

# Manipulative Behavior in Auction IPOs

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## Abstract

Book-building, the prevailing method for initial public offerings (IPOs), is widely considered flawed, because it results in stock under-pricing. Auction-IPO, on the other hand, is considered, by conventional wisdom, an alternative method that will eliminate the under-pricing. This paper shows how, contrary to customary belief, auction-IPOs may well result in under-pricing. In auction-IPOs, the under-pricing of the stock price is induced by undetected investors' manipulative strategic behavior. I analyze the requirements for such strategic behavior in a linear model. To reduce investors' incentive to manipulate their bid in the auction, this paper proposes to restrict auction participants from trading in the aftermarket immediately following the IPO.

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## I. Introduction

Becoming a publicly traded company entails numerous benefits for a company, ranging from the actual receipt of capital to increased prestige.<sup>1</sup> In general, initial public offerings (IPOs) play a major role in corporate finance and enable economic growth.<sup>2</sup> The dominant method by which a company becomes public in the U.S. is the book-building method. This method is administered by underwriters who have the discretion to choose the share price and allocate the offered shares.<sup>3</sup>

Underwriters have been severely criticized for abusing the book-building method to extract benefits indirectly for themselves. By underpricing the share price in the public offering – a common custom especially during the hot technology bubble – the underwriters were able to use their power to choose who may purchase the under-priced shares and thus were allegedly able to further their own benefits. Underpricing of the shares, however, reduces the proceeds the issuer receives from the public offering.<sup>4</sup>

The Dutch auction is an alternative method for a company to become public. Under this method, the company conducts an auction for its shares,

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<sup>1</sup> See Thomas Lee Hazen, *The Law of Securities Regulation*, (3<sup>rd</sup> ed. 1996) at § 1.6; and *infra* note 9, and accompanying text.

<sup>2</sup> See the NYSE/NASD IPO Advisory Committee, Report and Recommendations of a committee convened by the New York Stock Exchange Inc. and NASD at the request of the U.S. Securities and Exchange Commission, May 2003 (the “**Report**”); *infra* note 8, and accompanying text.

<sup>3</sup> See Francesca Cornelli & David Goldreich, *Bookbuilding and Strategic Allocation*, 56 J. OF FIN. 2337 (2001); *infra* note 10, and accompanying text.

<sup>4</sup> See, e.g., Stephen Choi & Adam Pritchard, *Should Issuers be on the Hook for Laddering? An Empirical Analysis of the IPO Market Manipulative Litigation*, 73 U. CIN. L. REV. 179; *infra* note 18 and accompanying text.

and the price is set at the level of the lowest successful bid. According to the conventional wisdom, public offering conducted in the form of a non-discriminatory Dutch auction, rather than the book-building method, maximizes the proceeds the issuer receives from the offering. This is based on the common belief that the price reached in the auction reflects the market-price for the share.<sup>5</sup> However, some of the companies that did use the auction method for their public offering in the U.S. were significantly under-priced. These companies experienced share price increase of more than 100% in the market, in the first days immediately following the offering.<sup>6</sup>

This paper explores the ability of investors to influence the auction IPO price by manipulating their bid strategically. The paper provides a model that shows how some investors, by lowering the amount of shares they ask to purchase in the auction, can maximize their profits from the bid and – contrary to the conventional wisdom – cause under-pricing. Unlike the book-building method, the price increase of the share in the market following an auction IPO, triggered by investors increasing their holdings, though, may take longer than a couple of days because of the investors’ efforts to avoid excessive price pressure.

Even if a public auction is conducted in the form of a non-discriminatory Dutch auction, under-pricing may well occur under certain scenarios detailed in the model shown in this paper. Thus, forcing the market to abandon the book-building method completely and leaving the issuers

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<sup>5</sup> See *infra* notes 21-22 and accompanying text.

<sup>6</sup> See, e.g., Laura S. Unger, *Raising Capital on the Internet*, 69 U. CIN. L. REV. 1205 (2001), *infra* note 26, and accompanying text.

with only the auction method, as has been suggested,<sup>7</sup> is likely to be inefficient.

Furthermore, an investor who lowers the amount she offers to purchase in her bid does not only gain from the resulting lowered auction price, but also has nothing to lose from her actions, as long as she is able to purchase the additional shares in the aftermarket for no more than the market price. Thus, this paper proposes to restrict investors who participate in the auction from purchasing more shares in the market in the period immediately following the IPO. This restriction will help deter some investors from using the strategy to lower the auction IPO price.

However, the model shows that even without the ability to purchase shares in the aftermarket, the strategy is still profitable for certain investors under certain conditions analyzed in the model. It is further argued that this behavior – of lowering the amount of the bid without purchasing additional shares in the aftermarket – is almost impossible to detect. Hence, regulatory measures cannot effectively eliminate this strategic, manipulative behavior and the resulting under-pricing, but can only reduce them.

