# Underwriter Certification and Japanese Seasoned Equity Issues

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In sharp contrast to results in the United States, the average stock price response to an announcement of a seasoned equity issue in Japan is positive. Offer prices in Japan, unlike the United States, are announced several days before the beginning of the subscription period and incorporate a substantial discount. We suggest that the positive announcement effects in Japan are consistent with the underwriter's *certification* of the issuing firm's value. We characterize the underwriter's risk as a put option and find a positive association between the underwriter's risk and the announcement returns, as well as other results consistent with underwriter certification.

Empirical studies document that the average stock price reaction to the announcement of a public seasoned equity issue by a U.S. corporation is negative.[1] In sharp contrast to the U.S. result, evidence by Kato and Schallheim (1993b) and Kang and Stulz (1996) support a positive (or at least nonnegative) stock price reaction to the announcement of new equity issues by Japanese corporations. In this study we use an extensive database of season equity issues covering a period of almost 20 years to

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[1] For examples see Asquith and Mullins (1986), Masulis and Korwar (1986), Mikkelson and Partch (1986), Schipper and Smith (1986), and Barclay and Litzenberger (1988).

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provide additional evidence supporting a *positive* announcement effect. We then explore an explanation for the positive announcement effect that is based on the underwriting process in Japan.

Three potential sources for the contrasting announcement effects of seasoned equity issues in Japan and the United States are (1) institutional differences in the underwriting process, (2) differences in the types of firms that issue stock, and (3) differences in general market conditions. Kang and Stulz (1996), focusing more on the second and third potential explanations, argue that the positive announcement effect is due to managers of small Japanese firms being motivated differently than U.S. managers. Kang and Stulz suggest that large Japanese firms are managed similar to U.S. firms in terms of their financing. For these larger firms, they find an overall negative announcement effect. In this study we investigate the first potential explanation and provide evidence that supports a significant role for the underwriter of Japanese equity issues as a "certifier" of firm value and bearer of underwriting risk.

Altinkilic and Hansen (2000) point out four main functions for the underwriter of firm-commitment offerings: certification, monitoring, marketing, and risk bearing. Certification is potentially more valuable in Japan than it is in the United States because the Japanese underwriter is at risk for a much longer time period. In the United States, offer prices are typically set less than 24 hours before the stock issue is sold to investors [Smith (1977), Eckbo and Masulis (1995)]. For our sample, the offer price for a fixed-price, firm-commitment underwriting in Japan is determined several days before the beginning of the subscription period and is set at a significant discount below the current market value of the issuing firm's stock. This offering method places the Japanese underwriter at risk for several trading days (and often more than a week or two in calendar time). We model this risk to the underwriter as a short position in a put option. The exercise price of the put reflects the discounted offer price of the stock issue and the time to expiration is the period from when the offer price is set to the end of the subscription period. To minimize the possibility of a loss resulting from being short an "in-the-money" put at the end of the subscription period, we argue that the underwriter will not enter into a firm-commitment offering agreement if it judges that the stock's "intrinsic" value is lower than the offer price. By agreeing to a firm-commitment stock offering, the Japanese underwriter partially reveals its private valuation of the issuing firm's stock. Intuitively this certification of the issuing firm's stock value truncates investors' distribution of possible stock values at the offer price (or decreases the probability of values below this level) and leads to an upward reevaluation of the stock price. U.S. firms are not at risk for the same time period and thus, we argue, do not provide the same amount of certification. However, our evidence complements the results of other studies supporting a certification role for underwriters in

the United States [Booth and Smith (1986), Denis (1991), and Puri (1996)] and the United Kingdom [Slovin, Sushka, and Lai (2000)].

We document several empirical findings supportive of the certification hypothesis for Japanese firm-commitment offerings. First, the announcement period return is significantly positive, indicating that the market estimates that the expected offer price is below the stock's intrinsic value as certified by the underwriter. Second, the underwriter's risk is increasing in the value of the put option, and the additional risk means greater certification of value from the underwriter. Consistent with this argument, we find that the put value is positively and statistically related to the announcement return of the equity offering.

In December 1983, near the midpoint of the sampling period used in this study, a new variation of the equity issue process was introduced in Japan, called the formula-price stock offering. In this type of offering, the offer price is set closer to the end of the subscription period and the offering is automatically canceled if the calculated offer price is below a minimum level. Both of these differences mean that the underwriter's risk is lower, resulting in less certification by the underwriter for formula-price offerings than for the fixed-price offerings. This (contingent) put option for the formula offerings will have lower value due to the shorter time to expiration as well as the potential cancellation provision. In fact, our calculations show that the formula-price put has a value-to-stock price ratio that is about 60% of the fixed-price put. This leads to our third main empirical finding—specifically, we provide strong evidence that the formula-price offerings have a significantly lower stock price reaction to the offering announcement. This result is consistent with our hypothesis of a lower level of certification for formula offerings. Nevertheless, the average stock price reaction to the announcement of a formula-price offering is *nonnegative*. This result is consistent with Kang and Stulz's (1996) conclusion that different managerial motivations from U.S. firms may apply to Japanese firms.

The remainder of the article is organized as follows. Section 1 provides a brief history of seasoned equity issues in Japan, including some of the changes in the process precipitated by the powerful Japanese Ministry of Finance. Section 2 presents an argument for underwriter certification of issuing firm value and its effect on the announcement-day stock price reaction. Section 3 describes the data. Section 4 provides our event study results. Section 5 presents time-series and cross-sectional tests of the certification hypothesis. We summarize our analysis in Section 6.

## 1. Background on Seasoned Equity Issues in Japan

Prior to the mid-1970s, almost all equity issues by Japanese firms were rights offerings to existing shareholders; only the unpurchased shares were

sold in the public market. The offer price for these rights offerings was typically set at 50 yen, which is par value for most Japanese stock. In January 1969, Nihon Gakki, a musical instrument maker, successfully made an underwritten public offering with the offer price based on the stock's market value [Kunimura and Iihara (1985)]. After that the number of public equity issues increased greatly. The offer prices, although higher than the par value, were set at a substantial discount below the stock's market value until the early 1980s, and many of the shares of these discounted issues were allocated to friendly investors or firms called *oyabike* (parent's underwriting advantage).

Until 1973, the *oyabike* issue, which resembles a private placement, dominated the seasoned equity issue market.[2] However, in February 1973, the Ministry of Finance (MOF) gradually started to restrict *oyabike* transactions. The initial guideline restricted *oyabike* transactions to no more than 40% of new equity shares. In October 1976, the ceiling became 20% and finally, in February 1983, the MOF informally prohibited all *oyabike* transactions except for employee stock ownership plans (ESOPs), for maintaining the ownership structure for joint-venture firms, and for subsidiaries issuing stock. Also during this period, the MOF placed restrictions on corporate purchases of newly issued shares. In February 1981, corporations could purchase no more than 50% of the new shares (reduced to 30% of new shares in February 1983).

The average discount in the early 1970s was very high, with offer prices typically more than 10% below the stock's market price. In February 1973, the MOF and the major underwriters informally agreed to lower the discount. In February 1977, the major underwriters announced a target range for the discount of less than 8%. The average discount finally fell to around 3.5% after 1983.

During our sample period the offer price of a seasoned equity issue in Japan was determined in one of two ways, the *fixed-price method* and the *formula-price method*.[3] Until November 1983, however, the offer price could only be determined by the fixed-price method. Under the fixed-price method, the offer price is announced more than one week before the

[2] There are several reasons why firms used the quasi public issues with *oyabike* instead of a true private placement. First, the issuer uses the help of the underwriter to allocate the new shares to friendly investors or corporations that are in the issuing firm's *keiretsu* group (a uniquely Japanese form of industrial organization). Second, private placements restrict the firm from issuing new equity for two years. Third, private placements are often associated with firms that are in financial distress. Finally, the underwriter, sometimes a member of the *keiretsu* group, receives financial support through the underwriting fees.

[3] The MOF informally stopped public equity offerings (with rare exceptions) after the stock market crash in early 1990 and only began accepting general applications again in March 1994. At this time the MOF eliminated the fixed and formula offering methods and introduced the "book-building" method to Japan. The risk to the underwriter is somewhat lower under this new method because the offer price is usually determined after the underwriter knows that the issue will be fully subscribed. In that sense, the book-building system may be more similar to the U.S. offering method than the more risky fixed and formula methods used during our sample period.

end of the subscription period (in our sample, the average is 7.2 trading days or 9.6 calendar days). To help shorten the interval between the announcement of the offer price and the subscription period and to allow for automatic cancellation of an offering due to a declining stock price, the MOF allowed the formula-price method to be introduced. In December 1983, NEC became the first firm to announce the use of a formula-method offering with the new shares being issued in February 1984. Under the formula-price method, the offer price is determined based on a prespecified day's closing price. This offer-price determination day is at least one day before the beginning of the subscription period and is usually less than one week before the end of the subscription period (a mean of 4.0 trading days or 5.4 calendar days in our sample).[4] Also under the formula-price method, a minimum offer price, set at 15% below the current stock price, is announced. If the offer price is calculated to be below this minimum offer price, the stock offering is canceled. Fixed-price offerings do not have this automatic cancellation provision.[5] For our sample period, underwriting fees for these two types of Japanese firm-commitment stock offerings are set at a fixed percentage of gross offer proceeds (3.5% until January of 1990 and 3% from January 1990 to February 1994). In summary, the two major differences between the fixed-price and formula-price methods are the amount of time between the offer-price determination day and the subscription period, and the formula method's automatic cancellation feature.

Formal stock price stabilization by the underwriter is permitted from the day after the offer-price determination day until the end of the subscription period.[6] Although the stabilization transactions are written into Japanese law, stabilization activity is not unique to Japan. Smith (1986) mentions the practice by underwriters in the United States of placing a limit order to buy shares of a listed firm that is issuing equity. Smith argues that this procedure prevents the investment banker from overpricing the new issue. (If the issue is overpriced, the investor can sell shares at the stabilizing bid.) Hanley, Kumar, and Seguin (1993) present evidence consistent with price stabilization in the U.S. initial public offering (IPO)

[4] The timing of the determination of the offer price is different in the United States. Smith (1977) notes that "(t)he 'Rules of Fair Practice' of the National Association of Security Dealers require that new issues must be offered at a fixed price and that a maximum offering price be announced two weeks in advance of the offering. However, the actual offering price need not be established until immediately before the offering date. In fact, the binding underwriting agreement which specifies the offer price is not normally signed until within 24 hours of the effective date of the registration" (p. 299).

