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# Why Are IPOs Underpriced? Evidence from Japan's Hybrid Auction-Method Offerings

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Until October 1997, firms wishing to go public in Japan were required to use a hybrid auction process where up to half of the issue (the “auction tranche”) was offered to investors via a discriminatory auction. Remaining shares (the “public offer tranche”) were sold a few days later by a firm commitment at a fixed price. We document underpricing and partial adjustment of IPO public offer prices in Japan’s auction regime, a regime where: investors are symmetrically informed or information differences are not important; roadshows are not held; preferential allocations to any investor are negligible; and institutional investing is low. The results raise important questions about theoretical interpretations of IPO underpricing in the U.S. We consider a broad range of competing, but non-mutually-exclusive, hypotheses about the reasons for underpricing and partial adjustment. Japan’s auction-method evidence is most consistent with a quasi-contractual allocation of risk related to initial mispricing. The risk allocation hypothesis is that, in exchange for guaranteeing a minimum price to the issuer, the underwriter participates indirectly in upside performance. The underwriter benefits from underpricing because underpriced IPOs are easier to place and because the underwriter can allocate small positions in the underpriced shares to preferred customers in implicit exchange for other benefits. As average underpricing in our sample is about three times as great as the underwriter’s fee, and as some IPOs are severely underpriced, we cannot exclude the possibility that underpricing is affected by agency cost and prospect theory considerations similar to those suggested by Ritter and Welch (2002) in their review of the U.S. IPO market.

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## **Why Are IPOs Underpriced? Evidence from Japan's Hybrid Auction Method Offerings**

Until October 1997, firms wishing to go public in Japan were required to use a hybrid auction process where up to half of the issue (the “auction tranche”) was offered to investors via a discriminatory auction. Remaining shares (the “public offer tranche”) were sold a few days later by a firm commitment at a fixed price. Under then-existing regulations, the weighted average winning bid price of the auction tranche was the maximum offer price of shares sold in the public offer tranche.<sup>1</sup>

Under the regulations that governed this procedure, the number of shares any investor could buy in either tranche was severely limited and investors who were likely to have private information about value were precluded from participating in the auction. Nonetheless, shares sold in the public offer tranche routinely were underpriced compared to the first aftermarket price.<sup>2</sup> In addition to systematic underpricing, we find a pattern of “partial adjustment” that is similar to the partial adjustment of issue prices for U.S. IPOs. That is, compared to the minimum allowable bid price for the auction tranche (the “minimum bid”), the adjustment of the offer price for the public offer tranche is a positive function of evidence of excess demand at the minimum bid. Because underpricing of the public offer tranche also is positively related to evidence of excess demand and to the magnitude of the price adjustment, the adjustment is only partial.

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<sup>1</sup> Japan's hybrid auction procedure, though still legally available, has not been selected by any issuer since the end of our sample period.

<sup>2</sup> In a study of U.S. Treasury auctions, Goldreich (1998) shows that expected underpricing is necessary to induce bidding in discriminatory auction processes. While that result implies that the IPO aftermarket price in our study will be above the weighted average successful bid price, it does not explain why the offer price of the public offer tranche is discounted further.

Results from Japan's auction-method offerings raise important questions about theoretical interpretations of IPO underpricing in the U.S. In contrast to Japan's auction method, IPOs in the U.S. are priced by a negotiation process that includes book building. Several well-established hypotheses about underpricing are related to information asymmetry or information production. Partial adjustment, in particular, is interpreted by Hanley (1993) as evidence consistent with the hypothesis that underpricing compensates informed investors for revealing their private information or valuations. However, in Japan, we find underpricing and partial adjustment even in a market where: investors are symmetrically informed or information differences are not important; roadshows are not held; preferential allocations to any investor are negligible; and institutional investing is low.

We consider a broad range of competing, but non-mutually-exclusive hypotheses about the reasons for underpricing and partial adjustment. While the evidence from Japan's auction-method offerings cannot reject any information-related hypothesis, it does establish that partial adjustment and underpricing patterns similar to those observed for U.S. book-built offerings also are produced by an auction method where information asymmetry and information production both are restrained aggressively. Thus, while any number of information-related hypotheses may be *sufficient* to generate underpricing and partial adjustment of book-built offerings, no information-related hypothesis is *necessary* for underpricing or partial adjustment to arise.

Japan's auction-method evidence is most consistent with a quasi-contractual allocation of risk related to initial mispricing. The essence of the risk allocation hypothesis is that, in exchange for effectively guaranteeing the minimum allowable bid price to the issuer, the underwriter participates in upside performance through lower selling costs and through the opportunity to make small allocations of underpriced public-offer-tranche shares to preferred

customers. Because average underpricing in our sample is about three times as great as the underwriter's fee (which is affected by auction-regime regulations) and because some IPOs are severely underpriced, underpricing and risk allocation may be affected by agency cost considerations (Ritter and Welch, 2002), prospect theory argument (Loughran and Ritter, 2002), or regulatory constraints.

In Section I we describe Japan's hybrid auction procedure. Section II presents the dataset and some cross-sectional characteristics of the sample. In it, we examine offering and issuer characteristics in the context of alternative theories of partial price adjustment. Section III provides two-stage estimates of a system of underpricing and partial adjustment equations that controls for the endogeneity of the offer price and underpricing choices. Section IV uses seasoned offerings and long-run returns after the IPO to examine underpricing as a signal of quality. In Section V we discuss the implications of our evidence for a wide range of existing hypotheses of underpricing.

## **I. Japan's Hybrid Auction Process**

Japan implemented its hybrid auction procedure in 1989, with the intent of improving the distribution and pricing of IPOs.<sup>3</sup> During the period of our study, there were regulatory constraints on offer size and allocation of IPO shares between the auction tranche and the public offer tranche. Specifically, under the new procedure, JASDAQ regulations required the minimum number of shares offered be at least 250,000 plus 12.5 percent of outstanding shares.<sup>4</sup>

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<sup>3</sup> See Beierlein and Kato (2003), Hamao, Packer and Ritter (2000), Jenkinson and Ljungqvist (1996), Kutsuna and Smith (2003), Pettway and Kaneko (1996), and the report of Shoken Torihiki Shingikai (Securities and Exchange Council) (1989) for details of the Japanese IPO market before and after adoption of the hybrid auction process and for review of the events that led to adoption of the auction method. The 1989 report addresses the shift to auction method.

<sup>4</sup> Financial firms with large numbers of shares outstanding were exempt from this requirement.

In addition, at least 50 percent of the shares were required to be offered in the auction tranche.<sup>5</sup> The auction failed if less than 25 percent of total shares were bid for.<sup>6</sup>

JASDAQ IPOs during our sample period were usually combined offerings, including primary shares that are sold to raise capital for the issuing firm and secondary shares that are sold by “selling shareholders.” On average, in our sample, secondary sales account for about 40 percent of shares issued in the IPO. Depending on the proportion of secondary to primary shares, the auction-regime procedure specifies the tranche in which the secondary shares are sold. If secondary shares represent more than 50 percent of the total offered shares, then secondary shares are sold in the auction tranche and selling shareholders receive proceeds based on the weighted average price in the auction. If the secondary shares represent less than 50 percent of total offered shares, then secondary shares are sold in the public offer tranche and selling shareholders receive proceeds based on the public offer price. If secondary shares represent exactly 50 percent of total offered shares, then selling shareholders, as a group, can elect whether to sell in the auction or in the public offer.

Under the auction procedure, a preliminary prospectus is published about 14 days before the auction. While the prospectus describes the firm and the issue, it contained no information on pricing. About 10 days later, shares allocated to the auction tranche are offered for bid using a “first-revised” prospectus. This prospectus specifies a minimum price or reservation price below which bids would not be accepted. This minimum bid was based on a formula that the underwriter applied to the market prices and financial data of a small selection of public

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<sup>5</sup> JASDAQ is the Japanese market for over-the-counter securities. JASDAQ made exceptions to this rule if the number of outstanding shares was relatively large compared to other firms executing IPOs.

<sup>6</sup> These requirements are documented in the report of Shoken Torihiki Shingikai (Securities and Exchange Council) (1995). The Council is advisory to the Japan Ministry of Finance and proposes and recommends institutional changes for Japanese stock markets.

companies that the underwriter had identified as comparable.<sup>7</sup> During our study period the minimum bid was set by regulation at 85 percent of market value estimated using the required formula. Three or four days later, a one-day auction occurred. This was a discriminatory auction where each bidder paid the price they bid. At the close of the auction, shares were allocated to highest bidders first, until the entire allocation was distributed or the minimum bid was reached.

Generally, four days after the auction, the formal underwritten offering of the remaining shares would take place, using a “second-revised” prospectus and an offer price set by the underwriter. The maximum price the underwriter could set was the weighted average of the successful bids. The minimum could not be less than the minimum bid.<sup>8</sup>

One objective of the auction was to achieve wide participation in the IPO by small and uninformed investors. Regulations to achieve this objective limited the incentives of insiders and institutions to develop information on the issues or to devote resources to valuation. To participate in the auction, investors had to meet specific criteria: Issuing-company employees and their families, the 10 largest shareholders of the issuing company, employees of securities companies, and companies that own the equity or debt of the issuing company were precluded from participating in the auction.

By significantly limiting the maximum number of shares any participant could bid to acquire, the regulations further discouraged institutional participation. Generally, a participant could bid to acquire no more than 5000 shares (5 round lots). At the average offer price in our sample, the maximum corresponds to about 10 million yen, or about \$100,000. Under these restrictions, incentives of investors to produce information about value appear to have been very

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<sup>7</sup> The required formula is documented in the report of Shoken Torihiki Shingikai (Securities and Exchange Council) (1989).

<sup>8</sup> See the report of Shoken Torihiki Shingikai (1995).

limited. The restrictions on insider and informed investor participation prevented bidding by these groups from directly affecting offer prices.

Excessive free riding on price discovery was prevented (and institutional participation was effectively discouraged) by limiting acquisition of public-offer-tranche shares. An investor could acquire no more than 5000 shares in the public offering (a total of 10,000 by both approaches) and could participate in no more than four public offerings per year. As a consequence, underwriters could not make large allocations of underpriced shares to any single investor and institutional investors generally did not participate in the IPO market during the auction regime.<sup>9</sup>

The underwriter's role in developing information for pricing of both IPO tranches also necessarily was limited. For the auction tranche, the information in the first revised prospectus included the minimum bid and information on the issuer's position and track record.<sup>10</sup> For the public-offer tranche, the second revised prospectus provided information on the auction, including the number and size of bids, the weighted average successful bid, the weighted average bid, and the minimum successful bid. The underwriter used information from the auction to determine the offer price for the public offer tranche, but except for information on aggregate demand, little information was conveyed to the market from the auction because the bidders in the auction were, by design, uninformed.

