Litigation Risk and IPO Underpricing Revisited

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Abstract

This paper explains why the evidence on the relation between litigation risk and initial public offering (IPO) underpricing is mixed. Two reasons are behind the non-stationary relation. First, the increasing usage of Directors and Officers' liability insurance arguably reduces the need to use underpricing to insure against litigation liability to a limited extent. Second, class action lawsuits over IPOs almost always include claims under both the Securities Act of 1933 and the Securities Exchange Act of 1934. While damages under the 1933 Act are related to underpricing, damages under the 1934 Act are not. It is not the potential damage under each claim that determines the likelihood of being sued under each Act; instead, it is the total damage under both claims that determines the likelihood of being sued. When the damage under the 1934 Act is much greater than the damage under the 1933 Act, underpricing cannot insure against litigation risk effectively. I use the IPO laddering cases during 1998-2000 to illustrate when and why IPO underpricing does not deter litigation.

JEL classification: G24; K22

The litigation-risk hypothesis explains initial public offering (IPO) underpricing from the perspective of legal liability. It argues that IPO firms underprice their new issues to deter potential lawsuits. The legal underpinning of this hypothesis is Section 11 of the Securities Act of 1933, under which damages are capped by the IPO offer price.[1] The hypothesis is along two dimensions. First, decreasing the offer price could reduce the chance that the aftermarket price drops below the offer price, and hence lower the probability of being sued. The reason is that if the aftermarket price is above the offer price, then litigations under Section 11 would have no standing. Second, decreasing the offer price could reduce the maximum damages that plaintiffs can recover under Section 11 in case the aftermarket price drops below the offer price. In summary, underpricing could reduce the expected damages under Section 11, therefore deterring lawsuits.

Under the litigation-risk hypothesis, the relation between underpricing and the probability of a lawsuit can be summarized as the following two effects. First, firms with a higher exogenous probability of being sued should underprice their IPOs to a greater extent as insurance against litigation (the insurance effect). Second, firms that underprice more will lower their probability of being sued (the deterrence effect).

However, the evidence on the relation between litigation risk and IPO underpricing is mixed. This paper adds to the debate by pointing out why the relation is not stationary.

[1] The guidelines for the calculation of associated damages under Section 11 are as follows. Damages for direct purchasers in the IPO are based on the difference between the offer price and either the sale price or the security's price at the time of the lawsuit, depending on whether the share was sold. Damages for aftermarket purchasers are based on the lower of the offer price and the price at which the security was bought. In summary, damages under Section 11 are directly related to and capped by the offer price. See Appendix A for more detail.

Although the argument for the litigation-risk hypothesis sounds reasonable, two facts, which mitigate one or both of the two effects to a certain extent, are ignored by the litigation-risk hypothesis. First, Directors and Officers (D&O) insurance, which in the late 1970s and early 1980s was thought to be "novel," is now considered a business necessity. According to the *2001 Directors and Officers Liability Survey* by insurance advisory company Tillinghast-Towers Perrin, 99% of large American companies now take out such insurance. Besides the typical coverage to the individual D&Os and the corporate indemnification reimbursement, a D&O policy can also extend coverage to the insured entity for claims against the company itself (Bordon et al. (1998)). According to the Tillinghast-Towers Perrin *2001 Directors and Officers Liability Survey*, more than 90% of U.S. companies that buy D&O insurance also buy coverage for the corporate entity itself. Therefore, if underpricing can insure against litigation liability sometimes, the wide usage of the D&O insurance among companies may reduce the level of underpricing needed for insurance purpose. This has implications against the insurance effect, but not against the deterrence effect, because the D&O liability coverage is not observable to investors in the U.S.[2]

The second fact neglected by the litigation-risk hypothesis has implications against both the insurance and the deterrence effects. Class action suits over IPOs almost always include claims under Section 11 of the Securities Act of 1933 as well as Section 10(b) of the Securities Exchange Act of 1934 and Rule 10b-5 promulgated thereunder (Alexander (1993)). I will refer to the above two types of claims as claims under the 1933 Act and the

[2] Disclosure of the D&O coverage is not mandatory in the U.S., although proxy statement disclosure of coverage is mandatory in Canada.

1934 Act, respectively. Damages in the 1934 Act suits are determined by the difference between the price paid and the price the plaintiffs would have paid if there had been no material misstatement or omission. Therefore, lowering the offer price cannot reduce the expected maximum litigation cost under the 1934 Act. For example, suppose an IPO firm's stock price was manipulated and the manipulation was known or knowable at the time of the offering. An investor bought shares at an inflated price of $30 in the aftermarket. If there had been no manipulation, the market price would have been $20 at the time of the investor's purchase. Hence, this investor's damage under the 1934 Act should be $10 per share, which would not be reduced if the IPO offer price had been set lower. When a class action suit is filed against the IPO firm under the 1934 Act, it is very likely that the 1933 Act claim would also be included due to the omission of the manipulation in the registration statement. It is important to point out that it is not the potential damage under each claim that determines the likelihood of being sued under each Act; instead, it is the total potential damage under both claims that determines the likelihood of being sued. If the total damage to the investors is higher than the lawsuit cost, the firm would be sued regardless of the level of the underpricing. In other words, if the damage under the 1934 Act is sufficiently high, even high underpricing can fail to deter litigation under the 1933 Act. [3]

These two points help to reconcile the mixed evidence about the litigation-risk hypothesis. First, the increasingly popular D&O insurance partially explains the more recent findings against the litigation-risk hypothesis, which I will discuss in more detail in the next

[3] Each Act has different advantages and disadvantages from a prosecutor's point of view. For example, the burden of proof is lower for claims brought under the 1933 Act than under the 1934 Act, while damages tend to be higher for claims brought under the 1934 Act than under the 1933 Act.

section. Second, when the damage under the 1934 Act is greater than the damage under the 1933 Act, the litigation-risk hypothesis can have less relevance. For example, during 1998-2000, IPO underpricing was astonishingly high and a record-breakingly high portion of the IPOs from this period were involved in class action lawsuits for laddering.[4] I use the laddering cases to illustrate when and why underpricing does not insure against or deter litigation risk. Controlling for the potential endogeneity between underpricing and litigation risk, I find that higher underpricing increases litigation risk, and higher expected litigation risk has no effect on underpricing. The results are in sharp contrast with the two effects implied by the litigation-risk hypothesis. Although part of the results, i.e., the positive effect of underpricing on litigation risk, is due to the specialness of the sample, the general message is important. When the sample contains enough cases in which the damage under the 1934 Act is much higher than the damage under the 1933 Act, litigation risk is not significantly related to IPO underpricing.

I use the laddering cases during 1998-2000 in my empirical investigation because the laddering cases can best demonstrate the reasons behind the mixed evidence on the relation between litigation risk and IPO underpricing. Extending my sample period only means adding other litigation cases in which the relative magnitude of the damages under the 1933 Act and the 1934 Act varies for no systematic reason. Therefore, I choose to focus on the three year period.

