other recent studies have shown that outsiders have perhaps been as creative as insiders in their informed trading. They have uncovered circumstantial evidence of informed trading based on information shared through social and other connections (Cohen, Frazzini, and Malloy, 2008). It appears that a great deal of information sharing occurs around the proverbial "water cooler" of universal banks (Chen and Martin, 2011; Cicero, Kalpathy, and Sulaeman, 2011), at the neighborhood block-party (Pool, Stoffman, and Yonker, 2012), and across the family dinner table (Berkman, Koch, and Westerholm, 2012). Although trades by informed market participants not formally defined as "insiders" under the S.E.C.'s definitions will not be in our sample, these results suggest the breadth of this behavior in the U.S. securities markets.

A closely related area of the literature focuses on executive stock options. Recent work in that area has examined executives' exercise strategies, and shows that the evidence of information-based trading is much stronger once the researcher distinguishes between the two most common exercise patterns (Cicero, 2009; Dhaliwal et al., 2009). The important distinction in that context is whether the insider holds onto the acquired shares, and the answer to this question predicts whether the exercise was motivated by positive or negative news.

In contrast to these prior studies, the focus of this paper is on insiders' stock trading patterns. Prior studies have tested for the existence of abnormal returns following stock trades, but have not considered the relation between the nature of an insiders' informational advantage and their trading patterns. The first principle that should affect this relation is that information, by its nature, is time sensitive; at some point information will be incorporated into prices. Insiders wishing to take advantage of an informational advantage therefore have a finite window of opportunity to do so. The information will eventually be revealed either through earnings announcements, press releases,

leakage from other insiders, or through the market impact of aggregate insider trading activity. We therefore expect that trades concentrated in a short period of time are likely to be motivated by an informational advantage. In particular, we expect insiders to concentrate their trades over short horizons when they possess the type of information that likely to be quickly incorporated into prices. An insider that is trading for diversification, liquidity, or to adjust their incentives, on the other hand, would be relatively more likely to spread their trades over a longer horizon since they can plan ahead under these predictable circumstances. Consistent with this expectation, Lebedeva, Maug, and Schneider (2012) demonstrate that insiders spread their trades out over time when they face liquidity constraints. Under this hypothesis, we expect trades concentrated in time to be followed shortly by abnormal returns favorable for the insiders, and trades spread out over time to not predict immediate abnormal returns.

However, there are times when an insiders' informational advantage may be longer-lived. We expect this to be the case when the information is non-routine in nature. For example, an executive may know their firm is likely to lose a key business relationship in the coming months, have internal data indicating that a particular R&D project looks particularly promising, or be involved in merger discussions with another firm. Indeed, Heitzman and Klasa (2012) show evidence consistent with insiders trading around the time of private merger negotiations. It may therefore be that sequences of trades spread over longer horizons are also motivated by private information that takes longer to be incorporated into prices. If this is the case, we expect to find abnormal returns favorable for the insiders, but not until the trade sequences end. Trades that *precede* the end of a sequence may actually be followed by abnormal returns that appear to go *against* the insider. If the trading is motivated by an informational advantage and the price moves in the direction of the insider's prior (because the market correctly incorporates the information or for any other reason) then the insider will no longer have incentive to continue trading. Therefore, if insiders trade to capture profits, interim sequence trades could be followed by a truncated distribution of returns that make it appear the market moves against insiders in the short-run. If this pattern holds, it is actually

additional evidence of informed trading in sequences, since trades motivated by diversification, liquidity or incentive re-alignment would not demonstrate the same pattern.

We also point out that to conclude that trade sequences are motivated by an ex-ante informational advantage, we should find that the eventual stock prices reflect new information relative to the pre-sequence price. This finding should rule out the possibility that trade sequences are executed by liquidity traders that anchor their stock valuations and choose to stop trading when there are large price movements that would affect them negatively (large declines during a sales sequence, or large increases during a purchase sequence). If this alternative story is true, we would expect to find abnormal returns following the end of the sequences, but would not expect the final price on average to reflect an abnormal return relative to the pre-trading price.

A. Data

The main data source used in this analysis is the Thompson Reuters Financial Network Insider Filing Data, which provides detailed information on insiders' transactions in the stock and derivatives of their own companies. An "insider" is broadly defined under S.E.C. regulations to be those who have "access to non-public, material, insider information," and includes officers, directors and 10% beneficial owners of a company's stock.⁵ For this analysis, we conduct our tests on both the broad cross-section of insiders covered in the data, and also on a subset of top executives that includes Chief Executive Officers ("CEO" rolecode1 in the Thompson data), Chairmen of Boards ("CB"), Chief Financial Officers ("CFO"), Presidents ("P"), Chief Operating Officers ("CO") and General Counsels ("GC").

We focus our analysis on stock trades, and in most of our specifications, we analyze sales and purchases separately. For each insider, we aggregate trades on a calendar month basis, and

⁵By regulation, these parties are required to report all of their transactions to the S.E.C. on Forms 3, 4, 5 and 144. Insiders are required to file Form 3 to report initial beneficial ownership of shares, Form 4 to report changes in beneficial holdings, Form 5 to report annual changes in beneficial ownership, and Form 144 to declare their intention to sell restricted shares.

treat months as sales or purchase months based on the net of their transactions. We use the full time series of transactions available in the data, which run from January 1986 to December 2011. In addition, firm financial statements data must be available in Compustat and return data must be available through CRSP. Finally, we restrict our analysis, at least initially, to trades that can be characterized as “opportunistic” according to the analysis of Cohen et al. (2012). To satisfy this requirement, we remove all trades by insiders that trade in the same calendar month in three consecutive years, since they may be classified as “routine” traders who are unlikely to trade on information.

A key part of our analysis is identifying patterns of isolated and sequenced trades. We classify trade months as a sequence if they occur in consecutive months. An isolated trade is one in which the insider did not trade in the month before a trade or the month after.⁶ We provide information about the trade distributions in Table 1 and Fig. 1. As can be seen in Table 1, isolated trade months make up the largest percentage of each group. There are 130,592 isolated sale months and 41,770 sequenced sale months. The sequence sale months add up to 17,335 sequences. For purchase months, the patterns are similar but there are fewer transaction months. There are 105,285 isolated purchase months and 27,294 sequenced purchase months, for a total of 11,387 sequences. Overall, the sequence trades make up about one-quarter of trade months. The longest sequences run over 12 months in a row, but the majorities consist of two or three months of trading in a row.

It is worth noting the concentration of trade days in the trade months. There are a mean (median) of 2.9 (1.0) trades per isolated sales month, compared to 6.1 (2.0) for sequence sales months. Somewhat similarly, there are a mean (median) of 1.7 (1.0) for isolated purchase months, and 3.3 (1.0) for sequence purchase months. It therefore appears that our classification system at the monthly level is consistent with the distribution of trading within the months. For sales, these

⁶As an alternative, we relax the rule that sequences should be in consecutive months and allow a one month gap between sequenced trades. The results using this classification are qualitatively and quantitatively similar to the results we present in the rest of the paper, although the percentage of trades classified as sequenced trades is of course larger.

numbers aggregate to 379,000 isolated sales trading days, versus 255,000 sequence trading days. For purchases, there are 179,000 isolated trading days, and 90,000 sequence trading days. It is also interesting that the isolated trading events are most commonly characterized by one trading day, which suggests the insider may view the trading opportunity as very time sensitive, and this may also help explain why on average there are fewer trades in these instances.

We provide additional summary statistics for our sample in Table 1. Notable findings are that the average sequence length is 2.50 months for sales, and 3.34 for purchases. In addition, there are differences in average firm characteristics across the isolated and sequence trade months. We also find some significant differences, in the firm characteristics and number of shares per trade, between isolated and sequenced trades. The firms associated with sequenced trades are bigger and have a higher book-to-market ratio than firms associated with isolated trades. Fewer shares are traded in isolated trades than sequence trades, across both sales and purchases. Although these are univariate statistics and we do not attach any specific inferences to them at this point, they do suggest that there are systematic differences between the nature of the information contained in isolated and sequenced trades.

B. Methodologies

Our main empirical strategy is twofold. We start by examining the determinants of insider trading patterns. We examine how the immediacy of information, the firm's information environment and investor in attention predict the start of a sequence of trades. We then move on to test for differences in abnormal stock returns following isolated and sequenced insider trading months, and this forms the bulk of our analysis. To establish the robustness of our results, we use a number of different methods for calculating abnormal stock returns.

