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Sell on the news: differences of opinion, short-sales constraints, and returns around earnings announcements

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Abstract

Miller (1977) hypothesizes that prices of stocks subject to high differences of opinion and short-sales constraints are biased upward. We expect earnings announcements to reduce differences of opinion among investors, and consequently, these announcements should reduce overvaluation. Using five distinct proxies for differences of opinion, we find that high differences of opinion stocks earn significantly lower returns around earnings announcements than low differences of opinion stocks. In addition, the returns on high differences of opinion stocks are more negative within the subsample of stocks that are most difficult for investors to sell short. These results are robust when we control for the size effect and the market-to-book effect and when we examine alternative explanations such as financial leverage, earnings announcement premium, post-earnings announcement drift, return momentum, and potential biases in analysts' forecasts. Also consistent with Miller's theory, we find that stocks subject to high differences of opinion and more binding short-sales constraints have a price run-up just prior to earnings announcements that is followed by an even larger decline after the announcements.

Key words: Differences of opinion; Earnings announcements; Institutional ownership; Limits to arbitrage; Market efficiency; Short-sales constraints
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as visitor while this research was conducted. This paper combines two earlier papers: "Sell on the news: differences of opinion and returns around earnings announcements" by Valentin Dimitrov, Prem C. Jain, and Sheri Tice, and "Overpricing and earnings announcements" by Henk Berkman and Paul D. Koch.

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1. Introduction

Miller (1977) hypothesizes that stock prices reflect an optimistic bias so long as differences of opinion exist among investors about stock value and pessimistic investors do not take adequate short positions due to institutional or behavioral reasons. In equilibrium, the overvaluation cannot persist indefinitely. With periodic announcements that reduce differences of opinion among investors, optimistic investors, on average, are disappointed and stock prices move closer to their fundamental values as investors "sell on the news."

Testing Miller's prediction on the role of differences of opinion is important because it is opposite of those from several popular asset pricing models. For example, differences of opinion relate closely to firm-specific volatility. In contrast to Miller (1977), traditional equilibrium capital asset pricing models conclude that firm-specific volatility is not associated with expected returns (e.g., Sharpe, 1964; and Lintner, 1965). Some models even predict that firm-specific volatility should be positively associated with expected stock returns (e.g., Merton, 1987).

Our main objective is to present new evidence on the effects of differences of opinion and short-sales constraints on stock prices. Prior empirical work on differences of opinion has not generated convincing evidence in favor of or against the Miller hypothesis. For example, Diether, Malloy, and Scherbina (2002) examine monthly returns on portfolios of stocks sorted by dispersion of analysts' forecasts of earnings. Consistent with the Miller hypothesis, they find that stocks with high dispersion of analysts' forecasts have lower future returns relative to stocks with low dispersion of analysts' forecasts. In contrast, Johnson (2004) shows that the findings of Diether, Malloy, and Scherbina (2002) can be explained away by financial leverage. He concludes that the results are not consistent with the Miller hypothesis.[1] Beyond dispersion of analysts' forecasts, other volatility-related variables such as stock return volatility can be used as proxies for differences of opinion. Consistent with the Miller hypothesis, Ang, Hodrick, Xing, and Zhang (2006) find a negative relation between idiosyncratic volatility and returns. However, based on extensive robustness tests, Bali and Cakici (2008) conclude that no robust relation exists between idiosyncratic volatility and returns.

Nagel (2005) extends this literature by examining the monthly returns on portfolios sorted by both differences of opinion and institutional ownership (his proxy for short-sales constraints). He finds that the poor performance of high differences of opinion stocks is concentrated among firms with low institutional holdings. In contrast, Diether, Malloy, and Scherbina (2002), Ang, Hodrick, Xing, and Zhang (2006), and Bali and Cakici (2008) do not incorporate the role of short-sales constraints in their analysis. In this paper, we investigate overpricing in relation to both differences of opinion and short-sales constraints in a more powerful setting.

Potentially the most important shortcoming of prior research testing the Miller hypothesis is the assumption (implicit or explicit) that differences of opinion are reduced over a long time horizon of several months. No specific event is used to study the reduction in differences of opinion and its effect on stock prices. Instead, the authors typically use monthly returns in the manner of traditional tests of capital asset pricing models. In such settings, it is difficult to isolate the effect of differences of opinion from other effects such as financial leverage, momentum, or post-earnings announcement drift. A second important limitation of prior research is a lack of evidence about how and when

[1] In addition, Chen and Jiambalvo (2004) show that the Diether, Malloy, and Scherbina (2002) results can be explained away by the well-known post-earnings announcement drift phenomenon. We control for this possibility and find that our results are robust.

stocks become overvalued. Without such evidence, findings of systematically low returns could indicate either mispricing or low risk.

We take a different approach to develop a sharper and more powerful test based on an important implication of the Miller model. Assuming that at least some investors are short-sales constrained, the Miller (1977) model suggests that higher differences of opinion about stock value result in larger overvaluation. This is because the more optimistic investors' opinions diverge further from the beliefs of the average investor. When new information is released (such as through earnings announcements), differences of opinion among investors are reduced. Upon the release of new information, average returns around those events are expected to be lower for stocks with high differences of opinion than for stocks with low differences of opinion, holding short-sales constraints fixed. To capture the effect of reductions in differences of opinion on stock prices, our analysis focuses on the three-day excess returns around earnings announcements conditional on differences of opinion as well as on short-sales constraints. Our focus on short-window returns also mitigates concerns that the results could be explained by differences in systematic risk. Over short windows, the effects from errors in the measurement of risk premia should be small.[2]

We choose earnings announcements as events that reduce differences of opinion among investors because managers make conscious efforts to communicate relevant information to the market through this process. Beyond information on current earnings, these announcements provide substantial details to help the market understand the financial information just released. In most cases, firms also hold a conference call in which the chief financial officer (CFO) or the chief executive officer (CEO) or both discuss the quarterly results and take questions from financial

[2] Our approach of focusing on earnings announcements is similar to that of La Porta, Lakonishok, Shleifer, and Vishny (1997), who examine the difference between earnings announcement period returns on value and glamour stocks.

analysts. The earnings announcements and the conference calls are among the most anticipated events through which a large amount of information is conveyed to the market. This process is designed to resolve uncertainty not only about current earnings but also about other variables that determine firm value. Hence, differences of opinion among investors about stock value are likely to be reduced around earnings announcements.[3]

Prior empirical research (Brown and Han, 1992; and Bamber, Barron, and Stober, 1997) supports this argument by showing that dispersion of analysts' forecasts of earnings declines after earnings announcements. We verify these prior results for our sample and time period, as well as for additional proxies for differences of opinion. We also show that the reduction in differences of opinion is greater for stocks with higher levels of differences of opinion prior to earnings announcements.[4] We are not suggesting that differences of opinion among investors about stock value are completely eliminated after earnings announcements. We are arguing only that, on average, differences of opinion are reduced.[5]

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[3] A typical earnings press release runs into several pages. In most cases, revenues, changes in capital structure, dividends, and major restructurings are also discussed along with earnings. Thus, these announcements resolve uncertainty about earnings and uncertainty about other value-relevant variables. While we show that there is reduction in uncertainty about earnings around announcements, it is reasonable to assume that uncertainty about other value-relevant variables is also reduced.

[4] Patell and Wolfson (1981, 1984) and Jennings and Starks (1985, 1986) also discuss potential resolution of uncertainty from earnings announcements and the speed of adjustment of stock prices. Using stock options data, Patell and Wolfson (1981) find a decline in implied volatility around earnings announcements. These results are also consistent with a reduction in uncertainty around earnings announcements.

[5] In discussing the resolution of uncertainty, Miller (1977) also emphasizes earnings. On page 1156, he states, "Over time the uncertainty is reduced as the company acquires a history of earnings or lack of them, and the market indicates how it will value these earnings." Similar discussions are presented in many other papers. For example, see Bernard, Thomas, and Wahlen (1997, p. 95), La Porta, Lakonishok, Shleifer, and Vishny (1997, p. 860), and Diether, Malloy, and Scherbina (2002, p. 2137).

Our focus on earnings announcements also provides a novel perspective on the mechanism and timing of the overvaluation and subsequent correction. Prior theoretical research suggests that speculative trading increases in the days prior to earnings announcements, as market participants bet on the forthcoming earnings results (e.g., Kim and Verrecchia, 1991; and He and Wang, 1995). In these models, both optimistic and pessimistic investors have incentives to trade prior to earnings releases, and this incentive is stronger for stocks with higher differences of opinions. At the same time the Miller model suggests that, when short-sales constraints are binding, optimists are more likely to buy than pessimists are to sell short. Consequently, in days leading up to earnings announcements, we expect to observe larger positive abnormal returns for stocks with high differences of opinion and more binding short-sales constraints.

We use several ex ante proxies to capture differences of opinion among investors prior to earnings announcements. We consider stock market-based proxies, earnings-based proxies, and analysts' forecasts-based proxies. Stock market-based proxies capture differences of opinion related to future events, earnings-based proxies capture differences of opinion related to earnings, and analysts' forecasts-based proxies capture differences of opinion among informed investors. The specific proxies are earnings volatility, stock return volatility, standard deviation of analysts' quarterly earnings forecasts, firm age, and share turnover. Following Nagel (2005), we use institutional ownership as a proxy for short-sales constraints to present additional evidence on the importance of the Miller hypothesis. Because institutional investors such as mutual funds and asset managers do most of the lending of shares, stocks with low institutional ownership are particularly difficult to short.[6]

[6] Other studies also use low institutional ownership to proxy for binding short-sales constraints (e.g., Ali, Hwang, and Trombley, 2003; Almazan, Brown, Carlson, and Chapman, 2004; Asquith, Pathak, and Ritter, 2005; Chen, Hong, and Stein, 2002; and D'Avolio 2002). We do not use the level of short

When we examine excess returns in the three-day period around earnings announcements, conditional on institutional ownership, differences of opinion, or both, we find uniform support for Miller's theory. For example, when we condition on institutional ownership alone, we find stocks with low institutional ownership earn significantly lower excess returns than stocks with high institutional ownership in the three-day period around earnings announcements (the return on high minus low institutional ownership stock quintiles is 0.31%). Alternatively, when we condition on differences of opinion alone, we find stocks with high differences of opinion earn excess announcement period returns that are significantly lower than stocks with low differences of opinion. In this case, the three-day hedge returns (the return on high minus low differences of opinion stock quintiles) are between -0.36% and -0.83%, depending upon the proxy used. Finally, when we condition on both differences of opinion and institutional ownership, these negative hedge returns are larger still for stocks that are more likely to be short-sales constrained. In particular, for stocks with low institutional ownership, the difference in returns on high and low differences of opinion stock quintiles varies between -0.53% and -1.69%, depending upon the proxy for differences of opinion used. Together, these results consistently support Miller's theory.

Focusing on earnings announcements allows us to rule out several alternative explanations for the findings. We find that financial leverage, post-earnings announcement drift, stock price momentum, or biased analysts' forecasts do not account for our results. We also control for other potential explanations such as the size effect, the market-to-book effect, and an earnings

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interest as a proxy for short-sales constraints. As pointed out by Chen, Hong, and Stein (2002), there are several shortcomings of this variable. In particular, variation across stocks in short interest could reflect variation in the transaction costs of shorting. Also, the majority of stocks have virtually no short interest. Thus, the use of short interest as a proxy for short-sales constraints would result in a very small sample size.

announcement premium effect and find that our results are robust. Additional analysis using ex post changes in differences of opinion provides further support for the Miller hypothesis.

Consistent with the Miller hypothesis, we also provide evidence that stocks with high differences of opinion and more binding short-sales constraints become more overvalued prior to earnings announcements. In particular, we find that these stocks experience a large and significant price run-up of approximately 1.0% in the ten-day period leading to earnings announcements. The price run-up ends when earnings are announced and is followed by a price reversal of approximately -2.5% over the ten-day period after the earnings announcements. This distinct pattern of a price run-up followed by a larger price decline over short time periods strengthens our conclusion in favor of the Miller hypothesis. Alternative theories or prior evidence (e.g., risk or prior anomalies) are unlikely to offer a satisfactorily explanation for our results because such arguments usually predict price movements in only one direction over an extended period of time.

The rest of the paper is organized as follows. In Section 2 we discuss our proxies for differences of opinion and short-sales constraints. In Section 3 we describe our sample and present summary statistics. Section 4 contains our main findings on the relation between differences of opinion, short-sales constraints, and stock returns around earnings announcements. In Section 5 we examine whether alternative explanations can account for our findings. We also examine several ex post measures of changes in differences of opinion, their relation to our ex ante proxies for differences of opinion, and their relation with earnings announcement period returns. In Section 6, we show a run-up in prices prior to earnings announcements for stocks with high differences of opinion and more binding short-sales constraints. Section 7 concludes this paper.

2. Proxies for differences of opinion and short-sales constraints

Our main objective is to present new evidence on the effects of differences of opinion and short-sales constraints on stock prices. In this section we discuss our proxies for differences of opinion and short-sales constraints.

2.1. Proxies for differences of opinion (DIFOPN)

One challenge in testing the Miller hypothesis is to find satisfactory proxies that capture differences of opinion among investors about stock value. No proxy is perfect because it is almost impossible to find reliable information (hard data) on investor opinion. Hence, it is important to use several proxies for differences of opinion among investors so that the results are not proxy-specific. We select five proxies that cover somewhat different notions of differences of opinion. We only use proxies that can be constructed from data available prior to earnings announcements. We also examine the change in these proxies around earnings announcements.[7]

Our first proxy for differences of opinion (*DIFOPN*) is given by historical income volatility (*INCVOL*). Historical earnings are usually an important source for forecasting future earnings. If a firm's historical earnings have been more volatile, forecasting earnings for that firm would be more difficult and consequently investors would disagree more with respect to the firm's stock value. We measure *INCVOL* as the standard deviation of the seasonally differenced ratio of quarterly operating income before depreciation (Compustat Quarterly Data #21) divided by average total assets (Compustat Quarterly Data #44), measured over the 20 quarters prior to the earnings announcement quarter. We require a minimum of eight quarters of operating income data to measure *INCVOL*.

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[7] Doukas, Kim, and Pantzalis (2006) use a proxy constructed with data from both before and after earnings announcements. Their results, based on monthly returns, do not support the Miller hypothesis.

Our second differences of opinion proxy is given by stock return volatility (*RETVOL*), which is defined as the standard deviation of a firm's daily excess stock returns relative to the value-weighted Center for Research in Security Prices (CRSP) index, over the 45-day period ending ten days prior to the earnings announcement date. We exclude the ten days leading up to the earnings announcement because prior research has shown that return volatility (and turnover) increases significantly during this time period (e.g., Frazzini and Lamont, 2007). By using stock returns relative to index returns, we control for common volatility across stocks. Stock prices play an important role in aggregating information from many sources. If investors disagree to a greater (lesser) extent about the value of a stock, then we would expect higher (lower) stock return volatility. This proxy for differences of opinion is likely to be closely related to *INCVOL*, as firms with more volatile businesses are likely to have higher return volatility as well. However, while accounting income is backward-looking, stock returns capture expectations. Thus, the first two proxies for differences of opinion are likely to complement one another.

