The Past Performance of Insider Trading and Future Insider Trading Activity

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This study finds evidence that open market purchases made by insiders are negatively influenced by poorly timed insider purchases. Specifically, insiders are sensitive to past loss when conducting open market purchase. These results are robust to various firm characteristics, estimation and sampling methods. Further analyses show that this sensitivity to losses can under certain circumstances enhance insider wealth by helping insiders avoid a loss of 5.7% on open market purchases over the course of the next year while ignoring losses under certain circumstances can help insiders net an average of 8.14% over the following year.

INTRODUCTION

This paper examines the relation between insider (officers and directors) open market transactions and the outcome of past insider trading to better understand what motivates insiders to trade. The primary goal of this paper is to test whether insider trading experiences (as measured by insider trading returns) have any effect on open market purchases made by insiders. If yes, are insiders more sensitive to prior losses than they are to prior gains and what is the economic impact of this sensitivity on insider wealth?

There is an extant literature documenting that insiders earn abnormal returns (e.g. Lorie and Niederhoffer 1968, Seyhun 1986, Rozeff and Zaman 1988, Lakonishok and Lee 2001, and Jeng, Metrick and Zeckhauser) which can be attributed to insiders' ability to recognize if their firm's stock is mispriced and also because they are privy to superior information about their firm's future performance. Despite these advantages, insider trading is still a risky proposition first because insiders stand to lose wealth if their opinion about the intrinsic value of the firm turns out to be wrong. Also, insiders tend to have a significant amount of their wealth invested in their firm (both financial and human capital) and by purchasing additional shares they are de-diversifying their wealth and foregoing liquidity.

I hypothesize that in addition to being influenced by the perceived misvaluation of their firm's securities and having superior information about their firm's future prospects, open market purchases by insiders may also be influenced by gains and losses on their existing portfolio of shares held (a proxy for the outcome of their past open market transactions). This is consistent with research demonstrating that in a variety of contexts decisions under uncertainty can be substantially affected by the outcomes of past decisions (see for example, Thaler 1980; Staw 1981; Arkes and Blumer 1985). Thaler and Johnson (1990) investigate how prior gains and losses affect risk taking behavior and find based on experimental data an increased willingness to take risk after prior gains, which they refer to as the "house money effect[1]." However, after experiencing a prior loss, individuals showed increased loss aversion and reduced willingness to take risk.

If past gains and losses influence open market purchasing activity, then including only recent stock returns and controlling for superior information at the disposal of insiders in one's model may fail to capture this effect. This is because purchases are not made smoothly, and thus the gains and losses on the portfolio are affected both by past returns and the timing of the cash flows used to purchase stock. I begin the empirical work by calculating firm-level insider trading returns, and examining their impact on open market purchasing activity. In this empirical work, I examine gains and losses separately to allow for the possibility of an asymmetric response which might obtain if insiders are more sensitive to prior losses than gains.

I find insider trading returns to be positively related to insider purchase ratios even after controlling for variables previously shown to affect purchasing activity. However, this effect seems to be primarily driven by negative insider trading returns. Given losses, an increase in insider trading losses is associated with decreased insider purchase ratios while given gains from insider trading; an increase in gains has no significant effect on insider purchase ratios. Thus the findings suggest insiders' sensitivity to losses play a role when insiders conduct open market purchases.

Finally, I examine the economic impact of insider loss sensitivity by identifying a subsample of insiders who have losses and are predicted not to purchase due to these losses. I find that having inside information about poor future stock performance and being sensitive to prior losses by not purchasing the firm's stock helps insiders to avoid an average loss of 5.7% over the next year. On the other hand, having inside information about good future stock performance, and ignoring prior losses by actually purchasing the firm's stock despite insider trading losses helps insiders to earn an average of 8.14% the following year.

The findings in this study contribute to the literature in several ways. First, this study helps us better understand why insiders engage in open market purchases. In addition to possessing superior information about their firm's future performance, poor timing decreases the intensity of open market purchases made by insiders. Secondly, the findings in this study confirms the existing literature that insiders have superior knowledge about their firm's future prospect since not conducting purchases in light of prior losses when the firm's future prospects are less favorable helps insiders avoid a negative return and ignoring losses when the firm has favorable future prospects helps insiders enhance their wealth.

The study proceeds as follows: Section 2 reviews the relevant literature on the motives of insider trading and develops the hypothesis. Section 3 describes the data used in the study. Section 4 presents the tests of the main hypothesis while section 5 provides the economic impact of insider trading losses and Section 6 concludes.

