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Overconfident Institutions and Their Self-Attribution Bias: Evidence from Earnings Announcements

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Abstract

Institutional demand for a stock before its earnings announcement is negatively related to subsequent returns. The relation is not attributable to the price pressure of institutional demand and is stronger for stocks with higher information asymmetry and/or greater valuation difficulty. These findings support the notion that overconfident institutions misprice stocks. Following announcements, institutions' behavior exhibits the outcome-dependent feature of self-attribution bias. Whether they become more overconfident and delay their mispricing correction depends on whether earnings news confirms their preannouncement trades. This behavioral bias also offers a new explanation for the well-known post-earnings-announcement drift.

I. Introduction

Earnings are regularly announced according to preset schedules, which is arguably one of the most important corporate events as these announcements release substantial amounts of information concerning corporations' fundamentals. The released information provides essential measures for investors to evaluate their investment decisions. We study institutional demand around earnings

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announcements, focusing on how it reacts to announcements and how it manifests in stock returns.

We begin by documenting that the cumulative abnormal institutional demand (CAID) for a stock before its earnings announcement is negatively related to the stock's subsequent cumulative abnormal return (CAR). A key and well-known feature of institutional demand is price pressure, which may cause subsequent returns to reverse.[1] Could this price pressure explain the observed negative relation between CAID and subsequent CAR around earnings announcements? To answer this question, we run placebo tests by contrasting the relations between preannouncement CAID and postannouncement CAR around actual and pseudo earnings announcements. Our findings demonstrate that price pressures before actual and pseudo announcements are similar, whereas subsequent stock returns are significantly different. This implies that the identified negative return predictability by preannouncement CAID cannot be simply attributed to the price pressure effect.

Another possibility for the return reversal is that mispricing caused by overconfident institutions gets corrected after earnings news is released. Institutional investors are likely to be overconfident about their valuations of risky securities and their trading skills. Such behavioral bias leads them to overreact to their information and knowledge, causing stocks to be mispriced in the preannouncement period. We support this claim with evidence that institutions are a driving force in setting stock prices as manifested by the strong and positive contemporaneous relation between CAID and CAR. More important, the overconfidence theory developed by Daniel, Hirshleifer, and Subrahmanyam (1998) implies stronger return predictability in stocks with greater information asymmetry. Moreover, psychological evidence indicates that overconfidence is more severe for diffuse tasks, which require judgment, than for mechanical tasks (see, e.g., Einhorn (1980), Griffin and Tversky (1992)). Consistent with these theories and in support of the overconfidence explanation, we find that the negative relation between preannouncement CAID and subsequent CAR is stronger for stocks with greater difficulty to value and higher information asymmetry. These findings are robust and remain even after controlling for earnings announcement premium (Savor and Wilson (2016)) and news-driven return reversal (So and Wang (2014)), which support the notion that institutions are subject to overconfidence bias.[2]

The self-attribution hypothesis is probably a more powerful test for overconfident institutions, because biased self-attribution is related to variation in confidence level, which is outcome dependent and cannot be explained by price pressure in the market. Biased self-attribution causes the shifts in an investor's confidence level to be asymmetric with respect to her/his investment outcomes and explains how overconfidence can persist over time (Daniel and Hirshleifer (2015)). To test this hypothesis, we consider 2 consecutive periods after an earnings announcement. We observe that stocks associated with confirming earnings news

[1]Studies documenting price pressure associated with institutional trading include Keim and Madhavan (1995) and Chan and Lakonishok (1997) at the stock level, and Warther (1995) and Edelen and Warner (2001) at the aggregate level.

[2]For brevity, these robustness tests are not reported in the text but are available in the Supplementary Material.

experience much weaker correction of mispricing in the earlier period, compared to stocks with disconfirming news. Moreover, they endure continued correction in the later period whereas stocks with disconfirming news tend to complete their correction in the earlier period. Apart from this, the magnitude of earnings surprise also matters: A greater confirming (disconfirming) earnings surprise leads to a weaker (stronger) mispricing correction in the earlier period. These results demonstrate that institutions asymmetrically update their confidence based on their investment outcomes, and more favorable (unfavorable) earnings news causes their confidence to rise (fall) more.

To further establish the validity of our evidence, we test for institutions' biased self-attribution by examining their postannouncement trading. Institutions tend to continue their preannouncement trading directions for a period after confirming earnings announcements, in contrast to more timely changing their trading directions after disconfirming earnings announcements. Moreover, their trading patterns become more asymmetric when the magnitude of earnings surprise increases. Similar trading dynamics are also observable in terms of the probability of individual institutions continuing or altering their preannouncement trading directions.

Biased trading behavior of overconfident institutions around earnings announcements also offers a novel explanation for the well-known anomaly of post-earnings-announcement drift (PEAD). We find that the PEAD phenomenon is strong (weak or even disappears) when earnings news disconfirms (confirms) preannouncement institutional trades, which is consistent with institutions' asymmetric reactions to confirming and disconfirming news as a result of their biased self-attribution.

Empirical examination and evidence of investor overconfidence in the literature are largely limited to individual investors, except in the study by Statman, Thorley, and Vorkink (2006) who consider aggregate overconfidence of all investors as a whole. Relative to typical individual investors, institutions are more sophisticated because they have more resources to collect, process, and analyze information, and their managers are better trained and more skillful in making investment decisions. Does this financial and technological sophistication help institutional investors avoid or alleviate behavioral or emotional bias? The lack of explicit evidence of institutions being overconfident suggests they are mostly rational. This perception, however, is questionable. Our findings support the claim that overconfidence is pervasive and experts can be overconfident (Daniel et al. (1998)).[3]

Our finding of negative return predictability by preannouncement CAID provides complementary evidence to studies that document a negative relation between institutional trading and future stock return. For instance, Edelen, Ince, and Kadlec (2016) show that changes in the number of 13F institutional investors over the prior 5 quarters are negatively correlated with abnormal stock return over the 3 days surrounding earnings announcements. In contrast, there are studies demonstrating that changes in institutional holdings are positively related to future stock returns. For instance, Baker, Litov, Wachter, and Wurgler (2010) demonstrate that stocks in

[3]For psychological evidence of experts being more overconfident than inexperienced individuals, see, for example, Griffin and Tversky (1992), Keren (1997), and Koehler, Brenner, and Griffin (2002).

which active mutual funds have increased (decreased) weight in the quarter before earnings announcements earn positive (negative) abnormal returns over the 3 days surrounding earnings announcements. Edelen et al. attribute this difference in terms of the relations being positive and negative to the length of the horizon over which returns and demand are measured. Different from these studies using quarterly institutional holding data, we adopt ANcerno data that record each transaction conducted by its clients, which helps us examine how institutions trade before and in reaction to earnings announcements with greater precision.[4] Additionally, we focus on the associations of CAID over the relatively short horizons (from 10 to 40 days) before earnings announcements with CARs and CAIDs over the announcement and various postannouncement periods up to 120 days.

Our findings also contribute to the growing literature on stock return anomalies by connecting institutional trading with market mispricing. The PEAD anomaly was first documented by Ball and Brown (1968) and recognized as one of the most robust asset pricing anomalies (Fama (1998)). Although Daniel et al. (1998) offer a theoretical explanation for the PEAD anomaly based on investor overconfidence and biased self-attribution, empirical evidence on its cause is mixed and whether individual or institutional investors are responsible for it remains an open question. For instance, Hirshleifer, Myers, Myers, and Teoh (2008) find no evidence that individual investors cause the PEAD anomaly, whereas Ke and Ramalingegowda (2005) provide evidence that transient institutional investors trade to exploit the PEAD. Unlike studies that examine whether individual or institutional investors trade in the direction of earnings surprises after earnings are announced, we focus on institutions' responses to earnings announcements conditional on their preannouncement trading. The new finding that overconfident institutions are, at least partially, responsible for the PEAD anomaly complements the existing explanations.

The remainder of this article is organized as follows: Section II describes data, variables, and sample characteristics. Price pressures and overconfident institutions are examined in Section III, and the self-attribution hypothesis is tested in Section IV. Section V examines overconfidence and biased self-attribution using postannouncement CAID, and Section VI provides an alternative explanation for the PEAD anomaly. Robustness checks are reported in Section VII. Section VIII concludes.

II. Data, Variables, and Sample Characteristics

A. Sample Selection

The data for stock purchases and sales by institutional investors are obtained from ANcerno, which records each transaction conducted by its clients. Variables in each transaction record include the following: a masked identification of an

[4]Our study differs from Baker et al. (2010) in terms of the types of institutional investors under investigation. Puckett and Yan (2011) show that ANcerno data are representative of the institutional investors who file Form 13F. Thus, our data include a much wider spectrum of institutional investors. In addition, their use of quarterly holding data introduces return gap effects, which do not necessarily exist in our analysis that uses transaction-level data.

institution that initiates a trade, ticker and CUSIP of the traded stock, date of execution, execution price, execution volume, whether it is a buy or sell transaction, commissions paid to brokers, and so on. During our sample period from Jan. 2000 to June 2013, there are 956 buy-side institutions. To minimize observation errors, we follow Anand, Irvine, Puckett, and Venkataraman (2012) and impose two screens on the ANcerno data: i) delete orders with volume greater than the stock's Center for Research in Security Prices (CRSP) volume on an execution date and ii) include only common stocks (with share codes of 10 and 11) listed on the New York Stock Exchange (NYSE), American Stock Exchange (AMEX), or National Association of Securities Dealers Automated Quotations (NASDAQ) with data available on CRSP. We collect stock price, return, market capitalization, and trading volume data from CRSP, accounting data from Compustat, and earnings announcement and analyst forecast information from Institutional Brokers' Estimate System (IBES). We require at least 40 days of data before each announcement and 120 days of data after it. We consider the preannouncement period from day −40 to day −1, the announcement period from day 0 to day 1, and various postannouncement periods.[5] To reduce the effect of the subsequent announcement in the postannouncement period, we exclude announcements with no more than 60 days between 2 consecutive announcements.[6]

B. Abnormal Institutional Demand

To characterize abnormal institutional demand, we first calculate daily imbalance by

$$\text{IM}_{i,t} = \frac{\text{BUY\_VOLUME}_{i,t} - \text{SELL\_VOLUME}_{i,t}}{\text{BUY\_VOLUME}_{i,t} + \text{SELL\_VOLUME}_{i,t}}, \quad (1)$$

where $\text{BUY\_VOLUME}_{i,t}$ ($\text{SELL\_VOLUME}_{i,t}$) is the number of shares purchased (sold) by ANcerno institutions for stock i on day t. Then, the abnormal institutional demand on that day can be proxied by the standardized volume imbalance:

$$\text{AID}_{i,t} = \frac{\text{IM}_{i,t} - \overline{\text{IM}}_{i,\text{YEAR}(t)}}{\text{std}\left(\text{IM}_{i,\text{YEAR}(t)}\right)}, \quad (2)$$

where $\text{YEAR}(t)$ denotes the year in which day t belongs and $\overline{\text{IM}}_{i,\text{YEAR}(t)}$ and $\text{std}\left(\text{IM}_{i,\text{YEAR}(t)}\right)$ are sample mean and standard deviation of $\text{IM}_{i,t}$ over $\text{YEAR}(t)$. Consequently, CAID over $[t_1, t_2]$ is defined as $\text{CAID}_{i,[t_1,t_2]} = \sum_{k=t_1}^{t_2} \text{AID}_{i,k}$.

[5]In robustness checks reported in the Supplementary Material, we further consider different preannouncement periods such as [−30,−1], [−20,−1], and [−10,−1], and replicate the key analysis and tests. Because they lead to qualitatively similar results, we do not explicitly discuss these tests in the text. Announcement day is defined as day 0. Both day 0 and day 1 are included in the announcement period to control for the effect of after-hour announcements. Following the convention of the PEAD literature, we choose the baseline postannouncement period from day 2 through day 60 and in turn a corresponding later period of day 61 through day 120. We also include other pairs of earlier and later postannouncement periods.

[6]Our findings are qualitatively similar if we include these announcements in the sample.

C. Abnormal Return and Earnings Surprise

We adopt a size-adjusted benchmark to measure abnormal return. At the beginning of each year, we sort all stocks on the NYSE, AMEX, and NASDAQ into deciles based on their market capitalizations. The daily abnormal return of stock i is the difference between its raw return and the average return of all stocks located in the same size decile, that is, $\text{AR}_{i,t} = R_{i,t} - R_{p,t}$, where $R_{i,t}$ is the raw return of stock i on day t and $R_{p,t}$ is the average return of all stocks located in the same size decile as stock i. CAR is estimated by aggregating abnormal returns over the evaluation window, that is, $\text{CAR}_{i,[t_1,t_2]} = \sum_{k=t_1}^{t_2} \text{AR}_{i,k}$.

We use standardized unexpected earnings (SUE) to proxy for earnings surprise.[7] It is calculated as the difference between the actual quarterly earnings and the mean analyst forecast, divided by the standard deviation of all analyst forecasts. Thus, a positive (negative) SUE measures a positive (negative) market surprise and both very high and very low SUEs indicate big shocks to the market.

