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Asymmetric Signaling Power of Insider Trading and Its Impact on Information Environment and Market Reactions

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Abstract: We document that market reactions to insider purchases and sales are different in terms of price and volume. With an extensive data set that covers the period from 1991 to 2006, we systematically segregate the asymmetric effects of these two types of insider transactions. We follow the design of previous studies (e.g., Basu, 1997; Ball and Shivakumar, 2005, Leone et al. 2006) to understand the asymmetric information provided by insider purchases and sales. We pioneer the forecast approach developed by Barron, Kim, Lim, and Stevens (1998)to test the precision of the information environment. We find that market can distinguish and discriminate the signaling strength of insider purchases and sales. Insider purchases are a stronger signal than insider sales, and insider purchases create a better environment to alleviate information asymmetry; thus enhancing average investors to trade and mimic.

JEL code: G00; G32, and G35
Key words: Insider Trading, Information Environment; Asymmetry

"At Peridot Capital, I tend to ignore insider selling completely. Sure, a lot of sales inside a company can indicate management feels their stock is overpriced, but there are dozens of other reasons top brass sell stock, and they are never required to give the reason for their actions. Investors should be able to tell if a stock is grossly expensive or not on their own, if they indeed manage their own money, so insider selling data really can't be relied upon…. Insider buying,

however, I believe is crucially important. While I can make a laundry list of reasons why someone chooses to sell a stock, the reasons to buy are much fewer in number. In fact, there's only one (to make money)....”

The Peridot Capitalist[1] (on September 07, 2007)

1. The Peridot Capitalist, September 7, 2007 (http://www.peridotcapitalist.com/?_s=insider+selling); accessed on June 15, 2010.

1. Introduction

Insider trading often draws a lot of attention. Top managers, directors, and blockholders(those who own 10% or more of the company) have superior knowledge of their firm, and hence their actions to trade are believed to send credible signal of a firm's future performance, potentially alleviating information asymmetry. Many agree though the strategy following insider trading could be different depending on the directions of the transactions. In general, studies report positive abnormal stock returns on insider purchases and negative returns on insider sales (see Seyhun, 1986; Lin and Howe, 1990; Chang and Suk, 1998). Fidrmuc, Goergen, and Renneboog (2006) argue that the responses that stem from insider purchases and sales are asymmetric. Because insiders incur a substantial cost to acquire their shares and create further burden to diversify their human capital as managers and directors, reasonably their purchases must stem from confidence of future performance, sending a strong positive signal about a firm's future financial health. However, this explanation cannot be easily translated for the action of insider sales. Insiders' expectation of a firm's poor future performance might only be one of many reasons to sell shares. For instance, insiders might choose to diversify or rebalance their portfolios once their shareholdings reach a threshold. They might also sell to finance their own liquidity needs, mediate their tax burden, or relieve from their own compensation contracts. Jenter (2005) argues that even if markets are rational and stock prices are reflective of fundamental value, the allocative role of equity could be distorted if managers hold a contrarian view of their firms. He suggests that managers could be motivated by the opportunity to take advantage of market's perceived misvaluations of the firm's stock. Insiders' action to sell is then guided by the opportunity rather than knowledge of future firm's performance. Opportunistic behavior to time the market creates distortion in the equity markets. Hence, insider selling at best poses a noisy signal. A recent study by Cohen, Malloy, and Pomorski (2012) show that there is predictable, identifiable routine insider trading that is not informative about firms' future. Hence, not all insider trades are informative.

While prior studies shed some light on the asymmetry of informativeness of insider purchases and sales (e.g., Beneish and Vargus, 2002; Fidrmuc, Goergen, and Renneboog, 2006), few papers systematically investigate the property of the asymmetry of insider purchases and sales. This article contributes to the literature in two aspects. First, we conduct a comprehensive study on the impact of insider purchases and sales and extend the scope of future market performance to include operating performance of firms, and market's reaction with respect to short-window returns and trading volume, and the information environment. The enlarged scope of this study provides us a window to analyze the impact of insider trading beyond the conventional stock return analysis. Second, we offer a detailed analysis of the asymmetric signaling power of insider purchases and sales by testing the precision of information. Current literature generally documents the relation between insider purchases (sales) and positive (negative) price reaction. Our research method presents a systematic method to disentangle the impact of insider purchases and sales. Hence, we can examine the asymmetric impact of insider purchases and sales.

We present four findings to help understand the fundamental differences of insider purchases and sales. We concur with previous literature that insider purchases have higher signaling power for a firm's future operating performance than insider sales. We find that insider purchases are associated more with the improvement of a firm's information environment than insider sales. Our findings indicate that insider purchases are associated more with the change of price than insider sales, when the insider trading news is released. Finally, we also present evidence that insider purchases are associated more with trading volume than insider sales, when the insider trading news is released. To sum up our findings, we conclude that insider purchases send a stronger signal to the market and that they possess more precise information for average investors to mimic than insider sales.

2. Development of hypotheses

Previous research has found that insiders buy before stock price increases and sell before stock price declines (e.g., Jaffe 1974; Finnerty 1976; Baesel and Stein 1979; Givoly and Palmon 1985; Seyhun 1986; Rozeff and Zaman 1988; Seyhun 1998). These studies show that it takes time for stock prices to reflect the information contained in insider trading. For example, Finnerty (1976), Baesel and Stein (1979), Givoly and Palmon (1985), Rozeff and Zaman (1988), and Seyhun (1998) find insignificant returns associated with insider trading from three to six months following the transaction. Indeed, these studies suggest that outside investors seeking to

mimic insider trading patterns ought to hold their positions for longer periods in order to generate returns that exceed transaction costs. Marin and Olivier (2008) develop a theoretical framework to explain the fact that insiders' selling peak many months before stock price crashes while insiders' buying peak only the month before stock price surges. Aktas, de Bodt, and Van Oppens(2008) find that insider trading has significant impact on price discovery in the stock market via the change in price sensitivity to relative order imbalance due to abnormal insider trading activities. The literature focuses more on stock price reactions and future stock returns than on insider trading. With the exception of Aktas et al (2008), few studies examine the trading volume of insider trading.

Prior studies suggest that insider trading is a leading, rather than a contemporaneous, indicator of firm performance. Following Marin and Olivier (2008), we argue that even though insider trading is a leading indicator for firm performance, insider purchases and sales have different strengths of signaling power. While insider sales could be due to many reasons, insider purchases result from a simple motive that implies better firm performance in the future. We focus on understanding the signaling strength of these two kinds of insider transactions. Assuming the market is efficient and individual investors are rational, the aggregate market price and volume reactions should shed some light on whether the market can distinguish and discriminate between these two types of insider transactions.

We conjecture that aggregate market price reaction to insider purchases should be more visible and observable than that of insider sales. We argue that an average investor finds more utility in observing and subsequently mimicking insider purchases while do not benefit from following insider sales because of a noisy environment. Hence, insider purchases present a stronger signaling strength to the market. Similarly, along the findings in Aktas et al (2008), it is likely that aggregate market trading volume is also associated more with insider purchases than insider sales because the volume itself is readily observable. Thus, we hypothesize that market price and volume reaction are asymmetrically related to insider purchases and insider sales. Insider purchases are associated more with the change in positive returns and change of volume than insider sales when the insider trading news is released.

