Determinants of Insider Trading Windows

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Abstract: Most publicly-traded firms adopt insider trading policies that establish pre-specified quarterly windows when insiders are allowed to trade. However, relatively little is known about how boards determine the length and timing of these windows, in part, because disclosure is voluntary and sparse. We use observed insider trading data to estimate the start and end points of quarterly trading windows, and the corresponding "blackout" periods when trading is restricted. We find that restrictions on trading reflect a heightened concern about expected information asymmetry, both with respect to how long insiders must wait after an earnings announcement before trading can begin, and how quickly the trading window closes as information builds up over the quarter. In addition, we find that trading is more restrictive when the firm has stronger external monitoring, and is more relaxed when insiders have greater liquidity needs. We also present evidence on event-specific "ad hoc blackout windows," where insiders appear to be largely prohibited from trading during a given quarter. These ad hoc blackout periods tend to be followed by disclosure of future material corporate events, such as M&A activity or changes in the board or top management, are associated with contemporaneously higher information asymmetry, and are followed by increased trading volume and higher stock returns, suggesting that investors may not immediately incorporate the information conveyed by these unscheduled restrictions.

1. Introduction

At most publicly traded firms, an insider trading policy (ITP) establishes a pre-specified open trading window each quarter when insiders are allowed to trade, which thereby also dictates a corresponding "blackout" period in which they are prohibited from doing so. The typical trading window begins two-to-three trading days after the previous quarter's earnings release and ends approximately 2-3 weeks prior to the end of the next fiscal quarter, resulting in an allowed trading window of about six weeks (40-45 calendar days or about 30 trading days). These restrictions on insider trading activity potentially provide both protection from legal or regulatory action as well as liquidity and cost of capital benefits (e.g., Fishman and Hagerty, 1992; Bettis et al., 2000). Although there is substantial variation in the length and timing of these trading windows (e.g., Bettis et al., 2000; Lee et al., 2014; Jagolinzer et al., 2011), little is known about the factors that boards consider when determining these constraints.

Furthermore, in addition to these pre-specified trading windows and corresponding blackout periods, firms may impose event-specific trading restrictions on insiders (e.g., due to ongoing merger or acquisition negotiations). These "ad hoc blackout windows," which not surprisingly, are undisclosed to the public (and may not even be widely known internally beyond those insiders that are involved in the event), are largely unexplored in prior literature.

In this paper, we provide a deeper understanding of the determinants of firms' insider trading restrictions. Specifically, we explore the determinants of the following three corporate policy decisions: 1) How soon after each quarterly earnings announcement should insiders be allowed to trade; 2) Once trading is allowed to commence after the earnings announcement, how long should insiders be allowed to trade before the window is again closed, and; 3) For what types of firm-specific events will an ad hoc blackout window be imposed on insider trading. Regarding

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this last question, we additionally explore whether an abnormal absence of trading in a given quarter contains information about material future corporate events and/or results in capital market responses.

We predict that the length and timing of allowed insider trading windows each quarter are, in part, related to how quickly information is impounded in price at the time of the earnings announcement, as well as how private information about the firm tends to build up during a quarter. Specifically, we expect that the faster information asymmetry is typically resolved following the earnings announcement, the sooner the trading window will be opened. Similarly, when information asymmetry typically builds up more quickly during a quarter, we expect that firms will close down the open trading window sooner. We also explore whether external monitoring from various stakeholders may pressure firms to employ shorter open trading windows, or alternatively, that such monitoring may serve as a substitute governance mechanism that allows firms to keep trading windows open for a longer period of time. Finally, we consider whether a firm's compensation practices might influence the length of trading windows. Specifically, firms that provide executives and employees with greater amounts of equity-based compensation may allow longer trading windows to accommodate liquidity needs with respect to these equity holdings.

A major challenge with empirically examining insider trading windows is that disclosure of ITPs is voluntary, and only a small proportion of firms choose to publicly disclose these policies (e.g., Jagolinzer et al., 2011). We address this issue by using the empirical distribution of actual insiders' trades to estimate the start and end of each firm's allowed trading window. Our approach is similar to prior studies that use the timing of insiders' trades to infer the presence of a policy restricting insider trading (e.g., Roulstone, 2003; Lee et al., 2014). However, our methodology is

designed to estimate the specific timing of these trading restrictions and corresponding allowed trading windows, rather than simply their existence. Specifically, to determine each firm's open trading window start- and end-points, we examine observed insider trades over a rolling eight-quarter period (imposing certain minimum number of trade requirements), and identify both the earliest trades following each earnings announcement, and the latest trades prior to the next earnings announcement. We then set simple distribution rules (e.g., the date, relative to the prior earnings announcement, at which 90% of the quarters' trades have been executed) to estimate the parameters of the open trading windows.

Although the typical open trading window is about six weeks in length, beginning three trading days after the previous quarter's earnings release and ending about three weeks prior to the end of the next fiscal quarter, there is substantial variation across firms in the length and timing of these allowed trading windows. For example, the interquartile range is about 100% of the median for both the start date relative to the earnings announcement, as well as for the end date relative to the next fiscal quarter end. As another example, some firms close the trading window four or five weeks prior to the end of each fiscal quarter, while other firms allow insiders to trade right up until the fiscal quarter end (and even beyond). We validate our open trading windows using a small sample of firms that publicly disclose their ITP and find that our estimates are highly correlated (40%-60%) with the trading window dates stated in these firms' actual ITPs.[1]

We begin our analysis by exploring potential determinants of the starting and ending points of these estimated open trading windows. Regarding the starting point, we predict that boards will

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[1] As we discuss in more detail below, these distributional trade rules are necessary, in part, because observed trading data available from SEC filings is not expected to map perfectly into allowed trading windows established by firms. There are a number of reasons for this, including: trades executed through a 10b5-1 trading plan (e.g., a trade may be executed during a blackout window even though the 10b5-1 trading plan was adopted during an open trading window), errors in SEC filing data, exceptions to normal trading windows as approved by the general counsel's office, and changes to the insider trading policy over time.

consider the speed with which earnings announcement information is impounded into the stock price. That is, the more quickly earnings information is incorporated into the stock price, the more quickly information asymmetry between insiders and investors is likely to be resolved, thereby reducing concerns about insiders trading on material private information.

Our findings are consistent with this prediction. We find that boards allow insiders to trade more quickly following earnings announcements at firms where a greater proportion of total return variation occurs at the earnings announcement date and where announcements are associated with greater trading volume. These findings suggest that boards place fewer restrictions on insiders' trades when earnings announcements convey more information and this information is incorporated into price more rapidly. We also find that boards allow insiders to trade more quickly following earnings announcements at firms that have lower bid-ask spreads on earnings announcement dates and when the announcements are associated with greater reduction in bid-ask spreads, again consistent with more relaxed insider trading windows when post-announcement information asymmetry is less of a concern.

Regarding the end point of the insider trading window, we predict that boards will close the window sooner in firms where private information builds up to a greater extent over the course of the quarter. For example, we find that firms whose stock price movements are more concentrated around earnings announcement dates—suggesting that earnings announcements resolve substantial uncertainty and therefore a significant amount of information asymmetry tends to build up over the course of the quarter—tend to have trading windows that end earlier in the quarter. Further, firms with greater average bid-ask spreads over the quarter also have trading windows that close earlier, suggesting that information asymmetry concerns are an important factor shaping trading window decisions.

As noted above, we also examine the influence of external monitoring on the length of the open trading window. We find that firms with greater analyst following, institutional ownership, and board independence have trading windows that end earlier in the quarter, suggesting that external monitoring disciplines the strictness of ITP, as opposed to serving as a substitute mechanism for monitoring insider trading that could allow for less restrictive trading windows. Finally, we find mixed evidence that executives' or employees' liquidity needs significantly shape the design of insider trading windows. In particular, we find that firms with greater CEO equity holdings tend to have earlier closing dates, and we find no association between firm-wide equity-based compensation and closing dates. These findings are inconsistent with boards viewing liquidity as a major consideration when establishing the end date of allowed trading windows. However, we do find that firms with more prior insider trades and higher stock price volatility have allowed trading windows that end later in the quarter, providing some evidence that employees' liquidity needs result in extending the allowed trading windows.

In addition to establishing pre-specified quarterly open trading windows, and corresponding blackout periods, ITPs typically note that ad hoc blackout windows may be imposed when there are firm-specific events, such as pending M&A activity, that can expose insiders to material non-public information. Identifying ad hoc blackout windows is challenging as firms generally do not disclose the occurrence or the length of these periods. Thus, similar to our preceding analyses, we infer the presence of ad hoc blackout windows using actual insider trading data. Specifically, we identify ad hoc blackout windows based on firm-quarters with abnormally low levels of insider trades (often zero trades) and find that these periods are associated with greater future 8-K filings, in particular, filings related to asset acquisitions or disposals as well as changes in executives or directors. We also find that bid-ask spreads are higher in the ad hoc

blackout quarter, which is interesting given that there is markedly *less* insider trading during such quarters. These findings suggest that ad hoc blackout windows provide an early signal of future material events. Consistent with this notion, we find significant increases in both trading volumes and stock returns in the quarters following these ad hoc blackout periods (with a reversal in the bid-ask spread relative to the prior quarter). We also find preliminary evidence that the material events giving rise to the ad hoc blackout windows tend to be positive news. For example, we find the excess returns based on Fama-French three-factor model are approximately 1% higher in the year following an ad hoc blackout window. Collectively, these results provide evidence that firms impose ad hoc blackout windows when facing material corporate events, and that such windows are leading indicators of these future corporate events or disclosures.

Our study contributes to the literature on voluntary restrictions on insider trading. In particular, we use data on actual insider trades to estimate allowed trading windows and provide evidence that boards manage the length and timing of insider trading restrictions in response to concerns regarding the time-series properties of information asymmetry. To our knowledge, our study is the first to explore the informational determinants of the length and timing of company-imposed insider trading windows. Our approach provides a more in-depth understanding of the nature of insider trading policies and the purposes that boards intend for them to serve. These findings complement the work in prior studies that explore the presence of insider trading policies (e.g., Bettis et al., 2000; Lee et al., 2014) and whether and how these policies constrain the returns to informed trading by insiders (e.g., Roulstone, 2003; Jagolinzer and Roulstone, 2009; Jagolinzer et al. 2011; Lee et al., 2014; Denis and Xu, 2013).

We also contribute to the literature on the information content of insider trades by studying a new empirical phenomenon that we refer to as an "ad hoc blackout window." We present a novel

method of identifying these ad hoc blackout windows and find that these abnormally quiet periods of insider trading tend to be followed by a greater number of future disclosures about material corporate events, such as M&A activity or changes in the firm's officers or directors. These findings complement prior insider trading literature, which largely focuses on the information content of insider purchase or sale transactions, by demonstrating that the absence of trading by insiders can also be informative about future events and stock price movements.[2]

The remainder of this paper proceeds as follows. Section 2 discusses insider trading policies and restrictions in more detail. Section 3 describes our data and process for estimating pre-specified quarterly allowed trading windows. Section 4 presents results from our analyses regarding how boards determine the length and timing of these pre-specified trading windows. Section 5 examines additional, unscheduled insider trading restrictions (ad hoc blackout windows) and the information that they convey, and Section 6 concludes.

2. Background and Literature Review

2.1. Background on Insider Trading Policies and Restrictions

Trading of company stock by corporate insiders is ubiquitous, which is not at all surprising given the large proportion of executive and director compensation that is provided in the form of equity grants. At the same time, the term "insider trading" has come to refer to something more nefarious, specifically trading a publicly traded company's stock or other securities by individuals with access to material, nonpublic information (Jaffe, 1974; Seyhun, 1986; Lakonishok and Lee, 2001). The Securities and Exchange Commission (SEC) defines illegal insider trading as "the

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[2] E.g., see Seyhun, 1986; Seyhun, 1992; John and Lang, 1991; Johnson et al., 1996; Lakonishok and Lee, 2001; Ke et al., 2003; Piotroski and Roulstone, 2005; Huddart et al., 2007; Veenman, 2012, and; Suk and Wang, 2020.

buying or selling a security, in breach of a fiduciary duty or other relationship of trust and confidence, on the basis of material nonpublic information about the security."[3] Federal law defines an insider as a company's officers, directors, and major stockholders owning more than 10% (15 U.S. Code § 78p), but the SEC has also brought insider trading cases against friends, business associates, family members, and other "tippees" of insiders (e.g., *Dirks v. SEC*, 463 U.S. 646 (1983)).

Several legal restrictions on insider trading are in place to discourage insiders from taking advantage of material, nonpublic information they may possess (Meulbroek, 1992; Ke et al., 2003). The SEC requires various disclosures on insider trades and holdings to monitor insider activities (Veenman, 2012). Namely, an SEC Form 4 must be filed within two business days when there is a change in insiders' holdings. Penalties, both civil and criminal, for violating insider trading laws can be substantial. Under the Securities Exchange Act of 1934, the maximum prison sentence for illegal insider trading is 20 years, and the maximum fine is $5 million.

In addition to these legal restrictions, most firms implement insider trading policies (ITPs) that place restrictions on insider trading activities. These ITPs can help firms protect themselves from legal and reputational risks associated with illegal or questionable insider trades, and can also provide capital market benefits if outside shareholders believe that ITPs prevent insiders from exploiting private information and reduce information asymmetry (e.g., Bettis et al., 2000). ITPs generally specify the scope of the policy (individuals covered by the policy), a pre-clearance requirement by the General Counsel or other compliance officers, quarterly allowed trading windows (or blackout periods), and prohibited transactions (e.g., short sales, derivative transactions, hedging). Over 92% of respondent firms surveyed by Bettis et al. (2000) answered

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[3] https://www.investor.gov/introduction-investing/investing-basics/glossary/insider-trading

that they have policies restricting insider trades, with the vast majority of these restrictions reflecting some form of blackout period during which insider trades are prohibited. A recent survey by Deloitte Consulting LLP and the National Association of Stock Plan Professionals (NASPP) also shows that almost all companies apply blackout periods to senior executives and directors. However, the disclosure of ITPs is voluntary, and only a small fraction of firms discloses their policies. Thus, the specific trading restrictions imposed by a firm's ITP are often unclear.

The regularly scheduled quarterly insider trading windows specified by ITPs generally start one to three days after a quarterly earnings announcement and end sometime in the five weeks leading up to the next fiscal quarter-end. Given that earnings announcements, on average, fall about 30 days after the end of the fiscal quarter, the trading policies leave approximately 39 calendar days for insiders to trade during a typical quarter.

