

**Book-building versus Auctions: An investigation into which IPO
pricing and selling method more effectively promotes the aims of
an IPO issuer**

Amrith Krushnakumar¹

Thesis advisors: Professor Edward Tower and Allen H. Huang

*Honors thesis submitted in partial fulfillment of the requirements for Graduation with
Distinction in Economics in Trinity College of Duke University*

Duke University
Durham, North Carolina
2007

¹ The author can be contacted at amrithk@gmail.com

Acknowledgements

First and foremost, I would like to thank my advisors, Professor Edward Tower from the Economics department and Allen H. Huang from the Fuqua School of Business, for patiently reading my various drafts and providing advice and encouragement throughout the entire process. I am also grateful to Professor Alison Hagy and my classmates in Econ 198S and 199S for their excellent criticisms during peer review sessions and presentations. Paul Dudenhefer helped me greatly by offering suggestions as to how I could present my research more clearly. Xinfeng Hu provided valuable help and advice on properly selecting my data. Finally, Abel Rodriguez patiently instructed me on how to use various statistical tests and procedures when analyzing my data.

Book-building versus Auctions: An investigation into which IPO pricing and selling method more effectively promotes the aims of an IPO issuer.

Abstract

In recent years, book-building has emerged as a method of choice among investment banks in the U.S and around the world for pricing and selling initial public offerings (IPOs). Proponents of the book-building method argue that discriminatory share allocations, the pooling of IPOs and other standard book-building practices price new shares more accurately, thus enabling the issuer to maximize proceeds received from the IPO, and minimize fluctuations in share price immediately after the IPOs. However, in view of the average first-day price increases common among IPOs marketed by the book-building method, and the potential for investment banks to abuse their power when allocating shares, skeptics claim that book-building is inadequate in helping the issuer meet its aims. Amid calls by regulators and critics to reform the existing book-building method, W.R Hambrecht, an investment bank, introduced the auction method of pricing and selling IPOs for the first time in the United States in 1999. This paper aims to determine which method might be more effective in promoting an issuer's aims by employing a matched methodology to fairly compare more recent book-building and auction IPOs in the U.S.

I. Introduction

For many companies, the Initial Public Offering (IPO) is usually an important first step towards gaining access to a significant amount of capital in public markets. Between 1995 and 2001 for example, IPOs in the United States (U.S.) cumulatively raised more than \$300 billion (in 2001 dollars) in gross proceeds or about \$115 million per IPO (Ritter & Welch, 2002). However, despite the significant amount raised by a typical IPO issuer, first day returns² in the U.S IPO market were also relatively high, averaging more than 14.0% (Ritter & Welch, 2002). As noted by Wilhelm (2005) and others, these first day returns suggest that demand for new shares in the market fails to equate with supply from the issuer, and that the new shares are not initially placed with those who value them most. Such inefficiencies are problematic to IPO issuers for two reasons. Firstly, because demand for the new shares fails to equate with supply, issuers are prevented from maximizing the gross proceeds³ they receive from the IPO. Secondly, because the new shares are initially misplaced, issuers may experience undesirable fluctuations in their share price immediately after the IPO, as investors who participated in the IPO sell their shares.

Although many factors may contribute to these inefficiencies in the IPO market, the methods used by investment banks to price and sell IPOs are possibly among the more significant. Most U.S IPOs have traditionally been priced and sold using the book-building method. When investment bankers ‘build a book’, they seek to gauge demand for the IPO during road-shows held to promote the IPO among primarily institutional investors. Subsequently, the indications of interest received are used by the banks to price

² The first-day return is a percentage change in the price of a share at the end of its first-day of trading from the offering price.

³ The gross proceeds received by the issuing firm is calculated by the number of shares that the firm places in the public market multiplied by the offering price of each share.

the new share offering, and determine how these new shares will be allocated among investors. Thus, the book-building method allows a bank to select investors for the IPO and control the allocation of shares. However, in view of the first-day price increases common among IPOs, critics point out that investor selection and discriminatory share allocation practices distort demand and prices for the new shares, thereby creating and perpetuating inefficiencies in the IPO market.

Amid calls by individuals and regulatory bodies like the Securities and Exchange Commission (SEC) to reform the existing book-building method, WR Hambrecht, a small investment bank in California developed the “OpenIPO” system in 1999. This was the first time that the auction method of pricing and selling IPOs had been introduced in the U.S. The “OpenIPO” system uses the uniform price auction process to determine the quantity and price of shares to be sold in the IPO. In a uniform price auction, investors place bids on the quantity of shares to be purchased at a certain price. Once all bids are received, the investment bank and the issuer use this information to establish a clearing price or the highest possible price that will enable the issuer to sell all its shares in the market. Investors who place bids above the clearing price obtain all the shares they request at the clearing price. Remaining shares are allocated on a pro-rata basis among those who submitted bids at the clearing price. Unlike book-building, uniform price auctions are generally open to both retail and institutional investors⁴.

General economic theory suggests that the auction process might be more effective in accurately pricing and fairly allocating new shares. This is because these shares are promoted to more investors, and are also sold to the highest bidders who arguably value

⁴ Although uniform price auctions are open to all investors, most auctions generally require investors to place a minimum bid for 100 shares. This requirement may potentially limit some investors, (particularly retail investors) from taking part in the auction.

these shares the most. Subsequently, one may expect a greater number of issuers to choose the auction method when pricing and selling IPOs. However, as Sherman (2005) notes, “IPO auctions were tried in Italy, the Netherlands, Portugal, Sweden, Switzerland in the 1980’s, and in Argentina, Malaysia, Singapore, Taiwan and Turkey in the 1990’s, but they were abandoned in all of these countries [as] book-building became popular.” (Sherman, 2005). In the U.S to date, only a handful of firms have chosen to use the auction process since WR Hambrecht introduced its “OpenIPO” system, although this may increase following Google Inc’s highly publicized IPO auction in 2004.

Given that issuers aim to maximize proceeds (Wilhelm, 2005) and minimize undesirable fluctuations in share price immediately following the IPO⁵, which method, book-building or auctions might be more effective in meeting these goals? There is a wide range of literature that has compared book-building, auctions, and other methods of pricing and selling IPOs, and examined how choosing one method over another has affected the issuer. Many of these papers, notably Benveniste and Spindt (1989); Benveniste and Wilhelm (1997); Sherman (2005); and Wilhelm (2005); have concentrated on theoretically modeling the book-building and auction processes. These studies hypothesize that book-building is better at pricing new shares more accurately because informational frictions⁶ between investors and the issuer can be overcome. This

⁵ If the price of new shares after the IPO is greater than the offering price, the issuing firm would have failed to maximize gross proceeds received, as the offering price for the shares could have been higher at the time of the IPO. Conversely, Drake (1993), Lowry & Shu (2002) and others have documented that a large decline in the price of new shares after the IPO prompts shareholders to file suit, claiming that insiders withheld information about unfavorable developments that should have been made public at the time of the IPO. Thus, IPO issuers would aim to prevent the price of new shares after the IPO from deviating too much from the offering price.

⁶ Informational frictions occur when the issuer and investors each possess private information that either party does not wish to share. This is further elaborated in the theoretical discussion section of this paper.

and the general consensus that book-building also reduces the risk of under-subscription⁷ have led theorists to believe that the book-building method is better in helping issuers achieve their aims. On the other hand, empirical work done in recent years tells a different story. For example, after analyzing French IPO data in the early 1990's, Degeorge, Derrien and Womack (2004) show that the auction process significantly reduced the under-pricing⁸ of new shares, enabling more issuers to maximize their proceeds from the IPO. However, much of the IPO data collected by these empirical studies primarily come from international share issues in the late 1980's and early 1990's. This could be problematic because the data is not only old, but may also be less typical than usual as it is obtained from a time when book-building practices were introduced around the world and adopted in favor of IPO auctions.

The recent introduction of IPO auctions in the U.S raises some interesting questions. Why have auctions been introduced here if they have been in decline world-wide? Have technological or procedural innovations in traditional auction processes that were not available before like the "OpenIPO" system by W.R Hambrecht, made the auction method of pricing and selling IPOs more effective in meeting the aims of issuers?

Using more recent U.S IPO data between January 1999 and June 2006, the present paper seeks to compare book-building and auctions⁹ to determine which method of pricing and selling IPOs might be more effective in promoting the issuer's aims.

⁷ Under-subscription can occur in the auction method if there are too few bidders by chance. Under-subscription can also occur in both the auction and book-building methods if there is little interest in the IPO. For this paper, the former version of under-subscription will be considered unless otherwise stated.

