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# Litigation risk, strategic disclosure and the underpricing of initial public offerings ☆

Kathleen Weiss Hanley [a], Gerard Hoberg [b,*]

[a] U.S. Securities and Exchange Commission, 100 F Street NE, Washington DC, 20549, United States
[b] Robert H. Smith School of Business, 4423 Van Munching Hall, University of Maryland, College Park, MD 20742-1815, United States

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ABSTRACT

Using word content analysis on the time-series of IPO prospectuses, we show that issuers tradeoff underpricing and strategic disclosure as potential hedges against litigation risk. This tradeoff explains a significant fraction of the variation in prospectus revision patterns, IPO underpricing, the partial adjustment phenomenon, and litigation outcomes. We find that strong disclosure is an effective hedge against all types of lawsuits. Underpricing, however, is an effective hedge only against Section 11 lawsuits, those lawsuits which are most damaging to the underwriter. Underwriters who fail to adequately hedge litigation risk experience economically large penalties, including loss of market share.

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## 1. Introduction

When proposed by Tinic (1988) and Hughes and Thakor (1992) as a potential explanation for underpricing in initial public offerings (IPOs), litigation risk seemed both intuitively plausible and economically relevant. Section 11 of the Securities Act of 1933 gives investors the right to sue issuers and underwriters for declines in value below the offer price due to material omissions in the prospectus.[1] Given the inherent uncertainty of an IPO, and the potential reputational losses associated with litigation, issuers and underwriters concerned about lawsuits can attempt to hedge litigation risk by underpricing.

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* Corresponding author. Tel.: +1 301 405 9685;
fax: +1 301 405 0359.
*E-mail address:* ghoberg@rhsmith.umd.edu (G. Hoberg).

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[1] Section 11 states, " In case any part of the registration statement …omitted to state a material fact required to be stated therein or necessary to make the statements therein not misleading, any person acquiring such security … may, either at law or in equity, in any court of competent jurisdiction, sue every person who signed the registration statement" including the underwriter. Further, "the suit… 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, …."

Drake and Vetsuypens (1993), in the first empirical paper to study the effect of litigation risk, examine differences in initial returns between IPOs that are sued and those that are not. The authors find no evidence that underpricing reduces the incidence of a lawsuit. Lowry and Shu (2002), however, take into account the endogeneity of initial returns and lawsuit incidence and find support for both an insurance and a deterrence effect as predicted by litigation risk theories. Despite this recent support, some researchers remain skeptical. Ritter and Welch (2002), in their review article state, "In our opinion, leaving money on the table appears to be a cost-ineffective way of avoiding lawsuits." This paper proposes an enriched litigation risk framework that can reconcile these disparate views.

The underlying assumption in existing studies of litigation risk is that stock market losses alone are sufficient to extract legal penalties. In reality, two conditions must be met. First, investors must have suffered damages in the form of investment losses. Second, investors must be able to produce evidence of a material omission in the firm's disclosure that existed at the time of their initial investment. Importantly, in our enriched litigation framework, plaintiffs must establish evidence of *both* losses and poor disclosure (an "and" not an "or" condition). To reduce litigation risk, therefore, issuers need to hedge only one of these conditions. Hedging can be done by either underpricing (to reduce damages) or by enhancing disclosure (to reduce the probability of a material omission).

Our approach differs from prior studies of litigation risk in IPOs in that we examine both the firm's disclosure and pricing strategy. We hypothesize that disclosure and underpricing are substitute hedges against liability risk. In our enriched litigation framework, underpricing should be high only when a firm has a potential material omission (and vice versa). In other words, not all issuing firms will choose to use underpricing as a hedge. Therefore, the effect of underpricing in reducing incidences of litigation will be concentrated only in firms with a high probability of a material omission.

One reason why this enriched litigation risk framework has not yet been tested is that a "material omission" in a firm's prospectus is difficult to measure. With the advent of textual analysis, determining a firm's disclosure strategy is now feasible. We determine the likelihood of a material omission by examining how the issuing firm reacts to the arrival of new information during the offering period. In particular, we examine the intensity of revisions to the issuer's prospectus text over the same time interval as information-gathering activities, such as bookbuilding and road shows, are being conducted. These activities often result in information material enough to generate large price revisions from the initial filing range to the final IPO price. The typical issuer files an initial prospectus and two to three revisions during the roughly three-month period between the initial filing and the IPO date, giving us considerable power to assess any changes in disclosure over time.

