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Market Sentiment, IPO Underpricing, and Valuation

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Abstract

We examine IPO underpricing, valuation, and wealth allocation in relation to investor sentiment, information asymmetry, and underwriter reputation. We find that underpricing is significantly higher for overvalued IPOs than for undervalued IPOs, and is positively correlated to investor sentiment. Information asymmetry is also positively correlated to the magnitude of underpricing but only for undervalued IPOs. We find no evidence of systematic over or undervaluation of IPOs based on peer firm accounting ratios. Change in market sentiment and information asymmetry is positively correlated to overvalued IPOs but not for undervalued. Better underwriter reputation leads to higher IPO valuation for all IPOs. Further, roughly 70% of the wealth from overvaluing IPOs is retained by the issuers. For overvalued IPOs with positive first day returns, we find the proportion of total overvaluation that occurs in the after market trading, i.e., wealth allocated to IPO subscribers, is negatively correlated to underwriter reputation. We conclude underwriters selectively overvalue some IPOs after observing investor sentiment and take advantage of their information to maximize the benefit for issuers and indirectly themselves.

Keywords

IPO, underpricing, valuation, sentiment, underwriter reputation, information asymmetry

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Abstract

We examine IPO underpricing, valuation, and wealth allocation in relation to investor sentiment, information asymmetry, and underwriter reputation. We find that underpricing is significantly higher for overvalued IPOs than for undervalued IPOs, and is positively correlated to investor sentiment. Information asymmetry is also positively correlated to the magnitude of underpricing but only for undervalued IPOs. We find no evidence of systematic over or undervaluation of IPOs based on peer firm accounting ratios. Change in market sentiment and information asymmetry is positively correlated to overvalued IPOs but not for undervalued. Better underwriter reputation leads to higher IPO valuation for all IPOs. Further, roughly 70% of the wealth from overvaluing IPOs is retained by the issuers. For overvalued IPOs with positive first day returns, we find the proportion of total overvaluation that occurs in the after market trading, i.e., wealth allocated to IPO subscribers, is negatively correlated to underwriter reputation. We conclude underwriters selectively overvalue some IPOs after observing investor sentiment and take advantage of their information to maximize the benefit for issuers and indirectly themselves.

1. Introduction

The dominance of positive first day returns for IPOs has puzzled finance academics for decades. A large body of finance literature have proposed various models and hypotheses to explain this so called "underpricing puzzle." However, empirical studies have documented mixed results for most of the models and hypotheses. This study examines how investor sentiment, information asymmetry, and underwriter quality affect IPO underpricing, valuation, and wealth allocation in the context of the offer price relative to the firm's intrinsic value. This paper contributes to the IPO literature in several important ways.

First, we directly test how investor sentiment affects the magnitude of underpricing by adopting a sentiment index developed in Baker and Wurgler (2006, 2007). Aggarwal and Rivoli (1990) test the "fads" hypothesis and conclude that IPOs are subject to overvaluation or fads in early aftermarket trading, but they do not use a measure of sentiment. Using close-end discount as a measure of investor sentiment, Lee, Shleifer, and Thaler (1991) and Lowry (2003) find that "hot issue" periods coincide with low discounts on closed-end funds. However, they do not test whether investor sentiment leads to a higher first day return.

Second, we examine the role of information asymmetry and underwriter reputation in IPO valuation and underpricing. Previous literature examines how information asymmetry and underwriter reputation affect the magnitude of underpricing but no study has investigated whether and how these two factors affect IPO valuation.

Third, Baker and Wurgler (2006) argue that investor sentiment is a more significant factor in the determination of valuation when information asymmetry is higher.

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We provide the empirical evidence of how sentiment interacts with information asymmetry.

Fourth, we provide empirical evidence on whether underwriters expropriate sentiment investors to better serve their clientele, the issuer, consistent with maximizing their own benefit.

We find that the level and change in investor sentiment prior to the offering are significantly positively correlated to the magnitude of underpricing. The explanatory power of the level of sentiment is even higher when information asymmetry is higher, which lends strong support to the conjecture by Baker and Wurgler (2006). Inconsistent with the information asymmetry based models on underpricing, we find that information asymmetry is not in general correlated to the magnitude of underpricing. However, it is significantly positively correlated to the first day returns for undervalued IPOs.

Regarding the valuation of IPOs at offer prices, we find that underwriters do not systematically under or overvalue IPOs relative to intrinsic value based on peer non-IPO firms. For our sample of over 2,100 IPOs from 1970 to 2004, about 50% are over-valued. Change in sentiment and information asymmetry is positively correlated to IPO valuation, but only for IPOs that are overvalued. However, better underwriter reputation leads to higher IPO valuation for all samples.

We also find the issuer retains approximately 70% of the wealth from overvaluation. Using a sub-sample of IPOs that are overvalued with positive first day returns, we examine the wealth allocation of the total overvaluation. We find that the proportion of total overvaluation that occurs in the after market trading, wealth allocated to IPO subscribers, is negatively correlated to underwriter reputation.

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Our findings suggest underwriters do expropriate sentiment investors to better serve their institutional clientele, the issuer, and to maximize their own benefit. Underwriters overvalue IPOs more when observing positive momentum in investor sentiment by setting the IPO offer prices closer to the maximum acceptable market prices in the presence of sentiment investors. Such a strategy would maximize their clientele's interests as well as their own.

The rest of the paper is organized as follows. In Section 2, we review related literature. Described in Section 3 are data, selection criterion, and methodology. We present major empirical findings in Section 4 and Section 5 concludes the paper.

2.   Literature Review

This paper is related to the literature of measuring investor sentiment and how such sentiment affects the cross section of stock returns. Traditionally, a few variables, such as close-end fund discount, have been used to capture investor sentiment. A positive correlation between the level of sentiment and cross section of stock returns has been documented; however, the quality of those sentiment measures has been questioned from time to time. It is argued that those variables may indeed reflect investor sentiment by some degree but the correlation between these variables and stock return maybe reflecting relationships between returns and some macroeconomic factor that is captured by the sentiment proxy variable. Baker and Wurgler (2006, 2007) construct a sentiment index based on six proxies for market sentiment orthoganized against a set of macroeconomic variables. They find that the sentiment index is significantly positively correlated to stock returns. In this paper, we used the sentiment index from Baker and

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Wurgler (2006, 2007) to examine whether the IPO first day return and underwriter's IPO valuation are positively correlated to investor sentiment.

This paper is also highly related to the large body of finance literature on IPO underpricing, especially those IPO papers relating underpricing to investor sentiment, information asymmetry, and underwriter reputation.

