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ALLOCATIONS**

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ABSTRACT

We interpret the theory and evidence on IPO activity: why firms go public, why they reward first-day investors with considerable underpricing, how underwriters choose these first-day investors, and how IPOs perform in the long run. Our perspective on the literature is three-fold: First, we believe that many IPO phenomena are not stationary. The long-run performance of IPOs is particularly sensitive to choice of sample period, but not necessarily how one would expect it to be. Second, we believe research into IPO share allocation issues is the most promising area of research in IPOs at the moment. Third, we argue that asymmetric information is not the primary driver of many IPO phenomena. Instead, we believe future progress in the literature will come from non-rational and agency conflict explanations. We describe some promising such alternatives.

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The last two decades have seen an active market for initial public offerings (IPOs) of equity securities in the U.S. and around the world. This market activity has been accompanied by a growing empirical and theoretical literature documenting and explaining the patterns. Indeed, given the size of the IPO market relative to, say, the bond market, a disproportionate amount of attention has focused on IPOs. But if one measures market size by the extent of uncertainty or potential misvaluations, this attention is warranted. Bonds are rarely misvalued by more than a few basis points, whereas the increase from the offer price of an IPO to its first closing market price can exceed several hundred percent. Thus, a substantial amount of money is at risk. In this article, we review some of the literature on IPO activity, pricing, and allocations. Space constraints require us to be selective. Indeed, an entire book by Jenkinson and Ljungqvist (2001) is devoted to IPOs.

In limiting our article, we assume that the reader has some background knowledge. Most finance textbooks have a chapter on securities issuance, with much of the chapter devoted to IPOs of equity securities. Thus, we will gloss over many of the institutional details on “how to go public.” We will also be U.S.-centric in our coverage of the empirical evidence. The Jenkinson and Ljungqvist book and recent surveys by Ritter (1998, 2002) cover the international evidence and theories explaining the differences across countries in the volume of IPO activity and mechanism design.

Our paper addresses four primary questions:

1. What induces firms to go public?
2. Why is the closing market price on the first day of trading on average higher than the offer price (“IPO underpricing”)?
3. Who receives these shares? I.e., how are IPOs allocated to investors?
4. Do issuers underperform over the long run?

These questions are not exclusive, but they are the defining first order questions of the IPO literature. Other issues, such as the role of intermediaries or the legal environment, are also quite interesting, but are more general and play a role outside the IPO domain. With their high agency and information costs, IPOs just happen to be an unusually good laboratory to examine them.

Our survey differs from earlier surveys in a number of dimensions. On a general level, even though we try to outline all sides, we do offer a personal perspective to weigh in on current debates, on issues that are still contentious. More specifically, we interpret some of the literature from a different perspective: First, we believe that time-variation in many IPO phenomena deserves more emphasis. For example, we show that long-run performance is sensitive to the choice of sample period as well as to the widely debated choice of econometric methodology. Second, we believe that the topic of share allocations and subsequent ownership ranks among the most interesting issues in IPO research today. Third, we believe that asymmetric information theories are unlikely to be the primary determinant of IPO activity and underpricing. Instead, we believe that specific non-rational explanations and agency explanations have to play a bigger role in the research agenda than they do today.

I. The Going Public Process

Selling securities to the general public in the United States requires the approval of the U.S. Securities and Exchange Commission (SEC). Furthermore, the American Stock Exchange (Amex), New York Stock Exchange (NYSE), and Nasdaq have listing requirements that companies must satisfy in order to be traded. In general, the requirements focus on full disclosure of information, leaving it up to investors to decide whether a security is fairly valued or not. Ellis, Michaely, and O'Hara (2000, Table I), Foerster (2000), and Killian, Smith, and Smith (2001, Chapter 1) provide a description of the IPO process.

Although there is no requirement to hire an investment banking firm, firms going public invariably do so. The process starts when the issuer chooses a lead investment banker (or increasingly, co-lead investment bankers) and signs a letter of intent to go public. The issuing firm then enters the "quiet period" during which neither it nor its underwriters are permitted to make forward-looking statements or release non-routine information that is not contained in the prospectus. The logic is that all material information should be in the prospectus, although some oral statements to qualified investors are permitted.

The first public disclosure of an IPO normally occurs when the issuer files a registration statement with the SEC. Except for small offerings and offerings by foreign firms, this is SEC form S-1, available on the SEC's Electronic Data Retrieval and Gathering (EDGAR) internet site (<http://www.sec.gov>). About a month later, the firm typically files an amended S-1/A that

contains the anticipated number of shares and the file price range (such as \$12-14 per share). The preliminary prospectus is distributed to the investment bankers' sales force, and a marketing campaign (e.g., road shows by executives to institutional investors) that typically lasts several weeks commences. Issuers often file amendments during the process, especially to amend the proposed filing price range.

With the exception of a handful of auctions, book-building has been the method used for selling almost all IPOs in the U.S. in recent years. During the road show period, there are two goals: the creation of demand and the measurement of demand. The underwriter attempts to generate demand by making potential investors aware of the company and its upside potential. Presentations are made to groups of institutional investors, both in person and by webcast. The most important institutional investors are given special consideration, with "one-on-one" meetings in which company executives visit investors' offices and answer questions in private.

In addition to creating demand, the lead underwriter, or book runner, also "builds the book." This involves collecting indications of interest from potential investors regarding the price they are willing to pay and the number of shares they would like to receive. Book-building is a complicated process in which potential investors know that their allocations will be based partly upon the amount of excess demand. Consequently, if they expect substantial excess demand, they ask for even more shares, creating artificial demand based upon conjectures about the demand from others. This can lead to explosively growing or collapsing demand.

The actual offering usually occurs the day after the SEC has given its go-ahead. The issuer and lead underwriter hold a pricing meeting at which the offer price, the gross spread (the commission paid to the underwriters), and the number of shares for sale are agreed upon. The IPO is declared "effective," shares are allocated, and trading commences. Ellis, Michaely, and O'Hara (2000, 2002) and Aggarwal and Conway (2000) document that the lead underwriter is typically the dominant market maker for Nasdaq-listed IPOs. Because the lead underwriter knows with whom shares are placed, it has a comparative advantage at contacting potential sellers if excess demand is present, and deterring flipping if there is insufficient demand to keep the price from dropping.

Most IPOs contain an overallocation option for up to 15% of the shares offered. The overallocation option is also called a "Green Shoe" option, after the first company that included one in its 1963 IPO. This option helps underwriters in post-IPO "price stabilization," which is

the only situation in which active stock price manipulation is legal. Typically, the option has an exercise date 30 days after the offering. Normally, if the price rises on the first day and stays up, the overallotment option is exercised in full.

Twenty-five calendar days after going public, the quiet period ends. Typically, the managing underwriters (lead and co-managers) initiate research coverage at this point, usually with a “buy” or “strong buy” recommendation. For shares not sold in the offering, pre-issue shareholders commit to a specified lockup period, during which they agree not to sell any shares without the written permission of the lead underwriter. Although there is no statutory minimum, most lockup periods are 180 calendar days in length and almost none are less than 90 days (Field and Hanka (2001)).

II. Choosing to Go Public

The first question must be "what makes firms go public?" In most cases, the primary answer is the desire to raise equity capital for the firm and create a public market where the founders and other shareholders can convert some of their paper wealth into cash at a future date. Non-financial reasons, such as increased publicity, play only a minor role for most firms: absent cash considerations, most entrepreneurs would rather just run their firms than concern themselves with the complex public market process. This still leaves the question of why IPOs are the best way for entrepreneurs to raise capital, and why these reasons are stronger in some situations or times than others. The number of IPOs, appropriately scaled, varies widely across countries and widely across years (sometimes by a factor of 50 or more). For example, Gompers and Lerner (2001) report that there were fewer U.S. IPOs from 1935-1959 than in 1969 alone, and La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997) report wide differences in IPO activity across countries. Surprisingly, changes in capital gains tax policy are not important determinants of the differences over time.

