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Seasoned Equity Offerings and Stock Price Crash Risk

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Abstract

Using a large sample of U.S. firms during 1987–2011, we find robust evidence that the issuance of seasoned equity is associated with abnormally high future stock price crash risk. The association between seasoned equity offerings and crash risk is stronger among offerings that involve the sale of secondary shares (existing shares sold by insiders or large blockholders). We also find that recent seasoned equity issuers are far less likely to experience sudden positive price jumps relative to firms that have not recently issued equity. Our findings of elevated crash risk and diminished jump risk, when taken together, are consistent with a heightened propensity for firms to hoard bad news but not good news when issuing equity.

Keywords: Stock Price Crash Risk; Tail Risk; Seasoned Equity Offering; Secondary Offering

JEL Classifications: G11, G17, G14, G30, G32

Introduction

Understanding and predicting extreme left-tail outcomes (i.e., tail risk) in financial markets has garnered significant attention from scholars, market participants, and policymakers, especially since the financial crisis of 2008. In the theoretical model of Jin and Myers (2006), bad news hoarding gives rise to firm-specific (idiosyncratic) tail risk. Various factors can incentivize managers to delay the disclosure of negative private information for extended periods of time (Kothari et al., 2009; Graham et al., 2005). Bad news, however, cannot be hoarded indefinitely, as the cost to managers of doing so will eventually become too high (Jin and Myers, 2006). When accumulated bad news eventually reaches a threshold level that managers can no longer sustain, it tends to come out all at once or very quickly, resulting in a very sudden and extreme drop in the stock price, which is empirically identified as an extreme left-tail outlier in the distribution of daily or weekly firm-specific returns. Empirical studies of firm-specific crash risk have therefore focused on identifying firm characteristics or corporate activities that may facilitate or incentivize bad news hoarding.

In this study, we expand this strand of literature by examining whether firm-specific crashes are more likely to occur after seasoned equity offerings (SEOs). The works of Graham and Harvey (2001), Baker and Wurgler (2002), and Jenter (2005) suggest that corporate managers have a preference for issuing equity when they perceive that the market price of the firm's stock is high, while the recent literature on crash risk argues that bad news hoarding temporarily keeps stock prices higher than they otherwise would be. The confluence of arguments from these hitherto disjointed literatures thus implies the potential for a strong association between equity issues and bad news hoarding, leading us to hypothesize that recent equity issuers should be especially prone to sudden crashes.

Using a large panel of U.S. firms during 1987-2011, we find robust evidence that the issuance of seasoned equity is associated with abnormally high one-year-ahead crash risk. As in prior studies of crash risk, we define a stock price crash as a weekly firm-specific log-return that is 3.1 or more standard deviations below the firm's average during the year. Firms that have recently complete a seasoned equity offering are significantly more likely to experience a stock price crash relative to firms that have not recently completed an equity offering, and this finding holds in both simple univariate comparisons and in multivariate models that control for known predictors of crash risk identified in prior literature. Our finding that SEOs are associated with a statistically and economically significant rise in crash risk is robust to the use of alternative measures of crash risk that have been employed in the literature, such as the degree of negative skewness in firm-specific weekly returns (Chen et al., 2001; Kim et al., 2011a, 2011b), as we find that returns are substantially more left skewed among firms that have recently completed an SEO relative to firms that have not.

We further investigate whether the association between SEOs and crash risk is stronger among issuers that sell secondary shares versus issuers that sell only primary shares. Primary shares are newly created shares that raise new equity capital for the firm, while secondary shares are pre-existing shares sold by insiders (e.g., officers and directors) or large blockholders. Given the relative information advantage that insiders and large blockholders are likely to possess over other market participants, combined with their personal financial incentives to exploit their private information, we hypothesize greater crash risk after SEOs that involve the sale of secondary shares. We find evidence that strongly supports this hypothesis.

Our findings are consistent with a contemporaneous association between SEOs and bad news hoarding. This interpretation of our results depends on the assumption that managers' have a strong preference for issuing stock at high prices. Graham et al. (2005), Kothari et al. (2009), Aboody and Kasznik (2000), and Devos et al. (2015) discuss various factors that may incentivize managers to delay the release of good news for extended periods, including reputational concerns, costs of revealing proprietary information to competitors, and managers' desire to maximize the value of their stock option grants. If managers do indeed have a strong preference for issuing stock when they perceive that the stock price is high, managerial incentives for delaying the release of good news should be significantly diminished prior to SEOs and, therefore, stock price jumps (sudden, extreme positive returns) should be especially unlikely after SEOs. We find robust empirical support for this prediction. Taken together, our findings that crashes are more likely and jumps are less likely after an SEO are consistent with a propensity for managers of issuing firms to hoard bad but not good news. It is worth noting that these findings, along with our finding of greater left skewness in recent issuers' idiosyncratic returns, indicate that SEOs are not associated with a heightened likelihood of extreme returns, per se, but only with a heightened likelihood of extreme left-tail returns.

Our study adds to the growing literature on tail risk in equity markets. The recent literature on firm-specific crash risk identifies various firm characteristics and corporate activities that portend the risk of a future crash, presumably through their association with bad news hoarding. Our study shines the spotlight on an observable corporate action with a robust association with future crash risk, which should help to further inform future empirical and theoretical research on bad news hoarding and crash risk. Our findings also shed new light on the implications of managers' preference for issuing stock at high prices. Evidence from the capital structure literature, specifically that presented by Graham and Harvey (2001) in their survey of corporate CFOs, along with the stylized fact that firms tend to issue new equity after their stock price has appreciated (Asquith and Mullins, 1986; Rajan and Zingales, 1995; Bae et al., 2002; Alti and Sulaeman, 2012), is consistent with the idea that managers' perception of the stock price plays an important role in equity issuance decisions. However, the implications of this regarding stock return dynamics after equity offerings remain disputed and thus unclear. Numerous studies have concluded that equity issuers earn post-offering returns that are, on average, significantly lower than those of matched firms or those predicted by asset pricing models (Ritter, 1991; Loughran and Ritter, 1995; Spiess and Affleck-Graves, 1995; Lee, 1997; Teoh et al., 1998; Bae et al., 2002; Clarke et al., 2004; Jenter, 2005). However, numerous other studies have questioned the validity of these findings or argued that recent issuers are less risky with respect to one or more priced risk factors omitted from standard pricing models or matching procedures, and thus have lower expected returns than implied by standard benchmarks (Fama, 1998; Mitchell and Stafford, 2000; Brav and Gompers, 1997; Brav et al., 2000; Eckbo et al., 2000; Shivakumar, 2000; Carlson et al., 2006; Lyandre et al., 2008; Li et al., 2009; Bessembinder and Zhang, 2013; Lin and Wu, 2013).

