

Cremers, Martijn; Pareek, Ankur; Sautner, Zacharias

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Short-Term Institutions, Analyst Recommendations, and Mispricing: The Role of Higher Order Beliefs

MARTIJN CREMERS,* ANKUR PAREEK,†
AND ZACHARIAS SAUTNER‡

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ABSTRACT

We document that stocks that have optimistic (pessimistic) consensus recommendations and are currently held by many short-term institutions exhibit large stock-return reversals: Their large past outperformance (underperformance) is followed by large negative (positive) future alphas. The predictable return reversals originate from overreaction to past recommendation releases and the correction of these overreactions around future releases. Results are stronger when earnings news is released and at firms with higher fundamental uncertainty. Further, firms with more short-term institutions show stronger announcement returns and price drift after recommendation changes. Our

*University of Notre Dame; †University of Nevada, Las Vegas; ‡Frankfurt School of Finance & Management

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results are consistent with models of higher order beliefs where short-term institutions coordinate trading around public signals.

JEL codes: G12, G14, M40

Keywords: short-term institutions; analyst recommendations; mispricing; higher order beliefs

1. Introduction

In standard asset-pricing models with a representative investor, higher order beliefs—that is, investor beliefs about the beliefs of other investors—do not matter, and stock prices reflect the discounted expected value of future dividends. This is different from models that feature multiple investors with heterogeneous information. In these models, the *average* expectation of all investors determines stock prices, and investors' beliefs about other investors' beliefs can cause a deviation between the prices and the fundamental values of stocks. The role of higher order beliefs in financial markets can be traced back to Keynes' [1936] comparison of the stock market to a beauty contest, and interest in higher order beliefs models extends into the present day.¹

In higher order beliefs models, public signals play an important role in the evolution of stock prices. Investors know that a public signal affects the average belief about the next period's stock price, as all investors observe the public signal and combine it with their private information. Because short-term investors are interested only in the next period's stock price, they rationally overweight the public signal compared to private signals. This may lead to a short-term overreaction of the stock price to the public signal, which is subsequently reversed when investors synchronize their trading in the opposite direction to correct the mispricing (Abreu and Brunnermeier [2003]). We refer to this mechanism as the "higher-order beliefs hypothesis."²

We test this hypothesis by examining whether short-term investors overweight widely disseminated public signals about stocks, leading to stock return predictability. For the public signals, we use analyst stock-recommendation releases, which are visible and widely followed public events that affect stock prices (Kacperczyk and Seru [2007]). At the same time, there are several indications that analyst recommendations

¹ See Biais and Bossaerts [1998], Abreu and Brunnermeier [2003], Allen, Morris, and Shin [2016], Bacchetta and van Wincoop [2008], Banerjee, Kaniel, and Kremer [2009], and Kondor [2012].

² An anecdotal example of the role of higher order beliefs is the downgrade of Citigroup by analyst Meredith Whitney in the financial crisis, which caused a large stock price drop. In her downgrade, Whitney seemed to only reiterate information in reports by other analysts. Because her downgrade was not based on new information, the reaction likely originated from investors that thought Whitney would catalyze investor beliefs (see "When Meredith Whitney Calls, Should You Listen?" *The Wall Street Journal*, April 9, 2009.)

contain limited fundamental information. First, analysts are commonly conflicted—they must generate trading volume and cater to management (Irvine [2000], Ertimur, Muslu, and Zhang [2011]). This makes their recommendations less likely *ex ante* to convey fundamental information (Beyer and Guttman [2011]). Second, Malmendier and Shantikumar [2014] show that analysts frequently “speak in two tongues,” revising recommendations in the opposite direction as their earnings forecast, which supports the view that recommendations contain little fundamental information. Third, there is little evidence that analyst recommendations predict stock prices or fundamental values over the long term (Barber et al. [2001]).

Our proxy for the presence of short-term investors is fund turnover, which is the average portfolio turnover of a firm’s institutional investors (Gaspar, Massa, and Matos [2005]). For robustness, we consider ownership by transient institutions (Bushee [1998], [2001]) and share turnover. Our tests use U.S. stocks, but we confirm our main results for international stocks. We demonstrate that short-term institutional ownership and extreme analyst recommendations (“strong buys” and “sells”) are mean-reverting over periods of one to two years but not in related ways, which implies that both variables are strongly predictable.

We then document predictable return reversals for stocks with extreme analyst recommendations and ownership by many short-term institutions across the same one- to two-year period that both the presence of short-term institutions and recommendations mean-revert. Using portfolio sorts, we show that, for high fund-turnover stocks (top quintile), the value-weighted long-short portfolio that sells (buys) stocks with the most optimistic (pessimistic) recommendations has an annualized five-factor alpha of 8.3% (*t*-stat of 3.41). These future alphas reflect return reversals, as the stocks with the most optimistic (pessimistic) current recommendations had positive (negative) alphas in the past. In Fama-MacBeth regressions, we find that, for high fund-turnover stocks, the next year’s average return is -4.7% when analysts are optimistic and 4.5% when analysts are pessimistic.³

To show that our results are driven by analyst recommendations, we calculate event-time cumulative abnormal returns (CARs) around recommendation releases. The stocks that have the most optimistic (pessimistic) analysts and are held by many short-term institutions had much higher (lower) CARs around *previous* recommendation releases. Large parts of these CARs are reversed around *future* recommendation releases, when recommendations reverse back to the mean.

The return reversals support an interpretation in which analyst recommendations act as coordinating signals for higher order belief traders, leading first to return overreactions and then to return reversals. However, the return patterns may also be consistent with an alternative “information-source hypothesis,” which holds that short-term institutions are more likely

³ The return pattern for pessimistic analysts is weaker in portfolio sorts and in the international sample.

to “outsource” their investment decisions to analysts, that is, to use analyst recommendations more strongly as inputs in their fundamentals-based valuations, relative to long-term institutions. To rule out this alternative, we test a series of predictions from models of higher order beliefs.

First, we examine the CARs of analyst recommendations at times when firms release earnings news. The model by Kondor [2012] predicts that, in the presence of short-term investors, earnings news can *polarize* higher order beliefs about the stock price (i.e., lead to more disagreement).⁴ Consistent with this prediction, the reversal pattern in CARs of high fund-turnover stocks is more pronounced when recommendations are released around earnings news. In contrast, under the alternative hypothesis, updated earnings news would increase the availability of fundamental information, making short-term institutions *less* reliant on—and less likely to overweight—analyst recommendations.

Second, in models of higher order beliefs, traders price stocks by combining private and public signals (Allen, Morris, and Shin [2006]). The models therefore imply that coordination around public signals is stronger if the private signal is noisier. Consistent with this prediction, the reversal pattern in CARs at high fund-turnover stocks is more pronounced at firms with high fundamental uncertainty, that is, among stocks with noisier private signals (high earnings volatility, R&D, and intangibles).

Third, Allen, Morris, and Shin [2016] and Banerjee, Kaniel, and Kremer [2009] predict that, in the presence of higher order beliefs traders, stock prices exhibit drift after public signals are released; that is, prices move only slowly toward fundamental values. This effect should be particularly strong at stocks whose ownership includes many short-term institutions. Empirically, stocks with more short-term institutions show stronger initial price reactions and stronger price drifts following recommendation changes. We validate these results by documenting particularly strong price reactions and drift at high fund-turnover stocks during the 1998–2000 tech bubble (a period in which widespread bubble-like mispricing has been documented).⁵ This evidence supports the predictions of higher order beliefs models but not the information-source hypothesis. Under the alternative hypothesis, stronger price drift is expected at stocks with more *long-term* institutions, if such investors, relying less on analysts as an input, act with some delay because of information processing or capital constraints.

Fourth, models of higher order beliefs predict that short-term institutions trade more strongly in response to recommendation changes as they overweight public signals. Indeed, on the days when recommendation

⁴ Earning news helps traders guess the private information of others. That more disagreement about the stock price can lead to mispricing, followed by return reversals, has been shown by Diether, Malloy, and Scherbina [2002].

⁵ See Brunnermeier and Nagel [2004] or Greenwood and Nagel [2009]. The results during the tech bubble are concentrated among NASDAQ stocks with high price-to-sales (P/S) ratios, that is, among stocks for which bubble-like mispricing was strongest.

changes are released, short-term institutions trade more strongly into stocks with positive recommendation changes and trade out of stocks with negative recommendation changes. In the postrecommendation period, short-term institutions continue to trade in the direction of the recommendation changes. When we consider institutional flow over the next year, however, short-term institutions trade out of stocks (into stocks) with positive (negative) recommendation releases in the past. Trading by short-term institutions *directly* in response to recommendation changes is also consistent with the information-source hypothesis. However, the alternative hypothesis does not explain short-term institutions' trading patterns in the postrecommendation period: If recommendations are an information source for short-term traders, the only prediction that follows is that their trading would be concentrated around the recommendation changes.

Higher order beliefs have received little attention in the empirical accounting and finance literature. A notable exception is Balakrishnan, Schrand, and Vashishtha [2020], BSV henceforth, who argue that recommendations coordinate higher order beliefs of traders, leading to the formation of asset price bubbles. We advance their findings in several ways. First, we show that concentrated buy recommendations in the presence of short-term institutions lead to predictable negative returns. This suggests that the pattern of concentrated buy recommendations followed by price declines applies not only to the tech bubble but to the cross-section of returns. Second, BSV do not show that analysts played a role in generating the tech bubble (their announcement-return tests focus on the subsequent crash period). In contrast, we show that announcement returns in the bubble period were higher in the presence of short-term traders. This result advances BSV's evidence by linking analyst recommendations to price formation in the bubble period. Third, BSV show that forecast downgrades helped to pop the bubble, and they attribute this development to skilled analysts' anticipation of price moves. We show similar mean-reversion in analyst recommendations independent of whether firms are owned primarily by short-term or long-term institutional investor. This finding suggests that analysts behaved similarly as the investor base changed. However, the future returns differ for firms owned by the two sets of investors. Hence, the similar pattern in recommendations, despite the large differences in future returns, suggests that analysts are not skilled in conditioning on predictable future returns when revising their recommendations. Instead, they simply issue recommendations that tend to mean-revert. This evidence contrasts with the view that analysts are "skilled identifiers of mispricing," but it is consistent with analysts' coordinating investors' beliefs without information about fundamentals.⁶

We also contribute to Brown, Wei, and Wermers [2014], who document that mutual fund herding relates to litigation risk and thus is most

⁶ Gallo [2017] also provides evidence that supports our assumption that the formation of higher order beliefs is correlated with the presence of short-term institutions.

prominent in negative recommendations. In contrast, asset price bubbles tend to form on the long side, and that is where we find our strongest results. In addition, the Brown, Wei, and Wermers results are empirically distinct from ours—our finding that stronger reversals to recommendations occur among stocks with more short-term institutions holds even after we control for their findings.

More broadly, we contribute two sets of studies examining stock price reactions and investor trading in response to analyst recommendations. Brennan, Jegadeesh, and Swaminathan [1993], Womack [1996], Barber et al. [2001], and Jegadeesh et al. [2004] demonstrate that recommendations affect short-term stock prices. Mikhail, Walther, and Willis [2007], Busse, Green, and Jegadeesh [2012], and So [2013] show that institutions trade upon the release of recommendations. Our evidence suggests that the results in these two sets of papers may in part reflect higher order beliefs trading by short-term institutions in response to analyst recommendations.

We also add to the mixed evidence relating short-term institutional ownership and stock returns. Some of the previous work demonstrates that stocks held by many short-term institutions outperform (Yan and Zhang [2009]), and that short-term institutional ownership is associated with more efficient markets (Bartov, Radhakrishnan, and Krinsky [2000], Collins, Gong, and Hribar [2003], Ke and Ramalingegowda [2005], Boehmer and Kelley [2009]). Other work finds that short-term institutions are associated with more anomalous pricing (Hou, Xiong, and Peng [2009], Cremers and Pareek [2015]). We contribute to this literature by demonstrating that analyst recommendations are key to understanding the mixed effects of short-term institutional ownership on stock returns.

2. *Hypotheses Development*

2.1 HIGHER ORDER BELIEFS: ECONOMIC MECHANISM

Discussions on the role of higher order beliefs in financial markets can be traced back to Keynes' [1936] famous statement that investors "are concerned, not with what an investment is really worth to a man who buys it for keeps, but with what the market will value it at [. . .] three months or a year hence." Theoretical papers that examine the effects of higher order beliefs on asset price dynamics include Biais and Bossaerts [1998], Abreu and Brunnermeier [2003], Allen, Morris, and Shin [2016], Bacchetta and Van Wincoop [2008], Banerjee, Kaniel, and Kremer [2009], and Kondor [2012]. These papers differ with respect to the information structure (e.g., whether or not beliefs are common knowledge), the life of the asset (finite or infinite), and the equilibrium concept (rational expectations or differences of opinion), but they have much in common: higher order beliefs, short-term traders, public signals, and predictions of some form of temporary mispricing.

In higher order beliefs models, short-term traders are interested only in a stock's short-term stock price. The short-term stock price is driven by other traders' average expectation of it, rather than by the expectation of all future dividends. Public signals impact the short-term stock price because they affect other traders' average expectation of the short-term payoff. Suppose a trader gets a public signal and a private signal about a stock's payoff, and that both signals are equally informative about the stock's fundamental value (Allen, Morris, and Shin [2016]). In the absence of a role for higher order beliefs, the trader would put equal weight on both signals. However, if there is differential information across traders, then the *average* expectation of the stock's payoff drives the price in the short term. The trader therefore needs to guess this average expectation. Knowing that the public signal is also observed by others, the trader will put more weight on it than on the private signal. This leads to an excess reliance on the public signal and short-term price drift away from the fundamental value. Consequently, the trader's belief about others' beliefs affects the short-term stock price. As short-term traders reverse their positions in the stock before the fundamental value is realized, their payoffs depend on what others are willing to pay for the stock in the short term rather than its fundamental value.

2.2 HIGHER ORDER BELIEFS: ANALYST RECOMMENDATIONS AS PUBLIC SIGNALS

The ideal experiment for testing the higher order beliefs hypothesis would examine whether short-term traders coordinate their trades around public signals that (1) contain no fundamental information and (2) affect stock prices by influencing other investors' opinions. We argue that analyst recommendations plausibly satisfy these two conditions.

