working paper

17 14

Dotcom Extreme Underpricing

Antonio Gledson de Carvalho,
Roberto B. Pinheiro, and
Joelson Oliveira Sampaio

Dotcom Extreme Underpricing

Antonio Gledson de Carvalho, Roberto B. Pinheiro, and Joelson Oliveira Sampaio

We conjecture that the Dotcom abnormal underpricing resulted from the emergence a large cohort of firms racing for market leadership/survivorship. Fundamentals pricing at the IPO was part of their strategy. Consistent with our conjecture, firms' strategic goals and characteristics fully explain the abnormal underpricing. Contrary to alternatives explanations, underpricing was not associated with top underwriting; there was no deterioration of issuers' quality; and top underwriters and analysts became more selective.

Antonio Gledson de Carvalho (corresponding author) is at Fundação Getulio Vargas, School of Business at São Paulo (gledson.carvalho@fgv.br.); Roberto B. Pinheiro is at the Federal Reserve Bank of Cleveland (roberto.pinheiro@clev. frb.org); and Joelson Oliveira Sampaio is at Fundação Getulio Vargas, School of Economics at São Paulo (joelson.sampaio@fgv.br).

1 – Introduction

The Dotcom bubble and the concomitant high underpricing are two puzzles. From 2,000 points in early 1999, the NASDAQ composite index escalated to 5,048 in March 2000, returning to near the 2,000 points after 2000. The average underpricing escalated from near 15 percent in 1991-1998 to 65 percent in 1999-2000 (Ritter, 2014). What is remarkable is that the high average underpricing was caused by an increase in extreme underpricing (fat right tale) rather than a parallel shift in the distribution. Histograms 1A-1D illustrate this point.[1] In the Pre-bubble period (Histogram 1A), the average underpricing was 16 percent and only 4 percent of the IPOs had underpricing above 60 percent. During the bubble (Histogram 1B), the average underpricing jumped to 66 percent, but such increase was mostly driven by extreme underpricing: 24 percent of the IPOs had underpricing above 140 percent. However, the left tale of the distribution was not much affected: 10 percent of the IPOs were overpriced and 32 percent had underpricing below 20 percent. If one winsorize the underpricing at 60 percent, the average drops to 32 percent. Moreover, differently from what some would expect, extreme underpricing was neither exclusive nor pervasive to technology IPOs: among non-technology (technology) IPOs, 15 (26) percent had underpricing above 140% (Histogram 1C and 1D); and 20 percent of the technology IPOs had underpricing below 20 percent. Traditional information-based theory of underpricing (e.g., Rock, 1986; and Benveniste and Spindt, 1989) cannot explain or justify the Dotcom extreme underpricing. Furthermore, it seems unlikely that underwriters forced extreme underpricing without issuers consent.

We conjecture that the Dotcom extreme underpricing resulted from the strategic behavior of firms racing for leadership (or survivorship). For such firms, the continued use of capital market was essential. Possible overvaluation of their shares, given the overheat market, would jeopardize their future capacity to tackle the capital markets. Thus, they preferred conservative pricing, extremely underpricing their IPOs.

The birth of the Internet spurred a variety of new products and processes (the so-called New Economy). The Internet also changed the structure of many traditional

---

[1] These histograms come from our dataset. As we shall see it is mostly restricted to firms with sales tracking record.

2

businesses. For example, it allowed for improved inventory management and new manners of marketing products that fostered market consolidation in some traditional industries. It even allowed some local businesses to become global (e.g., Amazon.com). The use of new processes even raised doubt on whether these new businesses would subsume traditional ones. Such revolution brought a large cohort of new firms in a race for leadership (or survivorship). These firms needed to go public either to raise cash to fund organic growth, or to turn their shares into currency to pay for acquisitions.[2] For them the continued use of the capital markets was a need. These firms also presented abnormal realized growth rate, but their track record was short because they were young. Short record of accomplishment along with uncertainty about the effectiveness the new processes made difficult the assessment of long-term growth rates and, consequently, valuation (Schwert 2002; Schultz and Zaman, 2001).

Our explanation for the abnormal underpricing builds on the behavior of firms with the need for continued use of capital markets. Such firms, facing the frenzy for their shares, had reasons to be conservative in the pricing of their IPOs. First, the continued use of the stock market requires good shares performance (e.g., price returns, regular analysts' coverage and low bid-ask spreads). Shares distributed at current high price could lose their attractiveness if a market reversion occurred. Second, race for leadership required large pre-IPO capital infusion, lowering CEO's ownership.[3] Maintenance of control with small ownership requires proper shares dilution,[4] preferentially among buy-and-hold investors. This would leave a small number of shares floating and make difficult for threatening investors to acquire significant ownership. However, underwriters would hardly place potentially overpriced shares among their premier buy-and-hold investors. Third, for an issuer intending to do a series of acquisitions, ownership dilution could come mostly from expensive acquisitions, rather than from IPO underpricing. By selling overvalued shares at their IPOs, strategic acquirers could create unrealistic expectations for acquisition

---

[2] Brau and Fawcett (2006) examining IPOs from 2000-2001 find that the desire to create an acquisition currency ranks as the most important reason for an IPO. Over a long sample period, Celikyurt, Sevilir, and Shivdasani (2010) report that newly public firms make acquisitions at a torrid pace.

[3] Ljungqvist and Wilhelm (2003) report that average CEO ownership dropped from 23 percent during 1996-1998 dropped to 17.3 percent in 1999 and to 11.6 percent in 2000.

[4] Brennan and Franks (1997) find that when shares are placed more widely rather than placed with just a few powerful large shareholders, the entrepreneur is less easy ousted from the company.

multiples, turning acquisitions expensive. Last, venture capital (VC) sponsored firms could want to protect VCs ability to tackle underwriters, auditors, analyst and investors (Barry et al., 1990; Megginson and Weiss, 1991).

We present evidence supporting our conjecture. We show that the Dotcom underpricing can be fully accounted by issuers' strategic goals and characteristics. Furthermore, once we control for issuers' strategy and characteristics, the presence of prestigious underwriters do not play any role in the dotcom abnormal underpricing

For robustness purposes, we also investigate other conjectures on Dotcom underpricing and produce some further results. Following Loughran and Ritter (2004), there are three alternative conjectures: 1) C*hange in Risk Composition* (Helwege and Liang, 2004; Howe and Zhang, 2005; Ibbotson, Sindelar, and Ritter, 1994; Loughran and Ritter, 2004; Lowry and Schwert, 2002; Ritter 1984; and Yung, Colak, and Wang, 2008): changes in average underpricing over time reflect changes in the riskiness of the IPOs. The increased failure rate within three or five years from the IPO for the Dotcom cohort (e.g., Yung, Colak, and Wang, 2008) is the main evidence supporting change in risk composition. We show that such increased failure does not hold in time horizons above 11 years from the IPO. Furthermore, contrary to Change in Risk Composition, high-quality firms where the ones that bore the highest underpricing; 2) *Change in Issuer Objective Function*: based on what Loughran and Ritter (2004) call *Analyst Lust*. Issuers placed more importance on hiring lead underwriters that would bring highly ranked analyst coverage. Because of this, they became less concerned with avoiding underwriters with the reputation for excessive underpricing. Analyst Lust is inconsistent with two of our findings: analysts' coverage during the bubble is unrelated to underpricing or prestigious underwriting, and underpricing during the bubble is fully accounted by issuers' strategic characteristics. Moreover, once one accounts for firms' characteristics, analysts' coverage during the bubble actually decreased; and 3) *Realignment of Incentives*: increased underpricing resulted from lower incentives for firms' insiders to monitor underwriters. Ljungqvist and Wilhelm (2003) interpret the observed sharp drop in CEO ownership as reduction in the incentives for CEOs to monitor underwriters, allowing for increased underpricing. Loughran and Ritter (2004) based their explanation on *spinning*: underwriters that usually force high

underpricing co-opted issuers' insiders by allocating to them stocks in highly underpriced IPOs. These two conjectures are inconsistent with the fact that firms' strategic behavior (rather than top underwriting) fully explains abnormal underpricing.

This article is structured as follows: Section 2 presents our hypotheses and methodology; Section 3 describes our data, sample and variables; Section 4 presents our results; and Section 5 concludes.