If the motive to profit is the most compelling reason for insiders to purchase based on their superior information about the firm's future performance, we should be able to observe a positive correlation between insider purchases and a firm's future performance. Prior research regards insider trading as an important tool to alleviate information asymmetry. We argue that

since the motive for insiders to purchase is clear, i.e., to profit, then the action and event of such insider purchases improves the information environment for investors. However, insider sales could be the result of other reasons, such as diversification, liquidity needs, litigation, taxes, compensation contracts, or managers' holding contrarian view of the firm. Hence, the action of insider sales could be noisy with many confounding events. We hypothesize that insider purchases are more likely to be associated with the improvement of a firm's information environment than insider sales. Also, insider purchases are superior to insider sales for average investors as a tool to lessen information asymmetry between insiders and the market.

3. Data and Research Design

We examine all firms with all required variables from 1991 to 2006. Return and stock price and volume data are from the Center for Research in Security Prices (CRSP) daily files. Financial statement and accounting data are collected from Compustat. We obtain insider trading data from Thomson Reuters Insiders Data. In addition, we obtain our analysts' forecast data from the I/B/E/S database. In addition, Barron, Kim, Lim, and Stevens (1998) present a model to relate financial analysts' earnings forecasts to their information environment. We adopt their model in our study to test the precision of information; we refer to their model as BKLS model throughout our paper.

We follow Lakonishok and Lee (2001) to define insider transactions as those conducted by top executives, directors, and shareholders who own 10% or more of company shares. Because they are required by the SEC to file their transactions, their actions are publicly observable, which provides a time window for outside investors to respond to the information and mimic insiders' action.

3.1 Effects of insider purchases and sales on market response

We conjecture that insider purchases are associated with more information content than insider sales. Similar to Kim and Verrecchia (1991), we predict that price and volume reactions of the market are more pronounced for insider purchases than insider sales. We test the prediction on stock price reactions of the market to the two types of insider trades with the following model:

$$CAR = \alpha_0 + \alpha_1 TRADE + \alpha_2 NEG\_TRADE + \alpha_3 TRADE * NEG\_TRADE + \alpha_4 ROA + \alpha_5 SIZE + \alpha_6 MTB + \alpha_7 LEV + \varepsilon \quad (1)$$

where

CAR = The abnormal returns calculated as the excess firm returns over the CRSP value-weighted index over the three-day window [-1, 1] around the insider trading date.

TRADE = The number of shares traded in the insider trading transaction event divided by outstanding shares, where trade is positive if it is a purchase and negative if it is a sale.

NEG_TRADE = An indicator variable that equals one if TRADE is negative (i.e., insider sale), and zero (i.e., insider purchase) otherwise.

ROA = Return on total assets.

SIZE = Firm size, calculated as the natural log of market capitalization at the beginning of year.

MTB = Market-to-book ratio of equity at the beginning of year.

LEV = Leverage, calculated as the percentage of long-term and short-term debt of total assets at the beginning of year.

ε = A random error term.

We regress *CAR* on three investigative variables (*TRADE, NEG_TRADE,* and *TRADE*NEG_TRADE*) and four control variables (*ROA, SIZE, MTB,* and *LEV*) in Equation (1). *CAR* should capture the abnormal returns identified surrounding the three-day window of any insider transaction. We construct the variable *NEG_TRADE* and the interactive variable, *TRADE* NEG_TRADE* as part of a piecewise regression. The piecewise regression design is to detect the asymmetric effect between insider purchase and sales. This setup is similar to the

model used in many prior studies, such as Basu (1997) and LaFond and Watts (2008). We include the other four independent variables: *ROA* is to control for firm performance, *SIZE* for firm size, *MTB* for growth, and *LEV* for financial risk. Furthermore, Lakonishok and Lee (2001) suggest that insider trading is a stronger indicator in small-cap stocks because small size firms tend to represent a less efficient segment of the market. Hence, the SIZE variable also helps mitigate a potential small-cap bias in our models.

Our piecewise regression model is constructed in the spirit of the literature that discusses the asymmetric timeliness of recognizing good news and bad news in earnings (Basu, 1997). In Basu (1997), accounting conservatism is defined as bad news and is recognized in earnings in a timelier manner than good news. Basu examines this asymmetric recognition timeliness using a piecewise regression model that includes a dummy variable to proxy for bad news, and a variable that interacts between this dummy variable and an economic news variable. Hence, the interactive variable can capture the asymmetric effect of good news and bad news. The idea of detecting asymmetric effects has been widely applied in prior studies, such as the asymmetric effects of cash inflow and cash outflow on accruals (e.g., Ball and Shivakumar, 2005, 2006, 2008); the asymmetric effects of current earnings increase and decrease on future earnings change (Ball and Shivakumar, 2005); and the asymmetric effects of returns increase and decrease on cash compensation (Leone, Wu, and Zimmerman, 2006).[For details of this type of regression model, please see Basu (1997), Ball and Shivakumar (2005), Leone, Wu, and Zimmerman (2006), and LaFond and Watts (2008) for discussion of their regression models.]

We follow the literature to construct the empirical model in Equation (1) to design the variables that will capture the strength of how the market responds to insider purchases and sales. We observe the effect of insider purchases on aggregate market price reaction in α_1 and the effect of insider sales in $\alpha_1 + \alpha_3$. In other words, if the market reacts "asymmetrically" to news impounded in insider purchases and sales, under our hypothesis the aggregate market price reactions to insider purchases has to be greater than that of insider sales, i.e., $\alpha_1 > (\alpha_1 + \alpha_3)$, and α_3 is predicted as negative. Furthermore, if our conjecture of insider purchases having information content is an indicator of above average firm performance in the future (i.e., positive signal of a firm's future performance); we should expect α_1 to be positive.

Utama and Cready (1997) argue that market trading volume around an event can be regarded as a proxy for information content of this event. In our scenario, we argue that if insider purchases contain more information than insider sales, then investors are more likely to mimic the trading strategy of insider purchases. Consequently, market trading volume around

insider purchases is predicted to be larger than around insider sales. We test this prediction on volume reactions of the market to insider purchases and sales with the following model:

$$CVOL = = \alpha_0 + \alpha_1 TRADE + \alpha_2 NEG\_TRADE + \alpha_3 TRADE * NEG\_TRADE + \alpha_4 ROA + \alpha_5 SIZE + \alpha_6 MTB + \alpha_7 LEV + \zeta \quad (2)$$

We regress *CVOL* on an identical group of independent variables where *CVOL* is the dependent variable defined as the sum of trading volume divided by outstanding shares over the three-day window [-1, 1] around the insider trading date. The independent variables are defined as in Equation (1) and ζ is a random error term. Similar to the argument for Equation (1), we contend that aggregate market volume reactions to insider purchases and sales are different in Equation (2); we predict α_3 to be negative and α_1 to be positive. Thus, we predict that insider purchases result in a higher market volume than that of insider sales.