Investor sentiment has long been suspected of playing a role in the IPO underpricing puzzle. We provide this evidence. Aggarwal and Rivoli (1990) argue that IPOs are subject to overvaluation or fads in early aftermarket trading. Derrien (2005) show that large individual investors' demand, as a proxy for investor sentiment, leads to high IPO prices, large initial returns, and poor long-run performance. Lee, Shleifer, and Thaler (1991) and Lowry (2003) find that "hot issue" periods coincide with low discounts on closed-end funds. Ljungqvist, Nanda and Singh (2006) model an IPO company's optimal response to the presence of sentiment investors and short sale constraints. They conclude that IPOs are to be underpriced even in the absence of asymmetric information. However, the offer price still exceeds fundamental value. Rajan and Servaes (1997) find more firms complete IPOs when analysts are particularly optimistic about the growth prospects of recent IPOs, but the degree of underpricing correlated to optimism is not directly tested. The lack of hard evidence of investor sentiment driving up IPO's first day return is at least partially due to the lack of a high quality reliable sentiment measure. In this paper, we provide a direct test on the relationship between investor sentiment and magnitude of IPO first day returns using the sentiment index constructed by Baker and Wurgler (2006, 2007).

Information asymmetry has been considered in various models to effect underpricing. The information asymmetry based models can be classified into two general categories. The first category considers underpricing as the necessary discount to attract uninformed investors to mitigate the winner's curse problem. Rock (1986) argues that when some investors have more information than others, underpricing is necessary to attract uninformed investors. Otherwise, uninformed investors face the "winner's curse" and will not participate in IPOs, which could lead to the failure of over- or even fair-priced IPOs. The second category of information asymmetry based models regards underpricing as compensation to informed investors for revealing their information on the value of the IPO firm to the underwriter. Benveniste and Spindt (1989) argue that the book-building process enables underwriters to obtain costly information from informed investors and underpricing is a way to compensate investors for information they reveal. In this paper, we not only re-examine how information asymmetry affects underpricing since the empirical evidence has been mixed, but also investigate the role of information asymmetry from two new aspects that have not been examined before. The first is how information asymmetry affects underwriter's IPO valuation at the offer price, and the second is how information asymmetry interacts with market sentiment. Baker and Wurgler (2006) argue that investor sentiment will play a more significant role in the valuation of stocks when information asymmetry is high. We provide a direct test on their conjecture in this paper.

One of the most consistent empirical findings regarding IPO underpricing is the negative correlation between underwriter reputation and magnitude of underpricing [Carter and Manaster (1990), Carter, Dark, and Singh (1998), and Loughran and Ritter

(2002)]. We find similar findings but in this paper, we also examine whether underwriter reputation is related to IPO valuation relative to the intrinsic value and the allocation of wealth in an IPO between the issuing firm and subscribers.

Another line of research related to this paper is the valuation of IPOs. Traditionally, most of the IPO literature either explicitly or implicitly assumes the market is efficient and investors are rational such that the after market trading price reflects the intrinsic value of an IPO share. The investor sentiment argument challenges such an assumption. Consistent with the sentiment argument, Purnanadam and Swaminathan (2004) provide empirical evidence that IPOs are overvalued at the offer prices. They compare IPO offer prices to the intrinsic value of IPO firms and find that IPO offer prices are 14% to 50% above values based on industry peer price multiples. Pukthuanthong and Varaiya (2005) also find IPOs are overvalued on average. However, Zheng (2006) argues there are problems with the Purnanadam and Swaminathan (2004) valuation methods and after the problems are corrected, IPOs are not overvalued on average.[1]

3.   Methodology, data, and sample selection

3.1.   *Methodology*

Following Purnanadam and Swaminathan (2004), we use matching firm's three price multiples, price-to-sales, price-to-EBITDA, and price-to-earnings ratios, to estimate intrinsic values for each IPO firm. The intrinsic values for IPO firms using the three price multiples are computed as follows:

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[1]IPOs are still overvalued based on Zheng's adjusted price ratios. The magnitude of overvaluation is smaller than in Purnanadam and Swaminathan (2004), but still statistically significant at the median. Zheng (2007) shows that after controlling for growth rate, the overvaluation of IPOs disappeared. However, as Purnanadam and Swaminathan (2004) point out the growth rates for IPOs are overly optimistic and ex post, the projected high growth of overvalued IPOs fails to materialize.

$$V_{IPO}^{Sales} = \frac{Price_{match}}{Sales_{match}} \times Sales_{IPO} \tag{1}$$

$$V_{IPO}^{EBITDA} = \frac{Price_{match}}{EBITDA_{match}} \times EBITDA_{IPO} \tag{2}$$

$$V_{IPO}^{Earnings} = \frac{Price_{match}}{Earnings_{match}} \times Earnings_{IPO}. \tag{3}$$

Based on the computed intrinsic value and the offer price, we separate the sample into two subsets: overpriced and underpriced.

For overpriced IPOs with positive underpricing, the total overvaluation is given by the difference between the first day trading price, P_{FP}, and the intrinsic value, V_{IPO}. For this group of IPO firms, the total amount of overvaluation is shared by two parties involved in the offering. The first party is the investors that are allocated IPO shares. They enjoy the difference between P_{FP} and P_{IPO}, which is referred to as the "money left on the table." The second party is the issuers, who enjoy the difference between V_{IPO} and P_{IPO}. We calculate the percentage of total overvaluation left to IPO subscribers for the case of overpriced IPOs with positive underpricing as follows:

$$MLT = \frac{P_{FC} - P_{IPO}}{P_{FC} - V_{IPO}}. \tag{4}$$

where P_{FC} is the first day closing price, P_{IPO} is the offer price, and V_{IPO} is the intrinsic value based on accounting ratios.

The variables used in the empirical tests can be classified into three groups. First are the variables used by Purnanandam and Swaminathan (2004). The second are control variables found to be relevant in previous studies and third are the variables used to test the hypotheses in this study.

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The first category contains variables used in Purnanandam and Swaminathan (2004). These include 1) the log of the value of the IPO to its intrinsic value, 2) log of the equity book to market value, 3) accruals of the firm at the time of issuance, 4) log of the firm's sales, and 5) EBITDA divided by sales. The second category includes variables that have been shown in the literature to be relevant to the underpricing of IPOs. These include 1) a dummy variable for whether the firm was backed by venture capital (1=yes), 2) a Greenshoe option dummy (1=yes), 3) a high technology dummy[2] (1=yes), 4) log of the IPO dollar value, 5) a lockup dummy (1=yes), 6) if the firm is younger than five years (1=yes) and, 7) the underwriter ranking. The third category has a dummy variable (1=yes) if earnings are positive for the IPO.

The information asymmetry index is the first principal component of four information asymmetry proxy variables. The four proxy variables are the lockup dummy (1=yes), fixed assets to total assets ratio, the percentage of secondary shares in the offering, and the young firm dummy (1=if the firm is in existence less than or equal to five years).