[5] Cancellations of stock offerings in Japan are extremely rare, but several formula-price offerings were automatically canceled shortly after the Japanese stock market crash in early 1990 because their offer prices were below the minimum offering price.

[6] The stabilization regulation is set under conditions of the Cabinet Order for Enforcement of the Securities and Exchange Law (Articles 20–26). Because the MOF closely examines the issuing firm's stock price volatility from three months prior to the announcement day until one month after the issue day, a period of *informal* stabilization may also occur during this period.

market. Their evidence shows a significant decrease in the bid-ask spread when stabilization activity is likely to be present. In addition, their evidence suggests significant price declines when the stabilization is "removed."

Prior to January 1983, Japanese Securities Exchange Law guidelines state that the application to sell new stock is not effective until 30 days after the registration statement is filed with the MOF. However, starting in 1983, firms that meet certain disclosure guidelines established by the MOF were permitted to use a shorter time period: 23 days from 1983 to 1987 and 15 days from 1987 to 1988. Typically only large, well-known firms met these disclosure guidelines. Starting in August 1988, the minimum time was shortened to 15 days for most firms and 7 days for firms that met the disclosure requirement. Once the minimum registration period is met, the equity offering is formally in effect and the underwriters can begin their sales activities.

One other restriction limits the ability of the firm to make a speedy issue of common stock. Japanese Commercial Law requires at least 14 days between the day all necessary information about the equity offering is released and the payment day. (The payment day is the day that the underwriter pays the proceeds of the stock issue to the issuing firm and is one day before the stock issue day.)

## 2. Hypotheses

Equity offerings by Japanese firms differ from U.S. common stock offerings in two important ways: (1) the lengthy period between the determination of the Japanese offer price and the selling period and (2) the significant discount for the offer price in Japan. Loderer, Sheehan, and Kadlec (1991) find that offer prices for seasoned equity offerings of New York and American stock exchange firms are typically set at or above the previous day's closing price. However, they do observe an average discount of several percentage points for NASDAQ firms.

The significant time period between the determination of the offer price and the subscription period means that firm-commitment offerings impose higher risks on Japanese underwriters than on their U.S. counterparts. In particular, a decline in stock price during this period to a level below the offer price can cause significant losses for the underwriter. To avoid the potential for a loss, we argue that the Japanese underwriter will refuse to offer stock of a corporation unless the likelihood of such a decline in stock price is small.

To assess the probability of a short-term decline in stock price, underwriters can compare publicly available information with managers' inside information to determine whether the stock's "intrinsic" value is different than its current market value. In this sense we rely on the asymmetric

information model developed by Myers and Majluf (1984) and extended by Cooney and Kalay (1993). In these models, managers possess more precise information about the value of the firm's existing assets and growth opportunities than potential purchasers of the firm's stock. A critical assumption is that managers cannot credibly reveal their private information to the public costlessly.

It is possible, however, to make a stock offering to a small group of investors, which would give managers the ability to credibly reveal favorable private information without fear of a disclosure to competitors. Hertzel and Smith (1993) use this explanation as a possible reason for the observed difference in stock market reaction for private versus public issues of common stock; the mean stock price reaction to announcements of private equity issues is *positive*, both in the United States and Japan. [See also Wruck (1989) for U.S. evidence and Kato and Schallheim (1993a) for evidence in Japan.] Also similar to a larger investor in a private placement, the underwriter is compensated to provide a monitoring role that overcomes the free-rider problem faced by existing shareholders.

Analogous to a private placement, management can reveal its private information about firm value to the underwriter. The willingness of the Japanese underwriter to agree to a firm-commitment offering indicates that this private information is favorable; that is, the stock's intrinsic value is not lower than the offer price. Thus the market interprets the announcement of the equity issue as good news.

There are several compelling arguments for the assertion that Japanese underwriters will not accept offerings in which the issuing firm's intrinsic stock value is less than the offer price. First, once the firm-commitment price is set, the underwriter is at risk from new information about the firm that will move the price toward its intrinsic value. Second, if the underwriter provides price support, it is at risk from the possibility of purchasing and holding the new shares of stock. Third, since underwriting fees are fixed in Japan, the underwriter cannot be compensated for taking on the additional risk of issuing stock in an overvalued firm. Finally, the underwriter has the incentive to properly price the new issue to maintain its reputation for future business and this concern for reputation makes the certification believable for investors.[7] For these reasons, we maintain that the underwriter's agreement to issue the new stock signals (certifies) to the market that it has determined that the intrinsic stock value is at least as great as the offer price. At best, this signal allows investors to truncate their distribution of possible stock values at the offer price. More likely,

[7] Beatty and Ritter (1986) and Carter and Manaster (1990) present evidence supporting underwriter reputation models. Unlike other underwriter reputation arguments, our hypothesis does not require an *underwriter ranking*. In fact, our argument is valid even if there is only *one* underwriter in Japan. However, the underwriter's reputation is important for a credible certification as well as a source of economic rents to the underwriter.

investors will decrease their subjective probabilities of prices below the offer price. In either case, the result will be an upward revision of the stock price.

The certification hypothesis, in which the underwriter guarantees the value of the issuing firm, is not new to this study. Booth and Smith (1986) argue that underwriters provide a valuable service by certifying the validity of the issuing firm's current stock price. Denis (1991) provides evidence consistent with underwriter certification in finding that the announcement-day effects of traditional underwritten equity issues are less negative than those for shelf-registration issues. Because underwriter certification is not provided with a shelf-registration issue, a lower (more negative) stock price response is expected for a shelf issue than the non-shelf-registered offerings. Puri (1996) argues that commercial banks are better informed than investment house underwriters, and commercial bank underwritings (in the pre-Glass–Steagall period) "can have a stronger 'certification effect' than those of investment houses" (p. 375). Puri finds that underwritings by commercial banks did result in higher issue prices than investment house underwritings. Slovin, Sushka, and Lai (2000) examine "placings" (firm-commitment offerings) in the United Kingdom. For the United Kingdom placings announcements, they find a positive stock price reaction that they attribute to underwriter certification and monitoring.

### 2.1 The underwriter's fixed-price put option

The offer price discount plays a pivotal role in our analysis. Low discounts (i.e., high offer prices) present more risk to the underwriter than offerings with high discounts. We model the underwriter's risk as a short position in a put option with the exercise price equal to the discounted offer price. Lower discounts increase the value of the underwriter's put option and thus the value of the underwriter's certification.[8]

On the announcement of the seasoned equity issue, the market anticipates the underwriter's put, but is uncertain about a key parameter value, the offer price (or exercise price). Nevertheless, investors have reasonable expectations about the discount from other recent equity issues. The days to maturity (equal to the number of days between the

[8] A similar argument is made by Singh (1997) regarding the determination of the subscription price in U.S. underwritten rights offerings. Singh observes that the offer price in his sample of U.S. rights offerings is disclosed an average of 13 days before the rights expire and that this offer price reflects an average discount of 8.4% below the firm's stock price. Similar to the certification hypothesis outlined above, Singh argues that "If the underwriter is apprehensive, they will attempt to keep the subscription price sufficiently low so that the common stock price will not fall below the subscription price before the rights expiration date. Thus the subscription price in a rights offer reflects the underwriter's expectations, and is an important piece of information to the capital market" (p. 127). Consistent with this argument, Singh reports a positive correlation between the discount and the announcement effect. (Unlike our measure, Singh defines the offer-price discount as the offer price divided by the stock's market price. Therefore his finding is consistent with our hypothesis.)

date the offer price is set and the end of the subscription period) is known at the first board meeting date. Other option pricing parameters such as the risk-free rate and the stock's return volatility can be estimated. Based on this information, we calculate the *expected put* value. At the second board meeting, the offer price (and discount) will be announced. Our put value estimate can be updated with the actual offer price, and the difference between the "actual" and the *expected put* values results in the variable we call the *put forecast error*.

The advantage of the option pricing approach to underwriter certification is that it incorporates the four important factors of stock price, offer price discount, the time the underwriter is at risk, and the volatility of the stock, all combined into one value. At the same time, it must be understood that underwriter certification derives from information asymmetry, which is not consistent with the assumptions of the Black and Scholes option pricing model. Therefore it is possible that the value of the underwriter's put option will not capture all the underwriter's risk. For example, stabilization purchases by the underwriter are additional activities that place the underwriter at risk.

### 2.2 The underwriter's formula-price put option

Starting in December 1983, the selection by issuing firms and their underwriters of fixed-price versus formula-price offerings provides a unique test of this underwriter certification hypothesis. The shorter period for formula offerings reduces the probability that the stock price will fall below the offer price before investors have agreed to purchase the new shares of stock. This makes the formula-price method less risky for the underwriter and accordingly it provides a lower level of underwriter certification than the fixed-price method. Also the possibility of future cancellation of the offering decreases the certification benefits of the initial announcement of the equity offering.

The risk that the underwriter faces with the formula offerings can be valued as a "contingent" put option very similar to the fixed-price put described above. The exception is that the underwriter's put may or may not exist given the cancellation option. The intuition is straightforward. The formula-price put is identical to the fixed-price put *if* the underwriting takes place. However, if the calculated offer price is below the *minimum offer price*, then the entire offering is canceled. To price this contingent option, a modification of the Black and Scholes formula is required in order to take into account the probability that the offering could be canceled. The appendix contains a detailed description of the valuation of both the fixed and formula put options.

One important caveat concerns the role of the MOF in the certification process. The announcement of the equity offering that we claim informs the market about underwriter certification also could signal "MOF

certification." While we cannot rule this out, our tests favor underwriter certification for two reasons. First, only the underwriter has a short position in the put option. Second, the differences in announcement stock price reaction between fixed-price and formula-price offerings cannot be explained by MOF certification. Nevertheless, for our purposes, the MOF and underwriter certifications can be considered complements.