The third proxy is derived from the Institutional Brokers Estimates System (I/B/E/S). Following Diether, Malloy, and Scherbina (2002), high (low) dispersion in analysts' forecasts (*DISP*) reflects high (low) differences of opinion among analysts and among investors. We define *DISP* as the standard deviation of analysts' quarterly earnings-per-share forecasts issued or confirmed as valid during the 45-day period ending two days prior to the earnings announcement date.[8] We use data contained in the Detailed I/B/E/S split-adjusted file to measure analysts'

[8] When the I/B/E/S review date falls before the I/B/E/S estimate date, we assume that the review date is the same as the estimate date.

forecasts.[9] We standardize dispersion by the absolute value of the mean analyst forecast.[10] We set *DISP* to missing for firm-quarters with fewer than two forecasts.

Our fourth proxy is firm age (*AGE*), defined as the number of years the firm has been covered by CRSP prior to the earnings announcement date. Older firms typically face less uncertainty because they have had a longer operating history and are frequently in more mature industries. The lower uncertainty about the prospects of older firms should generally lead to less disagreement among investors. For the regression tests we transform *AGE* to Ln(*1/AGE*) for two reasons. First, Ln(*1/AGE*) increases with increases in differences of opinion, consistent with our other proxies. Second, taking the natural logarithm of the raw measure reduces its skewness.

Our fifth and final proxy is average daily turnover (*TURN*) prior to earnings announcements. Daily turnover equals number of shares traded divided by number of shares outstanding as reported on the CRSP daily tapes. *TURN* is defined as the average daily turnover over the 45-day period ending ten days prior to the earnings announcement date. For Nasdaq-traded stocks, we divide the CRSP reported number of shares traded by two to adjust for the double counting of dealer trades.[11] Several empirical papers (see Karpoff, 1987 for a survey) as well as theoretical papers (e.g., Harris and Raviv, 1993) suggest that differences of opinion among investors bring forth trading. Clearly, this is not the only reason for trading. We assume that other reasons for trading (such as portfolio

[9] Payne and Thomas (2003) show that the practice of rounding forecasts to the nearest penny on the Summary I/B/E/S split-adjusted file could lead to a downward bias in the standard deviation of analysts' forecasts for firms with multiple stock splits. They state that the problem is reduced for the Detailed I/B/E/S file, where data are rounded to four (instead of two) decimal points. Our results are similar when we use the unadjusted Detailed I/B/E/S files instead.

[10] Our results are similar if we standardize dispersion by price per share or by assets per share.

[11] This is a crude adjustment because not all Nasdaq trades are recorded identically. As a robustness test, we verify that our results are similar when we examine NYSE and Amex stocks separately from Nasdaq stocks.

rebalancing) in the pre-announcement period do not nullify the effect from differences of opinion. Given these arguments, high (low) *TURN* for a stock indicates high (low) differences of opinion about its value.

The five differences of opinion proxies complement each other, because they capture different aspects of the uncertainty facing investors. Among the proxies used, dispersion of analysts' forecasts, return volatility, and turnover are potentially the best short-term measures as they can be computed using recent data. An interesting feature of return volatility and turnover is that they are based on the decisions made by market participants, and hence, unlike other proxies, they are direct measures of differences of opinion among investors. In contrast, earnings volatility is solely based on accounting data and is not itself affected by the behavior of market participants.[12]

2.2. Proxy for short-sales constraints

We use institutional ownership (*INSOWN*) as a proxy for short-sales constraints. Because institutional investors such as mutual funds and asset managers do most of the lending of shares, stocks with low institutional ownership are particularly difficult or costly to sell short (see, for example, Ali, Hwang, and Trombley, 2003; Asquith, Pathak, and Ritter, 2005; Chen, Hong, and Stein, 2002; D'Avolio, 2002; and Nagel, 2005). In addition, because of institutional and cultural barriers that effectively prevent short selling by institutional investors, most professional investors simply never sell short and thus cannot trade against overpriced stocks that they do not own (Almazan, Brown, Carlson, and Chapman, 2004; and Nagel, 2005). This limit to arbitrage by professional investors could result in the recurring and persistent overpricing behavior hypothesized by Miller's theory.

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[12] Researchers have used variables similar to our proxies in other studies. For additional discussion of these variables, see Ang, Hodrick, Xing, and Zhang (2006), Lee and Swaminathan (2000), Jiang, Lee, and Zhang (2005), and Zhang (2006).

We classify stocks with low institutional ownership as having more binding short-sales constraints. Institutional ownership (*INSOWN*) is measured as the fraction of the company's shares held by institutional investors prior to the earnings announcement, as reported in Thomson Financial's CDA/Spectrum Institutional (13f) Holdings data. We set *INSOWN* to zero if no ownership data are available for a firm-quarter during the 180 days prior to the earnings announcement. We set *INSOWN* to missing if it is greater than or equal to one.

3. Sample

In this section we describe our sample, define the remaining variables used in the study, and present descriptive statistics.

3.1. Data sources and variable definitions

The sample includes quarterly earnings announcements made by firms listed on the New York Stock Exchange, the American Stock Exchange, and Nasdaq during the period from January 1985 to December 2005. The sample starts in 1985 because insufficient data are available on analysts' quarterly earnings forecasts prior to that year. Earnings announcement dates are obtained from the Compustat Quarterly files. We exclude foreign stocks, Real Estate Investment Trusts (REITs), unit investment trusts, Americus trusts, financials (CRSP standard industrial classification (SIC) codes 6000 to 6999), and regulated utilities (CRSP SIC codes 4900 to 4999). To reduce the potential effects of outliers and stale prices on the results, we exclude earnings announcements of firms with $10 million or less in total assets, $10 million or less in market value of equity, or with a price of less than $1 per share as reported on Compustat at the start of the current fiscal quarter.

We define earnings announcement period excess returns (*EXRET*) as the firm's buy-and-hold return over the three-day period centered at the earnings announcement date, minus the corresponding buy-and-hold return on the value-weighted CRSP index. We exclude announcements of firms with missing returns on CRSP for any one of the three announcement days.

We use several variables to control for risk and other previously revealed patterns in stock returns. We use market value of common stock (*MV*) to control for differences in firm size, because smaller firms tend to earn higher returns on average (e.g., Fama and French, 1992). *MV* is given by price multiplied by number of shares outstanding as reported on Compustat at the start of the current fiscal quarter (Compustat Quarterly Data #14*Data #15). We also control for the market-to-book (*MB*) ratio to ensure that the effect of differences of opinion is different from the value and glamour anomaly (e.g., Fama and French, 1992; Lakonishok, Shleifer, and Vishny, 1994; and La Porta, Lakonishok, Shleifer, and Vishny, 1997). This variable is defined as market value of common stock (Compustat Quarterly Data #14*Data #15) divided by book value of common stock (Compustat Quarterly Data #59) at the end of the prior fiscal quarter. We set *MB* to missing if it is less than 0.01 or greater than 100.

We also examine whether our conclusions are affected by leverage, the earnings announcement premium, prior period earnings surprises, and price momentum. We measure leverage (*LEV*) as total debt (Compustat Quarterly Data #51 + Data #45) divided by total assets (Compustat Quarterly Data #44) at the end of the prior fiscal quarter. We set *LEV* to missing if it is less than zero or greater than one. To examine the effect of the earnings announcement premium, we measure the concentration of trading volume around earnings announcements (*ANNVOL*).[13] *ANNVOL* is given by the average daily volume over the three days around each of the four consecutive earnings announcements preceding the current fiscal quarter, divided by the average

[13] We motivate the use of *ANNVOL* as a proxy for the earnings announcement premium in Subsection 5.2.

daily volume for the 250 trading days ending ten days prior to the earnings announcement for the current fiscal quarter. The earnings surprise is measured as standardized unexpected earnings (*SUE*), defined as seasonally adjusted quarterly earnings per share divided by the price per share measured at the start of the current fiscal quarter. Consistent with prior research, we convert the data on *SUE* each quarter to their quarterly decile rankings (1 through 10) using the raw data on *SUE* for all sample firms reporting earnings in each respective calendar year-quarter. To capture the effects of price momentum (*MOM*), we calculate each firm's excess buy-and-hold returns (relative to the CRSP value-weighted index) over the 12 calendar months prior to the earnings announcement date.

In later tests, we measure whether earnings announcements reduce differences of opinion by calculating the change in three proxies for differences of opinion surrounding each earnings announcement. The first of these three measures is based on the change in the dispersion of analysts' forecasts of EPS ($\Delta DISP$). $\Delta DISP$ measures the change in the standardized dispersion of analysts' forecasts of next quarter's EPS surrounding a quarterly earnings announcement. Dispersion before (after) the earnings announcement is measured using the standard deviation across all valid forecasts during the 45 days (30 days) prior to (after) the three-day earnings announcement period, scaled by the absolute value of the mean analyst forecast before (after) the quarterly earnings announcement.[14]

The other two measures of changes in *DIFOPN* around quarterly earnings announcements are labeled $\Delta RETVOL$ and $\Delta TURN$. $\Delta RETVOL$ is the change in the standard deviation of excess daily stock returns (relative to the value-weighted CRSP index) surrounding a quarterly earnings announcement. $\Delta TURN$ is the change in average daily turnover surrounding a quarterly earnings

[14] More analyst forecasts typically are available in the period after earnings announcements than before earnings announcements. The use of a 45-day window before and a 30-day window after earnings announcements results in a more balanced sample (see Bamber, Barron, and Stober, 1997).

announcement. Daily turnover is number of shares traded divided by number of shares outstanding, as reported on the CRSP daily tapes. *RETVOL* and *TURN* before (after) the earnings announcement are measured over the 45-day period (30-day period) ending (starting) ten days prior to (after) the earnings announcement date. These two measures reflect the beliefs of all investors, not just analysts.[15]

Despite eliminating the smallest firms from our sample, some variables have extreme values. Thus, we winsorize *INCVOL*, *RETVOL*, *DISP*, and *TURN* at the 99% level and *ANNVOL*, *MOM*, Δ*DISP*, Δ*RETVOL*, and Δ*TURN* at the 1% and the 99% levels. The Appendix contains the definitions of all the variables used in this study.

3.2. Descriptive statistics

Panel A of Table 1 presents summary statistics for the five *DIFOPN* proxies and other variables. The maximum number of observations is 248,691 firm-quarter observations with data on excess returns around earnings announcements. For four of the *DIFOPN* proxies (*TURN*, *AGE*, *INCVOL*, and *RETVOL*), a high percentage of the observations are available (between 169,036 and 248,691). The *DIFOPN* proxy based on analysts' forecasts (*DISP*) yields a noticeably smaller number of observations (103,308), due to lack of analyst coverage for many smaller firms.

The mean (median) market value of firms in the sample is $1,723 million ($161 million). The mean excess buy-and-hold return in the three days around earnings announcements is positive (0.20%), but the median is negative (-0.09%). A positive mean return is consistent with the results in prior studies (e.g., Chari, Jagannathan, and Ofer, 1988).[16] The mean standard deviation of

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[15] We use operating income volatility and age as two other measures of *DIFOPN*. However, these two measures change too slowly to be used in this analysis.

[16] If earnings announcements reduce differences of opinion, Miller (1977) predicts a negative mean excess return around earnings announcements, especially for high difference of opinion stocks. A

seasonally adjusted operating income (*INCVOL*) is 2.67% of firm assets, and the mean standard deviation of excess daily stock returns (*RETVOL*) is 3.38%. The mean dispersion of analysts' forecasts of earnings relative to the absolute value of the mean analyst forecast (*DISP*) is 0.26. The mean age (*AGE*) of the firms in the sample is 14.12 years, and the mean daily share turnover (*TURN*) is 0.34% of outstanding shares.

Panel B of Table 1 presents the correlation coefficients among the main variables of interest. Pearson correlation coefficients are presented below the diagonal, and Spearman rank correlation coefficients are presented above the diagonal. We first calculate correlation coefficients within each calendar year-quarter using only firms that report earnings in that quarter. We then report averages across the 84 quarterly coefficients and their *t*-statistics. We discuss the Pearson correlation coefficients throughout the text. Spearman correlation coefficients lead to similar inferences.

All five *DIFOPN* proxies are negatively related to the announcement period excess returns. For example, firms with higher earnings volatility (*INCVOL*) have lower announcement period returns (*EXRET*), as indicated by the negative correlation coefficient between *EXRET* and *INCVOL* (coefficient of -0.03, *t*-statistic of -7.32). Similarly, firms with higher stock return volatility (*RETVOL*), firms with higher dispersion of analysts' forecasts (*DISP*), younger firms (as measured by high Ln(*1/AGE*)), and firms with higher share turnover (*TURN*) all have lower returns. The pair-wise correlations across our five differences of opinion proxies are positive in all cases, with the largest correlation coefficient of 0.36 between *INCVOL* and *RETVOL*. Thus, our five *DIFOPN* proxies capture similar although not identical information. We also find that firms with more binding short-sales constraints (lower *INSOWN*) have lower announcement period excess returns.

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positive mean return suggests the presence of additional variables (e.g., risk) correlated with earnings announcement period returns. We address this issue further in Sections 4 and 5.

4. Differences of opinion, short-sales constraints, and returns around earnings announcements

In this section, we first report excess earnings announcement period returns for portfolios of stocks formed using our five proxies for differences of opinion and our proxy for short-sales constraints. This analysis helps us determine the economic magnitude of the Miller effect. We then examine the results in a regression framework that controls for the size effect and the market-to-book effect. We use the Fama and MacBeth (1973) regression methodology for the latter analysis.

4.1. Portfolio approach

In Panel A of Table 2 we report excess earnings announcement period returns for quintile portfolios formed using each of the five *DIFOPN* proxies and for quintile portfolios formed using *INSOWN*. We first compute the average three-day excess return for every portfolio in each of the 84 calendar quarters. The reported portfolio returns are precision-weighted averages of this sequence of quarterly averages, where the number of observations available each quarter proxies for the precision of the quarterly average.[17]

We focus on the difference between the returns earned by the extreme portfolios and refer to this difference as a hedge return. The hedge portfolio methodology controls for two potential effects that could otherwise distort the evidence. First, the mean excess return for the three-day earnings announcement window is 0.20% (see Panel A of Table 1), which is generally interpreted as evidence of an earnings announcement premium (e.g, Chari, Jagannathan, and Ofer, 1988). Thus, while the mean returns to any one portfolio would tend to be overstated (larger) by that amount, the hedge

[17] The weighted-average approach is preferred because the number of observations in earlier periods is smaller than in later periods. A simple average of the quarterly statistics gives undue weight to quarters with few observations and noisy estimates (see Fama, 1998). Our results are similar when we calculate simple averages instead.

returns would not be affected. Second, other unknown factors could also affect returns around earnings announcements. The use of differences in mean returns across extreme portfolios controls for such effects.