LITERATURE REVIEW AND MOTIVATION

Determinants of Insider Trading

This section provides a brief overview of the literature on the determinants of insider trading, which is organized into the following broad categories: stock price misvaluation, superior information about the firm's future performance, stock based compensation changes, and the demand by institutional and individual investors.

Stock Price Misvaluation

There is an extant literature which documents that insiders earn abnormal returns (e.g. Lorie and Niederhoffer 1968, Seyhun 1986, Rozeff and Zaman 1988, Lakonishok and Lee 2001, and Jeng, Metrick and Zeckhauser 2003). Such returns can partially be achieved if insiders recognize mispricing. According to this motive, insiders would purchase (sell) their firm's security if they believe the security is undervalued (overvalued). In this vein, Seyhun (1986) shows insider purchases tend to occur after stock price declines and insider sell trades tend to occur after stock price rises.

Similarly, Rozeff and Zaman (1998) find evidence suggesting that insiders tend to buy undervalued stocks. In the same vein, Piotroski and Roulstone (2005) find insiders to be contrarian. Specifically, they find a positive relationship between insider trading (purchases) and the firm's book-to-market value and a

negative relationship between insider trading and recent stock returns. Both of these variables are used as measures of undervaluation. Similarly, Jenter (2005) finds insiders' perceived misvaluation of their stock is a motive for insider trading (insider purchasing is increasing in firms with low market-to-book values).

Superior Information about Firm's Future Performance

It has also been documented that insiders' abnormal returns from trading their firms' stock can be attributed to having an informational advantage about the firm's future performance (cash flow realizations and future earnings innovations). Piotroski and Roulstone (2005) use next year's annual earnings innovation and next year's market-adjusted stock returns as measures of future unexpected cash flow changes unknown by the market but known by insiders. The authors find a positive relationship between these proxy variables and insiders' open market purchasing activity. Similarly, Ke, Huddart, and Petroni (2003) examine insider-trading patterns ahead of a break in quarterly earnings increases and find insider sales increases three to nine quarters before the earnings break. They use this as evidence suggesting that insiders trade ahead of earnings breaks and avoid abnormal selling two quarters prior to the break to avoid potential legal issues.

Stock Based Compensation Changes

Ofek and Yermack (2000) show that insider trading is influenced by the changes in insider holdings due to stock and option grants and the exercising of stock options (for example, increased equity compensation to higher-ownership managers leads to the sale of previously owned shares). To this extent, Piotroski and Roulstone (2005) find an inverse relationship between insider purchasing activity and number of shares of restricted stock and stock options granted and number of stock options exercised.

Demand by Institutional and Individual Investors

Sias and Whidbee (2010) examine the relationship between insider trading and institutional and individual investors as a motive for insider trading. They find a negative association between insider trading and institutional.

The Effect of Insider Trading Returns (Gain and Losses) on Risk Taking Behavior

As earlier discussed there is an extant literature documenting that insiders earn abnormal returns which is attributed to their ability to recognize if their firm's stock is mispriced and also because they are privy to superior information about their firm's future performance. Despite these advantages, insider trading is still a risky proposition first, because insiders stand to lose wealth if their opinion about the intrinsic value of the firm turns out to be wrong. Also, insiders tend to have a significant amount of their wealth invested in their firm (both financial and human capital) and by purchasing additional shares they are de-diversifying their wealth and foregoing liquidity.

There is also a line of research suggesting investment decisions may be influenced by past returns. For instance, Ippolito (1992) shows inflows to mutual funds are strongly correlated with past fund performance. Empirical work by Friesen and Sapp (2007), Frazzini and Lamont (2008) and Dichev (2007) indicates that poor investment-timing decisions, in which investors buy after past gains and sell after past losses, destroy a significant percentage of investor wealth.

I hypothesize that in addition to being influenced by the perceived misvaluation of their firm's securities and having superior information about their firm's future prospects, open market purchases by insiders may also be influenced by gains and losses on their existing portfolio of shares held (which would capture the outcome of their past open market transactions). This is consistent with research demonstrating that in a variety of contexts decisions under uncertainty can be substantially affected by the outcomes of past decisions (see for example, Thaler 1980; Staw 1981; Arkes and Blumer 1985). Thaler and Johnson (1990) investigate how prior gains and losses affect risk taking behavior and find based on experimental data from Cornell undergraduate and MBA students an increased willingness to take risk after prior gains, which they refer to as the "house money effect". However, after experiencing a prior loss, individuals showed increased loss aversion, a phenomenon sometimes referred to as the "snakebite

effect." Their results suggest that losses are more painful if they happen after prior losses and less painful if they occur after prior gains, since prior gains act as cushions for future losses. Frino, Grant and Johnstone (2007) examine Australian futures traders and find supporting evidence that traders take on more risk in the afternoon on days with morning gains. Low (2004) finds that prior losses are associated with increased loss aversion, which is consistent with the snakebite effect. However, the evidence on the effect of past gains and losses is mixed. Coval and Shumway (2005) find that traders with morning losses increase risk-taking in the afternoon.

