# The Effect of Short Sales Constraints on SEO Pricing 

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#### Abstract

This article examines the influence of SEC's Rule 105, Regulation M on the information environment surrounding the offer day of a seasoned equity offering (SEO). The results of this study show that the constraints on short sales imposed by the Rule inhibit informed trading for offers with private adverse information and without listings on the options market. These constraints also contribute to a substantial increase in information asymmetry and market makers' relatively more sensitive response to seller-initiated trading. After controlling for other potential determinants of SEO discounts, such as price pressure and transaction cost savings, the results show that the increase in information asymmetry just before an offer day has a significant impact on the value discount of an SEO. The Rule's restrictions on informed trading appear to cause overpricing of stocks for which traders have access to private adverse information, which increases the pressure to sell on the offer day.


Key words: short sales constraint; information asymmetry; seasoned equity offering (SEO); SEC Rule 105.

JEL Classification: G18; G14

## The Effect of Short Sales Constraints on SEO Pricing

## 1. Introduction

There was a dramatic increase in the size of seasoned equity offering (SEO) discounts during the 1990s. For example, Corwin (2003) reports an average discount of $1.15 \%$ for seasoned equity offers from 1980 to 1989 and an average discount of $2.92 \%$ from 1990 to 1998 . While the discount for SEOs seems to be smaller than the discount for initial public offerings (IPOs), it is still a large issuing cost for offering firms. Altinkilic and Hansen (2003) document that in the 1990s the issuing expense attributable to discounting was more than $\$ 2.6$ billion, which is more than $50 \%$ of the underwriting fees paid to investment bankers.

Many studies (e.g., Corwin 2003; Kim and Shin 2004) attempt to explain the substantial increase in SEO discounts in the 1990s. They suggest that the adoption of Rule $10 \mathrm{~b}-21$ was one of the main reasons for the large SEO discounts. Rule 10b-21, adopted by the National Association of Securities Dealers (NASD) on August 25, 1988, prohibited short sellers from covering short positions established after the filing of registration statements or Form 1-A with securities purchased from an underwriter, broker, or dealer participating in the offering. NASD was concerned that investors would use prepricing short sales to drive the stock price down and obtain new issued shares at artificially low offer prices. Rule 10b-21 was designed to prevent manipulative short sales that could cause the market to function as an independent pricing mechanism and erode the integrity of the offering price. However, Gerard and Nanda (1993) argue that the adoption of Rule $10 \mathrm{~b}-21$ not only prevented manipulative conduct, but it also restricted informationally motivated sales. According to Kim and Shin (2004), the implementation of Rule 10b-21 saw a substantial increase in SEO discounts. They claim that Rule 10b-21 reduced the information content of trading before equity offerings and increased uncertainty, and they conclude that the larger discounts in the 1990s were the result of Rule 10b-21. Corwin (2003) finds that the time-series increase in SEO discounts can be partially explained by Rule 10b-21's restriction on short sales. Altinkilic and

Hansen (2003) suggest that this surprising increase may be due to higher offer frequency and contracting competition in the 1990s or to the adverse effects of Rule 10b-21.

In order to create an exception for transactions that are unlikely to have a market impact, in March 1997, SEC adopted Rule 105, Regulation M to replace Rule 10b-21. Like Rule 10b-21, Rule 105 prohibits short positions established during the restricted period from being covered with securities obtained from an underwriter, broker, or dealer who is participating in an offering. However, Rule 105 only restricts short sales made five trading days before the offering's pricing rather than the potentially much longer restricted period of Rule 10b-21, which commenced with the filing of a registration statement or Form 1-A. Rule 105 shortens the restricted period because some short sales are motivated by a short seller's evaluation of the stock's future performance, which can contribute to pricing efficiency and should be treated differently from manipulative conduct. SEC instituted Rule 105 to increase the informativeness of market prices, decrease uncertainty about stock value, and reduce the cost to issuers. This article examines whether Rule 105 effectively regulates manipulative conduct without causing adverse effects on nonmanipulative trading.

The present study analyzes the effects of short sales constraints imposed by Rule 105 on informed trading and the information environment from three fronts. First, the daily change of uncertainty is observed during the restricted period. The measure of uncertainty employed in this study is intraday volatility, estimated using 5-minute returns. Many studies (e.g., Altinkilic and Hansen 2003; Kim and Shin 2004) use volatility of daily returns as a measure of uncertainty; however, volatility of daily returns, which is generally defined as the standard deviation of daily close-to-close returns over the 30 trading days ending 11 days before an offer, reflects historical information and may be affected by the fluctuation of the whole market. In fact, informed trading before an issue can alter the information asymmetry between issuers and investors. Gerard and Nanda (1993) suggest that an informed short sale before an offering can increase the information content in the stock price. Danielsen and Sorescu (2001) claim that even when short selling is restricted investors still can react to negative information through the options market. Therefore, volatility calculated with historical prices is not a good proxy for a current information
environment. Furthermore, compared to volatility calculated from daily return, intraday volatility is more useful for estimating time-varying volatility. The focus of the present study is to analyze the daily change of the information environment during the restricted period, but the volatility of close-to-close returns can only be used to measure uncertainty over a long period and cannot capture day-to-day change in an information environment. In addition, Fleming et al. (2003) show that intraday-return-based volatility plays a more important role in determining investing strategies. They evaluate the advantages of intraday volatility in the context of investment and find that volatility timing at the daily level outperforms volatility timing over a long horizon. Therefore, it is reasonable to choose intraday volatility as the measure of uncertainty.

Second, the asymmetry of market makers' price sensitivity to the order flow of different trading directions is examined to discover if an increase in uncertainty during restricted period is the result of short sales constraints. According to Kyle (1985), market markers should be more price-sensitive to order flow from expected informed trading volume. Following Chae (2005), we measure price sensitivity by regressing the change of transaction prices on signed trading volume. Rule 105 should only limit the behavior of short selling and restrict the incorporation of unfavorable information into stock prices. Therefore, as time goes by, the potential of seller-initiated informed trading increases. The cumulative effects of constraints on informed trading based on unfavorable information cause market makers to become more sensitive to seller-initiated trading than to buyer-initiated trading.

Third, using the three-tiered approach suggested by Lee and Radhakrishna (2000), possible informed transactions and liquidity transactions are identified, and the change in informed transactions and liquidity transactions is analyzed during restricted period. Consistent with the predicted effects of short sales constraints, stocks that are not susceptible to these constraints experience larger increases in the number of informed transactions and smaller increases in the number of liquidity transactions. Controlling for other factors that may affect the extent of discounting, the results show that short sales constraints on discounting have a significant impact on information environment.

The results of the present study show that information asymmetry increases significantly during the restricted period for stocks susceptible to short sales constraints, especially on the trading day immediately before pricing, whereas an increase in uncertainty is not obvious for stocks that are not susceptible to these constraints. These results are consistent with the prediction that short sales constraints may exacerbate the information environment.

The results also show that during the restricted period, market makers' asymmetric respond to seller-initiated trading for stocks susceptible to short sales constraints become more apparent, whereas the asymmetry of market makers' price sensitivity hardly changes for stocks that are not susceptible to short sales constraints. These results support the view that the flow of unfavorable information is inhibited by short sales constraints.

The remainder of this article is organized as follows: In section 2, theories concerning the discounting of new offers are summarized, and testable hypotheses related to SEO discounting are developed; section 3 describes the sample data and summary statistics; section 4 discusses the influence of short sales constraints on information environment; section 5 describes the tests of hypotheses related to SEO discounting; in section 6, the adjustment of stock price on the offer day is analyzed; and section 7 offers some conclusions.

## 2. Literature Review

In this part, we will review previous studies on the determinants of SEO discounts.

### 2.1 Uncertainty and Asymmetric Information

Most theories about the underpricing of IPOs are based on the assumption of asymmetric information between equity issuers, investment bankers, and outside investors. On the one hand, if issuers are better informed than investors, then rational investors will be concerned about the so-called lemons problem: That is, it might not be possible to distinguish between good and bad firms, and only low-quality issuers will offer the market's average price. Therefore, good issuers will discount their offer price to signal their quality and recoup this discount in subsequent equity issues, dividend announcements,
or analyst coverage (Allen and Faulhaber 1989; Chemmanur 1993; Welch 1989). On the other hand, if some investors have better knowledge about the price the market can bear, then the issuer faces a placement problem. Rock (1986) presents a model in which a group of investors have better information than the firm and other investors. He shows that if new shares are priced at their expected value these informed investors will drive out other investors when IPOs are good and withdraw from the market when IPOs are bad. Therefore, the issuers have to place their IPOs at a discount in order for the shares to be purchased by uninformed investors. This argument has been dubbed the "winner's curse." Welch (1992) proposes an alternative explanation for IPO underpricing based on the assumption of better-informed investors. In his information cascade model, when IPO shares are sold sequentially, potential future investors can learn from the purchasing decisions of earlier investors, who presumably are more informed about the equity's value. This behavior, however, can rapidly lead to cascades in which investors will gradually ignore their private information and imitate earlier investors. As a result, offerings succeed or fail very soon, and issuers always underprice to avoid failure.

As a result of the periodic earnings announcements made by companies and purchase recommendations released by financial analysts, the information asymmetry of SEOs is not as large as the information asymmetry of IPOs, but the uncertainty about stock price still exists. Therefore, the study discussed in this article examines whether or not firms with high information asymmetry and uncertainty about a stock's value will have a larger SEO discount.

### 2.2 Constraints on Informed Trading

Research shows that the implementation of Rule 10b-21 increased issuing costs. For example, Gerard and Nanda (1993) claim that the limits on short sales prior to a new offer inhibit the release of new information and increase stock price uncertainty. In order to compensate for the additional risk absorbed by buyers of new shares, underwriters have to discount their offer price. Kim and Shin (2004) and Corwin (2003) show that SEO discounts increased substantially after the enforcement of Rule 10b-21.

Although Rule 105 shortens the restricted period to five trading days, it is still possible that this restriction will affect nonmanipulative transactions. In this article, the change in the uncertainty of stock value around an offer day is examined to determine whether the substantial increase in discounts during the trading days immediately before an offer day is due, in fact, to the unintended effect of the restrictions on informational short sales. The effect of the cumulative information asymmetry between informed and uninformed investors on the pricing of SEOs is also estimated in this article.

### 2.3 Alternative Explanations of SEO Discounting

### 2.3.1 Permanent Price Pressure or "Sweetener"

Research that examines the effects of price pressure has produced mixed results. For example, Corwin (2003) reports a positive and significant relation between the relative offer size and the extent of discounting. However, the multivariate models of Kim and Shin (2004) show that the coefficient of the relative offer size is positive but not significant at the $1 \%$ level. Altinkilic and Hansen (2003) find that larger offers have lower discounts, whereas a larger relative offer size (i.e., new shares issued divided by the shares outstanding) has a larger discount.

The theories of price pressure also vary. Some researchers (e.g., Mikkelson and Partch 1985; Scholes 1972) maintain that price pressure is temporary, and investors should be compensated for absorbing this temporary pressure. Other researchers (e.g., Asquith and Mullins 1986) argue that price pressure leads to a permanent increase in supply and a corresponding permanent reduction in stock price. If the market is efficient, the downside price adjustment should be completed immediately after the announcement of the new offer. In other words, the closing stock price prior to an offer should have incorporated the price pressure of a new offer and, therefore, it is not necessary for underwriters to artificially discount the offer price. In this present study, underwriters' response to an increased supply of shares is estimated to determine whether price pressure is permanent or temporary.

### 2.3.2 Transaction Cost Savings

Loderer et al. (1991) argue that investors do not need to pay transaction costs when they buy new shares directly from underwriters. This transaction cost saving can be viewed as another form of compensation to investors; therefore, underwriters should offer a smaller discount for stocks with high transactions costs. If this argument holds, there should be a negative relationship between transaction costs and the extent of SEO discounts. Corwin (2003) tests this hypothesis; however, because the relative quoted spread in his study is also used as a measure of stock price uncertainty, the effects of transaction cost savings cannot be distinguished. In the present study, the effects of uncertainty are controlled by using an alternative measure (i.e., intraday volatility).

### 2.3.3 Pricing at Closing Bid and Rounding of Closing Price

Research shows that sometimes SEOs are priced at the closing bid quote or at integers. For example, Corwin (2003) reports that $24.36 \%$ of the new offers on NYSE are priced at the closing bid quote. Mola and Loughran (2004) and Bradley et al. (2004) note that offer prices of both SEOs and IPOs cluster at integers. It is possible that the value discounts of SEOs are simply due to these two pricing practices

### 2.3.4 Rent Expropriation

Loughran and Ritter (2002) point out that lead underwriters tend to exploit the gains of issuers by underpricing for investors who are more likely to repay the bank through future reciprocal deals. Affleck-Graves et al. (1994) suggest that, if this hypothesis is true, then discounts will be higher when more good news is released about the firm, regardless of whether the news is private or public. Therefore, it was assumed that there was a positive relation between the positive cumulative abnormal returns over the five trading days immediately before the SEO and the extent of discounting.

