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# Manipulative Behavior in Auction IPOs

*Mira Ganor\**

## 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> Book-building is the dominant method by which a company becomes public in the United States.<sup>3</sup> This method is administered by underwriters who have the discretion to choose the share price and allocate the offered shares.<sup>4</sup>

Underwriters have been severely criticized for abusing the book-building method to extract benefits indirectly for themselves.<sup>5</sup> By underpricing the share price in the public offering, an especially common custom during the hot technology bubble, underwriters are able to use their power to choose who can purchase the underpriced shares and, thus, allegedly are able to further their own benefits.<sup>6</sup> However, underpricing the shares reduces the proceeds the issuer receives from the public offering.<sup>7</sup>

The Dutch auction is an alternative method for a company to become public. Using this method, the company conducts an auction for its shares and the price is set at the lowest successful bid. According to conventional wisdom, a public offering conducted in the form of a nondiscriminatory Dutch auction, rather than the book-building

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1. See THOMAS LEE HAZEN, *THE LAW OF SECURITIES REGULATION* § 1.6 (3d ed. 1996).

2. See NYSE/NASD IPO ADVISORY COMMITTEE, *REPORT AND RECOMMENDATIONS OF A COMM. CONVENED BY THE N.Y. STOCK EXCH., INC. & NASD AT THE REQUEST OF THE U.S. SEC. & EXCH. COMM’N 1* (2003), [http://www.finra.org/web/groups/rules\\_regs/documents/rules\\_regs/p010373.pdf](http://www.finra.org/web/groups/rules_regs/documents/rules_regs/p010373.pdf) [hereinafter IPO REPORT].

3. See Francesca Cornelli & David Goldreich, *Bookbuilding and Strategic Allocation*, 56 J. OF FIN. 2337, 2337 (2001).

4. *Id.*

5. IPO REPORT, *supra* note 2, at 1.

6. *Id.*

7. See, e.g., Stephen J. Choi & A.C. Pritchard, *Should Issuers be on the Hook for Laddering? An Empirical Analysis of the IPO Market Manipulation Litigation*, 73 U. CIN. L. REV. 179, 186 (2004).

method, maximizes the proceeds the issuer receives from the offering.<sup>8</sup> This is based on the common belief that the price reached in the auction reflects the market price for the share.<sup>9</sup> However, for some of the companies that used the Dutch auction method for their public offerings in the United States, shares were significantly underpriced.<sup>10</sup> These companies experienced share price increases of more than one hundred percent in the market during the first days immediately following the offering.<sup>11</sup>

This Article explores the ability of investors to influence the auction IPO price by strategically manipulating their bid. The Article provides a model that shows how some investors, by lowering the number of shares they ask to purchase in the auction, can maximize their profits from the bid and, contrary to conventional wisdom, cause underpricing. Unlike the book-building method, the price increase of the shares in the market following an auction IPO, which is triggered by investors increasing their holdings, may take longer than a couple of days because of the investors' efforts to avoid excessive price pressure.<sup>12</sup>

Even if a public auction is conducted in the form of a nondiscriminatory Dutch auction, underpricing may occur under certain scenarios as detailed in the models provided in this Article.<sup>13</sup> Thus, forcing the market to abandon the book-building method completely and leaving the issuers with only the auction method, as has been suggested,<sup>14</sup> is likely to be inefficient.

Furthermore, an investor who lowers the number 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 Article proposes to restrict investors who participate in the auction IPO from purchasing more shares in the market in the period immediately following the auction. This restriction will help deter some investors from using this strategy to lower the auction IPO price.

However, the model shows that even if the investors are unable to purchase shares in the aftermarket, the strategy is still profitable for

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8. Laura S. Unger, *Raising Capital on the Internet*, 69 U. CIN. L. REV. 1205, 1207 (2001).

