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Information Asymmetry before and after SEOs*

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Information Asymmetry before and after SEOs

Abstract

We study the information asymmetry of stock trading before and after seasoned equity offerings (SEOs), using a sample of 3,811 SEOs made from 1997 to 2012 and a matched sample of non-SEO firms. We find that various measures of information asymmetry and transaction costs all reduce significantly for the SEO firms in the post-offer period from the pre-announcement period, but they remain unchanged for the matched non-SEO firms. We also find that the magnitudes of the reductions in the information asymmetry and transaction cost measures are related to firm size, offer size, institutional ownership, and volatility, in some cases significantly so.

JEL Classification: G10

Keywords: Seasoned equity offerings; Information asymmetry; Adverse selection component of effective spreads; Illiquidity; Bid-ask spreads

1. Introduction

Seasoned equity offerings (SEOs) are a popular approach for firms to raise additional equity capital.[1] The existing literature on SEOs has mainly explored three issues: (1) price phenomena around SEOs, (2) post-SEO underperformance, and (3) post-SEO risk reduction. Two price phenomena around an SEO event have been documented. The first price phenomenon is the negative price response; that is, the prices of SEO firms tend to drop on the announcement day.[2] The second price phenomenon is the underpricing; that is, SEO firms tend to price their new shares on the offer day below the closing price on the day before.[3]

The second issue is that SEO firms tend to underperform in the long run after the offer day.[4] Two major theories have emerged to explain the post-issue underperformance.[5] The first one is the market-timing theory, which refers to the practice of firms that tend to issue shares when they are overvalued and to repurchase them when they are undervalued. According to Loughran and Ritter (1995), firms tend to issue equities when they are substantially overvalued, leading to poor long-run performance after SEOs. An extension of the market-timing theory, called the earnings management theory, can also explain the underperformance. The practice of

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[1] Gao and Ritter (2010) categorize SEOs into fully marketed offers, accelerated offers, and rights offers. Fully marketed offers are traditional bookbuilt offers. Accelerated offers, including bought deals and accelerated bookbuilt offers, are usually shelf-registered offers. In rights offers, rights are issued to existing stockholders so that they can purchase additional shares. Before the late 1990s, the US equity market was dominated by fully marketed SEOs, while many Asian, European, and Australian SEOs were rights offers. Since the late 1990s, however, accelerated offers have gained popularity. In 2004, approximately half of the SEOs in the U.S. and more than a third of the SEOs in the rest of the world were accelerated SEOs.

[2] See, for example, Asquith and Mullins (1986), Masulis and Korwar (1986), Korajczyk, Lucas, and McDonald (1991), Lang and Lundholm (2000), and Lee and Masulis (2009).

[3] See, for example, Corwin (2003), Altinkilic and Hansen (2003), So (2006), and Lee and Masulis (2009).

[4] See, for example, Loughran and Ritter (1995), Spiess and Affleck-Graves (1995), Loughran and Ritter (1997), Loughran and Ritter (2000), and Baker and Wurgler (2000).

[5] Other than the major theories, model misspecification may also help explain the underperformance. According to Brav, Geczy, and Gompers (2000), SEO returns underperform various characteristic-based benchmarks in event-time performance tests. However, the time-series factor models, which can price SEO portfolio returns, show that SEO returns covary with the returns of non-issuing firms.

earnings management inflates stock prices temporarily, causing overvaluation before SEOs and underperformance afterwards. Rangan (1998) and Teoh, Welch, and Wong (1998) document a negative relation between pre-offering abnormal accruals and post-offering abnormal stock returns. Jo and Kim (2007) find that firms with extensive disclosure are likely to engage in less earnings management and give better post-SEO performance.

The second major theory for long-term underperformance is the behavioral under- and over-reaction theory. Daniel, Hirshleifer, and Subrahmanyam (1998) argue that since investors are in general overconfident, they tend to overreact to private information signals and underreact to public information signals. Since SEOs are often initiated when stocks are overvalued by the market, they are associated with initial negative announcement date returns. Due to investor underreaction to public information, SEOs are normally followed by long-run post-announcement underperformance. Lee (1997) reports that growth firms experience significant deterioration in earnings performance after SEOs, but mature firms do not. The finding is consistent with the overvaluation hypothesis that managers issue equity securities when they expect significant decreases in the growth of their firms while investors are still optimistic about their growth potential.

The third issue explored in the SEO literature is that the post-SEO risk reduction is largely consistent with the post-SEO underperformance; that is, the lower post-SEO stock returns (vs. the pre-SEO stock returns) are related to the lower post-SEO risk (vs. the pre-SEO risk). Several types of risks have been examined: valuation uncertainty risk, systematic risk, investment risk, unexpected inflation and default risks, leverage risk, and liquidity risk. Carlson, Fisher, and Giammarino (2006) point out that equity issuance is associated with firm expansion.

As firms grow, they issue new equity and then invest the proceeds in real assets. That is, they convert real options into assets in place. Since new assets have less valuation uncertainty than the options they replace, SEO firms' risks are reduced. Carlson, Fisher, and Giammarino (2010) report that systematic risk (measured by beta) increases before SEOs and decreases gradually thereafter, which is in line with real options theory.

Lyandres, Sun, and Zhang (2008) argue that in the post-SEO period, SEO issuers invest more and face less investment risk than non-issuers. Thus SEO firms earn lower returns. Eckbo, Masulis, and Norli (2000) observe that as equity issuers lower their leverage after SEOs, their exposure to unexpected inflation and default risks decreases. Elliott, Prevost, and Rao (2009) find that bondholders make significant positive returns upon the announcement of an SEO, supporting the leverage risk reduction hypothesis. Eberhart and Siddique (2002) examine the long-term performance of bonds and stocks following their SEOs, and document higher bond returns than stock returns. They note that SEOs reduce default risk, and thus transfer wealth from shareholders to bondholders. Eckbo and Norli (2005) present evidence that SEO firms have significantly higher turnovers than their matched non-SEO firms; that is, they face lower liquidity risk after SEOs.

Following the third strand of literature (i.e., the one on post-SEO risk reduction), this paper investigates the change in information asymmetry risk after SEOs. It is a worthwhile endeavor since information asymmetry risk is associated with stock returns and the cost of capital, as Easley, Hvidkjaer, and O'Hara (2002) and Easley and O'Hara (2004) have demonstrated. In addition, recent studies have employed the theory of information asymmetry to analyze a number of SEO-related issues, including management guidance on earnings, management compensation, management quality, underwriters, dual-class firms, and dividend-paying firms.[6] Despite the importance of the information asymmetry theory, no study has yet directly scrutinized the information asymmetry risk existing shortly before and shortly after SEOs.

This paper examines various measures of information asymmetry and transaction costs before and after SEOs. These measures include the adverse selection measure of Lin, Sanger, and Booth (1995), the order imbalance measures, the illiquidity measure of Amihud (2002), the quoted and effective bid-ask spreads, and the effective cost and price impact measures of Hasbrouck (2009). As the existing literature has demonstrated, SEO events lead to increases in stock shares outstanding, equity amount, and asset size, and decreases in various types of financial risks (valuation uncertainty risk, systematic risk, investment risk, unexpected inflation and default risks, leverage risk, and liquidity risk). Hence, we hypothesize that the stock trading of SEO firms becomes less risky in the post-offer period, and therefore the information asymmetry cost, liquidity cost, and transaction cost all reduce following SEO events.