There is significant variation, however, in both the timing and length of these allowed trading windows. For example, many firms allow insiders to trade as soon as one trading day after the earnings announcement, while others require several days to pass. Likewise, some firms' ITPs allow insiders to trade right up to the end of the next fiscal quarter (and possibly even a bit beyond), while other firms prohibit trading five weeks or more in advance of the next quarter-end.[4]

2.2. Prior Literature on Insider Trading

Prior literature on insider trading focuses on two main topics: information content of insider trading and restrictions on insider trading. If corporate insiders possess private information about the firm and its prospects, they may be able to earn abnormal returns by trading based on the private information. Further, their trading activities could convey the private information to the

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[4] There may also be variation in how strictly firms enforce ITPs, although this is difficult to observe from publicly disclosed policies.

market. Jaffe (1974) document that insiders possess private information and that insider trades have information content. Insider trading activities have also been shown to be leading indicators of future firm outcomes, with insider purchases having explanatory power on future stock returns, future cash flows, and future earnings performances (Lakonishok and Lee, 2001; Piotroski and Roulstone, 2005; Seyhun, 1986; Seyhun, 1992). A more recent study finds that there exists "routine" insider trading that is not informative about future returns, and that a portfolio strategy using only the remaining "opportunistic" insider trades earns positive abnormal returns (Cohen et al., 2012). Insider trading activities also convey information about future disclosures (e.g., Huddart et al., 2007, and Ke et al., 2003).

Other studies find that insider trading activities serve as a complementary information signal. Prior insider trading activities moderate market reaction to dividend initiation announcements, seasoned equity offering announcements, voluntary disclosure of innovation strategy by high-tech firms, and accounting restatements (John and Lang, 1991; Johnson et al., 1996; Gu and Li, 2007; Badertscher et al., 2011). Suk and Wang (2020) suggest that a target firm's insider trading activities contain a signal on the profitability of the upcoming M&A. Veenman (2012) finds evidence consistent with investors using insider trades as a complementary signal to prior earnings when the uncertainty about the valuation implication of prior earnings is high.

The sources of insider private information were also investigated. Aboody and Lev (2000) suggest R&D as a potential source of private information leading to insider gains. They find that insider trading profits are substantially larger in R&D-intensive firms. Ahern (2017) finds that insider information flows through social ties based on family, friends, and geographic proximity for illegal insider trades.

The second stream of literature on insider trades examines legal and voluntary restrictions. Using insider trades over 24 years, Jagolinzer and Roulstone (2009) study how insider trading regulations affect how insiders trade. They find that increased litigation risk following regulatory changes is associated with insiders trading more after earnings announcements (than before earnings announcements). Denis and Xu (2013) provide cross-country evidence that equity incentives are used more in countries with stronger insider trading restrictions.

Studies on voluntary insider trading restrictions are limited, mainly because firms are not required to, and in most cases, do not disclose their insider trading policies. Bettis et al. (2000) survey 1,915 firms in 1996 and find that over 92% of their sample firms have policies restricting insider trading, most commonly pre-established allowed insider trading windows and corresponding blackout periods during which insider trading is prohibited. Bettis et al. (2000) also find fewer insider trades, narrower bid-ask spreads, and smaller insider gains during quarterly blackout periods.

Lee et al. (2014) identify firms that restrict insider trades by assuming insiders are restricted if more than 75% of insider trades occur within one-month periods following earnings announcements. They find that firms with voluntary insider trading restrictions are larger and tend to have lower information asymmetry and more anti-takeover provisions. They also find that voluntary restrictions do not reduce insider trading activities nor eliminate abnormal profits from insider purchases, questioning the effectiveness of voluntary insider trading restrictions.

Using a similar method to Lee et al. (2014) to identify voluntary insider trading restrictions, Roulstone (2003) finds that firms that restrict insider trading pay a premium in total compensation relative to unrestricted firms. Choi et al. (2020) document that firms with greater proprietary costs are more likely to implement voluntary insider trading restrictions, using the same method to

identify firms with voluntary insider trading restrictions. Jagolinzer et al. (2011) web scrape 437 insider trading policies and find that insider trading profits and information content of insider trades are higher when insiders trade during restricted trading windows. Following Jagolinzer et al.'s (2011) method, Dai et al. (2016) find that better-governed firms are more likely to adopt voluntary insider trading policies. Other studies suggest various mechanisms that reduce insider trade profitability, such as certain corporate governance mechanisms, involvement of the general counsel, and internal controls (Jagolinzer et al., 2011; Dai et al., 2016; Skaife et al., 2013).

3. Data and Variable Measurement

3.1. Estimating Allowed Trading Windows

We obtain insider trading data from Thomson Reuters Insiders Data. The data captures insider activities reported in SEC Forms 3, 4, 5, and 144. We only include open market and private purchases and sales by officers and directors who are not also 10% owners, following prior literature (e.g., Lee et al., 2014). We only include trades that are classified as non-10b5-1 plan trades by Thomson Reuters in our analyses. Rule 10b5-1 plans allows insiders to set pre-determined sales plans in order to reduce concerns on insiders trading on material non-public information. Trades based on Rule 10b5-1 plans are often exempt from quarterly blackout periods.[5] Thomson Reuters' coverage for the indicator for 10b5-1 trades is largely incomplete prior to 2012, so our sample period ranges from 2012 through 2020.[6] In total, our sample for estimating allowed trading windows consists of 234,200 insider trades.

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[5] Disclosing whether a trade is based on a 10b5-1 plan (via footnote in SEC Form 4) is voluntary, and there could be 10b5-1 trades that are not disclosed as 10b5-1 trades. These trades could potentially add noise in our trading window estimation. This is why we use distribution rules (e.g., excluding the latest 5% of trades) when estimating trading window using actual insider trades.

[6] We are currently exploring the WRDS Insider Data database as an additional source of trading data to supplement the Thomson Reuter's database.

Allowed quarterly trading windows in ITPs are most commonly specified relative to the dates of the quarterly earnings announcement (for the start of the window) and fiscal quarter-end (for the end of the window). Accordingly, we estimate allowed trading windows based on the timing of insider trades relative to these two dates. Specifically, we aggregate insider trades over a rolling eight-quarter window and estimate the starting point and the ending point of allowed trading windows using the distribution of insider trade timings in this window. After requiring eight-quarter aggregating windows, our sample period becomes 2014 through 2020.

To measure the timing of firms' open trading windows, we assume that insider trades typically occur during allowed trading windows (e.g., Bettis, 2000). Trading by insiders outside of the allowed trading window is unlikely to be pervasive (at least not without the consent of the general counsel/compliance office). The vast majority of firms require pre-clearance of insider trades by the general counsel's office (Jagolinzer et al., 2011). A recent survey by Deloitte/NASPP shows that over 95% of the firms require individual pre-clearance for executive officers to trade. And further, the SEC requires firms (typically carried out by the general counsel/compliance office) to make a public filing of Section 16 filer trades within 2 days (15 U.S. Code § 78p). Therefore, the boundaries of the trade timing distributions we observe should reflect the boundaries of a given firm's trading window. However, we acknowledge that shorter allowed trading windows could, in part, reflect more stringent enforcement of insider trading policies.

For each insider trade, we identify the transaction date, the most recent quarterly earnings announcement date prior to the transaction, and the subsequent fiscal quarter-end date. Then, we calculate the number of days between the previous quarterly earnings announcement date and the transaction date (*daysFromPrevEA*) and the number of days between the transaction date and the date of the next fiscal quarter-end (*daysToNextFQEnd*). Smaller *daysFromPrevEA* and larger

daysToNextFQEnd indicate that the insider trade occurred early in the quarter. Figure 1 illustrates this timeline, and Figure 2 shows the distribution of *daysFromPrevEA* and *daysToNextFQEnd* at the individual trade level. The median insider trade is approximately 20 days after the previous earnings announcement and approximately 36 days before the next fiscal quarter-end date.

As discussed above, we use the within-firm distribution of these trades on a rolling eight-quarter basis to estimate allowed trading windows. Examining the trailing eight quarters allows us to have sufficient insider trades to reliably infer the allowed trading windows.[7] We estimate the ending point of allowed trading window relative to the upcoming fiscal quarter-end (*WindowEnd15 (10, 5)*) as the 15th (alternatively, the 10th or the 5th) percentile of *daysToNextFQEnd*. In other words, we assume that the first 85% (alternatively, the first 90% or 95%) of insider trades within a given trading period (i.e., the period between two quarterly earnings announcements) occur before the allowed trading window ends. Such distribution rule allows us to reduce estimation noise coming from undisclosed 10b5-1 trades and outliers. Larger values of *WindowEnd* indicate that a greater proportion of the insider trades occurred earlier in the quarter (i.e., further away from the end of the next fiscal quarter, and closer to the previous quarter's earnings announcement) and reflect more stringent trading restrictions in the ITP. Smaller values indicate that a greater proportion of insider trades occurred later in the quarter (i.e., closer to fiscal quarter-end), suggesting less stringent ITPs.

In situations where the 15th (or 10th/5th) percentile of *daysToNextFQEnd* is less than zero (i.e., the trade occurred after the end of the next fiscal quarter), we set *WindowEnd* to 0, as these situations indicate that the firm likely does not have (or does not enforce) blackout periods prior to the end of the fiscal quarter. To help validate this assumption, we observe that this adjustment

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[7] On average, there are 18.11 insider trades in a given eight-quarter period. After requiring at least ten trades over the eight-quarter period, the firm-quarters included in our sample have, on average, 32.54 insider trades.

results in *WindowEnd* equaling 0 for approximately 10% of our sample. This proportion is consistent with Bettis et al. (2000), who document that about 8% of their survey respondents did not have voluntary restrictions on insider trading, and survey evidence that 10% of firms do not impose blackout periods prior to the end of the quarter (Deloitte, 2020).

Similar to our procedure for estimating *WindowEnd*, we estimate the starting point of quarterly allowed trading windows (*WindowStart*) as the minimum value of *daysFromPrevEA* during the eight-quarter period. Smaller values suggest allowed trading windows commence shortly after earnings announcements, while larger values indicate that insiders are prohibited from trading after earnings announcements for longer periods of time. We adjust for after-market earnings announcements by subtracting one from *daysFromPrevEA* when the earnings announcement occurs after market close. We set *WindowStart* equal to 10 if the minimum value of *daysFromPrevEA* is greater than 10 (i.e., we cap *WindowStart* at ten days), as we are not aware of any ITPs that restrict trading for a longer period of time.

3.2. Descriptive Statistics

Table 1 reports the descriptive statistics for our estimated trading windows measures. We also report descriptive statistics for the other variables used in our analyses, which we obtain from Thomson Reuter Insiders, Compustat, CRSP, NYSE TAQ, IBES, BoardEx, Execucomp, and SEC EDGAR. All variables are defined in Appendix A.

We observe that our estimated allowed trading windows typically end 17-22 calendar days before fiscal quarter-ends (depending on which point in the distribution we use to estimate the end date). The allowed trading window's starting point is three days following the earnings announcement for our median observation. Figure 3 shows the distribution of our estimated ending

and starting points of allowed trading windows. Although the typical trading window that we estimate ends approximately two to three weeks before the end of the quarter, we find considerable variation in these ending dates, as dates anywhere between one and six weeks are relatively common. As noted above, we also estimate that approximately 10% of our sample does not restrict insider trading prior to the end of the fiscal quarter (i.e., *WindowEnd* = 0). Our estimated starting date for the allowed trading window occurs within 8 days after earnings announcements for most of our sample, with two or three-day intervals representing the most common observations.

Our sample's average firm-quarter has a market capitalization of approximately $10 billion, and an analyst following of nine. The average institutional ownership is 70%, and the average proportion of independent directors is 78%. Overall, the firms in our sample are slightly larger than the firms in the Compustat universe. This reflects our requirement on minimum insider trading volume (at least ten trades in an eight quarter period), which likely focuses our analyses on larger firms with more liquid stocks.

3.3. Comparison with Actual Insider Trading Restrictions

We validate our estimated trading windows in a small sample of firms (16 firms) for which we have collected their publicly disclosed insider trading policies.[8] Appendix B shows excerpts from two of the insider trading policies (Adobe Inc. and Shake Shack Inc.). The quarterly trading window for Adobe Inc. starts the first trading day at least 24 hours after the public disclosure of quarterly earnings and closes four weeks prior to each quarter-end. Based on its policy, the approximate length of Adobe's quarterly trading window is 32 days.[9] Shake Shack Inc. specifies

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[8] We are in the process of collecting a somewhat larger sample of publicly disclosed ITPs to perform this validation test.

[9] Specifically, Adobe's ITP states: "The Trading Window opens each quarter at the start of the first trading day that is at least 24 hours following the date of public disclosure of the financial results for the previous fiscal quarter. The

quarterly blackout periods instead. Their blackout period starts the 14th calendar day before the end of fiscal quarters and ends at the end of the first trading day after earnings announcements. The approximate length of Shake Shack's quarterly allowed trading window is 44 days. Thus, the two insider trading policies differ significantly on how early they close quarterly allowed trading windows.

We observe that most insider trading policies specify quarterly allowed trading windows that start 1-3 days following the announcement of earnings and end 10-40 days before the end of the current fiscal quarter. We also observe that most of the variation in allowed trading window length reflects differences in the timing of when quarterly allowed trading windows end relative to upcoming fiscal-quarter ends. Using the ending points of allowed trading windows estimated above, we construct a measure of the lengths of allowed trading windows. Assuming 60 days between one quarter's earnings announcement and end of the next fiscal quarter, and that all allowed trading windows start the day after the earnings announcement, we estimate the length of allowed trading windows (in days, *EstWindow*) as *EstWindow15* (*10,5*) = 60 – *WindowEnd15* (*10,5*).[10]

Larger values of *EstWindow* suggest wider allowed trading windows. Figure 4 shows the distribution of the lengths of estimated allowed trading windows using different percentiles of *daysToNextFQEnd* as endpoints of allowed trading windows. The median estimated window is approximately 40 days (i.e., insider trading is allowed until approximately 2.9 weeks before the end of the fiscal quarter).

Trading Window closes four weeks prior to each quarter end." Assuming 60 days between the start of the Trading Window and the end of the quarter, the actual window length is therefore 60 days – 28 days (4 weeks) = 32 days.
[10] As noted above, most of the variation in the length of quarterly allowed trading windows arises from differences in the end of these windows. We assume a constant 60 days between earnings announcement and fiscal quarter end to focus on variation in this end date and avoid introducing noise due to variation in firms' quarterly earnings announcement dates.