The first five columns in Panel A of Table 2 show the effect of differences of opinion on earnings announcement period returns. Consistent with the Miller hypothesis, high *DIFOPN* portfolios (Portfolio 5) earn significantly lower excess announcement period returns than low *DIFOPN* portfolios (Portfolio 1). For example, the high *INCVOL* portfolio earns an average excess return of -0.18%, while the low *INCVOL* portfolio earns an average excess return of 0.41%. The difference in returns of -0.59% is large given the short time period and is statistically significant at the 1% level. This return pattern is similar for the remaining four *DIFOPN* proxies. The hedge returns vary from -0.36% for AGE to -0.83% for *TURN*, and they are statistically significant at the 1% level for all five *DIFOPN* proxies.

The hedge returns based on *INSOWN* provide further evidence in support of the Miller hypothesis. The results are shown in the last column in Panel A of Table 2. We find that stocks with the most binding short-sales constraints (low *INSOWN*) earn significantly lower excess announcement period returns than stocks with the least binding short-sales constraints (high *INSOWN*). The hedge return of 0.31% is similar in magnitude to the hedge returns based on *DIFOPN* and is also statistically significant at the 1% level.[18]

The magnitude of the hedge returns in Panel A of Table 2 is larger than the hedge returns based on monthly returns in prior work. For example, Diether, Malloy, and Scherbina (2002) use

[18] This result is also consistent with prior research suggesting that institutional investors have superior stock picking skills (see Baker, Litov, Wachter, and Wurgler, 2004; and Ali, Durtschi, Lev, and Trombley, 2004). However, as we show in Panel B of Table 2, the effect of *INSOWN* on returns varies systematically with the level of *DIFOPN*, which is consistent with the Miller hypothesis but not with this alternative explanation.

DISP as a proxy for differences of opinion and form hedge portfolios each month. They report monthly hedge returns of -0.79%. Assuming 21 trading days per month, this result translates to a daily hedge return of -0.038% and a three-day hedge return of -0.11%. When we use the same proxy but concentrate on announcement period returns, we find a three-day hedge return of -0.39%, which is more than three times as large as the hedge returns reported by Diether, Malloy, and Scherbina (2002).[19] This evidence indicates that focusing the analysis on earnings announcements has substantial benefits.

In Fig. 1 we examine the distribution of the hedge returns over the 84 quarters in our study, for each *DIFOPN* proxy and for *INSOWN*. For *DIFOPN*, we discuss only the results for *INCVOL* (Panel A). Our inferences based on the other four *DIFOPN* proxies are similar (Panel B to Panel E). The hedge return based on *INCVOL* quintile portfolios is negative for 64 out of the 84 quarters in the study (76%). For *INSOWN* (Panel F), the hedge returns are positive for 58 out of 84 quarters in the study (69%). Furthermore, the hedge returns increase in magnitude over time. One possible explanation for the greater importance of differences of opinion and short-sales constraints in the latter years is that earnings announcements have become more informative over time (e.g., Landsman and Maydew, 2002). Another possibility is that differences of opinion have increased in recent years because the number of market participants has increased (e.g., Hong, Kubik, and Stein, 2004).

In Panel B of Table 2, we examine the joint effect of *DIFOPN* and *INSOWN* on earnings announcement period returns using a two-dimensional sort by both *DIFOPN* and *INSOWN*. For each calendar year-quarter, we first sort firms into high, medium, and low *INSOWN* portfolios (top 30%, middle 40%, and bottom 30%). Then, within each *INSOWN* portfolio, firms are further sorted

[19] Results for *DISP* are similar if we exclude the third calendar quarter of 1993, when there are fewer

into high, medium, and low *DIFOPN* portfolios (top 30%, middle 40%, and bottom 30%). For each proxy for differences of opinion, this procedure leads to a 3 x 3 scheme of nine double-sorted portfolios. We use sequential sorts, first by *INSOWN*, followed by *DIFOPN*. The alternative approach of using independent sorts produces several portfolios with very few observations, resulting in volatile quarterly excess returns and high standard errors of the mean excess returns. Nevertheless, the results based on independent sorts are similar to those presented here.

Consistent with the Miller hypothesis, the results in Panel B of Table 2 indicate that both *DIFOPN* and *INSOWN* are associated with earnings announcement period excess returns when we control for the effect of the other variable. For example, within the group of stocks with low *INSOWN*, high *DIFOPN* stocks earn significantly lower excess returns than low *DIFOPN* stocks (hedge returns vary from -0.53% for *DISP* to -1.69% for *TURN*). Alternatively, within the group of stocks with high *DIFOPN*, high *INSOWN* stocks earn significantly higher excess returns than stocks with low *INSOWN* (hedge returns vary from 0.53% for *AGE* to 1.14% for *TURN*). We also find that the effect of *DIFOPN* on excess returns is stronger when stocks are more difficult to sell short (when *INSOWN* is low). When pessimistic investors can more easily sell shares short, stocks are unlikely to become overvalued even when differences of opinion are high. Similarly, we find that the effect of *INSOWN* on excess returns is stronger when differences of opinion are high. When differences of opinion are lower, there should be less demand by pessimistic investors to sell shares short, so that short-sales constraints do not result in overvaluation.

4.2. Size and market-to-book controls in a regression analysis

In this sub-section we examine the effect of differences of opinion and short-sales constraints together in a regression framework that controls for the size effect and the market-to-book effect.

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than one hundred observations with available data on the I/B/E/S files.

We use the following model that includes Ln(*MV*) and Ln(*MB*), along with one *DIFOPN* proxy at a time and *INSOWN*:

$$EXRET_{i,q} = \alpha + \beta_1 * \text{Ln}(MV)_{i,q} + \beta_2 * \text{Ln}(MB)_{i,q} + \beta_3 * DIFOPN_{i,q} + \beta_4 * INSOWN_{i,q} + \varepsilon_{i,q}, \qquad (1)$$

where *i* identifies the firm and *q* identifies the quarterly earnings announcement.[20] We estimate each model by calendar year-quarter and report precision-weighted Fama and MacBeth (1973) coefficient estimates and their corresponding *t*-statistics, where the weights correspond to the number of observations available in each calendar year-quarter.[21]

Panel A of Table 3 reports the results for Eq. (1), using each of the five different *DIFOPN* proxies. Consistent with the Miller hypotheses, the coefficient on *DIFOPN* is negative and significant at the 1% level for all five models in Table 3. Thus, size and market-to-book do not account for the relation between differences of opinion and announcement period returns. The economic significance of the effect is similar to that reported in Table 2. For example, controlling for differences in size and market-to-book, the coefficient on *INCVOL* is -0.09 (*t*-statistic of -8.45). This coefficient implies that an increase in *INCVOL* of 6.57% (which corresponds to the difference between the *INCVOL* of high and low *INCVOL* portfolios, not tabulated) is associated with 0.59% lower returns in the three days around quarterly earnings announcements. This difference is the same as the 0.59% spread in returns between high and low *INCVOL* stocks reported in Panel A of Table 2.

[20] All independent variables are measured ex ante. This approach is similar to using betas (or other firm characteristics) measured prior to returns in tests of asset pricing models. The use of ex ante independent variables also mitigates reverse causality concerns.

[21] The results for all regressions are similar when we adjust the Fama and MacBeth standard errors for first-order serial correlation using the Newey-West adjustment.

The results using *INSOWN* are also consistent with the Miller hypothesis. The coefficient on *INSOWN* in Panel A of Table 3 is positive and highly significant in all specifications. This shows that firms with more binding short-sales constraints (lower *INSOWN*) earn lower announcement period returns. Hence, size and market-to-book do not account for the relation between institutional ownership and announcement period returns.

Consistent with the results in Fig. 1, additional analysis of the quarterly Fama and MacBeth coefficient estimates reveals that the results are not driven by a few quarters. The coefficients on *DIFOPN* (β_3) are negative for the majority of quarters, for all five *DIFOPN* proxies. For example, the coefficient on *INCVOL* is negative for 68 out of the 84 quarters in the study (81%). For all the five proxies together, the β_3 coefficient is negative in 71% of all cases. Unlike the results in Diether, Malloy, and Scherbina (2002) using monthly returns, the results for earnings announcement period returns are not weaker in the more recent subperiods. For example, for the last one-third (one-half) of the study period, 80% (79%) of the coefficients are negative. Similarly, the coefficients on *INSOWN* (β_4) are positive for the majority of quarters and remain strong in the more recent subperiods.

As a robustness test we also estimate alternative specifications that control for outliers and allow for a nonlinear relation between *DIFOPN* proxies, institutional ownership, and announcement period returns (results not tabulated). We convert *MV*, *MB*, each *DIFOPN* proxy, and *INSOWN* to their deciles ranking and reestimate Eq. (1). The coefficients on all five *DIFOPN* variables remain negative and significant, and the coefficient on *INSOWN* remains positive and significant. The results are similar when we reestimate Eq. (1) using *DIFOPN* and *INSOWN* dummy variables that equal one if a firm is in the top 20% of the respective distribution and zero if the firm is in the bottom 80%. We conclude that the results are not driven by outliers and are robust to less restrictive regression models that allow for nonlinearity.

We perform two additional tests to verify that we are not simply showing the effect of size on earnings announcement period returns. First, we exclude firms with market value of equity of less than $50 million and reestimate Eq. (1). The coefficients on all *DIFOPN* variables are negative and significant at the 1% level with the exception of *AGE*. The coefficient on *INSOWN* is positive and significant at the 1% level. Second, we divide the sample into three size groups: small (bottom three size deciles), medium (middle four size deciles), and large (top three size deciles). We then reestimate the specification shown in Eq. (1) for each size group. For the small-size group, the coefficients on *INCVOL*, *RETVOL*, *AGE*, and *TURN* are reliably negative. For the medium-size group, the coefficients on *INCVOL*, *RETVOL*, *DISP*, and *TURN* are reliably negative. Finally, for the large-size group, the coefficients on *INCVOL* and *RETVOL* remain reliably negative. The coefficient on *INSOWN* remains positive and significant for all three size groups. Thus, the results are valid for the vast majority of stocks.

Finally, we test whether the results hold in the period preceding our sample period. The sample starts in 1985 because insufficient data on analysts' quarterly earnings forecasts exist prior to that year. However, earlier data exist for the other independent variables. Data are available back to 1972 for *RETVOL*, *AGE*, and *TURNOVER*, back to 1978 for *INCVOL*, and back to 1980 for *INSOWN* if at least one hundred observations are required in a quarter. The results are robust if we extend the data back to include the earlier years for each variable (results are available from the authors).

Overall, these results provide support for the Miller hypothesis, indicating that higher differences of opinion among investors and more binding short-sales constraints lead to an upward bias in stock prices, and this bias is partially corrected with the arrival of earnings news.

4.3. Institutional ownership and differences of opinion interaction

In Subsection 4.2 we show that *DIFOPN* and *INSOWN* each have a marginal effect on earnings announcement period returns holding the other variable fixed. The Miller hypothesis also predicts that the effect of *DIFOPN* on excess returns is stronger when stocks are more difficult to sell short (when *INSOWN* is low). In this subsection we examine whether this prediction holds. Similar to the analysis in Panel B of Table 2, each calendar year-quarter, firms that report earnings are sorted into three portfolios based on *INSOWN*. Low, medium, and high *INSOWN* portfolios contain stocks in the bottom 30%, middle 40%, and top 30% of the *INSOWN* distribution, respectively. We estimate Eq. (1) (excluding the *INSOWN* variable) for low, medium, and high *INSOWN* groups in each calendar year-quarter. Precision-weighted Fama and MacBeth (1973) coefficient estimates and their corresponding *t*-statistics are shown in Panel B of Table 3. As predicted by Miller, the coefficients on each of the five *DIFOPN* variables decrease monotonically from high *INSOWN* to low *INSOWN*. The negative effect of differences of opinion on announcement period returns is strongest when short-sales constraints are most binding. A *t*-test shows that the mean difference between the *DIFOPN* coefficient for low *INSOWN* stocks and high *INSOWN* stocks is significantly different from zero at the 1% level for all *DIFOPN* proxies with the exception of *DISP*. Because the sample of firms with analyst forecasts and low institutional holdings is small, it is not surprising that the results are weak for *DISP*. Overall, the findings provide additional support for the Miller hypothesis.

5. Additional tests

In this section we show that our conclusions remain valid when we control for several alternative explanations for our results. We also verify that earnings announcements lead to ex post convergence in beliefs. Subsection 5.1 examines whether our results are sensitive to including leverage and the interaction of leverage with *DIFOPN* in our specification. Subsection 5.2 examines whether the results are robust to including controls for the earnings announcement premium, the post-earnings announcement drift, and return momentum. Subsection 5.3 examines whether biases in analysts' forecasts can account for our findings. Subsection 5.4 examines ex post measures of changes in differences of opinion and their relation to our ex ante *DIFOPN* proxies. Finally, Subsection 5.5 examines the relation between ex post changes in differences of opinion and earnings announcement period returns.

5.1. The effect of leverage

Johnson (2004) argues that the negative relation between differences of opinion proxies and returns does not necessarily reflect systematic mispricing. He suggests that differences of opinion could proxy for idiosyncratic asset risk instead. Because levered equity is essentially an option on the assets of the firm, standard option-pricing theory predicts that the expected return on levered equity is decreasing in idiosyncratic asset risk. Johnson proposes a simple test of his theory: The negative relation between differences of opinion and returns should be increasing in financial leverage. In addition, Johnson predicts that differences of opinion should not explain the returns of firms with no leverage.

We use the following equation to test whether leverage can account for our findings:

$$\begin{aligned} EXRET_{i,q} = \alpha &+ \beta_1 * \text{Ln}(MV)_{i,q} + \beta_2 * \text{Ln}(MB)_{i,q} + \beta_3 * DIFOPN_{i,q} + \beta_4 * INSOWN_{i,q} \\ &+ \beta_5 * LEV_{i,q} + \beta_6 * (LEV_{i,q} * DIFOPN_{i,q}) + \varepsilon_{i,q}, \end{aligned} \tag{2}$$

where *i* identifies the firm and *q* identifies the quarterly earnings announcement. In this model we control for the leverage effect by including the two variables (*LEV* and *LEV**DIFOPN*) suggested by Johnson (2004). We also control for firm size and market-to-book ratios by including Ln(*MV*) and Ln(*MB*). If the Miller hypothesis is true, the coefficient on *DIFOPN* (i.e., β_3) should be significantly negative, and the coefficient on *INSOWN* (i.e., β_4) should be significantly positive, even after controlling for the leverage effect. Using monthly returns (without focusing on earnings announcement dates) and the dispersion in analysts' forecasts as a *DIFOPN* proxy, Johnson (2004) finds that β_3 is not significant and hence the original Diether, Malloy, and Scherbina (2002) results are subsumed by the leverage effect. We revisit this issue by focusing on earnings announcements.

