

Equilibrium in the IPO Market

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Abstract

In this survey, I criticize the ability of popular asymmetric information-based models to explain the magnitude of the underpricing of initial public offerings (IPOs) that is observed. I suggest that the quantitative magnitude of underpricing can be explained with a market structure in which underwriters want to underprice excessively, issuers are focused on services bundled with underwriting rather than on maximizing the offer proceeds, and there is limited competition between underwriters. Since the technology bubble burst in 2000, U.S. IPO volume has been low. Although regulatory burdens undoubtedly account for some of the decline, I suggest that much of the decline may be due to a structural shift that has lessened the profitability of small independent companies relative to their value as part of a larger, more established organization that can realize economies of scope. I also discuss the long-run performance literature. My interpretation of the evidence is that except for the smallest companies going public, IPOs have long-run returns that are similar to those on seasoned stocks with the same characteristics.

Equilibrium in the IPO Market

1. INTRODUCTION

The initial public offering (IPO) literature is vast, and this survey can touch on only a small part of the literature. This survey will focus exclusively on equity IPOs, mainly because the pricing and allocation of most other securities, such as corporate and government bonds, is comparatively boring. Bonds, while much more important in terms of the amount of money raised, are easy to price in comparison to equities, and most are sold at or very close to par value, with few controversies arising. In this survey, I focus on seven topics. Each of the seven sections that discuss these topics can be read relatively independently of the other sections.

Section 2 presents underpricing and IPO volume patterns for China and the U.S. The average underpricing of IPOs in China has been extreme, but this high level is due to regulatory constraints that have recently been removed.

Section 3 critiques the models of underpricing that dominate the academic literature and discuss how, in equilibrium, there can be average levels of underpricing with excess demand being normal. This requires 1) a desire by underwriters to excessively underprice, 2) a willingness of issuers to hire underwriters with a history of excessive underpricing, and 3) a market structure that results in an equilibrium where competition among underwriters does not eliminate the excess underpricing.

Section 4 focuses on conditional underpricing: why is it that U.S. IPOs using bookbuilding have average first-day returns that are close to zero if the offer price was revised downwards during the registration period, but average first-day returns of close to 50% if the offer price was revised upwards? I argue that the evidence suggests that agency problems between issuers and investment bankers are of first-order importance in explaining both conditional underpricing and the average level of underpricing, and that the asymmetric information-based model with no agency problems that dominates the academic literature is at best of second-order importance.

Section 5 discusses what I term the CLAS controversies. *C* is the payment of excessive *commissions* by investors as a way of currying favor for IPO allocations. *L* is *laddering*, the practice of allocating shares in return for promises of additional purchases once the stock starts trading. *A* is biased *analyst* recommendations, with underwriters competing for business from issuers by either implicitly or explicitly promising favorable coverage from their research analysts. *S* is *spinning*, the practice of allocating shares from other IPOs to the personal brokerage accounts of issuing firm executives in return for investment banking business from the executives' company. All of these practices, which have been muted following the regulatory crackdowns that ensued after the tech stock bubble burst in 2000, were both causes and

consequences of the severe underpricing that existed in the U.S. and some other countries in 1999-2000.

Section 6 analyzes why average underpricing is so high. The objective functions of both issuers and underwriters are discussed. I suggest that the market equilibrium that results is oligopolistic in nature, with more underpricing than would exist if issuers were focused solely on maximizing IPO proceeds.

Section 7 discusses why IPO volume has been low in the U.S. ever since the tech stock bubble burst in 2000. In the U.S., the drop has been particularly pronounced among young firms. While part of this drop is undoubtedly due to the higher direct costs of being public associated with the 2002 Sarbanes-Oxley Act and other regulatory changes in the U.S., part may be due to the disappointing historical stock-market performance of young firms, and a decline in the profitability of small independent firms. Specifically, I suggest that there has been a decrease in the profitability of small independent firms relative to the profitability of larger organizations that can realize economies of scope and bring new products to market quickly.

Section 8 summarizes the evidence on the long-run performance of IPOs. The average equally weighted return in the three years after an IPO is low, not counting the first-day return. The average return on small growth company stocks with similar characteristics is also low. The more interesting question is whether, once one knows that a stock is a small growth company, there is any incremental value for predicting returns if one knows that a stock recently went public. My summary of the evidence is “no” if the company had at least \$50 million in annual sales before going public, but “yes” if the company had not achieved this sales threshold. I also discuss the ability of IPO volume to predict subsequent aggregate market returns.

Because this article is a critical review of only a small part of the IPO literature, with a focus on very recent articles, I refer the reader to recent surveys by Ritter and Welch (2002), Ritter (2003), Ljungqvist (2007), and Yong (2007) for additional reading. These surveys, however, are less critical of the existing literature than I am in this article. There are also entire books devoted to IPOs, including those by Jenkinson and Ljungqvist (2001), which is aimed at an academic audience, and Westenberg (2009), which discusses the “how to go public” for U.S. issuers.

2. IPO VOLUME AND UNDERPRICING IN CHINA AND THE U.S.

The past decade has seen relatively few IPOs in many developed countries compared with the decade ending in 2000. Figures 1 and 2 show the number of companies going public domestically in, respectively, the U.S. and China, as well as the equally weighted average first-day returns, measured from the offer price to the first closing market price. The U.S. has

historically been the world's largest IPO market, and China has had the most extreme underpricing. The time period is 1990-2010, starting when China reopened its equity capital markets after a 40-year hiatus. Note the different vertical scales on the two figures: the average first-day return in the U.S. during this period is 18%, whereas it is 156% for China.

2.1 Chinese IPOs

The average underpricing of Chinese IPOs has been severe, although in 2010 the 40.4% average was comparatively modest. I suspect that the underpricing will be much lower in the future than in the last twenty years due to changing institutional constraints. To be specific, as described in Cheung, Ouyang, and Tan (2009), the China Securities Regulatory Commission (CSRC) from 1990 to 1995 determined the maximum offer price based on a multiple of book value. From 1996 to June 1999, the offer price was not permitted to result in a price-earnings (P/E) ratio of greater than 15. Not surprisingly, during periods when the average Chinese stock sold at a P/E ratio of 45, a company would go public at a P/E ratio of 15 and immediately see a 200% first-day return. From July 1999 until June 2002, auctions were used with pricing dominated by on-line bidding from retail investors. Offer prices were sometimes pushed to high levels, but market prices were frequently bid up even further, resulting in high first-day returns followed by low long-run returns.

***Underpricing:** The percentage first-day return, measured from the offer price to the closing market price. In principle, for the issuer the underpricing of an IPO should be measured relative to the market price, rather than the offer price, but in practice it is measured from an investor's point of view, using the offer price as the base.*

From July 2002 to the end of 2004, the CSRC returned to a controlled P/E system, with offer prices capped at a P/E of 20. Starting in 2005 the P/E cap regulation was dropped, but in practice the CSRC did not approve IPOs with a P/E ratio of greater than 30. Only recently have IPOs been approved with higher P/E ratios and, not surprisingly, the average first-day return has not been as extreme. Procedures with some aspects of bookbuilding were introduced in 2005 and then altered in 2009, although underwriters are not allowed to use discretion in allocations to either individual or institutional investors, and most shares are allocated to individual investors. Ma and Faff (2007) and Gao (2010) document the many different procedures that have been used for allocating IPOs in China.

The Chinese IPO market continues to evolve. In October 2009, the Shenzhen Stock Exchange opened up a second market aimed at young growth companies, called ChiNext. Unlike IPOs on the main boards in Shanghai and Shenzhen, IPOs on this market are not required to have positive earnings in each of the three years prior to going public. Furthermore, the government has relaxed its control on the number of companies permitted to list, thus allowing private-sector firms to go public rather than only state-owned enterprises.