The remainder of this paper proceeds as follows. Part II provides a brief description of the importance of the initial public offering mechanism. It describes the two initial public offering methods. The first Section discusses the book-building method. The second Section describes the auction IPO method. Part III discusses under-pricing in IPOs. It begins by reviewing the practice of setting the low price in book-building IPOs. It then describes the conventional wisdom regarding the ability of the auction IPO to eliminate under-pricing and ends by presenting evidence to the contrary. Part IV develops the model for strategic, manipulative bidding and shows how

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<sup>7</sup> See *infra* note 36 and accompanying text.

strategic bidding may cause under-pricing in a Dutch auction-IPO. Part V discusses possible regulatory measures to avoid under-pricing in auction IPO, and reaches the conclusion that such measures are required but cannot suffice, due to the undetectable nature of the strategic bidding. Part VI concludes.

## II. The IPO Mechanism

The initial public offering (IPO) is the process in which a company offers its shares to the public and becomes a public company. Raising capital through IPO plays an important role in corporate finance and enables economic growth. Indeed, in the past decade, over \$500 billion were raised through IPOs in the U.S. markets.<sup>8</sup>

Among the major advantages of creating a public market for the securities is the access to substantial amounts of capital that it provides. The company may not be able to raise sufficient amount of funds through other forms of financing, such as debt or private equity. The IPO does not only help the operation of the company by supplying funds, it also increases the shareholders' liquidity. This allows the shareholders to realize the gain on their investment. Going public also enhances the company's publicity. And being public increases the company's prestige in the eyes of its customers and suppliers.<sup>9</sup>

In the following Sections, I will discuss two methods a company may choose in order to sell its shares to the public. The first method, the book-

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<sup>8</sup> See the NYSE/NASD IPO Advisory Committee, Report and Recommendations of a committee convened by the New York Stock Exchange Inc. and NASD at the request of the U.S. Securities and Exchange Commission, May 2003 (the "**Report**") at p 1.

<sup>9</sup> See Thomas Lee Hazen, *Treatise on the Law of Securities Regulation*, (3<sup>rd</sup> ed. 1996) at § 1.6.

building method has been used by the vast majority of companies that went public in the U.S. The auction method, on the other hand, has enjoyed less popularity among U.S. companies going public.

#### *A. The Book Building Method*

Book-building is the prevailing method in the U.S. for setting the IPO price. Under this method, as part of the marketing process of the offering, the lead underwriters of the offering learn from potential investors - usually institutional investors - how many shares the investors are tentatively interested to purchase in the IPO and at what price. The IPO offering price is set by the underwriters, at their sole discretion, before the actual offering takes place.<sup>10</sup>

#### *B. The Auction Method*

Auction-bidding has been proposed as an alternative IPO method to replace book-building for at least two decades.<sup>11</sup> With progress in technology and, especially, with the internet revolution, a few online public auctions have actually been conducted instead of the customary book-building IPOs.<sup>12</sup>

The auction method, however, lacks the support of the major investor bankers that usually serve as underwriters.<sup>13</sup> Most issuers had preferred to

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<sup>10</sup> See, e.g., Francesca Cornelli & David Goldreich, *Bookbuilding and Strategic Allocation*, 56 J. OF FIN. 2337 (2001).

<sup>11</sup> See Note: *Auctioning New Issues of Corporate Securities*, 71 VA. L. REV. 1381 (1985).

<sup>12</sup> Most notably, the financing firm WR Hambrecht + Co has been specializing in using the auction process through the internet for what it calls Open IPO's, See <<http://www.wrhambrecht.com>>. See also Laura S. Unger, *Raising Capital on the Internet*, 69 U. CIN. L. REV. 1205 (2001).

use the services of a renowned underwriter, since they could rely on its marketing services and expected to have favorable reviews from the analysts who worked for the investor-banker that served as their lead underwriter.<sup>14</sup>

Google Inc., nonetheless, is certainly a company that is not in need of underwriters' marketing services in order to raise interest in its operation and induce offers for its shares.<sup>15</sup> Thus, Google is an exceptional example for a company that used an auction process to sell its shares to the public.<sup>16</sup>

Under the auction IPO method, the underwriters administer auction biddings for the company's shares. The auction participants are not restricted to the selected group of chosen investors who are favored by the underwriters as the auction is open to the public. Each participant's offer is comprised of the amount that the investor wishes to purchase in the IPO and the maximum price such investor is willing to pay for it. The underwriter aggregates all of the received bids and sets the offer price in a non-discriminatory Dutch auction – at the highest level that permits the sale of the entire amount of

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<sup>13</sup> See Christine Hurt, *Moral Hazard and the Initial Public Offering*, 26 CARDOZO L. REV. 711, at [p 52].

<sup>14</sup> See the Report, *supra* note 8, at p 2 (“With their compensation and promotion tied to the success of their firms’ investment business, some research analysts apparently agreed to issue and maintain “buy” recommendations on certain stocks despite aftermarket prices that jumped to multiples of their IPO prices.”)