D. Sample Descriptive Statistics

Our final sample includes 83,355 quarterly earnings announcements of 5,604 stocks over the 13.5 years of the sample period. Table 1 presents the summary statistics of the sample characteristics and key variables used in our analysis. For each announcement, market capitalization (MKTCAP),[8] stock price (PRICE), and bid–ask spread (SPREAD) are measured as their daily closing averages. ILLIQUIDITY is measured by the average daily Amihud (2002) illiquidity ratio, multiplied by a factor of 1,000,000. Market beta (BETA) is estimated from regressing daily excess return on the Fama–French 3 factors, and idiosyncratic volatility (IDIOV) is the standard deviation of the residuals. Institutional ownership (INST) of a stock is the average fraction of shares outstanding held by institutions filing Form 13F, analyst coverage (ACOVERAGE) is the average number of analysts following the stock on IBES, dispersion in analyst forecasts (DISP) is the standard deviation of analyst forecasts, book-to-market ratio (BM) is the average book-to-market ratio computed as book value of equity divided by market value of equity, and firm age (AGE) is the number of years since the stock first appears in the CRSP database. Probability of information-based trading (PIN) is estimated based on the model of Easley, Kiefer, and O'Hara (1997) and obtained from Stephen Brown's personal website.[9] All these measures of stock characteristics are estimated using data in the year before the announcement and they are included in our regression analysis as control variables.

We also consider a set of other stock characteristics: turnover (TO), the average daily trading volume divided by the number of shares outstanding; research and

[7]Our findings are qualitatively similar if we use market reaction over the announcement period, that is, the CAR from day 0 to day 1, as a proxy for earnings surprise.

[8]The logarithm of market capitalization proxies for firm size (SIZE) in the regression analysis.

[9]We thank Stephen Brown for making the estimated PIN measure available on his personal website, which is used in Brown and Hillegeist (2007) and Brown, Hillegeist, and Lo (2009) to examine information asymmetry. In unreported analysis, we use the PIN measure estimated based on the model of Venter and de Jongh (2006) and obtain qualitatively similar results.

TABLE 1

Summary Statistics of Sample Characteristics

Table 1 presents summary statistics for a sample of common stocks with quarterly earnings announcements from Jan. 2000 to June 2013. For each announcement, $CAR_{[t_1,t_2]}$ and $CAID_{[t_1,t_2]}$ are the cumulative abnormal return and cumulative abnormal institutional demand, respectively, from day t_1 to day t_2, where event day is day 0. Standardized unexpected earnings (SUE) is the difference between the actual earnings and the mean analyst forecast scaled by the standard deviation of the analyst forecasts, market capitalization (MKTCAP) is the average daily market capitalization of a stock, stock price (PRICE) is the average daily closing price, and illiquidity (ILLIQUIDITY) is the average daily illiquidity ratio of Amihud (2002) multiplied by a factor of 1 million. Market beta (BETA) is obtained by regressing daily excess returns on Fama–French 3 factors, and idiosyncratic volatility (IDIOV) is the standard deviation of regression residuals. Bid–ask spread (SPREAD) is the average daily closing bid–ask spread, institutional ownership (INST) is the average fraction of shares outstanding held by institutions filing Form 13F, analyst coverage (ACOVERAGE) is the average number of analysts following the stock on Institutional Brokers' Estimate System (IBES), and book-to-market ratio (BM) is the average book-to-market ratio. Probability of information-based trading (PIN) is estimated based on the model of Easley, Kiefer, and O'Hara (1997). Firm age (AGE) is the number of years since the stock first appeared in the Center for Research in Security Prices (CRSP) database, dispersion in analyst forecasts (DISP) is the standard deviation of analyst forecasts divided by the mean, turnover (TO) is average daily trading volume scaled by the number of shares outstanding, research and development intensity (R&D) is the firm's R&D expenditures divided by its total assets, earnings quality (EARNINGSQ) is the negative absolute value of industry-adjusted operating accruals for the firm, cash flow volatility (CASHFLOWV) is the volatility of the firm's operating cash flows scaled by its total assets during the past 5 years, and earnings volatility (EARNINGSV) is the volatility of the firm's earnings before extraordinary items scaled by its total assets during the past 5 years. All these measures of stock characteristics are estimated using data in the year before an earnings announcement.

Variable	Mean	Std. Dev.	25th	Median	75th
$CAR_{[-40,-1]}$	−0.01%	17.96%	−7.73%	0.13%	8.04%
$CAR_{[0,1]}$	0.02%	8.94%	−3.85%	0.06%	4.15%
$CAR_{[2,60]}$	−0.24%	20.73%	−9.47%	−0.11%	9.55%
$CAID_{[-40,-1]}$	−0.085	11.514	−7.513	0.000	7.469
$CAID_{[0,1]}$	−0.032	1.542	−1.107	0.000	1.086
$CAID_{[2,60]}$	0.142	14.470	−9.211	0.000	9.559
SUE	0.982	3.792	−0.483	0.737	2.402
MKTCAP ($millions)	4,609	12,394	331	888	2,853
PRICE ($)	26.75	19.73	12.26	22.15	36.04
ILLIQUIDITY	0.080	0.634	0.001	0.004	0.019
BETA	1.045	0.498	0.738	1.006	1.317
IDIOV	0.027	0.015	0.016	0.023	0.034
SPREAD	0.006	0.008	0.001	0.002	0.007
INST	0.652	0.259	0.462	0.688	0.854
ACOVERAGE	8.616	6.333	3.833	6.667	11.750
BM	0.522	0.430	0.256	0.440	0.682
PIN	0.121	0.085	0.056	0.101	0.172
AGE	17.67	17.55	5.00	12.00	24.00
DISP	0.073	0.190	0.010	0.021	0.054
TO	0.010	0.008	0.004	0.007	0.012
R&D	0.045	0.096	0.000	0.000	0.049
EARNINGSQ	−0.057	0.078	−0.070	−0.033	−0.127
CASHFLOWV	0.026	0.049	0.006	0.013	0.026
EARNINGSV	0.090	0.269	0.014	0.032	0.082

development intensity (R&D), the firm's R&D expenditures divided by its total assets; earnings quality (EARNINGSQ), the negative absolute value of industry-adjusted operating accruals for the firm; cash flow volatility (CASHFLOWV), the volatility of the firm's operating cash flows scaled by its total assets during the past 5 years; and earnings volatility (EARNINGSV), the volatility of the firm's earnings before extraordinary items scaled by its total assets during the past 5 years.[10]

We winsorize the raw SUE scores and stock characteristics at the top and bottom 0.5% to reduce the effect of extreme values.[11] In Table 1, we also report CAR and CAID over the preannouncement, announcement, and postannouncement periods.

[10]In unreported robustness checks of the regression analysis, we include these stock characteristics as controls and find qualitatively similar results.

[11]Our results remain qualitatively similar if we do not winsorize the SUE scores and stock characteristics.

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III. Institutional Demand and Stock Returns

A. Preannouncement Institutional Demand and Stock Returns Around the Announcement

We sort sample stocks into quintiles based on the preannouncement abnormal institutional demand from day -40 to day -1, that is, $\text{CAID}_{[-40,-1]}$, with Q5 (Q1) being the quintile of stocks strongly bought (sold) by institutions. Panel A of Table 2 reports their average preannouncement, announcement, and postannouncement CARs. During the preannouncement period, stocks strongly bought by institutions outperform those strongly sold by 354 basis points (bps). This strong positive contemporaneous relation between CAID and CAR implies that institutional demand is a driver of stock price and institutions play a dominant role in the stock market. Turning to subsequent returns, we find negative and significant relations, as CARs over all the subsequent periods in Panel A increase when the

TABLE 2

Analysis of CARs Based on Preannouncement Institutional Demand

Panel A of Table 2 presents a nonparametric analysis of cumulative abnormal returns (CARs) conditional on preannouncement cumulative abnormal institutional demand (CAID). Daily abnormal institutional demand is measured by standardized trading volume imbalance of institutional investors. Sample stocks are sorted into quintiles based on preannouncement CAID from day -40 to day -1 ($\text{CAID}_{[-40,-1]}$). Average CARs are reported from day t_1 to day t_2 ($\text{CAR}_{[t_1,t_2]}$) for each CAID quintile and the corresponding differences between Q5 and Q1, where Q5 (Q1) is the quintile of sample stocks strongly bought (sold) by institutions in the preannouncement period. Returns are reported in percentage terms. Panel B presents the regression analysis of CARs and adopts the regression specification:

$$\text{CAR}_{[t_1,t_2]} = \beta_0 + \beta_1 \text{CAID}_{[-40,-1]} + \beta_2 \text{CAR}_{[-40,-1]} + \sum_{i=1}^{12} \gamma_i \text{CV}_i + \varepsilon,$$

where CV_i are control variables estimated in the year before the earnings announcements, including stock size, which is the logarithm of the average daily market capitalization; stock price; stock illiquidity; market beta; idiosyncratic volatility; bid–ask spread; institutional ownership; analyst coverage; book-to-market ratio; probability of information-based trading; firm age; and dispersion in analyst forecasts of the stock. t-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Standard errors are clustered by stock and calendar quarter (Petersen (2009)) and 2-way cluster-robust t-statistics are reported for regression analysis.

$\text{CAID}_{[-40,-1]}$	$\text{CAR}_{[-40,-1]}$	$\text{CAR}_{[0,1]}$	$\text{CAR}_{[2,6]}$	$\text{CAR}_{[2,20]}$	$\text{CAR}_{[2,40]}$	$\text{CAR}_{[2,60]}$
Panel A. CARs Conditional on Preannouncement CAID						
Q5 (Strong buy)	1.74***	−0.33***	−0.26***	−0.29***	−0.87***	−1.58***
	(13.06)	(−4.89)	(−4.96)	(−3.16)	(−6.48)	(−9.38)
Q4	0.51***	−0.08	−0.08*	−0.02	−0.11	−0.31**
	(4.56)	(−1.34)	(−1.84)	(−0.26)	(−0.966)	(−2.30)
Q3	−0.69***	−0.02	−0.06	0.03	−0.36**	−0.99***
	(−3.73)	(−0.26)	(−0.81)	(0.24)	(−2.01)	(−4.53)
Q2	−0.32**	0.09	0.11**	0.37***	0.29*	0.34**
	(−2.28)	(1.37)	(2.12)	(4.14)	(2.30)	(2.20)
Q1 (Strong sell)	−1.80***	0.45***	0.35***	0.83***	0.83***	1.06***
	(−12.09)	(6.11)	(6.39)	(8.72)	(6.20)	(6.75)
Q5 − Q1	3.54***	−0.78***	−0.61***	−1.12***	−1.69***	−2.64***
	(12.09)	(−6.11)	(−6.39)	(−8.72)	(−6.20)	(−6.75)
Panel B. Regressions of Preannouncement, Announcement, and Postannouncement CARs						
$\text{CAID}_{[-40,-1]}$	0.0010***	−0.0002***	−0.0002***	−0.0003***	−0.0005***	−0.0007***
	(9.552)	(−6.574)	(−7.108)	(−5.839)	(−5.001)	(−6.067)
$\text{CAR}_{[-40,-1]}$		−0.0132***	−0.0158***	−0.0292***	−0.0483***	−0.0524**
		(−3.297)	(−3.386)	(−2.592)	(−2.874)	(−2.489)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
R^2 (%)	0.72	0.34	0.34	0.45	0.62	0.53
Adj. R^2 (%)	0.70	0.32	0.32	0.43	0.60	0.51

stock quintile moves from Q5 to Q1. CARs of stocks in Q5 underperform those of stocks in Q1 by an average of 78 bps over the announcement period of days 0 and 1. The difference is 61 bps over days 2 to 6 and this remains significant even if we extend the evaluation horizon to $[2,60]$.[12]

One could argue that the observed negative relations between CAID and subsequent CARs simply reflect return reversal (Jegadeesh (1990)) and/or the effects of some firm characteristics. To address this concern, we run the following regression:

$$\text{(3)} \qquad \text{CAR}_{[t_1,t_2]} = \beta_0 + \beta_1 \text{CAID}_{[-40,-1]} + \beta_2 \text{CAR}_{[-40,-1]} + \sum_{i=1}^{12} \gamma_i \text{CV}_i + \varepsilon,$$

where standard return reversal is captured by $\text{CAR}_{[-40,-1]}$ and controls for 12 stock characteristics of the prior year (i.e., CV_i): stock size, stock price, stock illiquidity, market beta, idiosyncratic volatility, bid–ask spread, institutional ownership, analyst coverage, book-to-market ratio, probability of information-based trading, firm age, and dispersion in analyst forecasts. The regression results are reported in Panel B of Table 2, where 2-way cluster-robust t-statistics are presented in parentheses. Apparently, $\text{CAID}_{[-40,-1]}$ has a positive and significant relation with $\text{CAR}_{[-40,-1]}$ and a negative and significant relation with each subsequent CAR. This verifies our findings through nonparametric analysis in Panel A. Kaniel, Liu, Saar, and Titman (2012) in their study on the trading of individual investors around earnings announcements discover that intense aggregate buying (selling) by individual investors predicts large positive (negative) abnormal returns on and after earnings announcement dates. To the extent that institutional investors are the counterpart of individual investors as a whole, our findings are consistent with theirs, as well as those of Busse, Green, and Jegadeesh (2012) and Griffin, Shu, and Topaloglu (2012) who find little or no evidence of information advantages owned by institutional investors.

B. Price Pressure Effect of Institutional Trading?

Abnormal institutional trading in the preannouncement period is likely to exert demand pressures on stocks so that their prices overshoot; consequently, the returns of the stocks revert to the fundamentals after earnings are announced. Could the negative relation between preannouncement CAID and subsequent CAR be the outcome of price pressure associated with institutional trading? To answer this question, we conduct placebo tests to compare the relations between CAID and CAR around actual and pseudo earnings announcements. For each actual earnings announcement, the pseudo announcement date is determined by subtracting a random number of trading days from the actual announcement date, which is drawn from a uniform distribution spanning 21 to 39. We consider

[12]In unreported robustness checks, we extend the postannouncement period to [2,70], [2,80], [2,90], and [2,120], and obtain qualitatively similar results in both nonparametric and regression analyses.

pre- and postannouncement periods up to 20 days so that they do not overlap with the actual announcement date.