With respect to the first condition, there is evidence that analyst recommendations convey only limited fundamental information. First, analysts are commonly conflicted because of incentives to generate trading volume and incentives to cater to management (e.g., Irvine [2000]). Second, analysts frequently "speak in two tongues," revising recommendations in the opposite direction as their earnings forecast (Malmendier and Shantikumar [2014]). And third, analyst recommendations do poorly in predicting stock prices and fundamental values over the long term (e.g., Barber et al. [2001]). With respect to the second condition, analyst recommendations constitute highly visible public signals about a stock and are followed by many traders.⁷ They are thus likely to affect the average opinion about the stock price in the short term. Importantly, analysts express views not only

⁷Li et al. (2015) demonstrate that, following corporate news events, analyst recommendations affect short-term returns by reversing the prevailing market sentiment through the issuance of contrarian revisions. This evidence relates to our analysis because we show that recommendations predict long-term returns as a result of mean reversion in recommendations, which is similar to their notion of "contrarian recommendations" that affect short-term returns.

about firm fundamentals but also about the next period's stock price, which is the metric that short-term traders care about.

2.3 HIGHER ORDER BELIEFS: MODEL PREDICTIONS

Based on these arguments, the higher order belief hypothesis predicts that stocks with currently optimistic (pessimistic) analysts experienced past inflows (outflows) by short-term traders and return outperformance (underperformance), followed by outflows (inflows) of short-term traders and negative (positive) future abnormal returns. If these return reversals are driven by analyst recommendations rather than by confounding information, we also expect positive (negative) CARs around the dates of optimistic (pessimistic) recommendation releases.

A predictable return reversal for stocks with extreme analyst recommendations in the presence of short-term trades supports the higher order beliefs hypothesis, but it could also be consistent with an alternative information-source hypothesis: If short-term traders have limited time for fundamental analysis or face information processing constraints (Kahneman [1973]), they may choose not to allocate effort to generate private information and may instead overweight analyst recommendations. This channel would also lead to return overreactions to recommendation releases and to subsequent return reversals in stock with many short-term institutions. To plausibly rule out this alternative hypothesis, we derive a series of explicit predictions from higher order beliefs models.

Kondor [2012] shows that the presence of short-term traders can polarize higher order beliefs about the stock price when earnings news is released. The reason is that earnings information helps traders guess the private information of other traders. Kondor [2012] shows that earnings news might in turn increase disagreement among different traders' higher order beliefs about the stock price (even if it decreases disagreement about fundamental expectations). Because disagreement has been shown to generate mispricing followed by return reversals (Diether, Malloy, and Scherbina [2002]), earnings releases should amplify the effects of higher order beliefs trading (i.e., lead to stronger overreactions and price reversals). In contrast, under the information-source hypothesis, updated earnings make more fundamental information available and thereby reduce short-term traders' reliance on analysts. As a result, short-term traders should be less likely to overweight analyst recommendations around earnings news.

In higher order beliefs models, traders combine public and private signals to price stocks. The precision (or informativeness) of these signals in turn affects how strongly prices react to analyst recommendations. We expect that, when there is high uncertainty about firm fundamentals, traders find it more difficult to obtain precise private signals on firms. Accordingly, we expect traders to put less weight on their private signals and more weight on the public signal in such cases. Firms with high fundamental uncertainty and many short-term traders would thus have stronger return reactions to analyst recommendations.

Allen, Morris, and Shin [2016] and Banerjee, Kaniel, and Kremer [2009] show that stock prices exhibit drift around public signals in the presence of higher order beliefs.⁸ Price drift means that prices move only slowly toward fundamental values after public signals are released. Following recommendation changes, higher order beliefs models thus predict price drift in the direction of the change, especially for stock with many short-term traders. The models further predict that these return overreactions are particularly pronounced in tech stocks during the tech bubble, a period in which widespread bubble-like mispricing has been documented (Brunnermeier and Nagel [2004], Greenwood and Nagel [2009], BSV). Under the alternative hypothesis, drift around public signals may also arise because of information-processing constraints or limited capital, but it should not be stronger in stocks with many short-term traders. In fact, if long-term traders outsource investment decisions to a lower extent, then drift should be stronger in stocks with many *long-term* traders (as these traders may react with more delay).

Higher order beliefs models predict that short-term investors trade more strongly in response to recommendation changes because they overweight public signals. Short-term traders anticipate other investors' trades by buying (selling) stocks with positive (negative) recommendation releases, then subsequently selling (buying) them again. If their horizons are shorter than the price reversal, they can capture the overreaction that results from other traders acting on the public signal. Hence, higher order beliefs models predict that short-term traders trade into stocks (out of stocks) when recommendation releases are positive (negative). Further, if higher order beliefs traders infer, from the positive (negative) price reaction following the public signal, that the average belief of others is positive (negative), then this would lead to further trading in the direction of the public signal. Over the longer term and before returns mean-revert, short-term traders should reverse their position. The information-source hypothesis can also explain the trading by short-term traders directly in response to recommendation changes, but it cannot explain the trading patterns of short-term traders in the postrecommendation period. Under the alternative hypothesis, trading by short-term traders should be concentrated only around the recommendation changes.

3. *Data and Summary Statistics*

3.1 DATA

We use 13F filings from Thomson Reuters to measure ownership by short-term institutional traders in U.S. stocks. Return data are from CRSP,

⁸ Although both papers model higher order beliefs, the origin of price drift is slightly different. Allen, Morris, and Shin [2016] use a rational expectations framework where investor beliefs are common knowledge, whereas Banerjee, Kaniel, and Kremer [2009] argue that price drift requires the presence of higher order difference of opinions.

accounting data are from Compustat, and consensus analyst recommendations are from I/B/E/S. We focus on common stocks from December 1993 to December 2017. We eliminate stocks without analyst recommendations, with missing market capitalization, with zero institutional ownership, and with prices below US\$1.

Our measure for the presence of short-term traders in a stock is *FUNDTURNOVER*, the weighted average of the quarterly portfolio turnover of all institutional investors holding a stock, weighted by the amount the institutions have invested in the stock (Gaspar, Massa, and Matos [2005]). Portfolio turnover (averaged over the past four quarters) is the sum of all dollar buys and sells in a quarter, scaled by the average net fund assets. For robustness we consider *TRANSIENT IO*, the proportion of institutional ownership held by transient institutions (Bushee [1998], [2001]), and *TURNOVER*, the average daily share turnover over the previous year. Some tests also use *STIO*, the percentage ownership by institutions in the top tercile of portfolio turnover across all institutions (Yan and Zhang [2009]).

We capture public signals about a stock using *MEANREC*, the consensus (mean) analyst recommendation. We reverse the I/B/E/S coding, so a recommendation of 1 (5) corresponds to a “sell” (“strong buy”). Data on institutional flows are from Campbell, Ramadorai, and Schwartz [2009], who infer daily institutional trading behavior from the TAQ database of the NYSE.⁹

3.2 SUMMARY STATISTICS

Table 1, panel A, provides statistics for the U.S. sample, reported at the quarterly level. *FUNDTURNOVER* has mean of 31.1%, and the average *MEANREC* is 3.8. Table 1, panel B, shows that the correlation between *FUNDTURNOVER* and *MEANREC* is 0.23, implying that recommendations are largely unrelated to the presence of short-term institutions. The correlations between *FUNDTURNOVER* and mutual fund herding (*BHM* and *SHM*) are low.

3.3 MEAN-REVERSION IN SHORT-TERM INSTITUTIONAL OWNERSHIP AND ANALYST RECOMMENDATIONS

As a starting point, we document that analyst recommendations and the presence of short-term institutions are strongly mean-reverting: Having currently high (low) recommendations predicts subsequent decreases (increases) in recommendations, and so does short-term institutional ownership. We then show that these patterns help predict return reversals.

To describe the mean-reversions, we independently double sort stocks into quintile portfolios based on *MEANREC* and *FUNDTURNOVER*. Figure 1 plots average values of *MEANREC* (panel A) and *FUNDTURNOVER*

⁹ These data are available from 1993 to 2000. In the past, similar institutional investor trading data were provided in the ANcerno database of Abel Noser. However, since 2017, Abel Noser has not provided these data for research purposes.

TABLE 1
Summary Statistics for U.S. Stocks

	Mean	Std. Dev.	p25	Median	p75
FUNDTURNOVER	31.1	11.9	23.9	28.5	35.2
TRANSIENT IO	0.24	0.14	0.14	0.22	0.32
STIO (%)	7.3	6.4	2.6	5.5	10.3
LTIO (%)	23.5	15.0	10.8	23.9	34.8
IO (%)	57.3	26.1	37.9	59.9	77.4
TURNOVER (%)	0.80	0.82	0.33	0.58	0.98
MEANREC	3.8	0.6	3.4	3.8	4.2
NUMREC	7.4	6.6	2.7	5.3	10.2
BHM	0.03	0.05	0.00	0.02	0.05
SHM	0.02	0.04	0.00	0.00	0.03
MCP (\$ billion)	4.2	17.1	0.2	0.6	2.1
BMRATIO	0.60	0.72	0.24	0.44	0.74
MOM12 (%)	17.6	65.1	-15.0	8.2	34.9
IDIOSK (%)	2.6	1.6	1.6	2.3	3.3

(Continued)

TABLE 1—Continued

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) <i>FUNDTURNOVER</i>	1.00										
(2) <i>TRANSIENT IO</i>	0.57	1.00									
(3) <i>TURNOVER</i>	0.34	0.34	1.00								
(4) <i>STTO</i>	0.64	0.48	0.44	1.00							
(5) <i>LTO</i>	-0.34	-0.14	0.09	0.12	1.00						
(6) <i>BHM</i>	0.09	0.05	-0.12	-0.04	-0.21	1.00					
(7) <i>SHM</i>	0.03	-0.01	0.11	-0.03	-0.06	-0.10	1.00				
(8) <i>IO</i>	0.01	0.11	0.43	0.44	0.54	-0.20	-0.08	1.00			
(9) <i>MEANREC</i>	0.23	0.19	0.06	0.15	-0.09	0.10	-0.05	0.03	1.00		
(10) <i>IDIORISK</i>	0.34	0.17	0.26	0.08	-0.37	0.12	0.10	-0.26	0.11	1.00	
(11) <i>MCAP</i>	-0.16	0.03	0.26	0.18	0.46	-0.22	-0.02	0.52	-0.06	-0.55	1.00
(12) <i>MOM12</i>	0.11	0.16	-0.02	0.15	0.05	0.16	-0.12	0.11	0.18	-0.19	0.24

This table reports summary statistics based on quarterly data for the sample of U.S. stocks. Panel A reports summary statistics and panel B reports Spearman rank correlations. The sample period is from December 1993 to December 2017. Variables are defined in the data appendix.

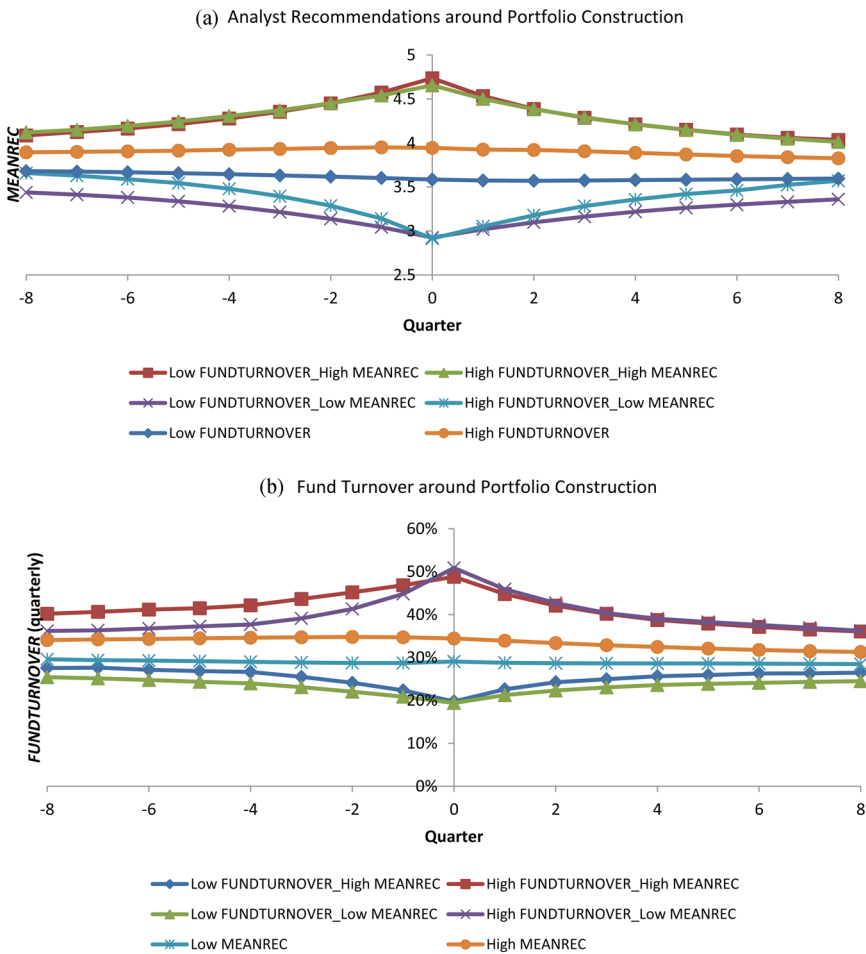


FIG. 1.—Changes in analyst recommendations and fund turnover for U.S. stocks. Panel A: Analyst recommendations around portfolio construction. Panel B: Fund turnover around portfolio construction.

This figure shows average values of *MEANREC* (panel A) and *FUNDTURNOVER* (panel B) from eight quarters before to eight quarters after portfolio construction. Portfolios are constructed based on annual independent 5×5 sorts into *FUNDTURNOVER* and *MEANREC* quintiles. *MEANREC* is a stock's consensus analyst recommendation, coded on a scale from 1 (sell) to 5 (strong buy). *FUNDTURNOVER* is the weighted average of the portfolio turnover of a firm's institutional investors (in % per quarter). The reported portfolios include stocks in the intersection of the first (Low) and fifth (High) *FUNDTURNOVER* quintiles and the first (Low) and fifth (High) *MEANREC* quintiles. We also report unconditional portfolios for high and low *FUNDTURNOVER* quintiles (in panel A) and for high and low *MEANREC* quintiles (in panel B).

(panel B) for different portfolios over the two-year period around portfolio construction. Panel A sorts stocks based on high or low *FUNDTURNOVER* quintiles, and panel B sorts them based on high or low *MEANREC* quintiles. Both panels also sort stocks based on the two extreme quintiles for both *MEANREC* and *FUNDTURNOVER*.