<sup>15</sup> See Christine Hurt, *supra* note 13, at p 56.

<sup>16</sup> See Google Inc., Form S-1 Registration Statement, as filed with the Securities and Exchange Commission on April 29, 2004, <<http://www.sec.gov/Archives/edgar/data/1288776/000119312504073639/ds1.htm>> at p 25: (“The auction process being used for our initial public offering differs from methods that have been traditionally used in most other underwritten initial public offerings in the United States. In particular, the initial public offering price and the allocation of shares will be determined primarily by an auction conducted by our underwriters on our behalf.”)

shares offered by the company. Thus, the IPO price is set at the level of the lowest successful bidder.

### III. Under-pricing

In the previous Part, we have seen the importance of going public and the two methods that a company can use to sell its shares in a public offering. As we have seen, these two methods significantly differ in the way that the price of the stock sold in the IPO is set. In this Part, we will consider the under-pricing phenomenon – the practice of setting the IPO price below the value of the stock. The first Section reviews under-pricing when the book-building method is used. The second Section presents the conventional wisdom concerning auction IPOs and under-pricing. The following Part challenges this conventional wisdom.

#### A. *Book-building and the resulting Under-pricing*

Significant increase in the stock price in the first days following the IPO is common in book-building IPOs. The IPO offering price is usually much lower than the price of the shares that is set by the market immediately following the IPO.<sup>17</sup> To be sure, the under-pricing of the IPO price directly lowers the proceeds that the issuer receives from the offering and constitutes a loss. In the IPO, the issuer receives for the shares a price that is lower than

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<sup>17</sup> See, e.g., Roger Ibbotson, *Price Performance of Common Stock New Issues*, 2 J. FIN. ECON. 235 (1975).

the market price at which the shares are traded in the aftermarket on the following day.<sup>18</sup>

The under-pricing, however, creates “a pool of instant profits for underwriters to distribute.”<sup>19</sup> This is because the underwriters decide which investor will receive the shares for the low IPO price. In fact, it is widely believed that the underwriters did not only use the opportunity to benefit from the under-pricing (by extracting benefits from those investors who received under-priced shares) but actually deliberately created the opportunity by intentionally pricing offerings well below the market price.<sup>20</sup>

#### *B. Auction IPO and Under-pricing – the Conventional Wisdom*

The proponents of the auction IPO method support it mainly because of the conventional-wisdom belief that a nondiscriminatory Dutch auction will eliminate the under-pricing of the IPO shares.<sup>21</sup> As one auction expert

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<sup>18</sup> See Stephen Choi & Adam Pritchard, *Should Issuers be on the Hook for Laddering? An Empirical Analysis of the IPO Market Manipulative Litigation*, 73 U. CIN. L. REV. 179, [184].

<sup>19</sup> See the Report, *supra* note 8.

<sup>20</sup> See, e.g., Choi & Pritchard, at [p 4-5]; the NYSE/NASD Report, *supra* note 8, at p 1; and Matt Marshall, *Opening Up the IPO to Smaller Investors - Concept Catching the Interest of Bay Area Tech Companies*, Mercury News, Sep. 22, 2003 <<http://www.siliconvalley.com/mld/siliconvalley/6832656.htm>> (visited July 2004).

<sup>21</sup> See, e.g., the Note (1985), *supra* note 11, at 1385; Laura Unger (2001), *supra* note 6, at 1207-8; the Report, *supra* note 8, at p 9: (“IPOs conducted through a true auction model should not experience the enormous aftermarket price spikes that fueled the abuses of the bubble period. The final IPO price in an auction represents, or is at least close to, the maximum price that the market is willing to pay for the issuer’s security.”); Christine Hurt, *supra* note 13, at 64 (“If IPO shares were distributed anonymously at an auction

was cited saying: "You should be relatively indifferent about winning or losing the I.P.O. auction, because ... you will have the option to buy at essentially the same price the next day."<sup>22</sup>

According to the conventional wisdom, each bidder in an auction-IPO, will set its bidding price at the level at which it values the share, and the amount it will offer to buy will reflect the amount it can afford to buy (given its liquidity constraints and diversification opportunities).<sup>23</sup> In an auction-IPO, the company expects to discover the market's demand-curve for the stock, and set the IPO price at the equilibrium, i.e., the highest price that permits the sale of the entire amount offered.<sup>24</sup> The outcome of choosing the equilibrium price as the IPO price is that there will be no bidders in the market that value

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price, then the unfair practices would disappear. The issuer would receive the maximum amount the market will bear for its equity shares."); Choi & Pritchard, *supra* note 18, at footnote 13; and Google's Registration Statement, *supra* note 16, at p iv-v: ("It is also crucial that we achieve a good outcome for Google and its current shareholders. This has led us to pursue an auction-based IPO for our entire offering. Our goal is to have a share price that reflects a fair market valuation of Google... to achieve a relatively stable price in the days following the IPO and that buyers and sellers receive a fair price at the IPO." )

<sup>22</sup> See Saul Hansell, *For Google, Going Dutch Has Its Rewards and Its Risks*, the New York Times, (May 10, 2004): (quoting professor Lawrence M. Ausubel, an auction expert.)