Regardless of the precise nature of the relationship, if past gains and losses influence open market purchasing activity, then including only recent stock returns and controlling for superior information at the disposal of insiders in one's model may fail to capture this effect. This is because purchases are not made smoothly, and thus the gains and losses on the portfolio are affected both by past returns and the timing of the cash flows used to purchase stock. I begin the empirical work by calculating at the firm-level insider trading returns and examine their purchasing activity. In this empirical work, I examine gains and losses separately to allow for the possibility of an asymmetric response, which might obtain if insiders are more sensitive to losses than gains.

Finally, to the extent that insiders are more sensitive to losses when conducting open market purchases, I examine the economic impact on insider wealth.

DATA AND SAMPLE CONSTRUCTION

The analysis in this study focuses on open market purchases and sales by directors and officers from Table 2 of Thomson Reuters (TFN) spanning 1986 to 2012. I impose the following screens on table 2 data: delete amendments and some cleansed observations[2]; keep transaction codes P and S as they are open market or private purchase and sales; ignore sales that are related to the exercise of an option[3]; and keep transactions in firms for which I have COMPUSTAT and CRSP data necessary to generate control variables. Finally, I define and retain insiders as those with a rolecode1 of CB, D, DO, H, OD, VC, AV, CEO, CFO, CI, CO, CT, EVP, O, OB, OP, OS, OT, OX, P, S, SVP, or VP. This results in 1,682,374 transactions over 27 years of which 442,882 (26%) are purchases and 1,239,492 (74%) are sales with 124,009 insiders[4].

Measurement of Insider Trading Behavior

Following Piotroski and Roulstone (2005) I measure insider trading as the firm's purchase ratio defined as follows:

$$PR_{i,t} = \frac{BUY_{i,t}}{BUY_{i,t}+SELL_{i,t}} \tag{1}$$

where $BUY_{i,t}(SELL_{i,t})$ is the number of shared purchased (sold) by insiders (officers and directors) of the i'th firm in year *t*.

Measurement of Insider Trading returns

The primary goal of this paper is to test whether the outcome of past insider trading (insider trading experience), as measured by insider trading returns ($InsiderRet_t$), has any effect on open market insider purchases. If yes, are insiders more sensitive to prior losses than they are to prior gains? The main variable, $InsiderRet_t$ is constructed as follows:

$$InsiderRet_{i,t} = \frac{Gain\ net\ of\ external\ flows}{AverageCapital} = \frac{MV_1 - MV_0 - CF}{MV_0 + \sum_{i=1}^{n} w_i \times CF_i} \tag{2}$$

where:

- MV_1 is the end of year market value of the portfolio of all shares held by insiders in the *i'th* firm. Computed as the number of shares held by all insiders at the end of the year multiplied by the closing stock price of the year.
- MV_0 is the beginning of year market value of the portfolio of all shares held by insiders in the *i'th* firm. Computed as the number of shares held by all insiders at the beginning of the year multiplied by the opening stock price of the year.
- CF is the net external inflows over year *t* made by insiders of the *i'th* firm. It is computed as total dollars spent on purchases minus the total dollars received from sales (Note: contributions to the portfolio are positive inflows and withdrawals form portfolio are negative flows)
- $\sum_{i=1}^{n} w_i \times CF_i$ is the sum of each cash flow multiplied by its weight:

$$w_i = \frac{CD - D_i}{CD} \tag{3}$$

  - CD is the number of calendar days during the return period being calculated (I use 365)
  - D_i is the number of days from the start of the return period until the day on which the flow CF_i occurred. For example, if a purchase occurs on January 31 then it is 31 days, if on February 2nd then it is 33 days.

The above return $InsiderRet_{i,t}$ is the Modified Dietz (see Dietz 1966) return and is an approximation of the IRR (the true dollar weighted return)[5]. The modified Dietz return has the advantage of having a closed form solution versus the IRR which requires numerical methods. The choice of the Modified Dietz over the IRR is motivated by several reasons. First, when computing the IRRs I have a convergence rate of about 70%. Thus, I lose a significant amount of data. Secondly, in most cases I have more than one IRR so which IRR should be used? Finally, computing the "true" IRR requires that I have the correct initial value of an insider's portfolio; but, TFN begins in 1986 thus for some insiders I do not have their actual initial portfolio value. However, with the Modified Dietz I need the beginning and ending value of the portfolio over the period for which I are computing the return.

