Insider Trading and Corporate Information Transparency

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Abstract

Our study examines the relation between insider trading and corporate information transparency. We find a negative relation between firms' information transparency and the economic significance of insider trading, including the amount of insider purchase and sale and the profitability of insider transactions. We also find a negative relation between information transparency and stock price reaction to news of insider trading, which suggests that increases in information transparency preempt insiders' private information. Our study provides evidence consistent with firms' transparency-enhancing activities decreasing information asymmetry between insiders and investors by revealing insiders' private information to investors in a timely manner.

Keywords: corporate information transparency, insider trading, information asymmetry

JEL Classification: G1

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1. Introduction

Insider trading frequency and profitability are important indicators of insiders' information advantage and its economic value. Under securities laws, insiders engaged in stock trading have responsibilities to ensure information transparency to investors. Our study examines the relation between insider trading and corporate information transparency. This relation is intriguing: While an important goal of transparency is to ensure information equality between insiders and investors, insider stock holding gives managers/insiders an incentive to trade on undisclosed information, leading to a potential conflict of interest in the decision making of corporate information transparency.[1] Evidence on the relation between information transparency and insider trading is useful for assessing conditions relevant for insiders trading on valuable information that other investors do not have. Currently, the U.S. Securities and Exchange Commission (SEC)'s sweeping and widening investigation of insider trading at numerous technology firms, highlights investors' and regulators' concerns about insiders profiting from their knowledge about key corporate events (e.g., new product development) that are not transparent to investors.[2]

Theoretical research suggests that the relation between insider trading and information transparency is not straightforward. On the one hand, research indicates that increases in transparency reduce information asymmetry between insiders and investors, pointing to a negative relation between information transparency and insider trading (e.g., Merton, 1987; Diamond and Verrecchia, 1991).[3] Indeed, Baiman and Verrecchia (1996) find that insider profits decrease as firms' information transparency increase. On the other hand, it is shown that transparency-enhancing activities, such

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[1] Following existing research on insider trading and corporate information transparency, our study examines insider transactions that are reported to regulators by corporate insiders and are in compliance with insider trading laws. Rule 10b-5 and section 10-b, the key U.S. securities laws concerning insider trading, prohibit insiders from trading while in possession of undisclosed material information. Information concerning "bombshell events," such as bankruptcy, mergers, and earnings reports, is considered material by the court under most circumstances (Carlton and Fischel, 1983), and insider trading on such information constitutes the lion's share of a relatively limited number of litigated insider trading cases over years (Dooley, 1980; Meulbroek, 1992). Prior research demonstrates abnormal profitability of insider transactions, suggesting that insiders indeed trade on important news before public disclosure of the news (e.g., Seyhun, 1986, 1992). Insiders' ability to profit from trading on important news stems from two factors. First, by nature, information on economic events other than "bombshell events" does not constitute the basis of illegal insider trading (Fried, 1998; Bebchuk and Fried, 2003). Second, due to limited resources, the enforcement of insider trading laws by the SEC tends to focus on violations of Rule 10b-5 that are the most obvious and easiest to prove in court, such as cases involving insiders trading shortly before a sharp movement in price (e.g., Fried, 1998).

[2] In an unprecedented move, the SEC is currently pursuing a large string of high-profile insider trading cases involving executives at numerous technology firms who profited from trading on or leaking nonpublic information on product development and other important events (e.g., Pulliam, Rothfeld, Strasburg and Zuckerman, 2010; Rothfeld, Pulliam and Bray, 2010; *New York Times*, 2011).

[3] This is consistent with the negative relation between firms' liquidity, which is positively correlated with transparency, and the extent of insider trading documented by Chung and Charoenwong (1998).

as information disclosure, facilitate trading by insiders who possess private information and enhance insiders' ability to gain from trading on private information (e.g., Bushman and Indjejikian, 1995; Hong and Huang, 2005). Given the conflicting predictions from theoretical research, it is useful to empirically examine the relation between corporate information transparency and insider trading. Evidence on this relation is relevant for assessing whether management-trading incentives interfere with the role of transparency in ensuring information equality between management and investors.

In our study, we focus on the relation between the significance of insider trading and comprehensive measures of information transparency level chosen by firms. Insider trading is a likely important channel for informed insiders to exploit the lack of corporate information transparency. Prior research suggests that insider trading activities reflect insiders' information superiority to investors.[4] We examine whether the magnitude of insiders' stock transactions varies with the degree of corporate information transparency. We also examine whether future abnormal returns associated with insider trading vary with firms' information transparency. The abnormal returns of insider trading directly measure the economic value of insiders' private information advantage. In addition, we relate corporate information transparency to the stock price reaction to the announcement of insider transactions. This reaction indicates the extent to which investors regard insider trades as a source of new information at the time of the announcement and reflects the value of insider information to investors. Since insiders' private information is not directly observable, examining multiple aspects of insider trading in our tests can enhance the validity of our results and conclusions.

We document strong evidence consistent with a negative relation between the economic significance of insider trading and firms' information transparency. Our results indicate that the amount of insider trading is negatively associated with the degree of transparency. We find that future returns associated with insider trading are significantly lower for firms with greater transparency. We also find a negative relation between transparency and stock price reaction to the announcement of insider transactions. The documented negative relation between insider trading and information transparency not only is statistically significant but also economically meaningful. For example, our results show that for firms with the highest transparency, future returns associated with insider purchase (sale) are approximately 48.4% (56%) lower compared with firms with the lowest transparency, whereas the difference in the average amount of insider purchase (sale) between firms with the highest transparency and those with the lowest transparency amounts to approximately 61% (64.6%). Taken together, our findings are consistent with transparency-enhancing activities

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[4] Longstanding research indicates that insiders profit from trading on their private information on the firm's future prospects. Such studies include Jaffe (1974), Finnerty (1976), Seyhun (1986, 1992), Rozeff and Zaman (1988, 1998), Lin and Howe (1990), Ferreira (1995), and Lakonishok and Lee (2001).

decreasing the value of insiders' private information, which in turn leads to decreases in the amount of insider trading, decreases in the profitability of insider trading, and decreases in investor reaction to the announcement of insider trading.