<sup>23</sup> It may be that a person who values the stock at a certain price and calculates how many shares she can afford to buy based on her liquidity constraints, may wish to buy more shares in the event that the purchase price of the share will be much lower than her valuation of the share, as she will be able to afford it. In such case, the person is likely to split her bid and basically place multiple bids for different price ranges, and offer to buy, for example, 100 shares for up to \$100 each and an extra 50 shares for up to \$50 each.

<sup>24</sup> See Google's Registration Statement, *supra* note 16, at p 27 ("As part of this auction process, we are attempting to assess the market demand for our Class A common stock and to set the size of the offering and the initial public offering price to meet that demand. Buyers hoping to capture profits shortly after our Class A common stock begins trading may be disappointed.")

the company's stock for more than the IPO price who did not buy in the IPO. This is because, bidders who did not succeed in the IPO, gave a lower bid for the stock, and value the stock for less than the IPO price. Thus, at the end of the day, people who own the company's stock value it at least as high as the IPO price. People who do not own the stock - the potential buyers of the stock - value the stock at a lower price than the IPO price.

Absent new information in the market and unforeseen liquidity needs of the shareholders, shares will not trade hands immediately following the IPO. As opposed to the customary underwriters' book-building system, the IPO price will remain the stock price in the market. The company will, under these assumptions, maximize its proceeds from the IPO, because it will sell its shares for the market price and not below.<sup>25</sup>

To illustrate this, let us look at a simple numerical example. Suppose there are 3 players in the market: A, B, and C. A values the company's stock at \$100 per share and wishes to buy 10 shares. B values the stock at \$75, and for up to that price, she wishes to buy 10 shares as well. C, on the other hand, values the shares at only \$50 and is interested in buying 10 shares for no more than \$50 a share. Let us assume the company plans to sell 20 shares in the public offering. If it sets the IPO price at \$75, both A and B successfully bid for 10 shares each. C's bid does not succeed. However, since both A and B value the share for more than C does, no share will transfer hands immediately in the days following the IPO. This is because the people who value the shares for more will already own them and will not be willing to sell for less than what they perceive as the share's value.

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<sup>25</sup> See, e.g., Laura Unger (2001), *supra* note 6, at 1207-8 ("In theory, by more accurately gauging market demand, the auction process should result in the maximum amount of offering proceeds for the company")

The evidence, however, tells a more complex story. One can learn from the few auction offerings that did take place in the U.S. in the last years that the auction method cannot ensure that no significant fluctuations in the stock price following the IPO will occur. In fact, some of the companies that did use the auction method for their public offering experienced share price increase in the market of more than 100% in the days immediately after the offering.<sup>26</sup>

The following Part provides a model that explains this counterintuitive result, and shows why and when auction IPOs can result in significant underpricing of the IPO stock price.

### **III. Investors' Manipulative Strategy – Under-pricing in Auction-IPOs**

In the previous Part, we have seen why auction-IPO is commonly expected to eliminate under-pricing in public offering. In this Part, I present a strategy that can be used by investors in an auction-IPO to decrease the auction price. The first Section illustrates the method and describes the potential under-pricing in auction IPOs. The second Section develops a linear model that generally analyzes the under-bidding strategy and its results.

#### *A. The Under-bidding Strategy*

A rational bidder wishes to maximize the value of its assets. Buying stock at or below the value a bidder assigns to the purchased stock is a

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<sup>26</sup> See Saul Hansell, *For Google, Going Dutch Has Its Rewards and Its Risks*, the New York Times, (May 10, 2004); and Laura Unger (2001), *supra* note 6, at 1207-8.

profitable strategy which increases the wealth for the bidder. If the bidder can manipulate the IPO price and lower it, she can increase the value of her assets.

The bidder does not have to bid for as many shares as she can afford at the price that she values the share. Instead, the bidder can bid for a different amount and/or a different price. Each of the possible changes in the way the bidder bids can have a different outcome, as we shall now see.

Changing the price for which the bidder offers to buy the shares, either lowering or raising it, not only increases the bidder's risk, but also is likely not to provide the desired outcome of increasing the bidder's profits.<sup>27</sup> If the bidder raises the price she offers, she exposes herself to a risk that she might have to pay the higher price for shares she values for less. In addition, if the IPO price is set at or below the price that the bidder believes represents the true value of the shares for her, raising the offering price does not change the outcome of the auction. This is because in a nondiscriminatory Dutch auction the price is set at the level of the lowest successful bidder. Thus, increasing the offering price above the true value of the share is not an optimal strategy.

