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The Determinants of Underpricing for Seasoned Equity Offers

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ABSTRACT

Seasoned offers were underpriced by an average of 2.2 percent during the 1980s and 1990s, with the discount increasing substantially over time. The increase appears to be related to Rule 10b-21 and to economic changes affecting both IPOs and SEOs. Consistent with temporary price pressure, underpricing is positively related to offer size especially for securities with relatively inelastic demand. Underpricing is also positively related to price uncertainty and, after Rule 10b-21, to the magnitude of preoffer returns. Additionally, I find that underpricing is significantly related to underwriter pricing conventions such as price rounding and pricing relative to the bid quote.

BEGINNING WITH SMITH (1977), numerous empirical studies have documented significant underpricing for seasoned equity offerings (SEOs) in the United States. Prior studies also point to considerable cross-sectional variation in SEO pricing. For example, Loderer, Sheehan, and Kadlec (1991) report significant differences in underpricing between exchange-listed securities and Nasdaq stocks. While the magnitude of SEO underpricing has been relatively small historically, it increased dramatically during the 1990s. SEO underpricing averaged 1.15 percent for offers from 1980 to 1989, increased to 2.92 percent for offers from 1990 to 1998, and reached as high as 3.72 percent in 1996. While this level of underpricing is much smaller than that observed for IPOs, it represents a substantial cost to issuing firms. For the average seasoned offer during 1998, for example, underpricing represented $1.95 million in lost proceeds and accounted for 21.7 percent of total direct and indirect issue costs.[1] Underpricing of this magnitude is quite

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[1] For seasoned offers from 1990 through 1998, underwriter gross spreads and other direct issue expenses averaged 5.32 percent and 1.33 percent, respectively, resulting in total direct expenses of 6.65 percent. In 1998, total direct expenses averaged 6.21 percent.

striking given the fact that a secondary-market price is easily observable for these securities.

Despite the prior evidence and the increasing costs associated with underpricing, only limited attention has been paid to the cross-sectional determinants of seasoned offer pricing.[2] To address this issue, I provide a comprehensive analysis of the determinants of underpricing for a sample of SEOs from 1980 through 1998. Using both trade and quote data, I develop and test hypotheses related to uncertainty and asymmetric information, price pressure, manipulative trading and preoffer price changes, transaction costs, and underwriter pricing practices such as offer-price rounding and pricing at the bid. I focus on the relative importance of these factors in explaining the cross section of seasoned offer pricing and differences in SEO underpricing over time. My findings provide an improved understanding of SEO pricing and should be of interest to investors, to managers making capital-raising decisions, to exchanges competing for listing firms, and to policy makers in determining the effects of current and prospective regulations.

Consistent with evidence from the IPO literature, I find that SEO underpricing is positively related to the level of uncertainty about firm value. However, I find little evidence of a reliable relation between SEO underpricing and proxies for asymmetric information such as firm size and bid-ask spread. Thus, while price uncertainty plays a significant role in SEO pricing, my results suggest that asymmetric information effects have little impact on offer pricing for seasoned firms. I also find strong support for the hypothesis that SEO underpricing reflects temporary price pressure. Specifically, underpricing is positively related to relative offer size and this effect is most pronounced for those securities hypothesized to have relatively inelastic demand. These results corroborate evidence of price pressure effects in other settings such as around block trades and S&P 500 index changes.

Conventional underwriter pricing practices have a significant impact on SEO pricing. I find that offer price rounding is a common practice on both the NYSE and Nasdaq. For example, nearly 35 percent of SEOs are priced on even dollars, while only 19 percent are associated with even-dollar closing trade prices on the day prior to the offer. This practice is reflected in larger underpricing for low-priced stocks and when the previous day's closing price does not fall on an even dollar or $0.25 price increment. I also find that underwriters are more likely to set the offer price at the closing bid quote for Nasdaq offers and at the closing transaction price for NYSE offers. I argue that this distinction results from differences in market structure. For example, the reported closing trade price may be more informative on the NYSE where trading is consolidated at a central location than on Nasdaq where trading is fragmented across multiple market makers. Regardless of the reason, the practice of pricing relative to the closing bid accounts for a significant portion of the observed underpricing for Nasdaq offers

[2] Recent papers by Safieddine and Wilhelm (1996), Kim and Shin (2001), Mola and Loughran (2001), and Altinkiliç and Hansen (2003) provide some cross-sectional analyses. These papers are discussed in more detail in Section I.

and also explains why offers by NYSE-listed firms are less underpriced (relative to the closing trade) than Nasdaq offers, on average.

Gerard and Nanda (1993) argue that manipulative trading prior to a seasoned offer may worsen the winner's curse problem faced by uninformed investors and lead to increased underpricing. However, I find no evidence that large price drops prior to the offer date led to increased underpricing prior to Rule 10b-21.[3] After the implementation of increased short sale restrictions through Rule 10b-21, I find that large price moves in either direction lead to more underpricing. One possible explanation for this result is that prices are considered less informative in the presence of increased short sale restrictions and large price moves are associated with more uncertainty.

I find weak evidence that the increase in SEO underpricing during the 1990s is related to the implementation of Rule 10b-21. However, this regulatory change provides at best a partial explanation. I also find that SEO underpricing is significantly related to the concurrent level of underpricing in the IPO market. This suggests that the increase in underpricing may reflect changes in underwriter–firm relationships or in the economics of the underwriting business that affect both IPOs and SEOs (see Loughran and Ritter (2001), Daniel (2002), and Ljungqvist and Wilhelm (2002)).

The rest of the paper is organized as follows. In Section I, I discuss the previous literature and develop testable hypotheses related to SEO underpricing. Section II provides a discussion of the data and sample characteristics. In Section III, I present evidence related to seasoned offer pricing and provide tests of alternative underpricing hypotheses. Section IV concludes.

I. Background and Hypotheses

A. Existing Evidence

While the literature related to IPO underpricing is extensive, the pricing of SEOs has attracted much less attention. Smith (1977) was the first to document significant underpricing for SEOs. For a sample of 328 firm-commitment offers by exchange-listed firms, Smith reports average close-to-offer returns of -0.54 percent and average offer-to-close returns of 0.82 percent. Subsequent studies are generally consistent with Smith's findings, but also point to substantial cross-sectional variation in SEO pricing. Bhagat and Frost (1986), for example, examine issues by public utilities and report a significant offer price premium of between 0.25 percent and 0.65 percent. Similarly, Eckbo and Masulis (1992) report mean (median) underpricing of 0.44 (0.00) percent for offers by industrial firms and mean (median) overpricing of 0.31 (0.00) percent for offers by public utilities. Loderer, Sheehan, and Kadlec (1991) compare SEO pricing across markets. In their combined sample of industrial and utility offers, they report statistically

[3] S.E.C. Rule 10b-21, adopted on August 25, 1988, prohibits investors from covering a short position with stock purchased in a new offering if the short position was established between the filing date and the distribution date.

significant underpricing of 2.96 percent for issuers listed on Nasdaq, but no apparent underpricing for NYSE-listed issuers. They conclude that existing models of IPO underpricing fail to adequately explain the observed differences in SEO pricing across exchanges and industries.

Complementing the empirical evidence, Parsons and Raviv (1985), Giammarino and Lewis (1989), and Gerard and Nanda (1993) develop theoretical models that are consistent with the underpricing of seasoned new issues. Giammarino and Lewis model an equity sale that incorporates negotiation between a price-setting firm and a less-informed purchaser. They find that, in some settings, underpricing can be used to signal positive information. Parsons and Raviv and Gerard and Nanda develop models that incorporate the endogenous interaction between secondary market trading and offer pricing. In the Parsons and Raviv model, underpricing reflects the reaction of the market to the anticipated offer price and the potential for rationing. Gerard and Nanda incorporate short sales and the possibility of strategic trading. In their model, manipulative trading prior to the SEO worsens the winner's curse problem faced by uninformed investors (see Rock (1986)) and results in increased offer price discounts.

Consistent with the effects of manipulative trading described by Gerard and Nanda, Barclay and Litzenberger (1988) find a significant price drop in the days prior to a seasoned offer and a significant price recovery in the days after the issue.[4] Safieddine and Wilhelm (1996) examine manipulative trading more directly by testing for a relation between SEO underpricing and pre-issue short selling. Prior to the adoption of Rule 10b-21, Safieddine and Wilhelm document unusually high levels of short interest in the preoffer period and a positive relation between short interest and SEO underpricing. They find no evidence of a significant relation after the adoption of Rule 10b-21, supporting the hypothesis that the rule was successful in curbing short selling and reducing underpricing.

This paper contributes to the existing literature by providing a comprehensive analysis of the determinants of seasoned offer pricing. Using a large sample of seasoned offers from 1980 through 1998, I examine the relative importance of various hypotheses in explaining the cross section of SEO underpricing and previously observed differences in underpricing across markets. In contrast to most previous studies, I incorporate bid and ask quote data, which allows tests of hypotheses related to transaction costs and the effects of conventional underwriter pricing practices such as pricing at the bid and offer price rounding. I also document a substantial increase in SEO underpricing over time and examine the extent to which the cross-sectional determinants can explain this increase.

Three concurrent studies also examine the pricing of seasoned offers in the 1990s. Mola and Loughran (2001) focus on the effects of offer-price clustering and show that clustering at integer prices is evident across time, markets, underwriter quality, and firm size. They conclude that offer-price clustering is a significant determinant of SEO underpricing. Kim and Shin (2001) test whether the

[4] Lease, Masulis, and Page (1991) and Tripathy and Rao (1992) also report price decreases prior to and on the offer date. In contrast, earlier studies by Smith (1977) and Asquith and Mullins (1986) find no abnormal price changes prior to the offer date.

adoption of Rule 10b-21 can explain the increase in SEO underpricing during the 1990s. In contrast to Safieddine and Wilhelm (1996), Kim and Shin conclude that Rule 10b-21 has resulted in less informative preoffer prices and increased SEO underpricing. Finally, Altinkiliç and Hansen (2003) decompose underpricing into expected and unexpected components and examine the relation between these components and stock returns. They find that expected underpricing is incorporated into stock prices on the SEO announcement date and that unexpected underpricing reflects issue placement costs and information gathering rather than rent expropriation by the underwriter. Unlike these studies, I incorporate offer-price clustering, the effects of Rule 10b-21, and other potential determinants in a comprehensive analysis that addresses their relative importance in explaining the cross section of seasoned offer pricing. I also include several factors, such as price pressure, bid pricing, and transaction costs, which are not examined in these papers.