## 3. Data

### 3.1 Data Selection

The sample of SEO firms used in the present study were obtained from the Securities Data Company (SDC) database, which provides the offer date, gross proceeds, offer price, shares issued, and number of shares outstanding. The sample consists of 60 new equity issues on NYSE from January to June 2003, excluding IPOs. The following criteria were used to screen data. First, to be included in the sample, the issues had to be ordinary common shares and could not be a unit offering, closed-end fund, real estate investment trust (REIT), or American Depository Receipt (ADR). Second, firms with offer prices smaller than $\$ 1.00$ were not included in this study. Third, firms that are not in NYSE's Trade and Quote (TAQ) database or the (CRSP) database were not included in this study.

As noted by Lease et al. (1991) and Corwin (2003), some firms announce new offer prices after the market closes, and the effective offer date should be the next trading day of the SDC offer date. Therefore, Factiva.com is used to examine time stamps and identify the effective date of an equity offering. Safieddine and Wilhelm (1996) document that on an offer day trading volume increases sharply. Therefore, if there is no record in the databases, the effective offer date is identified by using a volume-based adjustment method. Specially, if the trading volume on the day following the SDC offer date is more than twice the volume of the SDC offer date and more than twice the average daily trading volume over the 250 days prior to the offer date, the day following the SDC offer date is considered the effective offer date.

Intraday data were collected from the NYSE TAQ database. Raw transactions data, however, may contain some problems, such as misordered time series and the existence of data outside regular trading hours. Therefore, time series data are reordered, and observations that lie outside the trading interval between 9:30 am and 16:00 pm Eastern Time are not included in the present study. Market information, such as stock prices, returns, market index, and shares outstanding, was obtained from the CRSP database.

In order to identify whether a stock is listed on the options market, the database of monthly options trading volume was downloaded from the Chicago Board Options Exchange (CBOE) website. ${ }^{2}$ If there was no record of options trading during the issuing month, this stock was identified as stock with no listing on the options market.

### 3.2 Variable Definitions and Summary Statistics

Following Altinkilic and Hansen (2003) and Corwin (2003), the discounting of seasoned equity offerings is defined as -1 times the return from the previous day's closing transaction price to the offer price. Summary statistics for the sample SEOs are provided in Table 1.
<Insert Table 1 here>
The average discount across the full sample is approximately $1.76 \%$, which is lower than the average discounts in the 1990s but higher than the average discounts in the 1980s. This suggests that, although the adverse effect under Rule 105 is less severe than the adverse effect under Rule 10b-21, it still exists under the new rule. Of the 60 SEOs included in the sample, $77 \%$ are priced below the closing transaction price at day -1 , and $5 \%$ are priced at the closing price. The remaining $18 \%$ are priced above the closing price.

The variable used to measure uncertainty is $V O L_{[-2,-I]}$, which is defined as the median of intraday volatility of the two trading days immediately before an offer (i.e., on day -2 and -1 ). Intraday volatility, $V O L_{t}$ is calculated using five-minute interval price changes during each trading day. Following French, Schwert and Stambaugh (1987), intraday volatility is the total of sum of the squared 5-minute returns and the sum of the cross products of the adjacent 5 -minute returns. That is,

$$
\begin{equation*}
V O L_{t}=\sqrt{\sum_{j=1}^{N_{t}} r_{t, j}^{2}+2 \sum_{j=1}^{N_{t}-1} r_{t, j} r_{t, j+1}} \tag{1}
\end{equation*}
$$

[^0]where $N_{t}$ is the number of 5-minute-intervals in day $\mathrm{t}, r_{t, j}$ is the return in the j -th interval, which is calculated as the difference of the logarithm of the last transaction price of the j -th interval and the logarithm of the last transaction price of the ( $\mathrm{j}-1$ )-th interval.

The change in uncertainty prior to pricing is measured using the variable $R E L_{-} V O L_{[-2,-1]}$, which represents the change in uncertainty over the two trading days immediately before an offer relative to the benchmark period:

$$
\begin{equation*}
R E L_{-} V O L_{[-2,-1]}=\frac{V O L_{[-2,-1]}}{V O L_{[-15, \ldots,-11]}}-1 \tag{2}
\end{equation*}
$$

where $V O L_{[-15, \ldots,-1 l]}$ is the intraday volatility during the benchmark period measured by the median of $V O L$ from day -15 to -11 .

In order to differentiate the kind of private information held by informed traders prior to SEO pricing, we calculate the pre-pricing return, which is defined as the cumulative abnormal returns (CAR) over five trading days immediately before pricing, calculated using the market model:

$$
\begin{gather*}
R_{i t}=\hat{\alpha}+\hat{\beta} R_{m t}, \text { where } \mathrm{t}=-120, \ldots,-11  \tag{3}\\
A R_{i t}=R_{i t}-\hat{\alpha}-\hat{\beta} R_{m t}, \text { where } \mathrm{t}=-5, \ldots,-1  \tag{4}\\
C A R_{i}=\sum_{t=-5}^{-1} A R_{i t} \tag{5}
\end{gather*}
$$

where $R_{i t}$ is return for stock i on day $\mathrm{t}, R_{m t}$ is the NYSE equally-weighted index on day t , and $A R_{i t}$ is the abnormal return for stock ion day $t$.

Previous studies use the percentage difference between the closing transaction price and the closing bid quote to measure the effects of pricing at the closing bid. However, it can be argued that this becomes a de facto consideration only when the ex post SEO is truly priced at the closing bid. Therefore, in order to get a cleaner proxy for the closing bid pricing effect in the present study, $B I D_{-} P R C$ is equal to the percentage difference between the closing price and the bid quote if the offer price is at the closing bid
and 0 if otherwise. If the practice of pricing at the closing bid completely explains the discount, the coefficient of $B I D \_P R C$ should be equal to 1 .

Similar problems exist in estimating the effects of rounding off closing prices. Corwin (2003) finds that underwriters tend to round off offer prices to even dollars or by $\$ 0.25$ increments, and from 1996 to 1998, more than $40 \%$ of offers were priced at even dollars. As a result, he assigns a dummy variable that is equal to 1 if the decimal portion of the closing price is less than $\$ 0.25$ and 0 if otherwise. In the present study, Corwin's (2003) approach was modified, and $\$ 0.25$ was chosen as unit price increments, and the rounding measure is 1 if the offer price ends with $\$ 0.00, \$ 0.25, \$ 0.50$, or $\$ 0.75$ and 0 if otherwise. ${ }^{3}$

## 4. Evidence of Short Sales' Restrictions on Informed Trading

### 4.1 Constraints on Short Sales and Impact on Information Asymmetry

### 4.1.1 Evidence of Restriction on Informed Trading

Many recent studies (e.g., Corwin 2003; Kim and Shin 2004) of SEOs take into account the significant impact of Rule 10b-21 on pricing. They contend that this rule not only prohibits manipulative trading, but it also unintentionally restricts informed traders from trading on bad private news. (Informed trading does not refer to illegal insider trading; it refers to trading triggered by traders' rational estimation of stock prices based on public information, such as annual earnings report or media reports.) According to this argument, information asymmetry increases prior to an offer.

The daily change in uncertainty around SEO pricing relative to benchmark period is calculated as follows:

$$
\begin{equation*}
R E L_{-} V O L_{t}=\frac{V O L_{t}}{V O L_{[-15, \ldots .,-11]}}-1 \tag{6}
\end{equation*}
$$

[^1]where $V O L_{t}$ is the intraday volatility on day t and $V O L_{[-15, \ldots,-1 l]}$ denotes the median of intraday volatilities during the benchmark period, i.e., from day -15 to day -11 .

The changes in intraday volatility around pricing relative to the benchmark period are presented in Table 2. The results in Column (1) show that intraday volatility grows gradually during the four consecutive trading days prior to pricing and reaches its highest point on the day before an offer. On day -5 , the change in information asymmetry is $7 \%$, which is not significant at the $10 \%$ level, while on day -1 , this value increases to $9.6 \%$, which is significantly different from 0 at just above the $5 \%$ level. This increased information asymmetry reflects the cumulative effects of the restraints on informed trading.

## <Insert Table 2 here.>

The proposition of constraints on informed trading is also supported by the finding that information asymmetry falls substantially during an offer day and hits a historically low level during the day after the offer (i.e., on day 1 , the change in information asymmetry relative to the benchmark period is about $-18 \%$, which is significant at the $1 \%$ level) and continues to be lower than the benchmark period over the subsequent four trading days. The substantial decrease in information asymmetry after an offer date can be attributed to the subsequent relaxation of the limits on short sales and the resumption of informed trading.

### 4.1.2 Asymmetric Influence on Informed Trading with Favorable and Unfavorable Private Information

Constraints on short sales restrict the dissemination of information about stocks with unfavorable private information, but they should have little effect on informed traders trading with favorable information. Therefore, if the increase in uncertainty is due to the Rule's restraints on short sales, it is expected that for firms with favorable information the increase in uncertainty should not be significant. Altinkilic and Hansen's (2003) method is employed to discriminate among informed traders with different information, i.e., using the five-day cumulative abnormal returns (CAR) immediately before pricing are used to identify the type of potential information. If the five-day CAR is positive (negative), the firms are
classified as those with favorable (unfavorable) private information and are less (more) susceptible to short sales constraints. Column (2) and (3) in Table 2 present the subsample results conditioned on the sign of the five-day CAR. There is no restriction on informed trading for firms with potential favorable information; therefore, information asymmetry prior to an offer should not increase substantially, if at all. Column (2) in Table 2 shows that the fractional changes in uncertainty are only marginally higher or lower than 0 prior to the offer day and are not statistically significant, even at the $10 \%$ level. However, for firms with unfavorable private information, as shown in column (3), the cumulative effects of the constraints on informed trading are significant at the $10 \%$ level ( $\mathrm{p}=0.06$ ). During the day immediately before pricing, the cumulative increase in uncertainty is approximately $12.4 \%$ relative to the benchmark period. Accordingly, the results presented in column (2) and column (3) in Table 2 indicate that the increase in uncertainty can, at least partly, be explained by the unintended restraints on informed trading on unfavorable private information.

### 4.1.3 Asymmetric Influence on Informed Trading with Favorable and Unfavorable Private Information in the Presence of Options Listing

Danielsen and Sorescu (2001) propose that even when there is a restriction on short sales informed traders still can trade on unfavorable information through the options market. Therefore, for a stock that is also listed on the options market, the increase in information asymmetry due to short sales constraints should be smaller than for stocks with no listings on the options market. In order to control for the effects of listings on the options market, the sample is divided into two subsamples. Column (4) presents the subsample results for firms with a positive five-day CAR or listed on the options market, and column (5) shows the subsample results for firms with a negative five-day CAR and not listed on the options market. As illustrated in column (5), after controlling for the substitutive effects of options listings, the cumulative effects of short sales constraints on firms that are more susceptible to short sales constraints become more significant. On day -1 , the intraday volatility increases by $22.5 \%$, which is significant at the $5 \%$ level. Furthermore, the $p$-value of the comparison test of the two subsamples reveals
that on the day immediately before pricing the increase in uncertainty for stocks that are susceptible to short sales constraints are significantly larger than for stocks that are not susceptible to short sales constraints at the $10 \%$ level. These results strongly support the hypothesis that the short sales constraints imposed by Rule 105 unintentionally restrict informed trading triggered by traders' rational estimation of firms' future performance and inhibit the incorporation of unfavorable information into stock prices.

### 4.2 Constraints on Short Sales and Market Makers' Asymmetric Sensitivity to Trading Directions

### 4.2.1 Asymmetric Sensitivity to Different Trading Directions

In order to further check whether the increase in information asymmetry is actually the result of the restriction on informed trading on unfavorable information, market makers' asymmetric sensitivity to different trading directions is examined during the restricted period. If short sales constraints inhibit the incorporation of potential unfavorable information into stock price, it is reasonable to expect that market makers will be more sensitive to seller-initiated trading during the restricted period. Following Chae (2005), we measure market makers' price sensitivity by regressing change of transactions on signed trading volume. However, in order to differentiate market makers' price sensitivity to different trading direction, we include a dummy variable, TrDirection, in the following regression model.

$$
\begin{equation*}
\Delta P=\alpha+\beta_{1} * \text { SignedVolume }+\beta_{2} * \text { SignedVolume } * \text { TrDirection } \tag{7}
\end{equation*}
$$

where $\Delta P$ is the change of transaction prices, SignedVolume is the product of trading volume and the trading sign inferred by the methods suggested by Lee and Ready (1991), TrDirection is a dummy variable that equals 1 if the trade is buyer-initiated and 0 if the trade is seller-initiated.

A significant negative coefficient of the interaction term, $\beta_{2}$, indicates that market makers are more sensitive to seller-initiated trading, and a significant positive coefficient means that market makers are more sensitive to buyer-initiated trading. Market makers' sensitivity to buyer-initiated trading, SEN_POS, equals the total of $\beta_{1}$ and $\beta_{2}$, and sensitivity to seller-initiated trading, $S E N_{-} N E G$, equals $\beta_{1}$. The extent of market makers' asymmetric sensitivity, $A S Y M$, is measured as follows:

$$
\begin{equation*}
A S Y M=\frac{S E N_{-} P O S-S E N_{-} N E G}{S E N_{-} P O S+S E N_{-} N E G} \tag{8}
\end{equation*}
$$

The range of $A S Y M$ is between -1 and 1 because both $S E N_{-} P O S$ and $S E N_{-} N E G$ are supposed to be positive. A value of $A S Y M$ that is closer to -1 indicates that market makers are more sensitive to seller-initiated trading. On the other hand, a value of $A S Y M$ that is closer to 1 indicates that market markers are more sensitive to buyer-initiated trading. When the value of $A S Y M$ is close to 0 , market makers treat different trading directions equally.
<Insert Table 3 here.>
Panel A of Table 3 shows the extent of market makers' asymmetric sensitivity to different trading directions. Column (1) shows that market makers' asymmetric sensitivity, $A S Y M$, is mostly significantly below 0 , and the value of $A S Y M$ falls gradually during the restricted period and reaches its lowest point on the day immediately before an offer: That is, market makers respond more to seller-initiated trading than to buyer-initiated trading during the restricted period, and this asymmetry becomes more obvious as the offer day approaches. This result is consistent with the prediction that short sales constraints inhibit the incorporation of unfavorable information into stock price, and this constraint results in market makers' relatively more sensitive response to seller-initiated trading.