We then calculate the quarterly allowed trading windows based on the actual ITPs and examine their correlation with our estimated allowed trading windows. Table 2 shows estimated allowed trading windows based on actual ITPs and our estimated trading windows for the 16 sample firms. We note that the actual ITPs will not include ad hoc blackout periods or how strictly the ITPs are enforced. Therefore, we would not expect a perfect correlation between our estimated allowed trading windows and the quarterly trading windows stated in the ITPs.

The correlations between the length of allowed trading windows from the actual ITPs and our estimated trading window lengths (based on firm-level medians) are 0.437, 0.494, and 0.432 for *EstWindow15*, *EstWindow10*, and *EstWindow5*, respectively. When taking firm-level means, the correlation between our estimated window lengths and actual lengths based on ITPs are 0.411, 0.484, and 0.399. Collectively, these results indicate that our estimated allowed trading windows appear to capture the underlying variation in firms' actual ITPs.

4. Determinants of Allowed Trading Windows

In this section, we examine the determinants of allowed trading windows. We first examine how soon insiders are allowed to trade following a quarterly earnings announcement (i.e., *WindowStart*), then consider how late into the quarter insiders are allowed to trade (i.e., *WindowEnd*).

4.1. Starting Point of Allowed Trading Windows

We consider how boards determine how quickly insiders are allowed to trade following quarterly earnings announcements. We predict that the information environment around the earnings announcement will influence how soon after the earnings announcement the allowed

trading window begins. If earnings announcements convey insiders' private information better, and if the information in the earnings announcements is priced quickly, the firms will be more likely to allow insiders to trade soon after earnings announcements. Specifically, we predict that firms with greater trading volumes and smaller bid-ask spreads at earnings announcement dates to start their allowed trading windows earlier. Similarly, if earnings announcements have significant information content and therefore resolve a substantial amount of information asymmetry, the reduction in bid-ask spreads and the absolute price movement at the earnings announcement dates should tend to be large. Therefore, we predict that firms with greater reduction in bid-ask spreads and higher absolute price movement at earnings announcement dates (relative to the cumulative absolute price movement over the quarter) allow insiders to trade earlier after earnings announcements. Prior studies and practitioner surveys alike point to the role of financial analysts in improving price efficiency (e.g., Zhang 2008; Ellul and Panayides, 2018).[11] We predict that information in earnings announcements will be priced quickly for firms with greater analyst following, and therefore allow insiders to trade earlier following earnings announcements.

Based on the above predictions, we estimate the following model:

$$WindowStart_{i,t}$$

$$= \alpha + \beta Ind.Var._{i,t} + \gamma_1 lnMktVal_{i,t-1} + \gamma_2 ROA_{i,t-1} + \gamma_3 BtoM_{i,t-1}$$

$$+ \gamma_4 Leverage_{i,t-1} + Industry \times YearFE_{i,t} + \epsilon_{i,t} \ (1)$$

where $WindowStart_{i,t}$ is the estimated start of allowed trading window, in number of days from the previous earnings announcement, as described in Section 3.1. The starting point is estimated

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[11] In a survey by TheCorporateCounsel.net, 23.2% of the respondents said that the number of analysts providing coverage on the company is the most important factor in deciding when to end blackout period after earnings release (i.e. when to start the allowed trading window).

using insider trades between time *t* and *t+8*. The main independent variable ($Ind.Var._{i,t}$) is one of the earnings announcement date trading volume (*EA TradingVolume*), the earnings announcement date effective spreads (*EA EffectiveSpread*), the change in effective spreads around earnings announcement date (*EA ΔEffectiveSpread*), the earnings announcement date absolute stock price movement scaled by the cumulative absolute stock price movement over the entire quarter (*EA AbsRetProp*), or the number of analysts following (*lnAnalysts*). These measures capture the significance of information contained in earnings announcements and the speed in which the information is priced. The earnings announcement date variables are measured at time *t*. As discussed in Section 3, we adjust both the starting point of allowed trading window and earnings announcement date variables for after-market earnings announcements. We include lagged firm size, return on assets, book-to-market ratio, and leverage as controls, and also include industry-year fixed effects for industry-year specific factors that can affect firms' ITPs. We use these industry-year effects rather than firm fixed effects because firms' ITP designs tend to be very sticky over time and therefore variation is largely cross-sectional (Bettis et al., 2000; Jagolinzer et al., 2011). We define industries based on two-digit SIC codes. Standard errors are clustered by firm and year.

We report the results from estimating Eq. (1) in Table 3. In columns (1) and (2), we find that firms with lower trading volume and greater bid-ask spreads at earnings announcement dates require insiders to wait longer to trade after earnings announcements. For example, a one standard deviation increase in the earnings announcement date trading volume is associated with allowed trading windows starting approximately 0.23 days earlier. Results in column (3) show that firms allow insiders to trade earlier following earnings announcements if earnings announcements are associated with greater reduction in bid-ask spread. In column (4), we find that larger absolute

price movements at earnings announcement dates (i.e., announcements that provide more information or resolve greater information asymmetry) are associated with quarterly allowed trading windows that start earlier. We do not find evidence supporting the effect of financial analysts in shaping allowed trading windows. Collectively, these results suggest that firms set voluntary insider trading restrictions in response to concerns related to information asymmetry surrounding earnings announcements and how quickly capital markets incorporate the information provided by these announcements.

4.2. Ending Point of Allowed Trading Windows

Next, we identify three potential forces that could shape how early firms end allowed trading windows relative to subsequent fiscal quarter-ends. First, firms may implement shorter allowed trading windows to reduce investor concerns about information asymmetry. When faced with greater information asymmetry, shareholders may demand greater protections against insiders extracting private benefits through insider trading, resulting in shorter allowed trading windows. Second, external monitoring may influence how board shape voluntary restrictions on insider trades. Greater external monitoring may create pressure for firms to implement stricter ITPs, or function as a substitutive mechanism to monitor insiders. Third, firms may introduce longer allowed trading windows to allow their executives and other employees more liquidity with respect to their equity-based compensation.

We estimate a model to explain firms' allowed trading windows based on these economic considerations. Specifically, we estimate the following model:

$WindowEnd15(10,5)_{i,t}$

$$= \alpha + \beta_1 EffectiveSpread_{i,t-1} + \beta_2 EA\ AbsRetProp_{i,t-1} + \beta_3 lnMktVal_{i,t-1}$$

$$+ \beta_4 lnAnalysts_{i,t-1} + \beta_5 InstOwnPct_{i,t-1} + \beta_6 IndDirectorPct_{i,t-1}$$

$$+ \beta_7 CEODuality_{i,t-1} + \beta_8 lnCEOEquity_{i,t-1} + \beta_9 lnStockCompensation_{i,t-1}$$

$$+ \beta_{10} NumInsiderTrade_{i,t-1} + \beta_{11} Volatility_{i,t-1} + \beta_{12} Return_{i,t-1}$$

$$+ \beta_{13} ROA_{i,t-1} + \beta_{14} BtoM_{i,t-1} + \beta_{15} Leverage_{i,t-1} + Industry \times YearFE_{i,t}$$

$$+ \epsilon_{i,t}\ (2)$$

$WindowEnd15(10,5)_{i,t}$ is the estimated end of allowed trading window, in number of days to the upcoming fiscal quarter-end, as described in Section 3.1. The end of trading window is estimated using insider trades between time t and $t+8$. Higher values suggest that a greater proportion of insider trades occur earlier in the quarter (further in advance of the next fiscal quarter-end), indicating stricter ITPs.

We measure concerns about information asymmetry using bid-ask spreads (*EffectiveSpread*) and the absolute price movement in earnings announcement date scaled by the cumulative absolute market-adjusted return over the entire quarter (*EA AbsRetProp*) (Bushee et al., 2010; Blankespoor et al., 2014). Greater absolute price movement in earnings announcement dates signal greater information asymmetry before earnings announcements and that there are less information events other than earnings announcements during the quarters. We include several measures of external monitoring, including firm size (*lnMktVal*), analyst coverage (*lnAnalysts*), institutional ownership (*InstOwnPct*), the proportion of independent directors (*IndDirectorPct*), and an indicator for whether the CEO is also chair of the board (*CEODuality*) (Carter et al., 2009; Linck et al., 2008). Liquidity concerns are measured using the log of the value of the CEO's equity holdings (*lnCEOEquity*), overall stock-based compensation expense (*lnStockCompensation*), prior

number of insider trades (*NumInsiderTrade*), and stock volatility (*Volatility*). We additionally control for return on assets, book-to-market ratio, and stock returns. All independent variables are measured with a one-period lag. We include industry-year fixed effects to control for the time and industry effects on firms' ITPs. We define industries based on two-digit SIC codes. Standard errors are clustered by firm and year.

Table 4 presents the results from estimating Eq. (2). Consistent with firms responding to information asymmetry concerns by implementing stricter ITPs, firms with greater bid-ask spreads have allowed trading windows that end earlier in the quarter. Specifically, we find that a one standard deviation increase in average daily effective percentage spread is associated with the allowed trading windows ending approximately 0.63 days earlier. We also find that firms with greater stock price movement at earnings announcement dates have quarterly allowed trading windows that end earlier, providing additional evidence that firms at which information asymmetry (particularly surrounding earnings announcements) is a greater concern begin to prohibit insider trading earlier in the quarter.

We also find strong support for external monitoring leading to stricter ITPs. In particular, larger firms, firms with greater analyst following, and firms with more independent boards tend to end allowed trading windows earlier. For example, a one standard deviation increase in analyst coverage is associated with an allowed trading window that ends approximately 1.2 days earlier. Likewise, a one standard deviation increase in the proportion of independent directors is associated with an allowed trading window that ends approximately 0.4 days earlier. We also find that larger firms tend to have allowed trading windows that end early, signaling stricter ITPs. However, in Table 3, we find that larger firms tend to start allowed trading windows sooner following earnings announcements, which is associated with more relaxed ITPs. The set of results is consistent with

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larger firms being less concerned about information asymmetry around earnings announcements, but more concerned about insiders' private information build-up over the quarter.

We find mixed evidence for insiders' liquidity needs shaping insider trading policies. The allowed trading windows end earlier for firms with greater CEO equity holdings, which is inconsistent with insiders' liquidity concerns extending allowed trading windows. More prior insider activity and higher stock price volatility are associated with allowed trading windows ending later, which is consistent with insider liquidity demands delaying the end of trading windows. We also find no relation between firm-wide equity-based compensation and the ending point of allowed trading windows, suggesting that liquidity needs of the firm's employee base as a whole are also not a major consideration when boards establish these restrictions.

5. Ad Hoc Blackout Periods

5.1. Identifying Ad hoc blackout windows

In addition to regularly scheduled quarterly blackout periods, many firms implement ad hoc blackout periods ("ad hoc blackout windows") when they believe insiders possess material information that is not available to outside investors. Examples might include ongoing merger negotiations, pending removal or retirement of the CEO, major product announcements, etc. Identifying ad hoc blackout windows is challenging because, similar to ITP restrictions more generally, firms generally do not disclose when they impose these ad hoc blackout periods.

As with our estimates of regularly scheduled blackout periods, we estimate ad hoc blackout windows using observed insider trading data. We first estimate a normal level of insider trading for each quarter using a model including firm and time fixed effects and prior quarter stock performance. We then identify firm-quarters with the lowest (most negative) model residuals as

ad hoc blackout windows. In other words, we identify firm-quarters with abnormally small numbers of insider trades based on within-firm and within-time variation as ad hoc blackout windows.

Specifically, we estimate the model:

$$log(NumTrade_{i,t}) = \alpha + \sum_{i=1}^{I} \beta_i 1_i + \sum_{t=1}^{T} \gamma_t 1_t + \delta adjRET_{i,t-1} + \varepsilon_{i,t} \ (3)$$

where $NumTrade_{i,t}$ is the number of insider trades for firm i in quarter t, 1_i is an indicator for firm i observations, and 1_t is an indicator for quarter t observations. The model also includes prior stock performance to control for the effect of price movement on insider trading activities. ε_{it}, the residual from the model, estimates the abnormal level of insider trades.

We identify firm-quarters in the lowest quintile (alternatively, decile or quartile) based on the residual values as ad hoc blackout windows. Out of 117,166 firm-quarter observations, 22,762 (alternatively, 11,381 or 28,452) observations are classified as having ad hoc blackout windows during the quarter based on this model. The average number of insider trades in non-blackout quarters is 2.471, while insider trading activity in our estimated ad hoc blackout windows is significantly lower – 0.073 trades per quarter. In other words, the insider trading activity in ad hoc blackout windows is only 3% of that of non-blackout periods, and these ad hoc blackout windows almost entirely reflect periods of zero insider trading activity at firms that otherwise exhibit insider trading regularly.

5.2. Information Conveyed by Ad hoc blackout windows

After identifying firm-quarters with ad hoc blackout periods, we begin by exploring whether the existence of these ad hoc blackout windows predicts future material corporate events.

Specifically, we examine whether ad hoc blackout windows are more likely to be followed by quarters with a greater number of 8-K filings. We estimate the following regression:

$$lnNum8K_{i,t+1} = \alpha + \beta AdhocBlackout_{i,t} + FirmFE_i + YearFE_t + \varepsilon_{i,t} \quad (4)$$

where $lnNum8K_{i,t+1}$ is the natural logarithm of the number of 8-K filings during the following quarter, and $AdhocBlackout_{it}$ is an indicator for firm-quarters classified as ad hoc blackout windows based on our model. As discussed above, we consider three variations of $AdhocBlackout_{it}$, based on either the lowest quintile, decile, or quartile of model residuals from Eq. (3) as the cutoff to identify ad hoc blackout windows. In this model, we include firm and year fixed effects because our focus is on the within-firm relation between insider trading activity and subsequent disclosure.

Table 5 reports the results from estimating Eq. (4). Columns (1), (2), and (3) present results based on identifying ad hoc blackout windows as residuals in lowest decile, quintile, and quartile of Eq. (3), respectively. Across all three specifications, we find that ad hoc blackout windows, on average, tend to be followed by quarters with a greater number of 8-K filings. Specifically, quarters immediately following ad hoc blackout windows have approximately 3-5% more 8-K filings compared to all other quarters. Figure 5 shows the trend of 8-K filings during and after ad hoc blackout periods compared to other quarters. We find that the increase in 8-K filings is concentrated one quarter following the ad hoc blackout window. As a whole, these results indicate that the ad hoc blackout windows that we identify using the frequency of insider trades can predict the future disclosure of material corporate events.

