Market-wide sentiment, firm-level sentiment, and IPO pricing process

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Abstract

We document that market-wide investor sentiment is positively related with IPO underpricing over and above firm-level sentiment. This relationship is more pronounced in high sentiment periods and for harder-to-arbitrage firms. High sentiment periods are followed by lower long run IPO returns suggesting that sentiment does not proxy for unobservable fundamentals. We find some evidence that investor sentiment impacts IPO valuations, but this relationship is not robust. We infer that the degree of excess optimism or pessimism of investors matters in pricing of IPOs. Overall, our results are consistent with the notion that the behavior of investors impacts price formation in financial markets.

JEL classification: D14, D21, G32, G34

Keywords: Investor Sentiment, Behavioral finance, Underwriters, Going public, Initial public offerings, Underpricing, Investment banking

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Abstract

We document that market-wide investor sentiment is positively related with IPO underpricing over and above firm-level sentiment. This relationship is more pronounced in high sentiment periods and for harder-to-arbitrage firms. High sentiment periods are followed by lower long run IPO returns suggesting that sentiment does not proxy for unobservable fundamentals. We find some evidence that investor sentiment impacts IPO valuations, but this relationship is not robust. We infer that the degree of excess optimism or pessimism of investors matters in pricing of IPOs. Overall, our results are consistent with the notion that the behavior of investors impacts price formation in financial markets.

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1. Introduction

An initial public offering is arguably the most important event in the life of the firm. The IPO is the first time shares in the firm are offered to the public and the pricing of the IPO is very sensitive to both fundamental and behavioral market conditions existing at the time of the IPO. In this paper, we examine the relationship between behavioral market conditions, i.e. investor sentiment and the IPO pricing process. We examine market-wide sentiment and firm-level sentiment.

The business press has repeatedly emphasized that IPO pricing process is influenced by the sentiment of market participants. For example, Tessera Technologies Inc. shares soared 42% in first-day trading, "helped by improved investor sentiment" (Wall Street Journal, November, 2004) and Samsung Life Insurance Co. closed "well above its initial public offering price *despite weak sentiment* for the broad market." (WSJ, May, 2010). (WSJ, Aug, 2010). In general, investment bankers believe that "when market sentiment turns negative, investors don't want to be buying IPOs" (WSJ, May, 2010).

Recent behavioral finance theories postulate that behavioral biases of investors, for example the sentiment of investors, affect the pricing of an IPO during the first day of trading (Ljungqvist, Nanda and Singh, 2006; Cornelli, Goldreich and Ljungqvist, 2006; Derrien, 2005). Specifically, these papers suggest that the run up in the IPO price on the first day of trading (IPO underpricing) increases with the demand from sentiment investors.[1] Ljungqvist, Nanda and Singh (2006) suggest that underwriters underprice the IPO in order to compensate regular investors if the demand from sentiment investors falls and regular investors are left holding overpriced stocks (which they would have, otherwise, sold to the sentiment investors). Another reason for this positive relationship is that issuers underprice the IPOs relative to the aftermarket price to mitigate the risk of providing costly price support in the aftermarket if the market price drops below the offer price in the initial period of trading (Derrien, 2005).

Extant literature implies that sentiment investors come and leave the market together (Kumar and Lee, 2006) and, thus, the IPO pricing process is impacted by market wide sentiment

[1] One notable exception is Rajan and Servaes (2003) who argue that sentiment should be *negatively* related to underpricing as underwriters take into account the demand from sentiment investors and adjust offer price upwards. However, in their model sentiment investors are trend chasers who decide to trade *after* observing underpricing.

(Derrien, 2005; Cornelli, Goldreich and Ljungqvist, 2006). In this paper we use measures of market-wide sentiment based on the results from two well established surveys conducted by the University of Michigan and Conference Board; namely, the Index of Consumer Sentiment (*ICS*) and the Index of Consumer Confidence (*CBIND*). One of the primary objectives of the surveys is to capture the level of consumers' optimism or pessimism about the business climate in the US, the consumers' personal finances, and their spending habits. These surveys have been used by prior literature to proxy for investor sentiment and have been related to equity prices (Lemmon and Portniaguina, 2006). Validating the use of consumer sentiment as a proxy for investor sentiment, Billet, Jiang and Rego (2010) use a unique dataset to show that consumer sentiment contributes to investor sentiment in the market. Using these new measures, we examine whether consumers' confidence about the future of the US economy impacts the IPO pricing process. Specifically, we relate market-wide investor sentiment to IPO valuation, IPO underpricing, and IPO long run returns. Since it is likely that consumer sentiment measures the behavioral biases of consumers as well as the fundamentals of the US economy, we follow Lemmon and Portniaguina (2006) and orthogonalize the *ICS* and the *CBIND* to a broad set of macroeconomic variables. After removing the impact of fundamentals, the remaining residual is our empirical proxy for market wide investor sentiment.

Three prominent papers empirically examine the relation between IPO underpricing and firm-level sentiment (Derrien, 2005; Cornelli, Goldreich and Ljungqvist, 2006; and Dorn 2009). These papers utilize unique characteristics of the European IPO markets where retail demand for IPOs is observable and they use this demand as their empirical proxy for firm-level investor sentiment. In the same spirit, we use the abnormal trading by retail investors on the first day of the IPO as our proxy for firm-level investor sentiment in the sample of US IPOs.

We study a sample of 5,198 US IPO firms over the period 1981 to 2009 and find that IPO underpricing increases with market-wide investor sentiment. This relationship is stronger in the periods of high investor sentiment which suggests that the relationship is asymmetric as proposed by prior literature (Ljungqvist, Nanda and Singh, 2006). Since not all firms are impacted by sentiment in the same degree, we show that for harder to arbitrage firms the positive relation between IPO underpricing and sentiment is more pronounced. The influence of investor sentiment on IPOs is stronger for high tech firms, young firms, and firms with lower institutional

holding, higher R&D expenditure, lower sales, and lower profitability. Turning to the proxy for firm level sentiment we find that the abnormal trading by small investors is positively related to IPO underpricing consistent with the results by Derrien (2005), Cornelli, Goldreich and Ljungqvist (2006) and Dorn (2009). After controlling for this firm-level investor sentiment, the market-wide investor sentiment remains positively related with IPO underpricing in statistically significant and economically meaningful way. When sentiment investors leave market, IPO prices will revert to their fundamental values. In agreement, we find that long run IPO returns are negatively related to market-wide sentiment. Interestingly, after controlling for market-wide sentiment, long run returns are not related to firm-level sentiment. We also find some evidence that the IPO valuation at the offer date is positively related with market-wide sentiment. However, this relationship is not robust. We conclude that there is no convincing evidence that underwriters exploit the sentiment in order to obtain higher prices for their IPO clients. Overall, our results show that market-wide investor sentiment derived from consumer sentiment metrics is positively related to different aspects of IPO pricing process.

One possible concern is that the market wide sentiment is a monthly measure and this causes valuation and underpricing of IPOs in the same month to be not independent. We correct for this in two ways. First, we cluster residuals by month, and second, we average the dependent and independent variables in the regressions in each month, and estimate the regressions with the month as the unit of observation. We find that sentiment is positively related to underpricing similar to the results reported for the pooled cross sectional sample above. In addition, the number of IPOs is not the same in each month. We control for this issue by estimating a weighted least squares where the weight is the inverse of the number of IPOs in each month. We also control for influential observations, and adjust for the differences of the internet bubble period, and our results remain qualitatively unchanged.

Our contributions are as follows. First, we provide evidence that the pricing of IPOs is influenced by market-wide sentiment in addition to firm-level sentiment and this relationship is more pronounced in high sentiment periods. Prior literature has shown in a limited setting using specialized and unobservable investor sentiment proxies that firm-level sentiment is related to IPO underpricing. Our measure of market-wide sentiment is available for a long time period, and can be used by investors who want to take advantage of the mispricing due to sentiment. Second,

we provide further evidence that difficult-to-arbitrage firms are more affected by the sentiment as suggested by Baker and Wurgler (2006). Since our sample is based on US data that spans over 25 years, and includes over 5,000 observations, we are able to provide cross sectional results that prior literature using small samples and short time periods could not. Our cross sectional results highlight that not all IPOs are equally impacted by market-wide sentiment and the degree of limits to arbitrage play a crucial role in the impounding of market-wide sentiment into IPO pricing process. Third, we find that IPO long run returns are inversely related to market-wide sentiment and not related to firm-level sentiment. This suggests that the market does correct for the mispricing due to sentiment driven underpricing at the offer date. The long run tests also allow us to rule out information based explanations for the underpricing results that we document. Sherman and Titman (2002) argue in their model that IPO first day returns are driven by costly information production. It takes more underpricing to induce investors to produce information and share it with the issuers when investors' opportunity cost is high which may coincide with high market sentiment. If this is the reason for the higher underpricing, then the long run returns would not be related to a sentiment at the time of the IPO. Fourth, we find weak evidence that investor sentiment impacts IPO valuations, but this relationship is not robust. This is consistent with the notion that investment bankers understand the temporary nature of sentiment driven valuations and do not incorporate the demand from irrational investors into the offer price in order to protect their long term institutional investors from future price reversals. Finally, we add to the nascent sentiment literature by providing another setting in which sentiment plays a prominent role in price formation.

The rest of the paper is organized as follows. Section 2 reviews the related literature. Section 3 describes the research design. Section 4 presents the empirical results. Section 5 shows the results of the robustness check. Section 6 concludes the paper.

2. Literature review and research questions

2.1. Behavioral investor models in the IPO literature

Derrien (2005) develops a model of IPO pricing where underwriters extract private information from informed institutional investors and observe public information about investor

sentiment. In this model high investor sentiment is only partially incorporated into the offer price because underwriters are committed to provide costly price support if the aftermarket price falls below the offer price. This makes underwriters conservative in setting the offer price leading to higher underpricing. Using a sample of 62 French IPOs underwritten by a modified bookbuilding procedure during the period 1999 to 2001, Derrien (2005) finds that investor sentiment is positively related to underpricing. His proxy for the sentiment is the oversubscription of the fraction of the IPO reserved for individual investors.

Ljungqvist, Nanda and Singh (2006) model the optimal response of an issuer to the presence of sentiment investors who arrive in two stages. They assume that sentiment investors trade on sentiment and regular investors trade on fundamentals. Regular investors are assumed to hold the IPO shares during the first stage in order to resell them to sentiment investors who arrive in the second stage. If investor sentiment falls in the second stage (and sentiment investors do not arrive in the second period), the regular investors would suffer as they would be holding overpriced shares. To compensate regular investors for this possible loss, issuers underprice the IPO. The authors also predict that underpricing would increase with sentiment, because issuers would increase their offer size to maximize the funds raised from the issue. Regular investors hold a greater proportion of their portfolio in this expanded issue and need to be compensated for tying up additional funds in the IPO. Hence, the issuer would underprice the issue more during high sentiment periods.

Cornelli, Goldreich and Ljungqvist (2006) empirically examine the relationship between both market-wide as well as firm-level investor sentiment and post-IPO prices. Their proxy for firm-level investor sentiment is the pre-IPO (or "grey") market prices that are available in the European IPO market, and the proxy for market-wide investor sentiment is the return on the market index. Using a sample of 486 IPOs in 12 European countries between November 1995 and December 2002, the authors document a positive relation between the grey market prices (firm-level investor sentiment) and post IPO prices. They, however, do not find any relation between market wide-investor sentiment and the IPO underpricing.[2] On the contrary, we show a strong influence of the market-wide sentiment as well as the firm-level sentiment on the IPO pricing process.

[2] They state that the "market returns are at best a noisy proxy for investor sentiment" (p. 1205).

In a similar vein, Dorn (2009) utilizes the German "when-issued" IPO market trades during the period 1999 to 2000 and finds that IPOs characterized by aggressive retail trading have higher first day returns and lower long-run returns. He argues that the impact of sentiment investors on the IPO pricing process is not confined to the internet bubble period. This is consistent with our finding that sentiment impacts IPOs even in periods other than the internet bubble period.

Purnanandam and Swaminathan (2004) take a different approach and examine how IPOs are priced relative to their seasoned peers. They find that IPOs are overpriced by 14 – 50% at the offer. More overpriced IPOs have higher first day returns and lower long run returns. They argue that the higher valuation of IPOs is due to the overly optimistic growth forecasts that fail to materialize in the long run.

While Derrien (2005), Cornelli, Goldreich and Ljungqvist (2006) and Dorn (2009) posit that the firm-level sentiment influences the IPO pricing process in Europe, concerns remain about generalizing their results to other IPO markets and other time periods. For example, the samples from above papers are from the years surrounding the formation and the burst of the Internet bubble when the behavior of IPO market participants was atypical (e.g. Ljungqvist and Wilhelm, 2003). Ofek and Richardson (2003) argue that abnormal presence of retail investors in the "bubble" years contributed to the formation of Internet bubble. Hence, these anomalous years are not representative of IPO markets in general and any findings should be interpreted with the caution.

