Idiosyncratic risk and long-run stock performance following seasoned equity offerings

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Abstract

Post-issue stock underperformance is driven, at least in part, by the contemporary decline in idiosyncratic risk (proxied by idiosyncratic volatility) exposure for seasoned equity offerings (SEO) firms. As young firms dominate the SEO market, they generally face higher uncertainty of mean profitability, which they resolve more quickly due to learning. Hence they experience a larger reduction in idiosyncratic risk than their size, book-to-market, and exchange matching firms suggests. Furthermore, post-issue abnormal change in idiosyncratic risk is positively associated with long-run stock abnormal return, an association driven mainly by young firms that experience significant abnormal declines in idiosyncratic risk.

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1. Introduction

Over the last few decades, there has been a dramatic increase in the research on the long-run stock underperformance after a seasoned equity offering (SEO).[1] This research begins with Loughran and Ritter (1995) and Spiess and Affleck-Graves (1995). They report that SEO firms underperform their benchmarks by 40-60% over the three-to-five years following the offering date, calling this phenomenon the "new issues puzzle." To explain the puzzle, Lee (1997) argues that increased free cash flow problems after issuance play an important role in explaining primary issuers' stock underperformance. Clarke, Dunbar, and Kahle (2001) find that insiders attempt to issue overvalued equity and cancel the issue when the market reaction to the announcement eliminates the overvaluation, suggesting that insiders exploiting windows of opportunity can explain the underperformance of issuing firms. Teoh, Welch, and Wong (1998) find that pre-issue earnings management is negatively related to post-issue stock performance. Brav, Geczy, and Gompers (2000) find larger underperformance for small-firm SEOs than for large-firm SEOs. In addition, since an equity offering reduces the firm's financial leverage, several studies argue that the long-run underperformance merely reflects the lower systematic risk exposure (Eckbo, Masulis, and Norli, 2000; Carlson, Fisher, and Giammarino, 2010). SEO firms also show a rise in stock liquidity, which may explain the expected returns of issuers (Eckbo and Norli, 2005). However, Eckbo, Masulis, and Norli

[1] See Loughran and Ritter (1995), Spiess and Affleck-Graves (1995), Lee (1997), Teoh, Welch, and Wong (1998), Brav, Geczy, and Gompers (2000), Eckbo, Masulis, and Norli (2000), Jegadeesh (2000), Mitchell and Stafford (2000), Clarke, Dunbar, and Kahle (2001), Lyandres, Sun, and Zhang (2008), and Carlson, Fisher, and Giammarino (2010).

(2007) survey the extant literature on the performance of issuing firms in a holding period of two-to-five years following equity issue date, and suggest that the post-issue long-run stock underperformance remains largely unexplained. It is, therefore, important to explore potential explanations for the long-run underperformance of SEOs.

This study shows that rational learning about long-term mean profitability provides an alternative explanation for the long-run stock underperformance after a SEO. DeAngelo, DeAngelo and Stulz (2010) find that 55.00% of equity issuers are listed for less than five years, and 70.43% are listed for less than ten years, implying that young firms dominate the SEO market.[2] According to Pastor and Veronesi's (2003) rational learning model, a young firm has higher uncertainty about its future mean profitability, resulting in higher cross-sectional idiosyncratic return volatility.[3] Moreover, their model shows that a firm facing higher uncertainty about mean profitability resolves its uncertainty more quickly and therefore experiences a larger reduction in its idiosyncratic return volatility over time. It follows that if SEO firms face higher uncertainty about average profitability, their idiosyncratic return volatility should drop more than their benchmarks as more uncertainty about mean profitability will be resolved for SEO firms than for their non-SEO matching firms. We thus argue that while the SEO market is almost entirely dominated by young firms with high uncertainty, the long-run stock underperformance of SEOs can be ascribed to the *abnormal* decline in idiosyncratic return volatility over time due to learning.[4]

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[2] As corporate lifecycle theory suggests, young firms are typically at a growth stage featuring high market-to-book (M/B) ratios and low operating cash flows, and therefore inclined to finance their investments externally, especially via equity offerings.

[3] As investors rationally update their beliefs about a firm's long-term mean profitability over time, the uncertainty gradually unravels, reducing its idiosyncratic return volatility due to the idiosyncratic nature of learning.

[4] The abnormal decline is also called *excess* decline, defined in this article as the difference in decline in idiosyncratic volatility after an equity offering date between a SEO firm and its matching firm.

The key of our inference is the linkage between idiosyncratic return volatility and stock return. Several studies state that investors find it difficult to hold a perfectly diversified portfolio as suggested by modern portfolio theory. Thus, under-diversified investors should require greater returns to compensate for bearing idiosyncratic risk (Levy, 1978; Merton, 1987, and Malkiel and Xu, 2002). Recently, Fu (2009) empirically finds a positive relation between idiosyncratic risk and expected stock returns in the cross section.[5] Based on this evidence, we infer that the returns for SEO firms will drop more than their benchmarks over time (that is the post-issue long-run underperformance), because of SEO firms' *steeper* decline in idiosyncratic volatility due to learning.

The above predictions are confirmed by our sample from 1983 to 2007. First, we find that SEO firms experience a significant reduction in idiosyncratic volatility following the equity offerings, especially for firms listed less than ten years. Furthermore, our sample shows that the reductions in idiosyncratic volatility are sharper for SEO firms than for their size, book-to-market, and exchange non-SEO matching firms (matching firms for short). For example, SEO firms that are listed for less than five years show a 2.35% decline in idiosyncratic volatility from the SEO month to 36 months after the offering date, whereas their matching firms experience a mere 0.31% decline in idiosyncratic volatility, leading to a 2.04% abnormal decline for SEO firms. Most importantly, we find that the level of the abnormal decline decreases with the number of

[5] Ang, Hodrick, Xing, and Zhang (2006, 2009) find that stocks with high idiosyncratic volatility predict abnormally low average returns in the subsequent month, where they use one-month lagged idiosyncratic volatility to predict expected monthly return. However, Fu (2009) and Huang, Liu, Rhee, and Zhang (2010, 2011) attribute Ang et al.'s (2006, 2009) results to the return reversal of stocks with high idiosyncratic volatilities. As they shown, after controlling for the difference in the past month returns, the negative relation between expected returns and the lagged idiosyncratic volatility disappears; in contrast, the positive relation between expected returns and the contemporaneous idiosyncratic volatility is significant and remains robust after controlling for return reversal. Moreover, Bali and Cakici (2008) point out that the results of Ang et al. (2006) are not robust under different data frequency, weighting schemes, and breakpoints to construct the return portfolios.

years listed, which can be attributed to the learning effect.

Second, our sample shows that the stock returns of SEO firms on average underperform their matching firms following the offering date. In particular, issuers listed for less than five years experience the poorest post-issue stock performance among all other issuers. However, we find no evidence indicating that issuers listed for larger than ten years experience post-issue stock underperformance. Thus, we argue that the SEO long-run underperformance primarily occurs in young firms. In other words, while previous research shows that young firms almost entirely dominate the SEO market (DeAngelo et al, 2010), we argue that young firms' post-issue long-run underperformance can amply explain the phenomenon that SEO firms on average underperform their benchmark following the offering date, because SEO firms typically are young firms.

Finally, after controlling for other potential influences, we find a significantly positive association between the abnormal change in idiosyncratic volatility and post-issue stock performance, suggesting that the post-issue stock underperformance can be explained by the contemporary abnormal decline in idiosyncratic risk. In support, we find this evidence is more distinct for young issuers, typically listed for less than ten years. Further analysis shows that (1) once we control for the learning effect (i.e. the number of years listed), there is no evidence of abnormal decline in idiosyncratic volatility as well as long-run underperformance of SEOs; (2) our results are robust for considering the effect of leverage changed after issue on idiosyncratic volatility; (3) young SEO firms experience a reduction in the errors in analysts' forecasts after issue. These additional evidences substantially support our conjecture that rational learning about future average profitability can provide an alternative explanation for the post-issue long-run stock underperformance.

The main contributions of this paper to the literature are twofold. First, our results contribute to the literature on long-run stock underperformance of SEOs. We find that the post-issue long-run underperformance is larger for young SEO firms than for mature SEO firms, indicating that young firms accompanied by strong learning effect play an important role in the long-run underperformance of SEOs. To the best of our knowledge, this is the first study to investigate the association between learning effect and the long-run performance of SEOs. Further, our results contribute to the linkage between idiosyncratic return volatility and explanations for the long-run underperformance of SEOs by showing that the abnormal decline in idiosyncratic risk due to faster learning may be the reason for the poor stock performance following the equity offerings. A notable question we try to address in this article is why and how idiosyncratic return volatility can explain post-issue underperformance. Since stock prices equate to the present value of future expected cash flows in a rational market, Irvine and Pontiff (2008) indicate the following three reasons to provide fundamental explanations for the time trend in idiosyncratic risk: (1) discount rate shocks increase idiosyncratic return volatility; (2) cash flow streams have become more idiosyncratic; or (3) the market fail to price idiosyncratic risk. Moreover, Campbell, Lettau, Malkiel, and Xu (2001) find that since the idiosyncratic volatility has increased substantially over the period 1962 to 1997 even as the total volatility of the stock market has remained relatively constant, correlations among individual stock have declined and the number of stocks needed to achieve a well-diversified portfolio thus increases. As a result, idiosyncratic volatility becomes to be an important factor of the return to an individual stock for investors who require compensation for bearing such increasingly idiosyncratic volatility.

The remainder of the study is organized as follows. Section 2 describes our data and

methodology. Section 3 examines the change in idiosyncratic risk after the equity offerings. Section 4 investigates the long-run abnormal return of SEO firms and its association with the change in idiosyncratic risk. We offer discussions in section 5 and summarize our findings in the final section.

2. Sample and methodology

2.1 Sample construction

Following extant studies (Loughran and Ritter, 1995; Eckbo, Masulis, and Norli, 2000; Cohen and Zarowin, 2010), our SEO sample is drawn from Securities Data Corporation's (SDCs) Global New Issue Database for common stocks (CRSP's share type code=10 or 11) by completed U.S. issuers that are traded on the NYSE, Amex, or NASDAQ markets over the 1983 to 2007 period. The sample period starts from 1983, the first complete year that SDC reports a filing date and ends in 2007, enabling us to measure post-issue idiosyncratic volatility and stock performance. SEOs are restricted to using a firm commitment method.[6] We exclude samples when SEOs have the following conditions: (1) offer prices less than $5; (2) spin-offs; (3) reverse LBOs; (4) closed-end funds, unit investment trusts, REITs and limited partnerships; (5) rights and standby issues; (6) simultaneous or combined offers of several classes of securities (i.e., unit offers of stocks and warrants); (7) nondomestic and simultaneous domestic-international offers; (8) pure secondary offerings; and (9) SEOs lacking CRSP data to compute idiosyncratic volatility for the year subsequent to the SEO issue date. The final sample consists of 2,883 SEOs.