Panel A of Table 3 sorts actual and pseudo earnings announcements into quintiles based on $\text{CAID}_{[-20,-1]}$. It first reports the CAID or CAR difference between Q5 and Q1 over various periods and then tests difference in differences, that is, the difference between the actual and pseudo announcements in the differences between Q5 and Q1. The first and second columns report CAID and CAR in the preannouncement period (i.e., sorting period), and their differences between actual and pseudo earnings announcements are statistically insignificant, which indicates similar effects of price pressure across the two types of announcements. The third to sixth columns report subsequent returns. The differences between

TABLE 3

Analysis of CARs Around Actual and Pseudo Earnings Announcements

In Table 3, for each actual earnings announcement, the pseudo announcement date is determined by subtracting a random number of trading days from the actual announcement date, which is drawn from a uniform distribution spanning 21 to 39. For each actual or pseudo earnings announcement, $\text{CAR}_{[t_1,t_2]}$ denotes the cumulative abnormal return from day t_1 to day t_2 and $\text{CAID}_{[t_1,t_2]}$ denotes the cumulative abnormal institutional demand over the same period. In Panel A, the actual and pseudo earnings announcements are sorted into quintiles based on $\text{CAID}_{[-20,-1]}$. The panel first reports the differences in $\text{CAID}_{[t_1,t_2]}$ and $\text{CAR}_{[t_1,t_2]}$ between Q5 and Q1, where Q5 and Q1 are the quintiles of sample stocks strongly bought and sold by institutions in the preannouncement period. It then reports difference in difference, that is, the difference between the actual and pseudo announcements in the difference of $\text{CAID}_{[t_1,t_2]}$ or $\text{CAR}_{[t_1,t_2]}$ between Q5 and Q1. Returns are reported in percentage terms. Panel B examines the relation between preannouncement CAID and subsequent CAR by the following regression on the sample of pseudo earnings announcements:

$$\text{CAR}_{[t_1,t_2]} = \beta_0 + \beta_1 \text{CAID}_{[t_1^*,t_2^*]} + \beta_2 \text{CAR}_{[t_1^*,t_2^*]} + \sum_{i=1}^{12} \gamma_i \text{CV}_i + \varepsilon,$$

where $[t_1^*, t_2^*]$ indicates the period from day t_1^* to t_2^* and CV_i are control variables estimated in the year before the earnings announcements, including stock size, which is the logarithm of the average daily market capitalization; stock price; stock illiquidity; market beta; idiosyncratic volatility; bid–ask spread; institutional ownership; analyst coverage; book-to-market ratio; probability of information-based trading; firm age; and dispersion in analyst forecasts of the stock. t-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Standard errors are clustered by stock and calendar quarter (Petersen (2009)) and 2-way cluster-robust t-statistics are reported for regression analysis.

Panel A. Differences in CAID and CARs around Actual and Pseudo Earnings Announcements Conditional on $\text{CAID}_{[-20,-1]}$

	$\text{CAID}_{[-20,-1]}$	$\text{CAR}_{[-20,-1]}$	$\text{CAR}_{[0,1]}$	$\text{CAR}_{[2,6]}$	$\text{CAR}_{[2,10]}$	$\text{CAR}_{[2,20]}$
Actual Earnings Announcements						
Q5 − Q1	21.14***	3.21***	−0.57***	−0.46***	−0.74***	−1.10***
	(98.66)	(11.27)	(−4.93)	(−4.87)	(−5.13)	(−5.00)
Pseudo Earnings Announcements						
Q5 − Q1	21.21***	3.15***	−0.08	−0.15	−0.31*	−0.57**
	(95.68)	(11.61)	(−1.32)	(−1.62)	(−1.91)	(−2.06)
Differences between Actual and Pseudo Earnings Announcements						
Diff. in (Q5 − Q1)	−0.07	0.07	−0.49***	−0.31**	−0.42**	−0.53*
	(−0.22)	(0.16)	(−3.82)	(−2.09)	(−2.01)	(−1.68)

Panel B. Regressions of CARs on the Sample of Pseudo Earnings Announcements

	$\text{CAR}_{[-20,-1]}$	$\text{CAR}_{[0,1]}$	$\text{CAR}_{[2,6]}$	$\text{CAR}_{[2,10]}$	$\text{CAR}_{[2,20]}$
$\text{CAID}_{[-20,-1]}$	0.0025***	−0.00002	−0.00003	−0.00007	−0.0002
	(9.960)	(−0.854)	(−1.024)	(−1.420)	(−1.621)
$\text{CAR}_{[-20,-1]}$		−0.0081**	−0.0179**	−0.0170	−0.0290
		(−2.069)	(−2.501)	(−1.558)	(−1.580)
Control variables	Yes	Yes	Yes	Yes	Yes
R^2 (%)	1.22	0.11	0.15	0.14	0.25
Adj. R^2 (%)	1.20	0.08	0.13	0.12	0.23

Q5 and Q1 are negative and significant for actual earnings announcements but marginal or not significant for pseudo earnings announcements. The difference-in-difference tests confirm the significant difference between actual and pseudo announcements. For instance, the fourth column reports that the difference in $CAR_{[2,6]}$ between Q5 and Q1 is −46 (−15) bps for actual (pseudo) earnings announcements, and the difference-in-difference is −31 bps. The significant difference-in-difference implies that the strong negative association between preannouncement CAID and subsequent CAR around actual earnings announcements is not driven by price pressure in the market, as the price pressures around actual and pseudo announcements are not significantly different.

In Panel B of Table 3, we use the regression specified by equation (3) to regress subsequent CAR against preannouncement CAID on the sample of pseudo earnings announcements. In contrast to the strong negative return predictability by CAID in the preannouncement period of actual earnings, there is no return predictability by the preannouncement CAID of pseudo earnings announcements. This further confirms the difference between actual and pseudo earnings announcements. Table A2 in the Supplementary Material adopts a 10-day preannouncement period and obtains results qualitatively similar to Table 3.

C. Overconfident Institutions?

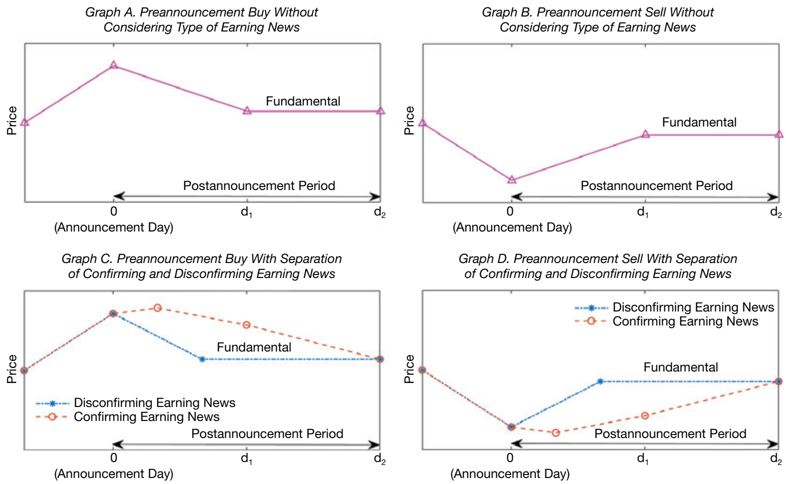
An alternative explanation for the return reversal around earnings announcements is the overconfidence of institutional investors. Investors are subject to psychological bias, and overconfidence is arguably one of the most prominent phenomena of behavioral bias. Studies have found a negative association between changes in quarterly institutional ownership and long-term future stock returns, which is used by these authors as evidence of institutions' behavioral bias such as herding (see Dasgupta, Prat, and Verardo (2011), Brown, Wei, and Wermers (2014), and Edelen et al. (2016)). Because information released at an earnings announcement is more likely to correct mispricing relative to other possible releases (Bernard, Thomas, and Wahlen (1997)), these announcements provide us with remarkable opportunities to examine whether return reversals around earnings announcements are driven by institutions' overconfidence and their trading to correct mispricing. The logic behind the conjecture is that if institutions are overconfident in their information and knowledge before earnings announcements, their abnormal buys (sells) are likely to push the stock price above (below) the fundamentals, as illustrated in Graph A (Graph B) of Figure 1. They may start to correct their errors when the earnings are announced, which drives the stock price back to its fundamentals.

The positive and significant contemporaneous relation between CAID and CAR documented in Table 2 demonstrates that institutional demand is a key determinant of stock prices and it leads stock prices in the preannouncement period to deviate from their fundamental values. This mispricing is partially and gradually corrected upon news arrivals when earnings are announced. Thus, the negative relation between preannouncement CAID and postannouncement CAR can be interpreted as empirical evidence supporting the argument that institutional investors are

FIGURE 1

Stock Price Paths around an Earnings Announcement When Institutional Investors Are Overconfident

In Figure 1, the announcement day is denoted by 0 and $2 < d_1 < d_2$ are the 2 time points after an announcement. Confirming (disconfirming) earnings news refers to an earnings surprise on the same (wrong) side of institutional investors' preannouncement trades, that is, a buy followed by a positive (negative) earnings surprise or a sell followed by a negative (positive) earnings surprise. Graph A (Graph B) illustrates that institutions are overconfident and that their strong preannouncement buy (sell) drives the stock price above (below) the fundamental. However, they correct the mispricing over period $[2, d_1]$ following the earnings announcement and the price reverts to the fundamental value. Graphs C and D detail the price paths by separating confirming and disconfirming earnings announcements. The correction of mispricing by institutional investors is delayed if they are subject to overconfidence and self-attribution bias and receive a confirming earnings announcement. The delayed correction, reflected by a short continuation of price movement, leads to an ambiguous direction of return over $[2, d_1]$ but a considerable correction over $(d_1, d_2]$. If the earnings news is disconfirming, institutions correct the mispricing in a timely manner and they may complete the correction before day d_1.



overconfident. Moreover, pseudo earnings announcements do not bring new information and in turn, they, as shown in Table 3, do not lead to mispricing correction.

Although the negative relation between CAID and subsequent CAR indicates that institutional investors are likely to be overconfident, their mispricing in the preannouncement period is reconfirmed if we can verify that institutions trade to correct this mispricing in the postannouncement period. For this reason, we examine whether institutions' trading moves stock price, that is, whether their trading direction is in line with return pattern, in the postannouncement period by the following regression:

$$(4)\quad \text{CAR}_{[t_1,t_2]} = \beta_0 + \beta_1 \text{CAID}_{[t_1,t_2]} + \beta_2 \text{CAID}_{[t_1^*,t_2^*]} + \beta_3 \text{CAR}_{[t_1^*,t_2^*]} + \sum_{i=1}^{12} \gamma_i \text{CV}_i + \varepsilon.$$

Table A3 in the Supplementary Material reports the regression for the 3 postannouncement periods of $[t_1, t_2] = [2, 20]$, $[2, 40]$, and $[2, 60]$ while controlling $\text{CAID}_{[t_1^*,t_2^*]}$ and $\text{CAR}_{[t_1^*,t_2^*]}$ for $[t_1^*, t_2^*] = [-40, -1]$, $[-30, -1]$, $[-20, -1]$, and $[-10, -1]$, respectively. All β_1 estimates are positive and significant at the 1% level, confirming that institutional demand is a driver of stock prices in all

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postannouncement periods considered. This finding is consistent with the dominant role of institutional investors in the stock market. It also implies that institutions' preannouncement mispricing is gradually corrected when earnings news and other subsequent public information are released. More important, it validates our later tests for the self-attribution hypothesis based on their implications for stock return patterns.

D. Effects of Information Asymmetry and Valuation Difficulty

The overconfidence theory of Daniel et al. (1998) takes private information into account and implies stronger return predictability in stocks with greater information asymmetry. Psychological evidence indicates that overconfidence is more severe for diffuse tasks, which require judgment, than for mechanical tasks. When stocks are more difficult to value, investors tend to exhibit more overconfidence because less hard information exists to benchmark their irrational expectations. Based on these arguments, we conjecture there is a stronger negative relation between preannouncement CAID and subsequent CAR for stocks whose information is more asymmetric and/or whose values are harder to accurately evaluate if institutional investors are overconfident. To test this assertion, we estimate the following regression model:

$$\text{(5)} \quad \text{CAR}_{[t_1,t_2]} = \beta_0 + \beta_1 \text{CAID}_{[-40,-1]} + \beta_2 \text{CAID}_{[-40,-1]} \times \text{SC} + \beta_3 \text{CAR}_{[-40,-1]} + \beta_4 \text{SC} + \sum_{i=1}^{12} \gamma_i \text{CV}_i + \varepsilon.$$

This model extends regression equation (3) by including SC and interaction term $\text{CAID}_{[-40,-1]} \times \text{SC}$, where SC denotes stock characteristics related to information asymmetry and/or difficulty of valuation, which is 1 of the 12 CV_is or 1 of the last 5 stock characteristics in Table 1. We use the probability of informed trading (PIN) to measure information asymmetry, and idiosyncratic volatility (IDIOV) as an overall proxy for information asymmetry and valuation difficulty.[13] In addition, bid–ask spread (SPREAD), stock size (SIZE), firm age (AGE), analyst coverage (ACOVERAGE), and dispersion in analyst forecasts (DISP) are deemed to be stock characteristics related to information asymmetry and valuation difficulty. Share turnover (TO) is expected to be positively related to valuation difficulty (Banerjee (2011)), and R&D intensity (R&D) and poor earnings quality (EARNINGSQ) are major contributors to information asymmetry (Aboody and Lev (2000), Bhattacharya, Desai, and Venkataraman (2013)) and increase valuation difficulty. Cash flow volatility (CASHFLOWV) and earnings volatility (EARNINGSV) reflect the level of uncertainty in fundamentals (Kumar (2009)).