B. Hypotheses Related to SEO Underpricing

The existing literature points to several potential explanations for the underpricing of seasoned equity offers. In this section, I highlight these factors and derive related testable hypotheses.

B.1. Uncertainty and Asymmetric Information

Many of the theories advanced to explain underpricing are based on uncertainty and differences in information between the parties involved in the offer. While the majority of these models deal explicitly with the case of initial public offerings, Loderer, Sheehan, and Kadlec (1991) point out that many of the theories can be extended to the case of seasoned offers. For example, Rock (1986) develops a model in which underpricing is necessary to compensate uninformed investors and thereby ensure their participation in the new issue market. This compensation is required because informed investors will participate only in good issues, leaving uninformed investors with a disproportionate share of bad issues. Beatty and Ritter (1986) further demonstrate that this winner's curse problem results in a positive relation between underpricing and ex ante uncertainty about the value of the issue. Underpricing has also been derived in the context of other types of information asymmetries. Under various informational assumptions, authors have shown that underpricing can be used as a mechanism to signal firm quality (Allen and Faulhaber (1989), Grinblatt and Hwang (1989), and Welch (1989)) and to induce the production or revelation of information (Baron (1982), Benveniste and Spindt (1989), and Chemmanur (1993)). Although the information problems identified in these models are likely to be smaller for seasoned firms than for newly public firms, they may still exist. I therefore expect seasoned offers by firms with high levels of uncertainty and asymmetric information to be more underpriced than other offers, all else equal.

Even in the absence of asymmetric information, the time lag between offer pricing and distribution may lead to a significant relation between uncertainty and

underpricing. Consider the case where the offer price is set after the close on day t and the distribution of shares occurs during day $t+1$. When setting the offer price in this case, the underwriter must take into consideration any potential price changes that may occur prior to completion of the offering. As a result, the underwriter may choose to set the offer price below the most recent market price. Again, this suggests that seasoned offers by firms with high price uncertainty will be more underpriced than other offers, all else equal.

B.2. Price Pressure

The underpricing of seasoned offers may also be related to either permanent or temporary price pressures. For example, one could view a seasoned offer as a permanent shift in the supply of existing shares. If the aggregate demand curve for the firm's shares is downward sloping, this increase in supply will result in a permanent decrease in stock price.[5] Alternatively, if one views a seasoned offer as a temporary liquidity shock that must be absorbed by the market, then a discounted offer price may be necessary to compensate investors for absorbing the additional shares. Prices return to normal following the distribution of the new shares, resulting in a positive return or "sweetener" to investors who purchase shares in the offering (Scholes (1972)). Both permanent and temporary price pressures will be increasing in the size of the new issue.

Previous research provides evidence of both downward-sloping demand and temporary price pressure for at least some securities. For example, studies of block trades generally report a permanent price effect for both buyer- and seller-initiated block trades and a temporary price concession for seller-initiated trades, with both effects significantly related to block size (see Kraus and Stoll (1972), Dann, Mayers, and Raab (1977), Holthausen, Leftwich, and Mayers (1987, 1990), and Keim and Madhavan (1996)). Studies of S&P index changes also report evidence of both permanent and temporary price effects related to changes in institutional demand (see, e.g., Harris and Gurel (1986), Shleifer (1986), Beneish and Whaley (1996), Lynch and Mendenhall (1997)).

Even in the presence of downward-sloping demand, however, a permanent stock price decrease may not occur on the issue day. Market efficiency suggests that investors will anticipate any price pressure effects related to the shift in supply and adjust their demand accordingly. As a result, any price effects associated with downward-sloping demand should occur on the announcement day rather than the issue day. Consistent with this efficient markets view, Scholes (1972) and Mikkelson and Partch (1985) find no evidence of a significant relation between issue size and issue-day price effects around secondary distributions. Marsh (1979) and Hess and Frost (1982) report similar findings for U.K. rights

[5] Downward-sloping demand implies that close substitutes for the firm's shares do not exist. Consistent with the "substitution hypothesis," Wurgler and Zhuravskaya (2002) find that stocks with relatively close substitutes (i.e., stocks that are more easily arbitraged) have flatter demand curves and smaller reactions to S&P 500 index changes than stocks without close substitutes.

issues and seasoned offers by utility companies, respectively. Evidence of price pressure on the announcement date is mixed. Both Asquith and Mullins (1986) and Mikkelson and Partch (1985) find a significant relation between announcement day returns and issue size, but Mikkelson and Partch find no evidence that this effect is related to hypothesized determinants of demand elasticity. Further, Mikkelson and Partch (1986) and Barclay and Litzenberger (1988) find no evidence of a significant relation between issue size and announcement effects, and Masulis and Korwar (1986) and Korajczyk, Lucas, and McDonald (1990) report only a sporadic effect.[6]

While previous studies test for price pressure around both the announcement and issue dates, price pressure has not been examined as a potential determinant of seasoned offer pricing. As noted above, permanent effects related to an increase in supply are unlikely to occur on the issue day if markets are efficient. However, it is possible that SEO underpricing reflects temporary price pressure related to distributing the large block of shares. In this case, underpricing represents a "sweetener" specifically targeted to those investors who purchase shares in the SEO. Based on the price pressure hypothesis, I expect larger issues to be more underpriced than smaller issues, all else equal. In addition, the effects of price pressure should be most pronounced for securities with relatively inelastic demand.

B.3. Preoffer Price Moves and Manipulative Trading

Previous studies report significant temporary price declines in the days prior to seasoned offers. As noted above, Gerard and Nanda (1993) argue that these preoffer returns may reflect manipulative trading by investors who attempt to depress the offer price by selling in the preoffer secondary market. This manipulation reduces the informativeness of secondary market prices and worsens the winner's curse problem faced by uninformed investors. As a result, a larger discount is required in order to sell the offered shares. If manipulative trading exacerbates the winner's curse problem, as Gerard and Nanda suggest, I would expect seasoned offers that are preceded by significant price drops to be more underpriced, all else equal.

However, Gerard and Nanda (1993) also discuss an opposing effect related to preoffer price changes. Specifically, preoffer price declines may reflect temporary movements away from the underlying value of the security. If underwriters account for these temporary price changes and price relative to expected value, underpricing measured from the prior day's close will underestimate true discounts. Thus, observed underpricing may actually be reduced following large price declines. If this effect dominates the informational effect of manipulative trading, I would expect SEOs that are preceded by large price drops to be less underpriced (relative to the previous day's close) than other offers, all else equal.

[6] Issue size is significant in one of three regressions reported by Masulis and Korwar (1986). Korajczyk et al. (1990) find that the coefficient on issue size generally has the correct sign, but is only occasionally significant.

Rule 10b-21 is intended to minimize manipulative short selling prior to SEOs. If this rule is successful, the effects of manipulative short selling should be less evident after its adoption. However, as noted by Gerard and Nanda (1993) and Kim and Shin (2001), restrictions on short sales may have the unintended effect of restricting informational short sales, thereby reducing the informativeness of prices and increasing required underpricing. In the empirical tests to follow, I examine whether the implementation of Rule 10b-21 has had important effects on SEO underpricing and whether the impact of preoffer price moves has changed as a result of this regulation.

B.4. Transaction Cost Savings

Investors who purchase offered shares from the underwriter do not pay transaction costs. In the absence of information asymmetries and trading restrictions, Loderer, Sheehan, and Kadlec (1991) argue that this transaction cost savings should allow underwriters to price seasoned offers above the preoffer price by the amount of the one-way transaction cost. Thus, the transaction cost savings hypothesis suggests that seasoned offers by firms with high transaction costs will be less underpriced (more overpriced) than other offers, all else equal.

B.5. Underwriter Pricing Practices

SEO underpricing may also reflect conventional underwriter pricing practices. For example, Lee, Lochhead, Ritter, and Zhao (1996) suggest that SEO underpricing may result from a tendency to round offer prices down to the nearest eighth or integer value. This conjecture is supported by Mola and Loughran (2001), who find that seasoned offer prices are clustered at integers and do not tend to fall on odd eighth fractions. Studies of price clustering in other settings provide two potential motivations for this common pricing practice. First, rounded prices may reflect the underwriter's desire to reduce the costs of negotiating over the offer price (see, e.g., Harris (1991) and Bradley et al. (2002)). Second, rounded prices may reflect uncertainty about the underlying security's value (see Ball, Torous, and Tschoegl (1985)). Conversations with underwriters are consistent with these motivations and suggest that rounded offer prices reflect the imprecise nature of the pricing process.

Notably, offer price rounding leads to a correlation between underpricing and stock price, since the effective tick size created by rounding represents a larger fraction of a lower price. In the presence of offer price rounding, I therefore expect offers of low-priced securities to be more underpriced than offers of high-priced securities, all else equal. In addition, this effect should be most evident when the previous day's closing price does not fall on an even dollar or $0.25 price increment.

Lee et al. (1996) also suggest that SEO underpricing may reflect a tendency for underwriters to price at the closing bid quote rather than the closing transaction price. Discussions with underwriters and market professionals confirm the use of this pricing practice, but further suggest that pricing at the bid is practiced only on the Nasdaq market. One possible explanation for this difference across

markets is that reported closing prices reflect different information on the two markets. On the NYSE, securities are assigned to a single specialist who handles the majority of order flow in that security. Thus, the reported closing price represents a centralized closing price and is likely to reflect the aggregate supply and demand for the security.[7] In contrast, trading on Nasdaq is fragmented across multiple market makers. For securities in this market, the reported closing price is simply the last reported trade from a single market maker and may or may not reflect information from other market makers. The closing inside quotes, on the other hand, reflect information available across all Nasdaq market makers. As a result, the closing inside bid quote may be more indicative of the price at which the underwriter could sell the new shares. Conversations with underwriters support this argument and suggest that, for Nasdaq securities, the closing inside bid is perceived as a better estimate of the potential selling price than the closing trade price.