[4] Laddering is a practice whereby the allocating underwriter requires the ladderer to buy additional shares of the issuer in the aftermarket as a condition for receiving shares at the offer price. On April 20, 2006, J.P. Morgan agreed to pay $425 million to settle a class action suit that alleged the major IPO underwriters engaged in laddering, profit-sharing, and biased analyst coverage for over 300 IPOs during 1998-2000 (Smith and Sidel (2006); Dash and Anderson (2006)).

This paper contributes to the literature in several ways. First, it explains the mixed evidence on litigation risk and IPO underpricing by pointing out two reasons behind the non-stationary relation. Second, it proposes a better identifying variable for the expected litigation risk in the two-stage regression framework, which makes the regression results more reliable.

The remainder of this paper is organized as follows. Section I briefly reviews the theoretical and empirical literature about the litigation-risk hypothesis. Section II describes the data and sample selection procedure. Section III explains the two-stage regression framework. Section IV presents and discusses the empirical results. Section V concludes. Appendix A contains the relevant provisions for IPO class action cases. Appendix B lists the definitions of the variables used in this study. Appendix C describes the construction of the All-star dummy variable.

I. Theoretical and Empirical Literature

The litigation-risk hypothesis predicts that the expected litigation risk affects underpricing positively. Ibbotson (1975) and Tinic (1988) conjecture that underpricing is a form of insurance against future litigation. Hughes and Thakor (1992) and Hensler (1995) formalize the hypothesis in a single-period model. Hughes and Thakor (1992) model a risk-neutral underwriter's tradeoff between current revenue and the risk of litigation and specify sufficient conditions under which underpricing occurs in equilibrium. Hensler (1995) models a risk-averse entrepreneur's tradeoff between the litigation cost and the up-front opportunity loss of underpricing.

However, no one can claim that litigation risk is the sole cause of underpricing. Indeed, underpricing occurs even in countries where litigation risk is not a factor (e.g., Keloharju (1993)). So it is an empirical question whether litigation risk significantly affects underpricing.

Empirical evidence related to the litigation-risk hypothesis is mixed. Tinic (1988) finds that the initial returns of a sample of 70 IPOs issued during 1923-1930, which was prior to the 1933 Act, are significantly lower than those of a sample of 134 firms that went public during 1966-1971, which was after this Act was implemented.

Drake and Vetsuypens (1993) point out that Tinic's results can be misleading because he does not control for the time variation in initial returns unrelated to litigation risk. Indeed, an alternative explanation for the difference in underpricing between 1923-1930 and 1966-1971 can be the use of overallotment options. Firm commitment IPOs did not start using overallotment options until the 1963 Green Shoe Manufacturing Co. IPO. Smith (1986) argues that overallotment options increase the incentive of underwriters to underprice more. Based on 93 sued IPOs issued during 1969-1990, Drake and Vetsuypens find that controlling for offer year, underwriter reputation, and size, the sued IPOs are no less underpriced than other IPOs.

However, Lowry and Shu (2002, hereafter LS) argue that Drake and Vetsuypens' results suffer from an endogeneity problem implied by the insurance and deterrence effects. Using a two-stage probit least squares regression framework to control for the endogeneity issue, LS find that both the insurance and deterrence effects are significant for IPOs from 1988-1995.

Nevertheless, the findings by LS seem to contradict with a point raised by Ibbotson and Ritter (1995) and Ritter and Welch (2002), i.e., studies show that countries in which U.S. litigative tendencies are not present have similar levels of underpricing. Further, Porta, Lopez-De-Silanes, and Shleifer (2006) examine the effect of securities laws on stock market development in 49 countries and find that the availability of class action suits in a prospectus liability case is an insignificant predictor of the value of IPOs in a country (relative to its GDP). If litigation risk is a significant concern for setting the IPO offer price, then countries with class actions available would arguably have a smaller value of IPO proceeds, ceteris paribus, i.e., in the regression of the value of IPOs in Porta, Lopez-De-Silanes, and Shleifer (2006), the availability of class action suits would have a significant and negative coefficient.

How do the practitioners think about the importance of litigation risk in IPO pricing? In a survey to the chief financial officers (CFOs) of the nonfinancial U.S. companies that involved in an IPO between 2000 and 2002, Brau and Fawcett (2006) find that the litigation-risk hypothesis of underpricing receives low support from the CFOs who respond.

After LS, two recent studies follow the same methodology and find different results on more recent sample periods. Walker (2001) examines the IPOs during 1995-2000 and does not find any support to the litigation-risk hypothesis, after controlling for size, industry, "hot market" period, market performance, and observable litigation risk against other firms in the market. Zhu (2004) studies the IPOs during 1990-1998 and finds that there is no relation between underpricing and IPO litigation. She uses the same two-stage regression framework as in LS but obtains different results. Besides using a different sample period, her study differs from LS in two ways. First, her definition of IPO litigation is broader than in LS.

Second, she uses a different instrumental variable, which is generated by a dummy variable indicating either before or after the passage of the Private Securities Litigation Reform Act of 1995.

How should we understand and reconcile the seemingly contradicting evidence? I will answer this question conceptually in this section and provide an example in the next section.

Besides methodology issues, there are two fundamental reasons behind the mixed evidence. The first reason is that the existence of D&O liability insurance reduces, although does not eliminate, the litigation risk concern in IPO pricing. If underpricing can insure against litigation risk in certain situations, the D&O insurance can partially substitute for underpricing for this purpose. Chalmers, Dann, and Harford (2002) find a significant negative relation between the three-year post-IPO stock price performance and the D&O insurance coverage purchased in conjunction with the IPO, consistent with the hypothesis that managers of IPO firms have superior inside information and they use D&O insurance to insure against potential litigation costs.

Several features of D&O insurance imply that it has advantages over underpricing to insure against the direct costs of litigation. First, the details of the D&O insurance are not usually reported in the IPO prospectus or provided in pre-IPO "road shows" in the U.S. This implies that purchasing D&O insurance would not signal to the market about the expected future performance of the IPO firm, because the information is not publicly available by the IPO date. In contrast, if the market believes the litigation-risk hypothesis, then more underpricing should signal to the market that the firm anticipates a higher probability of litigation in the future. This difference favors the use of the D&O insurance instead of underpricing to insure against litigation costs. Second, if an IPO firm uses

underpricing to insure against litigation costs, the costs of the insurance are borne by the pre-IPO shareholders; however, if an IPO firm purchases the D&O insurance, at least part of the premium is paid after the IPO, and the insurance costs can be shared between the pre-IPO and new shareholders.

However, D&O insurance does not cover the indirect costs of being sued, for example, lost management time and damaged reputation. Moreover, a firm's D&O premium will increase substantially if it is actually sued in a class action lawsuit. In other words, firms have an incentive to avoid a lawsuit in order to minimize their costs of carrying D&O insurance. Therefore, the wide usage of D&O insurance among companies does not eliminate the need to deter litigation. To the extent that firms have no perfect method of insurance, they are likely to consider multiple forms of insurance. If underpricing exists in the first place as a form of insurance, the increasingly popular usage of D&O insurance will both complement and substitute underpricing to certain extent.