## 3. Data Description

### 3.1 Sample selection and summary statistics

Our initial database consists of all public, seasoned, common stock offerings from Japanese corporations listed in the first section of the Tokyo Stock Exchange (TSE) announced during the period January 1974 to March 1993.[9] Firm names, announcement and issue dates, discounts, and offer prices were collected from various issues of the *Commercial Law Review*.

Firms that made simultaneous rights offerings, stock splits, or stock dividends were eliminated from our dataset, as were firms not included in our accounting database. We also eliminated equity offerings sold via a "standby agreement" by the underwriter (only 20 issues), leaving 703 "whole-purchase" (i.e., firm-commitment) stock offerings.[10] We lost 69 observations because of a lack of stock return data, particularly for those firms issuing during the 1970s. Finally, we required that the issuing firm's stock trade on at least one-half of the possible trading days during the period from one day before the announcement day to one day after the issue day, eliminating an additional 79 observations. Our final sample has a total of 555 stock offerings with announcement dates from February 1974 to August 1991.[11] Our sample includes 20% of the total number of public issues from TSE firms (both first and second sections) during this period and encompasses 46% of the yen value of those issues.

The yearly number of offerings, average and total yen value of the stock offerings, and the average, maximum, and minimum discount are given in Table 1, panel A. Total issues and the yen value of those issues peaked in 1989; the Tokyo stock market also peaked in late 1989. Although there were 19 stock issues in 1990, all were announced by the end of February

[9] As discussed in Section 1, our sample period covers a majority of the years that public offerings of equity were made in Japan through the use of the fixed and formula offering methods.

[10] Of these 703 observations, 304 firms issued common stock only once during the sample period, 129 firms issued two times, 33 firms issued three times, 8 firms issued four times, and 2 firms issued five times.

[11] We also require that returns are available for at least half of the estimation and event periods. Therefore, depending on the estimation technique, estimation period, and/or event period chosen, the number of observations may be less than 555.

**Table 1**
**Descriptive statistics**

**Panel A: Sample firms**

| Year of issue | Number of observations | Total value of offering (average value) | Mean discount [minimum–maximum] (%) |
|---|---|---|---|
| 1974 | 8 | 29 (3.60) | 9.07 [7.41–10.47] |
| 1975 | 20 | 113 (5.64) | 9.71 [8.37–10.91] |
| 1976 | 28 | 115 (4.12) | 9.67 [8.64–10.01] |
| 1977 | 20 | 84 (4.22) | 8.99 [7.03–9.98] |
| 1978 | 6 | 27 (4.53) | 6.91 [6.44–7.46] |
| 1979 | 10 | 74 (7.42) | 5.72 [5.07–6.28] |
| 1980 | 62 | 410 (6.61) | 5.54 [3.86–6.51] |
| 1981 | 58 | 525 (9.05) | 4.86 [3.78–5.65] |
| 1982 | 64 | 535 (8.35) | 4.80 [3.88–5.09] |
| 1983 | 17 | 172 (10.14) | 4.53 [3.77–4.91] |
| 1984 | 34 | 400 (11.78) | 3.50 [2.88–4.47] |
| 1985 | 25 | 281 (11.23) | 3.40 [2.88–3.99] |
| 1986 | 22 | 196 (8.91) | 3.42 [3.00–3.58] |
| 1987 | 31 | 810 (26.12) | 3.39 [2.70–3.57] |
| 1988 | 47 | 1201 (25.56) | 3.41 [2.90–3.50] |
| 1989 | 83 | 3558 (42.87) | 3.45 [2.95–3.50] |
| 1990 | 19 | 801 (42.16) | 3.39 [2.97–3.50] |
| 1991 | 1 | 22 (21.62) | 3.50 [3.50–3.50] |
| All years | 555 | 9353 (16.85) | 4.91 [2.70–10.91] |

**Panel B: Fixed-price and formula-price offerings (1984–1991)**

| | Fixed-price offerings | | | Formula-price offerings | | |
|---|---|---|---|---|---|---|
| Year of issue | Number of observations | Total value of offering (avg. value) | Mean discount [min.–max.] | Number of observations | Total value of offering (avg. value) | Mean discount [min.–max.] |
| 1984[a] | 18 | 160 (8.90) | 3.62 [2.88–4.40] | 15 | 233 (15.53) | 3.30 [2.90–3.90] |
| 1985 | 12 | 105 (8.74) | 3.44 [2.88–3.99] | 13 | 176 (13.53) | 3.36 [2.90–3.90] |
| 1986 | 11 | 114 (10.41) | 3.43 [3.25–3.58] | 11 | 81 (7.41) | 3.41 [3.00–3.50] |
| 1987 | 22 | 577 (26.22) | 3.37 [2.70–3.57] | 9 | 233 (25.89) | 3.43 [2.90–3.50] |
| 1988 | 17 | 564 (33.17) | 3.41 [2.90–3.50] | 30 | 637 (21.24) | 3.42 [3.00–3.50] |
| 1989 | 11 | 133 (12.11) | 3.33 [2.95–3.49] | 72 | 3425 (47.57) | 3.47 [3.00–3.50] |
| 1990 | 5 | 81 (16.13) | 3.37 [2.97–3.50] | 14 | 720 (51.46) | 3.39 [3.00–3.50] |
| 1991 | 0 | | | 1 | 22 (21.62) | 3.50 [3.50–3.50] |
| Total | 96 | 1734 (18.06) | 3.43 [2.70–4.40] | 165 | 5528 (33.50) | 3.42 [2.90–3.90] |

Yearly number and value (in billions of yen) of common stock offerings and percentage discount in the offer price. Observations are sorted by the issue date of the common stock offering. Panel A: Sample firm figures for the period 1974–1991. Panel B: Firms using the fixed-price offering method versus the formula-price offering method for the period 1984–1991.

[a]The equity issues in 1984 include all offerings announced on or after December 1, 1983, when both fixed and formula offerings were available.

and issued to the public by the end of March. The decline in the number of equity offerings coincided with the Tokyo stock market crash that started in early 1990. The average discount declined over our sample period, falling from an average of 9.1% in 1974 to 3.5% in 1991. Most of this decrease occurred during the period 1976 to 1984. For fixed-price offerings, we calculate the discount as one minus the offer price divided by the closing stock price one day before the second board meeting date. For formula-price offerings, the discount is announced at the second board meeting date.

Panel B of Table 1 gives the yearly breakdown of fixed-price versus formula-price offerings with announcement dates beginning in December 1983 (issue dates beginning in January 1984). Although discounts are comparable for the two offering methods, firms using the formula-price method tend to have a larger issue size. Fixed- and formula-price offerings were used with the same relative frequency in the mid-1980s, with the formula-price method becoming the dominant offering method late in the sample period.

Equity issues in our sample included firms from 23 of 26 industry groups with the most frequently represented group being the banking industry (69 issues). Electronic companies and trading companies followed with 55 and 54 issues, respectively. Observations were also aggregated into six major industry categories. Manufacturing companies made up a total of 351 of the equity issue announcements. Financial companies made 108 announcements, followed by trading companies (54), retail/wholesale (28), transportation (9), and service (5).

### 3.2 Time line of the stock issue process

One of the important pieces of information in our database is the various announcement and transaction dates for seasoned equity issues. The following is a description of these dates.

**Analyst announcement day** (*Analyst Announcement*): Newspaper date of a story reporting that a stock market analyst predicted a future common stock offering by the firm.

**Manager announcement day** (*Manager Announcement*): Newspaper date of a story reporting that the firm's management disclosed that the firm will be issuing common stock in the near future.

**First board meeting** (*Board 1*): The first board meeting date announcing the stock issue. Information from this board meeting, which includes the offering method (fixed versus formula), the date of the second board meeting, the offer price determination date for formula offerings, and beginning and ending dates of the subscription period, is posted at the TSE, usually after the close of trading. The registration statement is

submitted to the MOF on this day or shortly after this date. This date is used as the first official announcement day for our sample.

**Newspaper announcement** (*News 1*): Voluntary announcement in the newspaper, typically one day after the first board meeting. Some firms skip this announcement and make a formal announcement after the second board meeting (listed below as *News 2*).

**Second board meeting** (*Board 2*): The second board meeting date. Detailed information about the offering is released, including the offer price (and indirectly, the discount) if the fixed-price method is used and the discount if the formula-price method is used. Information from this board meeting is usually posted after the close of trading. Some firms combine the first and second board meetings, setting all the terms of the offering at the same time. Of course, the first and second board meeting dates would be the same in these cases.

**Newspaper announcement** (*News 2*): Announcement in the newspaper is required at this time. Only the earlier of the two dates, *News 1* or *News 2*, is collected.

**Formula offer-price determination day (Op Det)**: For formula offerings, the offer price is determined based on this day's closing price and the discount announced at the second board meeting.

**Ending date of the subscription period** (*Sub-End*): The last day investors can submit orders to purchase the new shares. Formal stock price stabilization by the underwriter is permitted from the day after the offer price is set to this day. Investors must make payment for the newly purchased stock on or before this day.

**Issue day**: Shares are distributed to investors on this date, which is one day after the "payment day." The payment day is the day that the firm receives the proceeds of the new issue (less commissions) from the underwriter.

