Differences of Opinion, Retail Investor Sentiment and Overvaluation

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Abstract

In price-optimism models, differences of opinion lead to stock overvaluation, as optimistic investors hold stocks while pessimistic investors stay out of the market due to short-sales constraints. We find retail investor sentiment plays an important role in the relation between differences of opinion and overvaluation. Stocks are overvalued when both differences of opinion and small-trade imbalances are high, but not so when either of these two is low. In addition, we find mispricing happens before retail investors start to buy. Therefore, retail investors does not directly cause mispricing with their trades, but rather delay the realization of negative information into stock prices.

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EFM Classification Codes: 320; 350; 720

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1. Introduction

The theoretical finance literature illustrates that under heterogeneous expectations, optimists hold stocks because they have the highest valuations (e.g., Miller, 1977; Harrison et al., 1978; Morris, 1996; Chen et al., 2002). In addition, stock prices are more likely to reflect the valuation of the optimistic market participants when short-sales constraints and other trading frictions prevent rational or pessimistic investors to trade against them. The empirical work of Diether, Malloy and Scherbina (2002) demonstrates that differences of opinion produce an upward bias in stock prices.

This valuation effect of differences in opinion can also be related to investors' sentiment, which is reflected in the retail investor demand. In particular, when there is a large divergence of opinion, stocks with high retail investor sentiment are more likely to be overpriced, because trade imbalances may either cause prices to deviate further from underlying fundamentals, or slow down price discovery of mispriced stocks. These stocks will have lower future returns when the upward biases are corrected. Small-trade imbalances reflect both sentiment of retail investors and trading frictions that keep pessimists out of the market. That is, small-trade imbalances reflect the domination of optimistic investors over pessimistic investors, as retail investors suffer from cognitive biases and/or short-sales constraints that make them more difficult or unwilling to take short positions on overvalued stocks. The sentiment also makes rational investors more difficult to arbitrage as they have to bear higher risk and cost to take short positions. Kumar and Lee (2006) show that retail investors' trades are systematically correlated and that the collective action of these individuals can influence stock returns. Odean (1999) and Barber and Odean (2000) demonstrate that the stocks individual investors purchase underperform the stocks they sell. Hvidkjaer (2008) shows that small-trade imbalances predict negative returns, the effects of which persist for at least two years after portfolio formation. Barber, Odean and Zhu (2009)

find that stocks bought strongly by small investors during the previous year underperform those sold strongly by small investors.

In this paper, we study the interactive impact of differences in opinion and retail investor sentiment on asset pricing. In particular, we employ two widely used proxies to measure differences of opinion, namely idiosyncratic volatility (Shalen, 1993; Harris et al.,1993) and the number of analyst coverage (Easley et al., 1998; Lobo et al., 2011), and we use small-trade imbalances as the proxy for retail investor sentiment (Barber et al., 2009). In addition, Shleifer and Vishny (1997) document that idiosyncratic volatility can deter arbitrage activities because arbitragers will take higher risks, especially in terms of short sales when trade stocks have greater idiosyncratic volatility. Since the price-optimism theory of Miller (1997) suggests that differences of opinion and short-sales constraints interactively lead to overpricing, we expect the effect of small-trade imbalances is stronger on stocks with higher idiosyncratic volatility.

We examine the pricing effect of differences in opinion and retail investor sentiment using portfolios that are sorted on the average value of proxies over previous J (J is equal to 1, 3, 6 and 12) months and held for K months (K is equal to 2-3, 2-7, and 2-12) before liquidation. The monthly holding-period returns are fitted into the Fama-French (1993) three-factor model. We examine the intercepts (alphas) of Fama-French (1993) regressions and find that the underperformance of stocks with historically high differences of opinion is a function of small-trade imbalances. For example, on the strategy (J=1, K=2-7), the risk-adjusted return of stocks in both the highest quintile of idiosyncratic volatility and the highest quintile small-trade imbalances is highly significant at (-0.697%), while those in the highest quintile of idiosyncratic volatility but lowest quintile of small-trade imbalances has an insignificant risk-adjusted return (-0.151%). In addition, the risk-adjusted profit of zero-investment portfolios that take long (short) positions on low (high) divergence of opinion is also affected

by small-trade imbalances. For example, the abnormal return of the hedge portfolio sorted on idiosyncratic volatility is 0.63% per month for the strategy (J=1, K=2-3) if the sorting is unconditional on small-trade imbalances, while it is 1.003% if the hedge portfolio is sorted conditional on high small-trade imbalances. For the analyst coverage, stocks with a large number of analysts' following outperform stocks with no analysts' following by 0.219% per month for the strategy (J=1, K=2-3), but conditional on high small-trade imbalances, the number increases to 0.593% per month.

On the other hand, the price impact of small-trade imbalances documented in (Hvidkjaer, 2008; Barber et al., 2009) is also related to differences in opinion. Interestingly, stocks with high small-trade imbalances but low divergence of opinion tend to have *positive* risk-adjusted future returns. That is to say, when investors largely agree each other, small-trade imbalances may reflect the (correct) consensus of the positive information of the firm. This positive information is revealed gradually into stock prices through investor trading. The positive future returns of stocks with high small-trade imbalances may reflect the lead-lag effect of trading on stock prices. When information asymmetry and trading frictions prevent stock prices immediately reveal all private information, investors will gradually discover the information from others' trades. On the other hand, stocks with high small-trade imbalances significantly underperform when differences of opinion are large. For example, on the strategy (J=1, K=2-3), the portfolios with highest small-trade imbalances have abnormal returns of (-0.811%) and (-0.429%) for stocks with the highest dispersion in opinion, but have abnormal returns of 0.192% and 0.164% for stocks with lowest dispersion in opinion, using the two proxies respectively. The risk-adjusted return of the zero-investment portfolios formed only on small-trade imbalances is 0.257% per month for (J=1, K=2-7), but it is 0.546% and 0.435% for stocks with highest idiosyncrasies volatility and stocks without analysts' following, respectively.

Hvidkjaer (2008) proposes possible explanations on the observation that high small-trade imbalances predict low future return. We test the pricing error explanations using cumulative abnormal returns (CAR) around earnings announcements. Stocks with both high differences of opinion and high small-trade imbalances have large negative CARs in quarters after the portfolio formation. This is consistent with our argument that these stocks tend to be overvalued, and therefore investors are negatively surprised by the announced earnings. Moreover, for stocks with high differences of opinion, there are negative CARs in the quarters before the portfolio formation, for both portfolios with high or low small-trade imbalances. However, for stocks with low small-trade imbalances, the negative CARs disappear in the quarter of the portfolio formation, while for stocks with high small-trade imbalances, the negative CARs last for at least two quarters after the portfolio formation. These evidences show that the overvaluation may not be caused by the small-trade imbalances but by changes in fundamentals. Informed investors observe the information about fundamentals and start to sell stocks. However, retail investors do not have same information, so they buy these stocks if they regard prices fallen below intrinsic value. Small-trade imbalances defers negative information realized into stock prices, because the buying pressures push price up and increase risk and cost of arbitrage.