The second reason for the mixed evidence on the litigation-risk hypothesis is related to the securities laws. Although there is a theoretical relation between underpricing and litigation risk under the 1933 Act, there is no theoretical relation between underpricing and litigation risk under the 1934 Act. One thing that is noteworthy is that class action suits over IPOs often include claims under both the 1933 and 1934 Acts. Due to the nature of class action suits, it is not the potential damage under each claim that determines the likelihood of lawsuit under each Act; instead, it is the total potential damage under both the claims that determines the likelihood of a lawsuit. This implies that the relations between litigation risk and underpricing are not stationary. In other words, any empirical finding on the relation

depends on the percentage of the sued firms in the sample that are involved in both the 1933 and the 1934 Acts and the relative magnitude of the damage under each Act.

LS examine a sample in which the litigation-risk hypothesis has certain significance. To complement their results, I use a different sample, which can best illustrate the situation in which the litigation-risk hypothesis has no support. Together, we show a more complete picture about the relation between litigation risk and underpricing.

II. The Data

I collect the following data from various sources:

(1) Thomson Financial's Securities Data Company (SDC) New Issues database: IPO data between 1998 and 2000. [5] The underwriter reputation measures are from Jay Ritter and are downloadable from his website.

(2) Stanford Law School Securities Class Action Clearinghouse (in cooperation with Cornerstone Research) website and the IPO Securities Litigation website: court dockets about class action cases. [6]

(3) Center for Research in Security Prices (CRSP) database: daily price, volume, and outstanding shares data.

(4) NYSE Trade and Quote (TAQ) database: the first and last daily trade data.

(5) *Institutional Investor*: all-America research team data.

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[5] Numerous corrections have been made to the SDC's IPO data based on Jay Ritter and Alexander Ljungqvist's SDC IPO data correction files, which are downloadable from their websites at http://bear.cba.ufl.edu/ritter/ipodata.htm and http://www.stern.nyu.edu/~aljungqv/research.htm, respectively.

[6] The two websites are at http://securities.stanford.edu and http://www.iposecuritieslitigation.com, respectively.

(6) Compustat database: Global Industry Classification Standard (GICS) codes.

(7) Investext Plus database: IPO industry classification and lead underwriter analyst name information.

I will explain how the data are used in the rest of the paper.

Because LS argue that the litigation-risk hypothesis is only applicable to Section 11 lawsuits, I only keep the IPO lawsuits brought under Section 11 to make our results comparable. In other words, I eliminate the IPO firms that are sued under Section 10(b) and Rule 10b-5 but not under Section 11. Keeping those firms would make my regression results in favor of my argument, because there is no theoretical relation between IPO litigation under Section 10(b) and Rule 10b-5 and underpricing. Through the remainder of the paper sued firms are only related to Section 11 lawsuits, while nonsued firms refer to firms that are not sued for violations relating to the IPO (i.e., not sued under Section 11, Section 10(b), or Rule 10b-5).

I eliminate the following IPOs from the sample: American deposit receipts (ADRs), units, spinoffs, reverse leveraged buyouts (LBOs), real estate investment trusts (REITs), closed-end funds, depository institutions, stocks that do not have data in the CRSP database, and stocks whose first trading dates from the CRSP and the SDC databases are inconsistent, leaving a sample of 1004 operating firm IPOs from 1998-2000. Further eliminating the stocks that do not have data in the TAQ database and the stocks whose first trading dates from the CRSP and the TAQ databases are inconsistent leaves a sample of 908 IPO firms during 1998-2000. The opening return and the intraday return are only calculated for the 908 IPO firms.

Table I provides the descriptive statistics. Among the 1004 operating firms that went

public during 1998-2000, 29% of them have been sued under Section 11 and 71% of them have not been sued. Among the sued firms, 94% of them went public during 1999-2000, about 88% of them are technology firms, and about 97% of them are traded on NASDAQ.

[Insert Table I about here]

The sued firms have significantly higher underpricing ((close-offer)/offer) than the nonsued firms. After decomposing the underpricing into the opening return ((open-offer)/offer) and the intraday return ((close-open)/open) on the first trading day, I still find that both components are significantly higher for the sued IPOs than for the nonsued IPOs.

The sued firms also have significantly higher share turnover and standard deviation of daily returns than the nonsued firms. For comparibility, turnover is defined the same way as in LS:

$$turnover = 1 - \Pi_{t=22}^{387}(1 - volume\ traded_t / total\ shares_t), \quad (1)$$

where *t* is the trading day. The turnover measure is defined this way because it is used to calculate damages in class action lawsuits. Consistent with prior studies, I adjust for the NASDAQ volume definition by dividing NASDAQ volume by a factor of two. When a firm does not have enough trading days to calculate the turnover in equation (1), I use the following average measure as a proxy for the turnover variable:

$$turnover = 1 - [\Pi_{t=22}^{T}(1 - volume\ traded_t / total\ shares_t)]^{\frac{366}{T-21}}. \quad (2)$$

The sued IPOs and the non-sued IPOs exhibit many other different characteristics. First, sued firms have a significantly higher offer price revision than the nonsued firms, where the offer price revision is defined as the percentage difference between the midpoint of the original price range filed with the SEC and the offer price. Second, sued firms have significantly higher-ranked underwriters than nonsued firms. This finding is consistent with

the "deep pocket" theory of lawsuits. Third, sued firms have significantly lower one year return and two year return than nonsued firms, where one (two) year return is measured as the percentage difference between the CRSP closing price on the one (two) year anniversary and the offer price. The conclusion is qualitatively the same if one (two) year return is measured as the percentage difference between the CRSP closing price on the one (two) year anniversary and the closing price on the first trading day. Fourth, sued IPOs have a higher percentage of VC backed firms, technology firms, internet firms, and purely primary share offers. Last, sued firms on average have a younger age, less assets and sales, and more negative earnings per share (EPS) than the nonsued firms.

Although Table I demonstrates some univariate differences between the sued and nonsued firms, these differences could be correlated. Therefore, I do not want to over-interpret the univariate differences here. Next, I will use two-stage multivariate regressions to investigate the relation between underpricing and litigation risk.

III. Methods

Among the discussion on the litigation-risk hypothesis, LS first use the two-stage probit least squares regression framework to control for the potential endogeneity issue. Their methodology is an important improvement over the prior studies, and their study paves the ground for future researches in this area. However, the biggest problem in their study is the weak instruments. As Ljungqvist (2006, p.44) points out, "weak instrument may aggravate the effect of simultaneity bias, rather than solving it. To be considered strong, an instrument needs to be highly correlated with the first-stage endogenous variable….Lowry and Shu's instruments would appear to be weak." In the rest of the paper, I will briefly describe the

regression framework in LS and explain why their instruments are weak. I will also explain my adjustments to the variable choice.