Our study is related to the research on insider trading. While the existence of insiders' information superiority and trading profits earned by insiders has been confirmed by prior studies, there is limited research on firm-specific factors that affect the extent and profitability of insider trading. Prior research finds that insider trading frequency and profitability are related to research and development (R&D) activities (Aboody and Lev, 2000) and firms' self-imposed insider trading restrictions (Bettis, Coles and Lemmon, 2000). The economic importance of insider trading news measured by stock price reaction to the announcement of insider trading also varies with the firm's ownership concentration (Fidrmuc, Goergen and Renneboog, 2006). Our study adds to this line of research on firm-specific factors influencing the frequency and profitability of insider trading. We focus on firms' information transparency and find that the frequency, profitability, and newsworthiness of insider trading all are negatively associated with the degree of information transparency. Our results indicate that increases in corporate transparency reduce insiders' advantage in trading with other investors. Our finding also complements prior evidence on the effect of transparency-enhancing regulations on the trading behavior of investors other than insiders (Chiyachantana, Jiang, Taechapiroontong and Wood, 2004).

The results of our research have implications for the regulations of insider trading, which play an essential role in maintaining the equity and integrity of capital markets. In securities regulation concerning investor protection, insider trading is widely viewed as a manifestation of information inequalities between insiders and investors (e.g., Bainbridge, 2001; Bhattacharya and Daouk, 2002; Bushman, Piotroski and Smith, 2005). Recently, changes in U.S. insider trading laws have increased the transparency of insider transactions and possibly reduced the information inequalities between insiders and investors. For example, the Sarbanes-Oxley Act of 2002 accelerates the filing deadlines for insider transaction reports to two business days after the transaction occurs. Our study suggests that transparency-enhancing measures, such as mandated information disclosure and liability-reducing provisions that encourage voluntary disclosure (e.g., safe-harbor rule), may also achieve the goal of reducing the extent of privately informed insider trading by decreasing the information asymmetry between insiders and investors.

2. Research hypothesis

Our hypotheses concerning the relation between corporate transparency and insider trading are based on the model of Kyle (1985). Kyle (1985) indicates that insiders' information superiority and profitable trading opportunities are positively related to the prior variance of stock price and the relative precision of the insider's private information. Increases in information disclosure and transparency reduce the relative precision of insiders' information by increasing the precision of outsiders'

information. The effect of transparency-increasing disclosure on the variance of stock price also is unambiguous: The market's beliefs about firm value are less divergent because public disclosure increases the extent of overlap in investors' information set. These two effects imply that insiders' information advantage is smaller at firms with more transparent information and suggest a negative relation between firms' information transparency and the advantage and value of insiders' private information.[5] Thus, we predict that the amount of insider trading is negatively associated with corporate information transparency. We also expect abnormal returns on insider trading to be negatively associated with the degree of transparency.[6] Our hypotheses are (in alternate form):

H_1: *The amount of insider trading is negatively associated with information transparency.*

H_2: *Abnormal returns on insider trading are negatively associated with information transparency.*

Prior research finds that investors may react to the reports of insider trading because pre-announcement stock prices do not fully incorporate the private information that motivates insiders to trade (Cheng and Suk, 1998; Aboody and Lev, 2000; Fidrmuc, Goergen and Renneboog, 2006). Kyle (1985) indicates that insiders' information monopoly precludes complete incorporation of insider's private information into stock prices through insider trades. "The informed trader trades in such a way that his private information is incorporated into stock prices *gradually*" (Kyle, 1985, p. 1316, emphasis added), and "not all information is incorporated into prices by the end of trading" (p. 1326). The greater the insiders' information advantage, the relatively less of insiders' information will be incorporated into stock prices.[7] Ceteris paribus, more significant market reaction to the announcement of insiders' trades is expected when insiders' information advantage is greater and less of insiders' information has been

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[5] A consideration of the specific source of insiders' private information suggests that transparency-increasing efforts decrease insiders' information advantage. Prior research finds that insiders have advance knowledge about information relating to future earnings (Beneish and Vargus, 2002; Ke, Huddart and Petroni, 2003). Lundholm and Myers (2002) suggest that the more current stock prices incorporate future earnings news, the less information superior insiders would have regarding future earnings.

[6] Our arguments for a negative relation between transparency and insider trading profit imply a trade-off for managers between stock trading gains and the benefits of transparency. Although profit from insider trading is an implicit form of management compensation (Roulstone, 2003), management also may benefit considerably from increases in information transparency via decreases in the cost of capital that enhances opportunities for future growth and profitability, which in turn will increase managers' future compensation and human capital.

[7] This conclusion of Kyle (1985) is consistent with prior evidence that very little information of insider trades is impounded into stock prices when the trade takes place (Lakonishok and Lee, 2001). This low price impact of insider trades is likely due to the relatively small size of insider transactions (Jeng, Metrick and Zeckhauser, 2003) and the anonymous nature of insider transaction. Thus, the lack of immediate market reaction to insider trades suggests that insiders' private information is gradually incorporated into stock prices.

incorporated in pre-announcement stock prices. Because transparency-enhancing disclosure by firms decreases insiders' information monopoly and increases the incorporation of insiders' information in stock prices prior to the announcement of insider trading news, the news of insiders' trading at firms with greater transparency, conveys less information to the market at the time of the news announcement. Thus, we predict a negative association between stock price reaction to news of insiders' trading and firms' information transparency. Our hypothesis is (in alternate form):

H_3: *Stock price reaction to the announcement of insider trading is negatively associated with information transparency.*

3. Sample data

Our sample consists of firms that are included in the *Report of the Association for Investment Management and Research* (AIMR). We use the AIMR's ratings of disclosure informativeness and transparency as our measure for corporate information transparency. Committees of the AIMR rank the informativeness of a firm's information disclosure within its industry based on an assessment of the transparency and quality of a firm's annual published information (annual reports and other required reports), quarterly and other published timely information, and investor relations (e.g., conference calls and meetings with analysts). The results of the evaluation and ranking are published annually in the AIMR reports.[8] Given analysts' expertise as sophisticated information users and their responsibilities in tracking and interpreting corporate information, analysts' rating of firms' disclosure quality provides a particularly relevant and informative measure for corporate information transparency (Lang and Lundholm, 1993; Yu, 2005).[9] Our initial sample is comprised of 4,705