3.2 Effects of insider purchases and sales on a firm's future operating and market performance

We argue that insider purchases signal positive future operating and market performance for a firm, while insider sales do not necessarily reflect negative future performance. For instance, managers have undiversified human capital in a firm and that when their personal shareholdings, received through compensation or bonus reach a threshold they simply sell their shares to lower their own risk. In addition, insiders have to exit at some point, and hence, their sales might not necessarily relate to any information content other than liquidity needs. To test this argument, we develop the following models with control variables similar to those used in Lev and Nissim (2004) and Lev, Radhakrishnan, and Zhang (2009):

$$OIG_{t+i} = \alpha_0 + \alpha_1 TRADESHRY_t + \alpha_2 NEG\_TRADESHRY_t + \alpha_3 TRADESHRY_t * NEG\_TRADESHRY_t + \alpha_4 SIZE_t + \alpha_5 DIV_t + \alpha_6 RDEXP_t + \alpha_7 EP_t + \alpha_8 D\_EP_t + \alpha_9 BM_t + \varepsilon \quad (3)$$

$$SALEG_{t+i} = \alpha_0 + \alpha_1 TRADESHRY_t + \alpha_2 NEG\_TRADESHRY_t + \alpha_3 TRADESHRY_t * NEG\_TRADESHRY_t + \alpha_4 SIZE_t + \alpha_5 DIV_t + \alpha_6 RDEXP_t + \alpha_7 EP_t + \alpha_8 D\_EP_t + \alpha_9 BM_t + \zeta \quad (4)$$

$$LCAR_{t+i} = \alpha_0 + \alpha_1 TRADESHRY_t + \alpha_2 NEG\_TRADESHRY_t + \alpha_3 TRADESHRY_t * NEG\_TRADESHRY_t + \alpha_4 SIZE_t + \alpha_5 BETA_t + \alpha_6 VOLATILITY_t + \alpha_7 EP_t + \alpha_8 D\_EP_t + \alpha_9 BM_t + \psi \quad (5)$$

where

OIG_{t+i} = Operating income growth in the subsequent year, calculated as the difference of operating income between t+i and t+i-1, divided by total assets at the end of year t.

$SALEG_{t+i}$ = Sales growth in the subsequent year, calculated as the difference of sales between t+i and t+i-1, divided by sales of year t.

$LCAR_{t+i}$ = Cumulative excess returns from end of year t to the end of year t+i, where excess returns are adjusted for the company size and book-to-market portfolio returns.

TRADESHRY = Shares net traded in the insider trading transaction divided by outstanding shares over a year, where trade is positive if it is a purchase and negative if it is a sale.

NEG_TRADESHRY = An indicator variable is equals to one if TRADESHRY is negative, and zero otherwise.

TRADEFREQY = Net frequency of trading in the insider trading transaction divided by outstanding shares over a year, where trade is positive if it is a purchase and negative if it is a sale.

NEG_TRADEFREQY = An indicator variable that equals one if TRADEFREQY is negative, and zero otherwise.

SIZE = Firm size, calculated as the natural log of market capitalization at the end of the year. DIV is common

dividend divided by total assets at the end of year t.

RDEXP = Sum of R&D expense and capital expenditure divided by sales of year t.

EP = EPS divided by price at the end of year t if EPS is positive, and zero otherwise.

D_EP = An indicator variable that equals one if EPS is negative, and zero otherwise.

BM = Book-to-market ratio of equity at the end of year.

BETA = Slope coefficient obtained from estimating a market model using the previous 60 monthly returns.

VOLATILITY = Variance of the monthly returns of a firm for the previous 60 months.

ε, ζ, and ψ = Random error terms.

In regression Equations (3), (4), and (5), we use either net trading shares (*TRADESHRY*) or net trading frequency (*TRADEFREQY*) as proxies for aggregate insider trading over a year (*TRADE* variable in Equation 1). We consider both net trading shares and net trading frequency because these two measures capture different dimensions of insider trading even though they are highly positively correlated.

The models in Equations (3) to (5) are estimated for a pooled time series and cross-sectional data using the Huber-White procedure with clustering by firms. In Equation (3), the effect of insider purchases on operating income growth can be manifested in α_1, and the effect of insider sales on operating income growth can be manifested in $\alpha_1 + \alpha_3$. Therefore, according to our asymmetric signaling argument, if the effect from insider purchases is greater than the effect from insider sales, i.e., $\alpha_1 > (\alpha_1 + \alpha_3)$, then α_3 is predicted as negative. Furthermore, if insider

purchases can signal better future performance, then we also predict α_1 to be positive. Similarly, in Equations (4) and (5), we predict α_3 to be negative and α_1 to be positive.

3.3 Effects of insider purchases and sales on the precision of public information

We argue that insider purchases reduce information noise more than insider sales. We also conjecture that insider purchases are associated with greater precision of public information in the market, greatly increasing the utility and benefit of mimicking such action on investor part. Barron, Kim, Lim, and Stevens (1998) develop a forecast approach, versus the traditional market approach, to assess the utility or impact of financial reports in order to enhance a clear understanding of its usefulness to investors. The BKLM model provides a practical guide for us to investigate the precision of the information environment to investors. Hence, we estimate the precision of public information with the BKLS model (Barron et al., 1998; Botosan, Plumlee, and Xie 2004; Barron, Byard, and Kim 2002), and use the variables as in Ali, Chen, and Radhakrishnan (2007) to control for other factors affecting the information environment.

$$RPUBLIC_t = \alpha_0 + \alpha_1 TRADE_t + \alpha_2 NEG\_TRADE_t + \alpha_3 TRADE_t * NEG\_TRADE_t + \alpha_4 BROKER_t + \alpha_5 EFFORT_t + \alpha_6 PROA_t + \alpha_7 ROA_t + \alpha_8 ACHEPS_t + \alpha_9 SIZE_t + \alpha_{10} RD_t + \alpha_{11} INVPRICE_t + \alpha_{12} STDROE_t + \alpha_{13} CORR_t + \alpha_{14} FD_t + \varepsilon \quad (6)$$

where

RPUBLIC = The percentile rank of public information. The precision of public information is estimated using the BKLS model.

BROKER = The average number of analysts employed by the brokerage houses that employ the firm's analysts.

EFFORT = The negative of the average number of firms followed by the firm's analysts in a particular year divided by the total number of analysts covering the firm that year.

PROA = The last year's earnings before extraordinary items divided by total assets.

ACHEPS = Absolute value of the difference of EPS between current year and previous year, deflated by stock price at the beginning of the fiscal year.

INVPRICE = The inverse of stock price at the beginning of the fiscal year.

STDROE = Standard deviation of ROE in the preceding 10-year period.

CORR = The Pearson correlation between ROE and annual stock returns in the preceding 10-year period.

FD = An indicator variable that equals one if the calendar year is after 2001, and zero otherwise. It is to control for the impact of Regulation Full Disclosure in 2000.

ε = A random error term.

Other variables in Equation (6) are defined earlier. Similar to Equations (3), (4), and (5), we use either net trading shares (*TRADESHRY*) or net trading frequency (*TRADEFREQY*) as proxies for aggregate insider trading over a year (*TRADE*) in Equation (6). The models are estimated for a pooled time series and cross-sectional data, using the Huber-White procedure with clustering by firms. In Equation (6), the effect of insider purchases on the precision of public information can be manifested in α_1, and the effect of insider sales on the precision of public information can be manifested in $\alpha_1 + \alpha_3$. Therefore, according to our asymmetric signaling argument, α_3 is predicted as negative, and α_1 is predicted as positive.