⁸ Under-pricing occurs when the investors who participate in the IPO experience positive first-day returns. These positive first-day returns suggest that the shares could have been offered at a higher price. Thus, the shares of the issuer are said to be under-priced and the issuer fails to maximize the proceeds received from the IPO.

⁹ There are many other types of auctions besides the uniform price auction although these other auction methods have not been widely used by auction issuers in the U.S. This study compares book-building IPOs with IPOs that have been priced and sold by any type of auction method.

Furthermore, unlike empirical studies by Degeorge, Derrien and Womack (2004), Hu (2006) and others, this paper aims to compare the two methods more fairly by matching issuing firms that used the auction method with similar firms that used book-building that same year or within 6 months of the auction IPO taking place. The matching technique, which is similar to the one used by Pukthuanthong, Varaiya and Walker (2005)¹⁰, ensures that any differences between the methods are not caused by the time period that an issuer chooses to conduct an IPO or by specific variations between industries. This methodology is further elaborated later in the paper. My findings suggest that the auction method might not necessarily be more effective in helping an issuer maximize proceeds from the IPO. Furthermore, there is also weak evidence for the claim that auction issuers are better able to minimize fluctuations in their share price immediately after the IPO.

This paper is organized as follows. Section II reviews relevant theoretical and empirical literature about book-building and auction methods. Section III summarizes the results of a theoretical model of book-building first developed by Benveniste and Spindt (1989). Their mathematical framework has greatly influenced many recent qualitative arguments made in favor of book-building, and illustrates why book-building has continued to remain the method of choice in pricing and selling IPOs. Section IV explicitly identifies and explains what variables will be measured, describes the data collection process, and elaborates on the ‘matching’ methodology that will be used to compare book-building and auction practices more fairly. In Section V, I describe and analyze the results obtained from my empirical investigation. Finally in Section VI, I provide concluding remarks, discuss the limitations of my study, and highlight further avenues for research in this area.

¹⁰ Pukthuanthong, Varaiya and Walker (2005) primarily study how the choice of the IPO pricing and selling method affects the reputations and long-term performance of U.S IPO issuers

II. Literature Review

The ways in which IPOs are priced, marketed and sold in public markets is an active area of research in finance. A few recent theoretical and empirical papers have sought to compare book-building and different types of auction processes¹¹ to determine which method might be the most effective in helping IPO issuers maximize the gross proceeds they receive from the IPO, and minimize fluctuations in their share price immediately after the IPO. While theorists have tended to favor book-building over auctions, several empirical observations suggest that the auction method might in fact be more effective.

The general advantages of the auction process and their benefits to the issuer are best highlighted by Pukthuanthong, Varaiya and Walker (2005). Since IPO auctions are open to everyone, issuers can sell their new shares to a greater number of investors at a price which more accurately reflects the market demand for the shares. Pukthuanthong, Varaiya and Walker (2005) subsequently explain that this should allow the issuer to maximize proceeds received, thus eliminating or at least significantly reducing the first-day returns which are observed after the IPO has taken place. Their empirical paper discusses several studies that corroborate their claims. For example, they cite Derrien and Womack (2003) who find that in the French IPO market, both the mean and variance of under-pricing are lower for IPOs that have been priced and sold through auctions than

¹¹ The most common type of auction is the uniform price auction where one clearing price for all shares is established after all bids have been received. Other types of auctions include Dutch auctions that were popularized by Google's IPO, and 'dirty' auctions. In a Dutch auction, the price for a certain number of shares is continually dropped until a bidder agrees to buy that quantity of shares. This process is repeated many times until all the shares are sold. Thus, different quantities of shares can potentially be sold at different prices. A 'dirty' auction is like the uniform price auction. The only difference is that in a 'dirty' auction, an issuer can choose an offering price for the shares that is less than the market-clearing price. Many of the IPO auctions that have taken place in the U.S and in other countries have in fact been uniform price 'dirty' auctions. Little evidence has been found suggesting that any one type of auction is more effective than others in helping IPO issuers meet their aims.

book-building. Similarly, in other papers cited by Pukthuanthong, Varaiya and Walker (2005) which have examined British privatizations in the 1980's and the Japanese IPO market, less under-pricing has also been observed in the auction sample compared to the non-auction sample.

However, despite the advantages of the auction process, the method is not popular. For instance, IPOs were priced and sold using the auction process in Western Europe in the 1980's and in Japan, Singapore and Taiwan in the 1990's before this method was abandoned (Pukthuanthong, Varaiya & Walker, 2005). Pukthuanthong, Varaiya and Walker (2005) also note that "out of more than 40 countries that allow for both [auction and book-building methods] there is no country in which auctions are dominant" (Pukthuanthong, Varaiya & Walker, 2005). Instead by the late 1990's, the book-building method gradually replaced auctions in Europe and Asia. Why has book-building become more popular?

In her model of the book-building process, Sherman (2005) introduces several reasons why book-building might be better in addressing an issuer's needs¹². Her arguments are influenced by the hypothesis first developed by Benveniste and Spindt (1989) which is explained later in the present paper; that book-building is better at overcoming the informational frictions in the IPO process which prevent issuers from achieving their goals. These informational frictions occur when the issuer and investors each possess private information that either party does not wish to share. For example, large and influential investors may choose not to reveal their true level of interest in an IPO in the hopes of forcing the issuer to lower the offering price for their shares. Sherman (2005) begins by explaining that investment banks who decide how to allocate

¹² The ideas proposed by Sherman are similar to those found in other papers, most notably in Benveniste & Spindt (1989), Benveniste & Wilhelm (1997), Wilhelm (2005) and Jagannathan & Sherman (2006).

shares among prospective investors can elicit more honest indications of interest from these investors. By controlling the allocation of new shares, the bank reduces the incentive for an investor to downplay their interest in an attractive IPO for fear of obtaining few or even no shares. Consequently, investors are forced to evaluate the IPO more carefully and indicate their interest more truthfully. The information gleaned from these indications is then used by the bank to determine a more accurate price for the new shares, thus limiting first-day returns and helping an issuer maximize gross proceeds received from the IPO.

Secondly, Sherman (2005) also notes that the expected proceeds received from book-building are higher as there is a greater risk of under-subscription in auctions. In the book-building process, an investment bank promotes and sells the new IPO shares to a regular group of investors it has built relationships with. Hence, if the issuer's new shares are attractive, there is a greater chance that all of these shares will be sold at a price which is close or equal to the expected offering price. An investment bank can also bundle or pool IPOs by tacitly requiring investors to participate in unattractive IPOs to be considered for more attractive future offerings. Thus, the book-building process allows an investment bank to co-ordinate "the number of investors that will participate [in the IPO], guaranteeing that a sufficient number (but not too many) are involved" (Pukthuanthong, Varaiya & Walker, 2005). In an auction process however, the number of shares sold and the offering price of these shares is dependent on the amount and size of bids received which neither the investment bank nor the issuer can greatly influence. Subsequently, the issuer faces greater uncertainty in predicting how much they will receive in gross proceeds. Pukthuanthong, Varaiya and Walker (2005) provide some examples of under-subscription in IPO auctions. For instance, they cite Jenkinson and Mayer (1988) who

found that half the IPOs of companies that were privatized in the U.K between 1982 and 1987 using the auction method were under-subscribed. Other examples include the last auction IPO in Singapore which only received bids for 18% of the available shares, and the IPO auction of Chunghwa Telecom in Taiwan in 2000 where 28% of the available shares remained unsold (Pukthuanthong, Varaiya & Walker, 2005).

Finally, Sherman (2005), Wilhelm (2005) and Pukthuanthong, Varaiya and Walker (2005) highlight that the prominent book-building practice of marketing IPOs to only a selected, and arguably more sophisticated group of investors reduces the possibility of attracting 'free-riders' who have not carefully evaluated the IPO and have little understanding of its value. Subsequently, there is a lower chance that the new shares will be over-priced or under-priced due to bids that are either too high or low. This is unlike the case for auctions which are open to a greater number of investors who may not be able to properly value the IPO. Argentina's experience with IPO auctions during telecom privatizations in 1992 illustrates the problems posed by 'free-riders'. Following the successful IPO of Telefonica de Argentina in 1991, the Argentinean government sought to privatize Argentina Telecom soon after through an auction IPO. "Because the Telefonica auction had been such a success, many [investors, particularly small retail investors] were eager to cash in" on the IPO by borrowing to finance their purchase of Argentina Telecom's stock (Jagannathan & Sherman, 2006). Jagannathan and Sherman (2006) estimate that "up to one-fourth of the shares purchased in the Telecom IPO were financed through...loans". The number and size of bids received eventually doubled the offering price for Argentina Telecom's shares, prompting many investors to dump the shares as the stock price fell following the IPO. To repay loans taken to purchase the shares, many investors sold other shares, causing a general market crash and a

cancellation of 20 other planned IPOs. As Jagannathan and Sherman (2006) note, the IPO auction exacerbated these problems because it attracted investors who had not carefully evaluated the IPO, and who had subsequently pushed up the size of their bids to ensure they would get the shares.