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[8] Healy, Hutton and Palepu (1999) describe in detail the process followed by the industry-specific subcommittees of analysts selected by AIMR in measuring firms' disclosure quality. Their study also provides the list of specific factors and their weightings used by the analysts in the evaluation and ranking of firms' disclosure practices. To gain some intuition for the disclosure activities reflected in the AIMR ratings and their implications, consider AIMR's criteria for evaluating firms' transparency-increasing disclosure efforts. Subcommittees of the AIMR focus on the informativeness of firms' disclosure of financial and nonfinancial information in three venues: annual published information, quarterly and other published information, and investor relations. Prior research demonstrates that all three disclosure activities increase transparency by addressing important information needs of investors. For example, annual reports and other filings have long been recognized as the most important disclosure venue (Knutson, 1992; CCH Editorial Staff, 2000).

[9] Researchers examining firms' disclosure quality and information transparency generally employ either self-constructed disclosure indexes or measures of disclosure adequacy that summarize the consensus judgments by the users of firms' disclosure. The AIMR ratings used in this study fall into the latter category. Compared to self-constructed disclosure indexes, the AIMR ratings have greater advantage in reflecting the perspective and opinion of financial analysts who are sophisticated users of firms' disclosure (Lang and Lundholm, 1993; Healy, Hutton and Palepu, 1999). The AIMR reports also cover a greater number of firms, industries, and years than most self-constructed disclosure indexes, an advantage that increases the richness of the research setting and the power of empirical tests using the AIMR ratings. The

firm-year observations included in the AIMR reports for the years 1986 to 1996, inclusive. We sequentially delete observations with missing data from the following sources: 547 observations without coverage in COMPUSTAT and/or CRSP and 631 firm-years for which we could not find data in the insider transaction files compiled by Thomson Financial.[10] Eliminating these observations (1,178 firm-years in total) from the sample, yields a final sample of 3,527 firm-year observations representing 708 firms.[11] In untabulated tests, we find that these sample firms are fairly evenly distributed across industries and years.

We report descriptive statistics for our sample in Table 1. All variables are computed on the basis of the firm's fiscal year. The statistics in parentheses are adjusted for the mean value of all firms traded on the same stock exchange as the sample firm in the same year. These adjusted statistics inform how our sample firms are compared to other firms traded on the stock exchange.[12] Our primary measure for the firm's information transparency is based on disclosure scores published in the AIMR reports. Because the number of firms varies by industry and year, we convert the AIMR rankings to percentile transparency ranks (*TRANSPARENCY*), computed as (raw disclosure rank − 1) ÷ (number of firms with no missing disclosure ranks in the industry/year − 1).[13] This procedure yields within industry/year percentile transparency ranks that range from zero (for the lowest-ranking firms or firms with the least informative disclosure and lowest transparency) to 1 (for the highest-ranking firms or firms with the most informative disclosure and highest transparency). Accordingly, the information transparency rank can be interpreted uniformly across industries and years. We use the firm's percentile transparency rank as our primary measure of corporate information transparency. Table 1 shows that the mean and median percentile transparency rank (*TRANSPARENCY*) is 0.518 and 0.506, respectively, and the standard deviation is 0.307.

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validity of the AIMR ratings as a comprehensive measure for firms' disclosure quality and information transparency has also been confirmed by prior research (e.g., Botosan and Plumlee, 2002; Lundholm and Myers, 2002). This disclosure quality measure continues to be used in current research on the economic consequences of disclosure (e.g., Yu, 2005; Lawrence, 2011). More importantly, in recent discussion about regulatory efforts for improving disclosure quality in the post-crisis era (e.g., the SEC's 2010–2015 Draft Strategic Plan), the evaluation criteria of the AIMR ratings are recognized as one of the best systems available to date for distinguishing high-quality disclosure (Financial Accounting Standards Committee [FASAC], 2009).

[10] Because systematic coverage of the insider-trading database of Thomson Financial began in 1986, the AIMR reports for the pre-1986 period were not included in our study.

[11] Because firm-years without insider transactions are omitted in the database on insider trading, we perform a robustness test for the relation between transparency and insider trading by including these 631 firm-years in our sample and setting the value of insider trading for these firm-years at zero. We obtain the same conclusion from this robustness test.

[12] In untabulated tests, we find that 80.4% of our sample firms are listed on NYSE, 13.5% on the National Association of Securities Dealers (NASD), 0.9% on Amex, and 5.2% on other exchanges.

[13] Conversion procedures identical or similar to this are used in prior studies that employ the AIMR data (e.g., Lundholm and Myers, 2002).

Table 1

Descriptive statistics of sample firms

Variable definitions are as follows. *TRANSPARENCY* is the industry/year-adjusted AIMR disclosure and transparency rankings, computed as (rank − 1) / (number of firms with no missing disclosure ranks in the industry/year − 1). *PURCHASE* (*SELL*) for a firm-year is the total value of insider purchases (sells) divided by the firm's market value at fiscal year-end. *MV* is the firm's market value at the fiscal year-end. *M/B* is the market-to-book ratio at the fiscal year-end. *LOSS* is a dummy variable that takes the value of 1 for firms reporting losses. *RD* is a dummy variable that takes the value of 1 for firms reporting nonzero R&D expenditures. R^2 is a proxy for the informativeness of the firm's financial statement, measured as the adjusted R^2 from a firm-specific time series regression of stock price per share as of three months after fiscal year-end on earnings per share and book value per share. *PRET* is the stock return for the prior fiscal year. *SPRD* is the firm's bid-ask spread, computed as the mean absolute difference between the closing bid and ask prices of daily trades, scaled by the mean of the bid and ask price. *FLLW* is the number of analysts providing earnings forecast of the next year. *AR_P* (%) (*AR_S* (%)) is the mean percentage excess returns on the day when insider purchase (sales) transactions are filed with the SEC. For each insider transaction excess returns on the filing day are defined as raw returns on that day minus expected returns, where expected returns are derived from the market model using parameters estimated over the last 120 days before the filing day (days −121 to −2 relative to the filing day). The statistics in parentheses are adjusted for the mean value of all firms traded on the same stock exchange as the sample firm in the same year.

