

**Underpricing of IPOs:  
Theory and the Role of Dutch Auctions  
In this Multi-Billion Dollar Market Anomaly**

By

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## **Abstract**

On average, initial public offerings are “underpriced” in the sense that the offering price at which the firm sells its issue is meaningfully lower than the price of the stock at the end of its first day of trading. These “initial returns,” the percentage change between the offering price and first day closing price, have averaged about 16% in recent years. This paper seeks to narrow the field of possible explanations for the persistence of IPO underpricing, primarily by using data on the seventeen auction IPOs underwritten by W.R. Hambrecht. By evaluating the “success” of these Dutch auction offerings, we are able to eliminate as possibilities many of the existing explanations for the persistence of underpricing in traditional IPOs and to conjecture as to the likelihood of auctions replacing bookbuilding as the standard offering mechanism, a prediction that a number of people made following Google’s attention-grabbing 2004 IPO.

## Table of Contents

I.	Introduction.....	4
II.	Background	
	a. Corporate Financing & The Decision to go Public.....	6
	b. The Traditional Bookbuilding Process.....	9
	c. Fixed Price Offers.....	11
	d. The Dutch Auction Process.....	11
	e. Direct Public Offerings.....	14
III.	Theoretical Explanations for Underpricing	
	a. Underpricing as a Consequence of the Bookbuilding Process.....	17
	b. Underpricing as an Intentional Choice on the Part of the Issuer.....	22
	c. Underpricing as a Consequence of an Investment Bank Cartel.....	26
IV.	Literature Review	
	a. Literature on Underpricing in Traditional Offerings.....	29
	b. Literature on Non-Traditional Offerings, Particularly the Dutch Auction.....	39
V.	Hypothesis Development.....	53
VI.	Explanation of Comparison Groups	
	a. Hambrecht's Auction IPOs vs. Hambrecht's Co-Managed Traditional IPOs.....	59
	b. Auction IPOs vs. All Peer IPOs.....	64
VII.	Data.....	66
VIII.	Empirical Analysis	
	a. The Dutch Auction's Effect on Underpricing.....	68
	b. The Dutch Auction's Effect on other Factors (Price Stability and Flipping) Related to IPO Proceeds Maximization.....	79
	c. The Dutch Auction's Effect on Factors (Stock Performance and Research Coverage) Related to Long-Term Value Maximization.....	81
IX.	Conclusions as to the True Reasons for Underpricing of Traditional IPOs...88	
X.	Conclusion.....	93
XI.	Bibliography.....	95
XII.	Appendices.....	98

## **I. Introduction**

Few financial market phenomena have received as much attention as the underpricing of initial public offerings (IPOs). An IPO is “underpriced” when the offering price at which the firm issues its stock is meaningfully lower than the stock’s price at the close of its first day of trading. The amount of underpricing is measured by a stock’s “initial return,” which is defined as the percent change between the offering price and the first day closing price.

There remains little consensus as to why this underpricing persists, whether it is “bad,” and how sustainable it is. The interest it has drawn is not unwarranted: for the 13,308 offerings conducted in the U.S. between 1960 and 1996, the average level of underpricing was 15.8%, meaning that issuers left billions of dollars on the table and IPO-inclined investors reaped a multiple of market returns.<sup>1</sup> Even the weakest form of the efficient market hypothesis seems to suggest that this underpricing should not exist. So why does it?

Economists have offered a variety of explanations. Unfortunately, though, they have failed to reach agreement as to the validity and relative significance of each of their theories. They also have yet to agree on the impact of an alternative offering mechanism—the Dutch auction—that is intended to overcome the underpricing observed in traditional IPOs. This paper seeks to tackle both issues of debate at once: it evaluates the “success” of the Dutch auction mechanism and uses this information to hone in on the

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<sup>1</sup> Ritter, Jay. “Initial Public Offerings.” p. 5-6.

true reasons for the underpricing of traditional offerings. Based on this analysis, we can hypothesize as to what the future holds for the IPO market.

The paper is divided into ten chapters. The second chapter, which follows this introduction, provides background information on the corporate financing process and the most common IPO offering mechanisms. The third summarizes all the various explanations that economists have proposed for the presence of underpricing in traditional IPOs. The fourth summarizes the relevant existing literature on IPO underpricing and non-traditional offerings. In the fifth, this paper's hypothesis is developed. In the sixth, we justify our choices of the two control groups we will use in testing our hypothesis. Chapter seven explains our data, and chapter eight presents our empirical results. Partly by using the results of the preceding chapter, chapter nine identifies what I think are the true reasons for IPO underpricing. In the tenth chapter, we conclude.

## **II. Background**

### **Corporate Financing and The Decision to go Public**

An initial public offering is the sale of a company's stock to the public for the first time. The primary impetus for an IPO is generally either to raise capital or to offer an exit strategy to some of the firm's existing owners, but a number of other motivations and considerations also influence a firm's decision to go public. This decision process illuminates a firm's goals in issuing an IPO, which are important in evaluating the potential reasons for the underpricing we observe.

Start-up companies rarely have the resources, history, or credibility to conduct an IPO. In fact, firms in the most incipient stage of development generally rely entirely on personal loans, savings, family, and friends for their initial financing. Even as a company begins to develop and show some sign of promise, it will rarely attempt a public offering; instead, it will look to angel investors or venture capital. Angel investors are wealthy individuals, often prior entrepreneurs, who will provide financing in exchange for equity in the company. Venture capital comes from firms rather than individuals, but the principle is the same: investors offer financing in return for a stake in the company. Both angel investors and venture capital firms frequently take an active role in the company, advising management on the host of issues it faces.

The initial investors are naturally hesitant to provide all the funding upfront, and different private equity investors target companies at different stages of growth. Thus, successful companies will typically undergo multiple rounds of financing and will develop a base of investors that intend to eventually liquidate their stakes. When

investors decide it is time to cash in on their investment, they have three choices: sell their equity to a larger or later-stage investment firm, sell the company to a larger company looking to make an acquisition, or sell their equity in an initial public offering of the company. Similarly, when an “IPO-ready” company requires additional financing, it has multiple options: pursue further equity financing from the private market, issue debt, or conduct an IPO. What prompts investors and the company to go with the IPO option?

In addition to providing an immediate capital influx and mechanism through which existing owners can cash in on their investment, there are other advantages to going public. Since the expectation is that a liquid aftermarket will develop following the offering, firms conducting an IPO can expect to be in a position to raise additional capital relatively easily and on favorable terms following the initial offering. The increased liquidity also makes it possible for public companies to offer stock-based incentives and compensation, which can help them attract and retain top employees and improve employee productivity. Trading on an exchange also makes mergers and acquisitions easier since stock can be issued as part of the deal. Due to increased visibility, companies going public may also experience an increase in prestige, which can improve their credibility with suppliers and customers, resulting in better credit terms and more pricing leverage. Even the increased scrutiny of public companies is not all bad since it usually allows the company to issue debt at lower rates.

However, an IPO does have drawbacks. For one, the costs of the offering itself are substantial. In addition to the legal, audit, and underwriting fees, there is a

tremendous opportunity cost associated with diverting senior management from its day-to-day role of running the company. The subject of this paper—the underpricing of IPOs—also carries, on average, an enormous immediate cost for the firm. Moreover, public companies face additional perpetual costs associated with complying with Securities and Exchange Commission (SEC) requirements regarding record keeping, disclosure statements, and publication of quarterly reports. These disclosure requirements also carry a loss of privacy; information the company would prefer to keep secret may be required to be disclosed. Furthermore, compared to debt financing, equity issuances are tax-disadvantaged since interest payments are tax deductible whereas dividends are not. The decision to go public also poses significant implications for the founding managers. Once the company goes public, they are subordinate to a board of directors, are more limited in their influence over the company, and risk being ousted in a hostile takeover. Due to shareholder pressure to achieve constant growth, going public can also have the effect of shifting management's focus toward projects with shorter time horizons, which can be detrimental to the long-term value of the company. While all but the hostile take-over concerns can also emerge when a firm gets angel or venture capital financing, they become particularly relevant in an IPO.

If, after weighing the costs and benefits associated with going public, the company decides to proceed with the IPO, it will be confronted with a whole new set of choices and decisions. The IPO process can be somewhat rigid, but not all offerings are conducted in exactly the same manner. This has become increasingly true in recent years as companies have ceased to limit themselves to the traditional bookbuilding offering

mechanism that is used in the vast majority of domestic IPOs. The bookbuilding mechanism and some alternatives that have been used in the U.S. and abroad are discussed below.

### **The Traditional Bookbuilding Process**

In the traditional IPO process, an investment bank is always hired to “underwrite” an IPO. The issuing firm will choose a “lead underwriter” (bookrunner) or “co-managers” to manage the IPO process from start to finish. In order to reduce their risk, the investment banks themselves almost always form a syndicate, each member of which will sell part of the issue.

Deals can be structured in a variety of ways. One major consideration is whether it is a "firm commitment" or “best efforts” agreement. In a firm commitment, the underwriter buys the entire offer and resells it to the public, thus guaranteeing the amount of money that will be raised; under a best efforts agreement the underwriter sells as much of the security to the public as it can sell at the offering price, but it does not guarantee the quantity. Underwriting contracts will also specify the underwriter fee (typically 7%) and the greenshoe option (allows the underwriter to increase the number of shares offered, typically by 15%).<sup>2</sup>

After the details of the deal have been worked out, the underwriter files a registration statement with the SEC. This document provides details on the offering, as well as company information, such as financial statements, management backgrounds, legal proceedings, and insider holdings. Next, the underwriter puts together a “red

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<sup>2</sup> Generally, underwriter fees are not used to cover specific expenses; printing, road show, legal and other specific costs are billed to the investment bank’s client separately.

herring” (a preliminary prospectus that contains information on the company and offering), and goes on a “road show” in which they present to potential investors and gauge demand. Most of these potential investors are institutional investors, such as mutual funds, pension funds, and hedge funds, and they give the underwriter feedback as to how much stock they intend to buy and at what price. This is called the “bookbuilding process” since the underwriter builds a book of potential orders.

After the SEC approves the registration and the road show is complete, the underwriter and issuing firm decide on an offering price range, which will depend upon the success of the road show, the current market conditions, and the company’s goals. After the offering range is decided upon, the underwriter will accept bids from interested investors. If the orders exceed the value of the issuance, the IPO is “oversubscribed.” When this is the case, the offering will price at the high end of (or even a little above) the offering range, the underwriter will have complete discretion over how to allocate the limited shares among the bidding investors, and the underwriter will exercise its greenshoe option. When an offering is undersubscribed, it will price at the low end of the range; or, if the offering is extremely undersubscribed, the issuer may decide to postpone the deal.

Most offerings are at least somewhat oversubscribed, so the investment banks normally have discretion over who will actually receive the allocation for which they bid. Since institutional investors are their best clients, investment banks heavily favor them over retail (individual) investors. Thus, there is a degree to which retail investors are “excluded” from IPOs. This is compounded by the fact that in many IPOs, only those

individual investors who have a brokerage account with one of the underwriters are even eligible to participate in the offering.

The defining features of the bookbuilding mechanism are: a price that is elastic to demand but ultimately set by the underwriter, and a discretionary share allocation mechanism that has historically led to the exclusion of most retail investors. This method is used in almost all domestic IPOs and is increasingly being used abroad. However, there are a number of other mechanisms that are at least theoretical options for an issuing firm to consider.

### **Fixed Price Offers**

In a fixed priced offer, the issuing firm (with the help of the underwriter) decides upon a selling price and offers a set number of shares at that price. The underwriter does not build a book of potential orders; instead, the price is based upon the underwriter's judgment of the market conditions and the intrinsic value of the company. In its offering materials, the issuer will give both a qualitative and quantitative justification for the chosen price. If the offering is oversubscribed, the shares are allocated on a pro rata basis. This type of offering is commonly used in Singapore, Finland, India and the U.K.<sup>3</sup>

### **The Dutch Auction Process**

Named after the 17<sup>th</sup> century tulip auctions in Holland, Dutch auctions are structured such that the auctioneer starts with an unrealistically high price and lowers the price until a bidder emerges. This is in contrast to the traditional English auction format,

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<sup>3</sup> Biasis and Faugeron-Crauzet (1999), p. 10.

Note: Some people have used the term "fixed price offer" to describe any uniform price offering (i.e. any offering in which there is no price discrimination). In this paper, we will use the term "fixed price offer" to describe the process discussed in the paragraph, and "uniform price offer" to describe a sale in which all buyers pay the same price.

in which the price ascends until only one bidder remains. When the auctioneer is selling several identical units of a good (as is the case with a firm issuing shares in an IPO), the price continues to fall until demand meets the entire supply. This is a uniform price auction since all successful bidders pay this same equilibrating price, no matter what point at which they entered the bidding.

This uniform price, market-clearing, Dutch auction format has been used for a while in Israel and Thailand, but the first IPO of this sort in the U.S. did not come until April of 1999, a year after the U.S. Treasury also adopted the Dutch auction format.<sup>4</sup> The 1999 Ravenswood Wineries auction offering was underwritten by the investment bank W.R. Hambrecht, which has used its patented “OpenIPO” process to take sixteen additional companies public in the years since then. Under the Hambrecht process, all potential investors (institutional *and* retail) submit bids for the stock online. The bids are then arranged in descending order of price, and the market-clearing price (the highest price at which there is sufficient demand to meet the supply) is determined. Even at the market-clearing price, demand will likely somewhat exceed supply since prices are discrete and each bid is for multiple shares.<sup>5</sup> If Hambrecht and the issuer decide to set the offering price below this market-clearing price, there will be even more excess demand. In either case, if demand exceeds supply the shares are allocated on a pro rata basis, meaning that all successful bidders will receive the same fraction of shares for which they bid. For example, if at the market-clearing price there is demand for 5.0 million shares

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<sup>4</sup> Biasis and Faugeron-Crauzet (1999), p. 10.

<sup>5</sup> To see this, consider the following hypothetical case. The issuer wants to sell 4.8 million shares. At a price of \$14.50, there is demand for 4.7 million shares. The next bids are at \$14.25, at which there are bids for an additional 300,000 shares. Then \$14.25 is the market-clearing price (the price at which demand is sufficient to meet supply), but the total demand of 5.0 million shares exceeds the supply of 4.8 million.

and the offering is for 4.8 million shares, all successful bidders will receive a number of shares equal to 96% of the amount they requested. (See Appendix C for W.R. Hambrecht's own explanation for its OpenIPO process)

Other than Hambrecht's seventeen auction IPOs, the Google IPO, underwritten by Morgan Stanley and Credit Suisse First Boston (CSFB), is the only other domestic IPO that has used a Dutch auction format. The Google founders, Sergey Brin and Larry Page, wanted an offering that had more transparency than traditional IPOs, that gave access to retail investors, and that priced at a sustainable level. While both Morgan Stanley and CSFB discouraged Google from diverging from the traditional bookbuilding process, Google's stature gave it the leverage it needed to make Wall Street go along. However, while Google did base its offering price on the outcome of a Dutch auction, the auction format was not as "pure" as it could have been since a number of actions were taken to reduce retail investor demand: Google required that investors complete a complicated double registration process in order to open an account to bid on shares, it prohibited orders from international retail accounts, it scheduled the offering during the market's quietest month, and it essentially prevented retail investors with brokerage accounts at places other than Morgan Stanley or CSFB from investing since only those firms were allowed to receive commissions for the sale of Google stock.<sup>6</sup> So, Google did use a Dutch auction pricing format, but it did not distance itself too far from the traditional offering process. As a result, this paper identifies Hambrecht's seventeen auction IPOs as the population of domestic Dutch Auction IPOs. Nevertheless, it is worth noting that

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<sup>6</sup> The stipulations requiring use of Morgan Stanley and CSFB accounts were insisted upon by Morgan Stanley and CSFB, not Google.