As these studies have shown, there is still considerable debate about which method is better in accurately pricing IPOs and placing new shares in the hands of investors who value them most. Theoretical models suggest that book-building might be more effective as the ability of banks to allocate shares forces investors to consider an IPO more carefully and make an honest indication regarding their interest. Furthermore, this method allows banks to use their existing relationships with investors to guarantee sufficient demand for the IPO. On the other hand, a wide range of empirical observations on international IPOs suggest that auctions do a better job in pricing IPOs. These observations also find that under-pricing is minimized in an auction process compared to non-auction methods like book-building. However, data from these empirical studies is primarily obtained from international share issues in the late 1980's and 1990's. The increasing sophistication of investors and various technological and procedural innovations in IPO processes in the past decade may have made findings from these studies less relevant today. At stake in this debate is the issuer's ability to maximize the proceeds they receive from an IPO, and minimize fluctuations in their share price immediately after the IPO.

The emergence of IPO auctions in the U.S provides an opportunity here to study book-building and auction methods using more recent data. To compare the two methods more fairly, this paper aims to use a matching technique whereby firms that used the book-building method for conducting an IPO, are compared with similar firms that used

auctions. The conclusions obtained from this fairer comparison can then be used to determine which method, book-building or auctions might best help an issuer achieve its goals.

III. Theoretical Discussion

As highlighted in the previous section, theorists who have studied various IPO pricing and selling methods have generally concluded that book-building is better for the issuer. The ability of the book-building method to reduce informational frictions between the IPO issuer and potential investors, the marketing of new shares to selected investors, and the greater risk of under-subscription in auctions are some of the ideas proposed by theorists in support of book-building¹³. Of these three ideas, the theory of informational frictions has been widely studied and will therefore be discussed below.

In their seminal paper on the book-building method, Benveniste and Spindt (1989) begin by highlighting that informational frictions are inherent in the IPO pricing and selling process. These frictions occur because both investors and the issuing firm possess private information that either party may not wish to share. For instance, the issuing firm is likely to be better informed about its business situation than outside investors. Subsequently, the firm may be tempted to ‘play up’ its prospects to attract more investment. This may especially be the case when the issuer believes in advance that demand for its IPO will be weak. More importantly, investors may have “superior information about an issuing firm’s competitors...and private information about...the issuing firm that [it] cannot credibly convey [to the public such as] the quality of the

¹³ The marketing of new shares to selected investors in the book-building method and the greater risk of under-subscription in auctions were explained earlier in the literature review. Therefore, they will not be discussed in this section.

management” (Benveniste & Spindt, 1989). If investors have positive information about the firm, Benveniste and Spindt (1989) argue that they will keep this information to themselves as they would then be able to “pay a low initial price for the [firm’s] stock” (Benveniste & Spindt, 1989), and sell it after the IPO for a higher price that would reflect the positive information.

By failing to disclose their private information and hence their true interest for the issuer’s shares, these investors prevent issuers from discovering the actual demand for their shares in the public market. This may become particularly problematic if the new shares are attractive to investors as the issuer could have increased the gross proceeds received by either introducing more shares to the market at a slightly lower price, or by increasing the offering price of the existing quantity of shares. Furthermore, because the new shares are marketed to investors who seek a low offering price, an issuer can expect their share price to fluctuate immediately after the IPO, as investors who participated in the IPO sell their new shares to other investors who are willing to buy them at a higher price. Thus, informational frictions in the IPO pricing and selling process prevent issuing firms from maximizing the gross proceeds they receive from an IPO, and from minimizing fluctuations in their share price immediately after the IPO.

In their mathematical model of the book-building process, Benveniste and Spindt (1989) show that by having the power to determine share allocations, an investment bank can motivate potential investors to provide more honest information regarding their interest in the new shares. This information can then be used to set a final offering price that is reflective of the market demand for the issuer’s shares. Furthermore, Benveniste

and Spindt (1989) also show that the book-building practice of pooling IPOs¹⁴ forces an investment bank to be more open about the issuer's prospects to potential investors. This is because the ability of an investment bank to pool IPOs successfully depends on the bank's reputation "for certifying that inside information is disclosed fully" (Benveniste & Spindt, 1989). An investment bank that "fails to maintain [its] reputation for monitoring diligently [could] lose [its] regular investors and the future rents [it] could earn" (Benveniste & Spindt, 1989) from the pooling of IPOs. Thus, by mathematically modeling the book-building process, Benveniste and Spindt (1989) show how these characteristics of the book-building process help reduce informational frictions between the issuer and investors in the IPO pricing and selling process¹⁵. Consequently, the authors conclude that new shares are priced more accurately in the book-building process which enables the issuer to meet its aims. By introducing the notion of informational frictions in the IPO pricing and selling process and explaining how book-building can overcome these frictions, Benveniste and Spindt (1989) have greatly shaped other theories such as those developed by Sherman (2005) and Wilhelm (2005), and influenced qualitative arguments made in favor of the book-building process.

IV. Data collection and methodology

As explained by Benveniste and Spindt (1989), informational frictions in the IPO pricing and selling process prevent issuers from maximizing the gross proceeds received in an IPO, and from minimizing fluctuations in the share price immediately after the IPO. Thus, the variables on which the effectiveness of book-building and auctions can be

¹⁴ As explained in the previous section, pooling IPOs refers to the practice by investment banks of tacitly requiring investors to participate in unattractive IPOs in order to be considered for more attractive future offerings. This method can be used by an investment bank to sell the issuer's shares, even if actual demand for the shares is weak.

¹⁵ Please refer to Benveniste & Spindt (1989) for details on their mathematical model.

compared would have to measure how successfully these different methods overcome the problems caused by informational frictions. First-day returns and the final offering price range for IPOs are two variables that can be used to determine this.

A. Variables

The *first-day return* is a percentage change in the price of a share at the end of its first trading day from the offering price. Investors experience positive first-day returns when they sell their shares to other investors at a higher price than what they paid the issuer during the IPO. By implying that there are other investors in the market who are willing to pay a higher price for the new shares, positive first day returns strongly suggest that an issuer's shares were under-priced, and that the issuer failed to maximize gross proceeds received from the IPO. On the other hand, negative first day returns may be observed if the IPO attracted fewer investors than expected. Finally, positive or negative first-day returns also directly measure the fluctuations in the issuer's share price immediately after the IPO. Thus, by comparing the direction and magnitude of first-day returns for book-building and auctions IPOs, one can find which method might be more effective in helping an issuer meet its aims. First day returns (FDR) are expressed as a percentage and can be computed from the offering price (OP) and the closing price of the issuer's shares at the end of the first trading day (FDP) as follows:

$$FDR = \frac{FDP - OP}{OP} * 100$$

Offering prices were obtained from IPO prospectuses filed by the issuer with the SEC. First-day closing prices were obtained from the CRSP (Center for Research in Security Prices) database.

The *final offering price range*¹⁶ for new shares, which is set by the investment bank managing the IPO process, is another variable that can measure how effectively book-building and auctions meet the aims of the IPO issuer. This range of prices is determined after the bank values an issuer's business prospects and financial position, and conducts road-shows that are designed to gauge potential demand for the issuer's shares. The final offering price range provides investors with an indication of what the offering price for the new shares might be, and is also a way for the bank to influence the quality of bids submitted by prospective investors in the pre-market¹⁷. In particular, by examining the width or the difference between the highest and lowest prices in the offering price range, one can evaluate "the level of uncertainty surrounding the pricing of [the] IPO" (Benveniste & Wilhelm, 1997), with a larger width suggesting greater uncertainty. Consequently, more uncertainty in the IPO pricing process may discourage prospective investors from making firm order commitments for new shares as these investors become wary of raising the issuer's final offering price through their bidding. By discouraging prospective investors from making firm orders, the issuer's ability to maximize proceeds received from the IPO may be hurt. Furthermore, higher uncertainty in the IPO pricing process also makes it more difficult for the issuer to determine an offering price that will match the expectations of prospective investors. Setting a price that is too high or low from what prospective investors expect may lead to heavy selling and buying of the shares respectively. This will cause a greater fluctuation in the issuer's

¹⁶ Before investment banks promote an IPO, they calculate an initial price range for the issuer's shares after analyzing the issuer's business prospects and financial position. After gauging the potential demand for the IPO (through road-shows in book-building or by obtaining initial bids in an auction), the bank may revise its price range before it promotes the shares again and formally accepts orders. The final offering price range is measured instead of the initial range as it is the final range that is determined by the type of pricing and selling method used.