The first and simplest methods consist of comparing stock returns over the calendar month subsequent to trading months to the returns on either matched firms ("match-firm adjusted" CAR) or the appropriate size-decile portfolio of firms from the NYSE/NASDAQ/ AMEX ("size-decile-

portfolio adjusted” CAR), where CAR is the cumulative abnormal return. For each observation the matched firm that is chosen is the NYSE/NASDAQ/AMEX firm in the same NYSE size-decile that has the most similar six month return prior to the trade month.⁷ The size-decile-portfolio adjusted return method is useful because it accounts for market-related risk factors that affect firms of similar size during the same one month period. However, the match-adjusted return methodology may be preferred given our understanding of momentum in returns (Jegadeesh and Titman, 1996, 2001), because it also adjusts for the pre-trade stock performance.

The second method for assessing the difference in abnormal returns following isolated or sequenced trades follows a regression framework, where the total one-month return following trade months is regressed onto the total market return and other variables that account for additional risk factors, including the firm’s stock market value, book-to-market value of equity, prior twelve- and one-month returns, and the trade size in number of shares. This method mimics that of Cohen et al. (2012), and serves to confirm their main results for opportunistic trades as a baseline for our analysis as well.

Finally, we present alphas (α s) from portfolio regressions where a portfolio is formed every calendar month of firms where an insider traded in the previous month (or months). We report the alphas (in percentage terms) from a regression of excess portfolio returns on three factors from Fama and French (1993): the market factor ($R_m - R_f$), the return difference between a portfolio of “small” and “big” stocks (SMB), the return difference between a portfolio of “high and “low” book-to-market stocks (HMB), augmented with a momentum factor from Carhart (1997).

⁷Both of these methods are preferred to a market-model approach because they do not require the estimation of parameters from an out-of-sample period. It would be inappropriate to do this in the period prior to insider transactions due to the fact that the sales tend to follow large abnormal stock price increases, and a model estimated over this period would therefore be biased.

III. Predicting Insider Trading Patterns

We have hypothesized that isolated trades precede information that is soon revealed to the market, and a longer sequence of trades predicts information that takes longer to be revealed. In this section, we examine the ex-ante determinants of insider trading patterns. We explore three broad factors that may predict whether or not a trade is the start of a sequence: the immediacy of the information, the nature of the firm's information environment, and investors' attention to the trading activity.

We use two proxies for the immediacy of information. The first is a dummy variable that equals one (and zero otherwise) if there is an earnings surprise in the next quarter-end earnings announcement. We predict that an insider is less likely to initiate a sequence (and more likely to engage in an isolated trade) when the informational advantage will be eliminated by the end of the current quarter, i.e., when the information is relatively short-lived. Our second proxy for the immediacy of information is the earnings reporting lag: the number of days between the end of the fiscal-quarter and the earnings announcement. We predict that the likelihood that an insider's trade signals the beginning of sequenced trades will be positively related to the earnings reporting lag.⁸

We also predict that the firm's information environment affects insider trading behavior. The higher the general level of information asymmetry between insiders and outsiders, the more likely it is that insiders can keep information from being revealed for longer, and exploit their informational advantage across a sequence of trades. In other words, for there to be a high level of information asymmetry, information must not be quickly incorporated into prices. Prior studies have shown that firm characteristics that proxy for the information asymmetry that enables insiders to exploit their information advantage include analyst following (Frankel and Li, 2004), firm size (Seyhun, 1986; Lakonishok and Lee, 2001), and book-to-market ratio (Huddart and Ke, 2007). In addition to these proxies, we also use the adjusted probability of informed trading (adjusted PIN) from

⁸Earnings data is taken from the I/B/E/S database.

Duarte and Young (2009) as a proxy for trading costs that suggests a high probability of informed trading.⁹

Finally, we expect insiders to have greater opportunity to exploit an informational advantage across multiple trades when investor attention is lower. DellaVigna and Pollet (2009) show that investors are generally less attentive to corporate announcements made at the end of the week, by showing that post-earnings announcement drift (PEAD) is extended when earnings surprises are announced on Fridays. Similarly, we predict that insiders will be more likely to initiate or report the execution of informed sequenced trades on Fridays since the market may be slower to incorporate this information into prices.¹⁰ In addition, since there is less immediacy associated with informed sequenced trade, insiders have the time to plan when to execute the trades and will choose to trade in such a way to even further minimize investor attention.

We present the results of our analysis in Table 2, which reports probit regressions predicting that a trade is either isolated (dependent variable = 0) or represents the beginning of a trade sequence (dependent variable = 1).¹¹ The results strongly support our predictions. A low market value of equity and low book-to-market value consistently predict sequenced trading. These are the two firm characteristics most closely associated with information asymmetry. In addition, when we omit these firm characteristics, we find that each of our other predictors of sequenced trading is significant in the expected direction. However, when we control for the dominant firm characteristics, we lose significance on the number of analysts and the adjusted PIN, both of which are highly correlated with firm size and book-to-market. However, taken together, the results provide compelling evidence that initiation of a sequence of insider trades is associated with firm's information environment.

⁹We thank Duarte and Young for making their adjusted PIN data available on their websites.

¹⁰We construct a dummy variable that equals one (and is zero, otherwise) if either the first trade of the month is on a Friday, or if the transaction is reported to the SEC on a Friday, since both events are likely to convey information to the market. Controlling for each separately generates coefficients that are in the same direction, but less pronounced.

¹¹Subsequent trades in a sequence are dropped from this analysis.

The results presented in Table 2 also show that isolated trades are more likely than sequences to be followed by an immediate earnings surprise, and that the start of a sequence is more likely to be associated with a subsequently longer lag between the end of the fiscal quarter and earnings reporting (earnings report lag). These findings support our prediction that information with valuation consequences is revealed much sooner after isolated trades. Finally, we find that sequenced trades are more likely to be executed or reported to the SEC on Fridays than are isolated trades. Since the information animating a sequence of trades has less immediacy, insiders have more flexibility to time their trades for the day of the week when investors are least attentive and they take advantage of this inattention by starting a reporting a sequence of trades on Fridays.

In summary, the results in Table 2 suggest that both the firm's information environment and the nature of the specific information predict whether or not an insider will initiate a sequence or execute an isolated trade. In situations where the information animating the trade will not soon be revealed to the investors, and where the overall level of information asymmetry between insiders and outsiders is high, insiders spread their trades over several months. They further exploit their information advantage by initiating or reporting sequences of trades to the SEC when investors are least attentive.

IV. Empirical Analysis of Returns following Insider Trades

The main hypothesis of this paper is that due to the time-sensitivity of information, informed insider trades with a short-lived informational advantage will trade quickly and their isolated trade will be followed shortly by abnormal stock returns. In contrast, informed insiders with a long-lived informational advantage will spread their trades over several months, and their sequenced trades will be followed by no (or smaller) abnormal returns. In this section, we present a number of empirical tests of this thesis by comparing the returns following isolated trading months to those that follow trading months that occur in a sequence, using the methodologies we described in the previous section.

We start with an anecdotal illustration of the patterns we analyze in this paper. Consider the trades of two CEOs who sold their companies' stock from February to May 2005. The companies will be identified as Company A and Company B, and their trades and stock returns during this period are shown in Fig. 2. After not reporting any insider sales in the previous month, the CEOs of both companies report a sale on February 1 of 2005. However, over the next six months, Company A's CEO reports no further trades. Thus, we would classify Company A's sale as an isolated trade. In contrast, following his trade in February, Company B's CEO reports sales in March, April and May. Since these trades are in consecutive months, they would be classified as a sequence of trades ending in May 2005.

Fig. 2 shows that in the month following the CEO of Company A's isolated sale, its stock price fell by 41%, suggesting his trade was informed and the information was reflected in his firm's stock in a relatively timely manner. A review of *World Street Journal* articles reveals that Company A reported a 15% decline in quarterly revenue at the end of April and the firm's earnings swung from a profit to a loss, which likely drove the decline in value. In contrast, the price of Company B actually rose by about 13% over the time that its CEO was executing his sequence of trades. However, in the three months following the completion of the sequence the stock price fell by 44% such that the price ended 31% lower than when he started trading. This suggests that while the CEO of Company B's trading was informed, it ultimately took longer for the information to be revealed to the market. In this case, the decline in value is concentrated around the time that Company B announced not only that they had missed earnings expectations (albeit with higher earnings than the previous quarter), but that they had canceled a major distribution contract in Canada. This is the type of information that the CEO would likely have been able to anticipate for some time, but that the market would have had difficulty identifying.