Google priced its offering at \$85 and the stock closed its first day of trading at \$100.34, reflecting a 17% initial return.

### **Direct Public Offerings**

Direct public offerings (DPOs) allow firms to bypass the traditional underwriting process and to sell directly to investors. In a DPO, a company offers shares directly to prospective investors, without using a broker or underwriter as an intermediary. Since DPOs are “exempt securities offerings,” the companies using them are exempt from many Securities and Exchange Commission registration and reporting requirements. The first DPO was done in 1976, but they did not become common until the rules were simplified in 1989 and again in 1992.

There are a number of different types of DPOs. The most common are “Small Corporate Offering Registrations” (SCOR’s). Private companies are permitted to conduct this form of exempt offering if they are raising no more than \$1 million in a twelve-month period. The stock may be traded and there are no restrictions on the number or types of investors who may participate.

A second type of DPO allows firms to sell up to \$5 million of stock during a twelve-month period, but does not allow for more than thirty-five of the investors to be non-accredited or for the stock to be freely traded. To be accredited, individual investors must have at least \$1 million in assets (excluding their home and car) or \$200,000 in net annual income. Likewise, institutions must have at least \$5 million in assets to be accredited. These accredited investors must also be “sophisticated,” which means that they are capable of understanding the merits and risks of the offering.

A third type of DPO allows firms to raise up to \$5 million over a twelve-month period, and does not restrict the stock from being freely traded. These are often referred to as “mini public offerings” since they follow many of the same procedures as IPOs. Rather than going through the federal SEC registration process, however, firms using this offering mechanism only need to file with the Small Business Office of the SEC.

Other forms of DPOs also exist. One type allows firms to raise unlimited funds, but requires that the stock be sold only in the state in which both the company and investors are residents. Two other types apply to firms with less than \$25 million in annual revenues. These small businesses may sell up to \$10 million in stock over a twelve-month period with only simple paperwork through a “Small Business Type 1” (SB-1) offering; they also have the option of selling an unlimited amount of stock through a “Small Business Type 2” (SB-2) filing, which requires more paperwork.

The internet has proved a useful tool in the DPO process and many companies now conduct their DPOs online. The first of these online offerings was conducted in 1996 by Spring Street Brewery, a start-up company that raised \$1.6 million by selling shares on its website. Since then there have been hundreds of online DPOs, almost all of which have been for small companies raising less than \$5 million in capital. A number of online DPO forums have emerged to facilitate the offering process. These forums are websites that manage DPOs on behalf of the firms using the forums.

This online process is superficially similar to Hambrecht’s OpenIPO system, but the two mechanisms target very different companies. SEC regulations make it possible to conduct a DPO with minimal legal and registration costs for companies raising less than

\$5 million, but the DPO process becomes more complicated and loses many of its advantages when financing is sought on a greater scale. Thus, DPOs are only economical for small offerings. Underwritten IPOs are just the opposite; even the smallest investment banks would hardly consider underwriting an offering that was only for \$5 million.<sup>7</sup> The quality of the companies issuing equity through a DPO is also different. Many companies that choose the DPO route would be unable to secure an underwriter and conduct a traditional offering. DPO users are also different in that the equity they issue is rarely traded on a major exchange (i.e. NYSE, NASDAQ, or AMEX) following the offering. In other words, DPOs and underwritten IPOs are not really alternative sources of financing even though they are superficially similar. DPOs are used by smaller, lower quality firms that don't have the option of conducting a normal offering; underwritten IPOs, on the other hand, are used by firms that want to sell equity on an entirely larger scale than is possible in a DPO.

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<sup>7</sup> DPOs are a form of IPO since they are a way of selling a security to the public for the first time. In this paragraph the term “underwritten IPO” is used to distinguish DPOs from the other forms of IPOs discussed in this section (i.e. bookbuilt, fixed price, and Dutch Auction IPOs).

### **III. Theoretical Explanations for Underpricing<sup>8</sup>**

A number of theories have been proposed as explanations for the underpricing of IPOs conducted through the bookbuilding process. These various hypotheses fall into three groups, which identify underpricing either as a necessary consequence of the bookbuilding process, an intentional choice on the part of the issuer, or a collusive outcome serving the interests of investment banks. While these theories are not mutually exclusive, a goal of this paper is to identify which are most important.

#### **Underpricing as a Consequence of the Bookbuilding Process**

##### Winner's Curse

The most widely discussed of these theories is known as the “Winner’s Curse.” In its general form, the Winner’s Curse theory hypothesizes that winners of auctions typically overpay for the items they win. In an auction, each bidder must estimate the value of the items being auctioned. Since these valuations are *estimates*, it is to be expected that some bidders will underestimate the value while others will overestimate it. Given that the winners are the bidders with the highest bids, they will be the ones who most overestimated. Thus, winning an auction is a “curse” since it is a sign of having overpaid for the item won.

In IPOs, investors place bids for the stock being offered. The Winner’s Curse can help explain IPO underpricing if some investors have better information than others (i.e. if some investors are more likely to estimate the stock’s value correctly than others). If this asymmetry of information exists, the better informed investors will be more likely to

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<sup>8</sup> A good summary of the theories presented in this chapter is included in Jay Ritter’s paper “Initial Public Offerings” (1998).

bid for shares in offerings that are underpriced, meaning that underpriced (good) offerings are more likely to be oversubscribed.<sup>9</sup> Likewise, the better informed investors are less likely to bid in offerings that are overpriced, so overpriced (bad) offerings are more likely to be undersubscribed.<sup>10</sup> Thus, if the less informed investors bid in the good and bad offerings with equal frequency, they will come out losers since they will receive all the stock for which they bid in the bad (overpriced and undersubscribed) offerings and only partial allocations in the good (underpriced and oversubscribed) offerings. In order for these investors to participate, there must be enough underpricing on average to compensate for the adverse selection problem.

This form of the Winner's Curse is completely logical, but only if we accept the assumption that some investors consistently have better information than others. If this were not the case, each investor would have the same expected return: the average return of all IPOs. This return could be significantly lower than the roughly 16% underpricing we have observed in recent years, and investors would still have an incentive to participate. Is the information asymmetry a fair assumption? Most IPO investors are institutional money managers, whose job it is to correctly value the stocks in which they invest. They all have the issuers' prospectuses, which include information on the issuers' history, performance, and financial condition. Moreover, they all have access to similar

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<sup>9</sup> In an oversubscribed offering, more shares are demanded than are supplied at the offering price. Thus, in oversubscribed offerings, most investors only get a fraction of the number of shares for which they bid. For example, if there is demand for 45 million shares at the offering price but the company is only selling 30 million shares, the average successful bidder will get only 2/3 of the shares for which he bid. This means that oversubscribed offerings are underpriced in the sense that market demand exceeds supply; thus, oversubscribed offerings generally experience large initial returns (i.e. they are good for investors).

<sup>10</sup> In undersubscribed offerings, successful bidders get all the shares for which they bid since there is no excess demand at the offering price.

investor resources, such as Bloomberg terminals, financial databases, and analyst research. However, some money managers *have* consistently outperformed (or underperformed) their peers. Thus, it seems that information asymmetries are small, but important. While most investors have access to similar resources, some are better at identifying and interpreting the most relevant data and they create informational asymmetries in this way. So, the Winner's Curse seems to be a rationally founded theory, whether or not it is the true explanation for the underpricing of bookbuilt offerings.

In Dutch auction IPOs, this particular form of the Winner's Curse is not an issue since the offerings are priced at the market equilibrating level; the offerings are not oversubscribed or undersubscribed, so the successful bidders always get full allocations.<sup>11</sup> However, it is possible that another form of the Winner's Curse arises in Dutch auctions. If we assume that these are common value auctions with asymmetric information, the winners are likely to have overvalued the offerings. Since all successful bidders pay the price of the lowest successful bid, the Winner's Curse in this situation is less concerning than in a single unit auction, but it still exists as long as there is enough demand from investors who overvalued the offering to sell the entire issue. Underpricing could result if investors shaved their bids to protect themselves from this version of the Winner's Curse.

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<sup>11</sup> Issuers do have the option of intentionally pricing below the market-clearing price, in which case offerings can be oversubscribed. However, this is an issuer choice that is independent of whether an offering is "good" or "bad," so it should not lead to a Winner's Curse problem.

### Market Feedback Hypothesis

A second potential explanation for IPO underpricing is the Market Feedback Hypothesis. According to this theory, investment banks underprice IPOs in order to induce investors to reveal information during the bookbuilding period. Underwriters price offerings on the basis of the level of investor interest they perceive while doing their bookbuilding during the IPO road show. Thus, they rely on potential investors to provide them with information with which they can gauge demand. In the absence of underpricing, it would not be in investors' interests to reveal favorable information that would result in upward revisions in the offering price range.<sup>12</sup> If underwriters always adjusted the offering price to fully reflect revealed information, investors would always present only unfavorable information so that the offering would be priced as low as possible. However, if IPOs for which favorable information is revealed by potential buyers are more underpriced than those in which the feedback is unfavorable, investors will indeed have an incentive to share information that could lead to partial upward price revisions. In other words, the Market Feedback Hypothesis suggests underwriters underprice offerings for which favorable information is revealed in order to get investors to reveal that favorable information, which still benefits the underwriter since a partial upward price revision is better than none.

The validity of this hypothesis relies on the premise that investors have relevant information that the underwriter and issuer do not have. Investors are the only ones who

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<sup>12</sup> "Favorable information" would include any feedback from the investor that would lead the underwriter to assign a higher value to the offering. For example, an investor would be revealing favorable information if he told the underwriter that he would be willing to buy the issue at a price above the current offering range.

know their own reservation prices precisely, and information about these reservation prices is important to the underwriter pricing the offering. However, it seems that underwriters could relatively easily guess the spectrum of reservation prices among the potential investors. Underwriters use all the same tools—discounted cash flows, comparative company analyses, and so on—as institutional investors. Moreover, the underwriter and issuer have more information on the stock than other investors! Thus, it seems that the road show is more about marketing an offering than soliciting information from potential investors. If this is true, the Market Feedback Hypothesis is unlikely to carry much validity.

#### Retail Investor Exclusion Theory

One of the most popular justifications for the high initial returns of IPOs is that the offering price and aftermarket price equilibrate different markets. For some IPOs, individual (retail) investors who do not have a brokerage account with one of the underwriters are unable to participate in the offering.<sup>13</sup> Even when this is not the case, retail investor demand is artificially suppressed since they are not included on the road show and they realize that they are unlikely to get an allocation in a desirable offering. Thus, the offering price reflects demand from institutional investors and a *limited* number of retail investors, whereas the aftermarket price reflects demand from institutional investors and *all* retail investors. Given the fixed supply (the float), the added demand in the aftermarket can be expected to result in large initial returns. The offering price is based on what institutional and a limited number of retail investors think the stock will be

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<sup>13</sup> For example, if an individual investor uses Morgan Stanley as his broker and Morgan Stanley is not an underwriter of the offering, he may not be able to buy the stock until it starts trading in the aftermarket.

worth in the aftermarket, realizing that the IPO process often results in high initial returns. There will always be “excluded” retail investors who valued the stock more highly, though, so the demand they add in the aftermarket can be expected to increase the price further. Including all retail investors in the bookbuilding process would overcome this problem but, according to this theory, it would be not be feasible since when an underwriter goes on an IPO road show it meets with institutional investors and gauges demand, and there are obviously far too many individual investors for the underwriter to meet with and include in the bookbuilding process.

While it would be impossible to include retail investors in the road show bookbuilding process in the same way that institutional investors are included, it seems that underwriters could nevertheless overcome the underpricing issue this causes. Making use of the internet, underwriters could post roadshow presentations online and allow any individual with a brokerage account to place bids through the underwriter’s website. Moreover, the fact that W.R. Hambrecht does not restrict retail investor access to its auction IPOs shows that the distribution challenges created by selling to smaller clients are not insurmountable. Thus, if underwriters were truly concerned about IPO underpricing and believed that the exclusion of retail investors was the cause, we would expect them to have already developed a way of including them.

### **Underpricing as an Intentional Choice on the Part of the Issuer**

#### Stock Price Momentum Hypothesis

It has been proposed that underpricing creates positive momentum that results in a higher aftermarket stock price, and that this causes issuers to intentionally underprice

their offerings. Companies issue only a portion of their equity in their initial offering and are likely to seek additional financing in the future. Moreover, managers typically hold onto much of their equity and are compensated partly based on the firm's stock price performance after the IPO. Thus, a higher stock price allows firms to raise more money in future offerings and makes managers richer. So, if initial underpricing creates positive momentum and a higher aftermarket price, leaving money on the table in the short run can be worthwhile in the long run. If this is the case, one would expect issuers to underprice their offerings intentionally.

Does this make sense? Theoretically, a stock's price should not depend on its past performance. A company is worth the discounted value of its future cash flows, so its stock price should not change unless there is an adjustment in investors' beliefs about either the discount rate or future cash flows. A stock's past returns should not have an impact on either of these estimates, so should not affect future performance. Thus, leaving money on the table in order to create momentum for a stock seems fool hardy, especially since a company that has left money on the table should be worth *less* than one that has not.<sup>14</sup> However, there are some reasons to believe that positive stock price momentum creates advantages for which it is worth paying. For one, the internet bubble showed that investors can exhibit "irrational exuberance"; as they see people around them getting rich on a stock that keeps rising, they jump on the bandwagon, driving the stock up even further. In addition, stocks that perform well draw attention, expanding their pool of potential investors and gaining additional research coverage. In the words of

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<sup>14</sup> If a company leaves money on the table it has less cash than it would had it priced properly. Thus, the equity value of the stock is comparatively smaller.

Aggarwal et al., “First-day underpricing initiates information momentum—it attracts attention to the stock, thereby shifting the demand curve for the stock outwards.” In light of these factors, the hypothesis that issuers intentionally underprice offerings to generate positive momentum for their stocks cannot be ruled out as potentially valid.

### Dispersion of Ownership Theory

Another proposed hypothesis is that issuers value dispersion of ownership, and are willing to underprice an offering so as to create excess demand for the stock. Having a large number of small shareholders will increase a stock’s liquidity and improve a company’s takeover defenses, both of which offer benefits for which a firm could be willing to leave money on the table. Since there should be more interested investors at a lower offering price, the issuer can use its allocation power to ensure the benefits of broader-based ownership if the offering is priced below the market-clearing level.<sup>15</sup>

This theory fails to recognize that, while there are clearly advantages to having broad-based ownership, underpricing is unlikely to be an ineffective way of achieving it. Pricing an offering below the market-clearing level will create dispersion of ownership at the time of the offering, but the temporarily avoided market equilibrium should be restored as soon as the stock begins trading in the aftermarket. The investors who had high reservation prices and received only partial allocations can be expected to buy the underpriced stock from the investors who valued the stock at the offering price, but not the market-clearing price. Put differently, the market should achieve the equilibrium

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<sup>15</sup> Since there is an extremely large pool of potential investors, lowering the offering price can be expected to increase the number of interested investors and not just the number of shares demanded by the existing investors.

concentration of ownership on its own, even if the issuer tries to avoid this by underpricing its offering.

### Choice of Investors Theory

An additional theory is that issuers prefer having as their shareholders investors with good reputations and who believe in the long-term value of the company. The idea is that respected, long-term investors offer stability, allow management to focus on creating real value, and attract other good investors. In underpriced offerings, demand exceeds supply so issuers/underwriters can have some discretion in choosing how to allocate the issue among the various investors. Thus, by intentionally underpricing an offering, issuers/underwriters can use the allocation process to maximize the amount of the offering that goes to these desirable investors.<sup>16</sup>

Is this logical? Management is ultimately accountable to shareholders, so it is reasonable to think that they care about who those shareholders actually are. Given that large investors, particularly when they work together, can influence a company's direction and force management to make certain choices, an issuer will naturally prefer to have long-term oriented investors who share management's vision for the firm. Moreover, having large and well-respected investors, such as Fidelity, helps establish the firm's credibility and attracts even more potential investors. As is discussed later, this seems to be an important reason for the underpricing of IPOs.