A. Life Cycle Theories

The first formal theory of the going public decision appeared in Zingales (1995). He observed that it is much easier for a potential acquiror to spot a potential firm as a takeover target when it is public. Moreover, entrepreneurs realize that acquirors can pressure them on pricing concessions more than they can pressure outside investors. By going public, entrepreneurs thus help facilitate the acquisition of their company for a higher value than what they would get from

an outright sale. Although probably the case for some IPOs, we believe that this is not the main reason for most IPOs going public.¹

Chemmanur and Fulghieri (1999) develop the more conventional wisdom that IPOs allow more dispersion of ownership, with its advantages and disadvantages. Pre-IPO “angel” investors or venture capitalists hold undiversified portfolios, and therefore are not willing to pay as high a price as diversified public-market investors. There are fixed costs associated with going public, however, and proprietary information cannot be costlessly revealed—after all, small investors cannot take a tour of the firm and its secret inventions. Thus, early in its life cycle a firm will be private, but if it grows sufficiently large, it becomes optimal to go public. Because of the fixed cost of going public, this should only occur once the firm can profitably invest the proceeds. If it raises too much money, value is destroyed because the abandonment option is discarded, assuming that contracting is sufficiently costly. This is the theory of staged financing (Sahlman (1990)). Public trading, however, can in itself add value to the firm, as it may inspire more faith in the firm from other investors, customers, creditors, and suppliers. On the other hand, as Maksimovic and Pichler (2001) point out, a high public price could also attract competition. Still, IPO capital can confer a first-mover advantage, which may outweigh this disadvantage of going public.²

B. Market-Timing Theories

Lucas and McDonald (1990) develop an asymmetric information model where firms postpone their equity issue if they know they are currently undervalued. If there are common misvaluations, aggregate issue volume will increase following bull markets. In Choe, Masulis, and Nanda (1993), building on the adverse selection framework of Akerlof (1970) and Myers and Majluf (1984), firms avoid issuing in periods where few other good-quality firms issue. Other theories have argued that markets provide valuable information to entrepreneurs

¹ In contrast, Black and Gilson (1998) point out that entrepreneurs often regain control from the venture capitalists in venture capital-backed companies at the IPO. Thus, many IPOs are not so much exits for the entrepreneur as they are for the venture capitalists.

² The quintessential company often cited as an example is Netscape. However, Spyglass was a browser company that went public two months before Netscape---and quickly faltered under Netscape’s competition. Schultz and Zaman (2001) report that many internet firms that went public in the late 1990s pursued an aggressive acquisition strategy, which they interpret as an attempt to pre-empt competitors.

(“information spillovers”), who respond to increased growth opportunities signaled by higher prices (Subramanyam and Titman (1999), Schultz (2000)).

We suggest that in addition to these rational theories for IPO volume fluctuations, there is a plausible semi-rational theory without asymmetric information: entrepreneurs’ sense of enterprise value derives more from their operations perspective and underlying business fundamentals than from public markets. Sudden changes in the value of publicly traded firms are not as quickly absorbed into the private sense of value held by entrepreneurs. Even if either the market price is driven by irrational public sentiment or the entrepreneur’s price is driven by irrational private sentiment, it is this discrepancy that makes entrepreneurs more inclined to sell shares *after* comparable valuations in the public markets have increased.

For the most part, these formal theories of IPO issuing activity are difficult to test. This is because researchers usually only observe the set of firms actually going public. They do not observe how many private firms could have gone public.

Pagano, Panetta, and Zingales (1998) escape this criticism, albeit for a set of Italian firms only. They have data on private companies, and find that larger companies and companies in industries with high market-to-book ratios are more likely to go public. One benefit of going public seems to be reduced costs of credit. Remarkably, they also find that IPO activity follows high investment and growth, not vice versa. Brau, Francis, and Kohers (2001) find that takeovers are a substitute for some private U.S. firms, especially in non high-tech industries. Lerner (1994) focuses on a single U.S. industry, biotechnology. Lerner documents that industry market-to-book ratios indeed have an effect on the decision to go public rather than acquire additional venture capital financing.

The academic literature has tended to view increases in the valuation of comparable firms as reflecting improved growth opportunities. But more favorable investor sentiment could also play a role in the increased valuations. When investors are overoptimistic, in this “windows of opportunity” framework, firms respond by issuing equity. Baker and Wurgler (2000) have investigated a prediction of this framework. If equity issuance increases when investors are overoptimistic, then subsequent stock returns will be low. Using data starting in the 1920s on aggregate equity issuance relative to debt plus equity issuance, Baker and Wurgler find that the higher the fraction of equity issuance is in a given year, the lower the overall stock market return is in the following year.

Lowry (2002) finds that investor sentiment (measured by the discount on closed-end funds), growth opportunities, and adverse selection considerations all are determinants of aggregate IPO volume. Table 1 shows that IPO activity has varied considerably over the years.³ The largest number of IPOs occurred in 1996, the highest inflation-adjusted gross proceeds occurred in 1999. Table 1 also conveys some of the correlation between IPO issuing activity and underpricing, investigated in greater detail in Lowry and Schwert (2002). They and other authors find that high IPO first-day returns lead high IPO activity by six months or so.

The reason for the leading relation is that underwriters encourage more firms to go public when public valuations turn out to be higher than expected (high IPO underpricing) and discourage firms from filing or proceeding with an offering when public valuations turn out to be lower than expected. For example, in 2000, the Nasdaq Composite index had the worst year in Nasdaq's thirty-year history, and about 200 firms that had filed to go public withdrew their offerings.

³ The annual volume numbers reported in Table 1 are lower than those reported in Ritter (1998, Table 2) because of our exclusion of "penny" stocks (defined as IPOs with an offer price of below \$5.00 per share) and unit offers. Ritter reports annual volume numbers for IPOs starting in 1960. In the 1960s, 1970s, and 1980s, penny stock IPOs were a major portion of the number of IPOs, although only a small portion of aggregate proceeds.

Table 1
**Number of IPOs, First Day Returns, Amount of Money Left on the Table,
Gross Proceeds, and Frequency of Upward Revisions, by Cohort Year**

IPOs with an offer price below \$5.00 per share, unit offers, REITs, closed-end funds, banks and S&Ls, ADRs, and IPOs not listed on CRSP within six months of issuing have been excluded. Data is from Thomson Financial Securities Data, with supplements from Dealogic and other sources, and corrections by authors. The first-day return is defined as the percentage change from the offer price to the closing price. IPOs doubling in price are those with a first-day return of 100% or more. Money on the table is defined as the first-day price change (offer price to close) times the number of shares issued (global offering amount, excluding overallotment options). Money on the table and gross proceeds numbers are in millions of dollars of 2001 purchasing power, using the CPI. The last column reports the mean issue size relative to the post-issue number of shares outstanding (including all classes of shares).

Year	Number of IPOs		Average First-day Return	Aggregate Money Left on the Table	Aggregate Gross Proceeds	Average Percentage of Firm Sold
	Total	Doubling				
1980	70	1	14.5%	\$408	\$2,020	30.3%
1981	191	0	5.9%	\$264	\$4,613	28.8%
1982	77	0	11.4%	\$245	\$1,839	27.4%
1983	442	3	0.1%	\$1,479	\$15,348	30.2%
1984	172	3	3.6%	\$86	\$3,543	29.9%
1985	179	1	6.3%	\$354	\$6,963	31.8%
1986	378	3	6.3%	\$1,030	\$19,653	31.6%
1987	271	0	6.0%	\$1,019	\$16,299	31.7%
1988	97	0	5.4%	\$186	\$5,324	27.8%
1989	105	0	8.1%	\$336	\$6,773	31.8%
1990	104	1	10.8%	\$454	\$5,611	33.2%
1991	273	0	12.1%	\$1,788	\$15,923	33.0%
1992	385	2	10.2%	\$2,148	\$26,373	35.3%
1993	483	2	12.8%	\$3,915	\$34,422	35.9%
1994	387	1	9.8%	\$1,650	\$19,323	34.3%
1995	432	13	21.5%	\$5,033	\$28,347	32.6%
1996	621	7	16.7%	\$7,383	\$45,940	31.9%
1997	432	2	13.8%	\$4,664	\$31,701	32.7%
1998	267	12	22.3%	\$5,352	\$34,628	30.1%
1999	457	111	71.7%	\$37,943	\$66,770	22.9%
2000	346	71	56.1%	\$27,682	\$62,593	21.8%
2001	80	0	14.0%	\$2,973	\$34,344	26.3%
1980-1989	1,982	9	7.4%	\$5,409	\$82,476	30.5%
1990-1994	1,632	6	11.2%	\$9,954	\$101,652	34.7%
1995-1998	1,752	34	18.1%	\$22,436	\$140,613	32.0%
1999-2000	803	182	65.0%	\$65,625	\$129,363	22.4%
2001	80	0	14.0%	\$2,973	\$34,344	26.3%
1980-2001	6,249	231	18.8%	\$106,397	\$488,448	29.0%

To examine stability, we divide our sample into three subperiods with roughly equal observations (1980-1989, 1990-1994, 1995-1998), one subperiod containing the internet bubble of 1999-2000, and the post-bubble year of 2001. For the full 22-year sample period, the average inflation-adjusted money left on the table is \$17 million, and the average inflation-adjusted gross proceeds is \$78 million.

C. The Changing Composition of IPO Issuers

Table 2 shows that the type of firms going public has changed over the years. The percentage of technology firms increased from about 25% of the IPO market in the 1980s and early 1990, to 37% after 1995 and an amazing 72% during the internet bubble, before returning to 29% in 2001.⁴ It is fair to characterize the bubble as a “tech-firm” phenomenon, even though many non-tech firms also showed large underpricing during the bubble. (The April 2000 IPO of Krispy Kreme Doughnuts had a first day return of 76%.) The increase in the percentage of technology firms over time is mirrored in the number of firms with negative earnings in the twelve months prior to going public. In the 1980s, only 19% of firms had negative earnings before going public. This gradually increased to 37% by 1995-1998, and then rose precipitously to 79% during the bubble. The last two columns of Table 2 report the average first-day returns, conditional on whether the firm had positive earnings or not. Except for the bubble period, there is little difference in the average first-day returns.