To capture the level and change in investor sentiment, we use the orthogonalized sentiment index constructed by Baker and Wurgler (2006). This index is based on six proxies for market sentiment: 1) NYSE trading volume turnover, 2) the dividend premium, 3) the closed end fund discount, 4) the number of IPOs, 5) the first-day returns on IPOs, and 6) the equity share in new issues. As they report, since many of these variables are correlated both the level and changes index are the principal components of the levels and changes, respectively. One important point to make is that the sentiment

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[2] An IPO firm is classified as a high-tech company if the description in the "HIGHTECH" data item in SDC IPO database contains the word "computer," "communication," or "biotechnology."

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index we use does not incorporate contemporaneous IPO underpricing, only lagged IPO underpricing. We use both the three month cumulative orthogonalized change in the index and the three month average index prior to the IPO.

3.2. Data and sample selection

We start with all IPO issues between 1970 and 2004 in the Thomson's Security Data Corporation IPO database and obtain information on the characteristics of the offerings found relevant in the literature. Unit offerings, close-end funds, Real Estate Investment Trusts, American Depository Receipts, and financial firms are excluded. We also exclude IPOs without data in the Center for Research in Security Prices and COMPUSTAT, IPOs with an offer price under $5, and IPOs with non-positive earnings before interest, taxes, depreciation and amortization (EBITDA) in the prior fiscal year. Each IPO firm is matched with a firm in the same industry based on sales and EBITDA to sales margin, similar to the matching procedure in Purnanadam and Swaminathan (2004).[3]

The monthly sentiment index and change in sentiment index are obtained from Wurgler's web site and described in Baker and Wurgler (2006, 2007). Underwriter rankings are obtained from Jay Ritter's web page. If no appropriate matching firm is found or if the underwriter of an IPO does not have a ranking score, the IPO is excluded. Our final sample consists of 2,140 IPOs.

4. Empirical Results

Table 1 reports sample summary statistics based on the three different price multiple intrinsic values; offer price to sales, EBITDA and earnings. Several of the

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[3] The matching by industry is based on 48 industry groups constructed by Fama and French (1997) using Standard Industry Codes (SIC).

statistics are similar to other IPO studies. For the whole sample the mean offer price and first day return is $13.05 and 12%, respectively. The average offering size is around $70 million and roughly 20% of the shares offered are secondary shares. The mean sales and EBITDA/sales for the sample are $300 million and 15%, respectively. Using the earnings multiple results in slightly different numbers due to the sample size being decreasing because positive earnings are required. In the overall sample, high technology firms represent 33.03% of the offerings, 28.79% received venture capitalist financing, 63.69% had Greenshoe options and 58.27% have lockup agreements.

Using the price to sales ratio 54.3% of IPOs are overvalued relative to the intrinsic value. These firms are valued on average 82.21% above the intrinsic value and the undervalued firms are offered at 40.55% below the intrinsic value. There are several significant differences between the two sub-samples. Overvalued offerings have higher initial day returns, a higher offer price, greater asymmetric information, and higher quality underwriters. More are backed by venture capitalists and use lockup agreements. Consistent with greater asymmetric information the firms are smaller, with sales half of the undervalued firms, lower returns on sales and are younger. The offering size is significantly smaller and the percentage of secondary offerings is less. Consistent with these variables that have been linked in the literature with asymmetric information, our information asymmetry index is significantly higher for overvalued firms. Further, the underwriter ranking is significantly higher for undervalued firms which may suggest ranking is more important when the market is less receptive to offerings.

[Insert Table 1]

Examining the EBITDA multiple, similar observations can be drawn. Due to the restriction of requiring positive earnings, the sample size declines to 1,729 and some of the variables between under and overvalued offerings are no longer significant. Overvaluation is not as predominant as positive first day return. For our sample of 2,140 IPOs, all IPOs, except 220 of them, have positive first day returns, whereas, the number of IPOs are almost evenly split between over and undervalued firms. This suggests that underwriters do not systematically overvalue IPOs.

4.1. *Underpricing for IPOs in the presence of asymmetric information and sentiment investors*

We turn first to the underpricing of IPOs. To examine this phenomenon, we use the following regression model:

$$
\begin{aligned}
FDR = a &+ b_1 * LnPVratio + b_2 * LnBM + b_3 * Accrual + b_4 * LnSale \\
&+ b_5 * EBITMrgn + b_6 * Venture + b_7 * GShoe + b_8 * HiTech \\
&+ b_9 * LnSize + b_{10} * PSTEarnings + b_{11} * UWRank + b_{12} * IA \\
&+ b_{13} * AvgSent + b_{14} * Cum\Delta Sent + b_{15} * (AvgSent*IA) \\
&+ b_{16} * (Cum\Delta Sent*IA) + \varepsilon
\end{aligned} \quad (5)
$$

where FDR is the natural log of the first day closing price to the offer price. Table 2 presents the results. For the entire sample, the five variables; log of the offer price relative to the intrinsic value, log of the book-to-market ratio, accruals, log of sales and EBITDA to sales margin, are a set of control variables used by Purnanandam and Swaminathan (2004). The coefficients have the same signs and significance levels as they report. The control variables of venture capital, Greenshoe, high tech, and IPO size also have the correct sign and are consistent with the literature. The dummy for positive earnings at the time of the IPO is significant and positive. Underwriter rank is significantly negative in

all but one of the regressions, which indicates lower underpricing by better underwriters, consistent with the literature.

[Insert Table 2 here.]

The information asymmetry index is not significant for any of the all-sample regressions. The insignificance does not support the winner's curse hypothesis and the compensation for information hypothesis. Both hypotheses imply that a higher information asymmetry leads to a higher first day return and our results do not support these hypotheses. However, the asymmetric information index does have explanatory power consistent with these hypotheses for undervalued IPOs only.

With respect to the variables related to market sentiment, the average sentiment is significant in all-sample regressions and regressions restricted to undervalued IPOs, while the cumulative change in investor sentiment is significantly positive in all regressions. This is compelling evidence that underpricing is significantly impacted by investor sentiment. Moreover the momentum in investor sentiment and the average investor sentiment interaction with information asymmetry are significantly positive, suggesting greater effects from level of sentiment on the first day return when information asymmetry is higher. This finding supports the conjecture by Baker and Wurgler (2006).

Dividing the sample into over and undervalued IPOs some determinants of the first day return are similar but others are decidedly different. The variables that are significantly positive and in common are the Greenshoe option, high technology dummy, size, cumulative change in sentiment and the interaction term between asymmetric information and average sentiment. For the undervalued IPOs the positive earnings, information asymmetry index, and average market sentiment coefficients are significant

and positive while they are not for overvalued IPOs. For overvalued IPOs the log of the sales and the profitability margin are significant and negative. The underwriter ranking is significant for undervalued IPOs, but not for overvalued IPOs. Moreover, the adjusted R^2 is lower for regressions restricted to undervalued IPOs than for other regressions. We conclude that the drivers behind first day IPO returns are not the same for under and overvalued IPOs. Moreover, this is consistent with traders in the market after the offering driving the price up, resulting in larger initial returns or underpricing.

