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Do insider trades reflect both contrarian beliefs and superior knowledge about future cash flow realizations?☆

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Abstract

This paper documents that insiders are both contrarians and possessors of superior information. We find that insider trades are positively related to the firm's future earnings performance (proxy for superior cash flow information), positively related to the firm's book-to-market ratio and inversely related to recent returns (proxies for trading against misvaluation). Each relation has incremental explanatory power, yet information about future cash flow changes explains a smaller portion of insider purchases than do proxies for security misvaluation. The relation between insider trades and future earnings performance is amplified (attenuated) as the benefits (costs) to trading on financial performance information increase.

JEL classification: M41; G14; G28

Keywords: Insider trading; Contrarian beliefs; Book-to-market ratios; Earnings; Capital markets

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1. Introduction

This paper documents that insider trades reflect both contrarian beliefs and superior information about future cash flow realizations. Prior research shows that insider trading activity generates abnormal returns (Jaffe, 1974; Givoly and Palmon, 1985; Seyhun, 1986; Rozeff and Zaman, 1988). Insiders can earn excess profit by either recognizing pricing errors made by outsiders or by having superior knowledge about future cash flow realizations. In the former case, insiders trade against current investor sentiment, recognizing that outsiders make valuation errors through the application of inferior valuation models and/or the incorporation of biased judgements. In the latter case, managers have private information about the pattern of future cash flows. Because prices respond to unexpected changes in cash flow, insiders trade when their private knowledge of future performance and payoffs differs from current market expectations. In both settings, insider trades help push prices towards fundamental value.

Prior research supports the hypothesis that insiders are contrarian traders. Seyhun (1992) shows that insiders are more likely to sell (purchase) shares following periods of significant price appreciation (declines), consistent with insiders trading in anticipation of subsequent price reversals. Rozeff and Zaman (1998) show that insiders predominantly buy (sell) shares in value (glamour) firms and interpret this as evidence of insiders trading against the market's over-reaction to past performance. Such trading behavior is consistent with insiders purchasing (selling) securities with high (low) expected returns or the greatest amount of undervaluation (over-valuation) (e.g., Fama and French, 1992; Lakonishok et al., 1994).

Past research, however, does not disentangle the source of insiders' superior trading performance. Rozeff and Zaman (1998)'s pattern of trading across book-to-market portfolios could reflect insiders trading on market pricing errors (e.g., over-reaction to past performance), but it could also reflect insiders' superior knowledge of future earnings performance. For example, LaPorta et al. (1997) show that, on average, value (growth) firms tend to have positive (negative) future earnings announcement period returns. Because earnings announcement returns tend to be correlated with actual changes in performance, Rozeff and Zaman's findings do not differentiate trading on the basis of contrarian beliefs from trading on the basis of superior information about future cash flows.

Prior research has also examined whether insiders trade on the basis of superior future cash flow information. The strongest evidence is found in Ke et al. (2003); they examine insider-trading patterns in advance of a break in quarterly earnings increases and find insider sales increase three to nine quarters before the earnings break. The authors conclude that insiders trade ahead of earnings breaks, but do so several quarters ahead of the break in order to avoid the appearance of trading on near-term, material news about earnings. Similarly, Elliot et al. (1984) find evidence that insiders increase (decrease) purchases (sales) in the 12 months before extreme earnings increases. However, the paper finds little evidence that insiders sell in advance of extreme earnings decreases, dividend changes or bond rating changes. In contrast, studies focusing on insider trading around short-window information

events produce mixed results. For example, Givoly and Palmon (1985) are unable to document a link between insider trading profits and subsequent disclosure events (including earnings and dividend announcements), while Noe (1999) examines insider trading around management forecasts of earnings and finds the trading patterns to be unrelated to the forecasted earnings news.[1]

Our paper extends prior research in two ways. First, prior research does not disentangle two potential sources of insider trading and profits, namely, trading against current investor sentiment (i.e., by trading with less bias and/or better models than outside investors) and trading on the basis of superior cash flow information. Building on the methodology of Rozeff and Zaman (1998), our tests are designed to document whether incremental associations between insider trades and various proxies for contrarian beliefs and future cash flow news exist, and provide evidence on the relative explanatory strength of each set of variables.

Second, our research design incorporates all trading activity, not just trading around information events or extreme earnings innovations. Our sample consists of a broad set of ordinary performance innovations that are less likely to attract regulatory scrutiny than extreme performance changes (see Ke et al., 2003). The use of a long measurement window increases the odds that our sample captures both the performance signals being used by the insiders and the transactions themselves.[2] Moreover, the long-window research design allows us to use simple proxies for unexpected earnings information at the time of the trade, increasing the power of the tests to detect the hypothesized relations.

Consistent with Rozeff and Zaman (1998), we measure investor sentiment/contrarian beliefs using two variables: the firm's book-to-market ratio and recent returns. To operationalize the insider's information advantage about future cash flows, we measure three firm-specific performance variables: next fiscal year's annual market-adjusted stock return, next fiscal year's annual earnings innovation and the contemporaneous annual earnings innovation. In our tests, we assume that these annual innovations represent unbiased (albeit inefficient) proxies of future cash-flow changes that are unexpected by market participants, yet known by management, at the time of the insider's trade.[3] If insiders trade on the basis of this informational advantage, we expect to observe greater purchasing (selling) behavior in advance of

[1] Another line of research documents that insiders trade in advance of significant corporate events, such as mergers and acquisition activity (Seyhun, 1990; Meulbroek, 1992), bankruptcy (Seyhun and Bradley, 1997), seasoned equity offerings (Karpoff and Lee, 1991) and stock repurchases (Lee et al., 1992). However, many of these events can both signal current security misvaluation and foreshadow future cash-flow changes. For example, managers can engage in seasoned equity offerings either because equity is overvalued (Myers and Majluf, 1984) or because the firm will have insufficient cash flows to fund future operations (Miller and Rock, 1985). As such, this evidence cannot help distinguish between these two underlying motives for insider trading.

[2] Beneish and Vargus (2002) employ a similar sample of insider trades to examine the quality of accruals conditional on contemporaneous insider trading behavior. Their evidence is consistent with insiders evaluating their firm's current earnings innovation when making trading decisions.

[3] An insider's informational advantage regarding changes in firm performance could be the result of information they possess at the firm, industry or economy level. Regardless of the level of advantage, the information would allow them to better predict their firm's future cash flow and trade accordingly.

unexpectedly strong (weak) performance, ceteris paribus. To the extent that these proxies do not fairly represent the insider's private knowledge about unexpected performance innovations at the time of the trade, this measurement error will reduce our ability to document a relation between insider trading and future firm performance.

Establishing incremental relations among insider trading, future cash flow news and proxies for contrarian beliefs is relevant for several reasons. First, we can establish that insider trading against misvaluation (i.e., on the basis of contrarian beliefs) and with superior information represent distinct trading scenarios. After controlling for future cash flow news, trading associated with book-to-market ratios and past returns is likely to reflect misvaluation and investor sentiment rather than correlated future performance changes. Similarly, an incremental relation between future cash flow news and insider trading would confirm that the results in Ke et al. (2003) are distinct from investor sentiment/misvaluation. Second, from a valuation perspective, a significant relation between insider trading and future firm performance would suggest that insider transactions are legitimate signals about future cash flows that can be used to improve earnings forecasts and equity valuations; such a signalling role would be consistent with Manne (1966a, b) and Carlton and Fischel (1983), who argue that insider-trading benefits society by inserting insiders' information into prices. Thus, our results are relevant to the on-going debate over the effect of insider trading on market efficiency.

The rest of the paper is organized as follows. Section 2 discusses our research design, methodology and the data, while Section 3 presents the main findings. Section 4 extends the main findings and Section 5 discusses robustness tests. Section 6 examines the insider's decision to trade, while Section 7 concludes.

2. Research design and data

2.1. Measurement of insider-trading behavior and related characteristics

We measure insider-trading behavior using the firm's purchase ratio, defined as

$$\mathrm{PR}_{i,t} = \mathrm{BUY}_{i,t}/(\mathrm{BUY}_{i,t} + \mathrm{SELL}_{i,t}), \tag{1}$$

where $\mathrm{BUY}_{i,t}(\mathrm{SELL}_{i,t})$ equals the number of shares purchased (sold) by the registered insiders (top executives and directors) of firm i during fiscal year t.[4] To be comparable with Rozeff and Zaman (1998), we restrict transactions to open-market transactions and do not include firm-years where insiders did not engage in

[4] Classifying trading behavior and firm performance on a calendar year basis does not change the tenor of the results. However, a calendar year approach introduces potential lead and lag periods between performance measurement and insider-trading behavior, thereby weakening the power of the research design.