A comparison of column (2) and column (3) of Panel A of Table 3 shows that market makers respond more to seller-initiated trading in both subsamples conditioned on the sign of the five-day CAR, and there is no significant difference in asymmetric sensitivity between these two groups. However, as suggested in the previous section, the absence of a significant difference may be due to the fact that options can act as synthetic short sales during a restricted period.

In order to control for the substitutive effects of listing on the options market, similar to the analysis of increase in information asymmetry, a group is formed from stocks susceptible to short sales constraints and stocks with negative five-day CAR and not listed on the options market. Column (4) shows that market makers' asymmetric sensitivity is between -0.03 and -0.27 before the offer day, while column (5) shows that the asymmetric sensitivity is between -0.22 and -0.35 , which is significantly lower
than those in column (4). The comparison of the two subsamples (i.e., the positive and negative five-day CAR groups) suggests that market makers are more sensitive to seller-initiated trading for those firms that are susceptible to short sales constraints. This evidence further supports the hypothesis that unfavorable information is not reflected in stock prices when there are short sales constraints.

### 4.2.2 Change of Asymmetric Sensitivity to Different Trading Direction

In order to analyze the change of market makers' sensitivity to seller-initiated trading more clearly, the change of asymmetric sensitivity, $R E L \_A S Y M$, is measured as the difference between $A S Y M$ and the median of $A S Y M$ during the benchmark period (i.e., from day -15 to day -11 ). That is,

$$
\begin{equation*}
R E L_{-} A S Y M_{t}=A S Y M_{t}-A S Y M_{[-15, \ldots,-11]} \tag{9}
\end{equation*}
$$

The mean change in asymmetric sensitivity for the whole sample and subsamples are listed in Panel B of Table 3. A positive (negative) change in asymmetric sensitivity indicates that market makers' relatively higher sensitivity to seller-initiated trading becomes less (more) apparent relative to benchmark period. Column (1) shows that for the whole sample the changes in asymmetric sensitivity are marginal from day -5 to day -2 , but asymmetric sensitivity becomes more negative on day -1 . This result is significant at the $5 \%$ level.

## <Insert Table 3 here.>

Asymmetric sensitivity remains steady for stocks with positive five-day CAR during the restricted period. In contrast, the changes of asymmetric sensitivity are significantly below 0 on day -1 for stocks with negative CAR. The negative change of asymmetric sensitivity becomes more pronounced when the effects of listing on the options market are considered relative to benchmark period. Column (5) shows that, for those stocks with a negative five-day CAR and not listed on the options market, the change in asymmetric sensitivity is negative and is significant for the three days immediately preceding the offer day. However, for stocks with a positive five-day CAR or are listed on the options market (i.e., stocks that are not susceptible to short sales constraints), the asymmetric sensitivity does not change substantially and, notably, on day -3 , the asymmetric sensitivity even increases by 0.13 , which is
significant at the $10 \%$ level. This evidence further demonstrates that, for those stocks that are more susceptible to short sales constraints, market makers become much more sensitive when they observe selling activity on the market relative to benchmark period. The sharp negative changes in asymmetric sensitivity support the proposition that short sales constraints restrict the incorporation of unfavorable information into stock prices.

### 4.3 Constraints on Short Sales and Informed Trading prior to Pricing

A direct way to estimate the effects of short sales constraints is to observe the change of informed transactions during the restricted period. However, with the TAQ database, it is not possible to directly identify which transaction is initiated by information and which is initiated by liquidity demand. Several studies (e.g., Cready 1988; Cready and Mynatt 1991; Lee 1992) use trading volume or trading value to distinguish individual and institutional trades. Lee and Radhakrishna (2000) use a unique dataset (i.e., TORQ), which contains information about individual orders, to test the techniques used to identify institutional orders and individual orders. After comparing different strategies of classification, they classify trades of $\$ 5,000$ or less as individual trades and trades of $\$ 50,000$ or more as institutional trades, resulting in a very low probability of errors.

In the present study, the effects on trades triggered by investors' rational estimation of future stock price are analyzed. It is reasonable to assume that institutional investors are more professional in analyzing firms' future performances compared to individual investors, and they should be more likely to initiate trades based on rational estimation. Therefore, institutional orders are more likely to be information based. Using the three-tiered approach suggested by Lee and Radhakrishna (2000), all transactions were divided into three groups: information-based transactions (i.e., informed transactions), liquidity transaction (i.e., uninformed transactions), and transactions that are hard to identify.

### 4.3.1 Change in Informed Transactions

Panel A of Table 4 shows the change in informed transactions relative to benchmark period. A transaction is considered a potential informed trade if the dollar volume of the transaction is larger than $\$ 50,000$. Column (1), Panel A of Table 4 shows that the number of informed transactions grows considerably and monotonically from day -4 to day -1 , and the increases are significant at the $1 \%$ level. On the day immediately before pricing, the number of potential informed transactions rose by approximately $500 \%$. As predicted by the preceding analysis, due to short sales constraints, trading on unfavorable information will be largely restricted. Therefore, if the hypothesis about the effects of short sales constraints is correct, changes in the number of informed transactions of stocks susceptible to short sales constraints should be lower than those of stocks that are not susceptible to the constraints. Column (2) and column (3) present the changes in the number of informed transactions of subsamples conditioned on the sign of five-day CAR. The comparison shows that changes in informed transactions for stocks that are not susceptible to short sales constraints are mostly higher than those for stocks susceptible to short sales constraints.
<Insert Table 4 here.>

### 4.3.2 Cumulative Change in Informed Transactions

Because institutional investors have a tendency to hide their transactions and not trade intensively on the market, they may choose to trade evenly over several days, resulting in daily informed transactions that are not noticeably large. For robustness, we therefore observe the cumulative change in informed transactions during the restricted period. This test was conducted, and the results are shown in Panel B of Table 4.

A comparison of column (2) and column (3), Panel B of Table 4 shows that the increases in informed transactions for stocks that are not susceptible to short sales constraints are larger than for stocks susceptible to the constraints. This difference becomes more obvious when the effects of options listing are controlled for. During all five days prior to the offer day, the cumulative increases in informed transactions of stocks that are not susceptible to constraints are significant at the $1 \%$ level, as shown in
column (4). However, for stocks susceptible to short sales constraints (column (5)), the increase in informed transactions is not all significant. This evidence further supports the hypothesis that short sales constraints restrict the occurrence of informed trading.

### 4.3.3 Change in Uninformed Transactions

Admati and Pfleiderer (1988), Foster and Viswanathan (1990), and Chae (2005) suggest that if liquidity traders have timing discretion they will postpone their trading when they suspect the existence of informed trading. According to this argument, if informed transactions are restricted by short sales constraints, liquidity transactions will experience a sharp increase

Panel C of Table 4 shows the change in liquidity transactions during the restricted period for the whole sample and subsamples. Column (2) reveals that liquidity trading does not change significantly during the restricted period for those stocks that are not susceptible to short sales constraints, but it does increase significantly from day -3 through day -1 for stocks susceptible to short sales constraints (see column (3)). The activity of liquidity traders reflects the restriction on informed transactions imposed by short sales constraints. This evidence is more obvious after controlling for the effects of options listing.

### 4.4 Robustness Tests: Relaxation of Constraints

As shown in the previous sections, short sales constraints imposed by Rule 105 inhibit the incorporation of unfavorable information into stock prices, resulting in an increase in information asymmetry. Although the effect of constraints on short sales has been measured as the increase in information asymmetry prior to an offer day relative to the median during the benchmark period (i.e., from day -15 to day -11 ), sometimes it is hard to separate the effects of constraints from the effects of other sources that may also affect the magnitude of information asymmetry, such as earnings announcement (see Korajczyk et al. 1991). Therefore, it was assumed that the decrease in information asymmetry after the offer day due to the lifting of short sales constraints may be an indirect measure of the cumulative effects of the constraints. On the offer day, when the constraints on short sales are
removed, informed trades that were restricted prior to the offer are reactivated. The substantial decrease in information asymmetry caused by the resumption of informed trading reflects the cumulative effects of the constraints on informed trading during the restricted period. The indirect measure of the cumulative effect of the constraint, $R E L_{-} V O L_{N}$, was calculated as follows:

$$
\begin{equation*}
R E L_{-} V O L_{N}=\frac{V O L_{[2,3,4,5]}}{V O L_{[-1]}}-1 \tag{10}
\end{equation*}
$$

where $V_{[2,3,4,5]}$ is the median of intraday volatility of the four trading days two days after the offer (i.e., from day 2 to day 5) and $V O L_{[-l]}$ is the intraday volatility of the trading day immediately before pricing (i.e., day -1 ).

To estimate the effects of short sales constraints on information asymmetry prior to SEO pricing, we estimate the following regression model:

$$
\begin{equation*}
R E L_{-} V O L_{N}=\beta_{0}+\beta_{1} C A R+\beta_{2} C A R D U M+\beta_{3} O P T I O N+\beta_{4} O P T I O N \_C A R+\varepsilon \tag{11}
\end{equation*}
$$

Rule 105 does not stop informed traders from acting on favorable information. Generally, the higher pre-pricing CAR is, the more likely the private information is favorable information and the post pricing decrease in information asymmetry should be smaller for stocks with hisgher five-day CAR: That is, $R E L L_{-} V O L_{N}$ is expected to be positively related to CAR. Moreover, due to short sales constraints, stock prices during the restricted period are upwardly biased; therefore, the larger the five-day CAR before day 0 , the more likely it is that the private information is favorable. Models 1 through 3, Table 5 demonstrate that the change in information asymmetry is positively related to the five-day $C A R$ and $C A R D U M$.

## <Insert Table 5 here.>

On the other hand, as suggested by Danielsen and Sorescu (2001), the relationship between the change of uncertainty and the dummy variable, OPTION, should be significantly positive. Model 4, Table 5 portrays a positive correlation between these two variables, which is significant at the $10 \%$ level. This evidence supports our hypothesis. Furthermore, the variable OPTION_CAR, which equals 1 if the stock is listed on the options market or has a positive five-day CAR and 0 if otherwise, is included in the analysis. From the analysis described in sections 4.1 to 4.3 , it is expected that the change of uncertainty is
positively correlated with OPTION_CAR. The significant positive coefficient $(p$-value $=0.0317$ ) in model 5 corroborates the hypothesis that short sales constraints inhibit informed trading during the restricted period.

## 5. Discounting and Increase in Information Asymmetry

The empirical predictions of the main theories that explain the determinants of SEO discounting are summarized in Table 6.

$$
\text { <Insert Table } 6 \text { here.> }
$$

In order to estimate the determinants of SEO discount, the following multivariate regression on the explanatory variables was conducted:

$$
\begin{align*}
& \text { DISCOUNT }= \\
& \beta_{0}+\beta_{1} * \text { Spread }+\beta_{2} * V O L_{[-15, \ldots,-11]}+\beta_{3} * V O L_{[-2,-1]} \\
& +\beta_{4} * R E L_{-} V O L_{[-2,-1]}+\beta_{5} * A M O U N T+\beta_{6} * R E L_{-} \text {OFFSIZE } \\
& +\beta_{7} * C A R+\beta_{8} * C A R_{-} P O S+\beta_{9} * C A R D U M \\
& +\beta_{9} * B I D_{-} P R C+\beta_{10} * R O U N D I N G+\varepsilon \tag{12}
\end{align*}
$$

Here, Spread is the time-weighted average of relative spreads over two trading days before the issue date. $V O L_{[-15, \ldots,-11]}$ is the median of intraday volatility in the benchmark period (i.e. from day -15 to day -11 ). $V O L_{[-2,-1]}$ is the median of intraday volatility of two trading days immediately before the offer (i.e. day -2 and day -1 ). REL_VOL is the change in intraday volatility over two trading days immediately before the offer relative to the median of intraday volatility during the benchmark period. AMOUNT is the logarithm of total dollar amount of an offer (in \$ million). REL_OFFSIZE is defined as offered shares divided by total shares outstanding prior to the offer. $C A R$ is the cumulative abnormal return of five trading days before the offer. CAR_POS equals CAR if CAR is positive and 0 if otherwise. CARDUM is a dummy variable that is equal to 1 if $C A R$ is positive and 0 if otherwise. $B I D \_P R C$ equals (closing transaction price - closing bid quote)/closing transaction price if an offer is priced at the closing bid quote. ROUNDING is a dummy variable that equals to 1 if the offer is priced at $\$ 0.25$ increments and 0 if otherwise.