¹⁷ The pre-market is the market where shares in the IPO are sold at an offering price before they are made available to the public.

share price immediately after the IPO which the issuer may wish to avoid. The width¹⁸ of the final offering price range is expressed in dollars and was obtained from a variety of online sources¹⁹ for all the book-building and auction IPOs in the sample.

Although maximizing the gross proceeds received from the IPO is largely a short-term aim, an IPO issuer may arguably wish to minimize large fluctuations in their share price over many months and years. Thus, one of the weaknesses in choosing the above variables is that they only measure how successfully the book-building and auction methods overcome the problems posed by informational frictions in the short-term. This could be changed if one also measured share returns over several months and years²⁰. If share prices over the long-term do not significantly deviate from the offering price established during the IPO, one can assume that the particular IPO pricing and selling method used, helped the issuer minimize fluctuations in its share price over a longer time period. Indeed, Ritter and Welch (2002) and Pukthuanthong, Varaiya and Walker (2005) study the long-term performance of book-building and auction IPOs and generally conclude that the returns from both types of IPOs are lower than those posted by value-weighted market indices after several months. However, as explained by Ritter and Welch (2002), the long-term returns of book-building and auction IPOs “hides the time-trends and year-by-year variations” (Ritter and Welch, 2002) of the issuer’s share price. Furthermore, movements in share prices over a longer time period can be attributed to events other than the IPO pricing and selling process such as earnings releases or product announcements. Consequently, long-term share returns are an unreliable measure of

¹⁸ This study actually measures the mean width of the final offering price range for auction and book-building samples in every group.

¹⁹ IPOHome.com, 123jump.com and MSN money were the main online sources used to obtain the final offering price range for all book-building and auction IPOs considered in this study. A variety of sources were used as the final offering price range was not readily available in any single database for all the IPOs considered in this study.

²⁰ One can apply the same method used to calculate first-day returns to compute long-term returns

determining whether the IPO pricing and selling method used, helps the issuer maintain a stable share price long after the IPO has taken place. Therefore, in choosing to measure the above variables for book-building and auction IPOs, this study limits itself to determining which method, book-building or auctions is more effective in helping the issuer overcome the problems caused by informational frictions during and immediately after the IPO.

B. Data

As explained earlier, the book-building and auction processes were compared by examining the width of the final offering price range and first-day returns for all IPOs in the United-States that were priced and sold using either of the two methods. Only IPOs from 1999 (when the first IPO auction was held) to June 2006 were considered. The FactSet database maintains a list of U.S IPOs that have taken place in the given time period. It also contains comprehensive information about each IPO such as the IPO date and the business sector of the IPO issuer. Thus, FactSet was used to obtain an initial list of all IPOs that took place in the above period. Consistent with other similar empirical studies, IPOs which were secondary or unlisted in a traditional exchange, which involved specific share types, or which were from firms in certain industries were then eliminated from this initial list. This was either because data obtained for these IPOs was unreliable or these IPOs had special characteristics that distorted the effects of the pricing and selling method used. Table 1 on the next page lists all IPO categories that were eliminated from the initial list of IPOs obtained from FactSet and provides reasons for their elimination.

Table 1: Categories of IPOs eliminated from consideration²¹		
	IPOs eliminated by Industry	Reason for Elimination
1	IPOs by commercial Banks and Savings and Loans (S&L) Institutions	When a commercial bank or a savings and loans institution carries out an IPO, its depositors have the right to purchase the firm's shares first. Furthermore, if the IPO by the commercial bank or the S&L institution is a result of demutualization, the offering price would have to be approved by government regulators before the new shares are sold. Consequently, the priority given to depositors and demutualizations by these firms may have an additional effect on the final offering price range and first-day returns for the IPO which will be difficult to remove. Thus, these firms have been eliminated from consideration.
2	IPOs by Real Estate Investment Trusts (REITs) and closed-end funds	Both REITs and closed-end funds operate by buying other financial assets. REITs typically invest in real-estate while closed-end funds have investments in a wide-range of securities such as stocks and bonds. Hence, these firms are not considered to be traditional operating companies. Furthermore, investments in REITs receive special tax considerations which may make them more attractive to investors than traditional shares. This could have an additional effect on the final price range and first-day returns for these IPOs. Thus, REITs and closed-end funds have also been removed from the final sample.

²¹ I would like to thank Xinfeng Hu (Duke '06) for helping me compile this list and explaining why IPOs belonging to certain categories had to be eliminated.

	IPOs eliminated by Share type	Reason for Elimination
3	IPOs by firms issuing American Depository Receipts (ADRs)	An ADR is a certificate that represents a certain number of shares in a foreign stock and trades in U.S stock exchanges. The ADR is denominated in US dollars and is issued by a U.S bank which also holds the underlying foreign stock. However, the value of the ADR is linked to the performance of the firm's shares that are listed in a foreign exchange. Thus, although ADRs are traded in U.S exchanges, they are not U.S common stocks. For this reason, all IPOs where ADRs were issued are eliminated from the final sample.
4	IPOs by firms issuing shares with an offering price of less than \$5.00	Firms issuing new shares with an offering price of less than \$5.00 are generally very small and financially instable. Thus, their shares are highly illiquid and speculative. The Penny Stock Reform Act of 1990, which was introduced to protect unsophisticated investors from high-risk investments, imposed many restrictions on IPOs with offering prices of less than \$5.00. As these restrictions may have an effect on how these shares are marketed, priced and sold, this category of IPOs was also not considered.

	IPOs eliminated by Firm Type	Reason for elimination
5	IPOs due to reverse leveraged buy-outs (LBOs)	<p>A leveraged buy-out (LBO) is an acquisition of one publicly traded company by another firm. Conversely, in a reverse LBO, the acquired company is sold to investors through an IPO, and its shares become publicly traded again. The offering price for new shares in an IPO of this type can be determined more accurately based on the firm's previous trading history and the market's perception of its financial position and business prospects before the LBO. This may consequently reduce first-day returns and narrow the final offering price-range. As the effects on first-day returns and the final offering price range may not be entirely attributable to the type of pricing and selling method used in IPOs due to reverse LBOs, this category of IPOs was not considered in the final sample.</p>
6	IPOs by firms that have been spun-off from parent companies	<p>In a spin-off, a new and independent company is created through the sale of shares of an existing business or division of a parent company. Although the new company's shares were not previously traded in the public markets, the offering price for the new shares can be more accurately determined by comparing the new company's prospects with that of the parent company whose shares are traded publicly. Thus, as with IPOs due to reverse LBOs, the ability of a bank to determine a more accurate price for the new shares will have an effect on first-day returns and the final offering price-range that is unrelated to the pricing and selling method used. IPOs due to spin-offs have not been included in the final sample for this reason.</p>

	IPOs eliminated by listings	Reason for Elimination
7	IPOs by firms whose shares were quoted and traded on pink-sheets or over-the-counter (OTC) immediately after the IPO.	<p>Over-the-counter stocks or those traded on pink-sheets are securities traded in some context other than on a traditional stock exchange. Issuers whose shares are initially quoted and traded on pink-sheets or over-the-counter are usually very small and financially unstable. Thus, they are unable to meet all the requirements for listing in a traditional stock-exchange. Furthermore, issuers who place their shares on the OTC market are not supervised by the SEC. This increases the potential for fraud. Subsequently, these factors make it difficult to obtain accurate IPO data for OTC securities or those trading on pink-sheets. Hence, only IPOs by firms whose shares were listed in a traditional U.S stock exchange were considered. More specifically, IPOs listed in the following stock exchanges were considered for this study.</p> <ol style="list-style-type: none"> 1. The New-York Stock Exchange (NYSE) 2. American Stock Exchange (Amex) 3. NASDAQ 4. The Boston Stock Exchange 5. The Cincinnati Stock Exchange (National Stock Exchange) 6. Midwest Stock Exchange (Chicago Stock Exchange) 7. The Pacific Exchange 8. Philadelphia Stock Exchange 9. Spokane Stock Exchange
8	Firms conducting secondary offerings	An issuer can only issue new stock in a secondary offering after its IPO has taken place. Thus, secondary offerings are not the first time that an issuer's shares are being priced and sold. Hence, all secondary offerings were eliminated from this study.