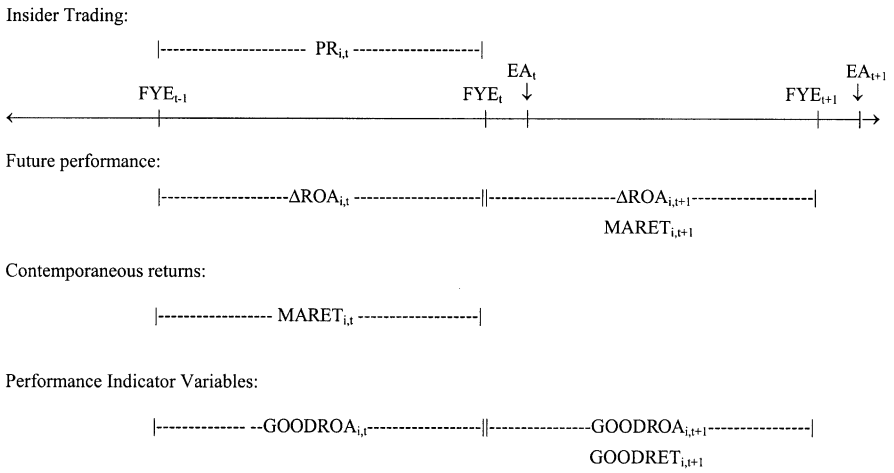

Fig. 1. *Empirical timeline*: This figure presents a timeline pertaining to the measurement of insider-trading and future firm performance variables. For each firm-year observation, a purchase ratio ($PR_{i,t}$) is measured for firm i over fiscal year t. Contemporaneous and future firm performance is measured over fiscal year t and $t+1$ respectively. FYE_t denotes the fiscal year end for year t. EA_t denotes the announcement of year t's annual earnings innovation ($\Delta ROA_{i,t}$). All variables are as defined in Table 8 of Appendix A.

open-market transactions during the fiscal year.[5] All insider trade data are gathered through Thomson Financial First Call Insiders Data.[6] (See Fig. 1 for a timeline regarding the measurement of our variables.)

2.2. Measurement of future firm performance

For each firm-year trading observation ($PR_{i,t}$), we measure the firm's future performance. Future performance is measured in the fiscal year following the measurement of insider transactions (i.e., year $t+1$). We use two measures of next year's performance: the firm's market-adjusted return and annual earnings innovation. The firm's future market-adjusted return ($MARET_{t+1}$) is measured as the 12-month buy-and-hold market-adjusted return during fiscal year $t+1$. This metric measures the insider's potential gain from trading in the firm's stock as opposed to the market portfolio. To the extent that insiders have superior knowledge

[5] The trading requirement reduces the sample by 16,473 (38.8%) available firm-years. Recent papers examining insider trading also utilize variations of this purchase ratio methodology and limit their sample to firms with insider-trading activity (e.g., Lakonishok and Lee, 2001; Frankel and Li, 2002).

[6] Thomson Financial First Call Insiders Data (formerly known as CDA/Investnet) is promoted to be the most comprehensive source of insider trading data. Data are gathered directly from the Securities and Exchange Commission and are based on the original filings that are required of all insider transactions. The insider-trading database spans the time period 1984–2000.

about information influencing future returns, insider purchases will be positively related to future return performance.[7]

Although the literature contains ample evidence linking insider trading to future returns, returns represent noisy measures of the information set that managers condition their expectations and trading decisions on. Neither insiders ex ante nor researchers ex post can perfectly predict or explain how market expectations and therefore future returns will evolve. Under these circumstances, the use of alternative, reasonable measures of the insiders' information set is likely to prove fruitful in explaining their buy/sell decisions. As corporate executives, insiders should observe financial performance signals before other investors. One financial measure of future firm performance is next year's earnings. Given that unexpected changes in a firm's earnings performance influence stock prices (e.g., Ball and Brown, 1968), insiders have an incentive to trade on the basis of superior information about future earnings innovations. Therefore, we expect insider trading to reflect the sign of next year's earnings change.

Our primary measure of future earnings news is year $t+1$'s annual earnings innovation, defined as

$$\Delta \mathrm{ROA}_{t+1} = \mathrm{ROA}_{t+1} - \mathrm{ROA}_{t}, \tag{2}$$

where ROA_t equals net income before extraordinary items scaled by average total assets. In this design, we are assuming that ROA_t is an unbiased representation of the market's expectation about next year's earnings performance; thus, changes in annual earnings represent private information held by management. Section 5 discusses the limitations of this particular earnings innovation benchmark and examines alternative measures of the insider's information advantage over market expectations.

A secondary measure of future earnings news is the contemporaneous annual earnings innovation ($\Delta \mathrm{ROA}_t$), which is measured in a corresponding manner. This variable measures future earnings because the contemporaneous earnings innovation will not be fully revealed until the beginning of year $t+1$. Additionally, if the market reacts slowly to innovations in current earnings, insiders may trade to take advantage of this slow incorporation of earnings news.

Based on these future performance realizations, each trading observation ($\mathrm{PR}_{i,t}$) is classified as being associated with good or bad future performance-related news. The indicator variables $\mathrm{GOODRET}_{i,t+1}$, $\mathrm{GOODROA}_{i,t+1}$, and $\mathrm{GOODROA}_{i,t}$ equal one if $\mathrm{MARET}_{i,t+1}$, $\Delta \mathrm{ROA}_{t+1}$ and $\Delta \mathrm{ROA}_t$ are greater than zero, respectively, zero otherwise. We test our primary hypotheses by examining whether insider transactions (i.e., $\mathrm{Pr}_{i,t}$) vary across these performance partitions.

[7] There is no *ex ante* guidance as to which return metric (i.e., raw returns, market-adjusted returns, risk-adjusted returns) best maps into an insider's trading decision. The use of MARET_{t+1} assumes that the market return represents the insider's opportunity cost of capital and that the insider will only trade if firm-level returns are expected to exceed opportunity costs. Tests using raw returns in lieu of market-adjusted returns show a stronger association between the insider purchase ratio and future returns with little change in the association between the insider purchase ratio and earnings measures, relative to the results reported in the following sections and tables.

2.3. Measurement of contrarian factors affecting insider trading

Insider trading activity is associated with both recent stock returns and the firm's relative equity valuation; therefore, we classify firm-year observations on the basis of the firm's contemporaneous stock return, measured as the contemporaneous 12-month buy-and-hold market-adjusted return ($MARET_t$), and the firm's book-to-market ratio (BM_t). These variables allow us to measure the impact of contrarian beliefs/current investor sentiment on insider trading. The firm's contemporaneous return ($MARET_t$) equals the firm's 12-month buy-and-hold return during fiscal year t less the 12-month buy-and-hold value-weighted market index return over the corresponding time period. The firm's book-to-market ratio (BM_t) equals the book value of common equity scaled by market capitalization at the end of fiscal year t.[8] Each year, firms are ranked on the basis of $MARET_t$ and BM_t and classified into return treciles and book-to-market quintiles, respectively. Our measurement choices follow the methodology of Rozeff and Zaman (1998) to facilitate comparability with their results.[9]

2.4. Measurement of other factors affecting insider trading

Insiders' trading behavior is known to be influenced by changes in their holdings due to the receipt of stock and option grants and the exercising of stock options (Ofek and Yermack, 2000). Given that these stock-based compensation arrangements are tied to the current firm performance and can influence future performance, stock grants and option exercises could represent correlated omitted variables. We gather data on two variables measuring compensation-related changes in insider holdings: number of shares of restricted stock and stock options granted ($GRANTS_t$) and number of stock options exercised ($OPTN\_EXRC_t$) in year t. Due to the extreme skewness of the underlying data, we measure each variable as the log of one plus the ratio of number of shares granted or options exercised during the fiscal year, respectively, scaled by total shares outstanding at year-end. We gather data on these two variables through Execucomp. Due to data limitations, these control variables are only available for fiscal years after 1991 and represent the primary constraint on our sample.

2.5. Data description and sample characteristics

This paper utilizes insider-trading data available between 1992 and 1999. After conditioning on the presence of open-market insider transactions and the required earnings, stock return and stock-based compensation data, we obtain a final sample of 25,893 firm-year observations. Table 1 provides descriptive statistics on the sample used in this study.

[8] BM ratios at the end of the fiscal year were used for consistency with Rozeff and Zaman (1998). Measuring the book-to-market ratio at the beginning of the fiscal year yields qualitatively similar results.

[9] Rozeff and Zaman classify firms into book-to-market deciles. Given our research design, we need to also partition the sample on the basis of future performance. Our coarser partition along the BM dimension allows us to maintain reasonable sub-sample sizes (between 1,953–3,227 observations per portfolio) after we apply the performance partition to each BM portfolio.

Table 1
Descriptive statistics

Panel A: Sample composition/number of observations

		Glamour				Value
	All firms	BM1	BM2	BM3	BM4	BM5
Unconditional	25,893	5176	5180	5181	5179	5177
Conditional on 1-*year ahead returns*:						
$MARET_{i,t+1} > 0$	10,262	2066	1953	1990	2122	2131
$MARET_{i,t+1} \leqslant 0$	15,631	3110	3227	3191	3057	3046
Conditional on 1-*year ahead annual earnings innovations*:						
$\Delta ROA_{i,t+1} > 0$	12,815	2594	2548	2512	2547	2614
$\Delta ROA_{i,t+1} \leqslant 0$	13,078	2582	2632	2669	2632	2563
Conditional on contemporaneous annual earnings innovations:						
$\Delta ROA_{i,t} > 0$	13,457	2932	2867	2715	2639	2304
$\Delta ROA_{i,t} \leqslant 0$	12,436	2244	2313	2466	2540	2873

Panel B: Descriptive statistics

	Mean	Std. Dev.	5th Pctl	25th Pctl	Median	75th Pctl	95% Pctl
PR_t	0.400	0.438	0.000	0.000	0.137	1.000	1.000
BM_t	0.600	0.488	0.109	0.293	0.499	0.770	1.419
MVE_t	2056.80	11431.06	11.288	54.450	190.57	795.75	7260.50
$MARET_{t+1}$	−0.007	0.729	−0.762	−0.387	−0.109	0.190	1.022
ROA_{t+1}	0.009	0.190	−0.280	0.006	0.033	0.078	0.169
ΔROA_{t+1}	−0.004	0.148	−0.170	−0.024	−0.000	0.017	0.144
$GRANTS_t$	0.062	0.242	0.000	0.000	0.000	0.034	0.292
$OPTN\_EXRC_t$	0.017	0.091	0.000	0.000	0.000	0.001	0.085

This table presents descriptive statistics for the sample of firm-year observations between 1992 and 1999 with insider-trading activity. All variables are as defined in Table 8 of Appendix A.