4. Empirical results

4.1 Market price and volume reactions to insider purchases and sales

To examine the effect of insider purchases and sales on aggregate market price and volume reaction, we use Equations (1) and (2) to examine if these two types of insider transactions have different impacts. Table 1, Panel A presents the descriptive statistics on the variables used in Equations (1) and (2). The mean and median of the main investigative variable, TRADE, are both negative, indicating that there are more insider sales than insider purchases during our sample period.

Table 1, Panel B provides the regression results for both Equations (1) and (2). All variables are statistically significant at the 0.001 level under the two models, except for *SIZE*, which is not significant under the Equation (1) model. We find that CAR, abnormal returns measured one day prior and after the transaction event, is positively correlated with the *TRADE* variable with a 6.825 coefficient estimate. Because of the variable's construction, a positive *TRADE* variable indicates insider purchases and a negative *TRADE* variable indicates insider sales. Hence, for every one standardized unit change of insider purchases (sales), there is an almost seven unit increase (decrease) in abnormal returns.

*TRADE*NEG_TRADE* is negatively related to CAR. Because we define *NEG_TRADE* as a binary variable that equals one if *TRADE* is negative and zero otherwise, we capture insider sales with this variable. Hence, this interactive variable, *TRADE*NEG_TRADE*, is only present in the model for insider sales. Recall that our research design suggests that if the market responds differently to insider purchases than to insider sales and if the aggregate market reaction to insider purchases is greater than that of insider sales, we would expect to observe the estimate α_1 (coefficient of *TRADE*) to exceed the sum of α_1 and α_3 (coefficient of *TRADE*NEG_TRADE*). Our coefficient estimate for α_1 is 6.825 and the sum of α_1 and α_3 is -1.81 [6.825 + (-8.635)]. Hence, our findings show that the aggregate market price reaction is indeed greater for insider purchases than insider sales. *ROA* is positively correlated to *CAR*, indicating that the higher the return on assets for a firm, the higher the abnormal returns. Similarly, *MTB*, the market-to-book ratio proxy for a firm's growth, is also positively related to *CAR*, suggesting the firm growth potential tends to relate to positive abnormal returns. *LEV*, the proxy for a firm's financial risk, is shown to have a statistically significant negative relation with *CAR*, suggesting that higher leverage leads to negative impacts on market returns. For Equation (2), the findings are similar to that of Equation (1). That is, the aggregate market volume reaction to insider purchases also exceeds that of insider sales.

Table 1Descriptive Statistics of CAR and CVOL around Trading

We obtain our stock price data from the Center for Research in Security Prices (CRSP) daily files. The sample period is from 1991 to 2006. *CAR* is the abnormal returns calculated as the excess firm returns over the CRSP value-weighted index over the three-day window [-1, 1] around the insider trading date.*CVOL* is the sum of trading volumes divided by outstanding shares over the three-day window [-1, 1] around theinsider trading date.*TRADE* is the number of shares traded in the insider trading transaction divided by outstanding shares, where trade is positive if it is a purchase and negative if it is a sale. *NEG_TRADE* is an indicator variable that equals one if *TRADE* is negative (i.e., insider sales), and zero (i.e., insider purchases) otherwise. We also create an interactive variable, *TRADE* NEG_TRADE*, to capture any interaction between the two major independent variables.*ROA* is return on total asset. SIZE is firm size, calculated as the natural log of market capitalization at the beginning of the year. *MTB* is the market-to-book ratio of equity at the beginning of year. *LEV* is leverage, calculated as the percentage of long-term and short-term debt of total assets at the beginning of year. Asterisks denote significance at the 0.01 (***), 0.05(**), and 0.10(*) levels.

Panel A: Descriptive Statistics

Variables	Mean	STD	Median	Q1	Q3
CAR	0.0054	0.0587	0.0015	-0.0231	0.0289
CVOL	0.0241	0.0313	0.0128	0.0056	0.0291
TRADE	-0.0004	0.0013	-0.0001	-0.0005	0.0000
NEG_TRADE	0.6947	0.4605	1.0000	0.0000	1.0000
ROA	-0.0036	0.1986	0.0336	0.0046	0.0810
SIZE	5.9955	2.0421	5.9599	4.5465	7.3064
MTB	3.4385	3.7720	2.2631	1.4130	3.9330
LEV	0.2062	0.2078	0.1557	0.0222	0.3252

Panel B: Regression

	(1)		(2)	
Dependent =	*CAR*		*CVOL*	
	Coefficient	t-statistics	Coefficient	t-statistics
INTERCEPT	-0.001***	-3.22	0.003***	3.77
TRADE	6.825***	19.81	5.194***	26.62
NEG_TRADE	0.005***	17.08	0.006***	17.43
*TRADE * NEG_TRADE*	-8.635***	-23.92	-11.088***	-48.03
ROA	0.009***	10.12	-0.013***	-8.42
SIZE	0.000	1.48	0.002***	12.21
MTB	0.001***	14.97	0.001***	14.30
LEV	-0.005***	-7.76	-0.015***	-13.06
R-Squared	0.0075		0.1292	
Number of Observations	603,874		603,874	

4.2 Differential effects of insider transactions on future operating performance of a firm

We present descriptive statistics on variables used in Equations (3) and (4) in Table 2. *TRADESHRY* in our sample has a mean of -0.0059 and a median of -0.0009. Because *TRADESHRY* is the net shares traded in the insider transaction divided by the number of outstanding shares over a year, a negative mean indicates the number of shares insiders sold is larger than the number of shares insiders purchased. Also, a negative median of *TRADESHRY* also shows more insider transactions are on the sell side than the buy side. By construction of the *TRADEFREQY* variable, we also observe that the frequency associated with insider sales exceeds that of insider purchases. The finding is consistent with Lakonishok and Lee (2001), in which they find insider purchases only account for roughly half of the selling activity.

Although both insider purchases and sales might contain information regarding a firm's future operating performance, we argue that the signal strength of insider purchases is greater than that of insider sales because purchases have a pure motive to profit while sales could be a result of many other reasons. Table 3, Panel A shows the regression results on Equations (3) and (4) using net trading shares as the proxy. We find that *TRADESHRY* is positively and significantly related to OIG_{t+1}, OIG_{t+2}, $SALEG_{t+1}$, and $SALEG_{t+2}$. The empirical findings indicate that net insider trading has a positive relation with firm future operating income growth and sales growth in the subsequent two years. Hence, if net insider trading ($\alpha 1$) is positive (i.e., insider purchases exceed insider sales), there is an increase in both the firm's operating income growth and sales growth, signaling positive future performance. For the same regression equations, the coefficient ($\alpha 3$) of the *TRADESHRY*NEG_TRADESHRY* variable is negative and significant so that $\alpha 1 > \alpha 1 + \alpha 3$. Therefore, the findings in Equations (3) and (4) are consistent with our conjecture that the effect from insider purchases is greater than the effect from insider sales, and insider purchases provide a better signal for future performance than insider sales.

To test the robustness of our models, we use the trading frequency in Equations (3) and (4). The findings are in Table 3, Panel B. The results in Panel B are qualitatively the same as those in Panel A. While trading frequency measures a different dimension of insider trading, our results are robust. Our findings in Table 3 are consistent with our hypotheses.