A potential issue with the Modified Dietz return ($InsiderRet_{i,t}$) in this study is that some of the shares held in the insiders' portfolio may have resulted from other sources than open market purchases especially from the exercise of options. To control for this I ignore sales that are related to the exercise of an option[6]. This may just take care of cases where the options are sold immediately and may not capture options that are exercised and sold at a later date (either because the insider has some insider information or the shares are held for some mechanical reason). I argue that such transactions will not bias the results in this study. First, if the insider holds on to the shares it is likely because they have some inside information and is then are making a conscious decision to increase their insider trading returns. Secondly, if they hold the shares for some mechanical reason I posit that such transactions are timing neutral and while they may add noise to results they will not bias the results. Finally, the number of such transactions should be small as Ofek and Yermack (2000) estimate that when executives exercise options to acquire stock they keep almost none of the shares (see page 1376). Similarly, Huddart and Lang (1996) hold that while their data doesn't detail the ultimate disposition of options in their sample, the authors' discussions with the data providers suggests that employees do not keep the shares acquired unexercised (page 19).

Jeng, Metrick and Zeckhauser (2003) attempt to measure insiders actual return by creating a purchase (sale) value-weighted portfolio of all insiders for the duration of six months since the purchase (sale). However, they do not exactly measure what insiders earn for several reasons: they only measure returns over a holding of six months, and they do not account for subsequent trades that insiders may execute.

Control Variables

In addition to insider trading data, I collect a set of control variables used by Piotroski and Roulstone (2005) to explain insider purchasing activity. This allows us to compare the results in this study to previous studies (e.g. Rozeff and Zaman 1988, and Sias and Whidbee 2010). The following control variables are used in the study.

- $GoodRet_{(t+1)}$: Is an indicator variable equal to 1 if the stock's next year's market adjusted return ($MaRet_{(t+1)}$) is greater than zero else equal to zero. This is a measure of the firm's future performance and measures the insiders' potential gain from trading the firm's stock as opposed to the market portfolio. To the extent that insiders have superior knowledge about information influencing future returns, it should be positively related to insider purchases.
- $GoodRoA_{(t+1)}$: Is an indicator variable equal to one if next year's change in ROA ($\Delta ROA_{(t+1)}$) is greater than zero else equals to zero. This is also a measure of the firm's future performance (next year's earnings innovations), and it is expected to be positively related to insider purchases. Where $\Delta ROA_{(t+1)}$ is the next year's first difference in Return-on-Assets ($ROA_{(t+1)}$ - $ROA_{(t)}$).
- $GoodRoA_{(t)}$: Is an indicator variable equal to one if the current year's change in ROA ($\Delta ROA_{(t)}$) is greater than zero else equals to zero.
- $BM1_t$ *to* $BM4_t$*:* Is an indicator variable equal to 1 if the book-to-market (BM) ratio is in the *i'th* quintile of year *t's* BM distribution (e.g. BM1=glamour firms). This is a measure of undervaluation.
- *HRet and Mret:* Is an indicator variable equal to 1 if the market adjusted stock return is in the high tercile and middle tercile respectively of year *t's* distribution of realized market adjusted returns. It is also is a measure of undervaluation.

TABLE 1
SUMMARY STATISTICS

Variable	Mean	Std	5%	25%	50%	75%	95%
$PR_All\ Insiders_t$	0.462	0.452	0.000	0.000	0.296	1.000	1.000
BM_t	0.637	3.785	0.063	0.279	0.502	0.815	1.790
MVE_t	2,752	310,303	11.5	65.9	261.1	1,048.6	9,593.1
$MARet_{(t+1)}$	0.065	0.983	-0.740	-0.326	-0.053	0.242	1.116
$ROA_{(t+1)}$	-0.058	0.929	-0.515	-0.019	0.018	0.063	0.148
$\Delta ROA_{(t+1)}$	-0.021	0.926	-0.262	-0.029	0.000	0.019	0.203
$InsiderRet_t$	0.112	1.980	-0.996	-0.090	-0.028	0.089	1.613
$Insider - lossDummy_t$	0.587	0.492	0.000	0.000	1.000	1.000	1.000