A. Abnormal Returns Associated with Isolated and Sequenced Trades

In this subsection, we evaluate the abnormal returns following insiders' isolated and sequenced stock trades. Table 3 presents a univariate analysis of abnormal returns following isolated and sequenced trade months for both insider sales and purchases. As reported in the first columns of Panel A, when we use the matching-firm adjusted CAR methodology, isolated sales months are followed by average negative abnormal returns of -0.72% ($t = -11.16$) over the following month, while sequenced sale months are followed by insignificant abnormal returns. The difference across the isolated and sequenced trade months is -0.70% ($t = -6.02$). We get similar results when we use the size-decile-portfolio adjustment; with this method, we find that isolated trades are followed by average negative abnormal returns of -0.47% ($t = -9.97$) over the following month, while sequenced sale months are followed by returns of 0.35% ($t = 4.81$). The difference across the isolated and sequenced trade months is -0.82% ($t = -9.96$).

The results are even more pronounced when considering only the trades of top executives, which reveal highly significant differences in abnormal returns (between isolated and sequenced trades) of -0.89% ($t = -3.79$) and -1.02% ($t = -5.89$), for matching-firm and size-decile portfolio adjustment, respectively. It is also of note that in no case are the returns following sequenced sale months significantly negative, and in one case they are significantly positive (although this was in an instance without a control for stock return momentum). Given that all of these trades fall into the "opportunistic trade" category of Cohen et al. (2012), the results strongly suggest that insiders execute trades quickly when they are trading on information, and that they spread their transactions over longer windows when they are able to maintain an informational advantage for longer.

The returns following purchase months reported in Panel B tell a similar story, although the returns following sequenced purchase months are still abnormally positive but to a significantly smaller degree than those of isolated. For the full insider sample, the abnormal returns in the month following the trade are approximately three times as large following isolated trade months

than sequenced trade months: 1.35% ($t = 16.35$) versus 0.43% ($t = 16.35$) and 1.39% ($t = 22.79$) versus 0.57% ($t = 5.82$) for matching-firm and size-decile portfolio adjustment, respectively. For top insiders, they are approximately twice as large, but the magnitude of the abnormal returns is very large: 2.09% ($t = 12.24$) versus 1.08% ($t = 3.71$) and 2.32% ($t = 18.21$) versus 1.05% ($t = 5.21$) for matching-firm and size-decile portfolio adjustment, respectively. Taken together, the univariate results for both insider sales and purchases are strongly consistent with our hypothesis that isolated trades are more likely when the information will be revealed to the market soon while sequenced trades are more likely when it takes longer for information to be revealed to the market.

We next turn to multivariate models explaining returns to control for additional risk factors that may affect our results. This part of our analysis is modeled on the results of Cohen et al. (2012), and consists of regressions of total one month returns on the market return and firm and trade specific factors. The key explanatory variable is a dummy variable (Isolated Sale/Purchase Month) that takes a value of one if the month follows an isolated trade and zero if the month follows a sequenced trade. The control variables are the number of shares traded, market capitalization, the ratio of book to market equity, prior one-year return, prior one-month return and the market return. The results are presented in Table 4 for sales months and Table 5 for purchase months.

Beginning with sales by all insiders (Table 4, Panel A), we first confirm in column (1) that we find similar results as Cohen et al. (2012), in that these “opportunistic trade” months are followed by abnormal returns of approximately 90 basis points.¹² In column (2), we also add the log of the number of shares sold and confirm that this does not impact our abnormal return estimate. Columns (3)–(6) add the dummy variable indicating that the trade month was isolated (and varying fixed effects), and confirm that the abnormal returns following isolated trades are more negative than those following sequenced trades by a magnitude that ranges from between $-0.75%$ ($t = -8.28$)

¹²As indicated by the coefficient on the constant in the regression. One difference in our sample from the Cohen et al. (2012) opportunistic trades sample is that we include trades by executives that traded in fewer than 3 consecutive calendar months. They require a trader to have three years of trading to classify them as routine or opportunistic.

and -1.19% ($t = -7.65$). Panel B provides the same analysis for top executives only, and again, the more dramatic results are confirmed in this multivariate setting. For top executives, abnormal returns following isolated trades are more negative than those following sequenced trades by a magnitude that ranges from between -1.03% ($t = -5.69$) and -2.00% ($t = -6.79$).

As with the univariate results, Table 5 tells a similar story for insider purchase months. The Cohen et al. (2012) “opportunistic” trade result is confirmed in column (1). The latter columns demonstrate the abnormal returns following isolated trades are larger than those following sequenced trades by a magnitude that ranges from between 1.12% ($t = 8.14$) and 1.41% ($t = 5.55$). Here as well, the evidence of informed trading is larger in the top executive group, as demonstrated in the incremental abnormal returns following isolated trades by top executives of approximately 1.5% in the latter columns of Panel B.

Finally, we test our main hypothesis with calendar-time portfolios in Table 6. Firms are added to the appropriate portfolio at the beginning of the month following that in which the trade was made and kept in the portfolio for one month. The portfolio is then rebalanced at the beginning of the next month based on new trades. We report the alphas (in percentage terms) from a regression of portfolio returns on: (1) the market factor (CAPM); (2) the market factor, the return difference between a portfolio of “small” and “big” stocks and the return difference between a portfolio of “high” and “low” book-to-market stocks from Fama and French (1993); (3) all three factors in (2), augmented with a momentum factor from Carhart (1997).

Table 6 confirms the results of the univariate and multivariate analysis. For example, focusing on Carhart alphas, we find that portfolio returns are insignificant following sequenced sales but are a significant -0.42% ($t = -5.13$) following isolated sales. A long-short portfolio that is long sequenced sales and short isolated sales yields an alpha of 0.60% ($t = 5.11$). We see a similar pattern for purchases. Portfolio returns following isolated purchases are significantly bigger than those following sequenced purchases; a long-short portfolio that is long isolated purchases and short sequenced purchases yields an alpha of 0.66% ($t = 4.82$). As with the univariate and multivariate

analysis, we find that the difference between isolated and sequenced trades is more pronounced when we limit our analysis to top executives.

B. Further Analysis of Sequenced Trades

The analysis in the previous section provides clear evidence that isolated insider trades are motivated by an informational advantage. However, the same cannot be clearly said of sequenced trades (especially sequenced sales) since monthly returns following the trades are insignificant or much smaller than following isolated trades. In this section, we look closer at the sequenced trades of insiders to determine whether they are best characterized as diversification and liquidity trades, or if they too are motivated by information.

B.1. Returns Across the Sequences

If insiders engage in sequences of trades solely for diversification and liquidity purposes, then we expect to find typical returns across the trades in the sequences. On the other hand, executives may trade over longer periods of time when they have information that continues to be hidden from the market. If this is the case, then we expect there to be abnormal returns following the end of the trade sequences.

Table 7 provides a breakdown of abnormal returns across trading sequences. Average monthly abnormal returns across the full sequence of trades are reported first. Returns are then broken down by whether or not they follow the final month of a trade sequence. The results are consistent with executives timing their sequence trades based on information that is incorporated into prices after the sequences end. For sequences of sales, the average monthly return across the sequence is insignificant. Average monthly abnormal returns prior to the end of the sequence are a positive 0.62% per month ($t = 4.15$), but they are -1.03% ($t = -6.54$) in the month following the sequence. The negative abnormal returns continue to grow over the three months following sequence ends, to a value of -2.05% ($t = -7.81$). As before, the pattern is similar and more pronounced when only considering the trades of top executives. It is therefore apparent that prices are lower on average

following sequenced sales than they were before the trading began, suggesting that the full trading sequence was motivated by an ex-ante informational advantage.¹³

Abnormal returns patterns across purchase month sequences are similar, too. In this case they are insignificant following trades before the sequence ends, and large and significantly positive upon completion of trading. For all insiders, over the three months following the completion of a sequence of purchases, abnormal returns are 2.18% ($t = 5.61$). The most striking result for purchases is that following the completion of sequence of purchases by top executives, their stocks experience an abnormal 3.95% ($t = 4.79$) increase in value over the following three months.

Table 8 confirms these results with a calendar-time portfolio analysis. For the sequenced sales (all insiders), we see that over the period from the beginning of the sequence to the month before the sequence ends, monthly portfolio alpha is 0.97% ($t = 4.20$) but monthly portfolio in the three months following the end of the sequence is -0.51% ($t = -6.24$). We see the symmetrically opposite pattern for purchases; over the period from the beginning of the sequence to the month before the sequence ends, monthly portfolio alpha insignificant. However, monthly portfolio in the three months following the end of the sequence is 0.95% ($t = 7.65$). The final column of this table is of greatest interest, as it shows average monthly abnormal returns over the period starting from when sequences begin and ending three months after sequences end. The results show that these periods are associated with significant negative returns for sales sequences (-0.17% , $t = 2.33$), and significant positive returns for purchase sequences (0.90%, $t = 7.77$). Here, too, the results are stronger when only considering top executives.