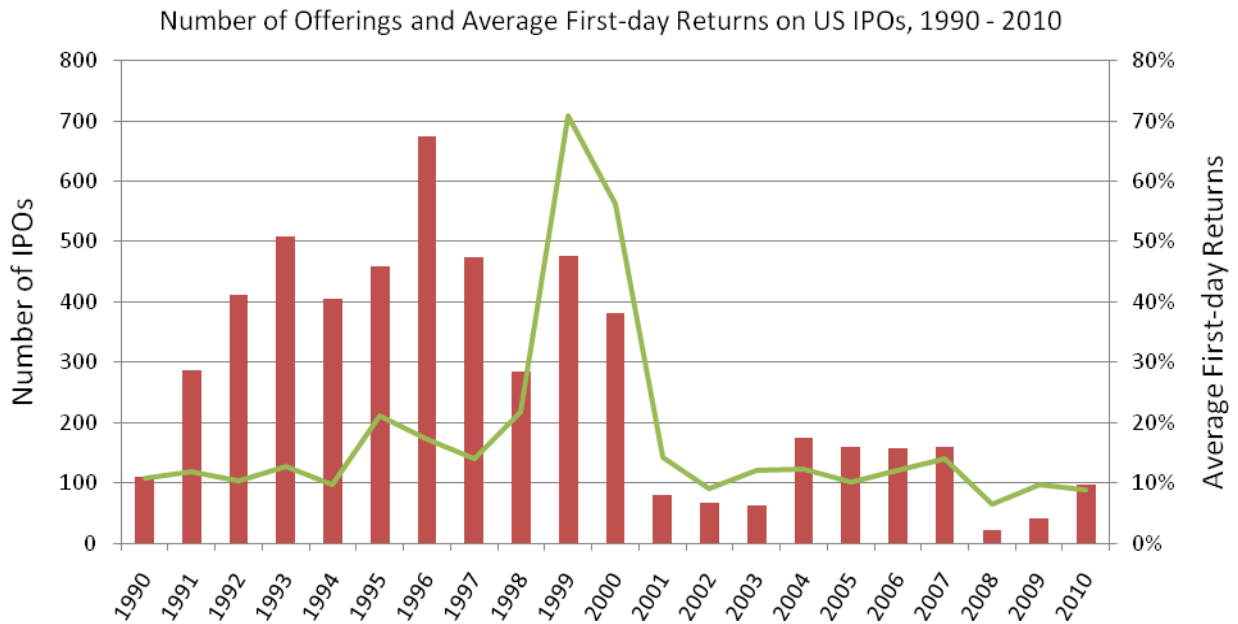


Figure 1. The number of U.S. IPOs (bars) and average first-day returns (connected dots).

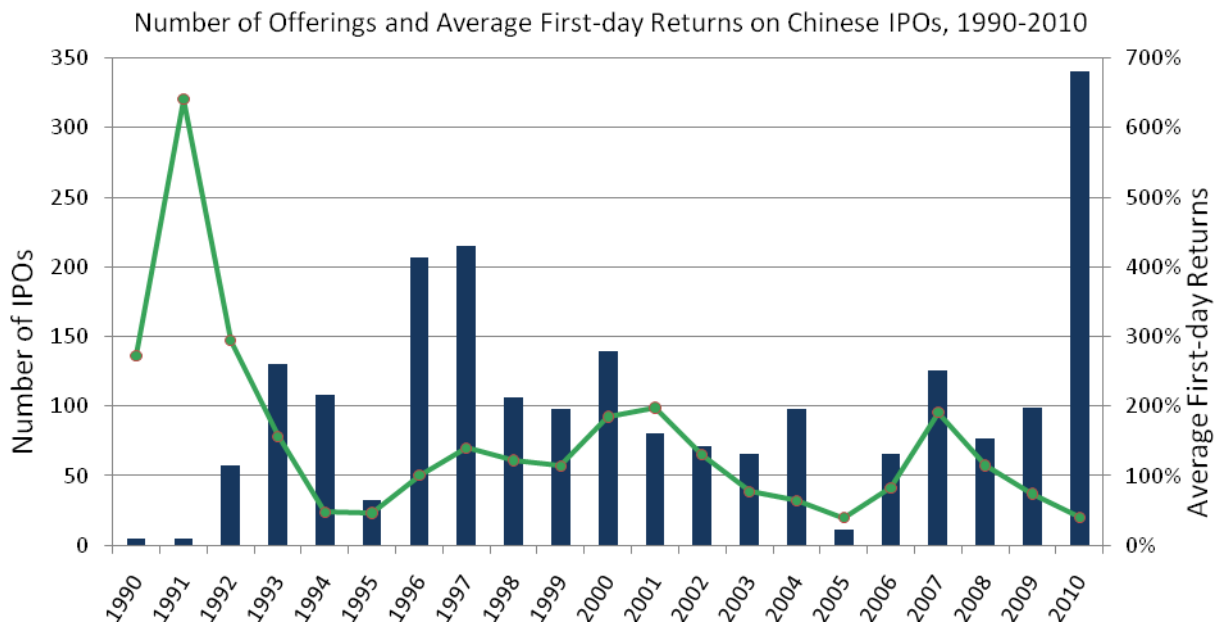


Figure 2. The number of Chinese A-share IPOs (bars) and average first-day returns (connected dots).

2.2 IPOs in the U.S. and Other Countries

With the exception of 1999-2000, the underpricing of IPOs in the U.S. has been modest in comparison to China. PowerPoint slides for a number of countries, as well as figures and tables showing the average first-day returns for at least 48 countries, can be found on my website (just Google “Jay Ritter”).

2.3 The Costs of Going Public

The empirical IPO literature focuses mainly on returns, both first-day and long-term. Yet, many questions are about price levels. For example, can a company achieve a higher valuation by going public or selling out to a strategic buyer? Very few papers focus on price levels, for the simple reason that as with much of asset pricing, it is difficult to measure expectations about growth, etc., in making comparisons between firms. Indeed, Purnanandam and Swaminathan’s (2004) findings that IPOs on average are overvalued relative to comparable firms can be interpreted as showing that IPOs are expected to grow much faster than the seasoned comparable firms that are used.¹

Underpricing is an opportunity cost to a firm going public. Combined with the direct costs, which include auditing, legal, printing, exchange listing, and investment banking fees, these costs are non-trivial in most countries. For moderate-size IPOs in the United States, the investment banking fees, known as the gross spread, are almost always 7% of the proceeds (Chen and Ritter, 2000). For larger IPOs, the gross spread is lower, and it is much lower in Europe and elsewhere, as documented by Torstila (2003) and Abrahamson, Jenkinson, and Jones (2011). If a firm sets an offer price of \$10 per share, netting \$9.30 after the gross spread, and sees the stock trade at \$11.80 (an 18% first-day return), the company has netted only \$9.30 for stock worth \$11.80, a discount of 21.2% without even including auditing, legal, and other costs.

On average, the post-IPO public float is about 30%, i.e., 30% of the post-issue number of shares outstanding are issued in the IPO. Thus, per pre-issue share, the opportunity cost is $(30\%/70\%) \times 21.2\% = 9.1\%$ of the value. For a stock selling at a price/earnings ratio of 22, this amounts to two years’ earnings. Given how much effort is put into earning a profit, it is surprising how casual many firms are about trying to minimize the costs of going public.

Why would a company choose to go public if the costs are so high? There are a number of reasons. These include the desire to raise capital; the desire of current shareholders to “cash out” by selling shares, either at the time of the IPO or in the future; and the desire to have publicly traded stock, both to clarify the valuation and to provide a “currency” for making stock-

¹ Aggarwal, Bhagat, and Rangan (2009) report that firms going public with negative earnings receive higher valuations than those with positive earnings, which they interpret as evidence of the importance of unobservable growth options.

financed acquisitions. Brau and Fawcett (2006) report that in a survey of chief financial officers (CFOs) of companies that went public, the acquisition currency motivation is the most frequent reason given.²

A number of recent articles have examined the desire to make acquisitions by companies going public. Celikyurt, Sevilir, and Shivdasani (2010), Hovakimian and Hutton (2010), Brau, Couch, and Sutton (2011), and Lyandres, Zhdanov, and Hsieh (2011) all document a high frequency of acquisitions by companies shortly after going public.

3. IPO UNDERPRICING EXPLANATIONS

There are a number of theories that have been developed to explain the positive average first-day returns on equity IPOs, many of which are based on asymmetric information. Ljungqvist (2007) devotes an entire chapter to discussing these theories and associated evidence. The asymmetric information-based theories would be plausible if the average first-day return was in the vicinity of 2%, or maybe even 5%. In almost all countries, average underpricing is noticeably higher than this. In some cases, such as China, institutional constraints explain severe underpricing. In other cases, I think that agency problems between issuers and underwriters, combined with a willingness of at least some issuers to focus on factors other than maximizing the net proceeds raised in the IPO, are important. Before discussing these ideas, however, I critique the most popular explanations for the underpricing of IPOs.

3.1 The Winner's Curse

Rock's (1986) adverse selection model assumes that the issuing firm and its underwriters do not know the value of the firm with certainty, but that some investors do know. There are no agency problems between issuers and underwriters, so underwriters play no role. For simplicity, each of the two types of investors (informed and uninformed) is able to invest a fixed amount in an IPO. The issuer sets an offer price and number of shares to be sold, and if there is excess demand, shares are allocated on a pro rata basis, i.e., if the offer is subscribed by a factor of three, every investor that requested shares receives one-third of the requested amount.