[6] Butler, Grullon, and Weston (2005), Chemmanur, He, and Hu (2009), Lee and Masulis (2009) adopt the same requirements.

2.2 Measuring idiosyncratic risk

Following Ang et al. (2006), Fu (2009), and Barinov (2012), we estimate the idiosyncratic risk of a stock as follows. For each firm-month, we estimate the following model created by Fama and French (1993, 1996), using all firms that have the necessary data on CRSP and Kenneth French's website:[7]

$$R_{i,d} - R_{f,d} = a_{i,t} + b_{i,t}[R_{m,d} - R_{f,d}] + s_{i,t}SMB_d + h_{i,t}HML_d + e_{i,d} \qquad (1)$$

where R_i is stock i's daily return, R_f is the one-month T-Bill rate, R_m is the value weighted NYSE/Amex/NASDAQ market return, *SMB* is the small-firm portfolio return minus the big-firm portfolio return, *HML* is high book-to-market portfolio return minus low book-to-market portfolio return. d and t are the subscript for the day and month. We require at least 15 trading days with daily returns and non-zero trading volume for each month. The idiosyncratic risk is the standard deviation of the regression residuals multiplied by the square root of the number of trading days in that month.[8]

2.3 Measuring post-issue abnormal stock returns

We measure post-issue long-run stock abnormal return by the three-year buy-and-hold abnormal return (BHAR) following the issue date. The three-year BHAR equals the difference in the three-year compound return between a SEO firm and its

[7] We thank Professor Kenneth French for sharing the factors data.

[8] We also estimate idiosyncratic risk by adopting the market model regression of monthly stock returns on the returns of the value-weighted portfolio of all NYSE-, AMEX-, and NASDAQ-traded stock, as Pastor and Veronesi (2003). The results are qualitatively the same as the original analyses.

matching firm. Matching firms must not have had a SEO announcement in the three years before the SEO firm's issue date; and they must be within the same size decile and book-to-market (B/M) quintile, and traded on the same stock exchange as the SEO firm. Among all firms meeting the criteria, we then select a matching firm based on the closest B/M ratio to the SEO firm.[9] We compute the three-year buy-and-hold returns for both SEO firms and matching firms from the day following the issue date to 756-trading day, or to a firm's delisting date.[10]

Previous studies have identified at least three points to argue the weakness of buy-and-hold returns (BHRs) method in the measure of long-run stock return. First, the compounding of returns tends to inflate long-run returns (Mitchell and Stafford, 2000). Second, BHRs tend to be right skewed (Baber and Lyon, 1997). Third, BHRs may raise the concern of pseudo-market timing (Schultz, 2003). Thus, as suggested by Fama (1998) and Mitchell and Stafford (2000), we also investigate the post-issue stock performance using the calendar-time portfolio approach.

As many studies investigate post-issue stock performance using the calendar-time portfolio approach,[11] we form a portfolio of SEO firms that includes an SEO issue date at any time in the previous three years and then compute the portfolio return. We then estimate the following four-factor model created by Fama and French (1993) and Carhart (1997):[12]

[9] Our conclusion remains unchanged if we identify matching firm on the basis of size and B/M only, if we use five matched firms based on the first five closest to B/M ratio of SEO firm, or if we use the 25 Fama and French size and B/M benchmark portfolio.

[10] We also calculate buy-and-hold return using monthly data, beginning in the month after the issuance for the earlier of 36 months or the delisting month. Our results are robust when using monthly data.

[11] See Jegadeesh (2000), Brav, Geczy, and Gompers (2000), Eckbo, Masulis, and Norli (2000), D'Mello, Schlingemann, and Subramaniam (2005), and Lyandres, Sun, and Zhang (2008).

[12] The results are similar if we adopt the Fama and French (1993) three-factor model.

$$R_{p,t} - R_{f,t} = a + b[R_{m,t} - R_{f,t}] + sSMB_t + hHML_t + uUMD_t + e_t \qquad (2)$$

where R_p is the SEO firm monthly portfolio return, R_f is the one-month T-Bill rate, R_m is the value weighted return constructed by NYSE, Amex, and NASDAQ stocks, *SMB* is small-firm portfolio return minus big-firm portfolio return, *HML* is high book-to-market portfolio return minus the low book-to-market portfolio return, and *UMD* is winner portfolio return minus loser portfolio return.[13] Notation *t* is the subscript for the month. The average monthly abnormal portfolio return of a SEO firm is estimated and then tested based on the statistical significance of the regression intercept.

2.4 Summary statistics

Panel A of Table 1 reports the sample distribution classified by the number of years listed. Following Pastor and Veronesi (2003), DeAngelo et al. (2010), and Fink, Fink, Grullon, and Weston (2010), years listed is calculated as the number of years between the year of the firm's first appearance in the CRSP database and the year of SEO issuance. Following DeAngelo et al. (2010), we partition SEOs based on years listed into five groups. G1-G5 represent SEO firms that are listed for less than 5, 5 to 10, 10 to 15, 15-20, and more than 20 years, respectively. Our sample shows that 42.14% of SEO firms are listed for less than 5 years and 61.57% of SEO firms are listed for less than 10 years. DeAngelo et al. (2010) found 54.98% (=1,871 / 3,403) and 70.43% (=2,397 / 3,403) of SEO firms listed for less than 5 and 10 years, respectively, because utilities and financial firms are excluded from their sample but included in our sample. Therefore, we have a

[13] The monthly factors data are collected from Kenneth French's website.

lower proportion of SEO firms listed for less than 10 years since utilities and financial firms are typically mature. However, our results are consistent with the lifecycle theory that young firms dominate the SEO market.

[Insert Table 1 here]

Panel B of Table 1 provides summary statistics for our SEO sample. Market-to-book ratio (M/B) declines after the issuance, and the average change in M/B from year -1 to +3 relative to equity offering year is -1.24. This can be attributed to rational learning about the firm's average profitability (Pastor and Veronesi, 2003). Consistent with the findings in Eckbo et al. (2000), we find a sharp decline in systematic risk (proxied by market beta) and a rise in stock liquidity after the equity offerings. The mean (median) of underwriter rank is 7.81 (8.00). 42% of SEO firms are in high-tech industries. The average total asset and market capitalization of SEOs before the issuance are $3,967 and $626 million, respectively. SEOs have an average stock abnormal return prior to the filing date of 0.68, an average primary share participation in the offering of 0.87, and an average ratio of total offer proceeds over the market value of 0.36. 20% (=8% + 12%) of SEO firms operate in regulated industries (utility and financial industries). Of the SEO firms, 67% are traded on NASDAQ, which is much higher than the proportion in previous studies. For example, Eckbo et al. (2000) report that NASDAQ issuers account for 44.17% (2,147 out of 4,860) of all the NYSE/Amex/NASDAQ issuers in a sample over 1963-1995.[14] In our sample, SEOs have an average discount of 3.48% and an average underpricing of

[14] To address any concern associated with NASDAQ issuers, we control for a NASDAQ dummy in the following multivariate analyses.

2.69%. As Teoh, Welch, and Wong (1998), SEO firms have positive discretionary accruals before the issuance. Further, 32% of SEO firms pay dividends in the year prior to the equity offering. The average market-to-book ratio, leverage ratio, and return-on-equity are 3.61, 0.23, and 0.01, respectively. Finally, 44% of SEO firms' have a multisegment organization.

3. Post-issue idiosyncratic risk

3.1 Time-series idiosyncratic risk

We predict that idiosyncratic volatility is likely to decrease after the equity offering because investors rationally learn about future average profitability of SEO firms. To assess this conjecture, we plot the median of idiosyncratic volatilities for both SEO firms and their Size-B/M-Exchange matching firms from 12 months before the equity offering date to 36 months after that date. We use Wilcoxon signed-rank tests to test the hypotheses that the medians are equal to zero. Differences in medians are assessed using Kruskal-Wallis tests. The results are reported in Figure 1.

[Insert Figure 1 here]

In Panel A of Figure 1, over the period following the month of equity offering (month 0), we observe a sharp decline in idiosyncratic volatility which persists through the 36 months following the equity offering. The median of idiosyncratic volatilities decreases from 11.00% in month 0 to 8.70% in month +36. We also analyze the time-series behavior of the Size-B/M-Exchange-adjusted idiosyncratic volatility. Panel B shows a dramatic decline in abnormal idiosyncratic volatility after the equity offerings.

The result is similar to the one in Panel A but more variable. Therefore, these findings are consistent with our conjecture that idiosyncratic volatility decreases after the equity offering, and falls more for SEO firms than for their matching firms.

We also argue that the reduction in idiosyncratic volatility is more likely explained by stronger learning effects in younger SEO firms. To assess this conjecture, we plot the median of idiosyncratic volatility for both SEO firms and their Size-B/M-Exchange matching firms, classified by the number of years listed from 12 months before the offering date to 36 months after that date. The results are reported in Figure 2.

[Insert Figure 2 here]

In Panel A of Figure 2, idiosyncratic volatility consistently falls following the equity offerings for firms listed for less than 10 years (G1 and G2). G3 and G4 also reveal a decline in idiosyncratic volatility following equity offerings, but the decline is weaker in magnitude than for G1 and G2. Old SEO firms (G5) exhibit a relative stable pattern in idiosyncratic volatility. A possible explanation is that old firms are less uncertain about their mean profitability. That is, the learning effect becomes weaker and less important in determining the idiosyncratic volatility. In Panel B, after we adjust for the Size-B/M-Exchange matching firm, the abnormal idiosyncratic volatility in G1 and G2 decreases rapidly as time goes on; while the abnormal idiosyncratic volatility in groups G3 through G5 fluctuates around zero. Overall, the results suggest that the learning effect is more distinct for young firms, which is consistent with Pastor and Veronesi (2003).