The results of equation (7) are presented in Table 7. After controlling for other factors that may impact a SEO discount, such as BID_PRC, ROUNDING, AMOUNT, REL_AMOUNT, and CAR, the SEO discount is positively related to uncertainty during the benchmark period $\left(V O L_{[-15, \ldots,-11]}\right)$ and the change in uncertainty (REL_VOL). The first result supports the hypothesis of uncertainty and asymmetric information. The second result reveals that the increase of uncertainty due to the constraints on informed trading before an offer enlarges the discount of the offer. It is worth noting that when both the median of intraday volatility during the benchmark period, $V O L_{[-15, \ldots,-1 l]}$, and the median of intraday volatility of the two trading days before pricing, $V O L_{[-2,-1]}$, are included in the model, as shown in model (2), the effects of $V O L_{[-15, \ldots,-1 l]}$ on discounts are no longer significant. This further demonstrates that the relative change of information asymmetry over the restricted period plays a key role in the magnitude of the discount.

$$
\text { <Insert Table } 7 \text { here.> }
$$

If the size of the relative bid-ask spread is considered a measure of uncertainty, the insignificant coefficient of this variable, as listed in model (3), is not consistent with the information asymmetry hypothesis. Also, if the spread is viewed as a measure of transaction costs, the result is still contrary to the prediction of the transaction cost savings hypothesis.

Furthermore, the results of the multivariate regression do not support the theories about the determinants of discounts advanced by Mola and Loughran (2004), Loughran and Ritter (2002), and Corwin (2003). For example, there is no evidence to support the hypothesis that some offers are priced at the closing bid quote. In the present study's sample, only one stock is priced at the closing bid, and the coefficient of variable, $B I D_{-} P R C$, is not close to 1 and is not statistically significant.

Model (5) shows that the coefficient on ROUNDING is positively significant at the $10 \%$ level; however, as variables CAR and CAR_POS are included, the coefficient of ROUNDING is not significant, as shown in model (6). This means that rounding the offer price may not be due to convention. It may be an endogenous variable determined by other factors. These two findings suggest that, at least in this study's sample, there is no evidence that the existence of either pricing at the closing bid or rounding off the offer price contributes to discounting.

The rent expropriation theory predicts that underwriters expropriate profits from firms with good news. In other words, the magnitude of discounts is positively related to positive cumulative abnormal returns (CAR). However, the results of the models in Table 7 argue against this prediction, with a negative and significant correlation between discounting and positive CAR. This evidence is contrary to the rent expropriation hypothesis.

The results of this study do not show any relationship between discounting and either measure of price pressure. However, a further analysis of correlation between the change in uncertainty and the relative offer size shows that they are positively and significantly correlated at approximately the $10 \%$ level. This means that the effects of relative offer size may be captured by $R E L \_V O L$. According to Myers and Majluf (1984), if there is information asymmetry between managers and investors, firms only issue equity when their stock is overpriced. Following this line of reasoning, a relatively larger offer size tends to increase the uncertainty of stock price. Therefore, underwriters should compensate investors for the additional risk they face in buying the shares. This evidence supports the temporary price pressure hypothesis.

## 6. Downward Adjustment of Stock Price On Offer Day

The results of the robustness test in section 4 indicate that, on an offer day, after the constraints on informed trading are relaxed, informed traders resume informed trading and incorporate their private information into the stock price. The first-day return reflects investors' adjustment of stock prices based on their rational estimation. If unfavorable private information is not released prior to an offer, the stock is most likely overpriced. Therefore, the downward adjustments of the estimated value for stocks with a higher increase in potential unfavorable information will be larger than for other stocks. The empirical results shown in Table 8 support this proposition.
<Insert Table 8 here.>
Panel A of Table 8 shows that the downside adjustment of stock prices on the offer day for stocks with favorable private information is significantly smaller than for stocks with unfavorable information.

For stocks with potentially unfavorable information, the closing prices on the offer day are downwardly adjusted by about $1.43 \%$, which is significant at the $1 \%$ level, while for stocks with potentially favorable information, the closing prices on the offer day grows by $1.07 \%$ relative to the closing price of day -1 , although it is not significant at the $10 \%$ level. Furthermore, the $t$-test of equality of the two samples shows that the differences in the adjustment of stock prices are significant at the $1 \%$ level. In order to further check the effects of short sales constraints on stock prices, the following regression was conducted:

$$
\begin{align*}
& \text { First-Day_return }= \\
& \beta_{0}+\beta_{1} * R E L_{-} V O L_{F}+\beta_{2} * C A R D U M \\
& +\beta_{3} * \text { OPTION_CAR }^{2}+\beta_{4} * S U R P R I S E+\beta_{5} * M K T_{-} \text {RETURN }+\varepsilon \tag{13}
\end{align*}
$$

The dependent variable is first-day return, which is defined as the return from the previous day's closing transaction price to offer day's closing transaction price. Three variables are included in the regression as the proxy for the effects of short sales constraints. $R E L_{-} V O L_{F}$ is the change in intraday volatility on an offer day relative to the median of intraday volatility of the two trading days immediately before the offer (i.e., day -2 and day -1 ). CARDUM is a dummy variable that indicates the sign of five-day CAR, which is equal to 1 if CAR is larger than 0 and equal to 0 if CAR is smaller than 0 . OPTION_CAR is another dummy variable, which equals 1 if the stock is listed on the options market or has a positive five-day CAR and 0 if otherwise.

Two control variables that may affect the adjustment of stock prices in the regression are included. The first is surprise discounting, SURPRISE, which is the residual of model 1, Table 7, and it represents discounts beyond the expectation of investors. As confirmed by Altinkilic and Hansen (2003), offer prices convey information that may alter the estimation of investors, and a major component of the information is the discount surprise. The larger the unanticipated discounts, the more investors will adjust their estimation downward. In addition, because part of the information contained in unanticipated discounts has been acquired by some investors and should have been incorporated into the closing price on day -1 , the coefficient of $S U R P R I S E$ is predicted to be higher than -1 and smaller than 0 . The second control
variable is the market return, MKT_RETURN, as measured by the NYSE equally-weighted index on the offer day, which reflects the market movement on the offer day.

The regression results of the determinants of offer-day adjustments are presented in panel B, Table 8 . These results show a significantly negative relationship between the first-day return and the degree of discounting surprise, which is close to -0.55 and significant at any reasonable significance level. This confirms that stock price adjustments, to a large extent, reflect the information contained in the stock price. The coefficient of market return is positive, which indicates that first-day returns move contemporaneously with the market.

The positive correlation between the dummy variable, CARDUM, and stock price adjustment supports the hypothesis that for stocks that are less susceptible to short sales constraints (i.e., when CARDUM equals 1) there is less obvious downward adjustment of stock prices on the offer day. The positive coefficient of OPTION_CAR provides further evidence that stocks susceptible to short sales constraints are more likely to be overpriced. Furthermore, the positive coefficient of $R E L V O L_{F}$ in models (3) and (4) also indicates that the constraints on informed trading on unfavorable information cause stocks to be overpriced.

## 7. Conclusion

Although previous studies suggest that the constraints on short sales over the restricted period before pricing increase the information asymmetry between informed and uninformed traders, none of these studies provide explicit evidence to support their supposition. The study discussed in this article examines the change of information environment around an offer day and reveals that, for those offers with hidden adverse information, the constraints on short sales inhibit the incorporation of unfavorable information and cause a substantial increase in uncertainty. The evidence supports the proposition that the constraints of Rule 105 worsen the information environment before an offer.

The effects of the relaxation of the constraints after an offer day are also examined in this study. Regression analysis reveals that there is a less significant decrease in information asymmetry for stocks
that have listed options and for firms with potential good information. These results are consistent with the prediction that the smaller the effect of the Rule on informed trading of a stock, the smaller the extent to which information asymmetry is exacerbated. Multivariate analysis suggests that after controlling for other possible contributors for a value discount on an offer day, such as transactions cost saving and price pressure, the information asymmetry and increase of uncertainty due to Rule 105 significantly affect the pricing of SEOs.

Due to the restraints of the Rule on informed trading based on bad news, stocks with private unfavorable information are more likely to be overpriced. Therefore, investors readjust their estimation of stock value according to the information released on the pricing day. This downward correction of value estimation causes the first-day returns of stocks with unfavorable private news to be smaller than the first-day returns of stocks with favorable news.

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Table 1
Summary Statistics for Seasoned Offers
This Table lists summary statistics for 60 seasoned offers issued on NYSE from January 2003 to June 2003. Discount is defined as -100 times the return from the previous day's closing transaction price to the offer price. $\operatorname{VOL}_{[-2,-1]}$ is the median of intraday volatility of two trading days immediately before an offer. $\mathrm{REL}_{-} \mathrm{VOL}_{[-2,-1]}$ is the change in intraday volatility over two trading days immediately before an offer relative to the median of intraday volatility during the benchmark period, which is five trading days ending two weeks before an offer (i.e., from day -15 to day -11 ). Spread is the time-weighted average of relative quoted spreads over two trading days before an offer date. CAR is the cumulative abnormal return of five trading days prior to an offer. Amount is total dollar amount of offer (in \$ million). REL_OFFSIZE is defined as a logarithm of the ratio of offered shares to total shares outstanding prior to the offer.

| Variables | Mean | Median | P90 | Skewness | $t$-stat | $p$-value | Percent <br> Negative | Percent <br> Zero |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Discount | 1.7579 | 1.1461 | 5.4957 | -1.6650 | 4.0947 | 0.0001 | 0.1834 | 0.05 |
| VOL $_{[-2,-1]}$ | 0.0180 | 0.0156 | 0.0291 | 0.8677 | 17.8491 | $<0.0001$ | - | - |
| REL__OL $_{[-2,-1]}$ | 0.0579 | 0.0163 | 0.4474 | 0.9149 | 1.3655 | 0.1733 | - | - |
| Spread | 0.1674 | 0.1479 | 0.2917 | 0.5994 | 14.9594 | $<0.0001$ | - | - |
| CAR | -0.0045 | -0.0044 | 0.0543 | -0.5517 | -0.6332 | 0.5291 | - | - |
| Amount | 200.42 | 132.25 | 455.00 | 2.6223 | 7.0799 | $<0.0001$ | - | - |
| REL_OFFSIZE | -2.2155 | -2.5168 | 0.2597 | 1.1163 | -8.7273 | 0.2597 | - | - |

Table 2

## Change in Intraday Volatility

This Table presents the mean of the change in intraday volatility around a new offer. Relative intraday volatility is the change in intraday volatility relative to the median of intraday volatility over the benchmark period, which is five trading days ending two weeks before an offer (i.e., from day -15 to day -11 ). CAR, which is used to divide the whole sample into subsamples, is the cumulative abnormal return of five trading days prior to an offer. The values in parentheses are the $p$-values of the t -test.