Table 1 presents the descriptive statistics of the variables used in this study pooled over all firm-year observations. The sample period is 1986-2012. $PR_All\ Insiders_t$ is the purchase ratio of all insiders (directors and officers) in year *t*, computed as the number of shares purchased by all insiders divided by the number of shares purchased and sold by all insiders. BM_t is the book-to-market ratio in year *t* defined as the book value of equity (COMPUSTAT: CEQ) scaled by MVE_t. MVE_t is the market value of equity at the end of year *t* defined as common shares outstanding at the end of year *t* multiplied by the closing stock price of the year (COMPUSTAT: CSHO multiplied by the stock's closing stock price at the end of year from CRSP). $MARet_{(t+1)}$ is next year's market-adjusted stock return measured as the firm's 12-month cumulative return in year *t+1* minus the corresponding12-month return on the valued weighted index. $ROA_{(t+1)}$ is the return on asset for year *t+1* measured as income before extraordinary items (COMPUSTAT: IB) scaled by total assets (COMPUSTAT: AT). $\Delta ROA_{(t+1)}$ is next year's first difference in ROA measures as ROA in year *t+1* minus ROA in year *t*. $InsiderRet_t$ is the Modified Dietz return on

the portfolio of the firm's shares held by all insiders (director and officers) computed over year *t*; it is my measure of insider trading returns. *Insider-lossDummy*$_t$ is an indicator which equals one if *InsiderRet*$_t$ is negative and zero if positive.

Although the sample is longer than Piotroski and Roulstone (2005) and Sias and Whidbee (2010), the descriptive statistics are close. About 59% of the time insiders have losses in their portfolios.

RESULTS AND DISCUSSION

This section examines the impact of insider trading returns on open market purchasing activity. The empirical framework, examines gains and losses separately to allow for the possibility of an asymmetric response, which might obtain if insiders are more sensitive to losses than gains. I start the analysis by examining the relation between insiders purchase ratios ($PR_{i,t}$) and insider trading returns ($InsiderRet_{i,t}$). Then, I examine the relationship between insider trading returns and the decision to conduct open market purchases.

Insider Purchase Ratios and Insider Returns

To test whether insider purchase ratios are related to insider returns, I utilize the methodology in Piotroski and Roulstone (2005) and augment their variables with the insider trading returns variable ($InsiderRet_{i,t}$). Rozeff and Zaman (1988), and Sias and Whidbee (2010) utilize a similar methodology.

To control for cross-sectional dependencies, the following model is estimated annually and the average annual coefficients are tested against the null of zero using standard errors from the empirically derived distribution of the annual coefficients:

$$PR_{i,t} = \alpha + \beta_1 GoodRET_{i,t+1} + \beta_2 GoodROA_{i,t+1} + \beta_3 GoodROA_{i,t} + \beta_4 BM1_{i,t} + \beta_5 BM2_{i,t} + \beta_6 BM3_{i,t} + \beta_7 BM4_{i,t} + \beta_8 HRET_{i,t} + \beta_9 MRET_{i,t} + \beta_{10} InsiderRet_{i,t} + \varepsilon_{i,t} \quad (4)$$

Fixed effects (with firm fixed effects and year effects) regression models are employed for robustness.

To test whether there is an asymmetric response between gains versus losses, equation 5 is estimated by augmenting equation 4 with two variables: (1) *LossDummy*$_{i,t}$, an indicator which equals one if *InsiderRet*$_{i,t}$ is negative and zero if positive; and (2) an interaction variable $InsiderRet_{i,t} \times LossDummy_{i,t}$:

$$PR_{i,t} = \alpha + \beta_1 GoodRET_{i,t+1} + \beta_2 GoodROA_{i,t+1} + \beta_3 GoodROA_{i,t} + \beta_4 BM1_{i,t} + \beta_5 BM2_{i,t} + \beta_6 BM3_{i,t} + \beta_7 BM4_{i,t} + \beta_8 HRET_{i,t} + \beta_9 MRET_{i,t} + \beta_{10} InsiderRet_{i,t} + \beta_{11} LossDummy_{i,t} + \beta_{12}(InsiderRet_{i,t} \times LossDummy_{i,t}) + \varepsilon_{i,t} \quad (5)$$

If insiders are more sensitive to prior losses than prior gains when conducting open market purchases then, the coefficient on$InsiderRet_{i,t} \times LossDummy_{i,t}$, β_{12} will be positive and significant[7]. Just as with equation 4, this model is estimated annually and the average annual coefficients are tested against the null of zero using standard errors from the empirically derived distribution of the annual coefficients Panel A uses Fama-MacBeth regressions where the model is estimated annually and the average annual coefficients are presented and tested against the null of zero using standard errors from the empirically derived distribution of the annual coefficients. For robustness, Panel B employs fixed effects regressions with firm and year effects.

Table 2 shows that the prior determinants of insider purchases have their expected signs and are statistically significant at an alpha level of 1% but for $GoodROA_{i,t}$.