⁴ Tech stocks are defined as internet stocks, computer software and hardware, communications equipment, electronics, navigation equipment, measuring and controlling devices, medical instruments, telephone equipment, and communications services, but do not include biotechnology. See Loughran and Ritter (2001, appendix 4) for the specific SIC codes.

Table 2**Fraction of IPOs with Negative Earnings (trailing last twelve months), 1980-2001**

IPOs with an offer price below \$5.00 per share, unit offers, ADRs, closed-end funds, REITs, bank and S&L IPOs, and firms not listed on CRSP within six months of the offer date are excluded. When available, we use the earnings per share for the most recent twelve months (commonly known as LTM for last twelve months) prior to going public. When a merger is involved, we use the pro forma numbers (as if the merger had already occurred). When unavailable, we use the most recent fiscal year EPS numbers. Missing numbers are supplemented by direct inspection of prospectuses on EDGAR, and EPS information from Dealogic (also known as CommScan) for IPOs after 1991, and Howard and Co.'s *Going Public: The IPO Reporter* from 1980-1985. Tech stocks are defined as internet-related stocks plus other technology stocks, not including biotech. Loughran and Ritter (2001) list the SIC codes in their appendix 3.

Time Period	Number of IPOs	Percentage Tech Stocks	Percentage of IPOs with EPS<0	Mean First-day Returns	
				EPS<0	EPS≥0
1980-1989	1,982	26%	19%	9.1%	6.8%
1990-1994	1,632	23%	26%	10.8%	11.4%
1995-1998	1,752	37%	37%	19.2%	17.4%
1999-2000	803	72%	79%	72.0%	43.5%
2001	80	29%	49%	13.3%	11.6%
1980-2001	6,249	34.5%	34%	31.4%	12.5%

Although we do not show it in our tables, it was unusual for a prestigious investment banker in the 1960s and 1970s to take a firm public that did not have at least four years of positive earnings. In the 1980s, four quarters of positive earnings was still standard. In the 1990s, fewer and fewer firms met this threshold. Still, the firm's analysts would normally project profitability in the year after going public. During the bubble, firms with no immediate prospect of becoming profitable became common. For example, public forecasts for eToys projected no profits for at least two years. At the time of going public in May 1999, forecasted EPS was -\$0.27 for 1999 and -\$0.55 for 2000. (These turned out to be overly optimistic forecasts. eToys liquidated in 2001.) Remarkably, the IPO volume fluctuation in the late 1990s is attributable almost entirely to the tech sector: the number of old-economy stocks going public remained at a level of about 100 firms per year, before, during, and after the bubble.

In sum, we interpret the evidence on the decision to go public as follows. The patterns suggest a life-cycle hypothesis, in which firms become larger and their products more mature,

and then go public in response to favorable market conditions. Loughran and Ritter (2001) report that the median age of firms going public has been remarkably stable at about 7 years old since 1980, with the main exceptions being the internet bubble period, when the median age fell to 5 years, and 2001, when the median age rose to 12 years. The large number of internet IPOs in 1999-2000, and their almost complete disappearance in 2001 (in response to tumbling internet public market valuations), of course raises the issue of what determines bubbles. But this is a question that transcends the IPO literature.

III. The Creation of Demand

Many investment-banking practices can be interpreted as attempts to “create demand.” This leads immediately to the question of how and why marketing influences the demand for IPO shares.⁵ Marketing or certification activity may not occur just at the time of the IPO. If bullish analysts can later seduce other investors to purchase, both entrepreneurs and original investors would value such a service (Aggarwal, Krigman, and Womack (2001)). With rare exceptions, academic finance researchers take the market price of an IPO as exogenous. This, after all, is consistent with standard asset pricing theory. Relaxing this assumption may prove to be a productive area for future research.

Issuers view the choice of underwriter as important. The choice of underwriter is typically negotiated and determined by the issue’s size and industry on one hand and the underwriter’s prestige and expertise on the other (Logue, Rogalski, Seward, and Foster-Johnson (2001)). It is rare that a top-tier underwriter handles a small issue, or that a third-tier underwriter handles a large offering.

One strand of research has focused on the effect of an underwriter’s pricing record on subsequent market share. Beatty and Ritter (1986) find that underwriters who underprice or overprice excessively subsequently lose market share, although Tinic (1988) argues that penny stock underwriters may drive their results. Nanda and Yun (1997) find that underwriters’ own public stock market price does best when offerings are moderately underpriced. Dunbar (2000) widens this view towards long-run IPO performance and other measures, and finds that

⁵ DuCharme, Rajgopal, and Sefcik (2001) report that, for internet IPOs, more pre-IPO media exposure resulted in greater underpricing. This is consistent with investor awareness affecting the demand for shares.

established IPO underwriters are especially vulnerable to missteps. On the other hand, Krigman, Shaw, and Womack (2001), in a questionnaire sent to firms who switched underwriters for a follow-on offering after their IPO, report that the amount of money left on the table in the IPO was not an important factor in deciding to switch lead underwriters. Instead, underwriter prestige or a desire to increase analyst coverage for the stock are the two most important determinants of switching.

Carter and Manaster (1990) and Carter, Dark, and Singh (1998) uncovered another interesting pattern, namely that high-quality underwriters seem to have left less money on the table for their investors---at least in the 1980s. Beatty and Welch (1996) and Cooney, Singh, Carter, and Dark (2001) find that this relationship reversed in the early 1990s, and Loughran and Ritter (2001) report that during the internet bubble period, prestigious underwriters were egregious in leaving huge amounts of money on the table.

An important service provided by the underwriter is coverage by analysts. Michaely and Womack (1999) provide evidence that the investment bank's analysts regularly provide "booster shots" in the form of buy recommendations even though issuers usually perform poorly after their IPOs. Oddly, the market does not seem to recognize the full extent of this bias, so that this service remains valuable to the issuer. However, the underwriters' analysts are not unique in being optimistic: Rajan and Servaes (1997) find that analysts of investment banking firms that did not co-manage the IPO tend to disproportionately follow underpriced IPOs and also are overly optimistic on average. Bradley, Jordan, and Ritter (2001) find that, for IPOs from 1996-2000, when the quiet period ends 25 calendar days after going public, there is a 3 percent positive market-adjusted return, on average. For IPOs where analyst recommendations occur, the market-adjusted return is 4 percent. For other IPOs, the market-adjusted return is close to zero. The positive average effect of 3 percent is difficult to reconcile with market efficiency, since the fact that positive recommendations will be forthcoming 25 days after going public is not a surprise.

IV. IPO Pricing

A. Empirical Patterns in Short-run Underpricing

Stoll and Curley (1970), Reilly (1973), Logue (1973), and Ibbotson (1975) first documented a systematic increase from the offer price to the first day closing price.⁶ Academics use the terms first-day returns and IPO underpricing interchangeably. In our sample of 6,249 IPOs from 1980-2001, which excludes penny stocks, the average first-day return is 18.8%. Although not shown, approximately 70% of the IPOs end the first day of trading at a closing price greater than the offer price and about 16% have a first-day return of exactly zero. We know of no exceptions to the rule that the IPOs of operating companies are underpriced, on average, in all countries. The offerings of non-operating companies, such as closed-end funds are generally not underpriced.

Table 1 shows that in our sample period, IPO underpricing increased from about 7% in the 1980s to 18% by 1995-1998. During the bubble years of 1999-2000, IPO underpricing jumped to a whopping 65%. The average IPO during this period left \$82 million on the table as a windfall profit for its first-day investors, and one in four IPOs doubled on the first day. This underpricing was so extreme that it is especially difficult to understand why the issuers/underwriters did not raise their offering prices further. Since the internet bubble burst, IPO underpricing has returned to more common levels, 14% in 2001.

Expressed in dollars of 2001 purchasing power, the average proceeds (the amount of money raised in the offer, before fees and before any overallotment option exercise) were \$78 million during 1980-2001, as reported in Table 1. Since the equally weighted average gross spread, or commission, paid by issuing firms is about 7%, on a \$78 million deal, this is just over \$5 million. The amount of money left on the table, defined as the change in price from the offer to first-day close, multiplied by the number of shares sold, averaged \$17 million. Thus, this opportunity cost of going public is roughly three times the direct cost. Financial economists find the willingness of issuing firms to leave so much money on the table perplexing. For example, if a firm leaving \$17 million on the table had 17 million shares outstanding before the offering, and

⁶ The opening market price is close to an unbiased indicator of the closing market price on the first day, so results are insensitive to whether the opening or closing market price is used. The vast majority of empirical work has used the first closing price to measure the first-day return. This is also frequently called the initial return.

none of its shares were sold in the offering, the opportunity cost to the pre-issue shareholders is \$1.00 per share.

Table 1 also reports the average issue size as a percentage of the post-issue shares outstanding. In its IPO, the average firm sells 29% of the post-issue shares outstanding. Thus, until the lockup period expires, the public float is only 29% of the market capitalization. During the internet bubble period, the mean public float dropped to 22%. At the time, many practitioners argued that internet IPOs were receiving especially high prices due to their special scarcity value.