9. *Id.*

10. See Unger, *supra* note 8, at 1207-08.

11. *Id.*

12. See *infra* Part IV.A.

13. See *infra* Part IV.

14. See Christine Hurt, *Moral Hazard and the Initial Public Offering*, 26 CARDOZO L. REV. 711, 788-89 (2005).

some investors under certain conditions as analyzed in the model.<sup>15</sup> The 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 underpricing, but can only reduce them.<sup>16</sup>

The remainder of this Article proceeds as follows: Part II provides a brief description of the importance of the IPO mechanism and describes the two IPO methods—first, the book-building method and, second, the auction IPO method. Part III discusses underpricing in IPOs. It begins by reviewing the practice of setting the low price in book-building IPOs. It then describes conventional wisdom regarding the ability of the auction IPO to eliminate underpricing and ends by presenting evidence to the contrary. Part IV develops the model for strategic, manipulative bidding and shows how this type of bidding may cause underpricing in a Dutch auction IPO. Part V discusses possible regulatory measures to avoid underpricing 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 IPO is the process in which a company first offers its shares to the public and becomes a publicly traded company.<sup>17</sup> Raising capital through IPOs plays an important role in corporate finance and enables economic growth.<sup>18</sup> In the past decade, over five hundred billion dollars were raised through IPOs in U.S. markets.<sup>19</sup>

Among the major advantages of creating a public market for a company's securities is it provides the company with access to substantial amounts of capital.<sup>20</sup> The company may not be able to raise a sufficient amount of funds through other forms of financing, such as debt or private equity. The IPO not only helps the operation of the company by supplying funds, but it also increases the shareholders' liquidity.<sup>21</sup> This allows the shareholders to realize the gain on their investment. Going public also enhances the company's publicity and

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15. See *infra* Part IV.B.

16. See *infra* Part V.

17. SEC, Initial Public Offering (IPO), <http://sec.gov/answers/ipo.htm> (last visited Dec. 23, 2007).

18. IPO REPORT, *supra* note 2, at 1.

19. *Id.*

20. See HAZEN, *supra* note 1, at § 1.6.

21. *Id.*

increases the company's prestige in the eyes of its customers and suppliers.<sup>22</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 is the book-building method, which has been used by the vast majority of companies that have gone public in the United States.<sup>23</sup> The auction method, on the other hand, has enjoyed less popularity among U.S. companies going public.<sup>24</sup>

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

Book-building is the prevailing method in the United States for setting the IPO price.<sup>25</sup> Under this method, as part of the marketing process of the offering, potential investors, usually institutional investors, inform the lead underwriters of the offering how many shares and at what price they tentatively plan on purchasing in the IPO.<sup>26</sup> The IPO price is set by the underwriters, at their sole discretion, before the actual offering takes place.<sup>27</sup>

### B. *The Auction Method*

For at least two decades, auction bidding has been proposed as an alternative IPO method to replace book-building.<sup>28</sup> Due to progress in technology and the internet revolution, a few companies have decided to conduct online public auctions instead of using the customary book-building method for their IPOs.<sup>29</sup>

The auction method, however, lacks the support of the major investment bankers that usually serve as underwriters.<sup>30</sup> Most issuers had preferred to use the services of renowned underwriters because they can rely on their marketing services and can expect favorable

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22. *Id.*

23. *See, e.g.*, IPO REPORT, *supra* note 2, at 1 n.1 (noting "the 'bookbuilding' IPO . . . is the predominant method for conducting IPOs in the United States and worldwide").

24. *Id.*

25. Cornelli & Goldreich, *supra* note 3, at 2337.

26. *Id.*

27. *Id.*

28. *See* Katina J. Dorton, *Auctioning New Issues of Corporate Securities*, 71 VA. L. REV. 1381, 1384-88 (1985).

29. Most notably, the financing firm WR Hambrecht + Co has been specializing in using the auction process through the internet for what it calls "OpenIPOs®." *See* WR Hambrecht + Co, <http://www.wrhambrecht.com> (last visited Dec. 12, 2007). *See also* Unger, *supra* note 8, at 1207-08.

30. *See* Hurt, *supra* note 14, at 765-67.

reviews from the analysts who worked for them.<sup>31</sup> However, some companies, such as Google Inc., do not need underwriters' marketing services in order to raise interest in their operations or to induce offers for their shares.<sup>32</sup> Thus, Google is an exceptional example of a company that used an auction process to sell its shares to the public.<sup>33</sup>

Under the auction IPO method, the underwriters administer auction biddings for the company's shares.<sup>34</sup> Because the auction is open to the public, the auction participants are not restricted to a select group of chosen investors who are favored by the underwriters. Each participant's offer is comprised of the number of shares that the investor wishes to purchase in the IPO and the maximum price such investor is willing to pay for them.<sup>35</sup> The underwriter aggregates all of the received bids and sets the offer price in a nondiscriminatory Dutch auction at the highest level that permits the sale of the entire number of shares offered by the company.<sup>36</sup> Thus, the IPO price is set at the level of the lowest successful bidder.