[6] More specifically, Li and Zhuang (2012) show that management guidance on firms' future earnings and other financial information (i.e., voluntary disclosure) serves to alleviate information asymmetry around SEOs, thus reducing the magnitude of SEO underpricing. Datta, Iskandar-Datta, and Raman (2005) report a negative relation between the stock market's response to SEO announcements and the equity-based compensation of issuing firm managers. The market believes that managers with higher equity-based compensation tend to issue more overvalued equity, benefiting existing shareholders and exacerbating the adverse selection problem for potential shareholders. Chemmanur, Paeglis, and Simonyan (2010) report that higher quality managers are more credible to equity market investors, thereby reducing the information asymmetry between insiders and outsiders. SEO firms with higher management quality tend to have more reputable underwriters, smaller underwriting spreads, and smaller SEO discounts. Luo, Rao, and Yue (2010) find that firms with a low degree of information risk tend to hire prestigious underwriters, based on SEOs in China. Chaudhuri and Seo (2012) demonstrate that returns around SEO announcement dates and long-run stock performance following SEOs are significantly related to measures of divergence between insiders' voting and cash flow rights based on U.S. dual-class companies. That is because the misalignment of interests between insiders and outside shareholders can create incentives for managers to undertake value-destroying investments. Booth and Chang (2011) document that since the mid-1980s the difference in information asymmetry between dividend- and non-dividend-paying firms has increased sharply, and the market has reacted less negatively to SEO announcements by dividend-paying firms.

Our empirical study employs a sample of 3,811 SEOs made from 1997 to 2012 and a matched sample of non-SEO firms in the same period. For both SEO firms and non-SEO firms, we compare the levels of information asymmetry and transaction cost measures during the pre-announcement period (about 60 trading days) with those during the post-offer period (about 60 trading days also). Moreover, we examine some of the firm characteristics that may influence the magnitude of the reduction in the information asymmetry and transaction cost measures around SEOs. Our results show that the information asymmetry and transaction cost measures of SEO firms are significantly higher in the pre-announcement period than in the post-offer period. In contrast, the information asymmetry and transaction cost measures of non-SEO firms differ very little between the two periods. In addition, the magnitudes of the reductions in the information asymmetry and transaction cost measures are related to firm size, offer size, institutional ownership, and volatility, sometimes significantly so.

The remainder of this paper is organized as follows. Section 2 describes the measures of information asymmetry and transaction costs. Section 3 discusses the sample selection and research methodology. Section 4 reports empirical results. Section 5 concludes the paper.

2. Measures of Information Asymmetry and Transaction Costs

We investigate various measures of information asymmetry, liquidity, and transaction costs. The information asymmetry measures include the adverse selection component of effective spreads (λ), the daily order imbalance in terms of trades (OI_n), and the daily order imbalance in terms of shares (OI_v). The liquidity measures include the illiquidity (ILL) and the trading frequencies (Buy_n, $Sell_n$, Buy_v, and $Sell_v$). The transaction cost measures include the quoted bid-ask spreads (*Q-spread* and *Q-spread* (*bp*)), the effective bid-ask spreads (*E-spread* and *E-spread* (*bp*)), the effective cost (C^{TAQ}), and the price impact (PI^{TAQ}). Please see Table 1 for variable definitions. In the following subsections, we discuss these measures in detail.

[Insert Table 1 Here]

2.1. Information asymmetry measures

According to Lin, Sanger, and Booth (1995), the adverse selection component of effective spreads is the slope coefficient (λ) estimated from the following regression model:

$$\Delta Q_{t+1} = \lambda Z_t + \varepsilon_{t+1}, \quad (1)$$

where $\Delta Q_{t+1} = Q_{t+1} - Q_t$, and $Z_t = P_t - Q_t$. Here Q_t denotes the natural logarithm of the quote midpoint (*Mid-quote*) at time *t*, P_t represents the natural logarithm of the trade price at time *t*, and Z_t stands for the effective bid-ask spread at time *t*. All trades except for opening transactions on each day are included in the empirical analysis.

The daily order imbalance in terms of trades (OI_n) is calculated as the absolute difference between the number of trades initiated by buy orders and the number of trades initiated by sell orders divided by the total number of trades in a day. The daily order imbalance in terms of shares (OI_v) is calculated as the absolute difference between the share volume initiated by buy orders and the share volume initiated by sell orders divided by the total share volume in a day.

Our hypothesis is that the information asymmetry cost decreases after SEOs. Thus, we expect that the adverse selection component of effective spreads (λ), the order imbalance in terms of trades (OI_n), and the order imbalance in terms of shares (OI_v) all reduce in the post-SEO period.

2.2. Liquidity measures

Following Amihud (2002), the illiquidity measure (*ILL*) for each stock is calculated based on the following equation:

$$ILL = \frac{10^8}{D} \sum_{d=1}^{D} \frac{|R_d|}{VOL_d}, \tag{2}$$

where $|R_d|$ is the absolute value of stock return on day d, VOL_d is the daily volume in dollars on day d, and D is the number of trading days in a period (such as three months before the SEO). This ratio of absolute daily return to daily dollar volume represents the absolute percentage price change per dollar of daily trading volume, or the daily price impact of the order flow.

As for trading frequencies, Buy_n ($Sell_n$) is the number of transactions (i.e., trades) initiated by buy orders (sell orders) in a day. Buy_v ($Sell_v$) is the trading volume in thousands of shares initiated by buy orders (sell orders) in a day. Since firms tend to have more shares outstanding, higher turnovers, and lower illiquidity costs after SEOs, our hypothesis is that the illiquidity (*ILL*) reduces and the trading frequencies (Buy_n, $Sell_n$, Buy_v, and $Sell_v$) increase in the post-SEO period.

2.3. Transaction cost measures

The quoted bid-ask spread measures include the quoted bid-ask spread in dollars (*Q-spread*) and the quoted bid-ask spread (i.e., the ask price minus the bid price) in the hundredth percentage (*Q-spread* (*bp*)), which is defined as *Q-spread*/*Mid-quote*. The effective bid-ask spread measures include the effective bid-ask spread in dollars (*E-spread*) and the effective bid-ask spread in the hundredth percentage (*E-spread* (*bp*)). *E-spread* is calculated as 2×|*Trade price* – *Mid-quote*|, while *E-spread* (*bp*) is *E-spread/Mid-quote*.

Based on Hasbrouck (2009), the effective cost of a single trade is defined as the absolute difference between the natural logarithm of the transaction price and the natural logarithm of the prevailing quote midpoint (*Mid-quote*). The effective cost of trading a firm's stock (C^{TAQ}) during a period is estimated as the average effective cost over all trades during the period, weighted by the dollar value of the trade. Besides the effective cost, the price impact of a trade can also contribute to the transaction cost when an order is executed in multiple trades. According to Hasbrouck (2009), the price impact coefficient (PI^{TAQ}) is the slope coefficient estimated from the following regression:

$$\Delta P_\tau = PI^{TAQ}\left(Signed\sqrt{Dollar\ Volume}\right)_\tau + \varepsilon_\tau, \quad (3)$$

where ΔP_τ is the change in the natural logarithm of stock prices between time $\tau - 1$ and τ; $Signed\sqrt{Dollar\ volume}$ is the aggregated signed dollar volumes for each five-minute interval indexed by τ. The equation is estimated during the 3-month period either before the SEO announcement or after the SEO issue.

Our hypothesis is that the bid-ask spread measures, the effective cost, and the price impact all reduce after SEO events, which are in line with the hypothesized reductions in information asymmetry and liquidity costs.

3. Data Description and Methodology

3.1. Data description

We obtain data on SEOs from the Investment Dealers' Digest Directory of Corporate Financing over the period 1997–2012. An SEO is included in our sample if it meets the following criteria: (1) the issue is a primary seasoned offering; (2) the issue involves only common stocks; (3) the company is not a regulated utility; (4) data for the company are available in the Trade and Quote (TAQ) database and the Center for Research in Security Prices (CRSP) daily database; and (5) the company has at least 60 days of intraday tick information in the TAQ database in the four months before the announcement and the four months after the issue. Overall, our sample contains 3,811 SEOs in the sample period. The common stocks of the SEOs in our sample are traded on the New York Stock Exchange (NYSE), American Stock Exchange (Amex), or Nasdaq.