A different way to view this phenomenon, popular with practitioners, is that internet IPOs were especially scarce and sought after, driving their high prices—in other words, the demand curve was particularly steep. At the time, many practitioners argued that internet IPOs were receiving high prices due to their scarcity value. This argument assumes that there is a negatively sloped demand curve for a given IPO. As we will see, the evidence is highly supportive of this assumption, and almost all explanations of the empirical patterns that have been documented in the literature either explicitly or, more commonly, implicitly, make this assumption.

B. Theoretical Explanations of Short-run Underpricing

Ibbotson (1975) offered a list of possible explanations for IPO underpricing, many of which were formally explored by other authors in later work. Before going into detail, it is important to understand that simple fundamental market misvaluation or asset-pricing risk premia are unlikely to explain the average first-day return of 18.8% reported in our Table 1. To put this in perspective, the comparable daily market return has averaged only 0.05%. Furthermore, if diversified IPO first-day investors require compensation for bearing systematic or liquidity risk, why do second-day investors (purchasing from first-day investors) not seem to require this premium? After all, fundamental risk and liquidity constraints are unlikely to be resolved within one day. Thus, the solution to the underpricing puzzle has to lie in focusing on the special differences between the issuer's price and the first after-market price, which are resolved or revealed when the aftermarket first opens.

Most theories of IPO underpricing were developed in the 1980s, when average first-day returns averaged about 7%. As we argue below, most of these theories are incapable of explaining the severe underpricing of internet IPOs observed in 1999-2000. Thus, just as our

Table 1 documents structural breaks in underpricing. It is our opinion that academics are appropriately responding with structural breaks in their explanations for IPO underpricing.

One way of classifying theories of IPO underpricing is to categorize them on the basis of whether asymmetric information or symmetric information is assumed. The former can in turn be classified into theories in which IPO issuers are more informed than after-market investors (perhaps about internal projects) and into theories in which investors are more informed than the issuer (perhaps about demand).

B.1. Theories Based on Asymmetric Information

If the issuer is more informed than investors, rational investors fear a lemons problem: only issuers with worse-than-average quality are willing to sell their shares at the average price. To distinguish themselves from the pool of low-quality issuers, high-quality issuers may attempt to signal their quality. In these models, better quality issuers deliberately sell their shares at a lower price than the market believes they are worth, which deters lower quality issuers from imitating. With some patience, these issuers can recoup their upfront sacrifice post-IPO, either in future issuing activity (Welch (1989)), favorable market responses to future dividend announcements (Allen and Faulhaber (1989)), or analyst coverage (Chemmanur (1993)). In common with many other signaling models, high quality firms demonstrate that they are high quality by throwing money away. One way to do this is to leave money on the table in the IPO. However, on theoretical grounds, it is unclear why IPO underpricing is a more efficient signal than, say, charitable donations or advertising.

The evidence in favor of these signaling theories is, at best, mixed: there is evidence of substantial post-issuing market activity by IPO firms (Welch (1989)), and it is clear that some issuers approach the market with a multi-issuing strategy.⁷ However, it is natural to believe that *any* price appreciation would induce entrepreneurs to return to the market for more funding.⁸ Jegadeesh, Weinstein, and Welch (1993) find that returns after the first day are just as effective

⁷ One statement of this is that the IPO is a marketing event rather than a capital-raising event. This only makes sense if the window of opportunity is likely to still be open when it is time for the follow-on offer (also known as a seasoned equity offer). It is worth noting that there is little controversy about whether IPO issuers pursue a dynamic strategy, in which the IPO is just one part. The controversy is whether post-issuing activity can explain IPO *underpricing*, not IPO activity.

⁸ van Bommel and Vermaelen (2001) find that firms with higher first-day returns spend more money on investment after the IPO.

in inducing future issuing activity as the first-day returns are. Michaely and Shaw (1994) outright reject signaling: in a simultaneous equation model, they find no evidence of either a higher propensity to return to the market for a seasoned offering or of a higher propensity to pay dividends for IPOs that were more underpriced. Still, aside from the persistence of this explanation on the street, the most appealing feature of the signaling hypotheses is that some issuers voluntarily desire to underprice and leave money on the table to create “a good taste in investors’ mouths.”

If investors are more informed than the issuer, for example about the general market demand for shares in the aggregate, then the issuer faces a placement problem. The issuer does not know the price the market is willing to bear. In other words, issuers face an unknown demand for their stocks. A number of theories model a specific demand curve.

One can simply assume that all investors are equally informed, and thus purchase shares only if their price is below their common assessment. Observed (successful) IPOs thus are necessarily underpriced. However, there are some overpriced IPOs going public, which would not be predicted since all investors are assumed to know that these would be overpriced. A more realistic assumption is that investors are differentially informed. Pricing too high might induce investors to fear a winner’s curse (Rock (1986)) or a negative cascade (Welch (1992)).

In a winner’s curse, investors fear that they will only receive full allocations if they happen to be among the most optimistic investors. When everyone desires the offering, they get rationed. An investor would receive a full allocation of overpriced IPOs but only a partial allocation of underpriced IPOs. Thus, his average return, conditional on receiving shares, would be below the unconditional return. To break even, investors need to receive IPO underpricing. Koh and Walther (1989) have rationing information, and find that an uninformed strategy in Singapore indeed just about broke even. In an informational cascade, investors attempt to judge the interest of other investors. They only request shares when they believe the offering is hot. Pricing just a little too high leaves the issuer with too high a probability of complete failure, in which investors abstain because other investors abstain. In support, Amihud, Hauser, and Kirsh (2001) find that IPOs are either hugely oversubscribed or totally undersubscribed, with very few offerings moderately oversubscribed.

Benveniste and Spindt (1989), Benveniste and Wilhelm (1990), and Spatt and Srivastava (1991) offer an alternative pricing mechanism for uninformed issuers: they can attempt to obtain

information from informed investors.⁹ And, indeed, the practice of building the book before the IPO and using this information to adjust the offer price for the IPO is widespread. To induce investors to truthfully reveal that they want to purchase shares, underwriters must offer them some combination of more IPO allocations and underpricing when they indicate a willingness to purchase shares at a high price. This information gathering perspective of book-building is certainly useful, but it is not clear how valuable the information provided by one incremental investor is when the investment banker can canvas hundreds of potential investors. Thus, it is unclear whether the Benveniste and Spindt (1989) framework is capable of explaining underpricing of more than a few percent.

Book-building theories lend themselves unusually well to empirical tests with available data. The most commonly cited evidence in favor of book-building theories is the effect of revisions in the offer price during the filing period, first documented by Hanley (1993). She finds that underwriters seem reluctant to fully adjust their pricing upward to keep IPO underpricing constant when demand is strong. Thus, when underwriters revise the share price upward from their original estimate in the preliminary IPO prospectus, underpricing tends to be higher. Table 3 shows that this pattern has held throughout 1980-2001: When the offer price exceeds the maximum of the original file price range, the average IPO underpricing is significantly above average (53% instead of 3% for IPOs adjusting their offer price downward and 12% for IPOs priced within their filing range). This extra underpricing is interpreted in this dynamic information acquisition theory to be compensation that is necessary to induce investors to reveal their high personal demand for shares. Consistent with the information revelation theory of bookbuilding, Lee, Taylor, and Walter (1999) and Cornelli and Goldreich (2001) show that informed investors request more, and preferentially receive more, allocations.

⁹ Benveniste and Busaba (1997) consider whether book building or cascade creation is more profitable from the issuer's point of view.

Table 3**Mean First-day Returns for IPOs Conditional Upon Offer Price Revision, 1980-2001**

Initial public offerings with an offer price below \$5.00 per share, unit offers, ADRs, closed-end funds, REITs, bank and S&L IPOs, and those not listed by CRSP within six months of the offer date are excluded. IPOs are categorized by whether the offer price is below, within, or above the original file price range. For example, an IPO would be classified as within the original file price range of \$10.00-\$12.00 if its offer price is \$12.00. Eleven IPOs from 1980-1989 have a missing file price range, and are deleted from this table.

Time period	Number of IPOs	Percentage of IPOs with Offer Price Relative to File Range			Mean First-day Returns			% of First-day Returns>0		
		Below	Within	Above	Below	Within	Above	Below	Within	Above
1980-1989	1,971	27.6%	59.9%	12.5%	0.6%	7.8%	20.5%	32%	62%	88%
1990-1994	1,632	26.1%	54.2%	19.7%	2.4%	10.8%	24.1%	49%	75%	93%
1995-1998	1,752	25.0%	49.1%	25.9%	6.1%	13.8%	37.6%	59%	80%	97%
1999-2000	803	18.1%	36.8%	45.1%	7.9%	26.8%	119.0%	59%	77%	96%
2001	80	25.0%	60.0%	15.0%	7.2%	12.5%	31.4%	70%	83%	92%
1980-2001	6,238	25.2%	52.3%	22.5%	3.3%	12.0%	52.7%	47%	72%	94%

But, as Loughran and Ritter (2002) and Lowry and Schwert (2002) point out, the book-building theories apply to private information only. If plain and simple reluctance to adjust prices, rather than a deeper theoretical cause (the search for information from investors) were at work, then we would also see public market changes help predict IPO underpricing. Indeed, both sets of authors find that when the overall stock market has rallied, underwriters do not fully adjust their pricing. In our opinion, the fact that past performance by other firms has an influence on IPO underpricing points more to a behavioral explanation, such as that in Loughran and Ritter (2002), than to an information extraction theory. It should be noted, however, that these theories are not mutually exclusive. Both probably explain part of the pattern.