Thus, we find that stocks are more overvalued when both differences of opinion and retail investor sentiment are high. The interactive effect of differences in opinion and retail investor sentiment can make the abnormal returns more than 50% higher than either of these two effects alone. In addition, when one effect is small or absent, the high level of the other effect may not be able to cause the overvaluation. Although neither of these two should impact equilibrium prices or predict future returns in the traditional asset-pricing theory, recent research finds that divergence of opinion and correlated retail investor trading do cause overpricing. In both scenarios, optimistic investors push stock prices far away from

fundamental values, while pessimistic investors are either absent or difficult to arbitrage. However, the interactions of these two effects are important. For example, if stocks are not over-bought by optimists or under-sold by pessimists (therefore low small-trade imbalances), stock prices will not be pushed higher than the fundamental value even though there are large differences of opinion. Similarly, when there are no differences of opinion, the trading imbalances may only reflect the investors' similar (but correct) perspective of stocks and therefore do not predict future negative abnormal returns.

The remainder of this paper is organized as follows. Section 2 introduces the data sample and constructions of variables. Section 3 reports the return of single-sorted portfolios on proxies of differences in opinion and retail investor sentiment. Section 4 examines the interactive pricing effect of differences in opinion and retail investor sentiment. Section 5 concludes the paper.

2. Data Sample and Construction of Variables

The sample includes all ordinary common stocks listed on the New York Stock Exchange (NYSE) and the American Stock Exchange (AMEX) from January 1983 through December 2006, and on NASDAQ from January 1987 through December 2006. Real estate investment trusts, stocks of companies incorporated outside the U.S., and closed-end funds are excluded from the sample. Data on stock returns, monthly trading volume and the number of shares outstanding are from the Center for Research in Security Prices (CRSP) files. We exclude stocks with negative or zero shares outstanding. The calculation of idiosyncratic volatility excludes any firm-month that has less than 18 daily return observations in the CRSP daily stock files. In the portfolio-formation month, we also exclude stocks with a current price lower than $5. The Fama-French and momentum factor returns are from Kenneth French's website, and the analysts' forecasts data are from the Institutional Brokers Estimates

System (I/B/E/S) unadjusted Summary History file. The intraday quotes and trade data are from the Institute for the Study of Security Markets (ISSM) and the Trade and Quote (TAQ) data sets. The ISSM data set includes data in all stocks listed on NYSE/AMEX in 1983-1992 and Nasdaq in 1987-1992, and TAQ covers 1993 to present. The ISSM/TAQ intraday data with irregular terms or trades outside regular trading hours are excluded.[1]

2.1 Small-Trade Imbalances

The classification of buyer-initiated and seller-initiated trades is based on the Lee and Ready (1991) algorithm: if a trade is executed at a price above (below) the quote midpoint, it is classified as a buy (sell). Trades at the quote midpoint are classified using the "tick test"; a trade at a price above (below) the previous trade is classified as a buy (sell). To correct for reporting delays of trades, we match trades with quotes that are at least five seconds older. Studies have shown that reporting errors are declining in recent period (Chordia et al., 2005), so no delay is imposed for data in year 1999 and onwards.

We classify trades by dollar-based trade-size following Lee (1992) and Hvidkjaer (2008). This method of classification has the following strengths. First, large and small traders are defined based on their investment value, so a dollar-based threshold for classifying trades is the most logical approach. Second, this method avoids the sensitivity to changes in stock price of a simple dollar-based classification.[2] Thirdly, the cutoff values are conditional on firm size. Lee and Radhakrishna (2000) illustrate that both large and small traders scale down their trade size when trading in smaller firms, so a classification method conditional on firm size is more accurate. The method is as follows. In each month *t*, we sort stocks into

[1] We delete trades and quotes outside the regular trade time 9:30-16:00. For ISSM data, we only include trades and quotes with a condition code of blank or "*". For TAQ quote data, we exclude quotes with modes of 4,7,9,11,13,14,15,19,20,27,or 28. For TAQ trade data, we only include trades with the correction indicator of 0 or 1 and a condition code of blank or "*".

[2] For example, if a stock is trading at $20, a $10,000 cutoff would classify all trades of 100-500 shares as small trades. If the stock moves to 20⅛, only 100-400 shares are classified as small due to the round lot of 100.

quintiles based on NYSE/AMEX firm-size cut-off points and find the 99th stock price within each quintile in each month. Then we average the 99th stock price for each quintile over all months in the sample, and denote this average as P99. For each firm size quintile, the small-trade cut-off points are set at \$100×P99 rounded up to the nearest \$100. Given the dramatic changes in market conditions and in trading mechanisms during the long period of 1983-2006, we split the entire sample period into three sub-periods (1983-1991, 1992-1999, and 2000-2006) and calculate the small-trade cut-off points for each sub-period. However, the results are robust if we calculate the cut-off points using the whole sample period. Table 1 reports the cut-off points for each firm-size quintile in each sub-period. Hvidkjaer (2006, 2008) sets the small-trade cut-off points for the firm-size quintiles at \$3,400 for the smallest firms and \$4,800, \$7,300, \$10,300, and \$16,400 for the largest firms over the years 1983-2001. Table 1 shows that our cut-off points in the first two sub-periods are close to those in Hvidkjaer (2006, 2008), while the cut-off points are significantly greater in the last sub-period, suggesting increased stock prices over the last sub-period due to the bull market. Then for each stock, we compare the month $t-1$ closing price to the cut-off points in Table 1 and determine the largest number of round lot shares less than or equal to that dollar value. This number of round lot shares will be the share volume cut-off point for this stock in month *t*. We define any trade with a share volume smaller than or equal to the small trade share volume cut-off as "small trade". The small-trade imbalances (*STI*) for an individual stock are the difference of the small-trade buy-volume and the small-trade sell-volume in a month divided by the total number of shares outstanding at the end of the previous month.

2.2 Proxies for Differences of Opinion

We use two proxies to measure divergence of opinion. The first is idiosyncratic volatility (*IVOL*), estimated from the time-series regression of the daily returns on stock *i* in month *t* (with at least 18 observations) on the contemporary three factors (*MKT*, *SMB*, and

HML) of Fama-French (1993). Shalen (1993) and Harris and Raviv (1993) develop theoretical models related to dispersion of opinion and return volatility, and they also observe a positive empirical relation between return volatility and the dispersion of analysts' forecasts. In addition, Shleifer and Vishny (1997) show that idiosyncratic volatility can also deter arbitrage activities because arbitragers will take higher risks, especially in terms of short sales when trade stocks have greater idiosyncratic volatility. Thus, the negative relation between small-trade imbalances and expected stock returns should be stronger for stocks with higher idiosyncratic volatility, because in those stocks, the larger dispersion of opinion and/or the higher difficulty of arbitrage lead to more upward biases in stock prices.