MEANREC and *FUNDTURNOVER* are strongly mean-reverting. In panel A, the stocks that currently have the most optimistic (pessimistic) analysts had recommendations that grew increasingly optimistic (pessimistic) over the past two years, whereas the mean-reversion in recommendations implies predictable downward (upward) changes in future recommendations. In panel A, there is no difference, between high- and low-turnover portfolios, in the *MEANREC* reversal for stocks with optimistic recommendations, or in the *MEANREC* reversal for stocks with pessimistic recommendations. The same holds in panel B. Hence, the mean-reversion in short-term institutional ownership around extreme recommendations is similar for positive and negative recommendations, and analyst recommendations are largely unrelated to short-term institutional ownership.

4. Short-Term Institutions and Analyst Recommendations: Predictable Return Reversals

4.1 FAMA-MACBETH REGRESSIONS: PREDICTABLE PRICE REVERSALS

In table 2, we use quarterly Fama-MacBeth [1973] regressions to document that the interplay of extreme recommendations and the presence of short-term institutions affects next-year returns. Before turning to this result, we confirm, in column 1, the Yan and Zhang [2009] finding that short-term institutional ownership (*STIO*) *on average* predicts positive returns. Measuring short-term institutional ownership the same way Yan and Zhang [2009] did, we find that a standard-deviation increase in *STIO* is associated with an increase in the next year's return of 0.9% (*t*-stat of 2.40). Column 2 adds *MEANREC* \times *STIO* to the regression. The negative and significant interaction implies that the outperformance in Yan and Zhang [2009] depends on how analysts evaluate stocks. Stocks with short-term institutions and pessimistic recommendations (low *MEANREC*) outperform, but stocks with short-term institutions and optimistic recommendations (high *MEANREC*) underperform.

Column 3 uses *FUNDTURNOVER* instead of *STIO* to confirm that stocks held by short-term institutions earn higher (lower) returns when analysts are pessimistic (optimistic).¹⁰ Column 4 shows that this predictability is better captured using *FUNDTURNOVER*, because including both proxies leaves *FUNDTURNOVER* \times *MEANREC* similar but renders *STIO* \times *MEANREC* insignificant. Column 5 interacts dummies for high or low fund turnover

¹⁰ Results are robust to using *TRANSIENT IO* or *TURNOVER* as proxies for short-term investors (online appendix [O.A.] table 1).

TABLE 2
Return Reversals: Fama-MacBeth Regressions for U.S. Stocks

Independent Variable	Dependent Variable						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>INTERCEPT</i>	0.217 (3.53)	0.278 (3.41)	0.010 (0.13)	0.110 (1.03)	0.181 (3.51)	-0.029 (-0.35)	-0.064 (-0.90)
<i>STIO</i>	0.140 (2.40)	0.796 (3.31)		0.089 (0.36)			
<i>LITTO</i>	0.007 (0.18)	-0.523 (-2.30)		-0.386 (-1.74)			
<i>STIO</i> × <i>MEANREC</i>		-0.168 (-2.70)		-0.0002 (0.00)			
<i>LITTO</i> × <i>MEANREC</i>		0.137 (2.48)		0.104 (1.94)			
<i>FUNDTURNOVER</i> × <i>MEANREC</i>			-0.162 (-5.56)	-0.147 (-3.84)		0.499 (6.44)	
<i>MEANREC</i>	-0.015 (-2.44)	-0.029 (-2.07)	0.036 (3.53)	0.011 (0.54)		-0.058 (-3.44)	
<i>FUNDTURNOVER</i>			0.720 (5.53)	0.635 (3.64)		-1.087 (-4.47)	
<i>HIGH FUNDTURNOVER</i> × <i>HIGH MEANREC</i>					-0.027 (-2.84)		0.093 (3.98)
<i>HIGH FUNDTURNOVER</i> × <i>LOW MEANREC</i>					0.045 (3.28)		-0.128 (-3.75)
<i>LOW FUNDTURNOVER</i> × <i>HIGH MEANREC</i>					0.016 (0.89)		-0.005 (-0.47)
<i>LOW FUNDTURNOVER</i> × <i>LOW MEANREC</i>					-0.007 (-0.62)		0.056 (9.50)

(Continued)

TABLE 2—(Continued)

Independent Variable	Dependent Variable						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>HIGH MEANREC</i>					-0.020		0.116
					(-2.09)		(11.77)
<i>LOW MEANREC</i>					-0.001		-0.020
					(-0.10)		(-3.20)
<i>HIGH FUNDTURNOVER</i>					0.016		0.236
					(1.74)		(5.60)
<i>LOW FUNDTURNOVER</i>					-0.022		-0.061
					(-2.55)		(-8.27)
<i>IO</i>			-0.014		-0.021	-0.039	-0.021
			(-0.60)		(-0.87)	(-1.61)	(-0.85)
<i>LOG(MCAP)</i>	-0.008	-0.008	-0.006	-0.008	-0.006	0.039	0.041
	(-1.51)	(-1.58)	(-1.15)	(-1.53)	(-1.14)	(5.72)	(6.00)
<i>BMRATIO</i>	0.022	0.022	0.024	0.022	0.025	-0.206	-0.215
	(1.63)	(1.61)	(1.72)	(1.59)	(1.79)	(-11.90)	(-11.68)
<i>MOM12</i>	-0.011	-0.010	-0.010	-0.009	-0.010		
	(-0.58)	(-0.53)	(-0.53)	(-0.50)	(-0.54)		
<i>TURNOVER</i>	-1.597	-1.600	-1.262	-1.602	-1.363	2.858	2.650
	(-1.27)	(-1.27)	(-0.99)	(-1.26)	(-1.08)	(1.41)	(1.32)
<i>IDIRISK</i>	0.295	0.251	0.152	0.200	0.136	2.284	2.355
	(0.32)	(0.28)	(0.17)	(0.22)	(0.15)	(1.44)	(1.49)
Requred (%)	5.6	5.7	5.7	6.0	6.0	17.9	18.4
# Obs.	220,328	220,328	220,328	220,328	220,328	220,328	220,328

This table reports quarterly Fama-MacBeth regressions to explain future and past stock returns. The dependent variable in columns 1 to 5 is the next year raw stock return ($RET(t+1,t+12)$) and in columns 6 and 7 is the last year raw stock return ($RET(t-1,t)$). *STIO* is the ownership by institutional investors that are ranked in the top tercile of portfolio turnover across all institutional investors. *FUNDTURNOVER* is the weighted average of the portfolio turnover of a firm's institutional investors (in % per quarter). *HIGH FUNDTURNOVER* and *LOW FUNDTURNOVER* are dummy variables corresponding to the highest and lowest fund-turnover quintiles. *MEANREC* is a stock's consensus analyst recommendation, coded on a scale from 1 (sell) to 5 (strong buy). *HIGH MEANREC* and *LOW MEANREC* are dummy variables corresponding to the most optimistic and the most pessimistic *MEANREC* quintiles. Newey-West [1987] adjusted *t*-statistics (reported in parentheses) are calculated based on four lags. 5% significance levels are denoted in bold. Variables are defined in the data appendix.

with dummies for stocks with optimistic or pessimistic analysts. For high fund-turnover stocks with optimistic analysts, the next-year return is -4.7% , whereas for high fund-turnover stocks with pessimistic analysts, it is 4.5% . (The pattern for pessimistic analysts is weaker in portfolio sorts and in the international sample.)

Columns 6 and 7 explain prior-year returns. Stocks with currently optimistic (pessimistic) recommendations and high fund turnover previously had high (low) returns. This implies that short-term institutions are more likely to hold stocks with optimistic recommendations that had high returns. It also implies that the predictability in columns 1 to 5 reflects a return reversal: The increase (decrease) in returns of stocks with currently pessimistic (optimistic) analysts and high short-term institutional ownership follows prior return decreases (increases).

4.2 FAMA-MACBETH REGRESSIONS: ADDRESSING THE ROLE OF INVESTOR HERDING

Brown, Wei, and Wermers [2014] show that herding by mutual funds can lead to overreactions to revisions in analyst recommendations. They attribute this finding to career concerns of fund managers, which leads them to herd on analyst recommendations. Consistent with this interpretation, they show that herding is most relevant for downgrades, where not acting entails greater reputational and litigation risk. We account for herding effects by controlling, in table 3, for Brown, Wei, and Wermers' [2014] measures of sell (*SHM*) and buy (*BHM*) herding. In column 1, *BHM* has a negative sign and *SHM* has a positive sign, confirming that herding affects returns. Column 2 adds interactions of the herding measures with *MEANREC*. Whereas *BHM* \times *MEANREC* is insignificant, *SHM* \times *MEANREC* is negative and significant. Hence, consistent with Brown, Wei, and Wermers [2014], return overreactions are primarily related to negative recommendations in the presence of sell herding. Importantly, in column 3, the effect of short-term institutions is independent of herding: *MEANREC* \times *FUNDTURNOVER* remains negative and highly significant when controlling for interactions between *MEANREC* and the herding measures. Column 4 includes interactions of the extreme recommendation dummies with the herding measures and turnover dummies. *HIGH FUNDTURNOVER* \times *HIGH MEANREC* (*HIGH FUNDTURNOVER* \times *LOW MEANREC*) remains negative (positive) and significant, whereas the only significant herding interaction is *SHM* \times *HIGH MEANREC*.

4.3 PORTFOLIO SORTS: RETURN PREDICTABILITY

Table 4 uses portfolio sorts—quarterly 5×5 independent double sorts on *MEANREC* and *FUNDTURNOVER*—to confirm predictable return reversals for stocks with extreme recommendations and many short-term institutions. We report monthly equal- and value-weighted five-factor alphas. In the first row, we report alphas for portfolios conditional on *MEANREC* only. On average, stocks with currently pessimistic recommendations earn higher

TABLE 3
Return Reversals: Accounting for Mutual Fund Herding in Fama-MacBeth Regressions for U.S. Stocks

Independent Variable	Dependent Variable <i>RET(i+1,i+12)</i>			
	(1)	(2)	(3)	(4)
<i>INTERCEPT</i>	0.199 (2.92)	0.178 (2.82)	-0.041 (-0.49)	0.190 (3.48)
<i>BHM</i>	-0.207 (-3.57)	0.041 (0.11)	-0.065 (-0.17)	-0.160 (-2.54)
<i>SHM</i>	0.306 (3.84)	1.269 (3.03)	1.109 (2.56)	0.309 (4.47)
<i>FUNDTURNOVER</i>	0.095 (1.84)	0.094 (1.80)	0.834 (4.85)	
<i>MEANREC</i>	-0.013 (-2.20)	-0.007 (-1.07)	0.052 (3.80)	
<i>HIGH MEANREC</i>				-0.013 (-1.38)
<i>LOW MEANREC</i>				-0.003 (-0.42)
<i>BHM</i> × <i>MEANREC</i>		-0.061 (-0.69)	-0.030 (-0.32)	
<i>SHM</i> × <i>MEANREC</i>		-0.254 (-2.58)	-0.212 (-2.08)	
<i>FUNDTURNOVER</i> × <i>MEANREC</i>			-0.193 (-4.89)	
<i>BHM</i> × <i>HIGH MEANREC</i>				-0.091 (-0.83)
<i>BHM</i> × <i>LOW MEANREC</i>				-0.002 (-0.01)

(Continued)

TABLE 3—(Continued)

Independent Variable	(1)	(2)	(3)	(4)
			Dependent Variable <i>RET(t+1,t+12)</i>	
<i>SHM</i> × <i>HIGH MEANREC</i>				-0.282 (-2.17)
<i>SHM</i> × <i>LOW MEANREC</i>				0.164 (0.85)
<i>HIGH FUNDTURNOVER</i> × <i>HIGH MEANREC</i>				-0.031 (-3.22)
<i>HIGH FUNDTURNOVER</i> × <i>LOW MEANREC</i>				0.043 (2.55)
<i>LOW FUNDTURNOVER</i> × <i>HIGH MEANREC</i>				0.020 (1.11)
<i>LOW FUNDTURNOVER</i> × <i>LOW MEANREC</i>				-0.014 (-1.26)
<i>HIGH FUNDTURNOVER</i>				0.014 (1.59)
<i>LOW FUNDTURNOVER</i>				-0.019 (-2.24)
Same Controls as in table 3	Yes	Yes	Yes	Yes
R-squared (%)	6.2	6.4	6.5	6.7
# Obs.	199,573	199,573	199,573	199,573

This table provides quarterly Fama-MacBeth regressions to explain future stock returns. The dependent variable is the next year raw stock (*RET(t+1,t+12)*). *BHM* and *SHM* are measures of buy and sell herding by mutual funds as proposed by Brown, Wei, and Wermers [2014]. *FUNDTURNOVER* is the weighted average of the portfolio turnover of a firm's institutional investors (in % per quarter). *HIGH FUNDTURNOVER* and *LOW FUNDTURNOVER* are dummy variables corresponding to the highest and lowest fund-turnover quintiles. *MEANREC* is a stock's mean (consensus) analyst recommendation, coded on a scale from 1 (sell) to 5 (strong buy). *HIGH MEANREC* and *LOW MEANREC* are dummy variables corresponding to the most optimistic and most pessimistic *MEANREC* quintiles. Newey-West [1987] adjusted *t*-statistics (reported in parentheses) are calculated based on four lags; 5% significance levels are denoted in bold. Variables are defined in the data appendix.