3.2. Matched sample

In addition to the test sample of SEOs, we also form a control sample of matched non-SEO firms. The SEO firms and non-SEO firms are matched based on stock price, trading volume, and industry.[7] More specifically, we use sequential matching to find the appropriate non-SEO firms. For each SEO firm in the sample, we first pick out from the databases those non-SEO candidate firms that are from the same industry. We then cross out those non-SEO candidate firms from the same industry that are not covered in both the TAQ and CRSP databases. Finally, among those qualified firms, we choose the one with the closest average trading volume and average price to the SEO firm during the six months before the SEO as the matched non-SEO firm.[8]

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[7] Easley, Kiefer, O'Hara, and Paperman (1996) show that the trading frequency affects the level of asymmetric information. Since the results for firms matched based on other firm characteristics (e.g., size, B/M, industry, etc.) are very similar, to save space, we will only report the results for firms matched based on stock price, trading volume, and industry. The results for firms matched by other criteria are available from the authors upon request.

[8] We choose the firm that minimizes the sum of $\left|\frac{AvgPrice_{non-SEo}-AvgPrice_{SEO}}{AvgPrice_{SEO}}\right|$ and $\left|\frac{AvgVolume_{non-SEo}-AvgVolume_{SEO}}{AvgVolume_{SEO}}\right|$ as the matched non-SEO firm.

3.3. Methodology

To investigate whether a firm's SEO affects the information asymmetry and transaction costs in its stock trading, we use the TAQ information for the 60 days before the announcement and the 60 days after the issue to estimate all the variables specified in Table 1.

We exclude all trades and quotes that occurred before the open and at the open, as well as those occurring at the close and after the close. In other words, all trades that occurred during the opening and closing auctions were omitted. Furthermore, we exclude all trades with non-typical settlement conditions. We also exclude all quotes with zero bid or ask prices, quotes with higher bid prices than ask prices, quotes for which the bid-ask spread is greater than 50% of the price, and trades with zero prices to eliminate possible data errors.

Two main adjustments are made to the data during our data processing. First, trades occurring within five seconds of each other at the same price and with no intervening quote revisions are collapsed into one trade. Second, trades are classified into buys and sells using the technique developed by Lee and Ready (1991). That is, trades at prices above the midpoint of the bid and ask prices are defined as buys, and those below the midpoint are sells. Trades occurring at the midpoint of the bid and ask prices are classified using the tick test. A trade executed at a price higher than the previous trade is defined as a buy, whereas one executed at a lower price is a sell. If the trade occurred at the midpoint and at the same price as the last trade, its price is compared with the next most recent trade. This process continues until the trade is classified.

To test whether the information asymmetry and transaction cost variables change significantly following an SEO, we regress each variable against a constant, a time trend, and a post-SEO dummy. The cross-sectional regression model is:

$$Var = c + \alpha_0 TT + \alpha_1 PostSEO + \varepsilon \quad (4)$$

where *Var* is any one of the measures of information asymmetry and transaction costs, including λ, OI_n, OI_v, *ILL*, *Q-spread* (*bp*), *E-spread (bp)*, C^{TAQ}, and PI^{TAQ}. *TT* is the time trend variable, calculated as the number of quarters between the SEO issue quarter and the quarter of the beginning of our sample (the 4th quarter of 1996). Since financial markets have gradually become more efficient over time, our measures of information asymmetry and transaction costs may have also been gradually reduced over time. To exclude the possibility that our results are driven by the time trend, we include this time trend dummy variable (*TT*) as the control variable. *PostSEO* is a dummy variable, which equals 1 for the period after the SEO issue, and 0 for the period before the SEO announcement. The *t*-statistics are adjusted by the Newey-West (1987) method. If the dependent variable (*Var*) reduces considerably after SEOs, the regression coefficient α_1 should be negative and significant.

To test what determines the changes in the information asymmetry and transaction cost variables after an SEO, we conduct a panel regression of the change in each variable against firm characteristics, as illustrated in the following equation:

$$\Delta Var = \alpha_0 + \alpha_1 FS + \alpha_2 OS + \alpha_3 IO + VOLA + \varepsilon \quad (5)$$

where ΔVar is the difference in a variable (*Var*) between the post-issue and pre-announcement periods. *Var* is λ, OI_n, OI_v, *ILL*, *Q-spread* (*bp*), *E-spread* (*bp*), C^{TAQ}, or PI^{TAQ}. *FS* is the log form of market capitalization before the announcement of the SEO. *OS* is the offer (or issue) size of the SEO in dollars divided by the market capitalization.[9] *IO* is the institutional ownership before the announcement of the SEO. *VOLA* is the volatility of the past 12-month returns ending three

[9] *OS* can also be defined as the number of shares offered divided by the number of shares outstanding. The results of the two kinds of definitions are the same.

months before the announcement of the SEO. Since we pool time-series and cross-sectional data together in the regression tests, the *t*-statistics are adjusted for the clustering effects of firms and SEO years.

To examine the relationship between the changes in information asymmetry and transaction cost measures and the SEO underpricing, we conduct a panel regression of the SEO underpricing (*UP*) against the changes in information asymmetry and transaction cost variables, with controls of firm features, as illustrated in the following equation:

$$UP = \alpha_0 + \alpha_1 \Delta Var + \alpha_2 Control\ Variables + \varepsilon \quad (6)$$

where ΔVar is the difference of a variable (*Var*) between after issue and before announcement of an SEO. *Var* is λ, OI_n, OI_v, *ILL*, *Q-spread* (*bp*), *E-spread* (*bp*), C^{TAQ}, or PI^{TAQ}. The control variables include *FS*OS, OS, IO,* and *VOLA*, which are defined previously. The SEO underpricing (*UP*) is calculated as *100*×(*Offer price – Pre-offer price*)/*Pre-offer price*.

4. Empirical Results

4.1. Summary statistics for SEOs

Table 2 presents the distribution of seasoned common stock offerings by year and by exchange. The entire sample contains a total of 2,942 firms and a total of 3,811 SEOs. The majority of the SEO firms made only one SEO during the entire sample period (1997–2012). The number of offerings each year ranges from 49 to 339. The average offer price is $26.25, the average of aggregate gross proceeds is $193.13 million, and the average relative offer size is 23.28% of pre-SEO market capitalization.[10]

[Insert Table 2 Here]

4.2. Information asymmetry and transaction cost measures around SEOs

Table 3 reports summary statistics for information asymmetry and transaction cost measures for SEO firms in Panel A, for the matched non-SEO firms in Panel B, and for their differences in Panel C. Results in Panel A indicate that various measures of information asymmetry and trading costs of stocks in the market tend to decline following SEO events. First, the information asymmetry measures, including the adverse selection component of effective spread (λ), the order imbalance in terms of trades (OI_n), and the order imbalance in terms of shares (OI_v), all reduce significantly at the 1% level after SEOs. Second, after SEOs, the level of the Amihud illiquidity (*ILL*) reduces significantly at the 1% level, while the trading frequencies (Buy_n, $Sell_n$, Buy_v, and $Sell_v$) increase significantly at the 1% level. The results suggest that the stocks of SEO firms tend to have lower liquidity costs or become more liquid after the issue. Third, the quoted and effective bid-ask spreads in dollars (*Q-spread* and *E-spread*) and in the hundredth percentage (*Q-spread* (*bp*) and *E-spread* (*bp*)), the effective cost (C^{TAQ}), and the price impact (PI^{TAQ}), all decrease significantly at the 1% level, implying lower transaction costs after SEOs. The reductions in bid-ask spreads are in line with the reductions in information asymmetry and liquidity costs in the post-SEO period, since information asymmetry and liquidity costs are components of bid-ask spreads.

[10] The relative offer size is defined as the offering gross proceeds divided by the pre-offering market value of the issuer's common stocks (Eckbo, Masulis, and Norli, 2000).