[Insert Table 2 here]

Panel A of Table 2 presents the median change in idiosyncratic volatility of SEO firms over month 0 (the offering month) through month +12, month +24, and month +36. SEO firms experience significant declines in idiosyncratic volatility in the periods subsequent to the equity offerings. Yet we find that the changes in idiosyncratic volatility for matching firms are not significantly different from zero. The differences in change of idiosyncratic volatility between SEO firms and their matching firms are negative and statistically significant at the 1% level. Panel B separates SEO firms by the number of years listed. SEO Firms that are listed for less than 15 years display significant reductions in idiosyncratic volatility after their equity offerings. But once we adjust for the matching firms, the abnormal decline in idiosyncratic volatility only appears in SEO firms that are listed for less than 10 years. The median abnormal change in idiosyncratic volatility during the three years from month 0 to month +36 is -2.66% for firms that are listed less than 5 years and -2.31% for firms that are listed for 5 to 10 years. This suggests that the reduction in idiosyncratic volatility of SEO firms is attributable to younger SEO firms with stronger learning effect regarding uncertainty about mean profitability.

3.2 Determinants of idiosyncratic risk

The previous section finds that SEO firms experience a decline in idiosyncratic volatility, on average. This decline is largely explained by the dominant presence of young firms with strong learning effects. However, these findings could be driven by other factors that are only incidentally correlated with firm age. Therefore, we begin by estimating the following regression equation:

$$\Delta IVOL_i \text{ or } \Delta Abnormal\_IVOL_i$$
$$= a + b_1 Young_i + b_2 M/B_i + b_3 Ln\_MktCap_i + b_4 Dividend_i + b_5 Leverage_i + b_6 ROE_i \quad (3)$$
$$+ b_7 Diversification_i + Year\ Fixed\ Effects + e_i$$

where *i* indexes firms, $\triangle IVOL$ is the change in idiosyncratic volatility of SEO firms from month 0 to month +36, and $\triangle Abnormal\_IVOL$ is the difference of change in idiosyncratic volatility from month 0 to month +36 between SEO firm and a Size-B/M-Exchange matching firm. *Young* is an indicator variable that equal one for SEO firms that listed for less than 10 years and zero otherwise. We also include several control variables suggested by Ferreira and Laux (2007).

[Insert Table 3 here]

Table 3 presents estimates of the median regression models in equation (3).[15] The consistent result is a significant negative relation between the change in idiosyncratic volatility and young SEO firms. As raw change in idiosyncratic volatility is a dependent variable, the regression coefficient on the variable *Young* is -0.019 with a *t*-statistic of -5.445. The same conclusion can be drawn from replacing the dependent variable by the change in abnormal idiosyncratic volatility. The estimated coefficient is -0.021 with a *t*-statistic of -5.108. We also find that dividend payers have less reduction in post-issue idiosyncratic volatility than dividend non-payers, since dividend payouts reduce the learning effect (Pastor and Veronesi, 2003).[16] Moreover, diversified firms experience a

[15] The results are qualitatively the same when we use OLS.

[16] Pastor and Veronesi (2003) show that the idiosyncratic volatility changes should be more negative when there is more uncertainty about average profitability or when learning is faster, implying that young firms should have steeper decline in idiosyncratic volatility, especially for dividend nonpayers, for which learning

larger decline in post-issue idiosyncratic volatility than focus firms (i.e. signal segment firms), consistent with the findings of Ferreira and Laux (2007).

4. Post-issue long-run stock performance

4.1 Univariate results

If post-issue stock underperformance can be explained by the abnormal declines in idiosyncratic return volatility due to learning, then the post-issue stock performance should be significantly poorer for firms with more substantial abnormal decline in idiosyncratic volatility after the offering date. Thus, we predict that the post-issue long-run stock performance should be poorer for younger issuers. Moreover, a recent empirical work by Fu (2009) finds that both stock realized returns and expected returns are positively related to stock idiosyncratic volatility in the cross section. He interprets the positive relation between mean stock returns and idiosyncratic volatility as investors' under-diversification. For the purpose of examining SEOs underperformance, this positive relation between returns and idiosyncratic volatility can have important implications, since we find that idiosyncratic volatility significantly declines after equity offerings.

[Insert Table 4 here]

Panel A of Table 4 presents average and median three-year buy-and-hold returns following equity offerings. As extant studies indicate SEO firms on average underperform their matching firms, we find that the average and median three-year

should be faster.

buy-and-hold abnormal returns are -7.27% and -4.01%, respectively, both of which are statistically different from zero at the 1% level. Panel B classifies the sample by the number of years listed. Younger SEO firms (less than 10 years old) on average underperform their matches by about 10% for a three-year buy-and-hold return, statistically significant at the 1% level. However, we find no evidence on the post-issue stock abnormal return for firms that listed for more than 10 years. We also make our findings more robust by adopting the calendar-time portfolio approach. The results are reported in Table 5.

[Insert Table 5 here]

We estimate alpha using a four-factor model which includes the Fama and French (1993) three factors as well as the Carhart (1997) momentum factor.[17] Panel A of Table 5 shows that the alphas are significant and negative for SEO firms that are listed for less than 10 years, when the portfolios are formed using equal-weight. However, the alpha estimates are not significant for firms that are listed for more than 10 years. With value-weight, as reported in Panel B, all results are similar but weaker than the equal-weighted portfolio. For example, the alpha for firms that are listed for less than 5 years is -0.59% using equal-weight, compared to -0.43% using value-weight. This is because value-weighting gives more weight to successful firms than equal-weighting (Eckbo et al., 2007).

In sum, our findings on SEO firms' stock performance show that post-issue underperformance is driven, at least in part, by the contemporary reduction in

[17] The results are similar if we use the Fama and French (1993) three-factor model.

idiosyncratic risk. However the univariate result does not allow us to draw reliable inferences since neither the simple correlation nor the univariate analysis takes into account the correlations between the change in idiosyncratic volatility and other determinants of SEO firms' long-run stock performance. Thus, before we can draw any conclusions from these results, we need to control for all the relevant variables found in the previous studies to affect SEO firms' long-run stock performance.

4.2 Multivariate analyses

To examine the association between the change in idiosyncratic volatility and post-issue stock performance, we estimate the following median regression model:[18]

$$\begin{aligned} SP_i = {} & a + b_1 \Delta Abnormal\_IVOL_i + b_2 \Delta Abnormal\_M/B_i + b_3 \Delta Abnormal \\ & \_BETA_i + b_4 \Delta Abnormal\_LIQ_i + b_5 High\_Reputation_i + b_6 High \\ & \_Tech_i + b_7 Ln\_Size_i + b_8 Prior\ BHAR_i + b_9 Primary\ Shares\ Offered_i \\ & + b_{10} Relative\ Offer\ Size_i + b_{11} Utility_i + b_{12} Financial_i + b_{13} Nasdaq_i \\ & + b_{14} Discount_i + b_{15} Underpricing_i + b_{16} Discretionary\ Accruals_i \\ & + Year\ Fixed\ Effects + e_i \end{aligned} \quad (4)$$

where *SP* is either a long-run buy-and-hold abnormal return or average monthly abnormal return over the three years after the equity offerings. $\triangle Abnormal\_IVOL$ is the difference

[18] The analysis of long-run buy-and-hold return reveals considerable right skewness in the data because the lower bound is -100% and returns are unbounded on the upside (Khotari and Warner, 2007). Moreover, Rajgopal, Shevlin, and Zamora (2006) indicate at least two benefits of using the median regression: (1) the median is more robust than the mean to the presence of large outliers because median regressions minimize the sum of absolute deviations rather than the sum of squared deviations; (2) the precision of estimates from a median regression is higher than Ordinary Least Squares (OLS), because the median is a more robust estimate of central tendency than the mean. Thus, the presence of such problems in the data and use of OLS motivates our use of median regressions in the study of long-run buy-and-hold return. However, in untabulated sensitivity tests, we reestimate all regressions using OLS while winsorizing the data at the top and bottom 1%. We obtain the results similar to the reported median regressions (available upon request).

of change in idiosyncratic volatility from month 0 to month +36 between SEO firm and a Size-B/M-Exchange matching firm. $\triangle$*Abnormal_M/B* is the difference of change in M/B ratio from month 0 to month +36 between the SEO firm and a Size-B/M-Exchange matching firm. $\triangle$*Abnormal_BETA* is the difference of change in the market beta from month 0 to month +36 between the SEO firm and a Size-B/M-Exchange matching firm. $\triangle$*Abnormal_LIQ* is the difference of change in Amihud's (2002) liquidity measure from month 0 to month +36 between the SEO firm and a Size-B/M-Exchange matching firm. Other independent variables are defined in the Appendix. We control for the change in market-to-book ratio (M/B) because Pastor and Veronesi (2003) also indicate that M/B decreases as investors rationally learn more about the profitability of the firms. Since Eckbo et al. (2000) find that post-issue underperformance reflects lower systematic risk, we control for the change in systematic risk (proxied by market beta). Controlling for other variables captures the relation between long-run stock performance and publicly available information about the SEO (e.g., Chemmanur et al., 2009). We also include year dummies to control for the impact of stock market condition on the equity offering and its long-run stock performance.

[Insert Table 6 here]

Table 6 presents the results of multivariate regressions for post-issue long-run stock performance. The dependent variable in regressions (1) through (3) are the three-year buy-and-hold abnormal return while in regressions (4) through (6) it is the average monthly abnormal return estimated from four-factor model. Regression (1) includes only $\triangle$*Abnormal_IVOL* as explanatory variable. The coefficient is positive and statistically

significant at the 1% level. Pastor and Veronesi (2003) indicate that both M/B and idiosyncratic volatility of a young firm declines as the firm ages due to learning on uncertainty about a firm's average profitability. Regression (2) considers this learning effect and thus includes $\triangle Abnormal\_IVOL$ and $\triangle Abnormal\_M/B$ in the same regression model. After we control for the effect of learning on M/B, the change in the abnormal idiosyncratic volatility is still a significant explanation of long-run underperformance. Regression (2) also shows that the coefficient on $\triangle Abnormal\_M/B$ is significantly positive, which implies that the reduction in M/B due to learning can also explain post-issue long-run underperformance. We estimate a full model in regression (3) and find the coefficient on $\triangle Abnormal\_IVOL$ of 0.873 (*t*-statistics=3.197). That is, the relation between the change in idiosyncratic volatility and post-issue stock underperformance is robust after controlling for other potential influences suggested by previous studies. A significant positive coefficient on $\triangle Abnormal\_M/B$ also suggests that investors rationally learning about uncertainty of mean profitability can explain post-issue stock underperformance. The coefficient on $\triangle Abnormal\_BETA$ is positive and statistically significant at the 1% level. This result is consistent with the finding that post-issue stock underperformance reflects lower systematic risk (Eckbo et al., 2000). Our results also support Eckbo and Norli (2005), who find that the change in stock liquidity is significantly negatively correlated with long-run abnormal return.