2 – Variables, data and sample

2.1 -- Variables

Most of them are standard in the IPO literature: *Gross proceeds*, *Assets size*, *Technology industries*, *Firms' age at IPO*, Sales *growth*, *initial price interval*, *price revision up* and *price revision down* (Table 1 described our variables). We highlight three variables that proxy for the issuers' strategic characteristics: *Acquisition pre-IPO*, which is a dummy variable indicating that the issuer made acquisitions in the 3-year period before the IPO. The creation of shares for acquisition plays an important role in our conjecture. To control for that, one ideally would want to use acquisitions post-IPO (a dummy variable indicating acquisition within 5 years after the IPO). However, post IPO acquisitions would be endogenous to the analysis of underpricing. Because of this, we alternatively use *Acquisition pre-IPO*. The correlation between these two variables is high: 0.79. Furthermore, in our sample only pre-IPO acquirers made acquisitions after their IPOs and only 28 percent of the pre-IPO acquirers did not make a post-IPO acquisition; *Big-Four auditing*, dummy that indicates if the external auditor is one of the Big-four auditing firms. Auditors do not play any role in the going public process. Thus, with respect to the underpricing analysis, Big-four auditing represents only a strategic choice concerning disclosure policy, and *Venture capital,* a dummy variable indicating venture capital sponsorship: the strategic role of venture capital in IPOs and its concern with reputation has already been extensively discussed (Barry et al. 1990; and Megginson and Weiss, 1991). Venture capital is also associated to firms' characteristics (e.g., young firms, technology industries and growth).

2.2 – Data and sample

Our dataset combines data from several sources. From Securities Data Corporation (SDC-Platinum) we obtained an exhaustive list of IPOs and information on offer price, offer date, proceeds, leading underwriter, price interval, issuer age and seasoned equity offerings (SEO). We complemented and corrected SDC-Platinum database following suggestions in Jay Ritter's website (Ritter, 2014). From Compustat we obtained data on quarterly and annual fundamentals: sales, book value of assets, and Big-Four auditing. Information on VC-sponsoring comes from Venture Economics database. Analysts' coverage comes from the I/B/E/S database. Data on institutional ownership and its Herfindahl index comes from Thomson Reuters Institutional Holdings (13F). As measure of underwriter quality we use the Carter and Manaster index (1990) updated by Loughran and Ritter (2004). Information on bid-ask spreads, delisting due to bankruptcy, mergers and drops, and daily quotation for NYSE and NASDAQ composite indices come from the CRSP-US. We use Loughran and Ritter's (2004) classification to identify High-tech firms. We define three periods: *Pre-bubble* (1991-1996), *Transition* (1997 and 1998) and *Bubble* (1999 and 2000).

Our sample consists of firms completing an IPO between January 1991 and December 2000. As usual, we exclude offerings from closed-end funds, limited partnerships, financial institutions (SIC codes 6000–6999), utilities (SIC codes 4900–4999), real-estate investment trusts, unit offerings, IPOs with offer price below five dollars, and American depositary receipts (ADRs). Our final sample consists of 2,754 IPOs with complete information on all variables used in underpricing regressions. Table 2 describes the drop in sample size due to missing values in relevant variables.

Table 3 compares our sample to that of Ritter (2014), the most complete that we are aware of. During the pre-bubble and transition periods our coverage is 58 and 61 percent of his sample. During the bubble period, the coverage is higher: 70 percent. Overall, our sample comprises 62 percent of his sample. Samples are similar in terms of underpricing, proportion of IPOs at NASDAQ, VC-sponsorship, median age, and proportion of IPOs with price revision up (down) in an annual basis. Differences are large for gross proceeds in 2000 and technology during the pre-bubble and bubble periods. During the pre-bubble

period, our sample has a higher proportion of technology firms. However, during the transition and bubble periods, that proportion is significantly lower.

2.1 – Change in IPO characteristics

Table 4 reports issuers' characteristics in three distinct periods pre-bubble (1991-1996) transition (1997 and 1998) and bubble (1999-2000). It also compares pre-bubble to bubble periods. The general message of Table 4 is the sharp change in issues' charcteristics. Underpricing increased significantly from the Pre-bubble to the Bubble period 16 versus 66 percent. Sales growth, measured by the average quarterly growth (over the previous three quarters) had an expressive increase: 56 to 91 percent. Firm age declined from 14.6 to 9.4 years. The fraction of IPO from technology firms increased from 29 to 50 percent. Firm size (measured by book value of assets) increased from $164 to $255 mi. Offer size increased from $58 million to $116 million. The relative size of offerings (offer-to-firm size) increased from 1 to 1.12. Top underwriting increased from 68 to 84 percent. VC backing increased from 41 to 67 percent. There was no sizable change in Big-four auditing: an increase from 33 to 36 percent. Finally, there was a decrease on pre-IPO acquisitions from 33 to 25 percent.

3 – Methodology

We conjecture that the high underpricing prevailing during the bubble can be fully accounted by issuers characteristics and strategic goals. To test this hypothesis, we run underpricing regressions controlling for the issues' characteristics, issuers' strategic characteristics, and underwriting. Our econometric model is:

$$Underpricing_i = \gamma_0 + \gamma_1 Bubble + \gamma_2 Issue_i + \gamma_3 Strategic_i + \gamma_4 Underwriting_i$$

$$+\gamma_5 Industry_i + \gamma_6 Bubble \times Strategic_i + \gamma_7 Bubble \times Underwriting_i + \mu_i, \tag{4}$$

where

$Issue_i$ is a vector of characteristics of issue i: technology, age, offer size, firm size, offer-to-firm size, sales growth and the size of the price interval scaled by its middle point;

$Strategic_i$ is a set of three dummy variables indicating pre-IPO acquisitions, Big-four auditing (Big_four) and VC-sponsorship; and

$Underwriting_i$ is a dummy variable indicating that the Carter-Manaster reputation index is above 8.

In our basic setting, we do not control for the *ex-ante* demand for the IPO (*price revision up* and *price revision down*) because these variables are affected by underwriter's selling effort and the timing of the IPO. Nevertheless, for robustness purposes we also present estimations controlling for *ex-ante* demand.

If our conjecture is correct, interactions of the bubble dummy with our proxies for firms' strategic goals and characteristics fully explain the abnormal underpricing observed during the bubble; i.e., the coefficients on the bubble dummy and its interaction with top underwriting will not be statistically significant.

We also investigate alternatives explanations for Dotcom underpricing. To evaluate the Risk-composition hypothesis we use means comparison of the average quality between the bubble and pre-bubble IPO cohorts. We use direct and indirect measures. Our direct measure is the frequency of failures. As indirect measures we use: institutional ownership and its concentration (one would expect institutional investors to run away from bad quality firms, decreasing institutional ownership and increasing its Herfindahl index), certification by reputable underwriters and auditors, and enhanced tradability conditions (analysts' coverage and bid-ask spreads). We measure tradability conditions and institutional ownership at the end of the second year from the IPO. This allows for the effect of underwriter efforts at the IPO to wear out, minimizing the possibility that firms are bad-quality but look good under indirect measures because of underwriting effort.

There are two objections to the use of top underwriting and analysts' coverage as measure for quality during the bubble. First, Loughran and Ritter (2004) suggest that top underwriters increased market share by lowering their standards (we call this *Underwriters' Opportunistic Behavior*). If so, top underwriting would not signal quality. Second, the same authors conjecture that during the bubble, firms coped with underwriters with a reputation for severe underprice in exchange for analyst coverage (*Analyst Lust*). Therefore, analysts' coverage was related to underpricing and underwriting rather than issuer quality. We test these two possibilities using probit analysis on the choices of underwriters and analyst coverage. Our specification for these tests is:

$$Dependent_i = \beta_0 + \beta_1 Bubble + \beta_2 Issue_i + \beta_3 Industry_i + \mu_i, \qquad (5)$$

where

$Dependent_i$ is either a dummy variable indicating Carter-Manaster index for underwriters' reputation above 8, or a dummy variable indicating analysts' coverage during the second year from the IPO;

$Bubble$ is a dummy variable indicating the bubble years (1999-2000);

$Issue_i$ is a vector of predetermined characteristics of issue i: VC-sponsorship, Big-four auditing, high-growth, pre-IPO acquisition, age, technology, firm size, offer size, offer-to-firm size and sales growth (in the analysis for analysts' coverage we also include underpricing, the top-underwriting dummy and their interactions with the bubble dummy); and

$Industry_i$ is a set of 9 industry dummies.