The second proxy of differences in opinion is the number of analyst coverage. Analysts help to disseminate information and make private information public (c.f., Easley et al., 1998; Lobo et al., 2011), which eliminates disagreement and increases the conformity of investors' opinions. Therefore, we propose that firms with greater analyst coverage should have smaller divergence of opinion. The analyst coverage number (*NUM*) is the number of analysts who provide the current-fiscal-year annual earnings per share, as reported monthly in the I/B/E/S unadjusted Summary History file. If a firm-month is not reported in the I/B/E/S data file, *NUM* is set to zero. We use the number of analyst coverage instead of the dispersion in analysts' forecasts as Diether, Malloy and Scherbina (2002), because the latter requires at least two forecasts to calculate the standard deviation. This requirement will eliminate about half of the sample and reduce the variety of divergence of opinion, since the remaining sample with large number of analyst forecast should have lower disagreement.

Table 2 Panel A reports the descriptive statistics on the variables. Panel B reports the correlation coefficients between the variables. The cross-sectional correlation coefficients are calculated between variables, and the table reports the time-series averages. We can see that the correlations between *STI* and proxies for differences of opinion are generally small in

magnitude. This suggests that the divergence of opinion itself does not necessarily generate buy-pressure or sell-pressure, or in other words, *STI* is not a direct indicator of divergence of opinion among investors.

3. Single-Sorted Portfolios on Differences of Opinion or on Retail Investor Sentiment

This part reports the abnormal returns of portfolios by one-way sort. At the beginning of each month, stocks are sorted into quintiles on the average *IVOL*/*STI* over the prior *J* months (*J* is equal to 1, 3, 6, and 12). Out of the whole sample firm-months, 35% have *NUM* equal to zero (361,519 out of 1,027,298). Therefore, stocks are classed into the "Zero" group if the average of *NUM* is zero over the prior *J* month, and the rest of the sample is sorted into terciles by *NUM*. Stocks with prices of less than $5 in the formation month are excluded. Returns are value-weighted on stocks within each portfolio. Portfolios are held over the horizon of *K* months (*K* is equal to 2-3, 2-7, and 1-12) and then liquidated. Therefore, similar to Jegadeesh and Titman (1993), the portfolio return in a given month *t* of this (*J, K*) strategy R_{pt} is the average of the current month's returns on the portfolios formed in the previous *K* months. We skip one month between the formation period and the holding period to avoid the influence of bid-ask bounces. In Table 3, we report the abnormal returns of portfolios, which are the intercepts (alphas) of the Fama-French (1993) three-factor model. Our results are consistent with those in the literature; stocks with high *IVOL*/*STI* or low analyst coverage tend to underperform than those with low *IVOL*/*STI* or high analyst coverage. This implies stocks with high divergence of opinion or high retail investor demand tend to be overvalued. High *IVOL* in particular predicts the biggest negative future abnormal returns. The hedge portfolios that take long (short) positions in low (high) historical *IVOL* stocks have monthly risk-adjusted returns as high as 0.722% (*J*=3, *K*=2-3), out of which 0.593% come from the underperformance of high *IVOL* stocks. This is not surprising if high *IVOL* represent both

high divergence of opinion and large short-sales constraints, which result in more severely overpriced stocks.

4. The Interactive Pricing Effect of Differences in Opinion and Retail Investor Sentiment

In this section, we examine the interaction effect of divergence of opinion and retail investor sentiment on stock valuation. We first rank all stocks by a proxy of differences in opinion and then by small-trade imbalances at the beginning of each month. This sequential ranking method can achieve the biggest possible spread on divergence of opinion and comparable sample size on all portfolios. Nevertheless, the unreported results using portfolios sorted independently are robust. In particular, all stocks are sorted into quintiles on the average *IVOL* over the prior *J* months (*J* is equal to 1, 3, 6, and 12). Then within each *IVOL* quintile, stocks are further sorted into quintiles on the average *STI* over the same time horizon, so we have 25 *IVOL*×*STI* portfolios in each month for each *J*. The sorting on *NUM* is different: Stocks are classed into the "Zero" group if the average of *NUM* is zero over the prior *J* month, and the rest of the sample is sorted into terciles by *NUM*. Within each of the four *NUM* groups, stocks are further sorted into quintiles on the average of prior *J*-month *STI*. Stocks with prices of less than \$5 in the formation month are excluded. Returns are value-weighted on stocks within each portfolio. Portfolios are held over the horizon of *K* months (*K* is equal to 2-3, 2-7, and 1-12) and then liquidated. Therefore, the portfolio return in a given month *t* of this (*J, K*) strategy R_{pt} is the average of the current month's returns on the portfolios formed in the previous *K* months. We skip one month between the formation period and the holding period to avoid the influence of bid-ask bounces. We report the abnormal returns of portfolios, which are the intercepts (alphas) of the Fama-French (1993) three-factor model.

4.1 The Valuation Effect of Differences in Opinion as a Function of Small-Trade Imbalances

Table 4 reports the abnormal returns of the portfolios that have the highest divergence of opinion, sorted by retail investor sentiment. Panel A reports the portfolios in the quintile 5 of *IVOL* and Panel B report the portfolio with no analyst coverage. We observe that the risk-adjusted returns reported in Table 4 are negative, which is consistent with Miller (1977) that stocks with high divergence of opinion tend to be over-valued. However, we observe that the negative risk-adjusted returns decrease with small-trade imbalances. In particular, all returns of stocks in the lowest *STI* quintiles are small in the magnitude and insignificant statistically. On the other hand, returns of stocks with high *STI* are large in the magnitude and highly significant. For example, on the strategy (*J*=1, *K*=2-7), the portfolio with high (low) *STI* and high *IVOL* has significantly (insignificantly) negative return of -0.697% (-0.151%), and the portfolio with high (low) *STI* and zero *NUM* has significantly (insignificantly) negative return of -0.472% (-0.037%). These results imply that retail investor sentiment is essential to cause the overvaluation in stocks with a large divergence of opinion. The excessive demand of small investor makes the stocks with large disagreement more upwardly biased and more underperformed thereafter.

