# Does Retail Sentiment Affect the Medium-Term Abnormal Returns of U.S. IPOs?

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**Abstract**

This paper examines whether retail sentiment during the first week of trading IPO shares affects the medium-term performance of IPOs in the U.S. markets. Using small-trade volume and purchases from the TAQ dataset as the sentiment proxies, I find a negative relation between retail sentiment and abnormal returns of hot IPOs up to a 9-month holding period. This negative relation is robust and economically significant, and can be found in the cross-sectional event-time abnormal returns regressions as well as in the time-series calendar-time portfolio regressions. My finding suggests that overoptimistic retail investors push up the stock prices in the early aftermarket and the fading of investor sentiment eventually leads to IPO underperformance in the medium term.

**Does Retail Sentiment Affect the Medium-Term Abnormal Returns of U.S. IPOs?**

This paper studies the relation between retail sentiment and IPOs' medium-term performance. The idea of how the subsequent stock price performance of IPOs is affected by investor sentiment at the time of the offering has been provided by Miller (1977). Miller assumes there are constraints on short-selling IPOs and investors have divergence of opinions about the valuation of the new issues. The most optimistic investors buy the IPOs and set the prices. As time passes, the valuation uncertainty is reduced and the appraisal of the optimistic investors is likely to decline even if the average assessment is not changed. Consequently, the group of new issues will underperform with respect to a group of stocks about which the uncertainty does not decrease over time.

Recently there are papers that relate Miller's divergence-of-opinions argument to retail sentiment in the IPO market. Ljungqvist, Nanda, and Singh (2006) present a theoretical model showing that issuers allocate stocks to "regular" institutional investors for gradual resale to sentiment investors who hold optimistic view in a hot issue market. Because the offer price has to exceed the fundamental value so as to capitalize on the "regular" investors' expected gain from trading with the sentiment investors, IPO firms subsequently underperform in the long run. Derrien (2005) develops a model in which the aftermarket price of IPO shares depends on the information about the intrinsic value of the company and individual investor sentiment. When individual investors' demand is large, IPO shares are more overpriced. Once the sentiment fades, IPOs with greater demand from individual investors experience poorer long-term stock price performance. The prediction of the above two models can be applied to a hot issue market where there exists a pool of bullish, or exuberant, investors. When there are no exuberant investors, IPOs may not be overpriced and the prediction that higher individual investor sentiment leads to poorer long-run performance may not be applied.

On the empirical side, there are studies on European stock markets suggesting that retail sentiment actually affects medium- to long-term stock price performance of IPOs issued in hot markets. For example, the findings by Derrien (2005) on IPOs completed on the French stock exchange between 1999 and 2001 confirm that long-run IPO performance is negatively related with individual investors' demand. Dorn (2009) provides evidence that retail investors' sentiment pushes aftermarket prices temporarily above their fundamental levels. Based on German IPO data from 1999 and 2000, he documents that IPOs which are more aggressively bought by retail investors in the pre-IPO market or on the day of the IPO suffer worse 6-month abnormal returns. Cornelli, Goldreich, and Ljungqvist (2006) also find that overoptimism in the European pre-IPO markets leads to high first-day abnormal returns and long-term underperformance. The above studies all suggest that the optimistic sentiment in a hot issue market is originated from retail investors.

To the best of my knowledge there are no similar studies performed using U.S. market data. Such a study is warranted due to the huge size and importance of the U.S. stock markets. In this paper, I use variables constructed from the Trade and Quote (TAQ) dataset provided by the New York Stock Exchange (NYSE) to proxy for retail sentiment during the first week of aftermarket trading, and investigate the sentiment-return relation for U.S. IPOs completed during the sample period between 1994 and 2000. There are two sentiment proxies used in this paper which are First-Week Adjusted Retail Volume and First-Week Adjusted Retail Purchases. These two variables are compiled from the volume and purchases of small trades in the first week of trading and scaled by the total number of shares offered in the IPO, and netted of their average weekly values in the medium term. Since these sentiment variables are constructed by comparing behavior of retail investors in the first-week trading with that in the medium term, they are thus able to reflect the fading of investor optimism over time.

I separate the sample into hot and non-hot IPOs based on firms' first-day return. My findings indicate that retail investors generally trade hot IPOs aggressively during the first week as evidenced by their active participation in the market and gross purchases of IPO shares. More importantly, when compared with non-hot IPOs, retail investors have substantially reduced their interest in hot IPOs as time passes. The fading of investor optimism causes downward pressures on stock prices of hot IPOs in the medium term. The regression analyses show that within the hot IPO sample, the medium-term abnormal returns are negatively related with my two proxies of retail sentiment up to a 9-month holding period. This negative relation is very robust and can be found in the cross-sectional event-time abnormal returns regressions as well as in the time-series calendar-time portfolio regressions. On the other hand, I do not find an obvious relation between retail sentiment and medium-term abnormal returns of non-hot IPOs in which retail investors do not have large interest. Therefore, there is evidence that the relative medium-term stock price performance of IPOs depends on the intensity of retail interest in the early aftermarket.

In addition, the effects of retail sentiment on abnormal returns discovered by both the cross-sectional and time-series regressions are considered to be economically significant. For example, the cross-sectional regression results suggest that a one-standard deviation increase in First-Week Adjusted Retail Purchases is associated with an 8.72% decrease in 6-month buy-and-hold market-adjusted return and an 9.82% decrease in 6-month buy-and-hold characteristics-adjusted return. On the other hand, the calendar-time portfolio regression results show that while the hot IPOs as a whole virtually have zero abnormal returns, the 6-month buy-and-hold risk-adjusted return equals –27.66% in the portfolio of buying hot IPOs with high First-Week Adjusted Retail Purchases and short selling hot IPOs with low First-Week Adjusted Retail Purchases.

Recently there are papers documenting the effects of retail trading on prices of U.S. IPOs. Chan (2010) finds that retail investors place their purchases orders with aggressive prices and their trades help to push up the stock prices and contribute to the high open-to-close returns of hot IPOs on the first trading day. It is worthwhile to determine whether such kind of sentimental pricing will be corrected in a later date. As such, this paper adds a contribution to the IPO literature by showing that the subsequent fading of retail sentiment eventually leads to IPO underperformance in the medium term.

The remainder of the paper proceeds as follows. In the next section, I explain my measurements of retail sentiment and IPO abnormal returns. Section II describes the data used in the study and Section III presents the empirical results. The final section concludes.

## I. Measurement of retail sentiment and IPO medium-term performance

I use the publicly available transaction-level data from the TAQ dataset to infer the trading behavior of retail investors. All eligible TAQ trades are assigned with trade direction and classified as retail trades or non-retail trades.

I follow Lee and Ready (1991) to assign direction for NYSE/Amex trades, and Ellis, Michaely and O’Hara (2000) to assign direction for Nasdaq trades. According to the Lee and Ready (1993) algorithm, a trade is classified as buyer- (seller-) initiated when the transaction price is above (below) the midpoint of the most recent bid-ask quotes. When the transaction price is executed at the quote midpoint, the Lee and Ready algorithm uses the tick rule which specifies that a trade is considered as a buy (sell) if the last nonzero price change is positive (negative). For trades executed on the Nasdaq, Ellis, Michaely and O’Hara (2000) find that the tick rule performs better than the quote rule for trades which are far away from the quotes. Following their suggestion, I classify trades at the ask (bid) quote as buys (sells), and use the tick rule for all other trades. For those trades which occur before the first observation of bid and ask quotes, they will not be assigned with trade direction and are excluded from my empirical analysis.

Similar to other previous studies which use TAQ data to analyze the behavior of retail investors, I use small-sized trades as the proxy for retail trading. While small-sized trades can be determined by either share-based cutoffs (e.g., 500 shares) or dollar-based cutoffs (e.g., $5,000), Lee and Radhakrishna (2000) show that it is more effective to separate institutional and individual trades by the dollar-based trade-size proxy. Furthermore, they also find that the classification accuracy can be further improved by assigning larger dollar cutoff values to larger sized firms. Based on the TORQ data used in Lee and Radhakrishna (2000), Hvidkjaer (2006, 2008) sorts stocks into quintiles and calibrates the dollar cutoff values to maximize the number of individual (institutional) trades in the small-trade (large-trade) bracket and to minimize the institutional (individual) trades in the small-trade bracket for each firm-size quintile. His procedure produces the following dollar cutoff points:

| Firm-size quintile | Small | 2 | 3 | 4 | Large |
|---|---|---|---|---|---|
| Small-trade cutoff | \$3,400 | \$4,800 | \$7,300 | \$10,300 | \$16,400 |

To decide whether a trade is originated from retail investors for my sample firms, for each month I compare each stock's month-end closing price with the above dollar cutoff points suggested by Hvidkjaer. To account for effects of inflation, these dollar values are expressed in 1991 (the sample year of the TORQ data) real dollars and adjusted using the Consumer Price Index. The firm-size quintile is updated monthly based on the market capitalization calculated at the end of the current month.[1] I then obtain the share cutoff points as the ratio of the dollar cutoff points to the month-end closing price rounded to the nearest round-lot. Those trades with size below the small-trade share cutoffs are considered as retail trades, and all other trades are considered as non-retail trades.

I use volume and purchases from retail investors to measure retail sentiment. The retail volume and retail purchases variables are scaled by the total number of shares offered in the IPO to control for the variation of number of shares available for aftermarket trading by public investors among sample firms. The Retail Volume variable is defined as:

$$\text{Retail Volume}_t = \frac{\text{Total number of shares of retail trades in week t}}{\text{Total number of shares offered}} \tag{1}$$

[1] The market capitalization breakpoints are obtained from Kenneth French's data library website: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

where t = 1, 2, … 52.[2] I use Retail Volume for the first week of trading (t=1) to reflect the level of retail trading at the time of the offering. However, it should be noticed that an IPO stock with large first-week Retail Volume may not necessarily imply excessive retail sentiment since retail investors may also trade this stock heavily in the later period. To better reflect whether there is excessive retail sentiment in the early aftermarket, I adjust first-week Retail Volume by medium-term Retail Volume by calculating the logarithm difference between first-week Retail Volume and medium-term Retail Volume, where medium-term Retail Volume is proxied by the average weekly Retail Volume during the second half-year after the IPO (i.e, week 27 – 52). After making such an adjustment, the constructed variable will be able to reflect the fading of retail optimism over time. As a result, the First-Week Adjusted Retail Volume variable is calculated as follows:

$$\begin{aligned}&\text{First} - \text{Week Adjusted Retail Volume}\\&= \ln(\text{Retail Volume}_1) - \ln\left(\frac{1}{26}\sum_{t=27}^{52}\text{Retail Volume}_t\right)\end{aligned} \qquad (2)$$

Apart from Retail Volume, the magnitude of gross retail purchases can also serve as another proxy for retail sentiment. For those investors who have not been allocated with IPO shares from the underwriters, the only way to participate in IPO trading is to purchase shares from the secondary market. Compared with net purchases, gross purchases concern with investors' buying activity only and are not affected by the selling in a later period due to subsequent attractive returns. Therefore, they are more able to reflect the degree of retail optimism. Similar to the definition of Retail Volume, I first define the Retail Purchases variable as:

$$\text{Retail Purchases}_t = \frac{\text{Total number of shares of buyer} - \text{initiated retail trades in week t}}{\text{Total number of shares offered}} \qquad (3)$$

[2] I use a 260-trading-day window after the offering date, and divide the 260-trading-day window into 52 weekly periods.