|  | Change in Intraday Volatility |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All | Seasoned Offers with |  | Seasoned Offers with |  |  |  |
| Relative Day | ( $n=60$ ) | Positive five-day CAR ( $n=34$ ) | Negative five-day CAR ( $n=26$ ) | $\begin{aligned} & \text { t-test: } \\ & (2)=(3) \end{aligned}$ | Positive five-day CAR or with Option Listing $(n=39)$ | Negative five-day CAR and without Option Listing $(n=21)$ | t-test: $(4)=(5)$ |
|  | (1) | (2) | (3) |  | (4) | (5) |  |
| -5 | $\begin{gathered} 0.0668 \\ (0.4207) \end{gathered}$ | $\begin{gathered} 0.0310 \\ (0.7968) \end{gathered}$ | $\begin{gathered} \hline 0.0958 \\ (0.4110) \end{gathered}$ | (0.6971) | $\begin{gathered} 0.0039 \\ (0.9619) \end{gathered}$ | $\begin{gathered} \hline 0.1957 \\ (0.3112) \end{gathered}$ | (0.3579) |
| -4 | $\begin{aligned} & -0.0136 \\ & (0.7978) \end{aligned}$ | $\begin{aligned} & -0.0128 \\ & (0.8388) \end{aligned}$ | $\begin{aligned} & -0.0143 \\ & (0.8635) \end{aligned}$ | (0.9885) | $\begin{aligned} & -0.0067 \\ & (0.8874) \end{aligned}$ | $\begin{aligned} & -0.0278 \\ & (0.8357) \end{aligned}$ | (0.8818) |
| -3 | $\begin{gathered} 0.0129 \\ (0.7212) \end{gathered}$ | $\begin{gathered} -0.0066 \\ (0.8969) \end{gathered}$ | $\begin{gathered} 0.0288 \\ (0.5785) \end{gathered}$ | (0.6248) | $\begin{aligned} & -0.0108 \\ & (0.7836) \end{aligned}$ | $\begin{gathered} 0.0615 \\ (0.4286) \end{gathered}$ | (0.4043) |
| -2 | $\begin{gathered} 0.0001 \\ (0.9990) \end{gathered}$ | $\begin{gathered} 0.0083 \\ (0.9245) \end{gathered}$ | $\begin{aligned} & -0.0066 \\ & (0.9068) \end{aligned}$ | (0.8858) | $\begin{aligned} & -0.0229 \\ & (0.7077) \end{aligned}$ | $\begin{gathered} 0.0472 \\ (0.5878) \end{gathered}$ | (0.5079) |
| -1 | $\begin{aligned} & 0.0955^{*} \\ & (0.0517) \end{aligned}$ | $\begin{gathered} 0.0610 \\ (0.4203) \end{gathered}$ | $\begin{aligned} & 0.1236^{*} \\ & (0.0601) \end{aligned}$ | (0.5241) | $\begin{gathered} 0.0327 \\ (0.5478) \end{gathered}$ | $\begin{gathered} 0.2245 * * \\ (0.0245) \end{gathered}$ | $\begin{gathered} * \\ (0.0805) \end{gathered}$ |
| 0 | $\begin{gathered} -0.1022 * \\ (0.0689) \end{gathered}$ | $\begin{gathered} -0.0944 \\ (0.2520) \end{gathered}$ | $\begin{aligned} & -0.1087 \\ & (0.1668) \end{aligned}$ | (0.8981) | $\begin{aligned} & -0.0622 \\ & (0.3575) \end{aligned}$ | $\begin{gathered} -0.1845^{*} \\ (0.0751) \end{gathered}$ | (0.3081) |
| 1 | $\begin{gathered} -0.1783 * * * \\ (0.0000) \end{gathered}$ | $\begin{gathered} -0.1255^{*} \\ (0.0642) \end{gathered}$ | $\begin{gathered} -0.2212 * * * \\ (0.0000) \end{gathered}$ | (0.2272) | $\begin{gathered} -0.1601 * * * \\ (0.0026) \end{gathered}$ | $\begin{gathered} -0.2156^{* * *} \\ (0.0011) \end{gathered}$ | (0.4599) |
| 2 | $\begin{gathered} -0.1188 * * \\ (0.0306) \end{gathered}$ | $\begin{aligned} & -0.1292 * \\ & (0.0638) \end{aligned}$ | $\begin{aligned} & -0.1104 \\ & (0.1858) \end{aligned}$ | (0.8596) | $\begin{gathered} -0.0853 \\ (0.2417) \end{gathered}$ | $\begin{gathered} -0.1877 * * \\ (0.0170) \end{gathered}$ | (0.3163) |
| 3 | $\begin{aligned} & -0.0776 \\ & (0.1883) \end{aligned}$ | $\begin{gathered} -0.0483 \\ (0.6297) \end{gathered}$ | $\begin{aligned} & -0.1015 \\ & (0.1563) \end{aligned}$ | (0.6624) | $\begin{aligned} & -0.0133 \\ & (0.8592) \end{aligned}$ | $\begin{gathered} -0.2097 * * \\ (0.0263) \end{gathered}$ | (0.0923) |
| 4 | $\begin{aligned} & -0.0700 \\ & (0.2401) \end{aligned}$ | $\begin{aligned} & -0.1196^{*} \\ & (0.0557) \end{aligned}$ | $\begin{aligned} & -0.0297 \\ & (0.7581) \end{aligned}$ | (0.4289) | $\begin{aligned} & -0.0643 \\ & (0.2583) \end{aligned}$ | $\begin{aligned} & -0.0817 \\ & (0.5707) \end{aligned}$ | (0.9101) |
| 5 | $\begin{gathered} -0.0786^{*} \\ (0.0573) \\ \hline \end{gathered}$ | $\begin{gathered} -0.0697 \\ (0.2680) \\ \hline \end{gathered}$ | $\begin{aligned} & -0.0858 \\ & (0.1263) \\ & \hline \end{aligned}$ | (0.8457) | $\begin{array}{r} -0.0290 \\ (0.5895) \\ \hline \end{array}$ | $\begin{gathered} -0.1805^{* * *} \\ (0.0028) \\ \hline \end{gathered}$ | $\begin{gathered} * * \\ (0.0474) \end{gathered}$ |

[^2]Table 3

## Asymmetric Sensitivity to Different Trading Directions

Panel A lists the mean of the asymmetric sensitivity (ASYM) to different trading directions around a new offer. Asymmetric sensitivity is the ratio of the difference between market makers' sensitivity to buyer-initiated trading, SEN_POS, and seller-initiated trading, SEN_NEG, and a total of these two sensitivities. We estimate SEN_POS and SEN_NEG by regressing the following model: $\Delta P_{t}=\alpha+\beta_{1} *$ SignedVolume $_{t}+\beta_{2} *$ SignedVolume $_{t} *$ TrDirection $_{t}$ where $\Delta P$ is the change of transaction prices, SignedVolume is the product of trading volume and the trading sign inferred by the methods suggested by Lee and Ready (1991), TrDirection is a dummy variable that equals 1 if the trade is buyer-initiated and 0 if the trade is seller-initiated. SEN_POS is equal to $\beta_{1}+\beta_{2}$ and SEN_NEG is equal to $\beta_{1}$. Panel B lists the mean of the change of asymmetric sensitivity to different trading directions around a new offer. Change of asymmetric sensitivity is the difference between the asymmetric sensitivity and the median of the asymmetric sensitivity over the benchmark period, which is five trading days ending two weeks before an offer (i.e., from day -15 to day -11 ). CAR, which is used to divide the whole sample into subsamples, is the cumulative abnormal return of five trading days prior to an offer. The values in parentheses are the $p$-values of the $t$-test.

Panel A: Asymmetric Sensitivity to Trading Direction

|  | Asymmetric Sensitivity to Different Trading Directions |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All | Seasoned Offers with |  | Seasoned Offers with |  |  |  |
| Relative Day | ( $n=60$ ) | Positive five-day $\begin{gathered} \text { CAR } \\ (n=34) \end{gathered}$ | Negative five-day CAR ( $n=26$ ) | t-test: $(2)=(3)$ | Positive <br> five-day CAR or <br> with Option <br> Listing <br> $(n=39)$ | Negative five-day CAR and without Option Listing $(n=21)$ | t-test: $(4)=(5)$ |
|  | (1) | (2) | (3) |  | (4) | (5) |  |
| -5 | $\begin{gathered} \hline-0.1945 * * * \\ (0.0003) \end{gathered}$ | $\begin{gathered} -0.2066^{* *} \\ (0.0183) \end{gathered}$ | $\begin{gathered} \hline-0.1846 * * * \\ (0.0082) \end{gathered}$ | (0.8347) | $\begin{gathered} \hline-0.1826 * * * \\ (0.0074) \end{gathered}$ | $\begin{gathered} \hline-0.2189 * * \\ (0.0178) \end{gathered}$ | (0.7335) |
| -4 | $\begin{gathered} -0.1831 * * * \\ (0.0010) \end{gathered}$ | $\begin{gathered} -0.1860 * * \\ (0.0234) \end{gathered}$ | $\begin{gathered} -0.1808^{* *} \\ (0.0190) \end{gathered}$ | (0.9614) | $\begin{gathered} -0.1556 * * \\ (0.0177) \end{gathered}$ | $\begin{gathered} -0.2396 * * \\ (0.0238) \end{gathered}$ | (0.4724) |
| -3 | $\begin{gathered} -0.1061 * \\ (0.0524) \end{gathered}$ | $\begin{aligned} & -0.0986 \\ & (0.2224) \end{aligned}$ | $\begin{aligned} & -0.1121 \\ & (0.1401) \end{aligned}$ | (0.9008) | $\begin{aligned} & -0.0272 \\ & (0.6809) \end{aligned}$ | $\begin{gathered} -0.2679 * * * \\ (0.0046) \end{gathered}$ | $\begin{gathered} * * \\ (0.0282) \end{gathered}$ |
| -2 | $\begin{gathered} -0.2001 * * * \\ (0.0001) \end{gathered}$ | $\begin{gathered} -0.1728^{* *} \\ (0.0178) \end{gathered}$ | $\begin{gathered} -0.2223 * * * \\ (0.0019) \end{gathered}$ | (0.6033) | $\begin{gathered} -0.1291 * * \\ (0.0337) \end{gathered}$ | $\begin{gathered} -0.3458 * * * \\ (0.0001) \end{gathered}$ | $\begin{gathered} * * \\ (0.0212) \end{gathered}$ |
| -1 | $\begin{gathered} -0.2812 * * * \\ (0.0000) \\ \hline \end{gathered}$ | $\begin{gathered} -0.2895^{* *} \\ (0.0013) \\ \hline \end{gathered}$ | $\begin{gathered} -0.2744 * * * \\ (0.0004) \\ \hline \end{gathered}$ | (0.8868) | $\begin{gathered} -0.2706^{* * *} \\ (0.0002) \\ \hline \end{gathered}$ | $\begin{gathered} -0.3029 * * * \\ (0.0018) \\ \hline \end{gathered}$ | (0.7624) |
| 0 | 0.1077** | 0.1629** | 0.0627 |  | 0.1399** | 0.0414 |  |
|  | (0.0367) | (0.0491) | (0.3421) | (0.3313) | (0.0378) | (0.5933) | (0.3302) |
| 1 | $\begin{gathered} 0.0076 \\ (0.8945) \end{gathered}$ | $\begin{gathered} 0.0462 \\ (0.5744) \end{gathered}$ | $\begin{aligned} & -0.0238 \\ & (0.7697) \end{aligned}$ | (0.5429) | $\begin{gathered} 0.0334 \\ (0.6149) \end{gathered}$ | $\begin{gathered} -0.0453 \\ (0.6901) \end{gathered}$ | (0.5485) |
| 2 | $\begin{gathered} -0.0640 \\ (0.2849) \end{gathered}$ | $\begin{aligned} & -0.1320 \\ & (0.1758) \end{aligned}$ | $\begin{gathered} -0.0088 \\ (0.9074) \end{gathered}$ | (0.3127) | $\begin{aligned} & -0.0499 \\ & (0.4992) \end{aligned}$ | $\begin{gathered} -0.0930 \\ (0.3812) \end{gathered}$ | (0.7364) |
| 3 | $\begin{gathered} -0.1802 * * * \\ (0.0008) \end{gathered}$ | $\begin{gathered} -0.1621^{* *} \\ (0.0406) \end{gathered}$ | $\begin{gathered} -0.1949 * * * \\ (0.0089) \end{gathered}$ | (0.7503) | $\begin{gathered} -0.1632 * * \\ (0.0101) \end{gathered}$ | $\begin{gathered} -0.2152 * * \\ (0.0365) \end{gathered}$ | (0.6473) |
| 4 | $\begin{gathered} -0.2036 * * * \\ (0.0000) \end{gathered}$ | $\begin{gathered} -0.1785^{* *} \\ (0.0420) \end{gathered}$ | $\begin{gathered} -0.2240 * * * \\ (0.0001) \end{gathered}$ | (0.6378) | $\begin{gathered} -0.1973 * * * \\ (0.0030) \end{gathered}$ | $\begin{gathered} -0.2167 * * * \\ (0.0010) \end{gathered}$ | (0.8168) |
| 5 | $\begin{array}{r} -0.0707 \\ (0.2049) \\ \hline \end{array}$ | $\begin{aligned} & -0.0962 \\ & (0.2861) \\ & \hline \end{aligned}$ | $\begin{array}{r} -0.0499 \\ (0.4849) \\ \hline \end{array}$ | (0.6837) | $\begin{gathered} -0.0758 \\ (0.2746) \\ \hline \end{gathered}$ | $\begin{aligned} & -0.0600 \\ & (0.5362) \\ & \hline \end{aligned}$ | (0.8933) |