TABLE 2
THE IMPACT OF INSIDER RETURNS ON PURCHASE RATIOS

Panel A: Fama-MacBeth Regressions

Hypotheses	Variables	Dependent variable = PR_t		
		[1]	[2]	[3]
	Intercept	0.6383***	0.6005***	0.6143***
Superior	$GoodRet_{(t+1)}$ (+)	0.0056	0.012	0.0032
Information	$GoodRoA_{(t+1)}$ (+)	0.0320***	0.0366**	0.0330***
	$GoodRoA_t$ (+)	-0.0114	-0.014	-0.0066
Undervaluation	$BM1_t$ (-)	-0.2620***	-0.2289***	-0.2764***
	$BM2_t$ (-)	-0.2681***	-0.2560***	-0.2790***
	$BM3_t$ (-)	-0.1911***	-0.1446***	-0.1978***
	BM4t (-)	-0.1014***	-0.0665	-0.1196***
	$HRet_t$ (-)	-0.0775***	-0.0864***	-0.0655***
	$MRet_t$ (-)	-0.0539***	-0.0424**	-0.0505***
	$InsiderRet_t$		0.0021***	0.0002
	LossDummy			0.0248**
Loss Sensitivity	$(InsiderRet\ X\ Loss)_t$			0.0054***

Panel B: Firm Fixed Effects Regressions

Hypotheses	Variables	Dependent variable = PR_t		
		[1]	[2]	[3]
	Intercept	0.0367***	0.0358***	0.0352***
Superior	$GoodRet_{(t+1)}$ (+)	0.0386***	0.0384***	0.0400***
Information	$GoodRoA_{(t+1)}$ (+)	0.0005	0.0002	0.0012
	$GoodRoA_t$ (+)	-0.2716***	-0.2768***	-0.2682***
Undervaluation	$BM1_t$ (-)	-0.2249***	-0.2294***	-0.2239***
	$BM2_t$ (-)	-0.1539***	-0.1550***	-0.1520***
	$BM3_t$ (-)	-0.0805***	-0.0806***	-0.0793***
	BM4t (-)	-0.0497***	-0.0520***	-0.0395***
	$HRet_t$ (-)	-0.0363***	-0.0377***	-0.0331***
	$MRet_t$ (-)		0.0012***	-0.0002
	$InsiderRet_t$			0.0247***
Loss Sensitivity	$(InsiderRet\ X\ Loss)_t$			0.0044***
Firm effects		Included	Included	Included
Year effects		Included	Included	Included

***, ** and * denote statistical significance at 1%, 5% and 10% respectively.

The second models in both panels of Table 2 document a positive relationship between insider purchase ratios and insider returns. This would suggest that insiders purchase more of their firm's shares if they have positive experiences from insider trading. The third model in both panels of table two shows that conditioning on losses, an increase in insider trading losses is associated with decreased insider

purchases. On the other hand, given gains from insider trading, an increase in gains has no significant effect on insider purchase ratios. Taken together, the results suggest that insider trading returns are positively related to the intensity of insider purchases. This effect seems to be primarily driven by negative insider trading returns and suggests that insiders are sensitive to losses

Insider Returns and the Decision to Purchase

The previous section established a relationship between insider returns and the level of insider purchases (insiders purchase ratios) once they decide to purchase. This section focuses on the decision to conduct open market purchases with the following conditional firm fixed effects logit model with year effects:

$$P(Purchase_{i,t} = 1 | X_{i,t}, c_{i.t}) = \beta_1 GoodRET_{i,t+1} + \beta_2 GoodROA_{i,t+1} + \beta_3 GoodROA_{i,t} + \beta_4 BM1_{i,t} + \beta_5 BM2_{i,t} + \beta_6 BM3_{i,t} + \beta_7 BM4_{i,t} + \beta_8 HRET_{i,t} + \beta_9 MRET_{i,t} + \beta_{10} InsiderRet_{i,t} + \beta_{11} LossDummy_{i,t} + \beta_{12}(InsiderRet_{i,t} \times LossDummy_{i,t}) + yearEffects \quad (6)$$

The dependent variable, $Purchase_{i,t}$ is an indicator variable that equals one if shares are purchased in year *t* else it is equal to zero. The results of the logit analysis are in table three and are consistent with the findings in the preceding sections. The prior determinants of insider purchases have their expected signs and are statistically significant at an alpha level of 1% but for $GoodROA_{i,t}$.