Overall, the results in Tables 6 and 7 confirm that sequenced trades which may appear to be

¹³In unreported tests we confirm that abnormal returns over 3, 6 and 9 month windows beginning 3 months after sequences end are not significantly different than zero. As such, the abnormal returns in the quarter following sequences are persistent. This helps rule out the possibility that trade sequences are not driven by information, and that the insiders just stop trading when the price moves beyond their psychologically anchored expected stock value. If anchoring explains the end of sequences, then the eventual long-run stock price would not reflect abnormal returns relative to the pre-trading price, which would require a reversal of the abnormal returns found in the three months after sequences end.

uninformed are actually informed trades where the information is not incorporated into prices until after the sequence ends.

B.2. Trading Strategies

The results of our first set of tests – that isolated trades by insiders predict future stock returns – is useful for understanding the economics of insider trading. It may not be easy, though, for investors to incorporate this information into their own trading strategies since the returns may quickly follow the trading activity.¹⁴ However, the results for sequences of trades suggest they continue to predict information over a number of months after they end. It may therefore be possible to construct a trading strategy to take advantage of this information. This analysis also provides further evidence of the economic magnitude of how informed sequenced trades are.

We present some possible trading strategies in Table 9. We assume that an investor can identify the end of a sequence of trade months by the second month after the final trade, after which the stock can be added to a portfolio. In other words, the investor can wait for a month to actually confirm that a sequence of trades has ended. The firms are held in the portfolio for one month after which the portfolio is then rebalanced based on newly completed sequenced trades. We find that such a strategy earns sizeable abnormal returns, particularly when the focus is on the transactions of top executives. The Carhart alphas are a significant -0.55% per month (-0.69% per month) for strategies that go short after confirming the end of a sequence of all insider (top executive) sales, and approximately 1.15% per month (1.76% per month) for strategies that go long after confirming the end of a sequence of all insider (top executive) purchases. A long-short portfolio that buys stocks after confirming the end of a sequence of insider (top executive) purchases, and shorts stocks after confirming the end of a sequence of insider (top executive) sales earns month alphas of 1.71% (2.37%), or 22.6% (32.5%) annualized.

¹⁴In unreported results, we find that the abnormal returns following isolated trades also continue over the next three months, but at a diminished rate. Following both sale and purchase months about 0.5% of additional abnormal return accrues over the additional two-months.

Of course, any trading strategies also need to also account for trading costs. The portfolios described would need to be rebalanced monthly, and there would be direct and indirect trading costs depending on the amount of capital invested. Korajczyk and Sadka (2004) estimate the profitability of momentum strategies that are rebalanced monthly and also have similar pre-trading cost returns as our strategy, so their conclusions serve as a good guide. They estimate monthly-rebalanced momentum strategies with direct trading costs and price impact using four different trading cost models.¹⁵

They focus only on long-only strategies, since the analysis is complicated when trying to estimate shorting costs. They identify momentum strategies that generate an alpha of between 1.17% and 1.60% per month over the time period 1967 to 1999, which is very close in magnitude to the alphas we find for long-only portfolios following insider purchases. After accounting for transactions costs, they determine that these strategies continued to generate positive alpha with investments of up to approximately \$5 billion, although the statistical significance of the alpha is lost after an approximate \$1 to \$2 billion additional investment. It seems reasonable, then, to predict a similar result for portfolios formed based on insider purchases. However, given the smaller alphas associated with insider sales and the additional short-selling costs, it is not clear that a strategy focused only on those transactions would be profitable.

C. An Analysis of “Routine” Trades

Past researchers have argued for the existence of corporate insiders who are routine traders that do not attempt to profit on an informational advantage. Cohen et al. (2012), in particular, adopt a sorting mechanism that classifies about half of insiders as routine traders and show that on average their trades do not predict abnormal returns. Under their methodology, insiders are considered routine traders if they trade in the same calendar month in three consecutive years.

¹⁵Korajczyk and Sadka (2004) use two proportional trading cost models based only on quoted and effective spreads, and the non-proportional trading cost models of Glosten and Harris (1988) and Breen, Hodrick, and Korajczyk (2002) that account for price impact.

In this section, we analyze the trading patterns of insiders identified as routine traders under the Cohen et al. (2012) methodology. Table 10 presents abnormal return regressions similar to those in Tables 4 and 5, but where the observations are based on the trades of routine traders. In both Panel A (Routine Sale Months) and Panel B (Routine Purchase Months), the regression in Column (1) confirms the results of Cohen et al. (2012) that these trades are not followed by significant abnormal returns on average. However, the results in Columns (2) (no fixed effects) and (3) (monthly fixed effects) demonstrate highly significant abnormal returns following isolated trade months as well as following trade sequences in this subsample, consistent with our main results. These regressions also demonstrate significant abnormal returns in the opposite direction following intra-sequence trade months which is further consistent with the analysis above.

An explanation for the insignificant abnormal returns in the routine trader sample overall may be found in the ratio of sequenced and isolated trades. We find a higher percentage of sequenced trade months among traders classified as “routine” under the Cohen et al. (2012) methodology than in the sample of non-routine traders. The ratio of sequenced to isolated trade months by “routine” traders is approximately 1:1 compared to a ratio of 1:3 among other traders. Therefore, if each trade is treated as an independent observation, the abnormal returns following “routine” trades are biased towards zero by the greater fraction of intra-sequence trades.

It makes sense that a rule classifying traders as “routine” based in part on trade frequency would be more likely to pick up sequence traders so long as they also trade more often. We verify that this is the case. Traders with above median levels of sequenced trades (18% or more of their trades being sequenced) trade in 3.6 times more months than isolated traders.

The results of this section demonstrate that once insiders’ trading patterns are taken into account, there is indeed evidence of informed trading among both non-routine traders and those previously thought to trade only for routine purposes. This finding suggests that informed trading is more widespread than previously thought, and demonstrates the importance of controlling for trading patterns when analyzing the profitability or information content of insiders trades. It also

points to a need for a more accurate mechanism for isolating those traders that do not appear to trade because of an informational advantage.

V. Conclusion

We identify how insiders trade during a short window of time when their trades are motivated by a short-lived informational advantage, and stretch their trades across longer horizons when their informational advantage will persist. Insiders are more likely to execute sequences of trades when their firms' information environment is poorer, and when investors are less attentive. Separating out sequenced trades, the information content of isolated trades becomes quite apparent. Analyzed individually, sequenced trades are not obviously informed; however, once viewed as part of a larger trade strategy, abnormal return patterns make it apparent that these trades, too, are intended to exploit an informational advantage. Once these patterns are accounted for, the evidence of opportunistic trading by corporate insiders on average is strong, even among those traders previously thought to trade only for routine purposes.

The analysis of this paper gives us a greater understanding of how insiders exploit their informational advantages. Future researchers should account for these patterns when investigating new hypotheses about informed trading, in order to maximize the power of their tests to detect such behavior. In addition, regulators and outside investors should be aided in their contrasting pursuits of prosecuting illegal activity versus profiting in the markets by accounting for these trading patterns. As our understanding of informed trading grows, our ability to minimize the total cost of participating in the public markets should decline.

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Fig. 1: The figure shows the distribution trade sequences in our sample. A net sales (purchase) month is one where insider sales (purchases) exceed purchases (sales) in that month. We identify an *isolated* trading month as one where insiders did not trade in the month before or after. We identify a *sequenced* trade month as one where the insiders also had net transactions of the same type (sales or purchases) in contiguous months. The chart shows the number of sequences sorted by the total number of contiguous trade months in the sequence.