4.2 The Valuation Effect of Small-Trade Imbalances as a Function of Differences in Opinion

Table 5 reports the abnormal returns of the portfolios that have the highest retail investor sentiment, sorted by differences of opinion. The structure of this table is similar with that of Table 4. We observe that the abnormal returns of high *STI* stocks also decrease with differences of opinion. For stocks with large differences of opinion, stocks with strong

buying pressure from retail investors have significant negative future abnormal returns. For example, when (*J*=3, *K*=2-7), stocks with high *IVOL* (zero *NUM*) and high *STI* have an abnormal return of -0.664% (-0.518%). This is consistent with our argument that strong retail investor demand and large divergence of opinion interactively drive the stocks overpriced. However, we can see from Panel A that high *STI* could predict positive abnormal returns when there are low *IVOL*. Although contradicting with Hvidkjaer (2008) and Barber et al. (2009), this is not surprising. When investors largely agree each other, small-trade imbalances may reflect the (correct) consensus on the positive perspective of the firm, which information is revealed gradually into stock prices through investor trading. The positive future returns reflect the lead-lag effect of trading on stock prices. When the information asymmetry and trading frictions prevent stock prices reflect private information immediately, investors will gradually discover the information from others' trades.

4.3 Abnormal Returns of Hedge Portfolios

In this section, we construct the zero-investment hedge portfolios to examine the partial effect of differences in opinion and retail investor sentiment. Table 6 Panel A reports the abnormal returns of portfolios that take long (short) position on stocks with low (high) divergence of opinion, conditionally on high small-trade imbalances. We can see such strategy can make very large abnormal profits. The risk-adjusted returns in this table are all higher than those reported in Table 3 for the unconditional hedge portfolios constructed on divergence of opinion. Conditional on high small-trade imbalances, the hedge portfolio formed on *IVOL* with (*J*=3, *K*=2-3), for example, has the risk-adjusted abnormal return of 1.224% per month, which is around 15% per year. In addition, we find such pricing impact persists for one year after the portfolios formation. The monthly risk-adjusted returns of

strategies with (*K*=2-12) are all significantly at 0.5 to 1.2% per month, which are 6 to 14% per year.

Panel B reports the abnormal returns of hedge portfolios that take long (short) positions on stocks with low (high) small-trade imbalances, conditionally on high divergence of opinion. Similarly, we can observe higher profit than the unconditional hedge portfolios reported in Panel C of Table 3. For those with highest *IVOL*, for example, the hedge portfolio on (*J*=1, *K*=2-7) has an abnormal monthly return of 0.546%, more than double of that in Table 3 (0.257%). For stocks with no analyst coverage (zero *NUM*) over the previous three months (*J*=3), the risk-adjusted monthly return on the *STI* hedge portfolios are ranged from 0.574 to 0.646% per month, all of which are higher than the returns in the last row of Table 3 Panel C, which are 0.281 to 0.346% per month.

4.4 Retail Investor Sentiment and Overvaluation

Hvidkjaer (2008) proposes two possible mechanisms that cause the relation between small-trade imbalances and future returns, but does not disentangle them. In one mechanism, retail investors' trading push prices away from fundamentals. Therefore the negative relation between future stock returns and current trade imbalances reflects prices reverting to fundamentals. In the second mechanism, informed investors start selling stocks that they know are overvalued. This overvaluation may be driven by changes in firms' fundamental values, but the falling prices attract retail investors, who do not observe changes in fundamentals and buy these stocks that they believe are "cheaper" relative to the intrinsic values. In the first scenario, retail investors cause the mispricing, while in the second one, they delay the price discovery process.

In this paper, we try to separate the two possible mechanisms using the cumulative abnormal returns (CAR) on the three-day event window [0, 2] around earnings announcements. According to the previous results, stocks tend to be overvalued when

differences of opinion and small-trade imbalances are both high. For the overvalued stocks, investors would be negatively shocked when they notice that earnings are lower than expectations. Therefore, we calculate CARs around earnings announcement for the portfolios that are sorted on *IVOL* and *STI*. First, we expect that conditional on high divergence of opinion, stocks with high small-trade imbalances should have more negative CARs than stocks with low small-trade imbalances. Secondly, we calculate CARs around earnings announcements before the portfolios formation. If overvaluations are caused by retail investors' over-trades, we should not observe negative CARs during the portfolio formation period, because there is no information about fundamentals in that period. However, if it is the second scenario, stock fundamentals change before retail investors realize. They jump to buy when stock prices falling, because they believe that prices are lower than intrinsic values. Therefore, in this case, stocks are already over-valued during the portfolio formation period and we can see large negative earnings announcement returns in that period. In Figure 1, we plot CARs before and after portfolio formations. We calculate a stock's *CAR* as the cumulative three-day return around the earnings announcement minus the corresponding return on its benchmark portfolio (one of the six portfolios formed on Size and Book-to-Market by NYSE benchmarks). *QTR* represents the quarter of earnings announcement day relative to the quarter of portfolio formation month. *QTR* equals zero when the earnings announcement and the portfolio formation are in the same quarter, (-1) when the earnings announcement is in the quarter before the portfolio formation, (+1) when the earnings announcement is in the quarter after the portfolio formation, etc. The figures plot CAR for the portfolios that have low *IVOL* and low *STI* (d1s1), low *IVOL* and high *STI* (d1s5), high *IVOL* and low *STI* (d5s1), or high *IVOL* and high *STI* (d5s5) for *J* equal to 1, 3, 6 and 12, respectively. We can see from the figures that there are large negative CARs in QTR (0) and QTR (1) for portfolios with high *IVOL* and high *STI*. For the other three portfolios,

the CARs are generally small in the quarters after portfolio formations. This evidence confirms our earlier argument that stocks tend to be overvalued when both dispersion in opinion and small-investor sentiment are high, but may not be so when either of these two is low. In addition, we also observe from d5s1 and d5s5 that stocks with high *IVOL* have large negative CAR before the portfolio formation, no matter *STI* is high or low. Those stocks with high *IVOL* but low *STI* no longer have significantly negative CARs since the formation quarter (QTR0), probably because the selling pressure on these stocks has corrected the mispricing. However, negative CARs for stocks with high *IVOL* and high *STI* are persistent until at least two quarters after the portfolio formation. Therefore, for the underperforming high-*STI* stocks, retail investors may not create the overvaluation, but they buy the stock with a higher price than it should be sold. These buying pressures push stock prices up, and the sentiment also make it is risker and more costly for informed investors to take short positions. Thus, the buying-pressures from retail investors eventually facilitate mispricing and delay the price discovery.