If the bidder, on the other hand, lowers the price that she offers for the shares, she exposes herself to the risk that her bid might be too low. Although the IPO price will be set below her true value of the shares, she might not succeed in participating in the bid, because her bid will be below the IPO price. On the other hand, the new lowered price the bidder may choose to offer can still be too high to change the IPO price, because it might be above the IPO price.

Only in the case where the bidder can predict the IPO price precisely will she be able to lower the IPO price by setting her bid at a price just below the IPO price that would have prevailed without this manipulation.

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<sup>27</sup> See the Note (1985), *supra* note 11, at 1391.

Otherwise, other bidders may take her place in the offer and leave her in the losing group of bidders. Reducing the bidding price is a very risky strategy and is likely to turn unprofitable.

Similarly, increasing the amount of shares the bidder offers to purchase in the IPO is unlikely to have favorable results. It is, though, likely to decrease the bidder's profits from the bidding. A bidder who offers to buy more shares might be forced to buy the excess shares.<sup>28</sup>

However, under certain scenarios, mathematically shown in Section B, a rational bidder will profit from lowering the amount of shares she offers to buy in the IPO. By lowering that amount, the auction price will be driven downward. A lower IPO price directly increases the value of the bidder. On the other hand, the decrease in shares bought at the IPO decreases the value of the bidder. The lower price and the decrease of the purchased amount are two opposing forces. Under certain circumstances, this strategy of lowering the amount a bidder offers is a preferred strategy that increases the aggregate value of the bidder's assets.<sup>29</sup>

As a result of bidders strategically lowering the amount they offers to purchase in the auction IPO, the company will not see the real demand curve

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<sup>28</sup> It is noteworthy that Google, in its registration statement, stated that it reserves the right to choose *not* to allocate the issued shares pro-rata among the successful bidders but rather it may choose to use a maximum share allocation method on a tiered basis (such a method sets the maximum amount that a bidder may receive and grants some bidders their entire bid and others a lesser amount but no less than 80% of the bid). In order to avoid manipulative over-bidding the company specifically reserved the right to reject "inappropriately large bids" all together. See Google's registration statement *supra* note 16.

<sup>29</sup> To be sure, if the investor wishes to obtain a large enough block of shares in order to gain a control-block, lowering the amount is counterproductive. However, the IPO process usually does not permit the purchase of a control-block. Google, for example, specifically stated in its registration statement, that it retains the right not to include in the auction any bids that seem manipulatively too large, see Google's registration statement *supra* note 16.

for its shares. Rather, the company will see a curve that is shifted towards the axes – for a given price the amount the bidders are willing to buy is lower. The IPO price will be set at a lower price than equilibrium, the highest price that the purchasers are willing to pay for the stock sold. This will allow trade in the stock in the day after the IPO. Following the IPO, bidders who value the stock for more than the IPO price but did not purchase their optimal amount, because they have applied the strategy, will buy shares in the aftermarket. This trading in the stock will cause the market price to rise.

To illustrate how the strategy works, let us first look at a simple numeric example with 4 bidders. The value that each bidder assigns to the company's shares and the corresponding amount are listed in the table below.

A Numeric Example with 4 Bidders:

Bidder	Price/value per share (P)	Quantity (Q)
A	\$100	10
B	\$75	10
C	\$50	10
D	\$25	10

Let us assume that the company wishes to sell 20 shares. Bidder A and Bidder B offer the highest prices for the shares, \$100 and \$75 respectively, and together are willing to buy the entire amount of shares offered by the company. Thus, without strategic manipulation the IPO auction price will be  $P_{IPO} = \$75$ , the lowest price of the successful bids. We can calculate Bidder A's profit, under these assumptions, by subtracting the value she assigns to the shares bought and the purchase price:  $(100 - 75) \times 10 = \$250$ .

Now let us assume that bidder A employs the manipulative strategy, and lowers the amounts she asks for in the auction. Suppose Bidder A now bids  $P = \$100$  and  $Q = 9$ . Given the manipulative bid, the new IPO price will be  $P_i = \$50$ , the highest price that enables the company to sell all of the 20 offered shares. Bidder A's new strategic profit is  $(100 - 50) \times 9 = \$450$ , an increase of \$200 in comparison to the profit without the manipulation.<sup>30</sup>

Even if the company allocates the shares to all bidders who have offered to buy at or above  $P_i$ , pro-rata, rather than allowing the lower successful bidder (Bidder C) to buy only the amount of shares left after the higher bidders (Bidders A & B) receive their full amount, we can see that our bidder A still profits. In this example, a pro-rata allocation of the shares to the bidders means that each bidder will receive approximately  $\frac{2}{3}$  of her bid, which is the ratio of the issued shares (20) and the total successful bids (30). Bidder A's profit, under this assumption, will be  $(100 - 50) \times 9 \times \frac{2}{3} = \$300$  which reflects a profit of \$50, deriving from the strategy. Furthermore, one can see that if bidder B employs the strategy, instead of Bidder A, her profits will be even higher.<sup>31</sup>

It should be noted that the calculation above does not take into account the bidders' profits from purchasing shares in the aftermarket, immediately following the IPO, to compensate for decreasing the amount they asked for in

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<sup>30</sup> We can, off course, easily see that if the company wishes to sell, for example, 11 shares rather than 20, the strategy will not work. To ensure profit from this strategy the investor has to be sophisticated enough to have an understanding of the distribution of the demand in the market. In Section B of this Part, I analyze the requirements for the strategy to work in a linear model.