4.2   *Underwriter IPO valuation*

We examine whether variables known to affect IPO first day returns also affect underwriter IPO valuation at the offer price using the following regression:

$$
\begin{aligned}
\text{LnPVratio} = a &+ b_1*\text{Accrual} + b_2*\text{LnSale} + b_3*\text{EBITMrgn} + b_4*\text{Venture} \\
&+ b_5*\text{GShoe} + b_6*\text{HiTech} + b_7*\text{PSTEarnings} + b_8*\text{UWRank} \\
&+ b_9*\text{IA} + b_{10}*\text{AvgSent} + b_{11}*\text{Cum}\Delta\text{Sent} + b_{12}*(\text{AvgSent}*\text{IA}) \\
&+ b_{13}*(\text{Cum}\Delta\text{Sent}*\text{IA}) + b_{14}*(\text{UWRank}*\text{IA}) + \varepsilon.
\end{aligned}
\tag{6}
$$

where LnPVratio is the natural log of the IPO offer price to intrinsic value ratio. The results are presented in Table 3. For the full sample underwriters value IPOs lower relative to intrinsic value for larger IPOs (lnsale), high tech firms, firms with higher accruals, and firms with lower EBITDA margins. The venture dummy is positive and significant only when earnings are used to compute intrinsic value and for the all-sample and overvalued firm samples. The Greenshoe dummy is not significant in any regression. Restrict the regressions to either under or overvalued IPOs, the signs for these control variables are generally consistent with the full sample regressions. However, more coefficients are significant in overvalued regressions than undervalued regressions.

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Underwriter rank is significantly positive in most of the regressions, suggesting more reputable underwriters price IPOs higher. The information asymmetry index and the cumulative change in sentiment are significant and positive in all of the over-valued IPO regressions. These findings are consistent with the notion that underwriters take advantage of investor sentiment by pricing IPOs at higher prices when there is an improvement in investor sentiment in order to maximize benefit for issuers and for themselves. Supporting this interpretation, the interaction term between the underwriter rank and the information asymmetry index is significant and negative in the full samples, but this appears to be driven by the overvalued firms since the coefficients are significant for overvalued, but not undervalued, IPOs. The interaction term between information asymmetry and underwriter rank is significantly negative, suggesting that keeping everything else constant, the higher the information asymmetry the lower underwriters price the IPOs.

When dividing the sample into under and overvalued IPOs we again find that they differ in the explanatory variables relevant to underwriter IPO valuation at offer price relative to intrinsic value. Not only do many of the coefficients differ in signs and significance but also the adjusted R^2 is much lower for undervalued IPOs. We conclude that just as the market prices undervalued IPOs differently than overvalued IPOs so do investment bankers. However, of significance is the apparent effort on behalf of their clients for investment bankers to price the offerings as high as possible given their information and skills.

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4.3 Allocation of wealth

When an IPO is over-valued with positive underpricing, the allocation of the over-valuation between the IPO participants becomes an issue. We predict that money "left on the table," or monies not received by IPO issuers due to underpricing, as a percentage of the total overvaluation should be lower when underwriter ranking is higher. Empirical evidence from early part of this paper suggests that underwriters act for the benefit of issuers and themselves. Therefore, we expect better underwriters to be able to better estimate the maximum acceptable offer price by the market and set offer prices closer to the maximum acceptable price by the market in the presence of sentiment investors, which implies that the proportion of over-valuation left on the table will be smaller. Market sentiment also affects this allocation of wealth. The stronger market sentiment the greater the underpricing resulting in more left on the table.

Table 4 reports the per share dollar amount in panel A and percentage of intrinsic value allocation in panel B of wealth "left on the table." IPO subscribers receive approximately 30% of the total overvaluation of the IPO, indicating about 70% is received by the firm. On a per share basis using sales or EBITDA multiples, reported in panel A, the first day closing price less the intrinsic value indicates approximately $7 to $8 is the amount of overvaluation with about $5.25 going to the client and $2.60 accruing to subscribers. Panel B supports the hypothesis that investment banker mispricing is to the benefit of the clients. The total overvaluation is around 200% while for undervalued firms the under valuation is in the vicinity of 30%.

[Insert Table 4.]

Money left on the table is defined differently from the previous literature. Previously, it is simply the first day return in a dollar amount. Here we define it to be overvaluation by the market first day close less the offer price divided by the total overvaluation or first day close less the intrinsic value. This percentage is the percent of overvaluation left on the table. This definition necessarily limits the sample to IPOs with positive first day return and overvaluation. The following regression is run:

$$MLT = a + b_1*LnPVratio + b_2*LnBM + b_3*Accrual + b_4*LnSale + b_5*EBITMrgn$$
$$+ b_6*HiTech + b_7*Venture + b_8*GShoe + b_9*LnSize + b_{10}*PSTEarnings +$$
$$b_{11}*UWRank + b_{12}*IA + b_{13}*AvgSent + b_{14}*Cum\Delta Sent + b_{15}*(AvgSent*IA)$$
$$+ b_{16}*(Cum\Delta Sent*IA) + b_{17}(UWRank*IA) + \varepsilon . \qquad (7)$$

The results are reported in Table 5. The significantly negative coefficient indicates the higher the underwriter rank the less money is left on the table consistent with greater overpricing relative to intrinsic firm value on behalf of their clients. The three-month cumulative change in investor sentiment is also positive and highly significant and leading to a higher apparent portion of money left on the table but investor sentiment results in greater underpricing and hence an appearance of more money left on the table. The evidence reinforces our conclusion that underwriters expropriate sentiment investors to better serve their institutional clientele, the issuer, and to maximize their own benefit.

[Insert Table 5 here.]

5.   Conclusions

As IPOs are priced by investment bankers away from the intrinsic value, IPOs can be either overvalued or undervalued. Unlike the systematic underpricing puzzle, we find that IPOs are about evenly split between undervalued and overvalued.

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We examine IPO valuation and underpricing in relation to investor sentiment, information asymmetry, and underwriter reputation. We find that underpricing is significantly higher for overvalued IPOs than for undervalued IPOs, and is positively correlated to investor sentiment. Information asymmetry is also positively correlated to the magnitude of underpricing but only for undervalued IPOs, which is not consistent with the information asymmetry based models regarding underpricing. Consistent with the literature, we do find smaller underpricing when underwriter reputation is higher.