Further, Jenkinson, Morrison and Wilhelm (2006) report that differences between the European IPO market and the US IPO markets are non-trivial. For example, there is an exchange of information early in the process in European IPOs, unlike US IPOs where exchange prior to registration is strictly prohibited. In the US, analysts are allowed to produce their research reports only after the quiet period ends (40 days after the issue), whereas in a European IPO analysts (many of them affiliated with the underwriter) may start producing research right after the underwriter is appointed, many months before the issue of the IPO. Another difference is that the initial price range in the US is non-binding and half of US IPOs are priced outside of initial price

range, whereas this fraction is only 10% in IPOs issued in Europe.[3] Differences in timing of communication and the flexibility of initial price range may impact the sensitivity of the IPO process to the sentiment and it is not obvious that implications from the European IPO markets will apply to the US IPO market.

2.2. Investor sentiment literature

Sentiment investors trade based on noise (sentiment) rather than on fundamental information (Black, 1986). In classical finance theory, investor sentiment has no role in setting prices because arbitrageurs take positions that are opposite to those taken by sentiment investors and drive them out of the market. However, Delong, Shleifer, Summers and Waldamann (1990) model continual generations of sentiment investors arriving to the market and in conjunction with limits to arbitrage they cause asset prices to deviate from fundamentals. Baker and Wurgler (2006) suggest that not only do prices deviate from fundamentals for the whole market, but, this effect is more prominent for hard to value and hard to arbitrage stocks, for example, small firms, young firms, growth and value firms, non dividend paying firms, and loss making firms. Prior literature has measured investor sentiment in terms of a market variable, for example, closed end fund discount (Lee, Shleifer and Thaler, 1991), or a combination of market variables, for example, the principle component from closed end fund discount, first day IPO returns, number of IPOs in a month, proportion of equity in capital raising, turnover, and dividend premium (Baker and Wurgler, 2006). Another set of popular measures of market sentiment are surveys, for example, Conference Board Consumer Confidence Index, Michigan Consumer Sentiment Index (Lemmon and Portniaguina, 2006; Qiu and Welch, 2004). A second survey that prior literature has used is one that is conducted by the American Association of Individual Investors. Individual or retail investors are most often touted to be sentiment investors and this survey tries to directly measure over or under optimism of sentiment investors. Using a vector autocorrelation regression model, Brown and Cliff (2004) document that investor sentiment is strongly correlated with contemporaneous market returns but not with near-term market returns. A third survey that has been used in the literature is the Investor Intelligence Survey which is

[3] Jenkinson, Morrison and Wilhelm (2006) provide the detailed analysis of these differences.

based on 150 market newsletters. Brown and Cliff (2005) use this survey as a proxy for *institutional* sentiment. More specifically, they use the bull-bear spread which is defined as the percentage of bullish minus the percentage of bearish newsletters. In an effort to validate the different sentiment measures, Qiu and Welch (2004) compare each of the measures with the UBS/Gallup investor sentiment survey and test which measure best predicts small firm performance. They conclude that Conference Board Consumer Confidence Index and Michigan Consumer Sentiment Index best capture the behavior of sentiment investors.

3. Research Design

3.1. Sample Selection

Table 1 describes the sample selection procedure. The initial sample contains all US IPOs from 1981 to 2009 in Securities Data Company (SDC) which consists of 11,570 observations. To improve data accuracy, we incorporate the correction file identifying IPO mistakes in SDC ("Corrections to Security Data Company's IPO database") from Jay Ritter's website.[4] Two observations are excluded, which are identified as "non-IPO" based on information contained in the Ritter's correction file. We also find errors regarding the midpoint of the filing range in SDC, in cases where the high price in the filing range is missing and midpoint of filing range is set equal to 50% of the offer price. Thirteen observations are excluded with erroneous midpoint of the filing range. Unit offerings (1,237 observations), closed-end funds (1,017 observations), partnerships (119 observations), ADRs (119 observations), and REITs (250 observations) are excluded from our sample. Utilities (SIC codes 4900-4999; 134 observations), and financials (SIC codes 6000-6999; 1,189 observations) are also excluded, because these industries are regulated by the government and have special rules that govern the IPO process. 2,292 IPOs are excluded because of incomplete information on independent variables that are included in the underpricing analysis. Our final sample consists of 5,198 US IPOs from 1981 to 2009.

[Insert Table 1]

3.2. IPO underpricing

[4] We thank Jay Ritter for generously sharing IPO data on his website, http://bear.cba.ufl.edu/ritter/.

We now describe the variables that are related to the characteristics of the IPO process.[5] *Underpricing* is the percentage change in the price between the offer price and the first-day closing price. The first-day closing price is the first recorded closing price available in CRSP if it is within 7 days of the offer date as reported in SDC.

3.3. IPO valuation at the offer date

To examine how underwriters value IPOs relative to their peers, we construct comparable firms based on *P/Vsales* and *P/Vebitda* following Purnanandam and Swaminathan (2004). Specifically, we choose a publicly traded non-IPO firm in the same industry which has comparable sales and EBITDA profit margin and did not go public within the past three years. To select a matching firm, we start with all firms in Compustat for the fiscal year prior to the IPO year. Then we eliminate firms that went public during the past three years, firms whose securities traded are not ordinary common shares, REITs, closed-end funds, ADRs, and firms with a stock price less than five dollars as of the prior June or December, whichever is later. We then group firms into the 48 Fama and French (1997) industries, based on SIC codes in CRSP at the end of the previous calendar year. Within every industry, we group firms into 3 portfolios based on past sales; within every industry-sales portfolio, we group firms again into 3 portfolios based on past EBITDA profit margin. We then slot each IPO into one of these nine portfolios and then select the non IPO firm with the closest sales within the matched portfolio as the IPO firm. If the matched firm cannot be obtained with this 3X3 classification, we use 3X2 and 2X2 classifications along the same lines as described above. After finding the matching firms for all IPOs, we compute two price-to-value ratios, *P/Vsales* and *P/Vebitda*, following equations (1) to (6) described below. For the IPO sample, we use shares outstanding at the close of the offer date. For the matching firms, we use market price and shares outstanding at the close of the day immediately prior to the IPO offer date. The above three variables are taken from CRSP.

$$\left(\frac{\mathrm{P}}{\mathrm{S}}\right)_{\mathrm{IPO}} = \frac{\text{Offer Price} \times \text{CRSP Shares Outstanding}}{\text{Prior Fiscal Year Sales}} \qquad (1)$$

[5] Descriptions of all variables are summarized in the appendix.

$$\left(\frac{\text{P}}{\text{EBITDA}}\right)_{\text{IPO}} = \frac{\text{Offer Price} \times \text{CRSP Shares Outstanding}}{\text{Prior Fiscal Year EBITDA}} \tag{2}$$

$$\left(\frac{\text{P}}{\text{S}}\right)_{\text{Match}} = \frac{\text{Market Price} \times \text{CRSP Shares Outstanding}}{\text{Prior Fiscal Year Sales}} \tag{3}$$

$$\left(\frac{\text{P}}{\text{EBITDA}}\right)_{\text{Match}} = \frac{\text{Market Price} \times \text{CRSP Shares Outstanding}}{\text{Prior Fiscal Year EBITDA}} \tag{4}$$

$$\text{P/V}_{sales} = \frac{(\text{P/S})_{\text{IPO}}}{(\text{P/S})_{\text{match}}} \tag{5}$$

$$\text{P/V}_{ebitda} = \frac{(\text{P/EBITDA})_{\text{IPO}}}{(\text{P/EBITDA})_{\text{match}}} \tag{6}$$

3.4. Survey based proxies for market-wide investor sentiment

Next, we turn to variables related to survey based proxies for market-wide investor sentiment. *ICS* is the Index of Consumer Sentiment constructed by the University of Michigan Survey Research Centre. *CBIND* is the Index of Consumer Confidence constructed by the Conference Board. These two indexes are used in Lemmon and Portniaguina (2006) and shown to be valid measures of investor sentiment by Qiu and Welch (2004). The survey for the Index of Consumer Sentiment by University of Michigan begins in 1947 and is conducted on a quarterly basis and changes to monthly basis from January 1978. The survey is conducted on a sample of at least 500 households and the respondents are asked to answer about fifty core questions, about their perception of current economic conditions, which comprise the Index of Current Economic Condition, about the expectation of the economy, which comprises the Index of Consumer Expectation, and the state of the consumers own personal finances. The survey for the Index of Consumer Confidence collected by the Conference Board begins on a bimonthly basis in 1967 and changes to a monthly survey from January 1978. The survey is conducted using a sample of 5,000 households, which is a larger sample compared with the sample in the Michigan's Index of Consumer Sentiment. Similar to the ICS the respondents are asked questions regarding their

perception of the current and future economic prospects in the US. 40% of the weight of the index comes from the respondents' opinion of current economic conditions and the remaining 60% from the respondents' opinions about the future of the US economy.

The consumer sentiment survey values reflect consumers beliefs about the fundamentals of the economy as well as their over optimism or pessimism (investor sentiment). Since we need to measure the excess optimism or pessimism, it is important to remove the effect of fundamentals from the raw survey values. Lemmon and Portniaguina (2006) provide an empirical model that allows us to separate the sentiment from economic fundamentals. We regress Michigan's Consumer Sentiment Index and Conference Board Consumer Confidence Index on a set of variables and their lagged values that proxy for fundamental economic activity and estimate the following equation.

$$\begin{aligned} ICS = {} & \alpha_0 + \alpha_1 DIV_t + \alpha_2 DEF_t + \alpha_3 YLD3_t + \alpha_4 GDP_t + \alpha_5 CONS_t + \alpha_6 LABOR_t + \\ & \alpha_7 URATE_t + \alpha_8 CPI_t + \alpha_9 CAY_t + \alpha_{10} DIV_{t-1} + \alpha_{11} DEF_{t-1} + \alpha_{12} YLD3_{t-1} + \alpha_{13} GDP_{t-1} + \\ & \alpha_{14} CONS_{t-1} + \alpha_{15} LABOR_{t-1} + \alpha_{16} URATE_{t-1} + \alpha_{17} CPI_{t-1} + \alpha_{18} CAY_{t-1} + \varepsilon \end{aligned} \quad (7)$$

Fundamentals of the economy are measured using a set of nine macroeconomic variables. We follow Lemmon and Portniaguina (2006) and measure the macroeconomic variables in the same manner as they did. These are dividend yield, default spread, yield on the treasury bill, GDP growth, consumption growth, labor income growth, unemployment rate, CPI, and consumption to wealth ratio.

Dividend yields (*DIV*) is measured as the total ordinary cash dividend of the CRSP value-weighted index over the last three months deflated by the value of the index at the end of the current month. The value of the index is the CRSP value-weighted returns monthly index both with and without dividend, as in Fama and French (1988) and Lemmon and Portniaguina (2006). Default spread (*DEF*) is measured at a monthly frequency, and is the difference between the yield to maturity on Moody's Baa-rated and Aaa-rated bonds, taken from the Federal Reserve Bank of St. Louis.[6] *YLD3* is the monthly yield on the three-month Treasury bill, taken from the Federal Reserve Bank of St. Louis. GDP growth (*GDP*) is measured as 100 times the quarterly

[6] The website for Federal Reserve Bank of St. Louis is http://research.stlouisfed.org/fred2/.

change in the natural logarithm of adjusted GDP (to 2005 dollars).[7,8] Consumption growth (*CONS*) is measured as 100 times the quarterly change in the natural logarithm of personal consumption expenditures. Labor income growth (*LABOR*) is measured as 100 times the quarterly change in the natural logarithm of labor income, computed as total personal income minus dividend income, per capita and deflated by the PCE deflator. Unemployment rate (*URATE*), *URATE* is the monthly and seasonally adjusted values as reported by the Bureau of Labor Statistics.[9] The inflation rate (*CPI*) is measured monthly and obtained from CRSP. Consumption-to-wealth ratio (*CAY*) is taken from data provided by Lettau and Ludvigson (2001). We measure sentiment at a monthly frequency and some of the macroeconomic variables are already at a monthly frequency. However, others like *GDP* growth, consumption growth, labor income growth and consumption-to-wealth ratio, are available at a quarterly frequency and thus take on the same value for all the months in a particular quarter.

The residual from the above equation is termed *ICSR* and *CBINDR* respectively when the consumer sentiment variable is *ICS* and *CBIND*. The residual denotes the excess optimism or pessimism of consumers and is our proxy for investor sentiment.

From the continuous variable (*ICSR*) representing investor sentiment, we obtain three dummy variables. *ICSR_ABVM* is a dummy variable that takes on a value of one if *ICSR* for that month is greater than the median of the *ICSR* distribution. Similarly, *ICSR_ABVP66* (*ICSR_BLWP33*) is a dummy variable which takes the value one if the *ICSR* for that month is greater (smaller) than the 66^{th} (33^{rd}) percentile of the *ICSR* distribution. We define similar variables for the *CBINDR* distribution and term them *CBINDR_ABVM*, *CBINDR_ABVP66*, and *CBINDR_BLWP33*.

3.5. Trading based proxies for firm level investor sentiment

[7] Lemmon and Portniaguina (2006) adjust GDP to 1996 dollars but we adjust GDP to 2005 dollar since the Federal Reserve Bank of St. Louis and Bureau of Economic Analysis have revised and updated their data and adjusted GDP to 2005 dollars.