Baron (1982) offers a different, agency-based explanation for underpricing. His theory also has the issuer less informed, but relative to its underwriter, not relative to investors. To induce the underwriter to put in the requisite effort to market shares, it is optimal for the issuer to make the shares easier to sell by underpricing them. In Habib and Ljungqvist (2001), underpricing is similarly a substitute for IPO marketing. However, Muscarella and Vetsuypens (1989) find that underwriters going public underprice just like other issuers. This does not favor the Baron hypothesis, even though underwriters may have to underprice in order to not shine the light on their underpricing practices in other cases. More importantly, internet IPOs were the easiest shares ever to sell, and nevertheless showed the highest, not the lowest underpricing.

In all theories that rely on asymmetric information, is that making the purchase of one IPO conditional on the purchase of other IPOs (“bundling”) could reduce the (average) uncertainty, which in turn could significantly reduce the necessary IPO underpricing. Thus, we deem it unlikely that asymmetric information theories explain more than a few percent of IPO underpricing. In the 1980s, when underpricing averaged 7 percent, the emphasis on asymmetric information models was understandable. With the levels of underpricing that we have observed in recent years, however, a new class of explanations is called for.

B.2. Theories Based on Symmetric Information

There are also theories of underpricing that do not rely on asymmetric information that is resolved on the first day of trading. Tinic (1988) and Hughes and Thakor (1992) argue that issuers underprice to reduce their legal liability: an offering that starts trading at \$30 that is priced at \$20 is less likely to be sued than an offering priced at \$30, if only because it is more

likely that at some point the after-market share price drops below \$30 than below \$20. Indeed, some law firms seem to specialize in suing IPOs that have dropped in value. Still, Drake and Vetsuypens (1993) find that sued IPOs had higher, not lower IPO underpricing, i.e., that IPO underpricing did not protect them from being sued. However, Lowry and Shu (2002) point out that this may be because IPOs more likely to be sued later also underpriced more. In our opinion, leaving money on the table appears to be a cost-ineffective way of avoiding subsequent lawsuits. But the most convincing evidence that legal liability is not the primary determinant of underpricing is that countries in which U.S. litigative tendencies are not present have IPOs that are similarly underpriced (Keloharju (1993)).

As shown in Table 1, the 1999-2000 internet bubble period saw extreme underpricing of IPOs. One popular explanation is that underwriters could not justify a higher offer price on internet IPOs, perhaps out of legal liability concerns, given the already lofty valuations on these companies. One way of interpreting this is that underwriters were “leaning against the wind” by not taking advantage of temporary overoptimism on the part of some investors. While this argument has a certain plausibility, we find the logic wanting because investment banking firms were making other efforts to encourage overvaluations during the internet bubble, such as subsequent buy recommendations at market prices far above the offer price.¹⁰

Another explanation for underpricing is advanced by Boehmer and Fishe (2001). They note that trading volume in the aftermarket is higher, the greater is the underpricing. (See Krigman, Shaw, and Womack (1999) and Ellis, Michaely, and O’Hara (2000) for related evidence.) Thus, an underwriter who makes a market in a Nasdaq-listed IPO gains additional trading revenue. Unlike the lawsuit-avoidance explanation of underpricing, it is not clear how the issuing firm benefits from the underpricing, unless the increased liquidity is persistent (Booth and Chua (1996)).

¹⁰For example, Credit Suisse First Boston (CSFB) took Corvis public on July 28, 2000 at an offer price of \$36.00. At the closing price of \$84.719 on the first day of trading, the first-day return was 135%. When the quiet period ended on August 22, 2000, the five co-managing underwriters all put out “buy” recommendations, and CSFB initiated coverage with a “strong buy” recommendation, even though the price had increased to \$90. At \$90 per share, Corvis had a market capitalization of \$30 billion, despite never having had any revenue. (In December 2001, its market valuation was less than \$1 billion.) Bradley, Jordan, and Ritter (2001) report that 87% of analyst initiations at the end of the quiet period were “buys” or “strong buys” during 1998-2000.

Table 4
Summary of Recent Articles Concerning the Allocation of IPO Shares

Discrimination in favor of regular investors to induce information revelation:

Benveniste, Busaba, and Wilhelm (1996) penalty bids allow discrimination to reward repeat investors
 Sherman and Titman (2002 *JFE*) underpricing is the reward to investors for acquiring information
 Sherman (2000) discretion allows bundling with book building

Agency problems between underwriters and issuers:

Loughran and Ritter (2002 *RFS*) state-contingent issuer psychology boosts underwriter profits
 Loughran and Ritter (2001) allocations of hot issues boost underwriter profits

Ownership structure:

Booth and Chua (1996) allocations to many investors increase liquidity
 Brennan and Franks (1997) allocations to many investors entrenches managers
 Stoughton and Zechner (1998) allocation creating a blockholder induces monitoring
 Mello and Parsons (1998) allocation creating a blockholder induces monitoring

Supply and demand effects:

Aggarwal (2000) cold issues are overallocated
 Zhang (2001) overallocation of cold issues boosts aftermarket demand
 Cornelli and Goldreich (2002) offer price is more related to prices bid than to quantity demanded

Empirical documentation of institutional versus individual investors:

Ljungqvist and Wilhelm (2002 *JFE*) across countries, there is less underpricing if institutions are favored
 Hanley and Wilhelm (1995) institutions are favored on hot IPOs, but bundling occurs
 Lee, Taylor, and Walter (1999) institutions ask for more shares on hot IPOs, but suffer discrimination
 Cornelli and Goldreich (2001 *JF*) underwriters use discretion to favor repeat investors (bundling)
 Aggarwal, Prabhala, and Puri (2002 *JF*) institutions receive higher allocations on hot IPOs

Flipping and stabilization:

Benveniste, Erdal, and Wilhelm (1998) penalty bids constrain selling by individuals on cold IPOs
 Chowdhry and Nanda (1996) stabilization activities reduce the winner's curse
 Ljungqvist, Nanda, and Singh (2001) selective flipping allows price discrimination
 Fische (2002 *JFQA*) flipping creates artificial demand which is sometimes useful
 Krigman, Shaw, and Womack (1999) institutions flip IPOs more successfully than individuals do
 Aggarwal (2002 *JFE*) hot IPOs are commonly flipped, with interdealer trades common
 Houge et al. (2002 *FM*) IPOs with heterogeneous valuations underperform more

B.3. Theories Focusing on the Allocation of Shares

In recent years, more attention has been drawn to how IPOs are allocated. Table 4 lists recent papers, both theoretical and empirical, that explicitly deal with allocations, including flipping and stabilization activity:

With bookbuilding, underwriters have discretion regarding who will be allocated shares (Sherman and Titman (2002)). This discretion can be used to the advantage of issuers, in that the pooling of hot and cold IPOs can reduce the winner's curse problem (Sherman (2000)). But there is a dark side to bookbuilding, too. There is some anecdotal evidence that underpriced share allocations have been used by underwriters to enrich buy-side clients in return for quid pro quos (Pulliam and Smith (2000, 2001)), to curry favor with other prospective IPO issuers (Siconolfi (1997)), or even to influence politicians.¹¹ Because direct payments to selected buy-side clients are generally illegal, preferential IPO allocations to them could be the next-best option.¹²

Unfortunately, not much public evidence is available to formally test this hypothesis because underwriters are careful to guard information about the specifics of their share allocations. We believe that the most interesting questions today relate to these allocations: How much effective bundling of shares across issues (and thus a reduction of average uncertainty) do subscribers experience? How do investors decide in which issues they would like to request IPO allocations, and how heavily influenced is this by perceptions of what others are going to do? Who receives IPO allocations? How do allocations relate to other business provided by the investor? Do large institutions receive preferential treatment based on valuable information, and if so, what is it? Furthermore, we believe that the answers to these questions are likely to depend upon the time period examined.

¹¹ Hundreds of private sector lawsuits against underwriters, as well as government investigations, have followed the bursting of the internet bubble. The lawsuits have focused on two issues. The first, so-called "laddering," alleges that underwriters drove up first-day market prices by requiring some investors to buy additional shares in the open market as a condition for receiving shares at the offer price. The second issue concerns how IPOs were allocated and the compensation that underwriters received. Some underwriters, especially Credit Suisse First Boston, are alleged to have allocated hot IPOs to hedge funds and other investors who in return generated abnormal commission business.