In contrast to Panel A, Panel B of Table 3 shows that most *t*-statistics for the changes in the information asymmetry and transaction cost measures are insignificant for the matched non-SEO firms. Hence, information asymmetry, liquidity, and transaction costs tend to remain the same after SEOs for the control sample firms which do not experience SEO events.

Panel C of Table 3 presents differences in various measures of information asymmetry and transaction costs between the SEO and non-SEO firms. We note that the changes in the differences are significant at the 1% level for most of the measures, confirming the results in Panel A of Table 3. Therefore, for the SEO firms, the changes in trading activities (including the decreases in the adverse selection component of effective spread and the order imbalance measures, the decrease in illiquidity, the increases in trading frequencies, the decreases in quoted and effective bid-ask spreads, and the decreases in effective cost and price impact) can all be ascribed to the SEO event, and they reflect a reduction in information asymmetry and transaction costs.

[Insert Table 3 Here]

In contrast, previous literature has shown that share repurchases, which involve a process that is the reverse of an SEO, exert the opposite effects on bid-ask spreads and information asymmetry. For example, Brockman and Chung (2001) document that bid-ask spreads widen during repurchase periods.[11] In addition, by decomposing bid-ask spreads into different cost components, they show that adverse selection costs increase substantially after share repurchases.

Since the measures of information asymmetry and transaction costs are serially correlated and may exhibit a declining trend over time, to further explore the changes in these measures around SEO events, we regress each measure against a constant, a time trend, and a post-SEO

[11] The authorized repurchase period is one year after the passage of the resolution of a buyback plan.

dummy, as illustrated in equation (4). Table 4 presents the regression estimates for SEO firms in Panel A, for non-SEO firms in Panel B, and for their differences in Panel C. As Panel A shows, the *PostSEO* dummy is negative and significant at the 1% level for each of the measures (λ, OI_n, OI_v, *ILL*, *Q-spread* (*bp*), *E-spread* (*bp*), C^{TAQ}, and PI^{TAQ}), even after controlling for the time trend. That is, the stock trading of SEO firms tends to have significantly reduced information asymmetry, illiquidity, and transaction costs shortly after their respective SEOs, and the reductions are not driven by the time trend. In Panel B, however, the *PostSEO* dummy is insignificantly different from zero, after controlling for the time trend for non-SEO firms. In other words, the matched non-SEO firms do not experience any significant changes in information asymmetry, illiquidity, and transact costs around their respective SEOs. In Panel C, the *PostSEO* dummy is negative and significant for the difference in each of the measures between SEO firms and non-SEO firms, even after controlling the time trend. Hence, the post-SEO differences in information asymmetry, illiquidity, and transaction costs between SEO and non-SEO firms are significantly lower than the pre-SEO differences. Overall, the results in Table 4 confirm those in Table 3.

[Insert Table 4 Here]

As shown above, the various measures of information asymmetry and transaction costs tend to reduce significantly after SEOs. The remaining issues to be examined include: (1) the magnitude of the reductions in information asymmetry and transaction cost measures in relation to firm features, and (2) the magnitude of the SEO underpricing in relation to changes in information asymmetry and transaction cost measures as well as firm features.

Table 5 provides a correlation matrix for the changes in information asymmetry and transaction costs ($\Delta\lambda$, ΔOI_n, ΔOI_v, *ΔILL*, *ΔQ-spread* (*bp*), *ΔE-spread* (*bp*), ΔC^{TAQ}, and ΔPI^{TAQ}), the firm features (*FS*, *OS*, *IO*, and *VOLA*), and the SEO underpricing (*UP*). We observe that most correlations tend to be low. There are only a few high correlation cases. For example, the change in the quoted bid-ask spread (*ΔQ-spread* (*bp*)) is highly correlated with the change in the effective bid-ask spread (*ΔE-spread* (*bp*)), and the change in the effective cost (ΔC^{TAQ}) is highly correlated with the change in the quoted bid-ask spread (*ΔQ-spread* (*bp*)) and the change in the effective bid-ask spread (*ΔE-spread* (*bp*)).

[Insert Table 5 Here]

4.3. Determinants of changes in information asymmetry and transaction cost measures

To investigate the magnitude of the reductions in information asymmetry and transaction costs in relation to firm features, we conduct a panel regression of the change in each of the measures against four determinants, as illustrated in equation (5). Table 6 presents regression estimates of the change in λ in Panel A, of the change in OI_n in Panel B, of the change in OI_v in Panel C, of the change in *ILL* in Panel D, of the change in *Q-spread* (*bp*) in Panel E, of the change in *E-spread* (*bp*) in Panel F, of the change in C^{TAQ} in Panel G, and of the change in PI^{TAQ} in Panel H.

[Insert Table 6 Here]

In Panel A of Table 6, the full version of the testing model shows that the change in the adverse selection component of effective spread ($\Delta\lambda$) is negatively and significantly related to firm size (*FS*) and volatility (*VOLA*). That is, companies with larger firm size and higher volatility before the SEO announcement tend to undergo a larger reduction in λ after the issue of seasoned equities. In Panel B, it is found that the change in the order imbalance of trades (ΔOI_n) is negatively and significantly related to firm size (*FS*). Thus, companies with larger firm size before the SEO announcement are likely to experience a larger reduction in OI_n after the issue of seasoned equities. In Panel C, we note that the change in the order imbalance of shares (ΔOI_v) is negatively and significantly related to firm size (*FS*) and offer size (*OS*), and positively and significantly related to volatility (*VOLA*). That is, companies with larger firm size, larger offer size, and lower volatility before SEOs tend to have a larger reduction in OI_v after SEOs.

In Panel D, based on the full version of the testing model, the change in the illiquidity measure (ΔILL) is positively and significantly related to firm size (*FS*) and volatility (*VOLA*), and negatively and significantly related to offer size (*OS*). Thus, companies with smaller firm size, bigger offer size, and lower volatility before the SEO announcement may see a larger reduction in *ILL* after the issue of seasoned equities.

In Panels E and F, the full version of the testing model shows that the change in the quoted and effective bid-ask spreads (Δ*Q-spread* (*bp*) and (Δ*E-spread* (*bp*)) are negatively and significantly related to offer size (*OS*) and volatility (*VOLA*), and positively and significantly related to firm size (*FS*). In other words, companies with smaller firm size, larger offer size, and higher volatility before SEOs tend to undergo a larger reduction in the quoted and effective bid-ask spreads after SEOs.

In Panel G, the full version of the testing model reveals that the change in the effective cost (ΔC^{TAQ}) is negatively and significantly related to offer size (*OS*), and positively and significantly related to firm size (*FS*). Hence, companies with smaller firm size and larger offer size before the SEO announcement are likely to experience a larger reduction in C^{TAQ} after the issue of seasoned equities. In Panel H, the change in the price impact (ΔPI^{TAQ}) is negatively and significantly related to firm size (*FS*), and positively and significantly related to institutional ownership (*IO*) and volatility (*VOLA*). Hence, companies with larger firm size, lower institutional ownership, and lower volatility before SEOs are likely to experience a larger reduction in PI^{TAQ} after SEOs.

In summary, the four determinants (*FS*, *OS*, *IO*, and *VOLA*) have different effects on the changes in the various measures of information asymmetry and transaction costs. The results appear to indicate that each of these measures may explain different dimensions of information asymmetry or transaction costs. More specifically, firm size (*FS*) has a significantly negative effect on $\Delta\lambda$, ΔOI_n, ΔOI_v, Δ*Q-spread* (*bp*), Δ*E-spread* (*bp*), or ΔPI^{TAQ} but a significantly positive effect on Δ*ILL* or ΔC^{TAQ}. Offer size (*OS*) has a significantly negative effect on ΔOI_v, Δ*ILL*, Δ*Q-spread* (*bp*), Δ*E-spread* (*bp*), ΔC^{TAQ}, or ΔPI^{TAQ} but no effect on $\Delta\lambda$ or ΔOI_n. Stock return volatility (*VOLA*) has a significantly negative effect on $\Delta\lambda$, Δ*Q-spread* (*bp*), or Δ*E-spread* (*bp*), positive effect on ΔOI_v, Δ*ILL*, or ΔPI^{TAQ}, but no effect on ΔOI_n or ΔC^{TAQ}. Finally, institutional ownership has a significantly negative effect on Δ*Q-spread* (*bp*) or Δ*E-spread* (*bp*), positive effect on ΔPI^{TAQ}, and no effect on the other five measures. It appears that offer size has the most consistent effect (negative) on these information asymmetry and transaction cost measures, followed by firm size (with the exception of Δ*ILL* or ΔC^{TAQ} having a positive effect).