If the *Underwriters' Opportunistic Behavior* is right, one would observe a positive coefficient on the bubble dummy in the probit analysis for top underwriting. If the *Analyst Lust* is right, one would observe positive coefficients on the interactions of bubble dummy with underpricing and top-underwriting

4 – Results

We conjecture that the high underpricing prevailing during the bubble is fully accounted by issuers' characteristics and strategic goals rather than underwriter's behavior. Table 5 investigates underpricing during the bubble (Model 2). Regression 1 includes only the usual controls plus the Bubble dummy.[5] The coefficient on the bubble dummy is 0.358 (35.8 percent) with statistical significance at the one percent level. Thus, the increase in underpricing during the bubble is not fully explained by change in firms' characteristics. Notice that the coefficients on the dummies for VC, Big-four, High-growth, Acquisition pre-IPO and Young are positive and statistically significant at the one percent level.

Regression 2 includes the interaction between top-underwriting and the bubble dummies. Now the coefficient on the Bubble dummy drops to 0.249 that is significant at the one percent level. The coefficient on the interaction is 0.137 that is significant at the

---

[5] We do not include controls for the *ex-ante* demand because they could be correlated to the bubble itself.

10% level, suggesting that part of the underpricing incurred during the bubble was due to the action of top underwriters. This result is similar to that of Loughran and Ritter (2004).[6]

Regression 3 examines the effect of VC sponsorship and pre-IPO acquisitions during the bubble on underpricing. The interaction of VC and bubble dummies has coefficient of 0.273 that is statistically significant at the one percent level indicating that VC sponsored firms bore additional 27.3 percent underpricing. Similarly, the interaction with the acquisition dummy has coefficient of 0.213 that is statistically significant at the one percent level. The coefficients on the bubble dummy drops to 0.074 and that on its interaction with top underwriting to 0.087. Both coefficients lose statistical significance. Thus, the underpricing during the bubble can be fully accounted by the behavior of VC and pre-IPO acquiring firms. Notice that once we include the interaction of VC and bubble dummies, the coefficient on VC loses statistical significance. Therefore, out of the bubble period VC sponsorship does not affect underpricing. Distinctively, the coefficient on Acquisition pre-IPO remains statistically significant at the 10 percent level, even though its magnitude drops from 0.072 to 0.023.

Regression 4 includes additionally the interaction between the bubble and Big-four dummy. The coefficient on such interaction is 0.217 that is statistically significant at the one percent level. Notice that now the coefficient on the bubble dummy becomes negative but still non-significant. The inclusion of this interaction does not change the magnitudes of the coefficients on the interactions of VC and Acquisition pre-IPO.

It is possible that our three strategic variables also have a selection component. For instance, VC-sponsored firms are frequently young, focused on technology and belong to high-growth industries. In order to disentangle these two components, regression 5 includes interactions between the bubble dummy and the three dummies for firms' characteristics (high-growth, technology and young). All of these interactions bear coefficients near 15 percent that are statistically significant at the five or 10 percent levels. Now the coefficient on the interaction of the bubble and VC dummies drops from 0.27 (Regressions 3 and 4) to 0.18, but remains statistically significant at the one percent level. This means that from the

---

[6] We note that these authors did not include in their analysis any other interaction with the bubble dummy.

27 percent extra underpricing bore by VC-sponsored firms, only 9 percent was due to their characteristics. The magnitude of the coefficient on the interactions between the Acquisition pre-IPO, Big-four and bubble dummies are only marginally affected by firms' characteristics, suggesting that the Acquisition pre-IPO and Big-four variables capture only strategic behavior.

Regression 6 drops the bubble dummy to include its interaction with the Non-top underwriting dummy. The coefficient on the interaction with the top-underwriting dummy becomes negative (-0.077) but still fails to present statistical significance (t-statistics is -1.13). Regression 7, for robustness purposes, includes controls for the *ex-ante* demand (price revision up and price revision down). The coefficient on the bubble dummy becomes -0.173 that is statistically significant at the 10 percent level. The coefficient on the interaction of the bubble and top-underwriting dummies remain positive but without statistical significance (t-statistics is 1.10).

As robustness, we also run quantile on underpricing (Table 6). Regressions 1 to 6 (7 to 12) refer to the Pre-bubble (Bubble) period. During the Pre-bubble period, extreme underpricing was mostly related to Acquisitions Pre-IPO and firms' characteristics (technology, age and firm's growth). Furthermore, quantile and OLS analysis yields very similar results. The only discrepancy relates to Price-interval that is statistically significant under OLS but not under quantile analysis. During the Bubble period, strategic variables (VC-sponsorship, Big-four auditing and Acquisition Pre-IPO) gain importance. Issues characteristics (issuer size and offer size) become statistically significant. Consistent with fight for leadership, large firms bear increased underpricing. Finally, firms' characteristics, with the exception of Sales growth, loose importance. Quantile and OLS analysis yields quite distinct results: under OLS, almost all variables are statistically significant. Thus, quantile analysis corroborates our assumption that extreme underpricing during the bubble is related to firms' strategic goals.

4.1 – Robustness

4.1.1 – Risk-Composition Hypothesis

We will now discuss some robustness tests that consider alternative theories for the market's bubble behavior. We start with the *Risk Composition hypothesis* (*RCH*) that assumes that issuers' quality decreased during the bubble period. We now investigate changes in issuers' quality.

One of the main evidences supporting *RCH* is the increased rate of failure (delisting due to bankruptcy or drop reasons) within the first five years from the IPO (Yung, Colak and Wang; 2008). We look at the evolution of failure rates over a period of 15 (Table 6). Compared to the pre-bubble period, failure rate within three years from the IPO during the bubble is almost three times bigger: 14.7 vs. 5.3 percent (difference statistically significant at the one percent level). Within five years, it is almost twice: 18.6 vs. 10.3 percent (significant at the one percent level). These results are in accordance to those of Yung, Colak and Wang (2008). However, difference in failure rates decreases monotonically over time. Within 14 years from the IPO, failure rates are similar: 26.5 vs. 24.0 percent (with no statistical difference). In fact, the difference loses statistical significance after the 11th year. Business cycles can explain difference in failure rates across cohorts: firms that went public during the bubble faced its burst just few months after their IPOs and a great credit crunch (2007-2009) within the first 10 years from their IPOs. Therefore, it is likely that the effect of macroeconomic shocks on failure rates is stronger for the bubble cohort. Summing up, there is no evidence of higher failure rates during the bubble in the long run.

Table 7 also reports the difference in failure rates across highly and lowly underpriced IPOs during the bubble. If underpricing is related to drop in quality, highly underpriced IPOs should be associated increases failure rate. We find just the opposite. Failure rate remains five to seven percent lower for highly underpriced IPO regardless of the time horizon (difference always statistically significant at the one percent level). Thus, failure rate seems negatively related to underpricing.

We also look at indirect quality measures: bid-ask spreads at the end of the second year from the IPO and analysts' coverage at the end of the first year, and institutional ownership and its Herfindahl index at the end of the second year from the IPO (Table 8). Bid-ask spreads decreased from 4.2 to 3.2 percent and were considerably lower for highly underpriced firms: 2.4 vs. 3.9 percent. Analysts' coverage increased from 70 to 76 percent

and was higher among highly underpriced IPOs: 80 vs. 73 percent. Institutional ownership was constant at 33 percent over both pre-bubble and bubble periods and it was slightly lower for highly underpriced IPOs: 31 vs. 34 percent (difference statistically significant at the 10 percent level). Similarly, the Herfindahl index was constant at 0.21 across periods and slightly lower for highly underpriced IPOs: 0.20 vs. 0.22 (no statistical difference). Thus, once more we find no evidence for drop in quality or than high underpricing is associated to lower quality.

Finally, we run regression analysis to search for drop in quality associated to issuers characteristics (Table 9). Initially we focus on VC-sponsorship. VC bubble firms experienced lower bid-ask spreads and institutional ownership. There was no relative change in failure rate, analysts' coverage and the Herfindhal index for institutional ownership. Therefore, VC-sponsorship at the bubble implies a higher liquidity. Thus, there is no evidence of a decrease in quality for VC-sponsored issuers. For pre-IPO acquirers bid-ask spreads and institutional concentration decreased. Moreover, the failure among pre-IPO acquirers was so rare that the variable drops in failure regression. Consequently, apart from some evidence of industry concentration, all results point to an increase in quality. For issuers with Big-four auditing there was decreased failure rate, improved analyst coverage and institutional ownership, and lower institutional concentration. These results point towards an improvement in quality.

The only groups of firms for which we see any evidence of decrease in quality are technology and high-growth firms. Evidence is stronger for technology firms: there was an increase in the rate of failure, even though they had improved their liquidity (lower bid-ask spreads and higher analysts' coverage). High-growth firms experienced a reduction in institutional ownership and an increase in its concentration. For both technology and high-growth firms there was an indication of sector consolidation, with higher likelihood of becoming an M&A target.