While this literature addresses important and relevant questions, its narrow focus on the first moment of the return distribution has left our understanding of post-issue return dynamics somewhat limited. Our study offers a completely new yet relevant perspective; rather than focusing on the first moment of post-issue returns, we ask whether managers' preference for issuing stock at high prices has important implications for tail risk inherent in post-issue returns. Despite the long history of interest among scholars in the behavior of stock prices after equity offerings, this study is the first, to our knowledge, to elucidate the presence of significantly elevated tail risk in the returns of recent seasoned equity issuers. Thus, our paper further enlightens scholarly literature focused on understanding stock return dynamics after seasoned equity offerings and, in particular, sheds new light on the implications of managers' preference for issuing stock at perceived high prices. In addition, given published empirical evidence that tail risk is priced in the cross-section of expected returns (Boyer et al., 2010; Huang et al., 2012; Conrad et al., 2013), the importance of extreme return likelihoods and skewness in option valuation (Corrado and Su, 1996; Bakshi et al., 1997; Arnold et al., 2007), and the economically significant effect of stock price crashes on shareholder wealth, we expect our findings to be especially useful to various market participants and practitioners interested in developing empirical models that more accurately predict tail risk in the stock returns of individual firms.

Literature Review

Our first hypothesis is motivated by two strands of literature. The first is the recent literature on firm-specific stock price crashes, which has its origins in the theoretical analysis of Jin and Myers (2006). In Jin and Myers (2006), managers possess private, firm-specific information and exercise significant control over how quickly or slowly information is disclosed to market participants. The withholding and accumulation of bad news for an extended period leads to a crash in the stock price when the accumulated negative information is eventually revealed to the market. Based on this line of thought, a growing body of empirical literature focused on identifying factors that predict firm-level crashes has emerged, with an explicit emphasis on corporate activities or firm characteristics that could be associated with bad news hoarding (or lack thereof). Examples include the religiosity of the area where a firm is located (Callen and Fang, 2015), the firm's approach to corporate social responsibility (Kim et al., 2014), stable ownership by institutional investors (Callen and Fang, 2013, An and Zhang, 2013), executive stock option compensation (Kim et al., 2011b), complex tax shelters such as those employed by Enron (Kim et al., 2011a), and opaque financial reporting (Hutton et al., 2009). Kothari et al. (2009) discuss certain factors that could incentivize managers to hoard bad news for extended periods, such as fear of termination, the desire to meet performance benchmarks that enhance prospects for promotion or trigger performance-based compensation, and concerns about future employment or post-retirement benefits like directorships. In addition, Ball (2009) suggests that managerial empire building and the desire to garner the esteem of peers could also incent managers to conceal bad news (Ball, 2009). Managers may also withhold bad news in hopes that subsequent positive developments will allow them to "bury" the negative news (Kothari et al., 2009), a conjecture which is supported by the survey evidence of Graham et al. (2005).

The second strand of literature from which we draw includes studies that attempt to shed light on important factors that managers consider in the decision to issue equity. Several studies argue that managers prefer to issue equity when they believe it to be overvalued or when they perceive that the market price is high relative to subjective benchmarks, such as book values or past market values (Ritter, 1991; Loughran and Ritter, 1995; Spiess and Affleck-Graves, 1995; Baker and Wurgler, 2002; Jenter 2005; Altı and Sulaeman, 2012). In their well-known survey of corporate CFOs, Graham and Harvey (2001) report that two-thirds of CFOs agree with the statement that "the amount by which our stock is undervalued or overvalued is an important or very important consideration in issuing equity," and nearly as many agree that "if our stock price has recently risen, the price at which we can sell is 'high'" (p. 216). Moreover, the overall results of the survey indicate that stock prices are regarded by CFOs as more important than nine out of ten factors considered in the study, which indeed suggests that managers' perception of the stock price plays an important role in equity issuance decisions.

The confluence of arguments and evidence from the different strands of literature cited above suggests that managers seeking to issue new equity should have heightened incentives for bad news hoarding. Moreover, managers already engaged in bad news hoarding for reasons other than issuing equity may exploit the opportunity to issue new shares while prices remain high, which will reinforce their incentives to continue hoarding bad news in order to avoid significant price declines prior to offering completion. Empirically, a contemporaneous association between bad news hoarding and equity issues implies a predictive relationship between equity offerings and future crash risk, which constitutes our first hypothesis:

H1: Firms that have recently completed an SEO are more likely to experience a stock price crash.

About 40% of SEOs during our sample period include secondary shares. Whereas primary shares represent newly created equity, with the proceeds accruing to the firm, secondary shares represent already existing shares that are sold by insiders (officers and directors) or large blockholders. Clearly, managers and directors of firms engaged in bad news hoarding have heightened incentives to exploit their private information by selling personally owned shares. The sale of secondary shares by insiders in an SEO may therefore be a stronger indicator of the presence of bad news hoarding and, thus, a stronger signal about future crash risk. In cases where the selling shareholder is not an insider, invariably it will be a large blockholder. Prevailing theories suggest that blockholders can also be privy to inside information. In the theoretical models of Maug (1998), Edmans (2009), and Admati and Pfleiderer (2009), the option to liquidate shareholdings based on negative nonpublic information at the expense of uninformed investors actually incentivizes costly information acquisition by the blockholder. Thus, the high potential for a relative information advantage among selling shareholders of secondary shares, whether they be insiders or blockholders, combined with obvious personal financial incentives to exploit their information advantage leads us to test the following hypothesis:

H2: SEOs that involve the sale of secondary shares are associated with greater future crash risk relative to SEOs that do not involve the sale of secondary shares.