A. Two-Stage Probit Least Squares Regressions

Based on the litigation-risk hypothesis, there is potential interrelation between underpricing and litigation risk. Therefore, controlling for the interrelation is necessary for testing the litigation-risk hypothesis. The following two equations are used in LS:

$$\text{Insurance effect}: \quad \textit{Initial Return} = \gamma_1 \textit{ Litigation Risk} + \theta_1 X + \beta_1 X_1 + \varepsilon_1, \tag{3}$$

$$\text{Deterrence effect}: \quad \textit{Litigation Risk} = \gamma_2 \textit{ Initial Return} + \theta_2 X + \beta_2 X_2 + \varepsilon_2. \tag{4}$$

In equations (3) and (4), the two primary variables of interest are Initial Return and Litigation Risk (i.e., the probability of litigation). Vector X stands for the control variables that are related to both Initial Return and Litigation Risk. Vector X_1 stands for Initial Return's identifying variables, and Vector X_2 stands for Litigation Risk's identifying variables. In other words, X_1 is only related to Initial Return, but not to Litigation Risk; X_2 is only related to Litigation Risk, but not to Initial Return.

B. Identifying Variables

I use the prior market return as the identifying variable for underpricing, because the prior market return can conceptually explain underpricing but not the occurrence of litigation (Loughran and Ritter (2002); Lowry and Schwert (2004)). To measure the prior market return, I use the value-weighted NASDAQ Composite's compounded return (including distributions) over the 15 trading days prior to the IPO, since my sample IPOs are primarily from NASDAQ. Although the prior market return is also empirically correlated to

the lawsuit dummy variable in my sample, their correlation coefficient (0.15) is much smaller than the correlation coefficient between the prior market return and underpricing (0.24).

LS use the share turnover of similar firms as the identifying variable for the litigation risk of IPO firms, because the share turnover of similar firms during one year prior to the IPO date is a good proxy for the share turnover of the IPO firms during their first year of trading and the two variables are highly correlated. In other words, they think that the share turnover of the IPO firms during their first year of trading is a good identifying variable for the IPO firms' litigation risk, but since the share turnover of the IPO firms is not available before the IPO date, they use the share turnover of similar firms as a proxy.

However, there are two reasons why turnover is not a valid identifying variable for litigation risk. First, the turnover variable indeed has no strong theoretical relation with Section 11 lawsuits. Although turnover measures the number of shares traded and thus is related to the number of shares damaged, this is true for Section 10(b) and Rule 10b-5 cases, but not for Section 11 cases. Plaintiffs in Section 10(b) and Rule 10b-5 cases typically use a "proportional trading model" to estimate the number of shares damaged during the class period. So the greater the turnover, the greater the number of shares purchased at allegedly inflated prices during a given class period. However, under Section 11 only the investors who sell the shares at a price below both their purchase price and the offer price within the class period can claim damage. For example, consider an IPO stock with high turnover in its first year's aftermarket trading. If its market price does not drop below the offer price until the second year, the investors who buy and sell shares in the first year cannot claim any damage under Section 11. In other words, the first year's high turnover would not be related

to a high probability of lawsuit under Section 11, although it could be related to a high probability of lawsuit under Section 10(b) and Rule 10(b)-5, if there is manipulation known or knowable at the time of the IPO. However, the turnover variable is empirically correlated with Section 11 litigation risk. I conjecture that the correlation is due to the fact that most of the Section 11 cases are also brought under Section 10(b). For example, LS mention in their footnote 3 that approximately 80% of the cases brought under Section 11 in their sample were also brought under Section 10(b). It is the big overlap between Section 11 cases and Section 10(b) cases that produces the correlation between turnover and Section 11 litigation risk.

The second reason why turnover is not a valid identifying variable for litigation risk is that turnover is often strongly related to underpricing.[7] As pointed out by Ljungqvist (2006), this violates the order condition for a valid identifying variable. I follow LS' procedure to select the matched firms for the IPO firms and find that the matched firms' turnover is more significantly correlated with IPO underpricing than to the IPO firm's litigation risk for my sample. Therefore, I do not use matched firms' turnover as the identifying variable for the expected litigation risk under Section 11.

Instead, I use the IPO stock's one year price change relative to the offer price as a proxy for the expected damage per share to the IPO investors. The expected damage to IPO investors should be correlated with the IPO firm's expected litigation risk. Conceptually the proxy for the expected damage should be observable prior to the IPO. However, from the

[7] Reese (1998) uses newspaper references as a proxy for the level of investor interest in an IPO and finds that IPOs with a higher level of investor interest have higher initial returns and higher trading volume in the aftermarket. This provides a link between turnover and underpricing.

econometric perspective, any variables that are correlated with the endogenous regressor but independent of the error term in the regression equation can be used as the identifying variables. It does not matter how the identifying variables are created or whether they are observable at the time of IPO. Indeed, it even does not matter whether they are truly economically related to the endogenous regressor. Empirically the post-IPO one year stock performance is strongly related to the probability of litigation but not related to underpricing. For the 1004 sample IPO firms, the correlation coefficient between the post-IPO one year price change and the lawsuit dummy is -0.21 and is highly significant with a *p*-value less than 0.001, while the correlation coefficient between the post-IPO one year price change and underpricing is -0.04 and is not significantly different from zero with a *p*-value equal to 0.26. This makes the post-IPO one year stock performance a strong identifying variable for litigation risk.

In contrast, the matched firms' share turnover turns out to be more related to underpricing than to litigation risk within my sample period, and this relation is robust to different selection criteria for the matched firms. For example, consider the following two selection procedures for the matched firms. (1) For each IPO firm, selecting all firms from the same three-digit SIC code that have market capitalization within 80%-120% of the IPO firm. This results in 767 IPO firms being matched. The matched firms' turnover's correlation coefficients with the lawsuit dummy and underpricing are 0.33 and 0.35, respectively. In contrast, the one year price change's correlation coefficients with the lawsuit dummy and underpricing are -0.24 and -0.06, respectively, for the 767 firms. (2) For each IPO firm, selecting all firms from the same six-digit Global Industry Classification Standard (GICS) codes that have market capitalization within 80%-120% of the IPO firm. This results

in 855 IPO firms being matched. The control firms' turnover's correlation coefficients with the lawsuit dummy and underpricing are 0.35 and 0.38, respectively. In contrast, the one year price change's correlation coefficients with the lawsuit dummy and underpricing are -0.19 and -0.08, respectively, for the 855 firms. The above two selection procedures and the related results show that using the matched firms' turnover as the proxy for expected litigation risk is not the best choice.

C. Control Variables

To make my regression results comparable with those of LS, I try to use as many of their control variables as possible. For example, my control variables include the lead underwriter reputation, offer price revision, VC dummy, technology dummy, and primary share dummy. These control variables are motivated by information asymmetry, signaling and other factors that potentially affect underpricing. A detailed explanation is included in Section 4 of LS.

My major adjustments to the control variables include the following. First, LS use an exchange dummy as a control variable. However, in my sample, IPOs are overwhelmingly listed on NASDAQ. Thus, my control variables do not include an exchange dummy. Second, I use log (assets) instead of log (proceeds) or market capitalization to avoid the mechanical relation between underpricing and log (proceeds) or market capitalization. Third, because they do not have data on firm age, LS construct a dummy equal to one if the firm reports five or more years of pre-IPO earnings data in its prospectus (i.e., age $\geq$ 5 years). I use a finer measure log (1+age) to replace their cruder age dummy. Fourth, I do not include the control firms' standard deviation of daily returns, mainly because the

procedure of finding control firms reduces the sample size, as discussed in the last paragraph of the last subsection. Because using fewer control variables can increase the significance of the litigation risk variable in the second stage of the insurance effect regression, therefore working against my point, this adjustment should not bias the results toward my conclusion.