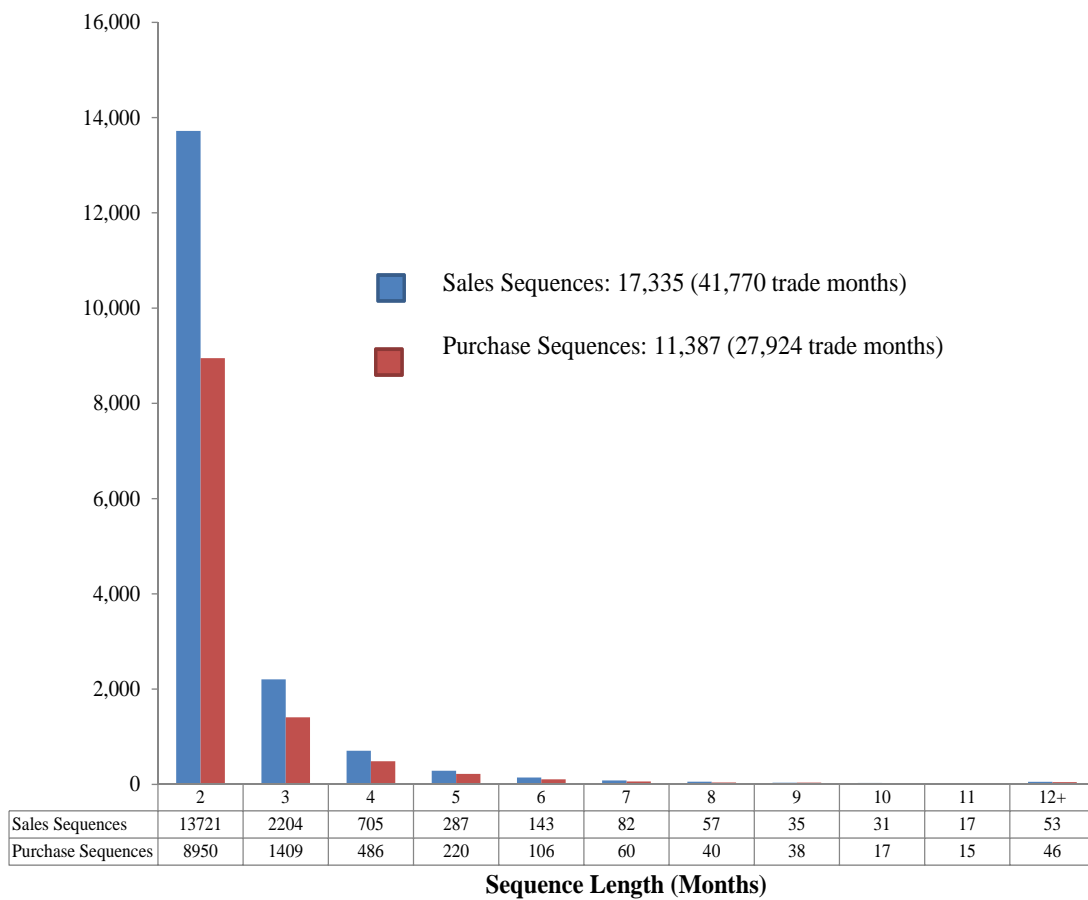


Fig. 2: The figure shows own company stock sales and stock prices for executives at Company A and Company B between December 2004 and July 2005. (Price = 1 on 02/01/2005)

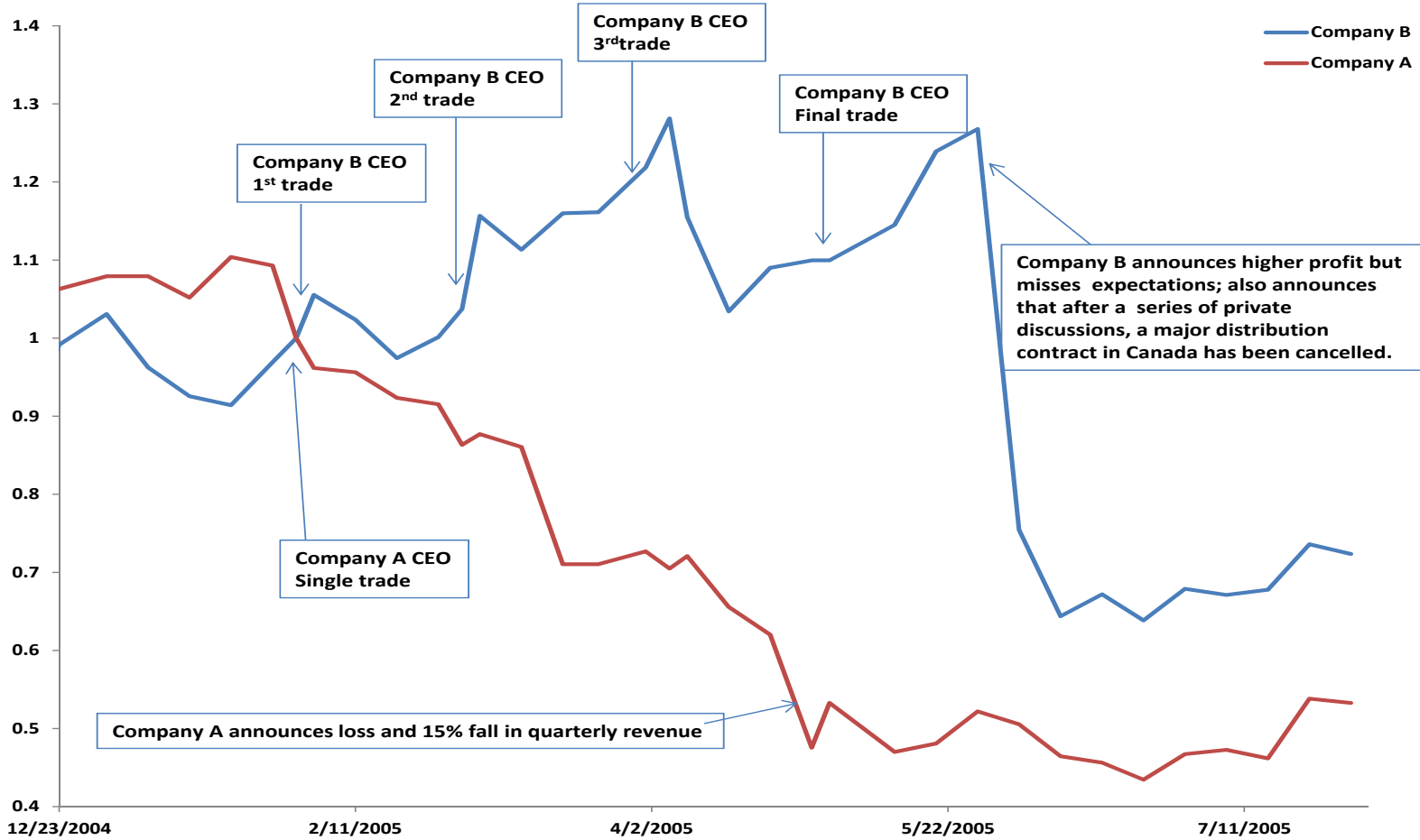


Table 1**Summary Statistics**

The table shows a summary overview of the sample we use in this paper, and shows the distribution of isolated and single trades. A net sales (purchase) month is one where insider sales (purchases) exceed purchases (sales) in that month. We identify an isolated net sale (purchase) month as one where insiders did not sell (buy) in the month before or after. We identify a sequenced net sale (purchase) month as one where the insiders also had net sales (purchases) in either the month before or after, or in both the month before and after. *a* and *b* represent significance at the 1% and 5% levels respectively.

Panel A: Months with Net Sales by Insiders

	Isolated trades		Sequenced trades		Diff. in Means <i>t</i> -statistic
	Mean	Median	Mean	Median	
Firms	7,412		4,809		
Insiders	56,203		12,375		
Top Executives	10,831		2,883		
All Others	49,260		10,304		
Trade Months	117,193		41,770		
Trade Months/Firm	15.81	8.00	8.69	6.00	
Trade Months/Insider	2.09	1.00	3.38	2.00	
Unique Trade Months	75,908		35,370		
Sequence Length (months)	1.00	1.00	2.52	2.00	
Trade Size (# shares)	44,522	5,000	54,633	9,605	-2.01 ^{<i>b</i>}
Market Value of Equity (\$Mils)	3,714.7	4,465.6	2,642.6	3,131.8	11.05 ^{<i>a</i>}
Book Equity/Market Equity	0.56	0.47	0.53	0.45	10.25 ^{<i>a</i>}
6 Month Pre-Trade Return	12.77%	11.40%	14.18%	13.07%	-7.75 ^{<i>a</i>}

Panel B: Months with Net Purchases by Insiders

	Isolated trades		Sequenced trades		Diff. in Means <i>t</i> -statistic
	Mean	Median	Mean	Median	
Firms	6,939		3,944		
Insiders	47,841		8,358		
Top Executives	10,771		2,153		
All Others	40,123		6,689		
Trade Months	105,285		27,924		
Trade Months/Firm	13.66	9.00	7.08	4.00	
Trade Months/Insider	1.98	1.00	3.34	2.00	
Unique Trade Months	62,797		23,197		
Sequence Length (months)	1.00	1.00	3.19	2.00	
Trade Size (# shares)	15,199	1,300	33,534	2,025	-10.92 ^{<i>a</i>}
Market Value of Equity (\$Mils)	2,317.1	1,947.8	1,377.3	1,158.4	9.77 ^{<i>a</i>}
Book Equity/Market Equity	0.70	0.58	0.79	0.64	-17.15 ^{<i>a</i>}
6 Month Pre-Trade Return	0.97%	1.93%	-1.77%	-0.79%	12.06 ^{<i>a</i>}