Each observation is classified into good/bad future news, as measured by our three performance-based metrics. Across all three benchmarks of future performance, the sample is divided approximately in half between good and bad future news. The future market-adjusted returns benchmark yields the greatest skewness across the performance partitions, with approximately 60.4 percent of the firm-years associated with poor future return performance (see panel A). Across BM quintiles, both contemporaneous and future firm performance display patterns consistent with prior research: A greater proportion of glamour firms displays strong contemporaneous earnings and return performance, while value firms are slightly more likely to have a positive future earnings innovation (e.g., Fama and French, 1992, 1995).

Panel B presents descriptive statistics about the key variables used in this study. Focusing on trading behavior, our sample illustrates that the vast majority of insider

transactions represent sales of securities. Specifically, only 40.0 (13.7) percent of the average (median) firm's insider trades are purchase transactions, while nearly 28.9% of the firm-year observations are associated with only sell transactions. However, nearly 26.5% of the firm-year observations are associated with only purchase transactions, suggesting that there is sufficient variation in trading behavior within our sample.

The remaining descriptive statistics highlight considerable economic variation and diversity within the sample. Although the mean and median 1-year ahead earnings realizations are positive (mean $ROA_{t+1} = 0.009$; median $ROA_{t+1} = 0.033$), 21.6% of the firm-years are associated with negative future earnings, while 50.5% of the firms experienced an actual decline in next year's ROA. Consistent with a broad cross section of firms in the sample, the inter-quartile range of MVE_t is \$54M–\$796M, with a sample average of \$2,057M. Consistent with considerable variation in firm-level incentives to sell securities, 34.3% of the firms granted restricted stock and/or stock options, while 25.8% of the firms had executives who exercised options in the year of insider trading. For these firms, the mean non-zero granting and exercising activity is equal to 1.16% and 0.11% of shares outstanding, respectively.

3. Primary results

3.1. Relations between insider trading, contrarian beliefs and future firm performance

Table 2 presents basic univariate relations between firm performance and insider buying. Consistent with prior research, we document that managers are more likely

Table 2
Insider-trading behavior conditional on future firm performance 1992–1999

Information variable:	Contemporaneous performance		Future performance	
	Contemporaneous market-adj. returns $MARET_{i,t}$	Contemporaneous change in earnings $\Delta ROA_{i,t}$	1-year ahead market-adj. returns $MARET_{i,t+1}$	1-year ahead change in earnings $\Delta ROA_{i,t+1}$
Good news	0.328	0.385	0.416	0.421
Bad news	0.449	0.417	0.390	0.380
Difference (*t*-statistic)	−0.121 (−22.01)	−0.032 (−5.97)	0.026 (4.67)	0.041 (7.62)

This table documents the average proportion of insider transactions that are purchases during each firm's fiscal year, conditional on contemporaneous (year t) and future (year $t+1$) firm performance. Firm performance is measured using two metrics: Twelve-month market-adjusted returns (MARET) and the firm's annual earnings innovation (ΔROA). Good (bad) news is defined as MARET or ΔROA realizations greater than zero (less than or equal to zero), respectively. Reported differences between good and bad news mean purchase ratios are tested using a two-sample *t*-test. Variables are as defined in Appendix A. For the contemporaneous return-based performance metric, 10,473 (15,420) firm-year observations are associated with positive (non-positive) contemporaneous market-adjusted returns. The sample composition for the remaining performance partitions reflects the number of observations reported in Table 1.

to purchase securities during periods of falling stock prices. Moreover, we find a similar, albeit substantially weaker, inverse relation between current earnings performance and the firm's purchase ratio. Both of these relations are consistent with insiders selling their securities, or taking profits, during periods of stronger firm performance.

The remaining columns of Table 2 focus on unambiguously future-oriented performance variables. Consistent with the conjecture that insiders purchase securities *in anticipation* of good future news, we find that insider purchase decisions are significantly positively associated with future firm performance. These positive relations hold using both earnings and return measures of firm performance and are significant at the one-percent level using two-tailed two-sample t-tests of means.[10]

These univariate tests, however, fail to separate out the effects of trading against misvaluation and trading with superior future information. To test whether the relations between insider purchase ratios and earnings news are incremental to variables capturing a contrarian trading strategy (i.e., recent return performance and the firm's BM ranking), and vice versa, we utilize the methodology in Rozeff and Zaman (1998) as our benchmark. Specifically, we estimate coefficients from the following cross-sectional model:

$$\begin{aligned} \mathrm{PR}_{i,t} = {} & \alpha + \beta_1 \mathrm{GOODRET}_{t+1} + \beta_2 \mathrm{GOODROA}_{i,t+1} + \beta_3 \mathrm{GOODROA}_{i,t} \\ & + \beta_4 \mathrm{BM1}_{i,t} + \beta_5 \mathrm{BM2}_{i,t} + \beta_6 \mathrm{BM3}_{i,t} + \beta_7 \mathrm{BM4}_{i,t} + \beta_8 \mathrm{HRET}_{i,t} \\ & + \beta_9 \mathrm{MRET}_{i,t} + \beta_{10} \mathrm{GRANTS}_{i,t} + \beta_{11} \mathrm{OPTN\_EXRC}_{i,t} + \varepsilon_{i,t}, \end{aligned} \tag{3}$$

where HRET_t and MRET_t are indicator variables equal to one if the firm's 12-month market-adjusted return (MARET_t) is in the top and middle third of all sample firms that year, zero otherwise. The indicator variables BMl_t, $\mathrm{BM2}_t$, $\mathrm{BM3}_t$ and $\mathrm{BM4}_t$ are equal to one if the firm's BM ratio ranks in the bottom, second, third and forth quintiles, respectively, of annual BM ratios, zero otherwise. In this methodology, the intercept reflects the mean purchase ratio for value (i.e., BM5) firms in the low contemporaneous return trecile with poor future performance prospects. The performance indicator variables $\mathrm{GOODRET}_{t+1}$, $\mathrm{GOODROA}_{t+1}$ and $\mathrm{GOODROA}_t$ measure the relation between strong future performance and insider-trading behavior after controlling for the other variables. To control for cross-sectional dependencies in the data, this model is estimated annually and average annual coefficients are tested against the null of zero using standard errors from the empirically derived distributions of the eight annual coefficients. Average coefficients and empirical t-statistics are presented in Table 3.

Estimation (1) confirms the previously documented contrarian relations between purchase ratios and the firm's past returns (HRET and MRET) and book-to-market ratios (BM1–BM4). These estimations show that insider purchases are inversely

[10] Differences in median purchase ratios are also significant at the one-percent level using Wilcoxon sign-ranked tests (not tabulated). Correlations between continuous measures of insider trading and firm performance also yield similar inferences. The spearman correlation between $\mathrm{PR}_{i,t}$ and $\mathrm{MARET}_{i,t}$, $\Delta\mathrm{ROA}_{i,t}$, $\mathrm{MARET}_{i,t+1}$ and $\Delta\mathrm{ROA}_{i,t+1}$ is -0.173, -0.037, 0.048 and 0.067, respectively. All relations are significant at the one-percent level.

Table 3
Regressions explaining the proportion of insider purchases by book-to-market quintiles, contemporaneous returns, stock-based compensation and future firm performance

Panel A: Regressions utilizing future performance indicator variables[a]

	(1)	(2)	(3)	(4)	(5)
Intercept	0.603 (22.55)	0.595 (20.05)	0.582 (21.44)	0.601 (22.12)	0.576 (19.34)
$GOODRET_{t+1}$	—	0.019[d] (2.05)	—	—	0.008 (0.72)
$GOODROA_{t+1}$	—	—	0.044[c] (6.74)	—	0.043[c] (5.05)
$GOODROA_t$	—	—	—	0.009 (1.42)	0.011 (1.66)
BM1	−0.331 (−19.92)	−0.313 (−20.01)	−0.315 (−20.09)	−0.316 (−20.07)	−0.313 (−20.03)
BM2	−0.283 (−19.97)	−0.271 (−18.98)	−0.272 (−18.98)	−0.273 (−19.18)	−0.271 (−19.10)
BM3	−0.181 (−18.70)	−0.175 (−21.00)	−0.176 (−19.98)	−0.177 (−19.65)	−0.176 (−21.25)
BM4	−0.096 (−7.15)	−0.093 (−7.53)	−0.093 (−7.31)	−0.094 (−7.63)	−0.093 (−7.57)
$HRET_t$	−0.057 (−3.26)	−0.053 (−2.98)	−0.054 (−3.09)	−0.055 (−3.08)	−0.059 (−3.35)
$MRET_t$	−0.035 (−2.53)	−0.034 (−2.47)	−0.034 (−2.48)	−0.035 (−2.58)	−0.037 (−2.76)
$GRANTS_t$	—	−0.041 (−2.24)	−0.040 (−2.36)	−0.039 (−2.24)	−0.041 (−2.26)
$OPTN\_EXRC_t$	—	−0.557 (−5.28)	−0.551 (−5.26)	−0.555 (−5.26)	−0.553 (−5.28)
Average adj. R^2	0.094	0.104	0.105	0.103	0.106