We estimate Eq. (2) by quarter and report weighted Fama and MacBeth (1973) coefficient estimates where the weights correspond to the number of observations available in each quarter. Table 4 provides the results for each of the five *DIFOPN* proxies. In stark contrast to the results in Johnson (2004), we find that the coefficient on each of the *DIFOPN* proxies remains significantly negative. We also find that the coefficient on *INSOWN* remains significantly positive. In contrast, the coefficients of *LEV* and *LEV**DIFOPN* are never statistically significant. Thus, financial leverage does not account for our results, and the evidence in support of Miller's theory is robust to this extension.[22]

5.2. The effect of the earnings announcement premium, post-earnings announcement drift, and return momentum

We next examine whether our results are robust to controlling for several additional firm characteristics that have been shown to explain earnings announcement period returns. Our first

[22] We also estimate Eq. (1) for firms with zero leverage (approximately 13% of the sample). The coefficient estimates on *DIFOPN* are similar to the corresponding estimates for the full sample and remain statistically significant for four of the five proxies (results not tabulated).

control is based on the work by Frazzini and Lamont (2007), who show that the concentration of trading volume around earnings announcements is positively related to earnings announcement period returns. Furthermore, they demonstrate that firms with higher trading volume around one earnings announcement also tend to have higher volume and larger returns around future earnings announcements. One interpretation of this evidence is that risk around earnings announcements is larger than at other times, and the premium related to this risk (the earnings announcement premium) is different for firms with different degrees of announcement period trading volume. We examine the effect of this possible return premium on our findings by incorporating *ANNVOL* in our regression specification. *ANNVOL* measures the concentration of trading volume around the past four quarterly earnings announcements (see the Appendix for a description of this variable).

Our second control is the firm's standardized unexpected earnings for the previous fiscal quarter ($SUE_{i,q-1}$). This variable is meant to capture the post-earnings announcement drift anomaly (e.g., Bernard and Thomas, 1989, 1990; and Chan, Jegadeesh, and Lakonishok, 1996). Chen and Jiambalvo (2006) find that, for monthly returns, the post-earnings announcement drift subsumes the results of Diether, Malloy, and Scherbina (2002). Once again, they use monthly returns and do not focus on the short windows around earnings announcements. We revisit this issue using earnings announcement period returns instead of monthly returns.

Finally, we control for past return momentum (*MOM*), measured as a firm's buy-and-hold return (relative to the CRSP value-weighted index) over the 12 calendar months prior to the earnings announcement. Jegadeesh and Titman (1993), among others, show that recent past winners continue to outperform recent past losers over the subsequent six to twelve months. They also show that recent past winners earn higher earnings announcement period returns than recent past losers. We include *MOM* in our specifications to investigate whether our results reflect this price momentum pattern.

The new specification is given by

$$EXRET_{i,q} = \alpha + \beta_1 {*} \mathrm{Ln}(MV)_{i,q} + \beta_2 {*} \mathrm{Ln}(MB)_{i,q} + \beta_3 {*} DIFOPN_{i,q} + \beta_4 {*} INSOWN_{i,q} + \beta_5 {*} ANNVOL_{i,q} + \beta_6 {*} SUE_{i,q-1} + \beta_7 {*} MOM_{i,q} + \varepsilon_{i,q}. \quad (3)$$

Table 5 shows the results for each of the five *DIFOPN* proxies. Our key finding is that, once again, the coefficient estimates and significance levels for all five *DIFOPN* proxies and *INSOWN* remain similar to the estimates of Eq. (1) presented in Panel A of Table 3. Hence, our previous results supporting Miller's theory are not explained by the premium around earnings announcements, the post-earnings announcement drift, or return momentum. The results remain robust when we include three additional *SUE* lags or when we use past excess earnings announcement period returns as alternative measures of past earnings surprises.

Consistent with Frazzini and Lamont (2007), the estimated coefficient on *ANNVOL* is positive, although it is not significantly different from zero when *INCVOL* is included in the regression. The positive coefficient on SUE_{q-1} is consistent with the existence of a post-earnings announcement drift. Finally, the positive coefficient on *MOM* is consistent with the momentum effect shown in Jegadeesh and Titman (1993) as past 12-month winners have more positive returns at earnings announcements.

5.3 The role of analysts

Scherbina (2008) suggests that the low monthly returns of high *DIFOPN* stocks reflect an optimistic bias in analysts' forecasts that is related to institutional, not behavioral, factors. Scherbina argues that it is less costly for analysts to inflate their earnings forecasts when the dispersion of analysts' forecasts is high. In addition, because the most pessimistic analysts could choose not to issue a forecast, high disagreement among analysts would lead to more optimistically biased mean and median forecasts. If naïve investors do not discount these institutional biases in analysts' forecasts, they are systematically disappointed by the earnings of high *DIFOPN* stocks.

We examine whether Scherbina's hypothesis can account for the negative relation between *DIFOPN* and announcement period returns and the positive association between *INSOWN* and announcement period returns. We reestimate Eq. (1) using the subsample of firms that do not have any forecasts by analysts (41% of the whole sample). We use the four *DIFOPN* proxies that do not require data on analysts' forecasts (*INCVOL*, *RETVOL*, *AGE*, and *TURN*). In results not reported here, we once again find significant positive coefficients on *INSOWN* and significant negative coefficients on *INCVOL*, *RETVOL*, and *TURN*. The coefficient on *AGE* is negative but insignificant (coefficient of -0.05, *t*-statistic of -1.40). Therefore, our results are not driven by biased analysts' forecasts.

5.4. Convergence of opinions around earnings announcements

A major premise of our analysis is that earnings announcements reduce differences of opinion among investors. Our results are consistent with this premise and with Miller's theory, as we find that stocks subject to high levels of differences of opinion and more binding short-sales constraints prior to earnings announcements earn lower stock returns when earnings are announced. In this subsection we examine this premise and provide evidence that the reduction in Miller's optimistic bias is due to a decline in differences of opinion after earnings announcements.

Any investigation of convergence of opinions around earnings announcements is complicated by the fact that it is difficult to measure how differences of opinion change at the precise time when earnings are announced. Changes in the level of differences of opinion do not necessarily reflect changes in the underlying differences of opinion among investors in a timely fashion. For example, changes in *INCVOL* or *AGE* (two of our ex ante *DIFOPN* proxies) are not meaningful measures of changes in differences of opinion in the few days around earnings announcements, because these two variables change slowly over time. While this weakness is valid for all *DIFOPN* proxies, it should be somewhat less important for *RETVOL*, *DISP*, and *TURN*, because these variables can change over relatively shorter periods of time. Hence, we examine whether *RETVOL*, *DISP*, and *TURN* decrease around earnings announcements.

Prior evidence by Brown and Han (1992) and Bamber, Barron, Stober (1997) shows that changes for one of our variables (*DISP*) around earnings announcements are negative, on average. However, these prior studies do not examine changes in volatility or turnover around earnings announcements, or whether these changes are greater for stocks with higher levels of differences of opinion before the announcement. We investigate these issues by calculating the change in return volatility (Δ*RETVOL*), the change in dispersion of analysts' forecasts of next quarter's earnings per share (Δ*DISP*), and the change in turnover (Δ*TURN*) around earnings announcements.

We find evidence consistent with prior research and with our premise that *RETVOL*, *DISP*, and *TURN* decrease around earnings announcements. When averaged across all earnings announcements, the mean Δ*RETVOL* and the mean Δ*DISP* are -0.05 and -0.01, respectively, both significant at the 1% level. The mean Δ*TURN* is also negative (-0.0004) but is not significantly different from zero. The median changes are negative and significant at the 1% level for all three variables (median changes of -0.10, -0.005, and -0.006, respectively). Hence, earnings announcements reduce differences of opinion, on average.

We also verify that the ex post reduction in *RETVOL*, *DISP*, and *TURN* is greater for stocks with higher ex ante levels of differences of opinion. The correlation coefficients between *RETVOL* and Δ*RETVOL*, *DISP* and Δ*DISP*, and *TURN* and Δ*TURN* are all negative and significant at the 1% level (correlation coefficients of -0.29, -0.08, and -0.29, respectively). These findings lend support for the use of ex ante differences of opinion proxies along with earnings announcements to test the Miller model, and they corroborate the view that our earlier results reflect a reduction in Miller's optimistic bias due to a decline in differences of opinion after earnings announcements.

5.5. Changes in differences of opinion and stock returns around earnings announcements

In this subsection, we examine Miller's theory using ex post data on changes in differences of opinion (Δ*RETVOL*, Δ*DISP*, and Δ*TURN*). All else held equal, Miller's theory implies a positive association between changes in differences in opinion and earnings announcement period returns. Firms with greater decreases in differences of opinion around earnings announcements should experience lower earnings announcement returns. Our tests so far in the paper are based entirely on ex ante levels of *DIFOPN* because there are some potential weaknesses in using ex post Δ*DIFOPN*.

One important weakness in using the ex post changes in differences of opinion to explain earnings announcement period returns is the well-known reverse causality problem. Because Δ*DIFOPN* is measured using data surrounding earnings announcements, earnings announcement period returns could affect the realized Δ*DIFOPN*. Prior research by Black (1976), Duffee (1995), and Tauchen and Pitts (1983) and recent research by Kumar, Sorescu, Boehme, and Danielsen (2008), among others, shows that contemporaneous links exist between stock price changes and other variables such as stock return volatility, trading volume, and analysts' forecasts. Thus, any results based on ex post changes in return volatility, turnover, or dispersion in analysts' forecasts should at least be interpreted with caution. Our earlier approach using the ex ante level of *DIFOPN* to predict earnings announcement period returns is not affected by reverse causality concerns.

Another potential weakness is the presence of omitted variables, such as changes in risk due to unexpected disclosures at earnings announcements, which could affect both Δ*DIFOPN* and announcement period returns. In this case, the relation between Δ*DIFOPN* and announcement period returns can be either positive or negative, depending upon which model (Miller's theory or other omitted variables such as changes in risk) better explains returns. Once again, omitted risk factors are less of a concern in our ex ante tests. Even if the level of *DIFOPN* is correlated with the level of risk, the expected risk premium over the three-day announcement period should be relatively small. In contrast, large changes in risk could result from news released with earnings announcements.

Despite these potential weaknesses, we extend our specification given by Eq. (1) to incorporate the effect of Δ*DIFOPN* (Δ*RETVOL*, Δ*DISP*, or Δ*TURN*) on announcement period returns. Similar to the results reported in Panel A of Table 3, we find that the coefficient on the level of *DIFOPN* (*RETVOL, DISP*, or *TURN*) remains negative and significant at the 1%. The coefficient on *INSOWN* remains positive and significant at the 1% level. Thus, our prior conclusions are not affected by incorporating ex post Δ*DIFOPN* variables in the specification. The coefficients on Δ*RETVOL* and Δ*DISP* are negative and significant at the 1% level, indicating that decreases in return volatility and dispersion of analysts' forecasts are associated with higher stock returns. However, the coefficient on Δ*TURN* is positive and significant at the 1% level, indicating that decreases in turnover are associated with lower returns. (These results are not tabulated but are similar to those reported in Table 6.) Thus, the results are mixed so far as Δ*DIFOPN* is concerned. This could indicate the presence of omitted variables, reverse causality, or some other unknown effects.

We attempt to address the potential omitted variable bias in the ex post specification by examining how the relation between announcement period returns and Δ*DIFOPN* (Δ*RETVOL*, Δ*DISP*, or Δ*TURN*) varies with the degree of short-sales constraints. The Miller model predicts that the positive relation between changes in differences of opinion and announcement period returns should be stronger when stocks are more difficult to sell short (i.e., when stocks have lower

INSOWN). Any omitted correlated variables should not affect this conditional relation between earnings announcement period returns and changes in differences of opinion, so long as these variables affect both low and high institutional ownership stocks in the same way. We estimate the following model:

$$\begin{aligned} EXRET_{i,q} = \alpha + \beta_1{*}\mathrm{Ln}(MV)_{i,q} + \beta_2{*}\mathrm{Ln}(MB)_{i,q} + \beta_3{*}DIFOPN_{i,q} + \beta_4{*}\Delta DIFOPN_{i,q} \\ + \beta_5{*}INSOWN_{i,q} + \beta_6{*}(INSOWN_{i,q} * \Delta DIFOPN_{i,q}) + \varepsilon_{i,q}, \end{aligned} \tag{4}$$

If the Miller theory is correct, we expect β_6 to be significantly negative, i.e., the relation between announcement period returns and $\Delta DIFOPN$ should be more positive for firms with lower *INSOWN*. The regression coefficients for Eq. (4) are shown in Table 6. We find that the coefficient on the interaction term, β_6, is negative for all three $\Delta DIFOPN$ proxies but only statistically significant for $\Delta RETVOL$ and $\Delta TURN$. Hence, despite the limitations of using ex post variables, the interaction approach provides some evidence consistent with Miller's theory.

The pitfalls of using ex post data to test Miller's theory are further illustrated in Rees and Thomas (2008). They estimate the same equation as our Eq. (1) but also include the realized analysts' forecast error (*FE*) and other FE-related variables in their regression model. They find that the sign on dispersion of analysts' forecasts (*DISP*) changes from negative to positive and argue that the evidence does not support Miller's theory. However, including *FE* in the specification is likely to reduce the power of *DISP* as a proxy for differences of opinion. A higher level of *DISP* implies that realized earnings are likely to deviate further from analysts' expectations. In other words, high *DISP* would likely result in large *FE* (a large positive or a large negative *FE*).[23] Analysts' forecasts and *FE* could also capture the Miller effect so long as pessimistic analysts are reluctant to issue earnings forecasts (see Scherbina, 2008 and our discussion in Subsection 5.3). In this case, the level

[23] The correlation coefficient between *DISP* and the absolute value of *FE* in our sample is 0.41.

of *DISP* would also systematically predict the sign of *FE*.[24] Consequently, including the realized *FE* in the specification is likely to reduce the predictive power of *DISP* or the other *DIFOPN* proxies for announcement period returns. Nevertheless, when we extend Eq. (1) and include *FE* on the right-hand side, the coefficient on *DIFOPN* remains negative and significant at the 1% level for all *DIFOPN* measures, except for *DISP*. The coefficient on *INSOWN* remains positive and significant at the 1% level in all five specifications.

To summarize, the results using the ex ante levels of *DIFOPN* to predict earnings announcement period returns show strong support for the Miller hypothesis. We also find some support for the Miller hypothesis by showing that the relation between announcement period returns and ex post Δ*DIFOPN* is more positive for firms with lower *INSOWN*.

6. Price run-up before earnings announcements

Consistent with the Miller model, we show that, when differences of opinion among investors are reduced, stocks with high differences of opinion and low institutional ownership earn significant negative excess returns. In other words, we find that Miller's overvaluation is attenuated around earnings announcements. If we can also identify periods when the overvaluation is exacerbated, we could provide additional evidence on the Miller hypothesis.

In this section, we conjecture that the days leading up to earnings announcements represent one specific period when differences of opinion combine with short-sales constraints to result in increasing overvaluation. Importantly, the nature of this pre-announcement period contrasts sharply with the period immediately following the announcement, when Miller's theory predicts a decline in overvaluation. To test this conjecture and to contrast the hypothesized pre-announcement price run-

[24] The correlation coefficient between *DISP* and *FE* in our sample is -0.11.

up with the subsequent price correction, we analyze returns over an extended window around earnings announcements. The results provide strong support for the Miller hypothesis.