Panel B: Change of Asymmetric Sensitivity to Different Trading Directions

|  | Change of Asymmetric Sensitivity to Different Trading Directions |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All | Seasoned Offers with |  | Seasoned Offers with |  |  |  |
| Relative Day | ( $n=60$ ) | Positive five-day $\begin{gathered} \text { CAR } \\ (n=34) \end{gathered}$ | Negative five-day CAR ( $n=26$ ) | t-test: $(2)=(3)$ | Positive five-day CAR or with Option Listing ( $n=39$ ) | Negative five-day CAR and without Option Listing $(n=21)$ | t-test: $(4)=(5)$ |
|  | (1) | (2) | (3) |  | (4) | (5) |  |
| -5 | $\begin{aligned} & \hline-0.0619 \\ & (0.2953) \end{aligned}$ | $\begin{aligned} & \hline-0.0339 \\ & (0.7308) \end{aligned}$ | $\begin{aligned} & -0.0847 \\ & (0.2488) \end{aligned}$ | (0.6773) | $\begin{aligned} & \hline-0.0262 \\ & (0.7270) \end{aligned}$ | $\begin{gathered} -0.1352 \\ (0.1652) \end{gathered}$ | (0.3670) |
| -4 | $\begin{aligned} & -0.0506 \\ & (0.3448) \end{aligned}$ | $\begin{aligned} & -0.0133 \\ & (0.8723) \end{aligned}$ | $\begin{aligned} & -0.0809 \\ & (0.2584) \end{aligned}$ | (0.5340) | $\begin{gathered} 0.0008 \\ (0.9902) \end{gathered}$ | $\begin{aligned} & -0.1560 \\ & (0.1257) \end{aligned}$ | (0.1838) |
| -3 | $\begin{gathered} 0.0265 \\ (0.6418) \end{gathered}$ | $\begin{gathered} 0.0741 \\ (0.4169) \end{gathered}$ | $\begin{aligned} & -0.0122 \\ & (0.8686) \end{aligned}$ | (0.4592) | $\begin{aligned} & 0.1292^{*} \\ & (0.0743) \end{aligned}$ | $\begin{gathered} -0.1843 * * * \\ (0.0275) \end{gathered}$ | $\begin{gathered} * * * \\ (0.0043) \end{gathered}$ |
| -2 | $\begin{gathered} -0.0676 \\ (0.2326) \end{gathered}$ | $\begin{aligned} & -0.0002 \\ & (0.9984) \end{aligned}$ | $\begin{gathered} -0.1223 \\ (0.1307) \end{gathered}$ | (0.2765) | $\begin{gathered} 0.0273 \\ (0.6841) \end{gathered}$ | $\begin{gathered} -0.2622^{* * *} \\ (0.0090) \end{gathered}$ | $\begin{gathered} * * \\ (0.0134) \end{gathered}$ |
| -1 | $\begin{gathered} -0.1487 * * \\ (0.0116) \\ \hline \end{gathered}$ | $\begin{array}{r} -0.1169 \\ (0.1530) \\ \hline \end{array}$ | $\begin{gathered} -0.1745^{* *} \\ (0.0405) \\ \hline \end{gathered}$ | $(0.6145)$ | $\begin{aligned} & -0.1142 \\ & (0.1079) \\ & \hline \end{aligned}$ | $\begin{gathered} -0.2193^{* *} \\ (0.0429) \\ \hline \end{gathered}$ | (0.3960) |
| 0 | 0.2402*** | 0.3356*** | 0.1627** |  | 0.2963*** | 0.1250 | * |
|  | (0.0000) | (0.0003) | (0.0219) | (0.1068) | (0.0001) | (0.1045) | (0.0943) |
| 1 | $\begin{gathered} 0.1402 * * \\ (0.0279) \end{gathered}$ | $\begin{gathered} 0.2189 * * \\ (0.0254) \end{gathered}$ | $\begin{gathered} 0.0762 \\ (0.3702) \end{gathered}$ | (0.2567) | $\begin{gathered} 0.1898 * * \\ (0.0154) \end{gathered}$ | $\begin{gathered} 0.0383 \\ (0.7329) \end{gathered}$ | (0.2640) |
| 2 | $\begin{gathered} 0.0685 \\ (0.3120) \end{gathered}$ | $\begin{gathered} 0.0406 \\ (0.6975) \end{gathered}$ | $\begin{gathered} 0.0912 \\ (0.3160) \end{gathered}$ | (0.7131) | $\begin{gathered} 0.1064 \\ (0.1816) \end{gathered}$ | $\begin{gathered} -0.0093 \\ (0.9430) \end{gathered}$ | (0.4480) |
| 3 | $\begin{aligned} & -0.0477 \\ & (0.3653) \end{aligned}$ | $\begin{gathered} 0.0106 \\ (0.9015) \end{gathered}$ | $\begin{aligned} & -0.0949 \\ & (0.1560) \end{aligned}$ | (0.3275) | $\begin{aligned} & -0.0068 \\ & (0.9149) \end{aligned}$ | $\begin{aligned} & -0.1315 \\ & (0.1724) \end{aligned}$ | (0.2728) |
| 4 | $\begin{gathered} -0.0711 \\ (0.1374) \end{gathered}$ | $\begin{aligned} & -0.0058 \\ & (0.9485) \end{aligned}$ | $\begin{gathered} -0.1241 * * * \\ (0.0089) \end{gathered}$ | (0.2439) | $\begin{aligned} & -0.0409 \\ & (0.5337) \end{aligned}$ | $\begin{gathered} -0.1330 * * \\ (0.0223) \end{gathered}$ | (0.2779) |
| 5 | $\begin{gathered} 0.0619 \\ (0.3291) \\ \hline \end{gathered}$ | $\begin{gathered} 0.0765 \\ (0.4036) \\ \hline \end{gathered}$ | $\begin{gathered} 0.0501 \\ (0.5764) \end{gathered}$ | (0.8353) | $\begin{gathered} 0.0805 \\ (0.2758) \\ \hline \end{gathered}$ | $\begin{gathered} 0.0236 \\ (0.8498) \\ \hline \end{gathered}$ | (0.6932) |

*Significant at the $10 \%$ level
**Significant at the $5 \%$ level
***Significant at the $1 \%$ level

Table 4

## Change in Informed Transactions and Liquidity Transactions

Panel A shows the change in informed transactions around a new offer. Transactions with a dollar volume larger than $\$ 50,000$ are considered informed transactions. The change in informed transactions is computed relative to the median number of informed transactions over the benchmark period, which is five trading days ending two weeks before an offer (i.e., from day -15 to day -11 ).Panel B lists the cumulative change in informed transactions around a new offer. Cumulative change in informed transactions is the total change in informed transactions from previous trading days. Panel C lists the change in liquidity transactions around a new offer. Transactions with a dollar volume lower than $\$ 5,000$ are considered liquidity transactions. Change in liquidity transactions is the change in liquidity transactions relative to the median of the number of liquidity transactions over the benchmark period, which is five five trading days ending two weeks before an offer (i.e., from day -15 to day -11 ). CAR, which is used to divide the whole sample into subsamples, is the cumulative abnormal return of five trading days prior to an offer. The values in parentheses are the $p$-values of the t -test.

Panel A: Change in Informed Transactions

|  | Change in Informed Transactions |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All | Seasoned Offers with |  | Seasoned Offers with |  |  |  |
| Relative Day | ( $n=60$ ) | Positive five-day $\begin{gathered} \text { CAR } \\ (n=34) \end{gathered}$ | Negative five-day CAR ( $n=26$ ) | t-test: $(2)=(3)$ | Positive five-day CAR or with Option Listing $(n=39)$ | Negative five-day CAR and without Option Listing $(n=21)$ | t-test: $(4)=(5)$ |
|  | (1) | (2) | (3) |  | (4) | (5) |  |
| -5 | $\begin{gathered} 0.8906^{* * *} \\ (0.0013) \end{gathered}$ | $\begin{aligned} & 1.1116^{* *} \\ & (0.0121) \end{aligned}$ | $\begin{gathered} \hline 0.7109^{* *} \\ (0.0481) \end{gathered}$ | (0.4588) | $\begin{gathered} \hline 1.0946 * * * \\ (0.0032) \end{gathered}$ | $\begin{gathered} 0.4717 \\ (0.2182) \end{gathered}$ | (0.2256) |
| -4 | $\begin{gathered} 0.8780^{* * *} \\ (0.0006) \end{gathered}$ | $\begin{gathered} 1.2714^{* * *} \\ (0.0019) \end{gathered}$ | $\begin{aligned} & 0.5584^{*} \\ & (0.0874) \end{aligned}$ | (0.1466) | $\begin{gathered} 1.0884^{* * *} \\ (0.0011) \end{gathered}$ | $\begin{gathered} 0.4461 \\ (0.2490) \end{gathered}$ | (0.1924) |
| -3 | $\begin{gathered} 1.2251 * * * \\ (0.0023) \end{gathered}$ | $\begin{gathered} 1.3124^{* *} \\ (0.0385) \end{gathered}$ | $\begin{aligned} & 1.1519 * * \\ & (0.0293) \end{aligned}$ | (0.8385) | $\begin{gathered} 1.1940 * * \\ (0.0133) \end{gathered}$ | $\begin{aligned} & 1.2925^{*} \\ & (0.0888) \end{aligned}$ | (0.9086) |
| -2 | $\begin{gathered} 1.9411 * * * \\ (0.0012) \end{gathered}$ | $\begin{aligned} & 1.9068^{* *} \\ & (0.0199) \end{aligned}$ | $\begin{aligned} & 1.9699^{* *} \\ & (0.0247) \end{aligned}$ | (0.9557) | $\begin{gathered} 2.0022 * * \\ (0.0128) \end{gathered}$ | $\begin{aligned} & 1.8087 * * \\ & (0.0217) \end{aligned}$ | (0.8543) |
| -1 | $\begin{gathered} 4.8805 * * * \\ (0.0000) \\ \hline \end{gathered}$ | $\begin{gathered} 4.9833 * * * \\ (0.0008) \\ \hline \end{gathered}$ | $\begin{gathered} 4.7914 * * * \\ (0.0004) \\ \hline \end{gathered}$ | (0.9138) | $\begin{gathered} 4.3368^{* * *} \\ (0.0003) \\ \hline \end{gathered}$ | $\begin{gathered} 6.1278^{* * *} \\ (0.0007) \\ \hline \end{gathered}$ | (0.3306) |
| 0 | 23.0124*** | 18.8984 | 26.5778 |  | 16.8871*** | 37.0644*** | * |
|  | (0.0000) | (0.0004) | (0.0003) | (0.3375) | (0.0000) | (0.0019) | (0.0713) |
| 1 | $\begin{gathered} 5.4293 * * * \\ (0.0000) \end{gathered}$ | $\begin{gathered} 4.4887 \\ (0.0008) \end{gathered}$ | $\begin{gathered} 6.2444 \\ (0.0004) \end{gathered}$ | (0.3707) | $\begin{gathered} 4.1654 * * * \\ (0.0001) \end{gathered}$ | $\begin{gathered} 8.3286^{* * *} \\ (0.0026) \end{gathered}$ | (0.1136) |
| 2 | $\begin{gathered} 3.1463 * * * \\ (0.0000) \end{gathered}$ | $\begin{gathered} 3.1777 \\ (0.0002) \end{gathered}$ | $\begin{gathered} 3.1191 \\ (0.0011) \end{gathered}$ | (0.9586) | $\begin{gathered} 2.6802 * * * \\ (0.0000) \end{gathered}$ | $\begin{gathered} 4.2156 * * * \\ (0.0078) \end{gathered}$ | (0.3139) |
| 3 | $\begin{gathered} 2.9824 * * * \\ (0.0001) \end{gathered}$ | $\begin{gathered} 2.5473 \\ (0.0044) \end{gathered}$ | $\begin{gathered} 3.3595 \\ (0.0078) \end{gathered}$ | (0.5727) | $\begin{gathered} 2.3205 * * * \\ (0.0003) \end{gathered}$ | $\begin{gathered} 4.5009 * * \\ (0.0395) \end{gathered}$ | (0.3097) |
| 4 | $\begin{gathered} 2.5265 * * * \\ (0.0000) \end{gathered}$ | $\begin{gathered} 2.6730 \\ (0.0024) \end{gathered}$ | $\begin{gathered} 2.3995 \\ (0.0002) \end{gathered}$ | (0.7800) | $\begin{gathered} 2.3862^{* * *} \\ (0.0002) \end{gathered}$ | $\begin{gathered} 2.8483 * * * \\ (0.0029) \end{gathered}$ | (0.6467) |
| 5 | $\begin{gathered} 1.6439 * * * \\ (0.0000) \\ \hline \end{gathered}$ | $\begin{gathered} 1.7609 \\ (0.0065) \\ \hline \end{gathered}$ | $\begin{gathered} 1.5425 \\ (0.0010) \\ \hline \end{gathered}$ | (0.7653) | $\begin{gathered} 1.4816^{* * *} \\ (0.0011) \\ \hline \end{gathered}$ | $\begin{gathered} 2.0163^{* * *} \\ (0.0073) \\ \hline \end{gathered}$ | (0.4985) |