Variable	# Obs.	Mean	SD	25%	Median	75%
TRANSPARENCY	3,527	0.518	0.307	0.250	0.506	0.786
		(NA)	(NA)	(NA)	(NA)	(NA)
PURCHASE (%)	3,527	0.164	0.022	0.000	0.002	0.016
		(−0.404)	(0.022)	(−0.439)	(−0.312)	(−0.290)
SELL (%)	3,527	0.619	0.036	0.007	0.043	0.198
		(−0.592)	(0.040)	(−1.493)	(−0.770)	(−0.363)
MV (in $millions)	3,527	4,666	9,552	672.0	1,810	4,423
		(2,526)	(6,394)	(−546)	(396)	(2,665)
M/B	3,527	2.261	6.857	1.254	1.819	2.896
		(−0.404)	(25.035)	(−2.069)	(−0.996)	(0.017)
LOSS	3,527	0.114	0.318	0.000	0.000	0.000
		(−0.531)	(0.318)	(−0.658)	(−0.654)	(−0.519)
RD	3,527	0.372	0.483	0.000	0.000	1.000
		(0.234)	(0.486)	(−0.144)	(−0.115)	(0.854)
R^2	3,527	0.380	0.403	0.103	0.373	0.703
		(0.057)	(0.405)	(−0.068)	(0.048)	(0.121)
PRET	3,527	0.156	0.343	−0.055	0.121	0.317
		(0.082)	(0.344)	(−0.041)	(0.047)	(0.131)
SPRD	3,527	0.021	0.009	0.015	0.019	0.024
		(−0.029)	(0.007)	(−0.046)	(−0.018)	(−0.012)
FLLW	3,527	20.00	9.689	12.00	19.00	27.00
		(10.34)	(9.328)	(3.19)	(8.98)	(16.92)
AR_P (%)	2,633	0.072	0.019	−0.623	0.008	0.682
		(−0.029)	(0.018)	(−0.764)	(−0.073)	(−0.673)
AR_S (%)	3,162	−0.011	0.017	−0.527	−0.028	0.549
		(0.017)	(0.016)	(−0.625)	(−0.004)	(0.625)

We measure the extent of insider purchase (sale) activities with the total value of insider purchases (sales) deflated by the firm's market value. Following prior research, we define insiders as the officers and directors of the firm. Table 1 shows that the mean value of insider purchase, *PURCHASE* (%), is 0.164%, whereas the mean value of insider sale, *SELL* (%), is 0.619%. Consistent with prior evidence, we find that insider sales exceed insider purchases. This pattern is due to insiders obtaining shares by means other than purchases (e.g., stock-based compensation plans). Table 1 also reports descriptive statistics on market value (*MV*), market-to-book ratio (*M/B*), the status of loss firms (*LOSS*), an indicator for firms engaged in R&D activities (*RD*), bid-ask spread (*SPRD*), a proxy for the firm's financial statement informativeness and earnings quality (R^2), stock returns of the prior year (*PRET*), and the number of analysts following the firm and issuing earnings forecasts (*FLLW*).[14] We compute bid-ask spread as the mean absolute difference between the closing bid and ask prices of daily trades, scaled by the mean of the bid and ask price. Following prior research, we include these firm characteristics as controls in the test of insider trading activity.[15]

In the last two lines of Table 1, we report descriptive statistics of stock price reaction to the SEC filing of insider purchase (*AR_P*) and sale (*AR_S*). For each insider transaction, we compute excess returns on the day when the transaction is filed with the SEC and disclosed to the public.[16] Following prior research (e.g., Brown and Warner, 1985; MacKinlay, 1997), we compute excess returns by taking into account both market-wide factors and stock-specific risk (e.g., beta). Specifically, for each insider transaction, excess returns on the filing day are defined as raw returns on that day minus expected returns, where expected returns are derived from the market model using parameters estimated over the last 120 days before the filing day (days −121 to −2 relative to the filing day). We then calculate the mean one-day abnormal returns across all purchase and sale transactions, respectively, for a

[14] We use the adjusted R^2 from a firm-specific time series regression of stock price per share as of three months after fiscal year-end on earnings per share and book value per share to substitute for earnings quality and the informativeness of the firm's financial statements.

[15] Early research suggests that the amount of insider trading is a function of firm size (Seyhun, 1986; Rozeff and Zaman, 1988, 1998; Lin and Howe, 1990). We expect insider purchases (sales) to be negatively (positively) associated with *M/B* and *PRET*, consistent with insiders' contrarian trading behavior of buying (selling) value (glamour) stocks and firms with negative (positive) prior returns (Rozeff and Zaman, 1988, 1998). Insider trades may vary with insider information advantage, which is likely greater at loss firms for which published accounting information (e.g., earnings and book value) has lower value-relevance (Hayn, 1995) and at R&D firms in which insiders have superior knowledge about the prospects of innovation activities (Aboody and Lev, 2000). Insider information advantage is also likely greater at firms with less informative financial statements (i.e., lower R^2s) and firms with less information available as indicated by higher bid-ask spread (*SPRD*) and lower analyst coverage (*FLLW*).

[16] Section 16(a) of the Securities and Exchange Act of 1934 requires that insiders who purchase or sell stocks file with the SEC by the tenth day after the end of the month in which a trade takes place. We define the event date in our analysis as the date when the filing was received by the SEC.

given firm in a given year.[17] Exactly 2,633 (3,126) firm-years have at least one insider purchase (sales) transaction. Table 1 shows that the mean one-day percent excess returns associated with the filing of insider purchases (sales) are 0.072% (−0.011%).[18]

The pattern of the adjusted statistics in Table 1 indicates that compared to the average firm traded on the same stock exchange, firms included in the AIMR reports are larger, have lower market-to-book ratios, and have lower incidences of losses. These differences are consistent with the AIMR committees' criteria of selecting larger firms and firms with better performance in the industry. Table 1 shows that the sample firms have lower insider trading activities, smaller bid-ask spread, and greater analyst following, suggesting that these firms also have more transparent information environments. The AIMR committees' criteria of selecting firms with more homogeneous characteristics likely reduce the cross-sectional variation in the information transparency and insider trading activity of the sample firms, leading to a possible bias against finding a significant relation between information transparency and insider trading.