Research Methodology

Our sample consists of U.S. firms in CRSP and Compustat during fiscal years 1987 to 2011 with public common stock (CRSP share codes of 10 or 11). Following Kim et al. (2011a), we include firm-years with non-negative book equity and book assets and firm-years with at least 26 twenty-six non-missing weekly returns in CRSP. We also require that firms have information in Compustat and CRSP necessary for the construction of our baseline control variables. Our baseline sample consists of 105,119 firm-years. Throughout our paper, any references to "years" denote fiscal years (not calendar years) unless otherwise stated.

We estimate firm-specific weekly returns for each firm-year in the sample with the following five-factor model:

$$R_{i,\tau} = \alpha_i + \beta_i R_{m,\tau} + s_i SMB_\tau + h_i HML_\tau + u_i UMD_\tau + \gamma_i IND_{i,\tau} + \varepsilon_{i,\tau}$$

where, for firm i in week τ , R_i is the weekly stock return of firm i and R_m is the weekly return on the CRSP value-weighted index. SMB and HML are the weekly returns on the Small-Minus-Big and High-Minus-Low portfolios, respectively, of Fama and French (1993), which capture size and book-to-market effects. UMD is the Up-Minus-Down portfolio of Carhart (1997), which captures return momentum effects. IND_i is the weekly return on a value-weighted index that includes all firms in firm i 's Fama-French industry using the updated industry classification scheme of Fama and French (1997) that groups firms into forty-nine industries. We define the weekly firm-specific log-return in week τ as the natural logarithm of one plus the residual from the

five-factor model. As in Hutton et al. (2009) and Kim et al. (2011a, 2011b), firm *i* is defined as having a price crash in a given week if the firm-specific log-return is 3.09 or more standard deviations below firm *i*'s mean weekly firm-specific log-return during that fiscal year. Our main dependent variable, CRASH, is a dummy variable that equals one if a firm has one or more crashes in the given fiscal year and zero otherwise. Our empirical analysis uses information available in year *t* to predict crash risk in year *t*+1. Thus, measurement of our SEO variables and control variables, described below, begins in the first year of our sample period, 1987, while measurement of our crash risk variables begins in 1988.

Table 1 reports the frequency of firm-specific crashes for each year and for the aggregate sample. In aggregate, 18.5% of firm-years in the sample contain a crash. Table 1 also reports the mean firm-specific and raw stock returns during crash weeks by year and for the aggregate sample. During weeks containing a crash, the average firm-specific return is -23% and the average raw stock return is -24%.

Table 1: Frequency of Stock Price Crashes and Average Crash Returns

Fiscal Year	Number of Firms	Number of Firms with a Stock Price Crash	Proportion of Firms with Stock Price Crash	Average Firm-Specific Return during Crash Weeks	Average Raw Return during Crash Weeks
1988	3,941	535	13.6%	-20.5%	-21.6%
1989	4,148	669	16.1%	-21.3%	-22.5%
1990	4,099	852	20.8%	-24.1%	-26.1%
1991	4,037	677	16.8%	-24.4%	-24.8%
1992	4,013	681	17.0%	-25.0%	-25.8%
1993	4,041	595	14.7%	-22.3%	-23.3%
1994	4,777	698	14.6%	-22.0%	-23.2%
1995	5,013	659	13.1%	-21.7%	-22.9%
1996	5,328	744	14.0%	-23.2%	-24.5%
1997	5,425	783	14.4%	-23.5%	-25.0%
1998	5,509	973	17.7%	-25.4%	-26.8%
1999	5,302	840	15.8%	-26.6%	-27.6%
2000	5,137	993	19.3%	-29.0%	-29.3%
2001	4,838	967	20.0%	-26.7%	-26.9%
2002	4,688	1,067	22.8%	-26.3%	-28.1%
2003	4,464	854	19.1%	-19.9%	-20.5%
2004	4,266	901	21.1%	-18.2%	-19.4%
2005	4,064	914	22.5%	-18.0%	-19.2%
2006	3,933	905	23.0%	-17.4%	-18.6%
2007	3,847	891	23.2%	-19.4%	-21.9%
2008	3,766	1,077	28.6%	-28.1%	-29.6%
2009	3,611	751	20.8%	-26.0%	-24.5%
2010	3,549	685	19.3%	-18.2%	-18.9%
2011	3,306	694	21.0%	-18.2%	-20.2%
Total	105,119	19,405	18.5%	-23.0%	-24.0%

This table reports the frequency of stock price crashes by year (fiscal) for firms in our sample. The table also reports average firm-specific and raw stock returns during weeks that contain a stock price crash. For robustness, we employ an additional crash risk variable originally constructed by Chen et al. (2001) and employed by An and Zhang (2013), Callen and Fang (2013, 2015), and Kim et al. (2011a, 2011b). NCSKEW equals negative one multiplied by the coefficient of skewness of the firm's weekly firm-specific log-returns during the given fiscal year. The coefficient of skewness equals the ratio of the sample third central moment to the sample standard deviation cubed. Larger values of this variable correspond to more negative skewness and thus higher crash risk. Table 2 reports sample descriptive statistics for NCSKEW_{t+1}. Since our empirical analysis regresses one-year ahead crash risk in year *t*+1 on explanatory variables measured in year *t*, we use the *t*+1 subscript for our crash risk variables. The sample mean and median values of NCSKEW_{t+1} of -0.178 and -0.174, respectively, indicate that weekly firm-specific log-returns are positively skewed for the mean and median firm-year.