Figure 1 presents two time lines — one for the fixed-price offerings and the other for the formula-price offerings — measured in trading days. It is quite clear from this representation that the formula-price offerings shorten the time period for the equity offering significantly. From the first board meeting (*Board 1*) until the end of the subscription period (noted as *Sub-End* and used as day zero in Figure 1), the average number of trading days is 41 for fixed-price offerings and about 20 days for formula-priced offerings. The average time between *Board 1* and *Board 2* for formula-price offerings is about one-third that of fixed-price offerings. The average number of days when the underwriter's put is outstanding is a little more than 7 days (9.6 calendar days) for fixed-price puts (*Board 2* to

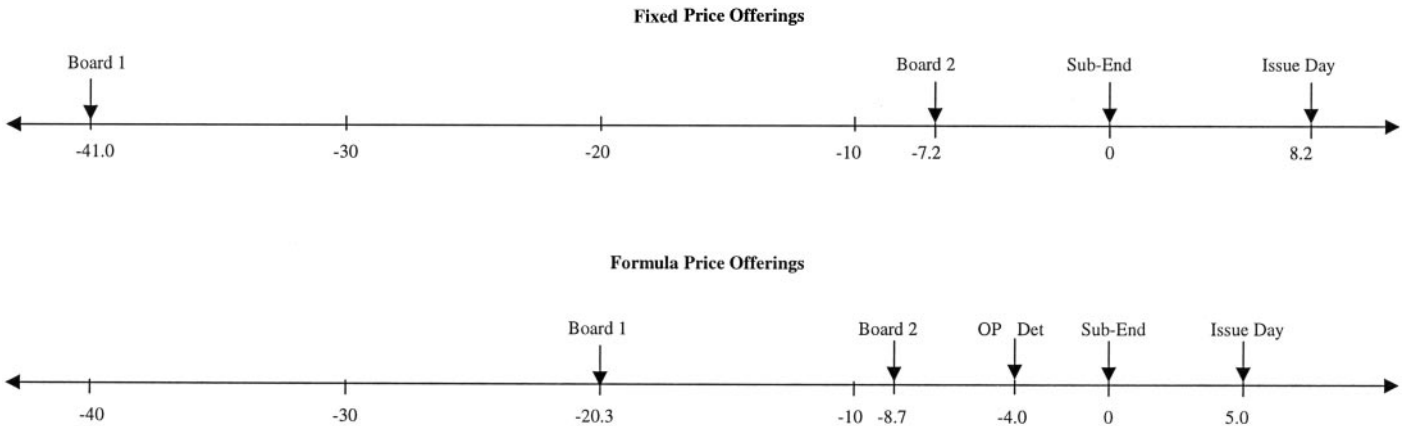


**Figure 1**
**Time line of Japanese equity issues.**
Events in the equity issue process are presented with respect to the mean number of *trading days* from the end of the subscription period (*Sub-End*). *Board 1* is the date of the first board meeting announcing the stock offering. For fixed-price offerings, the offer price is announced at the second board meeting (*Board 2*). For formula-price offerings, the discount in the offer price is announced at *Board 2* and is applied to the closing stock price on the formula offer-price determination day (*OP Det*). *Issue day* is the date that the purchasing investors receive the shares.

*Sub-End*) and 4 days (5.4 calendar days) for formula-price puts (*OP Det* to *Sub-End*). The contingent put of the formula-price offerings, when the entire offering is automatically canceled if the market price falls below the cancellation price, has an average life of 4.7 trading days or 6.7 calendar days (*Board 2* to *OP Det*).

In our event study analysis, we use the first board meeting date as the announcement day to ensure that information concerning the offering method and dates are available to the public. There are two earlier announcement dates that could have been chosen — the analyst announcement day and the manager announcement day. For example, newspaper accounts of the analysts' reports and managers' announcements, found in the *Nihon Keizai Shinbun*, the Japanese equivalent of the *Wall Street Journal*, occurred for 117 and 105 firms, respectively. The newspaper stories of the analysts' speculations averaged more than 50 trading days before *Board 1*, while the managers' announcements average 3.6 trading days before *Board 1*. Prior announcements about the upcoming offering will tend to bias our results toward the null hypothesis of no abnormal return around the *Board 1* date. For the sake of completeness, we analyze the market's reaction to alternative dates in Section 4.3, where we compare our results to Kang and Stulz (1996).

## 4. Event Study Results

### 4.1 Event period abnormal returns

In addition to examining the abnormal return around the announcement date, we calculate cumulative abnormal returns for longer periods before the announcement, from the announcement until the issue day, and post-issue. For formal statistical tests we calculate the abnormal returns using the Scholes and Williams (1977) method.[12] The normal return is estimated over a 140-trading-day period starting 31 days after the issue date. For analysis of the postissue abnormal returns, we use a preannouncement estimation period consisting of the 140 trading days starting 390 trading days before the first board meeting date. Significant run-ups or run-downs in the stock price during one or both of these estimation periods could bias the calculation of the "normal" return. We address this bias by also

[12] Yamaichi Research Institute and Daiwa Securities provided daily stock returns. If an event occurs on a day that the TSE is closed, we treat the event as if it occurred on the next trading day. Tokyo Stock Price index (Topix) prices, a value-weighted index of all first-section firms from the TSE, proxy for market returns in our event study analysis. Although index returns with dividends would be preferable, they were not available for the entire sample period. Individual stock returns, however, include dividends. The effects on the analysis in this study should be small because the average annual dividend, as reported in the *TSE Fact Book*, has ranged from 1% to 2% per year in the 1970s and early 1980s to less than 1% per year since 1985.

**Table 2**
**Event period abnormal returns**

| Event period | Methodology | Mean | *t*-statistic | Proportion positive | Number |
|---|---|---|---|---|---|
| *Board* $1_{-500\ to\ -2}$ | Scholes and Williams[a] | 0.1807 | 4.41 | 0.5992 | 474 |
| | Market adjusted | 0.3088 | 16.25 | 0.7600 | 475 |
| *Board* $1_{-1\ to\ +1}$ | Scholes and Williams[a] | 0.0063 | 4.59 | 0.5570 | 544 |
| | Market adjusted | 0.0072 | 5.35 | 0.5636 | 550 |
| *Board* $1_{-1}$ *to Issue Day*$_{+1}$ | Scholes and Williams[a] | 0.0274 | 4.40 | 0.5255 | 548 |
| | Market adjusted | 0.0443 | 8.07 | 0.5730 | 555 |
| *Issue Day*$_{+2\ to\ +500}$ | Scholes and Williams[b] | −0.3216 | −6.93 | 0.3801 | 442 |
| | Market adjusted | 0.0769 | 5.03 | 0.5505 | 545 |

Cumulative abnormal returns, *t*-statistics, proportion positive, and number of observations for four different event periods surrounding the announcement and issue of common stock. Normal returns are calculated using the Scholes and Williams method and the market-adjusted method.

[a]Using a postissue estimation period (31–170 trading days after the stock issue date).

[b]Using a preannouncement estimation period (390 days to 251 trading days before the date of the first board meeting announcing the stock issue, *Board 1*).

calculating abnormal returns over the entire period employing the market-adjusted method, which does not use an estimation period.[13]

Table 2 presents the mean cumulative abnormal return (CAR) for four periods of interest. The period from 500 days to 2 days before the announcement day (*Board* $1_{-500\ to\ -2}$) investigates the preannouncement period. The two estimates of the average CARs are +18.07% and +30.88% as reported in the first two rows of Table 2. Thus Japanese firms, like U.S. firms, announce new equity issues following a statistically significant abnormal stock price increase. As a comparison to U.S. results, Asquith and Mullins (1986) report a mean CAR for announcements of seasoned equity issues by AMEX and NYSE firms of 40.4% for the period from 490 to 10 days prior to the announcement. Loughran and Ritter (1995) report a 72% mean raw return during the year before issue for a more recent sample of firms from the NYSE, AMEX, and NASDAQ.

The second set of abnormal returns reported in Table 2 are the announcement-day effects. The two estimates of the mean CARs for the three-day event period around *Board 1* are +0.63% and +0.72%. These results contrast sharply with the U.S. market, where equity issue announcements by industrial firms elicit an abnormal stock return of approximately −3% (see references in note 1), but are consistent with

[13] Several of the issuing firms' stocks trade infrequently. We use one-trading-day returns in the estimation of the Scholes and Williams parameters (alpha and beta). An observation is eliminated from the sample if there are fewer than 70 one-trading-day returns in the 140-day estimation period. This requirement eliminated 7 of the 555 observations in our sample. No estimation period is used for the market-adjusted method allowing the potential use of up to 555 observations. In cases where nontrading days occur during the event period, compounded multiple-day normal returns are subtracted from the sample firm's multiple-day event return. As a further robustness test, we also eliminated any multiple-day event-period returns from the analysis, yet found almost identical results to those presented in Table 2.

other studies of the Japanese equity issue market [Kang and Stulz (1996) and Kato and Schallheim (1993a,b)].[14]

Our contention that the announcement of an equity issue is good news in Japan is reinforced by examination of the period from one day before the first board meeting to one day after the issue date (*Board* $1_{-1}$ to *Issue* $Day_{+1}$), the third set of results in Table 2. The abnormal returns are positive and highly significant with estimated means of +2.74% and +4.43% using the two estimation methods.

The last set of results in Table 2 report the postissue period (*Issue* $Day_{+2\ to\ +500}$). Here, the mean CAR calculated using the Scholes and Williams *preannouncement* parameter estimates is significantly negative (−32.16%). Because we use a preannouncement estimation period, when returns were unusually high as reported in the first two rows of Table 2, we have introduced a downward bias in the estimation of the postissue CAR. The market-adjusted mean CAR of +7.69% corroborates the existence of this bias for the postissue period. In fact, the market-adjusted returns are significantly *positive* for all four periods shown in Table 2. These positive abnormal returns do not seem to be caused by the risk level of these stocks. The mean preannouncement (days −500 to −71) and postissue (days +71 to +500) Scholes and Williams betas for these stocks are 0.971 and 0.965, respectively.

In summary, the results in Table 2 support the following conclusions: (1) Consistent with empirical studies investigating the U.S. market, Japanese firms issue equity following a statistically significant run-up in stock price. (2) Unlike the United States, the equity issue announcement effect is positive in Japan. In particular, the mean three-day announcement period return and the announcement day to issue day return are both significantly positive.[15]

### 4.2 Daily abnormal returns around the announcement day and issue day

Daily prediction errors for the period from five days before to five days after the announcement date, *Board 1*, are presented in panel A of Table 3.[16] Significant positive abnormal returns are found for the day

[14] Wruck (1989) shows that the announcement return for *private* equity issues is influenced by two factors: investors' interpretation of new information revealed about the firm and the size of the discount in the offer price. Adjusting for the discount using Wruck's formula (see note 24), we find that the mean adjusted CAR around Board 1 is a statistically significant +1.1% using the Scholes-Williams model. This indicates that the discount in Japan partially obscures the information effect of the announcement.

[15] Although not reported here, we also computed normal returns using the OLS market model and mean-adjusted methods, as well as using both the preannouncement and postissue estimation periods. For the important three-day announcement period surrounding *Board 1*, each method resulted in a statistically significant positive abnormal return at the 1% significance level with only one exception (the mean-adjusted return with a preannouncement estimation period had a positive, but insignificant mean).

