

# DO INSIDERS ACT AS ARBITRAGEURS?

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## ABSTRACT

This paper presents new evidence supporting the hypothesis that a large part of the returns generated by corporate trading (insider trading, share repurchases, and SEOs) can be attributed to public information rather than to private information. Corporate trades are contrarian and the magnitudes of returns prior to and following trades increase with idiosyncratic risk. These patterns cannot be explained by proxies for future cash-flow news and are not mitigated by increased regulatory oversight of insider trading. Furthermore, arbitrage forces are weak at high-idiosyncratic risk firms: institutions are slow to recognize the valuation implications of these trades and returns following the trades firms drift for several months. Overall, our results suggest that insiders exploit market mispricings, and thus, act as arbitrageurs.

JEL Classification: G11, G12, G14, G32, G35

Key Words: Limits-to-Arbitrage, Insider Trading, Share Repurchases, Seasoned Equity Offerings

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## ABSTRACT

This paper presents new evidence supporting the hypothesis that a large part of the returns generated by corporate trading (insider trading, share repurchases, and SEOs) can be attributed to public information rather than to private information. Corporate trades are contrarian and the magnitudes of returns prior to and following trades increase with idiosyncratic risk. These patterns cannot be explained by proxies for future cash-flow news and are not mitigated by increased regulatory oversight of insider trading. Furthermore, arbitrage forces are weak at high-idiosyncratic risk firms: institutions are slow to recognize the valuation implications of these trades and returns following the trades firms drift for several months. Overall, our results suggest that insiders exploit market mispricings, and thus, act as arbitrageurs.

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# I. Introduction

In a seminal work, Henry G. Manne argues that insider trading should be permitted because managers' trades increase the information content of prices (Manne 1966). Such trades can be based on information known privately to corporate insiders or on public information that insiders perceive as being misinterpreted by market participants (e.g., underreactions to earnings announcements or overreactions to past growth). In other words, insiders can exploit private information and information asymmetry or they can engage in arbitrage, buying (selling) shares in their firms when they perceive the firms as undervalued (overvalued). In both types of trades corporate insiders earn abnormal returns.

Previous research has found that insider trading, share repurchases, and seasoned equity offerings (SEOs) tend to be contrarian in nature (e.g., Jenter 2005, Rozeff and Zaman 1998, Piotroski and Roulstone 2005, Ikenberry, Lakonishok, and Vermaelen 1995, Graham and Harvey 2001) and earn abnormal returns. Although these results are consistent with managers exploiting mispricing, they are also consistent with managers exploiting private information.<sup>1</sup> Additional evidence that managers are able to identify mispricings (e.g., Baker and Wurgler 2002, Baker and Wurgler 2004) has been contested by other studies (e.g., Schultz 2003, Alti 2006, Butler, Grullon, and Weston 2005). However, researchers have also had difficulty in identifying the use of private information by corporate insiders. For example, Givoly and Palmon (1985) are unable to identify news events that explain abnormal returns to insider trades and Piotroski and Roulstone (2005) conclude that insider trades can be explained far better by valuation metrics, such as market-to-book and past returns, than

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<sup>1</sup>For example, one possibility is that these empirical findings are generated by a group of managers who are contrarian traders (as in Goetzmann and Massa 2002), and another group of managers who trade on private information.

the arrival of future information. In sum, it remains an open question whether managers use private information or act on perceived mispricing of public information when trading.

In this paper, we provide new evidence on how corporate insiders affect prices. We examine trades by managers in their own accounts (insider purchases and insider sales) and in the corporate account (share repurchases and SEOs). To investigate whether managers exploit private information or act as arbitrageurs, we document return patterns around insider and corporate transactions across firms with varying levels of idiosyncratic risk (controlling for firm size). The prior literature has linked idiosyncratic risk to firm-specific information (e.g., Durnev, Morck, Yeung, and Zarowin 2003)<sup>2</sup> and to the existence of mispricing (e.g., Pontiff 2006).<sup>3</sup> While prior research has shown that corporate and insider transactions are contrarian, we show that these patterns are strongest at high-idiosyncratic risk firms. For example, insiders at high-idiosyncratic risk firms initiate purchases following six-month price declines of 25.8% while insiders at firms with low-idiosyncratic risk initiate purchases after price declines of 6.2%. In the six months following an insider purchase, the difference in returns between high- and low-idiosyncratic risk firms averages 0.86% per month. Similar patterns are found for insider sales and share repurchases. For SEOs, returns prior to

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<sup>2</sup>Several studies show that prices of high-idiosyncratic risk firms incorporate more firm-specific information than prices of low-idiosyncratic-risk firms. For example, more-developed markets have more high-idiosyncratic risk firms, suggesting that prices at high-idiosyncratic risk firms reflect firm-specific news (Morck, Yeung, and Yu 2000) while high-idiosyncratic-risk firms have more information about future earnings impounded into current stock prices than low-idiosyncratic-risk firms do (Durnev, Morck, Yeung, and Zarowin 2003). Furthermore, Chen, Goldstein, and Jiang (2007) show that managers at high-idiosyncratic risk firms incorporate more information from prices into their investment decisions.

<sup>3</sup>Idiosyncratic risk is associated with limits to arbitrage because of the difficulty in hedging positions in firms that have few close substitutes. As a result, the market has difficulty incorporating publicly available information into the stock prices of high-idiosyncratic risk firms. Consistent with this prediction, researchers have found that high-idiosyncratic risk firms exhibit stronger market anomalies; for example, studies have found that idiosyncratic securities exhibit a larger closed-end fund discount (Pontiff 1996), a stronger S&P 500 inclusion anomaly (Wurgler and Zhuravskaya 2002), higher returns for the book-to-market strategy (Ali, Hwang, and Trombley 2003), stronger postearnings announcement drift (Mendenhall 2004), and a stronger accruals anomaly (Mashruwala, Rajgopal, and Shevlin 2006). Shleifer and Vishny (1997) present a general model of limited arbitrage while Pontiff (2006) reviews the literature that links idiosyncratic risk and mispricing.

the transaction are highest at high-idiosyncratic risk firms; however, returns following the transaction show no spread across levels of idiosyncratic risk.

Having documented differences in returns around transactions across levels of idiosyncratic risk, we refine our tests and investigate whether these post-transaction return spreads reflect variation in private information or variation in the ability of insiders to exploit mispricing. First, we find that idiosyncratic risk is not associated with the degree to which insiders trade on news about future cash flows. Second, we report that future cash-flow news (analyst forecast revisions and future earnings surprises) do not explain post-transaction returns and the spread in these returns across levels of idiosyncratic risk. Third, we document that our results continue to hold in the second half of our sample period despite the increase in penalties for illegal insider trading. Overall, this evidence is inconsistent with managers' exploitation of private information being the dominant explanation for returns around insider and firm trades.<sup>4</sup>

If corporate managers at high-idiosyncratic risk firms are exploiting mispricing, rather than private information, then outside arbitrage forces at these firms must be weak. To explore this idea, we examine the purchasing behavior of institutions and hedge funds around corporate transactions. We find that institutions are slow to buy high-idiosyncratic risk firms after insider purchases and share repurchases and slow to sell high-idiosyncratic risk firms after insider sales and SEOs. Also, we document that prices do not adjust immediately after corporate trades in high-idiosyncratic risk firms, but rather evolve slowly over several

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<sup>4</sup>We also note that if insiders are trading on private information the contrarian patterns we document require that insiders keep this information private for up to two years. This concealment seems unlikely given the strong demand for disclosure in modern markets.

months. Thus, arbitrage forces appear to be weak at these firms, providing opportunities for mispricings to develop and for managers to exploit them.

We conduct additional robustness tests. Specifically, we discuss portfolio rebalancing by managers as an explanation for our results. Further, we verify that sorting on idiosyncratic risk does not mechanically drive our results due to an association between idiosyncratic risk and returns. Finally, we examine proxies for limits-to-arbitrage other than idiosyncratic risk (e.g., size, transaction costs, and liquidity measures).

By conditioning on idiosyncratic risk, our study complements prior papers arguing that insiders perceive and act on market mispricing (e.g., Jenter 2005, Rozeff and Zaman 1998). While these papers show a relation between insider trading and indicators of mispricing (such as past returns and the book-to-market ratio), such relations could be due to insider awareness of future price-relevant events. For example, La Porta, Lakonishok, Shleifer, and Vishny (1997) show that value firms (which have experienced negative past returns and have high book-to-market ratios) tend to experience positive earnings surprises in the future, providing a reason for insider purchases other than perceived undervaluation. Similar to Piotroski and Roulstone (2005), we control for future cash-flow news and thus are able to make statements about the contribution of both private information and perceived mispricing to insiders' decisions to trade. Our results also provide additional evidence that the market underreacts to insider information (Lakonishok and Lee 2001), with this underreaction being greatest for firms where outside arbitrage is likely to be limited by difficulty in hedging trades. This contributes to the literature on market efficiency—specifically, the way in which prices react to managerial actions.

Our combined evidence suggests that trades at high-idiosyncratic risk firms are not, on average, made on the basis of private information that will be reflected in future returns. Rather, they are made when firms with weak arbitrage forces experience extreme past returns that insiders and firms perceive as mispricing. Overall, our results are consistent with a market where regulation of insider trading forces corporate insiders to trade mainly on mispricing as opposed to private information of value-relevant events. To paraphrase Givoly and Palmon (1985): “[Our] findings do not imply that instances of illegal exploitation of insider information do not occur. Nevertheless, our results suggest that such instances do not dominate the overall statistics and cannot explain the observed profitability of insider trading.”

Our paper contributes to our understanding of how insiders and firms earn returns to their trades. While the conventional wisdom is that insiders exploit investors by using private information, we provide evidence that a significant portion of their returns come from correcting prior mispricing. Note that we do not argue that insiders never exploit private information about value-relevant events, nor do we argue that idiosyncratic risk is not associated with the amount of firm-specific information impounded into a firm’s stock price. Our results simply show that variation in post-trade returns that is associated with idiosyncratic risk cannot be explained by proxies for news about firm fundamentals, and is associated with weak arbitrage forces.

In Section II, we describe the data we use. In Section III, we describe our return tests and their results. In Section IV, we discuss whether our return tests are driven by private information or perceived mispricing. In Section V, we consider additional possible explana-

tions for our results and alternative proxies for the difficulty of arbitrage. We conclude in Section VI.

## II. Data

### A. Data Sources

We employ data from the Compustat, CRSP, I/B/E/S, SDC Platinum, Thomson Financial Insider Trading Data Feed, and Thomson Financial 13F databases. The sample covers the years 1986 to 2006, which is the period covered by the Thomson Financial Insider Trading Data Feed database and for which we have full CRSP data available. We only include observations from CRSP which have a share code equal to 10 or 11 (ordinary common shares).

The basic unit of our dataset is a firm-month. To be included in the data set, each firm-month must have at least 24 valid monthly observations in CRSP and eight quarterly financial reports in the Compustat Quarterly file in the preceding four years. In the final sample, we have 1,331,995 firm-month observations.<sup>5</sup>

Insider trading data is from the Thomson Financial Insider Trading Data Feed, which collects the mandatory filings of insiders (Form 4 filings). We follow the insider trading literature regarding the definition of purchases and sales by insiders (e.g., Rozeff and Zaman 1998). We limit the population of insiders to officers and directors and consider only open-

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<sup>5</sup>For our Table IV and Table V cross-sectional regressions (which require additional control variables including non-zero analyst following) we have from 443,270 to 541,917 observations depending on the specific regression.

market purchases and sales with a size of at least 100 shares and a reported stock price below \$1,000. Trades are assigned to the firm-month in which they are executed. (In some tests we accumulate returns from the second month following the trade-month to allow more time for disclosure of the trade to occur.) Overall, we have 122,058 firm-months with purchases by insiders, and 137,940 firm-months with sales by insiders.

Data on share repurchases and SEOs from 1986 to 2006 are provided by SDC Platinum. Repurchases are defined as open-market repurchases and are assigned to the month of the effective date of the repurchase as listed on SDC. We also generate a list of all firms that conducted seasoned equity offerings during our sample period. Overall, the sample includes 11,015 firm-months that conducted open-market repurchases and 6,227 firm-months that conducted SEOs.<sup>6</sup>

We compute variables from the CRSP, Compustat, I/B/E/S, and Thomson Financial 13F databases. From CRSP, we calculate for each firm-month,  $t$ , the one-month lagged market value of equity ( $MVE$ ), six-month cumulative market-adjusted returns from  $t - 6$  to  $t - 1$  ( $PASTRET6$ ), and six-month cumulative market-adjusted returns from  $t + 1$  to  $t + 6$  ( $FUTRET6$ ). Using the Compustat Quarterly File, we compute the market-to-book ratio ( $M/B$ ) as the market value of equity scaled by the book value of equity (item #60). Firm-months with negative  $M/B$  are removed. We compute the future change in operating performance,  $FDROA$ , as the difference between the next quarter's operating income before depreciation (item #21) and the same data item four quarters before, all scaled by total assets (item #44). From I/B/E/S, we compute the number of analysts issuing a one-quarter-ahead earnings forecast in each month ( $ANALYST$ ), along with a measure of forecast revision over

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<sup>6</sup>Results are similar when we define repurchases using Compustat Quarterly item #93 (repurchases of common and preferred stock) and assign the repurchase event to the last month of the quarter.

months  $t + 1$  to  $t + 6$  (*REVISION*; details on this variable are given in Section IV). From the Thomson Financial 13F database, we compute for each firm-quarter the percentage of aggregate institutional share holding (*INST*) and apply that percentage to each month in the quarter.