TABLE 3
INSIDER RETURNS AND THE DECISION TO PURCHASE

Hypotheses	Variables	Dependent Variable = $Purchase_{i,t}$		
		[1]	[2]	[3]
Superior Information	$GoodRet_{(t+1)}$ (+)	0.1338***	0.1349***	0.1335***
	$GoodRoA_{(t+1)}$ (+)	0.1666***	0.1651***	0.1670***
	$GoodRoA_t$ (+)	0.0158	0.0154	0.0156
Undervaluation	$BM1_t$ (-)	-0.8829***	-0.8807***	-0.8796***
	$BM2_t$ (-)	-0.7520***	-0.7485***	-0.7478***
	$BM3_t$ (-)	-0.5167***	-0.5214***	-0.5208***
	BM4t (-)	-0.2689***	-0.2712***	-0.2699***
	$HRet_t$ (-)	-0.3819***	-0.3838***	-0.3937***
	$MRet_t$ (-)	-0.2529***	-0.2561***	-0.2633***
	$InsiderRet_t$		0.00533***	0.00268***
	LossDummy			-0.0825***
Loss Sensitivity	$(InsiderRet\ X\ Loss)_t$			0.00469***
Firm effects		Included	Included	Included
Year effects		Included	Included	Included

***, ** and * denote statistical significance at 1%, 5% and 10% respectively.

The second model in Table 3 documents a positive relationship between the decision to purchase shares and insider returns suggesting insiders tend to purchase their firm's shares when they have positive experiences from insider trading. The third model of Table 3 shows given losses, an increase in insider trading losses is associated with a lower probability of insider purchases. Likewise, given gains from insider trading, an increase in gains is also associated with a higher probability of purchasing. However,

there is an asymmetric response to losses versus gains as the decision to purchase is more sensitive to insider losses compared to gains.

IMPLICATION: THE ECONOMIC IMPACT OF INSIDERS' SENSITIVITY TO LOSSES

In this section I examine the economic impact of insiders' sensitivity to losses, specifically if it benefits or hurts insider wealth. To this extent, I identify a subsample of insiders who have losses and are predicted not to purchase due to their predicted sensitivity to losses. Next, I spilt this subsample into a group that acts upon their sensitivity to losses by not purchasing and a second group that is sensitive to losses but nevertheless go ahead and actually purchase purchasing. Finally I compare the returns of both groups

To identify a subsample of insiders who have losses and are predicted not to purchase due to the losses, I estimate two specifications of the logit model from equation 6 as follows:

$$P(Purchase_{i,t} = 1|X_{i,t}, c_{i.t}) = \beta_1 GoodRET_{i,t+1} + \beta_2 GoodROA_{i,t+1} + \beta_3 GoodROA_{i,t} + \beta_4 BM1_{i,t} + \beta_5 BM2_{i,t} + \beta_6 BM3_{i,t} + \beta_7 BM4_{i,t} + \beta_8 HRET_{i,t} + \beta_9 MRET_{i,t} + yearEffects \quad (7)$$

$$P(Purchase_{i,t} = 1|X_{i,t}, c_{i.t}) = \beta_1 GoodRET_{i,t+1} + \beta_2 GoodROA_{i,t+1} + \beta_3 GoodROA_{i,t} + \beta_4 BM1_{i,t} + \beta_5 BM2_{i,t} + \beta_6 BM3_{i,t} + \beta_7 BM4_{i,t} + \beta_8 HRET_{i,t} + \beta_9 MRET_{i,t} + \beta_{10} InsiderRet_{i,t} + \beta_{11} LossDummy_{i,t} + \beta_{12}(InsiderRet_{i,t} \times LossDummy_{i,t}) + yearEffects \quad (8)$$

In equation 7, I estimate the probability of purchasing without taking into account insider returns and save the predicted probabilities of purchasing. Next, equation 8 augment's equation 7 with the insider returns variables. Next, I keep firm year observations: (1) with losses, (2) whose probability of purchasing decreases once $InsiderRet_{i,t} \times LossDummy_{i,t}$ is brought into equation 8 and (3) are predicted not to purchase[8]. I posit that the reason these observations have a decreased probability of purchasing and are predicted not to purchase is because they have losses and are sensitive to these losses. This results in 8,730 firm-year observations. Then I split this subsample into two groups: (1) one group that actually does not purchase which results in 3,720 firm year observations (2) a second group that actually purchases which results in 5,010 firm year observations. The idea is that both groups are should be sensitive to losses and are thus predicted not to purchase but one group does not conduct purchase while the other group does. Finally I look at the mean insider trading returns and next year's market adjusted stock return for both groups documented in Table 4.