5. Conclusion

This paper combines the literature of differences in opinion and retail investor sentiment and investigates the interactive effect of these two on stock valuations. In the price-optimism models (e.g., Miller, 1977; Harrison et al., 1978; Morris, 1996; Chen et al., 2002), differences of opinion lead to stock overvaluation, as optimistic investors hold stocks while pessimistic investors stay out of the market due to short-sales constraints. We find that retail investor sentiment plays an important role in the relations between differences of opinion and stock overvaluation. In particular, the abnormal returns of stocks with large disagreement are a function of small-trade imbalances. On the other hand, the negative relation between small-trade imbalances and future stock returns as documented in Hvidkjaer (2008) and Barber et al. (2009) is also related to the differences of opinion. We find that stocks are overvalued when

small-trade imbalances and differences of opinion are both large. However, when either of these two is small, stocks are not necessarily overvalued. Moreover, when differences of opinion are small, small-trade imbalances can even predict positive abnormal returns, because trading imbalances may reflect the unrealized positive information of the stock.

We further show that when there are large differences of opinion, trades of retail investors do not directly create mispricing, but rather facilitate mispricing and defer the price discovery. Informed investors sell stocks of which they observe negative information on fundamentals. Without knowing similar information, retail investors may regard the falling prices as good opportunity to buy "cheaper" stocks. These buying pressures from retail investors delay the realization of new information in two ways. First, the buying pressures themselves result in prices higher than the intrinsic values. Second, the large sentiment of retail investor increases risk and cost for short-sales, which make informed investors reluctant to take short positions on those over-valued stocks.

REFERENCES

Barber, B. M., Odean, T., 2000. Trading is hazardous to your wealth: The common stock investment performance of individual investors. Journal of Finance 55, 773-806.

Barber, B. M., Odean, T., Zhu, N., 2009. Do retail trades move markets? Review of Financial Studies 22, 151-186.

Chen, *J*., Hong, H., Stein, *J*. C., 2002. Breadth of ownership and stock returns. Journal of Financial Economics 66, 171-205.

Chordia, T., Roll, R., Subrahmanyam, A., 2005. Evidence on the speed of convergence to market efficiency. Journal of Financial Economics 76, 271-292.

Diether, *K*. B., Malloy, C. *J*., Scherbina, A., 2002. Differences of opinion and the cross section of stock returns. Journal of Finance 57, 2113-2141.

Easley, D., O'Hara, M., Paperman, *J*., 1998. Financial analysts and information-based trade. Journal of Financial Markets 1, 175-201.

Fama, E. F., French, *K*. R., 1993. Common risk factors in the returns on stocks and bonds. Journal of Financial Economics 33, 3-56.

Harris, M., Raviv, A., 1993. Differences of opinion make a horse race. Review of Financial Studies 6, 473-506.

Harrison, M., Kreps, D., 1978. Speculative investor behavior in a stock market with heterogeneous expectations. Quarterly Journal of Economics 92, 323-36.

Hvidkjaer, S., 2006. A trade-based analysis of momentum. Review of Financial Studies 19, 457-491.

Hvidkjaer, S., 2008. Small trades and the cross-section of stock returns. Review of Financial Studies 21, 1123-1151.

Jegadeesh, N., Titman, S., 1993. Returns to buying winners and selling losers: Implications for stock market efficiency. Journal of Finance 48, 65-91.

Kumar, A., Lee, C. M. C., 2006. Retail investor sentiment and return comovements. Journal of Finance 61, 2451-2486.

Lee C. M., 1992. Earnings news and small traders. Journal of Accounting and Economics 15, 265-302.

Lee, C. M., Ready, M. *J*., 1991. Inferring trade direction from intraday data. Journal of Finance 46, 733-746.

Lee, C. M., Swaminathan, B., 2000. Price momentum and trading volume. Journal of Finance 55, 2017-2069.

Lee, C. M., Radhakrishna, B., 2000. Inferring investor behavior: Evidence from TORQ data. Journal of Financial Markets 3, 83-111.

Lobo, G. *J*., Song, M., Stanford, M., 2011. Accruals quality and analyst coverage. Journal of Banking & Finance, forthcoming.

Miller, E. M., 1977. Risk, uncertainty and divergence of opinion. The Journal of Finance 32, 1151-1168.

Morris, S., 1996. Speculative investor behavior and learning. The Quarterly Journal of Economics 111, 1111-1133.

Odean, T., 1999. Do investors trade too much? American Economic Review 89, 1279-1298.

Shalen, C. T., 1993. Volume, volatility, and the dispersion of reliefs. Review of Financial Studies 6, 405-134.

Shleifer, A., Vishny, R. W., 1997. The limits of arbitrage. The Journal of Finance 52, 35-55.

Table 1 Cut-Off Points for Small-Sized Trades

This table reports the dollar-based cut-off points for small-sized trades in each period (1983-1991, 1992-1999, and 2000-2006), for each firm-size quintile sorted on NYSE/AMEX firm-size cut-off points. The sample includes all ordinary common stocks listed on NYSE/AMEX and on NASDAQ (from 1987) from January 1983 through December 2006.

Firm Size	1983-1991	1992-1999	2000-2006
Small	3,100	3,400	6,200
S2	5,100	5,100	7,300
S3	7,700	7,200	8,700
S4	9,400	9,800	11,800
Large	15,300	14,900	17,000

Table 2 Summary Statistics and Simple Correlations

This table reports the summary statistics and the simple correlations of the variable. *STI* is the monthly small-trade imbalances (scaled up by 1,000), calculated as the difference in the number of shares of the small buy-trade and the small sell-trade scaled by the total number of shares outstanding. *IVOL* is idiosyncratic volatility, calculated each month for each stock as the standard deviation of the residual from a Fama-French three-factor regression using daily returns, requiring that at least 18 observations be available. *NUM* is the number of analysts who provide the current-fiscal-year annual earnings per share, as reported monthly in the I/B/E/S unadjusted Summary History file. If the firm-month is not reported in the I/B/E/S data file, *NUM* is set to zero. The sample includes all ordinary common stocks listed on NYSE/AMEX and on NASDAQ (from 1987) from January 1983 through December 2006. Stocks are excluded if the price in the formation months is lower than $5. Panel A reports the number of observations (*N*), the mean, the median, the standard deviation (*STD*), the 25th (*P25*) and 75th (*P75*) percentiles by pooling all firm-months. The cross-sectional correlation is calculated in each month and Panel B reports the time-series mean of the correlations.