4.4. SEO underpricing and changes in information asymmetry and transaction cost measures

We investigate whether investors *ex ante* price in the magnitude of the underpricing of SEOs that reflects the expected reductions in our measures of information asymmetry and transaction costs. Table 7 presents the results of regressions of SEO underpricing against changes in information asymmetry and transaction cost variables, with control of *FS*OS*, *OS*, *IO*, and *VOLA*. We observe that SEO underpricing (*UP*) is significantly affected by the change in most of the information asymmetry and transaction cost variables, but their effects are different. On one hand, underpricing is negatively and significantly related to changes of quoted spread, effective spread, and effective cost, indicating that a larger absolute amount of underpricing is related to a smaller amount of reduction in quoted spread, effective spread, or effective cost. On the other hand, underpricing is positively and significantly related to order imbalance in terms of trade and price impact, suggesting that a larger absolute amount of underpricing is related to a larger amount of reduction in order imbalance in terms of trades or price impact. Among the control variables, we note that underpricing is positively and significantly related to firm size, and negatively and significantly related to offer size, suggesting that companies with larger firm size and smaller offer size before SEOs tend to experience a smaller absolute amount of SEO underpricing.

[Insert Table 7 Here]

5. Conclusions

In this paper, we investigate several information asymmetry and transaction cost measures around SEO events. We document significant reductions in the adverse selection component of effective spread (λ), the order imbalance in terms of trades (OI_n), the order imbalance in terms of shares (OI_v), the illiquidity (*ILL*), the quoted bid-ask spread in the hundredth percentage (*Q-spread* (*bp*)), the effective bid-ask spread in the hundredth percentage (*E-spread* (*bp*)), the effective cost (C^{TAQ}), and the price impact (PI^{TAQ}) during the three months after an SEO. In addition, the magnitudes of the reductions in the information asymmetry and transaction cost measures are significantly related to some of the four determinants, including firm size, offer size, institutional ownership, and volatility.

Our findings of the post-SEO reductions in information asymmetry and transaction costs are in line with existing empirical results for other types of risk. That is, after SEOs, firms are apt to experience reductions in valuation uncertainty risk, systematic risk, investment risk, unexpected inflation and default risks, leverage risk, and liquidity risk. Moreover, our direct scrutiny of information asymmetry and transaction costs around SEOs complements the batch of recent studies that employ the information asymmetry theory to explain numerous SEO-related issues, such as management guidance on earnings, management compensation, management quality, underwriters, dual-class firms, and dividend-paying firms.

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Table 1. Variable definitions

λ	The adverse selection measure of Lin, Sanger, and Booth (1995). It is slope coefficient estimated from the regression: $\Delta Q_{t+1} = \lambda Z_t + e_{t+1}$, where $\Delta Q_{t+1} = Q_{t+1} - Q_t$, and $Z_t = P_t - Q_t$; Q_t is the natural logarithm of the quote midpoint (*Mid-quote*) at time *t*, and P_t is the natural logarithm of the trade price at time *t*. The regression is estimated for each firm during the 3-month period around the SEO announcement/issuing using the high-frequency (TAQ) data.
Buy_n	Daily number of transactions (in terms of trades) initiated by buy orders. Transaction types are classified by using the Ready and Lee (1991) method.
$Sell_n$	Daily number of transactions (in terms of trades) initiated by sell orders. Transaction types are classified by using the Ready and Lee (1991) method.
Buy_v	Daily trading volume (in terms of thousand shares) initiated by buy orders. Transaction types are classified by using the Ready and Lee (1991) method.
$Sell_v$	Daily trading volume (in terms of thousand shares) initiated by sell orders. Transaction types are classified by using the Ready and Lee (1991) method.
OI_n	Daily absolute order imbalance in terms of trades, calculated as $\lvert Buy_n - Sell_n \rvert / (Buy_n + Sell_n)$
OI_v	Daily absolute order imbalance in terms of share volume, calculated as $\lvert Buy_v - Sell_v \rvert / (Buy_v + Sell_v)$
Ill	The Amihud (2002) illiquidity measure, calculated as $\lvert Daily\ return \rvert / Daily\ dollar\ volume$, average over all days with nonzero volume. It is calculated for each firm during the 3-month period around the SEO announcement/issuing.
Q-spread	Daily quoted spread in dollars, calculated as *Ask price – Bid price*. Quotations with a size or price of zero are ignored.
Q-spread (*bp*)	Daily quoted spread in the hundredth percentage, calculated as *Q-spread/Mid-quote*. Quotations with a size or price of zero are ignored.
E-spread	Daily effective spread in dollars, calculated as |*Trade price – Mid-quote*| × 2.
E-spread (*bp*)	Daily effective spread in the hundredth percentage, calculated as *E-spread/Mid-quote*.
C^{TAQ}	Effective cost. For a given trade, the effective cost is the difference between the natural logarithm of the transaction price (*Trade price*) and the natural logarithm of the prevailing quote midpoint (*Mid-quote*). It is estimated for each firm during the 3-month period around the SEO announcement/issuing using the high-frequency (TAQ) data. C^{TAQ} is the average over all trades during the 3-month period, weighted by the dollar value of the trade.
PI^{TAQ}	Price impact coefficient. It is slope coefficient estimated from the regression: $\Delta P_\tau = PI^{TAQ}\left(Signed\sqrt{Dollar\ volume}\right)_\tau + \varepsilon_\tau$, where ΔP_τ is the change in the natural logarithm of stock prices between τ-1 and τ and $Signed\sqrt{Dollar\ volume}$ is the aggregated signed dollar volumes for each five-minute interval indexed by τ. The slope coefficient is estimated for each firm during the 3-month period around the SEO announcement /issuing using the high-frequency (TAQ) data.

Table 2
Distribution of seasoned common stock offerings by year and by exchange

This table presents the distribution of seasoned common stock offerings by year and by exchange. The sample period is from 1997 to 2012. Relative offer size is calculated as the gross proceeds divided by the pre-offering market value of the issuer's common stocks.