¹² Rydqvist (1997) argues that IPO compensation could be tax-efficient compensation if shares are primarily allocated to employees and capital gains taxes are low relative to labor income taxes.

An even more basic question is why issuers do not demand that underwriters conduct auctions. Auctions are associated with only a little underpricing (Biais and Faugeron (2001), Kandel, Sarig, and Wohl (1999), and Loughran, Ritter, and Rydqvist (1994)). On a world wide basis, however, auctions have been losing market share (Sherman (2001)), and the introduction of auctions in the U.S. by WRHambrecht in 1999 has attracted only six IPOs in the following 2.5 years. There have been allegations that issuers' managers are complacent because they personally (rather than their companies) received favorable allocations in other underpriced IPOs as a tit-for-tat from their underwriters (Siconolfi (1997)).

The first model to focus on the allocation of shares was Benveniste and Spindt (1989), which we have previously discussed along with other asymmetric information-based theories. This information revelation theory has the result that underwriter discretion results in less underpricing on average, and therefore higher expected proceeds. Loughran and Ritter (2002) instead focus on the agency problem which suggests that underwriter discretion can result in more underpricing on average: if underwriters can recapture money left on the table, they have an incentive to leave more of the issuers' money on the table. The mystery is why issuing firms appear generally content to leave so much money on the table. Loughran and Ritter use prospect theory to argue that entrepreneurs are more tolerant of excessive underpricing if they simultaneously learn about a post-market valuation that is higher than what they expected.¹³ In other words, the greater the recent increase in their wealth, the less is the bargaining effort of issuers in their negotiations over the offer price with underwriters.

Both the information revelation and prospect theory explanations of underpricing are consistent with the right-skewness in the first-day returns on IPOs that is observed. Only the prospect theory explanation explains why lagged market returns (public information) are not fully incorporated into the offer price, however. Indeed, empirically there is an asymmetric response: if there is a negative market return during the three weeks prior to going public, the offer price is lowered (Bradley and Jordan (2002) and Lowry and Schwert (2002)). But if the

¹³ Prospect theory is a positive model of how people behave developed by Kahneman and Tversky (1979). Prospect theory assumes that people focus on changes in wealth, rather than the level of their wealth, in making decisions. In Loughran and Ritter's (2002) application to the IPO market, it is assumed that issuers measure their wealth change from the midpoint of the file price range to the closing market price on the first day of trading.

market rallies during the three weeks prior to going public, the offer price is not equally raised, on average.

The prospect theory explanation for underpricing also addresses another pattern that has perplexed financial economists for decades: the strong autocorrelation of first-day returns. In Lowry and Schwert (2002, Table I), the equally weighted average first-day return is calculated in each calendar month from 1960 to 1997. The first-order autocorrelation of these monthly average first-day returns is 0.60. If offer prices are not adjusted upwards when the market return is positive during the book-building period, then all IPOs whose book-building periods overlap will have higher expected first-day returns. Since the typical book-building period lasts about 30 calendar days, the first-day returns in adjacent calendar months will be autocorrelated.

Almost all IPOs contain a 15% overallocation option. In allocating shares, if there is strong demand, the underwriter will allocate 115% of the shares. Then, if the price weakens in aftermarket trading, the underwriter can buy back up to the extra 15% and retire the shares, as if they had never been offered in the first place. In an important paper, Aggarwal (2000) reports that if the underwriter anticipates weak demand, it will typically allocate up to 135% of the offering, taking a naked short position. The underwriter then buys back the incremental 20%, and has the option of buying back the other 15%, treating the shares as if they were never issued in the first place.

Zhang (2001) argues that the allocation of these extra shares boosts the aftermarket demand for the stock. This is because institutional investors who are allocated shares are likely to continue holding them, whereas if they hadn't received any shares in the first place, they would be unlikely to buy the shares in the aftermarket. The extra demand to buy and hold that results from the overallocation boosts the aftermarket price, allowing the issuer to receive a higher offer price. If the demand for an IPO is strong, underwriters do not take a naked short position because covering it would be too costly. Aggarwal and Zhang's papers show that how many shares are allocated matters.

Who purchases an IPO's shares may in turn influence IPO activity, underpricing, and long-run performance. A good number of companies begin implementing takeover defenses as early as the IPO (Field and Karpoff (2001)). Booth and Chua (1996), Brennan and Franks (1997), Mello and Parsons (1998), and Stoughton and Zechner (1998) all point out that IPO

underpricing creates excess demand and thus allows issuers to decide whom to allocate shares to. Stoughton and Zechner argue that underpricing is needed to create an incentive to acquire a block of stock and then monitor the firm's management, creating a positive externality for atomistic investors. Mello and Parsons point out that a two-part issuing strategy may be more efficient, with the IPO aimed at atomistic investors and a private placement aimed at a blockholder. In the U.S., large blockholders are common prior to the IPO in the form of venture capitalists and leveraged buyout financiers, but the venture capitalists typically distribute shares to their limited partners as soon as the lockup period ends. Furthermore, the general partners typically also relinquish control via open market sales, rather than selling a strategic block. This is contrary to the predictions of almost all models of control in the corporate finance literature.

In Booth and Chua, issuers like the increased liquidity associated with more aftermarket trading brought about by more investor dispersion. In these models, the allocation of shares thus results in a higher market value for the firm. In contrast, in Brennan and Franks the diffuse ownership of public shareholders lowers firm value. Nevertheless, issuers may prefer a wider and more dispersed investor base to escape institutional pressure and allow them to enjoy private benefits of control.

In a sample of 69 British IPOs, 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 to oust from the company. Brennan and Franks also find that directors continue to hold onto shares more than other investors, again presumably trying to retain control of the company.

To raise a given proceeds, underpricing results in a dilution of the percentage ownership of the original shareholders since more shares must be sold, the lower is the offer price. Underpricing also results in excess demand, permitting the underwriter to allocate shares to specific clienteles. In our opinion, it is not at all obvious that the benefits of placing shares with specific clienteles, which may be just temporary unless there are resale restrictions, outweigh the control benefits of selling a smaller fraction of the firm. We believe that the identities and roles of different clienteles remain important areas of future research.

An extreme category of temporary investors is flippers. Flippers purchase shares at the IPO and quickly turn around to sell their shares in an attempt to profit from the first-day

underpricing. Underwriters have a quixotic view towards flippers: on the one hand, the new agency theories of underpricing argue that underwriters sometimes allocate shares specifically to investors so that these investors can make a quick profit. Furthermore, underwriters desire liquid after-market trading. (After all, someone has to sell!) On the other hand, the “unreal” demand of flippers make it difficult both to gauge the buy-and-hold demand for shares pre-IPO and properly price shares.

For IPOs where there is weak demand, underwriters discourage flipping through moral suasion (i.e., the threat of withholding future allocations on hot issues) and the imposition of penalty bids. A penalty bid occurs when the lead underwriter takes back the selling concession (the commission) from a broker who has allocated shares that are flipped. The existence of penalty bids gives a broker an incentive to allocate shares to clients who are likely to be buy-and-hold investors. More controversially, a penalty bid also gives a broker an incentive to discourage a client from selling shares, when the client may not be aware of the broker’s financial incentive. For IPOs where there is strong demand and a price jump, penalty bids are rarely imposed, and flipping may even be encouraged in order to keep market demand from pushing the price to unsustainable levels. This practice by underwriters explicitly assumes that there is a negatively sloped demand curve, and that the market price is not exogenous.

One question that arises is whether flipping by institutions can be used to predict long-term returns on IPOs. That is, do institutions succeed in identifying IPOs that are being overvalued when trading commences? Field (1997), Krigman, Shaw and Womack (1999) and Houge, Loughran, Suchanek, and Yan (2002) find evidence suggesting that indeed they do.

In Table 1, we report that \$66 billion was left on the table during the internet bubble. This is an enormous amount of money. At this point, there has been no research investigating how this \$66 billion was split among buy-side participants (individual investors, mutual funds, hedge funds, “friends and family,” etc.) and sell-side participants (the stockholders of investment banking firms through higher profits; and analysts, traders, and corporate finance employees through bigger bonuses). Furthermore, if many institutional investors were directing their trades to investment banking firms that had IPOs to hand out, how much did this harm electronic communication networks that did not get the order flow, in spite of their lower commissions?

In the 1980s, “dividend capture” schemes by Japanese insurance companies led to

artificially high volume for U.S. stocks paying high dividends around the ex dividend day. In recent years, it is likely that share volume was unusually high for certain stocks as certain investors sought to generate commissions as a way of receiving hot IPO allocations. To get some idea of the magnitude of the effect, table 1 reports that \$66 billion was left on the table in 1999-2000. If investors rebated 20% of this back to underwriters in the form of extra commissions, this would amount to \$13 billion. At an average commission of 10 cents per share, this would amount to 130 billion shares traded, or an average of 250 million shares per trading day during 1999-2000. Because combined Nasdaq and NYSE volume averaged about ten times this amount during these years, this would suggest that portfolio churning by investors to receive IPO allocations may have accounted for as much as 10 percent of all shares traded during the internet bubble. This extra trading volume is not likely to have been evenly distributed across all stocks. Instead, the churning probably was concentrated in the most liquid stocks. At this point, we are unaware of any market microstructure research that has investigated this issue.