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<sup>16</sup> As explained in "The Traditional Bookbuilding Process" section, underwriters in oversubscribed traditional offerings do not have to allocate shares on a pro rata basis; the investment banks have complete discretion over the allocation process.

### Bandwagon Effects Theory

Another possibility is that bandwagon effects create a need for underpricing. If investors base their own valuation of a company partly on how others view it, demand will be extremely elastic to the interest level of the first few potential investors to whom the offering is marketed on the road show. Since an indication of a low intended offering price will help ensure that these “first” investors are excited about the company, it serves to ensure demand. In other words, issuers can reduce their risk of a flopped IPO by planning on some underpricing at the start.

A potential problem with this theory lies in the fact that issuers do not have to price their offerings in the range indicated to investors during the road show. An issuer could start with a low “filing range”<sup>17</sup> to attract investors during the road show, but then price the offering higher once demand is established. Investors would eventually notice this strategy, though, so it would lose its efficacy quickly. Thus, the bandwagon theory should not yet be excluded as a potential explanation for IPO underpricing.

### **Underpricing as a Consequence of an Investment Bank Cartel**

#### Investment Bank Power Theory

An “investment bank cartel” has also been pointed to as a reason for the underpricing we observe. The claim of this theory’s advocates is that investment banks intentionally underprice offerings so as to reduce their expected costs. They argue that, while underpricing does result in lower underwriting fees, it has more than offsetting benefits: it reduces the risk that an investment bank will fail to re-sell the stock it

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<sup>17</sup> When the underwriter and issuer go on the road show, they have a preliminary offering price range called the “filing range.” This gives investors an idea of where the offering will be priced, but adjustments to the filing range are made frequently.

purchases in a firm commitment agreement; by making IPOs more attractive, it allows them to put fewer resources toward marketing; it helps each investment bank's relationship with its institutional clients, who invest in IPOs but also generate significant trading revenues for the each investment bank; and it reduces the risk of facing future litigation from a disgruntled investor. If these benefits really do outweigh the loss in underwriting commissions, underwriters have an incentive to underprice offerings. How do they get away with this? According to this "cartel" theory, the answer is that the major investment banks are part of an oligopoly in which a collusive outcome is being maintained.

This hypothesis is particularly compelling for firm commitment offerings and offerings in which the underwriter is required to provide aftermarket price support since, in these cases, they bear significant costs if they inadvertently overprice the offering. It is also compelling for any underwriter that receives significant trading revenues from the same institutional investors it targets in marketing IPOs. Interviews with investment bankers (discussed later in the paper) indicate that this is an important reason for IPO underpricing.

#### Tacit Aftermarket Tie-ins Hypothesis

A related explanation for IPO underpricing is that investment banks use their allocation power to ensure demand in the aftermarket. It is beneficial to an investment bank's reputation with investors and potential issuers if the IPOs it underwrites sustain high aftermarket prices. In oversubscribed offerings, the underwriter has discretion over which bidders to allow in on the IPO, so if allocations are given with the expectation that

clients also purchase more shares in the aftermarket, the price will be driven up on the first day of trading. Formal agreements of this nature (called aftermarket tie-ins) are prohibited by the SEC; however, underwriters and their buy-side clients have an ongoing relationship, so an implicit understanding results in the same outcome, according to the proponents of this theory of underpricing.

Illegal aftermarket tie-ins definitely contributed to the high initial returns of many of the stocks during the 1999-2000 internet bubble, but are they likely to be a major issue today? I would say no. Outside of the bubble years when stocks were expected to keep accelerating upward, investors have little incentive to participate in such a scheme. The advantage of getting an allocation in a hot IPO is that you can quickly sell the stock for a premium, not so that you can buy more of it at an inflated price. Moreover, today no underwriter would dare encourage investors to join this type of scheme because SEC allegations of illegal tie-ins could ruin its reputation.

## **IV. Literature Review**

### **Empirical Literature on Underpricing in Traditional Offerings**

The most apparent conclusion to be drawn from the existing empirical literature on underpricing in traditional (bookbuilt) offerings is that underpricing is substantial, has existed for decades, and is not limited to the United States. Domestically, initial returns have averaged about 16% and have been positive for all but five years since 1960.<sup>18</sup> Studies in 32 other countries have also shown strong evidence of underpricing internationally; all 32 countries had positive average initial returns, and half had returns exceeding 20%. Within the U.S., the distribution of returns is highly skewed, with a median return closer to zero.<sup>19</sup> A number of papers have sought to explore specific aspects of this underpricing, and the most relevant ones are discussed below.

#### Underpricing in Hot Issuance Markets

Using a model in which the aftermarket share price reflects both investor sentiment and information about the company's intrinsic value, Francois Derrien (2005) analyzes IPO pricing in hot issuance markets.<sup>20</sup> He suggests that, due to the impact of investor sentiment, IPOs in hot issuance markets can be overpriced relative to their intrinsic value and still experience positive initial returns. He bases his analysis on a theoretical model and a sample of French offerings in which a fraction of the shares offered were reserved for individual investors.

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<sup>18</sup> "IPO Monitor" website and Jay Ritter's "Initial Public Offerings."

<sup>19</sup> Ibid.

<sup>20</sup> An IPO market is referred to as a "hot issuance market" when there is a large volume of IPOs and they experience high average returns.

Derrien starts with the assumption that the underwriter is committed to providing costly aftermarket price support if the stock falls in the months following the offering. He also assumes that the value of a stock is influenced by both the company's intrinsic value and "noise traders," who are bullish at the time of the IPO (since we are discussing hot issuance markets) but may become bearish during the time in which the underwriter is still obliged to provide price support. Derrien's "noise traders" represent investor sentiment. Given the model's assumptions, the underwriter faces a trade-off: a higher offering price will generate a larger underwriting fee, but it will also increase the risk of providing costly price support in the future. Thus, in Derrien's model, underwriters only partially incorporate the noise trader sentiment; they set an IPO price between the intrinsic value and the price noise traders are willing to pay. Since the offering is priced above the intrinsic value, it is "overpriced." However, since the bullish "noise investor" sentiment was only partially incorporated, the stock is "underpriced" relative to current demand and will experience positive initial returns. Thus, according to this model, stocks can be overpriced relative to their intrinsic value and still experience positive initial returns.

Derrien finds support for his theoretical model in a sample of sixty-two French IPOs conducted between 1999 and 2001. They were done under a modified bookbuilding process in which a fraction of the IPO shares were reserved for individual investors. Using the bids submitted by individual investors and data on the long-term performance of the stock after the IPO, Derrien finds that individual investor demand varies widely across IPOs and is strongly correlated with market conditions. In other words, individual

investors behave like the noise traders in his model. He also finds that high individual investor demand is positively correlated with initial returns and negatively correlated with long-term stock performance. Put differently, when individual investor demand is high (i.e. when the noise traders are bullish) IPO shares are overpriced relative to their intrinsic value (i.e. reflected by the long term stock price) but nevertheless experience large initial returns.

Derrien's findings support the theory that underpricing is at least partly a consequence of investment banks exercising their market power. In asserting that underwriters committed to providing aftermarket price support choose to only partially adjust prices in response to positive noise trader sentiment, Derrien is claiming that underwriters are underpricing offerings in order to reduce their risk of providing costly aftermarket price support. In other words, according to Derrien, in hot issuance markets IPOs are deliberately underpriced<sup>21</sup> by investment banks exercising their market power so as to reduce their own risk at the expense of the issuer.

### The Effect of SEC Allegations

The collapse of the IPO market in the 4<sup>th</sup> quarter of 2000 came at a time when allegations of profiteering from severe underpricing and illegal tie-ins in the IPO aftermarket were brought into the media spotlight.<sup>22</sup> Using data on companies conducting firm commitment IPOs during the five quarters from April 1, 2000 to June 30, 2001, Robert Hull et al. (2005) analyze these allegations' impact on underpricing.

Instead of using the conventional definition of underpricing as the percentage return

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<sup>21</sup> Underpriced relative to market demand, even though this is overpriced relative to the intrinsic value.

<sup>22</sup> These illegal tie-ins involved investment banks allocating shares in desirable, oversubscribed offerings to investors who promised to buy more shares in the aftermarket at a higher price.

between the offering price and the first day closing price, these authors give two different and distinct definitions for underpricing. The “ex ante” definition defines underpricing as the dollar amount difference between the offering price and the midpoint of the offering range.<sup>23</sup> The “ex post” definition identifies underpricing as the dollar amount difference between the offering price and the closing price one week after the offering date. The “better” of their two definitions depends on whether the “true” price is more accurately depicted by the underwriters’ pre-IPO analysis (the midpoint of the offering range) or by the market valuation given after the IPO is finally “complete.” In both definitions, the authors use absolute, rather than percentage, differences because they believe this more accurately reflects the amount of profiteering that can take place.<sup>24</sup>

Using these definitions, Hull, et al. compare IPO underpricing with seasoned equity offering (SEO) underpricing. Seasoned equity offerings are secondary offerings made by companies that are already public, but are seeking to raise capital through further offerings. Since SEOs did not have the aftermarket tie-in issues of IPOs, Hull et al. use SEO underpricing as a benchmark, and measure IPO underpricing relative to the amount of SEO underpricing observed during the same period. Doing so, they find significant *overpricing* during the isolated period following the allegations that underwriters and their preferred customers were involved in illegal tie-ins; underpricing persisted until the time of the allegations, there was significant overpricing for a roughly

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<sup>23</sup> As explained in “The Traditional Bookbuilding Process” section, the offering range is the price range at which investors can choose to participate in an IPO. Hull, et al. see the offering range as representing the underwriter’ pre-IPO valuation of the stock.

<sup>24</sup> While Hull, et al. use the absolute level of underpricing, I prefer the conventional percentage-based measure since it does not depend on the arbitrary choice of a stock price. Under the absolute underpricing measure, underpricing of \$1 is treated the same whether it is for a \$10 or \$20 stock.

six month period, and then underpricing returned to past levels. These results are qualitatively the same regardless of what underpricing measure (ex ante or ex post) is used, and they are also robust to the inclusion or exclusion of high-tech and internet IPOs, even though these IPOs had extreme levels of underpricing during this period. The implication of these results is that the allegations seemed to have temporarily dramatically affected the behavior of the parties engaged in the IPO process. It appears that during the period of the allegations, investment banks were so careful to avoid underpricing offerings that they ended up overpricing them.

These findings, like Derrien's, support the idea that investment banks are at least partly responsible for IPO underpricing. The very fact that the SEC was accusing them of causing underpricing through aftermarket tie-ins is telling. Moreover, their ability to eliminate underpricing during the period in which they were worried about the allegations further suggests that they exercise at least some power in controlling underpricing. If underpricing were strictly a consequence of the bookbuilding process or intentional on the part of the issuer, investment banks would not have been able to eliminate underpricing during the period that they did. We cannot conclude, however, that investment banks are the *only* factor contributing to underpricing, even though they completely eliminated it (in fact, reversed it) during that period; factors such as the winner's curse may be able to be overcome over a finite period while investors still believe that IPOs are significantly underpriced on average, but this does not mean that they do not force underpricing over the long term.

## The Role of Management Quality & Reputation on Underpricing

Thomas Chemmanur and Imants Paeglis (2005) examine the relationship between underpricing and the quality and reputation of the management of a firm going public. They argue that higher quality management teams are better able to overcome the asymmetries of information that underlie the Winner's Curse hypothesis. By more credibly conveying the intrinsic value of their firm to potential investors, higher "quality" managers reduce underpricing, and also secure more reputable underwriters and more institutional interest.

The authors use a sample of 1,446 IPOs conducted between 1993 and 1996. In order to isolate the role of management quality and eliminate the effects of the quality of the firm's other backers (venture capitalists and institutional investors), the sample includes only non-venture-backed firms and firms having no institutional investors prior to the IPO. From each of the IPO prospectuses' management sections, Chemmanur and Paeglis hand collect data on the age, tenure, former work experience, education level, and board memberships of the members of the management teams. They then measure "quality" of management along three dimensions:

1. "Management team resources," including the education and relevant work experience available to firm management. Measured by:
  - a. The size of the firm's top management team (the number of officers with the rank of vice president or higher), adjusted to reflect a potentially nonlinear correlation between management size and firm size.
  - b. The percentage of the team with MBA degrees, who served as VP or higher prior to joining the firm, and who had previously been partners in law and accounting firms.
2. Management team structure. Measured by:
  - a. The average tenure of the management team, adjusted to account for correlation with the age of the firm.

- b. Tenure heterogeneity, defined as the coefficient of variation of the team members' tenures.<sup>25</sup>
    - c. CEO dominance, defined as the ratio of the CEO's salary and bonus to the average salary and bonus of other management team members.<sup>26</sup>
  3. Management reputation outside of the business community. Measured by:
    - a. The number of non-profit boards on which the management team members sit.

Using these measurements for management quality and isolating them from the effects of other dimensions of firm quality by controlling for firm size, firm age, the number of non-executive outside directors, and the financial condition of the firm (proxies for non-management dimension of quality), the authors test the relationship between management quality and IPO characteristics.<sup>27</sup>

Grouping all the companies into five management quality quintiles and running univariate tests, they find that the team resources variables have a statistically significant positive impact on their ability to secure more reputable underwriters, to reduce the costs associated with going public (both underwriting fees and other costs), and to attract institutional interest. They find that the variables for team structure have a statistically significant impact on reducing underpricing, but not as much of an effect as the team resource variables on other IPO characteristics.

Estimating OLS regressions, they find that firms with higher quality management teams do experience less underpricing. Of the six management quality variables used in

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<sup>25</sup> The authors believe that it is beneficial for a management team to have people with different tenures in the firm in order to "allow for an inflow of new ideas and perspectives" (p. 9).

<sup>26</sup> The authors view CEO dominance as important, but they are unsure as to whether its impact on management quality is positive or negative. They feel that "a strong-willed and dominating chief executive officer can severely diminish possible contributions from subordinate team members," but that "a strong CEO might improve the cohesion of the management team, especially in the early stages of the team's formation, which can be particularly important for young firms" (p. 9).

<sup>27</sup> The financial condition of the firm is measured by free cash flow as a percentage of the book value of assets for the fiscal year preceding the IPO.

the regression, one (the percentage of the management team with prior top management experience) is negative and significant at a 5% significance level and two (the past experience and length of tenure variables) are negative and significant at a 10% significance level.<sup>28</sup> They also find that the control variable for firm age has a negative and highly significant coefficient, suggesting that older firms experience less underpricing in IPOs. However, the coefficients on all these variables are relatively small compared to the total amount of underpricing. For example, *doubling* the percentage of the management team with prior top management experience from 25% to 50% only reduces underpricing by 1.59 percentage points.

These findings indicate that management quality would ideally be controlled for in a regression predicting the affect of other variables on initial returns. However, it also indicates that the effect of management quality is minimal compared to the total amount of IPO underpricing. Thus, failing to control for management quality weakens the results of a regression, but not significantly so.

#### The Role of Syndicate Size on Underpricing

Using data on 1,678 IPOs conducted between January of 1997 and June of 2002, Shane Corwin and Paul Schultz (2005) explore the impact of syndicate size on IPO underpricing. IPO underwriters almost always form a “syndicate” in order to reduce their risk and capital requirements. Together, the syndicate members buy all the stock issued in the offering. Each member then resells the fraction of the issue it bought to investors who want to invest in the IPO. The size of the syndicate (i.e. the number of investment

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<sup>28</sup> The negative coefficients mean *less* underpricing.

banks participating in the IPO) varies between offerings. Corwin and Schultz show that there may be benefits to larger syndicates, although several factors may limit syndicate size.