Next, we examine if the increase in 8-K filings following ad hoc blackout windows varies across specific 8-K items. Figure 6 shows that the increase in 8-K filings is concentrated in Item 1 (Registrant's business and operation), Item 2 (Financial Information) and Item 5 (Corporate

Governance and Management). Specifically, Item 1 includes disclosures related to firms' entry into and termination of material definitive agreements, Item 2 reports on completion of acquisition or disposal of assets, and creation of a direct financial obligation or an obligation under an off-balance sheet arrangement, and Item 5 reports changes in control or change in management or directors. In Table 6, columns (1) through (3), we examine the association between ad hoc blackout windows and future 8-K filings for these items and find a significant increase in the filing of 8-Ks related to firms' business and operations, financial information, and corporate governance matters. These findings provide additional evidence that ad hoc blackout windows provide an early signal of future material corporate events.

To provide further evidence that these results reflect material and unexpected disclosures, in columns (4) and (5) of Table 6, we exclude specific subitems within Items 2 and 5 that may represent 8-Ks that reflect either expected disclosures or reports of limited concern to capital markets. For example, Item 2.02 is related to results of operation and financial conditions (i.e., earnings announcements) and is therefore included every time that a firm reports earnings. In column (4), we find that firms are more likely to file 8-Ks containing Item 2 following ad hoc blackout windows even after excluding these regular quarterly announcements. Similarly, Item 5.04 relates to temporary suspension of trading in employee benefit plans (e.g., 401(k) plans or ESOPs), which are largely due to administrative changes unrelated to the firm's operations (e.g., changes in plan administrators). In column (5), we find that firms are more likely to file 8-Ks containing Item 5 following ad hoc blackout windows after excluding these filings. Overall, the results in Tables 5 and 6 suggest that ad hoc blackout periods are followed by major corporate events.

Finally, we consider capital market responses following ad hoc blackout windows. If ad hoc blackout windows are followed by the disclosure of material information, and capital market participants do not fully incorporate this information prior to its disclosure, we may observe that ad hoc blackout windows predict future capital market activity. Specifically, we estimate variations of the following model:

$$Outcome_{i,t+1} = \alpha + \beta AdhocBlackout_{i,t} + FirmFE_i + YearFE_t + \varepsilon_{i,t} \text{ (5)}$$

We consider three measures for *Outcome*: bid-ask spreads (*EffectiveSpread*), the natural log of trading volume (*TradingVolume*), and excess stock return based on a Fama-French three-factor model (*adjRET*).

Table 7 and Figure 7 report results from estimating Eq. (5) with *EffectiveSpread* (or the change in *EffectiveSpread*) as the dependent variable describe to examine how information asymmetry changes during and after ad hoc blackout windows. In column (1), we observe significantly higher bid-ask spreads during ad hoc blackout windows, which, as shown in column (2), promptly reverse in the following quarter. In Table 8, we report results from estimating Eq. (5) with *ΔTradingVolume* as the dependent variable. Consistent with more prevalent material disclosures following ad hoc blackout windows, we find a significant increase in trading volume in the quarter following these events. Thus, ad hoc blackout windows are associated with a temporary increase in information asymmetry, which disappears the following quarter as trading volume increases.

Table 9 and Figure 8 report results from estimating Eq. (5) with *adjRET* as the dependent variable. We find that abnormal stock returns during the ad hoc blackout window are negative, while returns following the ad hoc blackout window are significantly positive. For example, the one-year Fama-French three-factor adjusted return following ad hoc blackout windows is

approximately 1% higher than corresponding returns following non-blackout quarters.[12] These results indicate that, in addition to predicting the level of future trading activity, periods with abnormally low levels of insider trading can also predict future stock performance. Thus, capital markets may not fully incorporate the information contained in these ad hoc blackout windows.

6. Conclusion

We estimate the length and timing of restrictions on insider trading based on actual insider trade data. We show that boards appear to design regularly scheduled quarterly blackout periods to address concerns regarding information asymmetry. In particular, we find that boards prohibit trading for a longer period of time both following quarterly earnings announcements (i.e., allowed trading windows begin later) and prior to the subsequent quarter-end (i.e., allowed trading windows end earlier) when potential information asymmetry is greater. We also find that boards end allowed trading windows sooner when the firm is subject to greater external monitoring.

In addition to these regular blackout periods, we present evidence that boards impose additional ad hoc blackout periods during which insider trading is also prohibited ("ad hoc blackout windows") prior to the disclosure of material corporate events (e.g., M&A activity), suggesting that boards often restrict trading once negotiations begin on these deals. These ad hoc blackout windows also tend to be followed by higher trading volume and stock return, suggesting that this information is not fully incorporated immediately by capital markets. Collectively, our results help provide insight into the nature of insider trading restrictions and the purposes that boards intend for them to serve.

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[12] We find very similar results using alternative measures of excess return (e.g. market-adjusted or Fama-French four-factor models).

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Appendix A. Variable Definitions

Insider trade-level variables (Sources: Thomson Reuters Insider Data, Compustat)

Variable	Definition
TRANDATE	The transaction date of the insider trade.
rdq_previous	The most recent quarterly earnings announcement date prior to the insider trade.
rdq	The next quarterly earnings announcement date following the insider trade.
datadate	The subsequent fiscal quarter-end date following the insider trade.
daysFromPrevEA	The number of days between the previous quarterly earnings announcement date and the transaction date (the number of days between *rdq_previous* and *TRANDATE*).
daysToNextFQEnd	The number of days between the transaction date and the subsequent fiscal quarter-end (the number of days between *TRANDATE* and *datadate*)

Estimated allowed trading window variables

Variable	Definition
EstWindow15	The number of days in which the first 85% of the insider trades occur within a quarter, assuming 60 days between earnings announcement and subsequent fiscal quarter-end. Insider trading activities during the past eight quarters are aggregated to calculate the estimated allowed trading windows. The values are winsorized at 60 days. $EstWindow15 = 60 - 15\text{th percentile of } daysToNextFQEnd$
EstWindow10	The number of days in which the first 90% of the insider trades occur within a quarter, assuming 60 days between earnings announcement and subsequent fiscal quarter-end. Insider trading activities during the past eight quarters are aggregated to

	calculate the estimated allowed trading windows. The values are winsorized at 60 days. $EstWindow10 = 60 - $ 10th percentile of $daysToNextFQEnd$
EstWindow5	The number of days in which the first 95% of the insider trades occur within a quarter, assuming 60 days between earnings announcement and subsequent fiscal quarter-end. Insider trading activities during the past eight quarters are aggregated to calculate the estimated allowed trading windows. The values are winsorized at 60 days. $EstWindow5 = 60 - $ 5th percentile of $daysToNextFQEnd$
WindowEnd15	The 15th percentile of *daysToNextFQEnd* based on insider trades aggregated over the past eight quarters. *daysToNextFQEnd* is the number of days between the insider trade and the following fiscal quarter-end. The value of *x* indicates that the latest 15% of trades occurred within *x* days before fiscal quarter-end. The values are winsorized at 0.
WindowEnd10	The 10th percentile of *daysToNextFQEnd* based on insider trades aggregated over the past eight quarters. *daysToNextFQEnd* is the number of days between the insider trade and the following fiscal quarter-end. The value of *x* indicates that the latest 10% of trades occurred within *x* days before fiscal quarter-end. The values are winsorized at 0.
WindowEnd5	The 5th percentile of *daysToNextFQEnd* based on insider trades aggregated over the past eight quarters. *daysToNextFQEnd* is the number of days between the insider trade and the following fiscal quarter-end. The value of *x* indicates that the latest 5% of trades occurred within *x* days before fiscal quarter-end. The values are winsorized at 0.
WindowStart	The minimum value of *daysFromPrevEA* for insider trades that occurred during the past eight quarters winsorzied at 10 days. The

	previous earnings announcement dates are adjusted for after-market earnings announcements
lnMktVal	The natural logarithm of the firm market capitalization (in millions). (Source: Compustat)
ROA	Income before extraordinary items scaled by total assets multiplied by 100. (Source: Compustat)
BtoM	Total assets scaled by market capitalization. (Source: Compustat)
Leverage	Long term debt plus debt in current liabilities scaled by total assets. (Source: Compustat)
lnAnalysts	The natural logarithm of the number of analysts following. (Source: IBES)
InstOwnPct	The proportion of the firm's shares owned by institutional investors. (Source: Thomson Reuters 13F Data)
IndDirectorPct	The proportion of independent directors in board of directors. (Source: BoardEx)
CEODuality	Indicator variable that equals one for firm-years with CEOs who are also the chairs of the boards. (Source: BoardEx)
lnCEOEquity	The natural logarithm of the dollar value of the CEO's equity holding on the firm (in \$10,000s). (Source: Execucomp)
lnStockCompensation	The natural logarithm of stock compensation expense (in millions). (Source: Compustat)
Return	The average daily returns (in percentage points) of the firm's stock measured during 252 trading days prior to the insider trades aggregating period. (Source: TAQ)
EffectiveSpread	The average daily effective percentage spread (dollar-weighted) of the firm's stock measured during 252 trading days prior to the insider trades aggregating period. For each trading day, dollar-weighted average percentage effective spread is calculated. Then the average is taken over 252 trading days. (Source: TAQ)

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NumInsiderTrade	The average quarterly number of insider trades during four quarters before the insider trades aggregating period.
Volatility	The standard deviation of daily stock returns measured during 252 trading days prior to the insider trades aggregating period. (Source: TAQ)
EA TradingVolume	The dollar trading volume of the earnings announcement date (*rdq_previous*). To adjust for after-hour earnings announcements, dollar trading volume of the trading day following earnings announcement date is used if trading volume of the EA date is smaller than that of one trading day after EA. (Source: TAQ)
EA EffectiveSpread	The effective percentage spread (dollar-weighted) of the earnings announcement date (*rdq_previous*). To adjust for after-hour earnings announcements, effective spread of the trading day following earnings announcement date is used if trading volume of the EA date is smaller than that of one trading day after EA. (Source: TAQ)
EA ΔEffectiveSpread	The difference between the effective percentage spread (dollar-weighted) two days after earnings announcement and two days before earnings announcement scaled by the spread two days before EA. (Source: TAQ)
EA AbsRetProp	The absolute market-adjusted returns at the earnings announcement date scaled by the cumulative absolute market-adjusted return over the entire quarter (EA date to the next EA date -1). Returns are in log. Earnings announcement dates are adjusted for after-market earnings announcements. (Source: CRSP)

Ad hoc blackout period variables

Variable	Definition
NumTrade	The number of insider trades during the firm-quarter. (Source: Thomson Reuters Insiders Data)

AdhocBlackout	Indicator variables for firm-quarters estimated to include ad hoc blackout periods. Indicator variable that equals one for firm-quarters in the lowest decile (or quintile or quartile) of ε_{it}, where ε_{it} is the residual from estimating the model: $log(NumTrade_{it})$ $$= \alpha + \sum_{i=1}^{I} \beta_i 1_i + \sum_{t=1}^{T} \gamma_t 1_t + \delta adjRET_{it-1} + \varepsilon_{it}$$. 1_i and 1_t are indicators for firm *i* and time *t* observations, respectively. $adjRET_{it-1}$ is the prior quarter's CRSP market-adjusted returns.
lnNum8K	The natural logarithm of the number of 8-K filings during the next 90 days. (Source: SEC EDGAR)
lnNum8K (Item X)	The natural logarithm of the number of Item X 8-K filings during the next 90 days. 8-K items are 1. Registrant's business and operations, 2. Financial information, 3. Securities and trading markets, 4. Matters related to accountants and financial statements, 5. Corporate governance and management, 6. Asset-backed securities, 7. Regulation FD, 8. Other events, 9. Financial statements and exhibits. (Source: SEC EDGAR)
EffectiveSpread	The average daily effective percentage spread (dollar-weighted) of the firm's stock measured during the quarter. For each trading day, dollar-weighted average percentage effective spread is calculated. Then the average is taken over all trading days in the quarter. (Source: TAQ)
TradingVolume	The average of the log daily dollar trading volume during the quarter. (Source: TAQ)
adjRET	The daily Fama-French three-factor model excess log returns in percentage points accumulated over a specified period. The daily

| | abnormal return is the residual from estimating $r_{i,t} - r_{f,t} = \alpha_i + \beta_{i,mkt} mktrf_t + \beta_{i,SMB} SMB_t + \beta_{i,HML} HML_t + \epsilon_{i,t}$ using a rolling 252-trading day window (Fama and French, 1993). (Source: CRSP, Kenneth R. French Data Library) |

Appendix B. Examples of Insider Trading Policies

B1. Excerpts from Adobe Inc. Insider Trading Policy

Policy: LGL-SOP-01-002
Owner: Legal
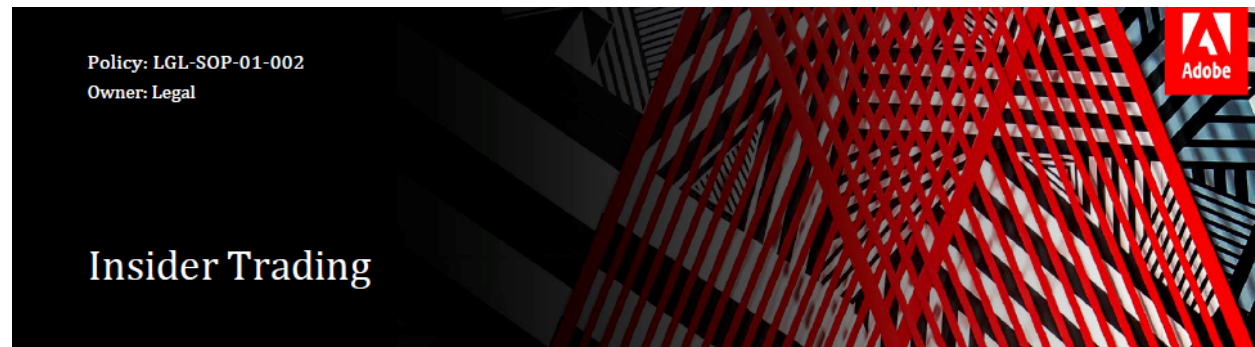
Insider Trading

1. Overview

This Insider Trading Policy (the "Policy") provides guidelines with respect to transactions in the securities of Adobe Inc. (the "Company" or "Adobe") and the handling of confidential information about Adobe and the companies with which Adobe does business. Adobe has adopted this Policy to promote compliance by all Adobe employees, consultants and other service providers with federal, state, and foreign securities laws that prohibit certain persons who are aware of material, nonpublic information ("Insider Information," further defined below) about a company from: (i) trading in securities of that company; or (ii) providing Insider Information to other persons who may trade on the basis of that information. Employees or consultants who trade on Insider Information (or tip such Insider Information to others) can be personally liable for damages totaling up to three times the profits made or the loss avoided by the individual trading with inside information. Insider trading is also a crime that can result in a criminal fine (no matter how small the profit) of up to five million dollars and a jail term of up to twenty years, as well as penalties described below under the heading "Consequences of Violations."