Contrary to what one could expect, there is no evidence of any change in quality for young issuers during the bubble. Issuers that went public earlier in their life cycle during the bubble were equally good as their predecessors. This result goes against the idea that

during the bubble firms were speeding up their IPOs to time the market and exploit investors' gullibility.

Overall, the evidence of a decrease in the quality of issuers seems weak. In particular, there is no evidence of deterioration in quality among VC-sponsored, acquiring, audited by Big-four or young companies. This leaves little room for a demand-driven explanation for the high underpricing.

4.2.1 -- Change in underwriters' certification

Certification increased during the bubble (Table 4). The proportion of top underwriting increased from 68 to 84 percent (difference significant at the one percent level). This led Loughran and Ritter (2004) to raise concern as top underwriting as measure of quality. Accordingly, the increase in top-underwriting during the bubble was due to top underwriters' opportunistic behavior to increase market share. We address such concern by running probit analysis on the probability of top underwriting (Model 5). Regressions 1-3 in Table 9 report marginal effects. Regression 1 includes only predetermined characteristics of issues. Top underwriting is more likely for VC-sponsored, technology and large firms, and for large offerings (in terms of absolute and relative size). Regression 2 includes a dummy variable for the bubble period. The marginal effect of the bubble dummy is -0.160 (statistically significant at the one percent level). Thus, the likelihood of any firm hiring a top underwriter fell by 16.0 percent during the bubble. Finally, Regression 3 also controls for issuers' strategic goals. The marginal effect of the bubble dummy remains the same both in terms of magnitude and statistical significance. In short, our results reject the idea of underwriters' opportunism. In fact, top underwriters became more selective. The increase in top underwriting during the bubble was due to the raise in the proportion of firms with the fit for it.

4.2.2 – Change in analysts' coverage

Loughran and Ritter (2004) suggest that during the bubble some firms coped with high underpricing to obtain analysts' coverage (*Analyst Lust*). We investigate such conjecture by running probit analysis on analysts' coverage (Model 5). Regressions 4-6 in

Table 10 report marginal effects. Regression 4 controls for firms' characteristics, underpricing and the bubble period. The coefficient on underpricing is 0.020 and bears no statistical significance. The coefficient on the bubble dummy, -0.052, is statistically significant at the 10 percent level. The marginal effect on Top-underwriting (0.055), even though positive and statistically significant at the 5% level is relatively small when compared to that of acquisition dummy (0.211 with t-statistics of 13.23) or VC sponsorship (0.133 with t-statistics of 7.18). Regression 5 also includes the interactions of underpricing and Top-underwriting with the bubble dummy. Both interactions are not statistically significant. Finally, regression 6 excludes Big-four auditing and Pre-IPO acquisition dummies, but results remain similar to those in regressions 4 and 5. Summing up, there is no evidence that during the bubble analyst coverage increased uniformly or that coverage was related to underpricing or top underwriting. Consequently, our results contradict the *Analyst Lust conjecture*.

5 – Conclusion

We conjecture that the Dotcom high underpricing was consequence of the emergence of a large cohort of firms racing for market leadership. Our empirical findings support our conjecture. We begin by showing that the abnormally high underpricing observed during the bubble can be fully accounted by issuers' characteristics and strategic purposes. The strategic dimensions we consider were firms that were doing acquisitions, sought Big-four auditing, and had VC sponsorship. The issuers associated with high underpricing were high-growth, technology and young. When one controls for these characteristics, it emerges that the abnormally high underpricing is not related to underwriters' behavior.

We also run some checks on alternative conjectures for Dotcom underpricing. We show that during the bubble there was no decrease in the quality of the average issuer. In fact, there is indication that quality increased. For example, we find that the tradability conditions and certification improve during the bubble. Finally, in order to reconcile our result with the previous literature, we show that the increase in failure rate previously reported in the literature prevailed only in the short-run. However, the mid- and long-run failure rates are not different for the bubble and pre-bubble IPO cohorts. Furthermore, we

observe that highly underpriced firms presented better quality than low-underpriced ones. Therefore, our evidence goes against the *Risk Composition Hypothesis*.

By examining the determinants of top underwriting an analysts' coverage we found that underwriters and analysts became more selective during the bubble. Controlling for firms' characteristics, the likelihood of obtaining top underwriting fell by near 15 percent, while that of analysts' coverage fell by near three percent. Top underwriting and analysts' coverage increased during the bubble because of the increase in the proportion of firms with the fit for them. This evidence is contrary to the *Analyst Lust Conjecture* and to the idea that top underwriters took advantage of the moment to increase their market share.

8 – Acknowledgements

9 – References

Barry, Christopher, Chris Muscarella, John Peavy and Michael Vetsuypens, 1990, The role of venture capital in the creation of public companies: evidence from the going public process. *Journal of Financial Economics* 27, 447-471. https://doi.org/10.1016/0304-405X(90)90064-7.

Benveniste, Lawrence M., and Paul Spindt, A, 1989, How investment bankers determine the offer price and allocations of new issues. *Journal of Financial Economics* 24, 343-361. https://doi.org/10.1016/0304-405X(89)90051-2.

Brau, James and Stanley Fawcett, Initial public offerings: an analysis of theory and practice. *Journal of Finance* 61, 399–436. https://doi.org/10.1111/j.1540-6261.2006.00840.x.

Brennan, Michael and Julian Franks, 1997, Underpricing, ownership and control in initial public offerings of equity securities in the UK. *Journal of Financial Economics* 45, 391‑414. https://doi.org/10.1016/S0304-405X(97)00022-6.

Celikyurt, Ugur, Merih Sevilir and Anil Shivdasani, 2010, Going public to acquire? The acquisition motive in IPOs. Journal of Financial Economics 96, 345–363. https://doi.org/10.1016/j.jfineco.2010.03.003.

Helwege, Jean and Nellie Liang, 2004. Initial public offerings in hot and cold markets. *Journal of Financial and Quantitative Analysis* 39, 541–569. https://doi.org/10.1017/S0022109000004026.

Howe, John and Shaorong Zhang, 2005. Underwriting in hot and cold markets. Unpublished working paper. University of Missouri at Columbia.

Ibbotson, Roger, Jody Sindelar and Jay Ritter, 1994. Initial public offerings. *Journal of Applied Corporate Finance* 1, 37–45. https://doi.org/10.1111/j.1745-6622.1988.tb00164.x.

Ljungqvist, Alexander and William Wilhelm Jr., 2003, IPO pricing in the Dot-com bubble. *Journal of Finance* 58, 723-752. https://doi.org/10.1111/1540-6261.00543.

Loughran, Tim and Jay Ritter, 2004, Why has IPO underpricing changed over time? *Financial Management* 33, 5-37.

Megginson, William and Kathleen Weiss, 1991, Venture Capitalist Certification in Initial Public Offers. *Journal of Finance* 46, 879-903. https://doi.org/10.1111/j.1540-6261.1991.tb03770.x.

Ritter, Jay, 1984, The 'hot issue' market of 1980. *Journal of Business* 57, 215–240. https://doi.org/10.1086/296260.

Ritter, Jay, 2014, *Initial Public Offerings: Updated Statistics*. Available at http://bear.warrington.ufl.edu/ritter/IPOs2014Statistics.pdf. access on Oct/30/2014.

Rock, Kevin, 1986, Why new issues are underpriced. *Journal of Financial Economics* 15, 187-212. https://doi.org/10.1016/0304-405X(86)90054-1.

Schultz, Paul, Zaman, Mir, 2001. Do the individuals closest to internet firms believe they are overvalued? Journal of Financial Economics 59, 347‑381. https://doi.org/10.1016/S0304-405X(00)00090-8.

Yung, Chris, Conul Colak and Wei Wang, 2008, Cycles in the IPO market. *Journal of Financial Economics* 89, 192-208. https://doi.org/10.1016/j.jfineco.2007.06.007.