IV. Empirical Results

I first discuss the regression results without controlling for the potential endogeneity between underpricing and litigation risk, then report the two-stage probit least squares regression results.

A. Regression results without controlling for endogeneity

To demonstrate the difference between the regressions with and without controlling for endogeneity, I first estimate an ordinary least squares (OLS) regression in which underpricing is the dependant variable, and a probit regression in which a lawsuit dummy is the dependant variable. Firms are assigned a value of one for the lawsuit dummy if they have been sued under Section 11 by the end of 2003. Table II shows the results for the two regressions.

[Insert Table II about here]

In the OLS regression of underpricing, the coefficient on the lawsuit dummy variable is highly significant. However, as I demonstrate in the next subsection, the significance disappears after controlling for endogeneity. Among other explanatory variables, the three strongest determinants of the underpricing are the positive offer price revision dummy, the tech stock dummy, and prior market returns.

In the probit regression of lawsuit, higher underpricing leads to a significantly higher lawsuit probability. As I demonstrate in the next subsection, the significance is robust to controls for endogeneity. Among other explanatory variables, the three strongest determinants of lawsuit are underwriter reputation rank, the tech stock dummy, and the post-IPO one year price change relative to the offer price.

B. Regression results controlling for endogeneity

In this subsection, I control for potential endogeneity between underpricing and litigation risk using two-stage probit least squares regressions. All the second stage standard errors are corrected according to the methodology in Maddala (1983, p. 245).

Bound, Jaeger, and Baker (1995) point out that in finite samples, "instrumental variables (IV) estimates are biased in the same direction as OLS estimates, and the magnitude of the bias of the IV estimates approaches that of the OLS estimates as the R^2 between the instruments and the endogenous explanatory variables approaches 0." Therefore, they suggest that the partial R^2 of the identifying variables in the first stage estimation are useful indicators of the quality of the IV estimates and should be reported. In my regressions, the partial R^2 is calculated as the difference between the adjusted R^2 or pseudo R^2 of first stage regressions with and without the identifying variables. For the first stage OLS regression, the partial (adjusted) R^2 for the prior market return is 3% (=29%-26%). For the first stage probit regression, the partial (pseudo) R^2 for the post-IPO one year performance is 4% (=31%-27%).

Table III reports the regression results controlling for endogeneity. Two findings are of primary interest. First, the coefficient on the lawsuit instrument in Column (2) is not

significantly different from zero. This result is different from the insurance effect reported in LS and suggests that firms with greater litigation risk do not underprice their shares more to insure against litigation. Second, the coefficient on the underpricing instrument in Column (4) is significantly positive. This is in sharp contrast with the deterrence effect reported in LS and suggests that greater underpricing leads to a higher probability of litigation.

[Insert Table III about here]

There are several reasons why the expected litigation risk does not significantly affect underpricing in my sample. First, if it is not believed that more underpricing can significantly reduce litigation risk, then the choice of the extent to which the issues are underpriced will not be significantly and positively affected by the expected litigation risk. It is always good to have some "free" underpricing (i.e., underpricing due to non-litigation related reasons) to serve as litigation insurance as well, but how much extra underprcing the issuer is willing to have purely for the purpose of litigation insurance depends on how cost-effective the issuer believes underpricing is. Second, even if it is believed that it is worthwhile to underprice more to reduce litigation risk, D&O insurance can reduce the need to underprice for this purpose. If the D&O insurance coverage of the IPO firms in my sample is available, I would be able to test whether and to what extent the D&O insurance affects the underpricing. However, without the data I will have to rely on anecdotal evidence. Out of the 288 sued IPO firms in my sample, 271 were sued for laddering under Section 11. Ha (2003) reports that virtually all of the 309 tech companies involved in the IPO laddering class action litigation had D&O insurance, which implies that almost all of the 288 sued IPO firms in my sample had D&O insurance. However, this is consistent with both of the above two reasons and cannot help to tell which plays a more important role.

The characteristics of the sued firms during my sample period help to explain why greater underpricing leads to a higher probability of litigation. Most of the sued firms in my sample are charged for laddering. Laddering is a manipulative practice whereby some IPO investors, i.e., ladderers, are required to buy additional shares of the issuing firm in the aftermarket to get favorable IPO allocation. Laddering boosts the aftermarket price to an artificially high level (Hao (2007) and Griffin, Harris, and Topaloglu (2007)). Hence the potential damage under Section 10(b) and Rule 10b-5 is positively related to the initial aftermarket price. I reiterate that the sued firms in my sample only include those brought under Section 11, although most of the firms are sued under Section 10(b) and Rule 10b-5 as well. Based on the litigation-risk hypothesis, more underpricing should reduce the chance of being sued under Section 11. However, the opposite result here illustrates my point that it is not the damage under Section 11 itself that determines whether the firm will be sued under Section 11. Instead, it is the total damage under Section 11, Section 10(b), and Rule 10b-5 that determines whether it is worthwhile to sue the firm. In other words, the chance of being sued under Section 11 also depends on the potential damage under Section 10(b) and Rule 10b-5. Therefore, even if we interpret litigation risk narrowly as Section 11 litigation risk, increasing underpricing would still be an ineffective way to insure against litigation risk.[8]

Given this background, it is not surprising to observe the following common characteristics among the sued firms. First, the IPO stock had high initial return and intraday return ((close-open)/open) on the first trading day of the IPO, consistent with the allegation

[8] Zhu (2004) interprets IPO litigation risk as an IPO firm being sued under both the 1933 Act and/or the 1934 Act and finds no systematic link between litigation risk and IPO underpricing for firms that went public during 1990-1998. I emphasize a more subtle point here that the probability of being used under the 1933 Act is positively related to the damage under the 1934 Act.

that laddering artificially boosts the aftermarket price. Griffin, Harris, and Topaloglu (2007) find that laddering significantly increases the opening price and the intraday return on the first trading day of the IPO. Second, the IPO stock's market price declined significantly from the first trading day to the end of the class period. Without price decline, plaintiffs cannot claim any damage and therefore will not initiate the lawsuits in the first place. The above two characteristics themselves do not suggest that the lawsuits are frivolous. Instead, they are two necessary conditions for laddering lawsuits. The first condition helps to explain why higher underpricing leads to a higher probability of litigation, and the second condition makes the post-IPO stock performance a strong identifying variable for litigation risk.

Next, I try to find out if the significantly positive coefficient on the underpricing instrument is driven by the above conditions. First, I screen the sample to include only the IPO firms with the following two characteristics: (1) the IPO stock was underpriced; (2) the market price at the end of the class period was lower than the closing price on the IPO's first trading day or offer price. The purpose of the screening is to control for the positive correlation between the IPO stock's positive initial return and its later price decline. Second, I use the opening return ((open-offer)/offer) to replace the initial return in the regressions in (3) and (4). The purpose of this replacement is to control for the effect of the first trading day intraday return on the probability of laddering litigation. If firms with a greater intraday return on the first trading day are more likely to be sued for laddering, then excluding the intraday return from the initial return may provide more insight into the more generalizable relation between litigation risk and underpricing. The results show that excluding the intraday return from the initial return reduces the significance of the positive effect of underpricing on litigation risk. This tells us that the intraday return does significantly affect

the risk of being sued for laddering.