The Securities and Exchange Commission ("SEC") is the federal agency charged with enforcing insider trading laws in the United States. The SEC vigorously pursues insider trading violations and can detect violations using advanced technologies. The SEC's authority to initiate insider trading investigations includes the ability to obtain Adobe's employee and consultant records, to access individual's bank accounts and phone records, to obtain broker's records, etc. An SEC investigation can be triggered through a variety of actions, including by an individual's unusual trading activity, trading volume, the timing of trades that coincide with important company changes, or simply an anonymous tip to the SEC.

Adobe has worked hard to establish a reputation as a leader for its ethical conduct and business practices, and violations or perceived violations of insider trading laws could subject the Company to reputational harm, as well as civil or criminal liability if it does not implement reasonable measures to prevent insider trading.

2. Policy

If you are aware of Insider Information related to Adobe, you may not directly, or indirectly through Family Members or other persons or entities:

1. Engage in transactions in Adobe securities, except as otherwise specified in this Policy under the headings "Transactions Under Company Plans," "Transactions Not Involving a Purchase or Sale" and "Rules and Guidelines for Rule 10b5-1 Trading Plans";

2. Recommend the purchase or sale of any Adobe securities;

3. Disclose Insider Information (e.g. "tipping") to persons within the Company whose jobs do not require them to have that information, or outside of the Company to other persons, including, but not limited to, family, friends, business associates, investors, and expert consulting firms, unless any such disclosure is made in accordance with the Company's policies regarding the protection and authorized external disclosure of information regarding the Company; or

4. Assist anyone engaged in the above activities.

Insider Information means information that is both material and nonpublic (as explained in section 6). These prohibitions apply even if the transaction in question was planned or initiated before you learned of Insider Information. Note that bona fide gifts of Adobe securities are considered transactions subject to the restrictions in this Policy.

3.1. Trading Window

You may only conduct transactions involving Adobe securities (other than as specified in section 4) when the Company trading window is open. Whether or not the trading window is open, you are always subject to the prohibitions on trading on the basis of Insider Information and any other applicable restrictions in this Policy.

(A) **Company-Wide Trading Window.** All employees, executive officers, directors, and other employees and agents of Adobe, as well as their Family Members and Controlled Entities, are prohibited from engaging in transactions involving Adobe securities when the Company-wide trading window (the "Trading Window") is closed each quarter. The Trading Window opens each quarter at the start of the first trading day that is at least 24 hours following the date of public disclosure of the financial results for the previous fiscal quarter. The Trading Window closes four weeks prior to each quarter end. The period following the closure of the Trading Window is a particularly sensitive time for transactions involving Adobe due to the fact that, during this period, individuals may often possess or have access to Insider Information relevant to the expected financial results for the quarter.

  - For example, if in 2018 Adobe were to issue its earnings release for the fourth quarter of FY2018 after the stock market closes on Thursday, December 13, the Trading Window would open at the start of trading on Monday, December 17, 2018. Assuming you were not in possession of Insider Information, you would be able to trade in Adobe securities again beginning on December 17, 2018. For purposes of this hypothetical, the Trading Window would have closed on November 1, 2018 at close of market (4pm Eastern Time) —four weeks prior to Q4 FY2018 quarter end.

(B) **Special Trading Restrictions.** From time to time, an event may occur that is material to Adobe and is known by only a few directors, officers, or employees. So long as the event remains material and nonpublic, the persons designated by the Trading Compliance Officer may not trade Adobe securities. The existence of an event-specific trading restriction will not be announced to the Company as a whole and should not be communicated to any other individuals. Even if the Trading Compliance Officer has not explicitly designated you as a person who is prohibited from trading due to an event-specific restriction, you may not trade while aware of Insider Information.

(C) **No "Safe Harbors."** There are no unconditional "safe harbors" for trades made at particular times, and all persons subject to this Policy should exercise good judgment at all times. Even when the Trading Window is open, you may be prohibited from engaging in transactions involving the Company's securities if you possess Insider Information, are subject to a special trading restriction, or are otherwise restricted under this Policy.

3.2. Rules and Guidelines for Rule 10b5-1 Trading Plans

Certain executives designated by the Trading Compliance Officer are eligible to establish qualified Rule 10b5-1 trading plans for transactions in Adobe securities that meet certain conditions specified in the Rule (a "Rule 10b5-1 Plan"). Rule 10b5-1 provides an affirmative defense from liability for trades executed pursuant to a valid Rule 10b5-1 Plan. Adobe's Rules and Guidelines for Rule 10b5-1 Trading Plans, as well as additional information on eligibility, are provided in Adobe's Trading Compliance Center.

4. Exceptions

The quarterly Trading Window closures and event-driven trading restrictions do not apply to those transactions described below. Further, the requirement for pre-clearance, the quarterly Trading Window closures and event-driven trading restrictions do not apply to transactions conducted pursuant to an approved Rule 10b5-1 Plan (although such requirements are applicable to the establishment of the plan itself).

4.1. Transactions under Company Plans

The prohibitions described in this Policy do not apply in the case of the following transactions, except as specifically noted:

(A) **Stock Option Exercises for Cash.** This Policy does not restrict the exercise for cash of an employee stock option acquired pursuant to Adobe's plans (including assumed plans of companies acquired by Adobe). It does, however, restrict any sale of stock as part of a broker-assisted cashless exercise of an option, any other market sale for the purpose of generating the cash needed to pay the exercise price of an option, or any sale of shares acquired upon the exercise of an option.

(B) **Restricted Stock Units and Performance Shares.** This Policy does not restrict the vesting of restricted stock units ("RSUs"), performance shares, or other similar equity instruments, or the related forfeiture of shares of stock to satisfy tax withholding or other regulatory requirements upon the vesting of any such equity instruments. The Policy does, however, restrict any market sale of the shares of Adobe common stock that are issued upon the vesting of such RSUs, performance shares, or other similar equity instruments.

(C) **Employee Stock Purchase Plan.** This Policy does not restrict purchases of stock under Adobe's Employee Stock Purchase Plan, as amended (the "ESPP"), resulting from contributions of money to the ESPP pursuant to the election you make at the time of any enrollment in the plan. It does, however apply to your sales of Adobe securities purchased pursuant to the ESPP. Additionally, you should not base your decision to participate in the ESPP, or your decision to change your election under the ESPP, on Insider Information.

4.2. Transactions Not Involving a Purchase or Sale

Transactions that involve merely a change in the form in which you own securities are permitted during a period when you are aware of Insider Information or during a company-enforced Trading Window closure. For example, you may transfer shares to an *inter vivos* trust of which you are the sole beneficiary during your lifetime. Further, transactions in mutual funds that are invested in Adobe securities are not transactions subject to this Policy.

The trading restrictions under this Policy also do not apply to a change in the number of securities held as a result of a stock split or stock dividend applying equally to all securities of a class, or similar transactions.

2.6. Prohibited Transactions

Because there is a heightened legal risk, the appearance of improper or inappropriate conduct, or both, in any of the following transactions, you may not engage in any of these:

(A) **Short Sales.** You may not engage in short sales of Adobe securities. Short sales of Adobe securities (i.e., the sale of a security that the seller does not own) may evidence an expectation on the part of the seller that the securities will decline in value, and therefore have the potential to signal to the market that the seller lacks confidence in the Company's prospects. Short sales may reduce a seller's incentive to seek to improve the Company's performance. In addition, Section 16(c) of the Exchange Act prohibits officers and directors from engaging in short sales. (Short sales arising from certain types of hedging transactions are addressed by the "Hedging Transactions" paragraph)

(B) **Publicly Traded Options.** You may not engage in transactions in put options, call options or other Adobe derivative securities, on an exchange or in any other organized market. (Option positions arising from certain types of hedging transactions are addressed by the "Hedging Transactions" paragraph.) Given the relatively short term of publicly traded options, transactions in options may create the appearance that you are trading based on Insider Information and may also focus your attention on short-term performance at the expense of the Company's long-term objectives.

(C) **Hedging Transactions.** You may not engage in hedging transactions of any type involving Adobe securities. Hedging or monetization transactions can be accomplished through a number of possible mechanisms, including through the use of financial instruments such as prepaid variable forwards, equity swaps, exchange funds, and collars. Such hedging transactions may permit you to continue to own Adobe securities obtained through employee benefit plans or otherwise, but without the full risks and rewards of ownership. When that occurs, you may no longer have the same objectives as the Company's other shareholders.

(D) **Margin Accounts and Pledged Securities.** You may not hold Adobe securities in a margin account or otherwise pledge Adobe securities as collateral for a loan, because a margin sale or foreclosure sale may occur at a time you are aware of Insider Information or otherwise are not permitted to trade in Adobe securities. Securities held in a margin account as collateral for a margin loan might be sold by the broker without your consent if you fail to meet a margin call. Similarly, securities pledged (or hypothecated) as collateral for a loan might be sold in foreclosure if you default on the loan. (Pledges of Adobe securities arising from certain types of hedging transactions are governed by the "Hedging Transactions" paragraph)

2.7. Placing Open Orders with Brokers

When placing an open order with a broker you should inform the broker that you are subject to this Policy and its Trading Window procedures (and Pre-Clearance Procedures, if applicable) to assure that all open orders are cancelled prior to the closure of any Trading Window. Exercise caution when placing open orders, such as limit orders or particularly where the order is likely to remain outstanding for an extended period of time, except in accordance with an approved 10b5-1 Plan (as discussed below). Open orders may result in the execution of a trade at a time when you are aware of Insider Information or otherwise are not permitted to trade in Adobe securities, which may result in inadvertent insider trading violations, Section 16 violations (for officers and directors), violations of this Policy, and unfavorable publicity for you and the Company.

2.8. Post-Termination Transactions

This Policy continues to apply to transactions in Adobe securities even after termination of your service (whether as an employee, consultant or other service provider) to the Company. If you are in possession of Insider Information when your service terminates, you may not trade in Adobe securities until that information has become public or is no longer material. In addition, if the Trading Window is closed or you are subject to a special trading restriction under this Policy at the time you cease to be affiliated with the Company are expected to abide by the applicable trading restrictions until at least the end of the applicable trading restriction.

3. Procedures

Adobe has established procedures in order to assist in the administration of this Policy, to facilitate compliance with the laws prohibiting insider trading, and to avoid the appearance of any impropriety. Additional information regarding these procedures is available on Adobe's Trading Compliance Center. All persons subject to this Policy are encouraged to routinely check the Trading Compliance Center for the latest information applicable to them.

(A) **Company Assistance.** If you have any concerns about whether you are in possession of Insider Information or if you are in a sensitive position within Adobe, you should contact the Trading Compliance Office (trading@adobe.com) before you buy or sell Adobe securities. This will help ensure that even employees and consultants unaware of a particular piece of information do not give the appearance of improperly trading Adobe stock. Any person who has a question about this Policy or its application to any proposed transaction may obtain additional guidance from the Trading Compliance Officer.

(B) **Pre-Clearance Procedures.** The executives designated by the Trading Compliance Officer as being subject to Pre-Clearance Procedures, as well as the Family Members and Controlled Entities of such persons, may not engage in any transaction in Adobe securities without first obtaining pre-clearance of the transaction from the Trading Compliance Officer. Additional information regarding Pre-Clearance Procedures and the individuals to whom such procedures apply is available on Adobe's Trading Compliance Center.

SHAKE SHACK

SHAKE SHACK INC.

INSIDER TRADING COMPLIANCE POLICY

This Insider Trading Compliance Policy (this "*Policy*") consists of seven sections:

- Section I provides an overview;

- Section II sets forth the policies of Shake Shack Inc. prohibiting insider trading;

- Section III explains insider trading;

- Section IV consists of procedures that have been put in place by Shake Shack Inc. to prevent insider trading;

- Section V sets forth additional transactions that are prohibited by this Policy;

- Section VI explains Rule 10b5-1 trading plans and provides information about Section 16 and Rule 144; and

- Section VII refers to the execution and return of a certificate of compliance.

I. SUMMARY

Preventing insider trading is necessary to comply with securities laws and to preserve the reputation and integrity of Shake Shack Inc. (the "*Company*") as well as that of all persons affiliated with the Company. "Insider trading" occurs when any person purchases or sells a security while in possession of inside information relating to the security. As explained in Section III below, "inside information" is information that is both "material" and "non-public." Insider trading is a crime. The penalties for violating insider trading laws include imprisonment, disgorgement of profits, civil fines, and criminal fines of up to $5 million for individuals and $25 million for corporations. Insider trading is also prohibited by this Policy, and violation of this Policy may result in Company-imposed sanctions, including removal or dismissal for cause.

This Policy applies to all corporate officers ("*officers*"), members of the board of directors ("*directors*") and employees of the Company. Individuals subject to this Policy are responsible for ensuring that members of their households also comply with this Policy. This Policy also applies to any entities controlled by individuals subject to the Policy, including any corporations, partnerships or trusts, and transactions by these entities should be treated for the purposes of this Policy and applicable securities laws as if they were for the individual's own account. This Policy extends to all activities within and outside an individual's Company duties.

IV.   STATEMENT OF PROCEDURES PREVENTING INSIDER TRADING

The following procedures have been established, and will be maintained and enforced, by the Company to prevent insider trading. Every officer, director and employee is required to follow these procedures.