[8] For all the quarterly macroeconomic variables (GDP, CONS, LABOR and CAY), the quarterly change from January 1 to April 1 is the GDP growth for January, February and March. The quarterly change from April 1 to July 1 is the GDP growth for April, May and June. The quarterly change from July 1 to October 1 is for July, August and September. The quarterly change from October 1 to January 1 the next year is for October, November and December.

[9] The website for Bureau of Labor Statistics is http://www.bls.gov/.

In this section we describe variables related to order flow of small traders, where, the abnormal order flow of small traders proxies for investor sentiment for that IPO. We use trade size to classify traders into small traders. Previous literature suggests that this classification maps well with the trading by individuals. Lee (1992) reports survey-based evidence that most of the transactions by individuals are of small dollar value. He also argues that while large traders may break up their orders into medium sized orders, for a variety of reasons they do not trade in very small lots. Lee and Radhakrishna (2000) compare the size-based classification of investors to the actual identities obtained from the TORQ database where the identity of the traders are clearly identified, and find that trade size does a good job of separating individuals trades from institutional trades. Not surprisingly, a large number of papers have used trade size as a proxy for small versus large investors (see, for example, Battalio and Mendenhall, 2005; Bhattacharya, 2001; and Chakravarty, 2001).[10]

The use of the well-accepted trade size proxy allows us to examine the influence of sentiment of small investors over a longer time period of 1994-2008. This measure of investor sentiment is similar in spirit to the proxy for investor sentiment in Derrien (2005) i.e., the oversubscription of the fraction of the IPO allocated for retail investors, and to the proxy for investor sentiment in Cornelli, Goldreich and Ljungqvist (2006), and Dorn (2009) i.e., 'grey market' pre IPO trading. These authors argue, as do we, that investor sentiment impacts prices through trading by noise traders, who are usually thought to be retail investors (for example, Kumar and Lee, 2006).

We use the Trade and Quotation (TAQ) dataset which contains information about each executed trade for each stock. When the dollar amount of a trade is less than or equal to $5,000, we assume the trade is executed by a small investor and is consistent with the prior literature (Bhattacharya, 2001). Defining small trades using such a low cutoff allows us to minimize the impact of large traders splitting their trades into small lots and being classified as small investors. However, since the dollar trade size would be large for high-priced stocks even for small trade lots, we follow Asthana et al. (2004) and modify the above classification for stocks whose prices

[10] Admittedly, the use of trade size may not provide as clean an evidence on the trading behavior of individuals as that documented from the detailed datasets used in some prior studies. For example, Odean, 1998; and Grinblatt and Keloharju, 2001 have the exact identity of the investors. However, such detailed datasets cover only a limited time periods of two or three years.

exceed $50. For these stocks, we classify trades below 100 shares as trades by small investors. To ensure that our results are not driven by stock price movements around the event date, the dollar values of all trades associated with an IPO are calculated by using the average of the daily share prices during the third month after the IPO.

After identifying trades executed by small investors, we follow the methodology developed by Lee and Ready (1991) to classify each trade as either buyer-initiated (i.e., a buy) or seller-initiated (i.e., a sell). The Lee-Ready algorithm matches a trade's execution price to the most recent quote. If the trade's execution price is above (below) the midpoint of the bid-ask spread, it is classified as a buy (sell). In cases where the trade execution price is at the mid-point of the bid-ask spread, the trade is classified based on a "tick-test". An up-tick classifies a trade as a buy and a down-tick as a sell. We only consider the trades executed between 9:30am and 4:00pm, since the exact time of execution and quotes become less reliable outside of the normal market hours.

We define order flow, *NetBuy*, as the difference between the number of shares in buyer-initiated transactions and number of shares in seller-initiated transactions.[11] We then follow Asthana et al. (2004) and define the *abnormal* order flow of small investors for IPO *i* on event date *t* which is the first trading date after the IPO date as $ANetBuy_{i,t}$ that is computed as follows.

$$ANetBuy_{i,t} = \left(\frac{NetBuy_{i,t} - \mu_i(NetBuy)}{\sigma_i(NetBuy)} \right) \qquad (8)$$

where μ_i and σ_i are the mean and standard deviation, respectively, of the daily order flow of the investor group for the IPO during the estimation period. The estimation period ranges from day +30 to day +60 relative to the event date. Since there is no "grey market" in the US, and hence ex-ante retail trading and prices of IPOs are unobservable, we have no option but to use ex-post data to proxy for investor sentiment that previous literature has used. Thus, there is a look ahead bias in the measurement of the trading based sentiment variable. Note that $ANetBuy_{i,t}$ is not our main variable of interest, but is a control variable for the firm-level sentiment which is empirically examined in several prior studies. However, in order to alleviate the concerns about

[11] Our results remain robust if we measure order flow in terms of dollar volume of shares traded instead of number of shares traded.

using data unavailable at the time of IPO, we perform additional tests using a daily order flow of a matching firm and standardized daily order flow. Our results are not sensitive to these alternative definitions.

Another possible concern is that in recent years, the practice of splitting orders has become common. Specifically, large orders from institutions are split into small orders. Our algorithm to identify small traders based on trade size may result in misclassification of large traders as small traders and introduce noise in the measurement of small trader sentiment. However, this will bias the results towards the null hypothesis; i.e. it will work against finding significant results.

3.6. Control Variables

To delineate the impact of investor sentiment, we control for other known determinants of IPO underpricing that have been documented by prior literature. *Revision* is the percentage change from the midpoint of the filing range to the offer price. Hanley (1993) showed that underwriters partially adjust the price during the bookbuilding process and *Revision* is positively related to underpricing. Lowry and Schwert (2004) show that the impact of partial adjustment is asymmetric between upward and downward revision. Thus, we define $Revision^{+}$ as equal to *Revision* if *Revision* is positive, and zero otherwise. Underwriter ranks are defined as in Carter and Manaster (1990), and updated by Carter, Dark, and Singh (1998) and Loughran and Ritter (2004). Underwriter ranks data are obtained from Ritter's website. *MaxRank* is the maximum of all the lead managers' ranks.[12] Carter and Manaster (1990) and Carter, Dark and Singh (1998) document a negative relation between underwriter ranks and underpricing. However, Beatty and Welch (1996) report that the negative correlation reverses after 1990s (see also Loughran and Ritter, 2004; Hansen, 2001; Fernando, Gatchev and Spindt, 2005). To control for the difference in time periods, we use *MaxRank_BF1990* which is equal to *MaxRank* if the IPO is issued before 1990, zero otherwise. *Sales* is the sales of the fiscal year prior to the offering. *HiTech* equals one if the IPO firm is in the high tech industry, zero otherwise. *Venture* equals one if the IPO firm is backed by venture capitalists, zero otherwise. Loughran and Ritter (2002), Benveniste, Ljungqvist, Wilhelm and Yu (2003) find that venture capital backing is associated with higher

[12] In unreported regressions, we substitute *MeanRank*, the mean of all the lead managers' ranks, but the results are qualitatively the same.

underpricing, however, Lowry and Shu (2002), Li and Masulis (2005), Megginson and Weiss (1991) document a negative relation between venture capital backing and underpricing. *NASDAQ* equals one if the IPO is listed on NASDAQ, zero otherwise. *Bubble* equals one if the IPO occurs between September 1998 and August 2000, zero otherwise (Lowry and Schwert, 2004). *Age* is the number of years between the IPO year and the founding year, taken from the Field-Ritter database on Ritter's website. Studies find underpricing falls as firm age rises (Lowry and Shu, 2002; Cliff and Denis, 2006; Loughran and Ritter, 2004; Ljungqvist and Wilhelm, 2003; and Megginson and Weiss, 1991).

4. Results

4.1. Descriptive Statistics

Table 2 presents the summary statistics for all the variables used in study. For the full sample, median *valuation* is *P/Vsales*=1.503, and *P/Vebitda*=1.474. This shows that IPOs are on average overvalued compared to the peers. The mean and median *Underpricing* are 20.60% and 7.71% which are statistically different from zero. The mean and median reputation of the lead underwriter (*MaxRank*) are 7.299 and 8; mean and median *Age* of the IPO is 14.911 and 8; the mean and median number of shares offered (*ShrOffer*) are 4.644 and 2.750 million shares. These numbers are comparable to prior studies (for example, Ritter and Welch, 2002). Since we are interested in how investor sentiment impacts the IPO pricing process, we split the sample into the high sentiment (top third of the sentiment distribution) and low sentiment (bottom third of the sentiment distribution) based on *ICSR*. We see that valuation at the offer date during high sentiment periods is *P/Vsales*=1.474 and *P/Vebitda*=1.455, whereas during low sentiment periods is *P/Vsales*=1.509 and *P/Vebitda*=1.398. The difference in the median in relative valuation between the high and low sentiment periods is not significant. For companies going public in the high sentiment periods, the average underpricing (*Underpricing*) is 27.74% (median=9.09%). In contrast, the average underpricing for firms going public in low sentiment periods is only 13.71% (median=6.82%). The difference in the average underpricing is 14.03% and is statistically significant (p-value=0.000). The average revision (*Revision*) in price from the midpoint of the filing range to the offer price is positive (mean=3.29%, median=0.00%) for IPOs

offered in the high sentiment periods whereas, it is negative (mean= -0.88%, median=0.00%) for IPOs offered in the low sentiment period. The difference in the averages is significant. We find that a greater number of hi-tech (*HiTech*) firms go public in high sentiment periods than in low sentiment periods. Further, younger firms go public in high sentiment periods than in low sentiment periods. The average *Age* is 13.921 years (median=7 years) during high sentiment periods, whereas, average *Age* is 16.115 years (median=9 years) during low sentiment periods.

[Insert Table 2]

4.2. Sentiment and IPO valuation at the offer date

Theoretical literature in behavioral finance suggests that underwriters set the offer price to take advantage of the prevailing market sentiment, but they do not fully incorporate the effects of sentiment. These models suggest that the offer price is increasing in sentiment. We test whether managers set the offer price higher (lower) for IPO firms in high (low) sentiment periods to take advantage of the prevailing sentiment. As described in Section 3.3 we adopt the methodology suggested by Purnanandam and Swaminathan (2004), and construct comparable firms. The two *valuation* metrics of interest are *P/Vsales* and *P/Vebitda*. These measure the excess valuation of the IPO firm over a comparable non IPO firm. The following regression model is estimated to test the relation between sentiment and valuation of IPO firms.

$$Valuation = \alpha_0 + \alpha_1\, ICSR + \alpha_2\, ANetBuy + \alpha_3\, MaxRank + \alpha_4\, MaxRank\_BF1990 + \alpha_5\, HiTech + \alpha_6\, Venture + \alpha_7\, NASDAQ + \alpha_8\, Age + \alpha_9\, DecShrOffer + \alpha_{10}\, Sales + \alpha_{11} Year + \omega \quad (9)$$

Table 3 presents the result of testing the relationship between valuation at the offer date and investor sentiment. Both *P/Vsales* and *P/Vebitda* are winsorized at 1% level to remove the impact of outliers. We see that *P/Vebitda* is marginally positively associated with investor sentiment (*ICSR*) whereas *P/Vsales* is not. Hence, we do not find convincing evidence that underwriters set the offer price more aggressively when investor sentiment is high. This result holds after controlling for other factors which are likely to impact *valuation*. We see that underwriters reputation (*MaxRank*) is negatively related with valuation, whereas hi-tech (*HiTech*) firms, firms backed by venture capitalists (*Venture*), and firms on the NASDAQ are positively related to valuation. The market values hi-tech stocks higher. IPOs backed by venture capitalists (*Venture*) who are thought to be informed investors enjoy a premium at issue. Further,

prior literature suggests that NASDAQ stocks which are smaller and belong in greater proportions to hi-tech industries have higher valuations (Pastor and Veronesi, 2006). We find that *valuation* decreases with age (*Age*), suggesting that more mature firms are easier to value. Overall our results suggest that underwriters do not take advantage of market sentiment when pricing the IPO compared with similar publicly traded firms. This is consistent with the notion that investment bankers understand the temporary nature of sentiment driven valuations and do not incorporate the demand from irrational investors into the offer price in order to protect the long term institutional investors from future price reversals (perhaps out of reputational concerns or to avoid future litigations).

[Insert Table 3]

4.3. Sentiment and IPO underpricing

In this section we describe the results from estimating a multivariate regression of IPO underpricing on investor sentiment after controlling for other determinants of IPO underpricing shown to be significant by prior literature. We estimate the following regression to implement the above test.

$$Underpricing = \alpha_0 + \alpha_1\, ICSR + \alpha_2\, ICSR*ICSR\_ABVM + \alpha_3\, ANetBuy + \alpha_4\, Revision + \alpha_5\, Revision^{+} + \alpha_6\, MaxRank + \alpha_7\, MaxRank\_BF1990 + \alpha_8\, HiTech + \alpha_9\, Venture + \alpha_{10}\, NASDAQ + \alpha_{11}\, Age + \alpha_{12}\, DecShrOffer + \alpha_{13}\, Sales + \omega \quad (10)$$

Table 5 shows the results of estimating equation (10). We see that *ICSR* is significant and positive (coefficient=0.004, t-stat=2.71). This shows that as sentiment increases underpricing also increases. This lends support to the arguments put forward by Ljungqvist, Nanda and Singh (2006), and Derrien (2005), that underwriters do not fully incorporate the effect of sentiment into the offer price.