Panel B: Regressions utilizing continuous measures of future firm performance[b]

	(1)	(2)	(3)	(4)	(5)
Intercept	0.603 (22.55)	0.603 (22.37)	0.604 (22.83)	0.605 (22.99)	0.605 (22.68)
$MARET_{t+1}$	—	0.034[c] (4.67)	—	—	0.027[c] (3.70)
ΔROA_{t+1}	—	—	0.164[c] (4.72)	—	0.160[c] (4.04)
ΔROA_t	—	—	—	0.025 (0.55)	0.073 (1.51)
BM1	−0.331 (−19.92)	−0.314 (−20.18)	−0.319 (−20.22)	−0.317 (−20.39)	−0.318 (−20.75)
BM2	−0.283 (−19.97)	−0.270 (−19.00)	−0.273 (−19.10)	−0.273 (−19.17)	−0.270 (−19.17)
BM3	−0.181 (−18.70)	−0.175 (−21.72)	−0.177 (−20.40)	−0.177 (−19.59)	−0.175 (−22.21)
BM4	−0.096 (−7.15)	−0.092 (−7.72)	−0.093 (−7.39)	−0.093 (−7.46)	−0.092 (−7.61)
$HRET_t$	−0.057 (−3.26)	−0.053 (−3.07)	−0.051 (−2.85)	−0.053 (−2.91)	−0.055 (−3.19)
$MRET_t$	−0.035 (−2.53)	−0.033 (−2.43)	−0.032 (−2.35)	−0.033 (−2.26)	−0.035 (−2.64)
GRANTS	—	−0.043 (−2.30)	−0.040 (−2.31)	−0.038 (−2.18)	−0.042 (−2.24)
OPTN_EXRC	—	−0.554 (−5.35)	−0.549 (−5.19)	−0.553 (−5.31)	−0.546 (−5.31)
Average adj. R^2	0.094	0.105	0.106	0.104	0.108

[a]This panel presents average coefficients from eight annual estimations (1992–1999) of the following model:

$$PR_{i,t} = \alpha + \beta_1 GOODRET_{i,t+1} + \beta_2 GOODROA_{i,t+1} + \beta_3 GOODROA_{i,t} + \beta_4 BM1_{i,t} + \beta_5 BM2_{i,t} + \beta_6 BM3_{i,t} + \beta_7 BM4_{i,t} + \beta_8 HRET_{i,t} + \beta_9 MRET_{i,t} + \beta_{10} GRANTS_{i,t} + \beta_{11} OPTN\_EXRC_{i,t} + \varepsilon_{i,t}.$$

All variables are as defined in Table 8 of Appendix A. Average coefficients are tested against a null of zero using the empirical derived distribution of coefficients from eight annual cross-sectional estimations.

[b]This panel presents average coefficients from eight annual estimations (1992–1999) of the following model:

$$PR_{i,t} = \alpha + \beta_1 MARET_{i,t+1} + \beta_2 \Delta ROA_{i,t+1} + \beta_3 \Delta ROA_{i,t} + \beta_4 BM1_{i,t} + \beta_5 BM2_{i,t} + \beta_6 BM3_{i,t} + \beta_7 BM4_{i,t} + \beta_8 HRET_{i,t} + \beta_9 MRET_{i,t} + \beta_{10} GRANTS_{i,t} + \beta_{11} OPTN\_EXRC_{i,t} + \varepsilon_{i,t}.$$

All variables are as defined in Table 8 of Appendix A. Average coefficients are tested against a null of zero using the empirically derived distribution of coefficients from eight annual cross-sectional estimations.

[c,d]The average annual performance-related coefficient is significantly different than zero at the one, five and ten-percent level, respectively, using a two-tailed t-test.

related to contemporaneous 12-month returns and positively related to the firm's book-to-market ranking. Similar to the magnitudes documented in Rozeff and Zaman (1998), the mean purchase ratio for firms in the lowest return trecile and highest book-to-market portfolio is 0.603, while glamour firms with a similar historical return pattern have purchase ratios around 0.272.

Estimations (2)–(4) examine the incremental association between future firm performance and insider purchasing behavior. Consistent with the unconditional results in Table 2, both future earnings innovations ($GOODROA_{t+1}$) and future return performance ($GOODRET_{t+1}$) are positively associated with insider purchasing behavior after controlling for the valuation effects documented in Rozeff and Zaman (1998). In contrast, after controlling for book-to-market rankings and contemporaneous returns, we find that the concurrent annual earnings innovation has an insignificant positive relation with insider purchases.

To corroborate the preceding results and control for omitted performance variables, we estimate a full model (estimation (5)) that includes all three performance metrics. Consistent with insiders trading on superior knowledge about future earnings innovations, we find that next period's earnings innovation is positively associated with purchase activities after controlling for future returns and contemporaneous earnings news. Moreover, this trading–earnings relation is distinct from the BM and contemporaneous return relations documented in Rozeff and Zaman (1998) (i.e., trading on contrarian beliefs), and vice versa. These estimations confirm the findings in Ke et al. (2003) that insider trades are associated with future earnings news, and suggest that insiders capitalize on both outside investors' valuation errors and their own superior information when making their trading decisions. Finally, in terms of relative explanatory power, the low incremental R^2's associated with the inclusion of future cash flow news into the model suggest that trading on the basis of superior knowledge is less important than trading on the basis of misvaluation/contrarian beliefs.[11]

The use of indicator variables in estimation (3) is designed to eliminate measurement error in our independent variables. However, these indicator variables can also eliminate potentially useful information about the relative magnitude of the firm's future performance innovation. To better understand the relation between purchase ratios and future performance, we re-estimate the preceding model using our raw, continuous measures of future returns ($MARET_{t+1}$) and earnings innovations (ΔROA_{t+1} and ΔROA_t). Coefficients from these estimations are presented in panel B. Inferences are consistent with those gleaned using the performance indicator variables. The important exception is that $MARET_{t+1}$ retains a significant positive association with purchase ratios even after controlling for contemporaneous and future earnings innovations. Estimations in the remainder of

[11] Our methodology assumes that BM and past returns accurately measure misvaluation arising from investor sentiment/biased judgements, and do not also reflect superior information about actual future cash-flow changes. To the extent that these contrarian variables also reflect future cash-flow news, our results need to be interpreted with caution.

the paper utilize the performance indicator variables for parsimony and ease of interpretation.

3.2. Changes in insider holdings

The preceding tests directly control for compensation-based changes in insider holdings across time ($GRANTS_t$ and $OPTN\_EXRC_t$). Consistent with Ofek and Yermack (2000), we find that insider purchase ratios are inversely related to the number of shares granted and options exercised. Additional analyses (not tabulated) show that although these stock-based compensation variables have explanatory power, their inclusion in the model does not alter the sign or magnitude of the relation between insider trading, firm performance and contrarian beliefs. The primary results in this paper are robust to the use of a longer time-series of insider trading data (16 annual estimations (1984–1999) without controls for these compensation-based variables.

3.3. Variation in the relation between insider trading and earnings performance

The relation between insider trades and future performance realizations should vary by the expected costs and expected benefits of trading on this information. In this section, we examine whether cross-sectional differences in information environments, inter-temporal shifts in insider trading laws and intra-firm differences in the access to information are associated with systematic variation in the observed insider trading–earnings relation.

3.3.1. Relation between insider trading and future firm performance across analyst coverage and firm size portfolios

An insider's ability to trade on future performance is inversely related to the informational efficiency of the firm's stock price. The more quickly and completely a firm's stock price reflects shifts in firm level, industry or macro-economic factors, the less opportunity an insider has to profitably trade on his/her information about the firm's future performance. We partition the sample by two variables that are correlated with a firm's information environment: the presence of analyst coverage and firm size.

The presence of an active analyst community, through its private information acquisition activities and its pressure on management to disclose forward-looking financial information, leads to a richer information environment (e.g., Lang and Lundholm, 1993; Brennan and Subrahmanyam, 1995). To the extent that the analyst's information acquisition, synthesis and dissemination activities attenuate the manager's information advantage, the association between observed insider trading and future performance outcomes will be weaker for covered firms. We measure analyst coverage as whether or not at least one analyst filed a 1-year ahead earnings forecast on I/B/E/S during fiscal year t. In our sample, 45.4% of the firm-year observations have analyst coverage.

Firm size is also correlated with the strength of the firm's information environment. Large firms tend to be heavily followed by the investment community (Bhushan, 1989) and most information-based anomalies are attenuated for large firms (Fama, 1998). Moreover, Collins and Kothari (1989) and Collins et al. (1987) show that current annual earnings information is impounded into prices earlier in the fiscal year for large firms vis-à-vis small and mid-size firms. Based on these findings, insiders of large firms have fewer opportunities to profitably trade on earnings news; as such, we expect the relation between insider trading and future earnings to be inversely related to the firm's size. We measure size by the firm's equity market capitalization at the end of fiscal year t.[12] Firm-year observations are classified into three size portfolios (small, medium and large) based on each year's distribution of size realizations.

Table 4 presents coefficients from full estimations of Eq. (3) across analyst coverage and size partitions. For succinctness, the table only reports the average annual coefficients on the three performance-related variables.[13] First, we find that purchase ratios display a positive association with next period's earnings innovations across all partitions. However, the relation between purchase ratios and next year's earnings innovation varies inversely with firm size. The relation is strongest among small and midsize firms, while large firms display a positive, yet statistically insignificant, relation.