	All offers					NYSE/Amex offers				Nasdaq offers			
Year	No. of Firms	No. of offerings	Offer price	Aggregate gross proceeds ($M)	Relative offer size (%)	No. of offerings	Offer price	Aggregate gross proceeds ($M)	Relative offer size (%)	No. of offerings	Offer price	Aggregate gross proceeds ($M)	Relative offer size (%)
1997	49	49	27.25	104.87	22.69	36	29.03	118.04	21.31	13	22.31	68.41	26.51
1998	307	314	28.65	132.39	29.32	130	31.62	200.43	30.68	184	26.55	84.32	28.35
1999	325	333	41.31	219.48	28.35	94	36.35	312.43	23.96	239	43.26	182.92	30.10
2000	298	304	49.40	248.19	18.31	69	44.24	362.08	20.96	235	50.92	214.75	17.54
2001	261	270	25.96	181.18	36.67	137	28.78	240.67	50.96	133	23.04	119.90	21.96
2002	231	241	23.28	176.36	21.59	142	24.94	243.72	21.09	99	20.89	79.76	22.31
2003	294	307	21.84	149.99	27.88	157	24.76	197.11	32.24	150	18.78	100.68	23.30
2004	288	295	25.40	169.37	26.00	153	28.30	240.28	28.87	142	22.27	92.97	22.91
2005	150	152	26.42	243.02	28.58	69	26.89	361.40	31.84	83	26.02	144.60	25.84
2006	220	238	26.09	191.48	14.01	99	31.20	292.11	13.83	139	22.45	119.81	14.10
2007	204	214	24.34	197.53	15.39	83	28.43	318.75	15.12	131	21.75	120.72	15.55
2008	100	105	24.37	347.94	12.41	61	27.09	535.47	12.56	44	20.60	87.97	12.20
2009	319	339	14.22	202.96	17.01	140	18.73	370.81	15.02	199	11.05	84.87	18.36
2010	247	271	14.55	168.89	28.37	112	20.51	314.57	18.08	159	10.36	66.27	34.75
2011	195	205	19.76	203.30	17.06	87	25.73	342.51	17.52	118	15.36	100.66	16.80
2012	160	174	19.18	205.63	16.26	81	23.04	321.81	13.69	93	15.81	104.43	18.08
All	2,942	3,811	26.25	193.13	23.28	1,650	27.46	288.44	24.40	2,161	25.34	120.36	22.34

Table 3
Summary statistics for information asymmetry and transaction cost measures

This table reports summary statistics for information asymmetry and transaction cost measures for SEO firms in Panel A, for the matched non-SEO firms in Panel B, and for the differences between SEO and non-SEO firms in Panel C. λ is the adverse selection measure of Lin, Sanger, and Booth (1995). OI_n (OI_y) is the daily absolute order imbalance in terms of trades (shares). *ILL* is the Amihud (2002) illiquidity measure. Buy_n ($Sell_n$) is the number of trades initiated by buy (sell) orders. Buy_n ($Sell_n$) is the number of shares initiated by buy (sell) orders. *Q-spread* (*Q-spread* (*bp*)) is the quoted bid-ask spread in dollars (in the hundredth percentage). *E-spread* (*E-spread* (*bp*)) is the effective bid-ask spread in dollars (in the hundredth percentage). C^{TAQ} is the effective cost, while PI^{TAQ} is the price impact coefficient. Detailed definitions of variables are given in Table 1. Diff is the difference in the respective estimate between the after-issue and before-announcement periods. The t-statistic is used to test the null hypothesis that Diff = 0. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Before announcement (1)		After issue (2)		Diff=(2)-(1)		
	Mean	Median	Mean	Median	Mean	Median	t-stat
Panel A: Summary statistics for SEO firms							
λ	0.497	0.488	0.426	0.417	-0.064	-0.061	-11.83***
OI_n	12.984	9.171	12.131	8.507	-0.986	-0.982	-3.16***
OI_v	14.752	8.884	13.356	8.550	-1.368	-0.811	-3.08***
ILL	1.072	0.786	0.387	0.372	-0.685	-0.397	-5.16***
Buy_n	231.163	195.304	310.325	252.969	80.789	74.354	15.43***
$Sell_n$	273.716	221.350	363.885	380.433	93.715	89.660	15.87***
Buy_v	146.448	155.745	214.606	195.006	69.492	66.810	11.44***
$Sell_v$	177.251	163.930	251.516	204.009	77.028	77.322	11.43***
Q-spread	0.260	0.220	0.227	0.192	-0.030	-0.020	-11.83***
Q-spread (*bp*)	114.238	100.681	94.029	81.352	-20.455	-18.961	-27.39***
E-spread	0.149	0.114	0.127	0.097	-0.021	-0.011	-12.10***
E-spread (*bp*)	67.248	54.645	53.546	44.467	-14.185	-8.209	-21.81***
C^{TAQ}	0.314	0.264	0.255	0.222	-0.059	-0.036	-22.57***
PI^{TAQ}	2.375	1.719	1.454	1.479	-0.875	-0.867	-5.32***
Panel B: Summary statistics for non-SEO firms							
λ	0.512	0.512	0.519	0.534	0.003	0.006	0.34
OI_n	13.655	10.001	14.491	10.458	0.486	0.303	1.55
OI_v	14.828	10.058	15.856	10.771	0.702	1.489	1.10
ILL	1.149	0.974	1.078	0.909	-0.087	-0.063	-0.33
Buy_n	197.381	180.138	198.885	182.016	2.934	2.115	0.95
$Sell_n$	230.237	187.538	236.619	192.640	6.778	5.224	1.90*
Buy_v	149.198	154.272	150.931	148.891	-2.527	-2.315	-0.68
$Sell_v$	174.334	157.572	187.293	163.655	3.620	3.263	0.99
Q-spread	0.231	0.192	0.227	0.181	-0.001	-0.002	-0.54
Q-spread (*bp*)	111.242	95.957	111.571	93.615	-1.644	-1.546	-0.33
E-spread	0.128	0.097	0.126	0.094	-0.001	-0.001	-0.36
E-spread (*bp*)	65.172	48.678	66.157	49.091	-0.591	-0.825	-0.96
C^{TAQ}	0.309	0.244	0.304	0.240	-0.003	-0.003	-1.11
PI^{TAQ}	2.011	1.836	2.105	2.372	0.051	0.035	0.25

Table 3 – continued.

	Before announcement (1)		After issue (2)		Diff=(2)-(1)		
	Mean	Median	Mean	Median	Mean	Median	t-stat
Panel C: Summary statistics for the differences between SEO and non-SEO firms							
$\Delta\lambda$	0.003	-0.001	-0.089	-0.071	-0.092	-0.074	-4.57***
ΔOI_n	-0.439	-0.299	-2.359	-1.958	-1.691	-1.861	-3.92***
ΔOI_v	-0.514	-0.756	-2.479	-2.178	-1.897	-1.825	-2.05**
ΔILL	-0.073	0.111	-0.690	-0.637	-0.605	-0.633	-2.47***
ΔBuy_n	36.305	22.323	111.440	81.708	77.817	70.337	12.70***
$\Delta Sell_n$	46.487	35.810	127.266	140.197	86.305	84.591	12.32***
ΔBuy_v	-2.389	-1.492	64.307	48.677	75.249	68.440	10.48***
$\Delta Sell_v$	3.080	4.205	64.902	49.328	76.122	68.368	9.76***
Δ*Q-spread*	0.028	0.021	0.000	0.004	-0.028	-0.019	-8.16***
Δ*Q-spread* (*bp*)	1.632	2.613	-17.542	-11.804	-18.695	-16.372	-19.01***
Δ*E-spread*	0.021	0.013	0.000	0.004	-0.020	-0.010	-8.32***
Δ*E-spread* (*bp*)	1.195	2.490	-12.611	-5.084	-13.561	-8.454	-15.50***
ΔC^{TAQ}	0.005	0.008	-0.051	-0.020	-0.056	-0.037	-13.57***
ΔPI^{TAQ}	0.364	0.472	-0.651	-0.381	-0.824	-0.692	-2.33**

Table 4
Tests of information asymmetry and transaction cost measures for SEO and non-SEO firms