The authors find that offer prices are more likely to be revised prior to the offering date in response to new information when the underwriting syndicate has more members, particularly more co-managers.<sup>29</sup> As a proxy for “new information,” they use the total return from the midpoint of the filing range to the closing price on the first day of trading.<sup>30</sup> Their rationale for using this proxy is that new positive (negative) information is responsible for the increase (decrease) from the expected offering price (i.e. the middle of the filing range) to the first day closing price. Their data show that for any given amount of new information so measured, larger syndicates are more likely to revise the offering price. The data also reveal that upward price revisions tend to result in reduced underpricing. Putting these two observations together, an implication is clear: since larger syndicates are more likely to revise the offering price and offering price revisions reduce underpricing, larger syndicate size reduces underpricing. The authors find, however, that this relationship between syndicate structure and underpricing operates purely through the frequency of price revisions. Controlling for these revisions, the relationship disappears.

The authors also discover that having more co-managers results in more analyst coverage and market-makers following the IPO. Using the number of research analysts as the dependent variable, they find that each additional co-manager results in 0.8

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<sup>29</sup> The authors are discussing price revisions prior to the offering date, not revisions that are made after the bids are received.

<sup>30</sup> The filing range is the price range that the investment bank filed with the SEC prior to the road show.

additional research analysts covering the stock after the IPO. A similar regression reveals that the number of non-managing syndicate members does not affect research coverage. However, using a probit model, the authors find an underwriter is more likely to be included in a syndicate if it has a top-ranked analyst in the issuer's industry.

Despite these benefits of larger syndicates, the authors conclude that syndicate size may be limited by the size of the offering, competition and relationships between underwriters, and the costs of adding co-managers. The best co-managers demand large share allocations in order to participate, so the size of the offer can necessitate a limit on the syndicate size. Since co-managers of the IPO have the best chance of being hired as the lead manager in follow-on offerings, a lead underwriter has a disincentive to add additional co-managers to the IPO syndicate. Also, ongoing relationships between underwriters diminish free-riding and moral hazard problems, so underwriters dislike large syndicates composed of underwriters with whom they rarely work.

Since W.R. Hambrecht is the sole lead manager in all of its Dutch auction offerings, Corwin's and Schultz's results indicate that, all else equal, offerings with more co-managers can be expected to have less underpricing. Thus, since W.R. Hambrecht is the sole managing underwriter in its Dutch auction offerings, these offerings can be expected to have more underpricing than otherwise identical offerings in which there are co-managers. This means that the effectiveness of the Dutch auction mechanism in overcoming IPO underpricing may be understated if Hambrecht's auction offerings are compared to traditional offerings for which there were multiple managing underwriters.

## **Literature on Non-Traditional Offerings, Particularly the Dutch Auction**

### The Unpopularity of Dutch Auction IPOs

Ravi Jagannathan, et al. (2006) document and try to explain a surprising fact: of the many countries that have tried Auction IPOs, almost all have abandoned the auction method. The authors note that “issuer reluctance to try a new experimental method” and “underwriter pressure towards methods that lead to higher fees” are the common explanations for this phenomenon, but that neither one fits the evidence.<sup>31</sup> They conclude that auctions suffer from large fluctuations in the number of participants and that free rider and winner’s curse problems hinder price discovery and discourage investors from participating in auctions. They suggest that, rather than switching to the auction method, the U.S. should continue using the bookbuilding method, but increase the transparency of the allocation process and create a separate retail tranche that would open IPOs up to *all* investors.

The authors point out that the auction offering method has been tried in more than twenty countries, but has been entirely abandoned in all except France, Israel, Taiwan and the U.S., where they are used only rarely. By pointing out that the auction method tends to be most popular when it is first introduced in any given country, they show that in many countries issuers become *less likely* to use auctions as they *gain familiarity* with the auction method. They also note that issuers in Japan were forced to use the auction method from 1989 to 1997, but that they abandoned the auction method after they were given the choice of instead using bookbuilding. Based on these observations they

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<sup>31</sup> Jagannathan et al., p. 1.

conclude that, internationally, the rarity of Dutch auctions cannot be attributed to issuers' fear of trying a new offering mechanism; however, they do concede that the "lack of familiarity" explanation could have some merit in countries like the U.S., where there was never more than very limited usage of auctions.

The authors also challenge the idea that investment banks pressure issuers to use bookbuilding rather than auctions because the underwriter fees are higher with bookbuilding. They note that it is illogical to assume that investment banks have sufficient power to charge artificially high fees for bookbuilding but not for auctions. Moreover, they point out that in most countries auctions were replaced by fixed price public offers, which were in turn replaced by bookbuilt offers; so, since fixed price public offers typically have fees at least as low as auctions, it seems unlikely that the abandonment of the auction method stemmed from the influence of underwriters trying to improve their fees.

Using data from Singapore, Jagannathan et al. find that average initial returns are lower for auctions, but that issuer choices do not seem to be driven by a desire to minimize underpricing. They assert that IPOs are an expensive way to raise capital and that a company generally has more goals in conducting an IPO than just maximizing its initial funds. Insiders cannot sell until the end of the lock-up period, only a portion of a company's equity is sold in its initial offering, and firms often conduct follow-on offerings, so issuers are also interested in generating a strong, sustainable long-term stock price. The authors say that this may require having a core of long-term institutional investors, a liquid aftermarket, and plenty of research coverage, all of which require that

the issuer generate lots of interest in their stock; one way to attract interest is by underpricing the offering.

Jagannathan et al. also identify a free rider problem in the auction format. Assuming that the information analysis required to properly value an issue is costly, investors in a uniform price auction have an incentive to bid high without doing any analysis; if they are one of the only free riders, they will have only a marginal upward impact on the offering price, but they will not have had to bear any research costs. As more free riders enter, though, the offering price will be driven artificially high by the free rider bids. Thus, there is a mixed strategy equilibrium in which each investor acts as a free rider in only a fraction of the IPOs in which it is a bidder. This free rider problem makes auctions less efficient and noisier, according to the authors.

The author's concerns about a free rider problem in auction IPOs do not seem particularly warranted given that the research costs associated with valuing a stock are so low compared to the size of investments. It is unlikely, for example, that any institutional investor would invest millions of dollars in an IPO without one of the firm's equity research analysts at least developing a valuation model and discussing it with the fund manager. However, the conclusions the authors draw on the basis of their Singapore data seem logical and are extremely relevant to this paper. In Singapore, average initial returns are lower for auctions, which offers some international support for the theory that auctions reduce IPO underpricing. Moreover, the authors' conclusions as to issuers' incentives are consistent with the theory that investors underprice their offerings intentionally.

### The Rarity of all types of Vickrey Auctions

Vickrey auctions are sealed bid, second price auctions. In these auctions, the highest bidder wins, but pays only the amount of the second highest bid. In 1961, Vickrey showed that, “in an independent private-values context with symmetric risk-neutral bidders, sealed second-price auctions have dominant truth-revealing strategies, that they are perfectly efficient economically, and that they produce the same expected revenue for bid takers as equilibrium strategies in oral progressive auctions, Dutch Auctions, or standard first-price sealed bid auctions.”

Michael Rothkopf, et al. (1990) try to explain why Vickrey auctions are so rare. They conclude that fear of cheating and disincentives for bidders to reveal truthful information are the primary explanations. They argue that, in practice, Vickrey auctions do not create the incentives for the truthful revelations of preferences Vickrey believed they would.

Rothkopf et al. point out that the seller can profit by inserting fake bids just below the highest bid. If bidders fear a possibility of such cheating, they no longer have an incentive to bid their true reservation price; instead, they will bid in a strategic manner similar to how they would in a sealed bid, first price auction. Moreover, the authors note that truth-revealing bidding strategies can hurt successful bidders in future negotiations. A truth-revealing bid (one equal to the bidder’s reservation price) may reveal valuable information to the parties with whom the bidder must negotiate later. If these other parties know the bidder’s bid (reservation price) and the final price the bidder paid, they can calculate the rent the bidder has already captured, and thus exactly how much it can

yield in future negotiations. The authors give the example of successful oil lease bidders who must negotiate with drilling contractors, rig owners, and so forth after winning a bid. It would be to the successful bidder's disadvantage if these third parties acquired information about the amount of their bids since it would increase the third parties' negotiating levers. Would keeping the winning bid secret remedy that disadvantage? The authors argue that it would not for two reasons: (1) secrecy discredits the honesty and fairness of the process and feeds those very fears of cheating that prevent bidders from using a truth-revealing strategy, and (2) secrecy is never complete and even a small breach of secrecy results in a deviation from the dominant truth-revealing strategy.

To justify their qualitative conclusions, Rothkopf et al. use a model in which third parties can capture some of the economic rent associated with the revealing of reservation prices. They assume that a truth-revealing strategy imposes on successful bidders a disadvantage in subsequent negotiations. Given this assumption, it is not surprising that the model reveals an optimal bidding strategy in which the bidders bid below their reservation prices. Consistent with this conclusion, the authors find that Vickrey auctions are most common in markets in which cheating is difficult and there is little cost to revealing one's reservation price.

The authors' conclusions suggest that the reason for the rarity of Dutch auction IPOs cannot be explained by general problems with Vickrey auctions. The fear of cheating is not an issue in auction IPOs since an underwriter would have to be foolish to cheat in an industry in which trust and reputation are so important. Moreover, underwriters do not even have a way to profitably cheat in Dutch auction IPOs. Since

there will already be bids at every possible price point, there is no way to insert fake bids so as to artificially raise the offering price and still sell the issue. In Dutch auction IPOs there are also almost no disincentives for truth-revealing bidding; no one investor's bids will meaningfully impact the final offering price and investors do not lose any negotiating power by revealing their true reservation price. Thus, the IPO market is one in which cheating is difficult and there is little cost to revealing one's reservation price, so we would not expect Vickrey auctions to have the normal disadvantages with which they may be plagued.

#### Fairness and Efficiency of Dutch Auction IPOs

Anand (2005) addresses the question of whether Dutch auctions are preferable to the traditional bookbuilding offering method. She concludes that the Dutch auction is not "more efficient" or "fairer" than traditional offerings. She further asserts that the means by which most retail shareholders invest in securities make reform of the current system unnecessary.

In support of her conclusion, Anand points to the popularity of the bookbuilding method internationally, to examples of underpricing in recent Dutch auction transactions, and to the fact that retail investors hold the majority of their investments in mutual funds. Looking at forty-seven countries, Anand notes that "in all countries in which the bookbuilding method has been introduced, pre-existing auction systems have decreased in popularity or disappeared altogether."<sup>32</sup> She also notes examples of underpricing even with Dutch Auctions. Moreover, the fact that retail investors hold the majority of their

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<sup>32</sup> Anand, p. 25.

investments in mutual funds means that they are indirectly participating in IPOs even under the bookbuilding process.

Anand's analysis is based on logical reasoning, but it uses little economic theory or empirical analysis. She blindly assumes that the decreasing use of auctions in countries in which bookbuilding has been introduced reflects the superiority of the bookbuilding method. Is it not possible, for example, that bookbuilding replaced auctions because investment banks realized that bookbuilding served their interests better? Moreover, she cites the fact that some Dutch auctions have experienced underpricing as evidence that Dutch auctions are not better than bookbuilding, but she fails to acknowledge that the mean underpricing of Dutch auctions is significantly below the mean of all IPOs. I seek to address similar questions to Anand, but to apply a more rigorous methodology and achieve more defensible conclusions.

#### The Google IPO's Impact on the Future of Online Auction IPOs

Christine Hurt (2005) analyzes the Google IPO and its implications for the future of online auction IPOs. She concludes that Google's use of the Dutch Auction will help other issuers in negotiating with underwriters for alternative offering mechanisms, but that it is not a harbinger of radical change.

Hurt finds that Google priced its offering below market demand and "scared off both institutional investors and retail investors with its confusing auction process and regulatory missteps."<sup>33</sup> She argues that the Google IPO was not a "true Dutch Auction." She says that in a true Dutch Auction "anyone would be able to bid, and the clearing

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<sup>33</sup> Hurt, p. 36.

price would determine the offering price,” but that that in Google’s IPO participation by retail investors was made difficult, the high offering price limited retail demand (to buy a round lot of 100 shares would cost over \$10,000 at the original filing price), the IPO was conducted during the market’s slowest month, and the offering price was set below the market clearing price determined by the auction.<sup>34</sup> Moreover, she asserts that the Google IPO was not a loud success. Some underwriters (e.g. Merrill Lynch) dropped from the deal, the roadshow got negative reviews, an interview with Google’s founders created problems since it was published during the quiet period<sup>35</sup>, and the revelation that Google was being investigated by the SEC for large numbers of unregistered shares it granted to service providers in the preceding years raised concerns over regulatory issues. Moreover, the offering priced at the low end of the already lowered offering range, and the allocation process was opaque. Furthermore, Google’s tremendous aftermarket price run up has cast some doubt on the merits of the auction pricing mechanism. Citing these factors as evidence, Hurt characterizes the Google IPO as being far from a resounding success and does not believe that it will inspire many followers to use the auction model. However, she acknowledges that Google did bring public attention to the auction method and established it as an “acceptable” means of conducting an IPO.

Hurt’s predictions have thus far proved accurate since the Google IPO has made “Dutch auction” a familiar term but has not inspired a slew of copy-cat auction offerings. Her analysis suggests that lack of familiarity with Dutch auctions is a less valid

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<sup>34</sup> Hurt, p. 13. Like most economists discussing auction IPOs, Hurt views the term Dutch Auction IPO as involving more than just a pricing mechanism; she sees open access as an integral part of what it means to have a Dutch Auction offering.

<sup>35</sup> Issuers are not allowed to speak publicly about an offering during the quiet period.

explanation for the rarity of auction IPOs now than it was prior to the Google offering. However, the problems of the Google IPO prevent it from inspiring confidence in the auction process. Thus, Hurt's article suggests that the majority of issuers will need some other impetus if they are to switch from the traditional bookbuilt model to the Dutch auction one.

### Direct Public Offerings as a Means of Capital Finance

Anita Anand and Lewis Johnson (2005) analyze the willingness of firms to conduct securities offerings over the internet and without an underwriter, rather than through the traditional bookbuilding IPO process. They conclude that few firms are likely to use such "direct public offerings" (DPOs) as a means of capital finance, despite the apparent cost savings. Using both qualitative and quantitative data, they find that both the value of underwriters' services and unfamiliarity with the DPO process make traditional IPOs more attractive to both issuers and investors.

The authors use focus group and survey methodology to gather both qualitative and quantitative data. They hold two focus groups in Toronto in June 2003, and group the participants according to experience. One group includes buy-side constituents, such as institutional investors and regulators. A second group includes sell-side constituents, such as issuers and underwriters. They also conduct a survey targeted at a similar audience. Their response rate is only 5%, which leaves them with some concerns about response bias; however, they note that this response rate is "not out of line with other corporate survey studies," and they do not believe that it affects their conclusions.<sup>36</sup>

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<sup>36</sup> Anand and Johnson, p. 5.

Based on the survey and focus group data, Anand and Johnson conclude that underwriters' services, particularly with respect to marketing and distribution, reduce issuers' transaction costs by more than the aggregate costs of retaining an underwriter. A consensus that "securities are sold not bought" existed among the focus group participants, and was a primary reason for why those in the sell-side group (i.e. the issuers) felt underwriters are necessary. Issuers felt they would have trouble securing a comparable level of interest and demand without an underwriter's sales force marketing an offering. The focus group conversations also reveal that investors are hesitant to invest in DPOs due to the lack of due diligence and external verification and the lack of a liquid secondary market.