For each firm-month, we assign indicator variables for whether any of the following transactions took place: stock purchase by a manager or director (*INDBUY*), stock sale by a manager or director (*INDSAL*), open-market share repurchase by the firm (*INDREP*), and seasoned equity offering by the firm (*INDSEO*).<sup>7</sup>

## B. Computing Idiosyncratic Risk

Our measure of idiosyncratic risk (*IRISK*) is the standard deviation of residuals from a regression of monthly returns on a four-factor model (*MKTRF*, *SMB*, *HML*, and *MOM*).<sup>8</sup> Using residuals from a four-factor model ensures that we do not associate idiosyncratic risk with insider and firm trading strategies correlated with these factors.<sup>9</sup>

Our proxy is constructed as follows: For each firm-month,  $t$ , we collect monthly excess (return minus the risk-free rate) returns from months  $t - 60$  through  $t - 12$  and regress these excess returns on the relevant factors. We then compute the standard deviation of the

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<sup>7</sup>Results are similar when the indicator variables equal one only when sufficiently large transactions have occurred. Large transactions are defined as being an above-median trade size for all trades of that type; trade size is measured by the market value of the trade.

<sup>8</sup>Prior studies have used similar measures of idiosyncratic risk (e.g., Wurgler and Zhuravskaya 2002, Ali, Hwang, and Trombley 2003, Mashruwala, Rajgopal, and Shevlin 2006). Pontiff and Schill (2003) who similarly examine returns following SEOs, use the standard deviation of residuals from regressions of three years of monthly firm returns on industry, market, and Fama-French factor-mimicking portfolios. Risk factors are available at Ken French's website: [http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data\\_library.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html)

<sup>9</sup>For example, Rozeff and Zaman (1998), Jenter (2005), and Piotroski and Roulstone (2005) show that insiders are value investors.

residuals from each firm-specific regression.<sup>10</sup> Our proxy for systematic risk (*SYSRISK*) is the total standard deviation of monthly returns over months  $t - 60$  through  $t - 12$ , minus *IRISK*. To allow for portfolio analysis and to ease interpretation of our regression output, we rank both *IRISK* and *SYSRISK* into quintiles and use the quintile assignment as the measure of volatility.

In sorting firms by *IRISK*, there is a concern that we are implicitly sorting by firm size, which is highly correlated with *IRISK* (Bali, Cakici, Yan, and Zhang 2005). To alleviate this concern, we perform a double-sort procedure where we first sort firms on the lagged market value of equity, and then, within these size quintiles, sort firms into quintiles of *IRISK*. With this procedure, the Spearman correlation between the *IRISK* portfolio assignment and lagged market value is  $-0.03$ . Tabulated calendar-time-portfolio results (Tables II, III, and VIII) and cross-sectional regression results (Tables IV and V) use this double-sorting procedure to assign firms to *IRISK* quintiles.

### C. Descriptive Statistics

Table I, Panel A, presents descriptive statistics for the firm-months in our sample. Insider buys (insider sells, share repurchases, SEOs) occur in 9.2% (10.4%, 3.1%, 0.5%) of our firm-months. The mean firm in our sample has a past-six-month market-adjusted return of 1.6%, a market value of equity of \$1.6 billion, a market-to-book ratio of 2.6, is followed by 4.2

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<sup>10</sup>We have also experimented with measuring idiosyncratic risk with respect to market return alone and to market and industry returns where the industry return is the value-weighted return to other firms in the same two-digit SIC sector; results with these measures are similar to those reported. Results are also similar if we use the variance of residuals from a regression of the past year's daily returns on the value-weighted market index as our proxy for idiosyncratic risk.

analysts, and has 27.4% of its shares held by institutions. Raw idiosyncratic risk has a mean (median) value of 0.125 (0.106).

Table I, Panel B, presents correlation coefficients for our main variables. Idiosyncratic is negatively correlated with insider trading and share repurchases, and positively correlated with past returns. Insider buys and share repurchases occur after negative returns and prior to positive returns, while insider sales and SEOs occur after positive returns and prior to negative returns.

### III. Empirical Tests

#### A. Idiosyncratic Risk and Returns around Trades

We conform to Fama (1998), Mitchell and Stafford (2000), and Mitchell, Pulvino, and Stafford (2002), who advocate using the calendar-time-portfolio method to measure abnormal returns around corporate events. With this method, a trading strategy is tested by regressing the excess returns (returns minus the risk-free rate) of portfolios generated by the trading strategy on the contemporaneous returns of factor-mimicking portfolios. If the intercept of these regressions is significantly different from zero, the trading strategy produces abnormal returns, i.e., returns that cannot be subsumed by the known risk factors. As a matter of practice, most researchers use three- or four-factor models where the factors are the market excess return ( $MKTRF$ ), small minus big ( $SMB$ ), high book-to-market minus low book-to-market ( $HML$ ), and a momentum factor ( $MOM$ ).<sup>11</sup>

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<sup>11</sup>For further details on the calendar-time methodology, see Mitchell and Stafford (2000). Jeng, Metrick, and Zeckhauser (2003) use this methodology to estimate the returns to insider trades.

To illustrate the calendar-time-portfolio methodology, we describe the process for assessing abnormal returns in the six months preceding the month of an insider or firm transaction. For each calendar month in our sample, we form a portfolio of all firms that experienced a transaction in the following six months but did not experience the same transaction in either the current month or in the preceding six months.<sup>12</sup> To control for confounding events, we also require that the firm-month not experience an opposing transaction (e.g., insider sales versus insider buys or share repurchases versus SEOs) in the following six months.<sup>13</sup> Within each monthly portfolio, we form five subportfolios based on the quintile of *IRISK* at the beginning of the month (portfolio 1 is low-*IRISK*; portfolio 5 is high-*IRISK*). We then compute equal- and value-weighted returns for each subportfolio and subtract the risk-free rate to form a monthly portfolio excess return. This calculation gives us five time series of monthly observations, one for each level of *IRISK*. The excess returns to these monthly portfolios are then regressed on the contemporaneous returns to the factor-mimicking portfolios with the intercepts in these regressions representing the average monthly return in the six months preceding the specified transaction.

$$R_{pt} - R_{ft} = \beta_0 + \beta_1 MKTRF_t + \beta_2 HML_t + \beta_3 SMB_t + \beta_4 MOM_t + \varepsilon_t$$

We carry out these procedures for insider purchases, insider sales, repurchases, and SEOs.

We assess the significance of the difference in abnormal returns between high-*IRISK* and low-*IRISK* stocks by regressing the difference between portfolio 5's and portfolio 1's ex-

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<sup>12</sup>When we examine returns following transactions, we include firm-months in the portfolio if a transaction occurred in the prior six months; however, we do not require an absence of transactions in the following six months, as this would induce a look-ahead bias. This extra restriction on the pre-transaction portfolios explains the difference in the average number of firm-months per portfolio in Table II versus Table III.

<sup>13</sup>For insider trades, this restriction helps screen out trades made for liquidity reasons. Removing this restriction does not qualitatively change our results although the post-transaction spread in returns across *IRISK* quintiles is slightly lower for all types of transactions.

cess returns on the factors. The intercept from this regression represents the difference in abnormal returns to high- and low-*IRISK* stocks.

## B. Pre-Trade Returns

Results for pre-trade returns are presented in Table II. In the first column of Table II, we present the results for equally-weighted returns preceding purchases by insiders. The average abnormal equal-weighted monthly return in the six months preceding an insider purchase is  $-215$  basis points for high-*IRISK* firms, versus  $-103$  basis points for low-*IRISK* firms; the mean difference of 112 basis points is significant at the 1% level. Similar results are evident for insider sales (Column 3), share repurchases (Column 5), and SEOs (Column 7): insider sales at high(low)-*IRISK* firms are preceded by monthly returns of 363 (141) basis points; monthly returns preceding share repurchases by high(low)-*IRISK* firms are  $-150$  ( $-33$ ) basis points; and returns preceding SEOs at high(low)-*IRISK* firms are 430 (248) basis points (all differences between high- and low-*IRISK* firms for share repurchases, insider sales, and SEOs are significant at the 1% level). Value-weighting the returns (Columns 2, 4, 6, and 8) produces similar results.<sup>14</sup>

Twelve-month pre-trade returns (Table II, Panel B) show similar results: for both equal- and value-weighted returns, abnormal returns in the year ahead of insider purchases and share repurchases (insider sales and SEOs) are negative (positive) with the magnitudes of the returns increasing in the quintile of *IRISK*. These results indicate that insiders and

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<sup>14</sup>Note that our calendar-time analyses may understate the returns to insider and firm trades if these trades are based on mispricing related to the market-to-book ratio. This is particularly important in our regressions as insiders tend to buy “value” stocks and sell “glamour” stocks (Rozeff and Zaman 1998). For a discussion of this issue, see Daniel, Hirshleifer, and Subrahmanyam (2005).

corporations are contrarians, with high-idiosyncratic risk firms displaying the greatest return movement ahead of the transaction.

### C. Post-Trade Returns

Table III presents results for abnormal monthly returns in the six months *following* corporate transactions. For insider purchases and share repurchases (insider sales), abnormal returns following the transaction increase (decrease) in the level of *IRISK*. For example, in Panel A, insider purchases at high (low)-*IRISK* firms are followed by equally-weighted abnormal monthly returns of 155 (72) basis points. Share repurchases at high (low)-*IRISK* firms are followed by abnormal monthly returns of 112 (20) basis points.<sup>15</sup> Differences in equally-weighted monthly abnormal returns between high- and low-*IRISK* stocks are significant at the 1% level for insider purchases and shares repurchases. For insider sales, abnormal monthly returns are decreasing in *IRISK*: in high (low)-*IRISK* firms, insider sales are followed by returns of  $-113$  ( $-60$ ) basis points, with the mean difference significant at the 5% level.<sup>16</sup> However, returns following SEOs are not significantly different across levels of *IRISK*.<sup>17</sup> Value weighting the returns provides similar results for insider purchases and share repurchases (post-trade returns increase in *IRISK*) and for SEOs (post-trade returns are unrelated to *IRISK*); however, post-trade return differences for insider sales are no longer significant. Overall, these results are consistent with managers at high-*IRISK* firms

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<sup>15</sup>These results are consistent with Ikenberry, Lakonishok, and Vermaelen (1995), who find that firms exhibit abnormal returns for several months following stock repurchases.

<sup>16</sup>In general, the empirical evidence suggests that insider purchases have stronger short-term predictive power relative to insider sales (e.g., Marin and Olivier 2008, Lakonishok and Lee 2001).

<sup>17</sup>With equally-weighted returns, only the third quintile of *IRISK* shows significant underperformance. Similarly, Butler, Cornaggia, Grullon, and Weston (2008) show that equity issuances react to prior returns but do not forecast future returns.

either exploiting private information about the future or trading in reaction to perceived misvaluation of their firms' shares.

One potential concern with these results is that market participants may not learn of corporate trades prior to our portfolio formation. For example, for most of our sample period insiders were not required to disclose their trades until the month after they occurred. It is possible that news of trades reported late is not available to investors until two or more months following the trade. To mitigate the possibility that post-trade returns are due to a delay in disclosure, we examine the returns from the *second* to the sixth month following trade-months. Table III, Panel B, presents these results. We again find that insider trades and firm transactions are followed by significant abnormal returns over this time period and that (with the exception of SEOs) return differences across high- and low-*IRISK* stocks are significant at conventional levels.

Finally, Table III, Panel C, presents results for returns over the 12 months following the transaction: results are similar to the six-month results, although equally-weighted return differences across high- and low-*IRISK* firms following insider sales are only significant at the 10% level. Overall, these results indicate that insider and firm transactions at high-idiosyncratic risk firms display greater post-trade returns than insider and firm transactions at low-idiosyncratic risk firms. This is consistent with investors showing a delayed response to events at high-idiosyncratic risk firms, as suggested by the limited-arbitrage literature, but is also consistent with insiders trading on information that only becomes known to the market following the transactions.

## IV. Discussion: Trading on Private Information or Correcting Mispricing?

The results in the previous section show that managers at high-idiosyncratic risk firms earn significant abnormal returns on their personal trades and when repurchasing their firm's equity. Furthermore, purchases (sales) in high-idiosyncratic risk stocks follow, on average, a period of abnormally low (high) returns. These facts are consistent with two interpretations regarding idiosyncratic risk.

The first interpretation is that idiosyncratic risk is a proxy for how much private information is possessed by managers. Rajgopal and Venkatachalam (2005), for example, find that firm idiosyncratic risk is correlated with an accounting measure of information asymmetry, while Aboody, Hughes, and Liu (2005) report that the return to insider trading is positively correlated with this same measure. The idea is that when information asymmetry is high, managers have more opportunities to capitalize on their private information. If managers trade on private information that becomes public after the trade, this future news can explain the returns to insider and corporate transactions.

The second interpretation is that idiosyncratic risk is a proxy for the degree to which stocks may become mispriced. Stocks with highly idiosyncratic returns can become mispriced when arbitrageurs are reluctant to trade on market mispricing because of the difficulty in hedging positions in stocks with few close substitutes (Pontiff 2006). According to this explanation, managers, even when not endowed with private information about value-relevant events, have opportunities to trade when price diverges from their estimate of the firm's value.