Other effects of the large amount of money left on the table during the internet bubble might include the growth of hedge funds. If hedge funds were able to boost their returns substantially because of their ability to receive hot IPO allocations in return for rebating part of the profits back to underwriters via commission business, then the high returns on this asset class may have been transitory. Hedge funds operate more clandestinely, trade more frequently, and share a larger fraction of their profits with their principals, giving them even greater incentives than mutual funds.

B.4. Summary of IPO Pricing

As readers of this literature we come away with the view that IPO underpricing is real and persistent, indeed even increasing over time. While asymmetric information models have been popular among academics, we feel that these models have been overemphasized. In any case, we believe that there is no single dominant theoretical cause for underpricing. In other words, it is not so much a matter of which model is right, but more a matter of the relative importance of different models. Furthermore, one reason can be of more importance for some firms and/or at some times. To date, there has been little empirical work attempting to quantify the relative importance of different explanations of underpricing.

C. Valuation

An immediate question raised by the sometimes large differences between the offer price and the first-day market price is whether issuers or the stock market is pricing offerings in line with a firm's fundamentals. The most common method for valuing firms going public is the use of comparable firm multiples. But unfortunately, accounting data are too unreliable a measure of true valuation to facilitate reliable tests, especially because many firms going public are being valued for their growth options, not their historical financials. As a result, the power of tests to explain pricing relative to some "true fundamental value" is too low to make much headway in testing whether IPO pricing or after-market valuation better reflects the IPOs' fundamental valuations. Kim and Ritter (1999) found only a modest ability to explain the pricing of IPOs using accounting multiples. Purnanandam and Swaminathan (2001) find that IPOs tend to be overpriced relative to comparables ("comps") in the public market. We also hope that future research would use practitioner earnings forecasts (e.g., I/B/E/S) instead of time-series forecasts from historical earnings listed on the IPO prospectus.

One method of testing whether the offer price or the first closing market price is a better measure of "true" value is to examine long-run returns. If the first closing market price is an unbiased measure of a firm's fundamental value, then there should be no abnormal returns in the future.

V. Long-run Performance

No survey would be complete without covering a facet of IPOs that has attracted substantial interest from academics in recent years: the performance of IPOs in the market in the years after the offering. Efficient markets proponents would argue that once an IPO is publicly traded, it is just like any other stock and thus that the after-market stock price should appropriately reflect the shares' intrinsic value. Thus, risk-adjusted post-IPO stock price performance should not be predictable. In this sense, post-IPO long-run performance is less of an IPO (or corporate finance) issue as it is a standard asset-pricing issue. Still, many IPO shares have been difficult to sell short and thus have retained some peculiarity even post-IPO.

In measuring long-run performance, one can focus either on raw (absolute) performance, or performance relative to a benchmark (abnormal returns). The evidence below shows that

IPOs had poor abnormal returns, but even more so, poor absolute performance since 1970. However, the choice of sample period plays a role in how significant this underperformance was, and perhaps sometimes as much as the chosen statistical measurement techniques.

A. Long-Run Performance Evidence

Statistical inference is problematic when the returns on individual IPOs overlap, as they do when multi-year buy-and-hold returns are used. Indeed, this is a problem for all long-term performance studies, not just those examining IPO performance. While Brav (2000) and others have addressed this issue, an alternative approach is to measure returns in calendar time. In Table 5, we report time-series regression results using the Fama-French (1993) 3-factor model.

Table 5

Multi-factor Regressions with an Equally Weighted Portfolio of U.S. IPOs

All regressions use 345 observations when the sample period is from January 1973 to September 2001. The dependent variable is the equally weighted monthly percentage return on a portfolio of IPOs that have gone public during the prior 36 months. A coefficient of -0.32 represents underperformance of 32 basis points per month, or -4 percent per year. $r_{pt} - r_{ft}$ is the excess return over the risk-free rate on a portfolio in time period t , $r_{mt} - r_{ft}$ is the realization of the market risk premium in period t , SMB_t is the return on a portfolio of Small stocks Minus the return on a portfolio of Big stocks in period t , and VMG_t is the return on a portfolio of Value stocks Minus the return on a portfolio of Growth stocks in period t . Value and growth are measured using book to market ratios, and VMG is denoted HML in the literature (High book-to-market (value) Minus Low book-to-market (growth) stocks). The factor returns are supplied by Ken French, using his “research factors” with annual rebalancing, as distinct from his “benchmark factors” with quarterly rebalancing. T-statistics are in parentheses.

$$r_{pt} - r_{ft} = a + b_t(r_{mt} - r_{ft}) + b_{t-1}(r_{mt-1} - r_{ft-1}) + s_tSMB_t + s_{t-1}SMB_{t-1} + v_tVMG_t + v_{t-1}VMG_{t-1} + e_{pt}$$

	a	b _t	b _{t-1}	s _t	s _{t-1}	v _t	v _{t-1}	R^2_{adj}
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Panel A: Sensitivity of intercepts to expanding the number of factors

(1) Jan 73-Sept 01	-0.32 (-1.17)	1.40 (24.25)						63.1%
(2) Jan 73-Sept 01	-0.47 (-1.82)	1.39 (25.22)	0.34 (6.08)					66.6%
(3) Jan 73-Sept 01	-0.21 (-1.23)	1.11 (27.01)		1.16 (22.16)		-0.23 (-3.76)		86.1%
(4) Jan 73-Sept 01	-0.20 (-1.22)	1.10 (28.12)	0.11 (2.85)	1.13 (22.07)	0.10 (2.01)	-0.22 (-3.80)	-0.15 (-2.50)	87.5%

Panel B: Sensitivity of the intercepts to different sample periods

(5) Jan 73-Dec 89	-0.15 (-0.83)	1.02 (23.83)		1.33 (20.20)		-0.17 (-2.36)		89.7%
(6) Jan 90-Dec 99	-0.14 (-0.77)	1.11 (20.79)		1.23 (18.88)		-0.17 (-2.24)		91.3%
(7) Jan 90-Dec 00	-0.48 (-2.01)	1.17 (17.39)		0.96 (13.80)		-0.25 (-2.76)		88.2%
(8) Jan 00-Sept 01	0.62 (0.29)	1.45 (3.13)		0.60 (1.59)		-0.68 (-2.24)		75.9%

The intercepts reported in Table 5 are measures of abnormal performance. An intercept of -0.32 is minus 32 basis points per month, or about -4% per year. Row 1 reports the results of a simple one-factor regression, with the market excess return as the explanatory variable. Row 2 reports the results of a regression that includes a lagged market return. The lagged beta is significantly positive, and the summed beta is 1.73, indicating that IPOs have a high level of systematic risk. This accords with the common sense notion that IPOs tend to be risky stocks. The row 2 intercept is -47 basis points per month, suggesting that the row 1 intercept is underestimated due to the underestimation of systematic risk when the lagged effect is ignored.

Row 3 of Table 5 reports regression results with the three traditional Fama-French (1993) regressors, and row 4 adds the lagged Fama-French factors. The intercepts in rows 3 and 4 return to a value of about -2.5% per year. As Brav and Gompers (1997) note, Fama-French 3-factor regressions tend to have negative intercepts for portfolios of small growth firms, whether or not the portfolio is composed of IPOs. Brav and Gompers show that a large fraction of IPOs fall in the extreme small growth firm category, so this is an important concern. In our Table 5, we have excluded most of the smallest firms by screening out IPOs with an offer price below \$5.00 per share. There is another bias in multi-factor regressions, as normally implemented. Loughran and Ritter (2000) point out that the right-hand side variables, the Fama-French factor returns, are partly composed of the returns on IPOs.¹⁴ This “factor contamination” biases the intercept towards zero. Table 6 of Loughran and Ritter (2000) reports that the effect of this bias is 18 basis points per month during 1973-1996.

Rows 5 through 8 split the sample into different time periods. The underperformance in the 1990-1999 period is virtually identical to that in the 1973-1989 period, a statistically insignificant -14 or -15 basis points per month. The estimates, however, are very sensitive to the ending date. While the internet bubble was inflating in the late 1990s, post-IPO returns were exceptionally good. If the sample is extended by just one year, from December 1999 to December 2000, the intercept of -14 basis points for 1990-1999 changes to -48 basis points for 1990-2000.

¹⁴ Because IPOs tend to be small growth stocks, a small firm portfolio will have more IPOs than a large firm portfolio, especially after periods of heavy issuing volume. Similarly, a portfolio of value stocks will have fewer IPOs than a portfolio of growth stocks. Thus, SMB will have a low return and VMG will have a high return following heavy IPO issuance if IPOs underperform.