Table 2: Summary Statistics for Sample Firms

Variable	Mean	Standard Deviation	25th Percentile	Median	75th Percentile	N
CRASH _{t+1}	0.185	0.388	0.000	0.000	0.000	105,119
NCSKEW _{t+1}	-0.178	0.822	-0.600	-0.174	0.235	105,119
SEO _t	0.059	0.236	0.000	0.000	0.000	105,119
SECONDARY_SEO _t	0.024	0.153	0.000	0.000	0.000	105,119
LN_MARKETCAP _t	5.412	2.122	3.856	5.288	6.881	105,119
MARKETCAP _t	1,945	5,978	47	198	973	105,119
MB _t	2.840	3.566	1.114	1.762	3.029	105,119
LEVERAGE _t	0.207	0.188	0.036	0.171	0.331	105,119
ROE _t	-0.095	0.653	-0.045	0.080	0.144	105,119
DTURN _t	0.002	0.075	-0.018	0.000	0.018	105,119
NCSKEW _t	-0.154	0.759	-0.575	-0.168	0.228	105,119
SIGMA _t	0.062	0.038	0.034	0.053	0.080	105,119
ALPHA _t	0.001	0.010	-0.004	0.001	0.006	105,119
LRETR _t	0.394	0.315	0.184	0.313	0.461	80,361
ACCRUALS _t	0.237	0.242	0.086	0.161	0.297	87,289
STD _t	0.003	0.003	0.002	0.003	0.004	79,515

This table presents summary statistics of variables used in our empirical analysis for a sample of firm-years (fiscal) comprised of firms in CRSP and Compustat during fiscal years 1987 to 2011. We use the SDC Platinum New Issues database to collect data on public offerings of seasoned common equity marketed in the United States. We exclude rights offerings and unit offerings, as well as initial public offerings (IPOs), since newly public firms lack sufficient historical data necessary for the construction of most of our control variables. During the sample period, a total of 6,698 SEOs were completed by the firms in our sample. Proceeds of the average SEO represent 22% of the firm's pre-offering market value of equity. 2,672 (40%) of the 6,698 SEOs in our sample include secondary shares, while the remaining 4,176 (60%) are purely primary. Of those that include secondary shares, on average the secondary proceeds represent approximately 59% of total offering proceeds.

For the purposes of testing H1, we construct a binary variable, denoted as SEO_t, that equals one if the firm had at least one public seasoned equity offering in year t and zero otherwise. We note that this variable, when equal to one, captures all firms-years that contain at least one SEO, irrespective of whether the firm's SEO(s) involved the sale of secondary shares or not. For the purposes of testing H2, among the firm-years that contain an SEO, we identify the subset of firm-years that have at least one SEO that involves the sale of secondary shares. We then construct an indicator variable, SECONDARY_SEO_t, that takes a value of one for these firms-years and zero otherwise.

We report sample descriptive statistics for SEO_t and SECONDARY_SEO_t in Table 2. The sample mean of SEO_t (0.059) indicates that 5.9% of firms-years in the sample contain one or more SEOs. The mean of SECONDARY_SEO_t indicates that 2.4% of firm-years contain an SEO that involves secondary shares. Thus, of the firm-years that contain an SEO, roughly 41% (2.4/5.9) is comprised of firm-years in which the secondary shares were sold, while the remaining 59% is comprised of firm-years in which the SEO(s) were purely primary.

We use control variables employed by An and Zhang (2013), Callen and Fang (2013, 2015), and Kim et al. (2011a, 2011b). Monetary variables are measured in millions of 2012 US dollars. As in Callen and Fang (2013, 2015), we winsorize all variables at the 1st and 99th percentiles to reduce the influences of outliers. The baseline control variables are LN_MARKETCAP_t, MB_t, LEVERAGE_t, ROE_t, DTURN_t, NCSKEW_t, SIGMA_t, and ALPHA_t. LN_MARKETCAP_t equals the natural log of the market value of common equity. MB_t is the ratio of the market value of common stock to the book value of common stock. LEVERAGE_t is the ratio of total debt to total assets. ROE_t is the ratio of income before extraordinary items to the book value of common stock. DTURN_t is the firm's average monthly share turnover during fiscal year t minus the firm's average monthly share turnover during fiscal year t-1, where monthly share turnover equals the number of

shares traded during the month divided by shares outstanding. This variable is a commonly used measure of differences of opinion among investors. NCSKEW_t equals negative one multiplied by the skewness coefficient of the firm's weekly firm-specific log-returns in year t. SIGMA_t is the standard deviation of the firm's weekly firm-specific log-returns during year t. It is well known that SEOs tend to be preceded by unusually high stock returns. Since firms with high past returns have also been shown to exhibit greater negative return skewness (Chen et al., 2001), we consider it especially important to control for past stock return performance. ALPHA_t, measures the firm's idiosyncratic stock return performance and equals the natural log of one plus the estimated intercept from the firm's five-factor model estimated during year t.

Hutton et al. (2009) find that firms with abnormally high discretionary accruals, which can be used to manipulate reported earnings, are more likely to experience stock price crashes. Therefore, following Hutton et al. (2009) and Kim et al. (2011a), in some regressions we include the variable ACCRUAL_t, which equals the sum of the absolute value of discretionary accruals during years t, t-1, and t-2. Discretionary accruals are estimated using the Jones model originally proposed by Dechow et al. (1995). Kim et al. (2011a) find that tax avoidance is positively related to crash risk. Thus, in some regressions we include a variable that measures the firm's long-run effective tax rate as constructed in Dyreng et al. (2008) and Kim et al. (2011a). Specifically, LRETR_t is the ratio of total taxes paid during the past five years (years t-4 to t) to total pre-tax income net of special items during the same period. Our regressions that include ACCRUAL_t and LRETR_t have fewer observations than our baseline regressions because the Compustat data needed to construct these variables are missing for a significant number of firm-years in the sample.