Regressions (4) through (6) repeat the analyses in regressions (1) through (3) by applying Carhart's (1997) model of the Fama and French (1993) method. Our conclusions remain unchanged. The reduction in idiosyncratic volatility still appears to be an important factor in explaining post-issue stock underperformance. Table 6 also indicates that the more primary shares offered in the SEO, the greater the stock

underperformance, while firms in regulated industries (utility and financial industries) experience lower stock underperformance.

Below, we examine whether younger firms with a greater reduction in idiosyncratic volatility experience poorer long-run stock performance following the equity offerings. The results are reported in Table 7.

[Insert Table 7 here]

Regressions (1) and (3) of Table 7 include $\triangle$*Abnormal_IVOL*, *Young*, and *Young* x $\triangle$*Abnormal_IVOL*. The variable *Young* equals one if the SEO firm is listed for less than 10 years, and zero otherwise. The coefficients on the interaction term of *Young* x $\triangle$ *Abnormal_IVOL* are positive and statistically significant at the 1% level. This evidence suggests that younger firms with greater declines in idiosyncratic volatility exhibit greater long-run stock underperformance. The results also show that when we add the interaction term of *Young* x $\triangle$ *Abnormal_IVOL* into regressions, the coefficients on $\triangle$ *Abnormal_IVOL* become not statistically significant, indicating that young firms' abnormal declines in idiosyncratic volatility can almost entirely explain the long-run stock underperformance of SEOs. Regression (2) and (4) further include other potential factors suggested by the previous studies**.** The interaction term of *Young* x $\triangle$ *Abnormal_IVOL* are still significantly positively related to long-run stock performance. The variable *Young* is not statistically significant in all regressions.

4.3 Controlling for the number of years listed

Previous analyses clearly indicate that young firms experience more declines in

idiosyncratic volatility due to learning, and this can explain, at least in part, why SEO firms underperform their benchmarks. For robustness, we reexamine post-issue buy-and-hold abnormal return after removing the potential effect of the number of years listed on post-issue stock performance. We thus further add a criterion of the number of years listed to the matching procedure. Specifically, we sort all the non-SEO firms on basis of the year-listed group measured in Panel A of Table 1. We then select all the firms within the same year-listed group, size decile, book-to-market (B/M) quintile, and stock exchange as the SEO firm. From these potential firms, we choose a matching firm based on the closest B/M ratio to the SEO firm. If learning effect can amply explain the post-issue long-run underperformance, we can predict that the matching firm selected by the new matching procedure should have the same pattern of idiosyncratic volatility as the SEO firm. Thus, before examining the long-run buy-and-hold abnormal return, we first present the idiosyncratic volatility for SEO and Year-Listed-Size-B/M-Exchange matching firms following the equity offerings in Table 8.

[Insert Table 8 here]

Panel A of Table 8 shows that the SEO firms and their matched firms experience the same change in idiosyncratic volatility, suggesting that our new matching procedure provides a desirable matching sample with similar change in idiosyncratic volatility as the SEO firms. In Panel B, we further separate SEO firms into the five year-listed groups. All the differences between the SEO firms and the matched firms are not statistically significant across the year-listed groups. To examine the long-run buy-and-hold abnormal return, Table 9 reports the three-year long-run buy-and-hold returns for the SEO firms

and Year-Listed-Size-B/M-Exchange matching firms.

[Insert Table 9 here]

Panel A of Table 9 shows that, after controlling for the number of years listed, there is no evidence that SEO firms experience significant stock underperformance following equity offerings. Panel B shows results similar to those given in Panel A. All the long-run buy-and-hold abnormal returns are not statistically significant across the year-listed groups. Overall, the evidence in Table 9 further confirms that the post-issue stock underperformance can be explained by young firms with steeper declines in idiosyncratic volatility due to learning about future average profitability. Once we control for the number of years listed, we find no evidence of stock underperformance.

5. Discussions

5.1 Financial leverage and idiosyncratic volatility

While we show that long-run stock underperformance of SEOs is significantly associated with the decline in idiosyncratic stock volatility, it is worth pondering more deeply over the causes of the abnormal idiosyncratic volatility decline following the equity offerings. Previous studies find evidence of a positive relation between leverage and total and idiosyncratic volatility of equity return. Black (1976), Christie (1982) and others show that leverage is positively related to the volatility of equity returns. Furthermore, Dennis and Strickland (2004) find an increase in leverage could amplify a firm's total and idiosyncratic volatility of equity return. Therefore, the immediate reduction in leverage resulting from raising equity (hereafter leverage effect) could

diminish idiosyncratic stock volatility, providing an alternative potential explanation for the long-run post-issue stock underperformance.[19] In this section, we attempt to ascertain the role that learning effect plays in explaining the abnormal decline in idiosyncratic volatility following the equity offerings, while considering the leverage effect. More specifically, if our finding is driven by the leverage effect, we can conjecture that SEO firms listed for less than 10 years experience larger reductions in leverage than other SEO firms. We thus conduct the analysis presented in Table 10.

[Insert Table 10 here]

Panel A and Panel B of Table 10 show a reduction in leverage from year -1 to year 0 (SEO year) across SEO firms, which are statistically different from zero at the 1% level. In the periods subsequent to the equity offerings, however, the reduction in leverage for young SEO firms is not as significant and large as other SEO firms, which is inconsistent with the finding that young firms experience more distinct declines in idiosyncratic volatility after SEOs. This preliminary analysis suggests that the learning effect remains essential in explaining the abnormal decline in idiosyncratic volatility after SEOs. After further analysis, Panel C of Table 10 presents estimates of the median regression models in equation (3) while the independent variable *Leverage* is replaced by $\triangle$*Leverage*, which is the change in leverage from year -1 to year 0. Consistent with our intuition, when raw change in idiosyncratic volatility is the dependent variable, the regression

[19] Eckbo et al. (2000) and Charlson et al. (2010) argue that the reduction of leverage can explain the long-run SEO underperformance. Both of these papers explain the SEO underperformance by investigating the effect of leverage reduction on total risk, while we examine the relationship between leverage and idiosyncratic risk.

coefficient on the variable $\triangle$*Leverage* is positive and statistically significant at the 5% level, suggesting that the immediate reduction in leverage in the SEO year may contribute to the decline in idiosyncratic stock volatility in the following three years. However, when we control for the leverage effect, the regression coefficient on the variable *Young* is still negative (-0.019) and statistically significant at the 1% level. The same conclusion can be drawn when the dependent variable is change in abnormal idiosyncratic volatility, where the estimated coefficient on the variable *Young* is -0.022 with a *t*-statistic of -6.321. In other words, the relation between the abnormal decline in idiosyncratic volatility and learning effect is still robust after controlling for the leverage effect.

5.2 Learning and analyst forecast error

While we conjecture that the post-issue stock underperformance is associated with the abnormal decline in idiosyncratic stock volatility due to learning, it should be necessary and interesting to investigate whether and how financial analysts improve their accuracy of earnings forecasts via learning about the firm-specific information over time. Mikhail, Walther, and Willis (1997) and Markov and Tamayo (2006) document that the analysts rationally learn about the earnings process over time. Mikhail et al. (1997) also find that analysts' earnings forecast errors decrease as their firm–specific experience increases. In this section, we examine the monthly absolute errors in analysts' forecasts in the periods subsequent to the equity offerings. Analyst forecast error is defined as the realized annual earnings per share (EPS) minus the median analysts' consensus forecast of EPS, scaled by the previous year's book value of equity. The monthly analysts' consensus forecasts of annual earnings per share are collected from the I/B/E/S database. Ideally, the absolute value of analyst forecast error should decline if the learning effect is

present. Accordingly, we posit that analysts improve their earnings forecast faster after SEOs for young SEO firms than old SEO firms.

[Insert Table 11 here]

Panel A and B of Table 11 present the median level of and change in the absolute analyst forecast error over month 0 (the offering month) through month +12, month +24, and month +36. In Panel A, the results show that the absolute analyst forecast errors is bigger for young SEO firms than old SEO firms. Jiang, Xu, and Yao (2009) suggest that firms with high idiosyncratic volatility are less predictive of future earnings and earning shocks. Thus, young SEO firms accompanied with high idiosyncratic volatility lead to large errors in analysts' forecasts. Panel B shows that analysts' earnings forecast errors experience significant and lasting reductions after the equity offerings for SEO firms that are listed for less than 10 years, even firms listed for less than 5 years are statistically significant at the 1% level, indicating that analysts do improve their accuracy of earnings forecast over time, and learn faster for young firms. These evidences provide further support for the learning effect in explaining the post-issue underperformance.

Through these analyses, we conclude that the learning effect indeed plays an important role in explaining the abnormal decline in idiosyncratic volatility following the equity offerings as well as the post-issue long-run underperformance, when considering either the effect of leverage change on idiosyncratic volatility or the errors in analysts' forecasts after issue.

6. Conclusion

This study provides a potential explanation for the post-issue long-run stock underperformance. While DeAngelo et al. (2010) show that the SEO market is dominated by young firms, we argue that the long-run stock underperformance of SEOs can be explained by *steeper* declines in idiosyncratic return volatility over time due to young firms' faster learning about their long-term average profitability. Consistent with our conjectures, we find that SEO firms have significant abnormal reduction in average idiosyncratic volatility after the equity offerings, and this reduction is largely attributable to their youth. Furthermore, we find that young SEO firms experience significantly poorer abnormal returns in the post-issue period, which can be explained, at least in part, by the contemporary abnormal declines in idiosyncratic volatility. More importantly, once we control for the learning effect (i.e. the number of years listed), we find no evidence of poorer post-issue stock performance. Therefore, we conclude that rational learning about future mean profitability indeed plays an important role in explaining the abnormal decline in idiosyncratic volatility following the equity offerings as well as the long-run underperformance of SEOs. In this view, it does not necessary mean that SEO firms truly underperform their benchmarks following the offering date. Instead, it could imply that investors in the SEO market rationally and more quickly update their beliefs about future mean profitability. However, although we find robust results suggesting that post-issue stock underperformance is associated with the decline in idiosyncratic volatility, we do not rule out that other factors may also contribute to the poorer performance. For instance, the change in systematic and liquidity risks still robustly explains post-issue stock underperformance.