If underwriters price Nasdaq offers relative to the bid quote, underpricing defined relative to the closing transaction price will be positively related to the bid-ask spread for these securities. In addition, if this pricing practice completely explains underpricing, discounts should be indistinguishable from zero when measured relative to the previous day's closing bid quote. The potential difference in pricing practices across markets is discussed in more detail in Section II.

II. Data and Summary Statistics

I identify the sample using Securities Data Company's (SDC) Global New Issues database. To begin, I collect the full sample of U.S. common stock offerings from January 1, 1980 through December 31, 1998, excluding initial public offerings, units, rights, mutual conversions, and issues by non-U.S. firms, closed-end funds, or utilities.[8] This results in a sample of 6,637 offers. I then obtain additional data for each issue from the Center for Research in Security Prices (CRSP) tapes and apply several additional sample restrictions. To be included in the final sample, an offer must (1) include at least some primary shares, (2) be issued by a firm listed on either the NYSE or Nasdaq, (3) have at least 30 days of prior trading data available on CRSP, and (4) have an offer price of at least \$3.00 and less than \$400.00. These restrictions eliminate 1,136, 521, 327, and 95 offers, respectively. I

[7] The NYSE's current procedures for handling market-on-close and limit-on-close orders are designed to disseminate information about supply and demand prior to the close and to ensure that the closing price reflects the overall supply and demand in the market. Enforcement actions may be taken in cases where it is determined that the closing price does not accurately reflect supply and demand conditions at 4 p.m. (see *The Exchange* (NYSE, 2000)). See Cushing and Madhavan (2000) for a discussion of market-on-close orders and the NYSE's closing procedures.

[8] Closed-end funds, REITs, and Units are identified using SDC classifications and by CRSP share codes of 40 or greater or ending in 3, 4, 5, or 8. Non-U.S. issues are defined as securities with CRSP share codes between 30 and 39 or share codes ending in 2. Utilities are defined as securities with three-digit SIC codes between 491 and 494. SIC codes are obtained from CRSP or, where missing, from COMPUSTAT.

also eliminate 89 offers for which a stock split occurred during the 11-day window surrounding the offer date and 15 offers due to potential data errors.[9]

The sample restrictions result in a final sample of 4,454 seasoned equity offers, including 1,268 offers by NYSE-listed firms and 3,186 offers by Nasdaq-listed firms. Further, the sample includes offers by 3,313 firms. Of these firms, 2,477 made one seasoned offer, 619 made two offers, 146 made three offers, 57 made four offers, 11 made five offers, and 3 made six offers. The annual number of SEOs ranges from 62 in 1988 to 436 in 1996.

Lease et al. (1991) note that stated offer dates are often inappropriate for analyzing price effects due to the fact that some offers take place after the close of trading. They examine time stamps from the Dow Jones News Service (DJNS) and find that 25 percent of offers from 1981 through 1983 take place after the close. Similarly, Eckbo and Masulis (1992) identify offer dates using both the DJNS and the closing price listed in the final prospectus and find that 20 percent of offers from 1963 through 1981 take place after the close. Safieddine and Wilhelm (1996) note that even time stamps from the DJNS may not identify the true time of the offer. They apply a volume-based correction and find that 18.4 percent of offers from 1980 through 1991 require an offer-date correction. Following Safieddine and Wilhelm, I apply a volume-based offer date correction. Specifically, if trading volume on the day following the SDC offer date is (1) more than twice the trading volume on the SDC offer date and (2) more than twice the average daily volume over the previous 250 trading days, then the day following the SDC offer date is designated as the offer date. This correction results in an offer-date change for 35.1 percent of the sample offers.[10]

For offers after January 1, 1993, I also collect intraday and closing quote data from the NYSE's Trades and Quotes (TAQ) database. This data is used to examine hypotheses related to transaction costs and underwriter pricing practices. For these analyses, I consider only the subset of 1,912 offers for which I could obtain at least 30 days of quote data prior to the offer.

[9] Fourteen outliers with underpricing of more than 60 percent are deleted as potential data errors. The results are similar if these outliers are included. I also delete one preferred stock issue that is misclassified by SDC as a common stock offer.

[10] Safieddine and Wilhelm (1996) apply only part (1) of this correction. I apply a more restrictive correction because a larger fraction of offers during the 1990s is affected. Consistent with earlier studies, I find that 18.1 percent of offers from 1980 through 1991 are affected by the offer-date correction. However, the frequency of corrections varies substantially across time, with 51.5 percent of offer dates corrected from 1992 through 1998. To test the validity of the offer date correction, I examined time stamps from the Dow Jones Newswire for a random sample of 200 SEOs from 1991 through 1998. I was unable to find a time-stamped newswire story for eight of these offers. I also identified and deleted one preferred stock issue that was misclassified by SDC as a common stock offer. Of the remaining 191 offers, 92 (48.2 percent) are affected by the offer-date correction and all 92 of these corrections are confirmed by newswire time-stamps after the close of trading. Of the 99 uncorrected offer dates, 93 are confirmed by newswire time stamps. In the remaining 6 cases, the newswire time stamp is after the close, but volume data suggest that the stated offer date is correct. This analysis suggests that the volume-based correction accurately identifies offer dates for between 96 percent and 100 percent of SEOs.

Table I provides summary statistics for the sample of SEOs. Panel A lists results for the entire sample of SEOs, while Panel B provides results for the 1,912 offers with bid-ask quote data. For each variable, Table I lists mean and median values for the complete sample and for the subsamples of NYSE and Nasdaq offers. The last column lists the *p*-value from a test of the restriction that means (medians) are equal across markets based on an analysis of variance (Wilcoxon rank sum test). Although the discussion focuses on the mean results, conclusions based on medians are similar.

The average seasoned offer raised $61.6 million in proceeds and was associated with underwriter spreads and direct expenses of 5.4 and 1.5 percent, respectively. However, offer characteristics differ significantly across markets, with NYSE firms making larger, higher-priced offers. Offer proceeds average $114.9 million for NYSE issues compared to $40.3 million for Nasdaq issues. While NYSE issues are larger, they represent a smaller fraction of the existing firm. Relative offer size, defined as offered shares divided by pre-issue shares outstanding, averages 16.0 percent on the NYSE relative to 26.8 percent on Nasdaq.

As expected, NYSE issuers tend to be larger, more actively traded firms. The average pre-issue market capitalization is $1.5 billion for NYSE issuers and $249.7 million for Nasdaq issuers. To provide comparable measures of share volume across markets, I divide Nasdaq volume by two. After this adjustment, the average daily share volume over the 250 trading days prior to the issue is 119,000 for NYSE issuers and 34,000 for Nasdaq issuers. Even without the volume adjustment, however, NYSE issuers tend to have significantly higher trading volume than Nasdaq firms.[11]

NYSE issuers are also associated with lower volatility and narrower spreads. The standard deviation of daily returns, measured over the 30 trading days ending 11 days prior to the offer, averages 2.34 percent for NYSE offers compared to 3.40 percent for Nasdaq offers. The results are similar if volatility is estimated from midpoint returns (Panel B). The percentage bid-ask spread over the 30 days prior to the offer averages 0.87 percent on the NYSE and 2.95 percent on Nasdaq.

III. Seasoned Offer Pricing

A. Close-to-Offer Returns

Summary statistics for close-to-offer returns are provided in Table II. The analyses to follow focus on returns calculated from the previous day's closing transaction price to the offer price (Panel A). However, for the subsample of offers with available quote data, I also calculate close-to-offer returns based on the closing

[11] Volume is adjusted to account for the fact that NYSE specialists participate as either the buyer or seller in only a fraction of trades. For example, specialists acted as either buyer or seller in 25.3 percent of 1998 share volume (New York Stock Exchange (1998)). Because specialist participation is greater than zero, adjusting by a factor of two is likely to understate Nasdaq volume relative to NYSE volume. This volume adjustment does not affect either the analysis or conclusions to follow. See Atkins and Dyl (1997) and Dyl and Anderson (2002) for an analysis of reported volume on the NYSE and Nasdaq.

Table I

Summary Statistics for Seasoned Offers, 1980 through 1998

The table lists means [medians] for offer and firms characteristics for the sample of seasoned offers. The sample includes 4,454 offers on the NYSE and Nasdaq from 1980 through 1998 that meet the sample restrictions described in Section II. The *p*-value is from a test of the restriction that means [medians] are equal across markets based on an analysis of variance [Wilcoxon rank sum test]. Offer proceeds equals the offer price times the number of shares issued. Relative offer size equals offered shares divided by total shares outstanding prior to the offer. Shares outstanding and market value are as of the day prior to the offer. Daily volume is the mean daily share volume over the 250 trading days immediately prior to the offer. For comparability, I divide Nasdaq volume by two. Standard deviation is defined as the standard deviation of daily returns over the 30 trading days ending 11 days prior to the offer. Standard deviation is estimated from closing stock price returns in Panel A and from midpoint-to-midpoint returns in Panel B. The percentage bid-ask spread is defined as the time-weighted average of percentage quoted spreads over the 30 days ending two days prior to the offer. This variable is calculated using offers from 1993 through 1998 only. Data for gross spread and direct expenses are available for only 4,445 and 4,354 offers, respectively.