In the following tests, we attempt to distinguish between these two explanations for the relation between *IRISK* and returns around corporate transactions. First, we investigate whether proxies for cash-flow news can explain our results. Specifically, we investigate whether analyst forecast revisions and future earnings surprises are associated with corporate transactions in such a way that they can explain the post-transaction returns. Second, we examine whether our results weaken in the latter half of our sample, a time period marked by more aggressive regulation of insider trading than the first half of the sample (Jagolinzer and Roulstone 2009). Third, we test whether arbitrage forces at high-idiosyncratic risk stocks are weak, and therefore mispricing is likely for these stocks. In particular, we examine the response patterns of outside (institutional) investors to trades and the patterns of returns before and following trades.

## **A. Future News and the Likelihood of Trading**

### **A.1. Controlling for Future News: Analyst Revisions**

Our first proxy for private information that becomes public after corporate trades is revisions in analyst consensus forecasts. If insiders are trading on private knowledge of cash-flow news that becomes known after the trades and leads to abnormal post-trade returns, analysts should incorporate this news into their estimates of future earnings. Further, Table III implies these revisions should be greater at high-idiosyncratic risk firms relative to firms with low-idiosyncratic risk.

To test this idea we regress consensus analyst forecast revisions from months  $t+1$  to  $t+6$  relative to a given month  $t$  on indicator variables for whether a trade took place in month

$t$ . The dependent variable ( $REVISION_{t+1,t+6}$ ) is measured as the mean consensus analyst forecast of one-year ahead earnings measured in month  $t+6$ , less the mean consensus analyst forecast of one-year ahead earnings measured in month  $t+1$ , scaled by stock price at the end of month  $t-1$ . We require forecast horizons at month  $t$  to be at least six months to ensure that six-month revisions are completed before actual earnings are released. To reduce noise, we define our trade indicators as equal to one when a trade occurs and no contrary trade occurs in the same month.<sup>18</sup> We include the following control variables in the regressions: the market-adjusted buy and hold return ( $PASTRET6$ ) from months  $t-6$  to  $t-1$ ; the consensus analyst forecast revision from month  $t-3$  to month  $t-1$ ; the logged market value of equity at the end of month  $t-1$ ; and the log of the market-to-book ratio ( $M/B$ ). In addition, we include fixed effects for calendar month and industry (defined by two-digit SIC); standard errors are clustered at the industry level. We interact trade indicators with idiosyncratic risk quintiles. Thus, in Column 1 of Panel A of Table IV, *Corporate Transaction* is the coefficient on an indicator for the existence of insider purchases (with no insider sales that month) for a firm in the lowest quintile of idiosyncratic risk. *Corporate Transaction*  $\times$  *IRISK2* is the change in that coefficient for a firm with insider purchases (and no insider sales) but in the second lowest quintile of idiosyncratic risk. The main effect of idiosyncratic risk (*IRISK*) is also included in the regression.

Contrary to the hypothesis that variation in idiosyncratic risk reflects variation in private information (proxied by analyst forecast revisions) this test shows that analyst revisions following managerial trades do not explain return spreads across levels of idiosyncratic risk.

Column 1 of Panel A of Table IV shows that for firms with low-idiosyncratic risk, insider

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<sup>18</sup>E.g., the trade indicator for insider purchases (sales) equals one when insider purchases (sales) occur during a month and no insider sales (purchases) occur during the same month. Results are similar if we define our trade indicators to simply reflect the presence or absence of a trade (results untabulated).

purchases are followed by positive forecast revisions. However, as idiosyncratic risk increases, forecast revisions are unchanged. Thus, the positive returns following insider purchases at high-idiosyncratic risk firms cannot be explained by information captured by positive analyst forecast revisions: revisions are no more positive at high-idiosyncratic risk firms than at low-idiosyncratic risk firms. Forecast revisions are positively associated with past returns, past revisions, and the market-to-book ratio and are negatively correlated with firm size.

Column 2 reports results for insider sales. For all levels of idiosyncratic risk, forecast revisions are contrarian: they are positive following insider sales and are not more negative for high levels of *IRISK*. Again, if forecast revisions capture shocks to cash-flow news, this news does not explain the post-insider sales returns documented in the paper. For share repurchases (Column 3) and SEOs (Column 4) forecast revisions are essentially zero in the six months following the transactions across all levels of *IRISK*. Overall, our results suggest that for insider and firm trades, post-trade return differences across levels of *IRISK* are not driven by fundamental news as captured in analysts' forecast revisions.

## **A.2. Controlling for Future News: Earnings Surprises**

Our second proxy for private information that becomes public after corporate trades is future earnings surprises. Roulstone (2009) finds a positive correlation between insider purchasing volume and future quarterly earnings surprises. To assess whether future earnings surprises explain insider activity in our sample, Panel B of Table IV shows the results of regressing future earnings surprises on indicators for corporate transactions and control variables. For a given firm-month the dependent variable ( $SUE_{t+3}$ ) is the upcoming quarterly earnings surprise from a random walk with drift time-series model of quarterly earnings (see Brandt,

Kishore, Santa-Clara, and Venkatachalam 2008). Control variables include the most recent earnings surprise ( $SUE$ ), past returns, size, the market-to-book ratio, and the log of the number of analysts following the firm, along with month and industry fixed effects. Column 1 of Panel B shows that for insider purchases at low-idiosyncratic risk firms, the upcoming earnings surprise is positive, consistent with Roulstone (2009). However, earnings surprises in high-idiosyncratic risk are more negative on average than those in low-idiosyncratic risk firms. This evidence contradicts the hypothesis that insiders exploit more private information in high-idiosyncratic risk firms.

Inferences are similar for the rest of the table. Earnings surprises that follow insider sales at low-idiosyncratic risk firms are weaker than when they follow insider sales at high-idiosyncratic risk firms (Corporate Transaction  $\times IRISK5$  is greater than the base level of Corporate Transaction). Earnings surprises that follow share repurchases at high-idiosyncratic firms are weaker than those that at low-idiosyncratic risk firms. In contrast, earnings surprises following SEOs do not vary across levels of idiosyncratic risk. In sum, future news that is revealed through earnings surprises does not vary in a way that can explain the spread in returns across levels of  $IRISK$  following corporate transactions.<sup>19</sup>

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<sup>19</sup>The standardized unexpected earnings in our sample have a high standard deviation. To guard against outliers driving our results we 1) run our regressions after restricting the sample to observations with SUEs between the first and third quartile of the SUE distribution and 2) winsorize the SUE variables at the 1% level. The results (untabulated and available upon request) are similar: there is no evidence that high- $IRISK$  firms have more positive SUES after buys or more negative SUES after sells. For repurchases, after deleting outliers, the future SUE is less negative for high- $IRISK$  firms. However, it is no more positive than the future SUE for low- $IRISK$  firms. Thus, our finding that future earnings surprises do not drive the difference in returns across level of idiosyncratic risk is not driven by outliers.

## B. Future News and the Returns to Corporate Transactions

The previous section presents evidence that corporate insiders do not front run future cash-flow news more in high idiosyncratic risk firms than in low idiosyncratic risk firms. In this section we directly test whether returns to corporate transactions can be explained by future news events. We do this by calculating market-adjusted buy-and-hold returns over months  $t + 1$  to  $t + 6$  (corresponding to the return period in Panel A of Table III) ( $FUTRET6$ ). We then regress these returns on indicators for corporate transactions (fully interacted with  $IRISK$  as in Table IV) along with the future news proxies. In addition to analyst forecast revisions (from Panel A of Table IV) and the next quarterly earnings surprise (from Panel B of Table IV) we include the earnings surprise two quarters ahead ( $SUE_{t+6}$ ). Control variables include logged market-to-book (interacted with  $IRISK$ ), past six-month, market-adjusted returns (interacted with  $IRISK$ ), the log of market value, the log of analyst following, and the past quarterly earnings surprise ( $SUE_t$ ) along with month and industry fixed effects. Standard errors are robust to cross-sectional and time-series dependency across observations in the same industry.

The main finding presented in Table V is that, after controlling for forecast revisions and future earnings surprises, insider purchases, insider sales, and share repurchases continue to be associated with future returns with this association varying with  $IRISK$ . For example, insider purchases at low-idiosyncratic risk firms are followed by six-month returns of 1.3%. At high-idiosyncratic risk firms, insider purchases are followed by six-month returns of 4.4%. The second column of Table V shows that insider sales continue to show increasingly negative returns as  $IRISK$  increases; similarly, Column 3 shows that returns following repurchases are highest at high- $IRISK$  firms. Thus, the return spreads across levels of  $IRISK$  cannot

be explained by two intuitive measures of future cash-flow news.<sup>20</sup> As in Givoly and Palmon (1985), we continue to see post-transaction returns that are unexplained by future news. This is supportive of the idea that insider trades at least partially correct past market mispricing.

### **C. Regulatory Changes in the Penalties for Using Private Information**

Another way to investigate whether private information is related to managerial trades is to compare results from early in our sample period to late in our sample period. Specifically, we rely on a quasi-natural experiment in which the regulatory environment regarding insider trading has evolved over our sample period (Jagolinzer and Roulstone 2009). From 1984–1990 Congress passed three laws regulating insider trading and securities fraud: the Insider Trading Sanctions Act of 1984, the Insider Trading Securities Fraud Enforcement Act of 1988, and the Securities Enforcement Remedies and Penny Stock Reform Act of 1990. Jagolinzer and Roulstone (2009) show that over this time period, insiders increasingly conduct their trades during the month after earnings announcements, a time period marked by relatively low information asymmetry between managers and outside investors (see Figure 1 in their paper).

We test the hypothesis that if differences in return patterns across levels of idiosyncratic risk are driven by insider exploitation of private information, these effects should be lower in the latter half of our sample. We investigate this by rerunning our calendar-time regressions of the difference in excess returns between high- and low-idiosyncratic-risk firms and adding

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<sup>20</sup>The magnitudes of the returns are smaller in Table V relative to Table III; this is probably due to the fact that requiring forecast revisions and earnings surprises leaves us with a sample tilted towards large, stable stocks which are likely to have smaller returns following insider trades (Lakonishok and Lee 2003).

an indicator variable for post-1996 calendar months. An insignificant coefficient on this indicator variable would signify no change in the return differences across levels of idiosyncratic risk. A coefficient that is significant and of the same sign as the overall intercept would indicate a strengthening of the return difference. Observing either result would be inconsistent with the return difference being driven by insider exploitation of private information.

The results in Table VI show that the legislation did not affect the spread in returns across idiosyncratic risk. Panel A shows that in the post-1996 period, return spreads are similar to pre-1996 return spreads for insider purchases, share repurchases, and SEOs. For insider sales, return spreads are actually higher in the post-1996 period. Panel B shows that for all types of transactions, post-trade return spreads do not differ across the two sample periods. Thus, in the latter half of our sample, a time when insiders faced higher regulatory pressure to abstain from trading on private information, we see either no change in return differences across levels of idiosyncratic risk, or an increase in these return differences. This is inconsistent with these return differences being driven by insider exploitation of private information.

In sum, our results are largely inconsistent with the idea that private information and information asymmetry are the main drivers of the spread in post-trade returns across levels of idiosyncratic risk. The other alternative is that the timing of trades by managers are related to market inefficiencies and that variation in post-trade returns across idiosyncratic risk levels reflect different degrees of mispricing. In the next section we look for evidence that arbitrage forces are weak at idiosyncratic firms allowing mispricing to occur.

## D. Returns to Corporate Transactions and Weak Arbitrage Forces

### D.1. Trades by Institutional Investors

Our inference that insiders at high-idiosyncratic risk stocks trade against perceived mispricing implies that arbitrage forces are weak in these firms. In this section, we test this implication by examining the trading behavior of two groups of investors in firms undergoing trading events: institutional investors who report their holdings in 13F filings, and the subset of these institutions who operate as hedge funds.<sup>21</sup> Because the results are similar across the two groups, we only report and discuss results for all institutional investors.

The analysis was performed as follows: we regress quarterly changes in institutional ownership (measured as a percentage of shares outstanding) on indicator variables for trade transactions and the interaction between the trade indicators and the quintile of *IRISK*. We control for lagged market capitalization, market-to-book, analyst following, and six-months past market-adjusted buy-and-hold returns, as well as fixed effects for industry and calendar month. Standard errors are clustered at the industry level.

Results are presented in Table VII. There are four horizontal panels, one for each type of trade (insider purchase, insider sale, share repurchase, and SEO) and four columns for quarters  $-1$ ,  $0$ ,  $+1$ , and  $+2$ , relative to the quarter of the trade event. Thus, the first column and first horizontal panel of Table VII models determinants of the institutional ownership percentage from the end of quarter  $-2$  through the end of quarter  $-1$ , relative to the quarter of an insider purchase event.

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<sup>21</sup>The hedge funds we examine are the same as those in Brunnermeier and Nagel (2004). We thank Stefan Nagel for providing data identifying these funds.