TABLE 4
Return Predictability: Portfolio Results for U.S. Stocks

	Equal-Weighted Five-Factor Alpha					Value-Weighted Five-Factor Alpha								
	MEANREC					MEANREC								
<i>FUNDTURNOVER</i>	Uncond.	1 (Sell)	2	3	4	5 (Str. Buy)	5 - 1	Uncond.	1 (Sell)	2	3	4	5 (Str. Buy)	5 - 1
Uncond.		0.43 (4.55)	0.36 (5.68)	0.30 (4.53)	0.08 (1.03)	-0.02 (-0.24)	-0.45 (-4.32)		0.11 (1.44)	0.16 (2.71)	0.13 (2.43)	0.06 (0.99)	-0.09 (-0.96)	-0.20 (-1.53)
1 (Low)	0.30 (3.99)	0.35 (3.03)	0.36 (5.01)	0.37 (4.20)	0.23 (2.65)	0.20 (1.53)	-0.15 (-1.20)	0.18 (2.59)	0.14 (1.18)	0.18 (1.88)	0.18 (1.99)	0.29 (2.55)	0.10 (0.64)	-0.03 (-0.16)
2	0.30 (5.06)	0.44 (4.87)	0.34 (4.56)	0.35 (4.92)	0.17 (2.06)	0.24 (2.66)	-0.20 (-1.80)	0.10 (1.95)	0.24 (2.43)	0.24 (3.18)	0.18 (1.86)	0.08 (0.84)	0.00 (0.03)	-0.24 (-1.31)
3	0.26 (3.78)	0.44 (4.01)	0.36 (4.35)	0.32 (4.30)	0.16 (1.87)	0.09 (0.93)	-0.35 (-2.90)	0.06 (0.87)	0.03 (0.28)	0.21 (2.38)	0.03 (0.33)	0.09 (0.89)	0.05 (0.41)	0.02 (0.14)
4	0.14 (1.90)	0.44 (3.44)	0.39 (4.27)	0.23 (2.68)	0.05 (0.59)	-0.08 (-0.67)	-0.52 (-3.37)	-0.09 (-1.08)	0.21 (1.71)	0.16 (1.61)	0.03 (0.30)	-0.08 (-0.71)	-0.44 (-3.16)	-0.65 (-3.53)
5 (High)	0.13 (1.10)	0.65 (3.59)	0.46 (3.43)	0.26 (2.01)	0.01 (0.08)	-0.10 (-0.65)	-0.75 (-4.25)	-0.06 (-0.45)	0.39 (2.38)	0.35 (1.98)	0.23 (1.28)	-0.20 (-1.27)	-0.30 (-2.01)	-0.69 (-3.41)
5 - 1	-0.17 (-1.39)	0.31 (1.73)	0.10 (0.65)	-0.11 (-0.83)	-0.22 (-1.51)	-0.30 (-1.80)	-0.61 (-2.88)	-0.23 (-1.39)	0.25 (1.31)	0.17 (0.80)	0.05 (0.22)	-0.49 (-2.44)	-0.40 (-1.79)	-0.66 (-2.50)

This table reports monthly equal-weighted and value-weighted five-factor alphas from quarterly independent double sorts based on *MEANREC* and *FUNDTURNOVER*. At the beginning of each quarter, stocks are first divided into five groups based on *FUNDTURNOVER* and then independently divided into five groups based on the stocks' consensus analyst recommendation (*MEANREC*). We then report returns for these 25 portfolios, which are calculated over next four quarters. *FUNDTURNOVER* is the weighted average of the portfolio turnover of a firm's institutional investors (in % per quarter). *MEANREC* is a stock's mean (consensus) analyst recommendation, coded on a scale from 1 (sell) to 5 (strong buy). To account for overlapping portfolios when calculating returns, we follow the methodology in Jegadeesh and Titman [1993] such that stocks ranked in each of the last four quarters form one-fourth of each portfolio. The five-factor model includes the Fama-French three factors, Carhart's momentum factor, and the Pastor-Stambaugh liquidity factor. *t*-statistics are reported in parentheses; 5% significance levels are denoted in bold. Variables are defined in the data appendix.

future returns than stocks with optimistic recommendations, but the difference is only significant for equal-weighted portfolios (annualized alpha of $12 \times 0.45\% = 5.4\%$, t -stat of 4.32).

The double sorts indicate that stocks with the most optimistic analysts underperform stocks with the most pessimistic analysts—and thus appear overvalued—only when these stocks are held by many short-term institutions. Using value-weighted portfolios (right half), the long-short portfolio that sells (buys) stocks with the most optimistic (pessimistic) analysts among high fund-turnover stocks (top quintile) has an alpha of 8.3% per year (t -stat of 3.41). The analogous long-short portfolio among stocks in the lowest fund-turnover quintile has an insignificant alpha. These future alphas reflect large return reversals, as stocks with the most optimistic (pessimistic) analysts at present had large positive (negative) alphas in the past. We obtain similar results for equal-weighted portfolios (table 4, left half), *TRANSIENT IO* (online appendix [O.A.] table 2, panel A), and *TURNOVER* (O.A. table 2, panel B).

For stocks with the most optimistic recommendations, the difference in returns for stocks with high minus low fund turnover is -4.8% (t -stat of 1.79) using value-weighted portfolios (right half). The corresponding difference for stocks with pessimistic recommendations is only 3% (t -stat of 1.31). The difference between the two long-short portfolios is a significant 7.92% (t -stat of 2.50). Results are more symmetric for equal-weighted portfolios (left half).

Figure 2 illustrates the key results of table 4 by plotting the event-time performance of two long-short portfolios based on *FUNDTURNOVER* and *MEANREC*. The two portfolios are long (short) in stocks with currently the most optimistic (pessimistic) analysts, and we consider only stocks with high or low *FUNDTURNOVER* (alphas are set to zero in month -12). The figure shows that the high fund-turnover portfolio, relative to the low fund-turnover portfolio, exhibits strong outperformance for the first 12 months before portfolio formation, and this outperformance completely reverses in the subsequent 12 months.

4.4 EVENT-STUDY CARS AROUND ANALYST RECOMMENDATION RELEASES

If the return reversals originate from analyst recommendations, we expect positive (negative) CARs around the days, in the past, when analysts announced their recommendations for stocks that currently have the most optimistic (pessimistic) recommendations and high fund turnover. Furthermore, any overreaction around past announcements would imply stronger subsequent reversals around future releases when recommendations revert back (see figure 1) and traders synchronize trading in the opposite direction to correct any mispricing.

Table 5 reports three-day CARs around recommendation announcements for stocks in the same portfolios as in table 4. We report these CARs for announcements in the previous four (left half) and in the next four (right half) quarters around portfolio construction. For stocks with

TABLE 5
Event-Study CARs around Recommendation Announcements: Portfolio Sorts for U.S. Stocks

		CAR(-I,+I)												
		Past 4 Quarters					Next 4 Quarters							
		MEANREC					MEANREC							
FUNDTURNOVER	Uncond.	1 (Sell)	2	3	4	5 (Str. Buy)	5 - 1	Uncond.	1 (Sell)	2	3	4	5 (Str. Buy)	5 - 1
	Uncond.	-1.98 (-13.43)	-0.95 (-12.32)	-0.19 (-4.37)	0.44 (12.25)	1.24 (22.07)	3.22 (20.87)	0.81 (14.73)	0.21 (5.41)	-0.25 (-5.49)	-0.74 (-8.94)	-1.29 (-11.65)	-2.11 (-16.24)	
1		-0.54 (-9.43)	-1.31 (-12.08)	-0.60 (-10.00)	-0.21 (-5.02)	0.17 (4.03)	1.91 (17.78)	0.14 (4.91)	0.66 (12.27)	0.20 (5.02)	-0.14 (-3.80)	-0.18 (-2.64)	-0.52 (-4.96)	-1.17 (-10.03)
5		0.15 (1.76)	-2.33 (-8.46)	-1.06 (-7.08)	0.01 (0.10)	1.06 (13.15)	4.34 (15.02)	-0.63 (-5.07)	1.54 (10.34)	0.17 (1.41)	-0.50 (-4.71)	-1.04 (-6.48)	-1.41 (-8.55)	-2.95 (-14.68)
5 - 1		0.69 (8.80)	-1.02 (-4.93)	-0.46 (-3.51)	0.22 (2.40)	0.89 (10.73)	2.43 (9.93)	-0.77 (-6.18)	0.88 (6.01)	-0.03 (-0.24)	-0.35 (-3.35)	-0.86 (-5.28)	-0.90 (-4.70)	-1.78 (-8.85)

This table reports average three-day cumulative abnormal stock returns (CARs) around analyst recommendation announcements made during the past four (left half) and next four (right half) quarters from the portfolio formation date. At the beginning of each quarter, stocks are first divided into five groups based on FUNDTURNOVER and then independently divided into five groups based on the stocks' consensus analyst recommendation (MEANREC). We then calculate average three-day size-adjusted CARs around all analyst recommendation announcements in the previous four quarters and next four quarters for each stock in each of these 25 portfolios. We report the average of these mean CARs. We give equal weight to each recommendation for stocks in each portfolio, resulting in quarterly averages of CARs for each portfolio. The CAR for a stock is the sum of daily abnormal returns over a three-day window centered on the recommendation-announcement date. Daily returns are the difference between a stock's return and a value-weighted return for a portfolio of stocks in the same size decile. These results equally weight each recommendation but can be interpreted as giving more weight to stocks with more recommendations. We find similar results if we calculate abnormal returns first across all events for each stock and then the average (equally weighted) of these returns across stocks. FUNDTURNOVER is the weighted average of the portfolio turnover of a firm's institutional investors (in % per quarter). MEANREC is a stock's mean (consensus) analyst recommendation, coded on a scale from 1 (sell) to 5 (strong buy). We report results for the extreme groups only. *t*-statistics are reported in parentheses; 5% significance levels are denoted in bold. Variables are defined in the data appendix.

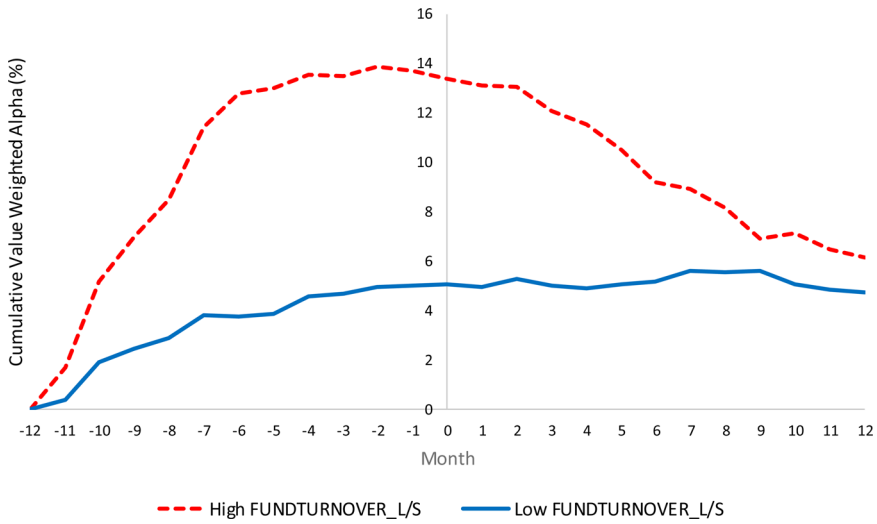


FIG. 2.—Cumulative event-time abnormal returns using fund turnover and analyst recommendation for U.S. stocks.

This figure reports event-time monthly value-weighted five-factor alphas from independent double sorts based on *MEANREC* and *FUNDTURNOVER*. At the beginning of each quarter (month zero in the figure), stocks are first divided into five groups based on *FUNDTURNOVER* and then independently divided into five groups based on *MEANREC*. We then calculate and report cumulative abnormal returns for the value-weighted long-short portfolio that buys stocks in the first (Low) *MEANREC* quintile and sells stocks in the fifth (High) *MEANREC* quintile. We only report the long-short portfolios of stocks in the first (Low) or fifth (High) *FUNDTURNOVER* quintile. We report returns for these two long-short portfolios over the 12 months before and 12 months after portfolio formation. The cumulative alphas are set to 0 at the beginning of the event-time period (month -12). *MEANREC* is a stock's consensus analyst recommendation, coded on a scale from 1 (sell) to 5 (strong buy). *FUNDTURNOVER* is the weighted average of the portfolio turnover of a firm's institutional investors (in % per quarter). The five-factor model includes the Fama-French three factors, Carhart's momentum factor, and the Pastor-Stambaugh liquidity factor. Variables are defined in the data appendix.

currently optimistic (pessimistic) recommendations, the past CARs were positive (negative)—the difference across the first and fifth *MEANREC* quintile equals 3.22% (t -stat of 20.87). Importantly, stocks with the most optimistic (pessimistic) analysts at present had much higher (lower) CARs around previous announcements if they are currently held by short-term institutions. For stocks with the most optimistic analysts, the CAR difference around past recommendations for stocks with high minus low fund turnover equals 1.41% (t -stat of 11.94). Similarly, for the most pessimistic recommendations, the difference in CARs between stocks with high minus low fund turnover equals -1.02% (t -stat of 4.93).

Turning to CARs around *future* releases, we find return reversals around recommendations over the next year. For stocks with the most optimistic (pessimistic) current recommendations, future CARs are negative (positive); the difference across the first and fifth *MEANREC* quintile equals

2.11% (t -stat of 16.24). The double sorts reveal again that these reversals are driven by stocks with many short-term institutions. For high fund-turnover stocks, the difference in CARs between stocks with optimistic minus pessimistic analysts equals -2.95% (t -stat of 14.68). For low fund-turnover stocks, the difference is only -1.17% (t -stat of 10.03). We obtain similar results for *TRANSIENT IO* and *TURNOVER* (O.A. table 3).

5. Higher Order Beliefs: Cross-Sectional and Intertemporal Evidence

The reversals suggest that short-term institutions' trading around recommendations is associated with mispricing. We interpret this as consistent with higher order beliefs models, but the information-source hypothesis could also explain these patterns. To plausibly rule out this alternative hypothesis, we test explicit predictions from models of higher order beliefs.

5.1 CARS OF ANALYST RECOMMENDATIONS: ROLE OF EARNINGS NEWS RELEASES

As predicted by Kondor [2012], higher order beliefs can be *polarized* when earnings news is released because, in addition to reducing disagreement about fundamentals, it helps traders guess others' private information. Kondor [2012] shows that this effect may increase disagreement among traders with respect to their higher order beliefs about the stock price. The increased disagreement may lead to overreactions to recommendation changes and thus to misvaluation of stocks.¹¹ Hence, we predict that concurrent earnings news amplifies the effects of higher order beliefs; that is, it leads to stronger reactions to analyst recommendations.

To test this prediction, table 6 compares CARs around recommendations issued within (panel A) or outside (panel B) a three-day window around earnings announcements; panel C reports the differences in CARs between panel A and panel B. In table 6, panel A, we find that, for recommendation releases coinciding with earnings news, stocks with the most optimistic (pessimistic) analysts at present had high (low) CARs around previous announcements if they are currently held by many short-term institutions. For high fund-turnover stocks, the difference in CARs of the most optimistic minus the most pessimistic analysts equals 9.72% (t -stat of 17.84); for low fund-turnover stocks, the corresponding difference is only 3.8% (t -stat of 11). As a result, the difference-in-differences of the CARs (bottom right cell) equals a statistically significant 5.91% (t -stat of 8.9). In contrast, in table 6, panel B, for recommendations not coinciding with earnings news, the corresponding CAR difference-in-differences is only 1.71% (t -stat of 7.15).

¹¹ This effect of disagreement would be consistent with the theoretical argument in Miller [1977] and empirical findings in Diether, Malloy, and Scherbina [2002], who show that stocks with high differences in opinion (measured by dispersion in analyst forecast) are more likely to be misvalued.