[16] For the remainder of this article, abnormal returns are calculated using the Scholes and Williams method with a postissue estimation period. Also, to isolate the effect of the information released at each meeting date, 23 observations were eliminated from the remaining analysis where the first and second board meetings were combined.

**Table 3**
**Daily prediction errors**

| | Panel A: Board 1 | | | | Panel B: Issue day | | | |
|---|---|---|---|---|---|---|---|---|
| Day | Mean | *t*-statistic | Proportion positive | Number of observations | Mean | *t*-statistic | Proportion positive | Number of observations |
| −5 | 0.0000 | 0.043 | 0.4634 | 492 | 0.0005 | 0.624 | 0.4727 | 512 |
| −4 | 0.0001 | 0.131 | 0.4603 | 491 | 0.0026 | 2.818 | 0.4971 | 509 |
| −3 | 0.0006 | 0.722 | 0.5020 | 492 | −0.0021 | −2.144 | 0.3996 | 508 |
| −2 | 0.0010 | 1.147 | 0.4507 | 497 | −0.0001 | −0.056 | 0.4570 | 512 |
| −1 | 0.0033 | 3.088 | 0.5010 | 499 | 0.0005 | 0.482 | 0.4725 | 510 |
| 0 | 0.0046 | 4.753 | 0.5549 | 501 | −0.0046 | −3.537 | 0.3214 | 504 |
| +1 | −0.0011 | −1.112 | 0.4588 | 497 | 0.0032 | 3.124 | 0.4922 | 510 |
| +2 | −0.0017 | −1.910 | 0.4398 | 498 | 0.0014 | 1.651 | 0.5212 | 518 |
| +3 | −0.0012 | −1.414 | 0.4436 | 505 | 0.0009 | 0.977 | 0.4836 | 517 |
| +4 | −0.0010 | −1.189 | 0.4451 | 501 | 0.0018 | 2.023 | 0.4642 | 517 |
| +5 | 0.0006 | 0.775 | 0.4900 | 500 | −0.0000 | −0.053 | 0.4288 | 520 |

Daily prediction errors, *t*-statistics, proportion positive, and number of observations for the 11 trading days around the date of the first board meeting announcing the stock issue (*Board 1*) and the issue date. Normal returns are calculated using the Scholes and Williams method with a postissue estimation period (31–170 trading days after the stock issue date).

before and the day of the first board meeting, but insignificant results are obtained for the day after the board meeting. Because information from the first board meeting is usually released after the close of trading, the significant returns on the day before and the day of the first board meeting are problematic, but are consistent with the early leakage of information about the upcoming stock issue. Leakage of information for a significant portion of our sample is a plausible explanation, as evidenced by newspaper articles reporting analysts' and managers' announcements prior to the first board meeting day.[17] This result is also consistent with increased risk and return around information events where the event date is known in advance.[18]

Panel B of Table 3 provides evidence that the mean abnormal return for the issue date, day 0, is significantly negative. However, the mean abnormal return for day +1 is significantly positive, indicating a rebound in stock prices. Investors who purchased new shares at a discount have the incentive to sell these new shares on the issue day in order to realize a quick profit. Abnormal selling activity on the issue day and the sequence of returns, negative on the issue day and positive the day after, is consistent with most issue-day transactions occurring at the (implicit) bid price.[19]

[17] We use a three-day period around the first board meeting to calculate the abnormal announcement return, therefore including day −1. However, the mean two-day CAR (for days 0 and +1) is also significantly positive with a point estimate of 0.35% and a t-statistic of 2.73.

[18] Kalay and Loewenstein (1985) discuss this point in terms of dividend announcement and ex-dividend dates. There is also a growing body of rational expectations models in the accounting literature that suggests rational risk and return increases prior to accounting information releases [e.g., Demski and Feltham (1994).

[19] Lease, Masulis, and Page (1991) describe a similar "order-flow imbalance" in the U.S. equity issue market. In the United States, individuals can save transaction costs by purchasing in the primary market where there are no brokerage commissions. This leaves the secondary market with mostly sell orders on the issue day, resulting in more transactions occurring at the bid than at the ask price.

(Although there are no explicit bid and ask prices in the Japanese stock market, there are, naturally, implicit bid and ask prices.)

### 4.3 Comparison of abnormal returns with the Kang and Stulz study

Kang and Stulz (1996), investigating the period from January 1985 to May 1991, calculate cumulative abnormal returns using the newspaper announcement day of the common stock issue rather than the board meeting date used in our study. In addition, their sample excludes financial companies. For the 185 public offering announcements included in their study, they report a mean cumulative abnormal return for days $-1$ and 0 of $+0.0051$ ($t$-statistic $= +2.32$) and $+0.0045$ ($t$-statistic $= 1.73$) for days $-1$, 0, and $+1$.

In order to compare our results with the Kang and Stulz study, we exclude from our sample financial companies (banks, securities firms, and insurance companies) and calculate CARs around the earlier of the following newspaper story dates, *Manager Announcement, News 1*, or *News 2*. We find a mean CAR of $+0.0054$ ($t$-statistic $= +3.95$) for days $-1$ and 0 and a mean of $+0.0050$ ($t$-statistic $= +2.97$) for days $-1$, 0, and $+1$, with 398 and 407 observations, respectively. These results are similar to both our full sample and to the results of Kang and Stulz.

Kang and Stulz also document a drop in stock price on the issue day, but find no evidence of a price rebound on the following day. They speculate that a possible explanation for the negative return on the issue day involves stock price stabilization by the underwriter. If the stock price is supported until the day before the stock issue day, then a decline in stock price would be expected after the price support is removed. However, this argument by Kang and Stulz is not valid because payment by new investors is made during the subscription period, which is several days before the issue day in Japan. Also, formal stock-price stabilization by the underwriter is not allowed (nor does it make sense) after the end of the subscription period. Other forces, such as the Lease, Masulis, and Page (1991) order-flow imbalance hypothesis, appear to provide an explanation for the returns around the issue day.

## 5. Tests of Abnormal Returns, Underwriters' Puts, and Offering Method

In this section we test the certification hypothesis. We investigate the impact of the underwriter's put on the equity offering announcement return. The estimation of the value of the underwriters' put options involves several details that we describe in the appendix. The announcement return should be positively related to the put value. In this section we also focus on the two offering methods, fixed and formula, available to issuing firms and underwriters during the later half of our sample period

**Table 4**
**Fixed-price and formula-price offerings and put values**

| Sample | Mean | *t*-statistic | Proportion positive | Put-to-stock value | No. of observations CAR/Put[a] |
|---|---|---|---|---|---|
| 1. Fixed-price offerings (*Feb. 1974–Nov. 1983*) | 0.0056 | 3.191 | 0.5654 | 0.0032 | 283/279 |
| 2. All offerings (*Dec. 1983–Aug. 1991*) | 0.0083 | 3.630 | 0.5588 | 0.0076 | 238/237 |
| 3. Fixed-price offerings (*Dec. 1983–Aug. 1991*) | 0.0156 | 3.796 | 0.6458 | 0.0103 | 96/96 |
| 4. Formula-price offerings (*Dec. 1983–Aug. 1991*) | 0.0034 | 1.307 | 0.5000 | 0.0058 | 142/141 |
| 5. All offerings (*Feb. 1974–Aug. 1991*) | 0.0068 | 4.833 | 0.5624 | 0.0052 | 521/516 |

Cumulative abnormal returns for the three-day period around the equity issue announcement day, $CAR_{-1\ to\ +1}$ (*Board 1*), *t*-statistics, proportion positive, put-to-stock value ratios, and number of observations across five different samples. Formation of the samples is based on the announcement day of the offering and the offering method.

[a]Number of observations for the put value estimates is less due to the lack of data availability for all the put parameters.

(December 1983–August 1991). Because underwriters are at risk for a longer period of time with fixed-price offerings and fixed-price offerings do not include the cancellation option, the fixed-price put should have greater value than the formula-price put. According to the certification hypothesis, announcement effects for fixed-price offerings should be higher than for formula-price offerings. We also examine the stock return variance as an important input into the option pricing model and as a measure of some of the risk facing the underwriter. Finally, because Kang and Stulz argue that firm size possibly proxies for corporate governance differences among firms, we examine the interaction between the offering method and firm size.[20]

## 5.1 The underwriter's put

*5.1.1 The underwriter's put and the announcement return.* According to the certification hypothesis, higher put values should result in a higher announcement return. As a first test, we calculate abnormal stock returns for the three-day period from one day before to one day after the first board meeting. The results are presented in Table 4 for four subsamples: (1) announcements from February 1974 to November 1983 when only fixed-price offerings were permitted, (2) from December 1983 to August 1991 when both fixed-priced and formula-priced offerings were permitted,

[20] We also examine several market-adjusted accounting ratios — earnings-to-price, book-to-market, return-on-equity, return-on-assets, and leverage — in an attempt to identify differences in firm characteristics for those firms using the fixed-price versus the formula-price method. We found that firms using the formula method had a statistically higher market-adjusted earnings-to-price ratio than those using the fixed method. None of the other variables were statistically different.

(3) fixed-price offerings for the later period, and (4) formula-price offerings over this same period. Numbers for (5) the entire sample are provided for comparison purposes.

The mean abnormal announcement return for fixed-price offerings announced before December 1, 1983, is 0.56% when the mean put value is 0.32% of the stock price. A higher mean abnormal return, 0.83%, is found for both types of offerings announced after December 1, 1983, when the mean put value was 0.76% of stock price. Because the fixed-offering puts are more valuable than the formula-offering puts, the combination of the two in the post-1983 period obscures the differential information between the two types of offerings. For fixed-price offerings after December 1, 1983, the mean return is roughly three times larger, 1.56%, and is statistically higher than the mean return for the earlier period ($t$-statistic for difference of means equals 2.25). The corresponding mean put value-to-stock price ratio for fixed offerings is 1.03% for the post-1983 period, or about three times larger than the earlier period value. These results are certainly supportive of the prediction of the certification hypothesis that higher put values are correlated with higher announcement returns. The put-to-stock price ratio for formula offerings is 0.58% and is significantly less than the put-to-stock price ratio for fixed offerings ($t$-statistic for difference in means is 8.44). Consistent with a lower level of certification, the average announcement effect for formula-price offerings is insignificantly different from zero and is significantly lower than the fixed-price sample ($t$-statistic = 2.53 for the difference).