Callen and Fang (2013) and An and Zhang (2013) find that stable institutional ownership is associated with lower crash risk. As in Callen and Fang (2013), we measure the stability of institutional ownership using the variable STDI_t, which was originally developed by Elyasiani et al. (2010). STDI_t is defined as the average standard deviation of quarterly institutional shareholding proportions across all institutional investors in the firm over a 5-year period (year t-4 to year t). More formally,

$$STDI = \sum_{j=1}^{J_i} Std(p_{i,q}^j) / J_i$$

where $p_{i,q}^j$ is the proportion of firm i held by institutional investor j at quarter q (q = 1, 2, ..., 20), and J_i is the number of institutional investors in firm i. The twenty quarters used to compute this measure are those that comprise fiscal years t-4 through t. Smaller values of this variable indicate more stable institutional ownership. We test H1 in a multivariate setting using the following regression model:

$$CrashRisk_{i,t+1} = \alpha + \beta SEO_{i,t} + \sum_{q=1}^m \delta_q (q^{th} Control_{i,t}) + \mu_{i,t}$$

where for firm i in fiscal year t, CrashRisk_{i,t+1}, is one of the previously defined measures of crash risk (CRASH or NCSKEW), SEO_{i,t} is the previously defined indicator variable capturing whether a firm completed an SEO in year t, and the control variables are previously described. We interpret a positive and statistically significant estimate of β as evidence in favor of H1. As in Hutton et al. (2009) and Kim et al. (2011a, 2011b), when the dependent variable is CRASH_{t+1}, we estimate a logistic regression that includes year dummies and industry dummies that correspond to the 49 Fama-French industry classifications. When the dependent variable is NCSKEW_{t+1}, we use OLS with industry and year dummies. In all regressions, we adjust the standard errors for clustering by firm and year.

We test H2 by augmenting the right-hand side of the regression equation above with the previously defined variable, SECONDARY_SEO_t, which produces the following regression specification:

$$CrashRisk_{i,t+1} = \alpha + \beta SEO_{i,t} + \gamma SECONDARY_SEO_{i,t} + \sum_{q=1}^m \delta_q (q^{th} Control_{i,t}) + \mu_{i,t}$$

In this case, the interpretation of the β coefficient is altered. β now captures the difference in crash risk between (i) firms that complete one or more SEOs without selling any secondary shares in year t and (ii) firms that do not complete an SEO in year t. The coefficient of interest in this case is γ , which captures the difference in crash risk between (i) firms that complete one or more SEOs that include secondary shares in year t and (ii) firm that complete one or more SEOs without selling any secondary shares in year t. H2 implies that γ should be positive and statistically significant.

Findings

In Table 3, we conduct univariate tests of H1 by comparing the proportion of firms with a crash in year $t+1$ ($CRASH_{t+1} = 1$) across (i) firms that have at least one seasoned equity offering in year t ($SEO_t = 1$) and (ii) firms that do not issue seasoned equity in year t ($SEO_t = 0$). Among firms that do not issue seasoned equity, 18.1% have a crash in the following year. In contrast, for firms that issue seasoned equity, the probability of crashing in the following year climbs to 24.2%, yielding a difference between the two subsamples of 6.1 percentage points. This difference is significant (z -statistic = 11.48) and corresponds to a 34% (6.1/18.1) rise in the probability of crashing. Table 3 also reports mean and median values of $NCSKEW_{t+1}$ across the two subsamples. The mean (median) value of $NCSKEW_{t+1}$ is -0.192 (-0.184) for firms that do not issue seasoned equity in year t and 0.050 (-0.009) for firms that do. The difference in means (and medians) is highly significant, indicating that recent equity issuers have returns that are more left skewed than non-issuers. These results provide support for H1.

Table 3: SEOs and Crash Risk: Univariate Comparisons

	Firms with an SEO in year t ($SEO_t = 1$)	Firms without an SEO in year t ($SEO_t = 0$)	test-statistic (difference)
# of Firm-Years	6,208	98,911	
Proportion with a crash in year $t+1$ ($CRASH_{t+1} = 1$)	24.2%	18.1%	12.03***
Mean $NCSKEW_{t+1}$	0.050	-0.192	22.47***
Median $NCSKEW_{t+1}$	-0.009	-0.184	22.48***

This table compares measures of one-year ahead crash risk across (i) firms that complete an SEO in year t and (ii) firms that do not complete an SEO in year t . We use a two-proportion z -test to test for significance of the difference in crash proportions across the two subsamples. We use a two-sample t test (Wilcoxon test) to test for statistical significance of the difference in mean (median) values of $NCSKEW_{t+1}$. *, **, and *** denote significance at the 10%, 5%, and 1% levels respectively in a two-tailed test.

In Table 4, we test H1 with regressions that model one-year-ahead crash risk as a function of seasoned equity issuance (SEO_t) and the previously described set of control variables. Models (1) and (2) in report the results of logistic regressions where $CRASH_{t+1}$ is the dependent variable. The coefficient estimate for the indicator variable SEO_t is positive and significant at the 1% level in both models, indicating that a crash in year $t+1$ is more likely to occur if the firm completed an SEO in year t . In specifications (3) and (4) of Table 4, we perform OLS regressions using $NCSKEW_{t+1}$ as the dependent variable. We continue to observe positive coefficients on SEO_t that are statistically significant. The results in Table 4 indicate that, relative to firms that have not recently issued equity, recent equity issuers are more likely to experience a stock price crash and have idiosyncratic returns that are more negatively skewed. Thus, our regression results in Table 4 are supportive of H1.

Table 4: SEOs and Crash Risk: Multivariate Analysis

Dependent Variable	CRASH _{t+1}		NCSKEW _{t+1}	
	(1)	(2)	(3)	(4)
SEOt	0.323*** (9.54)	0.299*** (6.67)	0.161*** (11.91)	0.161*** (9.84)
LN_MARKETCAP _t	0.018 (0.96)	0.052*** (3.31)	0.059*** (9.97)	0.066*** (12.50)
MB _t	0.011*** (4.69)	0.010*** (2.93)	0.006*** (6.81)	0.006*** (5.39)
LEVERAGE _t	0.099** (2.05)	0.103 (1.45)	0.006 (0.36)	-0.015 (-0.54)
ROE _t	0.014 (0.55)	0.001 (0.04)	0.014 (1.44)	0.001 (0.07)
DTURN _t	0.524*** (3.34)	0.592*** (3.61)	0.138** (2.39)	0.146** (2.42)
NCSKEW _t	0.142*** (9.21)	0.120*** (6.99)	0.055*** (10.26)	0.049*** (6.90)
SIGMA _t	-2.085*** (-3.38)	-1.656** (-2.43)	0.049 (0.19)	0.192 (0.77)
ALPHA _t	4.844*** (4.88)	4.499*** (2.73)	2.670*** (8.43)	3.562*** (6.13)
LRETR _t		-0.095*** (-3.78)		-0.049*** (-4.38)
ACCRUALS _t		0.202*** (3.24)		0.045** (2.50)
STDIt		19.502*** (2.74)		8.707*** (3.32)
R ² / Pseudo R ²	0.019	0.021	0.048	0.049
# of Firm-Years	105,119	58,446	105,119	58,446