TABLE 6
Event-Study CARs around Recommendation Announcements for U.S. Stocks: Evidence from Releases Around Earnings News

Panel A: Event-study CARs for double sorts on fund turnover and recommendation announcements: around earnings news

		<i>CAR(-1,+1)</i>												
		Past Four Quarters					Next Four Quarters							
		<i>MEANREC</i>					<i>MEANREC</i>							
<i>FUNDTURNOVER</i>	Uncond.	1 (Sell)	2	3	4	5 (Str. Buy)	5 - 1	Uncond.	1 (Sell)	2	3	4	5 (Str. Buy)	5 - 1
		-4.63	-2.30	-0.69	0.61	1.60	6.23	1.38	-0.07	-1.36	-2.61	-4.00	-5.38	
		(-22.95)	(-16.52)	(-6.00)	(6.04)	(12.24)	(24.13)	(9.97)	(-0.71)	(-11.04)	(-16.43)	(-17.88)	(-20.28)	
1 (Low)		-1.47	-1.47	-0.55	-0.20	0.66	3.80	-0.11	1.16	0.19	-0.70	-1.21	-2.20	
		(-14.30)	(-17.65)	(-10.10)	(-4.51)	(-1.16)	(11.00)	(-1.35)	(7.13)	(1.59)	(-4.63)	(-6.12)	(-7.39)	
5 (High)		-2.00	-7.35	-3.71	-1.39	0.81	9.72	-3.14	2.67	-1.18	-3.33	-4.54	-5.00	
		(-8.64)	(-16.90)	(-10.29)	(-4.71)	(3.40)	(17.84)	(-15.35)	(6.55)	(-3.65)	(-8.70)	(-14.18)	(-13.67)	
5 - 1		-0.52	-4.21	-2.24	-0.83	1.01	5.91	-3.04	1.51	-1.38	-2.62	-3.32	-2.80	
		(-2.31)	(-10.22)	(-5.88)	(-2.85)	(3.58)	(8.90)	(-14.27)	(3.61)	(-4.06)	(-6.86)	(-8.60)	(-7.41)	

(Continued)

TABLE 6—Continued

Panel B: Event-study CARs for double sorts on fund turnover and recommendation announcements: *not* around earnings news

		CAR(-1,+1)												
		Past 4 Quarters					Next 4 Quarters							
		MEANREC					MEANREC							
		1 (Sell)	2	3	4	5 (Str. Buy)	5 - 1	Uncond.	1 (Sell)	2	3	4	5 (Str. Buy)	5 - 1
<i>FUNDTURNOVER</i>	Uncond.	-1.50 (-10.06)	-0.71 (-9.02)	-0.11 (-2.68)	0.42 (11.64)	1.19 (22.09)	2.69 (18.16)		0.73 (14.62)	0.26 (6.80)	-0.06 (-1.18)	-0.43 (-4.63)	-0.86 (-7.54)	-1.59 (-12.96)
	1 (Low)	-0.39 (-6.89)	-1.01 (-7.73)	-0.45 (-3.67)	0.24 (4.75)	0.61 (8.34)	1.61 (12.91)	0.18 (6.66)	0.59 (11.73)	0.21 (5.59)	-0.05 (-1.43)	-0.02 (-0.24)	-0.23 (-2.17)	-0.81 (-7.02)
	5 (High)	0.49 (5.50)	-1.36 (-3.87)	-0.56 (2.19)	1.10 (13.35)	1.97 (19.62)	3.32 (11.71)	-0.22 (-1.68)	1.37 (9.55)	0.42 (3.47)	-0.01 (-0.05)	-0.48 (-2.78)	-0.86 (-5.05)	-2.23 (-11.82)
	5 - 1	0.88 (11.64)	-0.35 (-0.86)	0.38 (3.93)	0.87 (10.32)	1.36 (11.61)	1.71 (7.15)	-0.40 (-3.17)	0.78 (5.58)	0.21 (1.77)	0.04 (0.41)	-0.46 (-2.62)	-0.64 (-3.31)	-1.41 (-7.03)

(Continued)

TABLE 6—Continued

Panel C: Tests of differences in event-study CARs between double sorts: around minus not around earnings news

	CAR(-1,+1)													
	Past Four Quarters					Next Four Quarters								
	MEANREC					MEANREC								
	Uncond.	1 (Sell)	2	3	4	5 (Str. Buy)	5 - 1	Uncond.	1 (Sell)	2	3	4	5 (Str. Buy)	5 - 1
FUNDTURNOVER	Uncond.	-3.13 (-21.41)	-1.59 (-12.49)	-0.58 (-5.49)	0.19 (1.82)	0.41 (3.32)	3.54 (19.10)	0.65 (5.27)	-0.33 (-3.41)	-1.30 (-9.63)	-2.18 (-12.09)	-3.14 (-14.59)	-3.79 (-17.54)	
1 (Low)		-1.08	-2.13	-1.02	-0.39	-0.44	0.05	2.19	-0.29	0.57	-0.65	-1.19	-1.97	-2.55
		(-12.96)	(-13.52)	(-7.24)	(-3.21)	(-2.23)	(0.17)	(5.40)	(-3.69)	(3.61)	(-4.42)	(-5.40)	(-6.60)	(-6.84)
5 (High)		-2.49	-5.99	-3.15	-1.62	-0.29	0.39	6.40	-2.92	1.30	-1.60	-3.32	-4.06	-5.44
		(-10.78)	(-14.20)	(-8.98)	(-5.37)	(-1.20)	(1.66)	(13.19)	(-14.43)	(3.30)	(-4.99)	(-8.19)	(-11.45)	(-10.31)
5 - 1		-1.40	-3.86	-2.13	-1.21	0.14	0.34	4.20	-2.64	0.73	-1.59	-2.66	-2.86	-2.90
		(-6.46)	(-8.83)	(-5.62)	(-3.99)	(0.49)	(0.79)	(6.46)	(-13.63)	(1.80)	(-4.72)	(-6.72)	(-6.74)	(-5.81)

This table reports average three-day cumulative abnormal stock returns (CARs) around analyst recommendation announcements made during the past four (left half) and next four (right half) quarters from the portfolio formation date. We separate the announcements based on whether they were issued within a three-day window around earnings announcements. Panel A reports CARs of analyst recommendation announcements surrounding earnings news, and panel B reports the same CARs for analyst recommendation announcements not surrounding earnings news. Panel C reports the difference in the CARs between panel A and panel B. CARs are constructed as in table 5. FUNDTURNOVER is the weighted average of the portfolio turnover of a firm's institutional investors (in % per quarter). MEANREC is a stock's mean (consensus) analyst recommendation, coded on a scale from 1 (sell) to 5 (strong buy). We report results for the extreme groups only. *t*-statistics are reported in parentheses; 5% significance levels are denoted in bold. Variables are defined in the data appendix.

Panel C shows that the difference-in-differences in panel A is not just economically, but also statistically significantly, larger than the corresponding number in panel B (t -stat of 6.46).

Similarly, the future CAR difference-in-differences in panel A is much more negative when future recommendations coincide with earnings news, compared to panel B when they do not coincide with earnings news. The difference between two difference-in-differences in panel C is again statistically significant (t -stat of 5.19).

These results are consistent with higher order beliefs trading but not with the alternative hypothesis. Under the information-source hypothesis, updated earnings news increases the availability of fundamental information, making short-term institutions less reliant on analyst recommendations. As a result, short-term institutions should be less likely to overweight recommendations around days with earnings news.¹²

5.2 CARS OF ANALYST RECOMMENDATIONS: ROLE OF FUNDAMENTAL UNCERTAINTY

Models of higher order beliefs predict stronger mispricing around analyst recommendations if a trader's private signal is noisier. Hence, we predict that the price reaction to analyst recommendations for stocks held by more short-term institutions is stronger when higher fundamental uncertainty adds noise to traders' private signals.

To this prediction, table 7 compares CARs around recommendations at firms with high (panel A) or low (panel B) fundamental uncertainty; panel C reports again the CAR differences between the two panels. We capture fundamental uncertainty using three proxies: earnings volatility, R&D expenses over sales, and whether firms operate in an "intangibles industry" (detailed definitions in the table heading). We split the sample based on whether the first principal component score for these three proxies is above (high fundamental uncertainty) or below the median (low fundamental uncertainty).

In table 7, panel A, we find, for firms with high fundamental uncertainty, that stocks with the most optimistic (pessimistic) analysts had high (low) CARs around previous announcements if held by many short-term institutions. For high fund-turnover stocks, the difference in CARs of the most optimistic minus the most pessimistic analysts is 5.22% (t -stat of 12.24). As a result, the CAR difference-in-differences (bottom right corner) equals a statistically significant 2.5% (t -stat of 5.57). In contrast, in panel B, for firms with low fundamental uncertainty, the CAR difference-in-differences equals

¹²The results in table 6 related to Yezegel [2015], who shows that analysts revise their recommendations after earnings news, when they are more likely to detect mispricing and when both the information supply and the demand for their advice increase. Therefore, CARs for recommendations around earnings news are expected to be larger. However, Yezegel's [2015] argument does not explain our finding of stronger results for firms with more short-term institutions.

TABLE 7
Event-Study CARs Around Recommendation Announcements for U.S. Stocks: Evidence from Fundamental Uncertainty

Panel A: Event-study CARs for double sorts on fund turnover and recommendation announcements: high fundamental uncertainty

		CAR(-1,+1)												
		Past Four Quarters					Next Four Quarters							
		MEANREC					MEANREC							
FUNDTURNOVER	Uncond.	1 (Sell)	2	3	4	5 (Str. Buy)	5 - 1	Uncond.	1 (Sell)	2	3	4	5 (Str. Buy)	5 - 1
		-2.89	-1.41	-0.28	0.45	1.52	4.41		1.56	0.47	-0.17	-0.72	-1.22	-2.78
		(-12.89)	(-10.73)	(-4.29)	(5.94)	(16.73)	(18.02)		(14.22)	(4.95)	(-1.97)	(-6.92)	(-8.08)	(-14.81)
1 (Low)		-0.93	-1.20	-0.30	-0.13	0.43	2.72	0.15	1.29	0.16	-0.27	-0.19	-0.11	-1.40
		(-8.84)	(-7.80)	(-3.90)	(-0.84)	(2.53)	(8.97)	(1.67)	(8.38)	(1.29)	(-2.15)	(-0.86)	(-0.52)	(-6.26)
5 (High)		0.01	-2.82	-1.12	1.08	2.39	5.22	-0.23	2.43	0.52	-0.25	-0.73	-1.23	-3.66
		(0.09)	(-7.33)	(-4.85)	(0.53)	(6.67)	(14.63)	(-1.48)	(7.88)	(2.07)	(-1.24)	(-3.01)	(-5.44)	(-10.04)
5 - 1		0.94	-0.53	0.08	1.21	1.96	2.50	-0.38	1.14	0.35	0.02	-0.54	-1.12	-2.26
		(7.22)	(-1.48)	(0.37)	(6.18)	(8.34)	(5.57)	(-2.67)	(3.44)	(1.44)	(0.08)	(-1.82)	(-3.77)	(-4.96)

(Continued)

TABLE 7—Continued

Panel B: Event-study CARs for double sorts on fund turnover and recommendation announcements: low fundamental uncertainty

$CAR(-I,+I)$

	Past Four Quarters					Next Four Quarters								
	MEANREC					MEANREC								
	Uncond.	1 (Sell)	2	3	4	5 (Str. Buy)	5 - 1	Uncond.	1 (Sell)	2	3	4	5 (Str. Buy)	5 - 1
FUNDTURNOVER														
Uncond.		-1.40 (-10.20)	-0.65 (-10.33)	-0.07 (-1.39)	0.35 (8.89)	0.96 (16.49)	2.36 (15.30)		0.72 (10.28)	0.21 (3.98)	-0.20 (-4.37)	-0.52 (-7.81)	-0.80 (-7.03)	-1.52 (-10.71)
1 (Low)	-0.44 (-7.80)	-1.24 (-11.28)	-0.46 (-5.95)	-0.13 (-2.58)	0.15 (2.60)	0.77 (6.71)	2.01 (12.18)	0.14 (3.81)	0.71 (6.83)	0.18 (3.19)	-0.20 (-3.24)	-0.05 (-0.56)	-0.10 (-0.59)	-0.81 (-3.74)
5 (High)	0.26 (2.73)	-0.94 (-2.24)	-0.54 (-2.67)	0.22 (1.65)	0.80 (5.75)	1.51 (12.61)	2.45 (5.56)	-0.21 (-2.42)	0.83 (4.00)	0.37 (2.22)	-0.41 (-2.55)	-0.39 (-2.76)	-0.78 (-3.77)	-1.61 (-5.13)
5 - 1	0.70 (8.79)	0.30 (0.82)	-0.08 (-0.41)	0.35 (2.62)	0.65 (4.45)	0.74 (4.75)	0.44 (1.04)	-0.34 (-4.03)	0.11 (0.56)	0.19 (1.13)	-0.21 (-1.26)	-0.35 (-2.03)	-0.68 (-2.77)	-0.80 (-2.49)

(Continued)

TABLE 7—Continued

Panel C: Tests of differences in event-study CARs between double sorts: high minus low fundamental uncertainty

		<i>CAR(-1,+1)</i>												
		Past Four Quarters					Next Four Quarters							
		MEANREC					MEANREC							
<i>FUNDTURNOVER</i>	Uncond.	1 (Sell)	2	3	4	5 (Str. Buy)	5 - 1	Uncond.	1 (Sell)	2	3	4	5 (Str. Buy)	5 - 1
Uncond.		-1.49 (-10.20)	-0.76 (-7.67)	-0.21 (-3.18)	0.10 (1.36)	0.56 (6.48)	2.05 (13.08)		0.84 (6.99)	0.26 (2.88)	0.03 (0.33)	-0.20 (-1.84)	-0.42 (-3.02)	-1.26 (-7.69)
1 (Low)		-0.49 (-6.16)	-0.74 (-5.09)	-0.17 (-1.98)	-0.28 (-1.70)	-0.34 (-1.80)	0.71 (2.69)		0.58 (3.16)	-0.02 (-0.13)	-0.07 (-0.52)	-0.14 (-0.68)	-0.01 (-0.06)	-0.59 (-1.95)
5 (High)		-0.25 (-1.69)	-0.58 (-2.04)	-0.11 (-0.50)	0.28 (1.39)	0.88 (4.35)	2.77 (6.26)		1.60 (4.72)	0.15 (0.51)	0.16 (0.63)	-0.34 (-1.25)	-0.45 (-1.86)	-2.05 (-5.23)
5 - 1		0.24 (1.58)	-0.83 (-1.70)	0.06 (0.24)	0.56 (2.33)	1.22 (4.28)	2.06 (3.70)		1.03 (2.88)	0.16 (0.55)	0.23 (0.81)	-0.19 (-0.60)	-0.44 (-1.34)	-1.46 (-3.09)