Panel A Summary Statistics

	N	MEAN	MEDIAN	STD	P25	P75
STI	1,027,298	0.210	0.020	6.582	-0.430	0.671
IVOL	1,019,497	0.024	0.020	0.017	0.013	0.030
NUM	1,027,298	4.841	2.000	6.772	0.000	7.000

Panel B Simple Correlations

	IVOL	*NUM*
STI	0.122	0.022
IVOL		-0.182

Table 3 Returns of Single-Sorted Portfolios

This table reports the returns of single-sorted portfolios on *IVOL*/*NUM*/*STI*. *IVOL* is idiosyncratic volatility, calculated each month for each stock as the standard deviation of the residual from a Fama-French three-factor regression using daily returns, requiring that at least 18 observations be available. *NUM* is the number of analysts who provide the current-fiscal-year annual earnings per share, as reported monthly in the I/B/E/S unadjusted Summary History file. If the firm-month is not reported in the I/B/E/S data file, *NUM* is set to zero. *STI* is the monthly small-trading imbalances, calculated as the difference in the number of shares of the small buy-trade and the small sell-trade scaled by the total number of shares outstanding. At the beginning of each month, portfolios are formed by ranking the average of prior *J*-month *IVOL*/*NUM*/*STI* and held for *K* months. Returns are value-weighted within portfolios. The sample includes all ordinary common stocks listed on NYSE/AMEX and on NASDAQ (from 1987) from January 1983 through December 2006. Stocks are excluded if the price in the formation months is lower than $5. The abnormal return is estimated as the intercept (alpha) of the Fama-French (1993) three-factor model. Returns are reported in percentages. *, **, and *** denote that the returns are significant at the 10%, 5% and 1% levels, respectively. Panel A reports abnormal returns of portfolios sorted by *IVOL*. Panel B reports abnormal returns of portfolios sorted by *NUM*. Panel C reports abnormal returns of portfolios sorted by *STI*.

Panel A Returns of Portfolios Sorted by *IVOL*

	J=1			*J*=3		
IVOL Rank	*K*=2-3	*K*=2-7	*K*=2-12	*K*=2-3	*K*=2-7	*K*=2-12
Low	0.093	0.083	0.069	0.130**	0.105*	0.079
2	-0.043	-0.004	-0.008	-0.041	-0.010	-0.013
3	-0.094	-0.095	-0.093	-0.071	-0.076	-0.077
4	-0.077	-0.110	-0.147	-0.180	-0.192	-0.167
High	-0.538***	-0.494***	-0.393**	-0.593***	-0.482**	-0.453**
Low-High	0.630***	0.577***	0.462**	0.722***	0.586**	0.532**
	J=6			*J*=12		
	K=2-3	K=2-7	K=2-12	K=2-3	K=2-7	K=2-12
Low	0.130**	0.130**	0.092	0.106*	0.090	0.075
2	-0.039	-0.025	-0.004	-0.039	0.015	0.026
3	-0.047	-0.101	-0.107	-0.044	-0.068	-0.062
4	-0.162	-0.120	-0.085	-0.152	-0.080	-0.078
High	-0.517**	-0.528**	-0.505**	-0.440**	-0.475**	-0.593***
Low-High	0.647**	0.658***	0.597**	0.546**	0.565**	0.668***

Panel B Returns of Portfolios Sorted by *NUM*

	J=1			*J*=3		
NUM Rank	*K*=2-3	*K*=2-7	*K*=2-12	*K*=2-3	*K*=2-7	*K*=2-12
Zero	-0.166*	-0.191**	-0.202**	-0.155*	-0.182**	-0.193**
Low	-0.064	-0.073	-0.052	-0.026	-0.035	-0.033
Medium	-0.08	-0.078	-0.058	-0.085	-0.054	-0.044
High	0.053	0.054	0.042	0.064*	0.062	0.047
High-Zero	0.219**	0.245***	0.243***	0.218**	0.244***	0.24***
	J=6			J=12		
	K=2-3	K=2-7	K=2-12	K=2-3	K=2-7	K=2-12
Zero	-0.151*	-0.168**	-0.182**	-0.129	-0.157*	-0.168**
Low	-0.033	-0.010	-0.030	-0.028	0.008	-0.004
Medium	-0.060	-0.036	-0.051	-0.067	-0.041	-0.048
High	0.067*	0.062	0.048	0.058	0.059	0.049
High-Zero	0.217**	0.230***	0.229***	0.187**	0.215**	0.216**

Panel C Returns of Portfolios Sorted by *STI*

	J=1			*J*=3		
STI Rank	*K*=2-3	*K*=2-7	*K*=2-12	*K*=2-3	*K*=2-7	*K*=2-12
Low	0.214*	0.17	0.187*	0.214*	0.251**	0.241**
2	0.164**	0.098	0.094	0.092	0.049	0.058
3	-0.076	-0.058	-0.029	-0.012	-0.040	-0.003
4	0.015	-0.007	-0.053	-0.003	-0.025	-0.080
High	-0.031	-0.087	-0.102	-0.067	-0.081	-0.106
Low-High	0.246	0.257**	0.289***	0.281	0.332**	0.346***
	J=6			J=12		
	K=2-3	K=2-7	K=2-12	K=2-3	K=2-7	K=2-12
Low	0.291**	0.273**	0.256**	0.315**	0.291*	0.209
2	-0.015	0.018	0.033	0.04	0.034	0.062
3	-0.012	0.012	0.032	0.035	0.036	0.057
4	0.025	-0.021	-0.053	-0.042	-0.029	-0.028
High	-0.046	-0.094	-0.120	-0.044	-0.087	-0.102
Low-High	0.337*	0.367**	0.376***	0.359**	0.378**	0.311**

Table 4 Abnormal Returns of Stocks with Highest Divergence of Opinion as a Function of Small-Trade Imbalances

This table reports the abnormal returns of the portfolios that have the highest divergence of opinion, sorted by small-trade imbalances. *IVOL* is idiosyncratic volatility, calculated each month for each stock as the standard deviation of the residual from a Fama-French three-factor regression using daily returns, requiring that at least 18 observations be available. *NUM* is the number of analysts who provide the current-fiscal-year annual earnings per share, as reported monthly in the I/B/E/S unadjusted Summary History file. If the firm-month is not reported in the I/B/E/S data file, *NUM* is set to zero. *STI* is the monthly small-trading imbalances, calculated as the difference in the number of shares of the small buy-trade and the small sell-trade scaled by the total number of shares outstanding. At the beginning of each month, portfolio are formed by ranking the average of prior *J*-month *IVOL*/*NUM* and then on the average of prior *J*-month *STI*. Portfolios are held for *K* months. Returns are value-weighted within portfolios. The sample includes all ordinary common stocks listed on NYSE/AMEX and on NASDAQ (from 1987) from January 1983 through December 2006. Stocks are excluded if the price in the formation months is lower than $5. The abnormal return is estimated as the intercept (alpha) of the Fama-French (1993) three-factor model. Returns are reported in percentages. *, **, and *** denote that the returns are significant at the 10%, 5% and 1% levels, respectively. Panel A reports abnormal returns of portfolios sorted by *IVOL* and *STI*. Panel B reports abnormal returns of portfolios sorted by *NUM* and *STI*.