Variable	All Offers	NYSE Offers	Nasdaq Offers	*p*-value
		Panel A: Full Sample		
N	4,454	1,268	3,186	
Offer price	22.71	30.68	19.54	0.000
	[19.38]	[28.00]	[17.25]	[0.000]
Offer proceeds (mil.)	61.57	114.90	40.34	0.000
	[33.50]	[66.00]	[25.90]	[0.000]
Relative offer size (%)	23.75	16.00	26.84	0.000
	[19.95]	[13.41]	[22.83]	[0.000]
Market value (mil.)	603.72	1493.20	249.71	0.000
	[170.59]	[518.74]	[117.89]	[0.000]
Shares outstanding (mil.)	18.57	39.48	10.24	0.000
	[8.77]	[18.63]	[7.02]	[0.000]
Standard deviation (%)	3.09	2.34	3.40	0.000
	[2.87]	[2.21]	[3.20]	[0.000]
Adjusted daily share volume (000)	58.62	119.25	34.49	0.000
	[22.74]	[51.61]	[15.67]	[0.000]
Gross spread (%)	5.41	4.29	5.86	0.000
	[5.40]	[4.36]	[5.74]	[0.000]
Direct expenses (%)	1.53	0.69	1.86	0.000
	[0.94]	[0.44]	[1.24]	[0.000]
		Panel B: 1993 through 1998 Offers Only		
N	1,912	431	1,481	
Bid-ask spread (%)	2.48	0.87	2.95	0.000
	[1.99]	[0.75]	[2.44]	[0.000]
Midpoint standard deviation (%)	3.19	2.42	3.41	0.000
	[2.80]	[2.12]	[3.00]	[0.000]

bid quote, the closing ask quote, and the closing quote midpoint. The *p*-value listed in parentheses below the mean (median) is from a test of the restriction that the mean (median) is significantly different from zero based on a *t*-test (sign

Table II

Close-to-Offer Returns for Seasoned Offers

The table lists summary statistics for offer pricing in the sample of seasoned offers. Panel A lists results for the full sample of 4,454 offers on the NYSE and Nasdaq from 1980 through 1998 that meet the sample restrictions described in Section II. Panels B through E list results for the subsample of 1,912 offers with available TAQ data. In Panels A and B, the return is defined from the previous day's closing transaction price to the offer price. In Panels C, D, and E, the return is defined relative to the previous day's closing quote midpoint, closing bid quote, and closing ask quote, respectively. *p*-values listed in parentheses below the mean are from a *t*-test of the restriction that the mean is equal to zero. *p*-values listed in parentheses below the median are from a sign test of the restriction that the distribution is centered on zero. The last row of each panel provides a *p*-value from a test of the restriction that means (medians) are equal across markets based on an analysis of variance (Wilcoxon rank sum test).

	N	Mean (*p*-value)	Median (*p*-value)	Percent Negative	Percent Zero
Panel A: Close-to-Offer Return (Full Sample)					
All offers	4,454	−2.21% (0.000)	−1.12% (0.000)	67.00	27.97
NYSE offers	1,268	−0.92 (0.000)	0.00 (0.000)	45.50	50.24
Nasdaq offers	3,186	−2.72 (0.000)	−1.67 (0.000)	75.55	19.11
p-value for difference	—	0.000	0.000	—	—
Panel B: Close-to-Offer Returns (1993 through 1998 Offers Only)					
All offers	1,912	−3.06% (0.000)	−1.98% (0.000)	80.75	16.63
NYSE offers	431	−1.52 (0.000)	−0.63 (0.000)	61.95	35.27
Nasdaq offers	1,481	−3.51 (0.000)	−2.38 (0.000)	86.23	11.21
p-value for difference	—	0.000	0.000	—	—
Panel C: Midpoint-to-Offer Return (1993 through 1998 Offers Only)					
All offers	1,912	−2.99% (0.000)	−1.82% (0.000)	91.58	3.66
NYSE offers	431	−1.59 (0.000)	−0.65 (0.000)	76.57	10.67
Nasdaq offers	1,481	−3.40 (0.000)	−2.16 (0.000)	95.95	1.62
p-value for difference	—	0.000	0.000	—	—
Panel D: Bid-to-Offer Return (1993 through 1998 Offers Only)					
All offers	1,912	−1.73% (0.000)	0.00% (0.000)	49.32	37.60
NYSE offers	431	−1.20 (0.000)	−0.17 (0.000)	50.35	24.36
Nasdaq offers	1,481	−1.89 (0.000)	0.00 (0.000)	49.02	41.46
p-value for difference	—	0.000	0.000	—	—
Panel E: Ask-to-Offer Return (1993 through 1998 Offers Only)					
All offers	1,912	−4.19% (0.000)	−3.03% (0.000)	96.81	2.14
NYSE offers	431	−1.97 (0.000)	−1.06 (0.000)	90.02	6.96
Nasdaq offers	1,481	−4.84 (0.000)	−3.57 (0.000)	98.78	0.74
p-value for difference	—	0.000	0.000	—	—

test). Again, results are presented for the full sample and for the subsamples of NYSE and Nasdaq offers. The last row of the table provides a *p*-value from a test of the restriction that mean (median) returns are equal across markets based on an analysis of variance (Wilcoxon rank sum test).

Consistent with previous studies, I find that SEOs are underpriced relative to the previous day's close. Across all subsamples and all return definitions, the mean close-to-offer return is negative and statistically significant. In the full sample, the mean and median returns are -2.21 and -1.12 percent, respectively. In addition, 67 percent of the sample offers are priced below the previous day's closing transaction price and 28 percent are priced at the previous day's closing price. Although not reported, I also estimated underpricing relative to the closing price on the offer day. The results are similar to those discussed above, with mean (median) offer-to-close returns of 2.30 (0.94) percent in the full sample. The similarity of underpricing estimates based on pre- and post-offer market prices suggests that SEO underpricing does not reflect permanent price pressure as discussed in Section I.

The magnitude of underpricing has increased substantially over time. This time-series pattern is illustrated in Figure 1. During the 1980s, underpricing averaged 1.15 percent in the full sample, 0.48 percent on the NYSE, and 1.30 percent on Nasdaq. These results are consistent with previous studies of this time period. In contrast, the mean underpricing from 1990 to 1998 is 2.92 percent for the full sample, 1.48 percent for the NYSE subsample, and 3.48 percent for the Nasdaq subsample. This increase in SEO underpricing during the 1990s is consistent with results reported by Kim and Shin (2001), Mola and Loughran (2001), and Altinkiliç and Hansen (2003), and is discussed in more detail below. Notably, underpricing appears to have increased gradually during the early and mid-1990s, reaching as high as 3.72 percent in 1996. This suggests that the adoption of Rule 10b-21 in August of 1988 is at best a partial explanation for the increase in SEO underpricing.

For the subsample of offers from 1993 to 1998, close-to-offer returns relative to closing quotes are summarized in Panels C, D, and E of Table II. For comparison to the full sample, Panel B lists returns based on closing transaction prices for the post-1993 subsample. The last two columns in Panel B show that discounting has become more common over time. For example, over 80 percent of offers from 1993 through 1998 were discounted, compared to less than 56 percent of offers prior to 1993. This result is consistent with Altinkiliç and Hansen (2003), who show that the occurrence of discounting increased throughout the 1990s. However, further investigation reveals that the magnitude of discounts also increased from the 1980s to the 1990s. Among offers that were discounted, underpricing averaged 2.47 percent during the 1980s relative to 3.83 percent during the 1990s.

As expected, Panels D and E show that close-to-offer returns are more negative when calculated from the closing ask quote and less negative when calculated from the closing bid quote. However, seasoned offers are significantly underpriced even relative to the closing bid quote. The mean bid-to-offer return for offers between 1993 and 1998 is -1.73 percent. While the median point estimate is

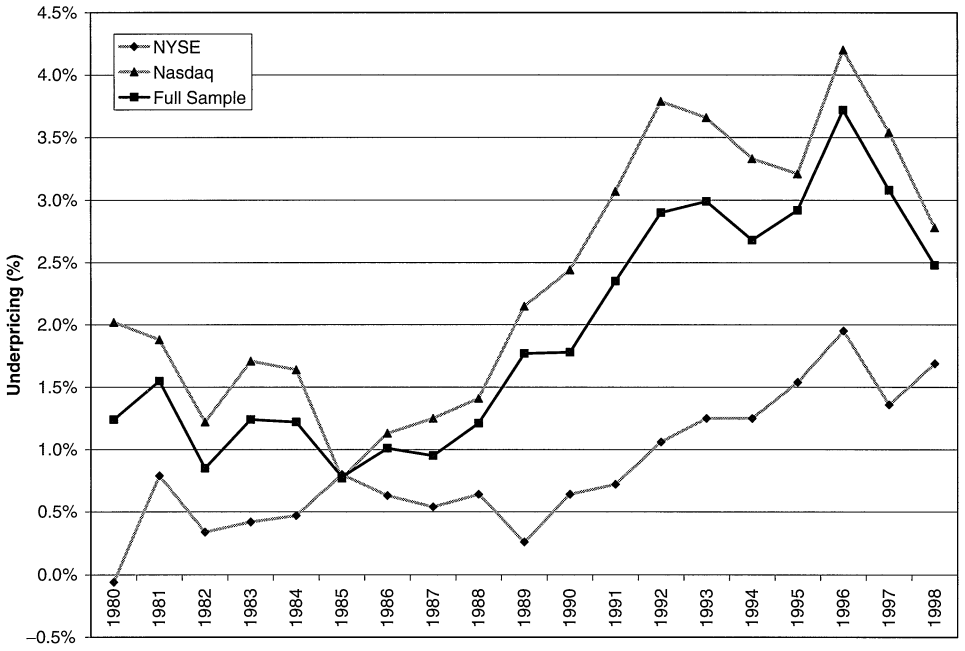

Figure 1. SEO underpricing by year. The figure plots mean SEO underpricing by year. Underpricing is defined as negative one times the return from the previous day's closing transaction price to the offer price. The sample includes 4,454 offers on the NYSE and Nasdaq from 1980 through 1998 that meet the sample restrictions described in Section II.

zero, a sign test easily rejects the restriction that the distribution is centered on zero. This asymmetry is evident in the last two columns of the table, where we see that 49 percent of bid-to-offer returns are negative, while only 13 percent are positive. These results suggest that SEO underpricing is not simply an artifact of pricing at the bid. Further, the results in Panel C show that returns based on closing quote midpoints are similar to those computed from closing trade prices. This suggests that the estimates are not significantly affected by order imbalances prior to the issue (see Lease et al. (1991)).

Consistent with Loderer, Sheehan, and Kadlec (1991) and Altinkiliç and Hansen (2003), I find that Nasdaq issues tend to be more underpriced than NYSE issues. In Panel A of Table II, the mean (median) close-to-offer return is -0.92 (0.00) percent for NYSE issues, relative to -2.72 (-1.67) percent for Nasdaq issues. On the NYSE, 45.5 percent of SEOs are priced at a discount from to the closing transaction price, while over 75 percent of Nasdaq SEOs are underpriced. In addition, differences across markets are evident regardless of whether returns are measured relative to the closing trade price or closing quotes. In the analysis to follow, I test whether these observed differences across markets can be explained by firm and offer characteristics.