4.3 Asymmetric signals of insider purchases and sales on future market performance

We use market returns to proxy a firm's future performance; our empirical findings are shown in Table 4. Our dependent variable, $LCAR_{t+i}$, is the cumulative excess returns from end of year t to the end of year t+i, where excess returns are adjusted for the companion size and

book-to-market portfolio returns. We find that the coefficient of *TRADESHRY* is 1.6868, and it is statistically significant at 0.001 level. Coefficient *TRADESHRY*NEG_TRADESHRY* is -1.3805 and is also statistically significant at 0.001 levels. In addition, the coefficient of TRADESHRY (1.6868) is indeed larger than the sum of the two coefficients [0.3063 = 1.6868 + (-1.3805)], *TRADESHRY* and *TRADESHRY*NEG_TRADESHRY*, and *TRADESHRY*NEG_TRADESHRY* is indeed negative. The findings confirm that insider purchases are a stronger signal than that of insider sales. Our results are consistent with our accounting performance measures earlier in Table 3. Table 4, Panel B provides results on the effects of two types of insider transaction trading frequency on the cumulative abnormal market returns. Again, the findings in Panel B are similar to those in Panel A of Table 4.

4.4 Effects of insider purchases and sales on the precision of public information

We follow the BKLS model to estimate the precision of public information. We then construct a percentile rank of public information based on estimated precision of public information to distinguish the quality and environment of information. We regress*RPUBLIC* on the same set of investigative and control variables of trading shares and frequency. Table 5, Panel A presents the descriptive statistics on these variables. Panel B presents the results on regression using trading shares as the proxy for insider purchases and sales. We find the estimated coefficient of *TRADESHRY* equals 2.8425, while *TRADESHRY*NEG_TRADESHRY* equals -4.8801. They are both statistically significant at the 0.001 level. The results indicate that insider purchases significantly improve the quality of information far better than insider sales. On average, when there is one unit of insider purchase, the ranking of information quality improves by almost three units in total. On the contrary, when there is one unit of insider sales, the ranking of information quality increases by almost five units in total. We also present the results on trading frequency in Panel C of Table 5. The empirical findings are qualitatively similar to Panel B of Table 5. The insider purchases are a much stronger signal than insider sales as observed in the estimated coefficients. We argue that insider purchases are more useful signal to resolve information asymmetry between insiders and outside investors compared to insider sales. The implication of the empirical findings is that outside investors can utilize the observed insider purchases and make positive excess returns.

Table 2
Descriptive Statistics of Future Performance

The sample period is from 1991 to 2006. OIG_{t+1} is operating income growth in subsequent year, calculated as difference of operating income between t+1 and t, divided by total asset at the end of year t. OIG_{t+2} is cumulated operating income growth in subsequent two years, calculated as difference between average operating income of t+1 and t+2 and operating income of year t, divided by total asset at end of year t. $SALEG_{t+1}$ is sales growth in subsequent year, calculated as difference of sales between t+1 and t, divided by sales of year t. $SALEG_{t+2}$ is cumulated sales growth in subsequent two years, calculated as difference between average sales of t+1 and t+2 and sales of year t, divided by sales of year t. $LCAR_{t+1}$ is excess returns of year t+1, where excess return is adjusted for companion size and book-to-market portfolio returns. $LCAR_{t+2}$ is excess returns cumulated from year t+1 to year t+2, where excess return is adjusted for the companion size and book-to-market portfolio returns. *TRADESHRY* is shares net traded in the insider trading transaction divided by outstanding shares over a year, where trade is positive if it is a purchase and negative if it is a sale. *NEG_TRADESHRY* is an indicator variable that equals one if *TRADESHRY* is negative, and zero otherwise. *TRADEFREQY* is net frequency of trading in the insider trading transaction divided by outstanding shares over a year, where trade is positive if it is a purchase and negative if it is a sale. *NEG_TRADEFREQY* is an indicator variable that equals one if *TRADEFREQY* is negative, and zero otherwise. *SIZE* is firm size, calculated as natural log of market capitalization at end of year. *DIV* is common dividend divided by total asset at end of year t. *RDEXP* is sum of R&D expense and capital expenditure divided by sales of year t. EP is EPS divided by price at end of year t if *EPS* is positive, and zero otherwise. *D_EP* is an indicator variable that equals one if *EPS* is negative, and zero otherwise. *BM* is book-to-market ratio of equity at end of year. *BETA* is slope coefficient obtained from estimating a market model using previous 60 monthly returns. *VOLATILITY* is variance of the monthly return of a firm for previous 60 months.

Variables	Mean	STD	Median	Q1	Q3
OIG_{t+1}	0.0209	0.0728	0.0118	-0.0088	0.0460
OIG_{t+2}	0.0317	0.0907	0.0155	-0.0099	0.0608
$SALEG_{t+1}$	0.1482	0.2834	0.0933	-0.0004	0.2301
$SALEG_{t+2}$	0.2385	0.4079	0.1454	0.0146	0.3393
$LCAR_{t+1}$	0.0154	0.4675	-0.0547	-0.2682	0.1882
$LCAR_{t+2}$	0.0264	0.6520	-0.0584	-0.3695	0.3020
$TRADESHRY_t$	-0.0059	0.0174	-0.0009	-0.0063	0.0001
$NEG\_TRADESHRY_t$	0.6867	0.4638	1.0000	0.0000	1.0000
$TRADEFREQY_t$	-9.7119	25.3263	-3.0000	-14.0000	2.0000
$NEG\_TRADEFREQY_t$	0.6192	0.4856	1.0000	0.0000	1.0000
$SIZE_t$	5.8150	1.9178	5.6976	4.4227	7.0581
DIV_t	0.0080	0.0151	0.0000	0.0000	0.0102
$RDEXP_t$	0.1439	0.5126	0.0069	0.0000	0.1049
EP_t	0.0504	0.0502	0.0469	0.0118	0.0724
D_EP_t	0.2086	0.4063	0.0000	0.0000	0.0000
BM_t	0.5995	0.4711	0.4946	0.3013	0.7491
$BETA_t$	1.0614	0.7658	0.9682	0.5654	1.3989
$VOLATILITY_t$	0.0277	0.0456	0.0176	0.0089	0.0316

Table 3 Asymmetric Signal of Insider Purchases and Sales on Future Operating Performance

The models are estimated for a pooled time series and cross-sectional data, using the Huber-White procedure with clustering by firms. The sample period is from 1991 to 2006. OIG_{t+1} is operating income growth in subsequent year, calculated as difference of operating income between t+1 and t, divided by total asset at the end of year t. OIG_{t+2} is cumulated operating income growth in subsequent two years, calculated as difference between average operating income of t+1 and t+2 and operating income of year t, divided by total asset at end of year t. $SALEG_{t+1}$ is sales growth in subsequent year, calculated as difference of sales between t+1 and t, divided by sales of year t. $SALEG_{t+2}$ is cumulated sales growth in subsequent two years, calculated as difference between average sales of t+1 and t+2 and sales of year t, divided by sales of year t. *TRADESHRY* is shares net traded in the insider trading transaction divided by outstanding shares over a year, where trade is positive if it is a purchase and negative if it is a sale. *NEG_TRADESHRY* is an indicator variable that equals one if *TRADESHRY* is negative, and zero otherwise. *TRADEFREQY* is net frequency of trading in the insider trading transaction divided by outstanding shares over a year, where trade is positive if it is a purchase and negative if it is a sale. *NEG_TRADEFREQY* is an indicator variable that equals one if *TRADEFREQY* is negative, and zero otherwise. *SIZE* is firm size, calculated as natural log of market capitalization at end of year. *DIV* is common dividend divided by total asset at end of year t. *RDEXP* is sum of R&D expense and capital expenditure divided by sales of year t. *EP* is *EPS* divided by price at end of year t if *EPS* is positive, and zero otherwise. *D_EP* is an indicator variable that equals one if *EPS* is negative, and zero otherwise. *BM* is book-to-market ratio of equity at end of year. *BM* is book-to-market ratio of equity at the end of year. Asterisks denote significance at the 0.01 (***), 0.05(**), and 0.10(*) levels.