This table presents coefficient estimates from regressions that model crash risk in year $t+1$ as a function of whether the firm completed an SEO in year t and a set of controls. When the dependent variable is CRASH _{$t+1$} (NCSKEW _{$t+1$}) we use logistic (OLS) regression. All models include fiscal year and industry dummies (coefficients unreported). Z-statistics (t-statistics) based on standard errors adjusted for clustering by firm and year are reported in parentheses below logistic (OLS) coefficients. *, **, and *** denote significance at the 10%, 5%, and 1% levels respectively in two-tailed tests.

In order to gauge the economic significance of SEO _{t} 's ability to forecast the likelihood of a crash, we estimate marginal effects derived from the logistic regressions reported in Table 4 (models (1) and (2)). In a logistic regression, the marginal effect of an independent variable depends on the value of the given independent variable as well as the value of all other independent variables in the model. Since SEO _{t} is a dummy variable, we estimate its marginal effect as the change in crash probability that corresponds to a change from SEO _{t} =0 to SEO _{t} =1. In addition, we estimate the marginal effect of SEO _{t} while holding the values of the remaining independent variables at their sample means, which is common convention. In Table 4, SEO _{t} has a marginal effect of 0.048 in model (1) and 0.047 in model (2). Based on the slightly more conservative estimate, the implication is that the completion of an SEO in year t is associated with a marginal increase in the probability of crashing in year $t+1$ of about 4.7 percentage points. Although slightly smaller, this multivariate estimate is comparable in magnitude to the univariate estimate of this effect (6.1 percentage points) reported in Table 3. Moreover, given that the conditional probability of a crash among non-issuers in our sample is 18.1% (Table 3), this result implies that a completed SEO in the prior year corresponds to a 26% (4.7/18.1) increase in the risk of a crash and suggests that the association between seasoned equity offerings and stock price crashes is indeed economically meaningful.

In Table 4, the coefficient estimates on the control variables are generally consistent with the findings of prior works. The variables LN_MARKETCAP _{t} , MB _{t} , DTURN _{t} , NCSKEW _{t} , and ALPHA _{t} have positive and significant coefficients in all or a majority of models in Table 4, which is in line with the findings of Chen et al. (2001), Kim et al. (2011a, 2011b), Hutton et al. (2009), Callen and Fang (2013, 2015), and An and Zhang (2013). The coefficients on LEVERAGE _{t} , ROE _{t} and SIGMA _{t} exhibit inconsistencies in either their signs or

significance across the different models in Table 4. This is not altogether surprising, given that prior studies have reported mixed results regarding these three variables. $LRETR_t$ has a negative and significant coefficient across all specifications where it is included, indicating that firms with lower long-run effective tax rates have greater crash risk. This is consistent with the main findings of Kim et al. (2011a). In addition, $ACCRUAL_{St}$ has a significantly positive coefficient across all specifications where it is included, which indicates greater crash risk among firms with more discretionary accruals. This finding is in line with the empirical results of Hutton et al. (2009). Regarding the stability of institutional ownership, $STDI_t$, possesses a positive and significant coefficient in all specifications in which it is included, which indicates greater crash risk among firms with less stable institutional ownership. This result is in line with the conclusions of Callen and Fang (2013) and An and Zhang (2013).

We conduct empirical tests of H2 with univariate comparisons of the crash risk measures across (i) firms that complete one or more SEOs without selling any secondary shares in year t ($SEO_t = 1$, $SECONDARY_SEO_t = 0$) and (ii) firms that complete one or more SEOs that include secondary shares in year t ($SEO_t = 1$, $SECONDARY_SEO_t = 1$). Table 5 reports the results of these comparisons. As shown in the table, among firms that issue seasoned equity without selling any secondary shares in year t , 22.3% experience a crash in year $t+1$. In contrast, firms that complete one or more SEOs involving secondary shares in year t exhibit a significantly higher crash frequency, 27%, in year $t+1$. The difference of 4.7 percentage points is significant at the 1% level and represents a 21% ($4.7/22.3$) rise in the probability of crashing. Table 5 also compares mean and median values $NCSKEW_{t+1}$ for the same two subsamples. The mean (median) values of $NCSKEW_{t+1}$ are 0.006 (-0.037) for firms that issue seasoned equity without selling secondary shares and 0.114 (0.036) for firms that sell secondary shares. The difference in means (medians) is highly significant, indicating that idiosyncratic returns of the latter group are more negatively skewed. Thus, the evidence from these univariate tests is consistent with H2.

Table 5: Secondary SEOs and Crash Risk: Univariate Comparisons

	Issuing firms that sell secondary shares in year t ($SEO_t = 1$, $SECONDARY_SEO_t = 1$)	Issuing firms that do not sell any secondary shares in year t ($SEO_t = 1$, $SECONDARY_SEO_t = 0$)	test-statistic (difference)
# of Firm-Years	2,522	3,686	
Proportion with a Crash in year $t+1$ ($CRASH_{t+1} = 1$)	27.0%	22.3%	4.25***
Mean $NCSKEW_{t+1}$	0.114	0.006	5.05***
Median $NCSKEW_{t+1}$	0.036	-0.037	5.22***

This table compares measures of crash risk in year $t+1$ across (i) firms that have at least one SEO that involves the sale of secondary shares in year t and (ii) firms with one or more SEOs in year t where none involve the sale of secondary shares. We use a two-proportion z-test to test for significance of the difference in crash proportions across the two subsamples. We use a two-sample t test (Wilcoxon test) to test for significance of the difference in mean (median) values of $NCSKEW_{t+1}$. *, **, and *** denote significance of the difference at the 10%, 5%, and 1% levels respectively in a two-tailed test.