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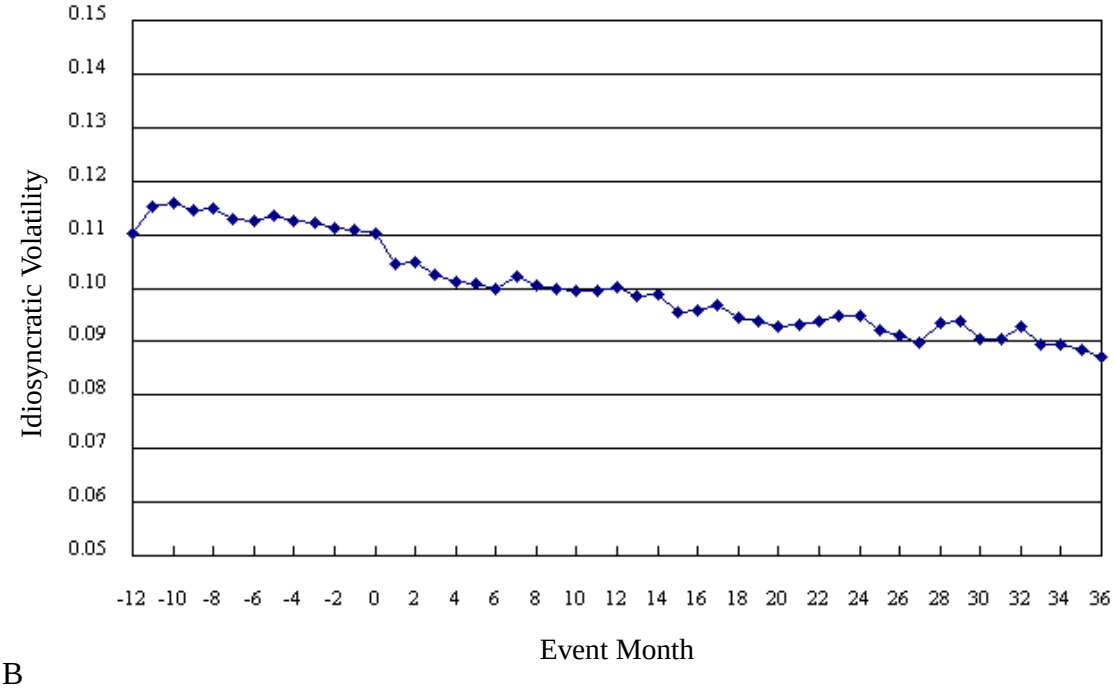
Appendix. Variable Definition

Variable	Definition
IVOL	For each firm-month, excess daily stock returns are regressed on the daily Fama-French three factors. The (monthly) idiosyncratic volatility of the stock is the multiple of the standard deviation of the regression residuals and the square root of the number of observations in the month.
M/B	Market-to-book ratio is defined as the market value of equity divided by the book value of equity.
BETA	Beta coefficient of the market model by regressing daily stock returns for each firm-month.
LIQ	Amihud's (2002) liquidity measure.
Discount	Price change from the offer price to the closing price the day prior to the offering.
Discretionary Accruals	Discretionary accruals for the fiscal year-end preceding the offering, calculated as in Teoh, Welch, and Wong (1998).
Diversification	An indicator which is equal to 1 for firm operates in multisegments in the year prior to the equity offering and 0 otherwise.
Dividend	An indicator which is equal to 1 for firm pay dividends in the year prior to the equity offering and 0 otherwise.
Financial	An indicator which is equal to 1 for issuers in a financial industry and 0 otherwise.
High_Reputation	An indicator which is equal to 1 for highest lead underwriters' or bookrunner's rank is 9.001, and 0 otherwise.
High_Tech	An indicator which is equal to 1 for issuers in a high technology industry and 0 otherwise.
Leverage	Sum of long-term debt and short-term debt divided by total asset in the year prior to the equity offering.
Ln_MktCap	Logarithm of market capitalization at the fiscal year-end immediately before the equity offering.
Ln_Size	Logarithm of total asset at the fiscal year-end immediately before the equity offering.
NASDAQ	An indicator which is equal to 1 for issuers listing on NASDAQ, and 0 otherwise.
Prior BHAR	252-days buy-and-hold abnormal return prior to the filing date.
Primary Shares Offered	Number of primary shares offered divided by the total number of shares offered.

Appendix-*Continued*

Relative Offer Size	Total offer proceeds divided by the market value of equity at the fiscal year-end immediately before the offering.
ROE	Earnings before extraordinary items divided by the book value of equity in the year prior to the equity offering.
Underpricing	Price change from the offer price to the closing price on the offer day.
Utility	An indicator which is equal to 1 for issuers in a utility industry and 0 otherwise.
Young	An indicator which is equal to 1 for SEO firms listed for less than 10 years and zero otherwise.

A



B

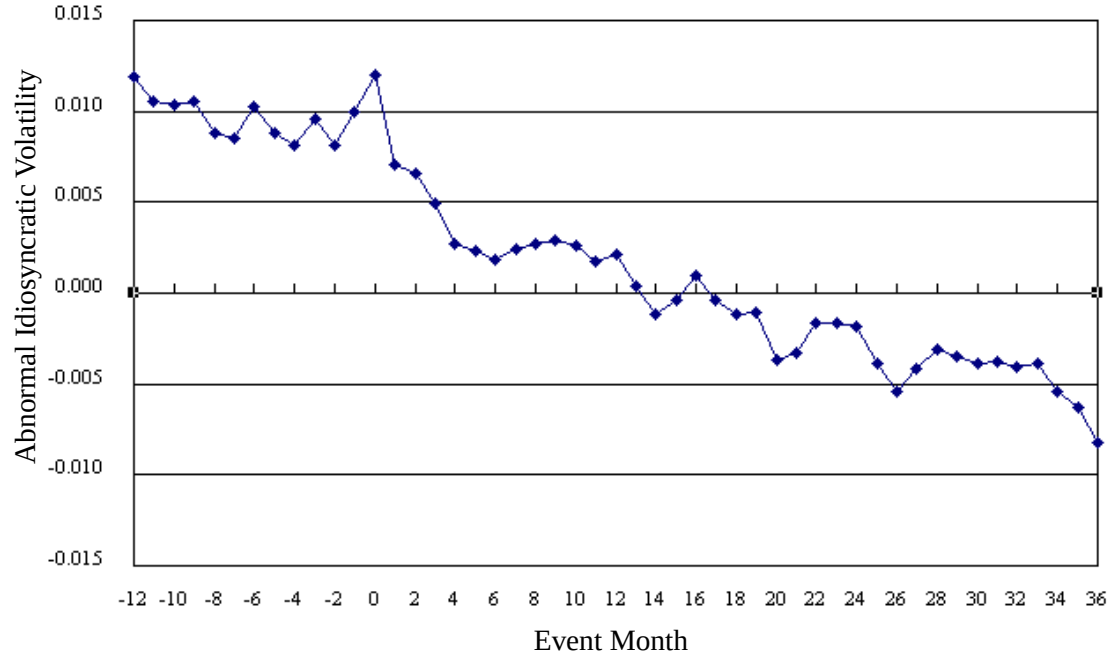
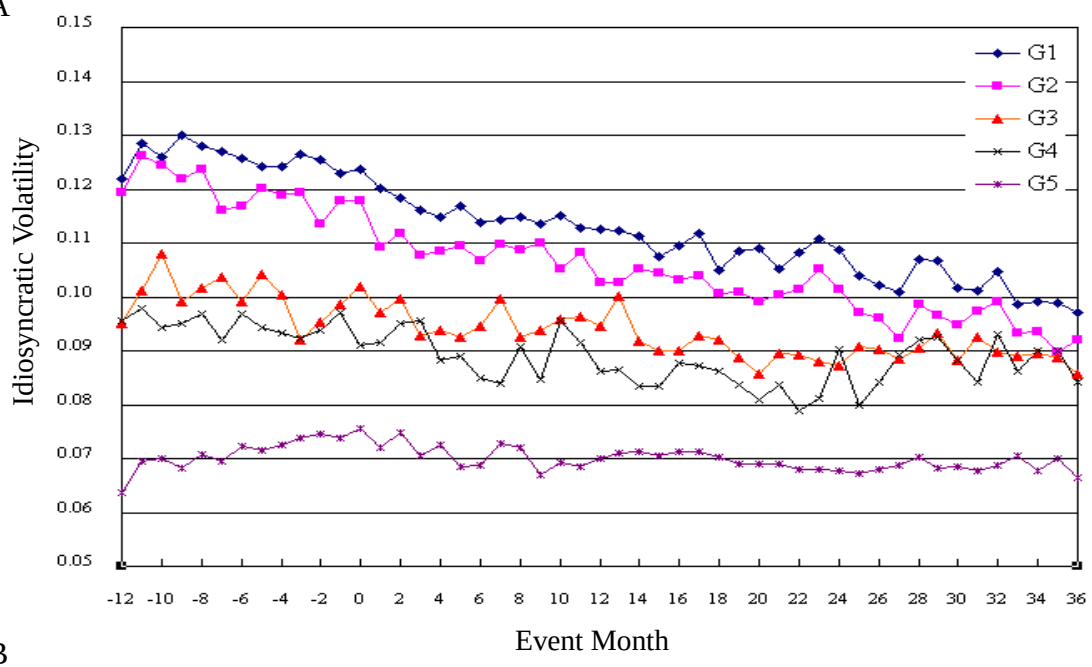


Figure 1. Idiosyncratic volatility around the SEOs offering date

This figure plots the median of idiosyncratic volatility of SEO firms from month -12 to month +36 relative to the SEO offering month (month 0). Idiosyncratic volatility is estimated as follows. For each firm-month, excess daily stock returns are regressed on the daily Fama-French three factors. The (monthly) idiosyncratic volatility of the stock is the multiple of the standard deviation of the regression residuals and the square root of the number of observations in the month. Abnormal idiosyncratic volatility is measured as the difference in idiosyncratic volatility between SEO firm and its Size-B/M-Exchange match.