The following information was collected for all remaining IPOs in the initial list obtained from FactSet:

1. Name of the firm issuing the IPO
2. Ticker symbol registered by issuer during the IPO.
3. New ticker symbol (if any)
4. Date when the IPO was filed
5. Exchange in which the new shares were initially listed
6. SIC Code²²

The FactSet database was also used to gather the above data for the remaining IPOs.

All auction IPOs in the remaining sample were identified by examining financial press-releases and searching for completed IPO offerings in W.R Hambrecht's website²³. This list of auction IPOs was confirmed using auction data made available by Pukthuanthong, Varaiya and Walker (2005). In all, 17 auction IPOs were identified from this remaining sample²⁴. The small sample of auction IPOs is one of the major limitations of this study and is discussed more thoroughly in the matched methodology subsection on the next page. Finally, book-building IPOs in the remaining list were also selected according to this matched methodology.

²² The SIC (Standard Industrial Classification) code is a standard 3 or 4 digit number that is used by the Securities and Exchange Commission (SEC) to categorize business activities. This number will be used to differentiate between firms operating in different business sectors.

²³ W.R Hambrecht is a small investment bank that helped introduce IPO auctions to the United States and prices and sells IPOs exclusively through this process. Since 1999, nearly all auction IPOs in the United States have been managed by W.R Hambrecht. Thus, W.R Hambrecht's website may be considered to be a reliable source when assembling a list of auction IPOs that have taken place.

²⁴ Although, 18 auction IPOs have taken place in the United States to date, only 17 were identified in the remaining sample as one of the IPOs was from a Savings and Loan institution, Bofl Holdings Inc.

C. The Matched Methodology

A matched methodology is used to compare auction and book-building IPOs more fairly by selecting book-building IPOs that have similar characteristics to the auction ones. Details on this methodology are provided below.

Firstly, all auction IPOs are divided into groups after they have been identified from the remaining sample of IPOs. The auction IPOs are grouped according to the year in which they took place and the business sector that the IPO issuer operates in. Thus, auction IPOs that took place in the same year and whose issuers operate in the same business sector are grouped together. The IPO filing date is used to determine the year in which the auction IPO took place while the SIC code classifies the business sector that the issuer operated in at the time of the IPO. 16 unique groups were created in this manner with one group containing 2 auction IPOs and the remaining groups having just one. Appendix 2 presents the final list of auction IPOs that are considered in this study, separated by their individual groups²⁵.

Next, for each group of auction IPOs, a computer program was written to select all book-building IPOs in the remaining sample that were similar to this group of auction IPOs. A book-building IPO is considered similar if it took place in the same year or within 6 months before or after the auction IPO was held. Furthermore, an issuer using the book-building method must also operate in the same business sector as the auction issuer. Not many book-building matches were initially found for each group of auction IPOs according to the above criteria. Therefore, the second requirement was relaxed to include book-building IPOs by issuers who operated in business sectors which were

²⁵ 2 auction IPOs belonging to two different groups were eliminated from the final list of groups as no suitable book-building matches could be found for them. The auction IPOs eliminated are Ravenswood Winery and Fortunet Inc.

considered to be closely related to that of the auction issuer. Appendix 3 lists all the related business sectors that were considered for each group of auction IPOs.

In total, 146 book-building IPOs were selected in the above manner and placed across 14 different auction groups. The largest group had 1 auction IPO and 23 similar book-building IPOs, while the smallest group contained 1 auction IPO and just 3 other similar book-building IPOs. 2 groups were eliminated from this study as no suitable book-building matches could be found for the auction IPOs in these groups. Figure 1 below shows what percentage of auction and book-building IPOs in the final sample took place each year between 1999 and 2006 respectively.

Figure 1

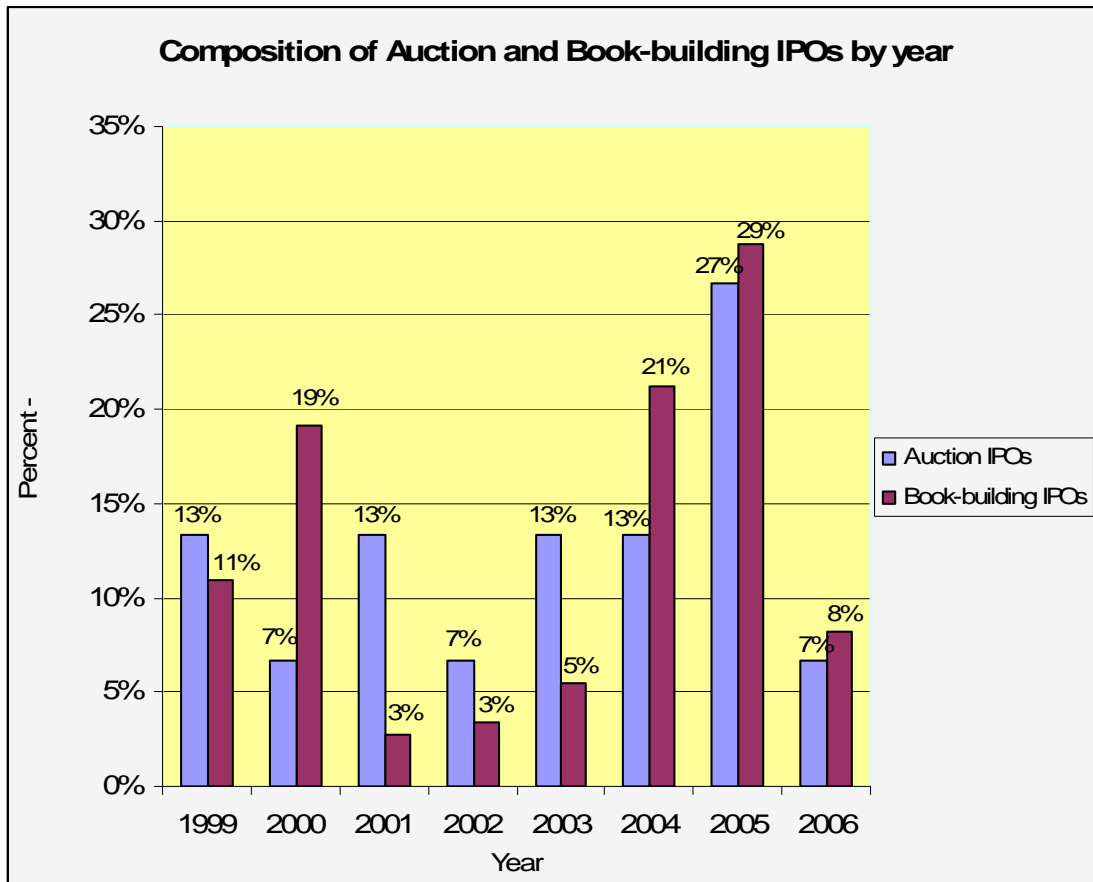


Figure 1 shows that the composition of auction IPOs by year is similar to that of the book-building sample. From these figures, one may infer that the matched methodology was reasonably successful in pairing all auction IPOs with book-building IPOs by time period.

Figures 2 and 3 on the next page highlight the composition of book-building and auction IPOs by business sector. However, as these figures show, the composition of auction IPOs by business sector is not as similar to that of the book-building sample. This might be the case because the final book-building sample includes issuers who operated in other business sectors which were considered similar to that of the auction issuer. Subsequently, as the selection of book-building IPOs by business sector for each auction group was more subjective, a different book-building sample may be obtained if another set of business sectors which are thought to be similar to that of the auction issuer are considered. The inability to obtain consistent data may be one possible weakness of this study.