Prospective investors in the auction developed bids on the basis of information in the prospectus. While the underwriter could engage in due diligence to verify statements in the

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<sup>9</sup> Based on a study of 110 JASDAQ IPOs in 1996, Tamura (1997) reports that institutions purchased 11.7 percent of auction tranche shares and 13.7 percent of public offer tranche shares. Individuals purchased the remaining shares.

<sup>10</sup> An agreement among underwriters to restrict fees to an artificially low percentage also may have constrained the information-production efforts underwriters might otherwise have elected to make. During the sample period, fees were fixed informally among underwriters at 3.1% plus two yen, although slightly higher fees of 3.3% to 3.5% sometimes were charged. These fees were paid from gross proceeds. The percentage was not a requirement, but was a common practice.



prospectus, a prospectus is an incomplete snapshot of the issuer's position and track record. Without damaging their prospects, issuers cannot fully disclose intellectual property, strategic plans, or other proprietary information that could benefit rivals. Pettway and Kaneko (1996) establish that the formula-based minimum bid requires minimal information collection efforts by the underwriter and is not very informative about the underwriter's assessment of value. Furthermore, the informal agreement among underwriters, during the auction regime, to restrict fees to a low percentage, constrained the information-production efforts that underwriters might otherwise have made.

An important characteristic of the auction process in Japan is that it offered no discretion to adjust the quantity of shares offered. Once the initial size of the offer was determined, there was no over-allotment option the underwriter could use to adjust the size of the public offer based on interest expressed in the auction tranche.<sup>11</sup> Although there is a growing literature indicating that offer size and allocation of shares may play important parts in explaining some unresolved issues of IPO underpricing, these effects were specifically excluded or constrained in the hybrid auction process.<sup>12</sup>

## **II. Evidence of Underpricing and Partial Adjustment**

### **A. Data Sources**

From the start of 1995 until introduction of book building in October 1997, 321 JASDAQ firms used the auction method to go public. We obtain issue data and financial data for these IPOs from the Research Group for Disclosure database (1996-2000). Issue data include the offer date, number of shares issued, amount raised, offer price, first aftermarket price, and other

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<sup>11</sup> Additionally, before 2002, underwriters in Japan could not use over-allotment options or over-sell as ways of assuring the success of an offering or to offset pricing errors.

<sup>12</sup> Ritter and Welch (2002) review the literature related to IPO allocation issues. See also Aggarwal, Prabhala, and Puri (2002) for an empirical analysis of institutional allocation issues.

offering details. Financial data include sales revenue, equity book value, shares outstanding, firm age, and number of employees for the year before the offering. Toyo Keizai Inc. provides daily stock price data for JASDAQ companies. We use the daily JASDAQ Index as a measure of overall market performance.

## **B. Japan's Auction-Method Analog to the Filing Range**

For a firm-commitment offering in the U.S., the preliminary prospectus specifies a filing range, where the range is defined by a minimum and maximum anticipated offer price. By convention, the midpoint of the range is used as an estimate of the expected offer price. The final offer price is an adjustment to the filing range. Hanley (1993) documents that the adjustment is positively correlated with the underpricing. Hanley segregates IPOs into those with an offer price below, within, and above the filing range, and finds partial adjustment, in that the most underpriced issues also are those with the most positive price adjustments. Loughran and Ritter (2002) and Ritter and Welch (2002) find similar relationships between price adjustment and underpricing.<sup>13</sup>

In this study, we use the minimum bid in a similar way to Hanley's and Loughran and Ritter's use of the filing range. We measure price adjustment as the ratio of the offer price to the minimum bid. In lieu of indications of interest, we use the subscription ratio (the number of bids per share offered in the auction tranche) and weighted average successful bid price as indicators of excess demand in light of the specified minimum bid. Table 1 presents offering statistics grouped by subscription ratio. Our results are similar to the partial adjustment results in Hanley

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<sup>13</sup> To an extent, in the US, underpricing and partial adjustment may be a result of regulations that prevent issuers from revising the offer price up by more than 20 percent without amending and re-issuing the preliminary prospectus., a requirement that could delay the offering by a month or more. This regulation is currently under review by the SEC as a possible cause of extreme underpricing in the late 1990s. Japan's auction regime requires only that the offer price not be more than the weighted average successful bid. See the *Wall Street Journal*, May 30, 2003, p. C1.

(1993), Loughran and Ritter (2002), and Ritter and Welch (2002). That is, higher excess demand is associated with both a higher offer price relative to the minimum bid, and greater underpricing (or initial return).

For IPOs with the lowest subscription ratios, underpricing is negative. Under auction-regime regulations, the offer price could not be set below the minimum bid. The negative initial return was borne directly by initial investors, or by the underwriter if the shares could not be sold at the offer price. The occurrence of non-positive initial returns is evidence of an offer price risk allocation between the issuer and the underwriter. In our sample, 7.5 percent of the IPOs had negative initial returns and 11.5 percent had initial returns of zero. For issues with non-positive initial returns, on public-offer tranche shares, the issuer received gross proceeds per share equal to the minimum bid. For these issues, the underwriter would have incurred costs to support the market or would have acted, in effect, as the writer of a put option to the issuer at the minimum bid.

### C. Bivariate Statistics

*Characteristics of the Offering and the Issuer:* The analogy between the minimum bid in Japan and the filing range in the U.S. is not exact, but there are useful similarities. Japan's required approach for determining the minimum bid is similar to approaches U.S. underwriters use to establish the filing range. Commonly, underwriters in the U.S. use comparable firm data and discounted-cash-flow analysis to estimate aftermarket value. Normally, the underwriter establishes the filing range by reducing the estimated aftermarket value by 10 to 15 percent.<sup>14</sup> We use the minimum bid in a similar way. The formula price (which is not reported) is an estimate of aftermarket value based on financial information from similar companies. During

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<sup>14</sup> Our description of U.S. practice is based on a combination of published information and our review of the confidential pricing analysis work papers of 18 major investment bankers on a recent IPO.

our sample period, by regulation, the minimum bid reflects a discount of 15 percent relative to the formula price.

On that basis, we use a 15 percent difference between the offer price of the public offer tranche and the minimum bid as a convenient way to classify IPOs into two groups. IPOs where the minimum bid is more than 15 percent below the offer price are more likely to have been undervalued by application of the formula. Those where the minimum bid is less than 15 percent below the offer price are more likely to have been overvalued. We refer to these subsamples as the “high-price-adjustment subsample” and the “low-price-adjustment subsample.”

Table 2 presents offering and issuer statistics for the 321 observations and for the subsamples where the minimum bid is less than the offer price by more than 15 percent (181 observations) or less than 15 percent (140 observations). The high-price-adjustment subsample has significantly higher mean offer prices and gross proceeds. Number of shares offered, percent of firm equity offered, and percent of offered shares that are secondary shares do not vary significantly between the subsamples. High-price-adjustment firms are significantly younger than low-price-adjustment firms.

The JASDAQ run-up for the 40 days before the auction is significantly greater for high-price-adjustment issues. Given that the minimum bid is established about five days before the public offer, and is based on historical data for comparable firms, value adjustments are expected to result partly from market-wide value changes. Finally, occurrence of secondary offerings within one year of the IPO is higher among the subsample with more positive price adjustments. In Section IV, we use the secondary offering data to test whether some high quality firms intentionally underprice their IPO to distinguish themselves from lower quality firms.<sup>15</sup>

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<sup>15</sup> This signaling rationale for IPO underpricing is offered by Grinblatt and Hwang (1989) and others.

*Price Adjustments and the Aggregate Value of Initial Returns:* In Table 3, for both the auction tranche and the public offer tranche, we compute the average yen value of initial returns, grouped according to the size of the offer price adjustment. Following Loughran and Ritter (2002), we refer to this as “money left on the table.” As they recognize, money left on the table is not a measure of opportunity loss. The measure does not address, for example, higher costs the underwriter would have incurred in placing the issue at its aftermarket value, or the increase in explicit fees the underwriter would have required in exchange for foregoing the opportunity to recapture some of the initial-return gains IPO investors realized directly. In Japan, the weighted average successful bid, though market determined, generally is below aftermarket value. We compute money left on the table for the auction tranche, even though, without a change of offering method, there is no apparent way for issuer to sell these shares at higher values.

As Table 3 shows, underpricing of the auction tranche is small. Based on the weighted average successful bid, the average auction tranche generates 35.2 million yen less in gross proceeds (about \$350,000 or 1.63 percent of aftermarket value) than the aftermarket value of the tranche. Issues in the low-price-adjustment subsample have weighted average bids that average slightly above aftermarket value. Those in the high-price-adjustment subsample are underpriced by 3.09 percent, on average.

Underpricing of the public offer tranche is more economically significant, averaging 146.1 million yen (about \$1.5 million or 8.59 percent of aftermarket value). Low-price-adjustment issues average 41.8 million yen of money left on the table (about \$420,000 or 3.87 percent of aftermarket value). Underpricing of high-price-adjustment issues average 226.7 million yen (about \$2.3 million or 12.24 percent of aftermarket value).

Except for the difference in size between the public offer tranche and the IPOs studied by Loughran and Ritter, our results are strikingly similar to theirs. Their average offer size of \$68.1 million is approximately five times larger than the average public offer tranche in our sample and their average amount of money left on the table is approximately six times larger. They find that average money left on the table is 11.8 percent of aftermarket value, and ranges from 3.2 percent for offers priced below the filing range to 18.6 percent for offers priced above the range. That such different offering procedures yield such similar results suggests that explanations for observed underpricing patterns are likely to derive from the aspects of the procedures that are similar; most notably, the allocation of risk between issuers and underwriters.

Combining both tranches, underpricing of IPOs in our sample averages 181.3 million yen or 5.07 percent of aftermarket value. The low-price-adjustment subsample is underpriced by an average of 1.80 percent, and the high-price-adjustment subsample is underpriced by an average of 7.61 percent. As Loughran and Ritter (2002) find in the U.S., underpricing is concentrated among a small number of highly underpriced firms. The median issue in our sample is underpriced by 54.4 million yen (about \$540,000 or 3.64 percent). Even for the high-price-adjustment sample median underpricing is 155.9 million yen (about \$1.6 million or 5.82 percent).