4. Empirical results

4.1. Amount of insider trading and corporate information transparency

To examine the relation between the amount of insider trading and firms' information transparency, we estimate the following regression:

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\begin{aligned}
PURCHASE_{it} \text{ or } SELL_{it} = {}& \alpha_0 + \alpha_1 TRANSPARENCY_{it} + \alpha_2 LN(MV)_{it} + \alpha_3 M/B_{it} \\
& + \alpha_4 LOSS_{it} + \alpha_5 RD_{it} + \alpha_6 R^2_{it} + \alpha_7 PRET_{it} + \alpha_8 SPRD_{it} \\
& + \alpha_9 LN(FLLW)_{it} + \mu_{it},
\end{aligned}
\tag{1}
$$

where i and t are firm and year subscripts, respectively. All regression variables of Equation (1) have the same definitions as those in Table 1. We estimate Equation (1) for insider purchase and sale separately and report in Table 2 the mean coefficient estimates and other statistics from the cross-sectional annual ordinary least square regression of Equation (1).

In the regression for insider purchase, we find that the coefficient on *TRANSPARENCY* is negative (−0.001) and statistically significant at the 0.05 level. This result is stable across years. The coefficient estimate of *TRANSPARENCY* is negative in ten of 11 years in our sample period. Thus, our evidence indicates a negative relation between the amount of insider purchase and the degree of information

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[17] Results for all subsequent tests are similar when this measure is based on the median value of abnormal returns.

[18] Compared to insider purchases, insider sales have a more mixed nature as the transaction could be motivated by insiders' private information on the firm's prospects and/or liquidity needs and consideration of portfolio rebalancing.

Table 2

Summary statistics for annual regression of insider trading amount on corporate information transparency and control variables

$$PURCHASE_{it} \text{ or } SELL_{it} = \alpha_0 + \alpha_1 TRANSPARENCY_{it} + \alpha_2 LN(MV)_{it} + \alpha_3 M/B_{it} + \alpha_4 LOSS_{it}$$
$$+ \alpha_5 RD_{it} + \alpha_6 R^2_{it} + \alpha_7 PRET_{it} + \alpha_8 SPRD_{it} + \alpha_9 LN(FLLW)_{it} + \mu_{it}.$$
(1)

Variable definitions are as follows. *PURCHASE* (*SELL*) is the dollar value of insider purchase (insider sale) divided by the firm's market value. *TRANSPARENCY* is the industry/year-adjusted AIMR disclosure and transparency rankings, computed as (rank − 1)/(number of firms with no missing disclosure ranks in the industry/year − 1). *LN (MV)* is the logarithm of the firm's market value at the fiscal year-end. *M/B* is the market-to-book ratio at the fiscal year-end. *LOSS* is a dummy variable that takes the value of 1 for firms reporting losses. *RD* is a dummy variable that takes the value of 1 for firms reporting nonzero R&D expenditures. R^2 is a proxy for the informativeness of the firm's financial statement, measured as the adjusted R^2 from a firm-specific time series regression of stock price per share as of three months after fiscal year-end on earnings per share and book value per share. *PRET* is the stock return for the prior fiscal year. *SPRD* is the firm's bid-ask spread, computed as the mean absolute difference between the closing bid and ask prices of daily trades, scaled by the mean of the bid and ask price. *LN(FLLW)* is the logarithm of the number of analysts providing earnings forecast of the next year. *Industry dummies* are binary variables defined by the industry classification of the AIMR reports. The *t*-statistics in parentheses are adjusted for serial correlation following Newey and West (1987).

Variable	Definition	Predicted sign	Insider purchase	Insider sell
Intercept	Regression intercept	+/−	0.002	0.023
			(3.47)	(3.56)
TRANSPARENCY	Information transparency	−	−0.001**	−0.004**
			(−2.60)	(−2.36)
LN(MV)	Logarithm of market value	−	−0.001	−0.003**
			(−1.03)	(−2.13)
M/B	Market-to-book ratio	−	−0.001	0.001
			(−0.63)	(1.09)
LOSS	Loss firm indicator	+	0.002	0.004
			(0.67)	(0.64)
RD	Indicator for R&D firms	+	0.001	0.003
			(1.07)	(0.36)
R^2	Earnings informativeness	−	−0.003	0.046
			(−1.13)	(0.96)
PRET	Prior stock return	−	−0.004*	−0.001
			(−1.84)	(−1.03)
SPRD	Bid-ask spread	+	0.033**	0.084
			(2.87)	(0.71)
LN(FLLW)	Analyst following	−	−0.003*	−0.004
			(−1.97)	(−0.88)
Dummies	Industry dummies		Included	Included
N	Number of observations		3,527	3,527
Adj. R^2			2.66%	2.37%

***, **, * indicate one-tailed statistical significance at the 0.01, 0.05 and 0.1 level, respectively, when predicted sign is either "+" or "−" and two-tailed significance otherwise.

transparency, consistent with the prediction of H_1. To put into perspective the economic magnitude of the documented relation, recall that *TRANSPARENCY* ranges between zero (for firms with the lowest transparent rank in its industry/year) and 1 (for firms with the highest transparency rank in its industry/year). Compared to firms with the lowest transparency rank in the industry/year, the intensity of insider purchase at firms with the highest transparency rank is 0.1% lower, equivalent to 61% of the mean value of 0.164% for insider purchase (0.1% ÷ 0.164% = 61%).