Informed investors create a negative externality for the uninformed investors, since the informed will only submit purchase orders when the offer price is at or below what they know to be the true value. Uninformed investors thus suffer from a winner's curse: they will receive all of the shares being sold when the offer is overpriced, but only some of the shares being sold when

² See Bancel and Mittoo (2009) for a discussion of the motivations behind European IPOs based on a survey of CFOs.

the offer is underpriced. To compensate the uninformed investors for this adverse selection, IPOs must be underpriced, on average.

Numerous studies have found evidence consistent with this adverse selection story. Approximately none of these tests, however, have asked whether the causality is going from adverse selection to underpricing (Rock's model) or from underpricing to adverse selection (simple rent-seeking behavior). I would argue that, with free entry, investors will participate in the IPO market as long as profits are to be made. As a result, the greater is the expected underpricing, the greater will be the excess demand. To the observer, there will be more rationing the greater is the underpricing, but the evidence is fully consistent with the level of underpricing being determined exogenously and investors entering as long as the expected profits on IPO allocations are at least as high as their costs. Let me illustrate this idea with a simple example.

Assume that there is no fixed cost of submitting an indication of interest, but that there is an opportunity cost of 0.1% of the offer proceeds applied for, due to foregone interest. This corresponds roughly to the institutional arrangement in Hong Kong facing retail investors (see Fung and Che, 2010), and would correspond to a situation in which the interest rate is 5% per year, and the funds must be deposited for a week before being refunded if no shares are received. If the expected underpricing is 5% on a \$10,000,000 offering, \$500,000 is expected to be left on the table, and \$500,000,000 of shares will be applied for (0.1% of \$500 million is equal to \$0.5 million). Thus, the offer would be oversubscribed by a factor of 50 if expected profits are to be zero.

Money left on the table: *The product of the number of shares issued times the first-day capital gain per share, measured from the offer price to the closing market price, representing the aggregate dollar value of profits received by investors who were allocated shares at the offer price.*

If, instead, investors expect the offer to jump by 50% on the first day of trading, the expected money left on the table is \$5 million, and \$5 billion of shares will be applied for (0.1% of \$5 billion is \$5 million). A researcher would conclude that investors suffer from an adverse selection problem: the subscription ratio is 50 on the IPO with 5% underpricing, and 500 on the IPO with 50% underpricing. But adverse selection does not cause the underpricing; it is the result of underpricing. And in Hong Kong, it is easy to apply for shares on-line, and many local newspapers predict which IPOs are likely to be hot, with some of the offers oversubscribed by a factor of 600 (e.g., the Tom.com IPO in February 2000, which jumped by 335% on the first day of trading).

Bookbuilding: *A procedure for selling securities in which underwriters conduct a marketing campaign and then canvas institutional investors to measure demand before setting the final*

offer price. Underwriters use their discretion in allocating the securities if there is excess demand at the offer price, as is normally the case.

The institutional arrangement for allocating shares that Rock (1986) assumes corresponds to what is sometimes called a fixed-price offer, in which the offer price is set before the state of demand is known, and in which underwriters have no discretion in allocation. In practice, many IPOs during the last two decades have used bookbuilding, in which the offer price is set after indications of interest from institutional investors have been received, and in which underwriters have discretion for allocating shares. Because of these features, and the repeated dealings between an underwriter and institutional investors on subsequent deals, it is not obvious that there should be an adverse selection problem that requires anything other than a minimal amount of underpricing. Given the use of bookbuilding in many countries, the observed levels of underpricing seem to be far in excess of what could be explained by the winner's curse problem,

3.2 Silly Academic Theories

There are other asymmetric information-based theories of IPO underpricing. Some of these I would classify as "silly academic theories," such as the three signaling models of IPO underpricing (Allen and Faulhaber (1989), Grinblatt and Hwang (1989), and Welch (1989)). These articles, like much of the corporate literature at this time, applied signaling models to explain a variety of empirical phenomena. Daniel and Titman (1995) point out that high quality firms would use underpricing of the IPO as a signal to distinguish themselves from low quality firms only if the strategy space is severely restricted.³ Alternatively stated, underpricing the IPO is an extremely costly way for high quality firms to convey information to investors relative to alternative means of communication, and will occur only under extremely restrictive conditions.

Another explanation of IPO underpricing that does not pass the common sense test is the notion that underpricing occurs in order to reduce the probability and expected costs of subsequent litigation. This lawsuit avoidance theory of underpricing has the problem that leaving money on the table is an incredibly inefficient way of deterring lawsuits: the opportunity cost in foregone proceeds is \$1 for what is at most a few cents of expected benefits. Furthermore, the litigation environment in the U.S. is fairly unique, yet the magnitude of IPO underpricing in the U.S. is not unusual. Hao (2011) reports that there is no reliable relation between underpricing and subsequent litigation risk for U.S. IPOs from 1996-2005.

³ An example of an expanded strategy space is provided in Keloharju, Knüpfer, and Torstila (2008), who show that privatizations involving "loyalty bonuses" for retail investors induce greater participation by individual investors and longer holding periods than if the IPOs were underpriced more.

4. CONDITIONAL UNDERPRICING

When an IPO uses bookbuilding, the single variable that has the greatest explanatory power for first-day returns is the revision in the offer price from the midpoint of the original file price range. Companies first distribute a preliminary prospectus, typically three weeks before going public, which lists the number of shares to be offered and a price range, such as \$14-16 per share. (The range between the minimum and maximum is almost always \$2 in the U.S.) A marketing campaign is then conducted, known as a road show, and indications of interest are collected from potential investors. Based upon this demand, the issuer and bookrunners then decide on a final offer price and number of shares to be offered. If the offer price is revised down, on average there is very little underpricing. But if the offer price is revised upwards, there is on average fairly severe underpricing. Thus, the adjustment of the offer price can be used to forecast the first-day return, a pattern that is known as the partial adjustment phenomenon. This pattern, first documented by Hanley (1993), is shown in Table 1:

***Bookrunner:** A lead underwriter that is responsible for negotiating an offer price with the issuer and allocating shares to investors. In recent years, most IPOs have had multiple bookrunners. All bookrunners are lead underwriters, but an IPO might have two lead underwriters but only one bookrunner.*

Table 1

Average first-day returns for U.S. IPOs priced relative to the file price range

	Below	Within	Above
1990-2010	3%	11%	50%

This table uses 5,057 U.S. IPOs from 1990-2010 excluding IPOs with a midpoint of the original file price range of less than \$8.00, unit offers, ADRs, closed-end funds, REITs, limited partnerships, SPACs, and stocks not listed on CRSP (CRSP includes firms listed on the NYSE, Amex, and NASDAQ). The categories are defined relative to the minimum and maximum of the original file price range. The within category includes IPOs priced at the boundaries. The percentage of IPOs priced within each category is 28%, 51%, and 23%, respectively.

Similar patterns exist in Europe and Japan, although the bookbuilding process typically starts with a pre-marketing phase prior to setting the file price range (see Jenkinson, Morrison, and Wilhelm (2006) and Kutsuna, Smith, and Smith (2009)). In Europe, the underwriters rarely set the final offer price above the maximum of this range, although there is a fair amount of clustering on the maximum.

There are three theoretical analyses of the partial adjustment phenomenon, with the seminal paper that of Benveniste and Spindt (1989). Their mechanism design model provides a framework for understanding bookbuilding. Benveniste and Spindt posit that underwriters use their pricing and allocation discretion to induce regular investors to truthfully reveal their private information about the valuation of the company going public. To induce an investor to voluntarily reveal that the investor is willing to pay a higher price, the underwriter must increase the price only partially, and reward this investor with a favorable allocation of underpriced shares. If regular investors in the aggregate disclose positive information, the offer price will be revised upwards and the offer will be underpriced. By contrast, if regular investors disclose negative information, the offer price will be revised downwards with little or no underpricing. Thus, the theory generates the prediction that there will be conditional underpricing.

A central prediction of the Benveniste and Spindt (1989) model is there should be partial adjustment to favorable private information revealed during the bookbuilding period. Importantly, there is no reason why the offer price should not fully incorporate public information. Bradley and Jordan (2002), Loughran and Ritter (2002), and Lowry and Schwert (2002, 2004), among others, point out that public information can be used to predict first-day returns, and that offer prices are not fully adjusted during the registration period to reflect this public information. Furthermore, Hanley and Hoberg (2010) show that pre-issue due diligence can substitute for bookbuilding in generating information about pricing. IPOs with greater due diligence (those with more informative prospectuses) have 8% lower underpricing compared to those with less informative prospectuses.