Panel A: Using net trading shares as proxy

	(1)		(2)		(3)		(4)	
Dependent variable =	OIG_{t+1}		OIG_{t+2}		$SALEG_{t+1}$		$SALEG_{t+2}$	
	Coefficient	t-statistics	Coefficient	t-statistics	Coefficient	t-statistics	Coefficient	t-statistics
INTERCEPT	0.0498***	19.77	0.0685***	19.47	0.2756***	27.85	0.4273***	27.63
$TRADESHRY_t$	0.3756***	3.84	0.3823***	3.05	1.6270***	4.06	1.9706***	3.32
$NEG\_TRADESHRY_t$	-0.0026***	-2.56	-0.0020	-1.48	-0.0166***	-3.92	-0.0218***	-3.45
$TRADESHRY_t$* $NEG\_TRADESHRY_t$	-0.5695***	-5.36	-0.6684***	-4.89	-3.0415***	-7.15	-4.1310***	-6.53
$SIZE_t$	-0.0018***	-6.66	-0.0025***	-6.25	-0.0059***	-5.42	-0.0113***	-6.37
DIV_t	-0.1401***	-4.83	-0.2000***	-4.82	-1.7446***	-15.19	-2.5245***	-13.41
$RDEXP_t$	-0.0128***	-9.39	-0.0153***	-8.53	0.0837***	11.18	0.1588***	13.04
EP_t	-0.1425***	-8.49	-0.1711***	-7.90	-0.4316***	-6.90	-0.6112***	-7.30
D_EP_t	0.0177***	9.40	0.0232***	9.36	-0.0521***	-7.31	-0.0651***	-6.19
BM_t	-0.0198***	-16.71	-0.0265***	-16.55	-0.0988***	-19.52	-0.1406***	-17.98
R-Squared	0.0491		0.0528		0.0817		0.1025	
Number of Observations	29,527		29,527		29,527		29,527	

Panel B: Using net trading frequency as proxy

	(1)		(2)		(3)		(4)	
Dependent variable =	OIG_{t+1}		OIG_{t+2}		$SALEG_{t+1}$		$SALEG_{t+2}$	
	Coefficient	t-statistics	Coefficient	t-statistics	Coefficient	t-statistics	Coefficient	t-statistics
INTERCEPT	0.0537***	21.56	0.0749***	21.46	0.2961***	30.20	0.3382***	33.63
$TRADESHRY_t$	0.0002**	2.30	0.0001	1.05	0.0007**	2.07	0.0004	1.25
$NEG\_TRADESHRY_t$	-0.0020*	-1.79	-0.0015	-1.04	-0.0010	-0.21	-0.0017	-0.38
$TRADESHRY_t$ * $NEG\_TRADESHRY_t$	-0.0003***	-3.72	-0.0002***	-2.32	-0.0008**	-2.43	-0.0007**	-2.35
$SIZE_t$	-0.0025***	-9.63	-0.0033***	-8.74	-0.0089***	-8.14	-0.0091***	-7.65
DIV_t	-0.1428***	-4.89	-0.2125***	-5.08	-1.8966***	-15.95	-2.0373***	-16.57
$RDEXP_t$	-0.0129***	-9.50	-0.0154***	-8.64	0.0831***	11.09	0.1285***	16.09

EP_t	-0.1423***	-8.41	-0.1801***	-8.56	-0.4408***	-6.85	-0.5239***	-10.30
D_EP_t	0.0175***	9.27	0.0222***	9.03	-0.0546***	-7.56	-0.1064***	-16.15
BM_t	-0.0202***	-17.08	-0.0272***	-16.94	-0.1043***	-20.36	-0.1062***	-21.48
R-Squared	0.0480		0.0516		0.0756		0.0952	
Number of Observations	29,527		29,527		29,527		29,527	

Table 4Asymmetric Signal of Insider Purchases and Saleson Future Market Performance

The models are estimated for a pooled time series and cross-sectional data, using the Huber-White procedure with clustering by firms. The sample period is from 1991 to 2006. $LCAR_{t+1}$ is excess returns from end of year t to end of year t+1,where excess return is adjusted for companion size and book-to-market portfolio returns.$LCAR_{t+2}$is excess returnscumulated from end of year t+1 to end of year t+2, where excess return is adjusted for companion size and book-to-market portfolio returns.*TRADESHRY* is shares net traded in the insider trading transaction divided by outstanding shares over a year, where trade is positive if it is a purchase and negative if it is a sale. *NEG_TRADESHRY* is an indicator variable that equals one if *TRADESHRY* is negative, and zero otherwise. *TRADEFREQY* is net frequency of trading in the insider trading transaction divided by outstanding shares over a year, where trade is positive if it is a purchase and negative if it is a sale. *NEG_TRADEFREQY* is an indicator variable that equals one if *TRADEFREQY* is negative, and zero otherwise. *SIZE* is firm size, calculated as natural log of market capitalization at end of year. *BETA* is slope coefficient obtained from estimating a market model using previous 60 monthly returns. *VOLATILITY* is variance of the monthly return of a firm for previous 60 months. *EP* is *EPS* divided by price at end of year t if *EPS* is positive, and zero otherwise. *D_EP* is an indicator variable that equals one if *EPS* is negative, and zero otherwise. *BM* is book-to-market ratio of equity at end of year. Asterisks denote significance at the 0.01 (***), 0.05(**), and 0.10(*) levels.

Panel A: Using net trading shares as proxy

	(1)		(2)	
Dependent variable =	$LCAR_{t+1}$		$LCAR_{t+2}$	
	Coefficient	t-statistics	Coefficient	t-statistics
INTERCEPT	0.0012	0.08	-0.0615***	-2.91
$TRADESHRY_t$	1.6868***	2.64	2.3091***	2.52
$NEG\_TRADESHRY_t$	-0.0163**	-2.34	-0.0344***	-3.66
$TRADESHRY_t$ * $NEG\_TRADESHRY_t$	-1.3805**	-2.06	-1.9513**	-2.02
$SIZE_t$	-0.0044***	-2.72	0.0012	0.53
$BETA_t$	0.0063	1.36	0.0213***	3.40
$VOLATILITY_t$	0.0558	0.57	0.0677	0.54
EP_t	0.1757**	2.30	0.3570***	3.20
D_EP_t	0.0507***	5.13	0.1066***	7.55
BM_t	0.0393***	4.82	0.0589***	5.30
R-Squared	0.0080		0.0107	
Number of Observations	29,527		29,527	