[13]Idiosyncratic volatility measures overall firm-specific return variation. It is widely used in empirical studies to capture both information asymmetry and valuation difficulty (Moeller, Schlingemann, and Stulz (2007), Fernandes and Ferreira (2008), and Jiang and Sun (2014)). Theoretically, Ferreira and Laux (2007) argue that informed trade induces idiosyncratic volatility in stock returns, and Pástor and Pietro (2003) show that idiosyncratic volatility increases with profitability uncertainty.

Table 4 reports the outcomes of estimating regression equation (5) for $[t_1, t_2] = [0, 60]$.[14] The estimated β_2 is significant at the 1% or 5% level, which indicates that the negative relation between $\text{CAID}_{[-40,-1]}$ and $\text{CAR}_{[0,60]}$ is stronger for stocks with higher information asymmetry and greater valuation difficulty. To see the economic significance, let us take PIN as an example. The column labeled "PIN" reports that the regression coefficient of $\text{CAID}_{[-40,-1]}$ is $-0.0007 - 0.0028 \times \text{PIN}$. Thus, the negative relation between $\text{CAID}_{[-40,-1]}$ and $\text{CAR}_{[0,60]}$ increases in strength

TABLE 4

Overconfidence and Stock Characteristics

Table 4 evaluates the effects of stock characteristics (SCs) on overconfidence using the following regression model:

$$\text{CAR}_{[0,60]} = \beta_0 + \beta_1 \text{CAID}_{[-40,-1]} + \beta_2 \text{CAID}_{[-40,-1]} \times \text{SC} + \beta_3 \text{CAR}_{[-40,-1]} + \beta_4 \text{SC} + \sum_{i=1}^{12} \gamma_i \text{CV}_i + \varepsilon,$$

where $\text{CAR}_{[0,60]}$ is the cumulative abnormal return from day 0 to day 60, and $\text{CAID}_{[-40,-1]}$ is the cumulative abnormal institutional demand from day −40 to day −1. SCs are selected for their close relations with information asymmetry and/or stock valuation difficulty, including probability of information-based trading (PIN), idiosyncratic volatility (IDIOV), bid–ask spread (SPREAD), stock size (SIZE), firm age (AGE), analyst coverage (ACOVERAGE), dispersion in analyst forecasts (DISP), share turnover (TO), research and development intensity (R&D), earnings quality (EARNINGSQ), cash flow volatility (CASHFLOWV), and earnings volatility (EARNINGSV). CV_i are control variables estimated in the year before the earnings announcements, including stock size, which is the logarithm of the average daily market capitalization; stock price; stock illiquidity; market beta; idiosyncratic volatility; bid–ask spread; institutional ownership; analyst coverage; book-to-market ratio; probability of information-based trading; firm age; and dispersion in analyst forecasts of the stock. Standard errors are clustered by stock and calendar quarter (Petersen (2009)) and 2-way cluster-robust *t*-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	SC					
	PIN	IDIOV	SPREAD	SIZE	AGE	ACOVERAGE
$\text{CAID}_{[-40,-1]}$	−0.0007***	0.0007**	−0.0007***	−0.0007***	−0.0014***	−0.0014***
	(−3.705)	(2.445)	(−5.718)	(−5.695)	(−7.406)	(−7.381)
$\text{CAID}_{[-40,-1]} \times \text{SC}$	−0.0028**	−0.0588***	−0.0300***	0.0003***	0.00003***	0.00006**
	(−2.058)	(−4.619)	(−2.359)	(5.165)	(4.991)	(4.201)
$\text{CAR}_{[-40,-1]}$	−0.0655***	−0.0636***	−0.0653***	−0.0651***	−0.0648***	−0.0654***
	(−2.876)	(−2.837)	(−2.876)	(−2.861)	(−2.855)	(−2.874)
SC	0.0667*	−0.2913	1.1257	0.0026	0.00005	0.0004
	(1.776)	(−0.582)	(1.550)	(1.241)	(0.841)	(0.845)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
R^2 (%)	0.72	0.92	0.72	0.77	0.77	0.75
Adj. R^2 (%)	0.70	0.90	0.70	0.75	0.75	0.73

	SC					
	DISP	TO	R&D	EARNINGSQ	CASHFLOWV	EARNINGSV
$\text{CAID}_{[-40,-1]}$	−0.0007***	−0.0005***	−0.0007***	−0.0006***	−0.0007***	−0.0008***
	(−6.314)	(−2.947)	(−6.109)	(−4.382)	(−6.267)	(−7.571)
$\text{CAID}_{[-40,-1]} \times \text{SC}$	−0.0015**	−0.0448**	−0.0052***	0.0072***	−0.0088***	−0.0014**
	(−3.542)	(−2.360)	(−3.368)	(3.315)	(−2.625)	(−2.288)
$\text{CAR}_{[-40,-1]}$	−0.0655***	−0.0655***	−0.0647***	−0.0660***	−0.0661***	−0.0668***
	(−2.885)	(−2.877)	(−2.851)	(−2.988)	(−2.927)	(−2.954)
SC	−0.0010	−0.8791***	0.0364	−0.0321	−0.1137**	−0.0095
	(−0.156)	(−2.718)	(1.108)	(−1.303)	(−2.258)	(−1.483)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
R^2 (%)	0.73	0.79	0.79	0.81	0.78	0.73
Adj. R^2 (%)	0.71	0.77	0.77	0.79	0.76	0.70

[14]Qualitatively similar results can be found in the Supplementary Material, where Panel A of Table A4 reports the regressions excluding control $\text{CAR}_{[-40,-1]}$, Panel B uses different preannouncement periods for regression equation (5), and Panels C and D consider the postannouncement periods of [2,60] and [6,60], respectively, to control for earnings announcement premium (Savor and Wilson (2016)) and news-driven return reversal (So and Wang (2014)).

by 14.7% when PIN increases from its 25th percentile to its median, that is, from 0.056 to 0.101 (see Table 1 for the values).[15] Idiosyncratic volatility provides another example. When it increases from its 25th percentile to its median, that is, from 0.016 to 0.023, the regression coefficient of $\text{CAID}_{[-40,-1]}$ changes from −0.00024 to −0.00065, which implies that the intensity of the negative relation increases by 171%. Among all proxies listed in Table 4, idiosyncratic volatility has the highest economic significance, which is consistent with idiosyncratic volatility being an overall proxy for information asymmetry and valuation difficulty.[16] Cash flow volatility and earnings volatility are positively related to earnings predictability; therefore, the results in Table 4 suggest that investors tend to be more overconfident if the forthcoming earnings are more difficult to predict.

In sum, the analysis of information asymmetry and valuation difficulty provides further evidence consistent with of institutional investor overconfidence. Because stocks with greater information asymmetry and valuation difficulty tend to be riskier to arbitrage, our results also imply limits to arbitrage (Shleifer and Vishny (1997)) as an important channel for overconfident institutions to affect asset prices.

IV. Tests of the Self-Attribution Hypothesis

Investors' confidence level is time varying. Institutions' responses to earnings announcements provide great opportunities to investigate changes in the confidence level of institutional investors, which are arguably irrelevant to price pressure and a range of potential explanatory variables. Psychological findings reveal that when observing the outcomes of their actions, people update their confidence in a biased manner because they are subject to self-attribution bias (Langer and Roth (1975), Taylor and Brown (1988)). The psychological and behavioral finance literature argues that biased self-attribution is an important source of overconfidence (Gervais and Odean (2001), Daniel and Hirshleifer (2015)). According to the theory developed by Daniel et al. (1998), investors' overconfidence is reinforced upon receiving confirming public information, but it decreases moderately or remains unchanged if the public information is disconfirming. In the context of earnings announcements, institutions' overconfidence is reinforced if earnings news confirms preannouncement institutional trades (strong buy followed by good news or strong sell followed by adverse news). Thus, they keep their biased estimation of stock values shortly after earnings announcements and delay their correction of mispricing. In contrast, if earnings news disconfirms preannouncement institutional demand, institutions' overconfidence remains unchanged or declines only a little. However, their incorrect estimation of stocks is reduced or discontinued after earnings announcements as they incorporate the newly released information about the fundamentals into their considerations.[17] Accordingly, they act more speedily to correct mispricing. Thus, our self-attribution hypothesis asserts

[15]The change in the coefficient is $-0.0028 \times (0.101 - 0.056) = -0.000126$, which is 14.7% of the initial coefficient of $-0.0007 - 0.0028 \times 0.056 = -0.000857$.

[16]The economic significances of the other proxies are not reported but available from the authors.

[17]Even when an investor's confidence level remains unchanged, the arrival of new information concerning a stock's fundamentals may alter her/his valuation of the stock.

that stocks with confirming earnings news experience mispricing correction later than stocks with disconfirming earnings news.

To picture the self-attribution hypothesis and its tests, we illustrate the price path of a stock around its earnings announcement in Graphs C and D of Figure 1. Graph C (Graph D) shows that following a confirming announcement, the overconfidence of institutions is reinforced and their reaction to their biased beliefs pushes the stock price to continue moving up (down) over a few days immediately after the announcement. After that, they start to correct the mispricing and this delay in mispricing correction results in an average stock return over an earlier postannouncement period, say day 2 to day d_1, without a clear direction. Moreover, the delayed correction endures in the later postannouncement period, $[d_1, d_2]$, leading to a return drift that is negatively related to preannouncement institutional demand. In contrast, if the earnings news is disconfirming, institutions start to correct the mispricing in a more timely way. As the correction is likely to be completed before d_1, there is no need for further correction in the later period of $[d_1, d_2]$. Consequently, the preannouncement institutional demand should be negatively associated with the return over $[2, d_1]$ whereas its association with the return over $[d_1, d_2]$ can be ambiguous.

A. Nonparametric Tests of the Self-Attribution Hypothesis

To test the self-attribution hypothesis, we use the sign of the earnings surprise to gauge the outcome of institutions' preannouncement demand. We also use the postannouncement CAR to infer institutions' reaction to earnings announcements because we have confirmed there is a positive contemporaneous relation between CAR and CAID. Thus, we first sort stocks into quintiles based on $\text{CAID}_{[-40,-1]}$. Within each of these quintiles, stocks are further sorted into quintiles according to SUE.[18] Table 5 focuses on the postannouncement CARs for 4 of these 25 subsamples. They are the 2 subsamples of stocks with the highest (positive) and lowest (negative) SUEs within quintiles of largest (positive) and smallest (negative) $\text{CAID}_{[-40,-1]}$. As we can see from the first 2 columns in the upper panel, for stocks with strong preannouncement institutional buys and positive earnings news, that is, $Q(\text{CAID}_{[-40,-1]}) = 5$ and $Q(\text{SUE}) = 5$, average $\text{CAR}_{[2,60]}$ is -0.57% and insignificant, and average $\text{CAR}_{[61,120]}$ is -1.38% and significant at the 1% level. This indicates that the correction of mispricing is delayed to the later period of $[61, 120]$ when positive earnings news confirms strong preannouncement institutional buys. Similarly, the subsample of $Q(\text{CAID}_{[-40,-1]}) = 1$ and $Q(\text{SUE}) = 1$ yields an insignificant average $\text{CAR}_{[2,60]}$ of 0.60% and a significant $\text{CAR}_{[61,120]}$ of 1.25%, showing that the correction of mispricing is delayed when strong preannouncement institutional sells are favored by negative earnings news.

In contrast, when earnings news disconfirms institutions' investment outcomes, we observe a strong correction of mispricing in the earlier period of $[2, 60]$ but a negligible return drift in the later period of $[61, 120]$. In particular,

[18]Both CAID and SUE vary from negative to positive. Quintiles are arranged from 1 to 5 as their CAID or SUE measure increases from the smallest (negative) to the largest (positive).

TABLE 5

Nonparametric Analysis of the Self-Attribution Hypothesis

Table 5 presents the sorting analysis of postannouncement cumulative abnormal returns (CARs) conditional on preannouncement cumulative abnormal institutional demand (CAID) and standardized unexpected earnings (SUE) to examine the self-attribution hypothesis. $\text{CAR}_{[t_1,t_2]}$ is the CAR from day t_1 to day t_2, $\text{CAID}_{[-40,-1]}$ is the CAID from day −40 to day −1, and SUE_{NEXT} is the earnings surprise of the next earnings announcement. Stocks are first sorted into quintiles based on $\text{CAID}_{[-40,-1]}$, where $Q(\text{CAID}_{[-40,-1]})=5$ and $Q(\text{CAID}_{[-40,-1]})=1$ denote the quintiles of stocks strongly bought and sold by institutions in the preannouncement period, respectively. Within each quintile, stocks are further sorted into quintiles based on SUE, where $Q(\text{SUE})=5$ and $Q(\text{SUE})=1$ denote the quintiles with the highest and lowest SUE, respectively. The table documents average postannouncement CARs of stocks in 4 subsamples. Returns are reported in percentage terms. ** and *** indicate significance at the 5% and 1% levels, respectively. The columns labeled "CAR Diff." report the average CAR difference between the earlier and later periods, where the *p*-values in square brackets represent the hypothesis test of whether the difference is greater than 0 (labeled by superscript +) or smaller than 0 (labeled by superscript −).