The first two columns of Table VII indicate that institutions trade in the opposite direction of upcoming trade events: in quarters  $-1$  and  $0$ , institutions are selling ahead of insider purchases and repurchases and buying ahead of insider sales and SEOs with these patterns being most pronounced for high-*IRISK* firms. For example, in quarter  $-1$  relative to a quarter where insiders are buying, institutions purchase an additional  $0.13\%$  of low-*IRISK* firms but sell  $0.19\%$  of high-*IRISK* firms ( $0.0013 + (-0.0008 * 4)$ ). Similarly, in the quarter preceding insider sales, institutions do not significantly change their holdings in low-*IRISK* firms but purchase an additional  $0.62\%$  of high-*IRISK* firms ( $-0.0006 + 0.0017 * 4$ ). Given the results in Table II this indicates institutions chase returns (Badrinath and Wahal 2002). The third and fourth columns of Table VII model changes in institutional ownership in the two quarters following the transaction. In quarters  $+1$  and  $+2$ , institutions are slow to realize the valuation implications of the corporate trades. For example, given the results in Table III, institutions should be buying high-*IRISK* firms following insider purchases. Instead, in quarter  $+1$ , they are buying all firms equally (the interaction between the trade indicator and the level of *IRISK* is not significantly different from zero). Only in quarter  $+2$  do institutions begin buying high-*IRISK* firms aggressively: institutional purchases of high-*IRISK* firms are almost double the purchases of low-*IRISK* firms ( $0.52\%$  versus  $0.28\%$ ). Similarly, institutions are still buying in the quarter after insiders' sales and do not begin selling high-*IRISK* firms until quarter  $+2$ . Institutions buy all firms in the quarter following share repurchases and do not begin buying high-*IRISK* firms aggressively until quarter  $+2$ . Finally, institutions (which bought heavily ahead of SEOs) begin selling high-*IRISK* firms in the second quarter following SEOs. Collectively, our evidence indicates that institutions do not anticipate corporate transactions, nor do they react quickly to the

occurrence of the trades, especially for highly idiosyncratic firms. This is consistent with prices being less informative at these firms, allowing insiders opportunities to trade.<sup>22</sup>

## D.2. Price Drifts following Corporate Trades

Further evidence that arbitrage forces are weak comes from the observed drift of prices after corporate transactions. The intercepts in our calendar-time regressions provide the average monthly abnormal returns preceding or following insider and firm transactions but do not indicate how quickly these returns occur. Figure 1 graphs the cumulative monthly intercepts from our value-weighted four-factor regressions for the six months preceding and the 12 months following insider and firm transactions, stratified by *IRISK* quintiles. Consistent with the average monthly results, cumulative monthly returns to insider trades and repurchases increase in magnitude across the quintiles of *IRISK*. Before insider purchases and share repurchases (insider sales and SEOs), returns are decreasing (increasing) especially for high idiosyncratic-risk firms. Further, prices do not react quickly to these corporate transactions; in particular, for insider buys and share repurchases, prices drift upward for a year following the trade event. (For the value-weighted returns shown in Figures 1b and 1d, returns following insider sales and SEOs are essentially flat, consistent with the results in Table III. For equal-weighted results, returns following insider sales decrease over the year following the sale, with the decrease being greatest for high-idiosyncratic risk firms.)

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<sup>22</sup>In untabulated results, we find that the likelihood that a firm has zero institutional ownership is higher for high-*IRISK* firms than for low-*IRISK* firms; further, the level of institutional ownership is decreasing in the firm's quintile of *IRISK* after controlling for size, market-to-book, analyst following, past returns, industry membership, and calendar month. This aversion to idiosyncratic stocks may partially explain why these firms become mispriced in the first place. Similarly, Lev and Nissim (2006) document that institutions avoid extreme accrual stocks, leading to the persistence of the accrual anomaly.

Collectively, the evidence in Table VII and Figure 1 indicate that institutions take time to act on the valuation implications of corporate trades and firm-level idiosyncratic risk.

## V. Robustness

In this section we consider alternative explanations for our results and discuss other proxies for limited arbitrage.

### A. Portfolio Rebalancing

The relation between trading and past returns could be due to portfolio rebalancing: when prices rise (fall), insiders will sell (buy) to maintain an optimal portfolio value. However, if insiders rebalance following price changes, we would expect the relation between this rebalancing and past returns to increase with idiosyncratic risk (because, as idiosyncratic risk rises, the costs of a suboptimal portfolio increase). Instead, we see insiders at high-*IRISK* firms rebalancing after greater price changes than insiders at low-*IRISK* firms. Further, if insider trades are motivated by rebalancing considerations, these trades should not be informative about future returns. Finally, portfolio rebalancing cannot account for the behavior of firm equity transactions (share repurchases and SEOs).

### B. An *IRISK* Factor?

Past studies have shown that idiosyncratic risk may be positively associated with future abnormal returns (Goyal and Santa-Clara 2003). A positive association between future

abnormal returns and idiosyncratic risk should not explain our results, as we document a positive relation between idiosyncratic risk and post-trade returns for purchase events and a negative relation between idiosyncratic risk and post-trade returns for sales events.<sup>23</sup> However, for robustness, we investigate whether sorting firms on *IRISK* is mechanically driving our results.

We first examine this issue by measuring the return to *IRISK* in our sample. Similar to the analysis of the PIN measure in Easley, Hvidkjaer, and O'Hara (2009), we sort firms into 10 deciles based on market value at the end of the prior year. Within these 10 deciles and for each month of our sample period, we sort firms into three portfolios based on the one-month lagged value of *IRISK*. We create the return to *IRISK* by differencing the mean return across firms in the high-*IRISK* portfolio and the mean return across firms in the low-*IRISK* portfolio (creating separate differences within each size decile). We regress the monthly returns to *IRISK* on a four-factor model within each size decile.

The results (not tabulated) indicate that the intercept in these regressions is only significantly different from zero for the two lowest size deciles: 187 basis points per month in the lowest size decile ( $t = 4.64$ ), 116 basis points per month for the second-lowest size decile ( $t = 3.51$ ); for the third-lowest size decile, the intercept is 76 basis points and is marginally significant ( $t = 1.63$ ).

Overall, these pricing regressions suggest that only among the smallest firms is there a possible relation between *IRISK* and returns. Given the strength of our value-weighted results, this suggests that sorting on *IRISK* is not mechanically driving our return results. For

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<sup>23</sup>Pontiff (2006) also makes this point regarding the relation between idiosyncratic risk and the hedge returns to market anomalies.

completeness, we rerun our calendar-time regressions after eliminating firms in the bottom two size deciles; inferences are unchanged with this sample.

Our second technique to examine the effect of *IRISK* on returns involves constructing a factor based on *IRISK* and including this factor in our calendar-time analysis. We construct this factor by averaging the return difference across high- and low-*IRISK* firms over all 10 size deciles each month. Thus, for each month in our sample period, we have the mean return across size deciles for a portfolio long in high-*IRISK* firms and short low-*IRISK* firms. We call this difference our *IRISK* factor (*I\_FACTOR*). Table VIII presents our six-month post-trade calendar-time regressions with this factor included:

$$R_{pt} - R_{ft} = \beta_0 + \beta_1 MKTRF_t + \beta_2 HML_t + \beta_3 SMB_t + \beta_4 MOM_t + \beta_5 I\_FACTOR_t + \varepsilon_t$$

As can be seen in the table, the inclusion of *I\_FACTOR* does not significantly alter our inferences regarding returns following transactions: abnormal returns following insider buys and insider sales still have greater magnitudes when *IRISK* is high than when *IRISK* is low (although the return difference for insider sales disappears when returns are value-weighted). For share repurchases, equal- and value-weighted returns differ significantly across high- and low-*IRISK* firms. Finally, as before, there is no difference in returns following SEOs for high- and low-*IRISK* firms. Overall, the abnormal returns in the *IRISK*-based portfolios are not subsumed by any return difference between high- and low-idiosyncratic risk firms. Rather, controlling for this return difference, trades occurring at high-*IRISK* firms are followed by more extreme returns than are trades that occur at low-*IRISK* firms.

## C. Other Proxies for Limits to Arbitrage

In addition to idiosyncratic risk, several other variables associated with possible mispricing have been considered in the literature. For robustness, we explore whether these proxies are also correlated with post-trade returns. In untabulated results, we examine proxies proposed by Ali, Hwang, and Trombley (2003). Specifically, we examine the effect of share price, firm size, analyst following, institutional ownership, and bid-ask spread on returns following corporate transactions.

As in Ali, Hwang, and Trombley (2003), we regress long-term returns following trades on our proxies for limits-to-arbitrage. This analysis reveals two main points. First, the relations between idiosyncratic volatility and returns following corporate transactions are robust to including these additional arbitrage cost proxies. Second, the returns to insider trades generally increase in the additional proxies for limits to arbitrage. As share prices, firm size, analyst following, and institutional ownership (bid-ask spreads) increase (decrease), returns to insider trades decrease (increase). However, as in Ali, Hwang, and Trombley (2003), these relations are generally subsumed by the idiosyncratic risk relation. Only size and the bid-ask spread retain significance in the presence of idiosyncratic risk. Overall, this analysis indicates that the relation between insider and firm trading profits and potential mispricing is robust to multiple proxies for potential mispricing and that, consistent with Pontiff (2006), idiosyncratic risk is the strongest of these proxies.

We consider one other variable that has been linked to private information and returns to corporate trades. Aboody, Hughes, and Liu (2005) show that returns to insider trades are decreasing in a measure of the quality of financial reporting. The quality measure they

use ( $EQ1$  in their paper) is a measure of discretionary accounting accruals and is calculated as the absolute value of the difference between the total accruals of a firm and the firm-specific predicted total accruals which are calculated using a within-industry (Fama and French 1997) regression model that predicts accruals using the change in revenues, change in accounts receivable, and property, plant, and equipment, all scaled by total assets. (Aboody, Hughes, and Liu (2005) provide a detailed description of the calculation of  $EQ1$ .) Rajgopal and Venkatachalam (2005) show that accrual measures such as  $EQ1$  are correlated with idiosyncratic risk. Thus, we have estimated the effect of  $IRISK$  quintile on calendar-time post-trade returns after first sorting firms into quintiles of  $EQ1$ . Results (untabulated) are similar to those reported: returns following insider trades and share repurchases are of greater magnitude when idiosyncratic risk is high. Thus,  $IRISK$  is not simply proxying for financial reporting quality.

## VI. Conclusion

In this paper, we provide evidence that trades initiated by managers, especially insider trades and share repurchases, are largely motivated by managers' perceptions of market mispricing. This evidence is consistent with the views of Manne (1966), that trading by managers improves the quality of security pricing, and the findings in Rozeff and Zaman (1998) and Jenter (2005) that insider trades are motivated by what managers perceive as market overreactions. Our tests focus on the abnormal returns to insider and corporate trades in firms that differ in their exposure to private information and possible mispricing. Following the prior literature (e.g., Pontiff 2006) our proxy for the existence of private information and

mispricing is idiosyncratic risk. We find that the spread (across quintiles of idiosyncratic risk) in abnormal returns around insider trades and share repurchases is statistically and economically significant.

We further find that idiosyncratic risk is not proxying for private information exploited by corporate insiders, but rather is related to perceived mispricing in stocks where arbitrage is limited. Specifically, insider purchases and sales and share repurchases are not followed by future news events that can explain post-transaction returns, especially differences in those returns across levels of idiosyncratic risk. Controlling for forecast revisions and future earnings surprises, insider transactions and share repurchases continue to be followed by abnormal returns that increase in magnitude as idiosyncratic risk increases. Our results also hold in the latter half of our sample period despite more-stringent insider trading regulation in this time period relative to the early half of our sample period. Finally, we document that arbitrage forces by institutional investors are weak around trading events by corporate insiders, particularly for high-idiosyncratic risk stocks. This is consistent with the drift in returns following transactions. Overall, our results suggest that corporate insiders do make prices more efficient, but generally do so by correcting investors' pricing mistakes rather than by exploiting insiders' private information. That is, they act as arbitrageurs.

A common criticism of insider trading is that insiders will exploit private information and gain at the expense of outside investors. Our results suggest that this criticism is overwrought. However, insider activities in today's market are the endogenous outcome of a system that includes a strong regulatory component. Easing the regulation of insider activities could result in insiders increasing their use of private information in trading, possibly to the detriment of the average investor. Further research, especially research on insider

trading across differing regulatory environments (e.g., Jaffe 1974), is needed to assess the overall costs and benefits of allowing insiders greater freedom when trading in their personal or corporate accounts.

Although our tests support the idea that insiders and firms react to perceived mispricing, we do not argue that corporate trades never make use of private information. Consistent with Roulstone (2009) Table IV shows insider purchases in our sample are positively associated with future earnings surprises for many of our sample firms; however, this relation cannot explain differences in returns across the highest and lowest quintiles of *IRISK*. Similarly, Cheng, Nagar, and Rajan (2007) document that Form-5 trades, which are disclosed after the end of a firm's fiscal year, are predictive of negative future returns and low future earnings, especially in firms with weak corporate governance. Although they do not directly test for a mispricing explanation of Form-5 trades, their results for earnings suggest managers with private information about negative earnings performance sell shares and delay the disclosure of those trades to delay negative returns associated with the revelation of poor earnings performance. Our results should not be taken as evidence that managers do not trade in this manner; rather, we provide evidence that, in firms likely to have private information and/or mispricing, insider and firm trades are generally associated with mispricing.