Panel B: Cumulative Change in Informed Transactions

|  | Cumulative Change in Informed Transactions |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All | Seasoned Offers with |  | Seasoned Offers with |  |  |  |
| Relative Day | ( $n=60$ ) | Positive five-day $\begin{gathered} \text { CAR } \\ (n=34) \end{gathered}$ | Negative five-day CAR ( $n=26$ ) | t-test: $(2)=(3)$ | Positive five-day CAR or with Option Listing ( $n=39$ ) | Negative five-day CAR and without Option Listing ( $n=21$ ) | t-test: $(4)=(5)$ |
|  | (1) | (2) | (3) |  | (4) | (5) |  |
| -5 | $\begin{gathered} 0.8906^{* * *} \\ (0.0013) \end{gathered}$ | $\begin{aligned} & \hline 1.1116^{* *} \\ & (0.0121) \end{aligned}$ | $\begin{gathered} \hline 0.7109 * * \\ (0.0481) \end{gathered}$ | (0) | $1.0946^{* * *}$ | $0.4717$ |  |
| -4 | $\begin{gathered} 1.5325 * * * \\ (0.0006) \end{gathered}$ | $\begin{gathered} 2.3830^{* * *} \\ (0.0012) \end{gathered}$ | $\begin{aligned} & 1.2693^{*} \\ & (0.0515) \end{aligned}$ | (0.1466) | $\begin{gathered} 2.1830^{* * *} \\ (0.0006) \end{gathered}$ | $\begin{gathered} 0.9178 \\ (0.1914) \end{gathered}$ | (0.1924) |
| -3 | $\begin{gathered} 2.0945 * * * \\ (0.0004) \end{gathered}$ | $\begin{gathered} 3.6954 * * * \\ (0.0026) \end{gathered}$ | $\begin{gathered} 2.3852 * * \\ (0.0252) \end{gathered}$ | (0.5975) | $\begin{gathered} 3.3770 * * * \\ (0.0012) \end{gathered}$ | $\begin{aligned} & 2.1423^{*} \\ & (0.0794) \end{aligned}$ | (0.6030) |
| -2 | $\begin{gathered} 2.7856 * * * \\ (0.0004) \end{gathered}$ | $\begin{gathered} 5.6022 * * * \\ (0.0032) \end{gathered}$ | $\begin{gathered} 4.2936 * * \\ (0.0190) \end{gathered}$ | (0.6283) | $\begin{gathered} 5.3793 * * * \\ (0.0022) \end{gathered}$ | $\begin{gathered} 3.8558 * * \\ (0.0312) \end{gathered}$ | (0.4905) |
| -1 | $\begin{gathered} 6.8067^{* * *} \\ (0.0000) \end{gathered}$ | $\begin{gathered} 10.5855^{* * *} \\ (0.0013) \end{gathered}$ | $\begin{gathered} 8.7855^{* * *} \\ (0.0027) \end{gathered}$ | (0.6827) | $\begin{gathered} 9.7161^{* * *} \\ (0.0007) \end{gathered}$ | $\begin{gathered} 9.3385 * * * \\ (0.0029) \end{gathered}$ | (0.8337) |
| 0 | $\begin{gathered} 25.0045 * * * \\ (0.0000) \end{gathered}$ | $\begin{gathered} 29.4839 * * * \\ (0.0002) \end{gathered}$ | $\begin{gathered} 33.7022 * * * \\ (0.0002) \end{gathered}$ | (0.5310) | $\begin{gathered} 26.6032 * * * \\ (0.0000) \end{gathered}$ | $\begin{gathered} 42.5014 * * * \\ (0.0014) \end{gathered}$ | (0.1590) |
| 1 | $\begin{gathered} 12.0488 * * * \\ (0.0000) \end{gathered}$ | $\begin{gathered} 33.9727 * * * \\ (0.0002) \end{gathered}$ | $\begin{gathered} 39.5563 * * * \\ (0.0002) \end{gathered}$ | (0.9465) | $\begin{gathered} 30.7687 * * * \\ (0.0000) \end{gathered}$ | $\begin{gathered} 49.9533 * * * \\ (0.0013) \end{gathered}$ | (0.4049) |
| 2 | $\begin{gathered} 28.0423 * * * \\ (0.0000) \end{gathered}$ | $\begin{gathered} 37.1504 * * * \\ (0.0001) \end{gathered}$ | $\begin{gathered} 42.4804^{* * *} \\ (0.0002) \end{gathered}$ | (0.5895) | $\begin{gathered} 33.4488^{* * *} \\ (0.0000) \end{gathered}$ | $\begin{gathered} 53.7251 * * * \\ (0.0014) \end{gathered}$ | (0.1728) |
| 3 | $\begin{gathered} 14.9284 * * * \\ (0.0000) \end{gathered}$ | $\begin{gathered} 39.6977 * * * \\ (0.0001) \end{gathered}$ | $\begin{gathered} 45.6299 * * * \\ (0.0002) \end{gathered}$ | (0.8635) | $\begin{gathered} 35.7693 * * * \\ (0.0000) \end{gathered}$ | $\begin{gathered} 57.7523 * * * \\ (0.0019) \end{gathered}$ | (0.3751) |
| 4 | $\begin{gathered} 30.4817 * * * \\ (0.0000) \\ \hline \end{gathered}$ | $\begin{gathered} 42.3707 * * * \\ (0.0002) \\ \hline \end{gathered}$ | $\begin{gathered} 47.8795^{* * *} \\ (0.0002) \\ \hline \end{gathered}$ | (0.6457) | $\begin{gathered} 38.1556 * * * \\ (0.0000) \\ \hline \end{gathered}$ | $\begin{gathered} 60.3007^{* * *} \\ (0.0016) \\ \hline \end{gathered}$ | (0.1898) |

Panel C: Change in Liquidity Transactions

|  | Change in Liquidity Transactions |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All | Seasoned Offers with |  | Seasoned Offers with |  |  |  |
| Relative Day | ( $n=60$ ) | Positive five-day CAR $(n=34)$ | Negative five-day CAR ( $n=26$ ) | t-test: $(2)=(3)$ | Positive <br> five-day CAR <br> or with Option <br> Listing <br> $(n=39)$ | Negative five-day CAR and without Option Listing $(n=21)$ | t-test: $(4)=(5)$ |
|  | (1) | (2) | (3) |  | (4) | (5) |  |
| -5 | $\begin{gathered} 0.0461 \\ (0.3570) \end{gathered}$ | $\begin{gathered} 0.0301 \\ (0.6819) \end{gathered}$ | $\begin{gathered} \hline 0.0590 \\ (0.3974) \end{gathered}$ | (0.7737) | $\begin{gathered} 0.0185 \\ (0.7307) \end{gathered}$ | $\begin{gathered} \hline 0.1027 \\ (0.3450) \end{gathered}$ | (0.4835) |
| -4 | $\begin{gathered} 0.0528 \\ (0.2063) \end{gathered}$ | $\begin{gathered} 0.0445 \\ (0.5088) \end{gathered}$ | $\begin{gathered} 0.0596 \\ (0.2688) \end{gathered}$ | $(0.8593)$ | $\begin{gathered} 0.0613 \\ (0.1917) \end{gathered}$ | $\begin{gathered} 0.0354 \\ (0.6827) \end{gathered}$ | (0.7914) |
| -3 | $\begin{gathered} 0.1329 * * \\ (0.0331) \end{gathered}$ | $\begin{gathered} 0.0250 \\ (0.6513) \end{gathered}$ | $\begin{gathered} 0.2206 * * \\ (0.0335) \end{gathered}$ | $(0.0908)$ | $\begin{gathered} 0.0420 \\ (0.3141) \end{gathered}$ | $\begin{aligned} & 0.3195^{*} \\ & (0.0611) \end{aligned}$ | (0.1082) |
| -2 | $\begin{gathered} 0.0759 \\ (0.1268) \end{gathered}$ | $\begin{gathered} -0.0155 \\ (0.7533) \end{gathered}$ | $\begin{aligned} & 0.1502^{*} \\ & (0.0623) \end{aligned}$ | (0.0769) | $\begin{aligned} & -0.0040 \\ & (0.9168) \end{aligned}$ | $\begin{aligned} & 0.2399^{*} \\ & (0.0627) \end{aligned}$ | (0.0677) |
| -1 | $\begin{gathered} 0.1478 * * \\ (0.0163) \end{gathered}$ | $\begin{gathered} 0.0318 \\ (0.6254) \end{gathered}$ | $\begin{gathered} 0.2421 * * * \\ (0.0079) \end{gathered}$ | $\stackrel{*}{(0.0542)}$ | $\begin{gathered} 0.0164 \\ (0.7323) \end{gathered}$ | $\begin{gathered} 0.4177 * * * \\ (0.0031) \end{gathered}$ | $\begin{gathered} * * * \\ (0.0055) \end{gathered}$ |
| 0 | $\begin{gathered} 0.2852 * * * \\ (0.0004) \end{gathered}$ | $\begin{aligned} & 0.1802^{*} \\ & (0.0913) \end{aligned}$ | $\begin{gathered} 0.3705 * * * \\ (0.0019) \end{gathered}$ | (0.2092) | $\begin{gathered} 0.1163 \\ (0.1125) \end{gathered}$ | $\begin{gathered} 0.6319 * * * \\ (0.0007) \end{gathered}$ | $\begin{gathered} * * * \\ (0.0055) \end{gathered}$ |
| 1 | $\begin{gathered} 0.2001 * * * \\ (0.0003) \end{gathered}$ | $\begin{gathered} 0.1289 * * \\ (0.0201) \end{gathered}$ | $\begin{gathered} 0.2580 * * * \\ (0.0040) \end{gathered}$ | (0.1926) | $\begin{gathered} 0.0994 \\ (0.0125) \end{gathered}$ | $\begin{gathered} 0.4070 * * * \\ (0.0048) \end{gathered}$ | $\begin{gathered} * * \\ (0.0296) \end{gathered}$ |
| 2 | $\begin{gathered} 0.2103 * * * \\ (0.0043) \end{gathered}$ | $\begin{aligned} & 0.1372 * \\ & (0.0991) \end{aligned}$ | $\begin{gathered} 0.2698 * * \\ (0.0204) \end{gathered}$ | $(0.3349)$ | $\begin{gathered} 0.0916 \\ (0.1135) \end{gathered}$ | $\begin{gathered} 0.4540 * * \\ (0.0165) \end{gathered}$ | (0.0574) |
| 3 | $\begin{gathered} 0.2727 * * * \\ (0.0002) \end{gathered}$ | $\begin{gathered} 0.1385 * * \\ (0.0691) \end{gathered}$ | $\begin{gathered} 0.3817 * * * \\ (0.0014) \end{gathered}$ | $\stackrel{*}{(0.0687)}$ | $\begin{gathered} 0.1405^{* *} \\ (0.0136) \end{gathered}$ | $\begin{gathered} 0.5441 * * * \\ (0.0044) \end{gathered}$ | $\begin{gathered} * * \\ (0.0317) \end{gathered}$ |
| 4 | $\begin{gathered} 0.1918 * * * \\ (0.0047) \end{gathered}$ | $\begin{gathered} 0.0087 \\ (0.8653) \end{gathered}$ | $\begin{gathered} 0.3407 * * * \\ (0.0027) \end{gathered}$ | $\begin{gathered} * * * \\ (0.0064) \end{gathered}$ | $\begin{gathered} 0.0470 \\ (0.2862) \end{gathered}$ | $\begin{gathered} 0.4892 * * * \\ (0.0068) \end{gathered}$ | $\begin{gathered} * * \\ (0.0146) \end{gathered}$ |
| 5 | $\begin{gathered} 0.1209 * * \\ (0.0370) \\ \hline \end{gathered}$ | $\begin{gathered} 0.0802 \\ (0.3469) \\ \hline \end{gathered}$ | $\begin{aligned} & 0.1540^{*} \\ & (0.0559) \\ & \hline \end{aligned}$ | (0.5203) | $\begin{gathered} 0.0632 \\ (0.3094) \\ \hline \end{gathered}$ | $\begin{aligned} & 0.2394^{*} \\ & (0.0541) \\ & \hline \end{aligned}$ | (0.1905) |

*Significant at the $10 \%$ level
**Significant at the $5 \%$ level
***Significant at the $1 \%$ level

Table 5

## Change in Information Asymmetry and Constraints on Informed Trading

This Table describes the results of regressing change in intraday volatility after an offer against the constraints on informed trading. The dependent variable is $\mathrm{REL}_{-} \mathrm{VOL}_{\mathrm{N}}$, which is the change in intraday volatility on the trading days immediately before an offer relative to the median of intraday volatility over four trading days two days after the offer (i.e., from day 2 to day 5). CAR is the cumulative abnormal return of five trading days prior to an offer. CAR_POS (CAR_NEG) is equal to CAR if positive (negative) and 0 if otherwise. CARDUM is a dummy variable that is equal to 1 if CAR is positive and 0 if otherwise. Option is a dummy variable that is equal to 1 if the stock is listed on the options market and 0 if otherwise. OPTION_CAR is a dummy variable that is equal to 1 if the stock is listed on the options market or its five-day CAR is positive and 0 if otherwise. The values in parentheses are the $p$-values of the coefficients.

|  | Model (1) | Model (2) | Model (3) | Model (4) | Model (5) |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Intercept | -0.1376** | -0.0946** | -0.1284** | -0.1980*** | 0.2768*** |
|  | (0.0336) | (0.0458) | (0.0455) | (0.0020) | (0.0029) |
| CAR_NEG | 0.5335 | - | - | - | - |
|  | (0.6843) | - | - | - | - |
| CAR_POS | 2.9005 | - | - | - | - |
|  | *(0.0779) | - | - | - | - |
| CAR | - | 1.5255* | - | - | - |
|  | - | (0.0777) | - | - | - |
| CARDUM | - | - | 0.0622 | - | - |
|  | - | - | (0.5172) | - | - |
| Option | - | - | - | 0.2145** | - |
|  | - | - | - | (0.0220) | - |
| OPTION_CAR | - | - | - | - | -0.2365** |
|  | - | - | - | - | (0.0366) |
| Adj. R-square | 0.0364 | 0.0363 | -0.0098 | 0.0715 | 0.0572 |
| F-stat | 2.11 | 3.22 | 0.42 | 5.54 | 4.58 |

[^3]Table 6

## Summary of Empirical Predictions Related to SEO Discounting

This Table summarizes the directions of expected empirical relationships between the hypothesized explanatory variables and SEO discounting. The hypotheses are discussed in section 2. Discounting is defined as -1 times the return from the previous day's closing transaction price to the offer price. $\mathrm{VOL}_{[-2,-1]}$ is the median of intraday volatility over two trading days prior to an offer. $\mathrm{REL}_{-} \mathrm{VOL}_{[-2,-1]}$ is the change in average intraday volatility over two trading days immediately before an offer relative to the median of intraday volatility during the benchmark period, which is five trading days ending two weeks before an offer (i.e., from day -15 to day -11 ). Spread is the time-weighted average of relative quoted spreads over two trading days prior to an offer day. CAR is cumulative abnormal return of five trading days prior to an offer. CAR_POS (CAR_NEG) is equal to CAR if positive (negative) and 0 if otherwise. Amount is total dollar amount of offer (in \$ million). REL_OFFSIZE is defined as the ratio of offered shares to total shares outstanding prior to an offer. Rounding is a dummy variable that equals 1 if the offer is priced at $\$ 0.25$ increments and 0 if otherwise. BID_PRC is equal to (closing transaction price-closing bid quote)/closing transaction price times 100 if the offer is priced at the closing bid quote. OPTION is a dummy variable that is equal to 1 if the stock is listed on the options market and 0 if otherwise.