Second, the sign of the relation between insider purchases and contemporaneous earnings is a function of the firm's information environment. For small firms and firms lacking analyst coverage, the relation is significantly positive, while for large (covered) firms, the relation is significantly negative (near zero). Moreover, the relation displays a monotonic pattern across firm size partitions. The lack of a positive relation between insider purchase ratios and contemporaneous earnings news in strong information environments (especially among large firms) is consistent with prices fully reflecting current earnings news earlier in the fiscal year, thereby negating the potential trading benefits to insiders.

The results in Table 4 are also consistent with monitoring and cost-based arguments. For example, large firms with strong investor interest face greater external monitoring than small firms and are subject to greater potential litigation and political costs (see Watts and Zimmerman, 1986). Moreover, large firms are more likely to implement restrictions on insider-trading activity (see Bettis et al., 2000). As such, the observed variation in the relation between insider-trading and future earnings information across size partitions may reflect differential costs of trading as opposed to differential expected benefits.

[12] The results in this paper are robust to the inclusion of firm size (MVE) as an explanatory variable. The average coefficient on the variable $\log(\text{MVE}_t)$ is significantly negative (-0.047) at the one percent level. All remaining independent variables retain their tabulated relations with insider purchase ratios.

[13] The significance of the remaining relations, i.e., coefficients on BM and contemporaneous returns, are robust across these partitions, and are thus not reported.

Table 4
Relation between insider trading and future firm performance conditional on firm size and the presence of analyst coverage

	$GOODRET_{i,t+1}$	$GOODROA_{i,t+1}$	$GOODROA_{i,t}$	Average adj. R^2	# of estimations	n
Panel A: *Analyst coverage*						
No coverage	0.011 (0.89)	0.039[a] (4.05)	0.015[b] (1.73)	0.089	8	14,141
Coverage	0.009 (0.62)	0.042[a] (5.39)	0.000 (0.04)	0.106	8	11,752
Difference (t-statistic)	0.002 (0.10)	−0.003 (−0.27)	0.015 (1.39)			
Panel B: *Firm size*						
Small firms	0.041[c] (3.17)	0.056[a] (8.59)	0.041[a] (4.31)	0.032	8	8631
Medium firms	0.012 (0.72)	0.048[c] (3.40)	−0.003 (−0.23)	0.084	8	8631
Large firms	−0.024 (−1.53)	0.010 (1.02)	−0.011[b] (−2.27)	0.093	8	8631
Small–large (t-statistic)	0.065[a] (3.18)	0.046[a] (4.02)	0.053[a] (4.87)			

This table presents average coefficients from eight annual estimations (1992–1999) of the following model:

$$PR_{i,t} = \alpha + \beta_1 GOODRET_{i,t+1} + \beta_2 GOODROA_{i,t+1} + \beta_3 GOODROA_{i,t} + \beta_4 BM1_{i,t} + \beta_5 BM2_{i,t} + \beta_6 BM3_{i,t} + \beta_7 BM4_{i,t} + \beta_8 HRET_{i,t} + \beta_9 MRET_{i,t} + \beta_{10} GRANTS_{i,t} + \beta_{11} OPTN\_EXRC_{i,t} + \varepsilon_{i,t}.$$

All variables are as defined in Table 8 of Appendix A. Average coefficients are tested against a null of zero using the empirical derived distribution of coefficients from eight annual cross-sectional estimations.

[a,b,c]The average annual performance-related coefficient is significantly different than zero at the one, five and ten-percent level, respectively, using a two-tailed t-test. Differences in average annual performance-related coefficients are significantly different than zero at the respective level using a one-tailed, two-sample t-test of means.

3.3.2. Variation in the costs of trading on future information

Aside from potential variation in legal and political costs associated with differences in firm size and monitoring intensity, it is difficult to measure *ex ante* firm-level differences in the cost of trading on future earnings information. However, changes in securities laws can allow us to categorize (albeit crudely) observations into two insider-trading enforcement regimes: low enforcement and high enforcement. Prior to our sample period, Congress passed the Insider Trading and Securities Fraud Enforcement Act (1988) and the Securities Enforcement Remedies and Penny Stock Reform Act (1990). These laws were designed to increase the penalties associated with, and improve the detection of, insider-trading activities. It can be argued that the potential costs associated with insider trading increased after the enactment of these laws. If these new securities laws represent a credible deterrent to insider trading, we should find the relation between insider trading and firm performance is attenuated after 1990. We test for this effect using available insider trading data between 1984 and 1999. Due to the longer time-series of data, we are required to estimate the preceding models without including variables for granting activity; results are presented in Table 5, panel A.

These estimations reveal an interesting dynamic. Prior to the enactment of these laws, insider trades display a slightly stronger association with contemporaneous earnings innovations than future earnings innovations. After enactment, purchase ratios display a smaller association with contemporaneous earnings and a substantially larger association with next year's earnings innovation. Specifically, during the strong enforcement period, the coefficient on next year's earnings news ($GOODROA_{t+1}$) is significantly larger than the coefficient on current earnings news (difference = 0.029) at the five percent level of significance, while the coefficient on contemporaneous earnings displays a (marginally) significant decline between the two enforcement regimes. These changes are consistent with managers curtailing trading on near-term earnings information and instead trading on longer-term earnings expectations. Given that trading correlated with near-term earnings news is more likely to generate regulatory scrutiny and litigation risk than trading correlated with long-term earnings news, this switch is consistent with managers trading on a less blatant form of information advantage in response to the new laws.

3.3.3. Differential access to performance-related information

Our insider-trading metric combines the open-market transactions of registered executives and directors; as such, all of our tests implicitly assume that executives and directors have similar access to firm-specific information. Given that the board of directors is a monitoring body that only meets periodically, it is likely that executives of the company have access to performance-related information in a more timely manner than directors. To the extent that the insider's informational advantage (and related benefit from trading) decays over time, we would expect to see a stronger relation between future firm performance and trades for executives.

To test for these differences, we re-measure purchase ratios using executive-only ($PR^{E}_{i,t}$) and director-only ($PR^{D}_{i,t}$) transactions. Eq. (3) was re-estimated annually using these two dependent variables for those firm-year observations with the respective

Table 5
Variations in the relations between insider trading and future firm performance

Panel A: Relation between insider trading and future firm performance by enforcement regimes[a,c]

	$GOODRET_{i,t+1}$	$GOODROA_{i,t+1}$	$GOODROA_{i,t}$	Average adj. R^2	# of estimations	n
Insider trading enforcement regimes:						
Weaker enforcement (1984–1990)	0.001 (0.19)	0.032[d] (2.03)	0.041[e] (3.50)	0.076	7	10,294
Stronger enforcement (1991–1999)	0.007 (0.76)	0.047[f] (6.17)	0.018[d] (1.92)	0.099	9	27,847
Difference (t-statistic)	−0.006 (−0.48)	−0.015 (−0.95)	0.023 (1.59)			

Panel B: Relation between insider trading and future firm performance conditional on executives versus director trades[b,c]

	$GOODRET_{i,t+1}$	$GOODROA_{i,t+1}$	$GOODROA_{i,t}$	Average adj. R^2	# of estimations	n
Type of insider trades:						
Executive trades	0.009 (0.77)	0.054[f] (8.79)	0.019[e] (3.25)	0.109	8	21,655
Director trades	0.001 (0.12)	0.041[f] (6.18)	0.004 (0.41)	0.070	8	19,071
Difference (t-statistic)	0.008 (0.55)	0.013 (1.59)	0.015 (1.56)			

[a] This panel presents average coefficients from annual estimations of the following model across two insider trading enforcement regimes (weak enforcement: 1984–1990; strong enforcement: 1991–1999):

$$\begin{aligned} PR_{i,t} = {} & \alpha + \beta_1 GOODRET_{i,t+1} + \beta_2 GOODROA_{i,t+1} + \beta_3 GOODROA_{i,t} \\ & + \beta_4 BM1_{i,t} + \beta_5 BM2_{i,t} + \beta_6 BM3_{i,t} + \beta_7 BM4_{i,t} \\ & + \beta_8 HRET_{i,t} + \beta_9 MRET_{i,t} + \varepsilon_{i,t}. \end{aligned}$$

[b] This panel presents average coefficients from eight annual estimations (1992–1999) of the following model:

$$\begin{aligned} PR_{i,t} = {} & \alpha + \beta_1 GOODRET_{i,t+1} + \beta_2 GOODROA_{i,t+1} + \beta_3 GOODROA_{i,t} \\ & + \beta_4 BM1_{i,t} + \beta_5 BM2_{i,t} + \beta_6 BM3_{i,t} + \beta_7 BM4_{i,t} + \beta_8 HRET_{i,t} \\ & + \beta_9 MRET_{i,t} + \beta_{10} GRANTS_{i,t} + \beta_{11} OPTN\_EXRC_{i,t} + \varepsilon_{i,t}. \end{aligned}$$

[c] All variables are as defined in Table 8 of Appendix A. Average coefficients are tested against a null of zero using the empirically derived distribution of coefficients from the annual cross-sectional estimations.

[d,e,f] The average annual performance-related coefficient is significantly different than zero at the one, five and ten-percent level, respectively, using a two-tailed t-test. Differences in average annual performance-related coefficients are significantly different than zero at the respective level using a one-tailed, two-sample t-test of means.

type of insider transactions. These estimations (Table 5, panel B) reveal that both party's purchase transactions are significantly positively associated with future earnings news, while only executive trades have a significant positive relation with current earnings news. Moreover, the coefficient on $GOODROA_{t+1}$ is larger in magnitude for executives than directors; however, the difference between these average coefficients is only marginally statistically significant (difference = 0.013, t-statistic = 1.59). The lack of a positive relation between director trades and current earnings news is consistent with their delayed receipt of this information (and therefore smaller benefits to trading).