Underwriters price offerings, bring investors, provide a sales force, and establish the issuers' credibility. By eliminating underwriters from the offering process, firms conducting DPOs lose these services. Since the marketing, distribution, and verification services, in particular, are valuable and costly to self-provide, the authors conclude that we are unlikely to see many mainstream firms choosing to raise capital through DPOs rather than traditional IPOs. They also note that unfamiliarity with the DPO process will only serve to further discourage firms from using it.

This article suggests that Hambrecht's Dutch auction IPO process combines the benefits of traditional IPOs with those of DPOs. Hambrecht provides the underwriter services that the focus groups so highly valued, but it also provides some of the cost

savings of DPOs.<sup>37</sup> Thus, the article suggests that the authors would expect auction IPOs to be very popular, even though this is not the case.

### The Relative Efficiency of Various IPO Mechanisms

Bruno Biasis and Anne Marie Faugeron-Crouzetm (1999) analyze and compare four IPO mechanisms that are used in different parts of the world:

1. Bookbuilding (U.S. and U.K.): The IPO price and share allocation are set by an investment bank, which elicits indications of interest from institutional investors
2. An auction-like mechanism called the Mise en Vente (France): Investors make price and quantity bids, just as in a sealed-bid auction, and the SBF (the market authority in France) uses these bids to create a cumulative demand curve.<sup>38</sup> The issuer and underwriter then negotiate with the SBF on the offer price and a “maximum price.” To encourage investors to reveal their true valuations, all bids above the “maximum price” are discarded and the shares are allocated on a pro rata basis to all the investors who placed bids between the offering price (which everybody pays) and the maximum price.<sup>39</sup>
3. Fixed price offerings (Singapore, Finland, the U.K.): Investors submit bids at the fixed price, and rationing rules are used to allocate the shares.
4. Uniform price auctions (Israel) and W.R. Hambrecht’s OpenIPO online auctions: Price is set to equate supply and demand in this standard uniform price, market clearing, Dutch auction.

Biasis and Faugeron-Crouzetm conclude that fixed price offers are the least efficient, that Dutch auctions can lead to inefficiencies, and that the traditional bookbuilding method and the Mise en Vente are the most efficient.

The authors create a unified theoretical model to reach their conclusions. It is based on the assumption that sellers want to maximize the IPO proceeds and that

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<sup>37</sup> Hambrecht charges a 4% underwriter fee, which is lower than the 7% charged in traditional offerings but more than the cost of DPO.

<sup>38</sup> Derrien and Womack (2001).

<sup>39</sup> For some IPOs, there are investors who know that they want to participate in the offering, no matter how it prices. The “maximum price” is intended to discourage these investors from placing artificially high bids in order to guarantee that they get an allocation. The SBF (the French market authority) wants to establish an accurate price for each offering, so it uses the maximum price rule to create incentives for truth-revealing bidding.

financial intermediaries act in the interest of the sellers. It also assumes that the sellers face a number of large, strategic institutional investors who have private information about the valuation of the firm and who each have the capacity to absorb the entire issue; in addition, there are small, uninformed retail investors who cannot absorb the entire issue. The informed investors each send a message, either “good” or “bad,” and the aftermarket value of the shares is positively correlated with the number of “good” messages. The IPO mechanism maps these messages into price and allocation decisions, with the condition that all buyers pay the same price and all the shares are allocated.

Based upon their model, the authors find that some adjustment of prices to demand is necessary for efficient price discovery, but that tacit collusion can result from having prices adjust *too* strongly to demand. They find that winner’s curse problems lead to significant underpricing in fixed price offers since prices cannot adjust to demand. In the absence of collusion, their model (and intuition) suggest that the market clearing uniform price auction (and Hambrecht’s OpenIPO) should perform better since prices are set *after* demand is observed. However, they suggest that these auctions can be conducive to tacit collusion between bidders and result in meaningful underpricing. They assert that the strong reaction of prices to demand discourages buyers from deviating from a collusive bidding scheme since it reduces their ability to profit from doing so. By bidding a higher price in hopes of securing a larger allocation in a promising IPO, a buyer would increase demand and increase the price paid by all successful bidders, including himself. The bookbuilding and Mise en Vente methods allow for prices to adjust to reflect information held by investors, but the “underadjustment of prices to the

informational content of demand” makes these IPO mechanisms less conducive to collusion.<sup>40</sup>

The authors’ concerns about Hambrecht’s auction offerings being conducive to collusion seem unfounded. Their concerns rely on their belief that an investor’s decision to bid above the collusive price would increase the price paid by all investors, but this is unlikely to be the case. No one investor is likely to be buying enough of the issue to meaningfully affect the market-clearing price. Furthermore, there are far too many bidders for them to get together and choose a collusive price, and even if they did determine a collusive price they would all have an incentive to cheat on the colluders so that they could be sure of getting an allocation.

#### Unit Auction vs. Share Auction Format

Robert Wilson (1979) addresses the implications of the choice between a “unit” auction and “share” auction format. In a unit auction, a single indivisible item is sold to the highest bidder; in a share auction, shares of the item are sold to several bidders, and the price is set at the level at which demand matches supply. At the time Wilson was writing, the Department of the Interior was selling leases of tracts on the Outer Continental Shelf for oil and gas exploration and development, and there was a debate as to whether the leases should be sold individually or as a single “unitized” package. Wilson finds that a share auction can result in a significantly lower final sale price. In certain cases, sellers could lose up to half of the unit-auction sale price by adopting a share auction.

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<sup>40</sup> Biasis and Faugeron-Crouzet, p. 28.

Wilson reaches his conclusion using game theory based models. In the models, the loss in revenue from using a share auction can come from one of two reasons. When bidders have no proprietary information the loss in revenue stems from the fact that the seller obtains no advantages from increased competition as the number of bidders increases. When bidders do have proprietary information it is because bidders have multiple optimal strategies, which makes it possible for them to choose an optimal strategy that is disadvantageous to the seller. One key assumption of Wilson's model is that bidders are all alike in every characteristic and thus all bidders use the same optimal bidding strategy.

While he was analyzing a different situation, Wilson's conclusion clearly has implications regarding a firm's decision to go public and the degree of dispersion of ownership that is desirable. His findings, if accurate, imply that owners can get a higher value for their firm by selling it to a single buyer (a unit auction) than by going public (a share auction). The revenue loss from going from a closely held company (unit auction) to a public company (share auction) represents an additional cost of going public. Thus, it suggests that an IPO is not an efficient way of raising capital, so issuers may have important reasons for going public other than just raising capital. The nature of these other reasons can have meaningful implications for issuers' attitudes toward underpricing.

## **V. Hypothesis Development**

Despite the abundance of research on the underpricing of IPOs, some fundamental questions have yet to be answered sufficiently. This paper tackles three of these questions:

1. Does the Dutch Auction offering mechanism reduce IPO underpricing?
2. Are there advantages or disadvantages to Dutch auctions, other than their potential effect on underpricing?
3. Of the proposed explanations for the underpricing of traditional offerings, which carry the most weight?

### **Answering Question 1**

Excluding the unique Google IPO, there have been a total of seventeen Dutch Auction IPOs in the U.S., all since 1999 and utilizing the investment bank W.R. Hambrecht's patented OpenIPO offering mechanism. Google also had a "Dutch auction" offering and included Hambrecht as an underwriter, but, for reasons discussed earlier in this paper, it was not a "true" Dutch Auction and thus is appropriately excluded from the small pool of domestic Dutch Auction IPOs.

To test the null hypothesis that Dutch auctions reduce IPO underpricing, we compare the initial returns of Hambrecht's seventeen auction IPOs with the initial returns of comparable traditional IPOs. For the comparison to be useful, the "control groups" of traditional IPOs should be similar to the auction IPOs in all relevant respects other than the IPO method. Given this, there are two groups of traditional IPOs that serve as natural sources of comparison for the Dutch auctions. The first logical comparison is between the Dutch auction IPOs Hambrecht has underwritten and the traditional IPOs Hambrecht has underwritten. The second natural comparison is between each auction IPO and its

“peer offerings,” i.e. the traditional offerings conducted in the same industry during the same period as each auction IPO. The comparisons reveals that the auction IPOs have had less average underpricing than traditional IPOs but that there is only suggestive evidence that the offering mechanism is actually responsible for the difference; when other factors, such as industry and year, are accounted for, the regression results become inconclusive. The comparison procedure and results are discussed in the following chapter of this paper.

### **Answering Question 2**

Other than its potential effect on underpricing, are there other ways in which Dutch auctions are advantageous or disadvantageous to the issuer? A firm issuing stock in an IPO wants to maximize two things: (1) the amount of money it receives for the equity it sells in the IPO, and (2) the market value of the equity it retains following the offering. Thus, from the perspective of the issuer, an IPO is a “success” if it leaves little money on the table and generates the highest possible aftermarket share value. This raises the question, how does an issuer decide whether the IPO mechanism it has chosen (bookbuilding or Dutch auction) has maximized the amount of money it could have received for its equity and ensured that its aftermarket share value is as high as possible?

Large initial returns, first day stock price instability, and large amounts of first day “flipping” of the stock are signals that an IPO may have been mispriced and that the issuer did not maximize its proceeds from the offering. Initial returns, defined as the percentage change between the stock’s offering price and first day closing price, represent the difference between the price at which the issuer sold its equity and the price

at which the market values that equity. Thus, if an offering is characterized by large initial returns, the issuer sold its equity as a discount and thus left money on the table. Similarly, if there is a large amount of stock price instability on the first day of trading, it is a sign that the market value of the firm is difficult to assess and that the issuer may not have received the highest valuation possible. Likewise, a large amount of first-day flipping of a stock indicates that investors in the IPO saw the offering as priced below its market value and invested solely with the intention of trying to turn an immediate profit.

A stock's aftermarket performance and the amount and content of research coverage the company is given are indications of an IPO's success in maximizing the long-term market value of the issuer. Large aftermarket returns are clearly one indication that an issuer is maximizing its market value. However, a company could be experiencing strong stock returns but still be undervalued if it deserves even larger returns than it is experiencing. Thus, other factors should also be considered. Since research analysts bring attention to stocks, they can serve to increase demand by expanding the number of potential investors. Thus, if an IPO results in a large number of research analysts covering a stock it is an indication that the offering was conducive to helping the issuer maximize its aftermarket stock value. Of course positive research coverage is better for a stock's value than negative coverage. Thus, if an offering results in positive analyst ratings (i.e. "buy" recommendations) it is another sign that the offering helped the firm in maximizing its aftermarket value.

By comparing how firms using Dutch auctions fare in all these respects—first day price stability, amount of flipping, aftermarket stock performance and the amount and

favorableness of research coverage—we can determine whether there may be factors other than underpricing that make auctions more or less attractive to an issuer than traditional offerings. We find suggestive, but inconclusive, evidence that auctions increase price stability, reduce flipping, and improve aftermarket stock price performance (all good). However, we also find suggestive evidence of auctions resulting in fewer research coverage analysts and relatively conclusive evidence of auctions being correlated with worse analyst recommendations (both bad).

### **Answering Question 3**

As explained in Chapter III, the existing theories for the underpricing of traditional IPOs fall into three general categories: underpricing as a consequence of the bookbuilding process, underpricing as an intentional choice on the part of the issuer, and underpricing as the result of an investment bank “cartel.” Chapter IX assesses each of these theories and draws conclusions as to the true reasons for the underpricing of traditional IPOs. Economic theory, the results of the comparison between auction and traditional IPOs, and interviews with investment bankers and stockbrokers suggest that underpricing can be intentional on the part of both issuers and investment banks. Why? Because of issuers’ desire to avoid generating bad stock price “momentum” and due to the importance of institutional investors to both the issuers and investment banks.

#### *Consequence of the Bookbuilding Process?:*

If IPO underpricing stemmed primarily from some factor unique and inherent to the bookbuilding process, no one underwriter of traditional IPOs would be able to overcome it consistently. On the other hand, if IPOs conducted through a different

method experienced less underpricing than traditional IPOs, it would suggest that the bookbuilding process is at least partially responsible for the high average initial returns of IPOs. Chapter IX addresses these two possibilities in order to determine whether the exclusion of retail investors, the Winner's Curse, a market feedback mechanism, or any other unique feature of the bookbuilding process is a primary reason for the IPO underpricing we observe.

*Intentional on the Part of the Issuer?:*

The question of whether underpricing is ever intentional on the part of the issuer can, in a basic sense, be easily answered by simply considering whether issuers in a Dutch Auction ever choose to set the offering price below the market-clearing price reached in the auction. While issuers are forced to *estimate* demand in traditional bookbuilt IPOs, issuers in Dutch Auctions *know* demand. In auction offerings, the issuer has an exact demand schedule (based on the bids it receives) and has the option of pricing the offering exactly at the revealed market-equilibrating price. Thus, if issuers in the Dutch Auction ever *choose* to set the offering price below the price resulting from the auction, it is an indication there are at least some circumstances in which issuers intentionally underprice their offerings. The reasons they might do this can be determined through basic economic theory and interviews with those close to the decision-makers.

*Result of Investment Bank Cartel?:*

Under the assumption that investment banks act in their own best interest, we would only expect them to intentionally underprice offerings if they could profit from

doing so. Can they? If so, are they using their market power to stifle competition from underwriters that do not underprice offerings and who threaten to steal clients that do not want to avoid leaving money on the table? The answers to these questions are revealing as to whether underpricing is at least partly a consequence of investment banks exercising their market power.

## **VI. Explanation of Comparison Groups**

As explained in the previous chapter, there are two groups of traditional IPOs that serve as natural sources of comparison for Hambrecht’s Dutch Auctions. The first group—the traditional IPOs for which Hambrecht was an underwriter—has the advantage of reducing the effects of underwriter and firm quality; its disadvantage is that it is a smaller group, which makes it harder to get statistically significant results when explicitly controlling for other factors, such as industry. The second group—the “peer” offerings for each auction IPO—has the advantage of reducing industry and timing effects, but it introduces underwriter and issuer quality issues. The basis for each of the two groups is discussed below.

### Hambrecht’s Auction IPOs vs. Hambrecht’s Co-Managed Traditional IPOs

As mentioned before, all of the Dutch Auction IPOs conducted in the U.S. have been underwritten by the same investment bank, W.R. Hambrecht.<sup>41</sup> While Hambrecht will now act as lead manager only in IPOs that use its OpenIPO auction process, it does participate in traditional bookbuilt IPOs as a co-lead manager, co-manger, or non-managing underwriter. Since its founding in 1998, it has underwritten seventeen auction IPOs and forty-four more traditional offerings. Of the latter, it served as a co-lead or co-manager on nineteen and as a non-managing underwriter on the rest.

An ideal “control group” with which to compare Hambrecht’s Dutch auctions would consist of traditional bookbuilt IPOs similar to the auction offerings in all other respects that could affect underpricing. Such factors include the timing of the IPO, the

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<sup>41</sup> This does not include the Google IPO, which we have explained was not a “true Dutch auction.”

industry of the issuing firm, the “quality” of the underwriters and issuer, and the size of the offering. Hambrecht’s auction and traditional IPOs are similar or the same in all of these regards, except possibly for offering size.

Both Hambrecht's auction IPOs and its traditional IPOs span the years 1999-2006, which is important because the average degree of underpricing of all IPOs in the market can differ significantly from year to year, as the following table shows.<sup>42</sup>

**Table 1: Summary Statistics for all IPOs, 1999-2004**

<u>Year</u>	<u>Total Number of Completed Offerings</u>	<u>Average Offering Size (\$Million)</u>	<u>Average Initial Return</u>
1999	486	191	78%
2000	406	240	32%
2001	83	491	14%
2002	70	338	8%
2003	68	224	12%
2004	216	198	11%

Source: IPOhome.com

If we were to compare one set of IPOs spanning the years 2002-2004 with another set spanning the years 1999-2004, for example, our results would be skewed since we would expect IPOs conducted in 1999-2001 to exhibit more underpricing than those conducted in the later years. Thus, it is advantageous that the observations in both data sets are spread over the exact same time period since this makes a comparison of the means of the two data sets more meaningful. However, it may be inappropriate to ignore timing effects completely, so we control for IPO year in some of our regressions.