### III. UNDERPRICING

Part II addressed the importance of going public and discussed 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 is set for the stock sold in the IPO. This Part will consider the underpricing phenomenon—the practice of setting the IPO price below the value of the stock. The first Section reviews underpricing when the book-building method is used. The second Section presents the conventional wisdom concerning auction IPOs and underpricing. Part IV challenges this conventional wisdom.

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31. See IPO REPORT, *supra* note 2, at 2 (“With their compensation and promotion tied to the success of their firms’ investment banking 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.”).

32. See Hurt, *supra* note 14, at 764.

33. See Google Inc., Registration Statement (Form S-1), at 2 (Apr. 29, 2004), available at <http://www.sec.gov/Archives/edgar/data/1288776/000119312504073639/ds1.htm> [hereinafter Google Registration Statement] (“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 U.S. 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.”).

34. See *id.*

35. IPO REPORT, *supra* note 2, at 9.

36. *Id.*

### A. *Book-Building and the Resulting Underpricing*

A significant increase in the stock price is common the first days following a book-building IPO.<sup>37</sup> The IPO price is usually much lower than the price of the shares that is set by the market immediately following the IPO.<sup>38</sup> The underpricing of the IPO directly lowers the proceeds that the issuer receives from the offering and constitutes a loss for the company. In the IPO, the issuer receives a price for the shares that is lower than the price in the market the following day.<sup>39</sup>

The underpricing, however, creates “a pool of instant profits for underwriters to distribute.”<sup>40</sup> This is because the underwriters decide which investors will receive the shares at the low IPO price. It is widely believed that the underwriters not only use the opportunity to benefit from the underpricing by extracting benefits from those investors who receive underpriced shares, but also actually deliberately create the opportunity by intentionally pricing offerings well below the market price.<sup>41</sup>

### B. *Auction IPO and Underpricing: 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 underpricing of the IPO shares.<sup>42</sup> One auction expert said, “You should be relatively indifferent about

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37. See, e.g., Roger G. Ibbotson, *Price Performance of Common Stock New Issues*, 2 J. FIN. ECON. 235, 235 (1975).

38. *Id.*

39. See Choi & Pritchard, *supra* note 7, at 182.

40. IPO REPORT, *supra* note 2, at 1.

41. See Choi & Pritchard, *supra* note 7, at 180-82; IPO REPORT, *supra* note 2, at 1.

42. See, e.g., Dorton, *supra* note 28, at 1384-85; Unger, *supra* note 8, at 1207-08; IPO REPORT, *supra* note 2, at 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.”); Hurt, *supra* note 14, at 777-78 (“If IPO shares were distributed through a more transparent process, with all of the shares in the IPO being allocated anonymously at an auction 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 7, at 182 n.13. Google’s Registration statement notes:

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 [to ensure] buyers and sellers receive a fair price at the IPO.

Google Registration Statement, *supra* note 33, at iv-v.

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>43</sup>

According to conventional wisdom, each bidder in an auction IPO will set her bidding price at the level at which she values the shares, and the number of shares she offers to buy will reflect the number she can afford to purchase given liquidity constraints and diversification opportunities.<sup>44</sup> In an auction IPO, the company expects to discover the market’s demand-curve for the stock in order to set the IPO price at the equilibrium, that is, the highest price that permits the sale of the entire number offered.<sup>45</sup> The outcome of choosing the equilibrium price as the IPO price is all bidders in the market who value the company’s stock for more than the IPO price will buy in the IPO. Other bidders would not succeed in the IPO because they value the stock for less than the IPO price and, therefore, gave a lower bid for the stock. 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 price lower 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>46</sup>

To illustrate this, let us look at a simple numerical example. Suppose there are three players in the market: *A*, *B*, and *C*. *A* values the company’s stock at one hundred dollars per share and wishes to buy

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43. Saul Hansell, *For Google, Going Dutch Has Its Rewards and Its Risks*, N.Y. TIMES, May 10, 2004, at C1 (quoting Lawrence M. Ausubel, an auction expert and economics professor at the University of Maryland).

44. 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 then be able to afford purchasing additional shares. 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, one hundred shares for up to one hundred dollars each and an extra fifty shares for up to fifty dollars each.