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## Appendix: Variable Definitions

| Variable              | Definition  |
|-----------------------|---|
| <i>IRISK</i>          | Standard deviation of residuals from a regression of monthly excess returns on the monthly Fama/French factors plus a momentum factor; data from month $t - 12$ through $t - 60$ , minimum 24 months of returns to be in sample.                          |
| <i>IRISK</i> Quintile | <i>IRISK</i> quintile, sorted within calendar month. Quintile values range from 0 to 4.   |
| <i>INDBUY(SAL)</i>    | Indicator variable equal to one if at least one insider purchase (insider sale) occurred during the month.  |
| <i>INDREP(SEO)</i>    | Indicator variable equal to one if a share repurchase (SEO) occurred during the month.  |
| <i>PASTRET6</i>       | Buy-and-hold market-adjusted return over months $-6$ through month $-1$ .   |
| <i>FUTRET6</i>        | Buy-and-hold market-adjusted return over months $+1$ through month $+6$ .   |
| <i>MVE</i>            | The market value of equity at the end of month $t$ .  |
| <i>M/B</i>            | Market value of equity scaled by the book value of equity.  |
| <i>ANALYST</i>        | The number of analysts issuing a one-quarter ahead earnings forecast for the firm in month $t$ .  |
| <i>INST</i>           | Percentage of shares outstanding owned by institutional investors.  |
| $R_f$                 | Risk-free rate of return in month $t$ , proxied by one-month T-bill rate.   |
| <i>MKTRF</i>          | Excess return on the market defined as the value-weighted monthly return to all stocks on CRSP less the one-month treasury bill rate.   |
| <i>SMB</i>            | Mean monthly return on portfolio of small firms less the mean monthly return on portfolio of large firms.   |
| <i>HML</i>            | Mean monthly return on portfolio of value firms less the mean monthly return on portfolio of glamour firms.   |
| <i>MOM</i>            | Mean monthly return on portfolio of winners less the mean monthly return on portfolio of losers.  |
| <i>I_FACTOR</i>       | Mean monthly return on portfolio of high- <i>IRISK</i> firms less the mean monthly return on portfolio of low- <i>IRISK</i> firms.  |
| $REVISION_{t+1,t+6}$  | Forecast revision is the mean analyst forecast six months following the month of the corporate trade minus the mean analyst forecast one month following the corporate trade, scaled by share price at the beginning of the month of the corporate trade. |
| $REVISION_{t-3,t}$    | The forecast revision from three months before the trade month to the trade month.  |
| $SUE_{t+3}$           | For a given month $t$ the next quarterly earnings surprise where the surprise is calculated as the error term from a random-walk with drift earnings time-series model.   |
| $SUE_{t+6}$           | The two-quarter ahead quarterly earnings surprise.  |
| $SUE_t$               | Most recent quarterly earnings surprise.  |
| $I(Post - 1996)$      | An indicator variable for whether a firm-month occurs after 1996.   |
| $\Delta IO$           | The change in institutional ownership in percentage points from the previous quarter to the current quarter.  |

**Table I**  
**Descriptive Statistics**

The table presents descriptive statistics of the sample used (1,331,995 firm-month observations). The sample consists of all firms with complete data from Compustat, CRSP, I/B/E/S, CDA/Spectrum, Thomson Financial's Insider Trading Data Feed for 1986–2006. For the monthly Fama/French variables ( $R_f$ ,  $MKTRF$ ,  $HML$ ,  $SMB$ , and  $MOM$ ) statistics are based on 251 monthly observations. Variable definitions are in the Appendix.

**Panel A: Summary Statistics**

| Variable  | Mean    | Std Dev | Q1      | Median  | Q3     |
|---|---------|---------|---------|---------|--------|
| <i>Raw_IRISK</i>                                | 0.1249  | 0.0873  | 0.0692  | 0.1055  | 0.1595 |
| <i>INDBUY</i>                                   | 0.0916  | 0.2885  | 0.0000  | 0.0000  | 0.0000 |
| <i>INDSAL</i>                                   | 0.1036  | 0.3047  | 0.0000  | 0.0000  | 0.0000 |
| <i>INDREP</i>                                   | 0.0313  | 0.0906  | 0.0000  | 0.0000  | 0.0000 |
| <i>INDSEO</i>                                   | 0.0047  | 0.0682  | 0.0000  | 0.0000  | 0.0000 |
| <i>PASTRET6</i>                                 | 0.0146  | 0.3715  | -0.1675 | -0.0200 | 0.1386 |
| <i>FUTRET6</i>                                  | 0.0122  | 0.3533  | -0.1675 | -0.0200 | 0.1386 |
| <i>MVE</i> (\$millions)                         | 1620.0  | 9940.0  | 27.5    | 115.0   | 593.0  |
| <i>M/B</i>                                      | 2.5851  | 3.3563  | 1.0274  | 1.6127  | 2.7435 |
| <i>ANALYST</i>                                  | 4.1886  | 6.7011  | 0.0000  | 1.0000  | 6.0000 |
| <i>INST</i>                                     | 0.2740  | 0.2690  | 0.0137  | 0.1990  | 0.4760 |
| <i>FDROA</i>                                    | -0.0002 | 0.0213  | -0.0006 | 0.0000  | 0.0001 |
| $R_f$   | 0.0040  | 0.0016  | 0.0030  | 0.0042  | 0.0049 |
| <i>MKTRF</i>                                    | 0.0064  | 0.0464  | -0.0217 | 0.0111  | 0.0380 |
| <i>HML</i>                                      | 0.0030  | 0.0336  | -0.0158 | 0.0030  | 0.0193 |
| <i>SMB</i>                                      | 0.0005  | 0.0362  | -0.0209 | -0.0013 | 0.0197 |
| <i>MOM</i>                                      | 0.0087  | 0.0468  | -0.0055 | 0.0108  | 0.0287 |
| <i>I_FACTOR</i>                                 | -0.0004 | 0.0534  | -0.0233 | -0.0003 | 0.0207 |
| <i>REVISION</i> <sub><math>t+1,t+6</math></sub> | -0.0273 | 0.1109  | -0.0115 | -0.0007 | 0.0011 |
| <i>SUE</i> <sub><math>t+3</math></sub>          | -0.2466 | 4.6120  | -0.6972 | -0.0028 | 0.6756 |
| <i>SUE</i> <sub><math>t+6</math></sub>          | -0.2166 | 3.7615  | -0.6674 | -0.0018 | 0.6459 |
| <i>SUE</i> <sub><math>t</math></sub>            | -0.2533 | 20.7660 | -0.6521 | 0.0089  | 0.6702 |
| $\Delta IO_{Q=0}$                               | 0.0047  | 0.0624  | -0.0076 | 0.0000  | 0.0164 |

**Panel B: Correlation Table**

|                 | <i>IRISK</i>  | <i>IND BUY</i> | <i>IND SAL</i> | <i>IND REP</i> | <i>IND SEO</i> |
|-----------------|---------------|----------------|----------------|----------------|----------------|
| <i>INDBUY</i>   | <b>-0.045</b> |                |                |                |                |
| <i>INDSAL</i>   | <b>-0.037</b> | <b>0.033</b>   |                |                |                |
| <i>INDREP</i>   | <b>-0.095</b> | <b>0.010</b>   | <b>0.024</b>   |                |                |
| <i>INDSEO</i>   | 0.000         | <b>0.009</b>   | <b>0.024</b>   | <b>-0.016</b>  |                |
| <i>PASTRET6</i> | <b>0.059</b>  | <b>-0.051</b>  | <b>0.098</b>   | <b>-0.032</b>  | <b>0.049</b>   |
| <i>FUTRET6</i>  | <b>0.004</b>  | <b>0.027</b>   | <b>-0.008</b>  | <b>0.002</b>   | <b>-0.002</b>  |

**Table II**  
**Pre-trade Calendar-Time-Portfolio Returns by *IRISK* Quintile**

The table presents intercepts (which measure average monthly returns in basis points) from calendar-time regressions of monthly, portfolio excess returns, stratified by *IRISK* quintile (double-sorted by lagged market value), on the Fama and French (1993) and Carhart (1997) four-factor model. Standard errors are in parentheses. Each regression is based on 251 monthly observations from 1986 to 2006. *IRISK* is defined in the Appendix.  $R_p$  is the time-series of mean monthly returns from a portfolio that includes event-firm-months stratified by *IRISK* quintile. A firm-month is included in the event portfolio if it falls within the six months (Panel A) or the 12 months (Panel B) preceding the month of a corporate transaction (insider purchase or sale, share repurchase, or SEO) and there has not been a similar transaction in the past six months (Panel A) or 12 months (Panel B). The mean number of firms in each monthly *IRISK* category is 390 for insider purchases, 370 for insider sales, 215 for repurchases and 115 for SEOs. \*, \*\*, \*\*\* denote two-tailed significance at the 10%, 5%, and 1% level, respectively.

$$R_{pt} - R_{ft} = \beta_0 + \beta_1 MKTRF_t + \beta_2 HML_t + \beta_3 SMB_T + \beta_4 MOM_t + \varepsilon_t$$

**Panel A: Six-Month Pre-Trade Returns (Average Monthly Basis Points)**

| <i>IRISK</i><br>quintile | Insider purchases   |                     | Insider sales      |                    | Repurchases         |                     | SEOs               |                    |
|--------------------------|---------------------|---------------------|--------------------|--------------------|---------------------|---------------------|--------------------|--------------------|
|                          | EW                  | VW                  | EW                 | VW                 | EW                  | VW                  | EW                 | VW                 |
| 1                        | -102.7***<br>(14.7) | -65.4***<br>(19.2)  | 140.5***<br>(15.0) | 21.5<br>(16.8)     | -33.3**<br>(15.7)   | -25.0<br>(21.0)     | 247.9***<br>(34.9) | 141.6***<br>(39.7) |
| 2                        | -138.4***<br>(14.7) | -95.1***<br>(20.4)  | 160.7***<br>(16.6) | 76.8***<br>(21.8)  | -70.1***<br>(15.0)  | -24.7<br>(20.1)     | 310.5***<br>(65.0) | 106.9***<br>(30.8) |
| 3                        | -164.0***<br>(18.5) | -133.2***<br>(20.8) | 245.9***<br>(17.7) | 105.6***<br>(21.6) | -73.8***<br>(17.2)  | 13.6<br>(24.5)      | 371.9***<br>(37.6) | 193.7***<br>(34.2) |
| 4                        | -178.7***<br>(19.5) | -160.4***<br>(28.3) | 353.8***<br>(23.5) | 130.9***<br>(25.6) | -97.1***<br>(18.9)  | -75.0**<br>(31.5)   | 453.7***<br>(34.6) | 267.3***<br>(36.9) |
| 5                        | -215.1***<br>(27.6) | -276.0***<br>(34.0) | 363.1***<br>(30.8) | 254.9***<br>(27.0) | -150.4***<br>(24.6) | -137.3***<br>(33.0) | 429.9***<br>(36.2) | 367.9***<br>(35.7) |
| 5-1                      | -112.4***<br>(29.6) | -210.6***<br>(37.8) | 222.7***<br>(33.5) | 233.4***<br>(31.0) | -117.1***<br>(27.2) | -112.2***<br>(39.9) | 182.0***<br>(43.2) | 226.3***<br>(48.4) |

**Panel B: 12-Month Pre-Trade Returns (Average Monthly Basis Points)**

| <i>IRISK</i><br>quintile | Insider purchases   |                     | Insider sales      |                    | Repurchases        |                  | SEOs               |                    |
|--------------------------|---------------------|---------------------|--------------------|--------------------|--------------------|------------------|--------------------|--------------------|
|                          | EW                  | VW                  | EW                 | VW                 | EW                 | VW               | EW                 | VW                 |
| 1                        | -89.0***<br>(16.4)  | -58.4***<br>(20.8)  | 147.4***<br>(16.8) | 29.1<br>(22.6)     | -20.7<br>(14.1)    | -14.6<br>(18.0)  | 209.3***<br>(26.4) | 41.7<br>(25.8)     |
| 2                        | -100.1***<br>(17.3) | -86.1***<br>(23.1)  | 152.0***<br>(21.1) | 76.0***<br>(23.5)  | -29.2**<br>(12.5)  | -31.7*<br>(16.9) | 274.8***<br>(33.6) | 88.2***<br>(29.8)  |
| 3                        | -132.3***<br>(21.6) | -123.5***<br>(23.2) | 261.9***<br>(26.3) | 71.2***<br>(23.4)  | -41.9***<br>(14.2) | -5.6<br>(21.5)   | 350.9***<br>(37.6) | 137.7***<br>(35.0) |
| 4                        | -135.9***<br>(21.1) | -178.0***<br>(25.3) | 346.0***<br>(26.0) | 135.3***<br>(24.1) | -51.4***<br>(15.1) | -17.4<br>(20.7)  | 416.9***<br>(31.2) | 253.1***<br>(31.7) |
| 5                        | -170.4***<br>(29.3) | -286.6***<br>(30.6) | 334.9***<br>(34.9) | 130.5***<br>(33.8) | -71.8***<br>(21.5) | -38.4<br>(31.2)  | 417.3***<br>(31.3) | 309.0***<br>(33.4) |
| 5-1                      | -81.4***<br>(29.7)  | -228.2***<br>(37.4) | 187.5***<br>(35.7) | 101.4**<br>(41.9)  | -51.1**<br>(25.0)  | -23.8<br>(35.4)  | 208.0***<br>(35.3) | 267.3***<br>(39.2) |