Calibrating the Benveniste and Spindt (1989) model with plausible parameter values would suggest that conditional underpricing does not have to be as extreme as the 50% reported in Table 1 above in order to induce truthful revelation of positive information by regular investors. As in Rock (1986), in the formal model, investors are endowed with information. If information is costly to produce for investors, the number of informed investors can be endogenized in both models, as shown in the appendix to Beatty and Ritter (1986) for the winner's curse model and in Sherman and Titman (2002) for the mechanism design model.

Loughran and Ritter (2002) present an alternative explanation of the partial adjustment phenomenon using Kahneman and Tversky's (1979) prospect theory. Unlike Benveniste and Spindt (1989), Loughran and I assume that there are agency problems between issuers and underwriters. We posit that issuing firm executives form expectations about their wealth by anchoring on the midpoint of the file price range. If there is strong demand during the bookbuilding period, the market price will be higher than the price that the executives have anchored on, and they will be happy. Underwriters take advantage of this psychological state by not boosting the offer price on a one-for-one basis when positive news arrives, whether the news is public (such as information about whether the stock market went up) or private.

Edelen and Kadlec (2005) present a third explanation for the partial adjustment phenomenon. They posit that issuers are less willing to risk an offering failure when good news arrives because the NPV of growth opportunities has increased. If bad news arrives, they are more willing to risk a withdrawn offer. As a result of the tradeoff between expected underpricing and the probability of a withdrawn offer, there will be more underpricing when there is an upward revision in the offer price, and there will be less underpricing for downward revisions. The predicted pattern is partly due to the sample selection bias created because some offers that would have been underpriced are instead withdrawn in response to bad news.

Both the Loughran and Ritter (2002) prospect theory explanation and the Edelen and Kadlec (2005) tradeoff explanation of conditional underpricing predict that there will be partial adjustment to both private and public good news that arrives during the registration period. Loughran and I and Benveniste and Spindt (1989) predict that there will be full adjustment to bad news, whereas Edelen and Kadlec predict that there will be only partial adjustment. The Benveniste and Spindt dynamic information acquisition explanation predicts that there will be full adjustment to public information, but only partial adjustment to positive private information.

Ince (2010) tests these theories of partial adjustment by examining the incorporation of public and private information into the offer price for both good and bad news. He reports that offer prices make full adjustment to negative public and private information. The full adjustment to negative information (which holds after an adjustment for the sample selection bias that is caused by the fact that deals are more likely to be withdrawn if there is weak demand) is inconsistent with the Edelen and Kadlec (2005) tradeoff model, which predicts partial adjustment for both good and bad news. Ince finds no support for the Benveniste and Spindt (1989) prediction that there should be a 100% adjustment to positive public information. For good news, he reports that the offer prices adjust to only 21% of public information and 27% of private information. Thus, although in principle all three theories could explain at least part of the partial phenomenon, Ince finds that only the prospect theory explanation fits the data.

One can interpret the prospect theory explanation of conditional underpricing as implying that the underwriter “holds up” the issuer when good news arrives. Jenkinson and Jones (2009) describe a procedure that has become somewhat common in Europe as a way of reducing the holdup problem that exists when an underwriter is hired before the offer price is negotiated. By hiring one underwriter for the preparation and advisory functions, and others for the pricing and distribution, the choice of the underwriters for pricing and distribution can be delayed. Another practice that helps align underwriter incentives with the issuer’s objective of maximizing net proceeds is to pay an incentive fee to one or more bookrunners if the issuer is pleased with the outcome of the IPO. Gopalan (2011) reports that, according to data provider Dealogic, 40 IPOs in Hong Kong in 2010 offered incentive fees, and the practice is becoming more common globally.

A second method for distinguishing among the alternative explanations of conditional underpricing is to examine the subsequent actions of issuing firms. Ljungqvist and Wilhelm (2005) test the prospect theory explanation of conditional underpricing by observing the choice of underwriter for follow-on equity offerings (also known as seasoned equity offerings). They posit that if an issuer was upset about leaving too much money on the table in the IPO, the issuer would choose a different underwriter for a follow-on offering. Consistent with the prospect theory explanation, they report that relatively few issuers switch underwriters when the change in wealth, relative to the wealth level that issuers anchored on, is positive.

In addition to a conditional underpricing prediction, the mechanism design theory makes predictions for how shares will be allocated. A number of articles, including Jenkinson and Jones (2004), have examined allocation patterns using proprietary datasets, with the results varying, probably because not all investment banks follow the same practice, and the practice has varied over time.

In many countries, the number of shares sold in an IPO can be adjusted by the exercise of an overallotment option, which in the U.S. is almost always equal to the regulatory maximum of 15% of the stated number of shares sold.⁴ In practice, underwriters allocate 115% of the shares, and support the price by buying back some or all of the incremental 15% during the month after the offering if the market price is in danger of falling below the offer price. If underwriters expect that there will be weak demand for the stock once it starts trading, they frequently allocate as much as 130%, taking a naked short position on the incremental shares beyond 115%. Zhang (2004) posits that the demand to hold the shares is path-dependent, and explains this practice as a method to create more demand. He argues that institutions that are not allocated shares would be unlikely to buy any in the aftermarket, but if allocated shares, they might hold them or even buy more shares.

5. THE CLAS CONTROVERSIES

From the beginning of 1995 to July of 1998, the Nasdaq Composite index rose from 743 to 2,014, an increase of 171%, before dropping to 1,419 at the beginning of October 1998. The index then jumped to a peak of 5,049 in March 2000 before collapsing to 1,114 in October of 2002. During 1995-2000, the U.S. IPO market boomed, especially for tech stocks. Similar patterns occurred in Germany, as documented by Dorn (2009) and others. Starting in September 1998, many tech stock IPOs, and especially internet stock IPOs, jumped in price on the first day

⁴ Kutsuna, Smith, and Smith (2009, pp. 515-516) report that overallotment options were not permitted in Japan prior to February 2002.

of trading. The extremely high first-day returns continued for two years, averaging 64% during 1999-2000, with \$67 billion left on the table in the U.S. during 1999-2000.

The extremely high first-day returns and the large amount of money left on the table during the “bubble” years are hard to reconcile with traditional asymmetric information-based theories of IPO underpricing. But, even before 1999-2000, Loughran and Ritter (2004) point out that the average first-day return in the U.S. had doubled from 7% during the 1980s to 15% during 1990-1998. The high returns and large amounts of money left on the table led to rent-seeking behavior by both underwriters and investors. The high returns were both the cause and effect of what I term the CLAS controversies: excessive *Commissions*, *Laddering*, *Analyst* conflicts of interest, and *Spinning*. I discuss each of these practices in turn.

5.1 Commissions

If there is excessive underpricing, there will be excess demand, and an underwriter that has discretion in allocating shares can recoup part of the money left on the table by giving preference in allocations to rent-seeking investors who repay part of their trading profits by paying commissions in excess of direct execution costs, known as soft dollars, on other trades. Reuter (2006) documents that mutual funds that pay large amounts of soft dollars to specific brokerage firms have large holdings of IPOs underwritten by these brokers shortly after the IPO dates. Nimalendran, Ritter, and Zhang (2007) document that trading volume in non-IPO stocks is unusually high immediately surrounding hot IPOs. This evidence suggests that investment banking firms are able to benefit from IPOs not only due to the commissions paid by the issuers (the gross spreads), but also by capturing part of the money left on the table.⁵ Goldstein, Irvine, and Puckett (2011) estimate that underwriters captured 45% of the money left on the table through soft dollar payments during 1999-2005. If an underwriter can capture part of the money left on the table, this creates an incentive to recommend a lower offer price than would be optimal for the issuer, resulting in greater underpricing.

5.2 Laddering

Laddering is the practice of allocating shares with the condition that the investor buy additional shares in the immediate aftermarket. The term laddering refers to stepping up a ladder, with the incremental purchases pushing the price up one step at a time. A typical arrangement might be designated as 2X or 3X, where an investor agrees to buy twice or three times as many shares as are allocated. For example, in return for being allocated 10,000 shares, an investor would agree to buy 20,000 more shares. This buying in the aftermarket permits other investors to

⁵ Investment banks and mutual fund families can also use underpriced IPOs to boost the performance of particular funds under their management. Ritter and Zhang (2007) and Hao and Yan (2011) find evidence suggesting that there is a non-arms length relation between the underwriting and the asset management businesses among major investment banks.

flip (i.e., sell immediately after trading commences) 20,000 shares without impacting the price, or, if there are no incremental sales, the extra buying will temporarily inflate the stock price, resulting in greater underpricing if the offer price is not raised proportionately, as modeled by Hao (2007).