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<sup>42</sup> The fact that all observations for 2006 are from the first calendar quarter has the potential to raise seasonality issues. However, none of the IPOs from 2006 appear to be outliers, and exclusion of these IPOs does not change any of the empirical results discussed later in the paper.

Hambrecht's auction and traditional IPOs both come from a diverse range of industries. This is advantageous to the current purposes since underpricing can differ greatly between industries. The fact that the offerings include a broad, and seemingly random, spectrum of industries, prevents simple comparisons between the two groups from being entirely uninformative. However, we do control for industry in some of the regression models.

The quality and unique characteristics of any given underwriter could also plausibly impact underpricing<sup>43</sup>; moreover, as Chemmanur and Paeglis (2005) conclude, it is possible that the "quality" of the issuer affects the level of underpricing. Regardless of how a particular underwriter may influence the underpricing of its offerings, by comparing Hambrecht's Dutch auction offerings with its own traditional bookbuilt offerings, any underwriter effects are reduced.<sup>44</sup> The comparison between the Hambrecht auctions and traditional offerings also helps control for issuer "quality." Firms using the same underwriter are likely to be of relatively similar quality since low-quality firms will use different underwriters than high-quality ones because the most prestigious underwriters are unwilling to participate in the offerings of low-quality issuers. Thus, we would not expect differences in underwriter or issuer quality to be the primary reason for any underpricing difference we might observe between Hambrecht's

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<sup>43</sup> One can imagine, for example, a particularly risk-averse investment bank would be more inclined to underprice a firm commitment IPO than would its less risk-averse competitors. Similarly, a well-respected underwriter may be able to underprice offerings less and still attract investors (or, underprice offering more and still attract clients).

<sup>44</sup> *Reduced, not eliminated*, because while Hambrecht is an underwriter in all of these offerings, the other underwriters are not necessarily the same in all the offerings. However, since underwriter relationships are important, any two syndicates including Hambrecht as an underwriter are likely to share many of the same other underwriters.

auction and traditional offerings. This is confirmed by the fact that we find no statistically significant correlation between use of the Dutch auction and any of the measures of firm quality that we use. As the following table shows, none of total debt to equity ratio, net income margin, revenue per employee, return on assets, or net PPE to total equity value ratio<sup>45</sup> have a statistically significant correlation with use of the auction mechanism.<sup>46</sup>

**Table 2: Correlation between Dutch Auction and Firm Quality Metrics  
(From 5 Single Variable Regressions Predicting Firm Quality by use of the Dutch Auction)  
For Hambrecht’s Auction and Traditional IPOs  
(t Statistics in Parentheses)**

	Total Debt / Equity (%)	Net Income Margin (%)	Revenue / Employee	Return on Assets (%)	Net PPE / Total Equity Value (%)
Dutch Auction	-0.71 (0.03)	-12.65 (0.55)	-0.28 (0.49)	-36.46 (0.91)	-0.53 (0.16)

The signs of the coefficient suggest that the firms using auctions have weaker performance and less tangible assets, but also have less debt. However, none of these coefficients even approaches statistical significance, so this does not alter our belief that the quality of Hambrecht’s auction and traditional IPO clients are not meaningfully different.

While Hambrecht’s auction and traditional IPOs are similar in respect to timing, industry, and underwriter and issuer quality, they do differ somewhat in their size. The

<sup>45</sup> Net PPE / Equity Value is the ratio of the value of a firms Property, Plant and Equipment (its most tangible assets) to the entire value of the company (what it would cost someone to buy the entire firm, including its debt). A high ratio means that much of the firm’s value lies in these tangible assets, which could make it easier for the issuer to signal its true value to investors and thus reduce underpricing.

<sup>46</sup> Controlling for these measures of issuer quality in the regressions explained in the “Empirical Results” chapter does not affect our results in a meaningful way.

mean offering size is \$42 million for the auctions and \$160 million for the traditional IPOs. The medians are somewhat closer (\$33 million and \$72 million, respectively), but they still differ significantly. However, this size differential is not of great concern. Almost *all* the IPOs were for small cap stocks—ones with market capitalizations below \$200 million—and that category is more meaningful than a finer breakdown. Moreover, our data reveal no correlation between offering size and initial returns. If we regress initial returns on offering size for all Hambrecht IPOs, we find the coefficient on offering size is zero. The regression results are below:

**Table 3: Effect of Offering Size on Initial Returns  
(t Statistics in Parentheses)**

	Initial Return (decimal)
Offering Size (in \$10 millions)	-0.001 (0.12)
Constant	0.347 (2.93)**

The regression indicates that a \$100 million increase in the offering size will only decrease initial returns by 1 percentage point! Given this result, the offering size differences between the Hambrecht auction IPOs and traditional IPOs are unlikely to be responsible for any meaningful differences in the amount of underpricing observed using the two different IPO formats.

So, except for the different IPO mechanism, the Hambrecht auction offerings and traditional offerings are comparable in the respects most relevant to underpricing. Put differently, we have a base of comparison that isolates the effects of Hambrecht's

OpenIPO<sup>47</sup> process and can help determine whether underpricing is reduced by a Dutch auction offering mechanism.

Hambrecht’s Auction IPOs vs. All Peer IPOs

Our second source of comparison is between each auction IPO and its “peer” IPOs. As mentioned earlier, we can expect underpricing to be influenced by the timing of the IPO, the industry, the size of the offering, and the quality of the underwriter and issuer. Thus, we define each auction offering’s “peer group” as the similarly sized IPOs that were done in the same industry at about the same time. This controls for the most relevant factors to underpricing, except for underwriter and issuer quality. Issuer quality is unlikely to be a major factor, though, because use of the Dutch auction is not correlated to a statistically significant degree with any of our measures of firm quality.<sup>48</sup>

**Table 4: Correlation between Dutch Auction and Firm Quality Metrics  
(From 5 Single Variable Regressions Predicting Firm Quality by use of the Dutch Auction)  
For Hambrecht’s Auction IPOs and their “Peer” IPOs  
(t Statistics in Parentheses)**

	Total Debt / Equity (%)	Net Income Margin (%)	Revenue / Employee	Return on Assets (%)	Net PPE / Total Equity Value (%)
Dutch Auction	4.344 (0.16)	23.778 (1.01)	-0.002 (0.01)	-13.066 (0.40)	-2.655 (0.22)

We developed the list of peer offerings by running a screen on the financial services database CapitalIQ.<sup>49</sup> For each auction offering, we screened for all other companies that completed an IPO in the Hambrecht company’s industry *and* filed an SEC

<sup>47</sup> As mentioned earlier, OpenIPO is Hambrecht’s name for its patented Dutch auction IPO mechanism.

<sup>48</sup> Controlling for these measures of issuer quality in the regressions explained in the “Empirical Results” chapter does not effect our results in a meaningful way.

<sup>49</sup> CapitalIQ is a database used by equity research analysts and institutional investors.

registration statement within one year (before or after) of when the Hambrecht company using the auction method filed its statements. These screens provide a broad set of “peer offerings” for each of the seventeen auctions.

## VII. Data

For each IPO in our two data sets, we have information on the offering date, industry of the issuer, offering size, offering price, the first day closing price, and the type of offering (bookbuilt or Dutch auction). This information all comes from the financial services database Capital IQ. Thus, we have a complete and reliable data set to use in a regression predicting the effect of Dutch auctions on initial returns while controlling for offering size, IPO year, and issuer industry.

The data we use to analyze the effect of Dutch auctions on other factors related to issuers include: first day opening price, high price, and low price; first day trading volume; stock price as of one year following the offering; current number of research coverage analysts; current mean analyst recommendation; and mean analyst recommendation as of one year following the IPO. We get all of the stock price and volume data and old analyst recommendation information from CapitalIQ. The source of the data on current (as of 4/1/06) analyst coverage and recommendations is the Yahoo! Finance website. Unfortunately, neither Yahoo! Finance nor Capital IQ (or *any* public resource) has analyst information on companies that are no longer publicly traded or historical information on the number of research analysts covering a stock. The exclusion from this part of our analysis of companies no longer publicly traded is not ideal; however, this survival bias exists for both the auction and traditional IPOs, so should effectively cancel out. Likewise, while it would have been ideal to have data on amount of coverage one year following the offerings, this would unlikely have made much of a difference since the number of analysts covering a stock tends to increase

quickly in the first year, but then flatten out. Moreover, we control for year effects, so this should address the timing issue as well.

## VIII. Empirical Analysis:<sup>50</sup>

### The Dutch Auction's Effect on Underpricing

#### Simple Comparison of Means

##### *Control Group 1: Hambrecht's Auction IPOs vs. Hambrecht's Traditional IPOs*

If Dutch auctions do indeed reduce underpricing, we would expect Hambrecht's auction offerings to exhibit less underpricing than its traditional offerings. As the following tables show, the mean and median level of underpricing in Hambrecht's seventeen auction IPOs are indeed lower than in its forty-four traditional IPOs.

<b>Table 5a: Hambrecht's Auction IPOs</b>		<b>Table 5b: Hambrecht's Traditional IPOs</b>	
	<u>% Underpricing</u>		<u>% Underpricing</u>
Mean	15.4%	Mean	41.1%
Median	0.4%	Median	9.8%
Standard Deviation	61.6%	Standard Deviation	90.7%

The auction IPOs experience less than half the underpricing of the traditional IPOs, but the auction offerings still see a mean first day price rise of over 15%. Thus, the data seem to suggest that the auction mechanism does reduce underpricing, but does not eliminate it entirely. Based on this analysis alone, we would have to conclude that the traditional IPO mechanism compounds the underpricing problem, but that there is some factor not unique to the bookbuilding process that is also facilitating large first day price gains.

Appendix A shows the individual observations. Among the auction IPOs, there is a glaring outlier: Andover.net. With a 252.1% initial return it was one of the most underpriced of the 486 offerings conducted in 1999, and has subsequently been

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<sup>50</sup> Appendix Tables 1-12 in Appendix D have full regression results for every variable discussed in this chapter.

investigated by the SEC. Excluding Andover.net, no other auction IPO had an initial return greater than 17.2%. What are the mean and median estimates for underpricing when we exclude Andover.net from our sample? As shown in the following table, they fall to nearly 0%.

**Table 6: Hambrecht's Auction IPOs**  
(Excluding Andover.Net)

	<u>% Underpricing</u>
Mean	0.3%
Median	0.3%
Standard Deviation	9.4%

In other words, these new statistics support the theory behind auction IPOs perfectly! Thus, if there is a compelling reason to exclude Andover.net from our sample, we have shown that the Dutch Auction mechanism not only *reduces* underpricing, but actually nearly *eliminates* it.

At the time of its IPO, Andover.Net, Inc. “provided products, online tools, news, and other services for programmers, software developers, web site designers, technology managers, and corporate buyers.”<sup>51</sup> The stock’s experience exemplifies the irrational exuberance of the 1999 internet bubble; after pricing at \$18, it traded as high as \$90 two days later, and then proceeded to fall as low as \$10.13 within five months. While this makes the Andover.net IPO different from the other auction IPOs, it is not sufficient grounds for excluding it; according to the theories used to promote the auction format, the irrational valuations that investors assigned to the stock after its first day of trading should have been imbedded in the auction bids they submitted the previous day. Thus, the irrationality should not have caused the stock to *open* trading at more than double the

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<sup>51</sup> Capital IQ business description for Andover.net. Accessible with an account at [www.capitaliq.com](http://www.capitaliq.com).

offering price. However, there may be other reasons to believe that it should be excluded. Hambrecht set the offering price range at \$16-\$18, but the bids resulted in a market clearing price of \$24.<sup>52</sup> Had the company refiled its forms with the SEC, it could have increased its offering range and priced at \$24, rather than \$18.<sup>53</sup> In addition, some investors have complained that Hambrecht interfered with the bidding process.

Hambrecht is alleged to have indicated that any bids at least 20% above the high end of the offering range (i.e. bids of \$21.60 or higher) would be successful.<sup>54</sup> As a result, investors may have submitted bids that did not reflect their true valuations. The fact that the market clearing price still ended up being \$24 may have instilled in investors conviction that their original valuations were correct; these investors may then have added to aftermarket demand at a price well above the offering price. In other words, the offering price was set below a market-clearing price, which itself may have been artificially low due to misinformed bidding. If these problems were the primary reason for Andover.net's extreme underpricing and are problems not found in the other auction IPOs, we would have a defensible rationale for excluding the Andover.net IPO from our sample.

The following table summarizes the analysis above, as well as shows the statistical significance of our estimates. Including Andover.net, the difference in means between the sample of auction and traditional IPOs is significant at a 15% significance

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<sup>52</sup> "Andover Strikes it Rich." <http://www.wired.com/news/business/0,1367,32978,00.html>

<sup>53</sup> According to Hambrecht Partner Brad Marvin, the reason the company did not do that was that is did not want to delay the offering, which would have been necessary had they re-filed. (Source: Personal Interview on 5/4/06)

<sup>54</sup> As it turned out, only investors who bid \$24 or higher received an allocation.

level. Excluding Andover.Net, the means are statistically different at a 5% significance level.

<b>Table 7: Comparison of Initial Returns Between Hambrecht's Auction and Traditional IPOs</b>		
<u>Auction IPOs</u>	<u>Auction IPOs (Excluding Andover.Net)</u>	<u>Traditional IPOs</u>
$\mu = 15.4\%$	$\mu = 0.6\%$	$\mu = 41.1\%$
$\sigma = 61.6\%$	$\sigma = 8.8\%$	$\sigma = 90.7\%$
$n = 17$	$n = 16$	$n = 45$
<u>Traditional vs. Auction</u>		<u>Traditional vs. Auction (Excluding Andover.Net)</u>
Difference of Means = 25.7%		Difference of Means = 40.5%
Std. Dev. of Difference = 23.9%		Std. Dev. of Difference = 22.8%
$t = 1.077$		$t = 1.775$
<b>P (t) = 0.143</b>		<b>P (t) = 0.041</b>

In looking at the individual data points shown in Appendix A, it appears that Andover.net's high initial returns may have been more a function of the 1999-2000 IPO boom than any atypical mistakes that Hambrecht made in conducting the offering. The data clearly show that the 1999-2000 period includes the IPOs with the most underpricing. What happens if we exclude these years from our analysis? The following tables show that for 2001-2006, the average level of underpricing is near 0% for *both* the auction IPOs and the traditional IPOs.

<b>Table 8a: Hambrecht's Auction IPOs (Excluding 1999-2000)</b>		<b>Table 8b: Hambrecht's Traditional IPOs (Excluding 1999-2000)</b>	
	<u>% Underpricing</u>		<u>% Underpricing</u>
Mean	2.5%	Mean	1.9%
Median	0.4%	Median	0.1%
Standard Deviation	7.0%	Standard Deviation	9.0%

These tables are revealing in two respects. First, they indicate that for the last six years the auction mechanism has not resulted in a different level of underpricing than has the traditional bookbuilding method for the IPOs in which Hambrecht has been involved; the

mean, median, and standard deviation of underpricing is almost identical for the two groups, and there is no statistical difference in the means or medians at any significance level. Second, they suggest that the IPOs in which Hambrecht has been involved have an average level of underpricing that is lower than the average for all IPOs conducted in that period. As the table included in the previous chapter shows, the average level of underpricing for *all* IPOs during this 2001-2006 period is close to 10%. The averages for Hambrecht's auction and traditional IPOs are only 2.5% and 1.9%, respectively. Put differently, the data from the last six-year period indicate that it may not be use of the Dutch auction, but rather use of Hambrecht as an underwriter, that reduces underpricing.