I then calculate First-Week Adjusted Retail Purchases as the logarithm difference between first-week Retail Purchases and medium-term Retail Purchases, where medium-term Retail Purchases are proxied by the average weekly Retail Purchases during week 27 – 52. The First-Week Adjusted Retail Purchases variable is constructed as follows:

$$\begin{aligned}&\text{First} - \text{Week Adjusted Retail Purchases}\\ &= \ln(\text{Retail Purchases}_1) - \ln\left(\frac{1}{26}\sum_{t=27}^{52}\text{Retail Purchases}_t\right)\end{aligned} \tag{4}$$

The First-Week Adjusted Retail Volume variable of equation (2) and the First-Week Adjusted Retail Purchases variable of equation (4) will be used as the indicators of excessive retail sentiment in the early IPO aftermarket.

To gauge the medium-term stock price performance, I calculate both monthly buy-and-hold abnormal returns (BHAR) and monthly cumulative abnormal returns (CAR) over different time intervals for the sample IPOs.[3] These medium-term IPO returns are either market adjusted or characteristics adjusted. The n-month buy-and-hold market-adjusted return ($BHAR^{mkt}$) and the n-month cumulative market-adjusted return ($CAR^{mkt}$) for firm i is calculated as:

$$BHAR^{mkt} = \left[\prod_{t=2}^{n+1}(1+R_{it})\right] - \left[\prod_{t=2}^{n+1}(1+R_{mt})\right] \tag{5}$$

and

$$CAR^{mkt} = \sum_{t=2}^{n+1}(R_{it} - R_{mt}) \tag{6}$$

respectively, where $R_{it}$ is the monthly return for firm i in event month t after the IPO, and $R_{mt}$ is the monthly return on the Centre for Research and Securities Prices (CRSP) value-weighted index. In the case of buy-and-hold characteristic-adjusted return ($BHAR^{char}$) and cumulative

[3] There are papers studying the relative merits of using buy-and-hold and cumulative returns to represent long-run performance (e.g., Fama, 1998; Lyon, Barber and Tsai, 1999). Lyon, Barber and Tsai argue that the BHAR is appropriate as it can accurately represent investor experience but statistical inference should be performed with bootstrapped skewness-adjusted t-statistics or the empirically generated distribution of long-run abnormal returns. On the other hand, Fama proposes the use of cumulative returns as they pose fewer statistical problems than buy-and-hold returns.

characteristics-adjusted return ($CAR^{char}$), $R_{mt}$ is replaced by the corresponding monthly return on Fama and French's (1993) 25 value-weighed portfolios formed on size and book-to-market (BE/ME). For the purpose of matching our sample stocks to the corresponding size-BE/ME portfolios, BE is calculated as the book value of shareholders' equity, plus deferred taxes and investment tax credit, less the book value of preferred stock. The value of BE is based on the first quarterly report which has to be released within 18 months after the IPO, and the value of ME is based on market capitalization at the end of the second month after the IPO. The abnormal returns are calculated over a 3-, 6-, 9- and 12-month horizon, so n equals 3, 6, 9 or 12. I start calculating the abnormal returns from the second month after the IPO in order to remove the effect of the underwriters' price stabilization activities. Similar to Loughran and Ritter (1995), if an IPO firm is delisted prior to the end of a holding period, I truncate its BHAR and CAR till the delisting month.

## II. Data description and summary statistics

The sample used in this study consists of IPOs that were completed in the U.S. stock markets during the seven-year period between 1994 and 2000. Similar to Barber, Odean and Zhu (2009) and Chan (2010), I do not extend the analysis beyond 2000 because the systematic shift of the trade-size distribution in the post-2000 period may reduce the accuracy the trade-size classification algorithm discussed in the previous section.

I obtain my initial list of IPOs from the Securities Data Company (SDC) New Issues Database. Firms included in my sample have to fulfill certain criteria which are similar to other previous studies of IPO long-run performance. First, I exclude issues made by financial institutions (SIC 6000 – 6999), real estate investment trusts, closed end funds, spinoffs, unit offers, right issues and American Depository Receipts. Second, the IPOs have to be primarily listed in either the Amex, NYSE or Nasdaq with offer price equal to or above \$5. Third, the sample firms have to be covered by the CRSP Database. In addition, the IPO date specified by the

SDC dataset and the date of first observation in the CRSP dataset should not be differed by more than two days. Altogether I find 2,330 IPOs which have fulfilled the above criteria.

For these 2,330 firms I extract the trade and quote data from the TAQ dataset. I filter the TAQ data with the procedure used in Chan (2010). In addition, to ensure that the extracted data from the TAQ dataset really reflect my sample firms' early aftermarket trading, I delete firms with the date of first observation in the TAQ dataset not identical to the date of first observations in the CRSP dataset. Lastly, in order to avoid the empirical results distorting by firms with extreme underpricing, I truncate 9 IPOs with first-day return exceeding 400%.[4] After imposing these filtering there are 2,164 IPOs included in my final sample.

I gather offering- and issuer-specific information, such as offer prices, number of shares offered, gross proceeds, listing exchanges, etc from the SDC dataset. IPOs' first-day closing price, stock returns in the aftermarket, and other firm-specific information, including SIC codes and number of shares outstanding after the offering, are extracted from the CRSP dataset. I collect the variables needed to calculate book equity from the CRSP/COMPUSTAT Merged Database. The monthly returns on Fama and French's (1993) 25 size-BE/ME portfolios are obtained from Kenneth French's data library website.

As mentioned earlier, retail sentiment will be more likely to affect IPOs' aftermarket stock price performance when there exists a pool of bullish retail investors in the hot issue markets. Therefore, in my empirical analysis I need to separate the IPOs into the hot and non-hot samples. Similar to Helwege and and Liang (2004) and Ellis (2006), the categorization of hotness of the IPO is based on the firm's first-day return. I divide my sample IPOs into terciles according to their first-day return distribution. IPOs belonging to the top tercile (i.e., first-day return exceeding 25.0%) are considered to be hot IPOs, whereas the rest (i.e., first-day return less than

[4] The majority of these 9 IPOs are found to have extreme medium-term abnormal returns. The empirical results remain qualitatively unchanged though the statistical significance of the regression coefficients has been slightly weakened if these IPOs are included in the sample.

or equal to 25.0%) are considered to be non-hot IPOs. The summary statistics and distribution of sample IPOs by calendar year for the non-hot, hot and full IPO sample are presented in Table I.

(Insert Table I about here)

Panel A of Table I shows the IPO characteristics. In general, I find hot IPOs have higher offer price and offer less shares for sale to the public during the IPO process than non-hot IPOs. In addition, hot IPOs have larger upward adjustment in final offer price from the midpoint of the original filing range, and are more likely to be underwritten by top-tier underwriters and backed up by venture capitalists. This is consistent with existing IPO studies (e.g., Hanley, 1993; Loughran and Ritter, 2004) that such IPO characteristics are positively related to first-day return.

The distribution of sample IPOs by calendar year is presented in Panel B of Table I. The number of IPOs in each year ranges from the lowest of 175 in 1998 to the highest of 469 in 1996. It is not surprised to notice that the internet bubble years of 1999 – 2000 has generated more hot IPOs than non-hot IPOs while the 1994 – 1998 period has more non-hot IPOs than hot IPOs. As such, the 1999 – 2000 period has produced more than half (52.7%) of the observations in my hot IPO sample.

Panel C of Table I presents the summary statistics of IPOs' medium-term performance. Since it is not able to collect the book value for some of my sample firms, only 1,992 IPOs have data for the characteristics-adjusted returns. It should also be mentioned that the distribution of IPOs' medium-term abnormal returns is positively skewed such that the mean is far smaller than the median.

As seen from Panel C of Table I, the figures of both mean and median abnormal return indicate that the measured IPO medium-term performance is generally better when the returns are characteristics adjusted rather than market adjusted. This is because quite a number of the sample IPOs (25.9%) belong to the smallest, lowest BE/ME stocks, and the average return of the benchmark portfolio for this group of stocks is relatively lower than the average return on the CRSP value-weighted index. Overall speaking, my IPO sample has underperformed relative to both benchmarks since all except two median return figures shown in the last column of Panel C of Table I are negative. Furthermore, the abnormal return figures continue to decrease with the increase in length of holding period. In addition, I also find that the underperformance is more serious for hot IPOs than for non-hot IPOs. Given that medium-term performance is different between hot and non-hot IPOs, in the following sections I investigate whether the effects of retail sentiment on abnormal returns are different for these two groups of IPOs.

## III. Empirical results

### A. Retail sentiment in the early aftermarket and in the medium term

Table II shows the summary statistics for the retail sentiment variables. Panels A and B present Retail Participation and Retail Purchases in the first week and in the medium term, where the medium-term values are proxied by their average values during week 27 – 52. The statistics of First-Week Adjusted Retail Volume and First-Week Adjusted Retail Purchases are also presented in these two panels. At the same time, it is interesting to compare the trading patterns of retail investors to that of non-retail investors. Therefore, I compile the volume and purchases of non-retail investors and present Non-retail Volume and Non-retail Purchases in Panels C and D of Table II. Similar to Retail Volume (Purchases), I scale Non-retail Volume (Purchases) by the total number of shares offered in the IPO. In addition, in the four panels of Table II I also show the values of the sentiment variable for the first trading day of the IPO.