	$\text{CAR}_{[2,60]}$	$\text{CAR}_{[61,120]}$	CAR Diff.	SUE_{NEXT}	$\text{CAR}_{[2,10]}$	$\text{CAR}_{[11,20]}$	CAR Diff.
$Q(\text{CAID}_{[-40,-1]})=5$ and $Q(\text{SUE})=5$, (strong buys followed by confirming news)	−0.57	−1.38***	0.82	2.37***	0.52***	0.04	0.48
	(−1.573)	(−3.548)	$[0.0547]^{+}$	(21.574)	(3.659)	(0.291)	$[0.0076]^{+}$
$Q(\text{CAID}_{[-40,-1]})=5$ and $Q(\text{SUE})=1$, (strong buys followed by disconfirming news)	−2.58***	−0.46	−2.12	−1.22***	−1.00***	−0.09	−0.91
	(−6.501)	(−1.068)	$[0.0001]^{-}$	(−5.209)	(−6.160)	(−0.521)	$[0.0001]^{-}$
$Q(\text{CAID}_{[-40,-1]})=1$ and $Q(\text{SUE})=5$, (strong sells followed by disconfirming news)	1.19***	0.52	0.67	2.33***	0.81***	0.21	0.60
	(3.557)	(1.321)	$[0.0988]^{+}$	(9.955)	(5.773)	(1.474)	$[0.0001]^{+}$
$Q(\text{CAID}_{[-40,-1]})=1$ and $Q(\text{SUE})=1$, (strong sells followed by confirming news)	0.60	1.25***	−0.65	−1.07***	0.20	0.13	0.07
	(1.511)	(2.701)	$[0.1431]^{-}$	(−5.138)	(1.099)	(0.821)	$[0.3948]^{+}$

	$\text{CAR}_{[2,20]}$	$\text{CAR}_{[21,40]}$	CAR Diff.	$\text{CAR}_{[2,30]}$	$\text{CAR}_{[31,60]}$	CAR Diff.
$Q(\text{CAID}_{[-40,-1]})=5$ and $Q(\text{SUE})=5$, (strong buys followed by confirming news)	0.56***	−0.74***	1.31	0.23	−0.80***	1.03
	(2.819)	(−3.522)	$[0.0000]^{+}$	(0.950)	(−3.081)	$[0.0016]^{+}$
$Q(\text{CAID}_{[-40,-1]})=5$ and $Q(\text{SUE})=1$, (strong buys followed by disconfirming news)	−1.09***	−0.54**	−0.54	−1.24***	−1.34***	0.10
	(−4.698)	(−2.315)	$[0.0559]^{-}$	(−4.555)	(−4.475)	$[0.4068]^{+}$
$Q(\text{CAID}_{[-40,-1]})=1$ and $Q(\text{SUE})=5$, (strong sells followed by disconfirming news)	1.02***	0.07	0.95	1.20***	−0.01	1.21
	(5.126)	(0.336)	$[0.0005]^{+}$	(4.906)	(−0.031)	$[0.0005]^{+}$
$Q(\text{CAID}_{[-40,-1]})=1$ and $Q(\text{SUE})=1$, (strong sells followed by confirming news)	0.34	0.22	0.12	0.67**	−0.08	0.75
	(1.414)	(0.847)	$[0.3704]^{+}$	(2.271)	(−0.264)	$[0.0442]^{+}$

stocks in $Q(\text{CAID}_{[-40,-1]})=5$ and $Q(\text{SUE})=1$ on average show a significant $\text{CAR}_{[2,60]}$ of −2.58% but an insignificant $\text{CAR}_{[61,120]}$ of −0.46%. Likewise, the subsample of $Q(\text{CAID}_{[-40,-1]})=1$ and $Q(\text{SUE})=5$ has a significant average $\text{CAR}_{[2,60]}$ of 1.19% but an insignificant average $\text{CAR}_{[61,120]}$ of 0.52%. Therefore, stock prices revert to fundamentals in the earlier period of [2, 60] for disconfirming earnings news. The third column in the upper panel of Table 5 reports the average CAR difference between the earlier and later periods. Among 3 of the 4 subsamples considered, CARs over the earlier and later periods differ significantly, confirming the contrasting patterns of mispricing correction.

Because the later announcement period of [61, 120] covers next earnings announcements, it is possible that $\text{CAR}_{[61,120]}$ is driven by next earnings surprises instead of the delayed correction of mispricing by institutions. To address this concern, the fourth column in the upper panel of Table 5 reports the average SUE of next earnings announcements (SUE_{NEXT}). In the 2 subsamples with confirming news, $CAR_{[61,120]}$ is significant but its direction is opposite to that of SUE_{NEXT}, which suggests that next earnings announcements do not drive $CAR_{[61,120]}$. In contrast, $CAR_{[61,120]}$ is insignificant and in the same direction as SUE_{NEXT} for stocks in the 2 subsamples with disconfirming news.

To further mitigate the contamination of SUE_{NEXT} on postannouncement CARs, we consider shorter earlier and later postannouncement periods, [2,10] versus [11,20], [2,20] versus [21,40], and [2,30] versus [31,60], to avoid the overlap. For stocks with strong preannouncement institutional buys and followed by positive earnings surprises, that is, stocks in $Q(CAID_{[-40,-1]}) = 5$ and $Q(SUE) = 5$, institutions tend to continue mispricing stocks in the 2 weeks after earnings announcements, as evidenced by the positive and significant average $CAR_{[2,10]}$ of 0.52%. This mispricing is then eased and correction starts, as average $CAR_{[11,20]}$ is insignificant and average $CAR_{[21,40]}$ and $CAR_{[31,60]}$ are negative and significant. For the stocks in $Q(CAID_{[-40,-1]}) = 5$ and $Q(SUE) = 1$, average CAR is negative and significant over the earlier postannouncement periods of [2,10], [2,20], and [2,30], which suggests that institutions start to correct the mispricing shortly after receiving disconfirming earnings news.

In sum, the results documented in Table 5 are consistent with the stock price paths illustrated in Graphs C and D of Figure 1. As predicted by the self-attribution hypothesis, confirming earnings news makes institutions more overly confident, leading to a delay in mispricing correction, whereas disconfirming earnings news urges institutions to correct their mistakes sooner.

Following the placebo approach in Section III.B, we replicate the analysis in Table 5 for actual and pseudo earnings announcements based on a preannouncement period of 20 days.[19] To avoid the overlap of postannouncement periods with next announcements, we restrict our analysis to the earlier and later postannouncement periods of [2,10] and [11,20]. We use announcement CAR, that is, $CAR_{[0,1]}$, to proxy for earnings surprise so that earnings surprises for pseudo earnings announcements are measurable. As shown in the fourth and fifth columns of Table 6, there is no continuation but correction of mispricing after confirming pseudo earnings news, probably because of price pressure. For disconfirming pseudo earnings announcements, we do not observe mispricing correction in the earlier postannouncement period. These observations are in sharp contrast to the return patterns in the first 2 columns of Table 6, where earnings announcements are actual. The sixth column reports the average difference in post-pseudo-announcement CARs between the earlier and later periods, which is largely insignificant with the smallest p-value being 0.0927 among the 4 subsamples. The last 2 columns compare postannouncement CARs between the actual and pseudo announcements, confirming that the majority of these differences are significant. Collectively, our placebo tests demonstrate that earnings announcements provide an essential setting for testing self-attribution bias. Furthermore, the observations of institutional trading and market behavior around earnings announcements are not some random coincidences.

[19]Table A6 in the Supplementary Material considers a preannouncement period of 10 days and reports similar results.

TABLE 6

Nonparametric Analysis of the Self-Attribution Hypothesis: Actual Versus Pseudo Earnings Announcements

Table 6 presents the sorting analysis of postannouncement cumulative abnormal returns (CARs) conditional on preannouncement cumulative abnormal institutional demand (CAID) and announcement CAR for actual and pseudo earnings announcements. For each actual earnings announcement, the pseudo announcement date is determined by subtracting a random number of trading days from the actual announcement date, which is drawn from a uniform distribution from 21 to 39. For each actual or pseudo earnings announcement, $\text{CAR}_{[t_1,t_2]}$ denotes the CAR from day t_1 to day t_2 and $\text{CAID}_{[t_1,t_2]}$ denotes the CAID over the same period. Actual and pseudo earnings announcements are sorted into quintiles based on $\text{CAID}_{[-20,-1]}$, where $Q(\text{CAID}_{[-20,-1]})=5$ and $Q(\text{CAID}_{[-20,-1]})=1$ denote the quintiles of stocks strongly bought and sold by institutions in the preannouncement period, respectively. Within each quintile, stocks are further sorted into quintiles based on $\text{CAR}_{[0,1]}$, where $Q(\text{CAR}_{[0,1]})=5$ and $Q(\text{CAR}_{[0,1]})=1$ denote the quintiles with the highest and lowest announcement CAR, respectively. The table documents the average postannouncement CARs of stocks in the 4 subsamples. Returns are reported in percentage terms. *t*-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The third and sixth columns (labeled "CAR Diff.") report the average CAR difference between the earlier and later periods, where the *p*-value in square brackets represents the hypothesis test of whether the difference is greater than 0 (labeled by superscript +) or smaller than 0 (labeled by superscript −). The last 2 columns document the average CAR difference between the actual and pseudo earnings announcements, where the *p*-value in square brackets represents the hypothesis test of whether the difference is equal to 0.

	Actual Announcements			Pseudo Announcements			$\text{CAR}_{\text{ACTUAL}} - \text{CAR}_{\text{PSEUDO}}$	
	$\text{CAR}_{[2,10]}$	$\text{CAR}_{[11,20]}$	CAR Diff.	$\text{CAR}_{[2,10]}$	$\text{CAR}_{[11,20]}$	CAR Diff.	$\text{CAR}_{[2,10]}$	$\text{CAR}_{[11,20]}$
$Q(\text{CAID}_{[-20,-1]})=5$ and $Q(\text{SUE})=5$, (strong buys followed by confirming news)	0.30*	−0.33**	0.63^{+}	−0.53***	−0.48**	-0.04^{-}	0.83	0.16
	(1.926)	(−2.207)	$[0.0021]^{+}$	(−2.945)	(−2.524)	$[0.4314]^{-}$	[0.0004]	[0.5223]
$Q(\text{CAID}_{[-20,-1]})=5$ and $Q(\text{SUE})=1$, (strong buys followed by disconfirming news)	−1.11***	0.03	-1.14^{-}	−0.16	−0.48**	0.32^{+}	−0.95	0.52
	(−6.216)	(0.186)	$[0.0000]^{-}$	(−0.827)	(2.497)	$[0.1171]^{+}$	[0.0003]	[0.0539]
$Q(\text{CAID}_{[-20,-1]})=1$ and $Q(\text{SUE})=5$, (strong sells followed by disconfirming news)	0.80***	0.64***	0.16^{+}	−0.03	0.04	-0.07^{-}	0.83	0.61
	(4.677)	(3.717)	$[0.2548]^{+}$	(−0.162)	(0.183)	$[0.4058]^{-}$	[0.0009]	[0.0212]
$Q(\text{CAID}_{[-20,-1]})=1$ and $Q(\text{SUE})=1$, (strong sells followed by confirming news)	0.25	0.44**	-0.18^{-}	0.50**	0.11	0.39^{+}	−0.25	0.32
	(1.287)	(2.278)	$[0.2652]^{-}$	(2.500)	(0.550)	$[0.0927]^{+}$	[0.3798]	[0.2517]

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B. Regression Tests of the Self-Attribution Hypothesis

To further test the self-attribution hypothesis, we regress $\text{CAR}_{[t_1,t_2]}$ on $\text{CAID}_{[-40,-1]}$, taking the directions of SUE and $\text{CAID}_{[-40,-1]}$ into account:

$$(6)\qquad \begin{aligned}\text{CAR}_{[t_1,t_2]} = {} & \beta_0 + \beta_1 \text{CAID}_{[-40,-1]} \times \boldsymbol{I}\left(\text{SUE} \times \text{CAID}_{[-40,-1]} > 0\right) \\ & + \beta_2 \text{CAID}_{[-40,-1]} \times \boldsymbol{I}\left(\text{SUE} \times \text{CAID}_{[-40,-1]} \le 0\right) \\ & + \beta_3 \text{CAR}_{[-40,-1]} + \sum_{i=1}^{12} \gamma_i \text{CV}_i + \varepsilon,\end{aligned}$$

where $\boldsymbol{I}(x > 0)$ is an indicator function that equals 1 if the condition $x > 0$ is satisfied, and 0 otherwise. The first 2 columns in Panel A of Table 7 report that the β_1 values are −0.0004 and −0.0006 for the regressions of $\text{CAR}_{[2,60]}$ and $\text{CAR}_{[61,120]}$, respectively, and both are significant at the 5% level. This implies the later period of [61, 120] experiences a more substantial mispricing correction than the earlier period of [2, 60], supporting the argument that confirming earnings news exacerbates institutions' overconfidence and delays their actions to correct mispricing. In contrast, β_2 is −0.0009 and significant at the 1% level for the regression of $\text{CAR}_{[2,60]}$ and it turns out to be an insignificant −0.0001 for $\text{CAR}_{[61,120]}$. Therefore, the mispricing correction occurs only in the earlier period of [2, 60] and there is no observable delay if disconfirming earnings news arrives in the market. The delay effect can be further illustrated by the comparison between β_1 and β_2 in the same period: The former has a smaller magnitude and *t*-statistic than the latter in the earlier period of [2, 60] but the opposite is true in the later period of [61, 120]. Thus, both regression results in the first 2 columns support the self-attribution hypothesis.