In principle, in an efficient market the extra buying pressure should not inflate the stock price, especially since Edwards and Hanley (2010) suggest that short-selling is not constrained, even in the immediate aftermarket. But if there is a lot of valuation uncertainty, other investors may not be sure whether the incremental buying pressure is motivated by information-based trading or laddering. Thus, other investors would fail to fully counter-act the effect of the laddering purchases.

5.3 Analyst Conflicts of Interest

As long as issuing firms desire favorable coverage from influential security analysts employed by investment banking firms that also underwrite equity securities, one way to attract business (“winning the mandate”) is to bundle analyst coverage with underwriting. Because sell-side analysts are paid partly out of revenue generated by investment banking, they have an incentive to give favorable “buy” recommendations to underwriting clients.⁶ Fang and Yasuda (2009, 2010) and others have documented that sell-side analysts are likely to give buy recommendations on stocks that are underwriting clients. If underwriters with an influential analyst covering an industry find that they are able to win mandates for IPOs from issuers in that industry in spite of setting lower offer prices, there will be more underpricing than there otherwise would be.

Bradley, Jordan, and Ritter (2008) report that 98% of U.S. IPOs from 1999-2000 that had a file price midpoint of at least \$8.00 per share had analyst coverage from a bookrunner within one year of the IPO. Gao, Ritter, and Zhu (2011) report that, at least since 1993, analyst coverage by lead underwriters has been the norm. Martin (2010) reports that the analysts employed by lead underwriters are especially likely to release a positive recommendation shortly before the lockup period expires.⁷

5.4 Spinning

⁶ The Global Settlement in 2003 explicitly prohibits analyst compensation to be directly linked to investment banking deals. There is, however, no prohibition on indirect linkages. In general, a competitive labor market will reward individuals who have a reputation for being a successful “rainmaker.”

⁷ Most IPOs, either voluntarily in the U.S., or by regulation in many other countries, require that any shares held by pre-issue shareholders that are not sold in the IPO must be “locked up” for a period of time, such as 180 calendar days. The purpose of this lockup is to deter a company from withholding negative information at the IPO and allowing insiders to sell their shares in open-market sales prior to the bad news being released.

Spinning is the practice of allocating underpriced IPOs to the personal brokerage accounts of corporate executives as a way of influencing the executives in their choice of corporate investment banking decisions. The decisions include which investment banker to hire, and what direct and indirect fees to pay. The term spinning refers to the idea that the shares can be immediately resold, or spun, by the recipient. Investment bankers can use underpriced shares to influence (a polite term for “bribe”) not only corporate executives, but venture capitalists and politicians. If underwriters are able to win mandates by spinning issuing firm executives, there will be more underpricing. Indeed, as Liu and Ritter (2010) point out, severe underpricing of other IPOs will be an attraction for issuers whose executives will be spun by that underwriter, resulting in greater underpricing on average.

5.5 But Why Weren’t the Controversial CLAS Practices Always Present?

Soft dollar Commissions, Laddering, Analyst conflicts of interest, and Spinning resulted in greater underpricing in the 1990s and, especially, the bubble years. But why aren’t these practices always present? Loughran and Ritter (2004) posit that the rise in stock market valuations during 1982-1999 led issuing firms to put less emphasis on maximizing IPO proceeds, and more emphasis on other considerations that are bundled with underwriting. This idea will be discussed in more detail in Section 6 below.

5.6 Regulatory Responses to the CLAS Controversies

The 2003 Global Settlement placed restrictions on both spinning and analyst conflicts of interest. The Global Settlement between ten (subsequently 12) major investment banking firms and the U.S. S.E.C., the New York State Attorney General’s office, the NYSE, NASD Regulation, and other regulators involved fines, restitution, and commitments to subsidize independent research with a total of \$1.4 billion being paid by the 12 investment banking firms.

The Global Settlement, along with subsequent regulations from the S.E.C. and FINRA (the Financial Industry Regulatory Authority, the name given to the self-regulatory organization resulting from the 2003 merger of NYSE Regulation and NASD Regulation) and voluntary changes, has resulted in substantial changes in industry practice. In the U.K., the Financial Services Authority (FSA) has also introduced new regulations affecting IPOs.

6. EXPLAINING WHY AVERAGE UNDERPRICING IS SO HIGH

Although the Loughran and Ritter (2002) prospect theory model can explain why some IPOs are more underpriced than others, it does not explain why issuing firms willingly hire an underwriter with a history of excessively underpricing IPOs. Ljungqvist and Wilhelm (2003) also provide a rationale for why some issuers are underpriced more than others. Both of these

papers focus on only the demand for underwriting, without modeling the supply conditions that determine the equilibrium degree of underpricing. Not only do some underwriters persistently underprice their IPOs more than others (Hoberg, 2007), but these high underpricing underwriters have gained market share over time.

6.1 The Objective Function of Issuers

Loughran and Ritter (2004) provide an explanation for why issuing companies would hire an underwriter that is expected to leave more money on the table than necessary to complete the IPO. Loughran and I posit that the issuer's objective function has three components:

$$\alpha_1 \cdot \text{IPO Proceeds} + \alpha_2 \cdot \text{Proceeds from Future Sales} + \alpha_3 \cdot \text{Side Payments} \quad (1)$$

where $\alpha_1 + \alpha_2 + \alpha_3 = 1$. They assume that the proceeds from future sales are boosted by bullish coverage from influential analysts.

Most of the IPO literature has implicitly or explicitly assumed that $\alpha_1 = 1$. Notable exceptions that assume that $\alpha_2 > 0$ include the signaling models of Allen and Faulhaber (1989), Grinblatt and Hwang (1989), and Welch (1989), and the analyst coverage models of Chemmanur (1993) and Aggarwal, Krigman, and Womack (2002). Liu and Ritter (2011) assume that $\alpha_3 > 0$, and generalize eq. (1) to include other components, such as loan tie-ins.

Hoberg (2007) and Liu and Ritter (2011) provide explanations for why issuers are willing to hire underwriters with a history of excessive underpricing. Hoberg posits that some underwriters are better than others at evaluating issuer quality, and that each issuer faces an exogenously determined duopoly of one skilled and one unskilled underwriter. The skilled underwriter realizes that for the high-quality issuers that the underwriter has been able to identify, it has an informational advantage that it can use in setting the offer price. Liu and I observe that an executive who is being spun will seek an underwriter that is able to allocate underpriced IPOs to the executive.

6.2 The Objective Function of Underwriters

Underwriters receive revenue both from the gross spread paid by issuers on IPOs and from soft dollars paid by rent-seeking investors. For selling mechanisms in which underwriters have no discretion in the allocation of shares, such as auctions or retail tranches in which shares are allocated on a pro rata basis, the soft dollar revenue gained is zero. With bookbuilding, the soft dollars can be considerable. This soft dollar revenue creates an incentive to underprice, but if issuers avoid underwriters with a history of excessive underpricing, an underwriter will win fewer mandates. Liu and Ritter (2011) express underwriter k 's profits as

$$\pi_k = (\gamma(U - \bar{U}) - C)D_k \quad (2)$$

where \bar{U} is the dollar amount of underpricing needed to compensate investors for the ex-ante uncertainty of issue valuation and C is the cost of providing all-star analyst coverage ($C = 0$ when no all-star coverage is provided). D_k is the demand for underwriter k 's service. The cost of underwriting the issue is assumed to be covered in the gross spread, which is taken as exogenous. In our article, we assume that a fraction γ of the incremental money left on the table $U - \bar{U}$ flows back to the underwriters through indirect channels, such as collecting soft dollars from rent-seeking investors. The underwriter's optimal level of underpricing is determined by the tradeoff between the higher profits associated with greater underpricing if the mandate is won versus the lower probability of winning the mandate.

6.3 The Market Structure of the IPO Underwriting Industry

Liu and Ritter (2011) posit that issuing firms also place a positive weight on α_2 and α_3 in equation (1) above, which gives underwriters with an all-star analyst in an industry some market power. Liu and I use this insight to develop a model of local underwriter oligopolies where, in equilibrium, issuers that place a sufficiently high value on services that are bundled with underwriting will be underpriced more. Competition between underwriters does not compete the underpricing down to competitive levels because there are only three underwriters with all-star analysts in each industry, giving these three underwriters oligopoly power. The underwriters with market power will vary across industries.