A



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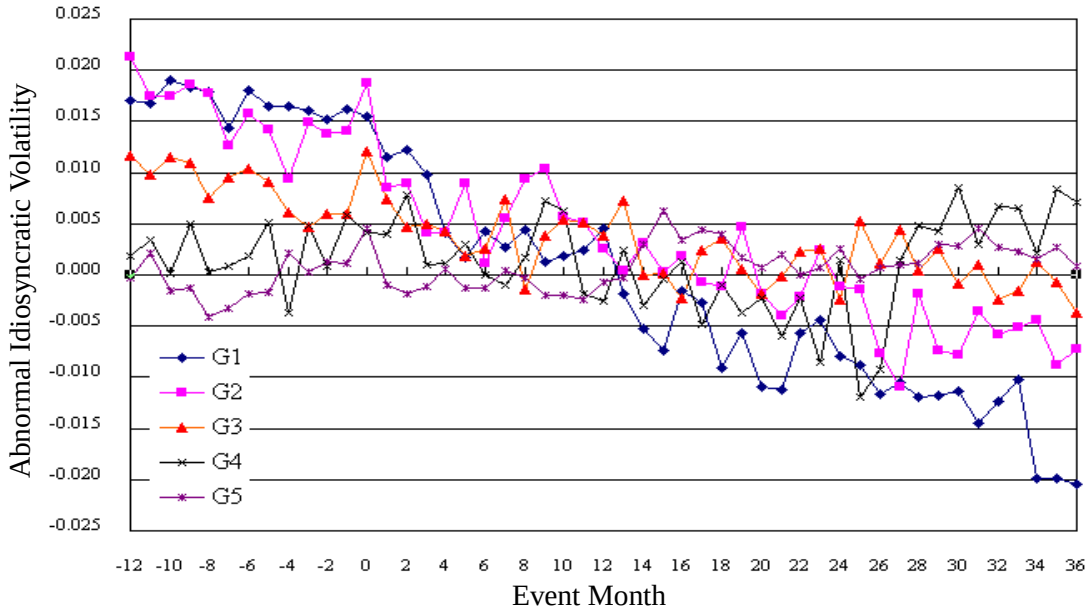

Figure 2. Idiosyncratic volatility around the SEOs offering date classified by years listed

This figure plots the idiosyncratic volatility of SEO firms from month -12 to month +36 relative to the SEO offering month (month 0). Idiosyncratic volatility is estimated as follows. For each firm-month, excess daily stock returns are regressed on the daily Fama-French three factors. The (monthly) idiosyncratic volatility of the stock is the multiple of the standard deviation of the regression residuals and the square root of the number of observations in the month. G1-G5 represent SEO firms that listed for less than 5, 5 to 10, 10 to 15, 15-20, and more than 20 years, respectively. Abnormal idiosyncratic volatility is measured as the difference in idiosyncratic volatility between the SEO firm and its Size-B/M-Exchange match.

Table 1. Sample distribution and summary statistics

This table presents descriptive statistics about SEO firms from 1983 through 2007. G1-G5 represent SEO firms that are listed for less than 5, 5 to 10, 10 to 15, 15-20, and more than 20 years, respectively. Underwriter Rank is obtained from Jay Ritter's website (Loughran and Ritter, 2004). If there is more than one lead underwriter, we use the bookrunner's rank or the highest-ranking joint bookrunner. $\triangle M/B$ is the change in market-to-book ratio of the SEO firm from the previous fiscal year to three years following the issuance date. $\triangle BETA$ is the change in market beta of the SEO firm from month 0 to month +36. $\triangle LIQ$ is the change in Amihud's (2002) liquidity measure of the SEO firm from month 0 to month +36. Other variable definitions are presented in the Appendix.

Panel A: Sample distribution			
Year listed	*N*	%	Cumulative %
G1: Less than 5	1,215	42.14	42.14
G2: 5 to 10	560	19.42	61.57
G3: 10 to 15	398	13.81	75.37
G4: 15 to 20	214	7.42	82.80
G5: 20 or more	496	17.20	100.00
All SEO Firms	2,883		
Panel B: Firm and offering characteristics			
Variables	*N*	Mean	Median
$\triangle M/B$	2,630	-1.24	-0.56
$\triangle BETA$	2,630	-0.11	-0.04
$\triangle LIQ$	2,630	0.13	0.01
Underwriter Rank	2,818	7.81	8.00
High_Tech (%)	2,883	41.87	0.00
Size (Million $)	2,859	3,967.16	131.63
MktCap (Million $)	2,790	626.37	174.50
Prior BHAR	2,883	0.68	0.47
Primary Shares Offered	2,883	0.87	1.00
Relative Offer Size	2,790	0.36	0.25
Utility (%)	2,883	8.46	0.00
Financial (%)	2,883	12.04	0.00
NASDAQ (%)	2,883	66.81	100.00
Discount (%)	2,883	3.48	1.84
Underpricing (%)	2,883	2.69	1.25
Discretionary Accruals	2,718	0.02	0.00
Dividend (%)	2,875	32.42	0.00
M/B	2,777	3.61	2.52
Leverage	2,841	0.23	0.20
ROE	2,857	0.01	0.11
Diversification (%)	2,632	43.58	0.00

Table 2. Median change in idiosyncratic volatility for SEO and matching Firms

This table presents the percentage of median change in monthly idiosyncratic volatility for SEO and Size-B/M-Exchange matching firms after the offering date. Idiosyncratic volatility is estimated as follows. For each firm-month, excess daily stock returns are regressed on the daily Fama-French three factors. The (monthly) idiosyncratic volatility of the stock is the multiple of the standard deviation of the regression residuals and the square root of the number of observations in the month. G1-G5 represent SEO firms that are listed for less than 5, 5 to 10, 10 to 15, 15-20, and more than 20 years, respectively. *p*-value for Wilcoxon signed-run test (Kruskal-Wallis test) of univariate analysis (median difference analysis) in parentheses.

	Event Month		
	0 to 12	0 to 24	0 to 36
Panel A: All SEO firms			
SEO firms	-0.75	-1.18	-1.40
	(0.000)	(0.000)	(0.000)
Matching firms	-0.07	-0.01	-0.09
	(0.671)	(0.543)	(0.624)
Difference (SEO - Matching)	-0.68	-1.17	-1.31
	(0.000)	(0.000)	(0.000)
N	2,883	2,830	2,630
Panel B: SEO firms classified by the number of years listed			
G1: Less than 5			
SEO firms	-0.97	-1.86	-2.35
	(0.000)	(0.000)	(0.000)
Matching firms	0.13	0.22	0.31
	(0.924)	(0.101)	(0.254)
Difference (SEO - Matching)	-1.11	-2.08	-2.66
	(0.000)	(0.000)	(0.000)
N	1,215	1,188	1,089
G2: 5 to 10			
SEO firms	-0.98	-1.89	-2.14
	(0.000)	(0.000)	(0.000)
Matching firms	0.53	0.22	0.17
	(0.046)	(0.336)	(0.482)
Difference (SEO - Matching)	-1.51	-2.11	-2.31
	(0.000)	(0.000)	(0.000)
N	560	550	511
G3: 10 to 15			
SEO firms	-0.85	-0.86	-0.98
	(0.000)	(0.000)	(0.000)
Matching firms	-0.22	-0.05	-0.18
	(0.294)	(0.729)	(0.828)
Difference (SEO - Matching)	-0.63	-0.81	-0.80
	(0.206)	(0.153)	(0.156)
N	398	390	365

Table 2-*Continued*

G4: 15 to 20			
SEO firms	-0.43	-0.53	-0.29
	(0.134)	(0.103)	(0.253)
Matching firms	-0.19	-0.18	-0.35
	(0.386)	(0.283)	(0.237)
Difference (SEO - Matching)	-0.25	-0.35	0.06
	(0.343)	(0.162)	(0.634)
N	214	213	200
G5: 20 or more			
SEO firms	-0.44	-0.11	-0.26
	(0.119)	(0.513)	(0.292)
Matching firms	-0.05	-0.21	-0.30
	(0.319)	(0.153)	(0.149)
Difference (SEO - Matching)	-0.39	0.10	0.04
	(0.256)	(0.714)	(0.634)
N	496	489	465

Table 3. Determinants of idiosyncratic volatility changes

This table reports coefficient estimates from the median regressions of the following form:

$$\Delta IVOL_i \text{ or } \Delta Abnormal\_IVOL_i = a + b_1 Young_i + b_2 M/B_i + b_3 Ln\_MktCap_i + b_4 Dividend_i + b_5 Leverage_i + b_6 ROE_i + b_7 Diversification_i + e_i$$

where $\triangle IVOL$ is the change in idiosyncratic volatility of SEO firms from month 0 to month +36. $\triangle$ *Abnormal_IVOL* is the difference of change in idiosyncratic volatility from month 0 to month +36 between the SEO firm and its Size-B/M-Exchange matching firm. Other independent variables are defined in the Appendix. *t*-statistics are in parentheses. Statistical significance is indicated by ***, **, and * for 1%, 5%, and 10%, respectively.

	$\triangle IVOL$	$\triangle Abnormal\_IVOL$
Intercept	-0.001 (-0.159)	-0.016 (-2.190)**
Young	-0.019 (-5.445)***	-0.021 (-5.108)***
M/B	-0.001 (-0.502)	0.001 (1.004)
Ln_MktCap	0.001 (0.367)	0.002 (1.574)
Dividend	0.007 (2.389)**	0.009 (2.504)**
Leverage	0.002 (0.308)	0.002 (0.232)
ROE	0.005 (1.317)	0.004 (0.621)
Diversification	-0.015 (-4.983)***	-0.010 (-2.908)***
Year effects	Yes	Yes
Pseudo-R^2	0.027	0.019
Number of observations	2,314	2,314

Table 4. Long-run buy-and-hold abnormal returns of SEO firms

This table presents long-run stock price reactions to seasoned equity issuances. We compound annual buy-and-hold returns for both SEO firms and matching firms from the first year (year +1) following the share issuance to the third anniversary or to a firm's delisting date. Each year is defined as a uniform block of 252 trading days and year +1 starts following the issue date. The abnormal return of SEO firms is measured by the difference between their post-SEO buy-and-hold returns and their Size-B/M-Exchange matching firms' buy-and-hold returns. G1-G5 represent SEO firms that are listed for less than 5, 5 to 10, 10 to 15, 15-20, and more than 20 years, respectively. *p*-value for *t*-test (Wilcoxon signed-run test) in parentheses (brackets).