Further investigation of the interaction of the underwriter's put and stock returns is performed with multiple regression analysis. To control for the effect of the offering method, fixed and formula offerings are analyzed separately. In the first set of regressions, the three-day CAR around *Board 1* is used as the dependent variable (Table 5, panel A). In the second set of regressions, the abnormal return on the day after *Board 2* is used as the dependent variable (Table 5, panel B). Standard errors (and $t$-statistics) have been corrected for possible heteroscedasticity by using the procedure developed by White (1980). Although the actual discount, which determines the put's exercise price, is not announced until *Board 2* (and therefore should typically be reflected in stock prices on the day after *Board 2*), investors should be able to anticipate the discount as of the first board meeting date based on recent experience with other equity issues. Therefore we use an expected discount to determine the expected put-to-stock ratio, *Expected Put*, at *Board 1*. *Expected Put* is used as an independent variable in the first set of regression equations to measure the effect of the underwriter's put on the three-day CARs around the first board meeting. Our approximation of the market's anticipated discount is the average actual discount for other sample firms using the same offering method over the six-month period centered on the first board

**Table 5**
**Put regressions**

| Sample | Intercept | Expected put | Put forecast error | *F*-statistic (*p*-value) | $R^2$ (adj. $R^2$) | Number of observations |
|---|---|---|---|---|---|---|
| **Panel A: Dependent variable = $CAR_{1\ to\ +1}$ (*Board 1*)** | | | | | | |
| 1) All fixed offerings | 0.0028 | ***1.1206*** | | 0.99 | 0.061 | 372 |
| | (0.420) | ***(2.342)*** | | (0.484) | (−0.001) | |
| 2) Fixed offerings before Dec. 1, 1983 | 0.0034 | ***3.1006*** | | ***1.80*** | 0.135 | 276 |
| | (0.546) | ***(4.541)*** | | ***(0.017)*** | (0.060) | |
| 3) Fixed offerings after Dec. 1, 1983 | 0.0039 | −0.4187 | | 1.04 | 0.207 | 96 |
| | (0.179) | (−0.439) | | (0.427) | (0.008) | |
| 4) All formula offerings | 0.0150 | −0.0465 | | 1.03 | 0.140 | 140 |
| | (1.624) | (−0.057) | | (0.435) | (0.004) | |
| **Panel B: Dependent variable = $AR_{+1}$ (*Board 2*)** | | | | | | |
| 1) All fixed offerings | −0.0024 | | ***6.4405*** | ***2.58*** | 0.234 | 370 |
| | (−0.616) | | ***(2.045)*** | ***(0.000)*** | (0.143) | |
| 2) Fixed offerings before Dec. 1, 1983 | −0.0054 | | 0.4710 | ***1.61*** | 0.171 | 275 |
| | (−0.739) | | (0.206) | ***(0.026)*** | (0.065) | |
| 3) Fixed offerings after Dec. 1, 1983 | 0.0091 | | ***16.5186*** | ***1.74*** | 0.399 | 95 |
| | (1.266) | | ***(3.359)*** | ***(0.037)*** | (0.169) | |
| 4) All formula offerings | ***−0.0105*** | | 0.4018 | 0.78 | 0.153 | 139 |
| | ***(−2.486)*** | | (0.179) | (0.768) | (−0.044) | |
| 5) Fixed offerings (rounded) | 0.0023 | | −0.0536 | ***1.53*** | 0.283 | 177 |
| | (0.356) | | (−0.007) | ***(0.042)*** | (0.098) | |
| 6) Fixed offerings (not rounded) | −0.0008 | | ***8.2232*** | ***2.28*** | 0.337 | 193 |
| | (−0.162) | | ***(2.567)*** | ***(0.000)*** | (0.189) | |

Coefficients and *t*-statistics for regressions of the three-day CAR around the first board meeting date, $CAR_{-1\ to\ +1}$ (*Board 1* ), panel A, and the day after the second board meeting, $AR_{+1}$ (*Board 2*), panel B, against various explanatory and control variables. *T*-statistics have been corrected for possible heteroscedasticity using White's (1980) procedure. ***Bold italics*** indicate significance at the 5% level or less (two-tail test).

**Independent variables and other definitions**

*Expected Put* = the expected put-to-stock value at the date of the first board meeting.

*Put Forecast Error* = the actual put-to-stock value at the date of the second board meeting **less** the expected put-to-stock value at the second board meeting date.

*Industry Dummy Variables* included in all regressions, but not reported in Table 5 were created for 22 of the 23 industry groups represented in our sample with construction companies included in the intercept term.

*Year of Announcement Dummy Variables* (included in all panel B regressions, but not reported in Table 5) were created for 16 years of the 17-year period, 1974–1990, based on the calendar year of the *Board 1* announcement. (The expected discount could not be calculated for the offering in 1991 and the observation was therefore dropped from the sample.) 1989 was included in the intercept term for all panel B regressions other than Regression 2. Regression 2 includes 1974 in the intercept.

*Rounded Fixed-Price Offerings* are offerings where the difference between the actual offer price and the expected offer price (calculated using the expected discount and the stock price one day before the offer-price determination day) is less than one yen. All other fixed-price offerings are "*not rounded*."

meeting date.[21] This proxy for the market's anticipated discount is highly correlated with the actual discount (correlation coefficient 0.986). Because the average discount fell during our sample period, the expected discount also proxies for the year of announcement (the correlation between the

[21] As an alternative, the expected discount was calculated as an average of the sample firms' actual discounts over a six-month period before the first board meeting. Both methods give similar results for our main regression estimates. One observation in 1991 was lost because the expected discount could not be calculated using either method.

expected discount and the year of announcement is −0.890). The certification model predicts a positive relation between the *Expected Put* and the abnormal returns around *Board 1*.

Investors should only react to the announcement of the discount at the second board meeting if there is a difference between the actual discount announced at that meeting and the expected discount. Accordingly, *Put Forecast Error*, which equals the put-to-stock ratio calculated from the actual discount minus the ratio using the expected discount value, is used in the second set of regression equations as an explanatory variable. If *Put Forecast Error* is positive, the underwriter's guarantee is at a higher level than expected, causing investors to revise their estimate of firm value upward. Therefore *Put Forecast Error* should be positively related to the *Board 2* announcement return. Potential industry and time-series effects are controlled by including industry classification dummy variables in both sets of regressions and year-of-announcement dummy variables in the second set of regressions.

The results for these two sets of regressions are consistent with the underwriter certification model. For fixed-price offerings, the regression results confirm that the CARs around the first board meeting date are higher when expected put values are higher (panel A, Regression 1). *Put Forecast Error* exhibits a positive and significant coefficient in the second regression (panel B, Regression 1). This evidence indicates that, other things being equal, investors react positively when the actual put is more than the expected put. (Several of the industry and year of announcement control variables were significant but are not reported in Table 5.)

In the next two regressions we separately analyze fixed-price offerings announced before and after December 1, 1983. *Expected Put* is significantly and positively related to the abnormal returns in the earlier period (panel A, Regression 2), but it is insignificantly related in the later period (panel A, Regression 3). One reason for this result concerns the variation in the put's strike price (i.e., the discount) over the years. As shown in Table 1, almost the entire decline in the discount occurred during the first half of our sample period and the mean discount remained fairly stable during the second half of our sample period. For example, the coefficient of variation for the discount is more than four times as high in the first half of the sample as in the second half. The *Put Forecast Error* is insignificant in the early period (panel B, Regression 2), but significantly positive in the later period (panel B, Regression 3). This result is consistent with the much larger put values given by the underwriters in the later period. These put values are much more susceptible to even small price movements.

Regression coefficients for *Expected Put* and *Put Forecast Error* are insignificantly different than zero for the formula-price offering sample (Regression 4, panels A and B). Since all formula-price offerings were

made in the later half of our sample period, the smaller cross-sectional variation in discounts can explain the insignificant coefficient for *Expected Put*. Also, the lower level of certification provided by these offerings should make the deviations of the actual put value from the expected put value less informative to investors.

As noted earlier, our calculations of put values as proxies for the underwriter's risk may not be complete. The underwriter is also at risk from MOF-approved stabilization activities. Just as the put values became more valuable in the post-1983 period (when the discounts became smaller), stabilization activities also increased in the post-1983 period. According to the *Commercial Law Review*, 45% of stock issues reported stabilization activities from 1975 to 1984, while 61% of the issues reported activities from 1984 to 1990. For our sample in the post-1983 period, we find the mean return for the stabilization period to be much higher and more strongly skewed to the right. These results imply that underwriters are indeed at risk from their stabilization activities, especially when the discount is low and the put value is high.[22]

**5.1.2 Robustness of the regression model.** In this section we discuss several alternative regression models in order to test the robustness of the results presented in the previous section. First, several control variables are added to the regression equations. Second, the regressions are estimated after adjusting the abnormal returns for the "dilution effect" of the discount. Finally, the issue of the rounding of offer prices is addressed.

In our first test, several "traditional" control variables (*Issue Size*, *Market-Adjusted Firm Size*, and *Keiretsu* status) were added to regression equations 1–4 presented in both panels of Table 5. We also included dummy variables that captured the purpose of the stock offering, such as new project, operations, debt repayment, or other. For the most part, these control variables were not significant. More importantly, results for the put variables remained similar to those reported.[23]

Next, we use the formula developed by Wruck (1989) to adjust the abnormal returns used as dependent variables in the above regression equations. Again, the results for the put variables remain similar to those presented above.[24]

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[22] Mean raw returns during the stabilization period were 0.56% in the pre-1983 period and 1.63% in the post-1983 period, while the skewness measure went from 1.1 to 1.7.

[23] The one exception to this statement is a single regression (Table 5, panel A, regression 1), with all control variables including the purpose of the equity offering. The *Expected Put* variable lost its significance, but 65 observations are lost in this specification.

[24] $Adjusted\ \ Announcement\ \ Return = [1/(1-\alpha)][(P_{after} - P_{before})/P_{before}] + [\alpha/(1-\alpha)][(P_{before} - P_{offer})/P_{before}]$. $\alpha$ is equal to the new shares issued in the stock offering divided by the outstanding shares after the stock offering, $P_{before}$ and $P_{after}$ are the stock prices before and after announcement, respectively, and $P_{offer}$ is the offer price [Wruck (1989, p. 26)].

