Option implied volatilities and the cost of issuing equity

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ABSTRACT

The structure of a firm-commitment Seasoned Equity Offering (SEO) resembles a put-option underwritten by an investment bank syndicate (Smith, 1977). Employing implied volatilities from issuers' stock options as a direct forward-looking measure, this paper examines the impact of expected price risk around SEO issue dates on the direct cost of issuing equity. Using a comprehensive sample of 1208 SEOs between 1996 and 2009, we find issuers with higher option implied volatilities raise less external equity capital and pay higher investment bank fees in the stock market, *ceteris paribus*. The effect of implied volatility on the investment bank fees is stronger for larger issuers with lower pre-SEO abnormal realized stock volatilities, and for SEOs with higher expected price pressures around issue dates. These relationships are robust to adjustments for correlations among control variables, sample selection bias and also simultaneous determination of offer size and SEO fees.

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1. Introduction

In a firm commitment Seasoned Equity Offering (SEO), investment banks underwrite a fixed-price underwriting contract with a put option structure and agree to purchase shares of the issuing firm at a price discounted from the agreed upon final offer price that is usually set within 24 h of the issue date (Smith, 1977; Lee et al., 1996). This difference between the purchase and offer price, a.k.a. the gross spread or investment banking fees, erodes an economically important portion of the proceeds for SEOs conducted in the U.S. (Eckbo et al., 2007). Prior literature generally indicates that investment banking fees may be related to the information asymmetries between insiders and outside investors regarding the true value of issuer, expected future financial performance, and marketing and certification functions of underwriters (Corwin and Schultz, 2005; Lee and Masulis, 2009, among others).[1]

In this paper, we revisit the determinants of SEO fees, but deviate significantly in our approach from past studies. Specifically, we seek to illuminate the role of expected price risk around the issue dates on the direct cost of raising external capital. We argue that implied volatilities from issuers' outstanding equity options are superior, forward-looking proxies that represent the market's best prediction of a stock's forecasted price risk (e.g. Christensen and Prabhala, 1998), and therefore should directly affect investment bank fees after controlling for previously documented factors in the SEO literature.[2]

As first shown by Smith (1977), the structure of a firm-commitment SEO resembles a put-option written by the underwriting syndicate where the value of compensation is equivalent to a long and a cash position in the issuer along with a written call option. Similar to increased price risk faced by put option writers when underlying asset prices are expected to be more volatile, increased downside price risk around issue dates is associated with higher probabilities of decreased underwriter compensation. Given this increased downside price risk and expected losses associated with

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[1] Among commonly used information asymmetry proxies are past realized volatility (Corwin, 2003), access to credit markets (Liu and Malatesta, 2006), and analysts' earnings forecast dispersion (Bowen et al., 2008; Marquardt and Wiedman, 1998). None of these measures are ex-ante direct proxies for information asymmetry. For example, past realized volatility is a backward-looking measure contaminated by macroeconomic and industry effects (Lee and Masulis, 2009). Debt ratings are related to financial solvency, capital structure and competition in the credit ratings industry (Becker and Milbourn, 2011); whereas forecast dispersion may be driven by the characteristics and number of analysts following a particular firm.

[2] To the extent that price risk matters and is priced for SEOs, this should be reflected in option implied volatilities, but not necessarily by backward-looking realized volatilities or other proxies from stock or debt markets. As Cremers et al. (2008) demonstrate, an increase in price risk premium directly affects implied volatilities via higher option prices independent of backward-looking realized stock return volatilities.

collecting lower net fees, the underwriting syndicate's estimation of expected stock volatility around the issue date should be directly related to the compensation required for writing this put option.[3] Thus, we expect investment banks to lower their exposure to greater price risk associated with higher volatility issuers by either increasing required compensation for writing these put options or demanding smaller offers. However, we are unaware of any studies that directly examine the association between expected price risk around issue dates and SEO gross spreads. We therefore address this current gap in the literature by investigating the relation of SEO issuer option implied volatilities to the SEO size and gross spread in an attempt to provide additional insights into the broad determinants of direct flotation costs beyond previously documented factors.

We follow Cremers and Weinbaum (2010) and measure implied volatility as the open-interest weighted average implied volatility for all outstanding equity options of the issuing firm.[4] A higher implied volatility indicates option investors believe the stock's returns will be more variable over the life of the option relative to stocks with lower implied volatilities. In our 1996 and 2009 sample of 1208 firm-commitment SEOs between conducted by U.S. firms with traded equity options available on OptionMetrics and also listed on the New York Stock Exchange/American Stock Exchange (NYSE/AMEX) or Nasdaq, we find that implied volatility from issuers' equity options is an important determinant of SEO issue size. Specifically, issuers with higher implied volatilities around issue dates tend to raise less equity capital, consistent with the notion that underwriters may be demanding smaller SEOs for issuers with higher expected price risk.