This table reports average three-day cumulative abnormal stock returns (CARs) around analyst recommendation announcements made during the past four (left half) and next four (right half) quarters from the portfolio formation date. We separate the announcements based on whether fundamental uncertainty is high (panel A) or low (panel B). Panel C reports the difference in the CARs between panel A and panel B. We split the sample based on whether the first principal component score for three proxies for fundamental uncertainty is above (high fundamental uncertainty) or below the median (low fundamental uncertainty). We use the following proxies: (i) earnings volatility, (ii) the ratio of R&D expenses to sales, and (iii) whether firms operate in an “intangibles industry.” Earnings volatility is calculated as the standard deviation of deflated earnings (Income before Extraordinary Items/(Assets (t) + Assets (t-1))/2) over the last five fiscal years. We require a minimum of the last three years of data; otherwise earnings volatility is missing. Following Balakrishnan, Schrand, and Vashishtha [2020], intangibles industries are SIC codes 282 (plastics and synthetic materials), 283 (drugs), 357 (computer and office equipment), 367 (electronic components and accessories), 48 (communications), 73 (business services), 87 (engineering, accounting, R&D and management related services); the remaining industries are “tangible industries.” CARs are constructed as in table 5. *FUNDTURNOVER* is the weighted average of the portfolio turnover of a firm’s institutional investors (in % per quarter). *MEANREC* is a stock’s mean (consensus) analyst recommendation, coded on a scale from 1 (sell) to 5 (strong buy). We report results for the extreme groups only. *t*-statistics are reported in parentheses; 5% significance levels are denoted in bold. Variables are defined in the data appendix.

a statistically insignificant 0.44% (t -stat of 1.04). Panel C confirms that the difference-in-differences in panel A is also statistically significantly larger than the corresponding number in panel B (t -stat of 3.7).

Similarly, the future CAR difference-in-differences in panel A is much more negative around future recommendations when firms face high rather than low fundamental uncertainty (the difference between panels A and B continues to be statistically significant). O.A. table 4 confirms these results for each of the three uncertainty proxies. Overall, the results of these tests are consistent with the predictions of models of higher order beliefs.

5.3 ABNORMAL RETURNS AND PRICE DRIFTS AROUND RECOMMENDATION CHANGES

5.3.1. Broad Sample Evidence. We next examine short-term return reactions and price drifts around recommendation upgrades and downgrades. If short-term institutions overrely on public signals because of their higher order beliefs, we expect that initial return reactions to recommendation changes will be stronger for stocks held by more short-term institutions. Further, Allen, Morris, and Shin [2016] and Banerjee, Kaniel, and Kremer [2009] predict that the returns of stocks held by many short-term institutions will exhibit drift after the recommendation changes. In contrast, under the alternative hypothesis, stronger price drift is expected at stocks with more long-term institutions, if such investors, relying less on analysts as an input, act with some delay because of information processing or capital constraints.

To test these predictions, for each recommendation announcement, we calculate the recommendation change (*CHANGEREC*) as the difference between the newly announced and the outstanding recommendation. *UPGRADE* (*DOWNGRADE*) equals 1 if *CHANGEREC* is positive (negative), and 0 otherwise. In table 8, we then explain the three-day abnormal return around these recommendation changes ($CAR(-1,+1)$) as well as the subsequent price drift (the 30-day abnormal return after the same change, $CAR(+2,+31)$).

Column 1 shows that the three-day CAR around an *UPGRADE* (*DOWNGRADE*) is positive (negative). In column 2, the interaction between *UPGRADE* (*DOWNGRADE*) and *HIGH FUNDTURNOVER* is positive (negative) and significant, implying that returns of stocks with many short-term institutions react more strongly to recommendation changes. Similarly, in column 3, $CHANGEREC \times FUNDTURNOVER$ is positive and significant, confirming greater price reaction to recommendation changes for stocks with many short-term institutions.

Column 4 shows that, for *UPGRADES* and *DOWNGRADES*, price drift in the same direction as the recommendation changes, consistent with Womack [1996] and Barber et al. [2001]. Column 5 shows that the drift for upgrades is strongly amplified at high fund-turnover stocks. There is no corresponding effect for low fund-turnover stocks. There is also no effect

TABLE 8
Abnormal Returns and Price Drift Around Recommendation Announcements for U.S. Stocks

Independent Variable	Dependent Variable					
	(1)	(2)	(3)	(4)	(5)	(6)
		<i>CAR(-1,+1)</i>			<i>CAR(+2,+31)</i>	
<i>INTERCEPT</i>	0.005 (2.10)	0.005 (2.04)	0.014 (5.82)	-0.003 (-0.83)	-0.003 (-0.83)	-0.002 (-0.39)
<i>UPGRADE</i>	0.028 (63.06)	0.028 (5.81)		0.005 (8.62)	0.005 (6.38)	
<i>DOWNGRADE</i>	-0.030 (-46.58)	-0.029 (-40.27)		-0.003 (-4.41)	-0.002 (-3.02)	
<i>CHANGERECC</i>			0.007 (8.23)			-0.001 (-0.90)
<i>CHANGERECC</i> × <i>FUNDTURNOVER</i>			0.040 (13.79)			0.012 (4.12)
<i>UPGRADE</i> × <i>HIGH FUNDTURNER</i>		0.012 (8.67)			0.005 (2.23)	
<i>DOWNGRADE</i> × <i>HIGH FUNDTURNOVER</i>		-0.017 (-7.33)			-0.002 (-0.55)	
<i>UPGRADE</i> × <i>LOW FUNDTURNOVER</i>		-0.007 (-9.35)			0.000 (-0.20)	
<i>DOWNGRADE</i> × <i>LOW FUNDTURNOVER</i>		0.010 (9.71)			-0.002 (-1.50)	
<i>FUNDTURNOVER</i>			-0.030 (-7.72)			-0.001 (-0.15)
<i>HIGH FUNDTURNOVER</i>	-0.002 (-1.86)	-0.002 (-2.25)		0.001 (0.77)	-0.001 (-0.32)	
<i>LOW FUNDTURNOVER</i>	0.003 (5.41)	0.002 (4.42)		-0.001 (-0.59)	0.000 (0.20)	

(Continued)

TABLE 8—(Continued)

Independent Variable	Dependent Variable					
	CAR(-I,+I)			CAR(+2,+3I)		
	(1)	(2)	(3)	(4)	(5)	(6)
<i>IO</i>	-0.003 (-2.02)	-0.003 (-2.02)	-0.003 (-2.66)	0.003 (1.58)	0.003 (1.67)	0.003 (1.67)
<i>LOG(MCAP)</i>	-0.001 (-3.48)	-0.001 (-3.31)	-0.001 (-4.10)	0.000 (-0.61)	0.000 (-0.58)	0.000 (-0.77)
<i>BOOK/MKT</i>	0.005 (5.17)	0.005 (5.20)	0.005 (4.98)	0.007 (4.03)	0.007 (4.04)	0.007 (3.99)
<i>MOM12</i>	0.001 (1.74)	0.000 (1.02)	0.001 (2.01)	0.002 (2.33)	0.002 (2.27)	0.002 (2.32)
<i>TURNOVER</i>	-0.073 (-1.93)	-0.068 (-1.81)	-0.064 (-1.73)	-0.165 (-2.43)	-0.165 (-2.43)	-0.157 (-2.32)
<i>IDIOSK</i>	-0.239 (-5.50)	-0.238 (-5.47)	-0.225 (-5.09)	0.227 (3.98)	0.227 (3.98)	0.231 (4.03)
<i>Resquared (%)</i>	6.6	6.9	6.4	0.2	0.2	0.2
<i># Obs.</i>	406,312	406,312	406,312	406,109	406,109	406,109

This table reports regressions to explain abnormal stock returns and price drift around analyst recommendation announcements. The dependent variable in columns 1 to 3 is the three-day abnormal return around the announcement ($CAR(-I,+I)$); in columns 4 to 6, it is the 30-day abnormal return after the announcement ($CAR(+2,+3I)$). *FUNDTURNOVER* is the weighted average of the portfolio turnover of a firm's institutional investors (in % per quarter). *HIGH FUNDTURNOVER* and *LOW FUNDTURNOVER* are dummy variables corresponding to the highest and lowest fund-turnover quintiles. *CHANGEREC* is the difference between the newly announced recommendation and the previous (outstanding) recommendation by the same analyst. *UPGRADE* is a dummy variable that takes the value 1 if *CHANGEREC* is positive, and 0 otherwise. *DOWNGRADE* is a dummy variable that takes the value 1 if *CHANGEREC* is negative, and 0 otherwise. *t*-statistics (reported in parentheses) are based on standard errors clustered by firm; 5% significance levels are denoted in bold. Variables are defined in the data appendix.

for downgrades in either group. In column 6, we find significant effects also for $CHANGERE \times FUNDTURNOVER$.

Figure 3 visualizes the results of table 8. The figure reports in panel A (panel B) event-time CARs for stocks that experience upgrade (downgrades). We compare high and low fund-turnover stocks over a two-sided 30-day window around the recommendation change (day 0). Panel A shows that the initial positive return reaction around an upgrade and the subsequent price drift are stronger for high fund-turnover stocks. In panel B, there is a more negative reaction around the downgrades at high fund-turnover stocks, but little evidence of differential price drift in the following 30 days.¹³

Figure 4 displays, for high fund-turnover stocks, CARs over the 250 days after the recommendation changes. We report these returns for stocks with currently optimistic (high $MEANREC$) or pessimistic (low $MEANREC$) analysts. The figure confirms (longer term) return reversals after upgrades (downgrades) at high fund-turnover stocks with optimistic analysts (pessimistic), that is, among stocks that subsequently experience downgrades (upgrades) in their recommendations (see figure 1). There are no such effects after upgrades (downgrades) at high fund-turnover stocks with currently pessimistic (optimistic) analysts—these stocks see a continuation of their returns (their recommendations are also not reversed).

Our finding of price drift following upgrades for stocks with short-term institutions supports Allen, Morris, and Shin [2016] and Banerjee, Kaniel, and Kremer [2009]. Furthermore, it is consistent with BSV, who interpret price drift at stocks with a high concentration in buy recommendations as evidence of effects of higher order beliefs. Stronger price drift among stocks with short-term institutions is inconsistent with the information-source hypothesis.

5.3.2. Tech Bubble Evidence. To validate the table 8 results, we examine announcement returns and price drift during the tech bubble. We predict that the effects will be particularly strong during this period in which we know ex post that a bubble existed.¹⁴ Results are reported in table 9. Columns 1 to 6 examine return reactions to recommendation changes during the bubble period (January 1998 to March 2000), and columns 7 and 8 look at return reactions during the subsequent transition and crash period (April 2000 to June 2002). Columns 1 to 3 include NASDAQ stocks, and columns 4 to 6 are non-NASDAQ stocks. We additionally split the sample into stocks with high and low price-to-sales (P/S) multiples, which is a common way to compare bubble (high P/S) with nonbubble (low P/S) stocks (Brunnermeier and Nagel [2004], BSV).

¹³The observed stock price run-up (stock price decrease), one day before the recommendation upgrade (downgrade), is consistent with prior studies (e.g., Womack [1996]).

¹⁴Brunnermeier and Nagel [2004] and Greenwood and Nagel [2009] show that during this bubble period, stock prices for tech firms deviated strongly from fundamentals.

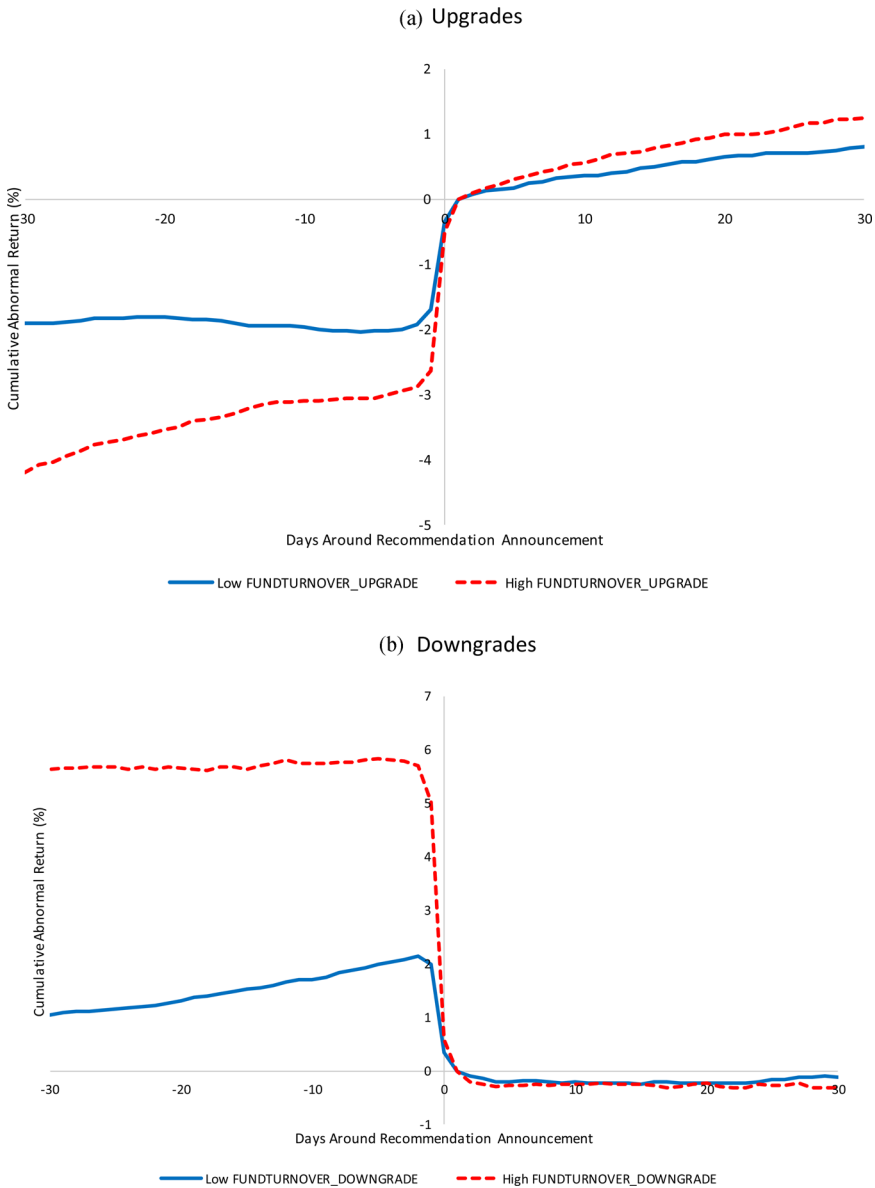


FIG. 3.—Event-time abnormal returns using fund turnover and recommendation change portfolios. Panel A: Upgrades; Panel B: Downgrades.