A.   Pre-Clearance of All Trades by All Officers, Directors and Certain Employees

To provide assistance in preventing inadvertent violations of applicable securities laws and to avoid the appearance of impropriety in connection with the purchase and sale of the Company's securities, all transactions in the Company's securities (including without limitation, acquisitions and dispositions of Company stock, the exercise of stock options and the sale of Company stock issued upon exercise of stock options) by officers and directors and such other employees as are designated from time to time by the Board of Directors, the Chief Executive Officer, the Chief Financial Officer or the General Counsel as being subject to this pre-clearance process (a *"Pre-Clearance Person"*) must be pre-cleared by the Company's General Counsel. Pre-clearance does not relieve anyone of his or her responsibility under SEC rules.

A request for pre-clearance may be oral or in writing (including without limitation by e-mail), should be made at least two business days in advance of the proposed transaction and should include the identity of the Pre-Clearance Person, the type of proposed transaction (for example, an open market purchase, a privately negotiated sale, an option exercise, etc.), the proposed date of the transaction and the number of shares or options to be involved. In addition, the Pre-Clearance Person must execute a certification (in the form approved by the General Counsel) that he, she or it is not aware of material, nonpublic information about the Company. The General Counsel shall have sole discretion to decide whether to clear any contemplated transaction (The Chief Executive Officer shall have sole discretion to decide whether to clear transactions by the General Counsel or persons or entities subject to this policy as a result of their relationship with the General Counsel). All trades that are pre-cleared must be effected within five business days of receipt of the pre-clearance unless a specific exception has been granted by the General Counsel (or the Chief Executive Officer, in the case of the General Counsel or persons or entities subject to this policy as a result of their relationship with the General Counsel). A pre-cleared trade (or any portion of a pre-cleared trade) that has not been effected during the five business day period must be pre-cleared again prior to execution. Notwithstanding receipt of pre-clearance, if the Pre-Clearance Person becomes aware of material, non-public information or becomes subject to a black-out period before the transaction is effected, the transaction may not be completed.

B.   Black-Out Periods

Additionally, no officer, director or employee listed on <u>Schedule I</u> shall purchase or sell any security of the Company during the period beginning on the 14th calendar day before the end of any fiscal quarter of the Company and ending upon the completion of the first full trading day after the public release of earnings data for such fiscal quarter or during any other trading suspension period declared by the Company, except for purchases and sales made pursuant to the permitted transactions described in <u>Section II</u>.

Exceptions to the black-out period policy may be approved only by the Company's General Counsel (or, in the case of an exception for the General Counsel or persons or entities subject to this policy as a result of their relationship with the General Counsel, the Chief Executive Officer or, in the case of exceptions for directors or persons or entities subject to this policy as a result of their relationship with a director, the Board of Directors).

From time to time, the Company, through the Board of Directors, the Company's disclosure committee or the General Counsel, may recommend that officers, directors, employees or others suspend trading in the Company's securities because of developments that have not yet been disclosed to the public. Subject to the exceptions noted above, all of those affected should not trade in the Company's securities while the suspension is in effect, and should not disclose to others that the Company has suspended trading.

If the Company is required to impose a "pension fund black-out period" under Regulation BTR, each director and executive officer shall not, directly or indirectly sell, purchase or otherwise transfer during such black-out period any equity securities of the Company acquired in connection with his or her service as a director or officer of the Company, except as permitted by Regulation BTR.

C. Post-Termination Transactions

With the exception of the pre-clearance requirement, this Policy continues to apply to transactions in the Company's securities even after termination of service to the Company. If an individual is in possession of material, non-public information when his or her service terminates, that individual may not trade in the Company's securities until that information has become public or is no longer material.

D. Information Relating to the Company

1. Access to Information

Access to material, non-public information about the Company, including the Company's business, earnings or prospects, should be limited to officers, directors and employees of the Company on a need-to-know basis. In addition, such information should not be communicated to anyone outside the Company under any circumstances (except in accordance with the Company's policies regarding the protection or authorized external disclosure of Company information) or to anyone within the Company on an other than need-to-know basis.

In communicating material, non-public information to employees of the Company, all officers, directors and employees must take care to emphasize the need for confidential treatment of such information and adherence to the Company's policies with regard to confidential information.

All officers, directors and employees should take all steps and precautions necessary to restrict access to, and secure, material, non-public information by, among other things:

- maintaining the confidentiality of Company-related transactions;

Figure 1: Timeline of Insider Trades

This figure shows the timeline of insider trades relative to quarterly earnings announcements and fiscal quarter-ends. For each period between two earnings announcements (*rdq_previous* and *rdq*), we collect insider trades. Then, for each trade, we calculate the number of days between earnings announcement and transaction date (*daysFromPrevEA*) and the number of days between the transaction date and upcoming fiscal quarter-end (*daysToNextFQEnd*). These variables measure how early or late the insider trades occurred relative to previous earnings announcement and subsequent fiscal quarter-end.
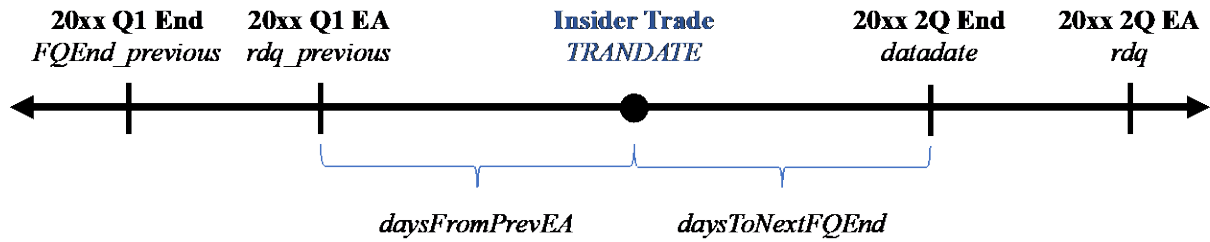
Figure 2: Distribution of Insider Trade Timing

The figure displays the distribution of insider trade timing at the individual insider trade level. The figure on the left shows the distribution of the number of days between the previous earnings announcement and transaction date (*daysFromPrevEA*). Insider trades are concentrated right after earnings announcements and decreases over the quarter. The right figure shows the distribution of the number of days between the transaction date and the upcoming fiscal quarter-end (*daysToNextFQEnd*). A greater value indicates that the insider trade occurred earlier in the quarter (far before the next fiscal quarter-end).
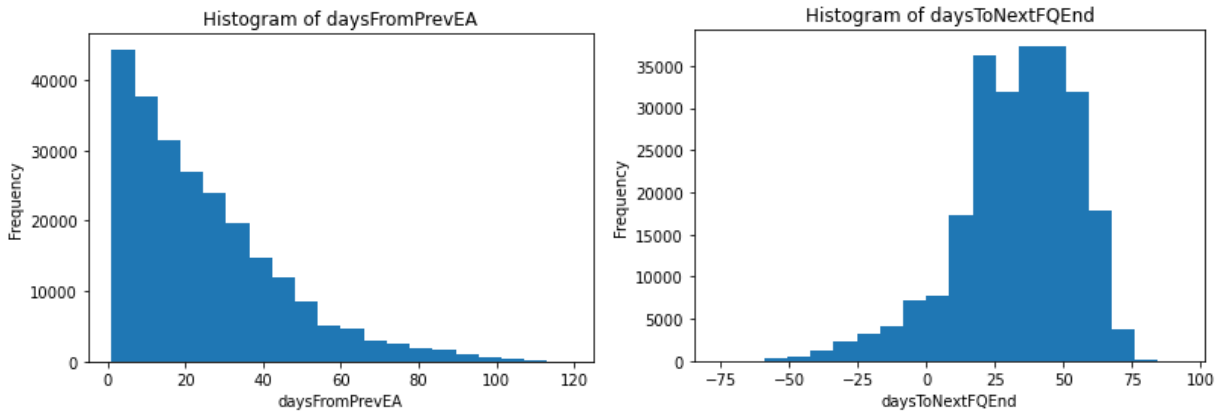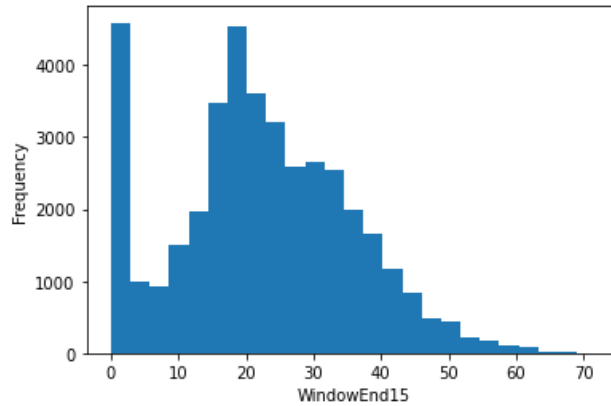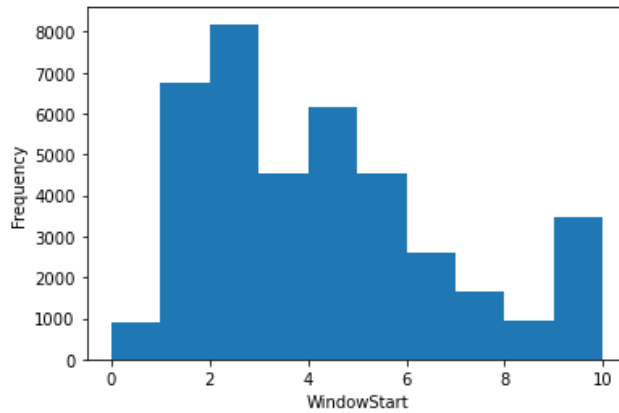
Figure 3: Distribution of the End and the Start of Estimated Allowed Trading Windows

This figure shows the distribution of the ending point and the starting point of estimated allowed trading windows. Insider trading activities from the past eight quarters are aggregated to estimate the allowed trading windows' starting point. We require at least ten insider trades during the eight-quarter period to estimate allowed trading windows. The end of allowed trading window (*WindowEnd15*) is estimated as the 15th percentile of the number of days between the insider transaction date and the upcoming fiscal quarter-end (*daysToNextFQEnd*). The starting point (*WindowStart*) is estimated as the minimum value of the number of days between previous earnings announcement and insider trade transaction date (*daysFromPrevEA*).
Therefore, *WindowStart* reflects the timing of the earliest insider trade over the past eight quarters.

(a) The estimated ending point of allowed trading windows (in number of days to the upcoming fiscal quarter-end)


(b) The estimated starting point of allowed trading windows (in number of days from the earnings announcement)

Figure 4: Distribution of Estimated Allowed Trading Windows

This figure shows the distribution of estimated allowed trading windows. Allowed trading windows are estimated using the distribution of actual insider trades. Insider trading activities from the past eight quarters are aggregated to estimate the allowed trading window. *EstWindow15 (10, 5)* is the period (in days) including the earliest 85% (90%, 95%) of insider trades. Estimated windows are winsorized at 60 days. A wider estimated window indicates that more insider trades occurred later in the quarter (close to fiscal quarter-end) and suggests more relaxed insider trading policies.
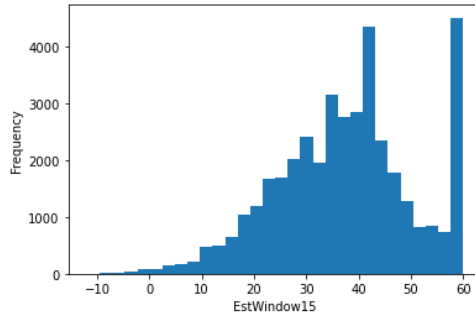
(a) *EstWindow15* (the number of days including the earliest 85% of trades)
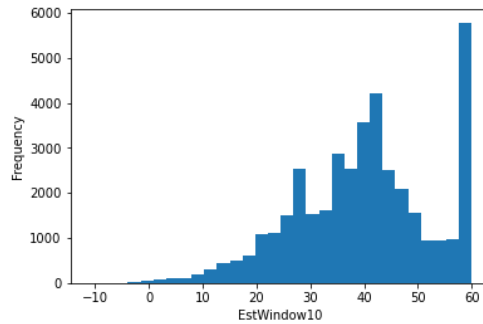
(b) *EstWindow10* (the number of days including the earliest 90% of trades)
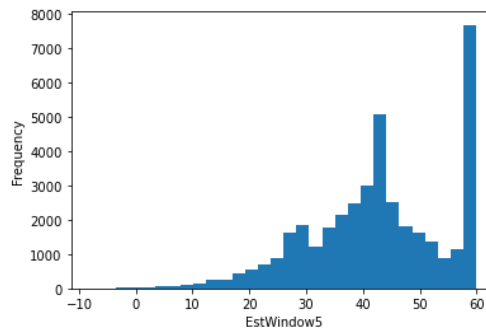
(c) *EstWindow5* (the number of days including the earliest 95% of trades)

Figure 5: Trend in 8-K Filings at and after Ad Hoc Blackout Periods

This figure shows the trend in 8-K filings during and after our estimated ad hoc blackout periods relative to non-blackout quarters. The y-axis is the coefficient β from estimating $Dep.Var. = \alpha + \beta AdhocBlackout_{i,t} + FirmFE_i + YearFE_t + \varepsilon_{i,t}$, where $Dep.Var$ is the natural logarithm of the number of 8-K filings during the quarter, 90 days after the quarter, 90-180 days after the quarter, 180-270 days after the quarter, and 270-365 days after the quarter. Ad hoc blackout periods are identified by estimating the model: $\log(NumTrade_{i,t}) = \alpha + \sum_{i=1}^{I} \beta_i 1_i + \sum_{t=1}^{T} \gamma_t 1_t + \delta adjRET_{i,t-1} + \varepsilon_{i,t}$. Firm-quarters in the lowest quintile of the model residual $\varepsilon_{i,t}$ are classified as ad hoc blackout periods.