Panel A Abnormal Returns of Portfolios of Highest *IVOL* as a Function of *STI*

	J=1			*J*=3		
STI Rank	*K*=2-3	*K*=2-7	*K*=2-12	*K*=2-3	*K*=2-7	*K*=2-12
Low	-0.328	-0.151	-0.105	-0.429	-0.199	-0.175
2	-0.209	-0.241	-0.170	-0.445**	-0.355*	-0.304
3	-0.509**	-0.469***	-0.396**	-0.324	-0.372	-0.340
4	-0.642**	-0.615***	-0.534***	-0.687***	-0.640***	-0.623***
High	-0.811***	-0.697***	-0.599***	-0.906***	-0.664**	-0.664***
	J=6			*J*=12		
	K=2-3	*K*=2-7	*K*=2-12	*K*=2-3	*K*=2-7	*K*=2-12
Low	-0.271	-0.151	-0.109	-0.195	-0.083	-0.170
2	-0.404*	-0.427**	-0.318*	-0.069	-0.256	-0.267
3	-0.412	-0.320	-0.298	-0.097	-0.136	-0.384*
4	-0.620***	-0.697***	-0.582***	-0.546**	-0.531**	-0.532**
High	-0.615**	-0.676**	-0.735***	-0.697**	-0.791***	-0.960***

Panel B Abnormal Returns of Portfolios of Zero *NUM* as a Function of *STI*

	J=1			J=3		
STI Rank	K=2-3	K=2-7	K=2-12	K=2-3	K=2-7	K=2-12
Low	0.008	-0.037	-0.078	0.196	0.086	0.063
2	-0.024	-0.047	-0.056	-0.044	-0.044	-0.085
3	-0.121	-0.178*	-0.164*	-0.071	-0.169	-0.162
4	-0.185	-0.245**	-0.246**	-0.288**	-0.246**	-0.248**
High	-0.429**	-0.472**	-0.463**	-0.450**	-0.518**	-0.511***
	J=6			J=12		
	K=2-3	K=2-7	K=2-12	K=2-3	K=2-7	K=2-12
Low	0.233	0.152	0.100	0.111	0.164	-0.003
2	-0.157	-0.020	-0.070	0.096	0.062	0.035
3	-0.030	-0.119	-0.137	-0.086	-0.111	-0.114
4	-0.218	-0.179	-0.183*	-0.212	-0.216*	-0.155
High	-0.477**	-0.542***	-0.51**	-0.476**	-0.443**	-0.439**

Table 5 Abnormal Returns of Stocks with Highest Small-Trade Imbalances as a Function of Divergence of Opinion

This table reports the abnormal returns of the portfolios that have the highest retail investor sentiment, sorted by differences of opinion. *IVOL* is idiosyncratic volatility, calculated each month for each stock as the standard deviation of the residual from a Fama-French three-factor regression using daily returns, requiring that at least 18 observations be available. *NUM* is the number of analysts who provide the current-fiscal-year annual earnings per share, as reported monthly in the I/B/E/S unadjusted Summary History file. If the firm-month is not reported in the I/B/E/S data file, *NUM* is set to zero. *STI* is the monthly small-trading imbalances, calculated as the difference in the number of shares of the small buy-trade and the small sell-trade scaled by the total number of shares outstanding. At the beginning of each month, portfolios are formed by ranking the average of prior *J*-month *IVOL*/*NUM* and then on the average of prior *J*-month *STI*. Portfolios are held for *K* months. Returns are value-weighted within portfolios. The sample includes all ordinary common stocks listed on NYSE/AMEX and on NASDAQ (from 1987) from January 1983 through December 2006. Stocks are excluded if the price in the formation months is lower than $5. The abnormal return is estimated as the intercept (alpha) of the Fama-French (1993) three-factor model. Returns are reported in percentages. *, **, and *** denote that the returns are significant at the 10%, 5% and 1% levels, respectively. Panel A reports abnormal returns of portfolios sorted by *IVOL* and *STI*. Panel B reports abnormal returns of portfolios sorted by *NUM* and *STI*.

Panel A Abnormal Returns of Portfolios of Highest *STI* as a Function of *IVOL*

	J=1			J=3		
IVOL Rank	K=2-3	K=2-7	K=2-12	K=2-3	K=2-7	K=2-12
Low	0.192*	0.227***	0.122	0.318***	0.268***	0.158*
2	0.190*	0.120	0.081	0.059	0.104	0.067
3	-0.002	-0.010	-0.043	0.054	-0.031	-0.016
4	-0.049	-0.186	-0.273*	-0.294	-0.359**	-0.392**
High	-0.811***	-0.697***	-0.599***	-0.906***	-0.664**	-0.664***
	J=6			J=12		
	K=2-3	K=2-7	K=2-12	K=2-3	K=2-7	K=2-12
Low	0.342***	0.277***	0.188**	0.257**	0.257**	0.234**
2	0.175	0.140	0.063	0.093	0.120	0.014
3	-0.015	-0.115	-0.097	-0.065	-0.115	-0.095
4	-0.304	-0.286	-0.337*	-0.426*	-0.341	-0.308
High	-0.615**	-0.676**	-0.735***	-0.697**	-0.791***	-0.96***

Panel B Abnormal Returns of Portfolios Highest *STI* as a Function of *NUM*

	J=1			J=3		
NUM Rank	K=2-3	K=2-7	K=2-12	K=2-3	K=2-7	K=2-12
Zero	-0.429**	-0.472**	-0.463**	-0.450**	-0.518**	-0.511***
Low	-0.432***	-0.358***	-0.350***	-0.393**	-0.323**	-0.358***
Medium	-0.260**	-0.270**	-0.247**	-0.231	-0.189	-0.227**
High	0.164	0.056	0.039	0.114	0.083	0.072
	J=6			J=12		
	K=2-3	K=2-7	K=2-12	K=2-3	K=2-7	K=2-12
Zero	-0.477**	-0.542***	-0.510**	-0.476**	-0.443**	-0.439**
Low	-0.313**	-0.353**	-0.436***	-0.392**	-0.440***	-0.450***
Medium	-0.187	-0.217*	-0.270**	-0.389***	-0.308**	-0.279**
High	0.154	0.133	0.101	0.117	0.107	0.098

Table 6 Abnormal Returns of Hedge Portfolios

This table reports the abnormal returns of the hedge portfolios. *IVOL* is idiosyncratic volatility, calculated each month for each stock as the standard deviation of the residual from a Fama-French three-factor regression using daily returns, requiring that at least 18 observations be available. *NUM* is the number of analysts who provide the current-fiscal-year annual earnings per share, as reported monthly in the I/B/E/S unadjusted Summary History file. If the firm-month is not reported in the I/B/E/S data file, *NUM* is set to zero. *STI* is the monthly small-trading imbalances, calculated as the difference in the number of shares of the small buy-trade and the small sell-trade scaled by the total number of shares outstanding. At the beginning of each month, quintiles are formed on the average of prior *J*-month *IVOL*/*NUM* and then on the average of prior *J*-month *STI*. Portfolios are held for *K* months. Returns are value-weighted within quintiles. The sample includes all ordinary common stocks listed on NYSE/AMEX and on NASDAQ (from 1987) from January 1983 through December 2006. Stocks are excluded if the price in the formation months is lower than $5. The abnormal return is estimated as the intercept (alpha) of the Fama-French (1993) three-factor model. Returns are reported in percentages. *, **, and *** denote that the returns are significant at the 10%, 5% and 1% levels, respectively. Panel A reports abnormal returns of portfolios that take long (short) positions in the stocks with the highest *STI* and the lowest (highest) *IVOL* or the highest (zero) *NUM*. Panel B reports abnormal returns of portfolios that take long (short) positions in the stocks with the lowest (highest) *STI* and the highest *IVOL* or zero *NUM*.