Together, the preceding evidence suggests that insiders trade on the basis of their superior information about next period's earnings innovation and against misvaluation produced by outsiders' inferior valuation models and/or judgement biases. In terms of trading on the basis of superior information, this trading behavior is amplified (attenuated) as the likely benefits (costs) to trading on this information increase. However, despite the strength and consistency of the documented relations, a causal relation has not been proven.[14]

4. Interaction between future earnings performance and book-to-market ratios

Rozeff and Zaman (1998) document that insider purchase ratios are positively related to the firm's book-to-market ratio and conclude that insiders recognize the market's over-reaction to past good and bad news and trade accordingly, i.e., insiders are contrarians. This explanation for their trading behavior, however, is predicated on the insider's recognition of market mispricing. Given that nearly half of all value firms experience negative returns in year $t+1$, a strict book-to-market trading strategy does not indicate efficient insider trading. If insiders use their private information about future earnings to differentiate between over-valued and under-valued securities, the relation between insider trading and future earnings innovations should be robust across all book-to-market portfolios. Table 6 presents evidence on this issue. The research design is similar to Table 3, except that the BM indicator variables are interacted with the respective good earnings news indicator variable. Coefficients on the past return and stock-based compensation variables are not tabulated for parsimony.

Partitioning our sample by BM quintiles illustrates the robustness of the documented positive relation between insider purchases and next period's earnings performance. In each BM portfolio, the proportion of shares purchased is significantly higher for those firms experiencing good future earnings news than for those firms with bad future earnings news. The magnitude of the difference in

[14] For example, our results are also consistent with an endogenous relation between insider-trading behavior and future earnings performance: insiders purchasing shares in the current year have an incentive to subsequently inflate future earnings (or depress current earnings) in order to create strong earnings and stock price performance in the future. The link between insider trading and potential earnings management is a topic for future research.

Table 6
Relation between insider trading and future earnings performance conditional on the firm's book-to-market quintile ranking

Panel A: Future earnings innovation: $GOODROA_{t+1}$

	Coefficient	*t*-statistic	$GOODROA_{t+1} + BM^{*}GOODROA_{t+1}$
Intercept	0.573	19.26	
BM1	−0.303	−14.15	
BM2	−0.259	−12.39	
BM3	−0.168	−16.80	
BM4	−0.083	−4.82	
BM 1*$GOODROA_{t+1}$	−0.022	−1.27	0.039[a]
BM 2*$GOODROA_{t+1}$	−0.026	−1.15	0.035[b]
BM 3*$GOODROA_{t+1}$	−0.014	−1.54	0.047[c]
BM 4*$GOODROA_{t+1}$	−0.018	−1.09	0.043[c]
$GOODROA_{t+1}$	0.061	6.21	0.061[c]
Average adj. R^2	0.106		

Panel B: Contemporaneous earnings innovation: $GOODROA_t$

	Coefficient	*t*-statistic	$GOODROA_t + BM^{*}GOODROA_t$
Intercept	0.589	20.57	
BM1	−0.279	−17.70	
BM2	−0.250	−13.56	
BM3	−0.164	−15.41	
BM4	−0.098	−7.33	
BM 1*$GOODROA_t$	−0.071	−6.20	−0.032[a]
BM 2*$GOODROA_t$	−0.047	−2.33	−0.008
BM 3*$GOODROA_t$	−0.030	−2.60	0.009
BM 4*$GOODROA_t$	0.004	0.22	0.043[a]
$GOODROA_t$	0.039	3.44	0.039[a]
Average adj. R^2	0.103		

Panels A and B present average coefficients from eight annual estimations of the following model:

$$PR_{i,t} = \alpha + \beta_1 GOODROA_i + \beta_2 BM1_{i,t} + \beta_3 BM2_{i,t} + \beta_4 BM3_{i,t} + \beta_5 BM4_{i,t} + \beta_6 BM1_{i,t}{*}GOODROA_i + \beta_7 BM2_{i,t}{*}GOODROA_i + \beta_8 BM3_{i,t}{*}GOODROA_i + \beta_9 BM4_{i,t}{*}GOODROA_i + \beta_{10} HRET_{i,t} + \beta_{11} MRET_{i,t} + \beta_{12} GRANTS_{i,t} + \beta_{13} OPTN\_EXRC_{i,t} + \varepsilon_{i,t}.$$

Panel A (B) presents an estimation using next year's (contemporaneous) earnings innovation metric. All variables are as defined in Table 8 of Appendix A. Average coefficients are tested against a null of zero using the empirically derived distribution of coefficients from eight annual cross-sectional estimations.

[a,b,c]The sum of the coefficients on GOODROA and the related interaction term BM*GOODROA is significantly different than zero at the one, five and ten percent level, respectively, using a two-tailed *t*-test.

purchase ratios between good news and bad news firms tends to be larger for value firms (coefficient = 0.061) than glamour firms (sum of coefficients = 0.039); however, all trading differences are significant at conventional levels.

Table 3 documented a weak positive relation between $PR_{i,t}$ and contemporaneous earnings innovations. After controlling for a firm's BM ranking, we find the relation between insider trading and contemporaneous earnings performance depends on the

firm's book to market ratio. For glamour firms (i.e., BM1), contemporaneous good news is associated with insiders selling their shares, while value firms (i.e., BM5) experience increased insider buying. This switch from selling to purchasing behavior is nearly monotonic across book-to-market portfolios.

These results suggest that insiders of glamour firms "cash out" after revealing strong earnings news. This trading behavior is consistent with insiders recognizing that the valuation implications of current annual earnings innovations are already impounded in price (and potentially over-extrapolated) for heavily followed glamour firms. For value firms, the positive relation suggests that insiders use the current earnings news as a signal of strong future performance. This behavior is consistent with Piotroski's (2000) findings that strong earnings performance in year t can be used to identify value firms with strong subsequent returns and earnings performance in year $t+1$ (due to the slower impounding of current earnings into prices for neglected firms). This asymmetric trading response to the current earnings innovation is consistent with insiders recognizing both differences in investor interest across glamour and value stocks and the impact investor neglect has on the informational efficiency of stock prices.

5. Robustness tests

5.1. Alternative measures of insider-trading behavior

We measure insider transactions using a purchase ratio defined as the number of shares purchased during fiscal year t divided by the total number of shares traded by insiders during fiscal year t. Alternative measures of insider purchasing behavior are the number of shares purchased (scaled by total trading volume) and the net number of shares purchased (shares purchased minus shares sold, scaled by trading volume). Use of these measures yields results similar to those presented in this paper.

Rozeff and Zaman (1998) use a purchase ratio that is defined as the *number* of purchase transactions scaled by the total number of insider transactions. We have repeated our tests using their transactions-based measure and find results similar to those presented. We present our results with a shares-based measure because this measure gives more weight to economically significant transactions. We also re-estimated our models using a weighted-least-squares methodology where firm-year observations are weighted by the total number of shares traded by insiders. Our results strengthen using this methodology, suggesting that heavy (light) insider trading is more likely to be influenced by private information (liquidity needs).

As discussed in Section 2.5, a large percentage of our sample consists of firm-years with either all purchases or all sales by insiders. We have replicated our tests using a purchase ratio measure that attempts to quantify "insider consensus". This measure takes on the values 0, 1, 2, and 3 for observations with only sales, greater than 50% (but less than 100%) sales, greater than 50% (but less than 100%) purchases, and only purchases. The models are estimated using an ordered probit procedure. Results (not tabulated) are similar to those previously presented. This approach eliminates

concerns about model misspecification arising from the non-normality of the insider-trading data and highlights the robustness of the documented relations. We retain the annual OLS regression framework for ease of interpretation and consistency with prior research.

5.2. Earnings performance benchmark

A concern is that our earnings innovation metrics are measured with error. Walther (1997) finds that for small, thinly-followed firms, time-series models provide a reasonable benchmark for expected earnings. For larger firms, however, analyst forecasts are a better measure of market expectations. Thus, measurement error in our earnings innovation metrics could potentially explain the weak association between insider trading and future earnings performance for large firms and firms with analyst coverage.[15]

To eliminate this concern, we employ the consensus analyst forecast of current and next period's earnings to measure expected good earnings news and re-define GOODROA accordingly for those firms with analyst coverage in the year of insider trading. Results (not tabulated) using this analyst-based benchmark support our prior evidence, with two exceptions. First, the relation between insider trading and current earnings news becomes significantly negative for *both* large firms and firms with analyst coverage. Second, after this adjustment, insider purchase ratios are significantly positively associated with *future* earnings news ($GOODROA_{t+1}$) across *all* information environment partitions.[16]

6. Further evidence on the role of earnings in insiders' trading decisions

The preceding evidence links the direction of insider trades to the sign of future earnings news. All of these results, however, are predicated on the insider's decision to trade. Namely, given the decision to actively trade, the type of trade (i.e., buy vs. sell transaction) chosen by management is a function of the sign of future earnings innovations. However, some insiders do not trade in a given fiscal year. The removal of these *no-trade* observations eliminates potentially useful information about insider-trading decisions. Specifically, a no-trade decision is the equivalent of both a no-purchase observation and a no-sale observation, yet is economically distinct from a $PR_{i,t}$ observation equal to 0, $\frac{1}{2}$ or 1. For completeness, we utilize the entire sample of available firm-year observations between 1992 and 1999 with sufficient return,

[15] Alternatively, market expectations (as measured by the consensus analyst forecast) evolve and fluctuate over time. If managers are averse to forming a trading rule based on a constantly shifting performance benchmark, then an analyst forecast-based measure of good performance would also display a minimal relation with insider trading.