All-star analyst: Every October, a trade publication, Institutional Investor magazine, lists by name the top three sell-side analysts for roughly 70 industries, based on a poll of institutional investors such as mutual funds.

Empirically, Liu and Ritter (2011) find that for U.S. IPOs from 1993-2008, if a bookrunner has an all-star analyst who covers the firm within 12 months of the offer date, the first-day return is 9% higher, consistent with the findings of Cliff and Denis (2004). When all-star coverage is interacted with VC-backing, however, the coefficients on all-star coverage and VC-backing both become insignificantly different from zero, and the interaction term has a coefficient implying that VC-backed IPOs with all-star analyst coverage are underpriced by 20% more than other VC-backed IPOs, e.g., by 38% rather than 18%. We argue that VCs have an especially strong desire for analyst coverage because VCs rarely sell shares in the IPO itself, but instead typically distribute the shares to limited partners starting six months after the IPO, and are thus very focused on the market price in the year after the offering. In other words, in terms of equation (1) above, VCs have a high value of α_2 .

Lastly, it is worth noting that the discussion has focused on underwriters exercising their market power through underpricing, rather than by charging a higher gross spread. The reason for this focus is because there is little competition on IPO gross spreads in the U.S., with almost all moderate size IPOs paying 7% of the proceeds. 7% of the proceeds is paid whether an issuer

raises \$25 million or \$100 million, even though the costs are not four times as high, and whether the company is easy to value and market or difficult to value and risky. The clustering of gross spreads in itself suggests that there is little competition on fees. Furthermore, this clustering has been present in the high-volume markets of the late 1990s and the low-volume markets of this past decade.

Abrahamson, Jenkinson, and Jones (2011) document that during 1998-2007 European IPOs have gross spreads that are less clustered and, on average, only about 60% as high as for U.S. IPOs of the same size. Furthermore, there is less underpricing in Europe than in the U.S. Kim, Palia, and Saunders (2010) conclude that, using U.S. IPOs from 1980-2000, gross spreads are complements rather than substitutes for underpricing. Alternatively stated, underwriters with the market power to charge high spreads are also able to leave more money on the table.

In spite of the high direct and indirect costs associated with going public using bookbuilding in the U.S., auctions are uncommon, as discussed by Degeorge, Derrien, and Womack (2010) and Jagannathan, Jirnyi, and Sherman (2010). Indeed, the latter authors document that auctions are rarely used anywhere, unless mandated by regulators.

Degeorge, Derrien, and Womack (2007) suggest that one reason that bookbuilding has become the dominant method of underwriting IPOs, in spite of its apparently higher costs, is that underwriters bundle other services with IPO underwriting. Specifically, they posit that many issuers care about analyst coverage that is bundled with underwriting, and the underwriters with the more influential analysts are able to receive greater total compensation because of their ability to collect soft dollars when they have discretion in the allocation of shares.

If IPO underpricing is determined largely by a need to compensate investors for adverse selection risk, one might expect that improvements in disclosure regulation would lead to less underpricing. Chambers and Dimson (2009), however, document that in the U.K. there has been an increase in underpricing over the 1917-2007 period, in spite of an evolution of the IPO market from a weakly regulated series of local markets to a national market with greater regulation.

7. WHY HAS IPO VOLUME BEEN SO LOW SINCE THE TECH BUBBLE BURST?

Numerous articles have attempted to explain large fluctuations in volume and underpricing over a multi-month horizon, collectively known as hot and cold issue markets. Some articles have focused on information spillovers, the idea that issuing firms and/or investors learn information that assists in the pricing of similar companies when a firm goes public. Articles by Alti (2005) and Binay, Gatchev, and Pirinsky (2007) fit in this category. Other articles, such as that by Yung, Colak, and Wang (2008), have emphasized time-varying investment opportunities and adverse selection costs.

New issues volume fluctuates for many security types, such as high-yield bonds and mortgage-backed securities. Henderson, Jegadeesh, and Weisbach (2006) and Kim and Weisbach (2008) have documented large volume fluctuations in other securities offerings, a pattern that occurs in every country. Focusing on U.S. IPOs, Lowry (2003) concludes that changes in the demand for capital by corporations and changes in investor sentiment explain much of the fluctuation in volume. Bhattacharya, Galpin, Ray, and Yu (2009), however, find little evidence that media hype caused the bubble in internet-related stock valuations and the associated severe underpricing of IPOs during 1999-2000.

A number of articles have addressed the microfoundations of the choice of being private or public, with some papers also discussing the choice of going public versus selling out to another company. The choice of remaining private or going public has been modeled as a tradeoff between a higher cost of capital from undiversified private financiers and either duplicative costs of evaluating the firm incurred by each public market investor (Chemmanur and Fulghieri, 1999) or control problems (Boot, Gopalan, and Thakor, 2006).

Traditionally, venture capitalists have exited successful investments by either selling a portfolio company to another company in the same industry (a “trade sale” to a “strategic buyer”) or by taking the firm public. Since the tech stock bubble burst, a larger fraction of private U.S. companies have been selling out to a strategic buyer rather than going public. Brau, Francis, and Kohers (2003) document that the valuation received is, on average, 22% higher for companies going public than for those being acquired. Bayar and Chemmanur (2011), Poulsen and Stegemoller (2008), and Aslan and Kumar (2010, 2011) analyze this choice, with Bayar and Chemmanur emphasizing that an independent firm must fend for itself in the product market.

The loss of private benefits of control when a company goes public (Benninga, Helmantel, and Sarig (2005)) or sells out (Aslan and Kumar (2010) and Bayar and Chemmanur (2011)) is emphasized in several articles. Benninga et al (2005) assume that the entrepreneur is risk-averse, and benefits from the diversification associated with partially cashing out, whereas Aslan and Kumar assume that the entrepreneur is risk-neutral and that public market investors must be compensated for valuation risk. Either way, issuers face a tradeoff that determines the optimal equity financing and ownership structure.

In recent years, two markets for the shares in private companies have come into existence in the U.S. SecondMarket and SharesPost match buyers and sellers, including venture capitalists and employees on the sell side, and investors (individual and institutional) on the buy side of the market.⁸ As with most illiquid markets where there is private information, buyers have had to

⁸ In 2007, Goldman Sachs set up a private marketplace for unregistered shares (Rule 144a securities), Goldman Sachs Tradable Unregistered Equity trading platform, or GSTrUE. After quickly attracting two large private companies that each issued close to \$1 billion in shares, the venue failed to attract additional issuers and liquidity dried up. GSTrUE appears to have been supplanted by the Portal Alliance, a marketplace formed in 2009 by

worry about adverse selection. For some stocks, however, notably Facebook, there have been many transactions, and the ability of pre-IPO investors and employees to cash out some or all of their stake has reduced the benefits of going public.

Many commentators have noted that annual U.S. IPO volume has been lower in every year during 2001-2010 than in any year during 1991-2000. This prolonged drought has been attributed to, among other things, the costs of complying with the Sarbanes-Oxley Act of 2002 and a decline in analyst coverage of smaller firms associated with lower bid-ask spreads, Regulation FD in 2000, and the Global Settlement in 2003 (e.g., Bradley and Litan, 2010). Consistent with these explanations, the dropoff in activity has been concentrated primarily among younger companies. On my website, I report that the median age of companies going public in the U.S. has increased from seven years during 1980-2000 to ten years during 2001-2010.

Gao, Ritter, and Zhu (2011) suggest that one reason for a decrease in the number of IPOs and an increase in trade sales is that there may have been a structural shift in the relative profitability of small stand-alone companies compared to larger organizations. We emphasize the decline in the profitability of small companies and the low returns earned by public market investors on companies that have gone public at a stage of their life cycle with less than \$50 million in annual sales. Furthermore, we suggest that a fundamental cause of the low volume is that the relative operating profitability of small independent companies has declined relative to the profitability of large organizations that can realize economies of scope and rapidly bring new technologies to the market.

8. LONG-RUN RETURNS

IPOs have low long-run returns. Partly, this is because there are more IPOs following periods of high market returns than before these periods. But do IPOs have negative long-run *abnormal* returns? In other words, holding constant the characteristics that are associated with low returns in general (small growth stocks, high levels of investment), is there any incremental value in knowing that a stock had recently completed an IPO?