Our final test looks at the rounding of offer prices. Expected offer prices, computed with the current market price and the expected discount, can be any real number (e.g., 878.62 yen). However, actual offer prices are in whole yen. Therefore underwriters need to "round" the offer price to an integer. Inspection of our database shows that the difference between the actual and expected offer price is less than one yen in 177 of the 370 fixed-price offerings in Regression 1, panel B.[25] It is unlikely that investors will interpret the *Put Forecast Error* as revealing new information about firm value if the difference between actual and expected put values is caused by a rounding effect.[26] To examine this, we separate the fixed-price method sample into observations in which the difference between the actual and expected offer prices is less than one yen (rounded) and observations in which this difference is at least one yen (not rounded). Regression coefficients for *Put Forecast Error*, reported in panel B, Regressions 5 and 6, is significantly positive only for the sample of not-rounded observations. This implies that investors are less likely to adjust their expectation of stock value when the difference between the actual and expected offer prices appears to be due to rounding.

### 5.2 Stock-return variance and the offering method

The stock-return variance is an important parameter in the estimation of the underwriter's put. It is also a difficult parameter to estimate. For the put valuation, we use a postannouncement period to estimate the variance. However, it is worth exploring some of the properties of the variance before and after the announcement date, as well as differences in variances between fixed and formula offerings.[27] To investigate, we calculate the daily preannouncement residual equity variance and also the change in the residual equity variance from the preannouncement to the postissue periods. The preannouncement residual equity variance is calculated using Scholes and Williams alpha and beta estimates over the period from 500 to 71 days before the first board meeting (to avoid any potential influence from informal stock price stabilization). The postissue residual equity variance is calculated in a similar manner over the period from 71 to 500 days after the issue day. Means and medians for these variables are presented in Table 6, panels A and B.

[25] A comparable analysis of formula offerings is not appropriate since any rounding of the offer price occurs at the formula offer-price determination day.

[26] We thank Jay Ritter for pointing this issue out to us.

[27] In the United States, high preannouncement stock-return variance has been associated with a negative effect on the equity issue announcement return [Merton (1987), Dierkens (1991), Loderer, Cooney, and Van Drunen (1991)].

**Table 6**
**Stock-return variance**

| Sample | Mean | *t*-statistic | Median | Observations |
|---|---|---|---|---|
| **Panel A: Preannouncement residual equity variance** | | | | |
| All offerings 2/74–11/83 | 0.00043 | NA | 0.00039 | 207 |
| All offerings 12/83–8/91 | 0.00050 | NA | 0.00043 | 228 |
| Fixed offerings 12/83–8/91 | 0.00058 | NA | 0.00053 | 92 |
| Formula offerings 12/83–8/91 | 0.00045 | NA | 0.00039 | 136 |
| **Panel B: Change in residual equity variance** | | | | |
| All offerings 2/74–11/83 | −0.00011 | −7.241 | −0.00009 | 203 |
| All offerings 12/83–8/91 | −0.00006 | −3.362 | −0.00003 | 227 |
| Fixed offerings 12/83–8/91 | −0.00013 | −4.505 | −0.00011 | 92 |
| Formula offerings 12/83–8/91 | −0.00002 | −0.660 | 0.00001 | 135 |

**Panel C: Correlation between the preannouncement residual equity variance and $CAR_{-1\text{ to }+1}$**

| Sample | Pearson correlation (*p*-value) | Spearman correlation (*p*-value) | Observations |
|---|---|---|---|
| All offerings 2/74–11/83 | −0.1181 | −0.1424 | 205 |
| | (0.0916) | (0.0417) | |
| All offerings 12/83–8/91 | 0.0743 | 0.1425 | 228 |
| | (0.2640) | (0.0315) | |
| Fixed offerings 12/83–8/91 | −0.0135 | 0.0361 | 92 |
| | (0.8982) | (0.7328) | |
| Formula offerings 12/83–8/91 | 0.1013 | 0.1435 | 136 |
| | (0.2409) | (0.0957) | |

Mean, *t*-statistic, and median values for the preannouncement residual equity variance (panel A) and the change in residual equity variance from the preannouncement period to the postissue period (panel B). Panel C presents Pearson and Spearman correlations (and *p*-values) between the preannouncement residual equity variance and the three-day CAR around the first board meeting date, $CAR_{-1\text{ to }+1}$. The preannouncement residual equity variance is calculated using Scholes and Williams alpha and beta estimates over the period from 500 to 71 trading days before the first board meeting. The postissue residual equity variance is calculated in a similar manner over the period from 71 to 500 trading days after the issue day.

For all offerings announced after December 1983, the mean preannouncement residual equity variance is 0.00050 and the residual equity variance is significantly lower in the postissue period. Partitioning this sample by offering method reveals that the mean preannouncement residual equity variance is significantly higher for firms using the fixed-price method than for firms using the formula-price method. Therefore fixed-price offerings are used by underwriters to offer new equity in firms with higher-variance stocks, yet they have the higher announcement effect. In addition, firms with fixed-price offerings experience a significant decline in residual equity variance, but no decline in variance is found for firms using formula offerings. Panel C of Table 6 presents Pearson and Spearman correlation coefficients between the preannouncement residual equity variance and the announcement return. Unlike U.S. offerings, a positive or at least nonnegative relation is found between these two variables in the post-1983 sample. (The Spearman correlation is significantly positive, the Pearson correlation is also positive, but is insignificant.) Breaking the post-December 1983 sample by offering method confirms that the relation

between the announcement return and the preannouncement stock return variance is nonnegative during this period of lower offer-price discounts.

These findings are consistent with our hypothesis because the firms with higher volatility receive the most benefit from underwriter certification. Thus firms with high preannouncement variance gravitate to fixed-price offerings, receive a higher level of certification, experience an increase in market value, and undergo a postannouncement decrease in uncertainty (variance) in stock price. Firms with lower preannouncement variance would not benefit as much from underwriter certification; investor uncertainty about intrinsic firm value is lower, so these firms can use the formula-price method successfully.[28]

### 5.3 Comparison of firm size with the offering method

One important result of the Kang and Stulz (1996) study is their finding that announcement returns for large firms are similar to those for U.S. firms (significantly negative), while small firms experience significant positive announcement returns. This result supports their contention that managers of large firms have similar incentives to managers of U.S firms, and therefore should exhibit negative announcement returns similar to those documented in the United States. Conversely, managers of small firms in Japan may be motivated differently. Therefore investors should view equity issue announcements by small firms differently than large firms.

We explore this issue in the context of underwriter certification by examining the relative impact of firm size and offering method on the announcement return. To investigate, we limit our analysis to announcements after December 1983 and calculate the median market value of equity for our sample of issuing firms for each of the remaining years of our sample period. Small firms are defined as firms that have a market value of equity less than the yearly median. All other firms are defined as large firms.[29] Table 7 presents the mean and median abnormal announcement return for fixed-price and formula-price subsamples split by firm size.

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[28] Loughran and Ritter (1995) contend that firms may issue equity to take advantage of a "window of opportunity" when the investing public has temporarily overvalued their stock. Japanese firms can avoid the associated negative signal through underwriter certification. Therefore, similar to the argument about preannouncement variances, Japanese firms with positive abnormal returns prior to the stock issue announcement can use the fixed-price offering method to certify the relatively high value of their stock. Firms with lower returns during the preannouncement period can use the formula-price method. This may explain why we observe that the mean CAR, computed over the period from 500 trading days to 2 trading days before the first board meeting, is significantly positive for firms using fixed-price offerings (24.84%, $t$-statistic = 4.237 for offerings before 12/83, 32.32%, $t$-statistic = 3.135 for offerings after 12/83), but is insignificantly different from zero for firms using the formula-price method (3.25%, $t$-statistic = 0.447).

[29] Kang and Stulz (1996) split their sample at the median market value of equity across their entire sample period. Because the Japanese stock market made steady and large advances in the 1980s, their large-firm subsample is likely to be comprised of issues from the latter part of the 1980s when formula-price offerings became the dominant issuance method.

**Table 7**
**Offering method and firm size**

| Sample | Fixed-price | Formula-price | *t*-statistic for difference of column means (*p*-value) |
|---|---|---|---|
| Small firms | Mean = 0.0133<br>Median = 0.0126<br>*t*-statistic = 2.366<br>Observations = 52 | Mean = 0.0069<br>Median = −0.0011<br>*t*-statistic = 1.606<br>Observations = 65 | 0.909 (0.3651) |
| Large firms | Mean = 0.0184<br>Median = 0.0117<br>*t*-statistic = 3.018<br>Observations = 44 | Mean = 0.0003<br>Median = 0.0005<br>*t*-statistic = 0.109<br>Observations = 77 | 2.658 (0.0099) |
| *t*-statistic for difference of row means (*p*-value) | −0.615<br>(0.5402) | 1.257<br>(0.2114) | |

Mean, *t*-statistic, and median values for the three-day CAR around the first board meeting date for four subsamples created by splitting the equity offering sample by offering method (fixed-price offerings versus formula-price offerings) and firm size (small versus large). Small firms are defined as firms that have a market value of equity as of the month prior to the offering less than the median value for all sample firms announcing an equity issue for that year. Issuing firms with a market value of equity greater than or equal to the median are designated as a large firm. *t*-statistics listed along the bottom row are for the two-way difference of means between the two rows: small firms versus large firms. *t*-statistics listed along the last column are for the two-way difference of means between the two columns: firms using the fixed-price versus formula-price methods. The sample period is December 1983 to February 1991.

Holding the offering method constant, there is no significant difference between the abnormal announcement returns for the large- and small-firm subsamples. Therefore, contrary to the evidence provided by Kang and Stulz, firm size does not explain announcement returns in our sample.

Announcements of fixed-price offerings result in a significant positive abnormal return across both the large and small firms' subsamples; abnormal returns for formula-price offerings remain insignificantly different from zero. These results support the contention that the type of offering is more important than the size of the firm in explaining the announcement return.