To ensure the robustness of our tests for the self-attribution hypothesis and avoid contaminating the next earnings surprises, we experiment with different pairs of earlier and later periods that end before the next earnings announcements. They generate qualitatively similar results. For instance, the third and fourth columns in Panel A of Table 7 document even stronger results for the pair of [2, 10] versus [11, 20]. In particular, β_1 in the third column is 0.00003 and insignificant and it changes to a significant −0.0001 in the fourth column. This means there is no material mispricing correction during [2, 10] after confirming earnings news arrives; however, substantial corrections occur after day 10. A comparison of the first 2 columns with the third and fourth columns in Panel A suggests that confirming earnings news can trigger further mispricing in the postannouncement period, as predicted by the self-attribution hypothesis. Such momentum, nevertheless, is short-lived and eventually reversed as more public information gradually draws prices back to the fundamentals as illustrated by Graphs C and D of Figure 1. The earlier and later postannouncement periods of [2, 20] versus [21, 40] and [2, 30] versus [31, 60] in the last 4 columns provide consistent results.

Whereas regression equation (6) takes the direction of an earnings announcement into account, equation (7) considers not only its direction but also its magnitude:

TABLE 7

Regression Tests for the Self-Attribution Hypothesis

Panels A and B of Table 7 test the self-attribution hypothesis using the following regression models, respectively:

$$\text{CAR}_{[t_1,t_2]} = \beta_0 + \beta_1 \text{CAID}_{[-40,-1]} \times \boldsymbol{I}(\text{SUE} \times \text{CAID}_{[-40,-1]} > 0) + \beta_2 \text{CAID}_{[-40,-1]} \times \boldsymbol{I}(\text{SUE} \times \text{CAID}_{[-40,-1]} \leq 0) + \beta_3 \text{CAR}_{[-40,-1]} + \sum_{i=1}^{12} \gamma_i \text{CV}_i + \varepsilon,$$

$$\text{CAR}_{[t_1,t_2]} = \beta_0 + \beta_1 \text{CAID}_{[-40,-1]} \times \boldsymbol{I}(\text{SUE} \times \text{CAID}_{[-40,-1]} > 0) \times |\text{SUE}| + \beta_2 \text{CAID}_{[-40,-1]} \times \boldsymbol{I}(\text{SUE} \times \text{CAID}_{[-40,-1]} \leq 0) \times |\text{SUE}| + \beta_3 \text{CAR}_{[-40,-1]} + \beta_4 |\text{SUE}| + \sum_{i=1}^{12} \gamma_i \text{CV}_i + \varepsilon,$$

where $\text{CAR}_{[t_1,t_2]}$ is the cumulative abnormal return from day t_1 to day t_2, $\text{CAID}_{[-40,-1]}$ is the cumulative abnormal institutional demand from day −40 to day −1, SUE is standardized unexpected earnings. $\boldsymbol{I}(x>0)$ is equal to 1 if $x>0$ is true, and 0 otherwise. Control variables CV_i are estimated in the year before the earnings announcements including stock size, stock price, stock illiquidity, market beta, idiosyncratic volatility, bid–ask spread, institutional ownership, analyst coverage, book-to-market ratio, probability of information-based trading, firm age, and dispersion in analyst forecasts. Standard errors are clustered by stock and calendar quarter (Petersen (2009)) and the 2-way cluster-robust t-statistics are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	$\text{CAR}_{[2,60]}$	$\text{CAR}_{[61,120]}$	$\text{CAR}_{[2,10]}$	$\text{CAR}_{[11,20]}$	$\text{CAR}_{[2,20]}$	$\text{CAR}_{[21,40]}$	$\text{CAR}_{[2,30]}$	$\text{CAR}_{[31,60]}$
Panel A. Tests for the Self-Attribution Hypothesis Considering SUE Direction Only								
$\text{CAID}_{[-40,-1]} \times \boldsymbol{I}(\text{SUE} \times \text{CAID}_{[-40,-1]} > 0)$	−0.0004**	−0.0006**	0.00003	−0.0001**	−0.0001	−0.0002**	−0.0002*	−0.0002*
	(−2.413)	(−2.887)	(0.571)	(−2.330)	(−1.047)	(−2.067)	(−1.849)	(−1.753)
$\text{CAID}_{[-40,-1]} \times \boldsymbol{I}(\text{SUE} \times \text{CAID}_{[-40,-1]} \leq 0)$	−0.0009***	−0.0001	−0.0005***	−0.0001**	−0.0006***	−0.0001	−0.0006***	−0.0004***
	(−5.038)	(−1.024)	(−10.019)	(−2.234)	(−7.454)	(−0.645)	(−5.456)	(−3.112)
$\text{CAR}_{[-40,-1]}$	−0.053**	0.0001	−0.023***	−0.0068	−0.0302***	−0.0189	−0.0451***	−0.0083
	(−2.525)	(0.004)	(−3.149)	(−0.970)	(−2.665)	(−1.091)	(−3.240)	(−0.514)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 (%)	0.55	0.89	0.53	0.18	0.51	0.25	0.57	0.18
Adj. R^2 (%)	0.53	0.87	0.51	0.16	0.49	0.23	0.55	0.16
Panel B. Tests for the Self-Attribution Hypothesis Considering Both SUE Direction and Magnitude								
$\text{CAID}_{[-40,-1]} \times \boldsymbol{I}(\text{SUE} \times \text{CAID}_{[-40,-1]} > 0) \times \|\text{SUE}\|$	−0.00002	−0.0001**	0.0001**	−0.0000	0.0001***	−0.0001	0.00004	−0.0001
	(−0.376)	(−2.203)	(2.538)	(−0.019)	(2.022)	(−1.555)	(1.486)	(−1.487)
$\text{CAID}_{[-40,-1]} \times \boldsymbol{I}(\text{SUE} \times \text{CAID}_{[-40,-1]} \leq 0) \times \|\text{SUE}\|$	−0.0002***	−0.00001	−0.0001***	−0.00004**	−0.0002***	0.00000	−0.0002***	−0.00003
	(−4.223)	(−0.186)	(−5.575)	(−2.433)	(−4.871)	(0.079)	(−5.486)	(−0.882)
$\text{CAR}_{[-40,-1]}$	−0.0564***	−0.0009	−0.0247***	−0.0074	−0.0321***	−0.019	−0.0473***	−0.0473***
	(−2.667)	(−0.023)	(−3.295)	(−1.058)	(−2.807)	(−1.118)	(−3.359)	(−3.359)
$\|\text{SUE}\|$	0.0011**	0.0001	−0.00003**	−0.00002	−0.00005	0.0009**	0.0001	0.0001
	(2.017)	(0.247)	(−0.102)	(−0.148)	(−0.142)	(2.066)	(0.414)	(0.414)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 (%)	0.52	0.87	0.59	0.17	0.55	0.29	0.60	0.18
Adj. R^2 (%)	0.50	0.85	0.56	0.15	0.53	0.27	0.58	0.16

$$\text{(7)}\quad \text{CAR}_{[t_1,t_2]} = \beta_0 + \beta_1 \text{CAID}_{[-40,-1]} \times \boldsymbol{I}\left(\text{SUE} \times \text{CAID}_{[-40,-1]} > 0\right) \times |\text{SUE}| + \beta_2 \text{CAID}_{[-40,-1]} \times \boldsymbol{I}\left(\text{SUE} \times \text{CAID}_{[-40,-1]} \leq 0\right) \times |\text{SUE}| + \beta_3 \text{CAR}_{[-40,-1]} + \beta_4 |\text{SUE}| + \sum_{i=1}^{12} \gamma_i \text{CV}_i + \varepsilon.$$

The regression results in Panel B of Table 7 show that the β_1 estimate is -0.00002 (-0.0001) and insignificantly (significantly) different from 0 when $\text{CAR}_{[2,60]}$ ($\text{CAR}_{[61,120]}$) is the dependent variable. Because the regression coefficient of $\text{CAID}_{[-40,-1]}$ is $\beta_1|\text{SUE}|$ for stocks with confirming earnings news, we find that institutions are likely to continue mispricing stocks in period $[2,60]$ and correct the mispricing in the later period of $[61,120]$ if they observe an confirming surprise. Moreover, the magnitude of this delayed correction increases in $|\text{SUE}|$. In contrast, the estimated β_2 is -0.0002 (-0.00001) and significant (insignificant) for the regression on $\text{CAR}_{[2,60]}$ ($\text{CAR}_{[61,120]}$). This demonstrates that institutions are committed to mispricing correction in period $[2,60]$ but not so much in period $[61,120]$ upon receiving disconfirming earnings surprises. Their commitments are also positively related to $|\text{SUE}|$. Therefore, combining the regression results of $\text{CAR}_{[2,60]}$ and $\text{CAR}_{[61,120]}$, we find clear evidence of asymmetric correction of mispricing and its dependence on institutions' investment outcomes.[20] Furthermore, if the confirming earnings surprise is greater, the delay phenomenon is stronger. We also consider other earlier and later postannouncement periods for regression equation (7) and our findings remain qualitatively similar and sometimes are even stronger.

Regression equations (6) and (7) examine the impact of direction and magnitude of earnings surprises on changes in institutions' confidence level, but the accuracy or precision of such public signals may also matter. Although theory does not explicitly examine the effect of signal precision,[21] one might expect institutional investors to more profoundly amend their confidence upon observing more accurate earnings signals. To study this effect, we adopt various proxies for signal precision but fail to find convincing evidence validating the role of signal precision in affecting institutions' confidence.

V. Further Tests Based on Institutional Demand After Earnings Announcements

So far, we have investigated the behavioral bias of institutional investors by testing the relation between their preannouncement CAID and subsequent CAR. To further consolidate our empirical findings, we examine CAIDs over various periods

[20]Our results in Table 7 remain qualitatively similar if we control for next earnings surprises and/or $\text{CAR}_{[2,60]}$ in the regression of $\text{CAR}_{[61,120]}$. We also extend regression equation (7) to control for the interaction between $\text{CAID}_{[-40,-1]}$ and news direction and obtain qualitatively similar results, which are reported in Table A7 in the Supplementary Material.

[21]For instance, the model developed by Daniel et al. (1998) considers two types of public signals. The first type is discrete signals, that is, either positive or negative, and the precision of the signal is irrelevant to investor confidence. The second type is normally distributed signals, and the higher is the precision of new confirming signal, the less likely are investors to revise their confidence upward.

after earnings announcements. More specifically, we replace the dependent variable $CAR_{[t_1,t_2]}$ in regression equations (6) and (7) with $CAID_{[t_1,t_2]}$. The results are reported in Table 8.[22] As can be seen from Panel A, for stocks with earnings news confirming preannouncement CAID, the coefficient of $CAID_{[-40,-1]}$ is 0.0313 and significant at the 1% level in the regression of $CAID_{[2,20]}$. It is −0.0482 and significant at the 1% level in the regression of $CAID_{[21,40]}$, and it continues to be negative and significant for the regressions of CAIDs over later subperiods. This demonstrates that institutions continue their preannouncement trading directions in

TABLE 8

Tests for the Self-Attribution Hypothesis Based on Postannouncement Abnormal Institutional Demand

Panels A and B of Table 8 test the self-attribution hypothesis using the following regression models, respectively:

$$CAID_{[t_1,t_2]} = \beta_0 + \beta_1 CAID_{[-40,-1]} \times \boldsymbol{I}(SUE \times CAID_{[-40,-1]} > 0) + \beta_2 CAID_{[-40,-1]} \times \boldsymbol{I}(SUE \times CAID_{[-40,-1]} \leq 0) + \beta_3 CAR_{[-40,-1]} + \sum_{i=1}^{12} \gamma_i CV_i + \varepsilon,$$

$$CAID_{[t_1,t_2]} = \beta_0 + \beta_1 CAID_{[-40,-1]} \times \boldsymbol{I}(SUE \times CAID_{[-40,-1]} > 0) \times |SUE| + \beta_2 CAID_{[-40,-1]} \times \boldsymbol{I}(SUE \times CAID_{[-40,-1]} \leq 0) \times |SUE| + \beta_3 CAR_{[-40,-1]} + \beta_4 |SUE| + \sum_{i=1}^{12} \gamma_i CV_i + \varepsilon,$$

where $CAID_{[t_1,t_2]}$ is the cumulative abnormal institutional demand from day t_1 to day t_2, $CAR_{[t_1,t_2]}$ is the cumulative abnormal return, SUE is standardized unexpected earnings. $\boldsymbol{I}(x>0)$ is equal to 1 if $x>0$ is true, and 0 otherwise. Control variables CV_i are estimated in the year before the earnings announcements and include stock size, stock price, stock illiquidity, market beta, idiosyncratic volatility, bid–ask spread, institutional ownership, analyst coverage, book-to-market ratio, probability of information-based trading, firm age, and dispersion in analyst forecasts of the stock. Standard errors are clustered by stock and calendar quarter (Petersen (2009)) and 2-way cluster-robust *t*-statistics are reported in parentheses. *** indicates significance at the 1% level.