This table presents the regression estimates for SEO firms in Panel A, non-SEO firms in Panel B, and the differences between SEO and non-SEO firms in Panel C. The cross-sectional regression model is

$$Var = c + \alpha_0 TT + \alpha_1 PostSEO + \varepsilon$$

where *Var* is any one of the following measures of information asymmetry and transaction costs: λ, OI_n, OI_v, *ILL*, *Q-spread* (*bp*), *E-spread* (*bp*), C^{TAQ}, and PI^{TAQ}. λ is the adverse selection measure of Lin, Sanger, and Booth (1995). OI_n (OI_v) is the daily absolute order imbalance in terms of trades (shares). *ILL* is the Amihud (2002) illiquidity measure. *Q-spread* (*Q-spread* (*bp*)) is the quoted bid-ask spread in dollars (in the hundredth percentage). *E-spread* (*E-spread* (*bp*)) is the effective bid-ask spread in dollars (in the hundredth percentage). C^{TAQ} is the effective cost, while PI^{TAQ} is the price impact coefficient. Detailed definitions of variables are given in Table 1. *TT* is the time trend variable, calculated as the number of quarters between the SEO issue quarter and the quarter of the beginning of our sample (the 4th quarter of 1996). *PostSEO* is the dummy variable, which equals 1 for the period after the SEO issue, and 0 for the period before the SEO announcement. The numbers in parentheses are *t*-statistics adjusted by the Newey-West (1987) method. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Var	*Intercept*	*t-statistic*	*TT*	*t-statistic*	*PostSEO*	*t-statistic*
Panel A: SEO firms						
λ	0.411***	(53.68)	0.003***	(14.32)	-0.074***	(-11.21)
OI_n	0.090***	(27.76)	0.001***	(9.56)	-0.008***	(-2.55)
OI_v	0.071***	(19.64)	0.002***	(14.09)	-0.004***	(-3.86)
ILL	0.083***	(5.80)	0.001**	(2.40)	-0.068***	(-4.88)
Q-spread (*bp*)	1.223***	(64.47)	-0.015***	(-2.61)	-0.216***	(-12.96)
E-spread (*bp*)	0.753	(50.06)	-0.020***	(-4.97)	-0.148***	(-11.94)
C^{TAQ}	0.308***	(55.18)	0.000	(0.47)	-0.059***	(-11.96)
PI^{TAQ}	-3.756***	(-35.51)	0.054***	(21.97)	-0.884***	(-10.64)
Panel B: Non-SEO firms						
λ	0.312***	(5.96)	0.007***	(3.93)	0.049	(0.95)
OI_n	0.096***	(22.41)	0.002***	(10.53)	0.007	(0.73)
OI_v	0.071***	(16.65)	0.003***	(18.11)	0.010**	(2.18)
ILL	0.141***	(6.75)	-0.001	(-1.32)	-0.006	(-0.33)
Q-spread (*bp*)	1.506***	(65.87)	-0.013***	(-22.13)	-0.021	(-1.09)
E-spread (*bp*)	0.885***	(45.62)	-0.007***	(-15.00)	-0.012	(-0.80)
C^{TAQ}	0.004***	(50.67)	-0.000	(-0.83)	-0.000	(-0.74)
PI^{TAQ}	-0.809***	(-9.65)	0.017***	(8.54)	-0.113	(-1.61)
Panel C: Differences between SEO and non-SEO firms						
λ	0.028***	(5.50)	-0.003***	(-6.36)	-0.023***	(-5.44)
OI_n	-0.011**	(-2.05)	0.001***	(3.38)	-0.015***	(-2.84)
OI_v	-0.009	(-1.43)	-0.001	(-1.54)	-0.006**	(-2.01)
ILL	-0.092***	(-4.22)	0.003***	(3.16)	-0.029***	(-3.46)
Q-spread (*bp*)	-0.353***	(-16.35)	0.013***	(21.85)	-0.185***	(-9.64)
E-spread (*bp*)	-0.190***	(-9.90)	0.007***	(13.28)	-0.125***	(-8.05)
C^{TAQ}	-0.001***	(-10.15)	0.001***	(14.28)	-0.005***	(-8.29)
PI^{TAQ}	-0.301***	(-18.49)	0.040***	(10.67)	-0.989***	(-8.08)

Table 5 Correlation matrix

This table provides a correlation matrix for the changes in information asymmetry and transaction costs ($\Delta\lambda$,ΔOI_n, ΔOI_v, *ΔILL*, *ΔQ-spread* (*bp*), *ΔE-spread* (*bp*), ΔC^{TAQ}, and ΔPI^{TAQ}), the firm features (*FS*, *OS*, *IO*, and *VOLA*), and the SEO underpricing (*UP*). λ is the adverse selection measure of Lin, Sanger, and Booth (1995). OI_n (OI_y) is the daily absolute order imbalance in terms of trades (shares). *ILL* is the Amihud (2002) illiquidity measure. *Q-spread* (*Q-spread* (*bp*)) is the quoted bid-ask spread in dollars (in the hundredth percentage). *E-spread* (*E-spread* (*bp*)) is the effective bid-ask spread in dollars (in the hundredth percentage). C^{TAQ} is the effective cost, while PI^{TAQ} is the price impact coefficient. Detailed definitions of variables are given in Table 1. *FS* is the log form of market capitalization before the announcement of the SEO. *OS* is the offer size of the SEO in dollars divided by the market capitalization. *IO* is the institutional ownership before the announcement of the SEO. *VOLA* is volatility of the past 12-month returns ending three months before the announcement of the SEO. *UP* is the SEO underpricing, calculated as *100*×(*Offer price–Pre-offer price*)*/Pre-offer price*.

	ΔOI_n	ΔOI_v	*ΔILL*	*ΔQ-spread*	*ΔE-spread*	ΔC^{TAQ}	ΔPI^{TAQ}	*FS*	*OS*	*IO*	*VOLA*	*UP*
$\Delta\lambda$	0.038	0.003	-0.135	-0.072	-0.111	-0.090	-0.086	-0.104	0.080	0.026	-0.033	-0.021
ΔOI_n		0.536	0.019	-0.032	0.065	-0.014	0.128	-0.071	0.037	0.036	0.021	0.034
ΔOI_v			0.036	-0.025	0.000	-0.050	0.115	-0.092	0.004	0.044	0.038	0.009
ΔILL				0.326	0.385	0.276	-0.009	0.261	-0.257	-0.014	0.056	0.004
ΔQ-spread					0.852	0.749	-0.124	0.324	-0.285	-0.053	-0.089	-0.133
ΔE-spread						0.814	-0.104	0.357	-0.284	-0.052	-0.096	-0.107
ΔC^{TAQ}							-0.135	0.340	-0.262	-0.072	-0.018	-0.117
ΔPI^{TAQ}								-0.140	0.055	0.063	0.199	0.049
FS									-0.502	-0.117	-0.002	0.002
OS										0.065	-0.024	0.112
IO											0.012	-0.018
VOLA												-0.017

Table 6
Determinants of changes in information asymmetry and transaction cost measures

This table presents regression estimates for the changes in the liquidity and information asymmetry measures. The panel regression model is:

$$\Delta Var = \alpha_0 + \alpha_1 FS + \alpha_2 OS + \alpha_3 IO + VOLA + \varepsilon$$