If only controlling for part of the above characteristics, the estimated regression coefficient on the underpricing instrument in the second stage regression is at least marginally significant. After controlling for all the above characteristics, the estimated regression coefficient on the underpricing instrument is no longer significant. In contrast, controlling for the above characteristics does not qualitatively change the estimated regression coefficient on the lawsuit instrument in the second stage regression. This further confirms that underpricing is not used to insure against litigation risk.

C. Robustness checks

As a robustness check, I further include an all-star analyst dummy as a control variable. Both anecdotal and systematic evidence indicate that research coverage has become an essential element of the security issuance process in recent years. Cliff and Denis (2004) find that IPO underpricing is significantly predicted by the presence of an all-star analyst covering the issuing firm's industry on the research staff of the lead underwriter. Their finding is robust to controls for other determinants of underpricing and to controls for the endogeneity of underpricing and analyst coverage. Therefore, I collect data on *Institutional Investor* (hereafter *II*)'s all-star analyst team and create an all-star dummy variable for each IPO in my sample. An all-star analyst dummy is equal to one if the lead underwriter has an all-star analyst (among the first, second, third, and runner-up teams) in the same industry as the issuer in the year prior to the IPO, and zero otherwise. Appendix C contains the details about how I construct this variable. However, in unreported regressions, including an all-star analyst dummy actually does not change my main results qualitatively.

I also confirm that using the following variants of the post-IPO price performance as the identifying variable does not make any qualitative difference to my main results: (1) post-IPO price change over two years vs. over one year. (2) post-IPO return vs. post-IPO price change.

Replacing the variable log(assets) with log(market capital) does not change the main results, except that the sign of the coefficient on the underwriter reputation rank will change from significantly positive to significantly negative. This is due to the fact that the underwriter reputation rank is much more correlated with the IPO firms' market capital than with their assets during my sample period.

V. Conclusion

This study reconciles the mixed evidence on the relation between IPO underpricing and litigation risk. Whether underpricing significantly deters litigation largely depends on something that is unrelated to underpricing, i.e., the damage under the 1934 Act. As a result, whether underpricing is significantly affected by the litigation risk concern varies case by case. The relation between underpricing and litigation risk varies as the relative magnitude of the damages under the 1933 Act and the 1934 Act varies. Therefore, different sample periods can generate different results, none of which can be considered truly generalizable. Furthermore, the increasing usage of D&O insurance among IPO firms arguably reduces the litigation risk concern in IPO pricing to a limited extent.

To complement the empirical results in the literature, I focus on a sample period when the litigation-risk hypothesis has the least theoretical relevance. Not surprisingly, the main empirical findings are inconsistent with the litigation-risk hypothesis. Although the results

are not completely generalizable, they help to demonstrate the situation in which the litigation-risk hypothesis has no explanatory power. It is important to understand when and why IPO underpricing is not significantly related to litigation risk.

Appendix A. Relevant Provisions for IPO Class Action Cases

1. Securities Act of 1933

Section 11 (15 U.S.C. § 77k) -- Civil Liabilities on Account of False Registration Statement

e. Measure of damages; undertaking for payment of costs

The suit authorized under subsection (a) of this section may be to recover such damages as shall represent the difference between the amount paid for the security (not exceeding the price at which the security was offered to the public) and (1) the value thereof as of the time such suit was brought, or (2) the price at which such security shall have been disposed of in the market before suit, or (3) the price at which such security shall have been disposed of after suit but before judgment if such damages shall be less than the damages representing the difference between the amount paid for the security (not exceeding the price at which the security was offered to the public) and the value thereof as of the time such suit was brought: Provided, That if the defendant proves that any portion or all of such damages represents other than the depreciation in value of such security resulting from such part of the registration statement, with respect to which his liability is asserted, not being true or omitting to state a material fact required to be stated therein or necessary to make the statements therein not misleading, such portion of or all such damages shall not be recoverable. In no event shall any underwriter (unless such underwriter shall have knowingly received from the issuer for acting as an underwriter some benefit, directly or indirectly, in which all other underwriters similarly situated did not share in proportion to their respective interests in the underwriting) be liable in any suit or as a consequence of suits authorized under subsection (a) of this section for damages in excess of the total price at which the securities underwritten by him and distributed to the public were offered to the public. In any suit under this or any other section of this title the court may, in its discretion, require an undertaking for the payment of the costs of such suit, including reasonable attorney's fees, and if judgment shall be rendered against a party litigant, upon the motion of the other party litigant, such costs may be assessed in favor of such party litigant (whether or not such undertaking has been required) if the court believes the suit or the defense to have been without merit, in an amount sufficient to reimburse him for the reasonable expenses incurred by him, in connection with such suit, such costs to be taxed in the manner usually provided for taxing of costs in the court in which the suit was heard.

g. Offering price to public as maximum amount recoverable

In no case shall the amount recoverable under this section exceed the price at which the security was offered to the public.

2. Securities Exchange Act of 1934

Section 10 -- Manipulative and Deceptive Devices

It shall be unlawful for any person, directly or indirectly, by the use of any means or instrumentality of interstate commerce or of the mails, or of any facility of any national securities exchange--

b. (15 U.S.C. § 78j(b)) To use or employ, in connection with the purchase or sale of any security registered on a national securities exchange or any security not so registered, or any securities-based swap agreement (as defined in section 206B of the Gramm-Leach-Bliley Act), any manipulative or deceptive device or contrivance in contravention of such rules and regulations as the Commission may prescribe as necessary or appropriate in the public interest or for the protection of investors.

Rules promulgated under subsection (b) that prohibit fraud, manipulation, or insider trading (but not rules imposing or specifying reporting or recordkeeping requirements, procedures, or standards as prophylactic measures against fraud, manipulation, or insider trading), and judicial precedents decided under subsection (b) and rules promulgated thereunder that prohibit fraud, manipulation, or insider trading, shall apply to security-based swap agreements (as defined in section 206B of the Gramm-Leach-Bliley Act) to the same extent as they apply to securities. Judicial precedents decided under section 17(a) of the Securities Act of 1933 and sections 9, 15, 16, 20, and 21A of this title, and judicial precedents decided under applicable rules promulgated under such sections, shall apply to security-based swap agreements (as defined in section 206B of the Gramm-Leach-Bliley Act) to the same extent as they apply to securities.

3. General Rules and Regulations promulgated under the Securities Exchange Act of 1934

Rule 10b-5 (17 C.F.R. §240.10b-5) -- Employment of Manipulative and Deceptive Devices

It shall be unlawful for any person, directly or indirectly, by the use of any means or instrumentality of interstate commerce, or of the mails or of any facility of any national securities exchange,

a. To employ any device, scheme, or artifice to defraud,

b. To make any untrue statement of a material fact or to omit to state a material fact necessary in order to make the statements made, in the light of the circumstances under which they were made, not misleading, or

c. To engage in any act, practice, or course of business which operates or would operate as a fraud or deceit upon any person,

in connection with the purchase or sale of any security.