Table 2**Predicting insider trading patterns.**

The table reports results from a probit regression predicting whether or not a trade begins a sequence. The dependent variable is one if the trade starts a sequence and zero if the trade is an isolated trade. The number of analysts is the average number of analysts that provided fiscal quarter-end forecasts for the firm in the fiscal year before the trade. Adjusted PIN is the adjusted probability of informed trading from Duarte and Young (2009). Friday execution or reporting dummy equals one if the insider report making a trade on Friday or report their trades to the Securities and Exchange Commission, and zero otherwise. The near-term earnings surprise dummy equals one if the firm beats or misses earnings expectation in the next fiscal quarter-end following the trade, and zero otherwise. Earnings report lag is the number of days between the end of the next fiscal quarter-end and the earnings announcement date. *t*-statistics are reported in parenthesis. *a*, *b* and *c* represent significance at the 1%, 5% and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
No. of Analysts	-0.014 ^a (-20.84)	0.001 (1.58)									-0.009 ^a (-6.45)	-0.001 (-0.61)
Adj. PIN			0.936 ^a (13.50)	-0.057 (-0.61)							0.588 ^a (4.60)	0.147 (1.02)
Friday execution or reporting dummy					0.018 ^b (2.57)	0.020 ^a (2.85)					0.046 ^a (3.29)	0.047 ^a (3.33)
Near-term earnings surprise dummy							-0.114 ^a (-13.89)	-0.076 ^a (-9.20)			-0.064 ^a (-4.41)	-0.061 ^a (-4.20)
Earnings reporting lag									0.036 ^a (4.76)	0.004 (0.45)	0.043 ^a (3.34)	0.035 ^a (2.68)
Ln(Market Cap)		-0.064 ^a (-25.34)		-0.074 ^a (-18.12)		-0.061 ^a (-33.55)		-0.059 ^a (-31.92)		-0.057 ^a (-21.48)		-0.055 ^a (-7.29)
Book Equity/Market Equity		-0.147 ^a (-10.12)		-0.175 ^a (-6.55)		-0.147 ^a (-10.09)		-0.142 ^a (-9.72)		-0.160 ^a (-7.60)		-0.126 ^a (-3.39)
Constant	-1.120 ^a (-262.18)	-1.194 ^a (-131.47)	-1.385 ^a (-106.63)	-1.174 ^a (-61.97)	-1.185 ^a (-281.69)	-1.193 ^a (-161.52)	-1.154 ^a (-310.20)	-1.168 ^a (-163.88)	-1.261 ^a (-152.51)	-1.193 ^a (-100.15)	-1.322 ^a (-43.39)	-1.252 ^a (-37.19)
Observations	241,122	241,122	88,976	88,976	241,122	241,122	241,122	241,122	153,089	153,089	61,466	61,466
Pseudo-R2	0.00277	0.00652	0.00283	0.00835	0.00003	0.00656	0.00111	0.00699	0.00019	0.00465	0.00424	0.00566

Table 3**Cumulative abnormal returns in the month following isolated or sequenced trades**

The table shows the cumulative abnormal return (CAR) following isolated and sequenced trade months. The matching-firm adjusted CAR, is obtained by subtracting the returns of the NYSE/NASDAQ/AMEX firm in the same NYSE size-decile with the most similar six-month return prior to the trade month. The size-decile portfolio adjusted CAR is obtained by subtracting the returns of the appropriate NYSE size-decile portfolio. *a* represents significance at the 1% level.

Panel A: Months with Net Sales by Insiders

	All Insiders		Top Executives	
	Matching-firm adjusted CAR	Size-decile-portfolio adjusted CAR	Matching-firm adjusted CAR	Size-decile-portfolio adjusted CAR
All Trade Months				
CAR	-0.50% ^a	-0.21% ^a	-0.91% ^a	-0.50% ^a
<i>t</i> -statistic	(-9.13)	(-5.19)	(-8.33)	(-6.21)
<i>N</i>	111,278	111,278	30,384	30,384
Isolated Trade Months				
CAR	-0.72% ^a	-0.47% ^a	-1.18% ^a	-0.82% ^a
<i>t</i> -statistic	(-11.16)	(-9.97)	(-9.14)	(-8.57)
<i>N</i>	75,908	75,908	18,052	20,915
Sequence Trade Months				
CAR	-0.02%	0.35% ^a	-0.29%	0.20%
<i>t</i> -statistic	(-0.17)	(4.81)	(-1.47)	(1.37)
<i>N</i>	35,370	35,370	9,469	9,469
Isolated minus Sequence				
CAR	-0.70% ^a	-0.82% ^a	-0.89% ^a	-1.02% ^a
<i>t</i> -statistic	(-6.02)	(-9.96)	(-3.79)	(-5.89)

Panel B: Months with Net Purchases by Insiders

	All Insiders		Top Executives	
	Matching-firm adjusted CAR	Size-decile-portfolio adjusted CAR	Matching-firm adjusted CAR	Size-decile-portfolio adjusted CAR
All Trade Months				
CAR	1.11% ^a	1.17% ^a	1.83% ^a	1.99% ^a
<i>t</i> -statistic	(15.42)	(22.53)	(12.41)	(18.43)
<i>N</i>	85,994	85,994	26,098	26,098
Isolated Trade Months				
CAR	1.35% ^a	1.39% ^a	2.09% ^a	2.32% ^a
<i>t</i> -statistic	(16.35)	(22.79)	(12.24)	(18.21)
<i>N</i>	62,797	62,797	19,319	19,319
Sequence Trade Months				
CAR	0.43% ^a	0.57% ^a	1.08% ^a	1.05% ^a
<i>t</i> -statistic	(3.03)	(5.82)	(3.71)	(5.21)
<i>N</i>	23,197	23,197	6,779	6,779
Isolated minus Sequence				
CAR	0.92% ^a	0.82% ^a	1.02% ^a	1.27% ^a
<i>t</i> -statistic	(5.71)	(6.95)	(3.02)	(5.14)

Table 4

Stock returns in month following isolated sales relative to sequenced sales.

The table reports results of a regression of monthly stock returns on firm characteristics following isolated and sequenced trades. The dependent variable is the return in the month following an insider trade. The key explanatory variable is a dummy variable (Isolated Sale Month) that takes a value of one if the month follows an isolated sale and zero if the month follows a sequenced sale. Panel A shows the results for all insiders. Panel B shows the results for top executives where the top executives is either the chief executive officer, chairman of the board, chief financial officer, president, chief operating officer, or general counsel. *t*-statistics are reported in parenthesis. *a*, *b*, and *c* represent significance at the 1%, 5% and 10% levels, respectively.

Panel A: Months with net sales by all insiders

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-0.898 ^a (-8.55)	-0.956 ^a (-8.30)	-0.405 ^a (-2.99)			
Isolated Trade Month			-0.748^a (-8.28)	-0.803^a (-8.95)	-0.919^a (-9.61)	-1.194^a (-7.65)
Ln(Shares Traded)		0.030 (1.24)	0.008 (0.31)	0.010 (0.40)	0.043 ^c (1.66)	0.022 (0.45)
Ln(Market Cap)	-0.066 ^a (-2.64)	-0.066 ^a (-2.64)	-0.050 ^b (-2.00)	-0.026 (-1.01)	-1.276 ^a (-19.02)	-1.101 ^a (-10.10)
Book Equity/Market Equity	1.132 ^a (6.40)	1.140 ^a (6.41)	1.177 ^a (6.62)	1.058 ^a (6.12)	1.208 ^a (4.75)	1.414 ^a (3.67)
Prior 1 Year Return	0.707 ^a (4.71)	0.699 ^a (4.63)	0.681 ^a (4.51)	0.636 ^a (3.99)	0.024 (0.15)	-0.032 (-0.13)
Prior 1 Month Return	0.950 ^c (1.69)	0.934 ^c (1.66)	0.915 (1.62)	0.861 (1.47)	-0.171 (-0.34)	-0.194 (-0.27)
Market Return	78.297 ^a (93.28)	78.292 ^a (93.29)	78.221 ^a (93.18)	-48.894 ^a (-11.62)	75.841 ^a (93.55)	75.023 ^a (65.24)
Fixed Effects	none	none	none	month	firm	person
Observations	111,278	111,278	111,278	111,278	111,278	111,278
R-squared	0.102	0.102	0.102	0.133	0.222	0.526