**Table III**  
**Post-trade Calendar-Time-Portfolio Returns by *IRISK* Quintile**

The table presents intercepts (which measure average monthly returns in basis points) from calendar-time regressions of monthly portfolio excess returns, stratified by *IRISK* quintile (double sorted by lagged market value), on the Fama and French (1993) and Carhart (1997) four-factor model. Standard errors are in parentheses. Each regression is based on 251 monthly observations from 1986 to 2006. *IRISK* and *I\_FACTOR* are defined in the Appendix.  $R_p$  is the time-series of mean monthly returns from a portfolio that includes event-firm-months stratified by *IRISK* quintile. A firm-month is included in the event portfolio if it falls within the six months (Panel A and C), the second through sixth month (Panel B), or the 12 months (Panel C) following the month of a corporate transaction (insider purchase or sale, share repurchase, or SEO). The mean number of firms in each monthly *IRISK* category is 825 for insider purchases, 800 for insider sales, 250 for repurchases and 141 for SEOs. \*, \*\*, \*\*\* denote two-tailed significance at the 10%, 5%, and 1% level, respectively.

$$R_{pt} - R_{ft} = \beta_0 + \beta_1 MKTRF_t + \beta_2 HML_t + \beta_3 SMB_T + \beta_4 MOM_t + \varepsilon_t$$

**Panel A: Six-Month Post-Trade Returns (Average Monthly Basis Points)**

| <i>IRISK</i><br>quintile | Insider purchases  |                    | Insider sales       |                    | Repurchases        |                    | SEOs               |                  |
|--------------------------|--------------------|--------------------|---------------------|--------------------|--------------------|--------------------|--------------------|------------------|
|                          | EW                 | VW                 | EW                  | VW                 | EW                 | VW                 | EW                 | VW               |
| 1                        | 71.6***<br>(11.7)  | 45.8***<br>(15.7)  | -59.9***<br>(12.2)  | -42.5***<br>(13.1) | 19.8<br>(15.4)     | -6.6<br>(19.3)     | 4.7<br>(26.1)      | -40.8<br>(36.0)  |
| 2                        | 54.2***<br>(13.7)  | 59.6***<br>(19.2)  | -54.3***<br>(10.6)  | -54.3***<br>(15.8) | 54.2***<br>(14.0)  | 43.8*<br>(22.5)    | -8.9<br>(25.7)     | 3.9<br>(27.7)    |
| 3                        | 87.6***<br>(15.5)  | 65.4***<br>(16.5)  | -76.8***<br>(11.0)  | -42.3**<br>(16.4)  | 56.8***<br>(15.5)  | 55.7**<br>(23.9)   | -67.2***<br>(25.5) | -38.5<br>(29.6)  |
| 4                        | 147.7***<br>(19.5) | 84.4***<br>(21.4)  | -64.7***<br>(13.3)  | -44.2**<br>(18.3)  | 57.0***<br>(17.3)  | 90.3***<br>(30.8)  | -21.3<br>(28.0)    | -60.3*<br>(32.0) |
| 5                        | 155.1***<br>(31.1) | 132.2***<br>(23.8) | -112.7***<br>(17.9) | -64.8***<br>(24.2) | 112.4***<br>(27.0) | 119.5***<br>(37.4) | -15.2<br>(26.5)    | -37.5<br>(33.2)  |
| 5-1                      | 83.5***<br>(29.7)  | 86.4***<br>(28.7)  | -52.7**<br>(22.1)   | -22.2<br>(29.9)    | 91.7***<br>(30.2)  | 124.9***<br>(42.1) | -19.9<br>(34.3)    | 3.3<br>(48.7)    |

**Panel B: Two-to-Six-Month Post-Trade Returns (Average Monthly Basis Points)**

| <i>IRISK</i><br>quintile | Insider purchases  |                    | Insider sales       |                    | Repurchases        |                    | SEOs               |                  |
|--------------------------|--------------------|--------------------|---------------------|--------------------|--------------------|--------------------|--------------------|------------------|
|                          | EW                 | VW                 | EW                  | VW                 | EW                 | VW                 | EW                 | VW               |
| 1                        | 64.5***<br>(11.5)  | 47.7***<br>(15.6)  | -54.0***<br>(12.5)  | -31.7**<br>(12.7)  | 0.5<br>(17.0)      | -24.9<br>(19.5)    | -12.8<br>(25.4)    | -38.6<br>(38.8)  |
| 2                        | 43.5***<br>(13.0)  | 57.8***<br>(19.0)  | -45.2***<br>(10.6)  | -60.9***<br>(16.0) | 45.4***<br>(14.6)  | 33.5<br>(24.2)     | -25.2<br>(28.7)    | -16.2<br>(32.8)  |
| 3                        | 69.2***<br>(16.1)  | 52.8***<br>(17.2)  | -64.7***<br>(10.7)  | -34.0*<br>(17.4)   | 35.9**<br>(17.3)   | 57.6**<br>(25.4)   | -86.4***<br>(26.7) | -43.2<br>(31.0)  |
| 4                        | 126.7***<br>(18.8) | 68.7***<br>(20.7)  | -58.7***<br>(12.5)  | -32.0<br>(19.4)    | 38.2**<br>(18.9)   | 64.3*<br>(32.8)    | -42.3<br>(28.4)    | -61.3*<br>(32.1) |
| 5                        | 142.1***<br>(31.1) | 143.3***<br>(24.6) | -105.5***<br>(18.5) | -60.7**<br>(24.8)  | 118.4***<br>(29.6) | 133.5***<br>(40.9) | -28.6<br>(28.6)    | -61.1*<br>(33.0) |
| 5-1                      | 77.6**<br>(30.2)   | 95.6***<br>(28.2)  | -51.5**<br>(21.9)   | -29.1<br>(29.8)    | 117.9***<br>(34.2) | 158.3***<br>(45.3) | -15.7<br>(36.6)    | -22.5<br>(50.6)  |

**Table III**  
**Post-trade Calendar-Time-Portfolio Returns by *IRISK* Quintile (Cont.)**

**Panel C: 12-Month Post-Trade Returns (Average Monthly Basis Points)**

| <i>IRISK</i><br>quintile | Insider purchases  |                    | Insider sales      |                    | Repurchases        |                    | SEOs               |                   |
|--------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------------|
|                          | EW                 | VW                 | EW                 | VW                 | EW                 | VW                 | EW                 | VW                |
| 1                        | 50.1***<br>(10.9)  | 31.8**<br>(16.0)   | -44.2***<br>(13.2) | -23.7*<br>(13.0)   | 25.0*<br>(13.5)    | -3.6<br>(16.4)     | -23.0<br>(21.7)    | -33.4<br>(23.3)   |
| 2                        | 36.7**<br>(14.2)   | 55.8***<br>(18.5)  | -46.4***<br>(12.6) | -45.1***<br>(15.5) | 33.6***<br>(12.4)  | 11.4<br>(16.7)     | -19.4<br>(20.7)    | 1.9<br>(26.5)     |
| 3                        | 67.5***<br>(16.0)  | 45.8***<br>(15.6)  | -54.6***<br>(11.2) | -43.4**<br>(16.8)  | 41.9***<br>(12.5)  | 46.1**<br>(20.5)   | -58.5***<br>(19.6) | -42.9*<br>(23.8)  |
| 4                        | 127.7***<br>(19.9) | 92.6***<br>(19.0)  | -38.2***<br>(14.5) | -41.8**<br>(19.6)  | 65.0***<br>(14.0)  | 96.9***<br>(27.1)  | -16.1<br>(20.1)    | -47.9**<br>(21.9) |
| 5                        | 123.1***<br>(32.4) | 100.5***<br>(22.7) | -85.9***<br>(19.3) | -36.7<br>(25.2)    | 108.5***<br>(22.4) | 118.8***<br>(28.4) | -15.3<br>(25.1)    | -4.6<br>(28.3)    |
| 5-1                      | 73.0**<br>(30.8)   | 68.7**<br>(26.5)   | -41.8*<br>(22.6)   | -13.1<br>(31.7)    | 82.6***<br>(27.1)  | 121.1***<br>(33.9) | 7.8<br>(32.3)      | 28.8<br>(34.1)    |

**Table IV**  
**Are Trades at High-Idiosyncratic Risk Firms Correlated with Innovations in Cash-Flow Expectations or Cash-Flow News?**

The table presents results from OLS regressions of revisions in analysts' earnings forecasts (Panel A) and earnings surprises (Panel B) on indicator variables for corporate transactions and control variables for all firms with complete data from Compustat, CRSP, I/B/E/S, CDA/Spectrum, SDC Platinum, and Thomson Financial's Insider Trading Data Feed for 1986–2006. Variable definitions are provided in the Appendix. \*, \*\*, \*\*\* denote two-tailed significance at the 10%, 5%, and 1% level, respectively. Standard errors (in parentheses) are robust to heteroscedasticity and dependence across observations in the same industry (defined by two-digit SIC).

**Panel A: Revisions of Analyst Expectations**

|                        | (1)  | (2)        | (3)         | (4)        |
|------------------------|--|------------|-------------|------------|
|                        | Dependent Variable: REVISION <sub>t+1,t+6</sub> ( $\times 100$ ) |            |             |            |
| Corporate Transaction: | Buys   | Sells      | Repurchases | SEOs       |
| Corporate Transaction  | 0.0103*  | 0.0098**   | 0.0060      | 0.0225     |
|                        | (0.0053)   | (0.0046)   | (0.0123)    | (0.0162)   |
| $\times IRISK2$        | -0.0064  | 0.0046     | 0.0122      | -0.0093    |
|                        | (0.0060)   | (0.0075)   | (0.0130)    | (0.0154)   |
| $\times IRISK3$        | -0.0055  | 0.0024     | -0.0153     | -0.0082    |
|                        | (0.0069)   | (0.0060)   | (0.0164)    | (0.0214)   |
| $\times IRISK4$        | 0.0039   | 0.0066     | 0.0126      | 0.0016     |
|                        | (0.0067)   | (0.0048)   | (0.0156)    | (0.0196)   |
| $\times IRISK5$        | -0.0048  | 0.0039     | 0.0029      | -0.0271    |
|                        | (0.0064)   | (0.0059)   | (0.0207)    | (0.0172)   |
| $PASTRET_{t-6,t-1}$    | 0.0071**   | 0.0059*    | 0.0068**    | 0.0067**   |
|                        | (0.0033)   | (0.0033)   | (0.0034)    | (0.0033)   |
| $REVISION_{t-3,t-1}$   | 0.1957***  | 0.1958***  | 0.1956***   | 0.1955***  |
|                        | (0.0060)   | (0.0060)   | (0.0060)    | (0.0060)   |
| $LN(MKTCAP)$           | -0.0029***   | -0.0031*** | -0.0029***  | -0.0029*** |
|                        | (0.0010)   | (0.0009)   | (0.0010)    | (0.0010)   |
| $LN(M/B)$              | 0.0053***  | 0.0049**   | 0.0052***   | 0.0052***  |
|                        | (0.0019)   | (0.0019)   | (0.0019)    | (0.0019)   |
| $IRISK$                | 0.0016   | 0.0014     | 0.0016      | 0.0016     |
|                        | (0.0010)   | (0.0010)   | (0.0010)    | (0.0010)   |
| Month Fixed Effects    | Yes  | Yes        | Yes         | Yes        |
| Industry Fixed Effects | Yes  | Yes        | Yes         | Yes        |
| Observations           | 537887   | 537887     | 537887      | 537887     |
| R <sup>2</sup>         | 0.7205   | 0.7205     | 0.7205      | 0.7205     |

**Table IV: Are Trades at High-Idiosyncratic Risk Firms Correlated with Innovations in Cash-Flow Expectations or Cash-Flow News? (Cont.)**

**Panel B: Innovations in Future Earnings**

| Corporate Transaction: | (1)                             | (2)        | (3)         | (4)        |
|------------------------|---------------------------------|------------|-------------|------------|
|                        | Dependent Variable: $SUE_{t+3}$ |            |             |            |
|                        | Buys                            | Sells      | Repurchases | SEOs       |
| Corporate Transaction  | 0.0656*                         | 0.0149     | -0.0867     | 0.2771**   |
|                        | (0.0354)                        | (0.0474)   | (0.0798)    | (0.1371)   |
| $\times IRISK2$        | -0.0812*                        | 0.0151     | -0.2417*    | 0.0343     |
|                        | (0.0437)                        | (0.0645)   | (0.1277)    | (0.1619)   |
| $\times IRISK3$        | -0.0791                         | 0.1731***  | 0.0345      | 0.0093     |
|                        | (0.0492)                        | (0.0438)   | (0.0998)    | (0.1551)   |
| $\times IRISK4$        | 0.0078                          | 0.1665***  | 0.0644      | -0.0678    |
|                        | (0.0532)                        | (0.0475)   | (0.0999)    | (0.1629)   |
| $\times IRISK5$        | -0.0934*                        | 0.1137*    | -0.2968***  | -0.2665    |
|                        | (0.0538)                        | (0.0638)   | (0.1101)    | (0.1630)   |
| $SUE_t$                | 0.0658***                       | 0.0656***  | 0.0657***   | 0.0658***  |
|                        | (0.0067)                        | (0.0067)   | (0.0067)    | (0.0067)   |
| $PASTRET_{t-6,t-1}$    | 0.7942***                       | 0.7846***  | 0.7926***   | 0.7923***  |
|                        | (0.0900)                        | (0.0893)   | (0.0896)    | (0.0896)   |
| $LN(MKTCAP)$           | 0.0385**                        | 0.0371**   | 0.0389**    | 0.0385**   |
|                        | (0.0157)                        | (0.0160)   | (0.0158)    | (0.0157)   |
| $LN(M/B)$              | 0.0690***                       | 0.0659***  | 0.0691***   | 0.0691***  |
|                        | (0.0174)                        | (0.0174)   | (0.0174)    | (0.0174)   |
| $LN(ANALYST + 1)$      | -0.1265***                      | -0.1284*** | -0.1264***  | -0.1264*** |
|                        | (0.0277)                        | (0.0278)   | (0.0277)    | (0.0277)   |
| $IRISK$                | -0.0180                         | -0.0236    | -0.0185     | -0.0184    |
|                        | (0.0148)                        | (0.0147)   | (0.0147)    | (0.0147)   |
| Month Fixed Effects    | Yes                             | Yes        | Yes         | Yes        |
| Industry Fixed Effects | Yes                             | Yes        | Yes         | Yes        |
| Observations           | 541917                          | 541917     | 541917      | 541917     |
| $R^2$                  | 0.0158                          | 0.0159     | 0.0158      | 0.0158     |