Several theoretical papers predict that speculative trading increases prior to earnings announcements (e.g., Kim and Verrecchia, 1991; and He and Wang, 1995). Trading just ahead of earnings announcements reduces holding costs and risk, because the positions are held for only short periods of time (until the earnings are announced). Investors would not wait until the last moment to trade because waiting increases the possibility that other traders with similar opinions would affect the price. Hence, trading volume should increase steadily for several days prior to earnings announcements. Morse (1981) and Frazzini and Lamont (2007), among others, provide empirical evidence consistent with this prediction.

The prior research on speculative trading around earnings announcements does not distinguish between the trading of optimists and pessimists. However, the Miller model suggests that, when short-sales constraints are binding, optimists are more likely to buy than pessimists are to sell short. Consequently, the net effect of intensified speculative trading on prices is expected to be positive and should lead to increasing overvaluation just ahead of earnings announcements. Furthermore, because investors who are more optimistic are more likely to take such speculative positions, the increase in overvaluation should be larger when differences of opinion are high. Based on these arguments, we expect to observe a price run-up during the days leading up to earnings announcements for stocks subject to both high differences of opinion and more binding short-sales constraints.

To test this prediction, we analyze the stock returns on nine portfolios formed each quarter by sorting all stocks into three categories, first by *INSOWN*, followed by *DIFOPN*. The sorting procedure is the same as that described in Subsection 4.1. For each portfolio, we compute average cumulative buy-and-hold excess returns starting on day -10 relative to the earnings announcement day. To capture the price reversals, we follow the cumulative performance of each portfolio through the earnings announcement period and until day +10. We focus our analysis on stocks that are most prone to overvaluation (low *INSOWN* and high *DIFOPN*). To control for the overall effect of earnings announcements on returns, we calculate and report the difference (hedge return) between the buy-and-hold excess returns on stocks that are most prone to overvaluation and the buy-and-hold excess returns on stocks that are least prone to overvaluation (high *INSOWN* and low *DIFOPN*). This difference represents the cumulative return to a strategy of being long the portfolio of stocks most prone to Miller's overvaluation effect and short the portfolio of stocks least prone to Miller's overvaluation effect, over the 21-day period centered at the earnings announcement day.

The results are provided in Table 7 and Fig. 2. Consistent with the Miller hypothesis, we find a substantial price run-up for stocks most prone to overvaluation over the ten days prior to earnings announcements. During this pre-announcement period, the cumulative hedge returns are predominately positive. By day -1, the hedge returns for *INCVOL*, *RETVOL*, *AGE*, and *TURN* are positive and significant, ranging from 0.84% for *AGE* to 1.48% for *TURN*. For *DISP*, the hedge returns are also positive (0.34%) but insignificant. These results provide direct evidence that stocks most prone to Miller's overvaluation (with high differences of opinion and more binding short-sales constraints) become even more overvalued just prior to earnings announcements.[25]

Similar to results discussed earlier, once the earnings announcements are made, the hedge returns become negative. The price reversals start on the Compustat earnings announcement date (day 0), but the largest price reversal occurs on the following day, which might reflect the large

[25] Comparisons of high to low *DIFOPN* stocks (without regard to *INSOWN*) reveal a similar pattern: High *DIFOPN* stocks earn higher excess returns relative to low *DIFOPN* stocks during the days prior to earnings announcements (results not tabulated).

percentage of earnings announcements that occur after the markets close on day 0 (e.g., Hughes and Ricks, 1987; and Berkman and Truong, 2008). We find that the price reversals continue for several trading days following the announcements, as investors interpret and analyze the earnings information that is released.

It is noteworthy that the post-announcement price reversal shown in Fig. 2 is larger in magnitude than the pre-announcement price run-up. As a result, the buy-and-hold hedge returns over the entire 21-day period are below -1% for hedge portfolios based on all five *DIFOPN* measures. This net price decline around earnings announcements for overpriced stocks is consistent with our previous results in Tables 2 to 6, which similarly show a net price decline in the three days around the announcement. One interpretation of this result is that the trading activity during the days prior to earnings announcements does not fully account for the overvaluation effect. Some additional price run-up probably occurs over earlier periods.

The novel evidence in Table 7 and Fig. 2 is that stocks most prone to Miller's overpricing tend to become even more overpriced in the period just prior to earnings announcements. Our findings in this section extend the work by Trueman, Wong, and Zhang (2003), who examine a sample of 393 internet stocks during the 1990s. They show positive abnormal returns during the five-day period prior to earnings announcements, followed by larger price reversals over the five-day period after earnings announcements. Their findings can be interpreted as consistent with the Miller hypothesis. As pointed out by Ofek and Richardson (2003), internet stocks in the late 1990s had low institutional ownership and high differences of opinion. Hence, our findings provide a possible explanation for the results in Trueman, Wong, and Zhang (2003).

Motivated by Trueman, Wong, and Zhang (2003), Aboody, Lehavy, and Trueman (2007) examine the returns around earnings announcements for the top 1% of stocks based on return momentum, using prior 12-month returns. For these high momentum stocks, they find abnormal returns of 1.6% over the five days before earnings announcements and -1.9% over the five days after earnings announcements. They suggest that this return pattern is due to the greater attention that past winners attract from individual investors, particularly before earnings are announced. When we repeat our analysis after excluding high momentum stocks from the various portfolios, we find that the patterns reported above are not affected. We conclude that our results are most consistent with the Miller hypothesis.

7. Conclusion

We provide evidence that stocks with high differences of opinion among investors and more binding short-sales constraints earn lower returns around earnings announcements than other stocks. This evidence is consistent with the Miller (1977) hypothesis, indicating that events which reduce differences of opinion also reduce the upward bias in stock prices. We use five proxies for differences of opinion (earnings volatility, return volatility, dispersion of analysts' earnings forecasts, firm age, and share turnover) to ensure that the results are not proxy-specific. We use institutional ownership as a proxy for short-sales constraints. By focusing on narrow windows (three days) around earnings announcements, we are able to present results that are less open to alternative interpretations.

We find that stocks in the lowest institutional ownership quintile earn significantly lower earnings announcement period returns than stocks in the highest institutional ownership quintile (the return on high minus low institutional ownership quintiles is 0.31%). Similarly, we find that stocks in the highest differences of opinion quintile earn significantly lower earnings announcement period returns than stocks in the lowest differences of opinion quintile. The mean difference in portfolio returns is between -0.36% and -0.82%, depending upon the proxy for differences of opinion used.

Furthermore, these negative hedge returns around earnings announcements are exacerbated for stocks subject to more binding short-sales constraints. Within the subsample of stocks with low institutional ownership, the three-day hedge returns vary from -0.53% to -1.69%, depending upon the proxy for differences of opinion used.

We control for other well-known effects such as the size effect and the market-to-book effect and find that our results are robust. We also find that alternative explanations such as financial leverage, the earnings announcement premium, post-earnings announcement drift, return momentum, or biased analyst forecasts do not account for our results. Additional results based on ex post changes in differences of opinion support our premise that earnings announcements reduce differences of opinion, and provide further evidence in favor of the Miller hypothesis.

Motivated by prior research on speculative trading, we also show a price run-up in the days prior to earnings announcements for stocks with high differences of opinion and more binding short-sales constraints. Because pessimistic investors face short-sales constraints, optimistic investors betting on the outcome of the earnings release drive up the prices of such stocks to even greater levels prior to the announcements, exacerbating their overvaluation and subsequent price correction. Focusing on the 21 days around earnings announcements, we find that differences of opinion combine with short-sales constraints to produce a price run-up of about 1.0% prior to earnings announcements, followed by an even greater stock price reversal of about -2.5% in the days following the announcements. The combined price run-up and price reversal results strengthen our conclusion in favor of the Miller hypothesis.

Our findings have an important implication with regard to information disclosures. While it could be intuitive that information disclosures affect stock price volatility, we show that they also reduce the optimistic bias in stock prices. Thus, information released through required or voluntary mechanisms helps to make stock markets more efficient by reducing both volatility and mispricing.

The tests in this paper suggest many avenues to further enhance our understanding of the evolution of stock prices, and especially of the Miller (1977) model. It could be fruitful to examine whether stocks with high differences of opinion have lower returns around other public signals such as dividend announcements or management announcements of earnings forecasts. The Miller model could also be tested in other markets such as the commodities market and around other announcements such as Federal Reserve announcements on interest rates. Future theoretical research could also be undertaken to foster a better understanding of the empirical results.

Table 1
Sample characteristics

Panel A: Summary statistics

Variable	# Observations	Mean	Minimum	Q1	Median	Q3	Maximum
EXRET	248,691	0.20	-87.85	-3.84	-0.09	3.91	279.28
MV	248,691	1,723	10	52	161	645	602,780
MB	241,700	3.23	0.04	1.29	2.06	3.48	99.93
INCVOL	169,036	2.67	0.00	0.94	1.70	3.19	17.80
RETVOL	247,993	3.38	0.43	1.95	2.90	4.26	10.93
DISP	103,308	0.26	0.00	0.03	0.07	0.20	4.24
AGE	248,691	14.12	0.01	3.82	9.09	19.5	79.95
TURN	247,992	0.34	0.00	0.11	0.23	0.44	2.00
INSOWN	246,153	37.09	0.01	15.16	34.18	56.97	99.99
LEV	244,925	0.22	0.00	0.03	0.19	0.34	0.99
ANNVOL	222,828	1.47	0.30	1.01	1.34	1.78	4.11
MOM	234,506	4.08	-92.63	-34.67	-7.02	25.02	308.52

Panel B: Correlation coefficients

	EXRET	Ln(MV)	Ln(MB)	INCVOL	RETVOL	DISP	Ln(1/AGE)	TURN	INSOWN
EXRET	1	0.03	-0.003	-0.04	-0.05	-0.04	-0.02	-0.02	0.04
		(9.78)	(-0.65)	(-10.76)	(-11.74)	(-9.69)	(-4.49)	(-4.48)	(14.27)
Ln(MV)	-0.003	1	0.40	-0.38	-0.56	-0.20	-0.25	0.42	0.60
	(-1.19)		(48.30)	(-69.01)	(-51.03)	(-44.74)	(-25.63)	(30.65)	(113.05)
Ln(MB)	-0.02	0.36	1	0.08	-0.05	-0.26	0.16	0.26	0.10
	(-4.79)	(40.53)		(8.02)	(-4.72)	(-30.74)	(20.86)	(25.75)	(16.70)
INCVOL	-0.03	-0.27	0.19	1	0.48	0.29	0.29	0.05	-0.32
	(-7.32)	(-63.35)	(22.64)		(84.31)	(67.33)	(58.67)	(4.82)	(-64.88)
RETVOL	-0.02	-0.50	-0.05	0.36	1	0.28	0.42	0.03	-0.43
	(-4.61)	(-55.94)	(-5.02)	(82.35)		(59.58)	(76.69)	(2.53)	(-88.39)
DISP	-0.01	-0.15	-0.15	0.12	0.20	1	0.06	0.10	-0.13
	(-3.04)	(-41.72)	(-25.18)	(21.32)	(32.67)		(11.38)	(13.50)	(-25.00)
Ln(1/AGE)	-0.01	-0.28	0.16	0.25	0.34	0.04	1	0.02	-0.21
	(-2.89)	(-30.95)	(20.43)	(81.95)	(64.22)	(13.36)		(1.66)	(-34.36)
TURN	-0.03	0.29	0.22	0.09	0.11	0.04	0.04	1	0.40
	(-7.68)	(24.56)	(24.50)	(10.70)	(9.28)	(8.30)	(4.30)		(36.95)
INSOWN	0.01	0.57	0.09	-0.28	-0.40	-0.10	-0.21	0.30	1
	(3.64)	(133.07)	(14.71)	(-87.66)	(-90.19)	(-22.80)	(-35.78)	(30.37)	

This table reports summary statistics for the sample of firm-quarter observations with data on earnings announcement dates from the Compustat Quarterly files and price data from the Center for Research in Security Prices daily files. The sample excludes financials, utilities, foreign stocks, American Depository Receipts, Real Estate Investment Trusts, unit investment trusts, and Americus trusts. Variable definitions are presented in the Appendix. Panel A reports summary statistics for the main variables in the study. Panel B reports average quarterly Pearson (below diagonal) and Spearman (above diagonal) correlation coefficients across these variables. Numbers in parenthesis are *t*-statistics from a test of whether the average quarterly correlation coefficients are different from zero. In Panel B, *AGE* is inverted so that *DIFOPN* proxies are interpreted similarly across all five measures (larger numerical values imply higher differences of opinion, and smaller numerical values imply lower differences of opinion). *MV*, *MB*, and *1/AGE* are transformed using the log function so that their distributions are not highly skewed.

Table 2
Excess returns around quarterly earnings announcements (*EXRET*) for differences of opinion (*DIFOPN*) and institutional ownership (*INSOWN*) portfolios

Panel A: Single variable portfolio sorts

	Excess portfolio returns (in percent)					
Portfolio	INCVOL	RETVOL	DISP	1/AGE	TURN	INSOWN
1 (low)	0.41***	0.35***	0.28***	0.32***	0.75***	0.09
2	0.43***	0.39***	0.36***	0.38***	0.28***	0.04
3	0.41***	0.38***	0.35***	0.18**	0.04	0.18**
4	0.35***	0.03	0.13	0.15*	0.01	0.29***
5 (high)	-0.18*	-0.16	-0.11	-0.04	-0.08	0.40***
P5 – P1	-0.59***	-0.51***	-0.39***	-0.36***	-0.83***	0.31***

Panel B: INSOWN x DIFOPN portfolio sorts

DIFOPN	INSOWN			
INCVOL	Low INSOWN	Medium INSOWN	High INSOWN	High - low
Low	0.48***	0.37***	0.47***	-0.01
Medium	0.37***	0.35***	0.40***	0.03
High	-0.34**	-0.03	0.34***	0.68***
High - low	-0.82***	-0.40***	-0.13	
RETVOL	Low INSOWN	Medium INSOWN	High INSOWN	High - low
Low	0.43***	0.36***	0.34***	-0.09
Medium	0.02	0.25***	0.43***	0.41***
High	-0.26*	-0.07	0.31**	0.57***
High - low	-0.69***	-0.43***	-0.03	
DISP	Low INSOWN	Medium INSOWN	High INSOWN	High - low
Low	0.03	0.24**	0.40***	0.37**
Medium	-0.02	0.22**	0.41***	0.43***
High	-0.50**	-0.08	0.19*	0.69***
High - low	-0.53**	-0.32**	-0.21**	
1/AGE	Low INSOWN	Medium INSOWN	High INSOWN	High - low
Low	0.41***	0.33***	0.30***	-0.11
Medium	0.01	0.18**	0.46***	0.45***
High	-0.23**	0.05	0.30***	0.53***
High - low	-0.64***	-0.28**	0.00	
TURN	Low INSOWN	Medium INSOWN	High INSOWN	High - low
Low	0.93***	0.54***	0.36***	-0.57***
Medium	0.02	0.21***	0.35***	0.33***
High	-0.76***	-0.21*	0.38***	1.14***
High - low	-1.69***	-0.75***	0.02	