Histograms 1

1A: Bubble period (full sample)
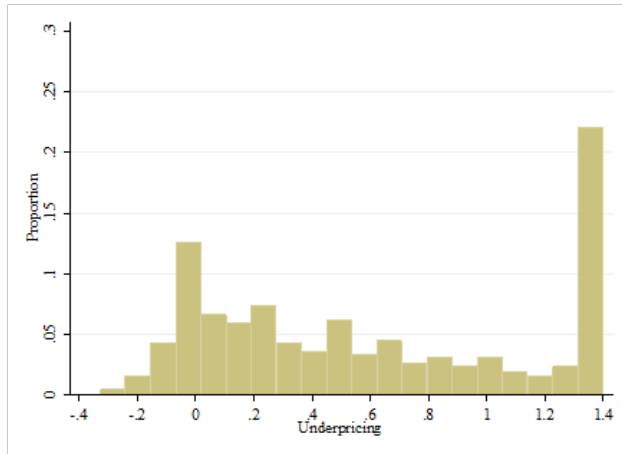
1B: Pre-bubble period (full sample)
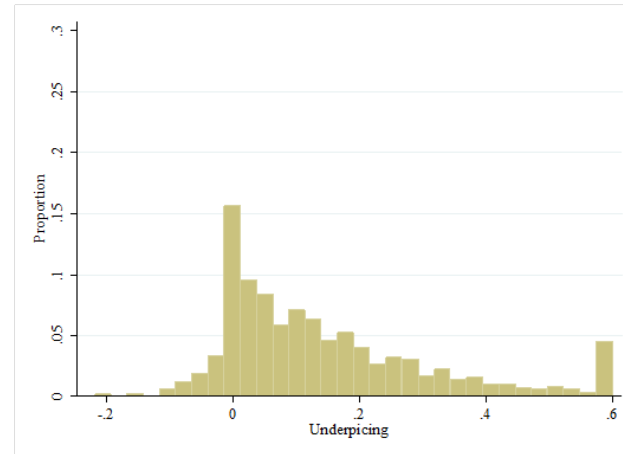
1C: Bubble period (technology sample)
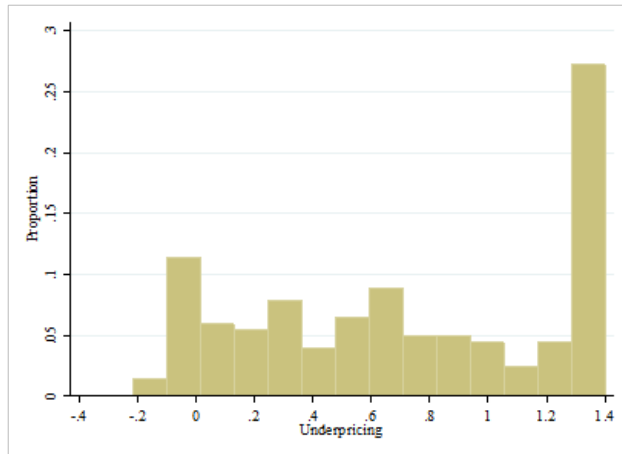
1D: Bubble period (non-technology sample)
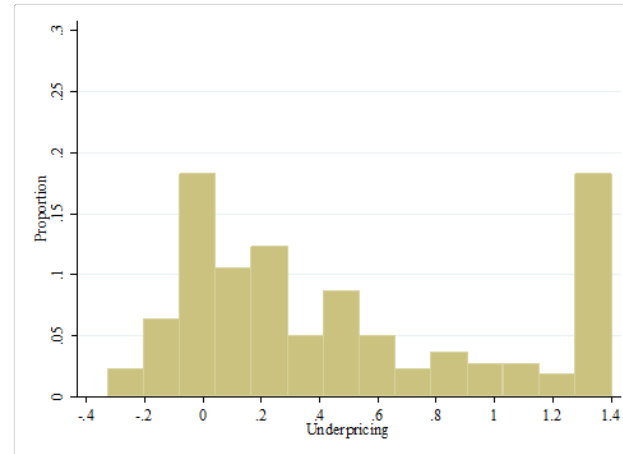
Table 1

Variables Definition

Underpricing	percent change from the IPO offer price to the closing price of the first trading day.
Acquisition post-IPO	Dummy variable indicating that the firm made acquisitions in the 5-year period after the IPO.
Acquisition pre-IPO	Dummy variable indicating that the firm made acquisitions in the 3-year period before the IPO.
Big-four auditing	Dummy variable indicating whether financial statements were audited by Big-Four auditor
Venture Capital (VC)	Dummy variable indicating VC sponsorship.
M&A	Dummy variable indicating that the firm was target for merger or acquisition between 3th and 10th years from the IPO.
Top underwriting	Dummy variable indicating whether the Carter-Manaster index (updated for the period 1992-2003 by Loughran and Ritter (2004) for the member of the underwriting syndicate with the highest score is bigger than 8.
Bid-ask spread	Difference between bid and ask prices, divided by the arithmetic average between the two.
Failure	Dummy variable indicating delisting for bankruptcy or drop.
Institutional ownership	Percentage of outstanding shares held by institutional investors.
Herfindhal index	Herfindhal index for institutional ownership.
Analysts' coverage	Dummy variable indicating that the firms is followed by at least one analyst during the year
Sales growth	Geometric average of quarterly sales growth during the last three quarters before the IPO (or available period if less).
High-growth	Dummy variable indicating that *Sales growth* was above the cut off for the top quartile using the sample from 1991-1996
Price revision up	Dummy variable indicating that the offer price was higher than original filing high price.
Price revision down	Dummy variable indicating that the offer price is lower than original filing low price.
Price interval	Original filing high price minus original filing low price divided by their average.
Offer size	Filled amount in the IPO prospectus (MM).
Firm size	Book value of assets in the last financial statement before the IPO (MM).
Technology	Dummy variable indicating technology industries as defined in Loughran and Ritter (2004).
Age	IPO year minus founding year.
Young	Dummy variable indicating if the firm is younger than 8.1 years old (the median age during the bubble).
Industry dummies	Mapped into US 2-digit SIC codes

Table 2
Reasons for drop in sample

Description	Number of IPO
Original Sample from Ritter (2014) sample including founding date	9003
IPOs missing prospectus and information from SDC Platinum	-2888
IPOs with multiple entries	-1
Firms without information on Institutional Holdings	-770
Firms without CRSP information on bid-ask spread	-60
Firms without Compustat Annual or Quarterly Fundamental's data	-1034
Firms with offer size less than US$ 5	-124
Firms that opened capital in unknown or foreign exchanges	-433
Firms with IPO after 2001	-880
Firms with IPO before 1990	-59
Total	**2754**

Table 3
Comparing samples

		Pre-bubble	Transition period		Bubble period	
		1991-1996	1997	1998	1999	2000
Sample	Ritter (2014)	2801	474	282	476	381
	Our Sample	1661	291	172	333	300
	coverage	58%	61%	61%	70%	79%
IPO at NASDAQ	Ritter (2014)	86%	79%	79%	92%	85%
	Our sample	88%	80%	73%	95%	94%
VC-backed IPOs	Ritter (2014)	37%	28%	27%	58%	64%
	Our sample	41%	33%	35%	63%	71%
Tech IPOs	Ritter (2014)	24%	58%	61%	78%	69%
	Our sample	29%	30%	28%	44%	57%
Gross Proceeds	Ritter (2014)	57.6	68.7	122.2	136.4	170.3
	Our sample	58.8	72.7	118	115.9	116.3
Median age	Ritter (2014)	8	7	6	4	5
	Our sample	8	9	7	5	6
Price revision up	Ritter (2014)	24.2%	24.2%	22.5%	47.7%	38.8%
	Our sample	27.0%	26.0%	25.0%	54.0%	38.0%
Price revision down	Ritter (2014)	27.0%	29.9%	28.0%	14.8%	22.1%
	Our sample	29.0%	32.0%	31.0%	17.0%	22.0%
Underpricing	Ritter (2014)	14.3%	14.0%	22.2%	71.7%	56.1%
	Our Sample	15.5%	15.1%	22.7%	75.1%	56.3%

Table 4
Characteristics of Sample across Periods

Underpricing: first trading day closing price relative to the offer price*; Age*: IPO year minus founding year; *Firm size*: book value of assets in the last financial report before the IPO; *Technology*: dummy variable indicating technology industries as defined in Loughran and Ritter (2004); *Sales growth:* geometric average of quarterly sales growth during the last three quarters before the IPO (or available period, if less); *High-growth*: dummy variable indicating quarterly sales growth above 100%; *Offer size:* filled amount in the IPO prospectus; and *Top underwriting*: dummy variable indicating that the Carter-Manaster index for the member of the underwriting syndicate with the highest score is bigger than 8. Number of firms with the attribute and t-statistics are in parentheses. *, ** and *** to denote statistical significance at the 10, 5 and 1percent levels (in **boldface**).