45. See Google Registration Statement, *supra* note 33, at 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.”).

46. See Unger, *supra* note 8, at 1207 (“In theory, by more accurately gauging market demand, the auction process should result in the maximum amount of offering proceeds for the company . . .”).



ten shares. *B* values the stock at seventy-five dollars per share and, for that price, she wishes to buy ten shares as well. *C*, on the other hand, values the shares at only fifty dollars and is interested in buying ten shares for no more than fifty dollars a share. Let us assume the company plans to sell twenty shares in the public offering. If it sets the IPO price at seventy-five dollars, both *A* and *B* successfully bid for ten shares each. *C*'s bid does not succeed. However, since both *A* and *B* value the shares for more than *C* does, no shares will transfer hands immediately following the IPO. Investors who value the shares for as much as or more than the share price will already own the maximum number of shares they desire to own and, therefore, will not be willing to sell for less than what they perceive as the shares' value.

The evidence, however, tells a more complex story. One can learn from the few auction offerings that took place in the United States the last few years that the auction method does not ensure that significant fluctuations in the stock price will not occur following the IPO.<sup>47</sup> In fact, some of the companies who used the auction method for their public offering experienced share price increases of more than one hundred percent in the days immediately following the offering.<sup>48</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.

#### IV. INVESTORS' MANIPULATIVE STRATEGY: UNDERPRICING IN AUCTION IPOs

Part III addressed why auction IPOs are commonly expected to eliminate underpricing in public offerings. This Part presents 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 underpricing in auction IPOs. The second Section develops a linear model that generally analyzes the underbidding strategy and its results.

##### A. *The Underbidding Strategy*

A rational bidder wishes to maximize the value of her assets. Buying stock below the value she assigns to the purchased stock is a profitable strategy which increases her wealth. If the bidder can

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47. See Hansell, *supra* note 43; Unger, *supra* note 8, at 1207-08.

48. See Unger, *supra* note 8, at 1207-08.

manipulate the IPO price and lower it, she can increase the value of her assets.<sup>49</sup>

The bidder does not have to bid for as many shares as she can afford at the price that she values the shares. Instead, the bidder can bid for a different number, a different price, or both. 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 likely decreases the bidder's profits.<sup>50</sup> If the bidder raises the price of her offer, she exposes herself to the risk that she might have to pay more for the shares than the price at which she values them. In addition, if the IPO price is set at or below the price the bidder believes the true value of the shares to be, raising the offering price would 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.<sup>51</sup> 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 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 chooses could still be too high to change the IPO price if it still is 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 manipulation. 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 be unprofitable.

Similarly, increasing the number of shares the bidder offers to purchase in the IPO is unlikely to have favorable results; it is 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>52</sup>

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49. This is because the bidder's assets will now include stocks that are worth more than the lower IPO price which the bidder paid for them.

50. See Dorton, *supra* note 28, at 1391.

51. See *supra* note 46 and accompanying text.

52. 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

However, under certain scenarios, mathematically shown in Section B, a rational bidder will profit from lowering the number of shares she offers to buy in the IPO. By lowering that number, the auction price will be driven downward. A lower IPO price directly increases the value for the bidder. At the same time, a decrease in the number of shares bought at the IPO decreases the value for the bidder. The lower price and the decrease of the purchase number are opposing forces. Under certain circumstances, this strategy of lowering the number of shares a bidder offers is a preferred strategy that increases the aggregate value of the bidder's assets.<sup>53</sup>

As a result of bidders strategically lowering the number they offer to purchase in the auction IPO, the company will not see the real demand curve for its shares. Rather, the company will see a curve that is shifted towards the axes; for a given price the number of shares bidders are willing to buy is lower. The IPO price will be set at a lower price than equilibrium, that is, the highest price purchasers are willing to pay for the stock sold. This will allow trade of the shares in the stock market the day after the IPO. Following the IPO, bidders who value the stock for more than the IPO price but did not purchase the optimal number of shares they wished to own because they used the manipulative underbidding strategy will buy shares in the aftermarket. This trading in the stock market will cause the share price to rise.

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

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

TABLE NO. 1. A NUMERIC EXAMPLE WITH FOUR BIDDERS

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a lesser amount, but no less than eighty percent 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 Registration Statement, *supra* note 33, at 27.