This table reports the excess returns around quarterly earnings announcements for portfolios formed using five proxies for differences of opinion and institutional ownership. We first calculate the average excess announcement period returns for each portfolio in every calendar year-quarter. We then calculate and report the weighted average values across these 84 quarterly average excess returns in our sample, where the weights correspond to the number of observations available in each calendar quarter. Variable definitions are presented in the Appendix. Panel A shows the mean excess returns around quarterly earnings announcements for quintile portfolios formed using each of our proxies for *DIFOPN* or *INSOWN*. Each calendar year-quarter, firms reporting earnings in that quarter are independently sorted into portfolios based on each proxy for *DIFOPN* or *INSOWN*. Panel B shows the mean excess returns around quarterly earnings announcements for portfolios formed using both *DIFOPN* and *INSOWN*. Each calendar year-quarter, firms reporting earnings in that quarter are first sorted into three portfolios based on *INSOWN*. Within each *INSOWN* portfolio, stocks are further sorted into three *DIFOPN* portfolios. Low, medium, and high *INSOWN* portfolios contain stocks in the bottom 30%, middle 40%, and top 30% of the *INSOWN* distribution, respectively. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Table 3
Differences of opinion (*DIFOPN*), institutional ownership (*INSOWN*), and excess returns around quarterly earnings announcements (*EXRET*)

Panel A: Basic specification

	Differences of opinion (DIFOPN) proxies				
Model	INCVOL	RETVOL	DISP	Ln(1/AGE)	TURN
Intercept	0.93	1.22	-0.18	0.26	0.43
	(8.16)	(7.78)	(-0.83)	(1.83)	(3.78)
Ln(MV)	-0.10	-0.12	0.01	-0.07	-0.04
	(-5.24)	(-6.52)	(0.29)	(-3.95)	(-2.39)
Ln(MB)	-0.08	-0.11	-0.03	-0.15	-0.11
	(-2.02)	(-2.84)	(-0.54)	(-3.63)	(-2.78)
DIFOPN	-0.09	-0.15	-0.16	-0.08	-0.76
	(-8.45)	(-5.57)	(-3.47)	(-2.25)	(-7.12)
INSOWN	0.49	0.54	0.75	0.72	0.94
	(3.71)	(4.70)	(4.78)	(6.00)	(7.24)
Avg. Adj. R^2	0.27%	0.34%	0.34%	0.24%	0.29%
Avg. Obs.	1,935	2,840	1,184	2,848	2,840

Panel B: Analysis conditional on institutional ownership

	DIFOPN = INCVOL			DIFOPN = RETVOL			DIFOPN = DISP			DIFOPN = Ln(1/AGE)			DIFOPN = TURN		
	INSOWN Portfolio			INSOWN Portfolio			INSOWN Portfolio			INSOWN Portfolio			INSOWN Portfolio		
Variable	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High
Intercept	1.80	0.82	0.62	2.14	1.27	0.59	-0.02	0.02	0.44	0.82	0.27	0.44	1.21	0.48	0.44
	(9.07)	(5.94)	(2.83)	(8.53)	(6.33)	(2.87)	(-0.04)	(0.07)	(1.63)	(4.26)	(1.59)	(1.75)	(6.33)	(3.42)	(1.89)
Ln(MV)	-0.25	-0.06	-0.02	-0.27	-0.09	-0.02	0.002	0.03	-0.002	-0.18	-0.02	0.002	-0.14	0.01	-0.01
	(-6.29)	(-2.86)	(-0.79)	(-6.67)	(-3.77)	(-0.88)	(0.04)	(1.00)	(-0.07)	(-4.80)	(-1.02)	(0.06)	(-3.58)	(0.59)	(-0.26)
Ln(MB)	-0.24	-0.05	0.05	-0.26	-0.05	-0.004	-0.12	-0.04	-0.03	-0.30	-0.12	-0.03	-0.23	-0.06	-0.03
	(-3.80)	(-0.90)	(0.64)	(-4.92)	(-0.93)	(-0.06)	(-0.89)	(-0.42)	(-0.43)	(-5.43)	(-2.02)	(-0.43)	(-4.20)	(-0.95)	(-0.47)
DIFOPN	-0.11	-0.08	-0.05	-0.18	-0.17	-0.04	-0.28	-0.16	-0.16	-0.12	-0.06	0.02	-1.65	-0.97	0.04
	(-7.10)	(-4.40)	(-1.88)	(-5.85)	(-5.03)	(-0.98)	(-1.90)	(-2.27)	(-2.37)	(-3.00)	(-1.50)	(0.47)	(-9.03)	(-6.19)	(0.26)
Avg. Adj. R^2	0.33%	0.23%	0.42%	0.41%	0.37%	0.46%	0.36%	0.25%	0.34%	0.20%	0.24%	0.28%	0.40%	0.35%	0.40%
Avg. Obs.	525	768	642	841	1,143	856	129	460	595	846	1,145	857	841	1,143	856
DIFOPN coefficient for low INSOWN group minus DIFOPN coefficient for high INSOWN group															
Difference		-0.06			-0.14			-0.12			-0.14			-1.69	
(*t*-statistic)		(-1.86)			(-2.63)			(-0.72)			(-2.75)			(-7.92)	

This table examines the association between differences of opinion proxies, institutional ownership, and excess returns around quarterly earnings announcements controlling for the effects of market value and market-to-book ratio. The dependent variable is given by *EXRET*. *DIFOPN* is different for each column. It is given by the differences of opinion proxy shown at the top of the respective column. Other variables are the same for each column. Each model is estimated by calendar year-quarter using all firms that reported earnings during that quarter. We report weighted Fama and MacBeth coefficient estimates and their corresponding *t*-statistics (in parenthesis), where the weights correspond to the number of observations available in each quarter. Avg. Obs. is the average number of firm-quarter observations over the 84 quarters in the study. Variable definitions are presented in the Appendix. Panel A reports the results for the basic specification. Panel B reports the effect of *DIFOPN* for high, medium, and low *INSOWN* groups. Each calendar year-quarter, firms reporting earnings in that quarter are sorted into three portfolios based on *INSOWN*. Low, medium, and high *INSOWN* portfolios contain stocks in the bottom 30%, middle 40%, and top 30% of the *INSOWN* distribution, respectively. A *t*-test is done to see whether the mean difference in *DIFOPN* coefficients for high and low *INSOWN* groups is different from zero.

Table 4
Differences of opinion (*DIFOPN*), institutional ownership (*INSOWN*), and excess returns around quarterly earnings announcements (*EXRET*), controlling for the leverage effect as per Johnson (2004)

	Differences of opinion (DIFOPN) proxies				
Model	INCVOL	RETVOL	DISP	Ln(1/AGE)	TURN
Intercept	0.98	1.23	-0.15	0.27	0.44
	(7.46)	(7.50)	(-0.67)	(1.68)	(3.45)
Ln(MV)	-0.10	-0.11	0.01	-0.07	-0.04
	(-5.28)	(-6.41)	(0.46)	(-4.08)	(-2.50)
Ln(MB)	-0.08	-0.11	-0.04	-0.15	-0.11
	(-1.99)	(-2.90)	(-0.58)	(-3.64)	(-2.91)
DIFOPN	-0.09	-0.16	-0.21	-0.07	-0.70
	(-6.71)	(-4.58)	(-2.99)	(-1.79)	(-5.10)
INSOWN	0.50	0.53	0.72	0.70	0.92
	(3.74)	(4.57)	(4.63)	(5.76)	(6.99)
LEV	-0.22	-0.18	-0.15	-0.01	0.03
	(-1.22)	(-0.74)	(-0.71)	(-0.03)	(0.14)
LEV*DIFOPN	0.02	0.06	0.23	-0.01	-0.35
	(0.34)	(0.88)	(0.86)	(-0.07)	(-0.96)
Avg. Adj. R^2	0.36%	0.42%	0.42%	0.28%	0.35%
Avg. Obs.	1,919	2,812	1,171	2,819	2,812

This table examines the association between differences of opinion proxies, institutional ownership, and excess returns around quarterly earnings announcements, controlling for the effects of market value, market-to-book ratio, and financial leverage. The dependent variable is given by *EXRET*. *DIFOPN* is different for each column. It is given by the differences of opinion proxy shown at the top of the respective column. Other variables are the same for each column. Each model is estimated by calendar year-quarter using all firms that reported earnings during that quarter. We report weighted Fama and MacBeth coefficient estimates and their corresponding *t*-statistics (in parenthesis), where the weights correspond to the number of observations available in each quarter. Avg. Obs. is the average number of firm-quarter observations over the 84 quarters in the study. Variable definitions are presented in the Appendix.

Table 5
Differences of opinion (*DIFOPN*), institutional ownership (*INSOWN*), and excess returns around quarterly earnings announcements (*EXRET*), controlling for the earnings announcement premium, post-earnings announcement drift, and return momentum

	Differences of opinion (DIFOPN) proxies				
Model	INCVOL	RETVOL	DISP	Ln(1/AGE)	TURN
Intercept	0.42	0.60	-0.52	-0.27	-0.04
	(3.50)	(3.80)	(-2.30)	(-1.83)	(-0.36)
Ln(MV)	-0.08	-0.09	0.03	-0.05	-0.02
	(-4.26)	(-4.82)	(1.22)	(-3.02)	(-1.20)
Ln(MB)	-0.16	-0.24	-0.18	-0.27	-0.24
	(-3.90)	(-6.21)	(-2.99)	(-6.71)	(-6.10)
DIFOPN	-0.09	-0.13	-0.13	-0.08	-0.87
	(-7.72)	(-4.61)	(-2.76)	(-2.25)	(-7.50)
INSOWN	0.41	0.42	0.52	0.56	0.78
	(3.07)	(3.51)	(3.40)	(4.45)	(5.87)
ANNVOL	0.05	0.06	0.20	0.08	0.08
	(1.36)	(1.88)	(3.46)	(2.36)	(2.40)
SUE_{q-1}	0.07	0.08	0.02	0.08	0.08
	(6.93)	(7.56)	(1.73)	(7.73)	(7.48)
MOM	0.002	0.003	0.004	0.003	0.004
	(3.29)	(4.57)	(3.90)	(4.45)	(5.86)
Avg. Adj. R^2	0.51%	0.57%	0.67%	0.47%	0.58%
Avg. Obs.	1,822	2,465	1,077	2,468	2,465

This table examines the association between differences of opinion proxies, institutional ownership, and excess returns around quarterly earnings announcements, controlling for the effect of market value, market-to-book ratio, the concentration of trading volume around earnings announcements, post-earnings announcement drift, and return momentum. The dependent variable is given by *EXRET*. *DIFOPN* is different for each column. It is given by the differences of opinion proxy shown at the top of the respective column. Other variables are the same for each column. Each model is estimated by calendar year-quarter using all firms that reported earnings during that quarter. We report weighted Fama and MacBeth coefficient estimates and their corresponding *t*-statistics (in parenthesis), where the weights correspond to the number of observations available in each quarter. Avg. Obs. is the average number of firm-quarter observations over the 84 quarters in the study. Variable definitions are presented in the Appendix.

Table 6
Difference of opinion (*DIFOPN*), ex post changes in differences of opinion (Δ*DIFOPN*), institutional ownership (*INSOWN*), and excess returns around quarterly earnings announcements (*EXRET*)

	DIFOPN/ΔDIFOPN proxies		
Model	RETVOL/ΔRETVOL	DISP/ΔDISP	TURN/ΔTURN
Intercept	2.22	-0.38	0.40
	(12.21)	(-1.26)	(3.77)
Ln(MV)	-0.20	0.03	-0.05
	(-10.57)	(0.88)	(-2.66)
Ln(MB)	-0.06	0.002	-0.15
	(-1.41)	(0.02)	(-3.51)
DIFOPN	-0.30	-0.14	-0.35
	(-9.80)	(-1.95)	(-2.69)
ΔDIFOPN	-0.33	-0.59	4.77
	(-7.62)	(-1.90)	(13.69)
INSOWN	0.25	0.72	0.76
	(2.40)	(4.03)	(6.19)
INSOWN * ΔDIFOPN	-0.54	-0.20	-7.91
	(-6.56)	(-0.40)	(-14.35)
Avg. Adj. R^2	1.15%	0.69%	0.96%
Avg. Obs.	2,970	676	2,970

This table examines the association between ex ante levels of differences of opinion, ex post changes in differences of opinion, and excess returns around quarterly earnings announcements, conditional on institutional ownership. The dependent variable is given by *EXRET*. *DIFOPN* and Δ*DIFOPN* are different for each column. They are given by the proxies shown at the top of the respective column. Other variables are the same for each column. Each model is estimated by calendar year-quarter using all firms that reported earnings during that quarter. We report weighted Fama and MacBeth coefficient estimates and their corresponding *t*-statistics (in parenthesis), where the weights correspond to the number of observations available in each quarter. Avg. Obs. is the average number of firm-quarter observations over the 84 quarters in the study. Variable definitions are presented in the Appendix.