Also, Ljungqvist, Nanda and Singh (2006) suggest that the impact of sentiment on underpricing is asymmetric between high and low sentiment periods. In order to test for the asymmetric relationship between sentiment and underpricing we interact *ICSR* with *ICSR-ABVM*, where *ICSR_ABVM* proxies for high sentiment periods. The coefficient on interaction variable is positive and significant (coefficient=0.006, t-stat=1.76) indicating that the relationship

is asymmetric. More specifically, the positive relationship between sentiment and underpricing is more pronounced during high sentiment periods.

We also see that *ANetBuy* which represents the abnormal buying behavior of small investors, our proxy for firm-level sentiment is positively related to underpricing (coefficient=0.002, t-stat=7.07). Retail investors are usually considered sentiment investors (Lee, 2001). This suggests that as retail investors' demand increases, they drive up the price of the IPO and underpricing increases. Further, this also suggests that underwriters do not fully incorporate the demand by retail investors into the offer price.

Revision is positively and significantly related with underpricing (coefficient=0.33, t-stat=4.09), and this result is consistent with the partial adjustment phenomenon suggested by Hanley (1993) and Lowry and Schwert (2004). Underwriters need to compensate informed investors by underpricing the IPO, to extract favorable private information from the informed investors during the book-building process. This leads to a greater amount of underpricing of the IPO if a greater amount of favorable information is extracted (i.e. higher revision in prices from the midpoint of the registration range). However, underwriters only need to pay for positive private information, because investors are willing to reveal negative private information to underwriters for free, in order to enjoy a lower offer price. Thus the relation between price revision and underpricing is higher for positive price revisions than for negative price revisions. The positive relation between $Revision^{+}$ and underpricing suggests that indeed this is the case (coefficient=1.059, t-stat=4.44).

Carter and Manaster (1990) and Carter, Dark and Singh (1998) document a negative relation between underwriter ranks and underpricing. These two papers argue that prestigious underwriters select less risky IPOs and their reputation serves as a signal of firm quality, thus reducing underpricing. We find that the coefficient on *MaxRank_BF1990* is negative and significant consistent with findings by Carter and Manaster (1990) and Carter, Dark and Singh (1998). However, Beatty and Welch (1996) and Loughran and Ritter (2004), report that the negative correlation between underwriter rank and underpricing reverses in the 1990s. Hansen (2001) justifies the positive relationship between underwriter reputation and underpricing based on the efficient contract theory. He suggests that more speculative offerings are associated with higher underpricing and also with more prestigious underwriters during the 1990s. Fernando,

Gatchev and Spindt (2005) argue that high underwriter reputation is a signal of high issuer quality, and underpricing measures the level of new positive information provided to the market about the quality of the issuer. Consistent with these findings we find evidence of a positive relationship between *MaxRank* and underpricing for the period after 1990. Coefficients on other control variables are consistent with the literature: high tech firms (*HiTech*), IPOs backed by venture capitalists (*Venture*) and companies listed on NASDAQ exchange (*NASDAQ*) have higher underpricing. The coefficient on *Age* is negative and significant suggesting that older firms have lower underpricing. The coefficients on the offer size of the IPO (*DecShrOffer*) and *Sales* are also negative and significant. Overall, our results suggest that both market-wide and firm-level investor sentiment are positively related to underpricing.

[Insert Table 5]

We propose abnormal order flow of small investors (*ANetBuy*) as proxy for firm-specific investor sentiment measure. The benchmark against which the order flow of the IPO date is measured in this proxy is the order flow of the IPO firms in the window [+30, +60] after IPO date. As mentioned earlier, this benchmark is measured *after* the IPO and, hence, this measure is subject to look-ahead bias. Consequently, there is a concern about using data unavailable at the time of IPO. In order to alleviate this concern, we create two other measures. First, we use matching-firm approach. *ANetBuy_Match* equals to *NetBuy* of IPOs by small investors on the first trading date in TAQ minus *NetBuy* by small investors of a matched firm on the same date as the IPO date. For identifying the matched firms we use the algorithm from Purnanadan and Swaminathan (2004), described in section 3.3. Second, *NetBuy* is standardized to represent the firm-specific investor sentiment on the IPO firms. *ANetBuy_Standardize* equals the *NetBuy* of IPO firm deflated by the sum of buy and sell orders of the IPO firm at the same day. Table 6 describes the results of regressing IPO underpricing on alternative firm-specific investor sentiment measures *ANetBuy_Match* and *ANetBuy_Standardize*. Both variables are positively and significantly correlated with underpricing, indicating that firm-level investor sentiment affects IPO underpricing. More importantly, the coefficient of market-wide sentiment measure *ICSR* remains positive and significant providing further evidence that market-wide sentiment impacts IPO underpricing over and above firm-level investor sentiment.

[Insert Table 6]

We have removed the macro-economic effects from our raw sentiment measures by regressing ICS on a set of current and lagged macro-economic variables following Lemmon and Portniaguina (2006). However, it is still possible that the residual part of consumer sentiment may influence future real economic activity. For example, if consumers are optimistic (rationally or irrationally) about their personal purchasing power and the overall economy, this excess optimism may influence their spending in the future (Qiu and Welch, 2004). In that case, consumer sentiment may have a real impact on increased future consumer spending and this, in turn, may lead to increased future corporate profits. Naturally, the question arises whether market-wide sentiment impacts IPO pricing through behavioral channels or future real economic activity channels (or both). In order to answer this question, we decompose our sentiment measure into a future real economic activity and a behavioral variable by regressing *ICSR* on future corporate profits and consumer spending, and label the predicted values as *ICSR_P* and the residual as *ICSR_R*. Note that ICSR is already orthogonolized against current and lagged macro economic variables. We collect future consumer spending and corporate profits from Bureau of Economic Analysis, following Qiu and Welch (2004). Then, we estimate the regression described in Eq. 11 again using these alternative sentiment variables. Table 7 presents the results. The coefficient for *ICSR_P* is positively and significantly related with underpricing suggesting that sentiment affects underpricing through future real economic activity. At the same time, the coefficient for *ICSR_R* is also positive and significant indicating that market-wide sentiment impacts IPO underpricing through behavioral channel as well. Overall, results in Table 7 indicate that market-wide sentiment impacts the IPO pricing process through both future real economic activity and behavioral channels.

[Insert Table 7]

4.4. Sentiment and IPO long run returns

If sentiment impacts IPO prices through a behavioral channel, the prices will eventually revert to the fundamental value when sentiment investors exit the market. However, if sentiment impacts IPOs only through future real economic activity (i.e. through increased future consumer spending), IPO prices will stay at the higher end of first day price and will not trend downward. Sherman and Titman (2002) argue that underpricing is a rational response by underwriters because this induces investors to gather and reveal information to the underwriter. If this is a

reason for the presence of underpricing then we should see no discernable pattern in long run returns. We examine whether the market corrects the underpricing in the longer run to distinguish whether the underpricing is due to behavioral biases caused by investor sentiment or future real economic activity caused by investor sentiment. The dependent variable in this test is the return on the IPO firm in excess of a benchmark for 2, 3, 6 and 12 months a calculation which is similar to that proposed by Cornelli, Goldreich and Ljungqvist (2006). The main test variables are market-wide sentiment and firm-level sentiment. Other control variables are *Venture* and *MaxRank* as in Cornelli, Goldreich and Ljungqvist (2006). The following regression describes the test.

$$Abnormal\ Return = \alpha_0 + \alpha_1\ ICSR + \alpha_2\ ANetBuy + \alpha_3\ Venture + \alpha_4\ MaxRank + \omega \qquad (14)$$

Table 8 summarizes the results of estimating equation (14). We find that long run IPO abnormal returns are negatively related to sentiment (coefficient= - 0.005, t-stat= - 1.99). Firm-level sentiment is negatively related to long run IPO returns, but, interestingly, this relationship is significant only for abnormal returns measured over 2 months. Significance drops below conventional levels when returns are measured over longer periods. Underwriter reputation is positive and significant suggesting that reputable underwriters are associated with IPOs which lose less value in the long run. Venture-backed IPOs have less negative returns in the long run. This result suggests that Venture firms are associated with the better performing IPOs. The coefficient on *Venture* is significant for 2 and 3 months abnormal return calculation periods.

Overall, Table 8 indicates that IPOs revert to their fundamental values over the long run and this is consistent with the notion that sentiment has a behavioral component. This provides further evidence that our measure of market-wide sentiment proxies for excess optimism or pessimism of investors and is not a proxy for future real economic activity.

[Insert Table 8]

4.5. Cross sectional (Sub sample) Analysis

This section documents results relating to the cross sectional differences in the impact of sentiment on IPO underpricing. Baker and Wurgler (2007) suggest that difficult-to-arbitrage stocks are more susceptible to investor sentiment. We classify difficult-to-arbitrage stocks as

those which are in the high tech industry, young firms, firms with a lower fraction of institutional holdings, firms with lower sales, firms with higher R&D expenditure and firms with a lower profitability in the fiscal year prior to the IPO. Growth and future profitability of such stocks are harder to assess and hence these stocks are more difficult to value and arbitrage. Therefore, the effect of sentiment on underpricing is likely to be higher for difficult to arbitrage stocks. We classify *HiTech* stocks as defined in SDC, young firms as firms below median of the *Age* distribution in our sample of IPOs, lower institutional ownership stocks as stocks below the sample median of the institutional holdings reported in 13F filings at the end of the first quarter after the IPO. Similarly, firms below the median of the sales in the year before the IPO are classified as firms with lower sales, firms above the median of the R&D expenditure are classified as high R&D firms, and firms below median profitability as low profitability firms.

Table 9 summarizes the results of estimating Eq. 10 for each of the subsamples described above. Panel A describes the results for estimating Eq. 10 for high tech firms and non-high-tech firms. Column 1 describes the results for high tech firms; and column 2 for non-high-tech firms; column 3 describes the test of equality of the coefficients for high tech and non high tech firms subsamples. The coefficient on our sentiment measure ICSR is 0.01 for high tech firms and is significant (t-stat = 9.53) . For non-high-tech firms, the coefficient on sentiment is only 0.003, and is significant (t-stat = 4.86). The difference in the two slope coefficients between high tech firms and non-high-tech firms is 0.007 and is significant (t-stat=5.85). These results are consistent with the conjecture by Baker and Wurgler (2006) that sentiment has a greater impact on hard-to-arbitrage firms. Panel B to Panel F are analyses based on firm age, institutional holding fraction, firm size, R&D expenses and profitability, respectively. We find that the relation between market sentiment (*ICSR*) and underpricing are stronger for hard-to-arbitrage stocks than for easy-to-arbitrage stock, i.e. the coefficient on sentiment for young firms, firms with a lower fraction of institutional holdings, firms with lower sales, firms with higher R&D expenditure and firms with a lower profitability in the fiscal year prior to IPOs is higher than the coefficient on sentiment for old firms, firms with higher fraction of institutional holding, firms with higher sales, firms with lower R&D expenditure, and firms with higher profitability. Interestingly, coefficients on institutional holding fraction, age, sales, and profitability are in hypothesized direction, but insignificant. Collectively these results suggest that sentiment plays a stronger role in determining underpricing for hard-to-arbitrage stocks.

[Insert Table 9]

5. Robustness tests

In this section, we estimate alternative specifications of the models described above in order to test the robustness of results. We estimate monthly regressions, cluster error terms, exclude bubble period, exclude influential observations, exclude firm-level sentiment variables, and finally substitute residual values of consumer confidence with the raw values from the surveys.

5.1. Correlation among IPOs issued in the same month

We have documented so far that IPO underpricing increases with investor sentiment. However, the sentiment variable is the same for all the firms going public within the same month. We address this issue in two ways. First we estimate monthly regressions, and secondly, we cluster standard errors by month to control for cross correlation of error terms in a month.

5.1.1. Monthly regressions

In this section we describe the results from estimating monthly regressions of Eq. (10). We take the averages of all the variables both dependent and independent variables described in Eq. (10) across all IPOs during a month. The sentiment measure is the same for all IPOs in the month. Table 11 shows the results from estimating Eq. (10) for the averages of the underpricing and control variables. Columns 1 and 2 include all months; columns 3 and 4 use the number of IPOs within one month as the weight in the regression;[13] columns 5 and 6 drop months with fewer than 2 IPOs.[14] In all the columns, the results show that market wide sentiment (ICSR) is positively and significantly correlated with monthly mean underpricing (coefficient=0.002, t-stat=2.47). This is consistent with results from table 4. When we break average firm-level sentiment into the component predicted by market-wide measure and the residual, both components are significantly positively related to the underpricing.

[Insert Table 10]

[13] We use the AWEIGHT option in STATA

[14] We use a cut off of 2 IPOs per month because it is the 5th percentile of the distribution.