Perhaps even more remarkable are the following 21 months, the period from January 2000 to September 2001. It shows how methodology matters in a most startling fashion. The (unreported) monthly average arithmetic return on our equal-weighted portfolio of IPOs from the past three years is –355 basis points per month (whereas the CRSP value weighted index produced an equivalent return of –151 basis points per month). The internet bubble collapsed and the majority of 1998-2000 IPOs fell below their offer price, or went outright bankrupt. Yet, row 8 shows a *positive* intercept of 62 basis points per month! The reason is that the regression attributes the collapse to the negative market returns and concurrent collapse of technology stocks, which is reflected in positive realizations on VMG.

This evidence suggests two areas of caution: First, one must be careful comparing papers which attribute a weakening or disappearance of the IPO effect to novel measurement techniques; instead, the sample period may be responsible for some of the conclusions. Second, unless one is comfortable to conclude that the internet IPOs with –400 basis points per month returns offered investors positive risk-adjusted returns, one should be wary of considering the Fama-French factors to be equilibrium risk factors and using them as controls. When using either a multifactor model or matching firms to examine abnormal performance, these tests should be regarded as testing “similarity to certain public firms,” rather than as tests of IPO mispricing.

Furthermore, long-run returns, even if remarkably low, are sufficiently noisy to make any statistical inference difficult. For example, in Brav (2000), it can require an abnormal return of –40% (depending upon specification) to reject the hypothesis that those long-run buy-and-hold returns are not underperforming. After controlling for the poor performance of book/market and size-matched non-IPO firms, “similarity” between IPO and non-IPO firms can no longer be rejected for some sample periods. Eckbo and Norli (2001) use size and liquidity matching, and find that similar publicly traded firms also performed poorly.¹⁵

Because the asset-pricing literature itself has failed to provide an accepted model of risk-adjusted performance against which one can measure post-IPO performance (and it is even

¹⁵ Barber and Lyon (1996), Barber and Lyon (1997) and Lyon, Barber and Tsai (1999) consider various statistics used in the literature, and propose some good intuitive measures of long-run performance. Teoh, Welch, and Wong (1998) suggest a Fama-MacBeth type procedure. The Loughran and Ritter (2000) and Schultz (2001) papers discuss the influence of weighting schemes.

unclear whether the Fama-French factors are risk factors or evidence of market inefficiency), it still remains unclear how abnormally poor post-IPO performance is. Nevertheless, it is clear that *IPOs and firms with characteristics similar to IPOs* had rather unappealing performance at a time when the overall stock market performed exceptionally well. It is not in dispute that equally weighted post-IPO returns have been low relative to broad market indices since Nasdaq came on line. For instance, if an investor had put an equal amount of money at the first CRSP-reported closing price into each of the 7,396 IPOs (using the same inclusion criteria as in our Table 1) from January 1970 to September 2000, and rebalanced the portfolio annually in event time, during the five years after going public, the average annual geometric return would have been 10.6%, according to Ritter (2002, Table 10). But if one had just invested in the S&P 500 at the beginning of January 1970, over the next 31 years an investor would have earned a compound annual return of 12.9% per year.

Out of sample evidence has confirmed long-run IPO underperformance in many other countries and in the years after its original description (Ritter (1991), Loughran and Ritter (1995)). However, Gompers and Lerner (2001) find that IPOs in the 1935-1972 did not underperform.

B. Sources of Long-run Underperformance

We know of only two semi-rational explanations for the long-run underperformance of IPOs. Miller (1977) assumes that there are constraints on shorting IPOs, and that investors have heterogeneous expectations regarding the valuation of a firm. The most optimistic investors buy the IPO. Over time, as the variance of opinions decreases, the marginal investor's valuation will converge towards the mean valuation, and its price will fall. This argument works better when the float is small and not too many investors are required. This is consistent with the drop in share price at the end of the lockup period (when more public shares become available to the public), as documented by Bradley, Jordan, Roten, and Yi (2001), Field and Hanka (2001), and Brav and Gompers (2001). Bradley *et al* show that the negative effect is much more pronounced for venture capital-backed IPOs. Typically with these IPOs, the VCs distribute shares to their limited partners on the lockup expiration date, and many limited partners immediately sell. This shows up not only in negative returns, but exceptionally high volume.

Schultz (2001) offers a second explanation: he argues that more IPOs follow successful

IPOs. Thus, the last large group of IPOs would underperform and be a relatively large fraction of the sample. Although this is a logical argument, it cannot predict underperformance when each time period is weighted equally, as is done in Table 5.

Other papers are less ambitious, and simply attempt to find variables that result in cross-sectional predictability. Jain and Kini (1994) and Mikkelsen, Partch, and Shah (1997) document that long-run return performance is also accompanied by poor financial accounting performance post-IPO relative to pre-IPO performance and/or industry conditions. So, what drives this long-run underperformance and can it be predicted?

Heaton (2001) argues that managers tend to be overoptimistic, and thus prone to overinvestment if the funds are available. Teoh, Welch, and Wong (1998) attribute some of the poor post-IPO stock performance to “optimistic” accounting early in the life of the firm. It is not surprising that firms are eager to look good when they conduct their IPO, and that the market has difficulties to disentangle carefully hidden warning signals. This suggests that at least a part of the poor long-run performance is due to a market that is unduly optimistic and unable to properly forecast tougher times ahead. Similarly, Purnanandam and Swaminathan (2001) find that IPOs that are priced high relative to public market comparables tend to perform worse in the long run, even though they show higher IPO initial returns. Both papers point towards overconfidence, perhaps by both entrepreneurs (Bernardo and Welch (2001)) and investors (Daniel, Hirshleifer, and Subramanyam (1998)).

There have been some other less successful attempts to correlate IPO long-run performance to pre-IPO characteristics. Brav and Gompers (1997) find few differences across different IPO underwriters. Similarly, there is no reliable relationship between short-run IPO underpricing and long-run performance, although this evidence is sensitive to whether penny-stock IPOs are included or not. These IPOs, which were common before the 1990s, frequently had high first-day returns and exceptionally low long-run returns. Many of these issues involved stock price manipulation. For samples excluding penny stock IPOs, whether there is a reversal of the highest first-day returns in the long run depends mostly on whether the internet bubble period is included in the sample. Almost all of the IPOs from 1999-2000 with large first-day returns have subsequently collapsed. Since most of these were internet related, the number of independent observations is limited.

Surprisingly, we could find very little academic evidence relating clientele information to long-run performance. There is no published study about how IPO first-day share allocations (or even institutional holdings [cite laura!]) influence long-run performance. There is not even a published study of how post-IPO insider trading affects long-run performance. Although there are problems with the data (such as exchange funds, which de-facto allow insiders to swap out their holdings without requiring formal disclosure), these problems have not prevented insider trading data from being used in other contexts.

The recent bubble has made it amply clear that even if there is systematic long-run underperformance, it is difficult or impossible to exploit in a reliable manner. Many short sellers lost a great deal of money on internet bubble IPOs, and had to close out their shorts before they would have paid off. Still, we hope to see further work to tell us which subsamples are particularly prone to poor post-IPO performance, both in the United States and in other countries.

VI. Conclusions

This paper has focused on four areas of current research on IPOs: reasons for going public, underpricing, share allocations, and long-run performance.

There are myriad theoretical reasons for firms wanting to go public, but only sparse evidence due to a general lack of data on the pool of private firms. Still, the evidence of large variation in the number of IPOs suggests that market conditions are the most important factor in the decision to go public. The stage of the firm in its life cycle seems to be the second important factor.

The underpricing of IPOs has been a topic of theoretical investigations for decades. Recently, this topic has enjoyed a resurgence of activity, motivated by the astonishingly high first-day returns on IPOs during the internet bubble. We argue that theories based on asymmetric information are unlikely to explain average first-day returns of 65 percent. Even if there was substantial uncertainty about the demand for a given IPO, the bundling of multiple IPOs could lower the uncertainty driving IPO underpricing in information models if issuers and underwriters were trying to reduce it. Thus, we believe that future explanations will need to concentrate on agency conflicts and IPO share allocation issues on one hand and behavioral explanations on the other hand. A particular challenge for such theories will be to explain the dramatic variations in

the magnitude of average IPO underpricing over the last few decades, and not just that variation is present, but why it could reach levels of 100% and more for some but not other IPOs.

The allocation of shares by underwriters is perhaps the most active area of current IPO research. Share allocation has an impact on many topics, including theories of underpricing, post-issue ownership structure, and underwriter compensation. To date, empirical research has been limited due to the lack of micro-level data on share allocations in the U.S. As this data becomes available, we expect that it will be able to shed light on many questions.

Post-IPO performance may be the most controversial area of IPO research, with some researchers lining up behind an efficient markets point of view and others lining up behind a behavioral point of view. Although we tend to favor the behavioral point of view, our main perspective is that caution is advisable. First, the results are sensitive not only to methodology, but also to the exact time-period chosen. Depending on whether and how one includes 1999, 2000, and 2001, one can come to rather different conclusions. Second, Fama-French multifactor regressions can produce very odd results. They indicate that the period during which the internet bubble collapsed were great years for recent IPOs, even though an equally weighted portfolio of recent IPOs lost on average 400 basis points per month.

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