[16] In addition, return-on-assets may not be the "earnings" benchmark used by insiders. Our results using random-walk earnings performance metrics are robust to using EBITDA, operating profit (EBIT) and recurring earnings (measured as net income before extraordinary and special items) as earnings-based performance metrics.

earnings and stock-based compensation data ($n = 42,366$) and examine whether the link between trading decisions and future earnings is robust to the inclusion of *no-trade* observations.

Univariate comparisons between firm-year observations with and without insider trading (25,893 and 16,473 firm-years, respectively) show that insider trading is concentrated in larger firms, growth firms (i.e., low book-to-market ratios) and firms with extensive stock-based compensation (statistics not tabulated). In terms of earnings attributes, firm-year observations with insider trading have stronger current and future earnings performance than firm-years without insider trading. However, firm-year observations with insider trading have smaller *absolute* future earnings innovations and report smaller *absolute* special items (although with similar frequency) than firm-years without insider trading. This evidence suggests that insiders limit their trading activities during periods of large and/or transitory earnings changes.[17]

To implement our trade/no-trade analysis, we measure the number of shares purchased by insiders in a given fiscal year, scaled by total number of shares outstanding at the end of the year. We create an indicator variable, $\text{PURCHASE}_{i,t}$, that equals zero if no shares were bought in year t, and equals one (two) if the scaled number of shares purchased is below (above) the median of all non-zero purchase observations in the sample-year. An indicator variable for insider sale transactions, $\text{SALES}_{i,t}$, is created in a corresponding manner.[18] We estimate the relations between these insider-trading decisions and future firm performance using the following ordered probit models:

$$\begin{aligned}&\text{Prob}(\text{PURCHASE}_{i,t} = 2)\\&\quad = \text{probit}(\alpha_1 + \alpha_2 + \beta_1\text{GOODRET}_{i,t+1} + \beta_2\text{GOODROA}_{i,t+1}\\&\qquad + \beta_3\text{GOODROA}_{i,t} + \beta_4\text{BM}_{i,t} + \beta_5\text{MARET}_{i,t} + \beta_6\text{MVE}_{i,t}\\&\qquad + \beta_7\text{GRANTS}_{i,t} + \beta_8\text{OPTN\_EXRC}_{i,t} + \varepsilon_{i,t}),\end{aligned} \tag{4}$$

$$\begin{aligned}&\text{Prob}(\text{SALES}_{i,t} = 2)\\&\quad = \text{probit}(\alpha_1 + \alpha_2 + \beta_1\text{GOODRET}_{i,t+1} + \beta_2\text{GOODROA}_{i,t+1}\\&\qquad + \beta_3\text{GOODROA}_{i,t} + \beta_4\text{BM}_{i,t} + \beta_5\text{MARET}_{i,t} + \beta_6\text{MVE}_{i,t}\\&\qquad + \beta_7\text{GRANTS}_{i,t} + \beta_8\text{OPTN\_EXRC}_{i,t} + \varepsilon_{i,t}).\end{aligned} \tag{5}$$

Average coefficients from eight annual estimations of these models are presented in Table 7. Consistent with Ofek and Yermack (2000), the insider's decision to trade

[17] These descriptive statistics support our *ex ante* motives for using the annual research design, namely, to create an insider-trading sample that is not dominated by extreme earnings innovations.

[18] Although these metrics have the advantage of including information associated with no trading activity, they do not incorporate information about competing/offsetting insider transactions. The difficulty in creating a meaningful continuous variable that can span buying, selling and no trading activity has led prior research to either focus on purchase ratios or net trading (i.e., the direction of trade) or the existence of directional insider trades around specific events. Our primary analyses focus on the trading sample in order to allow a direct comparison of our results with the recent literature on insider trading behavior (e.g., Rozeff and Zaman, 1998; Lakonishok and Lee, 2001; Frankel and Li, 2002).

Table 7
The relation between an insider's decision to trade and future firm performance

Dependent variable:	Prob($PURCHASE_{i,t}=2$)		Prob($SALES_{i,t}=2$)	
	Coefficient	(t-statistic)	Coefficient	(t-statistic)
Intercept	−0.841	(−5.31)	−0.953	(−10.26)
Intercept 2	0.627	(19.13)	0.674	(27.61)
$GOODRET_{t+1}$	0.128[b]	(3.48)	0.055[c]	(2.11)
$GOODROA_{t+1}$	0.085[a]	(4.52)	−0.051[b]	(−2.87)
$GOODROA_t$	0.064[a]	(4.70)	0.027	(1.29)
BM_t	−0.044	(−2.79)	−0.384	(−7.71)
$MARET_t$	−0.007	(−0.34)	0.142	(6.37)
$\log(MVE_t)$	−0.012	(−0.74)	0.067	(8.53)
$GRANTS_t$	0.168	(7.04)	0.124	(2.79)
$OPTN\_EXRC_t$	−0.345	(−3.53)	3.246	(6.02)
# of estimations	8	—	8	—

This table presents average coefficients from eight annual estimations of the following ordered probit models:

$$\begin{aligned}\text{Prob}(PURCHASE_{i,t}=2) = \text{probit}(&\alpha_1+\alpha_2+\beta_1 GOODRET_{i,t+1}+\beta_2 GOODROA_{i,t+1}\\&+\beta_3 GOODROA_{i,t}+\beta_4 BM_{i,t}+\beta_5 MARET_{i,t}+\beta_6\log(MVE_{i,t})\\&+\beta_7 GRANTS_{i,t}+\beta_8 OPTN\_EXRC_{i,t}+\varepsilon_{i,t}).\end{aligned}$$

$$\begin{aligned}\text{Prob}(SALES_{i,t}=2) = \text{probit}(&\alpha_1+\alpha_2+\beta_1 GOODRET_{i,t+1}+\beta_2 GOODROA_{i,t+1}\\&+\beta_3 GOODROA_{i,t}+\beta_4 BM_{i,t}+\beta_5 MARET_{i,t}+\beta_6\log(MVE_{i,t})\\&+\beta_7 GRANTS_{i,t}+\beta_8 OPTN\_EXRC_{i,t}+\varepsilon_{i,t}).\end{aligned}$$

All variables are as defined in Table 8 of Appendix A. $PURCHASE_{i,t}$($SALES_{i,t}$) is an indicator variable equal to zero if there were no insider purchases (sales) in the fiscal year, and equal to one or two if the amount of insider purchases (sales) in fiscal year t, scaled by total shares outstanding, was below or above, respectively, the median of all non-zero purchase (sale) firm-year observations. Average coefficients are tested against a null of zero using the empirically derived distribution of coefficients from eight annual cross-sectional estimations.

[a,b,c]The average annual performance-related coefficient is significantly different than zero at the one, five and ten-percent level, respectively, using a two-tailed t-test.

is influenced by current stock-based compensation activity. Specifically, the decision to sell is positively associated with contemporaneous options exercises and restricted stock grants, while the insider's decision to buy is inversely related to stock option exercises. After controlling for these compensation-related attributes, we find that insider sale decisions are inversely related to the firm's market-to-book ratio (i.e., insiders sell glamour firms) and positively related to current returns (i.e., insiders sell recent winners), consistent with insiders selling on the basis of contrarian beliefs. However, insider purchase decisions display a weak inverse relation with book-to-market ratios, suggesting that insiders are less likely to purchase value stocks. In terms of superior knowledge, these estimations reveal that the decision to purchase shares is positively related to current and future earnings and future return

performance, while the decision to sell is inversely related to next year's earnings performance.

Together, these estimations suggest that insider decisions to sell reflect contrarian beliefs (i.e., insiders sell winners, contrary to current investor sentiment), while both insider purchase and insider sale decisions reflect superior cash flow knowledge.

7. Conclusions

Existing research has separately shown that insiders trade on the basis of contrarian beliefs (e.g., Rozeff and Zaman, 1998) and on the basis of superior knowledge about future cash flow news (e.g., Ke et al., 2003). This paper examines whether these two insider-trading activities are incremental to each other and assesses the relative magnitude of these relations. We utilize a research design that measures current trading activity, proxies for contrarian beliefs and future earnings performance at the annual level. We find strong evidence that insider purchases are positively related to future earnings performance, positively related to book-to-market ratios and inversely related to past returns. Each of these relations has incremental explanatory power for insider purchases, suggesting that insiders trade on the basis of both contrarian beliefs *and* private information about future cash flow news. These superior information results are robust to several measures of insider-trading behavior and future earnings performance and are consistent with Ke et al. (2003), who document a relation between insider trades and future earnings downturns. Finally, in terms of relative importance, superior information about future cash-flow changes explains a smaller portion of insider purchase activities than do proxies for security misvaluation.

While our paper does not examine the profitability of insider trades, we do investigate the relation between insider trading and future earnings conditional on the expected benefits and costs associated with trading on performance-related information. Specifically, we examine insider-trading behavior conditional on cross-sectional differences in information environments, inter-temporal differences in insider trading enforcement regimes and intra-firm differences in the access to information. We find that relations between insider purchases and current and future earnings performance strengthen in weak information environments (i.e., small and thinly followed firms). We find that, in response to new legislation expanding the enforcement of insider-trading laws, the relation between insider-trading and earnings performance shifted from current to future earnings news. This shift is consistent with insiders basing their trades on a less blatant form of informational advantage in the stronger enforcement regime. Finally, the relation between insider purchases and earnings news is marginally stronger for executives than directors, consistent with an executive's more timely access to performance-related information.