8.1 The Measurement of Long-run Abnormal Returns

There are two common procedures for measuring long-run abnormal returns. The first procedure is to conduct an event study, in which each observation (each IPO) is weighted equally, and to calculate the buy-and-hold return on each sample firm relative to the buy-and-

NASDAQ OMX, Goldman Sachs, and other Wall Street firms. As of early 2011, the Portal Alliance has failed to attract issuers.

hold return on a characteristic-matched matching firm (or portfolio), and then take the average difference. For 7,314 U.S. IPOs from 1980- 2008, the average 3-year buy-and-hold return from the first closing market price is 20.8%. In comparison, the average buy-and-hold return over the identical holding period on stocks that had been publicly traded for at least five years, with approximately the same market capitalization and book-to-market ratio, was 27.9%. This difference in returns results in an average three-year buy-and-hold abnormal return of -7.1%, or approximately -20 basis points per month if the average holding period is 34 months.⁹

The second common procedure is to run a multi-factor time-series regression, in which the dependent variable is the calendar month excess return (that is, the portfolio return net of the risk-free rate of interest) on a portfolio of IPOs that went public during the prior 36 months. This rolling portfolio will have new stocks added each month (in month t , IPOs from month $t-1$ are added) and other stocks deleted, either because they were delisted or because they had gone public in month $t-37$.

Using a Fama-French (1993) time-series regression with 345 monthly returns from January 1973 to September 2001, Ritter and Welch (2002, Table V, row 3 of Panel A) report an average abnormal return of -21 basis point per month ($t=-1.23$). In general, the abnormal return measured using a time-series regression should not equal the average abnormal return from an event study for several reasons, as explained in Loughran and Ritter (2000).

First, the time-series regression weights each month equally, whether the portfolio has 60 or 1,500 IPOs in it. If there is a positive covariance between abnormal returns in a calendar month and subsequent volume, the time-series portfolio will have more IPOs in it when there are negative abnormal returns than when there are positive abnormal returns.

Second, the time-series portfolio abnormal returns will differ from the buy-and-hold abnormal returns because the characteristic-matched benchmark firms exclude recent IPOs in most studies, whereas the factor portfolios in a multi-factor regression normally contain recent IPOs, unless the factors have been explicitly constructed to exclude them. Alternatively stated, the buy-and-hold abnormal returns are comparing IPOs with nonIPOs, whereas the multifactor regression is comparing IPOs with portfolios that are partly composed of IPOs. This “factor contamination” will bias the abnormal returns in a multifactor regression towards zero.

In addition to the large literature that has focused on long-run abnormal returns, several papers have examined whether IPO volume or related measures can predict the return on the

⁹ The IPO return is measured from the first CRSP-listed closing price until the earlier of the three-year anniversary, the delisting date, or December 31, 2009. If the matching firm is delisted before the IPO, or if it conducts a follow-on offering for cash, a replacement matching firm is spliced in on a point-forward basis. In other studies, early delistings are handled by splicing in the market index return on a point-forward basis to calculate a full three-year buy-and-hold return.

aggregate stock market. Loughran, Ritter, and Rydqvist (1994) made an early attempt, using data from multiple countries, but we overstated the statistical power of our tests because we failed to account for the small sample bias in the slope coefficient when an autocorrelated stochastic regressor is used, as discussed by Stambaugh (1999). Baker and Wurgler (2000) account for the bias, and find that the fraction of external financing using equity reliably predicts the one- and two-year ahead market return in the U.S. since 1926. Guo (2011) reports that average first-day returns can be used to predict future aggregate stock returns in the U.S. during 1960-2006.

8.2 The Schultz (2003) Critique

If high abnormal returns induce other companies to also undertake an endogenous corporate event, such as an equity offer, subsequent volume will be higher *after* there are positive abnormal returns. Schultz (2003), in an innovative paper, uses this logic to posit that most long-run event studies will find negative abnormal returns when examining endogenous events. He argues that volume is likely to keep increasing as long as the abnormal returns are positive. Thus, *ex post* there will appear to be low volume *before* periods of positive abnormal returns and high volume *before* periods of negative abnormal returns. He presents simulations showing that if there is a positive covariance between current abnormal returns and the number of future events, the average long-run abnormal return in an event study is highly likely to be negative, even when there is no predictability of abnormal returns *ex ante*.

Two criticisms have been leveled at Schultz's conclusions. First, as his 2003 paper acknowledges, his analysis applies to event studies that weight each observation equally, but it does not apply to time-series regressions that are widely used in long-run performance studies. Second, as pointed out by Dahlquist and de Jong (2008) and others, the quantitative magnitude of the results in Schultz's simulations is very sensitive to whether the underlying volume process is non-stationary, as in his simulations, or not. In practice, in many countries, IPO volume does not appear to follow a non-stationary process. In other words, although volume fluctuates, there is strong mean reversion. Baker, Taliaferro, and Wurgler (2006) address whether Schultz's critique affects related studies, concluding that the bias is too small to account for the observed predictive power of several managerial decision variables.

Although Schultz's (2003) critique of long-run performance measurement does not appear to be relevant for IPOs, it is likely to be relevant for "fad" events such as roll-up IPOs or Special Purpose Acquisition Companies (SPACs). A roll-up IPO involves raising money to acquire small firms in a fragmented industry (Brown, Dittmar, and Servaes, 2005). SPACs are "blind pool" offerings in which equity investors provide cash with which the SPAC makes an acquisition within a specified period of time. Importantly, shareholder approval is required, and the money raised is put in an escrow account and returned to the investors, with interest, but net of some fees, if the money is not spent on an acquisition before the expiration date.

8.3 Alternative Multi-factor Models

Eckbo, Masulis, and Norli (2007) summarize several papers, including their own work, that use multi-factor models to estimate the abnormal returns on portfolios of stocks following securities offerings.¹⁰ Perhaps the strongest evidence in support of the hypothesis that IPOs have no abnormal performance occurs when an investment factor, constructed as a long-short portfolio that is long low-investment stocks and short high-investment stocks, is included.¹¹ Lyandres, Sun, and Zhang (2008) show that when an investment factor is added to the standard Fama-French (1993) three-factor model, the abnormal returns on IPOs become much less negative. Their four-factor model is given by

$$r_{pt} - r_{ft} = a + b(r_{mt} - r_{ft}) + sSMB_t + hHML_t + iINV + e_{pt}$$

Specifically, for U.S. IPOs from 1970-2005, the monthly abnormal return changes from -43 basis points per month ($t=-2.18$) for the three-factor model to -5 bp/month ($t=-0.21$) for the four-factor model when the excess returns on an equally weighted portfolio of IPOs is the dependent variable. The investment factor also reduces the negative abnormal performance on portfolios of SEOs, convertible bond issuers, and debt issuers. The empirical evidence in Brau, Couch, and Sutton (2011), however, suggests that “factor contamination,” as discussed in subsection 8.1 above, may bias the Lyandres, Sun, and Zhang abnormal performance estimate towards zero.

In spite of this evidence, other authors have found that firms issuing equity, whether for cash or for acquisitions, tend to underperform. McLean, Pontiff, and Watanabe (2009) use data from 41 countries and report that equity issuers reliably underperform.

8.4 Stationarity

In an efficient market, once investors become aware of systematic mispricing, they should adjust so that the mispricing is not present on a point-forward basis. Since it has been twenty years since I first documented the underperformance of IPOs in Ritter (1991), I would be surprised if there continued to be an independent effect on abnormal returns associated with being a recent IPO, at least for those IPOs that have substantial institutional ownership. Schwert

¹⁰ Brav, Michaely, Roberts, and Zarutskie (2009) examine the pricing of loans to companies before and after their IPOs, and conclude that the terms of the loans are similar to other companies that have similar characteristics.

¹¹ The investment portfolio is formed by ranking stocks each year on the basis of size, book-to-market, and investment-to-assets with three independent sorts, creating $3 \times 3 \times 3 = 27$ portfolios. The investment factor is then formed as an equally weighted average of the nine portfolios with low investment minus an equally weighted average of the nine portfolios with high investment. The return on this long-short portfolio forms the investment factor return each month.

(2003) suggests that many anomalous abnormal return patterns have disappeared after the publication of their existence.

An alternative to out-of-sample tests that use later periods than the original findings is to use an earlier sample period. Gompers and Lerner (2003) do this by examining the long-run performance of 3,661 U.S. IPOs from 1935-1972, a period when most IPOs started trading on the over-the-counter market. In nine of the years from 1935-1949, they are able to identify less than one IPO per month. Consistent with the evidence from later time periods, they report low average returns in the three years after issuing, although they are unable to reject the hypothesis of zero abnormal returns.