	$CAID_{[2,20]}$	$CAID_{[21,40]}$	$CAID_{[41,80]}$	$CAID_{[81,120]}$
Panel A. Tests for the Self-Attribution Hypothesis Considering SUE Direction Only				
$CAID_{[-40,-1]} \times \boldsymbol{I}(SUE \times CAID_{[-40,-1]} > 0)$	0.0313***	−0.0482***	−0.1699***	−0.1867***
	(5.659)	(−7.271)	(−10.118)	(−9.057)
$CAID_{[-40,-1]} \times \boldsymbol{I}(SUE \times CAID_{[-40,-1]} \leq 0)$	−0.0196***	−0.0788***	−0.1617***	−0.1486***
	(−3.235)	(−10.260)	(−8.913)	(−8.021)
$CAR_{[-40,-1]}$	1.3858***	1.0001***	0.8652***	1.0423***
	(5.461)	(4.193)	(2.985)	(2.620)
Control variables	Yes	Yes	Yes	Yes
R^2 (%)	0.35	1.09	2.86	2.74
Adj. R^2 (%)	0.33	1.07	2.84	2.72
Panel B. Tests for the Self-Attribution Hypothesis Considering Both SUE Direction and Magnitude				
$CAID_{[-40,-1]} \times \boldsymbol{I}(SUE \times CAID_{[-40,-1]} > 0) \times \lvert SUE \rvert$	0.0067***	−0.0053***	−0.0268***	−0.0319***
	(5.943)	(−3.501)	(−9.366)	(−9.179)
$CAID_{[-40,-1]} \times \boldsymbol{I}(SUE \times CAID_{[-40,-1]} \leq 0) \times \lvert SUE \rvert$	−0.0065***	−0.0162***	−0.0251***	−0.0214***
	(−5.072)	(−9.798)	(−6.420)	(−6.136)
$CAR_{[-40,-1]}$	1.3799***	0.7769***	0.3751	0.5648
	(5.447)	(3.039)	(1.390)	(1.338)
$\lvert SUE \rvert$	0.0332***	0.0152	−0.0049	0.0115
	(3.159)	(1.241)	(−0.284)	(0.678)
Control variables	Yes	Yes	Yes	Yes
R^2 (%)	0.39	0.64	1.14	1.12
Adj. R^2 (%)	0.37	0.62	1.12	1.10

[22]We consolidate $CAID_{[41,60]}$ and $CAID_{[61,80]}$ to $CAID_{[41,80]}$, and $CAID_{[81,100]}$ and $CAID_{[101,120]}$ to $CAID_{[81,120]}$ in Table 8. Table A10 in the Supplementary Material reports the results without consolidation and uses various preannouncement periods.

the first calendar month after earnings news confirms their preannouncement trading decisions, but later they change their trading directions. For stocks with disconfirming earnings news, the coefficient of $\text{CAID}_{[-40,-1]}$ is -0.0196 and significant at the 1% level for the regression of $\text{CAID}_{[2,20]}$ and remains negative and significant over later subperiods. This indicates that institutions start their mispricing correction shortly after disconfirming earnings announcements. The negative relation between preannouncement CAID and earlier (later) postannouncement CAID is stronger (weaker) for stocks with disconfirming earnings news versus confirming news, which is consistent with asymmetric shifts in institutions' confidence level.

Panel B of Table 8 reports the regression results after taking the magnitude of earnings surprise into account. A greater positive (negative) surprise indicates a better investment outcome if institutions buy (sell) before the announcement, and institutions are expected to be more overly confident if they are subject to self-attribution bias. This is the case here because the regression coefficient of $\text{CAID}_{[-40,-1]} \times \boldsymbol{I}\left(\text{SUE} \times \text{CAID}_{[-40,-1]} > 0\right) \times |\text{SUE}|$ is positive and significant for the regression of $\text{CAID}_{[2,20]}$ and is negative and significant for the regressions of CAIDs in the later periods. In addition, for the regressions of CAIDs in later periods, the coefficient of $\text{CAID}_{[-40,-1]} \times \boldsymbol{I}\left(\text{SUE} \times \text{CAID}_{[-40,-1]} > 0\right) \times |\text{SUE}|$ is more negative than the corresponding coefficient of $\text{CAID}_{[-40,-1]} \times \boldsymbol{I}\left(\text{SUE} \times \text{CAID}_{[-40,-1]} \leq 0\right) \times |\text{SUE}|$. Therefore, the asymmetric patterns in the regression coefficients of $\text{CAID}_{[-40,-1]}$ increase with |SUE|.

Because ANcerno data provide client codes for the sample period until Dec. 2010, we further examine the behavioral bias at the level of individual ANcerno clients. The demand of an ANcerno client is characterized by the daily imbalance as shown here:

$$\text{(8)} \qquad \text{IIM}_{k,i,t} = \frac{\text{BUY\_VOLUME}_{k,i,t} - \text{SELL\_VOLUME}_{k,i,t}}{\text{BUY\_VOLUME}_{k,i,t} + \text{SELL\_VOLUME}_{k,i,t}},$$

where $\text{BUY\_VOLUME}_{k,i,t}$ ($\text{SELL\_VOLUME}_{k,i,t}$) is the number of shares purchased (sold) by ANcerno institution k for stock i on day t. Then, abnormal demand is proxied by standardized volume imbalance:

$$\text{(9)} \qquad \text{AIID}_{k,i,t} = \frac{\text{IIM}_{k,i,t} - \overline{\text{IIM}}_{k,i,\text{YEAR}(t)}}{\text{std}\left(\text{IIM}_{k,i,\text{YEAR}(t)}\right)},$$

where $\text{YEAR}(t)$ denotes the year to which day t belongs and $\overline{\text{IIM}}_{k,i,\text{YEAR}(t)}$ and $\text{std}\left(\text{IIM}_{k,i,\text{YEAR}(t)}\right)$ are sample mean and standard deviation of $\text{IIM}_{k,i,t}$ over $\text{YEAR}(t)$. Consequently, cumulative abnormal individual institutional demand over period $[t_1, t_2]$ is $\text{CAIID}_{i,[t_1,t_2]} = \sum_{t=t_1}^{t_2} \text{AIID}_{i,t}$.

In Panel A of Table 9, we divide all client-announcement observations into 2 subsamples, one with confirming news and the other with disconfirming news, and report the percentage of individual institutions continuing their preannouncement trading directions over the subperiods after earnings announcements. As can be seen from the first column, 61.02% (10.11%) of individual institutions continue their preannouncement trading directions over the period of $[2,20]$ after receiving

TABLE 9

Trading Directions of Individual Institutions in Postannouncement Periods

Panel A of Table 9 divides observations into 2 subsamples: confirming news, that is, $\text{SUE} \times \text{CAIID}_{[-40,-1]} > 0$, and disconfirming news, that is, $\text{SUE} \times \text{CAIID}_{[-40,-1]} \le 0$, where SUE is standardized unexpected earnings and $\text{CAIID}_{[-40,-1]}$ is the cumulative abnormal demand of individual institutions from day −40 to day −1. The panel reports the percentage of institutions continuing their preannouncement trading directions in the postannouncement period of $[t_1, t_2]$. Panel B examines the probability of institutions continuing their preannouncement trading directions in the postannouncement period of $[t_1, t_2]$ and reports the marginal effects of the following probit regression models:

$$\mathbf{Pr}(\text{CO}_{[t_1,t_2]}) = \Phi\left(\beta_0 + \beta_1 \boldsymbol{I}(\text{SUE} \times \text{CAIID}_{[-40,-1]} > 0) + \beta_2 \text{CAIID}_{[-40,-1]} + \beta_3 \text{CAR}_{[-40,-1]} + \sum_{i=1}^{12} \gamma_i \text{CV}_i + \varepsilon\right),$$

$$\mathbf{Pr}(\text{CO}_{[t_1,t_2]}) = \Phi\left(\beta_0 + (\beta_1 + \beta_2|\text{SUE}|)\boldsymbol{I}(\text{SUE} \times \text{CAIID}_{[-40,-1]} > 0) + \beta_3 \text{CAIID}_{[-40,-1]} + \beta_4 \text{CAR}_{[-40,-1]} + \beta_5 |\text{SUE}| + \sum_{i=1}^{12} \gamma_i \text{CV}_i + \varepsilon\right),$$

where the dummy variable $\text{CO}_{[t_1,t_2]}$ equals 1 if $\text{CAIID}_{[t_1,t_2]} \times \text{CAIID}_{[-40,-1]} > 0$, and 0 otherwise, $\Phi(\cdot)$ is the cumulative distribution function of the standard normal distribution, and $\text{CAR}_{[-40,-1]}$ is the cumulative abnormal return from day −40 to day −1. $\boldsymbol{I}(x > 0)$ is the indicator function, which equals 1 if the condition $x > 0$ is satisfied, and 0 otherwise. CV_i are control variables estimated in the year before the earnings announcements, including stock size, stock price, stock illiquidity, market beta, idiosyncratic volatility, bid–ask spread, institutional ownership, analyst coverage, book-to-market ratio, probability of information-based trading, firm age, and dispersion in analyst forecasts of the stock. Robust standard errors are clustered at the individual institution level and reported in parentheses. ** and *** indicate significance at the 5% and 1% levels, respectively.

Panel A. Individual Institutions' Trading Directions in the Postannouncement Period

	$\text{CAIID}_{[2,20]}$	$\text{CAIID}_{[21,40]}$	$\text{CAIID}_{[41,60]}$	$\text{CAIID}_{[61,80]}$	$\text{CAIID}_{[81,100]}$	$\text{CAIID}_{[101,120]}$
Confirming news	61.02%	57.95%	53.96%	50.58%	49.86%	46.85%
Disconfirming news	10.11%	9.64%	8.94%	8.39%	8.26%	7.71%

Panel B. Marginal Effects on the Probability of Individual Institutions Continuing Their Preannouncement Trading Directions after Announcements

	$\mathbf{Pr}(\text{CO}_{[2,20]})$	$\mathbf{Pr}(\text{CO}_{[21,40]})$	$\mathbf{Pr}(\text{CO}_{[41,60]})$	$\mathbf{Pr}(\text{CO}_{[61,80]})$	$\mathbf{Pr}(\text{CO}_{[81,100]})$	$\mathbf{Pr}(\text{CO}_{[101,120]})$
$\boldsymbol{I}(\text{SUE} \times \text{CAIID}_{[-40,-1]} > 0)$	0.5394***	0.5131***	0.4764***	0.4467***	0.4402***	0.4123***
	(0.0051)	(0.0049)	(0.0046)	(0.0037)	(0.0034)	(0.0026)
$\text{CAIID}_{[-40,-1]}$	−0.0058***	−0.0055***	−0.0046***	−0.0041***	−0.0039***	−0.0032***
	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0001)
$\text{CAR}_{[-40,-1]}$	0.0054***	0.0027**	0.0045	0.0062***	0.0072***	0.0097
	(0.0012)	(0.0010)	(0.0010)	(0.0011)	(0.0011)	(0.0011)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-R^2 (%)	24.57	23.79	22.76	22.00	21.83	21.23

(continued on next page)

TABLE 9 (continued)

Trading Directions of Individual Institutions in Postannouncement Periods

Panel B. Marginal Effects on the Probability of Individual Institutions Continuing Their Preannouncement Trading Directions after Announcements (continued)

	$\mathbf{Pr}(CO_{[2,20]})$	$\mathbf{Pr}(CO_{[21,40]})$	$\mathbf{Pr}(CO_{[41,60]})$	$\mathbf{Pr}(CO_{[61,80]})$	$\mathbf{Pr}(CO_{[81,100]})$	$\mathbf{Pr}(CO_{[101,120]})$
$\boldsymbol{I}(\text{SUE} \times \text{CAIID}_{[-40,-1]} > 0)$	0.5299***	0.5039***	0.4680***	0.4380***	0.4319***	0.4029***
	(0.0050)	(0.0048)	(0.0045)	(0.0036)	(0.0034)	(0.0026)
$\boldsymbol{I}(\text{SUE} \times \text{CAIID}_{[-40,-1]} > 0) \times \lvert\text{SUE}\rvert$	0.0026***	0.0024***	0.0020***	0.0020***	0.0019***	0.0020***
	(0.0002)	(0.0001)	(0.0002)	(0.0001)	(0.0001)	(0.0001)
$\text{CAIID}_{[-40,-1]}$	−0.0058***	−0.0055***	−0.0046***	−0.0041***	−0.0040***	−0.0032***
	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0001)
$\text{CAR}_{[-40,-1]}$	0.0057***	0.0028***	0.0047***	0.0063**	0.0074***	0.0098***
	(0.0012)	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0011)
$\lvert\text{SUE}\rvert$	−0.0010***	−0.0008***	−0.0007***	−0.0006***	−0.0007***	−0.0006***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-R^2 (%)	24.58	23.80	22.77	22.01	21.84	21.24

confirming (disconfirming) news. When moving to later postannouncement periods, the percentage of institutions continuing their preannouncement trading directions reduces gradually for the subsample with confirming news and is less than 50%, consistent with delayed mispricing correction. For the subsample with disconfirming news, the percentage of institutions trading in the opposite directions of their preannouncement trading remains high over all subperiods after earnings announcements.

To further examine the probability of individual institutions continuing their preannouncement trading directions in the postannouncement period of $[t_1, t_2]$, we run the following 2 probit regressions:

$$(10)\quad \mathbf{Pr}\left(\mathrm{CO}_{[t_1,t_2]}\right) = \Phi\big(\beta_0 + \beta_1 \boldsymbol{I}\left(\mathrm{SUE} \times \mathrm{CAIID}_{[-40,-1]} > 0\right) + \beta_2 \mathrm{CAIID}_{[-40,-1]} + \beta_3\, CAR_{([-40,-1])} + \sum_{(i=1)}^{12} \gamma_i CV_i + \varepsilon\big),$$

$$(11)\quad \mathbf{Pr}\left(\mathrm{CO}_{[t_1,t_2]}\right) = \Phi\big(\beta_0 + (\beta_1 + \beta_2|\mathrm{SUE}|)\boldsymbol{I}\left(\mathrm{SUE} \times \mathrm{CAIID}_{[-40,-1]} > 0\right) + \beta_3\, CAIID_{([-40,-1])} + \beta_4\, CAR_{([-40,-1])} + \beta_5 |SUE| + \sum_{(i=1)}^{12} \gamma_i CV_i + \varepsilon\big),$$

where dummy variable $\mathrm{CO}_{[t_1,t_2]}$ equals 1 if $\mathrm{CAIID}_{[t_1,t_2]} \times \mathrm{CAIID}_{[-40,-1]} > 0$, and 0 otherwise. $\mathbf{Pr}\left(\mathrm{CO}_{[t_1,t_2]}\right)$ denotes the probability of $\mathrm{CO}_{[t_1,t_2]}$ being 1 and $\Phi(\cdot)$ is the cumulative distribution function of the standard normal distribution. We focus on the economic significance of our results and present the marginal effects obtained from the probit models in Panel B of Table 9. We observe from regression equation (10) that individual institutions are more likely to continue their preannouncement trading directions after confirming earnings announcements. For instance, the probability of continuation increases by 53.94% over the period of [2,20], but this figure gradually declines in later periods. The results in the lower part of Panel B indicate that the likelihood of trading continuation is positively related to the magnitude of earnings surprise. Collectively, our trading tests confirm that institutions' confidence is outcome dependent and they become more overly confident if their trading decisions are confirmed by more surprising earnings news.