The fact that *both* Hambrecht's auction and traditional offerings experience low mean amounts of underpricing means one of two things: (1) Hambrecht attracts a type of client less likely to have an underpriced IPO, or (2) Hambrecht acts in a manner that reduces underpricing in the offerings in which it is involved. The first possibility is difficult to test, but seems unlikely. According to Hambrecht's Head of Investment Banking, Hambrecht goes after all the same potential clients as its competitors and underpricing issues are not a factor in why Hambrecht wins the clients it does.<sup>55</sup> The second possibility is intuitively appealing given that Hambrecht markets itself largely on its ability to price deals in a way that leaves minimal money on the table in the form of underpricing. In a sense, the fact that Hambrecht's IPOs experience less underpricing just reflects its success in fulfilling a marketing promise. However, if Hambrecht really does behave in a way that reduces underpricing for its clients, we would expect the

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<sup>55</sup> Hambrecht hopes that in the future more clients *will* choose Hambrecht because it prices offerings accurately, but does not see this as being the case now. (Source: Personal Interview with Brian Bristol on 4/6/06)

traditional offerings in which Hambrecht was a managing underwriter to have even less underpricing than ones in which it was a non-managing underwriter. The reason is that managing underwriters have more influence over IPO pricing than non-managing underwriters, and are thus more responsible for the extent of underpricing. The traditional IPOs in which Hambrecht was a manager do have lower underpricing than those in which it was not. However, the relationship becomes uncertain do to a large standard error when year effects are taken into account.

**Table 9: Effect of Hambrecht’s being the *Managing* Underwriter on the Initial Returns of the Deals it Underwrites, Controlling for Year Effects  
(t Statistics in Parentheses)**

	Initial Return
Managing Underwriter	-0.202 (0.51)
Year Dummy (1999)	0.438 (0.43)
Year Dummy (2000)	0.500 (0.51)
Year Dummy (2001)	-0.091 (0.08)
Year Dummy (2002)	-0.184 (0.18)
Year Dummy (2003)	(Dropped)
Year Dummy (2004)	-0.065 (0.07)
Year Dummy (2005)	-0.042 (0.04)
Year Dummy (2006)	0.000 (0.00)
Constant	0.258 (0.26)

In summary, comparing the underpricing observed in Hambrecht’s auction IPOs with its traditional IPOs reveals that, overall, Hambrecht’s auction IPOs do have a lower amount of underpricing than its traditional IPOs, especially when the Andover.Net IPO is

excluded. However, over the last five years, both Hambrecht's auction IPOs *and* its traditional IPOs have experienced little underpricing. Thus, there is some suggestive evidence of Dutch auctions reduce underpricing, but it is possible that the relatively low initial returns of these auctions really just reflects either a selection bias surrounding the issuers who choose Hambrecht or Hambrecht's abilities as an underwriter. If one of these latter possibilities is correct it is inconclusive which it is; however, intuition and anecdotal interview information suggest that the "Hambrecht as an underwriter" hypothesis is more likely than the "selection bias" theory.

*Control Group 2: Auction IPOs vs. Their "Peer" IPOs*

Appendix B shows each auction and its corresponding "peer group," arranged in order of initial returns with the Dutch auctions offering listed in bold. The peer groups in which the auction offerings had the least underpricing relative to their peers are listed first. Looking at this table, it appears that more of the auctions are near the low returns end of their peer group list than are near the high returns end; however, it is a somewhat weak pattern and many of the auction IPOs are indeed in the high returns half of their peer group lists.

For each of the peer groups, we use a Z-test to compare the amount of underpricing in the auction with the average of the peer group.<sup>56</sup> While in many cases there are large underpricing differences between the auction and its peer group average, the small number of peers in some groups makes it hard to get statistically significant results, and in only two cases (Nogatech and Avalon Pharmaceuticals) were the auction's

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<sup>56</sup> We use a Z-test rather than a t-test because the peer group mean is the population mean; the peer group is the population and we are testing whether the auction fits with that population.

initial returns lower than its peer offerings at a 15% significance level. Unfortunately, this lends itself to conflicting interpretations. On the one hand, given the difficulty of getting statistically significant results with such small peer group sizes, the statistically significant data we do have is revealing; “where there is smoke, the is fire,” one might say. On the other hand, one could argue that if the Dutch auction really were effective at reducing underpricing to a meaningful extent, we would see evidence of this in more than just two of the seventeen auction offerings.

In our next analysis, we consolidate all seventeen peer groups into one sample and estimate regression models. A simple OLS regression reveals the correlation between initial returns and Dutch auctions is significantly negative (p-value = 0.116). The following table shows the regression results.

**Table 10: Effect of Dutch Auction on Initial Returns  
For Control Group 2—Auction IPOs vs. Peers  
(t Statistics in Parentheses)**

	Initial Return (decimal)
Dutch Auction	-0.332 (1.58)
Constant	0.486 (8.54)

Thus, our simple single variable regression model provides some evidence of Dutch auctions reducing IPO underpricing. Combining this with the most favorable interpretations of the results of the previous subsection (the Hambrecht vs. Hambrecht comparison) and of the Z-tests just described, one would have a tough time rejecting our null hypothesis that Dutch auctions reduce underpricing.<sup>57</sup> The analysis conducted thus

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<sup>57</sup> This is not to say that one would be prepared to *accept* the hypothesis.

far, though, has not controlled for some factors potentially relevant to underpricing. We do this next.

Controlling for Other Potentially Relevant Factors

*Control Group 1: Hambrecht’s Auction IPOs vs. Hambrecht’s Traditional IPOs*

In our initial analysis in which we did a comparison of the mean levels of underpricing in Hambrecht’s auction and traditional IPOs, we noted that the two groups spanned the same years, included a similarly broad range of industries, and were almost all of the same size classification (small cap). However, we did not estimate a regression in which we explicitly controlled for these additional variables.

Controlling for just offering size actually makes the coefficient on the Dutch auction variable more negative and increases the t-statistic.

**Table 11: Effect of Dutch Auction on Initial Returns, Controlling for Offering Size For Control Group 1—Hambrecht’s Auction IPOs vs. Its Own Traditional IPOs (t Statistics in Parentheses)**

	Initial Return (decimal)
Dutch Auction	-.272 (1.11)
Offering Size (\$10M)	-0.001 (0.33)
Constant	0.432 (3.07)**

However, as soon as we include dummy variables for the year and/or industry of the IPOs, the coefficient on the Dutch auction variable shrinks in magnitude and the standard errors become too large for the regressions to yield conclusive results.

**Table 10: Effect of Dutch Auction on Initial Returns,  
Controlling for Offering Size and Year  
(t Statistics in Parentheses)**

	Initial Return (decimal)
Dutch Auction	-0.050 (0.17)
Offering Size (\$10M)	0.001 (0.28)
Year (1999)	0.596 (0.89)
Year (2000)	0.53 (0.78)
Year (2001)	-0.035 (0.05)
Year (2002)	-0.09 (0.13)
Year (2003)	(Dropped)
Year (2004)	-0.166 (0.23)
Year (2005)	-0.11 (0.17)
Year (2006)	-0.058 (0.08)
Constant	0.121 -0.18

*Control Group 2: Auction IPOs vs. Their “Peer” IPOs*

Our initial regression using Control Group 2 did not control for industry, timing, or offering size differences, all of which could affect the amount of underpricing observed in an IPO. In order to control for these effects, we create dummy variables for each year and industry and enter offering size as another explanatory variable, as we just did for Control Group 1. First controlling for just offering size, we find that offering size has little effect on underpricing. As soon as we control for either industry or year,

though, the coefficient on our Dutch Auction dummy variable shrinks and loses any statistical significance.

#### *Summary of Underpricing Analysis*

In summary, comparing each of the seventeen auction IPOs with their industry and timing “peers” (Control Group 2), we see a very weak pattern of auctions experiencing less underpricing than their peers. When all seventeen peer groups are consolidated into one data set, a single variable regression produces a coefficient on the Dutch auction dummy variable of  $-.33$ , which is statistically significant at a 15% significance level and indicates that the Dutch auctions average 33% less underpricing. This result is robust to the inclusion of a control variable for offering size, but our regressions become inconclusive due to large standard errors as controls for industry and year are added. These findings are consistent with those derived using the other comparison group (Control Group 1) since that comparison also reveals some initial evidence of auctions reducing underpricing, but the evidence becomes inconclusive with further analysis. Our underpricing results are summarized in the following table, in which the coefficient on the Dutch auction variable is listed with its t statistic for each of our eight underpricing regressions.

**Table 12: Dutch Auction Coefficient for each of the Eight Regressions  
Models Predicting the Effect of Dutch Auctions on Initial Returns  
(t Statistics in Parentheses)<sup>58</sup>**

<u>Control Variables Used In Model</u>	<u>Model Using Control Group 1</u>	<u>Model Using Control Group 2</u>
Models 1,2: Single Variable Regression	-0.257 (1.08)	-0.332 (1.58)**
Models 3,4: Controlling For Offering Size	-0.272 (1.11)	-0.326 (1.55)**
Models 5,6: Controlling For Offering Size, Year	-0.050 (0.17)	-0.107 (0.49)
Models 7,8: Controlling For Offering Size, Year, Industry	0.341 (0.71)	0.060 (0.27)
*20% Significance Level, **15% Significance Level		
***10% Significance Level, ****5% Significance Level		

### **The Dutch Auction’s Effect on other Factors (Price Stability and Flipping) Related to IPO Proceeds Maximization**

As explained in the Hypothesis Development chapter, low initial returns, high first day price stability, and minimal flipping are signals that an issuer maximized its proceeds from an offering. The Dutch auction’s impact on initial returns has already been discussed, so now we turn to its effect on first day price stability and flipping.

#### Price Stability

Regardless of our choice of control group, we get similar results regarding the Dutch auction’s impact on first day price stability. We define “price instability” as the difference between the highest and lowest price at which the stock traded on its first day,

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<sup>58</sup> The rows correspond to the four different sets of control variables we used in our regressions. The columns represent the two different data sets that we used. For example, the tables show that the coefficient on the Dutch auction variable in the regression predicting initial returns with no other control variables (this is the single variable regression) and using the data set for Control Group 1 is –0.257 and has a t Statistic of 1.08.

divided by the average of those two prices. Thus, a negative coefficient on the Dutch auction variable represents more price stability (less instability). For both control groups, we find that Dutch auctions do experience more first day price stability than traditional IPOs. This difference is statistically significant, even if we control for offering size. However, our regressions become inconclusive once we control for year and industry effects. The following table summarizes our results, showing the coefficient on the Dutch auction variable for each of our regressions.

**Table 13: Dutch Auction Coefficient for each of the Eight Regressions  
Models Predicting the Effect of Dutch Auctions on First Day Price Instability  
(t Statistics in Parentheses)**

<u>Control Variables Used In Model</u>	<u>Model Using Control Group 1</u>	<u>Model Using Control Group 2</u>
Models 1,2: Single Variable Regression	-0.085 (1.96) <sup>***</sup>	-0.090 (2.28) <sup>****</sup>
Models 3,4: Controlling For Offering Size	-0.097 (2.20) <sup>****</sup>	-0.094 (2.38) <sup>****</sup>
Models 5,6: Controlling For Offering Size, Year	-0.023 (0.49)	-0.047 (1.24)
Models 7,8: Controlling For Offering Size, Year, Industry	-0.037 (0.45)	-0.005 (0.12)
*20% Significance Level, **15% Significance Level ***10% Significance Level, ****5% Significance Level		

### First Day Flipping

Measuring first-day flipping as the first day trading volume divided by the number of shares offered, we find a statistically significant difference in the amount of flipping between auction and traditional IPOs in each of our two control groups. The auction IPOs exhibit less flipping, and this difference is magnified further if we control for offering size. However, as has been the case in our other regressions so far, our

results become inconclusive as soon as we control for industry or year. The results of our regression models using our various controls are summarized in the table below.

**Table 14: Dutch Auction Coefficient for each of the Eight Regressions Models Predicting the Effect of Dutch Auctions on First Day Flipping**  
(t Statistics in Parentheses)

	<u>Model Using</u> <u>Control Group 1</u>	<u>Model Using</u> <u>Control Group 2</u>
Models 1,2: Single Variable Regression	-0.574 (1.40)*	-0.385 (1.31)*
Models 3,4: Controlling For Offering Size	-0.620 (1.47)**	-0.403 (1.37)*
Models 5,6: Controlling For Offering Size, Year	-0.455 (0.92)	-0.291 (0.99)
Models 7,8: Controlling For Offering Size, Year, Industry	-0.446 (0.39)	-0.099 (0.33)
*20% Significance Level, **15% Significance Level		
***10% Significance Level, ****5% Significance Level		

**The Dutch Auction’s Effect on Factors (Stock Performance and Research Coverage) Related to Long-Term Value Maximization**

In addition to maximizing its proceeds from the IPO, an issuer wants to maximize the long-term value of its equity. Strong aftermarket stock price performance, lots of analyst research coverage, and favorable (i.e. buy) recommendations on the stock are all indication that a stock is getting its best possible valuation.

Aftermarket Returns

Measuring aftermarket performance as the percent change between the stock’s price at the end of it first day of trading and its price one year following its IPO, we find that in both comparison groups the auctions had better aftermarket returns. For Control

Group 1, this difference is statistically significant and is robust to the inclusion of controls for offering size and year. However, the results for both groups are inconclusive when we control for industry. The regression results are summarized below.

**Table 15: Dutch Auction Coefficient for each of the Eight Regressions  
Models Predicting the Effect of Dutch Auctions on Aftermarket Returns  
(t Statistics in Parentheses)**

	<u>Model Using Control Group 1</u>	<u>Model Using Control Group 2</u>
Models 1,2: Single Variable Regression	0.624 (1.82) <sup>***</sup>	0.366 (0.73)
Models 3,4: Controlling For Offering Size	0.587 (1.67) <sup>**</sup>	0.355 (0.70)
Models 5,6: Controlling For Offering Size, Year	0.648 (1.33) <sup>*</sup>	0.180 (0.33)
Models 7,8: Controlling For Offering Size, Year, Industry	0.644 (0.53)	0.053 (0.08)
*20% Significance Level, **15% Significance Level ***10% Significance Level, ****5% Significance Level		

### Amount of Research Coverage

Using Comparison Group 1 (Hambrecht’s auction and traditional IPOs), a single variable regression reveals that Hambrecht’s auction clients have, on average, 2.1 fewer research analysts covering their stocks than Hambrecht’s traditional IPO clients. For Comparison Group 2, the results are similar: auction users average 2.4 fewer research analysts. While the inclusion of our control variables increases our standard errors, the coefficients are relatively unaffected and the p-values are still small enough to provide some relatively meaningful suggestive evidence of auctions reducing the amount of research coverage a company receives. In other words, we have substantial suggestive

evidence of Dutch auctions resulting in reduced analyst coverage, but our standard errors are too high to assert this conclusively. Our regression results are summarized below.

**Table 16: Dutch Auction Coefficient for each of the Eight Regressions  
Models Predicting the Effect of Dutch Auctions on Current Number of Research Analysts  
(t Statistics in Parentheses)**

	<u>Model Using Control Group 1</u>	<u>Model Using Control Group 2</u>
Models 1,2: Single Variable Regression	-2.115 (1.38)*	-2.432 (1.49)**
Models 3,4: Controlling For Offering Size	-1.518 (1.01)	-2.229 (1.38)*
Models 5,6: Controlling For Offering Size, Year	-0.326 (0.20)	-1.306 (0.77)
Models 7,8: Controlling For Offering Size, Year, Industry	-2.417 (1.28)	-1.976 (1.07)
*20% Significance Level, **15% Significance Level		
***10% Significance Level, ****5% Significance Level		

### Analyst Recommendations

For Control Group 1 (Hambrecht’s traditional IPOs), we find extremely persuasive evidence of use of the auction method leading to less favorable analyst coverage in the long run. Although the single variable regression is inconclusive, we get a highly significant (p-value = .016) and large coefficient on the Dutch auction variable once we control for offering size, year, and industry. The coefficient of 1.58 indicates that use of the Dutch auction results in a mean analyst recommendation that is higher by 1.58. Since recommendations are on a scale from 1 to 5 with 1=“Strong Buy” and 5=“Strong Sell,” this large, positive coefficient suggests that use of the Dutch Auction mechanism is associated with having significantly worse analyst recommendations.