53. 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 retained the right not to include in the auction any bids that seem manipulatively too large. See *id.*

Let us assume that the company wishes to sell twenty shares. Bidder *A* and Bidder *B* offer the highest prices for the shares, one hundred dollars and seventy-five dollars respectively, and together are willing to buy the entire number of shares offered by the company. Thus, without strategic manipulation, the IPO auction price would 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 numbers she asks for in the auction. Suppose Bidder *A* now bids  $P = \$100$  and  $Q = 9$ . Given the manipulative bid, the new IPO price would be  $P_I = \$50$ , the highest price that enables the company to sell all of the twenty 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>54</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 number of shares left after the higher bidders (Bidders *A* and *B*) receive the entire number of shares they bid on, 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 two-thirds of her bid, which is the ratio of the issued shares (twenty) and the total successful bids (thirty).<sup>55</sup> Bidder *A*'s profits, under this assumption, would be  $(100 - 50) \times 9 \times \frac{2}{3} = \$300$ , which reflects a profit of fifty dollars 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>56</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 decreased number of shares they bid on in the IPO. Such trade in the aftermarket will

54. We can, of course, easily see that if the company wishes to sell, for example, eleven shares rather than twenty, 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.

55. Actually, the number of total successful bids would be twenty-nine. This number was rounded up to thirty to simplify the mathematical equation.

56. 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.

expose the underpricing 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 one share in the auction for fifty dollars and does not value it for more, would be willing to sell her share to Bidder *B*, who manipulatively lowered her bid and offered to buy nine shares, although she wanted ten. Thus, if the share does switch hands, it will be sold for a price that is not less than fifty dollars but could be as high as seventy-five dollars, which is how much Bidder *B* really values it.

However, the underpricing, 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 fewer number of shares in the IPO may decide to buy the additional 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.<sup>57</sup> 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. In an efficient market, shares will be owned eventually by the shareholder who values them the most.

### B. *The General Model*

In order to generalize the underbidding 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 highest price 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 number by  $Q_d$ , then her new profit will be the product of the adjusted number 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  $Q_h \times (P_h - P_{IPO}) + Q_h \times P_d - Q_d \times (P_h - P_{IPO} + P_d)$ .

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57. See *supra* Part III.A.

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 number of shares, only now she does this in two stages, first in the auction and later in the aftermarket. However, 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 would lower the profitability of the strategy and deter some investors from choosing to lower their bids. This, in turn, would reduce the underpricing 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 only to be conservative, but also to check the ability of the proposed restriction on aftermarket trades to eradicate underpricing. 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 number of shares the investor wants to own and manipulatively bidding for a lower number without the benefit of aftermarket trading—is:

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

$P_d$ , 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 number by which the investor strategically lowers her bid.  $P_d$  is the change in the IPO price that results from lowering the demand number by  $Q_d$ . Therefore, let us maximize the difference (1) by taking the derivative with respect to  $Q_d$  and setting it at zero:

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

Let us set  $A = \frac{dP_d}{dQ_d}$ , the elasticity of the demand, that is, the mar-

ginal change in  $P_d$  caused by a marginal change in  $Q_d$ . It is, of course, a function of  $Q_d$ , but, for simplicity, we should assume that the demand curve is linear, so  $A$  is a constant and:

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

We expand the derivative (2):

$$(4) \quad 0 = Q_h \times A + P_{IPO} - P_h - A \times Q_d - Q_d \times A = Q_h \times A + P_{IPO} - P_h - 2A \times Q_d$$

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

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

From this equation (5), we can see that in order for a bidder to exploit the strategy and bid for  $Q_i$  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 investment bankers, are well positioned to calculate these variables.<sup>58</sup> Unfortunately, most of the public investors are not able to do this, but members of the public who participate in the auction IPO will benefit from the manipulative behavior of the sophisticated investor. 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 number to maximize the profits from the strategy:  $Q_d < \frac{1}{2}Q_h$ .

Further, 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.

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58. 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 that it underwrote. See Hurt, *supra* note 14, at 766-67 ("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.")

First, the left-hand side of the inequality,  $Q_h$ , the number 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. In other words, the investor must 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 the maximum profit for the bidder from employing the strategy is. We first recall  $P_d$  from (3) and substitute  $Q_d$  from (5), to find that:

$$(6) \quad P_d = A \times \frac{Q_h \times A + P_{IPO} - P_h}{2A} = \frac{Q_h \times A + P_{IPO} - P_h}{2}$$

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 (6), we find that the profit is:

$$(7) \quad \Delta = \frac{(A \times Q_h - (P_h - P_{IPO}))^2}{4A}$$

Using (5), we can recast this profit as:

$$(8) \quad \Delta = \frac{P_d^2}{A} = Q_d \times P_d$$

Equation (8) shows that the profit from the strategy is never negative under the assumptions, because both  $P_d$  and  $Q_d$  are positive. That means, subject to the assumptions above, the strategy is profitable.