Panel B: Months with net sales by top executives

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-1.459 ^a (-6.18)	-1.285 ^a (-4.56)	-0.557 ^c (-1.74)			
Isolated Trade Month			-1.043^a (-5.83)	-1.033^a (-5.69)	-1.490^a (-7.11)	-1.997^a (-6.79)
Ln(Shares Traded)		-0.068 (-1.37)	-0.076 (-1.53)	-0.068 (-1.39)	-0.034 (-0.54)	0.026 (0.25)
Ln(Market Cap)	-0.016 (-0.32)	-0.012 (-0.24)	0.013 (0.25)	0.015 (0.28)	-1.423 ^a (-8.84)	-1.879 ^a (-7.46)
Book Equity/Market Equity	1.529 ^a (3.59)	1.509 ^a (3.51)	1.572 ^a (3.68)	1.547 ^a (4.04)	2.038 ^a (3.27)	1.939 ^b (2.53)
Prior 1 Year Return	0.803 ^a (2.88)	0.825 ^a (2.94)	0.815 ^a (2.90)	0.749 ^b (2.54)	0.144 (0.44)	0.246 (0.61)
Prior 1 Month Return	0.801 (0.86)	0.853 (0.91)	0.913 (0.98)	0.981 (0.99)	-0.356 (-0.36)	-0.839 (-0.71)
Market Return	84.556 ^a (46.89)	84.578 ^a (46.95)	84.585 ^a (46.98)	-25.096 ^a (-3.43)	80.159 ^a (44.56)	82.204 ^a (35.57)
Fixed Effects	none	none	none	month	firm	person
Observations	30,384	30,384	30,384	30,384	30,384	30,384
R-squared	0.107	0.107	0.108	0.137	0.351	0.517

Table 5

Stock returns in month following isolated purchases relative to sequenced purchases.

The table reports results of a regression of monthly stock returns on firm characteristics following isolated and sequenced trades. The dependent variable is the return in the month following an insider trade. The key explanatory variable is a dummy variable (Isolated Purchase Month) that takes a value of one if the month follows an isolated purchase and zero if the month follows a sequenced purchase. Panel A shows the results for all insiders. Panel B shows the results for top executives where the top executives is either the chief executive officer, chairman of the board, chief financial officer, president, chief operating officer, or general counsel. *t*-statistics are reported in parenthesis. *a*, *b*, and *c* represent significance at the 1%, 5% and 10% levels, respectively.

Panel A: Months with net purchases by all insiders

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.527 ^a (5.12)	0.430 ^a (4.20)	-0.493 ^a (-3.53)			
Isolated Trade Month			1.188^a (9.80)	1.127^a (9.35)	1.115^a (8.14)	1.411^a (5.55)
Ln(Shares Traded)		0.277 ^a (10.28)	0.292 ^a (10.78)	0.309 ^a (11.53)	0.271 ^a (8.02)	0.320 ^a (4.94)
Ln(Market Cap)	-0.291 ^a (-9.02)	-0.258 ^a (-8.04)	-0.284 ^a (-8.77)	-0.244 ^a (-7.48)	-1.500 ^a (-16.37)	-0.788 ^a (-6.78)
Book Equity/Market Equity	0.732 ^a (4.87)	0.722 ^a (4.81)	0.737 ^a (4.91)	0.457 ^a (2.97)	0.749 ^a (3.93)	0.976 ^a (3.23)
Prior 1 Year Return	-0.325 (-1.63)	-0.191 (-0.96)	-0.230 (-1.15)	-0.113 (-0.55)	-1.173 ^a (-5.21)	-1.326 ^a (-3.93)
Prior 1 Month Return	-2.634 ^a (-4.52)	-2.310 ^a (-3.98)	-2.386 ^a (-4.11)	-2.618 ^a (-4.16)	-3.523 ^a (-6.04)	-3.103 ^a (-3.65)
Market Return	77.585 ^a (78.40)	77.637 ^a (78.40)	77.379 ^a (78.33)	-42.316 ^a (-8.44)	74.703 ^a (75.18)	69.900 ^a (48.75)
Fixed Effects	none	none	none	month	firm	person
Observations	85,994	85,994	85,994	85,994	85,994	85,994
R-squared	0.086	0.087	0.088	0.129	0.198	0.534

Panel B: Months with net purchases by top executives

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	1.014 ^a (5.67)	0.598 ^a (3.38)	-0.702 ^a (-2.66)			
Isolated Trade Month			1.640^a (6.64)	1.534^a (6.22)	1.448^a (4.31)	1.492^a (3.27)
Ln(Shares Traded)		0.543 ^a (10.20)	0.539 ^a (10.12)	0.557 ^a (10.62)	0.403 ^a (5.40)	0.715 ^a (5.79)
Ln(Market Cap)	-0.388 ^a (-5.23)	-0.360 ^a (-4.88)	-0.396 ^a (-5.31)	-0.308 ^a (-4.06)	-2.232 ^a (-9.43)	-2.429 ^a (-7.12)
Book Equity/ Market Equity	0.689 ^a (3.12)	0.660 ^a (3.00)	0.695 ^a (3.15)	0.360 (1.62)	0.777 ^b (2.32)	1.021 ^b (2.18)
Prior 1 Year Return	-0.765 ^b (-2.30)	-0.461 (-1.39)	-0.514 (-1.55)	-0.344 (-0.97)	-2.172 ^a (-4.67)	-1.984 ^a (-3.42)
Prior 1 Month Return	-3.019 ^a (-2.89)	-2.266 ^b (-2.17)	-2.248 ^b (-2.16)	-2.995 ^a (-2.75)	-2.748 ^b (-2.37)	-2.698 ^c (-1.83)
Market Return	85.033 ^a (42.12)	85.007 ^a (42.11)	84.654 ^a (41.98)	-39.990 ^a (-4.39)	78.299 ^a (36.87)	74.058 ^a (26.75)
Fixed Effects	none	none	none	month	firm	person
Observations	26,098	26,098	26,098	26,098	26,098	26,098
R-squared	0.086	0.089	0.091	0.150	0.354	0.564

Table 6

Portfolio returns following isolated and sequenced insider trades.

The table reports returns to portfolios formed in the month following isolated or sequenced trades. Firms are added to the appropriate portfolio at the beginning of the month following that in which the trade was made and kept in the portfolio for a month. The portfolio is then rebalanced at the beginning of the next month based on new trades. We report the alphas (in percentage terms) from a regression of portfolio returns on: (1) the market factor (CAPM); (2) the market factor, the return difference between a portfolio of “small” and “big” stocks and the return difference between a portfolio of “high” and “low” book-to-market stocks from Fama and French (1993); (3) all three factors augmented with a momentum factor from Carhart (1997). *t*-statistics are reported in parenthesis. *a* and *b* represent significance at the 1% and 5% levels respectively.

Panel A: All Insiders								
alphas	Sequenced Sells	Isolated Sells	Long/ Short	Sequenced Buys	Isolated Buys	Long/ Short	Sequenced Buys – Sells	Isolated Buys – Sells
CAPM	0.22 (1.28)	-0.35 ^a (-2.63)	0.57 ^a (4.92)	0.89 ^a (4.38)	1.50 ^a (8.29)	0.60 ^a (4.48)	0.67 ^a (3.69)	1.85 ^a (13.86)
Fama French	0.14 (1.21)	-0.45 ^a (-5.60)	0.60 ^a (5.20)	0.68 ^a (4.15)	1.33 ^a (9.20)	0.65 ^a (4.86)	0.53 ^a (3.14)	1.78 ^a (13.57)
Carhart	0.18 (1.50)	-0.42 ^a (-5.13)	0.60 ^a (5.11)	0.88 ^a (5.89)	1.54 ^a (12.07)	0.66 ^a (4.82)	0.70 ^a (4.32)	1.96 ^a (16.40)
Panel B: Top executives								
alphas	Sequenced Sells	Isolated Sells	Long/ Short	Sequenced Buys	Isolated Buys	Long/ Short	Sequenced Buys – Sells	Isolated Buys – Sells
CAPM	0.23 (0.94)	-0.68 ^a (-3.54)	0.93 ^a (4.26)	1.56 ^a (5.01)	2.18 ^a (8.93)	0.66 ^b (2.52)	1.42 ^a (4.13)	2.95 ^a (12.33)
Fama French	0.18 (0.86)	-0.74 ^a (-4.71)	0.94 ^a (4.23)	1.34 ^a (4.76)	2.03 ^a (9.68)	0.73 ^a (2.78)	1.26 ^a (3.71)	2.86 ^a (11.89)
Carhart	0.23 (1.09)	-0.76 ^a (-4.77)	1.00 ^a (4.47)	1.62 ^a (5.99)	2.28 (11.87)	0.71 ^a (2.69)	1.48 ^a (4.39)	3.13 ^a (14.02)

Table 7

Abnormal returns within and across sequenced trades.