When examining the impact of implied volatilities on the direct cost of raising equity, we find issuers with higher price risk are indeed charged higher gross spreads by investment bank syndicates. The association between implied volatilities and direct investment bank fees is not only statistically significant, but also suggests economically important fee differences. Our results indicate that a 100 basis point increase in option implied volatility around the issue dates is associated with 37.6 basis point higher investment bank fees after controlling for firm size, past stock volatility, access to debt markets and other factors shown in the SEO literature to explain cross-sectional differences in SEO direct fees. Furthermore, the economic impact of option implied volatility on SEO fees is at least as large as any other documented firm or issue characteristic.

We next examine the additional implications of our main findings and investigate the extent to which the pricing of option implied volatilities for SEOs varies with the issuer characteristics. Christensen and Prabhala (1998) and Mayhew and Stivers (2003) suggest option implied volatility is a more accurate predictor of future price risk for firms with lower information asymmetry and price uncertainty. Consistently, we find the marginal impact of option implied volatility on investment bank fees is stronger for larger issuers and issuers with lower past stock volatilities. Specifically, a 100 basis points increase in implied volatility relates to a significant 19.2 (23.5) basis point higher fees for larger (lower past volatility) issuers compared to smaller (higher past volatility) issuers, *ceteris paribus*.

Our further analysis considers the variation in the marginal impact of implied volatilities on gross spreads for SEOs with higher expected price risks around issue dates. Extant literature on firm-commitment SEOs has concluded that the number of underwriting syndicate members is negatively related to the level of downside price pressure for the SEOs as marketing and information production by investment banks flattens the demand curve (Corwin and Schultz, 2005; Huang and Zhang, 2011). Khanna et al. (2008) argue information production per issue decreases in hot markets with higher levels of issuance activity, increasing expected price risk around issue dates. Inclusion of over-allotment options (OAOs) is also expected to lower downside price risk for underwriting syndicates (Hansen et al., 1987). Our findings reveal that the marginal impact of option implied volatilities on SEO fees is greater for issues underwritten by fewer syndicate members, SEOs without OAOs, and when the issue takes place in markets with high volume of issuance activity. Collectively, these results are consistent with the notion that option implied volatility may be employed more heavily in SEO pricing when expected price pressure around issue dates is expected to be higher.

In order to rule out concerns regarding the possibility that option implied volatilities may be correlated with other control variables, we next perform a battery of robustness tests with four different measures of implied volatility around issue and filing dates. First, we orthogonalize implied volatilities with respect to a wide spectrum of information asymmetry and price uncertainty measures employed in previous SEO studies. We then re-examine the association between implied volatility and SEO fees using the residuals from these linear projections and provide further empirical evidence that implied volatility contains incremental information for the direct cost of raising external capital. Utilizing the matched sample technique as suggested by Butler et al. (2005) yields similar results. Our results are also robust to explicitly controlling for the endogenous offer size choice and potential sample selection bias arising due to requiring issuers to have traded equity options.

As a final component of our analysis, we explore whether option implied volatilities indeed predict realized price volatilities of issuers over issue dates, thus providing valuable incremental information to underwriters regarding expected price risk. Our findings show a robust and positive relationship between option implied volatilities prior to SEO issue dates and realized stock volatility of issuing firms following issue dates. A 100 basis points increase in pre-issue date implied volatility correlates to a 2.5 (2.4) basis point increase in daily stock volatilities over 2 (6) days following to the issue date.

Overall, our paper examines the link between implied volatilities from the issuers' equity options and the cost of raising external equity in the stock market. We establish a statistically and economically significant link between option implied volatilities and the direct fees associated with SEOs after controlling for previously documented factors, emphasizing the role of expected price risk on investment bank fees.

Our paper also complements previous studies examining the relationship between option implied volatility and cost of equity (Ang et al., 2006; Diavatopoulos et al., 2008; Fu, 2009). Our findings show implied volatility affects the cost of raising external capital without relying on any asset pricing model. Thus, our results do not depend on strong assumptions that expected returns, risk factors, or various factor loadings are unbiased and measured properly (e.g. Butler et al., 2005).

The rest of the paper is organized as follows. Section 2 introduces and explains the relationship between implied volatility and SEO pricing. Section 3 explains the data and provides descriptive statistics. In Section 4, we explore the relationship between offer size and implied volatility. In Sections 5 and 6 we

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[3] A legitimate concern with our analysis is that information asymmetry proxies employed in previous studies might confound the relationship between implied volatility and investment bank fees. Therefore, we control for the linear and non-linear correlation between option implied volatility and other control variables using several alternative methodologies such as double sorting, matched-sample analysis, and orthogonalization of implied volatilities with respect to a wide range of asymmetric information and price uncertainty proxies.

[4] Recognizing underwriters may be considering implied volatilities of shorter term equity options rather than all options, we also report results using only implied volatilities from options with 90 or fewer days remaining until expiration.