**Table V**  
**Are Future Returns Associated with Corporate Transactions after controlling for Cash-Flow News?**

The table presents results from OLS regressions of buy and hold market-adjusted returns on indicators for corporate transactions and proxies for future revisions in cash-flow news. Variable definitions are in the appendix. \*, \*\*, \*\*\* denote two-tailed significance at the 10%, 5%, and 1% level, respectively. Standard errors (in parentheses) are robust to heteroscedasticity and cross-sectional and time-series dependence across observations in the same industry (defined by two-digit SIC).

|                           | (1)                                | (2)                    | (3)                   | (4)                   |
|---------------------------|------------------------------------|------------------------|-----------------------|-----------------------|
|                           | Dependent Variable: <i>FUTRET6</i> |                        |                       |                       |
| Corporate Transaction:    | Buys                               | Sells                  | Repurchases           | SEOs                  |
| Corporate Transaction     | 0.0134***<br>(0.0033)              | -0.0021<br>(0.0043)    | -0.0020<br>(0.0069)   | 0.0023<br>(0.0083)    |
| × <i>IRISK2</i>           | -0.0039<br>(0.0043)                | -0.0074<br>(0.0046)    | 0.0068<br>(0.0093)    | -0.0024<br>(0.0129)   |
| × <i>IRISK3</i>           | 0.0177***<br>(0.0051)              | -0.0119**<br>(0.0055)  | 0.0175<br>(0.0108)    | -0.0403**<br>(0.0163) |
| × <i>IRISK4</i>           | 0.0473***<br>(0.0113)              | -0.0248***<br>(0.0061) | 0.0237<br>(0.0160)    | -0.0141<br>(0.0159)   |
| × <i>IRISK5</i>           | 0.0307***<br>(0.0073)              | -0.0251***<br>(0.0082) | 0.0475***<br>(0.0128) | -0.0199<br>(0.0160)   |
| <i>SUE</i> <sub>t+3</sub> | 0.0026***<br>(0.0006)              | 0.0026***<br>(0.0006)  | 0.0026***<br>(0.0006) | 0.0026***<br>(0.0006) |
| × <i>IRISK2</i>           | 0.0005<br>(0.0010)                 | 0.0005<br>(0.0010)     | 0.0005<br>(0.0010)    | 0.0005<br>(0.0010)    |
| × <i>IRISK3</i>           | 0.0010<br>(0.0011)                 | 0.0010<br>(0.0011)     | 0.0010<br>(0.0011)    | 0.0010<br>(0.0011)    |
| × <i>IRISK4</i>           | 0.0021**<br>(0.0010)               | 0.0022**<br>(0.0010)   | 0.0021**<br>(0.0010)  | 0.0021**<br>(0.0010)  |
| × <i>IRISK5</i>           | 0.0046***<br>(0.0013)              | 0.0046***<br>(0.0013)  | 0.0046***<br>(0.0013) | 0.0046***<br>(0.0013) |
| <i>SUE</i> <sub>t+6</sub> | 0.0054***<br>(0.0011)              | 0.0054***<br>(0.0011)  | 0.0054***<br>(0.0011) | 0.0054***<br>(0.0011) |
| × <i>IRISK2</i>           | 0.0043***<br>(0.0013)              | 0.0043***<br>(0.0013)  | 0.0043***<br>(0.0013) | 0.0043***<br>(0.0013) |
| × <i>IRISK3</i>           | 0.0055**<br>(0.0027)               | 0.0055**<br>(0.0027)   | 0.0055**<br>(0.0027)  | 0.0055**<br>(0.0027)  |
| × <i>IRISK4</i>           | 0.0048**<br>(0.0020)               | 0.0048**<br>(0.0020)   | 0.0048**<br>(0.0020)  | 0.0048**<br>(0.0020)  |
| × <i>IRISK5</i>           | 0.0114***<br>(0.0023)              | 0.0115***<br>(0.0023)  | 0.0115***<br>(0.0023) | 0.0115***<br>(0.0023) |

(continues on next page)

**Table V: Are Future Returns Associated with Corporate Transactions after controlling for Cash-Flow News? (Cont.)**

|                        |                        |                        |                        |                        |
|------------------------|------------------------|------------------------|------------------------|------------------------|
| $REVISION_{t+1,t+6}$   | 0.0121**<br>(0.0059)   | 0.0122**<br>(0.0060)   | 0.0120**<br>(0.0060)   | 0.0120**<br>(0.0060)   |
| $\times IRISK2$        | -0.0138***<br>(0.0047) | -0.0131***<br>(0.0047) | -0.0131***<br>(0.0048) | -0.0131***<br>(0.0047) |
| $\times IRISK3$        | -0.0192***<br>(0.0053) | -0.0191***<br>(0.0054) | -0.0193***<br>(0.0054) | -0.0193***<br>(0.0053) |
| $\times IRISK4$        | -0.0256***<br>(0.0054) | -0.0269***<br>(0.0054) | -0.0266***<br>(0.0055) | -0.0265***<br>(0.0055) |
| $\times IRISK5$        | -0.0251***<br>(0.0068) | -0.0243***<br>(0.0069) | -0.0243***<br>(0.0068) | -0.0243***<br>(0.0068) |
| $LN(M/B)$              | 0.0038<br>(0.0050)     | 0.0039<br>(0.0050)     | 0.0042<br>(0.0050)     | 0.0041<br>(0.0050)     |
| $\times IRISK$         | -0.0009<br>(0.0015)    | -0.0008<br>(0.0016)    | -0.0012<br>(0.0015)    | -0.0012<br>(0.0015)    |
| $PASTRET_{t-6,t-1}$    | 0.0348**<br>(0.0156)   | 0.0340**<br>(0.0157)   | 0.0334**<br>(0.0156)   | 0.0335**<br>(0.0156)   |
| $\times IRISK$         | -0.0031<br>(0.0048)    | -0.0028<br>(0.0048)    | -0.0030<br>(0.0048)    | -0.0030<br>(0.0048)    |
| $IRISK$                | -0.0031**<br>(0.0015)  | -0.0013<br>(0.0015)    | -0.0022<br>(0.0015)    | -0.0020<br>(0.0015)    |
| $SUE$                  | 0.0007**<br>(0.0003)   | 0.0007**<br>(0.0003)   | 0.0007**<br>(0.0003)   | 0.0007**<br>(0.0003)   |
| $LN(MKTCAP)$           | -0.0064***<br>(0.0015) | -0.0062***<br>(0.0014) | -0.0065***<br>(0.0015) | -0.0065***<br>(0.0015) |
| $LN(ANALYST + 1)$      | 0.0039<br>(0.0028)     | 0.0040<br>(0.0028)     | 0.0037<br>(0.0028)     | 0.0037<br>(0.0028)     |
| Month Fixed Effects    | Yes                    | Yes                    | Yes                    | Yes                    |
| Industry Fixed Effects | Yes                    | Yes                    | Yes                    | Yes                    |
| Observations           | 443270                 | 443270                 | 443270                 | 443270                 |
| R <sup>2</sup>         | 0.0632                 | 0.0628                 | 0.0625                 | 0.0624                 |

**Table VI**  
**Do Return Spreads Change Post-1996?**

The table presents intercepts (which measure average monthly returns in basis points) from calendar-time regressions of the difference in monthly portfolio excess returns between firms in the top *IRISK* quintile and the bottom *IRISK* quintile (Q5-Q1). The explanatory variables are the Fama and French (1993) and Carhart (1997) four-factor model and an indicator variable for post-1996 observations. Standard errors are in parentheses. Each regression is based on 251 monthly observations from 1986 to 2006. *IRISK* is defined in the Appendix.  $R_p$  is the time-series of mean monthly returns from a portfolio that includes event-firm-months stratified by *IRISK* quintile.  $I(Post-1996)$  is a dummy variable with the value of one for months later than 1996, and zero otherwise. A firm-month is included in the event portfolio if it falls within the six months prior to (Panel A) or following (Panel B) the event month. \*, \*\*, \*\*\* denote two-tailed significance at the 10%, 5%, and 1% level, respectively.

$$R_{pt} - R_{ft} = \beta_0 + \beta_1 I(Post-1996) + \beta_2 MKTRF_t + \beta_3 HML_t + \beta_4 SMB_T + \beta_5 MOM_t + \varepsilon_t$$

**Panel A: Six-Month Pre-Trade Returns (Average Monthly Basis Points)**

|                            | Insider purchases   |                     | Insider sales      |                    | Repurchases        |                     | SEOs               |                    |
|----------------------------|---------------------|---------------------|--------------------|--------------------|--------------------|---------------------|--------------------|--------------------|
|                            | EW                  | VW                  | EW                 | VW                 | EW                 | VW                  | EW                 | VW                 |
| Intercept ( $\beta_0$ )    | -107.6***<br>(39.8) | -167.9***<br>(50.7) | 152.3***<br>(44.5) | 169.8***<br>(41.3) | -99.1***<br>(36.5) | -128.7***<br>(53.7) | 143.1***<br>(57.9) | 192.1***<br>(65.0) |
| I(Post-1996) ( $\beta_1$ ) | -10.3<br>(56.5)     | -90.8<br>(71.9)     | 150.1***<br>(63.2) | 135.1***<br>(58.5) | -38.6<br>(51.8)    | 35.0<br>(76.2)      | 82.9<br>(82.3)     | 72.6<br>(92.2)     |

**Panel B: Six-Month Post-Trade Returns (Average Monthly Basis Points)**

|                            | Insider purchases |                  | Insider sales     |                 | Repurchases     |                   | SEOs            |                 |
|----------------------------|-------------------|------------------|-------------------|-----------------|-----------------|-------------------|-----------------|-----------------|
|                            | EW                | VW               | EW                | VW              | EW              | VW                | EW              | VW              |
| Intercept ( $\beta_0$ )    | 69.6*<br>(40.0)   | 77.3**<br>(38.6) | -59.8**<br>(29.8) | -38.9<br>(40.3) | 66.8*<br>(40.8) | 115.5**<br>(56.9) | 5.1<br>(46.1)   | 46.3<br>(65.4)  |
| I(Post-1996) ( $\beta_1$ ) | 29.5<br>(56.6)    | 19.1<br>(54.6)   | 15.0<br>(42.2)    | 35.3<br>(57.0)  | 52.4<br>(57.6)  | 19.7<br>(80.4)    | -53.1<br>(65.2) | -91.1<br>(92.6) |

**Table VII**  
**Do Institutional Investors Invest in High-Idiosyncratic Risk Stocks?**

The table presents results from OLS regressions of quarterly changes in institutional ownership around corporate transactions. Each segment of the table (separated by horizontal lines) reflects results from a separate OLS regression of the quarterly change in institutional holdings in percentage points in the previous quarter ( $\Delta IO$ ) (Column 1), current quarter (Column 2), or next two quarters (Columns 3 and 4) on an indicator of whether a firm had a transaction (insider purchase, insider sale, share repurchase, or SEO) in the current quarter. In addition, the regressions have controls for the idiosyncratic risk quintile of each firm (ranging from 0 to 4) (*IRISK Quintile*), and interaction between the transaction indicator and the idiosyncratic risk quintile, lagged logged market capitalization (*MVE*), logged market-to-book (*M/B*), logged number of analysts plus one (*ANALYST*), and 6-months market adjusted past returns (*PASTRET6*). Industry fixed effects are based on 2-digit SIC. Variable definitions are in the appendix. \*, \*\*, \*\*\* denote two-tailed significance at the 10%, 5%, and 1% level, respectively. Standard errors (in parentheses) are robust to heteroscedasticity and cross-sectional and time-series dependence across observations in the same industry.