<sup>31</sup> This is because, under these assumptions, both bidder A and bidder B experience the same benefit from the decreased IPO price, while bidder A, who values the share more than bidder B, stands to lose more for not purchasing another share for less than what she values it. This analysis is assuming that the manipulative bidder is restricted from participating in the aftermarket due to transaction costs or otherwise, as discussed below.

the IPO. Such trade in the aftermarket will expose the under-pricing of the shares in the IPO, because the trade among the three successful bidders will cause the price to increase. In the example above, Bidder C who buys 1 share in the auction for \$50 and does not value it for more will be willing to sell his share to Bidder B who manipulatively lowered his bid and offered to buy 9 shares, although she wants 10. Thus, if the share does switch hands it will be sold for a price that is not less than \$50 but can be as high as \$75, which is how much Bidder B really values it.

However, the under-pricing, which means that the company sold its shares for less than their true value in the market, exists even if it does not openly manifest itself in the trading immediately following the IPO. Transaction costs, for example, might postpone the additional aftermarket sale. The price of the stock in the market may not necessarily increase dramatically in the first three days immediately following the IPO. The investors who chose to buy a smaller amount of shares in the IPO may decide to buy the additional amount of shares gradually in the months that follow the IPO, in order to prevent an excessive price pressure. Therefore, the increase in the price of the share may be postponed in comparison to the regular book-building method that is usually followed by an immediate price increase. After the lapse of several months, the market price of a company that used the auction method should stabilize at the level that represents the true demand for the shares. To be sure, in an efficient market, the share will be owned eventually by the shareholder who values it more.

## B. *The General Model*

In order to generalize the under-bidding strategy and examine the requirements for the strategy to succeed, let us look at Bidder H. Bidder H values the stock at  $P_h$  and can afford  $Q_h$  shares at this price.  $P_{IPO}$  is the equilibrium price, the price that the company will be able to sell all of the offered shares, without strategic manipulations. H will profit  $Q_h \times (P_h - P_{IPO})$  from participating in the IPO without manipulation.

If H can lower the IPO price by  $P_d$  to  $P_l$  ( $P_l = P_{IPO} - P_d$ ) by lowering her offered amount by  $Q_d$ , then her new profit will be the product of the adjusted amount multiplied by the difference between the value she assigns to the company's shares and the new lower IPO price:  $(Q_h - Q_d) \times P_h - (Q_h - Q_d) \times P_l$  which equals  $Q_h \times (P_h - P_{IPO}) + Q_h \times P_d - Q_d \times (P_h - P_{IPO} + P_d)$ .

Assuming the investor can buy shares in the market on the days that follow the IPO for no more than the equilibrium price  $P_{IPO}$  (which should be the prevailing price after the market stabilizes), the strategy always assures a profit. This is because the bidder buys the same amount of shares, only now she does this in two stages -- first in the auction and later in the aftermarket -- but she pays a lower price for some of the shares, and she pays the same price she would have paid without the strategy, for the rest of the shares.

Restricting bidders from participating in the aftermarket will lower the profitability of the strategy and deter some investors from choosing to lower their bid. This, in turn, will reduce the under-pricing of the stock. For this reason, either a regulation prohibiting such trade in the aftermarket, or a similar contractual restriction, may well improve the efficiency of auction IPOs and increase the proceeds received by the issuer.

The model below will examine the effect of the strategy assuming that the investor does not buy more shares in the aftermarket immediately following the IPO, but only participates in the IPO. This is done not just in order to be conservative, but also to check the ability of the proposed restriction on aftermarket trades to eradicate under-pricing. Furthermore, there is no guarantee that the investor will be able to buy more shares in the aftermarket for the desired price because of price pressure and other market inefficiencies.