5.1.2. Cluster analysis

Another way to control for cross correlation between IPOs issued during a month is to cluster error terms by month. We estimate Eq. (10) after clustering standard errors by month. Table 12 describes the results from this estimation. We find that market sentiment (*ICSR*) is positively related to underpricing similar to results described for the full sample in table 4. The coefficient on ICSR is 0.006 and the t-statistic is 5.04.

[Insert Table 11]

5.2. Alternative measures of sentiment

We argue that consumer sentiment and investor sentiment are highly correlated, and hence, consumer sentiment measures ICSR and CBINDR from consumer surveys can be used as proxy for investor sentiment. Another prominent measure of market sentiment is the investor sentiment measure from the survey constructed by American Association of Individual Investors, which is used as proxy for individual investors' sentiment by Brown and Cliff (2004, 2005). The association asks a random sample of its members where they think the stock market will be in six months: up, down, or the same, and labels these responses as bullish, bearish, or neutral, respectively. We use these responses to calculate the percentage of bullish investors minus percentage of bearish investors (bull-bear spread) which is a common measure of sentiment in the popular press. The measure is subject to criticism as it doesn't follow the same individuals over time and it has a self-selection bias. In addition to that, Qiu and Welch (2004) report that changes in AAII are not correlated with changes in the closed-end fund discount, ICS or CBIND and it seems that it may not be the best proxy for the purposes of our study. Nevertheless, we use this alternative sentiment measure to check the robustness of our earlier findings. We also construct additional sentiment variable AAIIR which is a residual from the regression of AAII on macro variables similar to Eq. (7). Table 13 reports regression coefficients. Both AAII and AAIIR are positively and significantly related with IPO underpricing. In addition to that, coefficient on ANetBuy is positive and significant, consistent with earlier findings. All control variables have similar signs as in Table 4. Overall, these findings are additional evidence consistent with the notion that IPO underpricing is related to market-wide sentiment over and above firm-level sentiment.

We note that another prominent measure of investor sentiment that could be a candidate in studying the relation between IPO underpricing and market sentiment is the one developed by Baker and Wurgler (2006) (see Campbell, Du, Rhee and Tang, 2008). The Baker-Wurgler index of market sentiment uses observable metrics from the stock market. However, IPO related variables play a prominent role in the construction of this index which leads to a mechanical relationship between IPO underpricing and market sentiment. Hence, we do not use this metric as a proxy for investor sentiment.

[Insert Table 12]

5.3. Bubble Period

We have documented thus far that underpricing increases with investor sentiment. However, our sample period includes an incredible bull run as well as a subsequent crash related to the Internet Bubble. Business press and academic literature are unanimous that this period was unusual due to the unique nature of emerging Internet business, unprecedented media hype and widespread presence of retail investors (see Mir and Zaman, 2001; Ofek and Richardson, 2003; and DuCharme, Rajgopal and Sefcik, 2001). Hence, it is possible that our overall results are influenced by this specific time period. We interact the variable *Bubble* (equals one if the IPO occurs between September 1998 and August 2000, and zero otherwise) with market sentiment (*ICSR*) to control for the differential impact of sentiment on the IPO pricing process during this period. In supplementary regressions we find that sentiment (*ICSR*) is positively related with underpricing, with a coefficient of 0.002 and t-statistic of 3.78. This implies that there is a positive relation between underpricing and investor sentiment in the non-bubble period. The interaction term of ICSR and bubble is also positively and significantly associated with underpricing (coefficient=0.028, t-statistic =8.90), which implies that the impact of sentiment on underpricing is stronger in bubble period as expected.

[Insert Table 13]

5.4. Influential Observations

IPO underpricing is notorious for having extreme values. For example, the shares of VA Linux in December 1999 were offered at $30 and closed at $239.25 on the first day of trading for a first day return of 698 % (Loughran and Ritter, 2004). In another example, Globe.com IPO

shares had 900 % first day return (DuCharme, Rajgopal and Sefcik, 2001). Although our sample spans over 5,000 observations it is remotely possible that the empirical results are affected by a small number of influential observations. To identify influential observations we follow Belsley, Kun and Welch (1980) and drop 8 observations with the highest and the smallest distance values. We find that the relation between investor sentiment and IPO underpricing remains positive and significant (coefficient=0.006, t-stat=11.84).

[Insert Table 14]

5.5. Other robustness tests

The abnormal retail trading volume measure is subject to criticism as an indirect measure of sentiment since retail trading volume occurs for various reasons including changes in preferences, disagreement about the valuation, portfolio rebalancing and psychological biases. We rerun all our regressions omitting this firm-level sentiment measure. In unreported regressions, all our results are qualitatively unchanged.[15]

Other studies do not remove fundamental/macro variables from sentiment variables. We rerun all regressions using raw values of ICS and CBIND. In unreported regressions, all our results are qualitatively unchanged.

6. Conclusion

We examine the impact of market wide-sentiment and firm-level sentiment on IPO pricing process. Extant theoretical literature implies that sentiment investors come and leave the market together and, thus, the IPO pricing process is impacted by market-wide sentiment. However, empirical literature, possibly due to data limitations or a lack of an appropriate proxy, has not been able to document this impact of market-wide sentiment on the IPO pricing process. We bridge this gap between theoretical and empirical work and show evidence that the IPO pricing process in influenced by market-wide sentiment as well as firm-level sentiment.

[15] Unreported regressions are available from the authors upon request.

We find that the abnormal trading by small investors is positively related to IPO underpricing consistent with the results in Derrien (2005), Cornelli, Goldreich and Ljungqvist (2006) and Dorn (2009). After controlling for this firm level investor sentiment, the market wide investor sentiment remains positively related with IPO underpricing in statistically significant and economically meaningful way. This relationship is stronger in high sentiment periods. This is the first paper to provide empirical evidence that the pricing of IPOs is influenced by the market-wide sentiment in addition to the firm-level sentiment. Second, we provide the evidence that sentiment impacts IPO pricing process through both behavioral *and* rational channels. Third, we provide further evidence that difficult-to-arbitrage firms are more affected by the sentiment as suggested by Baker and Wurgler (2006). Fourth, we provide the evidence that sentiment impacts the IPO pricing errors. Fifth, we don't find conclusive evidence that IPO valuations are influenced by the sentiment. Sixth, high IPO secondary market valuations do not last as long run returns are negatively related to sentiment. Finally, we add to the sentiment literature by providing another setting in which sentiment plays a prominent role in price formation.

Our results are consistent with the notion that the behavior of investors impacts the price formation in financial markets. More broadly, our findings support a role for investor sentiment in financial markets.

Appendix: Variables Definition

Variable Name	Definition	Data Sources
Panel A: Variables of Interests		
Underpricing	The percentage change in the price between the offer price and the first-day closing price. The first-day closing price is the first recorded closing price available in CRSP if it is within 7 days of the offer date as reported from SDC.	Offer price: SDC; First-day closing price: CRSP
Volatility	The standard deviation of the underpricing for all the IPOs in each month, following Lowry, Officer, and Schwert (2010)	SDC and CRSP
P/Vsales	Price-to-value ratio based on sales, constructed following Purnanadam and Swaminathan (2004)	CRSP and Compustat
P/Vebitda	Price-to-value ratio based on EBITDA, constructed following Purnanandam and Swaminathan (2004)	CRSP and Compustat
Panel B: Sentiment Measures		
ICS	Index of Consumer Sentiment constructed by University of Michigan Survey Research Centre, beginning in 1947 on a quarterly basis (month 2, 5, 8, 11) and changing to monthly basis in 1978.	Michael Lemmon share the data and we update it by Bloomberg
ICSR	Residual sentiment measure obtained by orthogonalizing ICS on a set of macroeconomic variables, following Lemmon and Portniaguina (2006).	Michael Lemmon share the data and we update it by Bloomberg
ICSR _ABVM	Equals to one, if ICSR is above or equal to the median of all ICSR from 1978 to 2009, zero otherwise.	Michael Lemmon share the data and we update it by Bloomberg
ICSR _ABVP66	Equals to one, if ICSR is above or equal to the 66 percentile of all ICSR from 1978 to 2009, zero otherwise.	Michael Lemmon share the data and we update it by Bloomberg
ICSR _BLWP33	Equals to one, if ICSR is below or equal to the 33 percentile of all ICSR from 1978 to 2009, zero otherwise.	Michael Lemmon share the data and we update it by Bloomberg

CBIND	Index of Consumer Confidence constructed by the Conference Board, beginning on a bimonthly basis in 1967 (month 2, 4, 6, 8, 10) and changing to a monthly survey in 1977.	Michael Lemmon share the data and we update it by Bloomberg
CBINDR	Residual sentiment measure obtained by orthogonalizing CBIND on a set of macroeconomic variables, following Lemmon and Portniaguina (2006).	Michael Lemmon share the data and we update it by Bloomberg
CBINDR _ABVM	Equals to one, if CBINDR is above or equal to the median of all CBINDR from 1978 to 2009, zero otherwise.	Michael Lemmon share the data and we update it by Bloomberg
CBINDR _ABVP66	Equals to one, if CBINDR is above or equal to the 66 percentile of all CBINDR from 1978 to 2009, zero otherwise.	Michael Lemmon share the data and we update it by Bloomberg
CBINDR _BLWP33	Equals to one, if CBINDR is below or equal to the 33 percentile of all CBINDR from 1978 to 2009, zero otherwise.	Michael Lemmon share the data and we update it by Bloomberg
NetBuy	Order flow of small investors as the difference between the number of shares in buyer-initiated transactions and number of shares in seller-initiated transactions following Lee and Ready (1991)'s algorithm.	TAQ
ANetBuy	Abnormal order flow of small investors for IPO on the first trading date after the IPO date, calculated following Asthana et al. (2004).	TAQ
ANetBuy_Match	ANetBuy_Match equals to the NetBuy of IPOs by small investors on the first trading date in TAQ minus the NetBuy of matching firm by small investors on the same date	TAQ
ANetBuy_Standardize	ANetBuy_Standardize equals to the netbuy of the IPO firm deflated by the sum of buy and sell orders of the IPO firm.	TAQ
BWrd	The reduced Baker and Wurgler Index, based on the dividend premium, closed-end fund discount and NYSE turnover. These three proxies are first orthogonalized on macroeconomic variables and then the first principal component of the three residuals is constructed as the reduced BW index.	Wurgler's website
Panel C: Macroeconomic Variables (as defined in Lemmon and Portniaguina (2006))		

DIV	Dividend yield is measured as the total cash ordinary dividend of the CRSP value-weighted index over the last three months and divided by the value of the index at the end of the current month, calculated with the CRSP value-weighted returns monthly index with and without dividend, as in Fama and French (1998) and Lemmon and Portniaguina (2006).	CRSP
DEF	Default spread, monthly, is measured as the difference between the yields to maturity on Moody's Baa-rated and Aaa-rated bonds.	Federal Reserve Bank of St. Louis
YLD3	The yield on three-month Treasury bills, monthly.	Federal Reserve Bank of St. Louis
GDP	GDP growth, measured as 100 times the quarterly change in the natural logarithm of chained (2005 dollars) GDP.	Federal Reserve Bank of St. Louis
CONS	Consumption growth, measured as 100 times the quarterly change in the natural logarithm of personal consumption expenditures.	Federal Reserve Bank of St. Louis
LABOR	Labor income growth, measured as 100 times the quarterly change in the natural logarithm of labor income, computed as total personal income minus dividend income, per capita and deflated by the PCE deflator.	Federal Reserve Bank of St. Louis
URATE	Unemployment rate, monthly and seasonally adjusted.	Bureau of Labor Statistics
CPI	The inflation rate from CRSP, monthly (variable CPIRET)	CRSP
CAY	Consumption-to-wealth ratio, from Lettau and Ludvigson (2001).	Martin Lettau or Sydney Ludvigson's website
Panel D: IPO Characteristics		
IPO Proceeds	IPO proceeds amount, in millions.	SDC
Revision	Percentage change from the midpoint of the filing price range to the offer price.	SDC
$Revision^{+}$	Equals to Revision if the Revision is positive, zero otherwise.	SDC

MaxRank	Maximum of all the lead managers' ranks	Ritter's website
MaxRank_BF1990	Equals to MaxRank if the IPO is issued before 1990, zero otherwise.	Ritter's website
HiTech	Equals to one if the IPO firm is in high tech industry, zero otherwise.	SDC
Venture	Equals to one if the IPO firm is backed by venture capitalists, zero otherwise.	SDC
NASDAQ	Equals to one if the IPO is listed on NASDAQ, zero otherwise.	CRSP
Age	Number of years between the founding year and the IPO year, taken from the Field-Ritter database on Ritter's website.	Founding year: Ritter's website; IPO issue year: SDC
ShrOffer	Number of shares offered in the IPO, in millions.	SDC
DecShrOffer	Takes the values from 1 to 10, by ranking ShrOffer into deciles for the IPOs in the same year.	SDC
Sales	The sales of the prior fiscal year before offering.	Compustat
Year	IPO issue year.	SDC
ShrABVM	Equals to one if the number of shares offered in the IPO is above median of the number of shares offered in all IPOs in the sample, zero otherwise.	SDC
ShrABVP66	Equals to one if the number of shares offered in the IPO is above the 66^{th} percentile of the number of shares offered in all IPOs in the sample, zero otherwise.	SDC
AgeBLWM	Equals to one if the IPO firm's age is below the median of all the firms' ages in the sample, zero otherwise.	Founding year: Ritter's website; IPO issue year: SDC
IOBLWM	Equals to one if the IPO firm's institutional holding fraction is below the median of all the firms' fractions in the sample, zero otherwise. Institutional holding fraction is the number of shares held by institutional investors as reported in 13-F filings at the end of the IPO quarter divided by CRSP shares outstanding on the IPO date.	Thomson Reuters, CRSP

SaleBLWM	Equals to one if the IPO firm's sale in the year prior to IPO is below the median of all the firms' sales in the sample, zero otherwise.	Compustat
R&DABVM	Equals to one if the IPO firms R&D expense from Compustat is above the median of all the firms' R&D in the sample, zero otherwise.	Compustat
ProfBLWM	Equals to one if the IPO firm's profitability is below the median of all the firms' profitability, zero otherwise. Profitability is the IPO firm's EBITDA divided by sale in the year prior to IPO from Compustat.	Compustat
Bubble	Equals to one if the IPO occurs between September 1998 and August 2000, zero otherwise.	SDC

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Table 1. Sample Selection

This table describes the sample selection procedure. The initial sample contains all US IPOs from 1981 to 2009 in SDC. Two observations are excluded, which are identified as "non-IPO" based on information in Ritter's correction file, "Corrections to Security Data Company's IPO database". Thirteen observations are excluded, with problematic midpoint of filing price in SDC. Unit offering, closed-end fund, partnership, ADRs and REITs are also excluded from the sample. Utility issuers and finance issuers are excluded because they are probably regulated by the government. IPOs without complete information in the baseline underpricing regression are excluded. The final sample consists of 5198 US IPOs from 1981 to 2009.