Source: Securities Lawyer's Deskbook published by The University of Cincinnati College of Law, which is available at http://www.law.uc.edu/CCL/index.html.

Appendix B. Definition of Variables

1. **Initial return** = (Closing price-offer price)/offer price on the first trading day of IPO.
2. **Opening return** = (Opening price on the first trading day of IPO -offer price)/offer price.
3. **Intraday return** = (Closing price-opening price)/opening price on the first trading day of IPO.
4. **Lawsuit dummy**: a dummy variable equal to one if the IPO firm has been sued under Section 11 by the end of 2003, and zero otherwise.
5. **Offer price revision** = (offer price –midpoint of the file price range)/ midpoint of the file price range. The original file price range, before any amendments, is used.
6. **Positive offer price revision dummy:** a dummy variable equal to one if the offer price is higher than the midpoint of the file price range, and zero otherwise.
7. **Underwriter rank**: the integer part of the IPO lead underwriter reputation ranks that are downloadable from Jay Ritter's website at http://bear.cba.ufl.edu/ritter/Rank.htm.
8. **VC dummy**: a dummy variable equal to one if the firm is venture capitalist backed, and zero otherwise.
9. **Primary share dummy**: a dummy variable equal to one if 100% of primary shares offered out of total shares offered, and zero otherwise.
10. **Age** = IPO year - founding year. Founding years are downloadable from Jay Ritter's website.
11. **Internet dummy**: a dummy variable equal to one if the firm is in an internet firm (SDC High-Tech variable HITECHP = 420), and zero otherwise.
12. **Tech dummy**: a dummy variable equal to one if the firm is in a high-tech industry (SICs 3570, 3571, 3572, 3575, 3577, 3578, 3660, 3661, 3663, 3669, 3674, 3810, 3812, 3820, 3823, 3825, 3826, 3827, 3829, 3840, 3841, 3845, 4812, 4813, 4899, 7370, 7371, 7372, 7373, 7374, 7375, 7378, 7379, or internet dummy=1), and zero otherwise.
13. **Proceeds**: global proceeds (in US $ millions), exclusive of overallotment options.
14. **Assets**: total assets before offering (in US $ millions).
15. **EPS12**: earnings per share for the 12 month period after offering.
16. **Sales**: total revenues for the 12 month period after offering (in US $ millions).
17. **Turnover**: (1)For the sample IPO firms, it is defined in equation (1):

    $$turnover = 1 - \Pi_{t=22}^{387}(1 - volume\ traded_t / total\ shares_t),$$

    where t is the trading day. When a firm does not have enough trading days to calculate the turnover in equation (1), I use the following average measure as a proxy for the turnover variable: $turnover = 1 - [\Pi_{t=22}^{T}(1 - volume\ traded_t / total\ shares_t)]^{\frac{366}{T-21}}$.

    (2) For the control firms, it is calculated over one year prior to the IPO date of the sample IPO firms. I adjust for the Nasdaq volume definition by dividing Nasdaq volume by a factor of two.
18. **Standard deviation**: (1) For the sample IPO firms, it is the standard deviation of the daily percentage returns over one year after the IPO date starting at day 22. (2) For the control firms, it is the standard deviation of the daily percentage returns over one year prior to the IPO date of the sample IPO firms.
19. **Prior market return**: value-weighted Nasdaq Composite's compounded percentage return (including distributions) over the 15 trading days prior to IPO.
20. **All-star dummy**: a dummy variable equal to one if the lead underwriter has an all-star analyst in the same industry as the issuer in the year prior to the IPO, and zero otherwise. An all-star is defined as any research team mentioned on *Institutional Investor*'s all-star analyst team list in the October issue, including the first, second, third, and runner-up teams.

21. **Post-IPO one (two) year price change relative to the offer price**: CRSP closing price on the one (two) year anniversary after the IPO - offer price. If the closing price on the one (two) year anniversary is missing in the CRSP database, then the last closing price in CRSP is used instead.
22. **Post-IPO one (two) year return relative to the offer price**: (CRSP closing price on the one (two) year anniversary after the IPO - offer price)/offer price. If the closing price on the one (two) year anniversary is missing in the CRSP database, then the last closing price in CRSP is used instead.

Appendix C. Construction of the All-star Dummy Variable

The all-star analyst dummy is equal to one if the lead underwriter has an all-star analyst based on *Institutional Investor* (hereafter *II*) in the same industry as the issuer in the year prior to the IPO, and zero otherwise. To decide on the IPO firm's industry, we hand check all the initiating coverage reports by various investment banks as well as the coverage by *The IPO Reporter* and *IPO Maven* in the *Investext Plus* database. A major advantage of this method is that the industries proposed by *II* are very close to the industries classified by the analyst reports. Therefore, hand checking the analyst reports can provide a highly accurate industry classification. If an IPO firm is considered as belonging to more than one *II* defined industries, as suggested by analyst reports, we will define the firm as having a lead all-star analyst if its lead underwriter's analyst is an all-star in either of the industries. On the basis of this classification, 29% of our sample IPOs have an all-star analyst.

As a comparison, Cliff and Denis (2004) report that 39.9% of their sample IPOs from 1998-2000 have an all-star analyst. Note that their sample only includes the IPOs for which a subsequent SEO is made by 2001. Cliff and Denis set their dummy variable equal to one for an IPO in year t if there is an underwriter who has an all-star in the industry in year t or t-1. Our definition of an all-star analyst dummy is different than that in Cliff and Denis (2004) along two dimensions. First, we set the all-star analyst dummy to one only if the lead's analyst is on *II*'s all-star research team list in year t-1. Since *II* publishes its all-America research team list in its October's issue, IPOs from January-September could not have known who would be an all-star in October. Furthermore, the lead underwriter or underwriters are typically picked a few months before going public, so it is plausible that almost all of the lead underwriters for IPOs in the IPO year were picked using information based on the rankings in the prior year. Second, we consider all the first, second, third, and runner-up teams mentioned on *II* as all-star analyst teams, while Cliff and Denis only include the top three teams. We include runners-up mainly because the adjusted R^2 for the underpricing regression is higher including runners-up than excluding runners-up. However, our regression results are qualitatively the same regardless whether we include or exclude the runners-up.

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Table I. Characteristics of sued vs. non-sued IPO firms during 1998-2000

The original IPO sample is from SDC new issue database. ADRs, units, spinoffs, reverse LBOs, REITs, closed-end funds, depository institutions, the stocks that do not have data in the CRSP database, and the stocks whose first trading dates from the CRSP and the SDC databases are inconsistent are eliminated, leaving a sample of 1004 IPO firms during 1998-2000. Further eliminating the stocks that do not have data in the TAQ database and the stocks whose first trading dates from the CRSP and the TAQ databases are inconsistent leaves a sample of 908 IPO firms during 1998-2000. The opening return and the intraday return are only calculated for the 908 IPO firms. Sued IPO firms are charged under Section 11 of the Securities Act of 1933, and nonsued firms are not charged under Section 11 of the Securities Act of 1933, Section 10(b) of the Securities Exchange Act of 1934, or Rule 10b-5. Appendix B has the definition of the variables. The Wilcoxon rank-sum test is used to test the difference between the distributions of the non-dummy variables. The comparison of dummy variables is done by Pearson's Chi-square statistic. The two-tailed p-values are shown for either the Wilcoxon test or the Pearson test.