| Hypothesis | Explanatory Variables and Predicted Relations |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $\mathrm{VOL}_{[-2,-1]}$ | $\begin{gathered} \mathrm{REL}_{-} \\ \mathrm{VOL}_{[-2,-1]} \end{gathered}$ | Spread | Amount | REL_OFFSIZE | CAR | Rounding | BID_PRC | OPTION |
| Uncertainty/ Information Asymmetry | (+) |  | (+) |  |  |  |  |  |  |
| Price Pressure |  |  |  | (+) | (+) |  |  |  |  |
| Restraints on Informed Trading |  | (+) |  |  |  |  |  |  | (-) |
| Offer Price Rounding |  |  |  |  |  |  | (+) |  |  |
| Pricing at the Bid |  |  |  |  |  |  |  | (+) |  |
| Transaction Cost Savings |  |  | (-) |  |  |  |  |  |  |
| Rent Expropriation |  |  |  |  |  | $\begin{gathered} (+) \\ \text { CAR_POS } \end{gathered}$ |  |  |  |

Table 7

## Determinants of SEO Discounting

This Table lists coefficients (p-value) from regressions of discounting on firm and offer characteristics. The regression model is

$$
\begin{aligned}
& \text { DISCOUNT }=\beta_{0}+\beta_{1} * \text { Spread }+\beta_{2} * V O L_{[-15, \ldots,-11]}+\beta_{3} * V O L_{[-2,-1]}+\beta_{4} * R E L_{-} V O L_{[-2,-1]}+\beta_{5} * A M O U N T \\
& +\beta_{6} * R E L \_ \text {OFFSIZE }+\beta_{7} * C A R+\beta_{8} * C A R_{-} P O S+\beta_{9} * C A R D U M+\beta_{9} * \text { BID_PR }_{-} \beta_{10} * R O U N D I N G+\varepsilon
\end{aligned}
$$

The dependent variable, DISCOUNT, is defined as -100 times the return from the previous day's closing transaction price to the offer price. Spread is the time-weighted average of relative quoted spreads over two trading days before an issue date. $\mathrm{VOL}_{[-15, \ldots,-11]}$ is the median of intraday volatility in the benchmark period (i.e. from day -15 to day -11 ). $\mathrm{VOL}_{[-2,-1]}$ is the median of intraday volatility over two trading days immediately before an offer. $\mathrm{REL}_{-} \mathrm{VOL}_{[-2,-1]}$ is the change in intraday volatility over two trading days immediately before an offer relative to the median of intraday volatility during the benchmark period). CAR is the cumulative abnormal return of five trading days prior to an offer, calculated using CAPM. CAR_POS (CAR_NEG) is equal to CAR if positive (negative) and 0 if otherwise. CARDUM is a dummy variable that is equal to 1 if CAR is positive and 0 if otherwise. Amount is total dollar amount of offer (in \$ million). REL_OFFSIZE is defined as offered shares divided by total shares outstanding prior to an offer. BID_PRC equals (closing transaction price-closing bid quote)/closing transaction price times 100 if the offer is priced at the closing bid quote. ROUNDING is a dummy variable that equals 1 if an offer is priced at $\$ 0.25$ increments and 0 if otherwise.

|  | Dependent Variable: Discounting for SEOs ( $n=60$ ) |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Intercept | $\begin{aligned} & \hline-1.92^{*} \\ & (0.099) \end{aligned}$ | $\begin{gathered} \hline-1.31 \\ (0.247) \end{gathered}$ | $\begin{gathered} \hline-1.63 \\ (0.181) \end{gathered}$ | $\begin{aligned} & \hline-2.03^{*} \\ & (0.082) \end{aligned}$ | $\begin{aligned} & -2.60^{* *} \\ & (0.031) \end{aligned}$ | $\begin{gathered} \hline-1.97^{*} \\ (0.098) \end{gathered}$ | $\begin{gathered} \hline-1.07 \\ (0.367) \end{gathered}$ | $\begin{gathered} 2.62 \\ (0.341) \end{gathered}$ | $\begin{gathered} 0.72 \\ (0.777) \end{gathered}$ | $\begin{gathered} 0.69 \\ (0.765) \end{gathered}$ |
| Spread | - - | - | $\begin{gathered} 1.20 \\ (0.799) \end{gathered}$ | - - |  | - - | - - | - - | - - | - |
| $\mathrm{VOL}_{[-15, \ldots,-11]}$ | $\begin{gathered} 2.71^{* * *} \\ (0.000) \end{gathered}$ | $\begin{gathered} 1.16 \\ (0.173) \end{gathered}$ | $\begin{gathered} 2.45^{* * *} \\ (0.001) \end{gathered}$ | $\begin{gathered} 2.51^{* * *} \\ (0.001) \end{gathered}$ | $\begin{gathered} 2.05 * * * \\ (0.001) \end{gathered}$ | $\begin{gathered} 2.50^{* * *} \\ (0.006) \end{gathered}$ | $\begin{aligned} & 1.91^{* * *} \\ & (0.002) \end{aligned}$ | $\begin{gathered} 1.32^{*} \\ (0.050) \end{gathered}$ | $\begin{gathered} 1.39 \\ (0.105) \end{gathered}$ |  |
| $\mathrm{VOL}_{[-2,-1]}$ |  | $\begin{gathered} 1.20^{*} \\ (0.074) \end{gathered}$ | - - |  |  | - | - |  |  | $\begin{gathered} 1.40 \\ (0.006) \end{gathered}$ |
| REL_VOL ${ }_{[-2,-1]}$ | $\begin{aligned} & 2.14 * * \\ & (0.047) \end{aligned}$ |  | $\begin{aligned} & 2.27 * * \\ & (0.032) \end{aligned}$ | $\begin{aligned} & 2.31 * * \\ & (0.020) \end{aligned}$ | $\begin{gathered} 2.48^{* *} \\ (0.0407) \end{gathered}$ | $\begin{aligned} & 2.27^{* *} \\ & (0.023) \end{aligned}$ | $\begin{gathered} 2.07 * \\ (0.057) \end{gathered}$ | $\begin{gathered} 4.34 * * * \\ (0.007) \end{gathered}$ | $\begin{gathered} 1.83 \\ (0.913) \end{gathered}$ |  |
| Amount | - - | - | - |  |  |  |  | $\begin{gathered} 0.17 \\ (0.169) \end{gathered}$ | $\begin{gathered} -0.23 \\ (0.639) \end{gathered}$ | $\begin{gathered} -0.23 \\ (0.643) \end{gathered}$ |
| REL_OFFSIZE | - | - | - |  |  | - | - | $\begin{gathered} -0.79 \\ (0.141) \end{gathered}$ | $\begin{gathered} 0.10 \\ (0.407) \end{gathered}$ | $\begin{gathered} 0.08 \\ (0.429) \end{gathered}$ |
| CAR | $\begin{gathered} 20.13 \\ (0.133) \end{gathered}$ | $\begin{gathered} 12.97 \\ (0.317) \end{gathered}$ | $\begin{gathered} 16.58 \\ (0.203) \end{gathered}$ | $\begin{gathered} 17.28 \\ (0.160) \end{gathered}$ |  | $\begin{gathered} 17.53 \\ (0.175) \end{gathered}$ | - |  | $\begin{gathered} 1.83 \\ (0.913) \end{gathered}$ |  |
| CAR_POS | $\begin{gathered} -73.48^{* * *} \\ (0.001) \end{gathered}$ | $\begin{gathered} -64.78 * * * \\ (0.003) \end{gathered}$ | $\begin{gathered} -70.10^{* * *} \\ (0.002) \end{gathered}$ | $\begin{gathered} -69.33^{* * *} \\ (0.001) \end{gathered}$ |  | $\begin{gathered} -70.16 * * * \\ (0.001) \end{gathered}$ |  |  | $\begin{aligned} & -51.93 \\ & (0.050) \end{aligned}$ | $\begin{aligned} & -51.55 \\ & (0.000) \end{aligned}$ |
| CARDUM | - - | - - | - | - |  | - - | $\begin{aligned} & -1.42 * * \\ & (0.075) \end{aligned}$ | - |  |  |
| BID_PRC | - | - | - | - |  | $\begin{gathered} -14.88 \\ (0.663) \end{gathered}$ | ) | - | - | - |
| ROUNDING | - | - | - | $\begin{gathered} 0.98 \\ (0.160) \\ \hline \end{gathered}$ | $\begin{gathered} 1.35^{*} \\ (0.085) \end{gathered}$ | $\begin{gathered} 0.94 \\ (0.186) \\ \hline \end{gathered}$ |  |  |  |  |
| Adj._R-square | 0.4321 | 0.3300 | 0.3479 | 0.3708 | 0.2046 | 0.3612 | 0.1932 | 0.1999 | 0.3784 | 0.3922 |
| F-stat | 9.13 | 8.27 | 7.30 | 7.95 | 6.06 | 6.56 | 5.71 | 3.94 | 5.77 | 8.58 |

[^4]Table 8

## Adjustment of Estimation of Stock Prices on the Offer Day

Panel A shows the result of testing the equality of first-day returns between two subsamples. Panel B is the regression of first-day returns against surprise discounting and constraints on informed trading. The regression model is as follows:

$$
\begin{aligned}
& \text { First - Day_return }=\beta_{0}+\beta_{1} * R E L_{-} V O L_{F}+\beta_{2} * C A R D U M \\
& +\beta_{3} *{\text { OPTION__CAR }+\beta_{4} * S U R P R I S E ~}_{+} \beta_{5} * M K T_{-} \text {RETURN }+\varepsilon
\end{aligned}
$$

The dependent variable, First-Day return is the return from the previous day's closing transaction price to offer day's closing transaction price. Surprise is the residual of model (1) in Table 7. MKT_RETURN is the return on the CRSP equal-weighted index on offer day. $\mathrm{REL}_{-} \mathrm{VOL}_{\mathrm{F}}$ is the change of intraday volatility on an offer day relative to the median of intraday volatility over two trading days immediately before an offer. CAR is the cumulative abnormal return of five trading days prior to an offer, calculated using CAPM. CARDUM is a dummy variable that is equal to 1 if CAR is positive and 0 if otherwise. OPTION_CAR is a dummy variable that is equal to 1 if the stock is listed on the options market or its five-day CAR is positive and 0 if otherwise. The values in parentheses are the $p$-values of the coefficients.

Panel A: t-test of the equality of first-day returns between the subsamples where $\mathrm{CAR}>0$ and $\mathrm{CAR} \leq 0$

|  | N | Mean | Standard <br> Deviation | p -value |
| :--- | :---: | :---: | :--- | :--- |
| All Sample | 60 | -0.3451 | 3.2304 | 0.4113 |
| CAR $>0$ | 26 | 1.0707 | 3.8583 | 0.1694 |
| CAR $\leq 0$ | 34 | -1.4278 | 2.1432 | $0.0005^{* * *}$ |
| Test of equality |  |  |  | $0.0023^{* * *}$ |

Panel B: Regression of first-day return

|  | All sample |  |  |  |
| :--- | :---: | :---: | :---: | :---: |
|  | $(1)$ | $(2)$ | $(3)$ | $(4)$ |
| INTERCEPT | $-1.6314^{* * *}$ | 0.2304 | - | - |
|  | $(0.0005)$ | $(0.6099)$ | - | - |
| REL_VOL $_{F}$ | - | - | $0.0164^{* * *}$ | $0.0166^{* * *}$ |
| CARDUM | - | - | $(0.0005)$ | $(0.0016)$ |
|  | $2.8782^{* * * *}$ | - | $(0.0000)$ | $2.9182^{* * *}$ |
| OPTION_CAR | $(0.0000)$ | - | - | $(0.0003)$ |
|  | - | $1.7321^{* * *}$ | - | - |
| SURPRISE | - | $(0.0287)$ | - |  |
|  | $-0.5390^{* * *}$ | $-0.5677 * * *$ | $-0.5405^{* * *}$ | $-0.0001)$ |
| MKT_RETURN | $(0.0001)$ | $(0.0002)$ | $0.7634^{* *}$ | $0.9610^{* *}$ |
|  | $0.7647 * *$ | 0.6010 | $(0.0278)$ | $(0.0141)$ |
| Adj. R-square | $(0.0279)$ | $(0.1101)$ | 0.3825 | 0.2057 |
| F-stat | 0.3834 | 0.2515 | 10.29 | 6.18 |

[^5]
[^0]:    ${ }^{2}$ http://www.cboe.com/data/AvgDailyVolArchive.aspx

[^1]:    ${ }^{3}$ Although from January 29, 2001, decimal pricing is fully implemented on NYSE, underwriters are still inclined to price at even eighth increments. In the present study's sample, 33 of 69 offers are priced at even eighth increments. The proportion of the sample with an offer price ending with $\$ 0.00, \$ 0.25, \$ 0.50$, and $\$ 0.75$ are $18.8,5.8,15.9$, and $4.4 \%$, respectively.

[^2]:    *Significant at the $10 \%$ level
    **Significant at the $5 \%$ level
    ***Significant at the $1 \%$ level

[^3]:    *Significant at the $10 \%$ level
    **Significant at the $5 \%$ level
    ***Significant at the $1 \%$ level

[^4]:    *Significant at the $10 \%$ level
    **Significant at the $5 \%$ level
    ***Significant at the $1 \%$ level

[^5]:    *Significant at the $10 \%$ level
    **Significant at the $5 \%$ level
    ***Significant at the $1 \%$ level