Sample Selection Procedure	**Number of Observations**	**Loss in Observations**
All US IPOs from 1981 to 2009 in SDC	11570	
Exclude observations identified as "non-IPO" according to Ritter's correction file	11568	2
Exclude observations with problematic midpoint of filing price in SDC	11555	13
Exclude Unit Offering	10318	1237
Exclude Closed-end Fund	9301	1017
Exclude Partnership	9182	119
Exclude ADRs	9063	119
Exclude REITs	8813	250
Exclude Utility Issuers, with SIC codes 4900-4999	8679	134
Exclude Financial Issuers, with SIC codes 6000-6999	7490	1189
Exclude observations without complete information in the underpricing regression	**5198**	2292

Table 2. Descriptive Statistics

This table presents the descriptive statistics of the variables used in this paper. Column [1] is for the full sample. Column [2] is for the subsample with sentiment measure ICSR above the 66th percentile of the ICSR distribution. Column [3] is for the subsample with sentiment measure ICSR below the 33rd percentile of the ICSR distribution. Column [4] is the result of Wilcoxon rank sum test for the two subsamples. Underpricing is the percentage change in the price between the offer price and the first-day closing price. P/Vsales is the price-to-value ratio based on sales, calculated following section 3.3. P/Vebitda is the price-to-value ratio based on EBITDA, calculated following section 3.3. . ICSR is the market wide sentiment measure from the Index of Consumer Sentiment constructed by the Conference Board, orthogonalized on macroeconomic variables. ANetBuy is the abnormal order flow of small investors for IPO on the first trading date after the IPO date. Revision is the percentage change from the midpoint of the filing range to the offer price. MaxRank is the maximum of all the lead managers' ranks. HiTech equals to one if the IPO firm is in high tech industry, zero otherwise. Venture equals to one if the IPO firm is backed by venture capitalists, zero otherwise. NASDAQ equals to one if the IPO is listed on NASDAQ, zero otherwise. Age is the number of years between the founding year and the IPO year. ShrOffer is the number of shares offered in the IPO, in millions. Sales is the sales for the prior fiscal year before offering from Compustat, in billion. *, ** and *** represents the 10%, 5% and 1% significance level respectively.

	Full Sample		ICSR_ABVP66		ICSR_BLWP33		Wilcoxon Rank Sum Test	
	Mean	Med	Mean	Med	Mean	Med	Diff. in Med	p-value
Underpricing	20.60%	7.71%	27.74%	9.09%	13.71%	6.82%	2.27%***	0.000
P/Vsales	2.887	1.503	2.867	1.474	2.925	1.509	-0.035	0.445
P/Vebitda	3.228	1.453	3.273	1.455	3.259	1.398	0.057	0.907
ICSR	0.437	0.807	7.834	6.582	-8.691	-7.350	13.932***	0.000
ANetBuy	-6.688	-0.631	-0.313	0.779	-13.590	-3.447	4.226***	0.000
Revision	0.89%	0.00%	3.29%	0.00%	-0.88%	0.00%	0.00%***	0.000
MaxRank	7.299	8.000	7.359	8.000	7.292	8.000	0.000	0.277
HiTech	0.396	0.000	0.449	0.000	0.347	0.000	0.000***	0.000
Venture	0.433	0.000	0.428	0.000	0.446	0.000	0.000	0.280
NASDAQ	0.727	1.000	0.727	1.000	0.728	1.000	0.000	0.950
Age	14.911	8.000	13.921	7.000	16.115	9.000	-2.000***	0.000
ShrOffer	4.644	2.750	4.391	2.925	4.859	2.600	0.325*	0.063
Sales	0.188	0.026	0.144	0.022	0.159	0.031	-0.009	0.000
# of Obs	5198	5198	1946	1946	1541	1541		

Table 3. Investor Sentiment and IPO Valuation at the Offer Price

This table presents the results of testing the relationship between valuation at the offer date and investor sentiment. The dependent variables are the price-to-value ratios, calculated following Purnanandam and Swaminathan (2004). P/Vsales is the price-to-value ratio based on sales. P/Vebitda is the price-to-value ratio based on EBITDA. ICSR is the market wide sentiment measure from the Index of Consumer Sentiment constructed by the Conference Board, orthogonalized on macroeconomic variables. ANetBuy is the abnormal order flow of small investors for IPO on the first trading date after the IPO date. MaxRank is the maximum of all the lead managers' ranks. MaxRank_BF1990 equals to MaxRank if the IPO is issued before 1990, zero otherwise. HiTech equals to one if the IPO firm is in high tech industry, zero otherwise. Venture equals to one if the IPO firm is backed by venture capitalists, zero otherwise. NASDAQ equals to one if the IPO is listed on NASDAQ, zero otherwise. Age is the number of years between the founding year and the IPO year. Decshroffer takes the values from 1 to 10, by ranking ShrOffer into deciles for the IPOs in the same year. ShrOffer is the number of shares offered in the IPO, in millions. Sales is the sales for the prior fiscal year before offering from Compustat, in billion. Year is the IPO issue year. *, ** and *** represents the 10%, 5% and 1% significance level respectively. t-statistics are included below the coefficients.

	P/Vsales		P/Vebitda	
	[1]	[2]	[3]	[4]
ICSR	0.018	0.024	0.030*	0.047*
	1.64	1.43	1.87	1.93
ANetBuy		0.000		0.000
		0.02		0.12
MaxRank	0.009	-0.011	-0.025	-0.048
	0.18	-0.16	-0.36	-0.47
MaxRank_BF1990	-0.086**		-0.096*	
	-2.32		-1.89	
HiTech	0.771***	0.975***	1.116***	1.395***
	4.55	4.30	4.50	4.17
Venture	0.555***	0.728***	0.956***	1.091***
	3.34	3.02	3.80	2.96
NASDAQ	0.494***	0.712***	0.717***	1.007***
	3.11	3.30	3.27	3.26
Age	-0.021***	-0.021***	-0.026***	-0.027***
	-7.95	-6.52	-7.47	-7.37
Decshroffer	0.136***	0.145***	0.108**	0.106
	3.55	2.69	2.03	1.34
Sales	-0.173***	-0.140***	-0.165***	-0.127***
	-3.06	-3.07	-2.92	-2.78
Year	0.008	0.001	0.029	0.019
	0.47	0.06	1.25	0.58
Constant	-14.306	-0.858	-55.030	-36.372
	-0.41	-0.02	-1.20	-0.54
Number of Obs	3088	1891	3088	1891
R-Square	0.054	0.062	0.052	0.059

Table 4. Investor Sentiment and Offer Price Revision

This table presents the results of testing the relationship between offer price revision and investor sentiment. The dependent variable is the offer price revision, which is the percentage change from the midpoint of the filing prices to the offer price. ICSR is the market wide sentiment measure from the Index of Consumer Sentiment constructed by University of Michigan Survey Research Centre, orthogonalized on macroeconomic variables. ANetBuy is the abnormal order flow of small investors for IPO on the first trading date after the IPO date. MaxRank is the maximum of all the lead managers' ranks. MaxRank_BF1990 equals to MaxRank if the IPO is issued before 1990, zero otherwise. HiTech equals to one if the IPO firm is in high tech industry, zero otherwise. Venture equals to one if the IPO firm is backed by venture capitalists, zero otherwise. Nasdaq equals to one if the IPO is listed on Nasdaq, zero otherwise. Age is the number of years between the founding year and the IPO year. DecShrOffer takes the values from 1 to 10, by ranking ShrOffer into deciles for the IPOs in the same year. ShrOffer is the number of shares offered in the IPO, in millions. Sales is the sales for the prior fiscal year before offering from Compustat, in billion. Year is the IPO issue year. *, ** and *** represents the 10%, 5% and 1% significance level respectively. t-statistics are included below the coefficients.

	[1]	**[2]**
ICSR	0.001	0.001
	1.54	1.36
ANetBuy		-0.001***
		-4.13
MaxRank	0.011***	0.013***
	6.12	5.06
MaxRank_BF1990	-0.010***	
	-6.56	
HiTech	0.076***	0.094***
	10.79	10.53
Venture	0.003	0.017*
	0.44	1.89
Nasdaq	0.002	-0.011
	0.30	-1.02
Age	-0.001***	-0.001***

	-6.21	-5.52
DecShrOffer	0.003**	0.002
	2.14	1.12
Sales	0.001	0.002
	0.51	1.21
Year	-0.001*	-0.002*
	-1.87	-1.84
Constant	2.773*	3.741*
	1.81	1.78
Number of Obs	5037	3462
R-Square	0.06	0.07

Table 5. Investor sentiment and IPO underpricing

This table presents the result of testing the asymmetric effects of investor sentiment on IPO underpricing. The dependent variable is underpricing, which is the percentage change in the price between the offer price and the first-day closing price. ICSR is the market wide sentiment measure from the Index of Consumer Sentiment constructed by the Conference Board, orthogonalized on macroeconomic variables. ICSR_ABVP66 equals to one if ICSR is above the 66th percentile of the ICSR distribution. ICSR_BLWP33 equals to one if ICSR is below the 33rd percentile of the ICSR distribution. ANetBuy is the abnormal order flow of small investors for IPO on the first trading date after the IPO date. Revision is the percentage change from the midpoint of the filing range to the offer price. $Revision^{+}$ equals to one if the Revision is positive, zero otherwise. MaxRank is the maximum of all the lead managers' ranks. MaxRank_BF1990 equals to MaxRank if the IPO is issued before 1990, zero otherwise. HiTech equals to one if the IPO firm is in high tech industry, zero otherwise. Venture equals to one if the IPO firm is backed by venture capitalists, zero otherwise. NASDAQ equals to one if the IPO is listed on NASDAQ, zero otherwise. Age is the number of years between the founding year and the IPO year. Decshroffer takes the values from 1 to 10, by ranking ShrOffer into deciles for the IPOs in the same year. ShrOffer is the number of shares offered in the IPO, in millions. Sales is the sales for the prior fiscal year before offering from Compustat, in billion. Year is the IPO issue year. *, ** and *** represents the 10%, 5% and 1% significance level respectively. t-statistics are included below the coefficients.