Examining the valuation of IPOs based on accounting ratios for peer non-IPO firms, we find there is no systematic over or undervaluation of IPOs, which is in contrast to the predominance of positive first day returns. For our sample of over 2,100 IPOs from 1970 to 2004, about 90% have positive first day returns while about 50% are overvalued. Change in sentiment and information asymmetry is positively correlated to overvalued IPOs but not for undervalued. However, better underwriter reputation leads to higher IPO valuation for all IPOs. It is possible that underwriters selectively overvalue some of the IPOs after observing investor sentiment and take advantage of their information to maximize the benefit for issuers and indirectly themselves.

In support of this, we find that roughly 70% of the wealth from overvalued IPOs is retained by the issuers. Moreover, for overvalued IPOs with positive first day returns, we find that the proportion of total overvaluation that occurs in the after market trading, wealth allocated to IPO subscribers, is negatively correlated to underwriter reputation, suggesting that issuers retain more wealth from the overvaluation of IPOs when more reputable underwriters are used.

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Table 1 Summary Statistics

Summary statistics for the sample of 2,140 IPOs between 1970 and 2004 are reported. IPOs are grouped into two categories based on whether the IPO is over or undervalued relative to the intrinsic value determined by matching firm multiples. Intrinsic value is computed using price multiples as follows:

$$V_{IPO}^{Sales} = \frac{Price_{match}}{Sales_{match}} \times Sales_{IPO} \tag{1}$$

$$V_{IPO}^{EBITDA} = \frac{Price_{match}}{EBITDA_{match}} \times EBITDA_{IPO} \tag{2}$$

$$V_{IPO}^{Earnings} = \frac{Price_{match}}{Earnings_{match}} \times Earnings_{IPO} \tag{3}$$

First day return is the natural log of the first day closing price to offer price. Monthly sentiment index is the sentiment index constructed in Baker and Wurgler (2006) and is obtained form Wurgler's website. Information asymmetry index is the first principal component of four information asymmetry proxy variables: lockup dummy (1=yes), fixed assets to total assets ratio, the percentage of secondary shares in the offering, and the young firm dummy (1=if the firm is in existence less than or equal to five years). ***, **, and * indicate significance at the 1%, 5%, and 10% two-tailed tests, respectively.

Variable	Sales			EBITDA			Earnings		
	All	Undervalued	Overvalued	All	Undervalued	Overvalued	All	Undervalued	Overvalued
Log of offer price / intrinsic value	0.09	-0.52	0.60 ***	0.08	-0.62	0.68 ***	0.00	-0.77	0.81 ***
First day % return	0.12	0.10	0.13 ***	0.12	0.10	0.13 ***	0.12	0.10	0.13 ***
Offer price per share	13.05	12.66	13.38 ***	13.05	12.84	13.23	13.10	12.30	13.94 ***
Offering amount (M$)	71.91	89.00	57.52 ***	71.91	97.46	49.83 ***	68.61	71.05	66.06
Secondary shares (M$)	20.07	22.35	18.15 ***	20.07	22.19	18.24 ***	21.37	21.99	20.73
Fixed assets / total assets	0.27	0.27	0.27	0.27	0.27	0.27	0.26	0.25	0.28 **
Information asymmetry index	-0.03	-0.16	0.08 ***	-0.03	-0.17	0.09 ***	-0.08	-0.11	-0.05

Table 1 continued

Variable	Sales			EBITDA			Earnings		
	All	Undervalued	Overvalued	All	Undervalued	Overvalued	All	Undervalued	Overvalued
Average 3 month pre-offer sentiment	0.25	0.24	0.26	0.25	0.26	0.24	0.25	0.27	0.24
Cumulative 3 month Δ in pre-offer sentiment	0.04	0.00	0.07	0.04	0.03	0.05	0.01	0.00	0.01
Underwriter rank	7.32	7.46	7.20 ***	7.32	7.50	7.17 ***	7.32	7.09	7.56 ***
Log of book to market of equity	0.00	0.00	0.00 ***	0.00	0.00	0.00 ***	0.00	0.00	0.00 **
Accruals at IPO issuance	-0.03	-0.01	-0.03 *	-0.03	-0.02	-0.03	-0.02	-0.02	-0.02
Sales (M$)	305.04	414.53	212.88 ***	305.04	428.95	197.97 ***	275.81	304.68	245.75
EBITDA / assets	0.15	0.16	0.14 ***	0.15	0.16	0.14 ***	0.16	0.17	0.16 *
High technology firm	707	305	402 *	707	298	409 ***	561	268	293 *
Venture capitalist funded	616	244	372 ***	616	262	354 **	479	185	294 ***
Greenshoe option	1,363	614	749	1363	630	733	1105	559	546
Lockup provision	1,247	542	705 **	1247	532	715 ***	991	491	500
Younger than five years	200	75	125 **	200	79	121 **	148	72	76
N	2,140	978	1,162	2140	992	1148	1729	882	847

Table 2
Investor Sentiment, Information Asymmetry, Underwriter Rank, and IPO First Day Return

The table reports regression results for the following equation:

$$FDR = a + b_1*LnPVratio + b_2*LnBM + b_3*Accrual + b_4*LnSale + b_5*EBITMrgn + b_6*Venture + b_7*GShoe + b_8*HiTech + b_9*LnSize + b_{10}*PSTEarnings$$
$$+ b_{11}*UWRank + b_{12}*IA + b_{13}*AvgSent + b_{14}*Cum\Delta Sent + b_{15}*(AvgSent*IA) + b_{16}*(Cum\Delta Sent*IA) + \varepsilon \qquad (5)$$

where FDR is the IPO first day return, defined as nature log of first day closing price divided by offer price; LnPVratio is the nature log of offer price to intrinsic value ratio, where intrinsic value is computed using matching firms price to Sales ratio, price to EBITDA ratio, and price to Earnings ratio, respectively; LnBM is the nature log of book to market ratio for the fiscal year of IPO; Accrual is the total accruals for the fiscal year prior to IPO; LnSale is the nature log of sales for the fiscal year prior to IPO; EBITMrgn is the EBITDA margin defined as the EBITDA to total assets ratio; Venture is a dummy variable, euquals 1 for venture backed IPOs; GShoe is a dummy variable, equals 1 for IPOs with Greenshoe option; HiTech is a dummy variable, equals 1 for high technology companies; LnSize is the nature log of dollar offer amount; PSTEarnings is a dummy variable, equals 1 for IPOs with positive earning prior to IPO; UWRank is underwriter ranking score. Ranking score is obtained from Ritter's website; IA is the information asymmetry index, which the first principle component of four information asymmetry proxy variables: lockup dummy (1=yes), fixed assets to total assets ratio, the percentage of secondary shares in the offering, and the young firm dummy (1=if the firm is in existence less than or equal to five years); AvgSent is the 3-month average investor sentiment index prior to the month of IPO; CumΔSent is the cumulative 3-month change in investor sentiment index prior to the month of IPO. Investor sentiment index and change in the index are obtained from Wurgler's website; AvgSent*IA is the interaction term between 3-month average investor sentiment index and information asymmetry index; and CumΔSent*IA is the interaction term between 3-month cumulative change in investor sentiment index and information asymmetry index. Numbers in the parentheses are the p-values.