Using Comparison Group 2, we reach a similar conclusion: auctions result in less favorable analyst coverage in the long run. The coefficient on the Dutch Auction dummy variable is positive and significant (p-value = .073) when it is regressed on the mean analyst recommendation, and the result is robust to the inclusion of controls for offering size, year, and industry. However, the magnitude of the coefficient is significantly smaller when we use Comparison Group 2, rather than Comparison Group 1. Including the controls for size, year, and industry, we get a coefficient of 0.35, which has a p-value of 0.13.

The results from our eight regressions using the four different sets of control variables and the two comparison groups are summarized below.

**Table 17: Dutch Auction Coefficient for each of the Eight Regressions Models Predicting the Effect of Dutch Auctions on the Current Mean Analyst Recommendation (5= “Strong Sell” 1= “Strong Buy”)**  
(t Statistics in Parentheses)

	<u>Model Using Control Group 1</u>	<u>Model Using Control Group 2</u>
Models 1,2: Single Variable Regression	-0.050 (0.21)	0.338 (1.81)***
Models 3,4: Controlling For Offering Size	0.031 (0.13)	0.365 (1.97)****
Models 5,6: Controlling For Offering Size, Year	0.526 (1.58)**	0.365 (1.74)***
Models 7,8: Controlling For Offering Size, Year, Industry	1.581 (3.56)****	0.349 (1.52)**
*20% Significance Level, **15% Significance Level		
***10% Significance Level, ****5% Significance Level		

This evidence of use of the auction resulting in less favorable analyst coverage over the long term is confused by our analysis of the data on analyst recommendations as

of one year following the IPO. While almost all of our regressions using this data are inconclusive, there is a statistically significant negative coefficient on the Dutch auction variable in the single variable regression using Control Group 1.

**Table 18: Dutch Auction Coefficient for each of the Eight Regressions  
Models Predicting the Effect of Dutch Auctions on the Mean Analyst Recommendation as of  
One Year Following the IPO (5= “Strong Sell” 1= “Strong Buy”)  
(t Statistics in Parentheses)**

	<u>Model Using Control Group 1</u>	<u>Model Using Control Group 2</u>
Models 1,2: Single Variable Regression	-0.454 (2.12)****	-0.099 (0.56)
Models 3,4: Controlling For Offering Size	-0.393 (1.82)***	-0.079 (0.45)
Models 5,6: Controlling For Offering Size, Year	-0.319 (1.19)	0.038 (0.21)
Models 7,8: Controlling For Offering Size, Year, Industry	0.073 (0.18)	0.109 (0.54)
*20% Significance Level, **15% Significance Level ***10% Significance Level, ****5% Significance Level		

How do we reconcile this with our earlier results? Since analyst recommendations are heavily correlated with industry (analysts favor some industries over others), it is the regressions that control for industry on which we should focus. When we control for industry, our coefficients are positive in the regressions for both control groups and for both analyst recommendation periods (current and as of one year following each IPO), and the only statistically significant results (while controlling for industry) were found using the current analyst ratings. Thus, the results from using the ratings as of one year following each IPO should caution us from accepting our previous conclusions blindly, but they do not void the previous conclusions.

## Summary of Empirical Results

Simple single variable regressions provide suggestive evidence of Dutch auctions maximizing the issuers' proceeds from the IPO by reducing underpricing, first day price instability, and flipping. These single variable regressions offer a less clear picture of the Dutch auction's impact on an issuer's success in maximizing its aftermarket value; they indicate that auctions improve aftermarket stock price performance, but decrease the number of research analysts covering the stock. Moreover, the single variable regressions give mixed signals as to the effect of auctions on the favorableness of analyst coverage, but the lack of industry controls limits their usefulness when looking at analyst ratings.<sup>59</sup>

While the simple single regressions provide suggestive evidence of Dutch auctions helping issuers in all respects other than the amount of analyst coverage, most of the results become inconclusive when we control for year and industry effects. The one case in which our results remained statistically significant with the inclusion of all the controls is in the regression on current mean analyst recommendation, which revealed that the use of a Dutch auction IPO is correlated with having less favorable analyst coverage.

It is notable that, while their significance is limited by high standard errors, almost all the regression coefficients had the sign that proponents of the Dutch auction

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<sup>59</sup> While the other variables of interest may also be impacted by industry effects, analyst coverage is likely to be even more effected than the others since a company's attractiveness as a long-term investment option (which is what the ratings address) is so closely linked to the attractiveness of its industry.

would have guessed.<sup>60</sup> The theory on which the Dutch auction is based suggests that auctions provide more accurate pricing and should limit stock price volatility and flipping. Moreover, the proponents of auctions accuse traditional investment banks of denying favorable research coverage to their auction clients as a means of discouraging issuers from using the auction method. The fact that our suggestive evidence meshes with their ingoing hypotheses serves to at least give the auction method's proponents more confidence in their intuition about the topic, even if they do not have conclusive proof that they are correct.

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<sup>60</sup> The *only* exceptions to this are: (1) the Dutch auction coefficient was positive in the model predicting initial returns while controlling for offering size, year, and industry and, (2) the Dutch auction coefficient was negative in some of the regressions for mean analyst recommendation before we controlled for industry effects. No matter what control variables or comparison group we used, in all other regressions for initial returns, price stability, flipping, aftermarket returns, amount of analyst coverage, and mean analyst recommendation, the Dutch auction coefficient had the sign advocates of the auction method predicted.

## **IX. Conclusions at to the True Reasons for Underpricing of Traditional IPOs**

Chapter III of this paper highlighted the various theories that have been proposed to explain IPO underpricing. This chapter evaluates those theories through the use of economic reasoning, the empirical results of the last chapter, and interviews with professionals involved in the IPO process. We conclude that IPO underpricing is primarily a result of two things: (1) the perceived importance of institutional investors to issuers and investment banks, and (2) issuers' fear that first day price drops create bad momentum for a stock. These two things create incentives for both issuers and investment banks to intentionally underprice offerings.

### Underpricing as a Consequence of the Bookbuilding Process

If IPO underpricing were to stem directly from the mechanics of the bookbuilding process, no underwriter would be able to overcome it consistently. After all, if an underwriter were able to eliminate IPO underpricing while still using the bookbuilding method, it would not make sense to say that the bookbuilding method is responsible for underpricing! Since 2001, W.R. Hambrecht's nineteen traditional bookbuilt IPOs have had initial returns averaging just 1.9%. Weighting the returns by deal size gives a value-weighted average of 0.0%! The fact that Hambrecht's traditional IPOs have not experienced underpricing indicates that the Winner's Curse, Market Feedback Hypothesis, Bandwagon Effects theory, and the exclusion of retail investors theory are not driving factors behind IPO underpricing.

### Underpricing as an Intentional Choice on the Part of the Issuer

In W.R. Hambrecht's Dutch Auction IPOs, the auction process leads to a discovery of the market-clearing offering price. However, the Hambrecht system allows issuers to intentionally choose an offering price below the market-clearing price.<sup>61</sup> Thus, if issuers themselves are responsible for the underpricing of traditional IPOs, we would expect at least some issuers using the auction format to set their offering price below the market-clearing price revealed by the auction.

Some of Hambrecht's auction clients have indeed chosen to set their offering price below the market-clearing price.<sup>62</sup> While Hambrecht does not generally disclose which clients have done this, Hambrecht partner Brad Marvin indicated that this happens often, but is not the norm. He said that, of the companies that have done this, Overstock was a typical case; Overstock's auction cleared at \$13.50, but the offering was priced at \$13.00 because there were \$13.00 bids from "important potential long-term shareholders who Overstock wanted as investors...and who have remained for the long-term." According to Brian Bristol, Hambrecht's head of investment banking, institutional investors understand their importance and are not hesitant to assert it: "If Morningstar want us in their f\*cking IPO, they'll price it at \$\_\_\_," Bristol was told by one of the world's largest institutional investors.<sup>63</sup> While Morningstar did not acquiesce to the investor's demand, many other firms do, according to Marvin. Thus, it seems that an

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<sup>61</sup> If this is done, the limited number of shares are allocated on a pro rata basis to all bidders bidding at or above the chosen offering price.

<sup>62</sup> Personal Interview with Brad Marvin (a Hambrecht partner) conducted by Alex Bal on 5/4/06

<sup>63</sup> Personal Interview with Brian Bristol (Hambrecht's Head of Investment Banking) conducted by Alex Bal on 4/6/06.

issuer may intentionally underprice its offering in order to ensure the participation of particular investors that it wants as shareholders.

Another reason that firms have publicly given for intentionally underpricing offerings is that they want to ensure the presence of demand in the aftermarket. They fear that by pricing at the market-clearing price, there will be no depth to the demand for the stock and there is a risk that its price will fall on its opening day. We see an example of this in Google's prospectus, which stated,

“We and our underwriters have discretion to set the initial public offering price below the auction clearing price. We may do this to potentially reduce the downward price volatility in the trading price of our shares in the period shortly following our offering relative to what would be experienced if the initial public offering price were set at the auction clearing price.”<sup>64</sup>

Google felt that reducing the risk of “downward price volatility...in the period shortly following [its] offering” was worth paying for in the form of underpricing. In other words, Google would rather receive less money now and see its stock go up than receive more money now and see its stock go down. A firm would only draw such a conclusion if it believed that momentum mattered.

So, it appears that at least one explanation for underpricing is that issuers sometimes deliberately price below the market price. Why? There are two reasons: they want to ensure the participation of some specific investors, and they want to avoid first day price drops, which they believe can create bad momentum for the stock.

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<sup>64</sup> Google's S-1 Form. Available through the SEC.

## Underpricing as a Consequence of an Investment Bank Cartel

Underwriters receive a fee equal to a set percentage (typically 7%) of the final amount of the offering. Since underpricing reduces the size of offerings, it decreases underwriter revenues. Thus, underpricing is only in the interest of investment banks if it somehow contributes to an offsetting increase in revenues or decrease in costs. We have theoretical and interview-based reasons to believe that these offsetting benefits exist.

Many investment banks' greatest source of revenue is trading, and institutions are the clients from whom they get their trading revenues. Not surprisingly, this relationship leads to the situation Bristol explains,

“Trading with Fidelity is more important to an investment bank’s revenue than is any single deal. In other words, institutions like Fidelity are investment banks’ best customers. So, if Fidelity wants returns, you have a powerful natural incentive to try to get Fidelity returns. During the bubble, 30% of each IPOs first day pop would be given back to the investment bank trading floor. It is an informal kickback, but it is also just each side taking care of its best customers.”<sup>65</sup>

A Solomon Smith Barney broker described the situation similarly: “If Morgan Stanley gets Fidelity a large allocation in a hot IPO that gets large returns, Fidelity is going to do its next few trades using Morgan Stanley, and Morgan Stanley knows this.”<sup>66</sup> So, institutional investors are clients important to an investment bank’s trading revenues and these clients want IPOs to be underpriced, so investment banks have a powerful incentive to underprice offerings and hope for a quid pro quo. This incentive is even further compounded by the fact that it is easier (less costly) to sell an issue that is underpriced

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<sup>65</sup> Personal Interview with Brian Bristol (Hambrecht’s Head of Investment Banking) conducted by Alex Bal on 4/6/06.

<sup>66</sup> Personal Interview with Sunand Bal (Solomon Smith Barney Stock Broker) conducted by Alex Bal on 5/1/06.

and that the probability of being forced to supply aftermarket price support is reduced in an underpriced offering. Our findings of suggestive evidence that firms using auction IPOs get both less analyst coverage and worse analyst recommendations also suggest that there may be some validity to the hypothesis that investment banks are using their power to discourage the auction method, which is supposed to reduce underpricing; this, of course, would add support to the idea of underpricing being sustained by an investment bank “cartel.”

## **X. Conclusion**

In summary, there is some suggestive evidence that the Dutch auction reduces IPO underpricing, but overall the underpricing data is inconclusive; simple single variable regressions show a statistically-significant negative correlation between Dutch auctions and initial returns, but the coefficient standard errors become too large for the data to be conclusive once we control for industry and year effects. Similarly, there is suggestive evidence that auctions reduce first-day price instability and the amount of first day flipping, although the regressions become inconclusive once we control for year and industry effects. Thus, we have some indications that the auction method is better than the traditional bookbuilding method at maximizing an issuer's proceeds from an offering, but we cannot assert this conclusively.

The effect of the auction mechanism on helping issuers maximize the aftermarket value of their retained equity is more ambiguous. The auction offerings have had higher aftermarket returns (which is good), but fewer research analysts and less favorable research coverage (which is bad). Although the difference in aftermarket returns loses its statistical significance once we control for year and industry and the regressions on the number of analysts have relatively large p-values, the results regarding the auction's affect on current analyst recommendations are statistically significant and robust to the inclusion of all of our controls.

Confronted with mixed signals and suggestive, but mostly inconclusive, evidence as to the relative desirability of the auction and traditional methods, "fear, uncertainty, and doubt" have tended to cause issuers to stick to the traditional bookbuilding method in

the past, according to Hambrecht's Brian Bristol. Put differently, the difficulty in conclusively evaluating the success of past Dutch auctions can help explain why the auction IPO process has thus far served just a niche market. There is suggestive evidence that auctions offer certain benefits, but there is also statistically significant evidence that the use of the auction method may result in less favorable analyst recommendations. Lacking clear evidence that Dutch auctions better serve their interests, the majority of issuers have chosen to take the familiar route—bookbuilding.

Without a major impetus for change, it appears that the Dutch auction will remain a viable but less common IPO mechanism, at least in the near term. Hambrecht should continue to thrive in its patent-protected, niche market, but we can expect that the majority of offerings will continue to be done in the traditional bookbuilding process. As Bristol points out, “Nobody has ever gotten fired for hiring Goldman Sachs to manage an IPO” and “the top investment banks don't want us to succeed.”<sup>67</sup> In other words, none of the power players in the IPO process are clamoring for change. Thus, unless SEC regulations change the dynamic of the relationships at play, the near future for IPOs will likely look much the same as the present.

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<sup>67</sup> Personal Interview with Brian Bristol (Hambrecht's Head of Investment Banking) conducted by Alex Bal on 4/6/06.

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## **XII. Appendices**

Appendix A: Hambrecht Open IPOs vs. Hambrecht Traditional IPOs

Appendix B: Hambrecht Open IPOs vs. Peer IPOs

Appendix C: Hambrecht OpenIPO description

Appendix D: Full Regression Results

Table 1: Initial Returns Regressions, Control Group 1

Table 2: Initial Returns Regressions, Control Group 2

Table 3: Price Stability Regressions, Control Group 1

Table 4: Price Stability Regressions, Control Group 2

Table 5: Flipping Regressions, Control Group 1

Table 6: Flipping Regressions, Control Group 1

Table 7: Aftermarket Returns Regressions, Control Group 1

Table 8: Aftermarket Returns Regressions, Control Group 2

Table 9: Number of Analyst Regressions, Control Group 1

Table 10: Number of Analyst Regressions, Control Group 2

Table 11: Mean Current Recommendation Regressions, Control Group 1

Table 12: Mean Current Recommendation Regressions, Control Group 2

Table 11: Mean 1 Yr. After IPO Recommendation Regressions, Control Group 1

Table 12: Mean 1 Yr. After IPO Recommendation Regressions, Control Group 2