Table 4 (cont.) Panel B: Using net trading frequency as proxy

	(1)		(2)	
Dependent variable =	$LCAR_{t+1}$		$LCAR_{t+2}$	
	Coefficient	t-statistics	Coefficient	t-statistics
INTERCEPT	-0.0003	-0.02	-0.0420*	-1.75
$TRADEFREQY_t$	0.0024***	4.26	0.0032***	4.08
$NEG\_TRADEFREQY_t$	-0.0098	-1.34	-0.0176*	-1.67
$TRADEFREQY_t$ * $NEG\_TRADEFREQY_t$	-0.0025***	-4.45	-0.0035***	-4.29
$BETA_t$	-0.0039**	-2.41	0.0013	0.45
BM_t	-0.7651***	-4.63	-1.6519***	-5.63
D_EP_t	-0.0080	-1.33	-0.0095	-0.91
EP_t	0.1836**	2.41	0.3468***	2.70
$SIZE_t$	0.0569***	5.57	0.1213***	7.47
$VOLATILITY_t$	0.0362***	4.34	0.0518***	3.89
R-Squared	0.0089		0.0118	
Number of Observations	29,527		29,527	

Table 5 Asymmetric Effects of Insider Purchases and Sales on the Precision of Public Information

The models are estimated for a pooled time series and cross-sectional data, using the Huber-White procedure with clustering by firms. The sample period is from 1991 to 2006. *PUBLIC* is the precision of public information, estimated using the Barron, Kim, Lim, and Stevens (1998) (BKLS) model. *RPUBLIC* is the percentile rank of public information. *TRADESHRY* is shares net traded in the insider trading transaction divided by outstanding shares over a year, where trade is positive if it is a purchase and negative if it is a sale. *NEG_TRADESHRY* is an indicator variable that equals one if *TRADESHRY* is negative, and zero otherwise. *TRADEFREQY* is net frequency of trading in the insider trading transaction divided by outstanding shares over a year, where trade is positive if it is a purchase and negative if it is a sale. *NEG_TRADEFREQY* is an indicator variable that equals one if *TRADEFREQY* is negative, and zero otherwise. *SIZE* is the natural logarithm of market value of equity at the beginning of the fiscal year. *STDROE* is the standard deviation of *ROE* in the preceding 10-year period. *CORR* is the Pearson correlation between *ROE* and annual stock return in the preceding 10-year period. *INVPRICE* is the inverse of stock price at the beginning of the fiscal year. *ACHEPS* is absolute value of difference of *EPS* between current year and in previous year, deflated by stock price at beginning of fiscal year. *RD* is research and development expense deflated by total assets at beginning of the fiscal year. *EFFORT* is the negative of the average number of firms followed by firm's analysts in a particular year divided by number of analysts covering the firm in that year. *BROKER* is average number of analysts employed by the brokerage houses that employ the firm's analysts. *ROA* is earnings before extraordinary item divided by total assets. *PROA* is last year's earnings before extraordinary items divided by total assets. *FD* is indicator variable that equals one if calendar year is after 2001, and zero otherwise. Asterisks denote significance at the 0.01 (***), 0.05(**), and 0.10(*) levels.

Panel A: Descriptive statistics

Variables	Mean	STD	Median	Q1	Q3
$PUBLIC_t$	2,159.2	5,580.2	455.7	116.3	1,770.5
$TRADESHRY_t$	-0.0052	0.0126	-0.0012	-0.0055	-0.0001
$NEG\_TRADESHRY_t$	0.8259	0.3792	1.0000	1.0000	1.0000
$TRADESHRY_{t-1}$	-0.0060	0.0144	-0.0012	-0.0058	-0.0001
$NEG\_TRADESHRY_{t-1}$	0.8252	0.3798	1.0000	1.0000	1.0000
$TRADEFREQY_t$	-20.0142	33.0919	-8.0000	-27.0000	-1.0000
$NEG\_TRADEFREQY_t$	0.7608	0.4266	1.0000	1.0000	1.0000
$TRADEFREQY_{t-1}$	-17.9583	30.9726	-8.0000	-24.0000	-1.0000
$NEG\_TRADEFREQY_{t-1}$	0.7542	0.4306	1.0000	1.0000	1.0000
$BROKER_t$	57.9687	26.8315	51.7236	36.9412	76.0000
$EFFORT_t$	2.1993	3.4293	1.3265	0.8409	2.2449
$PROA_t$	0.0469	0.0734	0.0472	0.0159	0.0831
ROA_t	0.0453	0.0737	0.0459	0.0150	0.0819
$ACHEPS_t$	0.0034	0.0688	0.0042	-0.0156	0.0186
$SIZE_t$	7.3983	1.4830	7.3259	6.3819	8.3723
RD_t	0.0339	0.0648	0.0000	0.0000	0.0392
$INVPRICE_t$	0.0486	0.0476	0.0348	0.0235	0.0544
$STDROE_t$	0.0985	0.1424	0.0578	0.0317	0.1060
$CORR_t$	0.0856	0.3863	0.0857	-0.1763	0.3576
FD_t	0.3452	0.4754	0.0000	0.0000	1.0000

Table 5 (cont.) Panel B: Using net trading shares as proxy

Dependent variable = $RPUBLIC_t$				
	(1)		(2)	
	Coef.	t-stat.	Coef.	t-stat.
INTERCEPT	0.2539***	7.95	0.2593***	8.16
$TRADESHRY_t$	2.8415***	2.78		
$NEG\_TRADESHRY_t$	0.0476***	5.54		
$TRADESHRY_t$ * $NEG\_TRADESHRY_t$	-4.8801***	-4.60		
$TRADESHRY_{t-1}$			2.5063***	2.78
$NEG\_TRADESHRY_{t-1}$			0.0458***	5.48
$TRADESHRY_{t-1}$* $NEG\_TRADESHRY_{t-1}$			-4.2594***	-4.54
$BROKER_t$	-0.0004***	-2.55	-0.0004***	-2.56
$EFFORT_t$	0.0009	1.10	0.0011	1.30
$PROA_t$	0.2195***	3.48	0.1514***	2.44
ROA_t	0.7689***	11.40	0.8303***	12.45
$ACHEPS_t$	0.0317	0.62	0.0321	0.63
$SIZE_t$	0.0176***	4.09	0.0176***	4.10
RD_t	0.4738***	7.01	0.4779***	7.06
$INVPRICE_t$	0.5942***	6.08	0.5258***	5.51
$STDROE_t$	-0.1135***	-3.78	-0.1180***	-3.90
$CORR_t$	-0.0161	-1.57	-0.0139	-1.35
FD_t	0.0225***	2.91	0.0217***	2.80
R-Squared	0.0865		0.0862	
Number of Observations	12,362		12,362	