Thus, the difference in profit between the two strategies - bidding for the amount that the investor wants to own and manipulatively bidding for a lower amount - without aftermarket trading is:

$$\Delta = Q_h \times P_d - Q_d \times (P_h - P_{IPO} + P_d) \quad (1)$$

$P_d$ , the amount by which the price is lowered as a result of the strategic behavior of the investor, is a function of  $Q_d$ , the amount by which the investor strategically lowers her bid.  $P_d$  is the change in the IPO price that results from lowering the demand amount by  $Q_d$ . Therefore, let us maximize the difference (1) by taking the derivative with respect to  $Q_d$  and setting it to zero:

$$0 = \frac{d\Delta}{dQ_d} = Q_h \times \frac{dP_d}{dQ_d} + P_{IPO} - P_h - P_d - Q_d \times \frac{dP_d}{dQ_d} \quad (2)$$

Let us set  $A = \frac{dP_d}{dQ_d}$ , the elasticity of the demand, i.e. the marginal change in  $P_d$  caused by a marginal change in  $Q_d$ . It is, of course, a function of

$Q_d$ , but, for simplicity, I will assume that the demand curve is linear, so  $A$  is a constant and:

$$P_d = A \times Q_d. \quad (3)$$

We expand the derivative (2):

$$0 = Q_h \times A + P_{IPO} - P_h - A \times Q_d - Q_d \times A = Q_h \times A + P_{IPO} - P_h - 2A \times Q_d.$$

We solve for  $Q_d$ , thus obtaining the amount by which the bidder has to lower his bid in order to maximize his profit from participating in the auction:

$$Q_d = \frac{(Q_h \times A + P_{IPO} - P_h)}{2A} = \frac{Q_h}{2} - \frac{(P_h - P_{IPO})}{2A}. \quad (4)$$

From this equation (4) we can see that in order for a bidder to exploit the strategy and bid for  $Q_d$  shares in the auction, she should be able to estimate both  $P_{IPO}$  -- the real equilibrium price that would result if there were no manipulative strategic bidding, and  $A$  -- the elasticity. Fairly sophisticated investors, such as investor bankers, are well positioned to calculate these variables.<sup>32</sup> Unfortunately, most of the public investors will not be able to do that, but those members of the public who will participate in the auction IPO will benefit from the manipulative behavior of the sophisticated investor

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<sup>32</sup> Some variations on the Dutch IPO auction make it even easier for the investors to calculate these variables. An example for such variation is the 2000 version of how Wit Capital Corporation planned on conducting internet auctions underwritten by it, See Christine Hurt, *supra* note 13 at p 54: (“During this auction, any Internet user could view the aggregate demand in the auction at each price point, making the pricing of the shares virtually transparent.”)

because the method assigns a single price for all participants, the lowered auction price will be the purchase price of all those who successfully bid in the auction.

In addition, we can see from the equation for  $Q_d$  above that since  $P_h > P_{IPO}$ , the bidder must not lower her bid by more than half of her original amount to maximize the profits from the strategy:  $Q_d < \frac{1}{2}Q_h$ .

In addition, we can learn from the equation that the strategy works only when:  $Q_h > \frac{P_h - P_{IPO}}{A}$ , otherwise the optimal  $Q_d$  comes out negative. Therefore, we can see from this inequality that there are three requirements that help fulfill the equation and make the strategy profitable.

First, the left-hand side of the inequality,  $Q_h$ , the amount the investor wants to buy, must be sufficiently high. This means that large investors are more suited to exploit the strategy.

Second, the denominator of the right-hand side of the inequality,  $A$ , the elasticity, must be sufficiently high. This means that the distribution of bids of the auction participants must be spread in such a manner that renders the quantity sensitive enough to the price. The more elastic the demand curve the easier it is to exploit the strategy and succeed in lowering the auction price.

Third,  $P_h$ , the price that the investor believes the stock is worth, must be sufficiently close to  $P_{IPO}$ , the real equilibrium price that would result if there were no manipulative strategic bidding. This means that the investor does not value the company much more than the market does. Thus, if the investor has positive asymmetric information about the company, indicating that the company will be undervalued by the market because the market does

not know about the good information, the investor will be better off not lowering her bid, and refraining from using the strategy.

Now let us see what is the maximum profit for the bidder from employing the strategy. We first recall  $P_d$  from (3) and substitute  $Q_d$  from (4), to find that:

$$P_d = A \times \frac{Q_h \times A + P_{IPO} - P_h}{2A} = \frac{Q_h \times A + P_{IPO} - P_h}{2}. \quad (5)$$

We recall from (1) that the profit from the strategy is:

$$Q_h \times P_d - Q_d \times (P_h - P_{IPO} + P_d).$$

Expanding (1) and substituting  $P_d$  from equation (5), we find that the profit is:

$$\Delta = \frac{(A \times Q_h - (P_h - P_{IPO}))^2}{4A}.$$

Using (4), we can recast this profit as:

$$\Delta = \frac{P_d^2}{A} = Q_d \times P_d. \quad (6)$$

Equation (6) shows that the profit from the strategy is never negative under the assumptions, because both  $P_d$  and  $Q_d$  are positive. That means that, subject to the assumptions above, the strategy is profitable.