In Table 3, we also report mean and median minimum gross proceeds based on the minimum bid. These are the minimums guaranteed by the underwriter for both tranches of the issue. On average, total gross proceeds exceed the minimum by 46.95 percent (a median of 23.81 percent). The mean for the high-price-adjustment subsample is 77.86 percent above the minimum (a median of 59.65 percent), and the mean for the low-price-adjustment subsample is 7.00 percent above the minimum (a median of 5.86 percent). Although the underwriter

guarantees minimum gross proceeds, net proceeds are lower by the underwriter's fee, which averages 3.39 percent of gross proceeds. In our sample, 16.2 percent of issuers (52 firms) realized net proceeds below minimum gross proceeds.

***From Minimum Bid to Offer Price:*** In Table 4, we examine the interval from setting of the minimum bid to setting of the offer price. The first panel presents pricing and bidding statistics from the auction tranche and the offer price of the public issue tranche. The difference of minimum bids between subsamples is marginally significant and suggests that issues with high minimum bids tend to have the most positive price adjustments. Other bid and price information in the panel indicates that the differences between the subsamples are highly significant. Given the similarity of minimum bids between subsamples and the classification taxonomy based on price adjustment, the more significant differences of the other price metrics are to be expected.

The second panel presents indicators of auction demand conditioned on minimum bid. Whereas the low-price-adjustment subsample generated 2.75 bids per share auctioned, the high-price-adjustment subsample generated 5.79 bids per share. Overwhelmingly, issuers set the size of the auction tranche at the 50 percent regulatory minimum. Those that auction more than 50 percent of the IPO tend to do so because secondary shares comprise more than 50 percent of the offering and are required to be offered in a single tranche. While our database does not include failed offerings, the evidence suggests that failure was rare or non-existent. The auction tranches of all but three issues in our sample were fully subscribed or oversubscribed by auction bids. The lowest of the three IPOs that were not fully subscribed still was 80 percent subscribed, which is well above the minimum necessary to prevent failure of the auction.

Over the entire sample, the mean weighted average bid is 29.5 percent above the minimum bid; the mean weighted average successful bid is 53.3 percent above minimum bid; and the mean minimum successful bid is 46.4 percent above the minimum bid. These differences (and the corresponding medians) suggest that minimum bids generally were set well below expected aftermarket values, much more than the 15 percent difference suggested by the regulated pricing method. The differences between mean and median ratios all exhibit strong right-skewness, indicating that the minimum bids of some IPOs reflected extreme undervaluation. As ratios compared to the minimum bid, the weighted average bid, the weighted average successful bid, and the minimum successful bid all are significantly larger for the high-price-adjustment subsample.

As a measure of heterogeneity of valuations in the market, we use the difference between the maximum and minimum successful bid. Conceivably, even if the minimum bid is set very low, investors may have similar beliefs about value, in which case the range between the minimum and maximum successful bid would be small. To evaluate this, we standardize the range by the minimum bid. The ratio of dispersion to minimum bid is significantly higher for the high-price-adjustment subsample. However, the difference between subsamples in this measure of heterogeneity is driven largely by the underwriter's initial undervaluation as reflected in the minimum bid. When the range is standardized by the midpoint of the range, the difference between the groups is much smaller, but still is significant at the 0.05 level.

Finally, in the third panel, we examine the relationship of the offer price of the public offer tranche to several of the demand indicators from the auction. Relative to the minimum bid, the average offer price is 40.4 percent higher. Although we report the differences in this ratio



between the two subsamples, the significance test is not meaningful, as this is the measure we use to classify observations as low-price-adjustment or high-price-adjustment.

The ratio of offer price to weighted average successful bid measures the extent to which the underwriter discounts the offer. The weighted average successful bid is the maximum offer price permitted by regulation. On average, the offer price is discounted by 7.1 percent compared to the weighed average successful bid. Discounting is significantly less for the low-price-adjustment sample than for the high-price-adjustment sample. The fact that the offer price is discounted more in the high-price-adjustment sample is an indication of partial adjustment. Although the weighted average bid is an upper bound on price adjustment, this constraint is not binding in our sample. Only one IPO was offered at the weighted average successful bid price.

Finally, we compare the offer price to the minimum successful bid. As implied by the evidence in Table 3, on average, the offer price is lower. This suggests that an investor could usually do better by waiting, and buying the shares in the public offering. Three considerations mitigate this. First, as in the U.S., offerings usually were over-subscribed and underwriters could allocate shares to favored clients. Second, auction-regime regulations limited the number of shares any one investor could acquire in the public offering. An investor who wanted to take a larger position before aftermarket trading began would need to participate in the auction, as well. Third, investors could purchase shares in no more than four public-offer-tranches per year but could bid in any number of auctions. The fact that the high-price-adjustment subsample has a lower ratio of offer price to minimum successful bid than does the low-price-adjustment subsample is further evidence of partial adjustment. This result is inconsistent with the hypothesis that partial adjustment is due to residual uncertainty about aftermarket value.

*From Offer Price to First Aftermarket Price:* The first panel of Table 5 presents statistics for initial returns and underpricing. Initial return is the first aftermarket price minus the offer price, both divided by the offer price. Underpricing is the first aftermarket price minus the offer price, both divided by the first aftermarket price. We use underpricing in our analysis because it has less right skewness than does initial return. For both subsamples, mean and median underpricing are positive. As implied by partial adjustment, the mean is significantly higher for the high-price-adjustment subsample than for the low-price-adjustment subsample.

The second panel provides evidence that partial adjustment was foreseeable based on evidence of excess demand from the auction. The first aftermarket price is almost twice the minimum bid for the high-price-adjustment subsample, but it is only 10 percent larger than the minimum bid for the low-price-adjustment subsample. The first aftermarket price for the full sample is 3.29 percent larger than the weighted average successful bid, and the median is 0.39 percent larger. Thus, on average, the weighted average successful bid is close to being an unbiased predictor of the first aftermarket price. However, the average for the high-price-adjustment subsample is significantly higher than for the low-price-adjustment subsample. Other measures of aftermarket price relative to indicators of value from the auction yield similar differences between the subsamples.

To summarize, the hybrid auction process in Japan exhibits partial price adjustment. Those IPOs with the highest excess demand in the auction tranche have offer prices that are discounted the most relative to the weighted average successful bid price and result in the highest initial returns in the public offer.

### **III. Empirical Determinants of Offer Prices and Underpricing**

For book-built offerings, Benveniste and Spindt (1989) hypothesize that price adjustments are based on the private information collected during the road show. In their model, residual underpricing compensates investors for revealing private information. The implication of their argument, which is documented empirically by Hanley (1993), is that the price adjustment (from filing range to offer price) and underpricing (from offer price to first aftermarket price) should be positively correlated. Loughran and Ritter (2002) and Ritter and Welch (2002) point out that partial adjustment also can result from risk sharing, and may be affected by agency costs, prospect theory, or other considerations. Loughran and Ritter note that information production cannot account for a positive relationship between underpricing and market runup before the IPO.

While the evidence in Section II demonstrates a positive correlation between price adjustments and underpricing in Japan's auction regime, it does not exclude the possibility that factors unrelated to excess demand at the minimum bid may give rise to the correlation. In this section, we test whether partial adjustment can be explained by observable information about demand for the issue. For this, we use two-stage least squares to estimate a cross-sectional model of the simultaneously determined offer price-adjustment and underpricing percentages.

Table 6 presents estimates of the system.<sup>16</sup> The equations are estimated as a system because the price adjustment and expected underpricing are simultaneous decisions. The level of underpricing depends on the offer price and the aftermarket price. We assume that, in setting the

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<sup>16</sup> Two-stage least squares (2SLS) is a single-equation, partial information estimation method that simultaneously estimates each equation separately. Full-information methods, such as three-stage least squares (3SLS), estimate parameters in the system using all of the restrictions in the system. The results from 2SLS and 3SLS regressions for the system estimated here are indistinguishable from each other.

offer price, the underwriter takes account of the expected aftermarket price. We use the actual aftermarket price as an estimate of the aftermarket price the underwriter expected.

Independent variables include three exogenous measures of demand information generated from the auction: subscription ratio, weighted average successful bid divided by minimum bid, and successful minimum bid divided by weighted average successful bid. As controls for characteristics of the firm and issue, we include firm age, offer size, primary-to-total-shares-offered, auction-to-total-shares-offered, underwriter fees, and the underwriter's share of the IPO market. We use changes in the JASDAQ Index over appropriate intervals to control for market-wide changes in value before the IPO.

#### **A. Adjustment of the Offer Price**

The price-adjustment regression indicates (adjusted  $R^2=99.3\%$ ) that, by using demand information from the auction and our set of control variables, we come very close to estimating a variant of the formula underwriters use to determine the offer price. The auction provides information on demand for the issue, which information is available to the underwriter prior to setting the offer price. The information also is available to investors in the public offer tranche, as it is reported in the second-revised prospectus. If this information is material to setting the offer price then the information should have an impact on the price adjustment.

Because the price-adjustment model includes three interrelated exogenous measures and one endogenous measure related to excess demand at the minimum bid, interpreting their combined effect is complex. The model indicates that the price adjustment is about 82.5% of the adjustment that would result from setting the offer price equal to the weighted average successful bid. If the weighted average successful bid is an estimate of aftermarket value, as implied by Table 5, then an adjustment of less than one hundred percent is evidence of partial adjustment.

The offer price adjustment decreases with an increase in the subscription ratio, indicating that the underwriter discounts the weighted average bid information somewhat when the implied price adjustment is partly a result of a large amount of bidding. This is consistent with partial adjustment predictions where the subscription ratio is regarded as evidence of excess demand.

In the price-adjustment model, if the underwriter or the issuer is risk averse about overpricing, greater homogeneity is expected to be associated with greater price adjustment (pricing closer to the weighted average successful bid price and to aftermarket value). In Table 6, we use the ratio of minimum successful bid to weighted average successful bid as an indication of homogeneity. With this specification, more positive values indicate more homogeneity, suggesting that demand is elastic at around the weighted average successful bid price. When the bids are more homogeneous, we find that the price adjustment is increased so that the offer price is closer to the weighted average bid price.

The price adjustment regression includes, as an endogenous explanatory variable, the exponential of the ratio of the first aftermarket price to the minimum bid, as an estimate of the expected full adjustment from minimum bid to aftermarket. This variable is included in the price-adjustment model to test whether, after controlling for demand information from the auction, the expected aftermarket price has any incremental effect on offer price. We use the exponential transformation to reduce the importance of the outliers where first aftermarket price is much higher than minimum bid. After controlling for observable demand evidence from the auction, the ratio of aftermarket price to minimum bid has no further explanatory power.