Table 5 (cont.) Panel C: Using net trading frequency as proxy

Dependent variable = $RPUBLIC_t$				
	(1)		(2)	
	Coef.	t-stat.	Coef.	t-stat.
INTERCEPT	0.2978***	9.29	0.2975***	9.30
$TRADEFREQY_t$	0.0020**	2.42		
$NEG\_TRADEFREQY_t$	0.0425***	4.74		
$TRADEFREQY_t$* $NEG\_TRADEFREQY_t$	-0.0025***	-3.01		
$TRADEFREQY_{t-1}$			0.0022***	2.61
$NEG\_TRADEFREQY_{t-1}$			0.0466***	5.19
$TRADEFREQY_{t-1}$* $NEG\_TRADEFREQY_{t-1}$			-0.0028***	-3.21
$BROKER_t$	-0.0004***	-2.76	-0.0004***	-2.74
$EFFORT_t$	0.0010	1.16	0.0011	1.29
$PROA_t$	0.2187***	3.47	0.1717***	2.73
ROA_t	0.8013***	11.82	0.8363***	12.33
$ACHEPS_t$	0.0257	0.50	0.0339	0.65
$SIZE_t$	0.0128***	2.97	0.0129***	2.99
RD_t	0.4738***	6.98	0.4674***	6.86
$INVPRICE_t$	0.5428***	5.60	0.4923***	5.17
$STDROE_t$	-0.1131***	-3.78	-0.1129***	-3.76

$CORR_t$	-0.0155	-1.51	-0.0144	-1.40
FD_t	0.0180**	2.32	0.0178**	2.29
R-Squared	0.0813		0.0821	
Number of Observations	12,362		12,362	

5. Summary and conclusions

Information asymmetry between insiders and the outside market is a well-studied topic. Insiders are often believed to possess valuable information about a firm's future. The actions of insiders are becoming a useful measure to release information about a firm's future performance, resolving information asymmetry. Also, it is prohibitively costly for average investors to research information about a firm's future performance. Hence, the ability to correctly decipher insider trading could provide a useful tool and tremendous profits for average investors to mimic insider actions. In this study, we use an extensive data set that spans from 1991 to 2006, with an observation of roughly 600,000 firm-years in the sample, to systematically segregate the effects of insider purchases and insider sales. Following design of previous studies (e.g., Basu, 1997; Ball and Shivakumar, 2005, Leone et al. 2006), which examines the asymmetric effects of their interests, we investigate the asymmetric information provided by insider purchases and sales. Specifically, we focus on understanding the different signaling strengths of insider purchases and insider sales on aggregate market price and volume reactions. Also, we attempt to understand the usefulness of insider purchases versus that of insider sales to an average investor. We find that while both insider purchases and insider sales have a significant relation with a firm's future performance, the signal associated with purchases is much stronger than that of sales. We argue that insider purchases have a pure motive to profit, while insider sales might have other reasons such as insiders' voluntary choice to diversify or liquidate their portfolios. Furthermore, because insider sales are a noisy signal, we conjecture that insider purchases help improve the information environment for investors; hence creating higher quality and precision of information for the market. We pioneer the forecast approach developed in Barron, Kim, Lim, and Stevens (1998) rather than a traditional market approach to understand the usefulness and precision of the two types of insider trading in the information environment. Our empirical results show that while both insider purchases and insider sales are statistically and significantly related to aggregate market price and volume reactions, the market shows a much stronger reaction toward insider purchases than insider sales. The asymmetric reaction to these two types of insider transactions indicates that the market

interprets insider purchases with more weight and that the signal of purchases is more credible than that of sales. In addition, we also find that insider purchases have a stronger tie to a firm's positive future performance.

References

Aktas, N., E. de Bodt, and H. Van Oppens, 2008, Legal insider trading and market efficiency, Journal of Banking and Finance 32, 1379-1392.

Ali, A., T. Chen, and S. Radhakrishnan, 2007, Corporatedisclosures by family firms, Journal of Accounting and Economics 44, 238-286.

Baesel, J.B. and G.R. Stein, 1979, The value of information: inferences from the profitabilityof insider trading, Journal of Financial and Quantitative Analysis 14, 553-571.

Ball, R. and L. Shivakumar, 2005, Earnings quality in UK private firms: comparative loss recognition timeliness, Journal of Accounting and Economics 39, 83-128.

Ball, R. and L. Shivakumar, 2006, The role of accruals in asymmetrically timely gain and loss recognition, Journal of Accounting Research 44, 204-242.

Ball, R. and L. Shivakumar, 2008, Earnings quality at initial public offerings, Journal of Accounting and Economics 45, 324-349.

Barron, O., D. Byard, and O. Kim, 2002, Changes in analysts' information around earnings announcements, Accounting Review 77, 821-846.

Barron, O., O. Kim, S.C. Lim, and D.E. Stevens, 1998, Usinganalysts' forecasts to measure properties of analysts' information environment, Accounting Review 73, 421- 433.

Basu, S., 1997, The conservatism principle and asymmetric timeliness of earnings, Journal of Accounting and Economics 24, 3-37.

Beneish, M.D. and M.E. Vargus, 2002, Insider trading, earnings quality, and accrual mispricing, Accounting Review 77, 755-791.

Botosan, C.A., M.A. Plumlee, and Y. Xie, 2004, The role of information precision in determining the cost of equity capital, Review of Accounting Studies 9, 233-259.

Chang, S. and D.Y. Suk, 1998, Stock prices and the secondary dissemination of information: the Wall Street Journal's 'Insider Trading Spotlight' column, The Financial Review 33, 115-128.

Cohen, L., C. Malloy, L. Pomorski, 2012, Decoding insider information, Journal of Finance 67, 1009-1043.

Fidrmuc, J.P., M. Goergen, and L. Renneboog, 2006, Insider trading, news releases, and ownership concentration, Journal of Finance 61, 2931-2973.

Finnerty, J.E., 1976, Insiders and market efficiency, Journal of Finance 31, 1141-1148.

Givoly, D. and D. Palmon, 1985, Insider trading and the exploitation of inside information: some empirical evidence, Journal of Business 58, 69-87.

Jaffe, J.P., 1974, Special information and insider trading, Journal of Business 47, 410-428.

Jenter, D., 2005, Market Timing and Managerial Portfolio Decisions, Journal of Finance 60, pp.1903-1949.

Kim, O. and R.Verrecchia, 1991, Trading volume and price reactions to public announcements, Journal of Accounting Research 29, 302-321.

Lakonishok J. and I. Lee, 2001, Areinsider trades informative?' Review of Financial Studies 14, 79-111.

LaFond, R. and R. Watts, 2008, The information role of conservatism, The Accounting Review 83, 447-478.

Leone, A, J. Wu, and J. Zimmerman, 2006, Asymmetric sensitivity of CEO cash compensation to stock returns, Journal of Accounting and Economics 42, 167-192.

Lev, B. and D. Nissim, 2004, Taxable income, future earnings, and equity values, Accounting Review 79, 1039-1047.

Lev, B., S. Radhakrishnan, and W. Zhang, 2009, Organization capital,Abacus45, 275-298.

Lin, J.C. and J.S. Howe, 1990, Insider trading in the OTC market,Journalof Finance 45, 1273-1284.

Marin, J.M. and J.P. Olivier, 2008, The dog that did not bark: insider trading and crashes, Journal of Finance63, 2429-2476.

Rozeff, M.S. and M.A. Zaman, 1988, Market efficiency and insider trading: new evidence,Journal of Business 61, 25-44.

Seyhun, H.N., 1986, Insiders' profits, costs of trading, and market efficiency,Journal of Financial Economics 16, 189-212.

Seyhun, H.N., 1998, Insideinformation,Financial Planning 28, 114-122.

Utama, S. and W.M. Cready, 1997, Institutional ownership, differential predisclosure precision and trading volume at announcement dates, Journal of Accounting and Economics 24, 129-150.