#### IV. Regulatory Aspects

In the previous Part, we have seen how investors in auction IPOs can bid strategically, and manipulate the stock price downward. Such strategic behavior may cause under-pricing of the IPO and reduce the proceeds of the company. In the days following the auction IPO, subsequent trade in the company's stock will raise the price of the stock in the market.

The manipulative strategic behavior, however, cannot be identified just from judging the bid an investor makes in the auction. This is because the under-bidding strategy manifests itself only as an offer for fewer shares. And  $Q_h$ , the real amount that the bidder would ask to buy in the auction without the strategy, cannot be proven.

However, if the investor makes additional purchases immediately following the IPO for more shares, it might well be an indication that she intentionally lowered her bid in order to reduce the IPO price, because she could have bid for it during the auction. As I have shown in the previous Part, lowering the bid and purchasing the reduced amount in the aftermarket is a profitable strategy for investors that reduces the issuers' proceeds from the IPO.<sup>33</sup>

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<sup>33</sup> Indeed, the recent Google auction IPO was significantly under valued. The market price of the Google stock rose considerably in the days following the auction IPO. Interestingly, less than a month following the IPO, Fidelity Investments owned about 25% of the shares auctioned in the IPO. Fidelity, as a sophisticated investor, may well have known that in a Dutch auction a bid for 1/4 of the entire auctioned amount has a potentially significant impact on the IPO price. Why would Fidelity buy such a large amount of shares in the IPO, while it can divide the sale and thus lower the initial price? Since the securities' regulations do not require disclosure of the exact purchase dates we cannot check Fidelity's behavior, but it is plausible that Fidelity bought some of the stock in the IPO and some of it in the following days choosing to strategically under-bid

Thus, in order to deter this behavior, that causes the company to sell its stock in the auction IPO for less than its true market value, ex-ante preventing measures should be considered. Both a regulation and a contractual undertaking can be used to prohibit successful bidders, who participated in the IPO, from purchasing shares in the market immediately following the IPO. This proposed restriction on after auction trades will lower the profitability from the under-bidding strategy. To be sure, if the company allocated to those investors less shares than they offered to purchase in the auction, then the restriction should only apply to the amount that exceeds the difference between the amount such investors offered to buy in their bid and the amount they received in the IPO.

Assuming that such restrictions are in place, and the successful bidder is barred from buying shares in the market immediately following the auction, then in order for the bidders' strategy to work, it should still produce profits without relying on trading in the days that follow the IPO. Though to a lesser extent, this does happen in some circumstances, as I have shown in the previous Part. Even without the possibility to purchase more shares in the market following the auction IPO, certain investors can profit from manipulatively under-bidding their offer in the auction. However, without the bidder trading on the days following the IPO, the restricted strategy cannot be detected, because it is only an offer for fewer shares and  $Q_h$  is far from being easily proven. Therefore, the strategy cannot be entirely prevented even if prohibited by a regulation, but it can and should be limited.

Since, as shown above, the auction IPO method cannot ensure receipt of the maximum amount of offering proceeds to the company, because it cannot ensure that the auction price will reflect the real and un-manipulated

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in the auction, as explained in Part III.

demand for the shares, (though the conventional wisdom erroneously believes it can,<sup>34</sup>) the auction method is not necessarily a preferable substitute to the book-building method. The recommendation the NYSE/NASD IPO Advisory Committee made – to allow the market to choose the preferable method while facilitating the practice of alternative methods and restricting abusive allocation practices<sup>35</sup> – seems justified and rightly cautious. On the other hand, a regulatory eradication of the book-building method, as some commentators might prefer to see,<sup>36</sup> seems premature.

## V. Conclusion

I have shown that under certain circumstances in an auction IPO, some sophisticated investors can maximize their wealth by choosing to bid in a strategic way that causes under-pricing. This outcome is contrary to the conventional wisdom that postulates that auction IPO will always prevent under-pricing. Large enough sophisticated investors, however, are likely to be better off by lowering the amount they offer to buy in the IPO, below the actual amount they ultimately wish to have. This action is likely to manipulate the IPO price and increase their total wealth. Furthermore, because this manipulative strategic behavior is practically unidentifiable, no regulatory measure can successfully prevent it. However, in order to limit the

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<sup>34</sup> See *supra* notes 21 & 22.

<sup>35</sup> See the Report, *supra* note 8, at p 9-10.

<sup>36</sup> See, e.g., Christine Hurt, *supra* note 13, at p 74; William R. Hambrecht, *Comments on the NASD/NYSE IPO Advisory Committee Report*, (May 2003); and William R. Hambrecht, *Fixing the IPO Process*, (September 2002) <[http://www.wrhambrecht.com/ind/strategy/bill\\_pov/archive.html](http://www.wrhambrecht.com/ind/strategy/bill_pov/archive.html)> (visited July 2004).

extent of this behavior and maximize the issuer's proceeds from auction IPO,  
I propose to restrict bidders' ability to participate in the after-market.