The regression results for insider sales also are consistent with the prediction of H_1. We find a significantly negative coefficient on *TRANSPARENCY* (−0.004). The magnitude of this coefficient estimate implies that a jump from the lowest transparency rank to the highest rank in the industry/year is associated with a decrease in insider sales activities by 64.6% relative to the mean value (0.400% ÷ 0.619% = 64.6%). Thus, the negative relation between information transparency and insider trading amount is not only statistically significant but also economically meaningful for both insider purchase and insider sale activities.[19] Together, our results indicate that consistent with the prediction of H_1, insider trading is less prevalent at firms with greater information transparency.[20]

The results in Table 2 also show that in the regression for insider purchase, the coefficient on *PRET*, stock returns of the prior year, is significantly negative. This result implies that officers and directors increase (decrease) stock purchase following the decrease (increase) in the stock price of their own firms. The negative relation between firms' insider stock purchase and prior stock returns is consistent with the argument of Marin and Sureda-Gomila (2006) that corporate insiders have advantages in assessing the extent to which liquidity shocks drive share prices away from firms' fundamental (intrinsic) value. This argument suggests that insiders who trade after detecting significant deviation of share price from fundamental values can act as traders of last resort.

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[19] To extend our results, we also examine whether the probability of insider trading is negatively associated with the degree of transparency by estimating a multivariate logistic regression where the dependent variable is an indicator variable for the incidence of insider trading and independent variables are the same as those included in Equation (1). In untabulated tests, we find a significantly negative coefficient on *TRANSPARENCY* in the logistic regression, consistent with the results based on our continuous measures of insider trading as specified in Equation (1).

[20] Insider trading and information transparency could be endogenous variables affected by exogenous conditions of firm performance (e.g., good news of future performance increases insider trading while also prompting more disclosure and transparency) and uncertainty (e.g., firms increase disclosure and transparency in response to increases in uncertainty, while insiders increase or decrease trading activity). To account for this endogeneity, we estimate a system of equations consisting of Equation (1) and a model that relates transparency level to insider trading and other determinants (firm size, market-to-book, profitability, R&D, stock return volatility, and analyst following) using the two-stage least square method. We find that the coefficient on *TRANSPARENCY* remains significantly negative at the 0.01 level with similar magnitude. Thus, our results for the negative relation between transparency and insider trading are robust to the consideration of endogeneity.

4.2. Insider trading profitability and corporate information transparency

H_2 predicts that abnormal returns on insider trading are negatively associated with information transparency. To test this prediction, we include our measure for information transparency in the following regression for future abnormal returns of insider trading:

$$
\begin{aligned}
FRET_{ij} = {} & \beta_0 + \beta_1 LN(MV)_i + \beta_2 LN(B/M)_i + \beta_3 RET\_1_i + \beta_4 RET\_2_i \\
& + \beta_5 RET\_3_i + \beta_6 PURCHASE_i + \beta_7 SELL_i + \beta_8 TRANSPARENCY_i \\
& + \beta_9 TRANSPARENCY_i \times PURCHASE_i \\
& + \beta_{10} TRANSPARENCY_i \times SELL_i + \theta_{ij}, \quad j = 1 \ldots 12,
\end{aligned}
\tag{2}
$$

where i and j are firm-year and calendar month subscript, respectively. Equation (2) is based on a Fama-MacBeth monthly cross-sectional regression of future returns over the subsequent 12 months, *FRET*, on firm-specific risk factor, including size (*LN(MV)*) and book-to-market ratio (*LN(B/M)*) (Fama and MacBeth, 1973).[21] Following prior research (e.g., Jegadeesh and Titman, 1993; Chan, Jegadeesh and Lakonishok, 1996), we also include in Equation (2) returns over past one month (*RET_1*) as a control for the short-term contrarian effect, returns over months $t - 12$ to $t - 2$ (*RET_2*) as a control for medium-term momentum effect, and returns over months $t - 36$ to $t - 13$ (*RET_3*) as a control for long-term winner/loser effect. The focus of Equation (2) is on the amount of insider purchase (*PURCHASE*), insider sale (*SELL*), and the interaction term between information transparency and the amount of insider trading (*TRANSPARENCY × PURCHASE* and *TRANSPARENCY × SELL*). Insiders' information superiority implies a positive (negative) coefficient on *PURCHASE* (*SELL*), whereas the information transparency effect of H_2 predicts a negative (positive) coefficient on *TRANSPARENCY × PURCHASE* (*TRANSPARENCY × SELL*). That is, information transparency mitigates the positive (negative) abnormal returns associated with insider purchase (sale). Except for *RET_1*, *RET_2*, and *RET_3*, all independent variables are measured for the fiscal year immediately before the future return period.

We report in Table 3 the mean coefficient estimates and other statistics from the cross-sectional monthly regression of Equation (2). The results are obtained from 132 monthly regressions ($11 \times 12 = 132$) for the period 1987–1997. The results of Table 3 show that all control variables have the predicted sign and are statistically significant at the conventional level, except for *RET_3*. Consistent with insiders' information superiority and the predictive value of insider trading activity with respect to future return, we find a significantly positive coefficient on *PURCHASE* (2.313) and a significantly negative coefficient on *SELL* (−2.221). Consistent with

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[21] The distribution statistics of *FRET* are qualitatively similar to those of *PRET*. In untabulated test, we re-estimate Equation (2) by including beta as another firm-specific risk factor. We find that, consistent with prior research, the coefficient on beta is statistically insignificant and that our results remain unchanged with the inclusion of beta.