Buy-and-hold returns are right-skewed, with the skewness increasing as the horizon gets longer. One possible reason that researchers find low average returns on IPOs might be that there are just a few less extreme winners than could have occurred. Ang, Gu, and Hochberg (2007) examine this idea, and conclude that a paucity of big winners in a finite sample is unlikely to explain the low average returns that have been documented.

8.5 Are There Some Groups of IPOs that Underperform or Outperform in the Long-run?

In some countries, the IPO market is dominated by retail investors, sometimes due to government regulations. In the United States, all but the smallest IPOs are purchased primarily by institutional investors. Although it is not true in most countries, in the U.S. a reliable easy screen to identify IPOs targeted at retail investors is to observe the offer price. Almost all IPOs with an institutional interest have a midpoint of the file price range of \$8 or higher, and this screen has been used in many studies. Almost all studies during the last fifteen years have excluded IPOs with an offer price of less than \$5, with those stocks having a price below \$5 termed “penny” stocks. Bradley, Cooney, Dolvin, and Jordan (2006) report that penny stock IPOs from 1990-1998 had average first-day returns of 22.4% followed by average three-year buy-and-hold raw returns of -21.7%, whereas IPOs with a higher offer price had average first-day returns of 15.4% and subsequent average three-year buy-and-hold returns of 44.4%. In my early work on the long-run performance of IPOs (Ritter (1991) and Loughran and Ritter (1995)), I did not screen out all penny stock IPOs, which made the equally weighted abnormal return lower than it would have been if I had screened out the penny stocks.

In Table 2, I report the equally weighted average three-year buy-and-hold return on U.S. IPOs from 1980-2008, with returns measured through the end of 2009, after deleting all IPOs with an offer price of less than \$5.00. Inspection of the table shows that for IPOs with at least \$50 million of pre-IPO annual sales, there is no economically significant abnormal performance using either a value-weighted market index benchmark or controlling for size and book-to-market.

Table 2**Average 3-year Buy-and-hold Returns on U.S. IPOs Categorized by the Pre-Issue Sales**

Sales	Number of IPOs	Average First-day Return	Average 3-year Buy-and-hold Return		
			IPOs	Market-adjusted	Style-adjusted
0-49.999 mm	3,893	23.6%	5.0%	-35.2%	-16.6%
50 mm and up	3,421	12.0%	38.8%	-2.4%	3.7%
1980-2008	7,314	18.1%	20.8%	-19.8%	-7.1%

Sales are measured as annual sales in the last twelve months before going public, as reported in the final prospectus, and are expressed in terms of 2005 purchasing power in millions (mm) of dollars. IPOs with an offer price below \$5 (not adjusted for inflation), unit offers, ADRs, closed-end funds, REITs, limited partnerships, SPACs, and stocks not listed on CRSP (CRSP includes firms listed on the NYSE, Amex, and NASDAQ) are excluded. 100 companies with missing pre-IPO sales or post-issue book value of equity are also excluded. Buy-and-hold returns are measured from the first CRSP-reported closing price until the earlier of the third-year anniversary, a delisting date, or Dec. 31, 2009. For the market-adjusted returns, the CRSP value-weighted index return is used. For style-adjusted returns, IPOs are matched with a CRSP-listed stock that has been listed for at least five years with no follow-on equity offerings during the prior five years, with the nearest market-to-book value of equity for an eligible stock in the same decile of market value of equity.

Chan, Cooney, Kim, and Singh (2008) examine the cross-sectional distribution of long-run performance using the intercepts from Fama-French three-factor model regressions. They report that for 3,626 U.S. IPOs from 1980-2000 for which they have accounting information from Compustat, the IPOs that had the most negative abnormal returns are those with high discretionary accruals, less prestigious underwriters, and without venture capital (VC) backing. On my website, I report that for IPOs from 2001-2008, the pattern for VC-backing has reversed: VC-backed IPOs have underperformed in the three years after issuing relative to nonVC-backed IPOs this past decade, by 19.5% using market-adjusted returns, or 10% using style-adjusted returns.

The effect of a venture capital firm's reputation on the long-run performance of the IPOs of its portfolio companies is examined by Krishnan, Ivanov, Masulis, and Singh (2011). They find that the market appears to fail to fully account for a VC firm's history, since IPOs backed by higher reputation VC firms have better long-run stock price performance than other VC-backed IPOs. VC firms typically take minority positions in young growth firms. By contrast, buyout firms typically take ownership positions of close to 100% in portfolio companies that they invest in. Both VC and buyout firms, however, invest with the plan to exit at some point. Cao and Lerner (2009) report that U.S. buyout-backed IPOs (sometimes referred to as "reverse LBOs") have slightly outperformed the market and other benchmarks. Choi, Lee, and Megginson (2010)

examine another group of mature firms going public. Using a sample of 241 IPOs of state-owned enterprises from 42 countries during 1981-2003, they report that investors do well, consistently outperforming their domestic stock markets.

Although it is impossible to know at the time of the IPO which companies will subsequently make acquisitions or engage in further external financing, several papers have documented that the subsequent performance of these firms is poor. Brau, Couch, and Sutton (2011) document that firms that make an acquisition in the first year after going public subsequently underperform. Billett, Flannery, and Garfinkel (2011) document that firms that do multiple external financings post-IPO, whether in the form of syndicated bank loans, follow-on equity offerings, public debt issues, or private placements of equity, subsequently underperform. In general, it appears that firms that expand more rapidly than their internally generated cash permits wind up disappointing investors on average.

All of the above studies on the long-run performance of IPOs use U.S. data. Fan, Wong, and Zhang (2007) use Chinese IPOs and segment firms on the basis of whether the CEO is a current or former government bureaucrat. They report that firms with politically connected CEOs underperform the others by 18% in the three years after the IPO. Using UK data, Levis (2011) reports that buyout-backed IPOs have outperformed various benchmarks, but VC-backed IPOs have not.

8.6 Institutional versus Retail Investors

Regulators in many countries make a distinction between institutional and individual (“retail”) investors. For example, in Hong Kong there are explicit requirements regarding the number of shares allocated to individuals. The general philosophical underpinning is that individual investors are less well informed, less skilled at valuation, more prone to be subject to swings in investor sentiment unrelated to fundamental value, and more likely to be victimized by unscrupulous sellers of financial investment products. In the IPO context, Aussenegg, Pichler, and Stomper (2006), Cornelli, Goldreich, and Ljungqvist (2006), and Knüpfer and Kaustia (2008) all present European evidence consistent with the lack of sophistication of many retail investors. Chiang, Hirshleifer, Qian, and Sherman (2011) present evidence from Taiwan that individual investors overweight recent experience, but institutional investors do not.

Boehmer, Boehmer, and Fishe (2006), Field and Lowry (2010), Chemmanur, Hu, and Huang (2010), and others have attempted to examine whether institutional investors have better long-run performance on IPOs. In general, they conclude that the answer is yes, but much of the superior performance comes from screening on publicly available information. Chemmanur et al (2010) use data from institutions who report their transactions to Abel/Noser, a leading execution quality consultant. The authors report that most institutions are not buy-and-hold investors in the

shares that they are allocated, but when they hold on to a cold issue that they could have flipped, they are rewarded with preferential allocations on future IPOs.

9. SUMMARY

Due to space constraints, this survey has focused on a just a few selected topics and emphasized very recent contributions to the literature. In 2010, the Chinese IPO market was the most active in the world. Due to regulatory reforms, the extreme underpricing that characterized IPOs in China in the past has largely disappeared.

I have argued that the theories of short-run underpricing that dominate the literature are incomplete. Specifically, in addition to requiring a motivation for why underwriters want to excessively underprice and why issuers are willing to put up with excess underpricing, what has been missing is an explanation of how a market structure can persist in which competition between underwriters does not drive underpricing down to more modest levels. If, however, underwriters have oligopoly power due to a desire by issuers to hire underwriters with expertise in the issuer's industry, excessive underpricing can exist in equilibrium.

I have also argued that the popular (at least among academics) mechanism design explanation of conditional underpricing has little support, and that an alternative behavioral framework is completely consistent with the facts.

The low volume of IPOs this past decade in the United States suggests that there has been a structural break, and many commentators have argued that excessive regulation has deterred companies from going public. I have posited that a fundamental cause of the low volume is instead that the relative operating profitability of small independent companies has declined relative to the profitability of large organizations that can realize economies of scope and rapidly bring new technologies to the market. Others have argued that some of these same technological forces are the underlying causes of changes in the distribution of income and wealth throughout the world.

This essay has also examined the long-run performance of IPOs. I have expressed support for the view that there is little evidence that IPOs underperform in the long run relative to other companies with similar characteristics, except for subsets of small companies.

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