(Insert Table II about here)

From Table II it is not surprised to observe that a large proportion of the first-week trading activity occurs on the first day of trading. Using the mean value of the first-day variable divided by the mean value of the first-week variable as the proxy for the proportion of first-day trading, it is found that around 60% – 70% of the first-week volume and purchases come from the first trading day. This is true for volume and purchases originated from either retail or non-retail investors, as well as for hot or non-hot IPOs.

In Panels A and B, I find that both first-week Retail Volume and first-week Retail Purchases are substantially larger for hot IPOs than for non-hot IPOs. Both the t-test and the Mann-Whitney U test indicate that the difference in means and the difference in medians between the two groups of IPOs are highly statistically significant. At the same time, it also discovered from Panels C and D that there are increases in first-week Non-retail Volume and first-week Non-retail Purchases from the non-hot IPO sample to the hot IPO sample, though the percentages of increase are substantially smaller than that of first-week Retail Volume and first-week Retail Purchases. Furthermore, I also find that medium-term Retail Volume, medium-term Retail Purchases, medium-term Non-retail Volume and medium-term Non-retail Purchases of hot IPOs are all larger than that of non-hot IPOs. This suggests that both retail investors and non-retail investors have greater interests in trading hot IPOs than non-hot IPOs during the early aftermarket trading as well as in the medium term.

As discussed in section I above, whether investors have excessive sentiment in the early aftermarket can be better indicated by the magnitudes of first-week adjusted volume and first-week adjusted purchases. Table II shows that First-Week Adjusted Retail Volume and First-Week Adjusted Retail Purchases of hot IPOs are larger than that of non-hot IPOs, and their differences are statistically significant at the 1% level. On the contrary, hot IPOs have smaller First-Week Adjusted Non-retail Volume compared to non-hot IPOs, while the First-Week Adjusted Non-retail Purchases between the two groups of IPOs are not statistically different from each other.

In summary, the above findings provide the evidence that retail investors have excessive optimism in hot IPOs during the first week of trading. This is consistent with Miller (1977)'s assertion that there exists a pool of bullish retail investors in the hot IPO markets. When compared with non-hot IPOs, retail investors have substantially reduced their interest in hot IPOs as time passes. At the same time, there is no similar fading of non-retail interest in hot IPOs. Therefore, if we find that there is any difference in the sentiment-return relation between the hot and non-hot IPO sample, such difference should be related with the fading of optimism from retail rather than non-retail investors.

**B. Cross-sectional regression analysis**

This section presents the regression results to investigate the role of retail sentiment in affecting the medium-term abnormal returns of IPOs in event-time. In the regression analysis, I regress the medium-term abnormal return on our retail sentiment variables together with other control variables related with the offering characteristics. There are two measures of retail sentiment with Model A studies the effects of First-Week Adjusted Retail Volume and Model B studies the effects of First-Week Adjusted Retail Purchases. The general regression model is specified as follows:

$$\begin{aligned}
\text{Abnormal Return} = \; & \text{Intercept} + \delta_1 \text{ Retail Sentiment} \times \text{Non} - \text{Hot Dummy} \\
& + \delta_2 \text{ Retail Sentiment} \times \text{Hot Dummy} + \beta_1 \text{ First} - \text{Day Return} \\
& + \beta_2 \text{ Offer Price Revision} + \beta_3 \text{ Relative Offer Size} \\
& + \beta_4 \text{ Firm Size} + \beta_5 \text{ Proceeds} + \beta_6 \text{ Top} - \text{Tier Underwriter} \\
& + \beta_7 \text{ Venture Captial Backing} + \beta_8 \text{ Tech Firm} \\
& + \beta_9 \text{ Internet Firm} + \varepsilon
\end{aligned} \tag{7}$$

where Abnormal Return is either the n-month $BHAR^{mkt}$, $CAR^{mkt}$, $BHAR^{char}$ or $CAR^{char}$, with n equals 3, 6, 9 or 12. Since I have two measures of retail sentiment and four definitions of abnormal returns over four different holding methods, altogether I have estimated 32 cross-sectional regressions.

To differentiate the effects of retail sentiment between the non-hot and hot IPO samples, in equation (7) I interact the Retail Sentiment variables (i.e., First-Week Adjusted Retail Volume in Model A and First-Week Adjusted Retail Purchases in Model B) with Non-Hot Dummy and Hot Dummy where Non-Hot (Hot) Dummy takes a value of 1 (0 otherwise) for non-hot (hot) IPOs. The other control variables in the regression model are defined as follows. First-Day Return is the percentage change from the offer price to the first-day closing price. Offer Price Revision is the percentage change from the midpoint of the original filing range to the offer price. Relative Offer Size is number of shares offered as a proportion of number of shares outstanding after the offer. Firm Size is natural logarithm of market capitalization ($ million) calculated at the offer price. Proceeds is natural logarithm of the total amount ($ million) raised from the offering. Top-Tier Underwriter is the dummy variable which takes a value of 1 (0 otherwise) if the highest rank of all lead underwriters equals 8 or above according to Loughran and Ritter's (2004) updated 0 – 9 scale of Carter and Manaster (1990). Venture Capital Backing is the dummy variable which takes a value of 1 (0 otherwise) if the firm is backed by venture capitalists. Tech (Internet) Firm is the dummy variable which takes a value of 1 (0 otherwise) if the firm belongs to the technology (internet) sector according to the classification of Loughran and Ritter (2004).

I use least-squares method to estimate equation (7). To adjust for any potential correlation in residual terms between different IPOs, I calculate Rogers (1993) clustered standard errors which are White (1984) standard errors adjusted to account for the possible correlation within the same month of the IPOs.

Table III presents the estimation results. Among the offering-specific variables, Top-Tier Underwriter has the most explanatory power as its estimated coefficient is positive and highly statistically significant in all 32 regressions. Our finding of a positive relation between underwriter reputation and IPOs' medium-term abnormal return is consistent with the argument of Carter, Dark and Singh (1998) that investment banks protect their reputation by marketing IPOs that have relatively better long-term performance. On the other hand, I find Offer Price Revision to be negatively related with 3- and 6-month abnormal returns, and Relative Offer Size to be negatively related with 6- and 9-month abnormal returns. This indicates that those IPOs with larger upward adjustment in offer price or offer relatively more shares for sale to the public tend to have worse medium-term performance.

(Insert Table III about here)

We are most interested in the estimation results of the Retail Sentiment variables. First, I do not find an obvious relation between retail sentiment and non-hot IPOs' medium-term abnormal returns. Since only 4 out of our 32 regressions give a statistically significant coefficient on Retail Sentiment × Non-Hot Dummy, it is reasonable to conclude that retail sentiment in a non-hot early aftermarket does not drive IPOs' medium-term returns. In contrast, I find strong evidence that retail sentiment does affect the medium-term performance of hot IPOs. The regression results of Model A indicate that First-week Adjusted Retail Volume × Hot Dummy is negatively related with IPOs' $BHAR^{mkt}$s and $BHAR^{char}$s up to 9 months, and $CAR^{char}$s up 6 months. Furthermore, the effects of retail investors' purchase activity on hot IPOs' medium-term returns are even stronger as First-Week Adjusted Retail Purchases × Hot Dummy is significantly negative in 13 out of the 16 Model B regressions. To be specific, I find First-Week Adjusted Retail Purchases × Hot Dummy to be negatively related with all the 8 BHARs, as well as $CAR^{char}$s up to 9 months and $CAR^{mkt}$s up to 6 months. As a whole, the negative relation between Retail Sentiment × Hot Dummy and IPOs' medium-term abnormal returns is found in 21 out of the 32 regressions, and the negative relation is extremely robust for abnormal returns up to the 9-month holding period. Overall speaking, the above findings indicate that excessive retail sentiment in an early hot IPO aftermarket together with the fading of investor optimism over time indeed leads to poor medium-term abnormal returns, whereas the effects of retail sentiment on non-hot IPOs' medium-term abnormal returns are not obvious.

### C. Calendar-time portfolio regression analysis

The previous section has established the empirical relation between retail sentiment and hot IPOs' medium-term abnormal returns in event-time. In this section, I present the factor regression results on the returns of calendar-time portfolios that are composed of stocks with different intensity of retail sentiment. These calendar-time return regressions enable us to investigate the sentiment-return relation through an explicit asset pricing model while, at the same time, control for the problem of non-independence of observations.[5] Since we are interested in the relation between retail sentiment and medium-term performance of hot IPOs, I conduct the calendar-time portfolio analysis only for the hot IPO sample.

My method for forming the calendar-time portfolios is as follows. First, I divide the 713 hot IPOs into quartiles according to their measures of retail sentiment. Retail sentiment is either measured by First-Week Adjusted Retail Volume (Model A) or First-Week Adjusted Retail Purchases (Model B). IPOs belonging to the bottom (top) quartile are considered to be in the low (high) sentiment category and belong to the Low (High) portfolio, whereas those belonging to the second and third quartile are considered to be in the middle sentiment category and belong to the Middle portfolio. For each month t, I identify stocks to be included in the respective portfolio by picking IPOs issued in month t which belong to respective sentiment category. The identified stocks stay in their respective portfolios starting from month t+2 (in order to avoid the effect of underwriters' price stabilization activities) for 3, 6, 9 or 12 months. For each month I calculate the equal-weighted returns for each of the Low, Middle, and High portfolios, as well the equal-weighted returns of the High – Low zero cost portfolio which is formed by buying the High portfolio and selling short the Low portfolio. The High – Low portfolio is used to examine the returns between hot IPOs which are heavily participated or demanded by retail investors versus those shunned by retail investors. In addition, to gauge whether the whole hot IPO sample has underperformed, I also create the All portfolio and calculate the equal-weighted returns for all hot IPOs using similar portfolio formation procedure described above.