Table 3

Summary statistics for regression of future monthly stock return on insider trading activity, corporate information transparency, and control variables

$$
FRET_{ij} = \beta_0 + \beta_1 LN(MV)_i + \beta_2 LN(B/M)_i + \beta_3 RET\_1_i + \beta_4 RET\_2_i + \beta_5 RET\_3_i
$$
$$
+ \beta_6 PURCHASE_t + \beta_7 SELL_i + \beta_8 TRANSPARENCY_i + \beta_9 TRANSPARENCY_i
$$
$$
\times PURCHASE_i + \beta_{10} TRANSPARENCY_i \times SELL_i + \theta_{ij}, \quad j = 1 \ldots 12,
$$

(2)

Variable definitions are as follows. *FRET* is the firm's stock return over the next 12 months. *LN (MV)* is the logarithm of the firm's market value at the fiscal year-end. *LN (B/M)* is the logarithm of book-to-market ratio. *RET_1* is the previous month's (month − 1) return on the stock. *RET_2* is the previous year's return on the stock form month −12 to −2. *RET_3* is the return on the stock from month −36 to −13. *PURCHASE* (*SELL*) is the amount of insider stock purchase (sale) deflated by the firm's market value. *TRANSPARENCY* is the industry/year-adjusted AIMR disclosure and transparency rankings, computed as (rank − 1) ÷ (number of firms with no missing disclosure ranks in the industry/year − 1). The interaction term *TRANSPARENCY × PURCHASE* (*TRANSPARENCY × SELL*) equals *TRANSPARENCY* times *PURCHASE* (*SELL*). Except for *RET_1*, *RET_2*, and *RET_3*, all independent variables are measured for the fiscal year immediately before the future return period. This Fama-MacBeth regression is run cross-sectionally for every month from January 1987 to December 1997. The *t*-statistics in parentheses are adjusted for serial correlation following Newey and West (1987).

Variable	Definition	Predicted sign	Coefficient (*t*-statistics)
Intercept	Regression intercept	+/−	−0.011
			(−0.97)
LN(MV)	Logarithm of market value	−	−0.001*
			(−1.99)
LN(B/M)	Logarithm of book-to-market ratio	+	0.001*
			(1.75)
RET_1	Previous monthly return − 1	−	−0.039***
			(−3.08)
RET_2	Return from months −12 to −2	+	0.008*
			(2.00)
RET_3	Return from months −36 to −13	−	−0.001
			(−1.43)
PURCHASE	Amount of insider purchase	+	2.313**
			(2.28)
SELL	Amount of insider sale	−	−2.221***
			(−3.66)
TRANSPARENCY	Information transparency	+/−	−0.002
			(−1.12)
TRANSPARENCY × PURCHASE	*TRANSPARENCY* times *PURCHASE*	−	−1.193*
			(−2.19)
TRANSPARENCY × SELL	*TRANSPARENCY* times *SELL*	+	0.978***
			(4.28)
N	Number of monthly regression		132

***, **, * indicate one-tailed statistical significance at the 0.01, 0.05 and 0.1 level, respectively, when predicted sign is either "+" or "−" and two-tailed significance otherwise.

the prediction of H_2, we find a significantly negative coefficient on the interaction term *TRANSPARENCY* × *PURCHASE* (−1.193). This result indicates that insider purchases earn lower returns at firms with greater information transparency. The magnitude of this coefficient estimate implies that for firms with the lowest transparency rank (*TRANSPARENCY* = 0), the coefficient on *PURCHASE* is 2.313, whereas for firms with the highest transparency rank (*TRANSPARENCY* = 1) this coefficient is 1.12 (2.313 − 1.193 = 1.12), or 48.4% lower (1.12 ÷ 2.313 = 48.4%).

The results for the interaction term between insider sale and information transparency (*TRANSPARENCY* × *SELL*) also are consistent with the prediction of H_2. The coefficient on this interaction term is positive (0.978) and statistically significant at the 0.01 level. Its magnitude implies that moving from the least transparent firms (*TRANSPARENCY* = 0) to the most transparent firms (*TRANSPARENCY* = 1) in the industry is associated with a 56% decrease in the abnormal returns earned by insider sale (2.221 − 0.978 = 1.243 and 1.243 ÷ 2.221 = 56%). Thus, our evidence indicates that insiders earn significantly lower future abnormal returns for both purchase and sale when the firm's information transparency is greater, consistent with the prediction of H_2.

4.3. Market reaction to insider trading news and corporate information transparency

We now turn to examine the relation between information transparency and stock price reaction to the news of insider trades disclosed in the SEC filing. Stock price reaction to the filing of insider trades reflects the extent to which investors regard insider trades as new information linked to insiders' information advantage. Positive (negative) reaction to insider trading news indicates a good-news (bad-news) interpretation of the event by investors. We predict less positive (negative) stock price reaction to the news of insider purchase (sale) at firms with greater information transparency because increases in disclosure and transparency reduce insiders' information monopoly power and the information content of insider trading news (H_3). In other words, increases in the incorporation of insiders' private information into stock prices before the announcement of insider trades would render the announcement less informative. To test this prediction, we estimate the following regression:

$$
\begin{aligned}
AR\_P_{it} \text{ or } AR\_S_{it} = {} & \gamma_0 + \gamma_1 TRANSPARENCY_{it} + \gamma_2 LN(MV)_{it} + \gamma_3 M/B_{it} \\
& + \gamma_4 LOSS_{it} + \gamma_5 RD_{it} + \gamma_6 R^2 + \gamma_7 SPRD_{it} + \gamma_8 FLLW_{it} \\
& + \gamma_9 TRADE\_SIZE_{it} + \gamma_{10} NYSE_{it} + \gamma_{11} AMEX_{it} \\
& + \gamma_{12} NASD_{it} + \rho_{it},
\end{aligned}
\tag{3}
$$

where i and t are firm and year subscripts, respectively. AR_P_{it} (AR_S_{it}) is firm i's mean one-day excess returns associated with the SEC filing of insider purchase (sale) transactions in year t, where excess returns are estimated using the market model. *LN(MV)*, *M/B*, *LOSS*, *RD*, R^2, *SPRD*, and *FLLW* all have the same definitions as in

the regression of Equation (1). *TRADE_SIZE* is the total value of insider transactions deflated by the firm's market value. *NYSE*, *AMEX*, and *NASD* are indicator variables for firms traded on NYSE, Amex, and NASD, respectively.