From the last two columns of Table II, we see that Nasdaq offers are more likely to be priced at the previous day's closing bid quote, while NYSE offers are more

likely to be priced at the closing transaction price. To highlight this result, Table III presents pricing frequencies for the subsample of SEOs after 1993. Of the 1,481 Nasdaq offers with available quote data, 614 (41.5 percent) are priced at the previous day's closing bid quote. This compares to only 24.4 percent of NYSE offers. In contrast, 152 NYSE offers (35.3 percent) are priced at the previous day's closing transaction price, compared to only 166 Nasdaq offers (11.2 percent). The results are even more striking when I exclude those cases where the closing bid quote is equal to the closing transaction price. As the table shows, 480 Nasdaq offers (32.4 percent) are priced at the closing bid quote when the bid is different from the closing transaction price, compared to only 44 NYSE offers (10.2 percent). Further, 91 NYSE offers (21.1 percent) are priced at the closing transaction price when this price is different from the bid, compared to only 32 Nasdaq offers (2.2 percent). These results point to a clear difference in underwriter pricing mechanisms across markets and are consistent with the discussion of pricing practices presented in Section I. The effects of this pricing practice on underpricing are explored in more detail below.

B. Variable Definitions and Univariate Results

In this section, I define the explanatory variables used in the multivariate regression analysis presented below. These proxy variables are derived from the SEO pricing hypotheses developed in Section I. As an initial test of the hypotheses, I also present univariate results related to the key proxy variables.

Following previous research, I define three proxies for uncertainty and asymmetric information. The first proxy is firm size, defined as total market capitalization on the day prior to the offer. This measure reflects the fact that small firms are likely to be associated with more uncertainty and higher levels of asymmetric information than large firms. The second proxy is volatility, defined as the standard deviation of daily stock returns over the 30 trading days ending 11 days prior to the issue. This variable, which cannot be calculated prior to IPOs, reflects the ex ante uncertainty associated with the value of the issuing firm. Finally, asymmetric information should be reflected in the bid-ask spread (see Copeland and Galai (1983) and Glosten and Milgrom (1985)). As a third proxy, I therefore estimate the time-weighted average of percentage bid-ask spreads across the 30 days prior to the offer. Based on the uncertainty and asymmetric information hypothesis, I expect underpricing to be positively related to bid-ask spreads and volatility, and negatively related to firm size.

The price pressure hypothesis suggests that underpricing should be most pronounced for the largest offers, reflecting the market's ability to absorb the new shares. To test this hypothesis, I define relative offer size as offered shares divided by shares outstanding prior to the offer. This proxy reflects the size of the offer relative to the size of the existing market for the firm's shares.[12] The price pressure hypothesis also suggests that the impact of relative offer size should be most

[12] As an alternative, I repeated these analyses using an alternative proxy for relative offer size defined as offered shares divided by average daily (adjusted) trading volume. The conclusions are unaffected by the use of this alternative proxy.

Table III

Pricing at the Closing Transaction Price and the Closing Bid Quote, 1993 through 1998

The table lists the number (proportion) of seasoned offers with offer prices equal to the previous day's closing transaction price and closing bid quote, respectively. The results are based on the subsample of 1,912 seasoned offers from 1993 through 1998 for which bid quote data was available. In columns 1 and 2, counts are based on all SEOs with bid quote data. In columns 3 and 4, counts are based on the subset of cases for which the closing transaction price is not equal to the closing bid quote.

	All Cases		Closing Trans. Price ≠ Closing Bid Quote	
	Offer Price = Closing Trans. Price	Offer Price = Closing Bid Quote	Offer Price = Closing Trans. Price	Offer Price = Closing Bid Quote
All offers ($N = 1912$)	318 (16.63%)	719 (37.60%)	123 (6.43%)	524 (27.41%)
NYSE offers ($N = 431$)	152 (35.27%)	105 (24.36%)	91 (21.11%)	44 (10.21%)
Nasdaq offers ($N = 1481$)	166 (11.21%)	614 (41.46%)	32 (2.16%)	480 (32.41%)

pronounced for firms with relatively inelastic demand. Previous research provides some guidance as to the determinants of demand elasticity. For example, Mikkelson and Partch (1985) conjecture that demand is less elastic for small firms, low-priced stocks, low-volume stocks, and stocks with low institutional ownership. Loderer, Cooney, and Van Drunen (1991) argue that the price elasticity of demand is a function of volatility, firm size, investor base, heterogeneity of investor beliefs, and liquidity. Following these studies, I define four dummy variables to identify firms with relatively inelastic demand. D_{LowMV} is a dummy variable equal to one if the firm is in the lowest quartile of market capitalization and zero otherwise. D_{HighRisk}, D_{LowPrice}, and $D_{\text{HighSpread}}$ are defined similarly for firms in the highest quartile of standard deviation, lowest quartile of stock price, and highest quartile of bid-ask spread, respectively. To test the implications of the price pressure hypothesis, I include in the regression four interaction terms defined as relative offer size multiplied by each of the four dummy variables. If SEO underpricing is related to price pressure, I expect the coefficients on these four interaction terms to be positive.

To test the manipulative trading hypothesis, I examine market-adjusted returns prior to the offer. Daily market-adjusted returns are defined as the return on the stock minus the return on the CRSP value-weighted index.[13] For illustrative purposes, I present mean cumulative market-adjusted returns (CARs) for the

[13] I also estimated abnormal returns by (1) adjusting for the return on the S&P index, (2) adjusting for the return on the CRSP equally weighted index, and (3) adjusting for expected returns calculated based on coefficients from market model regressions for each firm. The results for these alternative measures are similar to those reported above.

11-day window from day −5 to day +5 in Figure 2. Because manipulative trading may be affected by Rule 10b-21, I present results separately for offers before and after the implementation of this rule. Consistent with previous research, I find a significant price drop in the days prior to the offer and a significant price recovery following the offer. The mean five-day preoffer CAR for the full sample is −2.19 percent and Nasdaq issues are associated with a larger price decline (−2.63 percent) than NYSE issues (−1.07 percent). While postoffer returns for NYSE issuers appear to differ before and after Rule 10b-21, there is little evidence that Rule 10b-21 significantly affected preoffer abnormal returns. In the multivariate analysis to follow, I include the CAR from day −5 to day −1 as a proxy for preoffer price moves.

If offer price rounding is important, I expect underpricing to be negatively related to price level. I define price as the closing price on the day prior to the offer. In addition, the effects of offer price rounding should be most evident in cases where the closing price does not fall on an even dollar or $0.25 price increment. To test this implication, I include in the regression a price-increment dummy

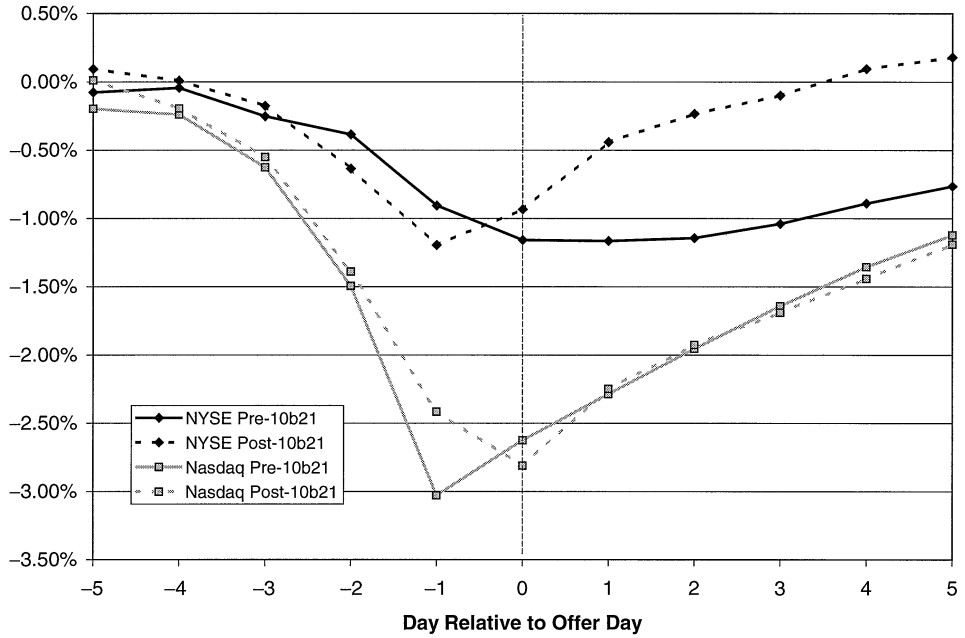

Figure 2. Cumulative market-adjusted returns around seasoned equity offers. The figure plots cumulative market-adjusted returns surrounding seasoned offers on the NYSE and Nasdaq. Market-adjusted returns are defined as the daily transaction price return minus the return on the CRSP value-weighted index. Cumulative adjusted returns are estimated from day −5 to day +5 relative to the offer date. Results are shown separately for offers issued before and after the implementation of Rule 10b-21 on August 25, 1988. The sample includes 4,454 offers on the NYSE and Nasdaq from 1980 through 1998 that meet the sample restrictions described in Section II.

variable (*Tick < 1/4*) and an interaction term between this dummy variable and price. *Tick < 1/4* is equal to one if the decimal portion of the closing price falls on an increment smaller than \$0.25 and is equal to zero otherwise. If offer price rounding is a significant determinant of SEO underpricing, I expect a positive coefficient on *Tick < 1/4*. In addition, the negative relation between underpricing and price should be most evident when price is interacted with the *Tick < 1/4* dummy variable.