## V. REGULATORY ASPECTS

Part IV showed how investors in auction IPOs can bid strategically and manipulate the stock price downward. Such strategic behavior may cause underpricing of the IPO and reduce the proceeds for 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 merely from judging the bid an investor makes in the auction. This is because the underbidding strategy manifests itself only as an offer for fewer shares, and  $Q_h$ , the real number 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 may 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 Part IV, lowering the bid and purchasing the reduced number in the aftermarket is a profitable strategy for investors that reduces the issuers' proceeds from the IPO.<sup>59</sup>

Thus, in order to deter the behavior that causes the company to sell its stock in the auction IPO for less than its true market value, ex ante prevention measures should be considered. Both a regulatory and contractual undertakings can be used to prohibit successful IPO bidders from purchasing shares in the market immediately following the IPO. This proposed restriction on after auction trades will lower the profitability of the underbidding 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 number of shares exceeding the difference between the number investors offered to buy and the number they received in the IPO.

Assuming such restrictions are in place and the successful bidder is barred from buying shares in the market immediately following the auction, in order for the bidders' strategy to work, it must still produce profits without relying on trading in the days that follow the IPO.

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59. Indeed, the recent Google auction IPO was significantly undervalued. 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 twenty-five percent of the shares auctioned in the IPO. Fidelity, as a sophisticated investor, may well have known that, in a Dutch auction, a bid for a quarter of the total auctioned shares had a potentially significant impact on the IPO price. Why would Fidelity buy such a large amount of shares in the IPO when it could have divided the sale and, thus, lowered the initial price? Because 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 underbid in the auction, as explained in Part IV.

Though to a lesser extent, this does happen in some circumstances, as I have shown in Part IV. Even without the possibility of purchasing more shares in the market following the auction IPO, certain investors can profit from manipulatively underbidding their offer in the auction. However, without the bidder trading on the days following the IPO, the restricted strategy cannot be detected because an offer to purchase fewer shares and  $Q_h$ , the number of shares they can afford to purchase, are far from easily proven. Therefore, the strategy cannot be entirely prevented even if prohibited by a regulation, but it can and should be limited.

The auction IPO method cannot ensure receipt of the maximum amount of offering proceeds to the company, though conventional wisdom erroneously believes it can.<sup>60</sup> As shown above, the auction method cannot ensure the auction price will reflect the real and unmanipulated demand for the shares. Therefore, the auction method should not necessarily be a preferable substitute to the book-building method. The NYSE/NASD IPO Advisory Committee recommendation to allow the market to choose the preferable method, while facilitating the practice of alternative methods and restricting abusive allocation practices,<sup>61</sup> seems justified and rightly cautious. On the other hand, a regulatory eradication of the book-building method, as some commentators might prefer,<sup>62</sup> seems premature.

## VI. 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 underpricing. This outcome is contrary to conventional wisdom that postulates auction IPOs always prevent underpricing. Large, sophisticated investors, however, are likely to be better off by offering to buy fewer shares in the IPO than actual number they ultimately wish to have. This action is likely to manipulate the IPO price and increase investors' total wealth. Furthermore, because this manipulative strategic behavior is practically unidentifiable, no regulatory measure could successfully prevent it. However, in

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60. See *supra* Part III.B.

61. IPO REPORT, *supra* note 2, at 9-10.

62. See, e.g., Hurt, *supra* note 14, at 788-89; Bill Hambrecht, *Comments on the FINRA/NYSE IPO Advisory Committee Report*, BILL'S POINT OF VIEW (May 29, 2003), [http://www.wrhambrecht.com/ind/strategy/bill\\_pov/200305/index.html](http://www.wrhambrecht.com/ind/strategy/bill_pov/200305/index.html); Bill Hambrecht, *Fixing the IPO Process*, BILL'S POINT OF VIEW (Sept. 2002), [http://www.wrhambrecht.com/ind/strategy/bill\\_pov/200209/index.html](http://www.wrhambrecht.com/ind/strategy/bill_pov/200209/index.html).

order to limit the extent of this behavior and maximize issuers' proceeds from auction IPOs, I propose to restrict bidders' ability to participate in the aftermarket.