	SEO Firms	Matching Firms	Abnormal Returns
Panel A: All SEO firms			
Mean	21.61	28.88	-7.27
	(0.000)	(0.000)	(0.002)
Median	4.87	8.88	-4.01
	[0.000]	[0.000]	[0.001]
N	2,883	2,883	2,883
Panel B: SEO firms classified by the number of years listed			
G1: Less than 5			
Mean	13.92	24.10	-10.18
	(0.000)	(0.000)	(0.008)
Median	-11.44	4.43	-15.87
	[0.785]	[0.000]	[0.003]
N	1,215	1,215	1,215
G2: 5 to 10			
Mean	15.89	26.03	-10.14
	(0.000)	(0.000)	(0.042)
Median	-4.00	9.11	-13.11
	[0.230]	[0.000]	[0.004]
N	560	560	560
G3: 10 to 15			
Mean	30.62	30.91	-0.29
	(0.000)	(0.000)	(0.964)
Median	13.52	9.23	4.29
	[0.000]	[0.000]	[0.119]
N	398	398	398
G4: 15 to 20			
Mean	34.97	36.74	-1.77
	(0.000)	(0.000)	(0.836)
Median	26.53	14.74	11.78
	[0.000]	[0.000]	[0.682]
N	214	214	214
G5: 20 or more			
Mean	33.92	38.80	-4.88
	(0.000)	(0.000)	(0.315)
Median	25.34	29.66	-4.31
	[0.000]	[0.000]	[0.244]
N	496	496	496

Table 5. Four-Factor Time-Series Regression

This table reports the average monthly abnormal return of the SEO firms in a three-year period following the issuance date. We form a portfolio of SEO firms, R_p, which includes an SEO issuance date at any of the previous three years and then compute the portfolio return. We use Fama and French (1993) and Carhart (1997) four-factor models to estimate the equations:

$$R_{p,t} - R_{f,t} = a + b[R_{m,t} - R_{f,t}] + sSMB_t + hHML_t + uUMD_t + e_t$$

where R_p is the equal-weighted (in Panel A) or value-weighted (in Panel B) monthly portfolio return of the sample firm, R_f is the risk-free rate, R_m is the market portfolio return, *SMB* is small-firm portfolio return minus big-firm portfolio return, *HML* is high book-to-market portfolio return minus low book-to-market portfolio return, and *WML* is winner portfolio return minus loser portfolio return. *SMB* is used to control for size, and *HML* is used to control for book-to-market effects. The abnormal returns of the SEO firms are estimated and then tested based on the statistical significance of the regression intercept. The monthly portfolio returns with less than 10 stocks are excluded from the regression. The numbers in parentheses are *t*-statistics.

	Coefficient Estimates					
	a	*b*	*s*	*h*	*u*	Adj-R^2
Panel A: Equal-weighted portfolio return						
All SEO firms	-0.0034	0.9951	0.5590	0.0336	-0.0805	
	(-3.509)***	(43.898)***	(17.740)***	(0.994)	(-3.897)***	0.9030
G1: Less than 5	-0.0059	1.0411	0.6871	-0.1161	-0.1258	
	(-4.351)***	(33.055)***	(15.676)***	(-2.476)**	(-4.398)***	0.8606
G2: 5 to 10	-0.0051	1.0052	0.5478	0.0051	-0.0659	
	(-3.272)***	(28.080)***	(10.994)***	(0.095)	(-2.033)**	0.8160
G3: 10 to 15	0.0004	0.9928	0.5886	0.0441	-0.2123	
	(0.274)	(27.968)***	(12.091)***	(0.855)	(-6.744)***	0.7977
G4: 15 to 20	0.0008	0.9189	0.5007	0.2206	-0.0388	
	(0.504)	(23.836)***	(9.344)***	(3.901)***	(-1.071)	0.7479
G5: 20 or more	-0.0014	0.8719	0.1716	0.3520	0.0431	
	(-1.079)	(29.946)***	(4.240)***	(8.114)***	(1.628)	0.7519
Panel B: Value-weighted portfolio return						
All SEO firms	-0.0025	1.1183	0.2439	-0.0576	-0.0759	
	(-1.968)**	(38.587)***	(6.053)***	(-1.334)	(-2.877)***	0.8596
G1: Less than 5	-0.0043	1.1497	0.6228	-0.4516	-0.0740	
	(-2.270)**	(26.177)***	(10.189)***	(-6.907)***	(-1.856)*	0.8041
G2: 5 to 10	-0.0042	1.2690	0.3365	-0.3191	-0.1971	
	(-1.987)**	(24.863)***	(4.736)***	(-4.181)***	(-4.264)***	0.7569
G3: 10 to 15	-0.0011	1.1387	0.3878	-0.1341	-0.1041	
	(-0.425)	(18.786)***	(4.666)***	(-1.523)	(-1.937)*	0.6365
G4: 15 to 20	-0.0024	1.1349	0.5881	0.0064	0.1055	
	(-0.848)	(17.627)***	(6.627)***	(0.068)	(1.880)*	0.6303
G5: 20 or more	0.0004	0.9876	-0.1564	0.5154	-0.0240	
	(0.275)	(26.613)***	(-3.026)***	(9.348)***	(-0.709)	0.6975

Table 6. Post-issue idiosyncratic volatility and long-run stock performance

This table reports the multivariate analyses of the relation between SEO long-run stock performance and post-issue idiosyncratic volatility. Regressions (1) through (3) present the results for the median regressions of buy-and-hold abnormal returns (BHAR), which is adjusted by a Size-B/M-Exchange matching firm's three-year buy-and-hold return, on post-issue idiosyncratic volatility as well as other control variables. Regressions (4) through (6) apply Carhart's (1997) model of the Fama and French (1993) method to calculate long-run abnormal returns associated with equity offerings, where the regression model is described in the legend of Table IV. The estimated intercept from this regression captures the average monthly abnormal return over the three-year period following the equity offering date. *△Abnormal_IVOL* is the difference of change in idiosyncratic volatility from month 0 to month +36 between the SEO firm and its Size-B/M-Exchange matching firm. *△Abnormal_M/B* is the difference of change in M/B ratio from month 0 to month +36 between the SEO firm and its Size-B/M-Exchange matching firm. *△ Abnormal_BETA* is the difference of change in the market beta from month 0 to month +36 between the SEO firm and its Size-B/M-Exchange matching firm. *△Abnormal_LIQ* is the difference of change in Amihud's (2002) liquidity measure from month 0 to month +36 between the SEO firm and its Size-B/M-Exchange matching firm. Other independent variables are defined in the Appendix. *t*-statistics are in parentheses. Statistical significance is indicated by ***, **, and * for 1%, 5%, and 10%, respectively.

	BHAR			Carhart Abnormal Return x 100		
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-0.052 (-0.038)	-0.027 (-0.029)	-0.287 (-0.213)	-0.154 (-0.378)	-0.225 (-0.494)	-0.308 (-0.510)
△Abnormal_IVOL	0.946 (3.286)***	1.034 (3.809)***	0.565 (2.043)**	1.904 (2.455)**	1.802 (2.265)**	2.633 (2.989)***
△Abnormal_M/B		0.021 (4.243)***	0.021 (4.597)***		0.028 (2.766)***	0.026 (2.358)**
△Abnormal_BETA			0.057 (4.302)***			0.064 (1.879)*
△Abnormal_LIQ			-0.035 (-3.486)***			-0.067 (-2.564)**
High_Reputation			0.043 (0.860)			-0.023 (-0.176)
High_Tech			-0.002 (-0.049)			0.140 (1.098)
Ln_Size			-0.039 (-2.560)**			-0.001 (-0.009)
Prior BHAR			0.013 (0.746)			0.079 (1.107)
Primary Shares Offered			-0.069 (-0.692)			-0.422 (-1.725)*
Relative Offer Size			-0.040 (-0.492)			-0.102 (-0.988)
Utility			0.155 (1.870)*			0.263 (2.268)**

Table 6-*Continued*

Financial			0.270 (3.610)***			0.270 (1.681)*
NASDAQ			-0.091 (-1.589)			-0.152 (-1.313)
Discount			0.518 (1.350)			0.252 (0.294)
Underpricing			-0.732 (-1.609)			-0.571 (-0.436)
Discretionary Accruals			-0.125 (-1.220)			-0.374 (-1.323)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-R^2 / Adj.- R^2	0.010	0.014	0.023	0.009	0.012	0.018
Number of observations	2,630	2,539	2,389	2,630	2,539	2,389

Table 7. Young SEO firms and long-run stock performance

This table reports the multivariate analyses of the relation between SEO long-run stock performance and post-issue idiosyncratic volatility. Regressions (1) and (2) present the results for the median regressions of buy-and-hold abnormal returns (BHAR), which is adjusted by a Size-B/M-Exchange matching firm's three-year buy-and-hold return, on post-issue idiosyncratic volatility as well as other control variables. Regressions (3) and (4) apply Carhart's (1997) model of the Fama and French (1993) method to calculate long-run abnormal returns associated with equity offerings, where the regression model is described in the legend of Table IV. The estimated intercept from this regression captures the average monthly abnormal return over the three-year period following the equity offering date. *△Abnormal_IVOL* is the difference of change in idiosyncratic volatility from month 0 to month +36 between SEO firm and a Size-B/M-Exchange matching firm. *△Abnormal_M/B* is the difference of change in M/B ratio from month 0 to month +36 between the SEO firm and its Size-B/M-Exchange matching firm. *△Abnormal_BETA* is the difference of change in the market beta from month 0 to month +36 between the SEO firm and its Size-B/M-Exchange matching firm. *△Abnormal_LIQ* is the difference of change in Amihud's (2002) liquidity measure from month 0 to month +36 between the SEO firm and its Size-B/M-Exchange matching firm. *Young* is an indicator variable that equals one for SEO firms that are listed for less than 10 years and zero otherwise. Other independent variables are defined in the Appendix. *t*-statistics are in parentheses. Statistical significance is indicated by ***, **, and * for 1%, 5%, and 10%, respectively.