Period	Pre Bubble 1991-1996	Transition 1997-1998	Bubble 1999-2000	Difference: Bubble - Pre-bubble
Sample	1660	464	633	-
Underpricing	16%	20%	66%	**50%***** (0.000)
Sales growth (Average of quarterly growth)	56%	68%	91%	**35%***** (0.000)
Age	14.6	15.2	9.4	**-5.2*** (0.077)
Technology	29%	30%	50%	**21%***** (0.000)
Firms size (Book value of assets in millions)	164.1	233.6	254.6	**90.5***** (0.000)
Offer size (in million)	58.8	95.35	116.1	**57.3***** (0.000)
Offer-to-firm size	1	1.09	1.12	**0.12***** (0.000)
Top underwriting	68%	67%	84%	**16%***** (0.000)
Venture capital	41%	34%	67%	**26%***** (0.000)
Big-four auditor	33%	31%	36%	**3%*** (0.082)
Acquisition pre-IPO (3 years)	33%	33%	25%	**-8%*** (0.094)

Table 5

Underpricing Analysis

Least square analysis of the underpricing. *Bubble dummy* indicates the years of 1999 and 2000; *Venture Capital* dummy: indicates VC sponsorship; *Top underwriting* dummy: Carter-Manaster score for the highest syndicate member ≥ 8; *Big-four auditing*: Big-Four auditing; *High-growth*: indicates quarterly sales growth $\geq 100\%$; *Acquisition pre-IPO*: indicates acquisitions in the 3-year period before the IPO; *Young*: indicates firm age ≤ 8.1 years; *Age*: IPO year minus founding year; *Technology*: indicates technology industries as defined in Loughran and Ritter (2004); *Firm size*: book value of assets; *Offer size:* filled amount in the IPO prospectus; *Sales growth:* geometric average of quarterly sales growth over the last three quarters before the IPO (or available period if less); *Price interval*: original filing upper bound minus lower bound divided by their average; and *Price Revision Up (or down)*: indicates offer price higher (or lower) than filing high price. T-statistics in parentheses. Estimates use White standard errors. Sample consists of 2,754 IPOs. We use *, ** and *** to denote statistical significance at the 10, 5 and 1 percent levels (two sided). Significant results (at 10% level or better) are in **boldface**.

	1	2	3	4	5	6	7
Bubble dummy	**0.358*** (10.67)**	**0.249*** (3.67)**	0.074 (1.01)	-0.003 (-0.04)	-0.143 (-1.53)		**-0.173* (-1.88)**
Bubble x Top underwriting		**0.137* (1.77)**	0.087 (1.14)	0.084 (1.08)	0.065 (0.85)	-0.077 (-1.13)	0.083 (1.10)
Bubble x Non-top underwriting						-0.143 (-1.53)	
Bubble x Acquisition pre-IPO			**0.213*** (2.64)**	**0.229*** (2.85)**	**0.232*** (2.89)**	**0.232*** (2.89)**	**0.239*** (2.99)**
Bubble x Venture capital			**0.273*** (4.36)**	**0.270*** (4.31)**	**0.181*** (2.78)**	**0.181*** (2.78)**	**0.185*** (2.90)**
Bubble x Big-four				**0.217*** (2.97)**	**0.215*** (2.96)**	**0.215*** (2.96)**	**0.221*** (3.06)**
Bubble x High-growth					**0.134* (1.80)**	**0.134* (1.80)**	**0.146** (1.97)**
Bubble Dummy x Technology					**0.165** (2.47)**	**0.165** (2.47)**	**0.186*** (2.80)**
Bubble Dummy x Young					**0.130** (2.05)**	**0.130** (2.05)**	**0.129** (2.06)**
Acquisition pre-IPO	**0.072*** (3.74)**	**0.072*** (3.73)**	**0.023** (2.10)**	**0.074*** (3.88)**	**0.023** (2.14)**	**0.023** (2.14)**	0.014 (1.33)
Venture capital	**0.053*** (2.89)**	**0.054*** (2.97)**	-0.005 (-0.38)	**0.051*** (2.83)**	0.016 (1.35)	0.016 (1.35)	0.010 (0.95)
Big-four	**0.070*** (3.57)**	**0.071*** (3.60)**	0.018 (1.55)	**0.066*** (3.43)**	0.015 (1.29)	0.015 (1.29)	0.011 (1.06)
High-growth	**0.112*** (3.00)**	**0.110*** (2.95)**	**0.095*** (2.60)**	0.039 (1.35)	0.037 (1.29)	0.037 (1.29)	**0.047* (1.72)**
Technology	**0.088*** (4.04)**	**0.089*** (4.05)**	**0.085*** (3.91)**	**0.034** (2.55)**	**0.041*** (3.12)**	**0.041*** (3.12)**	0.019 (1.60)
Young	**0.045*** (2.72)**	**0.045*** (2.69)**	**0.039** (2.38)**	0.011 (0.88)	0.013 (1.07)	0.013 (1.07)	0.011 (0.98)
Top underwriting	**0.034* (1.75)**	0.010 (0.66)	**0.042** (2.22)**	**0.036* (1.91)**	**0.030** (2.18)**	**0.030** (2.18)**	0.028 (1.56)
Age	**-0.001** (-2.29)**	**-0.001** (-2.21)**	**-0.001*** (-2.84)**	**-0.001*** (-3.64)**	**-0.001*** (-3.86)**	**-0.001*** (-3.86)**	**-0.001*** (-2.81)**
Firm size	**0.056*** (4.13)**	**0.054*** (4.05)**	**0.052*** (4.11)**	**0.055*** (4.21)**	**0.051*** (4.14)**	**0.051*** (4.14)**	**0.047*** (3.80)**
Offer size	**-0.058*** (-3.62)**	**-0.054*** (-3.48)**	**-0.055*** (-3.59)**	**-0.054*** (-3.56)**	**-0.050*** (-3.48)**	**-0.050*** (-3.48)**	**-0.047*** (-3.34)**
Offer-to-firm size	10.754 (1.39)	10.734 (1.39)	10.602 (1.42)	10.395 (1.35)	10.256 (1.37)	10.256 (1.37)	9.852 (1.34)
Sales growth	0.042 (1.61)	**0.043* (1.66)**	**0.048* (1.86)**	**0.044* (1.69)**	**0.049* (1.92)**	**0.049* (1.92)**	0.028 (1.10)
Price interval	**-0.005*** (-3.68)**	**-0.005*** (-3.47)**	**-0.005*** (-3.40)**	**-0.006*** (-3.78)**	**-0.005*** (-3.45)**	**-0.005*** (-3.45)**	**-0.008*** (-6.03)**
Price revision up							**0.203*** (11.63)**
Price revision down							**-0.057*** (-6.65)**
R-squared	0.238	0.247	0.257	0.251	0.275	0. 275	0.301
Industry dummies	yes	yes	yes	yes	yes	Yes	yes
Constant	yes	yes	yes	yes	yes	Yes	yes

Table 6
Underpricing: quantile analysis

Quantile analysis of the underpricing. *Venture Capital* dummy: indicates VC sponsorship; *Top underwriting* dummy: Carter-Manaster score for the highest syndicate member ≥ 8; *Big-four auditing*: Big-Four auditing; *Acquisition pre-IPO*: indicates acquisitions in the 3-year period before the IPO; *Technology*: indicates technology industries as defined in Loughran and Ritter (2004); *Firm size*: book value of assets; *Offer size:* filled amount in the IPO prospectus; *Sales growth:* geometric average of quarterly sales growth over the last three quarters before the IPO (or available period if less); *Price interval*: original filing upper bound minus lower bound divided by their average; and *Price Revision Up (or down)*: indicates offer price higher (or lower) than filing high price. T-statistics in parentheses. Estimates use White standard errors. Sample consists of 2,754 IPOs. We use *, ** and *** to denote statistical significance at the 10, 5 and 1 percent levels (two sided). Significant results (at 10% level or better) are in **boldface**.