The literature offers few predictions for the effect of offer and issuer characteristics on price adjustment. Although the bivariate analysis indicates that age differences may be important, the average age of firms offering IPOs is 30 years and few very young firms issued

during our sample period. The negative coefficient on age suggests that underwriters set the minimum bids of well-established issuers more fully. The positive coefficient on offer size suggests that they price more conservatively for large issues or issues with more-negatively sloping demand for shares. The primary-shares-offered percentage shows the proportion of IPO proceeds going to the firm rather than current shareholders. Although the coefficient is not statistically significant, it may imply that shareholders seek fuller pricing when their own shares are being offered. The auction-shares-offered percentage shows the proportion of shares that are offered in the auction tranche, but is at the 50 percent minimum for almost our entire sample.

The price-adjustment model allows for the possibility that the underwriter's fee and market share may be determinants of pricing. The relationship of price adjustment to market share is not significant. The negative coefficient on fee appears to be coincidental. During the study period, underwriter fees were fixed by informal agreement among the underwriters, but revisions of the formula resulted in slightly higher fees later in the sample period. Also, over the latter part of the study period, the JASDAQ Index was declining, and declines in the Index appear to have reduced the magnitudes of price adjustments. The net effect is that the coefficient on underwriter fees is negative.

To control more directly for unexpected market-wide value changes affecting the difference between minimum bid and offer price, we use run-up of the JASDAQ Index from 40 days before the public offering through the day before. A forty-day window is intended to be long enough to capture the effects of using the backward-looking formula pricing approach to establish the minimum bid. The negative and non-significant estimate in Table 6 indicates that, taking account of demand factors that are specific to the issuer, market run-up over the 40 days

before the offer has a negligible partial effect on price adjustment. That is, it does not appear that the underwriter adjusts the offer price based on changes in the JASDAQ Index.

## **B. Underpricing**

If the underwriter uses information from the auction to assess demand (regardless of whether investors in the public offer tranche use the information), then the information also can affect underpricing. Results in Table 6 indicate that underpricing is higher the higher is excess demand, as indicated by the auction subscription ratio. Weighted-average-successful-bid-to-minimum-bid is not significant in the model. Homogeneity of bids is associated with less underpricing, suggesting that discounts due to heterogeneity are not explained by lower expected aftermarket prices. When demand is elastic, issues are priced more fully.

The underpricing model includes, as an endogenous variable, the ratio of the offer price to the weighted average successful bid. This variable is included to test whether, controlling for other information from the auction, underpricing is predictably related to the discount adjustment relative to the weighted average successful bid price. As would be expected, the partial effect of the offer price adjustment is negative on underpricing. All else equal, the more fully the offer is priced relative to the weighted average successful bid, the less the issue is underpriced relative to aftermarket value. The coefficient indicates that reducing the offer price by 1.0 percent of the weighted average successful bid increases underpricing by 0.434 percent of aftermarket value.

Underpricing is negatively related to offer size, consistent with the view that larger IPOs are priced more fully. We use underwriter market share as an indication of the underwriter's skill and reputation. Skilled underwriters with large market shares may be able to set minimum bids more accurately and closer to aftermarket value. On the other hand, using high-reputation underwriters may signal quality to investors, resulting in higher valuation, enabling underwriters

to extract higher returns for their services. Loughran and Ritter (2002) and Kutsuna and Smith (2003) both note that underwriters may substitute more underpricing for higher fees. Because, during the auction regime, fees were fixed by agreement at an artificially low level based on offer price, any ability of the underwriter to extract rents from issuers should be reflected in underpricing. The evidence in Table 6 is consistent with the ability of high-market-share underwriters to extract higher effective compensation through greater underpricing.

Lowry and Schwert (2002), Loughran and Ritter (2002), and Kutsuna and Smith (2003) document that initial returns to IPOs are positively related to market returns from the period before the IPO. To control for unexpected market-wide value changes affecting the difference between the offer price and the first aftermarket price, we use the run-up of the JASDAQ Index from five days before the offering until the day before the offering. A five-day window is used to capture the effects of market-wide valuation changes that would have affected the price and quantity bidding information from the auction. We find that underpricing is positively related to market run-up for the five days before the IPO.

Because we use the geometric mean daily return over the five-day window, the coefficient suggests that a one-percent increase in JASDAQ yields approximately a one-percent increase in percent underpricing. Thus, it appears that underwriters do not revise offer prices in response to JASDAQ Index changes over the five days before the IPO. Rather, market-wide changes in value affect underpricing. As Loughran and Ritter (2002) note, hypotheses related to information production cannot account for this aspect of underpricing.

### **C. Partial Adjustment**

Because the models in Table 6 include several indicators of demand, it is not obvious whether the positive correlation between price adjustments and underpricing is attributable to



partial adjustment based on evidence of excess demand from the auction. To examine this, we used the coefficients on demand variables to compute a single measure of price adjustment attributable to demand factors. When underpricing is regressed on this measure, the coefficient is positive and significant ( $t = 5.82$ ), and indicates that a demand-related price adjustment equal to 1.0 percent of the minimum bid implies an increase in underpricing equal to 0.07 percent of aftermarket value. Taking account of the average excess of aftermarket value over minimum bid, a 1.0 yen price adjustment implies a 0.11-yen increase in underpricing. The aggregate effect of the other variables from the price-adjustment regression on underpricing is not statistically different from zero ( $t = 0.170$ ). The evidence suggests that partial adjustment is a result of the underwriter's response to evidence of excess demand.

#### **IV. Underpricing as a Quality Signal**

Theoretical models of Grinblatt and Hwang (1989), Allen and Faulhaber (1989), and Welch (1989) suggest that firms may underprice IPOs to signal quality. High quality firms are hypothesized to undertake small, underpriced IPOs and to follow them with seasoned equity offerings. Here we examine whether the observed pattern of underpricing and partial adjustment in Japan is related to these signaling hypotheses.

The particular ways that investors learn of an issuer's quality vary across these models, but all models suggest that, for high quality firms, money left on the table at the IPO is more than recouped in a seasoned offering.<sup>17</sup> A presumption of the models is that IPO issuers recognize that the market is undervaluing them. The models all imply that seasoned offerings after IPOs

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<sup>17</sup> Consistent with the incentive of high-quality firms to mitigate uncertainty, if investment can be staged, a firm could seek minimum funding initially and wait for the market's undervaluation to be resolved. High-quality firms issue initially at low prices and use seasoned offerings to complete the capital-raising effort. Low-quality firms that attempt to imitate high-quality firms run the risk of being discovered before the seasoned offering can be completed. Grinblatt and Hwang (1989) model underpricing and fraction of ownership retained as a quality signal, where quality depends on both expected cash flows and uncertainty. Welch (1989), in a related model, explores the conditions under which high-quality firms signal by underpricing and limiting IPO size versus when they pool with low-quality firms. Allen and Faulhaber (1989) develop a similar model.

are more likely when firms deliberately underprice IPOs and when IPOs are small. In some of the models, the market may not immediately perceive which firms are of high quality, so that immediate aftermarket value is not necessarily the best basis for computing underpricing.

Because our model of price adjustment in Table 6 explains virtually all of the variation of price adjustment, our partial adjustment evidence is inconsistent with the hypothesis that auction-regime issuers use IPO underpricing to signal quality. As the adjustment to minimum bid is determined almost fully on the basis of observable information, unless the minimum bid also is used to signal quality, high levels of residual underpricing cannot be used as quality signals.

To test the hypothesis more directly, we examine determinants of the decision to undertake a SEO and the long-run price performance of auction issuers. In addition, as a test of whether selling shareholders anticipate undervaluation, we examine the decision to sell their shares in the auction tranche or in the public offer tranche. Overall, our evidence suggests that firms that undertake SEOs do so in response to market value increases after the IPO. We find little to suggest that issuers or selling shareholders are able to anticipate the value increases. Rather, it appears that seasoned issues are reactions to unanticipated increases in market value.

#### **A. Bivariate Comparisons of SEO Issuers and Non-issuers**

Table 7 presents statistics for subsamples determined by whether the IPO issuer had a follow-on SEO within a year. The table also presents statistics for the subsample of firms that offer the minimum number of shares required by JASDAQ. The firms in this subsample include all firms that offered 50,000 or fewer shares more than were required by JASDAQ.<sup>18</sup>

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<sup>18</sup> All IPOs involve round numbers of offered shares. Results reported for the subsample of minimum-size IPOs in Table 7 hold across a broad range of definitions for JASDAQ minimum number of shares offered. The results reported are for firms offering less than 50,000 shares above the JASDAQ minimum required amount, but they do not change materially for 1,000, 10,000, or 25,000, or for offer sizes of 0.1 percent, 1 percent or 10 percent shares above the required minimum offer amount.

Of the 321 IPOs, 27 were followed by SEOs. Issuers with SEOs offered similar proportions of IPO shares compared to shares outstanding, and were about as likely as those without SEOs to issue the regulatory minimum number of shares. SEO issuers had higher IPO offer prices, and had marginally significantly larger IPOs in terms of proceeds. These comparisons do not suggest that SEO issuers were limiting the IPO size in anticipation of a seasoned offering on more favorable terms. For the subsample of 182 minimum size IPOs, 14 were followed by SEOs.

The signaling hypotheses suggest that firms that are relatively hard to value at the time of the IPO are more likely to undertake small IPOs followed by SEOs once their value is established in the market. However, as noted above and in the table, the proportion of firms offering the minimum number of shares is actually smaller for firms that have SEOs compared to firms that do not. In the full sample, except for firm age, which is somewhat lower for SEO issuers, there are no significant differences between groups in measures of “track record.” Furthermore, as the measures are consistently larger for the SEO subsample, there is little to suggest that firms in the SEO subsample would be harder for investors to value.

Table 7 also shows that SEO issuers in the full sample have high weighted average bids relative to the minimum bids and high weighted average successful bids relative to the minimum bids. This evidence indicates that, with regard to their minimum bids, SEO issuers were relatively undervalued by the underwriter. However, this does not result in significantly higher underpricing. Offer price discounts compared to weighted average successful bids are similar between the subsamples and initial returns are virtually identical. Rather than supporting the hypothesis that high quality issuers underprice to signal quality for a subsequent SEO, the results suggest that both the issuer and the underwriter underestimated demand for the IPO.

Finally for the full sample, Table 7 reports the JASDAQ-adjusted nine-month aftermarket returns for the two subsamples. We report the nine-month adjusted returns because the return information would have been available to most of the firms in our sample that issued within one year. A longer interval is unlikely to have influenced the decision to issue an SEO during the first year after the IPO. Over this interval, the SEO subsample has significantly more positive aftermarket performance than does the other subsample - an adjusted return of 40.5 percent, compared to -1.7 percent for non issuers. Relative to the entire 36 months after the IPO, nine months is approximately the point when the differences of mean and median adjusted returns between the subsamples reach their maximums. In summary, the evidence suggests that seasoned offerings occur following unexpected run-ups in the issuer's market value after the offering.