Figure 2²⁶

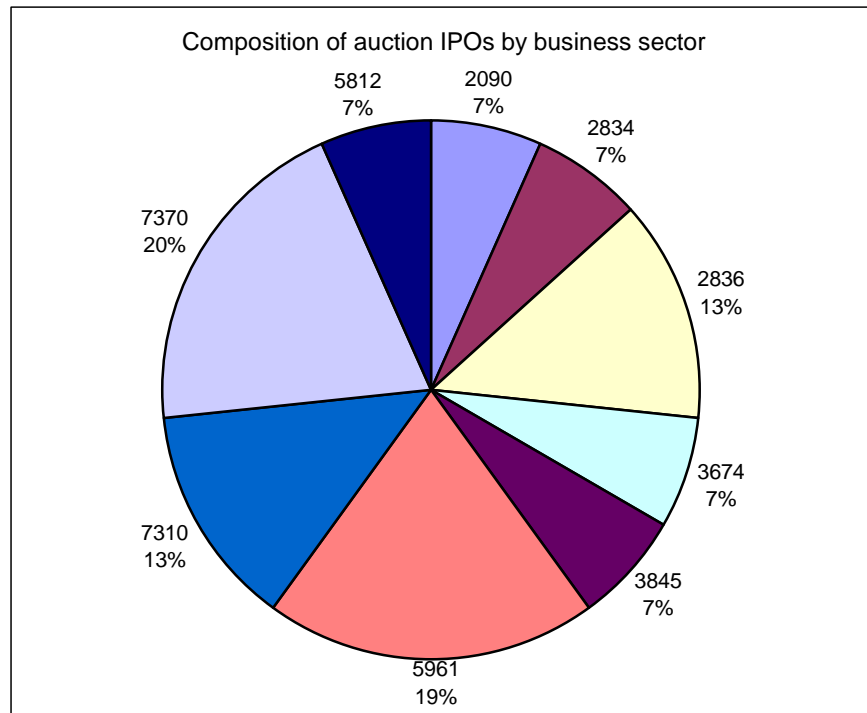
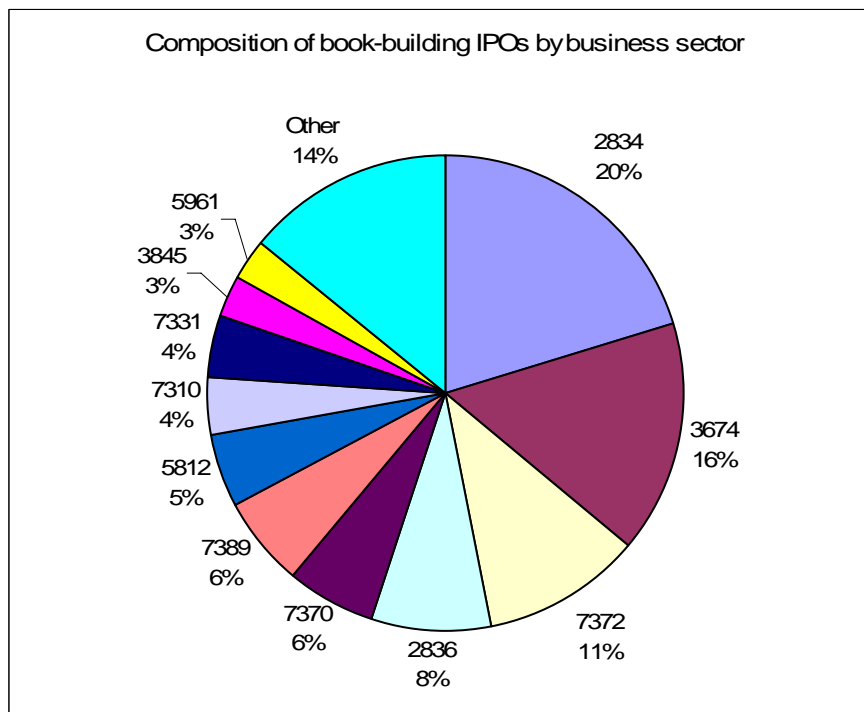


Figure 3



²⁶ The 4-digit labels in figures 2 and 3 are SIC Codes. A short table in appendix 1 lists the business sectors that the above SIC Codes in figures 2 and 3 represent. A full table of all SIC Codes and the business sector that each code represents can be found in <http://www.sec.gov/info/edgar/siccodes.htm>

Another weakness of this study is the small number of auction IPOs that were available for analysis. This can be attributed to the fact that to-date, only 18 IPOs have been priced and sold by the auction method in the U.S. The small number of auction IPOs prevents one from generalizing any characteristics or trends that may be observed when examining auction IPO data. Furthermore, the small auction sample also restricts one from using the matched methodology to control for other factors that may influence the effectiveness of the IPO pricing and selling method used. For example, the reputation of the investment bank promoting an IPO arguably has an effect on the quality of the advice received by the issuer. Subsequently, issuers who are advised by investment banks with higher reputations may have lower final offering price ranges and first-day returns. However, the small size of the auction sample and the fact that many of the auction IPOs have been priced and sold by the same investment bank, W.R Hambrecht, makes it difficult to also divide these IPOs by the reputation of the investment bank promoting them. These problems may perhaps be mitigated in the future when more IPOs in the U.S have been priced and sold using the auction method.

V. Data Analysis

As explained in section IV, first-day returns and the final offering price range for auction and book-building IPOs can be compared to determine which method, auctions or book-building, might be more effective in helping an issuer maximize proceeds received from the IPO, and minimize fluctuations in their share price immediately after the IPO.

Theorists like Sherman (2005) argue that since book-building is better at reducing the risk of under-subscription and at overcoming informational frictions between the issuer and investors, it may be more effective in helping an issuer meet its aims.

Subsequently, based on theory, one may expect book-building IPOs to have lower first-day returns and a narrower final offering price range than auction IPOs.

However, several empirical studies on international IPOs in the late 1980's and early 1990's have found both the mean and variance of under-pricing to be lower for auction IPOs than for book-building. As previously noted in the introduction, under-pricing occurs when investors who participate in the IPO experience positive first-day returns. Thus, these observations highlight that first-day returns for auction IPOs may in fact be lower than book-building ones. Furthermore, lower under-pricing in auction IPOs also suggests that auction issuers might have been more certain in setting a final offering price that matched the expectations of prospective investors. This could have only been possible if the final offering price range was narrower for auction IPOs than book-building ones. Using a matched methodology, are these results confirmed by more recent data from the U.S IPO market?

One could begin answering the above question by first studying the mean first-day returns for auction and book-building IPOs. Figure A1 on appendix 4 is a box-plot diagram which shows how first-day returns for individual book-building IPOs are distributed in each group. As the diagram shows, first-day returns for book-building IPOs range widely across all the groups. Table 2 on the next page summarizes the mean first-day returns for each group of auction IPOs and their matching book-building IPOs.

Table 2²⁷: Mean First Day Returns by group

	<i>Auction IPOs</i>	<i>Book-building IPOs</i>	<i>Difference in returns²⁸</i>	<i>t-statistic</i>	<i>p-value</i>
Group 1	123.66%	97.15%	-26.51%	0.294	0.7737
Group 2	-21.61%	62.17%	83.78%	-1.249	0.225
Group 3	17.19%	11.50%	-5.69%	0.308	0.7738
Group 4	0.37%	5.63%	5.25%	-0.384	0.727
Group 5	0.23%	14.09%	13.86%	-0.555	0.6083
Group 6	3.93%	0.35%	-3.57%	0.261	0.8185
Group 7	11.11%	8.31%	-2.80%	0.153	0.88
Group 8	-6.25%	8.08%	14.33%	-0.842	0.4108
Group 9	18.04%	24.12%	6.08%	-0.302	0.7678
Group 10	8.38%	9.09%	0.71%	-0.055	0.957
Group 11	-1.18%	11.89%	13.07%	-0.732	0.4782
Group 12	-9.62%	5.98%	15.60%	-0.801	0.4357
Group 13	2.50%	18.73%	16.23%	-1.238	0.2416
Group 14	1.25%	16.12%	14.87%	-0.833	0.4201

A glance at table 2 shows that the mean first-day returns for book-building IPOs is higher than that for auction IPOs in 10 of the 14 matched groups. In addition, the difference in returns is also economically significant (higher than 10%) in a large proportion of these groups. Thus, it seems that this initial analysis confirms results obtained by Degeorge, Derrien and Womack (2004) and others that auction IPOs generally exhibit lower under-pricing and hence, lower first-day returns than their book-building counterparts.

However, a closer look at the table reveals that the difference in mean first-day returns between the book-building and auction sample is not statistically significant in

²⁷ Highlighted rows signify groups where the mean first-day returns for the book-building sample is greater than the auction sample. Among the highlighted rows, the rows in bold signify groups where the difference in returns between the book-building and the auction sample is greater than 10% or economically significant.

²⁸ Difference in returns for each group is defined as the difference in mean first-day returns between the book-building and auction IPO samples.

any of the groups, including those which have been highlighted in table 2²⁹. Furthermore, the difference in returns between the book-building and auction samples are also not statistically significant across all the groups³⁰. Finally, in 4 of these highlighted groups, the mean first-day returns for auction IPOs are in fact negative with one of the groups, Group 12, containing an auction sample with a negative return that is greater in magnitude than the mean positive returns exhibited by the corresponding book-building matches.