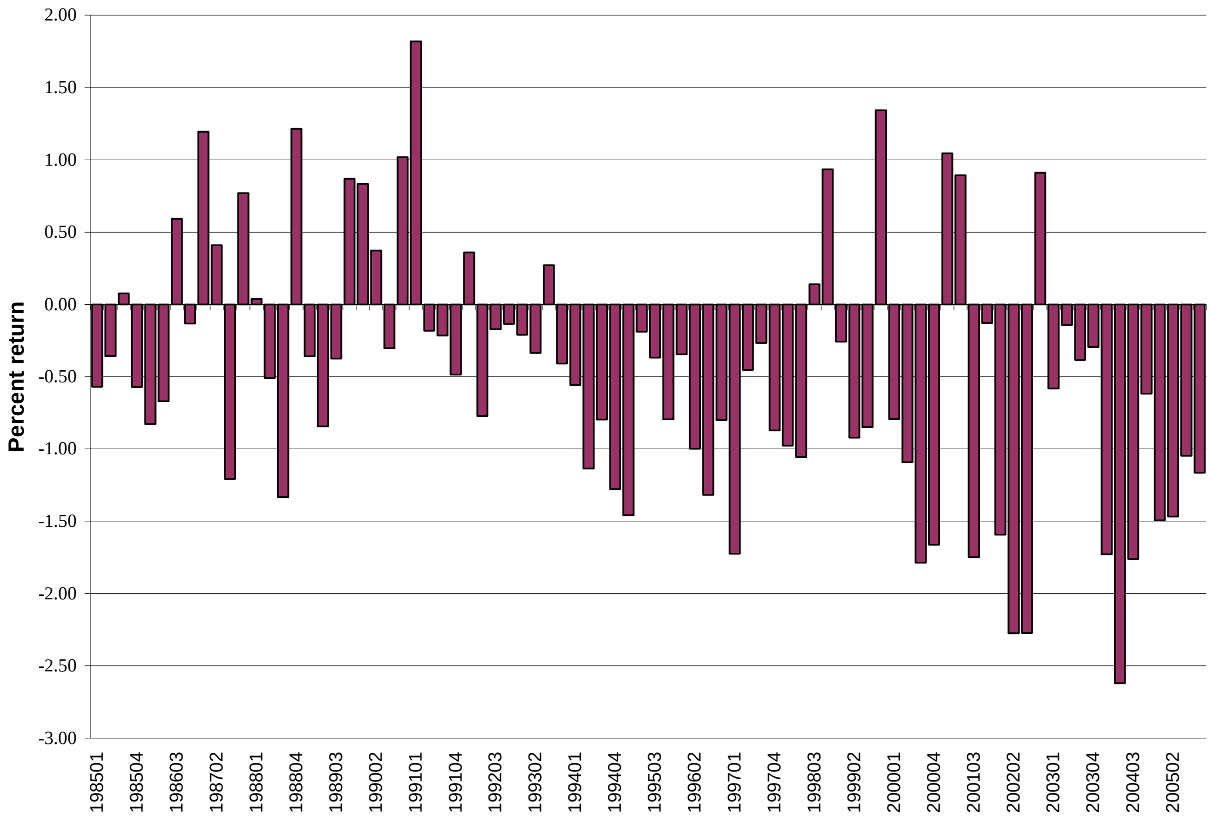
Table 7
Cumulative buy-and-hold hedge returns based on differences of opinion (*DIFOPN*) and institutional ownership (*INSOWN*) over the 21 trading days around earnings announcements

	Differences of opinion (DIFOPN) proxies				
Day	INCVOL	RETVOL	DISP	1/AGE	TURN
-10	0.09	0.14*	-0.05	0.01	0.06
-9	0.18**	0.18*	-0.08	0.06	0.16*
-8	0.25**	0.22	-0.06	0.06	0.34**
-7	0.34**	0.28	0.03	0.12	0.41**
-6	0.37**	0.38*	0.06	0.20	0.52**
-5	0.44**	0.44*	0.08	0.31	0.63***
-4	0.62***	0.55**	0.22	0.41*	0.84***
-3	0.72***	0.69**	0.19	0.50*	0.97***
-2	0.95***	0.88**	0.37	0.63**	1.25***
-1	1.15***	1.11***	0.34	0.84**	1.48***
0	0.93***	1.04**	0.07	0.76*	1.00**
1	-0.03	0.07	-0.61	-0.01	-0.01
2	-0.43	-0.26	-0.78*	-0.32	-0.33
3	-0.58	-0.58	-0.93**	-0.57	-0.61
4	-0.68	-0.77	-1.08**	-0.71	-0.74*
5	-0.85*	-0.92*	-1.27***	-0.86*	-0.88*
6	-0.88*	-1.01*	-1.29**	-0.95**	-0.93*
7	-0.93*	-1.11*	-1.38***	-1.05**	-0.97*
8	-0.90*	-1.23*	-1.35**	-1.19**	-1.07*
9	-0.91*	-1.33**	-1.44**	-1.18**	-1.07*
10	-1.05*	-1.47**	-1.38**	-1.21**	-1.09*

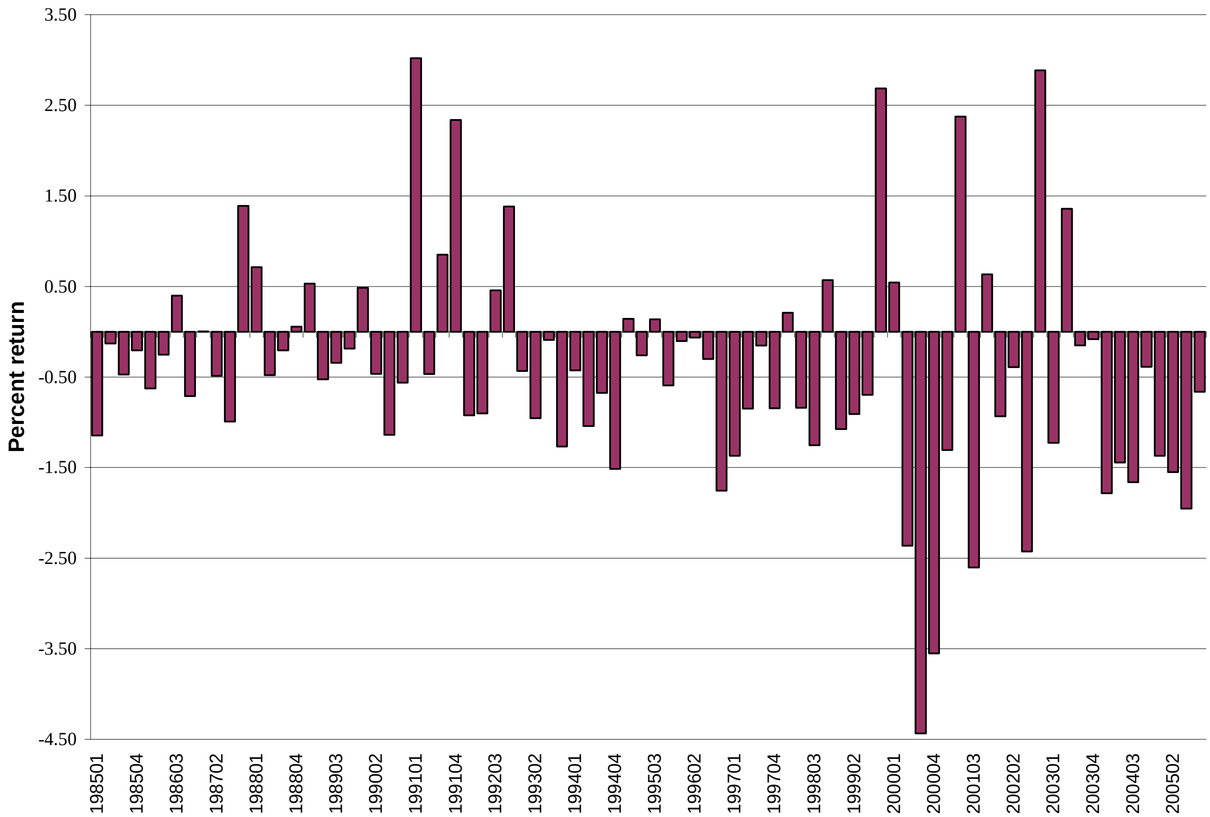
This table reports the difference between the cumulative buy-and-hold excess returns (in percent) on stocks most prone to overvaluation (low *INSOWN* and high *DIFOPN*) and the corresponding returns on stocks least prone to overvaluation (high *INSOWN* and low *DIFOPN)*, over the 21-day period centered at the earnings announcement date. The buy-and-hold returns are cumulated starting on day -10. Each calendar year-quarter, firms reporting earnings in that quarter are first sorted into three portfolios based on *INSOWN*. Within each *INSOWN* portfolio, stocks are further sorted into three *DIFOPN* portfolios. Low, medium, and high portfolios contain stocks in the bottom 30%, middle 40%, and top 30% of the distribution, respectively. For each day, we calculate the weighted average buy-and-hold excess returns on stocks most prone to overvaluation (low *INSOWN* and high *DIFOPN*) and on stocks least prone to overvaluation (high *INSOWN* and low *DIFOPN)*, across the 84 quarters in our sample. The weights correspond to the number of observations available in each calendar quarter. We report the difference between the mean buy-and-hold excess returns on the two groups of stocks. Variable definitions are presented in the Appendix. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively.

Fig. 1. Time-series distribution of the three-day earnings announcement period hedge returns based on differences of opinion (*DIFOPN*) or institutional ownership (*INSOWN*)