The results in Table 7 for the minimum IPO size subsample indicate that firms that subsequently had an SEO are essentially indistinguishable from firms that did not. These results are inconsistent these firms providing a useful signal to indicate a future SEO.

## **B. Determinants of Long-run Aftermarket Performance**

Table 8 reports the results of regressing three different measures of long-run market-adjusted returns on the variables hypothesized to be determinants of offer price and underpricing. The return measures are: the holding period return for the three months after the IPO, including the initial return; the holding period return for the three months after the IPO, excluding the initial return; and the holding period return for the 24 month period after the IPO excluding the initial return. Returns are calculated monthly and adjusted by the return to the JASDAQ Index.

Except for the measure that includes the initial return, aftermarket returns are not significantly related to price discounting of the offer price relative to the weighted average

successful bid. Relationships for measures that do not include the initial return are positive – more discounting relative to weighted average successful bid is associated with poorer, not better, aftermarket performance. As reflected in the subscription ratio, aftermarket performance is positively related to excess demand in the auction for the 3-month return including the initial return. This result is negative for the 3-month returns excluding the initial return. Three-month aftermarket performance excluding initial returns is positively related to excess demand in the auction, as reflected in the ratio of weighted average successful bid to minimum bid. Collectively, these results indicating that underpricing in setting the minimum bid is only weakly related to aftermarket performance.

Aftermarket performance, as reflected in the ratio of minimum successful bid to weighted average successful bid, is negatively related to homogeneity for all performance measures. The table reveals a number of other weak relationships: aftermarket performance is negatively related to offer size, and positively related to relative size of the primary offering to the secondary offering. Except for the model including initial return, total explanatory power of the models in Table 8 is low. Information from the auction regime does not explain the JASDAQ-adjusted returns after the initial return. As a further test of whether issuers use underpricing of a small IPO to signal quality, we tested for a relationship between aftermarket performance and the issuer's decision to issue the minimum number of IPO shares. The coefficient was not significant in any of the models.

In summary, the evidence in Tables 7 and Table 8 and related analysis provides no support for the hypothesis that, in Japan's auction regime, underpricing is used to signal value that is recognized by the market during the first two years after the IPO.

### **C. Source of Selling-Shareholder Proceeds**

As discussed earlier, a unique feature of Japan's auction-regime IPOs is that the proportion of total shares offered by selling shareholders determines the tranche in which secondary shares are sold. Selling shareholders realize proceeds based on the price at which the tranche they select is sold. Because the weighted average successful bid price is the maximum public offer price, selling shareholders could always expect to do better by selling in the auction than by selling in the public offer. The source of the difference is that when the firm sells to raise capital the underpricing on the sale is averaged over new and existing shares, whereas when a selling shareholder sells, all of the underpricing is realized by the selling shareholder.

The benefit to the selling shareholders of selling in the auction tranche is directly related to the size of the discount the underwriter makes to the weighted average successful bid in setting the price of the public offer tranche. Generally, the difference is small, but in a few cases it is over 20 percent. If selling shareholders expect that the minimum bid will be a significant undervaluation of the firm and if they recognize that large price adjustments are related to offer prices that reflect large discounts from the weighted average successful bid, then they have a greater incentive to try to increase their proceeds by electing to sell in the auction.

In Table 9 we seek to understand the choice to sell in the auction tranche or the public offer tranche. The first three columns show measures for the full sample of 321 IPOs classified by whether selling shareholders sell in the auction or the public offer. Statistical significance of the first three items in the upper panel is a direct consequence of our classification. Other than those items, there are no significant differences between the shares sold in the auction tranche and those sold in the public offer tranche. Thus, for the full sample, it appears that selling shareholders did not select between the auction tranche and the public offer tranche in a way that was related to underpricing of the public offer tranche compared to the auction tranche. This

evidence is not consistent with selling shareholders anticipating when the issuer's shares are likely to have been severely underpriced.

The second three columns show similar measures for the subsample of 90 IPOs where secondary shares were exactly 50 percent of the total offering, so that selling shareholders could choose the tranche in which their shares were sold. Shareholders choose to sell shares in the auction tranche in 18.8 percent (17 of 90) of the IPOs in which they had a choice, which is lower but not significantly different from the 21.8 percent (70 of 321) IPOs for the full sample.

The evidence for this subsample is also inconsistent with the view that selling shareholders who anticipate material underpricing sell in the auction tranche to mitigate the effect of underpricing on their proceeds. The upper panel of the table shows that there are no significant differences in the share offering characteristics between the two tranches. The number of selling shareholders is not different between the samples, which is inconsistent with a small number of informed shareholders choosing the auction tranche.

The middle panel indicates that selling shareholders are more likely to sell in the auction tranche when the weighted average successful bid is above the first aftermarket price. That is, they sell in the auction when underpricing of auction shares is negative, and there is significantly smaller negative underpricing of the public offer tranche. However, the differential between auction money on the table and public offer money on the table is not significantly different between the tranches, so there is no indication that sellers select the auction tranche when the spread between the auction tranche and the public offer tranche price is large.<sup>19</sup>

Compared to IPOs where the public offer tranche was chosen, for those observations where the auction tranche was chosen: the offer price is not much larger than the minimum bid,

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<sup>19</sup> The difference in auction money on the table between the tranche choices is  $-6.04 = -6.90 - (-.86)$ , and the difference in public auction money on the table between the tranche choices is  $-6.27 = (0.28 - 6.55)$ . The difference between these is  $0.23 = -6.04 - (-6.27)$ , has a t-statistic of 0.05, and is not significant.

the market has declined significantly in the 40 days before the IPO, and the excess demand, reflected in the ratio of shares-bid-for to shares auctioned, is significantly lower. These results do not suggest that selling shareholders are able to predict underpricing. If auction-tranche sellers anticipated larger price adjustments than public-offer-tranche sellers, the ratio of offer price to minimum bid should be larger for the auction-tranche subsample, but we find no such evidence. Similarly, because underpricing is positively correlated with excess demand, the excess demand result is inconsistent with shareholders choosing the auction tranche to mitigate the effects of underpricing.

Although these results do not support selling shareholders mitigating losses by choosing the auction tranche, the significant results are interesting in that they suggest that something else affects the decision. A likely factor is the significant negative market drift prior to the IPO. It appears that shareholders may choose to sell in the auction tranche after market declines. In discussions with investment bankers in Japan, we have been unable to identify a cause for this pattern. Conceivably, it is related to disappointed expectations about the decline in the market and its effect on share value or a concern that the market may continue to decline.

Finally, although there is no quantitative reason to expect a relationship between the tranche the selling shareholders select and aftermarket performance, we examine aftermarket performance in the third panel of the table. Those where selling shareholders sell in the auction are less likely to have a seasoned offering within the first year, but the difference is not statistically significant. Short- and longer-term aftermarket returns are similar between the two groups.



## V. Discussion

Evidence from Japan's auction-method offerings raises important questions about theoretical interpretations of IPO underpricing in the U.S. We use the evidence to test several specific hypotheses about the reasons for underpricing and partial adjustment. In this discussion, we extend to a broader range of competing, but non-mutually-exclusive hypotheses about the reasons for underpricing and partial adjustment. Many of the extant hypotheses are predicated on institutional arrangements that were not present during the Japan auction regime. Hence, it appears that these hypotheses cannot account for underpricing and partial adjustment of IPOs in the regime.

### A. Hypotheses that Cannot Account for the Japan Evidence

**Winner's Curse:** The Japanese auction-method evidence cannot be explained by the Rock (1986) "winner's curse" hypothesis, that underpricing is necessary to induce uninformed investors to participate in the IPO market. Rock argues that informed investors seek large allocations of IPOs they recognize to be underpriced and opt out of overpriced offerings, so that without intentional underpricing uninformed investors would end up with a disproportionate share of overpriced offerings and negative expected returns on IPO investing. The design of Japan's auction method prevented the winner's curse by assuring the ability of uninformed investors to participate and by preventing informed investors from acquiring large positions in offerings they expected would be underpriced.

**Information Revelation:** As tested above, the auction-method evidence cannot be explained by the Benveniste and Spindt (1989) hypothesis, and related literature, suggesting that shares are underpriced, and preferential allocations are given, to reward informed investors for

truthfully revealing their private information or private valuations of the shares.<sup>20</sup> If an investor in a Japanese auction has private information, the investor's incentive is to bid a price that maximizes expected surplus, taking into account the expected aftermarket price, and the investor's beliefs of how reducing the bid would affect the probability of being among the winning bidders. Thus, informed investors would be expected to bid below their reservation values and these bids could negatively affect the maximum price in the public offer tranche. Further, except for giving small (5000 share) preferential allocations of public offer tranches up to four times per year to an investor, there is no mechanism in the Japanese auction method that would enable the underwriter to reward high bidders in the auction.

***Information Production:*** Our evidence cannot be explained by the Sherman (2002) hypothesis that, rather than being a rent to informed investors for truthful revelation, underpricing may provide compensation to investors for the cost of becoming informed and revealing the information to the underwriter. Under Japanese regulations, the maximum investments in both the auction tranche and public offer tranche appear to be too small to induce investors to devote significant resources to producing information about the issuer value.

***Signaling:*** In the empirical analysis, we also consider the alternative hypothesis that high-quality issuers use underpricing to signal value as precursors to seasoned offerings at higher valuations, as suggested by Grinblatt and Hwang (1989), Allen and Faulhaber (1989), and Welch (1989). Our examination of aftermarket performance and seasoned offerings after the IPO is inconsistent with the view that highly underpriced auction issuers in Japan outperform less underpriced issuers in the aftermarket, or that highly underpriced issuers are more likely to

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<sup>20</sup> See, also, Benveniste and Wilhelm (1990). Sherman (2002) notes that, while underwriters may use roadshows to market auction offerings, without the ability to make allocations dependent on information reported, they cannot provide incentives for investors to report accurately.

undertake seasoned offerings within the first year after the IPO. Rather, the evidence suggests that issuers undertake SEOs after unanticipated increases in market value.

***Cascades and Ownership Dispersion:*** It does not appear that the Japan auction-method evidence of underpricing can be explained by hypotheses based on market dynamics, including avoidance of negative cascades and promotion of aftermarket liquidity. Welch (1992) hypothesizes that pricing too aggressively can cause potential bidders to ignore their private positive information about value and can result in failed offerings. The auction process, however, aggregates information about demand and prevents negative cascades. Booth and Chua (1996) hypothesize that underpricing can result in ownership dispersion and promote aftermarket liquidity. Japan's auction process, however, produces dispersed ownership regardless of the extent of underpricing.