In this table, we report matched firm cumulative abnormal returns within and across sequences. The returns are obtained by subtracting, from the firm's returns, the returns of the NYSE/NASDAQ/AMEX firm in the same NYSE size-decile with the most similar six-month return prior to the first trade month. *a* represents significance at the 1% level.

Panel A: All Insiders

	Monthly Average Over Sequence	Monthly Average Prior to Sequence End	Over 1 Month Following End	Over 3 Months Following End
Sales				
Abnormal Return	-0.09%	0.62% ^a	-1.03% ^a	-2.05% ^a
<i>t</i> -statistic	(-0.86)	(4.15)	(-6.54)	(-7.81)
<i>N</i>	14,172	14,172	14,172	14,172
Purchases				
Abnormal Return	0.59% ^a	0.28%	0.96% ^a	2.18% ^a
<i>t</i> -statistic	(3.84)	(1.31)	(4.07)	(5.61)
<i>N</i>	9,311	9,311	9,311	9,311

Panel B: Top executives

	Monthly Average Over Sequence	Monthly Average Prior to Sequence End	Over 1 Month Following End	Over 3 Months Following End
Sales				
Abnormal Return	-0.30%	0.46%	-1.41% ^a	-3.24% ^a
<i>t</i> -statistic	(-1.37)	(1.49)	(-4.15)	(-5.85)
<i>N</i>	3,486	3,486	3,486	3,486
Purchases				
Abnormal Return	1.19% ^a	0.51%	2.09% ^a	3.95% ^a
<i>t</i> -statistic	(3.75)	(1.14)	(4.22)	(4.79)
<i>N</i>	2,601	2,601	2,601	2,601

Table 8

Portfolio returns within and across sequences.

The table shows returns to portfolios formed within and across sequences. Firms with sequenced trades are added and kept in the portfolio for the different time-periods shown in the tables. The portfolio is then rebalanced based on new trades. We report the alphas (in percentage terms) from a regression of portfolio returns on the market factor, the return difference between a portfolio of “small” and “big” stocks, the return difference between a portfolio of “high” and “low” book-to-market stocks from Fama and French (1993), augmented with a momentum factor from Carhart (1997). *t*-statistics are reported in parenthesis. *a* and *b* represent significance at the 1% and 5% levels respectively.

Panel A: All Insiders

	Beginning of sequence to month prior to end of sequence	Beginning of sequence to month when sequence ends	1 month following end of sequence	3 months following end of sequence	Beginning of sequence to 3 months after sequence ends
Sales	0.97 ^a (4.20)	0.78 ^a (5.89)	-0.89 ^a (-6.61)	-0.51 ^a (-6.24)	-0.17 ^b (-2.33)
Purchases	-0.25 (-0.96)	0.41 ^b (2.36)	1.17 ^a (6.49)	0.95 ^a (7.65)	0.90 ^a (7.77)

Panel B: Top executives

	Beginning of sequence to month prior to end of sequence	Beginning of sequence to month when sequence ends	1 month following end of sequence	3 months following end of sequence	Beginning of sequence to 3 months after sequence ends
Sales	1.30 ^a (2.93)	0.57 ^b (2.34)	-1.21 ^a (5.15)	-0.84 ^a (5.93)	-0.33 ^b (2.51)
Purchases	-0.27 (0.53)	0.48 (1.60)	1.90 ^a (5.70)	1.37 ^a (6.62)	1.20 ^a (6.01)

Table 9

Trading on informed sequenced trades.

The table reports returns to portfolios that are formed one month after the month in which a sequenced trade ends, i.e., after waiting to confirm that a sequence of trades has ended. The firms are held in the portfolio for one month after which the portfolio is then rebalanced based on newly completed sequenced trades. We report the alphas (in percentage terms) from a regression of portfolio returns on: (1) the market factor (CAPM); (2) the market factor, the return difference between a portfolio of “small” and “big” stocks and the return difference between a portfolio of “high” and “low” book-to-market stocks from Fama and French (1993); (3) all three factors augmented with a momentum factor from Carhart (1997). *t*-statistics are reported in parenthesis. *a*, *b* and *c* represent significance at the 1%, 5% and 10% levels, respectively.

Panel A: All Insiders			
alphas	Sequenced Sells	Sequenced Buys	Sequenced Buys – Sells
CAPM	–0.48 ^a (–2.64)	1.12 ^a (4.81)	1.61 ^a (6.20)
Fama French	–0.54 ^a (–3.78)	0.94 ^a (4.45)	1.49 ^a (5.85)
Carhart	–0.55 ^a (–3.78)	1.15 ^a (5.70)	1.71 ^a (6.90)

Panel B: Top executives			
alphas	Sequenced Sells	Sequenced Buys	Sequenced Buys – Sells
CAPM	–0.60 ^c (–1.86)	1.68 ^a (3.45)	2.19 ^a (3.85)
Fama French	–0.64 ^b (–2.06)	1.51 ^a (3.19)	2.07 ^a (3.62)
Carhart	–0.69 ^b (–2.19)	1.76 ^a (3.72)	2.37 ^a (4.15)

Table 10

Stock returns in month following isolated and sequenced “routine” trades.

The table reports results of a regression of monthly stock returns on firm characteristics following isolated and sequenced “routine” trades. A “routine” is defined as a trade that occurs in a month where the insider has previously traded in the same month for three consecutive years. Isolated Trade Month takes a value of one in the month following an isolated trade, and zero otherwise. Sequence End Month takes a value of one following the end of a sequence of trades, and zero otherwise. Sequence Month takes a value of one following a sequence but not the end of the sequence, and zero otherwise. Panel A shows the results for “routine” insider sales. Panel B shows the results for “routine” insider purchases. *t*-statistics are reported in parenthesis. *a*, *b*, and *c* represent significance at the 1%, 5% and 10% levels, respectively.

Panel A: Routine Sales Months			
	(1)	(2)	(3)
Constant	-0.327 (-1.59)		
Isolated Trade Month		-0.724 ^a (-3.33)	-1.324 ^a (-9.05)
Sequence End Month		-1.009 ^a (-4.02)	-1.562 ^a (-7.77)
Sequence Month		0.583 ^a (2.61)	
Ln(Market Cap)	-0.165 ^a (-3.71)	-0.151 ^a (-3.40)	-0.098 ^b (-2.13)
Book Equity/Market Equity	1.129 ^a (2.62)	1.213 ^a (2.81)	1.217 ^a (2.77)
Prior 1 Year Return	0.462 ^b (2.13)	0.489 ^b (2.26)	0.475 ^b (2.06)
Prior 1 Month Return	-1.228 ^c (-1.69)	-1.086 (-1.49)	-1.206 (-1.56)
Market Return	78.383 ^a (57.19)	78.044 ^a (57.06)	-38.011 ^a (-5.78)
Fixed effects	no	no	month
Observations	37,661	37,661	37,661
R-squared	0.120	0.129	0.158

Panel B: Routine Purchase Months			
	(1)	(2)	(3)
Constant	0.183 (1.18)		
Isolated Trade Month		0.553 ^a (3.12)	1.041 ^a (6.33)
Sequence End Month		0.672 ^a (2.77)	1.134 ^a (4.82)
Sequence Month		-0.679 ^a (-3.75)	
Ln(Market Cap)	-0.168 ^a (-3.48)	-0.190 ^a (-3.89)	-0.159 ^a (-3.39)
Book Equity/Market Equity	1.126 ^a (4.98)	1.105 ^a (4.88)	0.700 ^a (3.07)
Prior 1 Year Return	0.244 (0.82)	0.249 (0.84)	0.185 (0.58)
Prior 1 Month Return	-3.003 ^a (-2.71)	-2.946 ^a (-2.66)	-3.159 ^a (-2.73)
Market Return	61.461 ^a (42.04)	61.214 ^a (41.89)	-40.379 ^a (-7.61)
Fixed Effects	no	no	month
Observations	29,018	29,018	29,018
R-squared	0.077	0.097	0.130