	Pre-bubble period						Bubble period					
Regression	1	2	3	4	5	6	7	8	9	10	11	12
Decile	50%	60%	70%	80%	90%	OLS	50%	60%	70%	80%	90%	OLS
Acquisition pre-IPO	0.007	0.017	**0.030****	**0.045****	**0.048***	**0.026****	**0.268*****	**0.363*****	**0.316*****	**0.264***	0.290	**0.254*****
	(0.70)	(1.52)	**(2.25)**	**(2.24)**	**(1.81)**	**(2.32)**	**(3.78)**	**(4.13)**	**(2.84)**	**(1.72)**	(1.41)	**(3.13)**
Venture capital	0.002	0.005	0.003	0.017	0.037	0.008	**0.121***	**0.218****	**0.270****	**0.305****	**0.388***	**0.240*****
	(0.16)	(0.39)	(0.23)	(0.81)	(1.32)	(0.74)	**(1.69)**	**(2.46)**	**(2.41)**	**(1.97)**	**(1.86)**	**(3.46)**
Big Four	**0.024****	**0.024****	0.017	0.023	-0.003	0.014	**0.174*****	**0.181****	**0.207****	0.218	0.242	**0.214*****
	(2.27)	**(2.10)**	(1.23)	(1.13)	(-0.09)	(1.28)	**(2.70)**	**(2.27)**	**(2.05)**	(1.56)	(1.29)	**(2.92)**
Technology	**0.037*****	**0.053*****	**0.067*****	**0.067*****	**0.109*****	**0.056*****	**0.157***	0.121	**0.249****	0.160	0.131	**0.158****
	(3.07)	**(4.20)**	**(4.41)**	**(3.02)**	**(3.65)**	**(4.27)**	**(2.41)**	(1.50)	**(2.44)**	(1.14)	(0.69)	**(2.22)**
Age	**-0.001***	**-0.001*****	**-0.001*****	**-0.001***	**-0.001***	**-0.001*****	**-0.006***	**-0.006***	-0.006	-0.006	-0.011	**-0.007*****
	(-2.26)	**(-2.83)**	**(-2.72)**	**(-1.86)**	**(-1.97)**	**(-5.91)**	**(-2.08)**	**(-1.89)**	(-1.37)	(-1.07)	(-1.40)	**(-3.33)**
Sales growth	**0.058*****	**0.085*****	**0.100*****	**0.121*****	**0.183*****	**0.083*****	**0.113***	**0.166****	**0.170***	**0.331****	0.231	**0.130***
	(4.87)	**(6.72)**	**(6.62)**	**(5.45)**	**(6.12)**	**(6.07)**	**(1.78)**	**(2.13)**	**(1.72)**	**(2.42)**	(1.26)	**(1.95)**
Firm size	0.004	0.005	-0.001	-0.006	-0.004	0.005	**0.186*****	**0.263*****	**0.266*****	**0.343*****	**0.386*****	**0.260*****
	(0.49)	(0.58)	(-0.09)	(-0.43)	(-0.21)	(0.81)	**(3.93)**	**(4.48)**	**(3.58)**	**(3.35)**	**(2.80)**	**(4.03)**
Offer size	-0.003	-0.012	-0.009	-0.007	-0.013	-0.008	**-0.195*****	**-0.270*****	**-0.290*****	**-0.336****	**-0.316***	**-0.243*****
	(-0.38)	(-1.26)	(-0.78)	(-0.38)	(-0.58)	(-0.78)	**(-3.08)**	**(-3.44)**	**(-2.93)**	**(-2.45)**	**(-1.72)**	**(-3.04)**
Offer-to-firm size	-0.912	-2.351	-3.701	-3.961	-4.374	-1.798	**86.961*****	**141.50*****	**133.64*****	**131.03*****	**107.414***	**89.972*****
	(-0.34)	(-0.82)	(-1.08)	(-0.79)	(-0.65)	(-1.32)	**(3.93)**	**(5.16)**	**(3.86)**	**(2.74)**	**(1.67)**	**(2.81)**
Price interval	-0.002	-0.002	-0.002	-0.003	-0.004	**-0.003***	-0.006	-0.009	-0.015	-0.016	-0.015	**-0.008***
	(-1.17)	(-1.61)	(-1.32)	(-1.10)	(-1.36)	**(-2.36)**	(-0.88)	(-1.11)	(-1.50)	(-1.15)	(-0.81)	**(-1.67)**
Top_underwriting	0.001	0.011	0.016	0.008	0.007	0.015	0.058	-0.023	0.047	0.074	0.170	0.059
	(0.10)	(0.77)	(0.96)	(0.33)	(0.22)	(1.33)	(0.63)	(-0.20)	(0.33)	(0.38)	(0.64)	(0.67)
Observations	1661	1661	1661	1661	1661	1661	611	611	611	611	611	611

Table 7
Failure along firms life

Failure: dummy variable indicating delisting for bankruptcy or drop. Number of firms with the attribute and t-statistics are shown in parentheses. The number or observations is 2,754. We use *, ** and *** to denote statistical significance at the 10, 5 and 1 percent levels (two sided). Significant results (at 10% level or better) are in **boldface**.

Cumulative Failure	Pre Bubble	Transition period	Bubble Period	Difference	Bubble Period		Difference
Years from the IPO	1991-1996	1997-98	1999-2000	Bubble - pre-bubble	High Under>50%	Low Under≤50%	High-Low
3	5.3% (88)	12.5% (58)	14.7% (93)	**9.4%*** (0.000)**	10% (27)	9% (35)	1% (0.723)
4	7.6% (126)	18.3% (85)	16.7% (106)	**9.2%*** (0.000)**	13% (34)	20% (72)	**-7%*** (0.000)**
5	10.3% (171)	22.0% (102)	18.6% (118)	**8.3%*** (0.000)**	15% (39)	21% (79)	**-7%*** (0.000)**
6	12.7% (210)	24.1% (112)	19.7% (125)	**7.1%*** (0.000)**	16% (42)	22% (83)	**-7%*** (0.000)**
7	15.7% (260)	25.4% (118)	21.3% (135)	**5.7%*** (0.000)**	18% (48)	24% (87)	**-5%*** (0.000)**
8	17.5% (291)	26.1% (121)	22.6% (143)	**5.1%** (0.034)**	20% (52)	25% (91)	**-5%*** (0.000)**
9	19.4% (322)	26.9% (125)	24.2% (153)	**4.8%** (0.027)**	22% (57)	26% (96)	**-5%*** (0.000)**
10	20.5% (341)	27.8% (129)	25.1% (159)	**4.6%* (0.082)**	22% (57)	28% (102)	**-6%*** (0.000)**
11	20.5% (341)	27.8% (129)	25.1% (159)	**4.6%* (0.091)**	22% (58)	28% (103)	**-6%*** (0.000)**
12	22.6% (375)	29.7% (138)	25.8% (163)	3.2% (0.124)	23% (60)	28% (105)	**-6%*** (0.000)**
13	23.5% (390)	30.2% (140)	26.2% (166)	2.7% (0.132)	23% (61)	28% (105)	**-5%*** (0.000)**
14	24.0% (399)	30.8% (143)	26.5% (168)	2.5% (0.133)	24% (63)	28% (105)	**-5%*** (0.000)**
15	24.3% (404)	31.0% (144)	26.5% (168)	2.2% (0.137)	24% (63)	28% (105)	**-5%*** (0.000)**

Table 8

Indirect quality measures: descriptive

Underpricing: first trading day closing price relative to the offer price. *Bid-ask spread*: difference between bid and ask prices, divided by the arithmetic average between the two. *Analysts' coverage*: dummy variable indicating that the firms was followed by at least one analyst. *Institutional ownership*: percentage of outstanding shares held by institutional investors. *Herfindal index*: for institutional ownership. Number of firms with the attribute and t-statistics are shown in parentheses. We use *, ** and *** to denote statistical significance at the 10, 5 and 1 percent levels (two sided). Significant results (at 10% level or better) are in **boldface**.