***Certification:*** Booth and Smith (1986), Tinic (1988), Chemmanur and Fulghieri (1994), and others offer various hypotheses of underwriter certification based on the premise that issuers and underwriters have private information about the value of IPO shares. While certification arguments are not precluded by Japan's auction process, the fee fixing agreement during the period, the limited role of the underwriter in establishing the offer price, and the relatively low level of litigation in Japan argue against underpricing as certification. Further, 7.5 percent of IPOs in our sample lose value shortly after the IPO, a result that is hard to reconcile with certification in a low-litigation environment such as Japan.

***Implications for Interpretation of Underpricing in the U.S.:*** Of course, our evidence does not refute any of these hypothesis, which all are based on information differences among investors. Rather, our more modest claim is that the Japanese evidence implies that alternative (non-mutually exclusive) theories may explain the empirical patterns of underpricing and partial

adjustment in the U.S. Underwriters in the U.S. may use underpricing to attract uninformed investors, reward investor for revealing what they know, and/or reward investors for producing information. However, none of these hypotheses can explain why Japan's hybrid auction-method offerings exhibit similar patterns of underpricing and partial adjustment. Also, underpricing in the U.S. may be used to signal value, prevent negative cascades, increase dispersion of ownership, or as an aspect of certification. However, it does not appear that these hypotheses can explain the underpricing of Japan's auction-method IPOs.

#### **B. Hypotheses that are not Rejected by the Evidence**

From among the various hypotheses of underpricing, we are left with the possibility that underpricing and partial adjustment in Japan's auction regime reflect a quasi-contractual risk-sharing arrangement, where principle features of the arrangement may be affected by prospect theory, agency costs, or regulation and quasi-regulatory agreements.

Loughran and Ritter (2002) observe that partial adjustment may be consistent with prospect theory and evidence of agency cost. Issuers whose offer prices are increased relative to the filing range accept greater underpricing because they focus on the gain they realize relative to the filing range, and they underweight the opportunity loss of not pricing the offering more fully. Alternatively, underwriters may benefit by using underpricing to reduce direct issue costs, to compensate investors who also occasionally buy shares in overpriced IPOs, and/or to reward favored customers or attract future business. While there is no clear way, in our analysis, to distinguish between these reasons for underpricing and partial adjustment, they both may influence pricing of the public offer tranche.

Underpricing and partial adjustment, however, is not a sufficient basis upon which to draw an inference of irrationality and agency cost. The alternative is that they arise from a

bilateral allocation between the issuer and the underwriter, of the risks associated with mispricing the offer. The essence of the risk-allocation hypothesis is that underpricing and partial adjustment are reflective of a long-term quasi-contractual allocation of IPO pricing gains and losses. As repeat participants in the IPO market, underwriters can contribute to the efficiency of the market in several ways. First, by intentionally underpricing, the underwriter can substitute underpricing for higher direct issue costs. Second, by committing to share gains from the most underpriced issues with investors, underwriters may develop relationships with customers who are willing to share losses when issues turn out to be overpriced. Third, by distributing shares of underpriced issues to prospective customers, such as prospects for future offerings, underwriters may be able to provide their underwriting services for lower fees.

As long as underwriters have sufficient reputational capital at stake, implicit contracting does not require tacit or explicit collusion by underwriters or irrationality on the part of issuers. Under implicit contracting, underpricing is part of an effort to maximize expected net proceeds to the issuers. Partial adjustment is a bilateral arrangement for sharing unexpected gains and losses between the issuer and the underwriter, where the underwriter only realizes the gains indirectly, through its relationships with investors or ability to attract future business. The implicit contract makes issue cost an increasing function of issue success relative to the filing range or minimum bid. This view is supported by the fact that no issuer in our sample received net proceeds below the minimum bid price; 24.6 percent of the IPOs were offered at the minimum, of these, 13.9 percent of all IPOs had negative first aftermarket returns. For those IPOs offered at prices above the minimum, only 5.4 percent of all IPOs had negative initial returns.

In summary, we examine the Japanese IPO auction data in the light of a broad range of competing, but non-mutually-exclusive hypotheses. We conclude that Japan's auction-method evidence is most consistent with a risk-allocation hypothesis. Underwriters are repeat participants in a market that is influenced by regulation and informal agreements among underwriters on pricing terms. In the context of existing regulation, they contribute to efficiency by substituting underpricing for direct issue costs, by committing to sharing gains (not just losses) from underpriced IPOs with investors, and by allocating shares in order to provide lower underwriting fees.

As underwriting fees constitute only about a third of average underpricing, we cannot exclude broader agency cost considerations, as suggested in Ritter and Welch (2002). Also, as some issues are seriously underpriced, and the underpricing appears to generate little dissatisfaction from issuers, we cannot exclude the possibility that issuers have asymmetric tolerance for over- or underpricing, which may be reflective of prospect theory or may be reflective of asymmetric risk tolerance arising, for example, from an issuer's declining marginal ability to employ offer proceeds in high-valued projects.

## References

- Aggarwal, Reena, Nagpurnanand Prabhala, and Manju Puri, 2002, Institutional allocation and initial public offerings: Empirical evidence, *Journal of Finance* 57, 1421-1442.
- Allen, Franklin, and Gerald R. Faulhaber, 1989, Signaling by underpricing in the IPO market, *Journal of Financial Economics* 23, 303-323.
- Beierlein, Jaclyn, and Hideaki Kiyoshi Kato, 2003, The winner's curse and changing the rules of the game: The effect of maximum price on Japan's discriminatory price auctions, The College of New Jersey Working Paper.
- Benveniste, Lawrence M., and Paul A. Spindt, 1989, How investment bankers determine the offer price and allocation of new issues, *Journal of Financial Economics* 24, 343-361.
- Benveniste, Lawrence M. and William J. Wilhelm, 1990, A comparative analysis of IPO proceeds under alternative regulatory environments, *Journal of Financial Economics* 28, 173-208.
- Booth, James R., and Lena Chua, 1996, Ownership dispersion, costly information, and IPO underpricing, *Journal of Financial Economics* 41, 291-310.
- Booth, James R., and Richard L. Smith, 1986, Capital raising, underwriting and the certification hypothesis, *Journal of Financial Economics* 15, 261-280.
- Chemmanur, Thomas J. and Paolo Fulghieri, 1994, Investment bank reputation, information production, and financial intermediation, *Journal of Finance* 49, 57-79.
- Goldreich, David, 1998, Underpricing in treasury auctions, IFA Working Paper 263-1998, London Business School.
- Grinblatt, Mark and Chuan Yang Hwang, 1989, Signalling and the pricing of new issues, *Journal of Finance* 44, 393-420.
- Hamao, Yasushi, Frank Packer, and Jay Ritter, 2000, Institutional affiliation and the role of venture capital: Evidence from initial public offerings in Japan, *Pacific-Basin Finance Journal* 8, 529-558.
- Hanley, Kathleen Weiss, 1993, The underpricing of initial public offerings and the partial adjustment phenomenon, *Journal of Financial Economics* 34, 231-250.
- Jenkinson, Tim, and Alexander Ljungqvist, 1996, *Going Public: The Theory and Evidence on How Companies Raise Equity Financing*, Oxford University Press: Oxford.
- Kutsuna, Kenji, and Richard Smith, 2003, Why does book building drive out auction methods of IPO issuance? *Review of Financial Studies*, forthcoming.

- Loughran, Tim and Jay Ritter, 2002, Why don't issuers get upset about leaving money on the table in IPOs?, *Review of Financial Studies* 15, 413-444.
- Lowry, Michelle and G. William Schwert, 2002, IPO market cycles: Bubbles or sequential learning?, *Journal of Finance* 57(3), 1171-1200.
- Pettway, Richard H., and Takashi Kaneko, 1996, The effects of removing price limits and introducing auctions upon short-term IPO returns: The case of Japanese IPOs, *Pacific-Basin Finance Journal* 4, 241-258.
- Ritter, Jay R. and Ivo Welch, 2002, A review of IPO activity, pricing and allocations, *Journal of Finance* 57, 1795-1828.
- Rock, Kevin, 1986, Why new issues are underpriced, *Journal of Financial Economics* 15, 187-212.
- Sherman, Ann, 2002, Global trends in IPO methods: Book building vs. auctions, University of Notre Dame working paper.
- Shoken Torihiki Shingikai (Securities and Exchange Council), 1989, *Kabushiki Koukai Seido No Arikata Ni Tsuite (Ideal Institutions of Initial Public offerings)*, Securities and Exchange Council: Tokyo.
- Shoken Torihiki Shingikai (Securities and Exchange Council), 1995, *Tento Tokusoku Shijyo No Kabushiki Koukai Seido To No Arikata Ni Tsuite (Ideal Institutions of Initial Public Offerings on the Second Division of JASDAQ)*, Securities and Exchange Council: Tokyo.
- Tamura, Yoshinori, 1997, Reform measures of initial public offerings: Introduction of book building method, Syoken Gyoho, *Monthly Report of Japan Association of Securities Dealers*, 51-62 (in Japanese).
- Tinic, Seha M., 1988, Anatomy of initial public offerings of common stock, *Journal of Finance* 43, 789-822.
- Welch, Ivo, 1989, Seasoned offerings, imitation costs, and underpricing of initial public offerings, *Journal of Finance* 44, 421-449.
- Welch, Ivo, 1992, Sequential sales, learning, and cascades, *Journal of Finance* 47, 695-732.



**Table 1****Bidding and Offering Statistics by Subscription Ratio**

Mean offering statistics by subscription ratio for 321 auction-method IPOs on JASDAQ from January 1, 1995 through October 1, 1997. The sample includes all JASDAQ IPOs during this period. The subscription ratio is the average number of bids per share offered in the auction tranche. Subscription ratio, weighted average successful bid, and weighted average bid are indicators of excess demand at the minimum bid. Offer price/minimum bid is the adjustment to the offer price of the public offer tranche. Initial return is measured as (first aftermarket price - offer price)/offer price. Underpricing is measured as (first aftermarket price - offer price)/first aftermarket price.