	[1]	[2]
ICSR	0.005***	0.004***
	5.16	2.71
ICSR*ICSR_ABVM	0.005**	0.006*
	2.46	1.76
ANetBuy		0.002***
		7.07
Revision	0.247***	0.330***
	3.86	4.09
$Revision^{+}$	1.086***	1.059***
	5.26	4.44
MaxRank	0.006*	0.015***
	1.65	3.21
MaxRank_BF1990	-0.013***	
	-6.34	
HiTech	0.065***	0.075***
	5.53	4.54
Venture	0.027**	0.033**
	2.54	2.16
NASDAQ	0.020**	0.036**
	2.19	2.46
Age	-0.001***	-0.001***
	-4.59	-3.81
Decshroffer	-0.008***	-0.010***
	-3.58	-3.03
Sales	-0.004**	-0.005**
	-2.13	-2.46

Year	0.002***	-0.002
	2.91	-1.60
Constant	-4.447***	3.596
	-2.87	1.61
Number of Obs	5198	3476
Adjusted R-Square	0.407	0.427

Table 6. Alternative Definition of Abnormal Order Flow

This table summarizes the result of using alternative definition of abnormal order flow. Column [1] uses matching-firm approach, in which ANetBuy_Match equals to the netbuy of IPOs by small investors on the first trading date in TAQ minus the netbuy of matching firm by small investors on the same date. The matching firms are found following Purnanadan and Swaminathan (2004), as those in Table 3. In column [2], netbuy is standardized to represent the firm-specific investor sentiment on the IPO firms. ANetBuy_Standardize equals to the netbuy of the IPO firm deflated by the sum of buy and sell orders of the IPO firm. The dependent variable is underpricing, which is the percentage change in the price between the offer price and the first-day closing price. ICSR is the market wide sentiment measure from the Index of Consumer Sentiment constructed by University of Michigan Survey Research Centre, orthogonalized on macroeconomic variables. Revision^{+} equals to one if the Revision is positive, zero otherwise. MaxRank is the maximum of all the lead managers' ranks. MaxRank_BF1990 equals to MaxRank if the IPO is issued before 1990, zero otherwise. HiTech equals to one if the IPO firm is in high tech industry, zero otherwise. Venture equals to one if the IPO firm is backed by venture capitalists, zero otherwise. Nasdaq equals to one if the IPO is listed on Nasdaq, zero otherwise. Age is the number of years between the founding year and the IPO year. DecShrOffer takes the values from 1 to 10, by ranking ShrOffer into deciles for the IPOs in the same year. ShrOffer is the number of shares offered in the IPO, in millions. Sales is the sales for the prior fiscal year before offering from Compustat, in billion. Year is the IPO issue year. *, ** and *** represents the 10%, 5% and 1% significance level respectively. t-statistics are included below the coefficients.

	[1] Matching-Firm Approach	**[2] ANetBuy Standardization**
ICSR	0.003***	0.007***
	3.07	8.22
ANetBuy_Match	0.0001***	
	2.91	
ANetBuy_Standardize		0.123***
		9.66
Revision	0.253***	0.319***
	5.00	3.90
Revision^{+}	0.923***	1.077***
	4.91	4.49
MaxRank	-0.0003	0.017***
	-0.05	3.64

HiTech	0.062***	0.072***
	3.90	4.42
Venture	0.014	0.032**
	0.80	2.08
NASDAQ	0.030*	0.040***
	1.93	2.72
Age	-0.0003	-0.0008***
	-1.58	-3.67
Decshroffer	-0.005	-0.011***
	-1.26	-3.25
Sales	-0.004*	-0.005**
	-1.86	-2.38
Year	0.002	-0.0001
	1.40	-0.08
Constant	-3.838	0.180
	-1.36	0.08
Number of Obs	1055	3474
Adjusted R-Square	0.380	0.423

Table 7. Controlling for Future Corporate Profits and Consumer Spending

This table presents the result of testing the relationship between IPO underpricing and investor sentiment, based on alternative approaches of ICS decomposition. The dependent variable is underpricing, which is the percentage change in the price between the offer price and the first-day closing price. ICSR is the market wide sentiment measure from the Index of Consumer Sentiment constructed by University of Michigan Survey Research Centre, orthogonalized on macroeconomic variables. ICS_R and ICS_P are the residual and the predicted value accordingly from regressing ICS on future corporate profits and consumer spending from Bureau of Economic Analysis, following Qiu and Welch (2004). ICSR is the residual from regressing ICS on macro variables as those in Lemmon and Portniaguina (2006). ICSR_R and ICSR_P are the residual and the predicted value accordingly from regressing ICSR on future corporate profits and consumer spending following Qiu and Welch (2004). ANetBuy is the abnormal order flow of small investors for IPO on the first trading date after the IPO date. Revision is the percentage change from the midpoint of the filing range to the offer price. $Revision^{+}$ equals to one if the Revision is positive, zero otherwise. MaxRank is the maximum of all the lead managers' ranks. MaxRank_BF1990 equals to MaxRank if the IPO is issued before 1990, zero otherwise. HiTech equals to one if the IPO firm is in high tech industry, zero otherwise. Venture equals to one if the IPO firm is backed by venture capitalists, zero otherwise. Nasdaq equals to one if the IPO is listed on Nasdaq, zero otherwise. Age is the number of years between the founding year and the IPO year. DecShrOffer takes the values from 1 to 10, by ranking ShrOffer into deciles for the IPOs in the same year. ShrOffer is the number of shares offered in the IPO, in millions. Sales is the sales for the prior fiscal year before offering from Compustat, in billion. Year is the IPO issue year. *, ** and *** represents the 10%, 5% and 1% significance level respectively. t-statistics are included below the coefficients.

	[1]	**[2]**
ICSR_R	0.005***	
	5.32	
ICSR_P		0.042***
		10.67
ANetBuy	0.002***	0.002***
	7.42	6.75
Revision	0.333***	0.329***
	4.09	4.07
$Revision^{+}$	1.072***	1.048***
	4.48	4.42
MaxRank	0.016***	0.013***

	3.41	2.78
HiTech	0.079***	0.069***
	4.79	4.29
Venture	0.034**	0.026*
	2.24	1.72
Nasdaq	0.037**	0.037**
	2.56	2.57
Age	-0.001***	-0.001***
	-3.96	-3.11
DecShrOffer	-0.010***	-0.009***
	-3.04	-2.85
Sales	-0.005**	-0.007**
	-2.52	-2.57
Year	-0.003**	0.015***
	-2.25	8.19
Constant	5.280**	-30.370***
	2.27	-8.18
Number of Obs	3476	3476
Adjusted R-Square	0.424	0.436

Table 8. Investor Sentiment and Long Run Risk Adjusted Returns

This table shows the result of examining the relationship between investor sentiment and long-run risk adjusted returns. We estimate ordinary least square (OLS) regressions with market-adjusted long run returns as the dependent variable. Column [1], [2], [3] and [4] are for the long-run risk adjusted returns during 2 months, 3 months, 6 months and 12 months period. ICSR is the market wide sentiment measure from the Index of Consumer Sentiment constructed by the Conference Board, orthogonalized on macroeconomic variables. ANetBuy is the abnormal order flow of small investors for IPO on the first trading date after the IPO date. MaxRank is the maximum of all the lead managers' ranks. HiTech equals to one if the IPO firm is in high tech industry, zero otherwise. Venture equals to one if the IPO firm is backed by venture capitalists, zero otherwise. Year is the IPO issue year. *, ** and *** represents the 10%, 5% and 1% significance level respectively. t-statistics are included below the coefficients.

	[1]	**[2]**	**[3]**	**[4]**
Panel A				
	2 months	**3 months**	**6 months**	**12 months**
ICSR	-0.002***	-0.002***	-0.002*	-0.003**
	-2.94	-2.64	-1.88	-1.97
Constant	0.025***	0.042***	0.025***	-0.028**
	5.58	6.8	2.75	-2.36
Number of Obs	5197	5197	5197	5197
Adjusted R-Square	0.001	0.001	0.001	0.001
Panel B				
	2 months	**3 months**	**6 months**	**12 months**
ICSR	-0.002***	-0.002***	-0.002*	-0.003*
	-2.89	-2.6	-1.86	-1.96
MaxRank	0.011***	0.015***	0.015***	0.022***
	6.03	5.74	3.66	3.71
Venture	0.027***	0.029**	0.008	-0.001
	2.91	2.22	0.4	-0.06
Constant	-0.066***	-0.082***	-0.088***	-0.189***
	-4.83	-4.06	-2.74	-4.13
Number of Obs	5197	5197	5197	5197
Adjusted R-Square	0.010	0.008	0.003	0.004

Panel C

	2 months	3 months	6 months	12 months
ICSR	-0.003***	-0.003***	-0.004**	-0.005**
	-2.87	-2.81	-2.2	-1.99
ANetBuy	-0.000**	0.000	0.000	-0.001
	-2.3	-0.50	-0.10	-1.31
MaxRank	0.015***	0.021***	0.024***	0.036***
	6.49	5.64	4.38	5.16
Venture	0.042***	0.043**	0.026	0.005
	3.37	2.43	1.04	0.15
Constant	-0.097***	-0.114***	-0.155***	-0.299***
	-5.37	-3.97	-3.66	-5.69
Number of Obs	3476	3476	3476	3476
Adjusted R-Square	0.015	0.011	0.006	0.007

Table 9. IPO Characteristics and the Impact of Investor Sentiment on Underpricing: Subsample Analysis

This table summarizes the subsample analysis. Panel A is for hitech and non-hitech subsamples, based on whether the IPO firms is in hitech industry or not. Panel B is for subsamples based on firm age, which is the number of years between the founding year and the IPO year. Panel C is for subsamples based on institutional holding fraction, which is the number of shares held by institutional investors as reported in 13-F file at the end of the IPO quarter divided by CRSP shares outstanding on the IPO date. Panel D is for subsamples based on firm size, which is the IPO firm's sales in the prior fiscal year before IPO from Compustat. Panel E is for subsamples based on research and development expenses (R&D) from Compustat. Panel F is for subsamples based on profitability, which is the IPO firm's EBITDA divided by sales in the prior fiscal year before IPO from Compustat. Column [1] is for IPO firms with characteristics more prone to sentiment. Column [2] is for IPO firms with characteristics less prone to sentiment. Column [3] is for their differences. The dependent variable is underpricing, which is the percentage change in the price between the offer price and the first-day closing price. ANetBuy is the abnormal order flow of small investors for IPO on the first trading date after the IPO date. Revision is the percentage change from the midpoint of the filing range to the offer price. $Revision^{+}$ equals to one if the Revision is positive, zero otherwise. MaxRank is the maximum of all the lead managers' ranks. MaxRank_BF1990 equals to MaxRank if the IPO is issued before 1990, zero otherwise. HiTech equals to one if the IPO firm is in high tech industry, zero otherwise. Venture equals to one if the IPO firm is backed by venture capitalists, zero otherwise. NASDAQ equals to one if the IPO is listed on NASDAQ, zero otherwise. Age is the number of years between the founding year and the IPO year. Decshroffer takes the values from 1 to 10, by ranking ShrOffer into deciles for the IPOs in the same year. ShrOffer is the number of shares offered in the IPO, in millions. Sales is the sales for the prior fiscal year before offering from Compustat, in billion. Year is the IPO issue year. We omit control variables for brevity. *, ** and *** represents the 10%, 5% and 1% significance level respectively.

Panel A: HiTech

	[1] HiTech		[2] Non-HiTech		[3] Difference	
	Coef	**t-stat**	**Coef**	**t-stat**	**Diff.**	**t-stat**
ICSR	0.009***	5.78	0.003***	3.47	0.006***	3.21
ANetBuy	0.004***	7.38	0.001**	2.48	0.003***	4.94

Panel B: Firm Age

	[1] Young		[2] Old		[3] Difference	
	Coef	**t-stat**	**Coef**	**t-stat**	**Diff.**	**t-stat**
ICSR	0.008***	5.70	0.004***	4.32	0.004	1.62
ANetBuy	0.003***	7.56	0.000	1.12	0.003***	5.82

Panel C: Institutional Holding Fraction

	[1] Low IO		[2] High IO		[3] Difference	
	Coef	**t-stat**	**Coef**	**t-stat**	**Diff.**	**t-stat**
ICSR	0.008***	4.26	0.004***	5.19	0.004	1.49
ANetBuy	0.003***	5.52	0.001***	3.48	0.002***	2.64

Panel D: Firm Size Based on Sales

	[1] Small		[2] Large		[3] Difference	
	Coef	**t-stat**	**Coef**	**t-stat**	**Diff.**	**t-stat**
ICSR	0.006***	3.72	0.005***	5.55	0.001	0.50
ANetBuy	0.003***	5.68	0.001***	2.96	0.002***	4.06

Panel E: R&D

	[1] High R&D		[2] Low R&D		[3] Difference	
	Coef	**t-stat**	**Coef**	**t-stat**	**Diff.**	**t-stat**
ICSR	0.008***	6.35	0.003***	3.10	0.005***	3.43
ANetBuy	0.004***	7.99	0.000	1.49	0.004***	7.22

Panel F: Profitability

	[1] Low Prof.		[2] High Prof.		[3] Difference	
	Coef	**t-stat**	**Coef**	**t-stat**	**Diff.**	**t-stat**
ICSR	0.006***	4.42	0.004***	3.77	0.002	1.21
ANetBuy	0.003***	6.48	0.000	0.75	0.003***	5.37

Table 10. Monthly Regression

This table presents the result for the monthly regression, by regressing monthly mean underpricing on monthly sentiment measures and mean control variables. Column [1] and [2] include all observations. Column [3] and [4] use the number of IPOs within one month as the weight in the regression (aweight option in STATA). Column [5] and [6] drop months with fewer than 2 IPOs. The dependent variable is volatility, which is the standard deviation of the underprcing for all the IPOs in each month. ICSR is the market wide sentiment measure from the Index of Consumer Sentiment constructed by the Conference Board, orthogonalized on macroeconomic variables. Mean ANetBuy is the mean of the abnormal order flow of small investors on the first trading date after the IPO date for all IPOs within one month. Predicted Mean ANetBuy is the predicted value by regressing mean ANetBuy on ICSR. Residual Mean ANetBuy is the residual by regressing mean ANetBuy on ICSR. Mean Revision is the mean of the percentage change from the midpoint of the filing range to the offer price. Mean Revision^{+} equals to Mean Revision if the Mean Revision is positive, zero otherwise. Mean MaxRank is mean of MaxRank of all IPOs within one month. MaxRank is the maximum of all the lead managers' ranks. Mean HiTech is the fraction of HiTech IPOs in all IPOs within one month. Mean Venture is the fraction of IPOs backed by venture capitalists in all IPOs within one month. Mean NASDAQ is the fraction of IPOs listed on NASDAQ within one month. Mean Age is the mean of the number of years between the founding year and the IPO year of all IPOs within one month. Mean Decshroffer is the mean of the shares offered in the IPOs ranked into deciles for all IPOs within one month, in millions. Mean Sales is the mean of sales for the prior fiscal year from Compustat for all IPOs within one month. *, ** and *** represents the 10%, 5% and 1% significance level respectively. t-statistics are included below the coefficients.