I then apply the Fama and French (1993)'s three-factor model to the portfolio returns. The three-factor model is specified as follows:

$$R_{pt} - R_{ft} = \text{Intercept} + \beta RMRF_t + s\,SMB_t + h\,HML_t + \varepsilon_t \qquad (8)$$

[5] Fama (1998) and Mitchell and Stafford (2000) strongly advocate the calendar-time portfolio approach as it is robust to the most serious statistical problems. They argue that monthly calendar-time portfolio returns are less susceptible to the bad model problem, and the distribution of this estimator is better approximated by the normal distribution such that it allows for classical statistical inference.

where $R_{pt} – R_{ft}$ is the monthly return of the respective portfolio ($R_{pt}$, p = Low, Medium, High, High – Low, All) minus the one-month Treasury bill rate ($R_{ft}$), RMRF is the value-weighted monthly return on all NYSE, Amex and Nasdaq stocks minus the one-month Treasury bill rate, SMB is the value-weighted monthly return of a portfolio of small stocks minus the value-weighted monthly return of a portfolio of large stocks (below and above the median NYSE market capitalization, respectively), HML is the value-weighted monthly return of a portfolio of high book-to-market stocks minus the value-weighted monthly return of a portfolio of low book-to-market stocks (above and below the 0.7 and 0.3 NYSE BE/ME fractiles, respectively). The intercept tem of these time-series regressions serve as an indicator of average risk-adjusted performance of the IPO portfolios. The interpretation of this measure is analogous to Jensen's alpha in the Capital Asset Pricing Model (CAPM) framework. Since the number of IPOs contained in the portfolios changes from month to month, I use weighted least squares (WLS) to account for the time-varying number of observations in the calendar-time portfolios.

(Insert Table IV about here)

Table IV presents the estimation results of the time-series regressions weighted by the number of IPO firms in the calendar-time portfolio in each month. First, I look at the results of the All portfolio. As shown in the last column of the table, the All portfolio has overperformed up to a 3-month holding period and earn zero abnormal returns thereafter. Based on this finding, the factor regression results indicate that, overall speaking, hot IPOs' medium-term abnormal performance is virtually zero. Nevertheless, I find that there are dramatic variations in abnormal returns among different subgroups of hot IPOs. Regardless of which retail sentiment measure is used, Table 4 shows that the Low portfolio is able to earn positive abnormal returns up to a 9-month holding period. On the contrary, it is observed the High portfolio in Model B suffers from negative abnormal returns up to 12 months while all the estimated intercepts of the High portfolio in Model A are not statistically different from zero. Since the Low portfolio earns positive abnormal returns and the High portfolio earns negative or zero abnormal returns in the 3-, 6- and

9-month calendar-time portfolio regressions, the intercepts of the High – Low portfolio are significantly negative in these regressions. The finding of negative intercepts of the High – Low portfolios in the calendar-time portfolio regressions is consistent with my earlier cross-sectional regression results which state that there is a negative relation between retail sentiment and medium-term performance of hot IPOs.[6] At the same time, the observation of negative intercepts for the High portfolio in Model B also indicates that overoptimistic retail investors push IPO's early aftermarket prices above the fundamental values and eventually lead to downward price adjustment in the later period.

**D. Discussion**

The empirical results presented in the above three subsections can be interpreted as follow. As noted in Table II above, compared with hot IPOs, non-hot IPOs do not attract intense interest from retail investors during the first week of trading. Therefore, the prediction that fading of retail optimism leads to poor medium-term IPO returns should not apply to non-hot IPOs. This assertion is supported by my cross-sectional regression results that most of the estimated coefficients on Retail Sentiment × Non-Hot Dummy are not statistically significant. On the other hand, the trading patterns shown in Table II indicate that retail investors are overoptimistic in trading hot IPOs in the early aftermarket and there are fading of retail optimism over time. As indicated by the results of the cross-sectional regressions presented in Table III, there is indeed a negative and robust relation between Retail Sentiment × Hot Dummy and IPOs' medium-term abnormal returns up to the 9-month period. In addition, the effects of retail sentiment on hot

[6] Brav, Geczy and Gompers (2000) show that the factor model has difficulty in pricing the smallest, lowest BE/ME firms and find negative intercept in the factor regression for this group of firms. To check whether my finding of difference in intercepts across the three sentiment portfolios of Model B is driven by this problem, I calculate the proportion of the smallest, lowest BE/ME firms in these three portfolios. It is found that the proportion of these firms is 18.3%, 18.3% and 16.2%, respectively, for the Low, Medium and High portfolios. Since the distribution of the smallest, lowest BE/ME firms is similar across the portfolios, the difference in intercepts in the factor regressions across these three portfolios should not be related with the issue related to the smallest, lowest BE/ME firms.

IPOs' abnormal returns discovered in Table III are also economically significant as well. For example, given that the First-Week Adjusted Retail Volume in Model A has a standard deviation of 1.099 for hot IPOs, a one-standard deviation increase in this sentiment variable is associated with an 6.84% decrease (–6.223% × 1.099) in 6-month $BHAR^{mkt}$ and an 7.85% (–7.144% × 1.099) decrease in 6-month $BHAR^{char}$. In Model B, the standard deviation of First-Week Adjusted Retail Purchases equals 1.105. Therefore, a one-standard deviation increase in this sentiment variable is associated with an 8.72% decrease (–7.930% × 1.099) in 6-month $BHAR^{mkt}$ and an 9.82% (–8.936% × 1.099) decrease in 6-month $BHAR^{char}$. Compared with the cross-sectional medians of 6-month $BHAR^{mkt}$ (–19.92%) and 6-month $BHAR^{char}$ (–27.94%) for hot IPOs reported in Panel C of Table I, the abnormal returns are considered to be significantly driven by retail sentiment from the economic point of view.[7]

The finding of a negative relation between retail sentiment and medium-term performance of hot IPOs is also supported by the calendar-time portfolio analysis. From Panels A to C of Table IV, I find that investors suffer from statistically significant negative returns if they form a portfolio by buying hot IPOs with high retail sentiment and short selling hot IPOs with low retail sentiment up to a 9-month holding period. For example, the Fama-French factor regression intercepts indicate that the 6-month buy-and-hold risk-adjusted return from such trading strategy is –17.76% ($(1 - 3.206\%)^6 - 1$) when sentiment is measured by retail volume (Model A), or –27.66% ($(1 - 5.254\%)^6 - 1$) when sentiment is measured by retail purchases (Model B). The magnitudes of these risk-adjusted returns again indicate that the effects of retail optimism on IPO returns are economically significant.

## IV. Summary and conclusions

[7] Since the distribution of abnormal returns is positively skewed, it is better to use medians rather than means as the benchmark of comparison.

This paper studies whether retail sentiment during the first week of trading can predict the medium-term performance of IPOs and compare their predictive power between hot and non-hot IPOs defined by first-day return. My sentiment proxies include First-Week Adjusted Retail Volume and First-Week Adjusted Retail Purchases which are designed to reflect the level of excessive retail sentiment in the early aftermarket.

My empirical results can be summarized as follows. I find the sentiment-return relation to be different between the hot and non-hot IPO samples. In the case of hot IPOs, the regression results show that their 3-, 6- and 9-month abnormal returns are negatively related with my two retail sentiment proxy variables. This negative relation is very robust and can be found when the IPO event-time returns are either market-adjusted or characteristics-adjusted, as well as when the abnormal returns are measured by the intercept of the Fama-French three-factors calendar-time portfolio regressions. On the other hand, I do not find an obvious relation between retail sentiment and non-hot IPOs' medium-term abnormal returns. On the whole, I can conclude that retail investor's sentimental behavior during the first week of trading and the subsequent fading of retail optimism is associated with worse medium-term performance of the hot IPOs, whereas such negative sentiment-return relation clearly does not apply to the non-hot IPO sample.

Recent studies has established a theoretical link between retail sentiment and aftermarket stock price performance of hot IPOs and find empirical support for such a link in markets outside the U.S. The rationale behind these findings is that the overoptimism of retail investors pushes up the IPO prices greatly above the fundamental level which results in poor long-run performance once the sentiment fades. My empirical finding is consistent with similar interpretation and therefore provides evidence that the established negative sentiment-return relation also applies to the U.S. markets.

**References**


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

Brav, A., C. Geczy and P.A. Gompers, 2000, Is the abnormal return following equity issuances anomalous? *Journal of Financial Economics* 56, 209–249.

Carter, R.B., F.H. Dark and A.K. Singh, 1998, Underwriter reputation, initial returns, and the long-run performance of IPO stocks, *Journal of Finance* 53, 285–311.

Carter, R. B. and S. Manaster, 1990, Initial public offering and underwriter reputation, *Journal of Finance* 45, 1045–1068.

Chan, Y.C., 2010, Retail trading and IPO returns in the aftermarket, *Financial Management* 39, 1475 –1495.

Cornelli, F., D. Goldreich and A. Ljungqvist, 2006, Investor sentiment and pre-IPO markets, *Journal of Finance* 61, 1187–1216.

Derrien, F., 2005, IPO pricing in 'hot' market conditions: Who leaves money on the table? *Journal of Finance* 60, 487–521.

Dorn, D., 2009, Does sentiment drive the retail demand for IPOs? *Journal of Financial and Quantitative Analysis*, 44, 85–108.

Ellis, K., 2006, Who trades IPOs? A close look at the first days of trading, *Journal of Financial Economics* 79, 339–363.

Ellis, K., R. Michaely and M. O'Hara, 2000, The accuracy of trade classification rules: Evidence from Nasdaq, *Journal of Financial and Quantitative Analysis* 35, 529–551.

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

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

Hanley, K.W., 1993, The underpricing of initial public offerings and the partial adjustment phenomenon, *Journal of Financial Economics* 34, 231–250.

Helwege, J. and N. Liang, 2004, Initial public offerings in hot and cold markets, *Journal of Financial and Quantitative Analysis* 39, 541–569.

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.

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

Lee, C.M.C. and M. Ready, 1991, Inferring trade directions from intraday data, *Journal of Finance* 46, 733–746.

Ljungqvist, A., V. Nanda and R. Singh, 2006, Hot markets, investor sentiment, and IPO pricing, *Journal of Business* 79, 1667–1702.

Loughran T. and J. Ritter, 1995, The new issues puzzle, *Journal of Finance* 50, 23–51.

Loughran, T. and J. Ritter, 2004, Why has IPO underpricing changed over time? *Financial Management* 33, 5–37.

Lyon, J.D., B.M. Barber and C.L. Tsai, 1999, Improved methods for tests of long-run abnormal stock returns, *Journal of Finance* 54, 165–201.

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

Mitchell, M.L. and E. Stafford, 2000, Managerial decisions and long-term stock price performance, *Journal of Business* 73, 287–329.

Rogers, W., 1993. Regression standard errors in clustered sample, *Stata Technical Bulletin* 13, 19–23.

White, H., 1984, A heteroskedasticity-consistent covariance matrix estimator and a direct test of heteroskedasticity, *Econometrica* 48, 817–838.