	Number of Obs.	Subscription Ratio	Weighted Average Successful Bid / Min. Bid	Weighted Average Bid / Min. Bid	Offer Price / Min. Bid	Initial Return (%)	Underpricing (%)	Percent Positive Initial Returns (%)
All Observations	321	4.466	1.533	1.295	1.404	11.50	8.59	81.00
Subscription Ratio ≤ 1	3	0.926	1.003	1.003	1.000	-10.14	-14.39	0.00
1 < Subscription Ratio ≤ 2	37	1.592	1.034	1.020	1.011	-0.97	-1.86	43.24
2 < Subscription Ratio ≤ 3	61	2.580	1.165	1.086	1.099	7.55	6.24	78.69
3 < Subscription Ratio ≤ 4	61	3.379	1.380	1.209	1.284	9.59	7.54	81.97
4 < Subscription Ratio ≤ 5	61	4.580	1.665	1.375	1.502	13.57	10.08	85.25
5 < Subscription Ratio ≤ 7	58	5.942	1.843	1.474	1.667	16.32	12.37	93.10
7 < Subscription Ratio ≤ 10	29	8.136	2.080	1.587	1.836	22.79	17.10	100.00
10 < Subscription Ratio	11	13.483	2.437	1.777	2.134	25.16	18.33	100.00

**Table 2****Offering and Issuer Statistics**

Mean and [median] offering and issuer statistics of 321 auction-method IPOs on JASDAQ from January 1, 1995 through October 1, 1997. Minimum bid is determined by the underwriter using a required formula and is based on the values of comparable public firms as determined by the underwriter. By regulation, the offer price can be discounted from the formula value by up to 15 percent. Statistical tests are of differences in means between subsamples where the minimum bid price is below the offer price by more than 15 percent (high-price-adjustment subsample) or less than 15 percent (low-price-adjustment subsample).

	All IPOs	Low-Price- Adjustment Subsample	High-Price- Adjustment Subsample	t-value
<b>Sample Size</b>				
Number of Issues	321	140	181	
Percent of Sample		43.6%	56.4%	
<b>Offering Characteristics</b>				
Shares Offered (thousands)	1224 [1000.0]	1209 [1012.0]	1236 [1000.0]	0.39
Offer Price (yen)	2080.6 [1650.0]	1420.1 [1380.0]	2591.5 [2180.0]	7.33***
Gross Proceeds (million yen)	2841.7 [1867.0]	1946.2 [1310.5]	3534.2 [2255.0]	3.61***
Shares Offered to Shares Outstanding	18.60% [18.10%]	18.29% [17.94%]	18.83% [18.25%]	1.31
Secondary Shares to Total Shares	40.38% [45.45%]	41.01% [47.49%]	39.89% [45.00%]	0.55
<b>Issuer Characteristics</b>				
Age of Issuer (years)	30.0 [29.9]	33.3 [33.5]	27.4 [25.3]	4.15***
Employees	465.0 [318.0]	498.5 [354.5]	439.0 [297.0]	1.04
Sales (million yen)	18607 [12176]	19645 [12874]	17805 [11385]	0.75
<b>Market Conditions</b>				
JASDAQ Runup (day -40 to day -1)	-3.76% [-4.89%]	-7.38% [-7.84%]	-0.96% [-1.65%]	6.75***
Seasoned Offer within 12 Months (percent of IPOs)	8.40% [0.0%]	4.30% [0.0%]	11.60% [0.0%]	2.49**

\*\*\* = significant at .01 level based on two-tail test.

\*\* = significant at .05 level based on two-tail test.

\* = significant at .10 level based on two-tail test.

**Table 3****Price Adjustments and the Aggregate Value of Initial Returns**

Mean [and median] aggregate value of initial returns grouped by price adjustment, for a sample of 321 auction-method IPOs on JASDAQ from January 1, 1995 through October 1, 1997. Gross proceeds of the auction tranche is computed at the weighted average successful bid price. Gross proceeds of the public offer tranche is computed based on the offer price. The yen-value of money left on the table is defined as the difference between the aftermarket value of the tranche and gross proceeds of the tranche. The percentage of money left on the table is computed based on aftermarket value.

	All IPOs	Low-Price- Adjustment Subsample	High-Price- Adjustment Subsample
<b>Sample Size</b>			
Number of Issues	321	140	181
<b>Auction Tranche</b>			
Gross Proceeds (million yen)	1493.6 [980.0]	1003.4 [673.6]	1872.8 [1212.4]
Minimum Proceeds (million yen)	972.6 [661.5]	914.6 [621.6]	1017.5 [728.0]
Money on the Table (million yen)	35.2 [3.2]	-0.3 [-3.5]	62.7 [14.0]
Money on the Table (percent)	1.63% [0.38%]	-0.30% [-0.37%]	3.09% [1.81%]
<b>Public Offer Tranche</b>			
Gross Proceeds (million yen)	1348.4 [884.0]	943.5 [636.4]	1661.7 [1044.0]
Minimum Proceeds (million yen)	953.6 [652.0]	898.3 [607.8]	996.4 [688.5]
Money on the Table (million yen)	146.1 [57.6]	41.8 [22.5]	226.7 [139.5]
Money on the Table (percent)	8.59% [6.67%]	3.87% [3.48%]	12.24% [11.49%]
<b>Total Offering</b>			
Gross Proceeds (million yen)	2842.1 [1867.0]	1946.8 [1311.4]	3534.5 [2255.4]
Minimum Proceeds (million yen)	1926.2 [1320.0]	1812.9 [1224.0]	2013.9 [1428.0]
Money on the Table (million yen)	181.3 [54.4]	41.4 [17.2]	289.5 [155.9]
Money on the Table (percent)	5.07% [3.64%]	1.80% [1.67%]	7.61% [5.82%]

**Table 4****Auction and Offer Pricing Statistics**

Mean and [median] auction and offer pricing statistics for 321 hybrid auction-method IPOs on JASDAQ from January 1, 1995 through October 1, 1997. Minimum bid is determined by the underwriter using a required formula and is based on the values of comparable public firms as determined by the underwriter. Statistical tests are of differences in means between subsamples where the minimum bid price is below the offer price by more than 15 percent (high-price-adjustment subsample) or less than 15 percent (low-price-adjustment subsample).

	All IPOs	Low-Price- Adjustment Subsample	High-Price- Adjustment Subsample	t-value
<b>Auction Bid Price Data</b>				
Minimum Bid (yen per share)	1447.4 [1310.0]	1356.0 [1320.0]	1518.2 [1290.0]	1.73*
Weighted Average Bid (yen per share)	1913.1 [1565.0]	1416.3 [1388.5]	2297.4 [1895.0]	6.12***
Weighted Average Successful Bid (yen per share)	2267.7 [1727.0]	1482.2 [1428.0]	2875.3 [2344.0]	7.84***
Minimum Successful Bid (yen per share)	2163.30 [1650.0]	1422.40 [1380.0]	2736.40 [2260.0]	7.81***
Maximum Successful Bid (yen per share)	2861.70 [2220.0]	1867.70 [1755.0]	3660.60 [3020.0]	7.75***
Offer Price (yen per share)	2080.61 1650.00	1420.14 1380.00	2591.46 2180.00	7.33***
<b>Auction Demand to Minimum Bid</b>				
Shares Bid For per Share Auctioned	4.47 [3.88]	2.75 [2.71]	5.79 [5.08]	13.79***
Weighted Average Bid to Minimum Bid	1.295 [1.145]	1.043 [1.036]	1.490 [1.365]	12.68***
Weighted Average Successful Bid to Minimum Bid	1.533 [1.280]	1.093 [1.089]	1.873 [1.671]	13.96***
Minimum Successful Bid to Minimum Bid	1.464 [1.217]	1.051 [1.032]	1.783 [1.600]	13.81***
(Max - Min Successful Bid) to Minimum Bid	0.468 [0.404]	0.318 [0.298]	0.584 [0.488]	8.28***
<b>Offer Price to Auction Demand Indicators</b>				
Offer Price to Minimum Bid	1.404 [1.194]	1.046 [1.035]	1.681 [1.497]	13.71***
Offer Price to Weighted Average Successful Bid	0.929 [0.934]	0.959 [0.962]	0.906 [0.905]	13.73***
Offer Price to Minimum Successful Bid	0.9711 [0.993]	0.9961 [1.000]	0.9518 [0.952]	11.58***

\*\*\* = significant at .01 level based on two-tail test.

\*\* = significant at .05 level based on two-tail test.

\* = significant at .10 level based on two-tail test.

**Table 5****Initial Return and Aftermarket Prices**

Mean [and median] initial return and aftermarket price statistics of sample of 321 auction-method IPOs on JASDAQ from January 1, 1995 through October 1, 1997. Minimum bid is determined by the underwriter using a required formula and is based on the values of comparable public firms as determined by the underwriter. The offer price may be discounted from the formula value by up to 15 percent. Statistical tests are of differences in means between subsamples where the minimum bid price is below the offer price by more than 15 percent (high-price-adjustment subsample) or less than 15 percent (low-price-adjustment subsample).

	All IPOs	Low-Price- Adjustment Subsample	High-Price- Adjustment Subsample	t-value
<b>Initial Return</b>				
Initial Return	11.50% [7.14%]	5.20% [3.60%]	16.38% [12.99%]	6.79***
Underpricing	8.59% [6.66%]	3.87% [3.47%]	12.24% [11.50%]	3.61***
Percent of First-day Returns > 0.0	81.0%	69.3%	90.1%	4.61***
<b>Aftermarket Price to Bid</b>				
Aftermarket Price to Minimum Bid	1.5937 [1.3000]	1.1024 [1.0801]	1.9763 [1.7133]	13.84***
Aftermarket Price to Weighted Average Successful Bid	1.0329 [1.0039]	1.0077 [0.9964]	1.0523 [1.0184]	3.06***
Aftermarket Price to Minimum Successful Bid	1.0807 [1.0479]	1.0478 [1.0332]	1.1061 [1.0675]	3.68***
Aftermarket Price to Maximum Successful Bid	0.8279 [0.8224]	0.8156 [0.8175]	0.8374 [0.8306]	1.46
Aftermarket Price to Weighted Average Bid	1.1942 [1.1321]	1.0558 [1.0412]	1.3012 [1.2386]	12.06***

\*\*\* = significant at .01 level based on two-tail test.

\*\* = significant at .05 level based on two-tail test.

\* = significant at .10 level based on two-tail test.

**Table 6**

**Offer Price and Underpricing: Two-Stage Estimates**

Two-stage least squares regression estimates of the system of the price-adjustment and the underpricing models for 321 hybrid auction-method IPOs on JASDAQ from January 1, 1995 through October 1, 1997. t-statistics are shown in parentheses.