To illustrate the extent of offer price rounding in the SEO sample, Figure 3 plots the frequencies with which closing transaction prices and offer prices end in various 1/16th price increments. Panel A shows that the proportions of the sample with closing prices ending in \$0.00, \$0.25, \$0.50 and \$0.75 are 18.9, 14.3, 16.1, and 13.3 percent, respectively. Prices ending in odd eighth increments are less frequent, but still represent a sizeable fraction of the sample. The results for offer prices, presented in Panel B, provide a striking contrast. Of the sample offers, 1,555 (34.9 percent) are priced at even dollar amounts and another 2,203 (49.5 percent) are priced at \$0.25 increments other than the even dollar. These results provide strong evidence that seasoned offer prices tend to be rounded to even dollar amounts or \$0.25 increments. Although not shown, I also find that the tendency to round offer prices has increased over time. The proportion of offer prices at even dollar amounts is 29.0 percent for offers from 1980 to 1989 and 38.7 percent for offers during the 1990s, with over 40 percent of offers priced at even dollar amounts in 1996, 1997, and 1998.

To examine whether underpricing is related to the underwriter practice of pricing at the bid quote, I include in the regression the percentage difference between the closing transaction price and the closing bid quote *(%CloseBidDiff)*. If SEO underpricing is completely explained by the practice of pricing at the bid, this variable will have a coefficient of one. Because conversations with underwriters and the results in Table III suggest that only Nasdaq offers are priced relative to the bid quote, I also include interaction terms to test whether the effects of pricing at the bid differ across markets.

To control for changes in underpricing over time, I provide specifications including year dummy variables. These variables account for time-series changes in underpricing that cannot be explained by the other independent variables. To test whether underpricing was affected by the adoption of Rule 10b-21, I also include a dummy variable to identify offers after August 25, 1988. However, if the short sale restrictions imposed by Rule 10b-21 have an important effect on SEO pricing, this effect may be reflected in the coefficient on preoffer price moves (*CAR*). To test this possibility, I incorporate an interaction term between the *Rule10b-21* dummy variable and *CAR*.

The gradual increase in SEO underpricing during the 1990s suggests that the time-series variation in offer pricing may be related to factors other than Rule 10b-21 (see Figure 1). One possibility is that the relationship between underwriters and firms or the economics of the underwriting business changed during this period. Consistent with this hypothesis, Loughran and Ritter (2001) report a dramatic increase in IPO underpricing during this same time period. They attribute this rise to an increase in agency problems between underwriters and

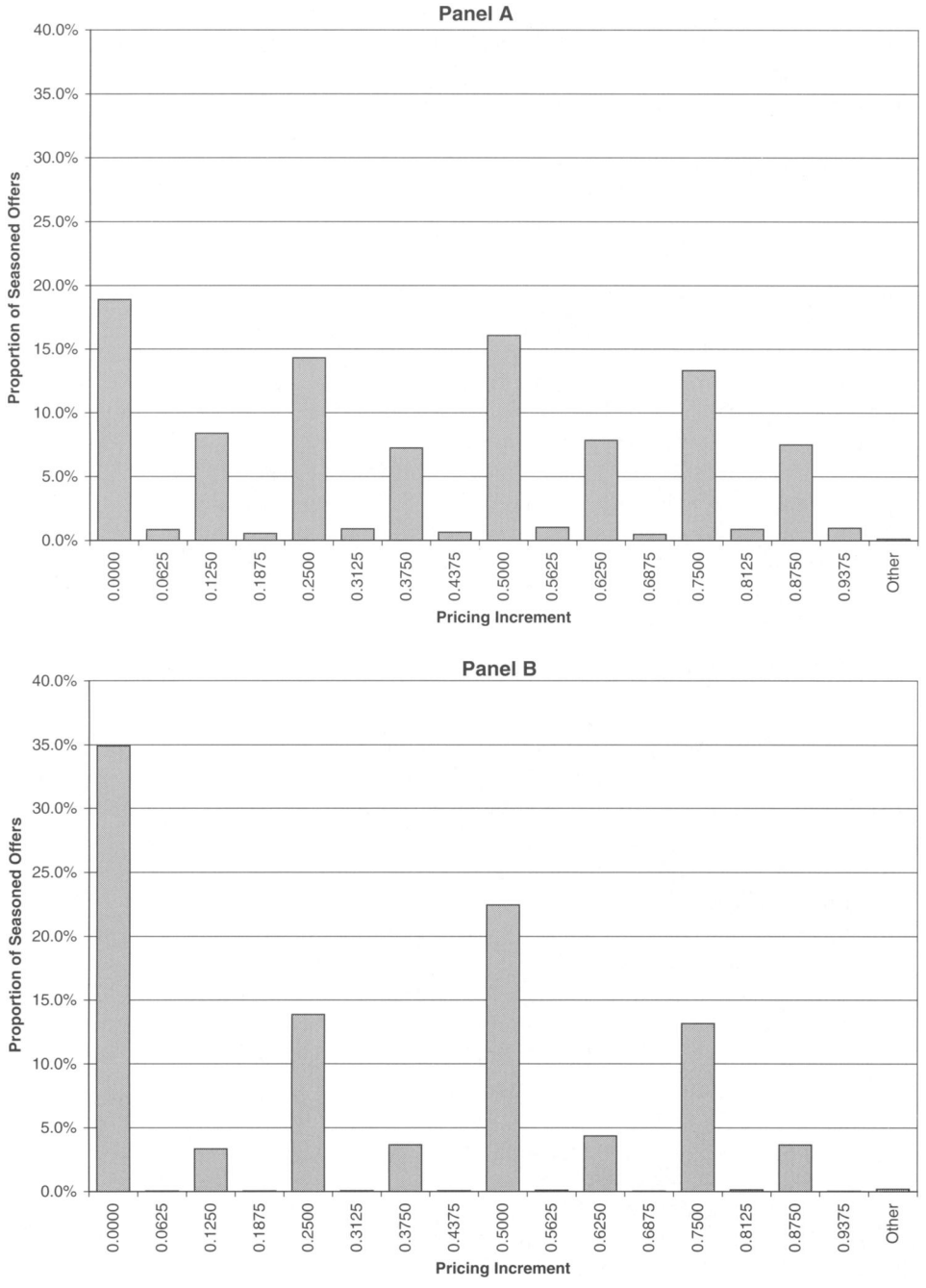

Figure 3. Transaction price and offer price increments. The figure plots the frequencies at which closing transaction prices and seasoned offer prices fall on various price increments. Panel A shows price increments for closing transaction prices on the day prior to the offer. Panel B shows price increments for offer prices. The sample includes 4,454 offers on the NYSE and Nasdaq from 1980 through 1998 that meet the sample restrictions described in Section II.

issuing firms, and an increased willingness by issuing firms to "leave money on the table" in the face of rising stock valuations. Alternatively, Ljungqvist and Wilhelm (2002) argue that significant changes in ownership structure may have reduced the incentives of key participants to control underpricing and Daniel (2002) argues that the relative bargaining positions of issuers, underwriters, and investors may vary with business and industry cycles. If any of these factors accounts for the time variation in underpricing, I would expect both IPOs and SEOs to be affected, leading to a positive relation between underpricing in the two markets. To test this possibility, I include in the regressions the mean level of underpricing across all IPOs during the same month as the SEO.

Table IV presents a summary of the empirical predictions related to SEO underpricing. I note that these hypotheses are not mutually exclusive and multiple explanations may be valid. As a preliminary test of the hypotheses, I present close-to-offer returns for quartiles of offers ranked on the key proxy variables. In the next section, I then present a multivariate regression analysis to control for interactions among the explanatory variables and to determine their relative importance.

The univariate quartile results are presented in Table V. For each proxy variable, the table lists the mean close-to-offer return in each quartile and provides the p-value from a test of the restriction that means are equal across quartiles. Consistent with the uncertainty and asymmetric information hypothesis, underpricing is decreasing in firm size, and increasing in volatility and bid-ask spread. The results for bid-ask spread are also consistent with pricing at the bid quote, but are inconsistent with the transaction costs savings hypothesis. Consistent with the price pressure hypothesis, underpricing is increasing in relative offer size. The results for preoffer CAR suggest that large preoffer price moves result in increased underpricing, regardless of direction. While the results for negative CAR are consistent with the manipulative trading hypothesis, this hypothesis cannot explain the positive CAR effect. Finally, SEO underpricing is decreasing in price, suggesting that offer-price rounding may account for a portion of the observed underpricing.

C. Multivariate Results

I present OLS regression results in Table VI. The dependent variable, underpricing, is defined as negative one times the close-to-offer return.[14] Panel A lists results for the full sample of 4,454 seasoned offers, while Panel B lists results for the subsample of 1,912 offers with available quote data. p-values based on White's het-

[14] Although not shown, multicollinearity tests suggest that the conclusions are robust to collinearity problems. I calculated Variance Inflation Factors (VIFs) and Condition Numbers for each of the OLS regression specifications (see Judge et al. (1988) and Kennedy (1992)). Based on these measures, significant collinearity is evident only when the price interaction terms are included or when the Rule 10b-21 dummy and year dummies are included simultaneously. In all other cases, the maximum Condition Number is less than 30.0 and the maximum VIF is less than 5.0. The inclusion of price interaction terms and the Rule 10b-21 dummy does not affect the conclusions regarding other explanatory variables.

Table IV

Summary of Empirical Predictions Related to SEO Underpricing

The table summarizes the direction of expected empirical relationships between the hypothesized explanatory variables and SEO underpricing. The hypotheses are discussed in Section I. Underpricing is defined as negative one times the close-to-offer return and a positive sign implies that an increase in the variable is associated with increased underpricing. The manipulative trading hypothesis provides implications only for *negative* preoffer abnormal returns. Thus, a negative sign suggests that a larger price drop leads to increased underpricing.