We also find that insider-trading behavior within book-to-market portfolios varies by the horizon of the subsequent earnings news. Although insider purchases are significantly positively related to next year's earnings performance across *all* BM

Table 8
Variable definitions

Variable		Definition[a]
$PR_{i,t}$	=	Purchase ratio, measured as the ratio of number of shares purchased by insiders during fiscal year t, scaled by total number of shares traded (purchased plus sold) by insiders during fiscal year t. Insider trade data are gathered through Thomson Financial First Call Insiders Data.
$PURCHASE_{i,t}$	=	$PURCHASE_{i,t}$ an indicator variable equal to zero if there were no insider purchases in the fiscal year, and equal to one or two if the amount of insider purchases in fiscal year t, scaled by total shares outstanding, was below or above, respectively, the median of all non-zero purchase firm-year observations.
$SALES_{i,t}$	=	$SALES_{i,t}$ is an indicator variable equal to zero if there were no insider sales in the fiscal year, and equal to one or two if the amount of insider sales in fiscal year t, scaled by total shares outstanding, was below or above, respectively, the median of all non-zero sale firm-year observations.
MVE_t	=	Market value of equity measured at the end of fiscal year t.
BM_t	=	Book-to-market ratio, measured as the firms book value of shareholders' equity (Compustat item #60) at the end of year t, scaled by MVE.
BMi_t	=	An indicator variable equal to one if the book-to-market ratio is in the ith quintile of year t's book-to-market distribution; zero otherwise. (e.g., BM1 = glamour firms)
$MARET_{t+1}$	=	Future 12-month market-adjusted return, measured as the firm's 12-month cumulative return during fiscal year $t+1$ less the corresponding 12-month return on the value-weighted market index.
$MARET_t$	=	Contemporaneous 12-month market-adjusted return.
ΔROA_{t+1}	=	Future first-difference in Return-on-Assets, i.e., Return-on-Assets for year $t+1$ less Return-on-Assets for year t. Return-on-Assets is Income before Extraordinary items (Compustat item #18), scaled by average total assets (Compustat item #6).
ΔROA_t	=	Contemporaneous first-difference in Return-on-Assets.
$GOODRET_{t+1}$	=	An indicator variable equal to one if $MARET_{i,t+1}$ is greater than zero, zero otherwise.
$GOODROA_{t+1}$	=	An indicator variable equal to one if $\Delta ROA_{i,t+1}$ is greater than zero, zero otherwise.
$GOODROA_t$	=	An indicator variable equal to one if $\Delta ROA_{i,t}$ is greater than zero, zero otherwise.
$HRET_t$	=	An indicator variable equal to one if the firm's $MARET_t$ is in the top trecile of the year t's distribution of realized market-adjusted returns, zero otherwise.
$MRET_t$	=	An indicator variable equal to one if the firm's $MARET_t$ is in the middle trecile of the year t's distribution of realized market-adjusted returns, zero otherwise.
$GRANTS_t$	=	The log of one plus the percentage ratio of the sum of the number of options and shares of restricted stock granted to the firm's executives and directors during fiscal year t to total shares outstanding at the end of the year.
$OPTN\_EXRC_t$	=	The log of one plus the percentage ratio of the number of options exercised by the firm's executives and directors during fiscal year t to total shares outstanding at the end of the year.

[a]All return and price data are gathered through CRSP. All financial statement-based information is gathered through Compustat. All data on restricted stock grants, options grants and option exercise activity are gathered through Execucomp.

partitions, the sign of the relation between insider purchase activity and contemporaneous earnings innovations depends on the firm's BM classification. Given good current earnings news, insiders at glamour firms sell, while insiders at value firms buy. This shift from selling to purchasing behavior is nearly monotonic across BM portfolios.

The recognition that insiders trade as contrarians and as possessors of superior information has several implications. First, trading on the basis of security misvaluation implies that insiders frequently act like arbitrageurs, exploiting valuation errors arising from outsiders' inferior valuation models and/or biased judgements. Second, insider purchases convey information about future earnings, and investors should treat these trades as credible signals when forming earnings forecasts and equity valuations. This predictive ability should be strongest where the relation between insider trades and superior knowledge was the strongest, namely, among the small, thinly covered firms. Together, these implications suggest that insider trades will help push prices towards fundamental value.

Appendix A

Variable definitions are provided in Table 8.

References

Ball, R., Brown, P., 1968. An empirical evaluation of accounting income numbers. Journal of Accounting Research 6, 159–178.

Beneish, M.D., Vargus, M., 2002. Insider trading, earnings quality, and accrual mispricing. The Accounting Review 77, 755–792.

Bettis, J., Coles, J., Lemmon, M., 2000. Corporate policies restricting trading by insiders. Journal of Financial Economics 57, 191–220.

Bhushan, R., 1989. Firm characteristics and analyst following. Journal of Accounting and Economics 11, 255–274.

Brennan, M., Subrahmanyam, A., 1995. Investment analysis and price formation in securities markets. Journal of Financial Economics 38, 361–381.

Carlton, D., Fischel, D., 1983. The regulation of insider trading. Stanford Law Review 35, 857–895.

Collins, D., Kothari, S.P., 1989. An analysis of inter-temporal and cross-sectional determinants of earnings response coefficients. Journal of Accounting and Economics 11, 143–181.

Collins, D., Kothari, S.P., Rayburn, J., 1987. Firm size and the information content of prices with respect to earnings. Journal of Accounting and Economics 9, 111–138.

Elliott, J., Morse, D., Richardson, G., 1984. The association between insider trading and information announcements. Rand Journal of Economics 15 (4), 521–536.

Fama, E., 1998. Market efficiency, long-run returns and behavioral finance. The Journal of Financial Economics 49, 283–306.

Fama, E., French, K., 1992. The cross-section of expected stock returns. The Journal of Finance 47, 427–465.

Fama, E., French, K., 1995. Size and book-to-market factors in earnings and returns. The Journal of Finance 50, 131–155.

Frankel, R., Li, X., 2002. The characteristics of a firm's information environment and the predictive ability of insider trades. Working Paper, Massachusetts Institute of Technology (January).

Givoly, D., Palmon, D., 1985. Insider trading and the exploitation of inside information: some empirical evidence. The Journal of Business 58 (1), 69–87.
Jaffe, J., 1974. The effect of regulation changes on insider trading. The Journal of Business 47 (3), 410–428.
Karpoff, J., Lee, D., 1991. Insider trading before new issue announcements. Financial Management 20, 18–26.
Ke, B., Huddart, S., Petroni, K., 2003. What insiders know about future earnings and how they use it: evidence from insider trades. Journal of Accounting and Economics 35, 315–346.
Lakonishok, J., Lee, I., 2001. Are insider trades informative? The Review of Financial Studies 14, 79–111.
Lakonishok, J., Shleifer, A., Vishny, R., 1994. Contrarian investment, extrapolation and risk. The Journal of Finance 44, 1541–1578.
Lang, M., Lundholm, R., 1993. Cross-sectional determinants of analyst ratings of corporate disclosures. Journal of Accounting Research 31, 246–271.
LaPorta, R., Lakonishok, J., Shleifer, A., Vishny, R., 1997. Good news for value stocks: further evidence on market efficiency. The Journal of Finance 52, 859–874.
Lee, D.S., Mikkelson, W., Partch, M., 1992. Managers' trading around stock repurchases. The Journal of Finance 47, 1947–1961.
Manne, H.G., 1966a. Insider Trading and the Stock Market. Free Press, New York.
Manne, H.G., 1966b. In defense of insider trading. Harvard Business Review 44, 113–122.
Meulbroek, L., 1992. An empirical analysis of illegal insider trading. The Journal of Finance 47, 1661–1699.
Miller, M., Rock, K., 1985. Dividend policy under asymmetric information. The Journal of Finance 40, 1031–1051.
Myers, S., Majluf, N., 1984. Corporate financing and investment decisions when firms have information that investors do not have. Journal of Financial Economics 13, 187–221.
Noe, C., 1999. Voluntary disclosures and insider transactions. Journal of Accounting and Economics 27, 305–326.
Ofek, E., Yermack, D., 2000. Taking stock: equity-based compensation and the evolution of managerial ownership. The Journal of Finance 55, 1367–1384.
Piotroski, J., 2000. Value investing: the use of historical financial statement information to separate winners from losers. Journal of Accounting Research 38 (Supplement), 1–41.
Rozeff, M., Zaman, M., 1988. Market efficiency and insider trading: new evidence. The Journal of Business 61, 25–44.
Rozeff, M., Zaman, M., 1998. Overreaction and insider trading: evidence from growth and value portfolios. The Journal of Finance 53, 701–716.
Seyhun, H.N., 1986. Insider's profits, cost of trading, and market efficiency. Journal of Financial Economics 16, 189–212.
Seyhun, H.N., 1990. Do bidder managers knowingly pay too much for target firms? The Journal of Business 63, 439–464.
Seyhun, H.N., 1992. Why does aggregate insider trading predict future stock returns? Quarterly Journal of Economics 107, 1303–1331.
Seyhun, H.N., Bradley, M., 1997. Corporate bankruptcy and insider trading. The Journal of Business 70, 189–216.
Walther, B., 1997. Investor sophistication and market earnings expectations. Journal of Accounting Research 35, 157–179.
Watts, R., Zimmerman, J., 1986. Positive Accounting Theory. Prentice-Hall, Englewood Cliffs, New Jersey.