Panel A Hedge Portfolio of Divergence of Opinion for Stocks with Highest Retail Investor Sentiment

	J=1			J=3		
	K=2-3	K=2-7	K=2-12	K=2-3	K=2-7	K=2-12
IVOL	1.003***	0.925***	0.720***	1.224***	0.931***	0.822***
NUM	0.593***	0.527***	0.502***	0.564***	0.602***	0.582***
	J=6			J=12		
	K=2-3	K=2-7	K=2-12	K=2-3	K=2-7	K=2-12
IVOL	0.957***	0.953***	0.923***	0.954***	1.048***	1.194***
NUM	0.632***	0.675***	0.610***	0.593***	0.550***	0.537***

Panel B Hedge Portfolio of Retail Investor Sentiment for Stocks with Highest Divergence of Opinion

	J=1			J=3		
	K=2-3	K=2-7	K=2-12	K=2-3	K=2-7	K=2-12
IVOL	0.483*	0.546***	0.493***	0.477	0.464*	0.488**
NUM	0.437**	0.435**	0.385**	0.646***	0.604***	0.574***
	J=6			J=12		
	K=2-3	K=2-7	K=2-12	K=2-3	K=2-7	K=2-12
IVOL	0.343	0.525*	0.626***	0.502	0.708**	0.790***
NUM	0.711***	0.693***	0.610***	0.587**	0.607***	0.436**

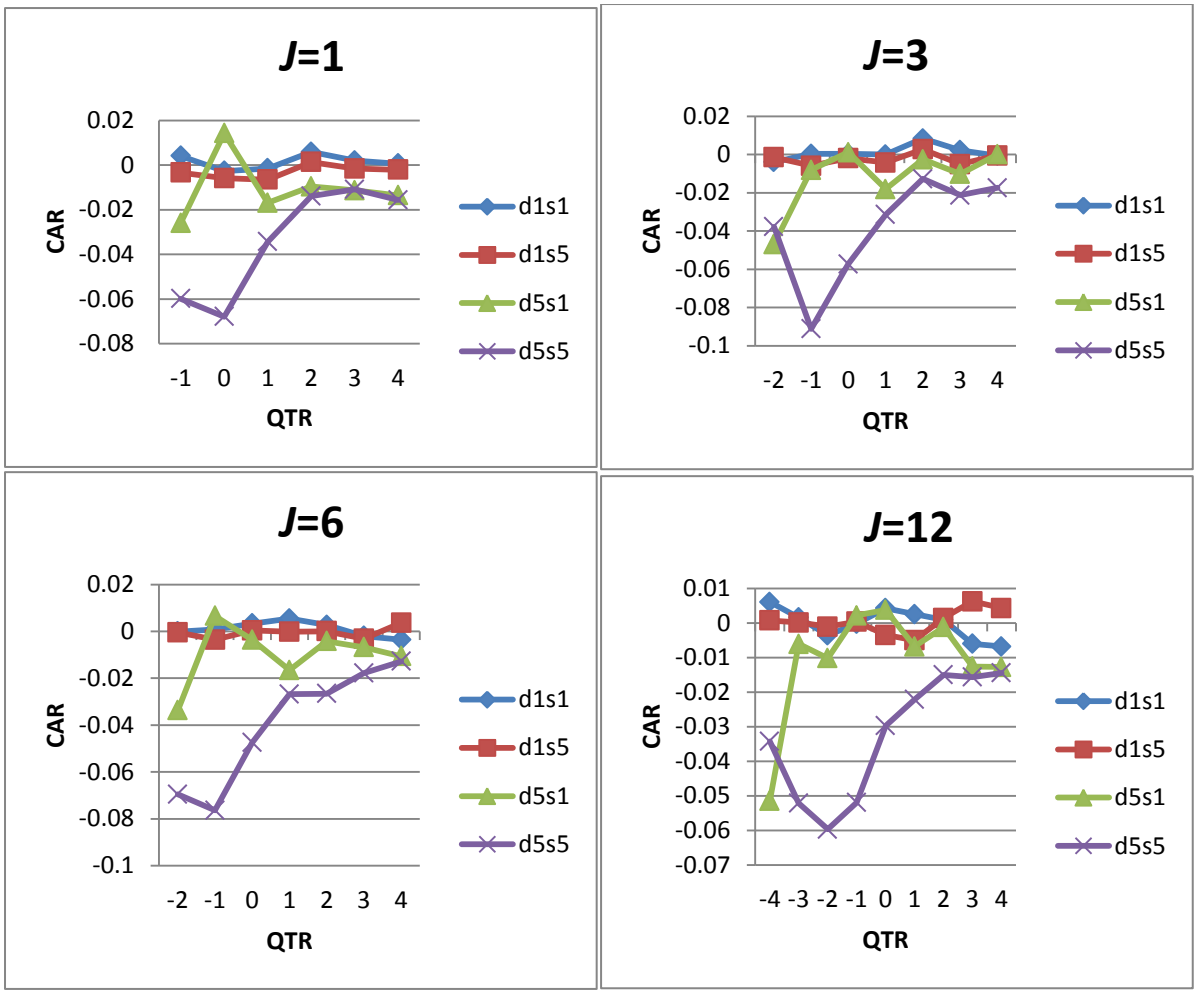

Figure 1 Cumulative Abnormal Return around Earnings Announcement
This figure plots the cumulative abnormal returns (CAR) on the three days window [0, 2] around earnings announcements in the quarters before or after the portfolio formation. *QTR* is the relative quarters around the portfolio formation month. The figure plots CAR for the portfolios that have low *IVOL* and low *STI* (d1s1), low *IVOL* and high *STI* (d1s5), high *IVOL* and low *STI* (d5s1), or high *IVOL* and high *STI* (d5s5).