	Explanatory Variable and Predicted Relation					
Hypothesis	Firm Size	Volatility	Bid-Ask Spread	Relative Offer Size	(Negative) Preoffer Abnormal Returns	Price
Uncertainty/asymmetric info.	(−)	(+)	(+)			
Price pressure				(+) Most evident for securities with inelastic demand		
Transaction cost savings			(−)			
Manipulative trading					(−) If manipulation worsens the information problem (+) If temporary price decline results in underestimated underpricing Manipulative trading effects should be reduced after Rule10b-21	
Offer price rounding						(−) Larger effect if closing price is not on a $0.25 increment
Pricing at the bid			(+) Due solely to the difference between closing trade price and closing bid			

Table V

Close-to-Offer Returns by Category

The table lists mean close-to-offer returns for quartiles of seasoned offers ranked according to six explanatory variables. The sample includes 4,454 offers on the NYSE and Nasdaq from 1980 through 1998 that meet the sample restrictions described in Section II. The close-to-offer return is defined from the previous day's closing transaction price to the offer price. Firm size is defined as the market capitalization on the day prior to the offer. Volatility is defined as the standard deviation of daily returns over the 30 trading days ending 11 days prior to the offer. Relative offer size equals offered shares divided total shares outstanding prior to the offer. CAR is defined as the cumulative market-adjusted return over the 5 days prior to the offer, where market return is defined as the return on the CRSP value-weighted index. Price is defined as the closing transaction price on the day prior to the offer. Bid-ask spread is defined as the time-weighted average of percentage quoted spreads over the 30 days ending 2 days prior to the offer. The last column provides a *p*-value from a test of the restriction that means are equal across quartiles.

	Close-to-Offer Returns				
	Quartile 1 (Low)	Quartile 2	Quartile 3	Quartile 4 (High)	*p*-value
Firm size quartile ($N=4454$)	−3.48%	−2.47%	−1.86%	−1.02%	0.000
Volatility quartile ($N=4454$)	−1.11	−1.55	−2.48	−3.67	0.000
Bid-ask spread quartile ($N=1912$)	−1.32	−2.22	−3.32	−5.39	0.000
Relative offer size quartile ($N=4454$)	−1.12	−1.79	−2.38	−3.53	0.000
CAR quartile ($N=4454$)	−2.56	−1.80	−1.85	−2.61	0.000
Price quartile ($N=4454$)	−3.88	−2.28	−1.58	−1.07	0.000

eroskedasticity-consistent χ^2-test are provided in parentheses below the coefficients. In both the full-sample and post-1993 regressions, the specifications provide good explanatory power. The adjusted R^2 ranges from 23.4 percent to 25.8 percent for the full-sample regressions and from 25.0 percent to 37.2 percent in the post-1993 regressions.[15]

I turn first to the full-sample regressions described in Panel A of Table VI. Consistent with the uncertainty and asymmetric information hypothesis, underpricing is generally higher for small firms and firms with high price uncertainty; the coefficient on market capitalization is negative and significant in models 1 through 4 and the coefficient on volatility is positive and significant in all but

[15] I also reestimated the model excluding (1) offers with closing secondary market prices less than $5.00, (2) NYSE offers with proceeds greater than the largest Nasdaq offer, and (3) NYSE offers by firms larger than the largest firm in the Nasdaq sample. In all cases, the results are similar to those presented in Table VI. The conclusions are also similar if offer size and firm size are adjusted for inflation based on the annual level of the CPI.

Table VI

Regression Results for SEO Underpricing

The table lists coefficients (p-values) from OLS regressions of underpricing on a set firm and offer characteristics. p-values are based on White's heteroskedasticity-consistent χ^2 test. Panel A lists results for the full sample of 4,454 offers on the NYSE and Nasdaq from 1980 through 1998 that meet the sample restrictions described in Section II. Panel B lists results for the subsample of 1,912 offers with available quote data. The dependent variable, underpricing, is defined as negative one times the return from the previous day's closing transaction price to the offer price. Price is the closing transaction price on the day prior to the offer. Market capitalization is defined on the day prior to the offer as the number of shares outstanding multiplied by price. Relative offer size equals offered shares divided by total shares outstanding prior to the offer. D_{LowMV} is defined as one if the firm is in the lowest quartile of market capitalization and zero otherwise. D_{HighRisk}, D_{LowPrice}, and $D_{\text{HighSpread}}$ are defined similarly for the highest quartile of volatility, lowest quartile of stock price, and highest quartile of bid-ask spread, respectively. Volatility is defined as the standard deviation of daily close-to-close returns over the 30 trading

Panel A: All Seasoned Offers ($N = 4{,}454$)

	1	2	3	4	5	6	7
Intercept	0.0563	0.0500	0.0500	0.0524	0.0208	0.0169	0.0127
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.010)	(0.020)
Ln(Market Cap.)	− 0.0016	− 0.0017	− 0.0017	− 0.0017	− 0.0011	− 0.0011	− 0.0006
	(0.018)	(0.015)	(0.015)	(0.016)	(0.106)	(0.105)	(0.338)
Volatility	0.2314	0.2343	0.2343	0.2342	0.1421	0.1338	0.1665
	(0.000)	(0.000)	(0.000)	(0.000)	(0.089)	(0.106)	(0.052)
Rel Offer Size	0.0129	0.0131	0.0131	0.0132	0.0103	0.0100	0.0139
	(0.004)	(0.004)	(0.004)	(0.003)	(0.026)	(0.030)	(0.002)
Rel Offer Size * D_{LowMV}	—	—	—	—	0.0060	0.0061	0.0053
					(0.001)	(0.001)	(0.004)
Rel Offer Size * D_{HighRisk}	—	—	—	—	0.0047	0.0047	0.0045
					(0.032)	(0.028)	(0.042)
Rel Offer Size * D_{LowPrice}	—	—	—	—	0.0141	0.0141	0.0137
					(0.000)	(0.000)	(0.000)
CAR_Positive	0.0742	0.0745	0.0744	0.0429	0.0424	0.0386	0.0357
	(0.000)	(0.000)	(0.000)	(0.156)	(0.156)	(0.198)	(0.233)
CAR_Negative	0.0156	0.0148	0.0148	0.0759	0.0836	0.0840	0.0825
	(0.226)	(0.248)	(0.248)	(0.000)	(0.000)	(0.000)	(0.000)
Ln(Price)	− 0.0147	− 0.0126	− 0.0126	− 0.0126	− 0.0041	− 0.0044	− 0.0037
	(0.000)	(0.000)	(0.000)	(0.000)	(0.016)	(0.009)	(0.025)
Tick < 1/4	—	0.0134	0.0134	0.0134	0.0119	0.0116	0.0127
		(0.045)	(0.044)	(0.043)	(0.069)	(0.076)	(0.052)
Ln(Price) * *Tick < 1/4*	—	− 0.0046	− 0.0046	− 0.0046	− 0.0042	− 0.0041	− 0.0042
		(0.027)	(0.027)	(0.026)	(0.042)	(0.046)	(0.040)
Rule10b-21	—	—	0.0019	− 0.0010	− 0.0028	− 0.0027	0.0121
			(0.765)	(0.876)	(0.670)	(0.681)	(0.000)
*CARPos * Rule10b21*	—	—	—	0.0449	0.0434	0.0466	0.0595
				(0.215)	(0.227)	(0.194)	(0.100)
*CARNeg * Rule10b21*	—	—	—	− 0.0894	− 0.0925	− 0.0941	− 0.1056
				(0.000)	(0.000)	(0.000)	(0.000)
IPO Underpricing	—	—	—	—	—	0.0097	0.0110
						(0.078)	(0.009)
NYSE Dummy	− 0.0031	− 0.0028	− 0.0028	− 0.0031	− 0.0032	− 0.0032	− 0.0043
	(0.004)	(0.009)	(0.009)	(0.004)	(0.002)	(0.001)	(0.000)
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	No
Adj. R^2	0.2344	0.2356	0.2355	0.2383	0.2582	0.2588	0.2453

Table VI

days ending 11 days prior to the offer. In Panel B, midpoint volatility is defined similarly but is estimated from midpoint-to-midpoint returns. *CAR* is defined as the cumulative market-adjusted return over the 5 days prior to the offer, where market return is defined as the return on the CRSP value-weighted index. *CARPositive* (*CARNegative*) equals *CAR* if positive (negative) and zero otherwise. *Tick < 1/4* is a dummy variable that equals one if the decimal portion of the closing price on the day prior to the offer is less than \$0.25. In Panel B, this Tick dummy variable is defined for Nasdaq offers relative to the closing bid quote rather than the closing transaction price. The Bid-Ask Spread is defined as the time-weighted average of percentage quoted spreads over the 30 days ending 2 days prior to the offer. *% CloseBidDiff* is defined on the day prior to the offer as (closing transaction price − closing bid quote)/closing transaction price). IPO underpricing is the average underpricing across all IPOs during the same month as the SEO, where monthly underpricing estimates for IPOs are obtained from Jay Ritter's web page at http://bear.cba.ufl.edu/ritter/ipoall.htm. *NYSE* is a dummy variable that equals one if the firm was listed on the NYSE at the time of the offer and zero if the firm was listed on Nasdaq.

Panel B: Seasoned Offers with Quote Data ($N = 1{,}912$)