	BHAR		Carhart Abnormal Return x 100	
	(1)	(2)	(3)	(4)
Intercept	-0.143	0.227	-0.352	-0.504
	(-0.201)	(0.225)	(-1.303)	(-0.970)
△Abnormal_IVOL	-1.145	-0.785	-1.429	-0.607
	(-1.388)	(-1.306)	(-1.365)	(-0.525)
*Young *△Abnormal_IVOL*	1.804	1.788	4.877	4.777
	(3.294)***	(3.002)***	(3.361)***	(3.118)***
Young	-0.123	-0.058	0.075	0.210
	(-1.042)	(-1.135)	(0.720)	(1.096)
△Abnormal_M/B		0.021		0.026
		(3.904)***		(2.376)**
△Abnormal_BETA		0.058		0.060
		(4.172)***		(1.761)*
△Abnormal_LIQ		-0.038		-0.058
		(-4.030)***		(-2.249)**
High_Reputation		0.087		-0.024
		(1.782)*		(-0.183)
High_Tech		-0.001		0.131
		(-0.014)		(1.030)
Ln_Size		-0.040		0.017
		(-2.740)***		(0.432)
Prior BHAR		0.010		0.084
		(0.631)		(1.103)
Primary Shares Offered		-0.091		-0.398
		(-1.054)		(-1.623)

Table 7-*Continued*

Relative Offer Size		-0.032		-0.107
		(-0.476)		(-0.982)
Utility		0.132		0.319
		(1.753)*		(2.708)***
Financial		0.269		0.224
		(3.860)***		(1.376)
NASDAQ		-0.059		-0.187
		(-1.108)		(-1.586)
Discount		0.583		0.222
		(1.497)		(0.249)
Underpricing		-0.854		-0.477
		(-1.772)*		(-0.363)
Discretionary Accruals		-0.159		-0.387
		(-1.624)		(-1.375)
Year effects	Yes	Yes	Yes	Yes
Pseudo-R^2 / Adj.- R^2	0.016	0.027	0.013	0.023
Number of observations	2,630	2,389	2,630	2,389

Table 8. Year listed adjusted matching and idiosyncratic volatility

This table presents the percentage of median change in monthly abnormal idiosyncratic volatility for SEO and Year-Listed-Size-B/M-Exchange matching firms after issuances of seasoned equity shares. Idiosyncratic volatility is estimated as follows. For each firm-month, excess daily stock returns are regressed on the daily Fama-French three factors. The (monthly) idiosyncratic volatility of the stock is the multiple of the standard deviation of the regression residuals and the square root of the number of observations in the month. G1-G5 represent SEO firms that are listed for less than 5, 5 to 10, 10 to 15, 15-20, and more than 20 years, respectively. *p*-value for Wilcoxon signed-run test (Kruskal-Wallis test) of univariate analysis (median difference analysis) in parentheses.

	Event Month		
	0 to 12	0 to 24	0 to 36
Panel A: All SEO firms			
SEO firms	-0.75	-1.18	-1.40
	(0.000)	(0.000)	(0.000)
Matching firms	-0.87	-1.20	-1.45
	(0.000)	(0.000)	(0.000)
Difference (SEO - Matching)	0.12	0.02	0.05
	(0.320)	(0.892)	(0.584)
N	2,883	2,830	2,630
Panel B: SEO firms classified by year listed			
G1: Less than 5			
SEO firms	-0.97	-1.86	-2.35
	(0.000)	(0.000)	(0.000)
Matching firms	-1.15	-1.76	-2.35
	(0.000)	(0.000)	(0.000)
Difference (SEO - Matching)	0.18	-0.09	0.00
	(0.300)	(0.819)	(0.648)
N	1,215	1,188	1,089
G2: 5 to 10			
SEO firms	-0.98	-1.89	-2.14
	(0.000)	(0.000)	(0.000)
Matching firms	-1.20	-1.59	-2.15
	(0.000)	(0.000)	(0.000)
Difference (SEO - Matching)	0.22	-0.31	0.00
	(0.328)	(0.901)	(0.678)
N	560	550	511
G3: 10 to 15			
SEO firms	-0.85	-0.86	-0.98
	(0.000)	(0.000)	(0.000)
Matching firms	-0.81	-0.80	-0.57
	(0.000)	(0.002)	(0.015)
Difference (SEO - Matching)	-0.05	-0.06	-0.41
	(0.692)	(0.401)	(0.235)
N	398	390	365

Table 8-*Continued*

G4: 15 to 20			
SEO firms	-0.43	-0.53	-0.29
	(0.134)	(0.103)	(0.253)
Matching firms	-0.29	-0.43	-0.43
	(0.176)	(0.139)	(0.166)
Difference (SEO - Matching)	-0.14	-0.10	0.14
	(0.851)	(0.514)	(0.774)
N	214	213	200
G5: 20 or more			
SEO firms	-0.44	-0.11	-0.26
	(0.119)	(0.513)	(0.292)
Matching firms	-0.41	-0.29	-0.32
	(0.168)	(0.300)	(0.216)
Difference (SEO - Matching)	-0.03	0.18	0.06
	(0.503)	(0.201)	(0.237)
N	496	489	465

Table 9. Year listed adjusted matching and long-run buy-and-hold abnormal returns

This table presents long-run stock price reactions to seasoned equity issuances. We compound annual buy-and-hold returns for both SEO firms and matching firms from the first year (year +1) following the share issuance to the third anniversary or to a firm's delisting date. Each year is defined as a uniform block of 252 trading days and year +1 starts following the issue date. The abnormal return of SEO firms is measured by the difference between their post-SEO buy-and-hold returns and their Year-Listed-Size-B/M-Exchange matching firms' buy-and-hold returns. G1-G5 represent SEO firms that are listed for less than 5, 5 to 10, 10 to 15, 15-20, and more than 20 years, respectively. *p*-value for *t*-test (Wilcoxon signed-run test) in parentheses (brackets).

	SEO Firms	Matching Firms	Abnormal Returns
Panel A: All SEO firms			
Mean	21.61	24.11	-2.50
	(0.000)	(0.000)	(0.331)
Median	4.87	7.03	-2.16
	[0.000]	[0.000]	[0.538]
N	2,883	2,883	2,883
Panel B: SEO firms classified by year listed			
G1: Less than 5			
Mean	13.92	17.51	-3.59
	(0.000)	(0.000)	(0.458)
Median	-11.44	-7.54	-3.90
	[0.785]	[0.566]	[0.889]
N	1,215	1,215	1,215
G2: 5 to 10			
Mean	15.89	18.71	-2.82
	(0.000)	(0.000)	(0.581)
Median	-4.00	-1.42	-2.58
	[0.230]	[0.045]	[0.444]
N	560	560	560
G3: 10 to 15			
Mean	30.62	38.21	-7.59
	(0.000)	(0.000)	(0.278)
Median	13.52	19.42	-5.90
	[0.000]	[0.000]	[0.703]
N	398	398	398
G4: 15 to 20			
Mean	34.97	26.98	7.99
	(0.000)	(0.000)	(0.317)
Median	26.53	16.00	10.53
	[0.000]	[0.000]	[0.243]
N	214	214	214
G5: 20 or more			
Mean	33.92	33.99	-0.07
	(0.000)	(0.000)	(0.970)
Median	25.34	29.32	-3.98
	[0.000]	[0.000]	[0.301]
N	496	496	496

Table 10. Financial leverage and idiosyncratic volatility

This table presents the effect of leverage change on idiosyncratic volatility. Panel A and B present the median level of and change in leverage around the year of SEO. Panel C reports the regression results for the determinants of change in idiosyncratic volatility. G1-G5 represent SEO firms that are listed for less than 5, 5 to 10, 10 to 15, 15-20, and more than 20 years, respectively. $\triangle IVOL$ is the change in idiosyncratic volatility of SEO firms from month 0 to month +36. $\triangle Abnormal\_IVOL$ is the difference of change in idiosyncratic volatility from month 0 to month +36 between the SEO firm and its Size-B/M-Exchange matching firm. $\triangle Leverage$ is the change in leverage from year -1 to year 0 (SEO year). Other independent variables are defined in Appendix. Statistical significance is indicated by ***, **, and * for 1%, 5%, and 10% for Kruskal-Wallis test, respectively.

Panel A: Level of leverage					
	Event year				
	-1	0	1	2	3
G1: Less than 5	0.1053	0.0636	0.0927	0.1316	0.1328
G2: 5 to 10	0.1682	0.1050	0.1265	0.1541	0.1762
G3: 10 to 15	0.2512	0.1681	0.1978	0.2130	0.2015
G4: 15 to 20	0.3070	0.2144	0.2360	0.2608	0.2609
G5: 20 or more	0.3386	0.2951	0.2999	0.3137	0.3113
Panel B: Change in leverage					
		-1 to 0	-1 to 1	-1 to 2	-1 to 3
G1: Less than 5		-0.0416 ***	-0.0126 *	0.0263	0.0276
G2: 5 to 10		-0.0632 ***	-0.0417 ***	-0.0141	0.0080
G3: 10 to 15		-0.0831 ***	-0.0534 ***	-0.0381 **	-0.0496 ***
G4: 15 to 20		-0.0926 ***	-0.0710 **	-0.0462 *	-0.0461 *
G5: 20 or more		-0.0435 ***	-0.0387 ***	-0.0249 **	-0.0272 **

Table 10-*Continued*

Panel C: Determinants of idiosyncratic volatility changes		
	△IVOL	*△Abnormal_IVOL*
Intercept	0.001 (0.164)	-0.015 (-2.361)**
Young	-0.019 (-6.175)***	-0.022 (-6.321)***
M/B	-0.001 (-0.359)	0.001 (1.080)
Ln_MktCap	0.001 (0.295)	0.002 (1.744)*
Dividend	0.007 (2.150)**	0.009 (2.444)**
△Leverage	0.024 (1.985)**	0.017 (1.117)
ROE	0.005 (1.452)	0.003 (0.548)
Diversification	-0.015 (-5.047)***	-0.010 (-2.737)***
Year effects	Yes	Yes
Pseudo-R^2	0.0278	0.0192
Number of observations	2,311	2,311

Table 11. Absolute analyst forecast error

This table presents the percentage of median change in absolute analyst forecast error for SEO firms after issuances of seasoned equity shares. Analyst forecast error is defined as the realized annual earnings per share (EPS) minus the median analysts' consensus forecast of EPS, scaled by the previous year's book value of equity. G1-G5 represent SEO firms that are listed for less than 5, 5 to 10, 10 to 15, 15-20, and more than 20 years, respectively. Statistical significance is indicated by ***, **, and * for 1%, 5%, and 10% for Kruskal-Wallis test, respectively.

Panel A: Absolute Analyst forecast errors (%)				
	Event Month			
	0	12	24	36
G1: Less than 5	0.1379	0.1003	0.0964	0.0721
G2: 5 to 10	0.0988	0.0815	0.0602	0.0745
G3: 10 to 15	0.0809	0.0774	0.0713	0.0767
G4: 15 to 20	0.0528	0.0557	0.0480	0.0499
G5: 20 or more	0.0293	0.0281	0.0235	0.0273
Panel B: Change in absolute analyst forecast errors (%)				
		0 to 12	0 to 24	0 to 36
G1: Less than 5		-0.0376 ***	-0.0415 ***	-0.0658 ***
G2: 5 to 10		-0.0174 **	-0.0386 ***	-0.0244 **
G3: 10 to 15		-0.0035	-0.0096	-0.0042
G4: 15 to 20		0.0029	-0.0048	-0.0029
G5: 20 or more		-0.0011	-0.0058	-0.0020