TABLE 4
THE ECONOMIC IMPACT OF INSIDERS' SENSITIVITY TO LOSSES

	Mean Value		T-test for differences of means (p-value)
Variable	Group 1: No Insider Purchase	Group2: Insider Purchase	
InsiderRet$_t$	-10.0501	-6.7995	0.0313
MarketAdjStockRet$_{(t+1)}$	-0.0570	0.0814	0.0526

Table 4 shows that both groups have insider trading losses but those decide not to purchase have a worse insider trading experience (mean $InsiderRet_t$ of -10.0501% versus -6.7995%). The key finding is with next year's mean market-adjusted stock return ($MktAdjStockRet_{t+1}$). Piotroski and Roulstone (2005) hold that next year's market adjusted stock return is a measure of the firm's future performance and measures insiders' potential gain from trading the firm's stock as opposed to the market portfolio.

Thus, having inside information about poor future stock performance in the presence of insider trading losses and thus deciding not to purchase the firm's stock today helps such insiders to avoid an average loss of 5.7% over the next year. On the other hand, having inside information about good future stock performance despite the presence of insider trading losses and hence deciding nonetheless to purchase the firm's stock today helps such insider to earn an average of 8.14% the following year. This finding also confirms the existing literature that insiders have superior knowledge about their firm's future prospect since acting upon ones sensitivity to losses when the firms future prospects are less favorable helps insiders avoid a loss, and ignoring this sensitivity in the presences of losses but favorable future prospects helps insiders.

CONCLUSION

There is an extant literature documenting that insiders earn abnormal returns which is attributed to insiders' ability to recognize if their firm's stock is mispriced and also because they are privy to superior information about their firm's future performance. Despite these advantages, insider trading is still a risky proposition first because insiders stand to lose wealth if their opinion about the intrinsic value of the firm turns out to be wrong. Also, insiders tend to have a significant amount of their wealth invested in their firm (both financial and human capital) and by purchasing additional shares they are de-diversifying their wealth and foregoing liquidity.

This paper shows that in addition to being influenced by the perceived misvaluation of their firm's securities and having superior information about their firm's future prospects, open market purchases by insiders may also be influenced by gains and losses on their existing portfolio of shares held (a proxy for the outcome of their past open market transactions). Specifically, this paper finds (1) insider trading returns to be positively related to insider purchase ratios, ceteris paribus; (2) however, this effect seems to be primarily driven by negative insider trading returns as insiders are seen to be sensitive to losses; (3) finally, insiders seem to be trading on superior information about their firm's future prospect since acting upon ones sensitivity to losses when the firms future prospects are less favorable helps insiders avoid a loss over the next year, while ignoring this sensitivity in the presences of losses but favorable future prospects helps insiders achieve positive returns over the following year.

ENDNOTES

1. The prior gains act as a cushion for potential future losses.
2. Thomson advises Cleanse Code (A) to be avoided from analysis. And also code (S) since data with a cleanse code of 'S' have a different security from the one they have been entered under.
3. The variable optionSell: Identifies a sale that is related to the exercise of options. Possible values include all (A), partial (P), none (N), or blank. We want open market sale of shares that were purchased for their account and not those that arose from option grants so we keep (N) and ignore (A) and (P) and Blanks.
4. Some individuals are insiders in more than 1 firm. This number is the sum of insiders in any given firm and thus allows for some individuals to show up multiple times if they are insiders in more than 1 firm. Descriptive statistics on the number of shares purchased and sold; transaction values; and shares held after each transaction; and the distribution and frequencies of insider transactions can be presented by the author upon request.
5. The Modified Dietz return assumes simple rate of interest and approximates the IRR which uses compounding principle. If the cash flows and rates of return are large enough, Modified Dietz would yield significantly different returns compared to the IRR.
6. TFN has a variable called optionSell which identifies a sale that is related to the exercise of options. Possible values include all (A), partial (P), none (N), or blank. We want open market sale of shares that were purchased for their account and not those that arose from option grants so we keep (N) and ignore (A) and (P) and Blanks.
7. The regression model presented in equation 5 is a piecewise linear model since holding all other variables constant, the coefficient on $InsiderRet_{i,t}$captures the slope in the region of positive insider returns (gains) while the coefficient on the interaction term $InsiderRet_{i,t} \times LossDummy_{i,t}$ plus that of $InsiderRet_{i,t}$ is

the slope in the region of negative insider returns (losses). Hence the coefficient on $InsiderRet_{i,t} \times LossDummy_{i,t}$ is a kink at origin and if positive results in a steeper slope in the domain of losses. However, the coefficient on $LossDummy_{i,t}$ captures a discontinuity at the origin or kink and we do not provide an economic interpretation of that parameter.

8. The cut off probability of purchasing used is 0.69 which represents the unconditional probability of purchasing since 33,983 firm-year observations have purchases out of 49,159.

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