|                                  | (1)   | (2)        | (3)       | (4)        |
|----------------------------------|---|------------|-----------|------------|
|                                  | $\Delta$ Institutional Ownership ( $\Delta IO$ ) (%) in ... |            |           |            |
|                                  | Q-1   | Q          | Q+1       | Q+2        |
| <i>I(Insider Purchase Event)</i> | 0.0013*   | 0.0017**   | 0.0028*** | 0.0028***  |
|                                  | (0.0007)  | (0.0007)   | (0.0006)  | (0.0008)   |
| $\times$ <i>IRISK Quintile</i>   | -0.0008***  | -0.0020*** | 0.0002    | 0.0006**   |
|                                  | (0.0003)  | (0.0004)   | (0.0002)  | (0.0003)   |
| <i>IRISK Quintile</i>            | 0.0012***   | 0.0011***  | -0.0000   | -0.0001    |
|                                  | (0.0002)  | (0.0002)   | (0.0002)  | (0.0002)   |
| <i>I(Insider Sale Event)</i>     | -0.0006   | 0.0002     | 0.0031*** | 0.0042***  |
|                                  | (0.0005)  | (0.0006)   | (0.0008)  | (0.0009)   |
| $\times$ <i>IRISK Quintile</i>   | 0.0017***   | 0.0021***  | -0.0000   | -0.0014*** |
|                                  | (0.0002)  | (0.0002)   | (0.0004)  | (0.0004)   |
| <i>IRISK Quintile</i>            | 0.0005***   | 0.0002     | -0.0000   | 0.0004*    |
|                                  | (0.0002)  | (0.0002)   | (0.0002)  | (0.0002)   |
| <i>I(Share Repurchase Event)</i> | -0.0011   | -0.0011    | 0.0030*** | -0.0028*   |
|                                  | (0.0011)  | (0.0011)   | (0.0011)  | (0.0015)   |
| $\times$ <i>IRISK Quintile</i>   | 0.0000  | -0.0021*** | -0.0004   | 0.0014*    |
|                                  | (0.0005)  | (0.0005)   | (0.0007)  | (0.0007)   |
| <i>IRISK Quintile</i>            | 0.0010***   | 0.0008***  | 0.0000    | -0.0000    |
|                                  | (0.0002)  | (0.0002)   | (0.0001)  | (0.0002)   |
| <i>I(SEO Event)</i>              | 0.0009  | 0.0397***  | 0.0000    | 0.0033     |
|                                  | (0.0019)  | (0.0093)   | (0.0033)  | (0.0030)   |
| $\times$ <i>IRISK Quintile</i>   | 0.0024***   | 0.0058*    | -0.0005   | -0.0023*   |
|                                  | (0.0008)  | (0.0030)   | (0.0013)  | (0.0013)   |
| <i>IRISK Quintile</i>            | 0.0010***   | 0.0005***  | 0.0000    | 0.0001     |
|                                  | (0.0002)  | (0.0002)   | (0.0002)  | (0.0002)   |
| Calendar Quarter Fixed Effects   | Yes   | Yes        | Yes       | Yes        |
| Industry Fixed Effects           | Yes   | Yes        | Yes       | Yes        |
| Observations                     | 191277  | 191292     | 189346    | 187001     |
| Min R <sup>2</sup>               | 0.0298  | 0.0237     | 0.0091    | 0.0064     |
| Max R <sup>2</sup>               | 0.0306  | 0.0375     | 0.0094    | 0.0068     |

**Table VIII**  
**Robustness: Does *IRISK* Mechanically Drive the Results?**

The table presents intercepts (which measure average monthly returns in basis points) from calendar-time regressions of monthly portfolio excess returns, stratified by *IRISK* quintile (double sorted by lagged market value), on the Fama and French (1993) and Carhart (1997) four-factor model. Standard errors are in parentheses. Each regression is based on 251 monthly observations from 1986 to 2006. *IRISK* and *I\_FACTOR* are defined in the Appendix.  $R_p$  is the time-series of mean monthly returns from a portfolio that includes event-firm-months stratified by *IRISK* quintile. A firm-month is included in the event portfolio if it falls within the six months. The mean number of firms in each monthly *IRISK* category is 825 for insider purchases, 800 for insider sales, 250 for repurchases and 141 for SEOs. \*, \*\*, \*\*\* denote two-tailed significance at the 10%, 5%, and 1% level, respectively.

$$R_{pt} - R_{ft} = \beta_0 + \beta_1 MKTRF_t + \beta_2 HML_t + \beta_3 SMB_T + \beta_4 MOM_t + \beta_5 I\_FACTOR_t + \varepsilon_t$$

| <i>IRISK</i><br>quintile | Insider purchases  |                    | Insider sales       |                    | Repurchases        |                    | SEOs               |                 |
|--------------------------|--------------------|--------------------|---------------------|--------------------|--------------------|--------------------|--------------------|-----------------|
|                          | EW                 | VW                 | EW                  | VW                 | EW                 | VW                 | EW                 | VW              |
| 1                        | 70.4***<br>(11.6)  | 53.9***<br>(15.8)  | -59.2***<br>(12.4)  | -35.9***<br>(13.4) | 26.6*<br>(14.7)    | 10.2<br>(19.1)     | 0.1<br>(25.9)      | -17.7<br>(35.9) |
| 2                        | 48.9***<br>(13.9)  | 76.0***<br>(18.6)  | -57.7***<br>(10.9)  | -41.7***<br>(15.4) | 58.9***<br>(13.5)  | 52.5**<br>(21.9)   | -7.4<br>(27.4)     | 25.0<br>(27.9)  |
| 3                        | 79.3***<br>(15.5)  | 81.1***<br>(16.7)  | -81.1***<br>(11.0)  | -29.0*<br>(16.8)   | 56.7***<br>(15.2)  | 60.4***<br>(22.9)  | -81.0***<br>(25.6) | -23.5<br>(29.3) |
| 4                        | 131.8***<br>(17.6) | 109.6***<br>(21.6) | -81.9***<br>(12.6)  | -26.6<br>(19.6)    | 44.6**<br>(17.2)   | 102.9***<br>(30.8) | -41.4<br>(26.8)    | -47.3<br>(32.9) |
| 5                        | 146.6***<br>(27.6) | 168.7***<br>(23.6) | -110.5***<br>(15.5) | -23.0<br>(25.4)    | 124.5***<br>(25.7) | 158.6***<br>(35.7) | -4.6<br>(26.4)     | 10.4<br>(34.6)  |
| 5-1                      | 76.3***<br>(25.7)  | 114.7***<br>(28.0) | -51.3**<br>(19.9)   | 12.9<br>(30.8)     | 97.9***<br>(27.2)  | 148.4***<br>(38.7) | -4.7<br>(34.0)     | 28.1<br>(46.6)  |

Figure 1. Cumulative Four-Factor Value-Weighted Intercepts

Figure 1a. Insider purchases

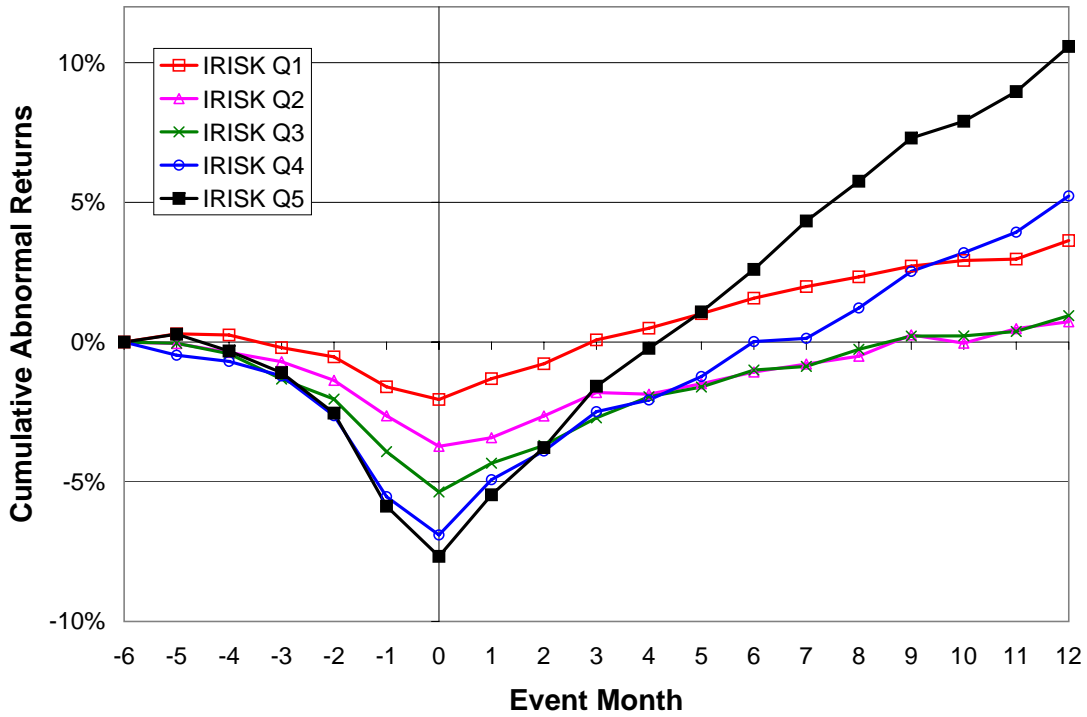


Figure 1b. Insider sales

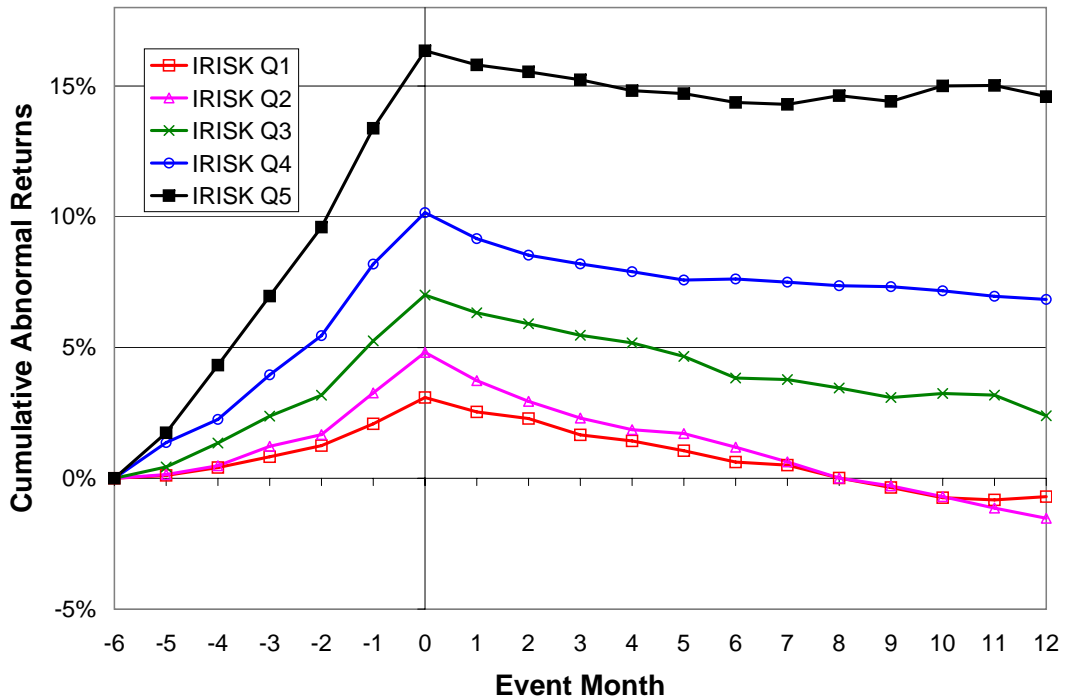


Figure 1. Cumulative Four-Factor Value-Weighted Intercepts (Cont.)

Figure 1c. Share repurchases

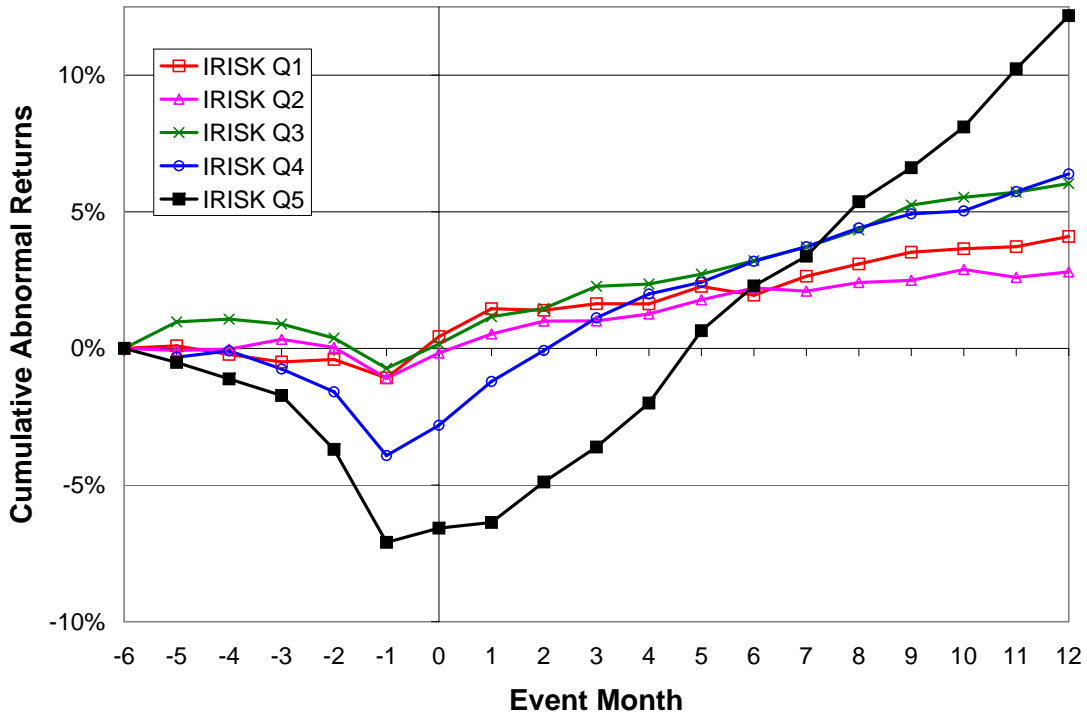


Figure 1d. Seasoned equity offerings