Period	Pre-Bubble 1991-1996	Transition period 1997-1998	Bubble Period 1999-2000	Difference: Bubble - pre-bubble	Bubble Period		Difference High-Low	Bubble
					High Under>50%	Low Under≤50%		Correlation with under.
Sample	1660	464	633		264	369		
Bid-ask spread	4.2%	3.4%	3.2%	**-1%** (0.047)	2.4	3.9	**-1.50** (0.024)	**-0.14*** (0.000)
Analyst's coverage (end of year 1)	70% (1157)	74% (350)	76% (480)	**6%** (0.042)	80% (212)	73% (268)	**7.4%*** (0.000)	**0.07*** (0.000)
Institutional ownership (end of year 2)	33%	30%	33%	0% (0.584)	31	34	**-3*** (0.052)	**-0.002*** (0.094)
Herfindahl Index (for institutional ownership in year 2)	0.21	0.23	0.21	0 (0.748)	0.20	0.22	-0.02 (0.341)	**-0.11*** (0.000)

Table 9
Quality Analysis
(Marginal effects)

The dependent variables are *Failure*: dummy variable indicating delisting for bankruptcy of drop in the first 10 years from the IPO; Bid-ask: bid-ask spreads at the end of the second year from the IPO; Analysts: dummy variable indicating analysts coverage at the end of the second year from the IPO; *Institutional ownership*: Percentage of outstanding shares held by institutional investors at the end of the second year from the IPO; and *Herfindhal*: Herfindhal index for institutional ownership at the end of the second year from the IPO. Explanatory variables are: *Bubble dummy* indicates the years of 1999 and 2000; *Venture Capital*: dummy variable indicating VC sponsorship; *Acquisition pre-IPO:* dummy variable indicating that the firm made acquisitions in the 3-year period before the IPO; *Big-four auditing*: dummy variable indicating auditing by Big-Four auditors; *High-growth*: dummy variable indicating quarterly sales growth above 100%; *Technology*: dummy variable indicating technology industries as defined in Loughran and Ritter (2004); *Young*: dummy variable indicating if the firm is younger than 8.1 years old; Age: IPO year minus founding year; *Firm size*: book value of assets in the last financial report before the IPO; *Offer size:* filled amount in the IPO prospectus; and *Sales growth:* geometric average of quarterly sales growth during the last three quarters before the IPO (or available period if less). T-statistics are shown in parentheses. Estimates use White standard errors. The number or observations is 2,754. We use *, ** and *** to denote statistical significance at the 10, 5 and 1 percent levels (two sided). Significant results (at 10% level or better) are in **boldface**.

	Failure	Bid-Ask	Analysts	Institutional ownership	Herfindhal
Bubble dummy	0.065	**-0.010***	**-0.207***	-0.026	**0.078***
	(1.36)	**(-7.00)**	**(-3.96)**	(-0.82)	**(3.17)**
Bubble x Venture capital	-0.010	**-0.003***	-0.033	**-0.079***	0.010
	(-0.24)	**(-1.81)**	(-0.65)	**(-2.73)**	(0.39)
Bubble x Acquisition pre-IPO	dropped	**-0.002***	0.050	0.012	**-0.053***
		(-1.88)	(0.97)	(0.47)	**(-2.49)**
Bubble x Big-four	**-0.067***	-0.001	**0.135***	**0.046***	**-0.047***
	(-1.93)	(-0.80)	**(3.62)**	**(1.79)**	**(-2.07)**
Bubble x High-growth	-0.023	0.002	-0.087	**-0.067***	**0.073***
	(-0.54)	(1.32)	(-1.58)	**(-2.47)**	**(2.84)**
Bubble x Technology	**0.095***	**-0.004***	**0.104***	-0.002	0.025
	(2.02)	**(-2.99)**	**(2.59)**	(-0.07)	(1.07)
Bubble x Young	0.013	-0.001	0.036	-0.003	0.009
	(0.27)	(-0.95)	(0.73)	(-0.09)	(0.37)
Venture capital	-0.034	-0.000	**0.155***	**0.088***	**-0.066***
	(-1.64)	(-0.31)	**(6.79)**	**(7.91)**	**(-6.61)**
Acquisition pre-IPO	dropped	-0.000	**0.294***	**0.063***	**-0.056***
		(-0.52)	**(15.71)**	**(5.77)**	**(-6.24)**
Big-four	-0.020	0.000	0.005	**0.029***	**-0.032***
	(-1.01)	(0.07)	(0.22)	**(2.60)**	**(-3.51)**
High-growth	**0.114***	-0.002	0.014	**-0.067***	**0.041***
	(2.91)	(-1.27)	(0.35)	**(-3.34)**	**(2.39)**
Technology	**-0.083***	-0.000	**-0.046***	**-0.026***	0.014
	(-3.63)	(-0.45)	**(-1.80)**	**(-2.25)**	(1.24)
Young	**0.047***	0.000	**-0.089***	-0.017	**0.020***
	(2.05)	(0.32)	**(-3.53)**	(-1.36)	**(1.91)**
Age	-0.000	0.000	-0.000	**0.001***	**-0.001***
	(-0.52)	(1.10)	(-0.39)	**(1.97)**	**(-2.84)**
Firm size	-0.007	**-0.002***	-0.015	0.011	**-0.022***
	(-0.62)	**(-3.38)**	(-1.10)	(1.62)	**(-4.29)**
Offer size	**-0.057***	**-0.004***	**0.060***	**0.074***	**-0.059***
	(-4.15)	**(-5.57)**	**(3.54)**	**(9.34)**	**(-9.12)**
Offer-to-firm size	4.335	0.361	1.659	**-4.512***	-0.965
	(1.12)	(0.79)	(0.41)	**(-2.60)**	(-0.52)
Sales growth	**-0.066***	-0.001	**0.061***	**0.041***	**-0.049***
	(-2.47)	(-1.27)	**(2.06)**	**(2.85)**	**(-3.58)**
R-squared		0.333		0.165	0.188
Industry dummies	yes	yes	yes	yes	Yes
Constant	yes	yes	yes	yes	Yes

Table 10
Determinants of Top Underwriting and Analysts' Coverage
(Marginal effects)

The dependent variables are *Top underwriting*: dummy variable indicating that the Carter-Manaster index for the member of the underwriting syndicate with the highest score is bigger than 8; and *Analysts' coverage*: dummy variable indicating that the firms was followed by at least one analyst in the second year from the IPO; *Bubble dummy* indicates the years of 1999 and 2000; *Acquisition pre-IPO:* dummy variable indicating that the firm made acquisitions in the 3-year period before the IPO; *Venture Capital*: dummy variable indicating VC sponsorship; *Big-four auditing*: dummy variable indicating auditing by Big-Four auditors; *Age*: IPO year minus founding year; *Technology*: dummy variable indicating technology industries as defined in Loughran and Ritter (2004); *Firm size*: book value of assets in the last financial report before the IPO; *Offer size:* filled amount in the IPO prospectus; and *Sales growth:* geometric average of quarterly sales growth during the last three quarters before the IPO (or available period, if less). T-statistics are shown in parentheses. Estimates use White standard errors. We use *, ** and *** to denote statistical significance at the 10, 5 and 1 percent levels (two sided). The number or observations is 2,754.

	Top underwriting			Analyst's Coverage in year 1		
	1	**2**	**3**	**4**	**5**	**6**
Bubble Dummy		**-0.160***	**-0.157***	**-0.052***	-0.046	**-0.063***
		(-5.23)	**(-5.12)**	**(-1.72)**	(-1.38)	**(-1.84)**
Underpricing x Bubble					-0.021	-0.030
					(-0.40)	(-0.55)
Top underwriting x Bubble					0.033	0.026
					(1.33)	(1.04)
Underpricing				0.020	0.036	0.052
				(0.96)	(0.75)	(1.03)
Acquisition pre-IPO			**0.036***	**0.211***	**0.211***	
			(1.95)	**(13.23)**	**(13.21)**	
Big-four auditing			0.012	**-0.035***	**-0.035***	
			(0.66)	**(-1.88)**	**(-1.89)**	
Venture capital	**0.160***	**0.173***	**0.171***	**0.133***	**0.133***	**0.135***
	(8.93)	**(9.58)**	**(9.47)**	**(7.18)**	**(7.18)**	**(7.19)**
Top underwriting				**0.055****	0.037	**0.058****
				(2.15)	(1.56)	**(2.30)**
Age	-0.001	**-0.001***	**-0.001***	0.001	0.001	0.001
	(-1.31)	**(-1.72)**	**(-1.71)**	(1.50)	(1.52)	(1.45)
Technology	**0.049****	**0.061***	**0.059***	0.015	0.015	0.027
	(2.42)	**(3.06)**	**(2.95)**	(0.75)	(0.74)	(1.35)
Firm size	**0.118***	**0.124***	**0.124***	-0.018	-0.018	-0.014
	(8.36)	**(8.63)**	**(8.57)**	(-1.49)	(-1.48)	(-1.18)
Offer size	**0.195***	**0.219***	**0.219***	**0.065***	**0.065***	**0.064***
	(10.87)	**(11.50)**	**(11.45)**	**(4.20)**	**(4.21)**	**(4.21)**
Offer-to-firm size	**9.480***	**10.187***	**10.274***	-1.740	-1.721	-1.916
	(1.77)	**(1.82)**	**(1.83)**	(-0.47)	(-0.47)	(-0.53)
Sales Growth	0.010	0.027	0.028	**0.043****	**0.043****	**0.040****
	(0.48)	(1.34)	(1.40)	**(2.23)**	**(2.18)**	**(1.98)**
Industry dummies	yes	yes	yes	yes	yes	yes
Constant	yes	yes	yes	yes	yes	yes