48
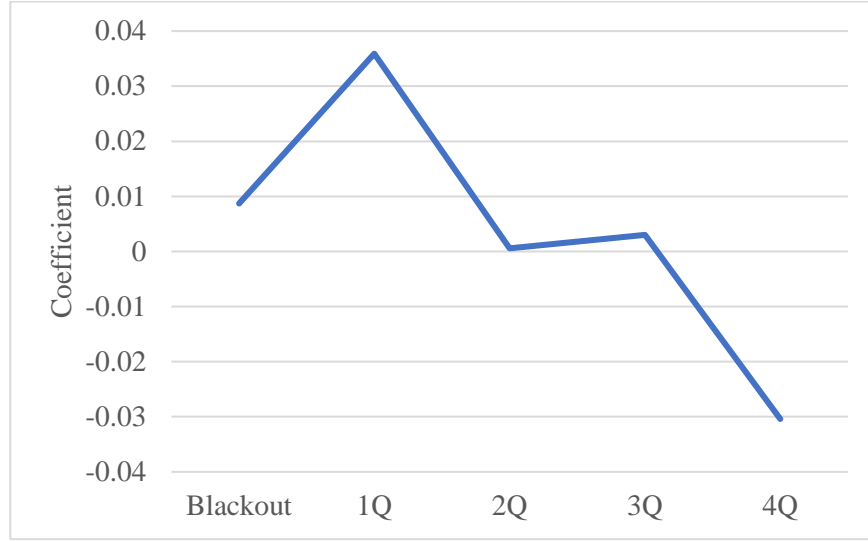
Figure 6: Frequencies of Future 8-K Filings following Ad Hoc Blackout Periods by 8-K Items

This figure shows the frequencies of individual 8-K item filings during 90 days following ad hoc blackout period relative to periods following non-blackout quarters. The y-axis is the coefficient β from estimating $lnNum8K_{i,t+1} = \alpha + \beta AdhocBlackout_{i,t} + FirmFE_i + YearFE_t + \varepsilon_{i,t}$ for each 8-K items. 8-K item descriptions are as follows: Item 1: Registrant's business and operations; Item 2: Financial information; Item 3: Securities and trading markets; Item 4: Matters related to accountants and financial statements; Item 5: Corporate governance and management; Item 6: Asset-backed securities; Item 7: Regulation FD; Item 8: Other events; Item 9: Financial statements and exhibits. Ad hoc blackout periods are identified by estimating the model: $\log(NumTrade_{i,t}) = \alpha + \sum_{i=1}^{I} \beta_i 1_i + \sum_{t=1}^{T} \gamma_t 1_t + \delta adjRET_{i,t-1} + \varepsilon_{i,t}$. Firm-quarters in the lowest quintile of the model residual $\varepsilon_{i,t}$ are classified as ad hoc blackout periods.
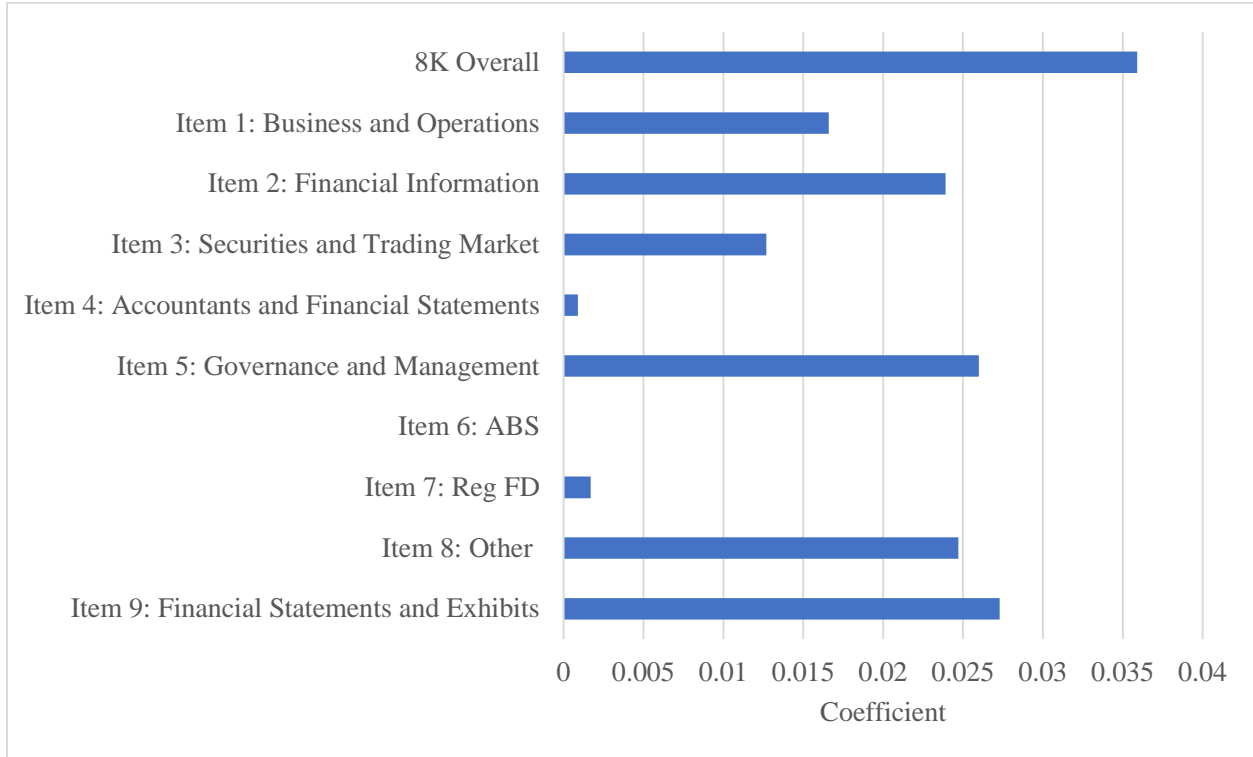
Figure 7: Trend in Bid-Ask Spreads during and after Ad Hoc Blackout Periods

This figure shows the trend in bid-ask spreads during and after our estimated ad hoc blackout periods relative to non-blackout quarters. The y-axis is the coefficient β from estimating $Dep. Var. = \alpha + \beta AdhocBlackout_{i,t} + FirmFE_i + YearFE_t + \varepsilon_{i,t}$, where $Dep. Var$ is the average daily effective percentage spread during the quarter, the 90 days after the quarter, the 90-180 days after the quarter, the 180-270 days after the quarter, and the 270-365 days after the quarter. Ad hoc blackout periods are identified by estimating the model: $\log(NumTrade_{i,t}) = \alpha + \sum_{i=1}^{I} \beta_i 1_i + \sum_{t=1}^{T} \gamma_t 1_t + \delta adjRET_{i,t-1} + \varepsilon_{i,t}$. Firm-quarters in the lowest quintile of the model residual $\varepsilon_{i,t}$ are classified as ad hoc blackout periods.
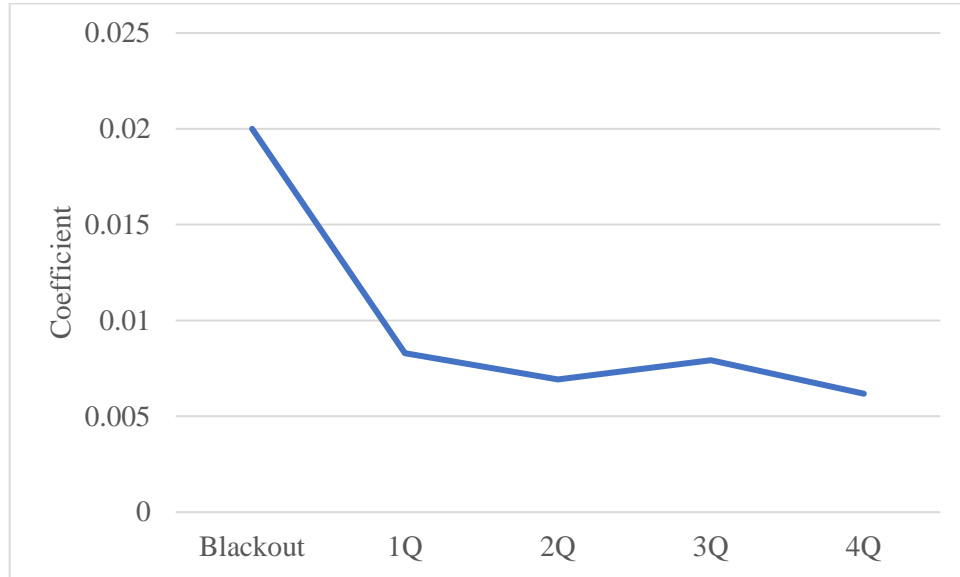
Figure 8: Returns during and after Ad Hoc Blackout Periods

This figure shows the trend in abnormal returns during and after our estimated ad hoc blackout periods relative to non-blackout quarters. The y-axis is the coefficient β from estimating $Dep.Var. = \alpha + \beta AdhocBlackout_{i,t} + FirmFE_i + YearFE_t + \varepsilon_{i,t}$, where $Dep.Var$ is the Fama-French three-factor excess returns cumulated over the quarter, over the 90 days after the quarter, over the 90-180 days after the quarter, over the 180-270 days after the quarter, and over the 270-365 days after the quarter. Ad hoc blackout periods are identified by estimating the model: $\log(NumTrade_{i,t}) = \alpha + \sum_{i=1}^{I} \beta_i 1_i + \sum_{t=1}^{T} \gamma_t 1_t + \delta adjRET_{i,t-1} + \varepsilon_{i,t}$. Firm-quarters in the lowest quintile of the model residual $\varepsilon_{i,t}$ are classified as ad hoc blackout periods.
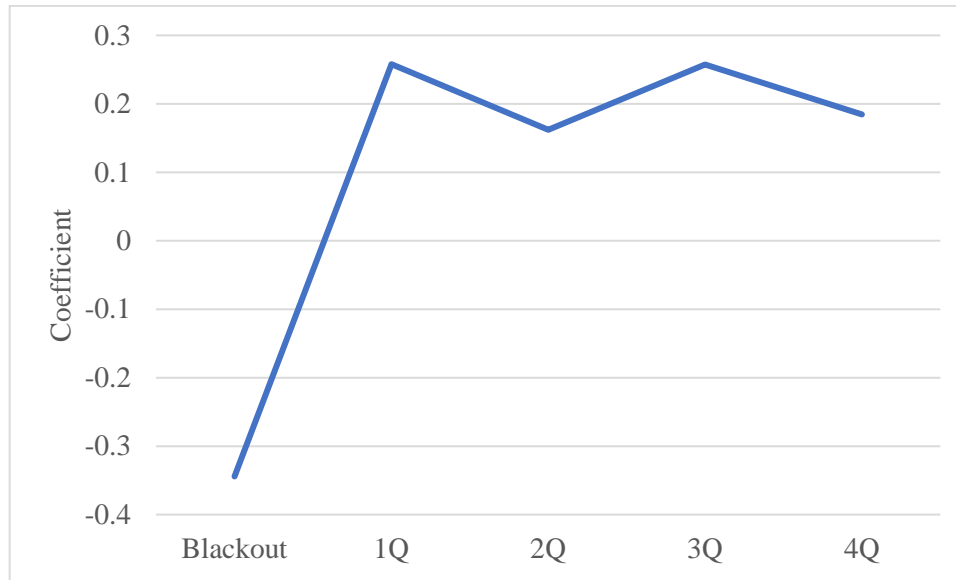
Table 1: Summary Statistics

This table presents the descriptive statistics for the variables used in the analyses. See Appendix A for variable definitions. Panel A includes variables related to the starting point and the ending point of allowed trading windows. Panel B reports the summary statistics of variables related to the ad hoc blackout periods.

Panel A. Variables related to the timing and length of allowed trading windows

	Mean	Std.Dev.	25%	Median	75%	Obs.
WindowStart (in days from Prev EA)	3.8543	2.6427	2.0000	3.0000	5.0000	39762
WindowEnd15 (in days to Next FQE)	22.2972	13.2653	14.2500	22.0000	31.2500	39762
WindowEnd10 (in days to Next FQE)	19.9369	12.9214	11.3000	19.2000	29.0000	39762
WindowEnd5 (in days to Next FQE)	17.1403	12.3565	7.0000	17.0000	25.0000	39762
EA TradingVolume	16.7775	2.6339	15.0955	17.2047	18.7949	37163
EA EffectiveSpread	0.3981	0.6953	0.0729	0.1561	0.3733	37132
EA ΔEffectiveSpread	0.1540	0.7579	-0.2549	-0.0073	0.3089	35275
EA AbsRetProp	0.0533	0.0477	0.0162	0.0390	0.0772	39525
EffectiveSpread	0.4156	0.7480	0.0603	0.1360	0.3696	37440
lnMktVal	7.3791	1.9180	6.0025	7.4051	8.6964	39708
lnAnalysts	1.8551	0.9986	1.0986	1.9459	2.6391	39762
InstOwnPct	0.7015	0.2721	0.5358	0.7767	0.9048	37999
IndDirectorPct	0.7804	0.1291	0.6667	0.8333	0.8889	36914
CEODuality	0.3781	0.4849	0.0000	0.0000	1.0000	39762
lnCEOEquity	4.5920	3.8894	0.0000	6.1631	7.8356	39762
lnStockCompensation	1.3431	1.1931	0.3235	1.0986	2.0564	39762
AveInsiderTrade	2.6221	3.4634	0.2500	1.5000	3.5000	39244
Volatility	0.0207	0.0103	0.0138	0.0178	0.0246	39710
Return	0.0175	0.1410	-0.0404	0.0298	0.0929	37440
ROA	0.4470	3.5929	0.1597	0.6972	1.8015	39752
BtoM	2.5592	3.5237	0.5657	1.0876	2.6405	39708
Leverage	0.2265	0.2071	0.0542	0.1814	0.3473	36710

Panel B. Variables related to the ad hoc blackout periods

	Mean	Std.Dev.	25%	Median	75%	Obs.
lnNum8K	1.0117	0.6280	0.6931	1.0986	1.3863	117166
EffectiveSpread	0.4914	0.8348	0.0719	0.1625	0.4628	106419
ΔTradingVolume	0.0413	0.4539	-0.1995	0.0075	0.2384	101924
adjRET	-1.6800	17.5875	-9.0920	-0.2380	7.2981	115906

Table 2: Estimated Allowed Trading Windows vs. Actual ITPs

This table compares our estimated allowed trading windows with allowed trading windows specified in actual insider trading policies for a small sample of firms. Actual ITPs of 16 companies are collected via web search. These actual ITPs are snapshots of firms' insider trading policies. We were not able to observe time-series variation of ITPs as firms do not disclose historical ITPs. For each ITP, the quarterly allowed trading window's length is calculated based on the policy's descriptions on quarterly allowed trading windows or blackout periods. Then, we estimate the allowed trading window for each firm-quarter using the distribution of insider trades. We take the median of the estimated windows to obtain a firm-level summary. *EstWindow15 (10, 5)* uses the earliest 85% (90%, 95%) insider trades to estimate the length of allowed trading windows.