Intercept	0.0974	0.0639	0.0554	0.0571	0.0459	0.0434	0.0139
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.192)
Ln(Market Cap.)	− 0.0024	− 0.0003	0.0004	0.0002	0.0001	− 0.0002	0.0007
	(0.036)	(0.826)	(0.750)	(0.829)	(0.906)	(0.883)	(0.550)
Volatility	0.1788	0.2045	0.1960	0.1984	0.1920	0.1841	0.1473
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)
Rel Offer Size	0.0173	0.0146	0.0142	0.0124	0.0119	0.0112	0.0093
	(0.003)	(0.000)	(0.014)	(0.027)	(0.029)	(0.042)	(0.092)
Rel Offer Size * D_{LowMV}	—	—	—	—	—	—	0.0080
							(0.006)
Rel Offer Size * D_{HighRisk}	—	—	—	—	—	—	0.0047
							(0.026)
Rel Offer Size * D_{LowPrice}	—	—	—	—	—	—	0.0120
							(0.000)
Rel Offer Size * $D_{\text{HighSpread}}$	—	—	—	—	—	—	0.0037
							(0.320)
CAR_Positive	0.0953	0.0928	0.1049	0.0998	0.0982	0.0946	0.0905
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CAR_Negative	− 0.0149	− 0.0177	− 0.0529	− 0.0521	− 0.0546	− 0.0599	− 0.0513
	(0.444)	(0.368)	(0.006)	(0.007)	(0.005)	(0.002)	(0.009)
Ln(Price)	− 0.0227	− 0.0198	− 0.0193	− 0.0197	− 0.0163	− 0.0165	− 0.0087
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)
Bid-Ask Spread	—	0.3812	0.1136	0.0599	0.0927	0.0820	− 0.0393
		(0.000)	(0.265)	(0.555)	(0.363)	(0.422)	(0.761)
% CloseBidDiff	—	—	0.6077	—	—	—	—
			(0.000)				
*% CloseBidDiff * NYSE*	—	—		− 0.0643	− 0.0363	− 0.0352	− 0.0562
				(0.684)	(0.824)	(0.826)	(0.740)
*% CloseBidDiff * Nasdaq*	—	—	—	0.7250	0.7378	0.7321	0.7109
				(0.000)	(0.000)	(0.000)	(0.000)
Tick < 1/4	—	—	—	—	0.0211	0.0204	0.0212
					(0.057)	(0.062)	(0.051)
Ln(Price) * *Tick < 1/4*	—	—	—	—	− 0.0052	− 0.0051	− 0.0057
					(0.113)	(0.123)	(0.080)
IPO Underpricing	—	—	—	—	—	0.0352	0.0323
						(0.054)	(0.069)
NYSE Dummy	− 0.0042	0.0001	0.0022	0.0053	0.0046	0.0046	0.0043
	(0.020)	(0.975)	(0.287)	(0.013)	(0.036)	(0.032)	(0.041)
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.2501	0.2703	0.3333	0.3473	0.3518	0.3558	0.3726

one specification. I note that these variables tend to lose statistical significance when the relative offer size interaction terms are included (models 5 through 7).

The coefficient on relative offer size is positive and significant in every specification. In addition, the coefficients on the relative offer size interaction terms suggest that the effects of this variable are most pronounced for small firms, risky securities, and low-priced securities. These results provide strong support for the price pressure hypothesis and suggest that price pressure is most pronounced for securities with relatively inelastic demand.

The coefficient on price level is negative and significant in every specification. This result is consistent with the effects of offer price rounding. Further, the coefficient on $Tick < 1/4$ is consistently positive and the negative relation between underpricing and price is most pronounced when the closing price falls on an increment smaller than \$0.25. Together, these results suggest that SEO underpricing is significantly related to offer price rounding and that offers are more underpriced when the previous day's closing price does not fall on an even dollar amount or \$0.25 price increment.

Examining coefficients on the year dummy variables (not shown), I find that firm and offer characteristics are unable to completely explain changes in underpricing over time. In models 1 through 6, a χ^2-test easily rejects the restriction that coefficients on all year dummy variables are jointly equal to zero (p-value = 0.00). In models 3–7, I also include a dummy variable to identify offers occurring after the adoption of Rule 10b-21. The coefficient on this variable is positive and significant when the year dummy variables are excluded (model 7), but is insignificant otherwise. Thus, like Kim and Shin (2001), I find that SEO underpricing increased following Rule 10b-21. However, my results suggest that underpricing increased gradually over time and the variation through time cannot be captured by a simple shift in the regression intercept following the implementation of Rule 10b-21.

The results in models 1–3 suggest that large positive preoffer returns lead to more underpricing, but negative preoffer returns do not affect SEO pricing. However, the results in models 4–7 show that the effect of preoffer returns changed significantly after the adoption of Rule 10b-21 and is not symmetric across positive and negative CARs. Consistent with the manipulative trading hypothesis, only negative preoffer CARs are significantly related to underpricing prior to Rule 10b-21. However, negative preoffer CARs result in smaller rather than larger levels of underpricing. This finding is inconsistent with the negative information effects of manipulative trading described by Gerard and Nanda (1993), but is consistent with the alternative hypothesis that underwriters price relative to expected value and give little weight to temporary price drops immediately prior to the offer. After the adoption of Rule 10b-21, the effect of positive preoffer CARs is increased and the effect of negative preoffer CARs is reversed. The signs on these coefficients suggest that both large positive and large negative CARs result in higher underpricing. One possible explanation for this result is that prices are considered less informative after Rule 10b-21 and large price moves in either direction are associated with more price uncertainty. However, only the positive

CAR effect is statistically significant after Rule 10b-21 in the full sample regressions.[16]

Models 6 and 7 include a proxy for the mean level of IPO underpricing in each sample month. The coefficient on this variable is positive and significant, suggesting that a portion of the observed increase in SEO underpricing can be explained by factors that affect both IPOs and SEOs. However, even after controlling for IPO underpricing and Rule 10b-21, the restriction that year dummy variable coefficients are jointly equal to zero is easily rejected (p-value = 0.00). I conclude that the hypothesized variables are unable to completely capture the increase in SEO underpricing over time.

Panel B of Table VI lists regression results for the subsample of seasoned offers with available quote data. These regressions allow for tests of hypotheses related to transaction costs and pricing at the bid quote. In general, the results are consistent with the conclusions from the full sample regressions. For example, in model 1 I find that SEO underpricing is negatively related to price and firm size, and positively related to volatility and relative offer size. In addition, the results for the price increment dummy variable suggest that underpricing is partially explained by the practice of offer-price rounding and the coefficient on the NYSE dummy variable suggests that NYSE offers are less underpriced than Nasdaq offers.[17] The interaction term between relative offer size and bid-ask spread is not significant (model 7), but coefficients on all other relative offer size interaction terms are positive and significant. As in Panel A, SEO underpricing differs significantly across years and is positively related to the magnitude of underpricing in the IPO market.

Models 2 through 7 incorporate the bid-ask spread and bid pricing variables. In model 2, the coefficient on bid-ask spread is positive and significant. Thus, I find no support for the transaction cost savings hypothesis. The coefficient on bid-ask spread is consistent with both pricing at the bid and the asymmetric information hypothesis. However, the results in models 3 through 7 suggest that this effect results solely from the tendency of underwriters to price Nasdaq offers relative to the closing bid quote. The coefficient on close-bid price difference is significantly positive and the coefficient on bid-ask spread is insignificant when the two variables are included simultaneously. Further, when the bid-close price difference is interacted with exchange dummy variables, we see that the effect is significant only for Nasdaq offers. Together, these results suggest that the prac-

[16] Both the positive and negative *CAR* effects are significant in the post-1993 regressions below (Panel B). These results are consistent with Altinkiliç and Hansen (2003) who find that large returns during the filing period, whether positive or negative, result in increased underpricing.

[17] To account for the observed difference in pricing practices across markets, I define *Tick* < *1/4* in the Panel B regressions based on the closing transaction price for NYSE offers and based on the closing bid quote for Nasdaq offers. In contrast to the full sample results (Panel A), the price increment dummy variable and interaction term are insignificant in the post-1993 regressions (Panel B) if *Tick* < *1/4* for Nasdaq offers is defined based on the closing transaction price, though the coefficients have the correct signs. This result highlights the importance of recognizing differences in pricing practices across markets, but does not affect the conclusions related to other explanatory variables.

tice of pricing at the bid has a significant effect on SEO pricing for Nasdaq-listed firms but not for NYSE firms.

I note two important differences between the full-sample results and the results in Panel B. First, the coefficient on firm size is insignificant after controlling for pricing at the bid quote. The insignificant coefficients on bid-ask spread and firm size in models 3 through 7 suggest that, while price uncertainty plays an important role in offer pricing for seasoned firms, asymmetric information effects have at most a weak effect. These results should be interpreted with caution, however, since bid-ask spread, firm size, and exchange location are strongly correlated.[18] A second notable change is that, after controlling for pricing at the bid, both positive and negative preoffer CARs are significantly related to underpricing. The coefficients on these variables suggest that, after 1993, large preoffer price moves in either direction result in increased underpricing.

As noted above, the cross-sectional analysis in Panel A suggests that seasoned offers are significantly more underpriced on Nasdaq than on the NYSE. The results in Panel B show that this effect is eliminated or even reversed after controlling for underwriter pricing practices. I conclude that the observed difference in SEO underpricing across markets results from the common underwriter practice of pricing Nasdaq offers relative to the bid quote and NYSE offers relative to the closing transaction price.

IV. Conclusion

I document significant underpricing for seasoned equity offers in the United States. Underpricing averages 2.2 percent for the sample of SEOs between 1980 and 1998, and has increased substantially over time. This underpricing results in a substantial cost to the shareholders of issuing firms. For example, for the average seasoned offer during 1998, underpricing represented a loss of $1.95 million in offer proceeds and accounted for nearly 22 percent of total direct and indirect issue costs.

Cross-sectional analysis suggests that SEOs are more underpriced for firms with high price uncertainty and, after the adoption of Rule 10b-21, for firms that experience large price moves immediately prior to the offer date. I also find strong support for the hypothesis that SEO underpricing reflects temporary price pressure. Specifically, underpricing is positively related to relative offer size and this effect is most pronounced for those securities hypothesized to have relatively inelastic demand. I find no evidence that SEO underpricing is related to transaction cost savings.

Conventional underwriter pricing practices have a significant effect on SEO pricing. I find that underwriters tend to round offer prices down to the nearest dollar or $0.25 price increment, resulting in larger percentage discounts for low-

[18] As an additional test of the asymmetric information hypothesis, I estimated regressions including the number of years since the issuer's IPO and the number of SEOs completed since the IPO. Neither of these variables enters the model significantly. These regressions are not reported because the additional variables are missing for many of the sample offers.

priced securities and when the previous day's closing price does not fall on a $0.25 increment. I also find that Nasdaq offers tend to be priced relative to the bid quote, while NYSE offers tend to be priced relative to the closing transaction price. I argue that this difference in underwriter behavior reflects a perceived difference across markets in the informativeness of reported closing prices. Notably, this pricing practice explains why seasoned offers by NYSE-listed firms are less underpriced (relative to the closing trade price) than Nasdaq offers, on average.

Firm and offer characteristics cannot fully explain the increase in SEO underpricing over time. This time-series increase appears to be partially explained by the restrictions on short selling imposed by Rule 10b-21. In addition, SEO underpricing is positively related to underpricing in the IPO market, suggesting that a portion of the increase may be related to changes in underwriter–firm relationships or changes in the economics of the underwriting business that affect both IPOs and SEOs.

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