Table I
Summary statistics and distribution of sample IPOs by calendar year

The sample consists of IPOs completed in the U.S. markets between 1994 and 2000. Non-hot (hot) IPOs are those belonging to the bottom and middle (top) tercile of the first-day return distribution. First-Day return is the percentage change from the offer price to the first-day closing price. Offer Price Revision is the percentage change from the midpoint of the original filing range to the offer price. Relative Offer Size is number of shares offered as a proportion of number of shares outstanding after the offer. Firm Size is market capitalization ($ million) calculated at the offer price. Proceeds is the total amount ($ million) raised from the offering. Firms with Top-Tier Underwriter are those IPOs with the highest rank of all lead underwriters equals 8 or above according to Loughran and Ritter's (2004) updated 0 – 9 scale of Carter and Manaster (1990). The classification of Tech Firm and Internet Firm follows Loughran and Ritter (2004). Buy-and-hold market-adjusted returns (BHARs) are firm's buy-and-hold raw returns minus the buy-and-hold returns on the CRSP value-weighted index. Buy-and-hold characteristics-adjusted returns are firm's buy-and-hold raw returns minus the buy-and-hold returns on the corresponding monthly returns on Fama and French's (1993) 25 value-weighed portfolios formed on size and book-to-market. Similar reasoning applies to the definitions of cumulative adjusted returns (CARs). In Panel B, figures in parenthesis represent percentage of IPOs as a proportion of the total number of IPOs in the whole sample period.

Panel A: Summary statistics of IPO characteristics

| | Non-hot IPOs (N=1,451) | Hot IPOs (N=713) | All IPOs (N=2,164) |
|---|---|---|---|
| First-Day Return (%) | | | |
| Mean | 6.372 | 82.781 | 31.548 |
| Median | 4.545 | 55.000 | 12.500 |
| Offer Price ($) | | | |
| Mean | 12.011 | 15.059 | 13.015 |
| Median | 12.000 | 15.000 | 12.500 |
| Offer Price Revision (%) | | | |
| Mean | –4.892 | 25.172 | 4.999 |
| Median | –3.846 | 20.000 | 0.000 |
| Relative Offer Size (%) | | | |
| Mean | 32.039 | 24.784 | 29.649 |
| Median | 29.633 | 22.258 | 27.434 |
| Firm Size ($ million) | | | |
| Mean | 238.027 | 435.566 | 303.112 |
| Median | 117.150 | 254.925 | 153.014 |
| Proceeds ($ million) | | | |
| Mean | 60.588 | 68.079 | 63.056 |
| Median | 33.000 | 48.100 | 39.000 |
| % of firm with Top-Tier Underwriter | 64.094 | 81.346 | 69.778 |
| % of firm with Venture Capital Backing | 44.108 | 66.059 | 51.340 |
| % of Tech Firm | 5.858 | 9.397 | 7.024 |
| % of Internet Firm | 9.442 | 34.081 | 17.560 |

Panel B: Distribution of sample IPOs by calendar year

| | Non-hot IPOs (N=1,451) | Hot IPOs (N=713) | All IPOs (N=2,164) |
|---|---|---|---|
| 1994 | 204 (9.43%) | 30 (1.39%) | 234 (10.81%) |
| 1995 | 225 (10.40%) | 94 (4.34%) | 319 (14.74%) |
| 1996 | 370 (17.10%) | 99 (4.57%) | 469 (21.67%) |
| 1997 | 242 (11.18%) | 68 (3.14%) | 310 (14.33%) |
| 1998 | 129 (5.96%) | 46 (2.13%) | 175 (8.09%) |
| 1999 | 137 (6.33%) | 221 (10.21%) | 358 (16.54%) |
| 2000 | 144 (6.65%) | 155 (7.16%) | 299 (13.82%) |

Panel C: Summary statistics of IPO medium-term performance

| | Non-hot IPOs (N=1,451) | Hot IPOs (N=713) | All IPOs (N=2,164) |
|---|---|---|---|
| Panel C1: Market-adjusted returns | | | |
| 3-month BHAR (%) | | | |
| Mean | 2.811 | 9.724 | 5.089 |
| Median | –4.049 | –5.491 | –4.605 |
| 6-month BHAR (%) | | | |
| Mean | –0.629 | 3.433 | 0.709 |
| Median | –11.435 | –19.919 | –14.097 |
| 9-month BHAR (%) | | | |
| Mean | –4.274 | –2.245 | –3.606 |
| Median | –19.488 | –33.042 | –22.792 |
| 12-month BHAR (%) | | | |
| Mean | –8.224 | –7.929 | –8.127 |
| Median | –28.024 | –49.352 | –34.462 |
| 3-month CAR (%) | | | |
| Mean | 1.800 | 6.960 | 3.500 |
| Median | –0.987 | 0.119 | –0.741 |
| 6-month CAR (%) | | | |
| Mean | –1.403 | 1.334 | –0.501 |
| Median | –3.712 | –2.088 | –3.513 |
| 9-month CAR (%) | | | |
| Mean | –3.925 | –4.746 | –4.196 |
| Median | –5.116 | –6.552 | –5.592 |
| 12-month CAR (%) | | | |
| Mean | –8.575 | –15.538 | –10.869 |
| Median | –8.010 | –20.041 | –11.585 |
| Panel C2: Characteristics-adjusted returns | | | |
| 3-month BHAR (%) | | | |
| Mean | 4.804 | 9.950 | 6.563 |
| Median | –1.334 | –4.087 | –2.279 |
| 6-month BHAR (%) | | | |
| Mean | 2.493 | 4.361 | 3.132 |
| Median | –6.828 | –19.117 | –9.600 |
| 9-month BHAR (%) | | | |
| Mean | 0.512 | –1.993 | –0.344 |
| Median | –11.808 | –27.939 | –16.069 |
| 12-month BHAR (%) | | | |
| Mean | –1.435 | –3.908 | –2.280 |
| Median | –17.961 | –37.452 | –24.136 |
| 3-month CAR (%) | | | |
| Mean | 3.899 | 7.331 | 5.072 |
| Median | 1.282 | 0.529 | 0.791 |
| 6-month CAR (%) | | | |
| Mean | 1.546 | 1.819 | 1.640 |
| Median | 1.480 | –1.018 | 1.070 |
| 9-month CAR (%) | | | |
| Mean | –0.189 | –5.009 | –1.837 |
| Median | 0.863 | –4.228 | –0.496 |
| 12-month CAR (%) | | | |
| Mean | –3.650 | –12.296 | –6.606 |
| Median | –0.419 | –11.711 | –4.585 |

Table II
Summary statistics of aftermarket trading

The sample consists of IPOs completed in the U.S. markets between 1994 and 2000. Non-hot (hot) IPOs are those belonging to the bottom and middle (top) tercile of the first-day return distribution. Retail Volume (Purchases) is the total number of shares of (buyer-initiated) retail trades divided by total number of shares offered. First-Week Adjusted Retail Volume (Purchases) is the logarithm difference between first-week Retail Volume (Purchases) and medium-term Retail Volume (Purchases), where medium-term Retail Volume (Purchases) is proxied by the average weekly Retail Volume (Purchases) during week 27 – 52. Similar reasoning applies to the definition of Non-retail Volume and Non-retail Purchases. The classification of retail and non-retail trades follows Hvidkjaer (2006, 2008). The testing of difference in means is based on t-test and the testing of difference in medians is based on Mann-Whitney U test. I use *** to denote statistical significance at the 1% level, ** to denote statistical significance at the 5% level, and * to denote statistical significance at the 10% level.

| | Mean | | | Median | | |
|---|---|---|---|---|---|---|
| | Non-hot IPOs (N=1,451) | Hot IPOs (N=713) | Difference in means | Non-hot IPOs (N=1,451) | Hot IPOs (N=713) | Difference in medians |
| Panel A: Retail Volume | | | | | | |
| First day (%) | 3.980 | 24.303 | 20.323*** | 0.923 | 13.997 | 13.074*** |
| First week (%) | 6.512 | 38.440 | 31.928*** | 1.913 | 20.765 | 18.852*** |
| Average of week 27 – 52 (%) | 1.428 | 7.117 | 5.689*** | 0.421 | 2.124 | 1.703*** |
| First-Week Adjusted Retail Volume | 1.530 | 2.068 | 0.538*** | 1.550 | 2.155 | 0.605*** |
| Panel B: Retail Purchases | | | | | | |
| First day (%) | 1.896 | 12.637 | 10.741*** | 0.382 | 6.700 | 6.318*** |
| First week (%) | 3.012 | 19.662 | 16.650*** | 0.796 | 10.430 | 9.634*** |
| Average of week 27 – 52 (%) | 0.717 | 3.639 | 2.922*** | 0.226 | 1.088 | 0.862*** |
| First-Week Adjusted Retail Purchases | 1.325 | 1.942 | 0.617*** | 1.349 | 1.985 | 0.636*** |
| Panel C: Non-retail Volume | | | | | | |
| First day (%) | 58.854 | 110.951 | 52.097*** | 52.327 | 107.939 | 55.612*** |
| First week (%) | 88.003 | 174.041 | 86.038*** | 77.467 | 165.371 | 87.904*** |
| Average of week 27 – 52 (%) | 10.177 | 33.859 | 23.682*** | 6.304 | 16.830 | 10.526*** |
| First-Week Adjusted Non-retail Volume | 2.401 | 2.148 | –0.253*** | 2.472 | 2.202 | –0.270*** |
| Panel D: Non-retail Purchases | | | | | | |
| First day (%) | 23.584 | 51.459 | 27.875*** | 19.369 | 49.556 | 30.187*** |
| First week (%) | 35.405 | 81.453 | 46.048*** | 29.816 | 75.053 | 45.237*** |
| Average of week 27 – 52 (%) | 4.911 | 16.627 | 11.716*** | 2.986 | 8.024 | 5.038*** |
| First-Week Adjusted Non-retail Purchases | 2.107 | 2.116 | 0.009 | 2.190 | 2.145 | –0.045 |