## 6. Conclusions

Equity issue announcement effects, on average negative in the United States, are significantly positive in Japan. This article, which is the first comprehensive study of Japanese equity issues over the period 1974 to 1993, explores the role of underwriting certification to explain the difference in results between the two countries. Unlike U.S. equity issues, Japanese underwriters using the fixed-price offering method set the offer price at a significant discount below the market price several days before the beginning of a two- to five-day subscription period. This places the underwriter at risk, and we measure this risk as a put option that the underwriter sells to the issuing firm. In addition, the underwriter is also at risk to the extent that costly price support or stabilization activities are

required. Hence the underwriter will carefully determine the intrinsic value of the issuing firm's stock before accepting the job. This implies that announcements of new equity offerings provide certification by the underwriter that the stock's intrinsic value is at least as great as the discounted offer price. This certification of value causes investors to revise their estimate of stock value upward upon announcement of the upcoming equity offering.

The offer price is the exercise price for the underwriter's put option. The higher the offer price (or the lower the discount), the higher is the put value, the more at risk is the underwriter, and the greater is the certification of the stock value. The put therefore is predicted to be positively correlated with the announcement effect. In a formula-price offering, the offer price is set closer in time to the subscription period and the stock offering may be automatically canceled if there is a significant decline in stock price. Therefore formula-price offerings present a lower level of risk to the underwriter (a contingent put option) and a lower level of certification, resulting in a lower expected announcement effect than for the fixed-price offerings. Underwriter risk for U.S. offerings is even lower because the offer price is set very close in time to the stock sale.

Results consistent with the underwriter certification model are presented. First, the announcement period return for fixed-price offerings is significantly positive, while the announcement return for formula-price offerings is insignificantly different from zero. Second, we find that the put value is positively and significantly related to the announcement return. Third, we find that the put values for the fixed-price offerings are significantly higher than the put values for the formula-price offerings. Fourth, fixed-price offerings are used primarily for issuing firms with high preannouncement stock price variance. This is consistent with fixed-price offerings being used by firms with a higher level of uncertainty about their value. Firms with less uncertainty can successfully use the lower-certification formula method. Finally, contrary to Kang and Stulz (1996), we find that firm size is unrelated to the announcement return, while the announcement returns for fixed-price offerings continue to remain significantly positive regardless of firm size.

## Appendix

### A.1 The value of a fixed-price offering put option

Japanese underwriters of fixed-price stock offerings set the offer price several days before the beginning of a two- to five-day stock subscription period. The financial obligation of the Japanese underwriter for these offerings is similar to a short position in a put option with the exercise price equal to the offer price and the days to expiration equal to the period from the day the offer price is set (the second board meeting date) to the end of the stock subscription period. The following details the method used to calculate the value of a fixed-price offering put option.

We use the Black and Scholes European (no dividend) option-pricing model to approximate the value of a Japanese underwriter's short put position for a fixed-price offering as of the first and second board meeting dates. To facilitate comparison across different stocks, put values are calculated as a proportion of the firm's stock price using the following notation:

First board meeting day $= t_1$
Second board meeting day and offer price determination date $= t_3$
End of the subscription period $= t_4$
$s_t =$ stock price on day $t$
$x =$ offer price $= s_3$ (1 – offer price discount)
$r =$ Japanese call interest rate
$\sigma =$ annual return standard deviation
$\tau_{3,4} =$ time to expiration $= (t_4 - t_3)/365$
$p_t/s_t =$ the put-to-stock value at time $t$

Japanese call interest rates are collected for each month of our sample period. The rate as of the date of the first board meeting is used as a proxy for the risk-free interest rate. We approximate the annual standard deviation of returns by calculating the standard deviation of daily stock returns for the period from 71 days after the stock issue date to 500 days after the stock issue date. We convert to an annual standard deviation by multiplying the daily standard deviation by the square root of the number of trading days in the year.

The following example gives the option parameter values and put value as of the second board meeting date (date $t_3$) for the fixed-price offering of Nihon Gosei Kagaku Kogyo:

$t_1 =$ 11/04/87
$t_3 =$ 11/24/87
$t_4 =$ 12/02/87
$s_3/x = 1/(1 - 2.88\%) = 1.0297$
$r = 3.56\%$
$\sigma = 34.44\%$
$\tau_{3,4} = 8/365 = 0.0219$
$p_3/s_3 = 0.8633\%$

To calculate the put forecast error, we recalculate the expected value of the put option at the second board meeting date using the expected discount in the place of the actual discount. The expected discount for the offering of Nihon Gosei Kagaku Kogyo is 3.435%.

$s_3/x = 1/(1 - 3.435\%) = 1.0356$
$r$, $\sigma$, and $\tau_{3,4}$ have the same values as given above
$E(p_3/s_3) = 0.7148\%$
*Put Forecast Error* $= p_3/s_3 - E(p_3/s_3) = 0.1485\%$

Since the actual put value is higher than the expected put value, the underwriter's risk is greater than expected. Consistent with the prediction that the financial markets interpret this as good news, Nihon Gosei Kagaku Kogyo experienced a 3.14% abnormal stock return for the day after its second board meeting.

The expected put value at the first board meeting date is calculated as the present value of the expected put value at the second board meeting date. There are 20 days between the first and second board meetings for Nihon Gosei Kagaku Kogyo. Thus $PV[E(p_3/s_3)] = e^{-0.0356(20/365)}\ 0.7148\% = 0.7134\%$.

**A.2 The value of a formula-price offering put option**

In Japanese formula-price offerings, the discount is set at the second board meeting date and is applied to the stock price on the offer price determination day. In comparison to fixed-price

offerings, Japanese underwriters of formula-price stock offerings set the offer price closer in time to the end of the stock subscription period. Also, formula-price offerings are automatically canceled if the calculated offer price is less than the minimum offer price. The financial obligation of the Japanese underwriter for these offerings is similar to a contingent short position in a put option. The contingency is based on whether the offer price is calculated to be above or below the cancellation price. The following details the methods used to calculate the value of a formula-price offering put option.
Notation:

First board meeting day $= t_1$
Second board meeting day $= t_2$
Offer price determination date $= t_3$
End of the subscription period $= t_4$
$s_t =$ stock price at date $t$
$x =$ offer price $= s_3$ (1 – offer price discount)
$r =$ Japanese call interest rate
$\sigma =$ annual return standard deviation
$\tau_{3,4} =$ time to expiration $= (t_4 - t_3)/365$

$\tau_{2,3} =$ time from the second board meeting to the offer-price determination date $= (t_3 - t_2)/365$

$s_3/x = 1/(1 - \text{discount}) \equiv \gamma$
$CP =$ cancellation price $= 15\%$ below the stock price at the second board meeting date

To approximate the value of the contingent short put position, we first use the Black and Scholes European (no dividend) option-pricing model to value the put-to-stock value ($p_3/s_3$) at the offer price determination day. On this date, the contingency is eliminated.

To value the formula-price put as of the second board meeting date, first rewrite the Black and Scholes put equation used to value the put as of the offer price determination day.

$$
\begin{aligned}
d_1 &= \lfloor (\ln(\gamma) + (r + 0.5\sigma^2)(\tau_{3,4}))/(\sigma\sqrt{\tau_{3,4}}) \rfloor \\
d_2 &= d_1 - \sigma\sqrt{\tau_{3,4}} \\
p_3 &= x e^{-r\tau_{3,4}} N(-d_2) - s_3 N(-d_1) \\
&= x[e^{-r\tau_{3,4}} N(-d_2) - \frac{s_3}{x} N(-d_1)] \\
&= \frac{s_3}{\gamma}[e^{-r\tau_{3,4}} N(-d_2) - \gamma N(-d_1)] = \frac{s_3}{\gamma} h
\end{aligned}
$$

Notice that $h$ does not depend on the stock price or strike price, but only depends on the discount.

As of the second board meeting date, the Japanese underwriter has a contingent obligation. If the offer price is greater than or equal to $CP$ on date $t_3$, the underwriter will be short a put (with a value equal to $p_3$). However, if the calculated offer price is below $CP$, the underwriter has no financial obligation. $\gamma CP$ is the stock price that triggers cancellation. The value of the put at $t_2$ is calculated as follows:

$$p_2 = e^{-r\tau_{2,3}} \int_{\gamma CP}^{\infty} \left(\frac{s_3}{\gamma} h\right) g(s_3) ds_3$$

$$p_2 = e^{-r\tau_{2,3}} \left(\frac{h}{\gamma}\right) \int_{\gamma CP}^{\infty} s_3 g(s_3) ds_3$$

$e^{-r\tau_{2,3}}$ is the PV operator used to discount from the offer price determination day to the second board meeting day. $g(s_3)$ is the date 3 stock price density function. Note that

$$e^{-r\tau_{2,3}}\int_{\gamma CP}^{\infty} s_3 g(s_3)ds_3 = s_2 N(d_1^{\gamma CP}).$$

Therefore

$$p_2 = \frac{h}{\gamma} s_2 N(d_1^{\gamma CP}),$$

where

$$d_1^{\gamma CP} = \left[\left(\ln\left(\frac{s_2}{\gamma CP}\right) + (r + 0.5\sigma^2)\tau_{2,3}\right) \Big/ (\sigma\sqrt{\tau_{2,3}})\right].$$

The following example gives the option parameter values and put value as of the offer price determination date (date $t_3$) and second board meeting date (date $t_2$) for the formula-price offering of Orix.

$t_1 = 05/31/88$
$t_2 = 06/15/88$
$t_3 = 06/22/88$
$t_4 = 06/27/88$
$s_3/x \equiv \gamma = 1/(1 - 3.00\%) = 1.0309$
$CP = 0.85 * s_2$
$s_2/\gamma CP = (1 - 3.00\%)/0.85 = 1.1412$
$r = 3.25\%$
$\sigma = 37.89\%$
$\tau_{3,4} = 5/365 = 0.0137$
$\tau_{2,3} = 7/365 = 0.0192$
$p_3/s_3 = 0.6273\%$
$p_2/s_2 = 0.6239\%$

Similar to the method used in Section A.1, we calculate the put forecast error by subtracting the expected value of the put option at the second board meeting date from the actual put value. The expected discount for the offering of Orix is 3.462%, and the expected put value at the second board meeting date is 0.5161%. The put forecast error is 0.1079%.

There are 15 days between the first and second board meeting dates for the offering of Orix. The expected put value as of the first board meeting date is $e^{-0.0325(15/365)}$ $0.5161\% = 0.5154\%$.

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