Variable	Intrinsic Value Based on Price to Sales Ratio			Intrinsic Value Based on Price to EBITDA Ratio			Intrinsic Value Based on Price to Earnings Ratio		
	All	Undervalued	Overvalued	All	Undervalued	Overvalued	All	Undervalued	Overvalued
Intercept	-0.3138	-0.2524	-0.3587	-0.3181	-0.2175	-0.3848	-0.3063	-0.2841	-0.3162
	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)
LnPVratio	0.0132	0.0107	0.0124	0.0153	0.0163	0.0129	0.0041	-0.0019	0.0025
	(0.0048)	(0.2701)	(0.1964)	(<.0001)	(0.0285)	(0.1329)	(0.1883)	(0.7578)	(0.7010)
LnBM	-0.0336	-0.0273	-0.0383	-0.0336	-0.0261	-0.0391	-0.0370	-0.0320	-0.0398
	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)
Accrual	-0.0046	-0.0150	-0.0017	-0.0042	-0.0165	0.0052	-0.0039	-0.0151	0.0062
	(0.6986)	(0.3668)	(0.9171)	(0.7250)	(0.2743)	(0.7695)	(0.7562)	(0.3276)	(0.7533)
LnSale	-0.0099	-0.0064	-0.0121	-0.0092	-0.0085	-0.0113	-0.0125	-0.0001	-0.0233
	(0.0169)	(0.2473)	(0.0480)	(0.0245)	(0.1098)	(0.0679)	(0.0053)	(0.9827)	(0.0005)
EBITDA / sales	-0.0683	-0.0241	-0.0966	-0.0593	-0.0241	-0.0887	-0.0770	-0.0013	-0.1331
	(0.0489)	(0.5985)	(0.0581)	(0.0868)	(0.5770)	(0.1019)	(0.0374)	(0.9779)	(0.0174)

Table 2 continued

Variable	Intrinsic Value Based on Price to Sales Ratio			Intrinsic Value Based on Price to EBITDA Ratio			Intrinsic Value Based on Price to Earnings Ratio		
	All	Undervalued	Overvalued	All	Undervalued	Overvalued	All	Undervalued	Overvalued
Venture	0.0123	0.0114	0.0123	0.0128	0.0151	0.0113	0.0134	0.0027	0.0202
	(0.0964)	(0.2582)	(0.2425)	(0.0825)	(0.1136)	(0.3011)	(0.0951)	(0.8062)	(0.0774)
GShoe	0.0870	0.0672	0.1038	0.0868	0.0681	0.1008	0.0885	0.0934	0.0832
	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)
HiTech	0.0246	0.0325	0.0204	0.0250	0.0239	0.0248	0.0217	0.0244	0.0196
	(0.0006)	(0.0007)	(0.0509)	(0.0005)	(0.0108)	(0.0187)	(0.0049)	(0.0151)	(0.0930)
LnSize	0.0331	0.0295	0.0352	0.0328	0.0281	0.0392	0.0340	0.0191	0.0478
	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(0.0121)	(<.0001)
PSTEarnings	0.0230	0.0323	0.0173	0.0243	0.0233	0.0252			
	(0.0362)	(0.0282)	(0.2765)	(0.0262)	(0.1104)	(0.1133)			
UWRank	-0.0051	-0.0072	-0.0045	-0.0052	-0.0067	-0.0053	-0.0058	-0.0054	-0.0068
	(0.0137)	(0.0079)	(0.1504)	(0.0119)	(0.0123)	(0.0933)	(0.0094)	(0.0526)	(0.0636)
IA index	0.0036	0.0094	-0.0039	0.0034	0.0085	-0.0040	0.0029	0.0149	-0.0106
	(0.2799)	(0.0188)	(0.4502)	(0.3049)	(0.0308)	(0.4501)	(0.4025)	(0.0007)	(0.0599)
AvgSent	0.0120	0.0230	0.0003	0.0121	0.0183	0.0052	0.0136	0.0160	0.0105
	(0.0214)	(0.0008)	(0.9725)	(0.0200)	(0.0059)	(0.5038)	(0.0159)	(0.0285)	(0.2205)
CumΔSent	0.0204	0.0181	0.0231	0.0204	0.0164	0.0236	0.0192	0.0118	0.0249
	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(0.0005)	(<.0001)
AvgSent*IA	0.0121	0.0119	0.0164	0.0115	0.0112	0.0160	0.0143	0.0139	0.0153
	(0.0226)	(0.0800)	(0.0426)	(0.0300)	(0.0971)	(0.0495)	(0.0133)	(0.0723)	(0.0803)
CumΔSent*IA	0.0004	0.0029	-0.0032	0.0003	0.0027	-0.0022	0.0005	0.0005	0.0015
	(0.8550)	(0.2719)	(0.2956)	(0.8759)	(0.2746)	(0.4914)	(0.8217)	(0.8646)	(0.6744)
Adusted R^2	0.2711	0.2340	0.2844	0.2737	0.2274	0.2921	0.2967	0.2589	0.3325
N	2,140	978	1,162	2,140	992	1,148	1,729	882	847

Table 3
Investor Sentiment, Information Asymmetry, Underwriter Rank, and Underwriter Valuation

This table reports regression results for the following regression:

$$LnPVratio = a + b_1*Accrual + b_2*LnSale + b_3*EBITMrgn + b_4*Venture + b_5*GShoe + b_6*HiTech + b_7*PSTEarnings + b_8*UWRank + b_9*IA + b_{10}*AvgSent$$
$$+ b_{11}*Cum\Delta Sent + b_{12}*(AvgSent*IA) + b_{13}*(Cum\Delta Sent*IA) + b_{14}*(UWRank*IA) + \varepsilon \qquad (6)$$

where LnPVratio is the natural log of offer price to intrinsic value ratio, where intrinsic value is computed using matching firms price to Sales ratio, price to EBITDA ratio, and price to Earnings ratio, respectively; Accrual is the total accruals for the fiscal year prior to IPO; LnSale is the nature log of sales for the fiscal year prior to IPO; EBITMrgn is the EBITDA margin defined as the EBITDA to total assets ratio; Venture is a dummy variable, euquals 1 for venture backed IPOs; GShoe is a dummy variable, equals 1 for IPOs with Greenshoe option; HiTech is a dummy variable, equals 1 for high technology companies; PSTEarnings is a dummy variable, equals 1 for IPOs with positive earning prior to IPO; UWRank is underwriter ranking score. Ranking score is obtained from Ritter's website; IA is the information asymmetry index, which the first principle component of four information asymmetry proxy variables: lockup dummy (1=yes), fixed assets to total assets ratio, the percentage of secondary shares in the offering, and the young firm dummy (1=if firm is in existence less than or equal to 5 years); AvgSent is the 3-month average investor sentiment index prior to the month of IPO; Cum∆Sent is the cumulative 3-month change in investor sentiment index prior to the month of IPO. Investor sentiment index and change in the index are obtained from Wurgler's website; AvgSent*IA is the interaction term between 3-month average investor sentiment index and information asymmetry index; Cum∆Sent*IA is the interaction term between 3-month cumulative change in investor sentiment index and information asymmetry index; and UWRank*IA is the interaction term between underwriter ranking score and information asymmetry index. Numbers in the parentheses are the p-values.