	[1]	[2]	[3]	[4]	[5]	[6]
			Aweight		Drop	
ICSR	0.002**		0.003***		0.003***	
	2.47		4.85		3.84	
Predicted Mean NETBUY		0.008**		0.004*		0.006***
		2.10		1.70		2.67
Residual Mean NETBUY		0.008***		0.005***		0.006**
		3.40		3.97		2.40
Mean Revision	-0.203	0.004	-0.342***	-0.084	-0.345**	-0.186
	-1.55	0.02	-2.93	-0.39	-2.58	-0.72
Mean Revision^{+}	2.350***	1.876***	2.491***	1.981***	2.561***	2.154***
	7.49	3.84	10.45	5.22	9.17	4.27
Mean MaxRank	-0.013	-0.054*	-0.001	-0.026	-0.010	-0.056
	-1.42	-1.66	-0.09	-1.25	-1.03	-1.41
Mean HiTech	0.000	-0.010	0.186***	0.184**	0.177***	0.225**
	0.00	-0.05	3.77	2.53	2.93	2.35
Mean Venture	0.088	0.191*	0.067	0.172**	0.063	0.212**
	1.59	1.74	1.38	2.33	1.41	2.34
Mean NASDAQ	0.108***	0.250***	0.076**	0.203***	0.043	0.042
	2.99	2.86	2.04	2.65	1.03	0.43

Mean Age	-0.003**	-0.003	-0.002*	-0.002	-0.002	-0.003
	-2.35	-1.65	-1.78	-1.23	-1.35	-1.30
Mean Decshroffer	-0.006	0.031	-0.003	0.018	-0.011	0.005
	-0.60	1.33	-0.44	1.60	-1.47	0.44
Mean Sales	0.087**	0.054	0.065*	0.055	0.081	0.064
	2.03	1.15	1.74	1.63	1.63	1.31
Constant	0.050	0.119	-0.112*	-0.107	0.016	0.282
	0.79	0.60	-1.71	-0.68	0.20	0.86
Number of Obs	324	170	324	170	285	158
R-Square	0.541	0.614	0.793	0.833	0.655	0.706

Table 11. Cluster Analysis

This table presents the result of cluster analysis by month. The dependent variable is underpricing, which is the percentage change in the price between the offer price and the first-day closing price. BWrd is the reduced Baker and Wurgler Index, based on the dividend premium, closed-end fund discount and NYSE turnover. These three proxies are first orthogonalized on macroeconomic variables and then the first principal component of the three residuals is constructed as the reduced BW index. ANetBuy is the abnormal order flow of small investors for IPO on the first trading date after the IPO date. Revision is the percentage change from the midpoint of the filing range to the offer price. Revision+ equals to one if the Revision is positive, zero otherwise. MaxRank is the maximum of all the lead managers' ranks. MaxRank_BF1990 equals to MaxRank if the IPO is issued before 1990, zero otherwise. HiTech equals to one if the IPO firm is in high tech industry, zero otherwise. Venture equals to one if the IPO firm is backed by venture capitalists, zero otherwise. NASDAQ equals to one if the IPO is listed on NASDAQ, zero otherwise. Age is the number of years between the founding year and the IPO year. Decshroffer takes the values from 1 to 10, by ranking ShrOffer into deciles for the IPOs in the same year. ShrOffer is the number of shares offered in the IPO, in millions. Sales is the sales for the prior fiscal year before offering from Compustat, in billion. Year is the IPO issue year. *, ** and *** represents the 10%, 5% and 1% significance level respectively.

	[1]		**[2]**	
	Coef.	**t-stat**	**Coef.**	**t-stat**
ICSR	0.007***	6.98	0.006***	5.04
ANetBuy			0.002***	4.07
Revision	0.248***	3.65	0.332***	3.88
$Revision^{+}$	1.089***	5.06	1.062***	4.42
MaxRank	0.006	1.64	0.016***	3.12
MaxRank_BF1990	-0.012***	-4.39	0	.
HiTech	0.066***	4.82	0.076***	4.09
Venture	0.028**	2.28	0.033*	1.92
NASDAQ	0.020**	2.19	0.037**	2.54
Age	-0.001***	-3.87	-0.001***	-3.34
Decshroffer	-0.008***	-3.60	-0.010***	-3.05
Sales	-0.004**	-2.24	-0.005***	-2.63
Year	0.002*	1.88	-0.001	-0.65
Constant	-4.398*	-1.84	2.378	0.66
Number of Obs	5198		3476	
R-Square	0.406		0.427	

Table 12. AAII Measure

This table summarizes the result of using alternative sentiment measure ---- the bull-bear spread of the survey conducted by American Association of Individual Investors, used as investor sentiment measure in Brown and Cliff (2004, 2005). The dependent variable is underpricing, which is the percentage change in the price between the offer price and the first-day closing price. AAIIR is the residual from regressing AAII on macro variables as those in Lemmon and Portniaguina (2006). AAIIR_R and AAIIR_P are the residual and the predicted value accordingly from regressing AAIIR on future corporate profits and consumer spending from Bureau of Economic Analysis, following Qiu and Welch (2004). ANetBuy is the abnormal order flow of small investors for IPO on the first trading date after the IPO date. Revision is the percentage change from the midpoint of the filing range to the offer price. $Revision^{+}$ equals to one if the Revision is positive, zero otherwise. MaxRank is the maximum of all the lead managers' ranks. MaxRank_BF1990 equals to MaxRank if the IPO is issued before 1990, zero otherwise. HiTech equals to one if the IPO firm is in high tech industry, zero otherwise. Venture equals to one if the IPO firm is backed by venture capitalists, zero otherwise. Nasdaq equals to one if the IPO is listed on Nasdaq, zero otherwise. Age is the number of years between the founding year and the IPO year. DecShrOffer takes the values from 1 to 10, by ranking ShrOffer into deciles for the IPOs in the same year. ShrOffer is the number of shares offered in the IPO, in millions. Sales is the sales for the prior fiscal year before offering from Compustat, in billion. Year is the IPO issue year. *, ** and *** represents the 10%, 5% and 1% significance level respectively. t-statistics are included below the coefficients.

	[1]	**[2]**
AAII	0.186***	
	4.44	
AAIIR		0.081*
		1.89
ANetBuy	0.002***	0.002***
	7.75	7.85
Revision	0.312***	0.324***
	3.89	4.01
$Revision^{+}$	1.094***	1.092***
	4.62	4.58
MaxRank	0.017***	0.017***
	3.5	3.47
HiTech	0.081***	0.083***

	4.95	5.01
Venture	0.033**	0.033**
	2.16	2.17
Nasdaq	0.038***	0.039***
	2.58	2.65
Age	-0.001***	-0.001***
	-3.77	-3.92
DecShrOffer	-0.010***	-0.010***
	-3.02	-2.94
Sales	-0.005***	-0.005***
	-2.65	-2.60
Year	-0.001	0.000
	-0.74	0.20
Constant	1.745	-0.441
	0.74	-0.19
Number of Obs	3476	3476
Adjusted R-Square	0.424	0.421

Table 13. Bubble Period

This table presents the result of the impact of investor sentiment on underpricing in bubble period. The dependent variable is underpricing, which is the percentage change in the price between the offer price and the first-day closing price. ICSR is the market wide sentiment measure from the Index of Consumer Sentiment constructed by the Conference Board, orthogonalized on macroeconomic variables. ANetBuy is the abnormal order flow of small investors for IPO on the first trading date after the IPO date. Bubble equals to one if the IPO occurs between September 1998 and August 2000, zero otherwise. ICSR*Bubble is the product of ICSR and Bubble. ANetBuy*Bubble is the product of ANetBuy and Bubble. Revision is the percentage change from the midpoint of the filing range to the offer price. $Revision^{+}$ equals to one if the Revision is positive, zero otherwise. MaxRank is the maximum of all the lead managers' ranks. MaxRank_BF1990 equals to MaxRank if the IPO is issued before 1990, zero otherwise. HiTech equals to one if the IPO firm is in high tech industry, zero otherwise. Venture equals to one if the IPO firm is backed by venture capitalists, zero otherwise. NASDAQ equals to one if the IPO is listed on NASDAQ, zero otherwise. Age is the number of years between the founding year and the IPO year. Decshroffer takes the values from 1 to 10, by ranking ShrOffer into deciles for the IPOs in the same year. ShrOffer is the number of shares offered in the IPO, in millions. Sales is the sales for the prior fiscal year before offering from Compustat, in billion. Year is the IPO issue year. *, ** and *** represents the 10%, 5% and 1% significance level respectively.

	[1]		[2]	
	Coef.	**t-stat**	**Coef.**	**t-stat**
ICSR	0.002***	3.78	0.001*	1.74
ICSR*Bubble	0.028***	8.90	0.020***	6.33
ANetBuy			0.000***	2.83
ANetBuy*Bubble			0.011***	8.63
Revision	0.256***	4.04	0.277***	3.61
$Revision^{+}$	1.009***	4.94	1.026***	4.44
MaxRank	0.000	0.17	0.013***	2.82
HiTech	0.054***	4.68	0.058***	3.77
Venture	0.021**	2.02	0.017	1.22
NASDAQ	0.016*	1.77	0.016	1.16
Age	-0.001***	-3.79	-0.001***	-2.90
Decshroffer	-0.007***	-3.25	-0.011***	-3.39
Sales	-0.004**	-2.08	-0.007**	-2.06
Year	0.003***	6.16	0.000	-0.29
Constant	-6.046***	-6.07	0.618	0.31
Number of Obs	5198		3476	
R-Square	0.425		0.475	

Table 14. Influential Observations

This table presents the results after dropping 4 largest and 4 smallest influential observations following Belsley, Kuh and Welch (1980). The dependent variable is underpricing, which is the percentage change in the price between the offer price and the first-day closing price. ICSR is the market wide sentiment measure from the Index of Consumer Sentiment constructed by the Conference Board, orthogonalized on macroeconomic variables. ANetBuy is the abnormal order flow of small investors for IPO on the first trading date after the IPO date. Bubble equals to one if the IPO occurs between September 1998 and August 2000, zero otherwise. ICSR*Bubble is the product of ICSR and Bubble. ANetBuy*Bubble is the product of ANetBuy and Bubble. Revision is the percentage change from the midpoint of the filing range to the offer price. $Revision^{+}$ equals to one if the Revision is positive, zero otherwise. MaxRank is the maximum of all the lead managers' ranks. MaxRank_BF1990 equals to MaxRank if the IPO is issued before 1990, zero otherwise. HiTech equals to one if the IPO firm is in high tech industry, zero otherwise. Venture equals to one if the IPO firm is backed by venture capitalists, zero otherwise. NASDAQ equals to one if the IPO is listed on NASDAQ, zero otherwise. Age is the number of years between the founding year and the IPO year. Decshroffer takes the values from 1 to 10, by ranking ShrOffer into deciles for the IPOs in the same year. ShrOffer is the number of shares offered in the IPO, in millions. Sales is the sales for the prior fiscal year before offering from Compustat, in billion. Year is the IPO issue year. *, ** and *** represents the 10%, 5% and 1% significance level respectively.

	[1]		**[2]**	
	Coef.	**t-stat**	**Coef.**	**t-stat**
ICSR	0.006***	11.84	0.006***	7.991
ANetBuy			0.002***	7.02
Revision	0.165***	4.19	0.250***	4.92
$Revision^{+}$	1.371***	12.17	1.281***	10.37
MaxRank	0.002	0.94	0.009***	2.62
MaxRank_BF1990	-0.010***	-6.78		
HiTech	0.054***	5.73	0.065***	5.04
Venture	0.020**	2.02	0.030**	2.23
NASDAQ	0.016**	2.02	0.029**	2.31
Age	-0.001***	-4.55	-0.001***	-3.59
Decshroffer	-0.008***	-3.85	-0.008***	-2.72
Sales	-0.004**	-2.17	-0.006***	-2.64
Year	0.003***	3.78	-0.001	-0.68
Constant	-5.166***	-3.72	1.510	0.71
Number of Obs	5190		3468	
R-Square	0.445		0.466	