VI. PEAD Anomaly

Our tests of the self-attribution hypothesis reveal that the return pattern of a stock after its earnings announcements largely depends on institutional investors' reaction to earnings news. Thus, a natural question to ask is whether institutions' overconfidence, self-attribution bias in particular, contributes to the PEAD anomaly. Before answering this question, we first confirm the existence of the PEAD anomaly by testing the following model:

$$(12)\quad \mathrm{CAR}_{[t_1,t_2]} = \beta_0 + \beta_1 \mathrm{SUE} + \beta_2 \mathrm{CAR}_{[-40,-1]} + \sum_{i=1}^{12} \gamma_i \mathrm{CV}_i + \varepsilon.$$

The literature on the PEAD anomaly usually adopts a period of 60 days after an earnings announcement as the postannouncement period (see, e.g., Bernard and Thomas (1989)). Thus, the period of $[2,60]$ in Table 10 is the focus of our PEAD analysis but we also include the period of $[61,120]$ to investigate the effect of delayed mispricing correction by institutions. The first column displays a positive and significant relation between SUE and $\text{CAR}_{[2,60]}$. Thus, CAR drifts in the same direction as SUE in the day 2 to day 60 period, indicating the existence of the PEAD anomaly. However, this drift is partially reversed in the later day 61 to day 120 period, as the third column documents a negative relation between SUE and $\text{CAR}_{[61,120]}$. A similar reversal is observed by Milian (2015).

Because institutions' trading and mispricing correction in the postannouncement period depend on the outcome of their preannouncement investment, we augment equation (12) to examine the impact of earnings surprise conditional on whether earnings announcements confirm or disconfirm preannouncement institutional demand:

$$(13)\qquad \begin{aligned} \text{CAR}_{[t_1,t_2]} = {} & \beta_0 + \beta_1 \text{SUE} \times \boldsymbol{I}\left(\text{SUE} \times \text{CAID}_{[-40,-1]} > 0\right) \\ & + \beta_2 \text{SUE} \times \boldsymbol{I}\left(\text{SUE} \times \text{CAID}_{[-40,-1]} \leq 0\right) \\ & + \beta_3 \text{CAR}_{[-40,-1]} + \sum_{i=1}^{12} \gamma_i \text{CV}_i + \varepsilon. \end{aligned}$$

The second column in Table 10 shows that the predictive effects of SUE on $\text{CAR}_{[2,60]}$ exhibit a profound difference between stocks with confirming and disconfirming earnings news. More specifically, the positive relation between SUE and $\text{CAR}_{[2,60]}$ remains significant for stocks with disconfirming earnings news, but is insignificant for stocks with confirming earnings news. This suggests that institutional investors tend to correct mispricing in a timely manner when earnings news disconfirms their preannouncement trading, and therefore CAR over period $[2,60]$ drifts in the direction of earnings news. Nevertheless, institutional trading after receiving confirming earnings news does not trigger the anomaly. Combining both types of earnings news, we observe a standard PEAD anomaly as shown in the first column. Moving to the later day 61 to day 120 period, the fourth column documents a negative and significant (insignificant) relation between SUE and $\text{CAR}_{[61,120]}$ for stocks with confirming (disconfirming) earnings news. This suggests that institutions continue their delayed correction of mispricing in this later period upon receiving confirming earnings news; however, there is no tangible CAR drift if news is disconfirming. Averaging over the two types of earnings news leads to the PEAD reversal shown in the third column.

To further understand how institutions' self-attribution bias is linked to the PEAD anomaly over the day 2 to day 60 period, we consider 2 subperiods of $[2,30]$ and $[31,60]$ and replicate regression equations (12) and (13). The predictive effect of SUE on $\text{CAR}_{[2,30]}$ remains strong for stocks with disconfirming earnings news, consistent with institutions starting to correct the stock mispricing shortly after the earnings announcements. For stocks with confirming news, SUE becomes a significant return predictor over the day 2 to day 30 period. This demonstrates that institutions tend to continue their mispricing shortly after earnings announcements when their preannouncement trades are confirmed by earnings news, and such reinforced confidence contributes to the PEAD anomaly as predicted by Daniel et al. (1998).

TABLE 10

The PEAD Anomaly and the Role of Institutional Trading

Table 10 demonstrates the existence of the post-earnings-announcement drift (PEAD) anomaly and the role of institutional trading in contributing to the PEAD anomaly, using the following regressions:

$$\text{CAR}_{[t_1,t_2]} = \beta_0 + \beta_1 \text{SUE} + \beta_2 \text{CAR}_{[-40,-1]} + \sum_{i=1}^{12} \gamma_i \text{CV}_i + \varepsilon,$$

$$\text{CAR}_{[t_1,t_2]} = \beta_0 + \beta_1 \text{SUE} \times \boldsymbol{I}(\text{SUE} \times \text{CAID}_{[-40,-1]} > 0) + \beta_2 \text{SUE} \times \boldsymbol{I}(\text{SUE} \times \text{CAID}_{[-40,-1]} \leq 0) + \beta_3 \text{CAR}_{[-40,-1]} + \sum_{i=1}^{12} \gamma_i \text{CV}_i + \varepsilon,$$

where $\text{CAR}_{[t_1,t_2]}$ is the cumulative abnormal return from day t_1 to day t_2, $\text{CAID}_{[-40,-1]}$ is the cumulative abnormal institutional demand from day −40 to day −1, and SUE is standardized unexpected earnings. $\boldsymbol{I}(\text{CAID}_{[-40,-1]} \times \text{SUE} > 0)$ is the dummy variable of confirming earnings news (i.e., $\text{CAID}_{[-40,-1]}$ is on the same side of SUE), and $\boldsymbol{I}(\text{CAID}_{[-40,-1]} \times \text{SUE} \leq 0)$ is the dummy variable of disconfirming earnings news. Control variables CV_i are estimated in the year before the earnings announcements and they include stock size, which is the logarithm of the average daily market capitalization; stock price; stock illiquidity; market beta; idiosyncratic volatility; bid–ask spread; institutional ownership; analyst coverage; book-to-market ratio; probability of information-based trading; firm age; and dispersion in analyst forecasts of the stock. Standard errors are clustered by stock and calendar quarter (Petersen (2009)) and 2-way cluster-robust t-statistics are reported in parentheses. * and *** indicate significance at the 10% and 1% levels, respectively.

	$\text{CAR}_{[2,60]}$		$\text{CAR}_{[61,120]}$		$\text{CAR}_{[2,30]}$		$\text{CAR}_{[31,60]}$	
SUE	0.0017***		−0.0007*		0.0016***		0.0001	
	(2.707)		(−1.712)		(4.394)		(0.216)	
$\text{SUE} \times \boldsymbol{I}(\text{CAID}_{[-40,-1]} \times \text{SUE} > 0)$		0.0006		−0.0015***		0.0010***		−0.0004
		(0.931)		(−2.742)		(3.046)		(−0.615)
$\text{SUE} \times \boldsymbol{I}(\text{CAID}_{[-40,-1]} \times \text{SUE} \leq 0)$		0.0025***		−0.0001		0.0020***		0.0005
		(3.787)		(−0.202)		(4.627)		(1.201)
$\text{CAR}_{[-40,-1]}$	−0.0587***	−0.0581***	−0.0007	−0.0002	−0.0492***	−0.0488***	−0.0096	−0.0093
	(−2.781)	(−2.757)	(−0.019)	(−0.007)	(−3.481)	(−3.462)	(−0.605)	(−0.586)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 (%)	0.47	0.50	0.86	0.88	0.61	0.62	0.12	0.14
Adj. R^2 (%)	0.45	0.48	0.85	0.86	0.59	0.60	0.11	0.12

VII. Robustness Checks

The relation between preannouncement CAID and postannouncement CAR can be sensitive to the choice of pre- and postannouncement windows. As reported earlier, we adopt various windows for these periods and find qualitatively similar results. For brevity, most are tabulated in the Supplementary Material. In addition to these considerations, we perform various tests to examine the robustness of our findings.

A. Alternative Measure of Institutional Demand

Motivated by the theoretical herding literature, Dasgupta et al. (2011) propose institutional trade persistence as a proxy for institutional trading. Following this, we consider an alternative measure of institutional demand, namely, the ratio of institutional trading (RIT):

$$\text{RIT}_{i,k} = \frac{\text{BUY\_DAYS}_{i,k} - \text{SELL\_DAYS}_{i,k}}{\text{BUY\_DAYS}_{i,k} + \text{SELL\_DAYS}_{i,k}}, \tag{14}$$

where $\text{BUY\_DAYS}_{i,k}$ and $\text{SELL\_DAYS}_{i,k}$ are the total numbers of days that stock i is net purchased and sold, respectively, by ANcerno institutions during period k. Preannouncement abnormal institutional demand is defined by $\text{ARIT}_{i,[-40,-1]} = \text{RIT}_{i,[-40,-1]} - \text{RIT}_{i,\text{YEAR}(t)}$, where $\text{RIT}_{i,\text{YEAR}(t)}$ is the institutional trading ratio for the year to which the announcement date belongs. Panel A of Table A14 in the Supplementary Material documents the results of the regression analysis of various CARs as specified in equation (3) but using $\text{ARIT}_{[-40,-1]}$ instead of $\text{CAID}_{[-40,-1]}$ as the key explanatory variable. A negative and significant relation exists between $\text{ARIT}_{[-40,-1]}$ and subsequent return, which is consistent with the overconfidence findings using $\text{CAID}_{[-40,-1]}$. To test for institutions' outcome-dependent confidence, we rerun regression equations (6) and (7) but use $\text{ARIT}_{[-40,-1]}$ instead of $\text{CAID}_{[-40,-1]}$ as the key explanatory variable. We present the results in Panels B and C of Table A14. They reveal findings similar to Table 7 and support the self-attribution hypothesis.

B. Alternative Measure of Abnormal Return

We consider an alternative measure of abnormal return by matching a sample stock with the stocks of similar size, book-to-market ratio (BM), and momentum that also announce earnings in the same calendar quarter. Each quarter, 125 benchmark portfolios are constructed and abnormal return is then calculated as the raw stock return minus the average return of the benchmark that the stock falls in. Table A15 in the Supplementary Material indicates that support for the overconfident institutions and their self-attribution bias is robust to the alternative CAR measure.

C. Other Robustness Checks

Recent studies reveal that past volume and return can predict return over the earnings announcement period (Akbas (2016)). Therefore, we use dummy variables of unusually low volume and the prior 12-month return to control for such return predictability in unreported regression analysis. Although ANcerno clients are largely pension and mutual funds, there are a small number of hedge funds. To avoid institutional heterogeneity, we exclude hedge funds when calculating CAID and report the main results in Table A16 in the Supplementary Material.[23] Our analysis requires pre-announcement (post-announcement) periods up to 40 (120) days. It is likely that some institutions become ANcerno clients or stop being clients during our evaluation periods. To address sample variation, we also estimate CAID based on ANcerno institutions that have their first (last) report date before (after) the start (end) of the preannouncement (postannouncement) period. We report the results of our main analysis in Table A17. Our findings of overconfident institutions and their self-attribution bias are not qualitatively different in these robustness tests.

VIII. Concluding Remarks

In this article, we examine the association between the behavioral bias of institutional investors and market mispricing around earnings announcements, which is exceptionally interesting because mispricing correction is often strong when earnings news is released. We provide evidence that preannouncement abnormal institutional demand negatively predicts subsequent abnormal returns, and show that institutional overconfidence rather than institutional trading price pressure drives stock prices to deviate from their fundamentals before earnings announcements. We also demonstrate that the negative relation is stronger for stocks that are more difficult to value and that have higher information asymmetry. This offers evidence that institutional investors tend to be more overconfident in these situations.

By conditioning on earnings surprise, we examine institutions' outcome-dependent confidence arising from biased self-attribution. Confirming earnings news is likely to exacerbate the overconfidence of institutional investors and in turn lead them to be even more biased in the period immediately after the earnings announcements and to delay mispricing correction. However, disconfirming earnings news does not have such effects; consequently, the correction occurs sooner. These asymmetric changes in investors' confidence and the resulting asymmetric mispricing correction after earnings announcements contribute to the PEAD phenomenon.

Supplementary Material

To view supplementary material for this article, please visit http://dx.doi.org/10.1017/S002210902000037X.

[23]We thank Russell Jame for making the list of ANcerno client–manager pairs classified as hedge funds available on his personal website. In our ANcerno data, client codes are not provided after 2010. Therefore, we consider the sample period from 2000 to 2010 in the analysis, which requires information on client codes, including Table 9 in the article and Tables A11, A16, and A17 in the Supplementary Material.

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