This figure reports in panel A (panel B) event-time cumulative abnormal returns (CARs) to stocks that experience an *UPGRADE* (*DOWNGRADE*) in analyst recommendations. Day 0 is the recommendation announcement day. We report returns over the 30 days before and 30 days after day 0. The CARs are set to zero at the end of the first day after the recommendation announcement day. We compare stocks in the first (Low) and fifth (High) *FUNDTURNOVER* quintile. *FUNDTURNOVER* is the weighted average of the portfolio turnover of a firm's institutional investors (in % per quarter). Returns in the preperiod are multiplied with minus 1 to display the CARs across the pre- and postperiod relative to day 0.

TABLE 9
Abnormal Returns Around Recommendation Announcements for U.S. Stocks: Evidence from the Tech Bubble

Independent Variable	January 1998 – March 2000						April 2000 – June 2002		
	Dependent Variable <i>CAR(-I,+I)</i>			Dependent Variable <i>CAR(-I,+I)</i>			Dependent Variable <i>CAR(-I,+I)</i>		
	NASDAQ ALL (1)	NASDAQ HIGH P/S (2)	NASDAQ LOW P/S (3)	Non-NASDAQ ALL (4)	Non-NASDAQ HIGH P/S (5)	Non-NASDAQ LOW P/S (6)	NASDAQ ALL (7)	Non-NASDAQ ALL (8)	
<i>INTERCEPT</i>	-0.026 (-2.71)	-0.033 (-2.30)	-0.028 (-2.29)	-0.018 (-2.19)	-0.030 (-2.39)	-0.018 (-1.73)	0.027 (2.59)	0.026 (2.97)	
<i>UPGRADE</i>	0.047 (14.84)	0.042 (8.56)	0.051 (12.26)	0.029 (12.50)	0.025 (6.92)	0.033 (10.66)	0.044 (14.21)	0.022 (11.45)	
<i>DOWNGRADE</i>	-0.059 (-13.15)	-0.072 (-9.17)	-0.050 (-8.86)	-0.029 (-9.71)	-0.027 (-5.81)	-0.030 (-7.93)	-0.054 (-12.68)	-0.036 (-12.80)	
<i>UPGRADE × HIGH FUNDTURNVER</i>	0.020 (3.01)	0.027 (2.92)	0.012 (1.21)	-0.002 (-0.35)	0.002 (0.17)	-0.005 (-0.49)	0.002 (0.29)	0.013 (1.71)	
<i>DOWNGRADE × HIGH FUNDTURNVER</i>	0.001 (0.16)	0.003 (0.18)	0.004 (0.32)	-0.024 (-1.42)	-0.039 (-1.11)	-0.014 (-0.95)	-0.026 (-2.66)	0.007 (0.78)	
<i>UPGRADE × LOW FUNDTURNVER</i>	-0.018 (-2.89)	-0.013 (-1.47)	-0.022 (-2.65)	-0.008 (-2.12)	-0.006 (-1.16)	-0.010 (-1.92)	-0.020 (-3.23)	0.000 (-0.02)	
<i>DOWNGRADE × LOW FUNDTURNVER</i>	0.040 (5.04)	0.052 (4.02)	0.031 (2.85)	0.004 (0.91)	0.002 (0.34)	0.005 (0.88)	0.032 (3.98)	0.015 (2.83)	
<i>HIGH FUNDTURNVER</i>	-0.017 (-2.62)	-0.020 (-2.18)	-0.013 (-1.51)	0.001 (0.09)	-0.005 (-0.53)	0.006 (0.61)	-0.009 (-1.59)	-0.003 (-0.54)	
<i>LOW FUNDTURNVER</i>	0.000 (0.00)	-0.002 (-0.33)	0.003 (0.37)	0.010 (3.32)	0.012 (2.36)	0.009 (0.22)	0.011 (2.15)	0.000 (0.18)	
<i>IO</i>	-0.030 (-3.66)	-0.028 (-2.30)	-0.031 (-3.15)	-0.011 (-2.06)	-0.008 (-0.89)	-0.014 (-2.24)	-0.008 (-1.00)	-0.002 (-0.43)	

(Continued)

TABLE 9—(Continued)

Independent Variable	January 1998 – March 2000						April 2000 – June 2002		
	Dependent Variable $CAR(-I,+I)$						Dependent Variable $CAR(-I,+I)$		
	NASDAQ ALL (1)	NASDAQ HIGH P/S (2)	NASDAQ LOW P/S (3)	NON-NASDAQ ALL (4)	NON-NASDAQ HIGH P/S (5)	NON-NASDAQ LOW P/S (6)	NASDAQ ALL (7)	Non-NASDAQ ALL (8)	
$LOG(MCAP)$	0.003 (1.99)	0.004 (2.35)	0.001 (0.74)	0.000 (0.53)	0.001 (0.84)	0.001 (0.84)	-0.003 (-3.24)		-0.002 (-2.72)
$BOOK/MKT$	0.022 (4.22)	0.037 (2.62)	0.018 (3.37)	0.013 (3.46)	0.028 (2.90)	0.010 (2.44)	0.007 (1.89)		0.004 (1.64)
$MOM12$	0.001 (0.54)	0.001 (0.81)	0.002 (0.44)	0.002 (1.12)	0.006 (1.89)	0.001 (0.36)	0.002 (1.59)		0.005 (2.02)
$TURNOVER$	0.092 (0.62)	0.053 (0.31)	0.345 (1.10)	0.078 (0.19)	0.216 (0.31)	-0.056 (-0.13)	0.082 (0.41)		-0.654 (-2.05)
$IDIOSISK$	0.048 (0.43)	-0.047 (-0.29)	0.192 (1.22)	0.145 (1.02)	0.130 (0.60)	0.190 (0.99)	-0.566 (-4.51)		-0.478 (-2.85)
R -squared (%)	11.0	12.5	9.9	7.3	7.0	7.9	9.8		7.8
# Obs.	17,417	8,426	8,991	19,623	8,572	11,051	18,534		19,531

This table provides regressions to explain abnormal stock returns around analyst recommendation announcements. The dependent variable is the three-day abnormal return around the announcement ($CAR(-I,+I)$). In columns 1 to 6, returns are measured for analyst recommendation announcements during the tech bubble period (January 1998 to March 2000); in columns 7 and 8, returns are measured for analyst recommendation announcements during the subsequent transition and crash period (April 2000 and June 2002). Columns 1 to 3 and 7 include NASDAQ stocks, and columns 4 to 6 and 8 include non-NASDAQ stocks. In addition, we split the sample in some columns into stocks with high and low price-to-sales (P/S) multiples, to compare bubble (high P/S, top tercile) versus non-bubble firms (low P/S, bottom two terciles). $FUNDTURNVER$ is the weighted average of the portfolio turnover of a firm's institutional investors (in % per quarter). $HIGH FUNDTURNVER$ and $LOW FUNDTURNVER$ are dummy variables corresponding to the highest and lowest fund-turnover quintiles. $CHANGEREK$ is the difference between the newly announced recommendation and the previous (outstanding) recommendation by the same analyst. $UPGRADE$ is a dummy variable that takes the value 1 if $CHANGEREK$ is positive, and 0 otherwise. $DOWNGRADE$ is a dummy variable that takes the value 1 if $CHANGEREK$ is negative, and 0 otherwise. t -statistics (reported in parentheses) are based on standard errors clustered by firm; 5% significance levels are denoted in bold. Variables are defined in the data appendix.

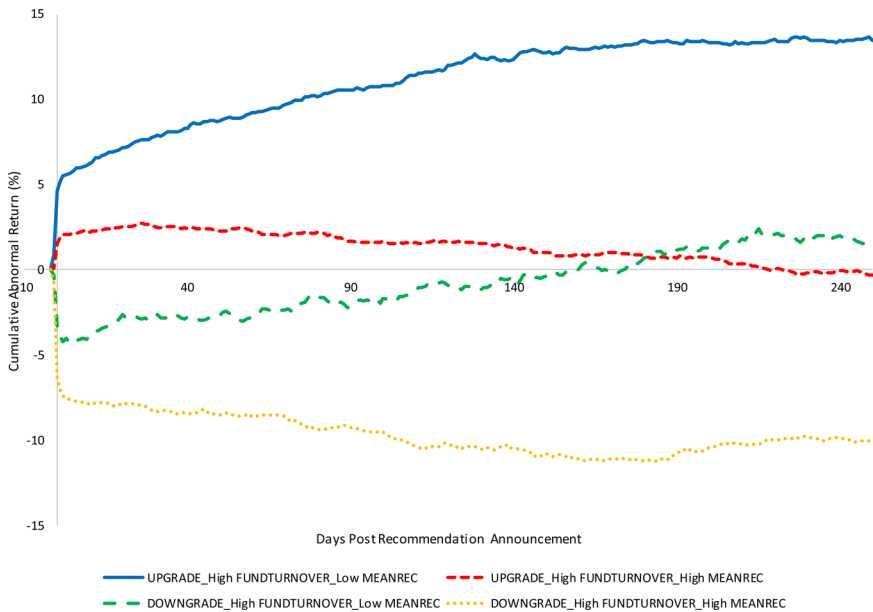


FIG. 4.—Long-term event-time abnormal returns using fund turnover and recommendation change portfolios.

This figure reports long-term event-time cumulative abnormal returns to stocks that experience an *UPGRADE* (*DOWNGRADE*) in recommendations. Day 0 is the recommendation announcement day. We report returns over the 250 days after the announcement of day. The returns are set to zero two days before the announcement day. We compare stocks in the first (Low) and fifth (High) *FUNDTURNOVER* quintile and additionally condition on stocks having high (top quintile) or low (bottom quintile) values of *MEANREC*. *FUNDTURNOVER* is the weighted average of the portfolio turnover of a firm’s institutional investors (in % per quarter). *MEANREC* is a stock’s consensus analyst recommendation, coded on a scale from 1 (sell) to 5 (strong buy).

In column 1, we find that, among NASDAQ stocks during the bubble, the positive return reaction to *UPGRADES* is amplified in the high fund-turnover stocks. There is no corresponding effect for *DOWNGRADES*; this may be because of overly positive beliefs about return continuation at the time even among stocks with many short-term institutions. In NASDAQ stocks, the reaction to upgrades at high fund-turnover stocks is much stronger for high P/S (column 2) than for low P/S stocks (column 3). Columns 4 to 6 show no such patterns among non-NASDAQ stocks during the bubble.¹⁵ Column 7 finds that, in NASDAQ stocks with many short-term institutions, the reactions to upgrades are reversed around downgrades in the transition and crash periods. Column 8 shows that, in non-NASDAQ stocks, this negative reaction is much smaller.

¹⁵ O.A. table 5 shows that we cannot detect similarly strong effects outside of the bubble.

O.A. table 6 further shows that there is stronger postannouncement price drift after *UPGRADES* for high P/S NASDAQ stocks held by many short-term institutions.

These results are difficult to reconcile with the information-source hypothesis. Analyst recommendations are unlikely to generate much more information for high P/S stocks than for low P/S or non-NASDAQ stocks. Also, the lack of a reaction to downgrades points to optimistic higher order beliefs in general during this period. Our interpretation is consistent with BSV, who find stronger bubble continuation among stocks with strong and concentrated buy recommendations in the tech bubble.

5.4 INSTITUTIONAL TRADING AROUND ANALYST RECOMMENDATIONS

If short-term institutions over-rely on public signals because of their higher order beliefs, we predict trading in the direction of recommendation changes among stocks held by many short-term institutions. If higher order beliefs traders infer from the positive (negative) price reaction immediately following the public signal that other traders' average beliefs are positive (negative), this should lead not just to price drift but also to further trading, by short-term institutions, in the direction of the public signal. Trading by short-term institutions directly in response to recommendation changes may also support the alternative hypothesis. However, trading drift is less consistent with this alternative: If analysts are in fact an information source, then trading would have to be concentrated around the recommendation changes.

To test these predictions, we create, in table 10, two dependent variables: *INSTFLOW*(-1,+1) in columns 1 and 2 sums the daily institutional flow into a stock over the three-day period around a recommendation release date; and *INSTFLOW*(+2,+31) in columns 3 and 4 sums the same flow over the 30-day postrecommendation period. As the investor flow data do not allow us to separate investor flow based on investor characteristics, we interact in the table the recommendation changes with *FUNDTURNOVER* to infer whether trading by short-term institutions differs from trading by long-term institutions.

In column 1, *CHANGEREK* \times *FUNDTURNOVER* is positive and significant, which shows that institutional flows move more strongly in the direction of the recommendation change when stocks are held by many short-term institutions. Column 2 uses *UPGRADE* and *DOWNGRADE* to see if the direction of the recommendation change differentially impacts trading by short-term institutions. Indeed, when there are upgrades, inflows into stocks are stronger for stocks held by many short-term institutions. Likewise, when there are downgrades, outflows are stronger for stocks held by many short-term institutions. Columns 3 and 4 show that the trading in high fund-turnover stocks exhibits drift over the next 30 days after an announcement change, mirroring the drift in the returns. These trading patterns support higher order beliefs models but are not consistent with the information-source hypothesis.