Table III
Results of cross-sectional regressions

This table presents the least-squares regression results of IPOs' medium-term abnormal returns where abnormal returns are either the n-month buy-and-hold market-adjusted return (BHAR), buy-and-hold characteristics-adjusted return, cumulative market-adjusted return (CAR) and cumulative characteristics-adjusted return, with n equals 3, 6, 9 or 12. Buy-and-hold market-adjusted returns are firm's buy-and-hold raw returns minus the buy-and-hold returns on the CRSP value-weighted index. Buy-and-hold characteristics-adjusted returns are firm's buy-and-hold raw returns minus the buy-and-hold returns on the corresponding monthly returns on Fama and French's (1993) 25 value-weighed portfolios formed on size and book-to-market. Similar reasoning applies to the definitions of cumulative adjusted returns. First-Week Adjusted Retail Volume (Purchases) is the logarithm difference between first-week Retail Volume (Purchases) and medium-term Retail Volume (Purchases), where medium-term Retail Volume (Purchases) is proxied by the average weekly Retail Volume (Purchases) during week 27 – 52. Retail Volume (Purchases) is the total number of shares of (buyer-initiated) retail trades divided by total number of shares offered. The classification of retail trades follows Hvidkjaer (2006, 2008). Non-Hot (Hot) Dummy takes a value of 1 (0 otherwise) for those IPOs belonging to the bottom and middle (top) tercile of the first-day return distribution. First-Day Return is the percentage change from the offer price to the first-day closing price. Offer Price Revision is the percentage change from the midpoint of the original filing range to the offer price. Relative Offer Size is number of shares offered as a proportion of number of shares outstanding after the offer. Firm Size is natural logarithm of market capitalization ($ million) calculated at the offer price. Proceeds is natural logarithm of the total amount ($ million) raised from the offering. Top-Tier Underwriter is the dummy variable which takes a value of 1 (0 otherwise) if the highest rank of all lead underwriters equals 8 or above according to Loughran and Ritter's (2004) updated 0 – 9 scale of Carter and Manaster (1990). Venture Capital Backing is the dummy variable which takes a value of 1 (0 otherwise) if the firm is backed by venture capitalists. Tech (Internet) Firm is the dummy variable which takes a value of 1 (0 otherwise) if the firm belongs to the technology (internet) sector according to the classification of Loughran and Ritter (2004). The sample consists of IPOs completed in the U.S. markets between 1994 and 2000. Figures in parenthesis are the t-statistics with Rogers (1993) standard errors adjusted for the correlation within the same month of the IPOs. I use *** to denote statistical significance at the 1% level, ** to denote statistical significance at the 5% level, and * to denote statistical significance at the 10% level.

Panel A: 3-month abnormal return

| | Model A | | | | Model B | | | |
|---|---|---|---|---|---|---|---|---|
| | BHAR | | CAR | | BHAR | | CAR | |
| | Market-adjusted | Characteristics-adjusted | Market-adjusted | Characteristics-adjusted | Market-adjusted | Characteristics-adjusted | Market-adjusted | Characteristics-adjusted |
| *Retail sentiment variables*: | | | | | | | | |
| First-Week Adjusted Retail Volume × Non-hot Dummy | –0.197 | –1.185 | 0.183 | –0.675 | | | | |
| | (–0.18) | (–1.05) | (0.19) | (–0.71) | | | | |
| **First-Week Adjusted Retail Volume × Hot Dummy** | **–3.965**** | **–4.732**** | **–2.225** | **–2.866*** | | | | |
| | **(–2.45)** | **(–2.61)** | **(–1.55)** | **(–1.85)** | | | | |
| First-Week Adjusted Retail Purchases × Non-hot Dummy | | | | | –0.489 | –1.653 | –0.215 | –1.241 |
| | | | | | (–0.48) | (–1.54) | (–0.23) | (–1.32) |
| **First-Week Adjusted Retail Purchases × Hot Dummy** | | | | | **–4.732***** | **–5.620***** | **–2.900*** | **–3.661**** |
| | | | | | **(–2.94)** | **(–3.11)** | **(–1.95)** | **(–2.31)** |

Table III Panel A (continued)

| | Model A | | | | Model B | | | |
|---|---|---|---|---|---|---|---|---|
| | BHAR | | CAR | | BHAR | | CAR | |
| | Market-adjusted | Characteristics-adjusted | Market-adjusted | Characteristics-adjusted | Market-adjusted | Characteristics-adjusted | Market-adjusted | Characteristics-adjusted |
| *Other explanatory variables*: | | | | | | | | |
| Intercept | 2.430 | 8.373 | –1.137 | 5.117 | 3.218 | 9.849 | –0.362 | 6.531 |
| | (0.18) | (0.65) | (–0.09) | (0.44) | (0.24) | (0.76) | (–0.03) | (0.56) |
| First-Day Return | 0.104 | 0.093 | 0.076 | 0.066 | 0.110* | 0.099 | 0.079 | 0.070 |
| | (1.64) | (1.56) | (1.50) | (1.40) | (1.73) | (1.66) | (1.57) | (1.48) |
| Offer Price Revision | –0.222** | –0.227*** | –0.213** | –0.218*** | –0.224** | –0.230*** | –0.212** | –0.218*** |
| | (–2.51) | (–2.74) | (–2.51) | (–2.88) | (–2.54) | (–2.79) | (–2.52) | (–2.90) |
| Relative Offer Size | –0.030 | –0.029 | 0.006 | 0.003 | –0.035 | –0.039 | 0.002 | –0.005 |
| | (–0.20) | (–0.19) | (0.04) | (0.03) | (–0.24) | (–0.26) | (0.02) | (–0.04) |
| Firm Size | 0.791 | 1.111 | 1.275 | 1.491 | 0.730 | 0.983 | 1.231 | 1.386 |
| | (0.14) | (0.21) | (0.25) | (0.32) | (0.13) | (0.18) | (0.24) | (0.30) |
| Proceeds | –2.879 | –3.815 | –3.137 | –3.980 | –2.875 | –3.835 | –3.109 | –3.973 |
| | (–0.56) | (–0.77) | (–0.67) | (–0.92) | (–0.56) | (–0.78) | (–0.66) | (–0.92) |
| Top-Tier Underwriter | 11.715*** | 11.430*** | 11.083*** | 10.491*** | 11.743*** | 11.388*** | 11.163*** | 10.509*** |
| | (2.97) | (3.24) | (2.66) | (3.00) | (3.01) | (3.27) | (2.69) | (3.02) |
| Venture Capital Backing | 2.574 | 1.889 | 2.868 | 2.173 | 2.445 | 1.694 | 2.758 | 2.003 |
| | (0.97) | (0.74) | (1.19) | (0.95) | (0.92) | (0.66) | (1.14) | (0.87) |
| Tech Firm | –8.615 | –3.621 | –7.969 | –2.452 | –8.398 | –3.303 | –7.786 | –2.163 |
| | (–1.12) | (–0.50) | (–0.94) | (–0.32) | (–1.10) | (–0.46) | (–0.92) | (–0.28) |
| Internet Firm | 11.464 | 8.604 | 5.055 | 2.298 | 11.975 | 9.278 | 5.324 | 2.714 |
| | (1.23) | (0.93) | (0.65) | (0.30) | (1.28) | (1.00) | (0.68) | (0.36) |
| Adj. $R^2$ | 0.023 | 0.021 | 0.019 | 0.019 | 0.024 | 0.023 | 0.020 | 0.021 |
| F-statistic | 5.51*** | 4.89*** | 4.84*** | 4.57*** | 5.74*** | 5.24*** | 4.99*** | 4.87*** |

Panel B: 6-month abnormal return

| | Model A | | | | Model B | | | |
|---|---|---|---|---|---|---|---|---|
| | BHAR | | CAR | | BHAR | | CAR | |
| | Market-adjusted | Characteristics-adjusted | Market-adjusted | Characteristics-adjusted | Market-adjusted | Characteristics-adjusted | Market-adjusted | Characteristics-adjusted |
| *Retail sentiment variables*: | | | | | | | | |
| First-Week Adjusted Retail | 0.212 | –1.600 | 1.657 | 0.184 | | | | |
| Volume × Non-hot Dummy | (0.14) | (–0.97) | (1.18) | (0.14) | | | | |
| **First-Week Adjusted Retail** | **–6.223**$^{*}$ | **–7.144**$^{**}$ | **–2.766** | **–3.691**$^{*}$ | | | | |
| **Volume × Hot Dummy** | **(–1.82)** | **(–2.09)** | **(–1.31)** | **(–1.76)** | | | | |
| First-Week Adjusted Retail | | | | | –0.582 | –2.665$^{*}$ | 0.831 | –0.899 |
| Purchases × Non-hot Dummy | | | | | (–0.40) | (–1.69) | (0.57) | (–0.65) |
| **First-Week Adjusted Retail** | | | | | **–7.930**$^{**}$ | **–8.936**$^{**}$ | **–4.183**$^{*}$ | **–5.251**$^{**}$ |
| **Purchases × Hot Dummy** | | | | | **(–2.28)** | **(–2.57)** | **(–1.92)** | **(–2.43)** |
| *Other explanatory variables*: | | | | | | | | |
| Intercept | 24.120$^{*}$ | 39.193$^{***}$ | 15.960 | 30.489$^{**}$ | 25.889 | 42.113$^{***}$ | 17.107 | 32.703$^{**}$ |
| | (1.78) | (3.06) | (1.11) | (2.10) | (1.88) | (3.27) | (1.16) | (2.23) |
| First-Day Return | 0.087 | 0.070 | 0.094$^{*}$ | 0.083$^{*}$ | 0.097 | 0.081 | 0.099$^{**}$ | 0.090$^{*}$ |
| | (1.30) | (1.11) | (1.90) | (1.77) | (1.42) | (1.25) | (2.00) | (1.89) |
| Offer Price Revision | –0.217$^{*}$ | –0.169$^{*}$ | –0.241$^{**}$ | –0.204$^{**}$ | –0.217$^{*}$ | –0.171$^{*}$ | –0.237$^{**}$ | –0.202$^{**}$ |
| | (–1.74) | (–1.75) | (–2.15) | (–2.19) | (–1.75) | (–1.79) | (–2.12) | (–2.17) |
| Relative Offer Size | –0.432$^{***}$ | –0.440$^{***}$ | –0.348$^{**}$ | –0.355$^{**}$ | –0.441$^{***}$ | –0.458$^{***}$ | –0.349$^{**}$ | –0.364$^{**}$ |
| | (–2.71) | (–2.89) | (–2.27) | (–2.33) | (–2.74) | (–2.99) | (–2.26) | (–2.38) |
| Firm Size | –8.882$^{*}$ | –9.142$^{*}$ | –6.971 | –7.700 | –9.002$^{*}$ | –9.378$^{*}$ | –7.007 | –7.843 |
| | (–1.86) | (–1.93) | (–1.30) | (–1.39) | (–1.89) | (–1.98) | (–1.31) | (–1.43) |
| Proceeds | 7.004 | 5.171 | 5.278 | 3.953 | 7.057 | 5.176 | 5.399 | 4.034 |
| | (1.37) | (1.00) | (0.99) | (0.73) | (1.39) | (1.01) | (1.02) | (0.75) |
| Top-Tier Underwriter | 15.168$^{***}$ | 15.681$^{***}$ | 14.191$^{***}$ | 15.122$^{***}$ | 15.332$^{***}$ | 15.702$^{***}$ | 14.501$^{***}$ | 15.321$^{***}$ |
| | (3.32) | (3.62) | (3.06) | (3.59) | (3.38) | (3.66) | (3.14) | (3.66) |
| Venture Capital Backing | –3.715 | –4.031 | –2.334 | –3.083 | –3.961 | –4.383 | –2.489 | –3.342 |
| | (–1.05) | (–1.18) | (–0.77) | (–1.02) | (–1.12) | (–1.29) | (–0.81) | (–1.10) |
| Tech Firm | –14.204 | –10.167 | –17.256$^{*}$ | –12.535 | –13.741 | –9.529 | –16.913$^{*}$ | –11.995 |
| | (–1.46) | (–1.03) | (–1.84) | (–1.40) | (–1.42) | (–0.97) | (–1.81) | (–1.35) |
| Internet Firm | 20.204 | 9.019 | 5.135 | –5.185 | 20.984 | 10.038 | 5.348 | –4.739 |
| | (1.35) | (0.70) | (0.38) | (–0.44) | (1.39) | (0.77) | (0.40) | (–0.40) |
| Adj. $R^2$ | 0.023 | 0.017 | 0.020 | 0.019 | 0.026 | 0.021 | 0.020 | 0.022 |
| F-statistic | 5.71$^{***}$ | 4.12$^{***}$ | 4.89$^{***}$ | 4.58$^{***}$ | 6.18$^{***}$ | 4.78$^{***}$ | 5.07$^{***}$ | 4.98$^{***}$ |