Variable	Intrinsic Value Based on Price to Sales Ratio			Intrinsic Value Based on Price to EBITDA Ratio			Intrinsic Value Based on Price to Earnings Ratio		
	All	Undervalued	Overvalued	All	Undervalued	Overvalued	All	Undervalued	Overvalued
Intercept	0.8034	-0.3915	1.1987	0.9617	-0.7305	1.5040	-0.3018	-0.9034	0.77403
	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(0.0134)	(<.0001)	(<.0001)
Accrual	-0.1404	-0.0622	-0.0680	-0.1510	-0.0835	-0.0507	-0.1260	-0.0683	-0.14676
	(0.0126)	(0.2575)	(0.2001)	(0.0243)	(0.2017)	(0.4202)	(0.1951)	(0.4244)	(0.1707)
LnSale	-0.2091	-0.0489	-0.1667 (<.0001)	-0.2210	-0.0324	-0.1861	-0.0269	0.0393	0.00693
	(<.0001)	(<.0001)		(<.0001)	(0.0228)	(<.0001)	(0.2216)	(0.0486)	(0.7685)
EBITDA / sales	-1.0693	-0.3397	-0.5873	-1.4628	-0.2916	-1.3271	-0.8310	-0.1756	-0.42561
	(<.0001)	(0.0108)	(<.0001)	(<.0001)	(0.0775)	(<.0001)	(0.0014)	(0.4538)	(0.1280)
Venture	0.0001	0.0233	-0.0651	-0.0345	-0.0019	-0.0500	0.2984	0.0688	0.11077
	(0.9969)	(0.4837)	(0.0497)	(0.4063)	(0.9639)	(0.1940)	(<.0001)	(0.2585)	(0.0746)
GShoe	0.0290	-0.0117	0.0540	0.0387	0.0436	0.0532	-0.0026	-0.0216	0.04441
	(0.3503)	(0.6776)	(0.0792)	(0.2961)	(0.2225)	(0.1282)	(0.9615)	(0.6607)	(0.4496)
HiTech	-0.1086	-0.0109	-0.0931	-0.1152	-0.1087	-0.0895	-0.0165	0.0403	-0.04051
	(0.0012)	(0.7280)	(0.0041)	(0.0040)	(0.0064)	(0.0148)	(0.7814)	(0.4595)	(0.5169)

Table 3 continued

Variable	Intrinsic Value Based on Price to Sales Ratio			Intrinsic Value Based on Price to EBITDA Ratio			Intrinsic Value Based on Price to Earnings Ratio		
	All	Undervalued	Overvalued	All	Undervalued	Overvalued	All	Undervalued	Overvalued
PSTEarnings	-0.0593 (0.2471)	0.0370 (0.4479)	-0.0444 (0.3657)	-0.1480 (0.0154)	0.0997 (0.1121)	-0.1495 (0.0068)			
UWRank	0.0478 (<.0001)	0.0149 (0.0885)	0.0207 (0.0298)	0.0514 (<.0001)	0.0278 (0.0142)	0.0248 (0.0195)	0.0650 (0.0001)	-0.0012 (0.9332)	0.00298 (0.8789)
IA-index	0.1917 (0.001)	0.0525 (0.3400)	0.1657 (0.0031)	0.1982 (0.0042)	0.0239 (0.7457)	0.2110 (0.0006)	0.1422 (0.1640)	-0.0472 (0.5766)	0.32447 (0.0088)
AvgSent	-0.0068 (0.7863)	0.0055 (0.8088)	-0.0129 (0.6021)	-0.0124 (0.6760)	0.0154 (0.5920)	0.0355 (0.2045)	-0.0390 (0.3765)	-0.0186 (0.6437)	-0.05228 (0.2634)
CumΔSent	0.0189 (0.0857)	-0.0032 (0.7462)	0.0224 (0.0430)	0.0175 (0.1808)	0.0117 (0.3472)	0.0261 (0.0373)	0.0238 (0.2261)	-0.0065 (0.7265)	0.04127 (0.0426)
AvgSent*IA	0.0039 (0.8763)	-0.0378 (0.0936)	0.0060 (0.8132)	0.0444 (0.1385)	-0.0188 (0.5153)	0.0733 (0.0108)	0.0061 (0.8925)	-0.1092 (0.0093)	0.05705 (0.2302)
CumΔSent*IA	-0.0056 (0.5680)	-0.0094 (0.2912)	-0.0011 (0.9081)	-0.0011 (0.9226)	0.0011 (0.9162)	-0.0006 (0.9595)	0.0122 (0.4837)	0.0096 (0.5326)	0.04889 (0.0120)
UWRank*IA	-0.0186 (0.0103)	-0.0048 (0.4825)	-0.0186 (0.0084)	-0.0186 (0.0308)	-0.0020 (0.8280)	-0.0246 (0.0018)	-0.0084 (0.5124)	0.0102 (0.3357)	-0.03024 (0.0477)
$Adj - R^2$	0.1613	0.0226	0.1824	0.1398	0.0065	0.2059	0.0330	0.0045	0.0387
N	2140	978	1162	2140	992	1148	1729	882	847

Table 4
Allocation of Wealth from IPO Overvalution and Positive First Day Return

This table presents the allocation of wealth between issuers and IPO subscribers coming from IPO overvaluation and positive first day returns. Panel A reports the allocation in dollar amount per share and Panel B reports the allocation as percent of intrinsic value. Intrinsic value is computed using matching firms price to sales ratio, price to EBITDA ratio, and price to earnings ratio, respectively.