In Table 6, we test H2 in a multivariate setting by augmenting our regressions with the variable, $SECONDARY_SEO_t$. As previously discussed, augmenting the regression equation with this variable alters the interpretation of the coefficient on SEO_t . In this case, the coefficient on SEO_t captures the difference in crash risk between firms that do not complete an SEO in year t and firms that complete one or more SEOs without selling any secondary shares in year t . For the purposes of testing H2, the coefficient of interest is that of $SECONDARY_SEO_t$, which captures the difference in crash risk between issuing firms that sell secondary shares and issuing firms that do not sell secondary shares.

In models (1) and (2) of Table 6, we perform logistic regressions with $CRASH_{t+1}$ as the dependent variable. The coefficient on SEO_t is positive and significant in both models, indicating that issuing firms that do not sell secondary shares are more likely to experience a crash than non-issuing firms. With respect to H2, the coefficient on $SECONDARY_SEO_t$ is positive and significant in both models (1) and (2). Thus, after controlling for other factors that predict crashes, we find that issuing firms that sell secondary shares are more likely to experience a crash relative to issuing firms that do not sell secondary shares. In Table 6, we run OLS regressions with $NCSKEW_{t+1}$ as the dependent variable in models (3) and (4). We continue to

observe positive and significant coefficient estimates on both SEOt and SECONDARY_SEOt. Hence, the results in Table 6 pertaining to the latter variable are supportive of H2.

Table 6: Secondary SEOs and Crash Risk: Multivariate Analysis

Dependent Variable	CRASH _{t+1}		NCSKEW _{t+1}	
	(1)	(2)	(3)	(4)
SEOt	0.242*** (6.35)	0.198*** (3.38)	0.135*** (11.53)	0.134*** (9.26)
SECONDARY_SEOt	0.188*** (3.64)	0.198*** (2.91)	0.063** (2.54)	0.056** (1.99)
LN_MARKETCAP _t	0.018 (0.97)	0.053*** (3.34)	0.059*** (9.98)	0.066*** (12.51)
MB _t	0.011*** (4.60)	0.010*** (2.83)	0.006*** (6.73)	0.006*** (5.36)
LEVERAGE _t	0.100** (2.07)	0.108 (1.50)	0.007 (0.39)	-0.014 (-0.50)
ROE _t	0.012 (0.48)	-0.001 (-0.02)	0.013 (1.39)	0.000 (0.01)
DTURN _t	0.522*** (3.31)	0.588*** (3.58)	0.137** (2.37)	0.145** (2.39)
NCSKEW _t	0.142*** (9.21)	0.120*** (6.99)	0.055*** (10.26)	0.048*** (6.89)
SIGMA _t	-2.072*** (-3.37)	-1.649** (-2.43)	0.052 (0.21)	0.194 (0.78)
ALPHA _t	4.808*** (4.85)	4.480*** (2.71)	2.660*** (8.40)	3.557*** (6.12)
LRETR _t		-0.094*** (-3.72)		-0.049*** (-4.34)
ACCRUAL _t		0.203*** (3.28)		0.046** (2.52)
STD _t		19.372*** (2.71)		8.672*** (3.30)
R ² / Pseudo R ²	0.019	0.021	0.048	0.049
# of Firm-Years	105,119	58,446	105,119	58,446

This table presents coefficient estimates from regressions that model crash risk in year $t+1$ as a function of whether the firm completed an SEO in year t , whether secondary shares were sold in the firm's SEO(s), and a set of controls. When the dependent variable is CRASH_{t+1} (NCSKEW_{t+1}) we use a logistic (OLS) regression. All models include fiscal year and industry dummies (coefficients unreported). Z-statistics (t-statistics) based on standard errors adjusted for clustering by firm and year are reported in parentheses below logistic (OLS) coefficients. *, **, and *** denote significance at the 10%, 5%, and 1% levels respectively in two-tailed tests.

In order to shed further light on the economic significance of the presence of secondary shares in SEOs, we estimate marginal effects of SECONDARY_SEOt derived from models (1) and (2) in Table 6. The marginal effect of this variable is defined as the change in crash probability that corresponds to a change from SECONDARY_SEOt=0 to SECONDARY_SEOt=1. As previously discussed, an estimate of the marginal effect of a given independent variable in a logistic regression depends on the values of the remaining independent variables. We follow convention and set the remaining independent variables to their sample means, with the exception of SEOt. Since our objective is to estimate the marginal difference in crash probability between issuing firms that do not sell secondary shares and issuing firms that do sell secondary shares, it is most appropriate to set the value of SEOt to one, since SEOt must equal one for both groups. Following this procedure, our estimates of the marginal effect of SECONDARY_SEOt from models (1) and (2) in Table 6 are 0.032 and 0.034, respectively. Based on the more conservative estimate, the implication is that the probability of a one-year-ahead crash is 3.2 percentage points higher for issuing firms that sell secondary shares relative to issuing firms that do not sell secondary shares. Though this multivariate estimate is somewhat smaller than our univariate estimates of this effect (4.7 percentage points) from Table 5, it is nonetheless economically meaningful.

For robustness, we examine whether the results from our tests in Tables 3 through 6 persist when we use the commonly used expanded market model to estimate firm-specific weekly returns as in Hutton et al. (2009) and Kim et al. (2011a, 2011b). Specifically, this return model includes the market factor (the weekly return on the CRSP value-weighted index) along with two weekly lags and two weekly leads of the market factor. The leads and lags are included to correct for potential biases in the loading coefficient caused by non-synchronous trading (Dimson, 1979). In untabulated analyses, we estimate this model for each firm-year in the sample and use the residuals as the firm-specific returns. We compute our crash risk measures using these firm-specific returns and rerun all of our empirical tests. We find that our results remain robust.