	P-value (Wilcoxon or Pearson)	Sued IPO Firms				Non-sued IPO Firms			
		N	Mean	Median	Std. Dev.	N	Mean	Median	Std. Dev.
Initial return (%)	<0.01	288	126.74	99.50	105.33	716	25.89	11.96	45.69
Opening return (%)	<0.01	247	107.77	85.00	109.67	661	22.39	8.85	35.62
Intraday return (%)	<0.01	247	10.32	7.14	24.68	661	2.26	0.39	16.01
Offer price revision (%)	<0.01	288	34.59	28.57	37.75	716	1.71	0	25.70
Underwriter rank	<0.01	288	8.64	9.00	0.75	716	7.52	8.00	2.01
Age	<0.01	285	5.71	4.00	4.87	694	10.85	6.00	16.47
Proceeds ($m)	<0.01	288	114.27	80.50	136.15	716	111.59	52.50	339.88
Assets ($m)	0.04	283	92.82	31.10	257.53	700	1178.04	25.15	13284.13
EPS12 ($)	<0.01	288	-7.90	-1.48	21.06	716	-6.78	-0.47	23.96
Sales ($m)	<0.01	288	42.57	11.60	139.63	699	252.37	19.20	2293.32
Turnover (%)	<0.01	288	80.43	84.73	17.83	716	68.93	70.82	21.23
Standard deviation (per day) (%)	<0.01	288	8.46	8.33	1.83	716	7.01	6.60	2.77
Post-IPO one year return relative to offer price (%)	<0.01	288	-42.51	-73.23	89.30	716	8.00	-38.92	137.33
Post-IPO two year return relative to offer price (%)	<0.01	288	-76.04	-87.96	35.79	716	-19.53	-64.25	118.13
VC dummy	<0.01	288	0.75			716	0.48		
All-star dummy	<0.01	288	0.45			716	0.20		
Primary dummy	<0.01	288	0.90			716	0.78		
Tech dummy	<0.01	288	0.89			716	0.56		
Internet dummy	<0.01	288	0.61			716	0.30		
Nasdaq dummy	<0.01	288	0.97			716	0.83		
Year 1998 dummy	<0.01	288	0.06			716	0.30		
Year 1999 dummy	<0.01	288	0.56			716	0.36		
Year 2000 dummy	0.15	288	0.38			716	0.34		

Table II. OLS regression and probit regression results

These regressions test the relation between lawsuit and initial return, without controlling for potential endogeneity. In the OLS regression, initial return is the dependant variable. In the probit regression, lawsuit is the dependant variable. Appendix B has the definition of the variables. Coefficients are reported with p-values in parentheses. The p-values are based on robust standard errors. Asterisks ** or * indicate significance at the 1% and 5% levels in two-tailed tests, respectively.

	OLS	Probit
Variable	Dep.=Initial return	Dep.= Lawsuit
Intercept	**-23.93****	**-4.56****
	(0.002)	(<0.001)
Lawsuit	**69.44****	
	(<0.001)	
Initial return (%)		**0.01****
		(<0.001)
Underwriter rank	**3.37****	**0.32****
	(0.002)	(<0.001)
VC dummy	6.40	0.15
	(0.151)	(0.215)
Primary share dummy	**8.43***	0.08
	(0.031)	(0.610)
Positive offer price revision dummy	**38.69****	**0.34****
	(<0.001)	(0.009)
Tech dummy	**13.99****	**0.61****
	(<0.001)	(<0.001)
Log(Assets)	**-3.23****	0.05
	(0.006)	(0.176)
Log(1+age)	0.38	**-0.15***
	(0.828)	(0.042)
Prior market return (%)	**1.54****	
	(<0.001)	
Post-IPO one year price change relative to offer price		**-0.02****
		(<0.001)
Adj. R^2 / McFadden pseudo R^2	0.41	0.42
Number of Observations	963	963

Table III. Two-stage regression results

These regressions test the relation between lawsuit and initial return using the two-stage probit least squares regression framework, where initial return and the lawsuit probability are treated as the endogenous variables. Columns 1 and 2 are the first- and second-stage regressions for the effect of litigation risk on initial return. The first stage is a probit regression, and the second stage is an OLS regression. The lawsuit instrument in the second stage (Column 2) equals the fitted value from the first-stage regression. Columns 3 and 4 are the first- and second-stage regressions for the effect of initial return on litigation risk. The first stage is an OLS regression, and the second stage is a probit regression. The initial return instrument in the second stage (Column 4) equals the fitted value from the first-stage regression. Appendix B has the definition of the variables. Coefficients are reported with p-values in parentheses. All the second stage p-values are based on the standard errors corrected by the methodology in Maddala (1983, page 245). Asterisks ** or * indicate significance at the 1% and 5% levels in two-tailed tests, respectively.

Variable	Insurance Effect		Deterrence Effect	
	First stage dep. = Lawsuit (1)	Second stage dep. = Initial return(%) (2)	First stage dep. = Initial return(%) (3)	Second stage dep. = Lawsuit (4)
Intercept	**-4.94****	-51.26	**-50.34****	**-4.36****
	(<0.001)	(0.155)	(<0.001)	(<0.001)
Lawsuit instrument		-0.19		
		(0.978)		
Initial return instrument (%)				**0.01****
				(0.001)
Underwriter rank	**0.36****	**6.54***	**6.47****	**0.29****
	(<0.001)	(0.023)	(<0.001)	(<0.001)
VC dummy	**0.25***	10.54	**10.50***	0.12
	(0.033)	(0.053)	(0.041)	(0.288)
Primary share dummy	0.23	**15.51****	**15.46****	0.06
	(0.103)	(0.014)	(0.009)	(0.707)
Positive offer price revision dummy	**0.85****	**54.71****	**54.55****	0.22
	(<0.001)	(<0.001)	(<0.001)	(0.342)
Tech dummy	**0.83****	**26.45****	**26.29****	**0.52****
	(<0.001)	(0.001)	(<0.001)	(0.001)
Log(Assets)	0.02	-2.67	-2.67	0.05
	(0.631)	(0.115)	(0.114)	(0.202)
Log(1+age)	-0.14	-2.50	-2.48	-0.11
	(0.057)	(0.405)	(0.382)	(0.121)
Prior market return (%)	**0.02****	**1.99****	**1.98****	
	(0.002)	(<0.001)	(<0.001)	
Post-IPO one year price change relative to offer price	**-0.02****		0.00	**-0.02****
	(<0.001)		(0.978)	(<0.001)
Adj. R^2 / McFadden pseudo R^2	0.31	0.29	0.29	0.31
Number of Observations	963	963	963	963