Panel C: 9-month abnormal return

| | Model A | | | | Model B | | | |
|---|---|---|---|---|---|---|---|---|
| | BHAR | | CAR | | BHAR | | CAR | |
| | Market-adjusted | Characteristics-adjusted | Market-adjusted | Characteristics-adjusted | Market-adjusted | Characteristics-adjusted | Market-adjusted | Characteristics-adjusted |
| *Retail sentiment variables*: | | | | | | | | |
| First-Week Adjusted Retail | 2.003 | 0.100 | 2.955$^{*}$ | 1.444 | | | | |
| Volume × Non-hot Dummy | (1.13) | (0.06) | (1.70) | (0.85) | | | | |
| **First-Week Adjusted Retail** | **–8.024**$^{**}$ | **–8.677**$^{**}$ | **–2.016** | **–2.721** | | | | |
| **Volume × Hot Dummy** | **(–2.00)** | **(–2.07)** | **(–0.82)** | **(–1.04)** | | | | |
| First-Week Adjusted Retail | | | | | 0.874 | –1.458 | 1.524 | –0.315 |
| Purchases × Non-hot Dummy | | | | | (0.49) | (–0.85) | (0.84) | (–0.18) |
| **First-Week Adjusted Retail** | | | | | **–9.915**$^{**}$ | **–10.784**$^{**}$ | **–3.912** | **–4.841**$^{*}$ |
| **Purchases × Hot Dummy** | | | | | **(–2.47)** | **(–2.53)** | **(–1.56)** | **(–1.81)** |
| *Other explanatory variables*: | | | | | | | | |
| Intercept | 26.123 | 48.461$^{***}$ | 16.817 | 37.085$^{**}$ | 27.602 | 51.461$^{***}$ | 18.524 | 40.078$^{**}$ |
| | (1.49) | (2.92) | (0.99) | (2.14) | (1.56) | (3.06) | (1.06) | (2.27) |
| First-Day Return | 0.133 | 0.123 | 0.073 | 0.078 | 0.140 | 0.132 | 0.076 | 0.083 |
| | (1.51) | (1.41) | (0.93) | (1.05) | (1.55) | (1.47) | (0.97) | (1.10) |
| Offer Price Revision | –0.012 | –0.019 | –0.201 | –0.212$^{*}$ | –0.013 | –0.021 | –0.192 | –0.204$^{*}$ |
| | (–0.09) | (–0.16) | (–1.66) | (–1.97) | (–0.09) | (–0.18) | (–1.58) | (–1.89) |
| Relative Offer Size | –0.412$^{**}$ | –0.477$^{**}$ | –0.302 | –0.350$^{*}$ | –0.414$^{**}$ | –0.491$^{***}$ | –0.302 | –0.358$^{*}$ |
| | (–2.16) | (–2.61) | (–1.59) | (–1.87) | (–2.15) | (–2.65) | (–1.58) | (–1.91) |
| Firm Size | –10.604$^{**}$ | –11.015$^{***}$ | –7.300 | –8.082 | –10.632$^{**}$ | –11.186$^{***}$ | –7.320 | –8.232 |
| | (–2.33) | (–2.75) | (–1.21) | (–1.30) | (–2.32) | (–2.77) | (–1.21) | (–1.33) |
| Proceeds | 6.600 | 4.269 | 3.037 | 1.110 | 6.724 | 4.347 | 3.245 | 1.282 |
| | (1.49) | (1.09) | (0.47) | (0.18) | (1.52) | (1.11) | (0.51) | (0.20) |
| Top-Tier Underwriter | 18.674$^{***}$ | 18.481$^{***}$ | 20.592$^{***}$ | 20.728$^{***}$ | 19.004$^{***}$ | 18.692$^{***}$ | 21.107$^{***}$ | 21.145$^{***}$ |
| | (3.06) | (3.23) | (3.40) | (3.92) | (3.14) | (3.30) | (3.50) | (4.01) |
| Venture Capital Backing | –5.367 | –6.351 | –3.384 | –4.536 | –5.684 | –6.813 | –3.611 | –4.879 |
| | (–1.15) | (–1.44) | (–0.85) | (–1.23) | (–1.22) | (–1.54) | (–0.91) | (–1.32) |
| Tech Firm | –13.970 | –15.348 | –19.877 | –23.090$^{*}$ | –13.497 | –14.616 | –19.431 | –22.357$^{*}$ |
| | (–1.43) | (–1.57) | (–1.64) | (–1.74) | (–1.39) | (–1.50) | (–1.61) | (–1.69) |
| Internet Firm | 11.402 | –5.002 | –2.094 | –16.463 | 12.172 | –3.996 | –2.083 | –16.230 |
| | (1.09) | (–0.55) | (–0.15) | (–1.37) | (1.15) | (–0.44) | (–0.15) | (–1.36) |
| Adj. $R^2$ | 0.018 | 0.017 | 0.018 | 0.031 | 0.019 | 0.020 | 0.018 | 0.033 |
| F-statistic | 4.58$^{***}$ | 4.19$^{***}$ | 4.66$^{***}$ | 6.84$^{***}$ | 4.88$^{***}$ | 4.71$^{***}$ | 4.66$^{***}$ | 7.06$^{***}$ |

Panel D: 12-month abnormal return

| | Model A | | | | Model B | | | |
|---|---|---|---|---|---|---|---|---|
| | BHAR | | CAR | | BHAR | | CAR | |
| | Market-adjusted | Characteristics-adjusted | Market-adjusted | Characteristics-adjusted | Market-adjusted | Characteristics-adjusted | Market-adjusted | Characteristics-adjusted |
| *Retail sentiment variables*: | | | | | | | | |
| First-Week Adjusted Retail | 4.272$^{**}$ | 2.336 | 3.903$^{**}$ | 2.448 | | | | |
| Volume × Non-hot Dummy | (2.14) | (1.21) | (2.09) | (1.36) | | | | |
| **First-Week Adjusted Retail** | **–5.422** | **–5.022** | **–1.098** | **–0.941** | | | | |
| **Volume × Hot Dummy** | **(–1.37)** | **(–1.26)** | **(–0.37)** | **(–0.30)** | | | | |
| First-Week Adjusted Retail | | | | | 2.639 | 0.280 | 1.897 | 0.127 |
| Purchases × Non-hot Dummy | | | | | (1.35) | (0.14) | (0.99) | (0.07) |
| **First-Week Adjusted Retail** | | | | | **–7.219**$^{*}$ | **–6.974**$^{*}$ | **–3.168** | **–3.217** |
| **Purchases × Hot Dummy** | | | | | **(–1.81)** | **(–1.70)** | **(–1.04)** | **(–0.99)** |
| *Other explanatory variables*: | | | | | | | | |
| Intercept | 8.407 | 41.224$^{**}$ | –6.963 | 23.363 | 9.609 | 44.006$^{**}$ | –4.774 | 26.852 |
| | (0.42) | (2.01) | (–0.39) | (1.29) | (0.47) | (2.13) | (–0.26) | (1.47) |
| First-Day Return | 0.083 | 0.055 | –0.001 | 0.003 | 0.082 | 0.055 | –0.002 | 0.004 |
| | (0.83) | (0.56) | (–0.02) | (0.04) | (0.80) | (0.55) | (–0.03) | (0.05) |
| Offer Price Revision | 0.039 | 0.075 | –0.196 | –0.180 | 0.043 | 0.079 | –0.183 | –0.168 |
| | (0.25) | (0.52) | (–1.34) | (–1.38) | (0.28) | (0.55) | (–1.26) | (–1.28) |
| Relative Offer Size | –0.303 | –0.445$^{**}$ | –0.157 | –0.326$^{*}$ | –0.298 | –0.450$^{**}$ | –0.155 | –0.332$^{*}$ |
| | (–1.50) | (–2.17) | (–0.86) | (–1.82) | (–1.45) | (–2.17) | (–0.84) | (–1.85) |
| Firm Size | –9.773 | –12.936$^{**}$ | –1.642 | –5.589 | –9.686 | –12.999$^{**}$ | –1.634 | –5.716 |
| | (–1.64) | (–2.26) | (–0.30) | (–1.00) | (–1.62) | (–2.26) | (–0.29) | (–1.03) |
| Proceeds | 6.785 | 6.652 | –1.132 | –0.095 | 7.021 | 6.832 | –0.862 | 0.139 |
| | (1.33) | (1.40) | (–0.21) | (–0.02) | (1.38) | (1.44) | (–0.16) | (0.03) |
| Top-Tier Underwriter | 19.319$^{***}$ | 19.446$^{***}$ | 19.320$^{***}$ | 20.009$^{***}$ | 19.893$^{***}$ | 19.902$^{***}$ | 19.973$^{***}$ | 20.575$^{***}$ |
| | (2.76) | (2.94) | (3.07) | (3.42) | (2.87) | (3.03) | (3.18) | (3.53) |
| Venture Capital Backing | –2.920 | –3.566 | 0.520 | –0.381 | –3.247 | –4.027 | 0.210 | –0.787 |
| | (–0.56) | (–0.68) | (0.13) | (–0.09) | (–0.63) | (–0.77) | (0.05) | (–0.19) |
| Tech Firm | –2.263 | –4.457 | –19.348 | –23.850 | –1.866 | –3.778 | –18.868 | –23.051 |
| | (–0.14) | (–0.27) | (–1.33) | (–1.52) | (–0.12) | (–0.23) | (–1.30) | (–1.47) |
| Internet Firm | 9.704 | –7.883 | –8.815 | –25.387$^{**}$ | 9.909 | –7.518 | –9.010 | –25.445$^{**}$ |
| | (0.86) | (–0.73) | (–0.64) | (–2.10) | (0.88) | (–0.71) | (–0.66) | (–2.13) |
| Adj. $R^2$ | 0.009 | 0.007 | 0.017 | 0.031 | 0.009 | 0.008 | 0.016 | 0.031 |
| F-statistic | 2.79$^{***}$ | 2.34$^{***}$ | 4.29$^{***}$ | 6.70$^{***}$ | 2.70$^{***}$ | 2.41$^{***}$ | 4.12$^{***}$ | 6.69$^{***}$ |