Panel A: Per share dollar amount

	Intrinsic Value Based on Price to Sales Ratio			Intrinsic Value Based on Price to EBITDA Ratio			Intrinsic Value Based on Price to Earnings Ratio		
	Under-valued	Over-valued	All	Under-valued	Over-valued	All	Under-valued	Over-valued	All
Total Overvaluation (First day closing – intrinsic value)	-9.0606	7.7325	0.0579	-14.5527	8.0298	-2.4384	-25.2563	9.0392	-8.4556
Allocation to Issuers (Offer price – intrinsic value)	-10.6281	5.1391	-2.0666	-16.1544	5.4535	-4.5629	-26.8669	6.4049	-10.5677
Allocation to Subscribers (First day closing – offer price)	1.5675	2.5934	2.1245	1.6017	2.5763	2.1245	1.7906	2.6343	2.1245
Percentage Allocation to Subscribers (Allocation to Subscribers / total overvaluation)	-	33.54%		-	32.08%	-	-	29.14%	-
N	978	1162	2140	992	1148	2140	882	847	1729

Panel B: As a percentage of intrinsic value

	Intrinsic Value Based on Price to Sales Ratio			Intrinsic Value Based on Price to EBITDA Ratio			Intrinsic Value Based on Price to Earnings Ratio		
	Under-valued	Over-valued	All	Under-valued	Over-valued	All	Under-valued	Over-valued	All
Total Overvaluation (First day closing – intrinsic value)	-28.22%	178.72%	84.15%	-32.89%	231.98%	109.20%	-38.98%	576.85%	262.70%
Allocation to Issuers (Offer price – intrinsic value)	-35.68%	133.65%	56.27%	-39.91%	172.37%	73.96%	-45.38%	479.12%	211.56%
Allocation to Subscribers (First day closing – offer price)	7.47%	45.06%	27.88%	7.02%	59.61%	35.24%	6.39%	97.74%	51.14%
Percentage Allocation to Subscribers (Allocation to retail investors / total overvaluation)	-	25.21%	-	-	25.70%	-	-	16.94%	-
N	978	1162	2140	992	1148	2140	882	847	1729

Table 5
Allocation of Wealth for Overvalued IPOs with Positive First Day Return

This table reports regression results for the following regression.

$$MLT = a + b_1*LnPVratio + b_2*LnBM + b_3*Accrual + b_4*LnSale + b_5*EBITMrgn + b_6*HiTech \\ + b_7*Venture + b_8*GShoe + b_9*LnSize + b_{10}*PSTEarnings + b_{11}*UWRank + b_{12}*IA \\ + b_{13}*AvgSent + b_{14}*Cum\Delta Sent + b_{15}*(AvgSent*IA) + b_{16}*(Cum\Delta Sent*IA) \\ + b_{17}(UWRank*IA) + \varepsilon \qquad (7)$$

where MLT is money left on the table define as (First day closing price – offer price)/(First day closing price – intrinsic value), where intrinsic value is computed using matching firms price to Sales ratio, price to EBITDA ratio, and price to Earnings ratio, respectively; LnPVratio is the nature log of offer price to intrinsic value ratio; LnBM is the nature log of book to market ratio for the fiscal year of IPO; Accrual is the total accruals for the fiscal year prior to IPO; LnSale is the nature log of sales for the fiscal year prior to IPO; EBITMrgn is the EBITDA margin defined as the EBITDA to total assets ratio; HiTech is a dummy variable, equals 1 for high technology companies; Venture is a dummy variable, equals 1 for venture backed IPOs; GShoe is a dummy variable, equals 1 for IPOs with Greenshoe option; LnSize is the nature log of dollar offer amount; PSTEarnings is a dummy variable, equals 1 for IPOs with positive earning prior to IPO; UWRank is underwriter ranking score. Ranking score is obtained from Ritter's website; IA is the information asymmetry index, which the first principle component of four information asymmetry proxy variables: lockup dummy (1=yes), fixed assets to total assets ratio, the percentage of secondary shares in the offering, and the young firm dummy (1=if the firm is in existence less than or equal to five years); AvgSent is the 3-month average investor sentiment index prior to the month of IPO; CumΔSent is the cumulative 3-month change in investor sentiment index prior to the month of IPO. Investor sentiment index and change in the index are obtained from Wurgler's website; AvgSent*IA is the interaction term between 3-month average investor sentiment index and information asymmetry index; CumΔSent*IA is the interaction term between 3-month cumulative change in investor sentiment index and information asymmetry index; and UWRank*IA is the interaction term between underwriter ranking score and information asymmetry index. Numbers in the parentheses are the p-values.

Variable	Intrinsic Value Based on Price to Sales Ratio	Intrinsic Value Based on Price to EBITDA Ratio	Intrinsic Value Based on Price to Earnings Ratio
Intercept	-0.1043 (0.1566)	-0.0651 (0.3670)	-0.0345 (0.6609)
LnPVratio	-0.1629 (<.0001)	-0.1456 (<.0001)	-0.1071 (<.0001)
LnBM	-0.0405 (<.0001)	-0.0356 (<.0001)	-0.0399 (<.0001)
Accrual	0.0138 (0.5831)	-0.0067 (0.7967)	-0.0004 (0.9901)
LnSale	-0.0252 (0.0049)	-0.0254 (0.0040)	-0.0236 (0.0135)
EBITMrgn	-0.0608 (0.4287)	-0.1626 (0.0424)	-0.1035 (0.2008)
HiTech	0.0027 (0.8616)	0.0191 (0.2012)	0.0261 (0.1168)
Venture	0.0247 (0.1096)	0.0164 (0.2893)	0.0317 (0.0542)
GShoe	0.1263 (<.0001)	0.1226 (<.0001)	0.1046 (<.0001)
LnSize	0.0555 (<.0001)	0.0636 (<.0001)	0.0514 (<.0001)

Table 5 continued

Variable	Intrinsic Value Based on Price to Sales Ratio	Intrinsic Value Based on Price to EBITDA Ratio	Intrinsic Value Based on Price to Earnings Ratio
PSTEarnings	0.0412	0.0323	
	(0.0742)	(0.1566)	
UWRank	-0.0160	-0.0162	-0.0205
	(0.0013)	(0.0008)	(0.0003)
IA-index	-0.0133	-0.0305	0.0107
	(0.6219)	(0.2368)	(0.7522)
AvgSent	-0.0104	-0.0066	-0.0046
	(0.3672)	(0.5571)	(0.7097)
Cum∆Sent	0.0209	0.0210	0.0295
	(<.0001)	(<.0001)	(<.0001)
AvgSent*IA	0.0076	0.0069	0.0150
	(0.5212)	(0.5517)	(0.2299)
Cum∆Sent*IA	-0.0024	-0.0061	0.0062
	(0.5835)	(0.1774)	(0.2308)
UWRank*IA	0.0013	0.0044	-0.0021
	(0.6939)	(0.1736)	(0.6117)
Adj – R^2	0.2399	0.2421	0.3033
N	1046	1035	767