	Price Adjustment (%)	Underpricing (%)
Intercept	-0.139 (-0.88)	1.383 (3.81)***
Exponential (First Aftermarket Price/ Minimum Bid)	0.000 (0.18)	
Offer Price / Weighted Average Successful Bid		-0.434 (-2.03)**
Subscription Ratio	-0.004 (-2.84)***	0.014 (4.64)***
Weighted Average Successful Bid / Minimum Bid	0.825 (142.63)***	0.007 (0.56)
Minimum Successful Bid / Weighted Average Successful Bid	0.549 (4.52)***	-1.067 (-3.53)***
Age of Issuer (years)	-0.001 (-2.26)**	0.000 (0.71)
Issue Size (billions of yen)	0.002 (2.47)**	-0.003 (-1.66)*
Primary Shares Offered / Total Shares Offered	0.021 (1.40)	0.025 (0.75)
Auction Tranche Shares Offered/ Total Shares Offered	0.115 (0.75)	0.557 (1.67)*
Market Share of Underwriter (decimal)	0.015 (0.60)	0.120 (2.21)**
Underwriter Fees (%)	-0.088 (-4.50)***	-0.080 (-1.81)*
JASDAQ Runup days -5 through -1 (decimal)		5.195 (4.30)***
JASDAQ Runup days -40 through -1 (decimal)	-0.044 (-1.40)	
F-Value	4382.59***	13.87***
Adjusted R <sup>2</sup>	0.993	0.307

\*\*\* = significant at .01 level based on two-tail test.

\*\* = significant at .05 level based on two-tail test.

\* = significant at .10 level based on two-tail test.

**Table 7**

**Descriptive Statistics by Seasoned Offer**

Mean and [median] statistics of sample of 321 hybrid auction-method IPOs on JASDAQ from January 1, 1995 through October 1, 1997, and the subset of these IPOs offering the JASDAQ required minimum number of shares in the IPO. The full sample includes 27 IPOs with seasoned offers within one year and 294 without seasoned offers within one year. The subsample includes 14 IPOs with seasoned offers within one year and 168 without seasoned offers within one year. Statistical tests are of differences in means between subsamples .

	Full Sample			Subsample of Firms Issuing JASDAQ Minimum Number of Shares		
	Seasoned Offer within One Year	No Seasoned Offer within One Year	t-value	Seasoned Offer within One Year	No Seasoned Offer within One Year	t-value
Number of Issues	27	294		14	168	
<b>Offering Characteristics</b>						
Shares Offered to Shares Outstanding	18.60% [17.58%]	18.60% [18.16%]	0.00	16.62% [16.79%]	17.27% [17.52%]	-1.11
Secondary Shares to Total Shares Offered	34.86% [40.00%]	40.89% [46.86%]	-1.66	36.05% [40.63%]	40.99% [47.37%]	-1.05
Percent of IPOs at minimum size	51.85%	57.14%	-0.52			
Offer Price (yen)	3131.3 [2380.0]	1984.1 [1565.0]	2.66**	3014.6 [2190.0]	1827.1 [1500.0]	1.79*
Offer Size (billion yen)	4893.1 [2523.0]	2653.3 [1758.0]	1.61	2749.0 [1094.0]	1161.7 [760.8]	1.23
<b>Issuer Characteristics</b>						
Age of Issuer (years)	24.9 [24.2]	30.5 [30.3]	-2.35**	25.2 [27.1]	31.2 [30.4]	-1.89*
Sales (billion yen)	23307.4 [16881.0]	18175.8 [12022.0]	0.93	30564.6 [23238.5]	17926.5 [11934.0]	1.29
Net Income (billion yen)	1377.9 [467.0]	631.5 [330.0]	0.89	2129.6 [462.5]	731.6 [313.5]	0.86
Proportion of Firms with Minimum JASDAQ Offer Amounts	57.14% [100.0%]	51.85% [100.0%]	0.52	100.0% [100.0%]	100.0% [100.0%]	
<b>Auction Data</b>						
Offer Price Discount from Wtd. Avg. Successful Bid	8.00% [8.25%]	7.03% [6.43%]	1.30	8.24% [6.96%]	7.14% [6.59%]	0.98
Weighted. Average Bid to Minimum Bid	143.95% [139.14%]	128.17% [113.19%]	1.88*	140.10% [130.63%]	128.39% [112.10%]	0.97
Weighted Average Successful Bid to Minimum Bid	177.02% [168.42%]	151.11% [126.40%]	1.84*	170.61% [153.27%]	151.91% [124.96%]	0.93
<b>Returns</b>						
Initial Return (percent)	11.47% [8.21%]	11.51% [7.03%]	-0.01	10.01% [6.33%]	11.17% [6.67%]	-0.38
Nine-month Adjusted Aftermarket Returns (percent)	40.50% [25.33%]	-1.71% [-7.83%]	2.74**	55.60% [41.47%]	3.35% [-4.70%]	1.85*
JASDAQ Runup -40 to -1 (percent)	-0.77% [1.67%]	-4.03% [-5.43%]	1.65	-0.18% [3.00%]	-3.64% [-5.27%]	-1.29

\*\*\* = significant at .01 level based on two-tail test.

\*\* = significant at .05 level based on two-tail test.

\* = significant at .10 level based on two-tail test.

**Table 8**

**Long-Run Returns**

OLS regression estimating the effects of the determinants of the offer price and level of underpricing on the long-term returns for 321 hybrid auction-method IPOs on JASDAQ from January 1, 1995 through October 1, 1997. t-statistics are shown in parentheses.

	3-month Aftermarket Return with Initial Return	3-month Aftermarket Return w/o Initial Return	2-year Aftermarket Return w/o Initial Return
Intercept	2.400 (4.75) <sup>***</sup>	1.588 (1.70) <sup>*</sup>	0.025 (1.83) <sup>*</sup>
Offer Price / Weighted Average Successful Bid	-0.538 (-1.80) <sup>*</sup>	0.682 (1.24)	0.010 (1.25)
Age of Issuer	0.000 (0.28)	-0.002 (-1.58)	0.000 (-0.89)
Offer Size	-0.004 (-1.61)	-0.006 (-1.56)	0.000 (-0.39)
Primary Shares Offered to Total Shares Offered	0.035 (0.74)	0.084 (0.98)	0.001 (0.47)
Auction Tranche Shares Offered to Total Shares Offered	1.008 (2.09)	-0.479 (-0.54)	-0.015 (-1.18)
Subscription Ratio	0.018 (4.46) <sup>***</sup>	-0.013 (-1.66) <sup>*</sup>	0.000 (0.26)
Weighted Average Successful Bid to Minimum Bid	0.009 (0.53)	0.063 (1.97) <sup>**</sup>	0.000 (0.28)
Minimum Successful Bid to Weighted Average Successful Bid	-1.261 (-2.96) <sup>***</sup>	-1.538 (-1.95) <sup>*</sup>	-0.025 (-2.15) <sup>**</sup>
Market Share of Underwriter	0.126 (1.67) <sup>*</sup>	0.185 (1.33)	0.002 (1.08)
Underwriter Fees (%)	-0.064 (-1.03)	-0.162 (-1.43)	-0.001 (-0.66)
JASDAQ Runup days -5 through -1	0.066 (3.96) <sup>***</sup>	-0.043 (-1.36)	-0.001 (-1.57)
Initial Return		-0.111 (-1.05)	-0.001 (-0.38)
F-Value	11.60 <sup>***</sup>	2.04 <sup>**</sup>	0.97
Adjusted R <sup>2</sup>	0.272	0.038	-0.001

<sup>\*\*\*</sup> = significant at .01 level based on two-tail test.

<sup>\*\*</sup> = significant at .05 level based on two-tail test.

<sup>\*</sup> = significant at .10 level based on two-tail test.



**Table 9**

**Source of Selling Shareholder Proceeds**

Mean and [median] statistics of sample of 321 hybrid auction-method IPOs on JASDAQ from January 1, 1995 through October 1, 1997, and the subset of these IPOs for which selling shareholders choose the tranche in which their shares are sold. The full sample includes 70 IPOs where selling shareholders sold in the auction tranche and 251 IPOs where selling shareholders sold in the public offer tranche. The subsample includes 17 IPOs where selling shareholders choose the auction tranche, and 73 IPOs where selling shareholders choose the public offer tranche.

	Full Sample			Subsample For Which Shareholders Choose Selling Tranche		
	Proceeds from Auction Tranche	Proceeds from Public Offer Tranche	t-value	Proceeds from Auction Tranche	Proceeds from Public Offer Tranche	t-value
Number of Issues	70	251		17	73	
<b>Offer Details</b>						
Secondary Shares Offered (thousand)	720.7 [600.0]	422.1 [400.0]	7.36***	640.41 [550.0]	586.1 [500.0]	0.92
Primary Shares to Total Offered Shares (percent)	41.40% [44.44%]	64.70% [58.82%]	-11.29***	50.00% [50.00%]	50.00% [50.00%]	
Primary Shares to Outstanding Shares (percent)	7.55% [7.72%]	12.10% [10.95%]	-8.78***	8.76% [8.53%]	9.25% [8.98%]	-1.15
Auction Tranche Shares (thousand)	618.9 [537.5]	619.1 [500.0]	-0.01	640.41 [550.0]	586.1 [500.0]	0.92
Number of Selling Shareholders	6.06 [6.00]	6.32 [5.00]	-0.18	6.06 [6.00]	6.25 [5.00]	-0.14
<b>Anticipation of Underpricing</b>						
Auction Money on the Table (percent)	1.59% [-0.26%]	1.65% [0.76%]	-0.04	-6.90% [-5.18%]	-0.86% [-0.33%]	-1.98*
Public Offer Money on the Table (percent)	8.94% [6.29%]	8.50% [7.00%]	0.27	0.28% [0.57%]	6.55% [7.14%]	-1.91*
Offer Price to Minimum Bid (percent)	130.96% [114.45%]	143.08% [120.21%]	-1.60	121.19% [108.70%]	140.39% [120.80%]	-1.66
JASDAQ Runup days -40 through -1 (percent)	-3.76% [-4.18%]	-3.76% [-5.20%]	0.00	-9.70% [-9.90%]	-4.25% [-5.82%]	-2.27**
Shares Bid For per Share Auctioned (times)	4.34 [3.60]	4.50 [4.00]	-0.44	2.93 [2.85]	4.29 [3.81]	-2.14**
<b>Anticipation of Aftermarket Performance</b>						
Seasoned Offerings in One Year (percent of IPOs)	4.29% [0.00%]	9.56% [0.00%]	-1.41	5.88% 0.00%	6.85% 0.00%	-0.14
One-month Adjusted Returns (percent)	-2.77% [-5.36%]	-2.83% [-4.16%]	0.02	-1.97% [-7.52%]	-3.50% [-4.46%]	0.29
Twelve-month Adjusted Returns (percent)	-2.22% [-10.81%]	-1.73% [-9.53%]	-0.10	0.50% [-8.05%]	0.53% [-10.56%]	0.00

\*\*\* = significant at .01 level based on two-tail test.

\*\* = significant at .05 level based on two-tail test.

\* = significant at .10 level based on two-tail test.