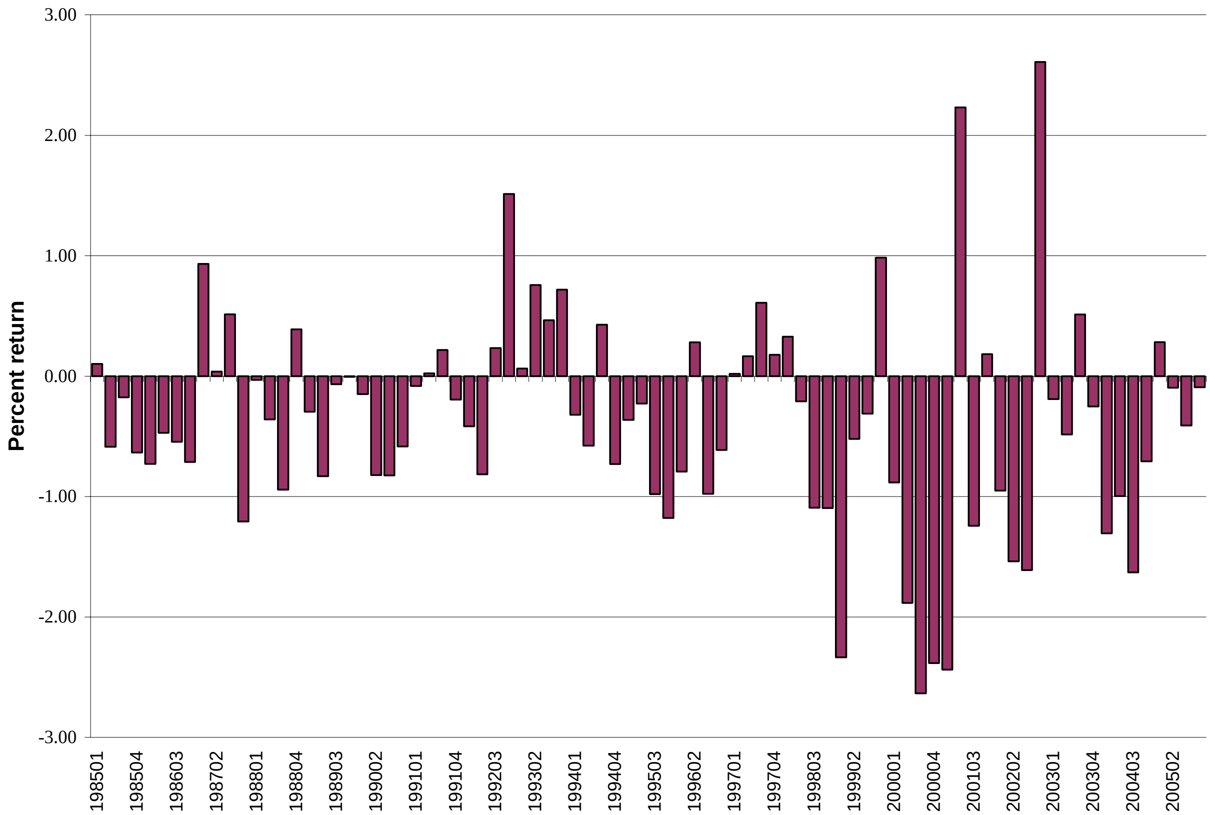
Panel A: INCVOL hedge returns



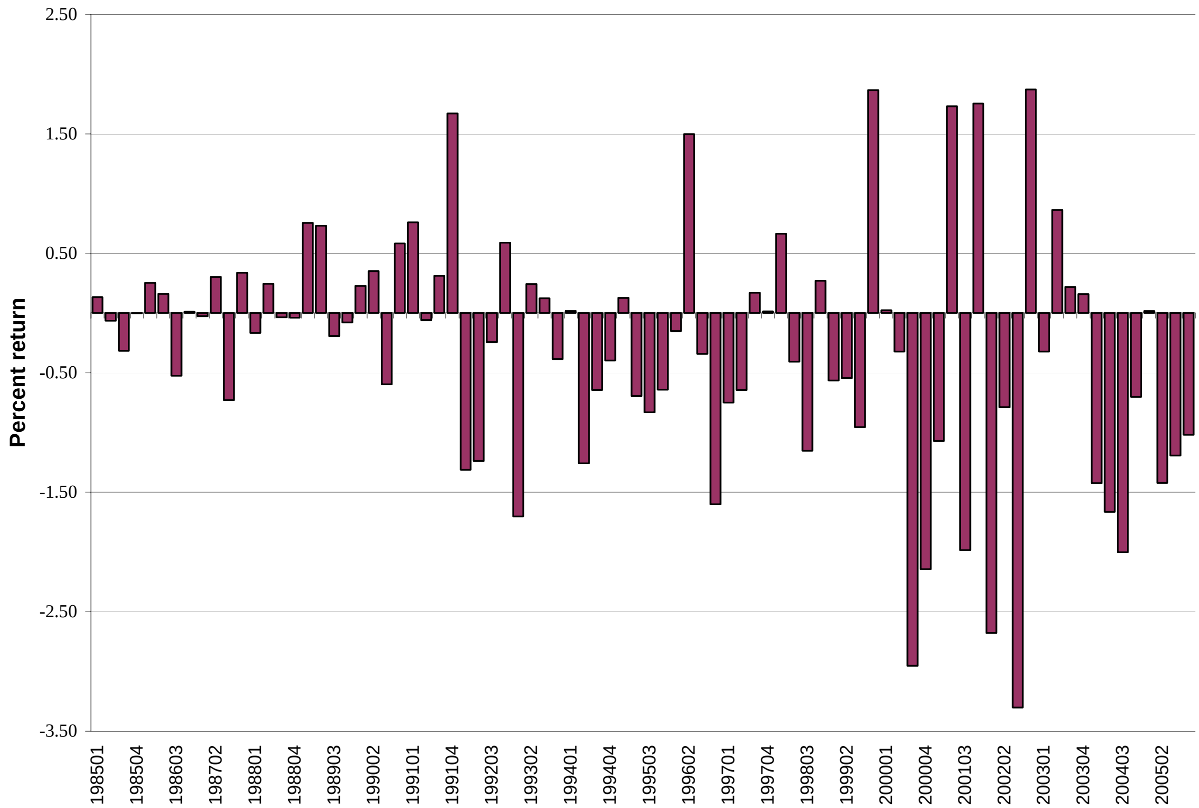
Panel B: RETVOL hedge returns



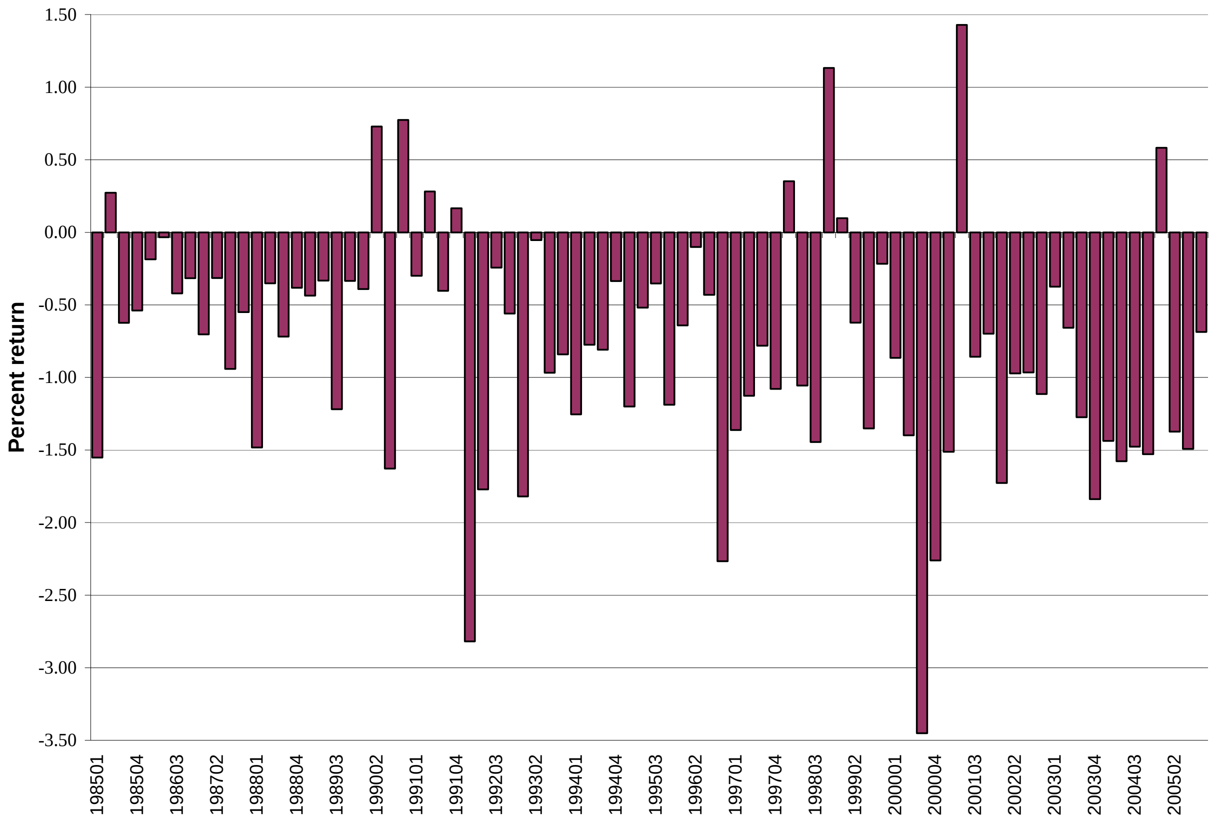
Panel C: DISP hedge returns



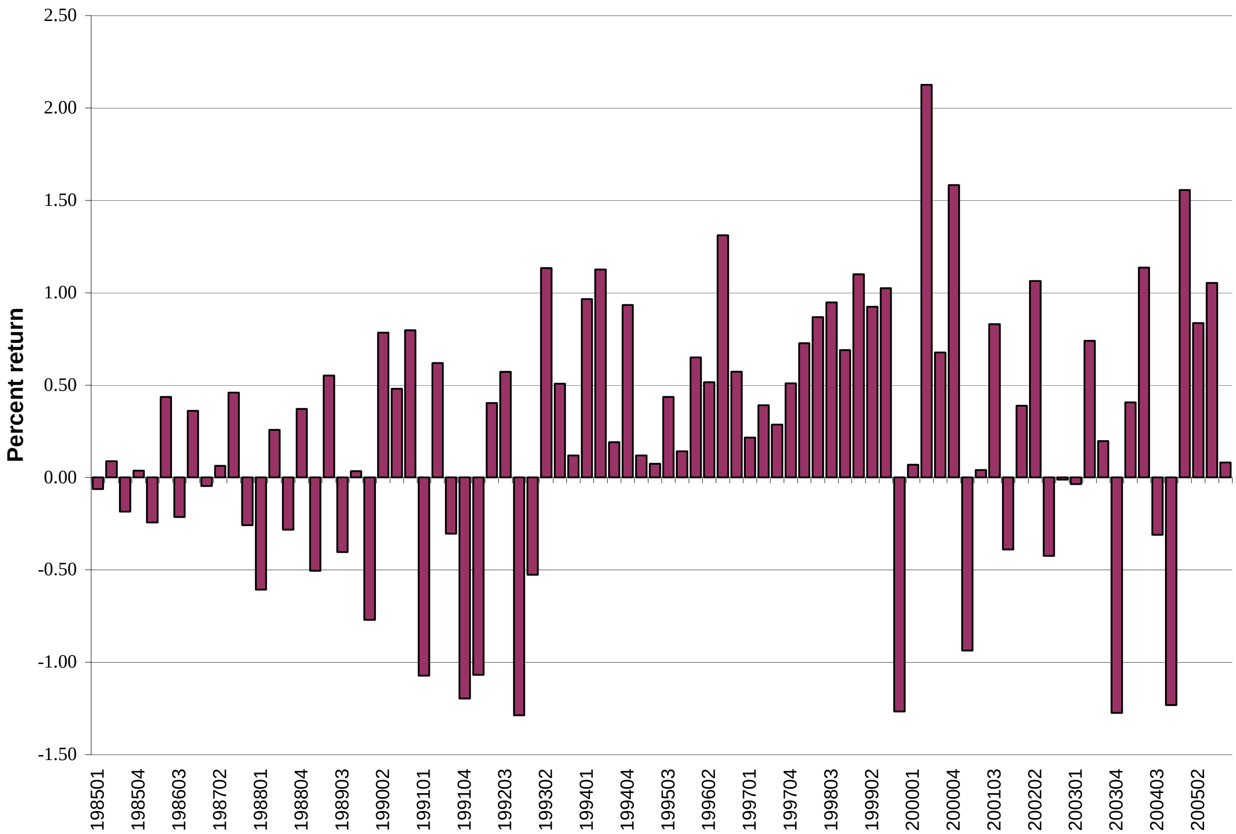
Panel D: 1/AGE hedge returns



Panel E: TURN hedge returns

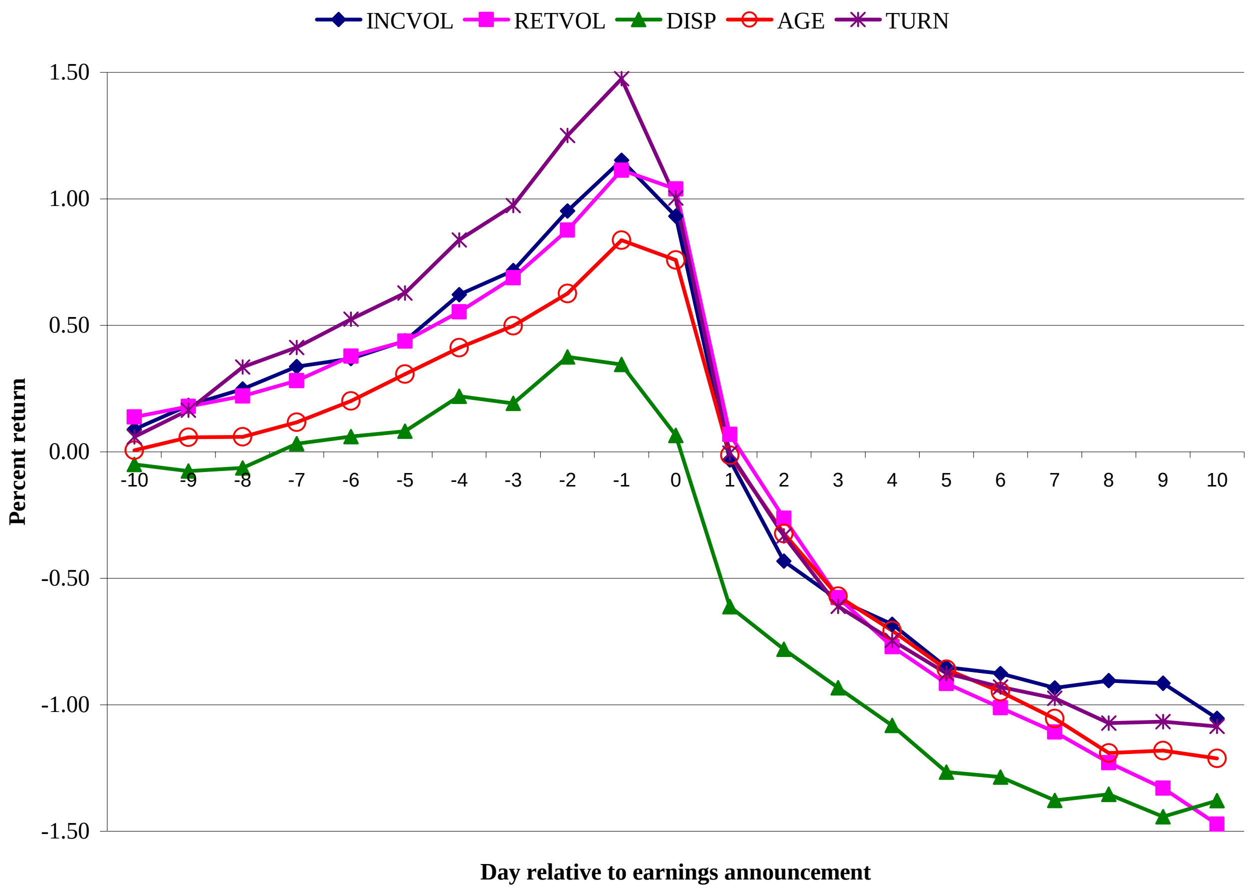


Panel F: INSOWN hedge returns



This figure plots the time-series of the three-day earnings announcement period hedge returns (in percent) based on the five *DIFOPN* proxies or *INSOWN*. Each calendar year-quarter, firms reporting earnings in that quarter are sorted into quintile portfolios based on each of the five *DIFOPN* proxies or on *INSOWN*. We calculate the excess buy-and-hold earnings announcement period returns for every portfolio in each calendar year-quarter and graph the difference between the buy-and-hold excess returns on portfolio 5 (high *DIFOPN* or high *INSOWN* stocks) and the excess returns on portfolio 1 (low *DIFOPN* or low *INSOWN* stocks). Variable definitions are presented in the Appendix.

Fig. 2. Cumulative buy-and-hold hedge returns based on differences of opinion (*DIFOPN*) and institutional ownership (*INSOWN*) over the 21 trading days around earnings announcements



This figure plots the difference between the cumulative buy-and-hold excess returns (in percent) on stocks most prone to overvaluation (low *INSOWN* and high *DIFOPN*) and the corresponding returns on stocks least prone to overvaluation (high *INSOWN* and low *DIFOPN)*, over the 21-day period centered at the earnings announcement date. The buy-and-hold returns are cumulated starting on day -10. Each calendar year-quarter, firms reporting earnings in that quarter are first sorted into three portfolios based on *INSOWN*. Within each *INSOWN* portfolio, stocks are further sorted into three *DIFOPN* portfolios. Low, medium, and high portfolios contain stocks in the bottom 30%, middle 40%, and top 30% of the distribution, respectively. For each day, we calculate the weighted average buy-and-hold excess returns on stocks most prone to overvaluation (low *INSOWN* and high *DIFOPN*) and on stocks least prone to overvaluation (high *INSOWN* and low *DIFOPN)*, across the 84 quarters in our sample. The weights correspond to the number of observations available in each calendar quarter. We plot the difference between the mean buy-and-hold excess returns on the two groups of stocks. Variable definitions are presented in the Appendix.

Appendix

Variable	Definition
EXRET	Buy-and-hold excess returns (in percent) over the three days centered at the quarterly earnings announcements date. Excess returns are defined relative to the buy-and-hold returns of the value-weighted (VW) Center for Research in Security Prices (CRSP) index.
MV	Market value of equity (price multiplied by number of shares outstanding) as reported on Compustat (in millions of dollars) at the start of the current fiscal quarter (Compustat Quarterly Data #14*Data #15).
MB	Market value of common stock (Compustat Quarterly Data #14*Data #15) divided by book value of common stock (Compustat Quarterly Data #59), measured at the end of the prior fiscal quarter.
INCVOL	Operating income volatility (in percent). The standard deviation of the seasonally differenced ratio of quarterly operating income before depreciation (Compustat Quarterly Data #21) divided by average total assets (Compustat Quarterly Data #44), measured over the 20 quarters prior to the current fiscal quarter. Minimum of eight quarterly observations required.
RETVOL	The standard deviation (in percent) of excess daily stock returns (relative to the VW CRSP index) over the 45-day period ending ten days prior to the earnings announcement date.
DISP	Dispersion of analysts' forecasts. Standard deviation of quarterly earnings per share (EPS) forecasts for the current fiscal quarter that are issued or confirmed as valid during the 45-day period ending two days prior to the earnings announcement date, divided by the absolute value of the mean analyst forecast.
AGE	Number of years the firm has been covered by CRSP prior to the earnings announcement date.
TURN	Average daily turnover (in percent), measured over the 45-day period ending ten days prior to the earnings announcement date. Daily turnover equals number of shares traded divided by number of shares outstanding, as reported on the CRSP daily tapes. For Nasdaq-traded stocks, the reported number of shares traded on CRSP is divided by two to adjust for the double counting of dealer trades.
INSOWN	Institutional ownership (in percent). Total fraction of the company's shares held by institutional investors prior to the earnings announcement as reported in the Thomson Financial's CDA/Spectrum Institutional (13f) Holdings data.
LEV	Financial leverage (total debt divided by total assets) measured at the end of the prior fiscal quarter. Total debt equals long-term debt (Compustat Quarterly Data #51) plus debt in current liabilities (Compustat Quarterly Data #45). Total assets equal Compustat Quarterly Data #44.

ANNVOL	Concentration of trading volume around earnings announcements. Average daily volume around the four consecutive earnings announcements preceding the current fiscal quarter (three days around each announcement), divided by the average daily volume for the 250 trading days ending ten days prior to the earnings announcement for the current fiscal quarter.
SUE	Quarterly decile of standardized unexpected earnings defined as (EPS_q – EPS_{q-4}) divided by price per share measured at the start of the current fiscal quarter. EPS is defined as basic earnings per share excluding extraordinary items (Compustat Quarterly Data #19), adjusted for stock splits and stock dividends.
MOM	Price momentum (in percent). Excess buy-and-hold return (relative to VW CRSP index) over the 12 calendar months prior to the earnings announcement date.
ΔDISP	Change in the standardized dispersion of analysts' forecasts of next quarter's EPS. The dispersion of analysts' forecasts before (after) the quarterly earnings announcement equals the standard deviation of all analyst forecasts of next quarter's EPS issued or confirmed as valid during the 45-day period (30-day period) before (after) the three-day period around the earnings announcement, scaled by the absolute value of the mean analyst forecast before (after) the quarterly earnings announcement.
ΔRETVOL	Change in the standard deviation of excess daily stock returns (relative to the VW CRSP index) around earnings announcements. The standard deviation of excess stock returns before (after) the earnings announcement is measured over the 45-day period (30-day period) ending (starting) ten days prior to (after) the earnings announcement date.
ΔTURN	Change in average daily turnover around earnings announcements. Daily turnover equals number of shares traded divided by number of shares outstanding, as reported on the CRSP daily tapes. For Nasdaq-traded stocks, the reported number of shares traded on CRSP is divided by two to adjust for the double counting of dealer trades. The average daily turnover before (after) the earnings announcement is measured over the 45-day period (30-day period) ending (starting) ten days prior to (after) the earnings announcement date.

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