Table IV
Results of calendar-time portfolio regressions for hot IPOs

This table presents the regression results of the calendar-time portfolio returns using the Fama and French (1993) three-factor model. The sample consists of 713 hots IPOs which belong to the top tercile of the first-day return distribution of 2,164 IPOs completed in the U.S. markets between 1994 and 2000. The dependent variables are the monthly returns of the Low, Medium, High, High – Low and All portfolios minus the one-month Treasury bill rate. The Low (High) portfolio consists of IPOs belonging to the bottom (top) quartile of the retail sentiment distribution of the 713 hot IPOs sample, where retail sentiment is either measured by First-Week Adjusted Retail Volume (Model A) or First-Week Adjusted Retail Purchases (Model B). The Medium portfolio consists of IPOs belonging to the second and third quartile of the retail sentiment distribution and the All portfolio consists of all the 713 IPOs. The High – Low portfolio is formed by buying the High portfolio and selling short the Low portfolio. Stocks stay in their respective portfolios starting from the second calendar month after the IPO for 3, 6, 9 or 12 months. Portfolio returns are equal weighted. RMRF is the value-weighted monthly return on all NYSE, Amex and Nasdaq stocks minus the one-month Treasury bill rate. SMB is the value-weighted monthly return of a portfolio of small stocks minus the value-weighted monthly return of a portfolio of large stocks. HML is the value-weighted monthly return of a portfolio of high book-to-market stocks minus the value-weighted monthly return of a portfolio of low book-to-market stocks. The regressions are estimated with the weighted least squares method in which the weight equals the number of IPOs contained in the respective portfolio in each calendar month. Figures in parenthesis are the t-statistics. I use $^{***}$ to denote statistical significance at the 1% level, $^{**}$ to denote statistical significance at the 5% level, and $^{*}$ to denote statistical significance at the 10% level.

Panel A: 3-month abnormal return

| | Model A | | | | Model B | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Low | Medium | High | High – Low | Low | Medium | High | High – Low | All |
| Intercept | 7.146$^{***}$ | 1.970 | –0.721 | –6.227$^{***}$ | 7.266$^{***}$ | 3.031$^{**}$ | –2.813$^{**}$ | –8.548$^{***}$ | 2.417$^{*}$ |
| | (3.38) | (1.51) | (–0.55) | (–3.22) | (3.39) | (2.35) | (–2.05) | (–4.27) | (1.88) |
| RMRF | 1.011 | 1.100$^{**}$ | 0.714 | 0.166 | 0.888 | 1.033$^{**}$ | 0.680 | 0.645 | 0.992$^{**}$ |
| | (1.65) | (2.59) | (1.62) | (0.28) | (1.43) | (2.47) | (1.46) | (1.05) | (2.44) |
| SMB | 1.039$^{*}$ | 0.466 | 0.130 | –0.882$^{*}$ | 0.992$^{*}$ | 0.528 | 0.098 | –0.642 | 0.450 |
| | (1.85) | (1.39) | (0.36) | (–1.75) | (1.72) | (1.58) | (0.27) | (–1.24) | (1.34) |
| HML | –1.701$^{**}$ | –2.380$^{***}$ | –1.514$^{**}$ | 0.449 | –1.856$^{**}$ | –2.425$^{***}$ | –1.666$^{***}$ | 0.942 | –2.034$^{***}$ |
| | (–2.02) | (–4.64) | (–2.62) | (0.57) | (–2.17) | (–4.76) | (–2.80) | (1.16) | (–3.94) |
| Adj. $R^2$ | 0.379 | 0.710 | 0.481 | 0.141 | 0.361 | 0.714 | 0.505 | 0.150 | 0.643 |
| F-statistic | 17.07$^{***}$ | 68.56$^{***}$ | 24.47$^{***}$ | 4.93$^{***}$ | 15.87$^{***}$ | 70.16$^{***}$ | 27.15$^{***}$ | 5.23$^{**}$ | 51.38$^{***}$ |

Panel B: 6-month abnormal return

| | Model A | | | | Model B | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Low | Medium | High | High – Low | Low | Medium | High | High – Low | All |
| Intercept | 3.849*** | –0.600 | –0.649 | –3.206** | 3.929*** | 0.423 | –2.359** | –5.254*** | 0.533 |
| | (2.66) | (–0.63) | (–0.59) | (–2.37) | (2.76) | (0.44) | (–2.24) | (–3.77) | (0.58) |
| RMRF | 1.199*** | 1.065*** | 1.262*** | 0.114 | 1.282*** | 0.993*** | 1.173*** | 0.149 | 1.147*** |
| | (3.01) | (3.64) | (3.55) | (0.29) | (3.28) | (3.38) | (3.47) | (0.36) | (4.12) |
| SMB | 0.750** | 0.788*** | 0.351 | –0.611* | 0.849** | 0.765*** | 0.357 | –0.577 | 0.607** |
| | (2.01) | (3.33) | (1.25) | (–1.78) | (2.27) | (3.19) | (1.36) | (–1.64) | (2.61) |
| HML | –2.167*** | –1.747*** | –1.368*** | 0.562 | –2.000*** | –1.914*** | –1.397*** | 0.587 | –1.774*** |
| | (–4.03) | (–5.00) | (–3.13) | (1.09) | (–3.73) | (–5.43) | (–3.41) | (1.11) | (–5.14) |
| Adj. $R^2$ | 0.642 | 0.801 | 0.670 | 0.196 | 0.634 | 0.805 | 0.701 | 0.184 | 0.794 |
| F-statistic | 51.18*** | 117.97*** | 59.14*** | 7.76** | 49.58*** | 120.31*** | 68.92*** | 7.31*** | 112.70*** |

Panel C: 9-month abnormal return

| | Model A | | | | Model B | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Low | Medium | High | High – Low | Low | Medium | High | High – Low | All |
| Intercept | 1.989* | –1.110 | –0.484 | –1.296 | 1.954* | –0.143 | –2.066** | –2.770** | –0.087 |
| | (1.73) | (–1.25) | (–0.50) | (–1.20) | (1.69) | (–0.16) | (–2.20) | (–2.33) | (–0.10) |
| RMRF | 1.226*** | 1.367*** | 1.306*** | –0.071 | 1.266*** | 1.319*** | 1.267*** | 0.012 | 1.303*** |
| | (3.79) | (5.02) | (4.33) | (–0.22) | (3.90) | (4.81) | (4.35) | (0.03) | (5.18) |
| SMB | 0.782*** | 0.788*** | 0.603** | –0.483* | 0.912*** | 0.743*** | 0.641*** | –0.446 | 0.707*** |
| | (2.76) | (3.62) | (2.51) | (–1.82) | (3.15) | (3.35) | (2.83) | (–1.54) | (3.44) |
| HML | –2.065*** | –1.411*** | –1.023*** | 0.673* | –1.863*** | –1.608*** | –0.974*** | 0.667 | –1.497*** |
| | (–5.01) | (–4.38) | (–2.81) | (1.71) | (–4.46) | (–4.94) | (–2.80) | (1.54) | (–4.93) |
| Adj. $R^2$ | 0.753 | 0.817 | 0.714 | 0.296 | 0.731 | 0.820 | 0.745 | 0.238 | 0.824 |
| F-statistic | 89.32*** | 134.88*** | 75.87*** | 13.18*** | 79.60*** | 137.99*** | 88.84*** | 10.07*** | 141.76*** |

Panel D: 12-month abnormal return

| | Model A | | | | Model B | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Low | Medium | High | High – Low | Low | Medium | High | High – Low | All |
| Intercept | 0.522 | –0.904 | –0.316 | 0.193 | 0.309 | –0.060 | –1.599* | –1.022 | –0.332 |
| | (0.49) | (–1.16) | (–0.38) | (0.22) | (0.29) | (–0.08) | (–1.93) | (–1.07) | (–0.44) |
| RMRF | 1.217*** | 1.398*** | 1.223*** | –0.221 | 1.228*** | 1.376*** | 1.199*** | –0.187 | 1.308*** |
| | (4.22) | (6.13) | (4.91) | (–0.88) | (4.27) | (5.93) | (4.84) | (–0.69) | (6.07) |
| SMB | 0.696*** | 0.758*** | 0.600*** | –0.383* | 0.829*** | 0.733*** | 0.595*** | –0.397* | 0.699*** |
| | (2.73) | (4.10) | (2.95) | (–1.80) | (3.19) | (3.86) | (3.05) | (–1.74) | (3.91) |
| HML | –1.937*** | –1.413*** | –1.078*** | 0.481 | –1.752*** | –1.560*** | –1.073*** | 0.429 | –1.460*** |
| | (–5.21) | (–5.24) | (–3.59) | (1.55) | (–4.67) | (–5.66) | (–3.67) | (1.28) | (–5.61) |
| Adj. $R^2$ | 0.766 | 0.852 | 0.766 | 0.288 | 0.744 | 0.852 | 0.790 | 0.241 | 0.851 |
| F-statistic | 99.24*** | 179.68*** | 102.60*** | 13.16** | 88.05*** | 179.19*** | 117.26*** | 10.51*** | 178.20*** |