Company Name	Based on Actual ITPs			Estimated using distribution of insider trades		
	Window start (in days from previous EA)	*Window end (in days to next FQ end)*	*Window length*	*EstWindow15 median*	*EstWindow10 median*	*EstWindow5 median*
Adobe	1	28	32	26	27.1	28.95
Ciena	3	15	43	30.925	38.35	45.3
Duke	3	30	28	27.8	28	28.85
FTI Consulting	1	20	40	49	49	49.9
f5	2	15	44	17.625	23.95	29.875
GM	2	30	29	33	33.8	37.8
Hershey	3	30	28	24.675	26.2	29.875
Meritor	3	15	43	31	31.3	37.5
The Michaels Companies	3	35	23	28.3	31.6	43.3
Myers Inc	3	15	43	24.3	26.2	28.65
Neogen	2	7	52	45.8	49	52
Netflix	1	20	40	31	31	31
1-800-flowers.com	3	15	43	58.95	59	59
Shake Shack	2	15	44	45	65.8	79.2
Sucampo Pharmaceuticals, Inc.	3	15	43	41	41	41
ViaSat	3	15	43	44.625	45.25	46

The correlation between the window length based on actual ITPs and the firm-level median of *EstWindow15* (*10*, *5*) is 0.437 (0.494, 0.431).

Table 3: Determinants of the Start of Allowed Trading Windows

This table reports the results from estimating a determinants model of the starting point of allowed trading windows. The dependent variable, *WindowStart* is the estimated start of allowed trading window using the distribution of insider trades aggregated over eight quarters, in number of days from the previous earnings announcement. The starting point of a trading window is estimated as the minimum value of the number of days between the earnings announcement date and the insider trade transaction dates. Smaller values suggest that more insider trades occurred soon after earnings announcements, signaling more relaxed ITPs. Variables are specified in Appendix A. All continuous variables are winsorized at 1% and 99% levels. Industry-year fixed effects are included. Standard errors are clustered on firm and year. ***, **, * indicate significance level for two-tailed tests at the 1%, 5%, and 10% level, respectively.

	(1) *WindowStart*	(2) *WindowStart*	(3) *WindowStart*	(4) *WindowStart*	(5) *WindowStart*
EA TradingVolume	-0.0884***	-	-	-	-
	(-2.7349)	-	-	-	-
EA EffectiveSpread	-	0.2102***	-	-	-
	-	(4.0265)	-	-	-
EA ΔEffectiveSpread	-	-	0.0438**	-	-
	-	-	(2.3374)	-	-
EA AbsRetProp	-	-	-	-1.5218***	-
	-	-	-	(-3.0857)	-
lnAnalysts	-	-	-	-	-0.0682
	-	-	-	-	(-1.2975)
lnMktVal	-0.139***	-0.1987***	-0.2441***	-0.2293***	-0.2089***
	(-2.9502)	(-8.9161)	(-10.790)	(-10.650)	(-7.0214)
ROA	-0.0417***	-0.0403***	-0.0406***	-0.0373***	-0.0397***
	(-4.6186)	(-4.3634)	(-4.3961)	(-4.0911)	(-4.4782)
BtoM	0.0071	-0.0000	0.006	0.0019	0.0042
	(0.3338)	(-0.0004)	(0.2858)	(0.0929)	(0.2057)
Leverage	-0.236	-0.2346	-0.2291	-0.2994*	-0.27
	(-1.1885)	(-1.1795)	(-1.1073)	(-1.6520)	(-1.4785)
Fixed Effects	Industry×Year	Industry×Year	Industry×Year	Industry×Year	Industry×Year
Standard Errors	Clustered by firm and year	Clustered by firm and year	Clustered by firm and year	Clustered by firm and year	Clustered by firm and year
N	33,973	33,944	32,173	36,416	36,119
R²	0.1212	0.1218	0.1183	0.1170	0.1172

Table 4: Determinants of the End of Allowed Trading Windows

This table reports the results from estimating a determinants model of the end point of allowed trading windows. The dependent variable, *WindowEnd15(10, 5)* is the estimated end of allowed trading window using the distribution of insider trades aggregated over eight quarters, in number of days to the upcoming fiscal quarter-end. For *WindowEnd15(10,5),* we assume that earliest 85% (90%, 95%) of insider trades occur within allowed trading window. Higher values suggest that more insider trades occurred earlier in the quarter, signaling stricter ITPs. Variables are specified in Appendix A. All continuous variables are winsorized at 1% and 99% levels. Industry-year fixed effects are included. Standard errors are clustered on firm and year. ***, **, * indicate significance level for two-tailed tests at the 1%, 5%, and 10% level, respectively.

	(1) *WindowEnd15*	(2) *WindowEnd10*	(3) *WindowEnd5*
EffectiveSpread	0.8149*	0.8453**	0.8361**
	(1.9259)	(2.0584)	(2.0847)
EA AbsRetProp	8.7221***	8.3537***	8.6864***
	(5.0378)	(4.6304)	(4.3581)
lnMktVal	1.0045***	0.8677***	0.7593***
	(4.0351)	(3.4609)	(3.2569)
lnAnalysts	1.0723***	1.2143***	1.2530***
	(2.8755)	(3.4554)	(3.9590)
InstOwnPct	0.8971	0.8652	0.6243
	(0.8613)	(0.8286)	(0.6296)
IndDirectorPct	3.1940*	3.4182*	3.5911**
	(1.7100)	(1.8532)	(1.9748)
CEODuality	-0.5885	-0.5734	-0.4050
	(-1.4801)	(-1.4679)	(-1.1145)
lnCEOEquity	0.1997***	0.1785**	0.1854***
	(2.8820)	(2.5677)	(2.595)
lnStockCompensation	0.2888	0.2658	0.1981
	(1.1519)	(1.0792)	(0.7975)
NumInsiderTrade	-0.1864***	-0.2068***	-0.2084***
	(-2.8973)	(-3.4734)	(-3.8072)
Volatility	-83.430***	-82.564***	-69.130**
	(-2.7008)	(-2.5962)	(-2.1786)
Return	0.5089	0.2072	0.0008
	(0.6265)	(0.2328)	(0.0009)
ROA	0.1442***	0.1436***	0.1463***
	(3.0290)	(3.3229)	(3.4903)
BtoM	0.0201	0.0135	0.0070
	(0.1966)	(0.1376)	(0.0708)
Leverage	-1.8927	-1.9515	-1.9279*
	(-1.4888)	(-1.6301)	(-1.6573)
Fixed Effects	Industry×Year	Industry×Year	Industry×Year
Standard Errors	Clustered by firm and year	Clustered by firm and year	Clustered by firm and year
N	30,591	30,591	30,591
R²	0.1659	0.1589	0.1534

Table 5: Ad Hoc Blackout Periods and Future 8-K Disclosures

This table reports results from regressing the natural logarithm of the number of 8-K filings over the next 90 days on the indicator for ad hoc blackout periods. Ad hoc blackout periods are identified by estimating the model: $\log(NumTrade_{i,t}) = \alpha + \sum_{i=1}^{I} \beta_i 1_i + \sum_{t=1}^{T} \gamma_t 1_t + \delta adjRET_{i,t-1} + \varepsilon_{i,t}$. Firm-quarters with the lowest residuals are labeled as ad hoc blackout quarters. These firm-quarters are those with abnormally small numbers of insider trades after controlling for firm fixed effect, time fixed effect, and prior quarter stock performance. For column (1), firm-quarters in the lowest decile of the model residual $\varepsilon_{i,t}$ are classified as ad hoc blackout periods. For column (2) and (3), the lowest quartile and the lowest quintile is used as cutoffs. The dependent variable, *lnNum8K,* is the natural logarithm of the number of 8-K filings during 90 days following the end of the quarter. Variables are specified in Appendix A. All continuous variables are winsorized at 1% and 99% levels. Firm and year fixed effects are included. Standard errors are clustered on firm and year. ***, **, * indicate significance level for two-tailed tests at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)
	lnNum8K	*lnNum8K*	*lnNum8K*
AdhocBlackout	0.0461***	0.0359***	0.034***
	(4.9247)	(4.5206)	(4.1069)
Fixed Effects	Firm, Year	Firm, Year	Firm, Year
N	115502	115502	115502
R²	0.3389	0.3390	0.3390
Firm-quarters with ad hoc blackout periods =	firm-quarters in the lowest decile of the model residual	firm-quarters in the lowest quintile of the model residual	firm-quarters in the lowest quartile of the model residual

Table 6: Ad Hoc Blackout Periods and Future 8-K Disclosures by Items

This table reports results from regressing the natural logarithm of the number of individual 8-K item filings over the next 90 days on the indicator for ad hoc blackout periods. Ad hoc blackout periods are identified by estimating the model: $\log(NumTrade_{i,t}) = \alpha + \sum_{i=1}^{I} \beta_i 1_i + \sum_{t=1}^{T} \gamma_t 1_t + \delta adjRET_{i,t-1} + \varepsilon_{i,t}$. Firm-quarters in the lowest quintile of the model residual $\varepsilon_{i,t}$ are classified as ad hoc blackout periods. These firm-quarters are those with abnormally small numbers of insider trades after controlling for firm fixed effect, time fixed effect, and prior quarter stock performance. The dependent variable, *lnNum8K,* is the natural logarithm of the number of 8-K filings during 90 days following the end of the quarter for each 8-K item. 8-K item descriptions are as follows: Item 1: Registrant's business and operations; Item 2: Financial information; Item 5: Corporate governance and management; Item 2 excl. 2.02: Financial information excluding Results of operation and financial conditions; Item 5 excl. 5.04: Corporate governance and management excluding Temporary suspension of trading under registrant's employee benefit plans; Item 2.01: Completion of acquisition or disposition of asset. Variables are specified in Appendix A. All continuous variables are winsorized at 1% and 99% levels. Firm and year fixed effects are included. Standard errors are clustered on firm and year. ***, **, * indicate significance level for two-tailed tests at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Specific 8-K item	*Item 1*	*Item 2*	*Item 5*	*Item 2 excl. 2.02*	*Item 5 excl. 5.04*	*Item 2.01*
	Business and Operations	*Financial Information*	*Governance and Management*	*Excl. Results of Operations*	*Excl. Suspension related to employee benefit plans*	*Completion of acquisition or disposition*
	lnNum8K	**lnNum8K**	**lnNum8K**	**lnNum8K**	**lnNum8K**	**lnNum8K**
AdhocBlackout	0.0166***	0.0239***	0.026***	0.0167***	0.026***	0.0118***
	(4.9495)	(3.3697)	(2.9669)	(5.4966)	(2.9582)	(5.5299)
Fixed Effects	Firm, Year	Firm, Year	Firm, Year	Firm, Year	Firm, Year	Firm, Year
N	115502	115502	115502	115502	115502	115502
R²	0.1874	0.2200	0.1260	0.151	0.1254	0.089

Table 7: Bid-Ask Spreads during and after Ad Hoc Blackout Periods

This table reports the bid-ask spreads during ad hoc blackout periods and the change in bid-ask spreads following ad hoc blackout periods. The dependent variables are the effective percentage spread during the quarter for column (1), and the change in effective percentage spread in the next quarter for column (2). Ad hoc blackout periods are identified by estimating the model: $\log(NumTrade_{i,t}) = \alpha + \sum_{i=1}^{I} \beta_i 1_i + \sum_{t=1}^{T} \gamma_t 1_t + \delta adjRET_{i,t-1} + \varepsilon_{i,t}$. Firm-quarters in the lowest quintile of the model residual $\varepsilon_{i,t}$ are classified as ad hoc blackout periods. Variables are specified in Appendix A. All continuous variables are winsorized at 1% and 99% levels. Firm and year fixed effects are included. Standard errors are clustered on firm and year. ***, **, * indicate significance level for two-tailed tests at the 1%, 5%, and 10% level, respectively.

	(1)	(2)
	EffectiveSpread	*ΔEffectiveSpread$_{t+1}$*
AdhocBlackout	0.0213**	-0.0767**
	(2.3462)	(-2.0723)
Fixed Effects	Firm, Year	Firm, Year
Standard Errors	Clustered by firm and year	Clustered by firm and year
N	105696	101921
R²	0.7888	0.0353

Table 8: Trading Volume following Ad Hoc Blackout Periods

This table reports the results from regressing the one-quarter ahead change in dollar trading volume on the indicator variable for ad hoc blackout periods. The dependent variable is the change in the natural logarithm of average daily dollar trading volume from the focal quarter to the next. Ad hoc blackout periods are identified by estimating the model: $\log(NumTrade_{i,t}) = \alpha + \sum_{i=1}^{I} \beta_i 1_i + \sum_{t=1}^{T} \gamma_t 1_t + \delta adjRET_{i,t-1} + \varepsilon_{i,t}$. Firm-quarters in the lowest quintile of the model residual $\varepsilon_{i,t}$ are classified as ad hoc blackout periods. Variables are specified in Appendix A. All continuous variables are winsorized at 1% and 99% levels. Firm and year fixed effects are included. Standard errors are clustered on firm and year. ***, **, * indicate significance level for two-tailed tests at the 1%, 5%, and 10% level, respectively.

	$\Delta Trading Volume_{t+1}$
AdhocBlackout	0.0244***
	(4.3357)
Fixed Effects	Firm, Year
N	101921
R²	0.0378

Table 9: Cumulative Returns during and after Ad Hoc Blackout Periods

This table reports the cumulative abnormal returns during and after ad hoc blackout periods relative to non-blackout quarters. The dependent variables are Fama-French three-factor excess returns (in percentage points) cumulated over the quarter, over 90 days following the end of the quarter, and over 365 days following the end of the quarter. Ad hoc blackout periods are identified by estimating the model: $\log(NumTrade_{i,t}) = \alpha + \sum_{i=1}^{I} \beta_i 1_i + \sum_{t=1}^{T} \gamma_t 1_t + \delta adjRET_{i,t-1} + \varepsilon_{i,t}$. Firm-quarters in the lowest quintile of the model residual $\varepsilon_{i,t}$ are classified as ad hoc blackout periods. Variables are specified in Appendix A. All continuous variables are winsorized at 1% and 99% levels. Firm and year fixed effects are included. Standard errors are clustered on firm and year. ***, **, * indicate significance level for two-tailed tests at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)
	adjRET	*adjRET _1Q*	*adjRET _1Yr*
AdhocBlackout	-0.3443**	0.2579*	0.9800**
	(-2.1577)	(1.8456)	(2.3521)
Fixed Effects	Firm, Year	Firm, Year	Firm, Year
Standard Errors	Clustered by firm and year	Clustered by firm and year	Clustered by firm and year
N	115823	116376	115462
R²	0.0887	0.0962	0.2555