In Table 4, we report the mean coefficient estimates and adjusted *t*-statistics from 11 annual cross-sectional regression of Equation (3). The regression for insider purchase (sale) includes exactly 2,633 (3,162) firm-years that have at least one insider purchase (sale) transaction in a given year. In the regression for insider purchase, we find that the coefficient on *TRANSPARENCY* is negative (-0.003) and statistically significant at the 0.01 level. This result is consistent with the prediction of H_3 for a negative relation between information transparency and market reaction to the news of insider purchase. The size of this coefficient implies that, between firms with the lowest transparency rank (*TRANSPARENCY* = 0) and those with the highest transparency rank (*TRANSPARENCY* = 1), there is a difference of 0.003, or 0.3%, in one-day excess returns associated with the filing of insider purchase. On a weekly basis, this is equivalent to a return difference of 1.5%. Thus, market participants react significantly less positively to the news of insider purchase when the firm has greater information transparency, suggesting that transparency-enhancing activities mitigate the information content in the announcement of insider purchase. This is consistent with the view that transparency preempts insiders' private information by revealing much of the information to investors before the announcement of insider trading news. The regression results for insider sales also are consistent with this effect of information transparency on market reaction to insider trading news. In the regression for insider sale, we find that the coefficient on *TRANSPARENCY* is positive (0.002) and statistically significant at the 0.01 level. Thus, consistent with the prediction of H_3, our results indicate a significantly negative relation between information transparency and market reaction to the news of insider purchase and sale.

5. Conclusion

In our study, we examine the relation between corporate information transparency and insider trading. We find that the amount of insider purchase and sale is negatively associated with the degree of firms' information transparency. Our results indicate that stock trading by insiders is more (less) prevalent at firms with lower (greater) transparency level. We find that insider-trading gains are smaller (larger) when firms' information transparency is greater (lower). We also find that the degree of transparency is negatively associated with the informativeness of insider trading news. Taken together, the results of our study are consistent with transparency reducing insider trading by decreasing insiders' information advantage and its economic value.

Insider trading is widely viewed as the result of firms' opaque information environment that can potentially harm investors and undermine investor confidence in equity market. Recently, there have been increases in the regulations and

Table 4

Summary statistics for regressions of market reaction to the SEC filing of insider trades on corporate information transparency and control variables

$$AR\_P \text{ or } AR\_S = \gamma_0 + \gamma_1 TRANSPARENCY_{it} + \gamma_2 LN(MV)_{it} + \gamma_3 M/B_{it}$$
$$+ \gamma_4 LOSS_{it} + \gamma_5 RD_{it} + \gamma_6 R^2 + \gamma_7 SPRD_{it} + \gamma_8 FLLW_{it}$$
$$+ \gamma_9 TRADE\_SIZE_{it} + \gamma_{10} NYSE_{it} + \gamma_{11} AMEX_{it} + \gamma_{12} NASD_{it} + \rho_{it}. \tag{3}$$

Variable definitions are as follows. AR_P (AR_S) is the firm-year's mean excess returns on the day when insider purchase (sales) transactions are filed with the SEC. For each insider transaction excess returns on the filing day are defined as raw returns on that day minus expected returns, where expected returns are derived from the market model using parameters estimated over the last 120 days before the filing day (days -121 to -2 relative to the filing day). $TRANSPARENCY$ is the industry/year-adjusted AIMR disclosure and transparency rankings, computed as $(rank - 1) / (number of firms with no missing disclosure ranks in the industry/year - 1)$. $LN(MV)$ is the firm's market value at the fiscal year-end. M/B is the market-to-book ratio at the fiscal year-end. $LOSS$ is a dummy variable that takes the value of 1 for firms reporting losses. RD is a dummy variable that takes the value of 1 for firms reporting nonzero R&D expenditures. R^2 is a proxy for the informativeness of the firm's financial statement, measured as the adjusted R^2 from a firm-specific time series regression of stock price per share as of three months after fiscal year-end on earnings per share and book value per share. $SPRD$ is the firm's bid-ask spread, computed as the mean absolute difference between the closing bid and ask prices of daily trades, scaled by the mean of the bid and ask price. $FLLW$ is the logarithm of the number of analysts providing earnings forecast of the next year. $TRADE\_SIZE$ is the amount of insider trading deflated by the firm's market value. $NYSE$, $AMEX$, and $NASD$ are indicator variables for firms traded on NYSE, Amex, and NASD, respectively. t-Statistics in parentheses.

Variable	Definition	Predicted sign	Insider purchase	Insider sell
Intercept	Regression intercept	+/−	0.002	−0.002
			(0.48)	(−1.13)
TRANSPARENCY	Information transparency	−, +	−0.003***	0.002***
			(−3.67)	(3.09)
LN(MV)	Logarithm of market value	−	−0.001	0.001
			(−0.26)	(0.41)
M/B	Market-to-book ratio	+	−0.001	−0.001
			(−0.44)	(−0.13)
LOSS	Loss firm indicator	+	−0.002	0.001
			(−1.07)	(0.69)
RD	Indicator for R&D firms	+	0.002**	−0.001
			(2.47)	(−1.16)
R^2	Earnings informativeness	−	0.002	0.001
			(0.58)	(0.28)
SPRD	Bid-ask spread	+	0.104*	0.080
			(2.19)	(1.29)
FLLW	Analyst following	−	−0.001	−0.001
			(−0.63)	(−0.20)
TRADE_SIZE	Size of insider trade	+, −	0.103	−0.102
			(0.79)	(−1.29)
NYSE	Dummy variable for NYSE	+/−	−0.008**	0.002
			(−2.55)	(1.13)
AMEX	Dummy variable for Amex	+/−	0.001	−0.005
			(0.46)	(−1.22)

(*Continued*)

Table 4　(*continued*)

Summary statistics for regressions of market reaction to the SEC filing of insider trades on corporate information transparency and control variables

Variable	Definition	Predicted sign	Insider purchase	Insider sell
NASD	Dummy variable for NASD	+/−	0.001	0.003
			(0.57)	(1.24)
N	Number of observations		2,633	3,162
Average adj. R^2			3.67%	2.69%

***, **, * indicate one-tailed statistical significance at the 0.01, 0.05 and 0.1 level, respectively, when predicted sign is either "+" or "−" and two-tailed significance otherwise.

enforcement of insider trading. Many corporations also have voluntarily adopted various restrictions on insider trading. Our study is relevant for understanding the usefulness of information disclosure and transparency in addressing investors' concern about insider trading. Our results suggest that enhanced information transparency via increases in disclosure is useful for mitigating the extent and profitability of insider trading.

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