where ΔVar is the difference in a variable (*Var*) between after issue and before announcement of an SEO. The variable (*Var*) is λ, OI_n, OI_v, *ILL*, *Q-spread* (*bp*), *E-spread* (*bp*), C^{TAQ}, or PI^{TAQ}. λ is the adverse selection measure of Lin, Sanger, and Booth (1995). OI_n (OI_y) is the daily absolute order imbalance in terms of trades (shares). *ILL* is the Amihud (2002) illiquidity measure. *Q-spread* (*Q-spread* (*bp*)) is the quoted bid-ask spread in dollars (in the hundredth percentage). *E-spread* (*E-spread* (*bp*)) is the effective bid-ask spread in dollars (in the hundredth percentage). C^{TAQ} is the effective cost, while PI^{TAQ} is the price impact coefficient. Detailed definitions of variables are given in Table 1. *FS* is the log form of market capitalization before the announcement of the SEO. *OS* is the offer size of the SEO in dollars divided by the market capitalization. *IO* is the institutional ownership before the announcement of the SEO. *VOLA* is volatility of the past 12-month returns ending three months before the announcement of the SEO. The *t*-statistics adjusted for the clustering effects of firms and SEO years are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Intercept	*FS*	*OS*	*IO*	*VOLA*	Adj. R^2
		Panel A: $\Delta Var = \Delta\lambda$			
0.175***	-1.993***				0.108
(4.94)	(-3.95)				
0.142***	-1.631***	4.578			0.114
(3.18)	(-2.82)	(1.11)			
0.138***	-1.601***	4.573	0.907		0.122
(3.06)	(-2.76)	(1.11)	(0.49)		
0.150***	-1.611***	4.450	0.935	-0.065**	0.133
(3.26)	(-2.78)	(1.08)	(0.51)	(-2.10)	
		Panel B: $\Delta Var = \Delta OI_n$			
0.028***	-0.436***				0.037
(2.48)	(-2.69)				
0.028**	-0.436**	-0.764			0.037
(1.96)	(-2.35)	(-0.01)			
0.026*	-0.416**	-1.568	0.607		0.043
(1.73)	(-2.21)	(-0.01)	(0.92)		
0.022	-0.414**	2.393	0.599	0.184	0.049
(1.47)	(-2.20)	(0.02)	(0.91)	(1.57)	
		Panel C: $\Delta Var = \Delta OI_v$			
0.044***	-0.671***				0.081
(3.68)	(-3.83)				
0.063***	-0.881***	-2.615*			0.105
(4.36)	(-4.54)	(-1.89)			
0.059***	-0.852***	-2.624*	0.871		0.116
(4.06)	(-4.38)	(-1.90)	(1.37)		
0.054***	-0.848***	-2.565*	0.859	0.281**	0.129
(3.64)	(-4.37)	(-1.86)	(1.35)	(2.23)	

Table 6 – continued.

Intercept	*FS*	*OS*	*IO*	*VOLA*	Adj. R^2
		Panel D: $\Delta Var = \Delta ILL$			
-0.408***	5.487***				0.072
(-7.09)	(6.83)				
-0.253***	3.799***	-20.998***			0.093
(-3.62)	(4.35)	(-2.67)			
-0.259***	3.845***	-21.019***	1.405		0.093
(-3.59)	(4.32)	(-2.67)	(1.45)		
-0.281***	3.861***	-20.774***	1.354	0.115***	0.096
(-3.73)	(4.33)	(-2.64)	(1.40)	(3.94)	
		Panel E: $\Delta Var = \Delta Q\text{-}spread$ (*bp*)			
-0.799***	9.081***				0.106
(-18.10)	(14.94)				
-0.593***	6.837***	-27.948***			0.125
(-10.64)	(9.79)	(-5.04)			
-0.587***	6.793***	-27.930***	-1.368		0.125
(-10.39)	(9.67)	(-5.05)	(-0.74)		
-0.537***	6.753***	-28.501***	-1.263	-0.266***	0.134
(-9.31)	(9.60)	(-5.19)	(-0.69)	(-5.07)	
		Panel F: $\Delta Var = \Delta E\text{-}spread$ (*bp*)			
-0.645***	7.552***				0.127
(-18.13)	(15.54)				
-0.502***	5.996***	-19.377***			0.143
(-11.31)	(10.90)	(-4.12)			
-0.499***	5.969***	-19.366***	-0.834		0.143
(-11.02)	(10.75)	(-4.12)	(-0.59)		
-0.462***	5.940***	-19.789***	-0.758	-0.196***	0.151
(-10.10)	(10.68)	(-4.24)	(-0.54)	(-5.04)	
		Panel G: $\Delta Var = \Delta C^{TAQ}$			
-0.235***	2.721***				0.116
(-18.35)	(15.47)				
-0.188***	2.200***	-6.444***			0.129
(-11.17)	(10.52)	(-4.02)			
-0.184***	2.171***	-6.432***	-0.907		0.130
(-10.83)	(10.34)	(-4.02)	(-1.53)		
-0.181***	2.168***	-6.468***	-0.901	-0.016	0.131
(-10.36)	(10.30)	(-4.05)	(-1.52)	(-1.05)	
		Panel H: $\Delta Var = \Delta PI^{TAQ}$			
0.323***	-3.352***				0.019
(8.46)	(-6.53)				
0.348***	-3.629***	-3.442			0.020
(7.28)	(-6.16)	(-0.75)			
0.331***	-3.498***	-3.491	4.022**		0.022
(6.82)	(-5.90)	(-0.76)	(2.14)		
0.237***	-3.419***	-2.397	3.827**	0.495***	0.061
(4.97)	(-5.84)	(-0.53)	(2.08)	(7.38)	

Table 7
Determinants of SEO Underpricing

This table presents regression estimates for the underpricing of the SEOs. The panel regression model is:

$$UP = \alpha_0 + \alpha_1 \Delta Var + \alpha_2 Control\ Variables + \varepsilon$$

where *UP* is the SEO underpricing, calculated as *100*×(*Offer price–Pre-offer price*)/*Pre-offer price*. *ΔVar* is the difference of a variable (*Var*) between after issue and before announcement of an SEO. The variable (*Var*) is λ, OI_n, OI_v, *ILL*, *Q-spread* (*bp*), *E-spread* (*bp*), C^{TAQ}, or PI^{TAQ}. λ is the adverse selection measure of Lin, Sanger, and Booth (1995). OI_n (OI_y) is the daily absolute order imbalance in terms of trades (shares). *ILL* is the Amihud (2002) illiquidity measure. *Q-spread* (*Q-spread* (*bp*)) is the quoted bid-ask spread in dollars (in the hundredth percentage). *E-spread* (*E-spread* (*bp*)) is the effective bid-ask spread in dollars (in the hundredth percentage). C^{TAQ} is the effective cost, while PI^{TAQ} is the price impact coefficient. Detailed definitions of variables are given in Table 1. The control variables include *FS**OS*, *OS*, *IO*, and *VOLA*. *FS* is the log form of market capitalization before the announcement of the SEO. *OS* is the offer size of the SEO in dollars divided by the market capitalization. *IO* is the institutional ownership before the announcement of the SEO. *VOLA* is volatility of the past 12-month returns ending three months before the announcement of the SEO. The *t*-statistics adjusted for the clustering effects of firms and SEO years are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Intercept	*ΔVar*	*FS*OS*	*OS*	*IO*	*VOLA*	Adj. R^2
Var=λ	-0.555***	0.094	7.064***	-0.205***	-1.181	-0.031	0.318
	(-6.43)	(0.62)	(5.76)	(-3.45)	(-1.19)	(-1.00)	
Var=OI_n	-0.535***	0.066*	7.237***	-0.234***	-1.148	-0.028	0.285
	(-6.26)	(1.65)	(6.03)	(-4.06)	(-1.16)	(-0.91)	
Var=OI_v	-0.537***	0.028	7.198***	-0.231***	-1.123	-0.028	0.275
	(-6.27)	(0.72)	(5.99)	(-4.01)	(-1.13)	(-0.90)	
Var=*ILL*	-0.541***	-0.022	7.202***	-0.231***	-1.191	-0.026	0.276
	(-6.28)	(-0.14)	(5.70)	(-3.73)	(-1.19)	(-0.84)	
Var=*Q-spread* (*bp*)	-0.594***	-0.068***	8.197***	-0.311***	-1.267	-0.049	0.443
	(-6.98)	(-6.26)	(6.83)	(-5.32)	(-1.29)	(-1.58)	
Var=*E-spread* (*bp*)	-0.586***	-0.071***	8.226***	-0.305***	-1.235	-0.044	0.378
	(-6.86)	(-4.91)	(6.78)	(-5.15)	(-1.25)	(-1.41)	
Var=C^{TAQ}	-0.611***	-0.207***	8.168***	-0.302***	-1.345	-0.035	0.399
	(-7.10)	(-5.38)	(6.76)	(-5.14)	(-1.36)	(-1.13)	
Var=PI^{TAQ}	-0.536***	0.325***	7.267***	-0.237***	-1.217	-0.045	0.303
	(-6.27)	(2.58)	(6.05)	(-4.11)	(-1.22)	(-1.40)	