Negative first-day returns occur when the price of the issuer's shares at the end of the first trading day after the IPO fall below what the shares were offered for during the IPO. These negative returns possibly indicate that the market for the issuer's shares is weak. As such, given a potentially weaker market for their shares, it is doubtful whether auction issuers from these 4 highlighted groups could have actually maximized the proceeds received from their IPOs. This is especially so, given the fact that in all of the groups where auction IPOs exhibited negative first-day returns, the book-building matches had mean positive returns which suggests that these issuers might have been more successful in maximizing proceeds received from their IPOs due to a stronger market for their shares. Consequently, the large proportion of highlighted groups in table 2 where the auction samples have a negative mean return, and the fact that differences in mean first-day returns are not statistically significant in any of the groups or across all the

²⁹ An unpaired two-sided two-sample t-test with equal variances was used to determine whether the difference in mean first-day returns between the book-building and auction samples in each group was statistically significant (had a p-value less than 0.0035). The two-sampled t-test used tests for the hypothesis that the difference in mean returns between book-building and auction IPOs in each group is 0%.

³⁰ This was determined by using a paired two-sided two-sample t-test with the 14 groups as observations. The mean first-day returns for the auction and book-building samples were paired for each of the 14 groups. The t-statistic obtained from this test was 1.601 and the corresponding p-value was 0.1332. This p-value (greater than 0.05) is large enough to reject the claim that the difference in returns across the groups is statistically significant.

groups indicate that auction issuers may not necessarily be better able to maximize proceeds received from the IPO.

Finally, first-day returns also explicitly measure the fluctuations in the issuer's share price immediately after the IPO. Although there are no groups in table 2 where differences in mean first-day returns between the auction and book-building sample are statistically significant, the difference in returns is economically significant (greater than 10%) in half the groups. Thus, there is some evidence that auction issuers can better minimize fluctuations in their share price after an IPO. However, their ability to do this is not significantly better or different from that of their book-building counterparts.

If first-day returns do not clearly indicate whether auctions have been more effective in helping IPO issuers achieve their aims, will examining the width of the final offering price range provide more conclusive evidence? Table 3 on the next page shows the mean width of the final offering price range for auction IPOs and their matching book-building IPOs in every group.

Table 3³¹: Mean final offering price range width by group

	<i>Auction IPOs</i>	<i>Book-building IPOs</i>
Group 1	\$3.00	\$1.88
Group 2	\$4.00	\$2.09
Group 3	\$4.00	\$1.80
Group 4	\$4.00	\$2.00
Group 5	\$4.00	\$1.80
Group 6	\$4.00	\$1.67
Group 7	\$4.00	\$2.00
Group 8	\$4.00	\$1.84
Group 9	\$27.00	\$1.69
Group 10	\$2.00	\$2.00
Group 11	\$2.00	\$1.85
Group 12	\$2.00	\$2.00
Group 13	\$4.00	\$1.92
Group 14	\$2.00	\$2.04

As shown by table 3, the width of the final offering price range is greater for auction IPOs in 11 of the 14 groups. Thus in general³², it appears that auction issuers face more uncertainty in determining a final offering price that would match the expectations of prospective investors. Subsequently, based on these results, one could argue that it should be more difficult for auction issuers to maximize proceeds received from the IPO as investors may be wary of submitting order bids that might raise the final offering price for the issuer's shares. Furthermore, the above observations also suggest that auction issuers should experience greater fluctuations in their share price immediately after the IPO as they are less certain about what their final offering price should be. However, this latter claim opposes the earlier observation that in a majority of the 14 groups, first-day returns for the auction sample are lower than that of their book-building matches

³¹ Highlighted rows indicate groups where the mean width of the final offering price range for auction IPOs is equal to or lower than the corresponding book-building sample.

³² No tests were done to determine if the difference in the mean width of the final offering price range for auction and book-building IPOs in each group was statistically significant. This is because in nearly every group, the book-building IPOs had identical or very similar price range widths which made it difficult to devise appropriate significance tests.

although the differences in these returns are not statistically significant in any of the groups.

This anomaly might be due to the greater probability of under-subscription in the auction method as hypothesized by Sherman (2005) and others. A greater probability of under-subscription may make it more difficult for an auction issuer and its investment bank to determine an offering price accurately. Subsequently on average, the final offering price range would have to be wider for the auction issuer to determine an offering price with the same level of confidence as a typical book-building issuer. However, one might expect issuers to desire a narrower final offering price range as this increases certainty in the IPO pricing and selling process and gives issuers a clearer indication of how much proceeds they can raise. To achieve a narrower final offering price range, Benveniste and Wilhelm (1997) and other theorists explain that issuers would have to obtain honest indications of interest from prospective investors. Indeed, the book-building method especially allows an investment bank to leverage its relationships with a select group of investors to obtain these indications of interest, which can then be used to narrow the final price range if necessary. In return for this information however, the issuer is expected to choose a final offering price within the price range that would enable these investors to obtain positive returns. Hence interestingly, it appears that book-building issuers may be willingly forgoing some proceeds from the IPO in order to obtain greater certainty when pricing the IPO. This may suggest why in the majority of the groups, book-building IPOs have higher first-day returns than auction IPOs although the final offering price range for book-building IPOs is narrower.

In summary, auction IPOs in many of the groups have lower mean first day returns and wider final offering price ranges than their matching book-building samples. However, no group exists where the difference in mean-first day returns between the auction and book-building sample is statistically significant. In addition, among the groups where the mean first-day return for the book-building sample is greater than the auction sample, there is a relatively large proportion of groups where the auction samples have a negative mean first-day return, even while the corresponding book-building samples have positive returns. These observations imply that the auction method might not necessarily be more effective in helping an issuer maximize proceeds from the IPO. This is corroborated by the observation that in many of the groups, auction IPOs have wider final offering price ranges which suggests that they might have received fewer bids from investors who may have been wary of raising the offer price through their bidding. The wider final offering price ranges also imply that auction issuers should experience greater fluctuations in their share price immediately after the IPO as they are less certain about what their final offering price should be. This reasoning is somewhat disputed given that in the majority of the groups in table 2, first-day returns for auction IPOs are less than their corresponding book-building matches. Furthermore, the difference in returns is also economically significant in half the groups. However, it weakens the evidence for the claim that auction issuers in general are better able to minimize fluctuations in their share price immediately after the IPO. This is especially the case as differences in first-day returns between auction and book-building IPOs are not statistically significant in any of the groups.

It is important to note that the small number of auction and book-building samples in each group restricts one from making broad generalizations about the data. However, it is possible that future studies using a larger data-set may find similar results.

VI. Conclusion

This paper set out to find which one of the two methods of pricing and selling IPOs, book-building or auctions are more effective in helping an issuer maximize the gross proceeds received from the IPO, and minimize fluctuations in their share price immediately after the IPO.

Theorists like Benveniste and Spindt (1989), Sherman (2005) and Wilhelm (2005) have argued that the book-building method should be better as it helps overcome informational frictions between the issuer and investors, reduces the risk of under-subscription which has been observed in numerous auction IPOs, and prevents ‘free-riders who have not carefully evaluated the IPO and have little understanding of its value from placing bids that are either too high or low. However, several empirical studies have found both the mean and variance of under-pricing to be lower for auction IPOs than for book-building. Their observations highlight that auction issuers may in fact be better able to maximize proceeds from the IPO. Furthermore, lower under-pricing also implies that the issuer’s share price may not fluctuate greatly after the IPO as first-day returns are significantly reduced. However, much of the data collected by these studies come from international share issues in the late 1980’s and early 1990’s and are hence relatively old. This paper used a more recent sample of U.S IPOs from January 1999 to June 2006. In addition, this paper also used a matched methodology to control for factors that might

have skewed the comparison of book-building and auction IPOs such as time and the industry of the firms in the IPO sample.

My findings suggest that the auction method might not necessarily be more effective in helping an issuer maximize proceeds from the IPO. Furthermore, my findings also weaken evidence for the claim that auction issuers are better able to minimize fluctuations in their share price immediately after the IPO.

However, this study has several limitations that may prevent one from decisively concluding the above. Firstly, because of the small number of auction IPOs that have taken place in the U.S, comparisons between book-building and auction IPOs using the matched methodology are less meaningful than those which might have been done for IPOs in international markets where auctions were more prevalent. Secondly, the small auction sample also restricts one from using the matched methodology to control for other factors which may skew the comparison between the two methods. For example, the size and reputation of the investment bank promoting an IPO may arguably have an effect on the quality of the advice received by the issuer. However, the small size of the auction sample and the fact that many of the auction IPOs in the U.S have been priced and sold by only one investment bank, W.R Hambrecht, makes it difficult to divide these IPOs by the reputation of the investment bank promoting them. Finally, issuers who chose the book-building method might have done so in the belief that they could obtain more certainty in raising a given amount of proceeds in exchange for setting a price that would enable prospective investors to realize first-day returns. Thus, there is a small chance that a self-selection problem may exist in this study. This might have led to the situation in tables 2 and 3 in section V where book-building IPOs in the majority of the groups have higher mean first-day returns and lower mean final offering price range

widths than the matching auction samples. However, most of these problems can be mitigated in the future when a larger sample of auction and book-building IPOs in the U.S is considered.