TABLE 10
Institutional Trading Around Recommendation Announcements for U.S. Stocks

Independent Variable	Dependent Variable			
	<i>INSTFLOW(-I,+I)</i>		<i>INSTFLOW(+2,+3I)</i>	
	(1)	(2)	(3)	(4)
<i>INTERCEPT</i>	5.35 (2.93)	4.61 (2.42)	30.20 (2.46)	28.80 (2.17)
<i>UPGRADE</i>		-0.99 (-0.76)		-3.99 (-0.16)
<i>DOWNGRADE</i>		2.59 (1.47)		7.10 (0.89)
<i>CHANGEREK</i>	-1.25 (-2.35)		-3.65 (-1.81)	
<i>CHANGEREK</i> × <i>FUNDTURNOVER</i>	10.53 (5.62)		33.85 (4.74)	
<i>UPGRADE</i> × <i>FUNDTURNOVER</i>		9.39 (2.08)		38.68 (1.70)
<i>DOWNGRADE</i> × <i>FUNDTURNOVER</i>		-21.60 (-3.50)		-64.89 (-2.32)
<i>FUNDTURNOVER</i>	-23.34 (-6.12)	-18.67 (-3.87)	-134.69 (-5.07)	-125.27 (-3.77)
<i>IO</i>	-25.47 (-15.10)	-25.39 (-15.06)	-190.35 (-14.67)	-190.21 (-14.67)
<i>LOG(MCAP)</i>	1.60 (11.71)	1.60 (11.69)	11.68 (13.54)	11.68 (13.53)
<i>BOOK/MKT</i>	1.88 (3.44)	1.83 (3.34)	9.17 (2.63)	9.06 (2.60)
<i>MOM12</i>	1.50 (3.37)	1.50 (3.37)	3.13 (1.12)	3.07 (1.09)
<i>TURNOVER</i>	457.36 (1.87)	460.15 (1.88)	5,654.64 (2.67)	5,666.35 (2.68)
<i>IDIORISK</i>	-87.91 (-2.81)	-85.34 (-2.72)	-476.42 (-2.18)	-470.17 (-2.15)
R-squared (%)	6.0	6.0	13.1	13.2
# Obs.	51,606	51,606	51,475	51,475

This table reports regressions to explain institutional investor flow around analyst recommendation announcements. The dependent variable in columns 1 and 2 is the sum of the three-day institutional investor flow for a stock around the announcement date (*INSTFLOW(-I,+I)*); the dependent variable in columns 3 and 4 is the sum of the 30-day institutional investor flow after the announcement date (*INSTFLOW(+2,+3I)*). Data on daily institutional investor flows is obtained from Campbell, Ramadorai, and Schwartz [2009]. *FUNDTURNOVER* is the weighted average of the portfolio turnover of a firm's institutional investors (in % per quarter). *HIGH FUNDTURNOVER* and *LOW FUNDTURNOVER* are dummy variables corresponding to the highest and lowest fund-turnover quintiles. *CHANGEREK* is the difference between the newly announced recommendation and the previous (outstanding) recommendation by the same analyst. *UPGRADE* is a dummy variable that takes the value 1 if *CHANGEREK* is positive, and 0 otherwise. *DOWNGRADE* is a dummy variable that takes the value 1 if *CHANGEREK* is negative, and 0 otherwise. *t*-statistics (reported in parentheses) are based on standard errors clustered by firm; 5% significance levels are denoted in bold. Variables are defined in the data appendix.

We also evaluate longer term institutional flow to evaluate whether short-term institutions trade again out of stocks (into stocks) that experienced positive (negative) returns around past recommendation releases. To perform this test, we return to the portfolio sorts in which we sorted

TABLE 11
Long-Term Institutional Trading After Analyst Recommendation Announcements for U.S. Stocks

Independent Variable	Dependent Variable	
	<i>INSTFLOW</i>	<i>INSTFLOW</i>
	(1)	(2)
<i>INTERCEPT</i>	-1.66 (-0.99)	1.41 (2.28)
<i>MEANREC</i>	0.73 (1.70)	
<i>HIGH MEANREC</i>		1.11 (1.50)
<i>LOW MEANREC</i>		-0.68 (-1.37)
<i>MEANREC</i> × <i>FUNDTURNOVER</i>	-5.71 (-4.02)	
<i>HIGH MEANREC</i> × <i>FUNDTURNOVER</i>		-5.61 (-2.49)
<i>LOW MEANREC</i> × <i>FUNDTURNOVER</i>		5.61 (3.03)
<i>FUNDTURNOVER</i>	16.82 (3.07)	-6.19 (-4.89)
<i>IO</i>	-7.95 (-13.74)	-8.07 (-13.87)
<i>LOG(MCAP)</i>	0.51 (11.48)	0.51 (11.37)
<i>BOOK/MKT</i>	0.23 (1.37)	0.31 (1.86)
<i>MOM12</i>	0.57 (3.86)	0.55 (3.73)
<i>TURNOVER</i>	129.80 (1.53)	134.78 (1.57)
<i>IDIORISK</i>	-18.21 (-1.69)	-22.90 (-2.13)
<i>R</i> -squared (%)	2.9	2.9
# Obs.	598,355	598,355

This table reports regressions to explain longer-term institutional investor flow over the one-year period after recommendation announcements. The dependent variable is the daily institutional investor flow (*INSTFLOW*) over the three days around future recommendation announcements in the four quarters after portfolio formation based on *MEANREC* and *FUNDTURNOVER*. Data on daily institutional investor flows is obtained from Campbell, Ramadorai, and Schwartz [2009]. *FUNDTURNOVER* is the weighted average of the portfolio turnover of a firm's institutional investors (in % per quarter). *MEANREC* is a stock's consensus analyst recommendation, coded on a scale from 1 (sell) to 5 (strong buy). *t*-statistics (reported in parentheses) are based on standard errors clustered by firm; 5% significance levels are denoted in bold. Variables are defined in the data appendix.

firms on *MEANREC* and *FUNDTURNOVER*. For the one-year period after portfolio formation, table 11 then examines institutional flows over the three days around future recommendation releases.

Column 1 examines how institutional flow differs across firms with different levels of *MEANREC* and *FUNDTURNOVER*. The negative and significant estimate on *MEANREC* × *FUNDTURNOVER* reveals that over the next year, institutions exit (enter) firms that currently exhibit positive (negative)

recommendations and are owned by many short-term institutions. Column 2 separates *MEANREC* based on whether recommendation are in the top (*HIGH MEANREC*) or bottom (*LOW MEANREC*) quintile. Over the next year, institutional flow is negative for stocks with optimistic analysts and high *FUNDTURNOVER* but positive for stocks with pessimistic analysts and high *FUNDTURNOVER*. Hence, there is investor flow out of (into) overvalued (undervalued) stocks that experienced positive (negative) return reactions around past recommendation releases. This pattern in investor flow is driven by short-term traders, as it is particularly pronounced at firms with high *FUNDTURNOVER*.

6. Evidence from International Stocks

As an out-of-sample validation we exploit an international sample comprising firms from Japan, the United Kingdom, France, Hong Kong, Canada, Germany, Australia, and Singapore. Together with the United States, these markets constitute, on average, 88% of the world market capitalization (Asness, Frazzini, and Pedersen [2019]). We obtain data from Compustat Global for the international sample. The start dates for this sample vary across countries (between December 1993 and March 1999) due to data availability. We use *TURNOVER* to capture short-term ownership because of a lack of institutional holdings data over a longer time period. O.A. figure 1 confirms the mean-reversion in *TURNOVER* and *MEANREC* for non-U.S. stocks.

O.A. table 7, panel A, shows that the average *MEANREC* for international stocks is 3.6, similar to the U.S. sample. Share turnover is 0.27% on average; this is lower than for the United States, possibly because of the lower free float in some of the countries. O.A. table 7, panel B, shows that the correlation between *TURNOVER* and *MEANREC* is only -0.01 .

O.A. table 8 confirms predictable price reversals for stocks with extreme recommendations and high turnover: *HIGH MEANREC* \times *HIGH TURNOVER* is negative and significant, implying that stocks with optimistic recommendations are likely to be overvalued in the presence of short-term institutions (*LOW MEANREC* \times *HIGH TURNOVER* is insignificant).¹⁶

O.A. table 9 indicates that the alpha for stocks with optimistic analysts and high turnover is negative and significant. The corresponding alpha for low turnover stocks is insignificant, and the difference in alphas is -7.08% per year. For stocks with the most pessimistic analysts, the differences in alphas between stocks in the high and low turnover quintiles are either significantly negative (equal-weighted) or insignificant (value-weighted). This provides further evidence of return reversals being conditional upon optimistic recommendations and high turnover.

¹⁶We estimate regressions at the monthly level, as turnover is available at this frequency. We include pooled panel regression because the number of stocks for each month is lower than for the U.S. sample.

O.A. table 10 shows that the three-day CAR around analyst releases during the past year for stocks with optimistic analysts and high (low) turnover is 1.44% (0.92%). The difference of 0.53% is highly significant. We also find a significant difference of -0.50% for stocks with currently pessimistic analysts. As before, there is a reversal in CARs for the stocks with the highest turnover. For low turnover stocks, the only reversal is for stocks with pessimistic analysts.

7. Conclusion

We document that the presence of short-term institutions, combined with extreme analyst recommendations, is associated with return reversals. Stocks that are currently held by short-term institutions and have the most optimistic (pessimistic) analyst recommendations had large positive (negative) past abnormal returns, which are followed by large negative (positive) abnormal returns. These abnormal returns originate largely from overreactions to past analyst recommendation releases.

We interpret our findings in light of models of higher order beliefs. These models help explain why short-term institutions may rationally focus on widely disseminated, coordinating public signals such as analyst recommendations, and why the interplay between short-term institutions and analyst recommendations can be associated with mispricing. In support of these models' predictions, we find that, in firms with many short-term institutions, return reactions around recommendations are larger when earnings news is released and when fundamental uncertainty is higher. In these firms, we also document stronger announcement returns and price drift after analyst recommendation changes, and find that these effects are particularly strong during the tech bubble. Finally, we demonstrate institutional flow consistent with short-term institutions coordinating their trading around analyst releases.

APPENDIX

Variable	Definition
<i>FUNDTURNOVER</i>	Weighted average value of the quarterly portfolio turnover of the institutional investors owning a stock, weighted by the amount the investors have invested in the stock (see Gaspar, Massa, and Matos [2005]). Quarterly portfolio turnover (averaged over past four quarters) is the ratio of the sum of the absolute dollar value of all buys and sells in a quarter, divided by the average total net fund assets.
<i>HIGH FUNDTURNOVER</i>	Dummy variable that takes the value 1 if <i>FUNDTURNOVER</i> is in the top quintile, and 0 otherwise.
<i>LOW FUNDTURNOVER</i>	Dummy variable that takes the value 1 if <i>FUNDTURNOVER</i> is in the bottom quintile, and 0 otherwise.

Variable	Definition
<i>TRANSIENT IO</i>	Percentage ownership by transient institutional investors divided by total institutional ownership (Bushee [1998], [2001]).
<i>TURNOVER</i>	Average value of the daily number of a firm's shares that are traded divided by the number of shares outstanding. Estimated over the past one year.
<i>HIGH TURNOVER</i>	Dummy variable that takes the value 1 if <i>TURNOVER</i> is in the top quintile, and 0 otherwise.
<i>LOW TURNOVER</i>	Dummy variable that takes the value 1 if <i>TURNOVER</i> is in the bottom quintile, and 0 otherwise.
<i>STIO</i>	Percentage ownership by institutional investors (relative to all shareholders) ranking in the top tercile of portfolio turnover across all institutional investors.
<i>LTIO</i>	Percentage ownership by institutional investors (relative to all shareholders) ranking in the bottom tercile of portfolio turnover across all institutional investors.
<i>MEANREC</i>	Mean (consensus) analyst recommendation for a stock according to the I/B/E/S database. Analyst recommendations are coded on a scale from 1 to 5. We reverse the I/B/E/S coding, so that a recommendation of 1 corresponds to a "sell" and a recommendation of 5 to a "strong buy" recommendation.
<i>HIGH MEANREC</i>	Dummy variable that takes the value 1 if the mean (consensus) analyst recommendation for a stock according to I/B/E/S is in the top quintile, and 0 otherwise.
<i>LOW MEANREC</i>	Dummy variable that takes the value 1 if the mean (consensus) analyst recommendation for a stock according to I/B/E/S is in the bottom quintile, and 0 otherwise.
<i>CHANGEREK</i>	Difference between the newly announced recommendation and the previous (outstanding) recommendation by the same analyst. For initiations and previous recommendations stopped by the broker (according to I/B/E/S Stopped file) or not confirmed by the analyst (in the I/B/E/S review date field) in the last 12 months, we assume the previous recommendation was a "hold," which equals 3.
<i>UPGRADE</i>	Dummy variable that takes the value 1 if <i>CHANGEREK</i> is positive, and 0 otherwise.
<i>DOWNGRADE</i>	Dummy variable that takes the value 1 if <i>CHANGEREK</i> is negative, and 0 otherwise.
<i>NUMREC</i>	Number of analysts covering a stock according to I/B/E/S.
<i>BHM</i>	Measure of buy herding by mutual funds, defined as $BHM_{i,t} = HM_{i,t} p_{i,t} E[p_{i,t}]$. We average $BHM_{i,t}$ over the last four quarters to get the measure. $HM_{i,t} = p_{i,t} - E[p_{i,t}] - E p_{i,t} - E[p_{i,t}] $, where $p_{i,t}$ is the proportions of mutual funds buying stock i during quarter t relative to total number of funds trading that stock in the same quarter; $E[p_{i,t}]$ is the expected number of stock i buys during quarter t , proxied by the proportion of all fund trades (of all stocks) that are buys during quarter t . $E p_{i,t} - E[p_{i,t}] $ is an adjustment factor that controls for random variation around the expected proportion of buys (Lakonishok, Shleifer, and Vishny [1992] and Brown, Wei, and Wermers [2014]).

Variable	Definition
<i>SHM</i>	Measure of sell herding by mutual funds, defined as $SHM_{i,t} = HM_{i,t} p_{i,t} < E[p_{i,t}]$. We average $SHM_{i,t}$ over the last four quarters to get SHM . $HM_{i,t}$ is defined as for <i>BHM</i> .
<i>INSTFLOW</i>	Measure of the daily institutional investor flow in a stock. Data on institutional investor flows is obtained from Campbell, Ramadorai, and Schwartz [2009], who infer daily institutional trading behavior from the “tape,” the Transactions and Quotes (TAQ) database of the New York Stock Exchange.
<i>IO</i>	Percentage ownership by institutional investors.
<i>BMRATIO</i>	Book value of a firm’s equity over the market value of a firm’s equity.
<i>MCAP</i>	Market capitalization of the equity of a firm (in millions).
<i>MOM12</i>	Raw stock return over the past 12 months.
<i>SHORTRATIO</i>	Number of a firm’s uncovered shares sold short, divided by the number of shares outstanding.
<i>IDIORISK</i>	Standard deviation of residuals obtained from firm-level regressions of daily excess stock returns on Fama and French three factors. The regressions are estimated at the end of each quarter with daily returns for the last four quarters.

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