Boehme and May (2016) find that multinational firms with weak shareholder rights or a low percentage of independent directors on the board exhibit especially high crash risk. About 16% of the firm-years in our sample are included in the ISS Governance and ISS Directors databases. In untabulated analyses of this subsample, we examine whether our results persist when we include an indicator variable capturing whether the firm is multinational and its interactions with shareholder rights and the percentage of independent directors, as in Boehme and May (2016). We find that our results remain robust. We also examine whether the relation between crash risk and seasoned equity issuance depends on the strength of shareholder rights or board independence, but we find no evidence that it does. That is, the strong positive relation between seasoned equity issuance and crash risk persists across firms with both weak and strong shareholder rights and firms with both a low and high percentage of independent directors on the board.

Graham et al. (2005) and Kothari et al. (2009) discuss factors that could incentivize managers to temporarily delay the release of positive news, including reputational concerns or expected costs of revealing proprietary information to competitors. If managers have a preference for issuing stock at high prices, we would expect incentives for good news hoarding to be especially low in the period before an equity offering. Hence, stock price jumps, i.e., extreme positive weekly returns, should be especially unlikely after an SEO, since the desire to issue equity at high prices would incentivize managers to disclose positive news in a timely manner prior to the offering. We examine this prediction in Table 7. We model the probability of a stock price jump as a function of equity issuance and the control variables used in our previous analysis of crash risk. As in Hutton et al. (2009), the dependent variable, $JUMP_{t+1}$, equals one if the firm experiences a weekly firm-specific log-return that is 3.09 or more standard deviations above the firm's mean in year $t+1$ and zero otherwise. As reported in Table 7, the coefficient on SEO_t is negative and highly significant across all models, which is consistent with a lower likelihood of stock price jumps after SEOs. Taken together with our finding that firms exhibit unusually high crash risk after SEOs, our finding that stock price jumps are especially unlikely after SEOs is consistent with a tendency for managers to hoard bad news but not good news when issuing equity.

Table 7: SEOs and Stock Price Jumps: Multivariate Analysis

Dependent Variable: JUMPt+1	(1)	(2)	(3)	(4)
SEOt	-0.340*** (-10.30)	-0.346*** (-7.42)	-0.323*** (-7.60)	-0.350*** (-6.34)
SECONDARY_SEOt			-0.045 (-0.64)	0.009 (0.12)
Table 7- continued				
Dependent Variable: JUMPt+1	(1)	(2)	(3)	(4)
LN_MARKETCAPt	-0.189*** (-12.83)	-0.189*** (-13.46)	-0.189*** (-12.83)	-0.189*** (-13.45)
MBt	-0.013*** (-5.68)	-0.018*** (-5.38)	-0.013*** (-5.64)	-0.018*** (-5.41)
LEVERAGEt	0.071 (1.41)	0.186** (2.58)	0.071 (1.41)	0.186** (2.57)
ROEt	-0.047*** (-2.97)	-0.040 (-1.63)	-0.047*** (-2.94)	-0.040 (-1.63)
DTURNt	-0.120 (-1.01)	0.019 (0.12)	-0.119 (-1.01)	0.019 (0.12)
NCSKEWt	-0.083*** (-8.82)	-0.079*** (-5.95)	-0.083*** (-8.81)	-0.079*** (-5.94)
SIGMAt	-0.870** (-1.99)	-1.521** (-2.31)	-0.871** (-1.99)	-1.521** (-2.31)
ALPHAt	-5.317*** (-6.97)	-7.577*** (-5.40)	-5.311*** (-6.98)	-7.578*** (-5.41)
LRETRt		0.044 (1.21)		0.044 (1.21)
ACCRUALSt		-0.025 (-0.53)		-0.025 (-0.53)
STDIt		-13.184** (-2.56)		-13.189** (-2.56)
Pseudo R2	0.0335	0.0316	0.0335	0.0316
# of Firm-Years	105,119	58,446	105,119	58,446

This table reports coefficient estimates from logistic regressions that model the probability of a stock price jump in year t+1 as a function of seasoned equity issuance in year t and a set of control variables. All models include fiscal year and industry dummies (coefficients unreported). Z-statistics based on standard errors adjusted for clustering by firm and year are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels respectively in two-tailed tests.

Conclusions

In a large panel of U.S. firms during 1987–2011, we find robust evidence that the issuance of seasoned equity is a reliable predictor of future stock price crash risk. Our findings are robust to alternative measures of crash risk, including the skewness of firm-specific returns, as well as controlling for known predictors of crash risk identified in prior studies. The association between seasoned equity offerings and crash risk is even stronger among offerings that involve the sale of secondary shares. Our results are consistent with a propensity for bad news hoarding among issuing firms and especially among firms that sell secondary shares. We also find that recent seasoned equity issuers are far less likely to experience sudden positive price jumps relative to firms that have not recently issued equity, which, when taken together with our finding of greater crash risk, suggests a propensity for managers of issuing firms to hoard bad but not good news.

Our paper makes several important contributions. We further advance the scholarly literature aimed at understanding and modeling extreme outcomes in financial markets and, in particular, the growing literature focused on understanding the precursors to firm-level crashes. Given that several studies suggest theoretically or empirically that investors are concerned with tail risk in the returns of individual stocks (Conrad et al., 2013; Huang et al., 2012; Boyer et al., 2010; Barberis and Huang, 2008; Brunnermeier et al., 2007; Mitton and Vorkink, 2007), our findings should be especially useful to practitioners and market participants

interested in modeling firm-specific crash risk. Finally, our paper offers new insights into the distributional properties of stock returns after equity issues that cannot be gleaned from existing studies. Numerous empirical works have attempted to determine whether equity issuers earn post-issue returns that are, on average, lower than those of non-issuers, with mixed results across different studies and considerable disagreement persisting among scholars. The near exclusive focus on the first moment of the return distribution in prior works leaves unexplored other important distributional characteristics that should be of interest to market participants and scholars. We offer a new perspective that elucidates the presence of fat left tails in the distribution of firm-specific returns after seasoned equity offerings. Thus, in addition to informing scholars interested in understanding the determinants of firm-specific crash risk, our findings should also be of notable importance to scholars interested in better understanding stock price dynamics after equity offerings and the concomitant implications of managerial preferences for issuing equity at high prices.

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