As one can observe, there is still some contention as to which method of pricing and selling IPOs, book-building or auctions might be best for the issuer. The present paper contributes to the debate by using a different methodology to study more recent IPO data. However, various limitations in this study restrict one from making broad conclusions. While seeking a more definitive answer to the above question, it would also be interesting for future studies to consider whether other ways of pricing and selling IPOs might be better for an issuer. For instance, might a combination of book-building and auction methods be better in helping issuers meet their goals? Although not yet popular, this hybrid method has been used in Chile for the past few years (due to regulations requiring IPO issuers to have an auction component) and even in the U.S³³. It may gain more ground as investment banks seek ways of modifying the existing book-building method. Given the potential for hybrid methods to become popular, how might one optimally combine auctions and book-building in a hybrid setting? Will information received from promoting shares using one method affect how the shares might be sold in another method? These are just some of the questions that future theoretical and empirical papers might wish to consider when studying hybrid methods of pricing and selling IPOs. Findings from these papers will greatly influence how firms approach an important point in their life-cycles; the raising of capital through an IPO.

³³ Instinet Group, a securities broker, is one example of an issuer in the U.S who decided to use the hybrid method to price and sell its IPO. 17.5% of Instinet's shares were sold in an auction while the remaining shares were sold using the book-building process.

References

Ann E.Sherman. (2005). Global Trends in IPO Methods: Book Building versus auctions with endogenous entry. *Journal of Financial Economics* 78, 615-649

Degeorge F. Derrien, & Womack, K. (2004). Quid pro quo in IPOs: why book-building is dominating auctions. *Working Paper*

Jay R. Ritter, & Ivo Welch. (2002). A Review of IPO Activity, Pricing and Allocations. *The Journal of Finance* Vol LVII, No 4, 1795-1828

Kuntara Pukthuanthong, Nikhil P.Varaiya, & Thomas J.Walker. (2005). Book Building versus Auction Selling Methods: A study of US IPOs. *Working Paper*

Lawrence M. Benveniste, & Paul.A.Spindt. (1989). How Investment Bankers determine the Offering price and Allocation of new issues. *Journal of Financial Economics* 24, 343-361

Lawrence M. Benveniste, & William J.Wilhelm. (1997). Initial Public Offerings: Going by the Book. *Journal of Applied Corporate Finance* 10, No 1, 98-108

Michelle Lowry, & Susan Shu. (2002). Litigation risk and IPO underpricing. *Journal of Financial Economics* 65, 309-335

Nayantara Hensel. (2005). Efficiency in IPO Issuance Processes? *Business Economics* 55-66

Philip D.Drake, & Michael R.Vestuypens. (1993). IPO underpricing and insurance against legal liability. *Financial Management* Vol 22, Issue 1.

Ravi Jagannathan, & Ann E.Sherman. (2006). Why do IPO Auctions fail? *National Bureau of Economic Research (NBER) Working Paper* 12151

William J.Wilhelm. (2005). Bookbuilding, Auctions and the future of the IPO Process. *Journal of Applied Corporate Finance* 17, No 1, 2-13

Xinfeng Hu. (2006). Efficiency of IPO Offering techniques: Semi-theoretical Framework and Empirical Results for US and Chinese New Issues. *Duke Journal of Economics* Vol XVIII.

Appendix 1: List³⁴ of SIC codes used and their business sector description

SIC Code	Business sector description
2090	Miscellaneous Food Preparations and Kindred Products
2834	Pharmaceutical Preparations
2836	Biological Products, (No Diagnostic Substances)
3674	Semiconductors and Related Devices
3845	Electro-medical & Electrotherapeutic Apparatus
5812	Retail-Eating Places
5961	Retail-Catalog and Mail-Order Houses
7310	Services-Advertising
7331	Services-Direct Mail Advertising Services
7370	Services-Computer Programming, Data Processing, Etc.
7372	Services-Prepackaged Software
7389	Services-Business Services, NEC

³⁴ A full list of SIC Codes and their corresponding business sectors can be found at <http://www.sec.gov/info/edgar/siccodes.htm>

Appendix 2: Final list of Auction IPOs separated into groups

Group	Auction Issuer Name	SIC Code	Business Sector Description ³⁵	Date of IPO	Offering price per Share	Number of Book-building matches
1	Salon.com	7310	Services-Advertising	6/22/1999	\$10.50	20
	Andover.net	7310	Services-Advertising	12/8/1999	\$18.00	
2	Nogatech Inc	3674	Semiconductors and Related Devices	10/18/2000	\$12.00	23
3	Peet's Coffee & Tea Inc	2090	Miscellaneous Food Preparations & Kindred Products	1/25/2001	\$8.000	5
4	Briazz Inc	5812	Retail-Eating Places	5/2/2001	\$8.00	4
5	Overstock.com Inc	5961	Retail-Catalog and Mail Order Houses	5/30/2002	\$13.00	5
6	RedEnvelope Inc	5961	Retail-Catalog and Mail Order Houses	9/25/2003	\$14.00	3
7	Genitope Corp	2836	Biological Products (No Diagnostic Substances)	10/30/2003	\$9.00	18
8	New River Pharmaceuticals	2834	Pharmaceutical Preparations	8/5/2004	\$8.00	19
9	Google Inc	7370	Services-Computer Programming, Data Processing etc	8/19/2004	\$85.00	13
10	Morningstar Inc	7370	Services-Computer Programming, Data Processing etc	5/3/2005	\$18.50	11
11	Cryocor Inc	3845	Electro-medical and Electrotherapeutic Apparatus	7/14/2005	\$11.00	13
12	Avalon Pharmaceuticals	2836	Biological Products (No Diagnostic Substances)	9/29/2005	\$10.50	16
13	Dover Saddlery Inc	5961	Retail-Catalog and Mail Order Houses	11/18/2005	\$10.00	12
14	Traffic.com Inc	7370	Services-Computer Programming, Data Processing etc	1/25/2006	\$12.00	14

³⁵ Describes the business sector represented by the SIC Code as classified by the SEC.

Appendix 3: List of related business sectors considered for each group of auction IPOs

Group	Related Business sectors considered	SIC Code for business sector	Number of Book-building matches for each business sector ³⁶
1	Services-Advertising	7310	6
	Services-Direct Mail Advertising Services	7331	6
	Services-Business Services	7389	8
2	Semiconductors and related devices	3674	23
3	Food and kindred Products	2000	1
	Retail-Eating Places	5812	4
4	Food and kindred Products	2000	1
	Retail-Eating Places	5812	3
5	Wholesale-Computers and Peripheral Equipment & Software	5045	1
	Retail-Women's Clothing Stores	5621	1
	Retail-Miscellaneous Shopping Goods Stores	5940	2
	Retail-Retail Stores	5990	1
6	Retail-Shoe Stores	5661	1
	Retail-Radio, TV and Electronics Stores	5731	1
	Retail-Catalog and Mail Order Stores	5961	1
7	Pharmaceutical Preparations	2834	17
	Biological Products (No Diagnostic Substances)	2836	1
8	Pharmaceutical Preparations	2834	19
9	Services-Computer Programming, Data Processing etc	7370	4
	Services-Computer Programming Services	7371	1
	Services-Prepackaged Software	7372	8
10	Services-Computer Programming, Data Processing etc	7370	5
	Services-Prepackaged Software	7372	6
	Services-Computer Processing and Data Preparation	7374	1

³⁶This is the final number of book-building matches for each group of auction IPOs.

11	Biological Products (No Diagnostic Substances)	2836	6
	Surgical and Medical Instruments and Apparatus	3841	3
	Electro-medical and Electrotherapeutic devices	3845	4
12	Pharmaceutical Preparations	2834	6
	Biological Products (No Diagnostic Substances)	2836	10
13	Retail-Family Clothing Stores	5651	2
	Retail-Shoe Stores	5661	1
	Retail-Eating Places	5812	3
	Retail-Miscellaneous Retail	5900	1
	Retail-Miscellaneous Shopping Goods Stores	5940	1
	Retail-Catalog and Mail Order Stores	5961	3
	Retail-Retail Stores	5990	1
14	Services-Computer Programming, Data Processing etc	7370	4
	Services-Prepackaged Software	7372	7
	Services-Computer Processing and Data Preparation	7374	3

Appendix 4

Figure A1

Distribution of first-day returns for book-building IPOs by group