We construct a proxy for the likelihood of a material omission in the prospectus using two conditions: (A) the extent to which the IPO price is revised since the initial filing estimate, and (B) whether the initial prospectus *is not* substantially revised during the offering period. Condition (A) reveals the potential materiality of the new price-relevant information that arrived during the bookbuilding process. If condition (A) is sufficiently large, condition (B) reveals that this new information was not disclosed in the prospectus, resulting in a potential material omission.

Specifically, we predict that the substitution effect of pricing for disclosure is increasing in the probability of a material omission. In this context, larger price revisions indicate that the new information is particularly relevant in determining the firm's offer price, and we consider it more "material." As a result, an issuer who chooses not to revise their disclosure following a large price revision is particularly prone to successful litigation should the stock price decline ex post.

We find strong support for a substitution of pricing for disclosure as a hedge against litigation risk. The strongest substitution effect occurs when the proprietary value of the revealed information is likely to be high, i.e., in IPOs with positive price-relevant information generated during the offering period. The economic magnitude of these initial returns is substantial and is even larger still for issuers with high ex ante litigation risk. Ex ante litigation risk is determined by how similar the issuer's prospectus is to IPOs that were sued prior to the issuer's filing date. Thus, litigation risk plays an important role in the partial adjustment phenomenon and can explain why the underpricing of IPOs with positive information "seems too large to be explained as equilibrium compensation for revealing favorable information" (Ritter and Welch, 2002).

The traditional interpretation of the litigation risk theory is that high underpricing can deter all lawsuits by reducing damages. But underpricing applies only to IPO purchasers and therefore, cannot deter lawsuits brought by aftermarket purchasers. In our enriched litigation framework, we propose and test an alternative view of the deterrence effect of initial returns. We show that the deterrence effect of underpricing is in reducing the probability that IPO investors will bring a lawsuit under Section 11.

We find that the primary benefit of deterring a Section 11 lawsuit is to reduce the likelihood of the underwriter being named in the suit and suffering reputational damage along with subsequent market share losses.[2] The risk of being named in a lawsuit and losing market share can explain why underwriters are willing to substantially underprice even when positive information is revealed.

Unlike initial returns, we show that enhanced disclosure can deter all types of lawsuits because it applies equally to

[2] Section 11 limits damages to underwriters, "In no event shall any underwriter … 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." Lawsuits against underwriters claiming fraudulent behavior can still be brought by aftermarket investors under Section 10b-5 but the threshold is higher because it requires a proof of intent.

both IPO investors and aftermarket purchasers. However, disclosure can be a more costly mechanism to hedge litigation risk than underpricing if the new information has high proprietary value to the issuing firm.

Our findings contribute to the ongoing debate regarding the role of voluntary disclosure in shareholder litigation (e.g., Francis, Philbrick, and Schipper, 1994; Evans and Sridhar, 2002; Field, Lowry, and Shu, 2005; Rogers and Buskirk, 2009; Lowry, 2009). While much of this literature has found that bad information is withheld and good information is disclosed (for example, Skinner, 1994, 1997; Healy and Palepu, 2001), we find the opposite to be true. We suggest that this conflicting finding is likely due to differences in incentives (Kothari, Shu, and Wysocki, 2009) and the regulatory environment surrounding the IPO process.

Finally, our paper adds to a growing body of work that uses word content analysis to analyze the informativeness of written disclosure. In the context of managing litigation risk, Nelson and Pritchard (2008), Mohan (2007), and Rogers, Buskirk, and Zechman (2010) find that certain word usage is related to the probability of being sued. Hanley and Hoberg (2010) examine the information content of IPO initial prospectuses and its effect on pricing. Hoberg and Phillips (2010) use text similarity analysis to test theories of merger incidence and outcomes. Loughran and McDonald (2010) show that firms using Plain English have greater small-investor participation and shareholder-friendly corporate governance. In other contexts, papers such as Antweiler and Frank (2004), Tetlock (2007), Tetlock, Saar-Tsechanksy, and Macskassy (2008), Li (2006), Boukus and Rosenberg (2006), and Loughran and McDonald (2011) find word content to be informative in predicting stock price movements.

The remainder of the paper is organized as follows: A brief discussion of the incentive to withhold or disclose information learned during bookbuilding is presented in Section 2. The data, word vector construction method, and summary statistics are in Section 3. Our method of classifying disclosure strategy is discussed in Section 4. The relation of disclosure strategy and litigation risk to initial returns (the insurance effect) is in Section 5. How disclosure strategy and initial returns affect the probability of a lawsuit (the deterrence effect) is in Section 6. The economic consequence of lawsuits for underwriters is explored in Section 7. The paper concludes in Section 8.

## 2. IPO disclosure incentives

After receiving and addressing comments from the Securities Exchange Commission (SEC) on the initial prospectus, the underwriter and issuer begin the bookbuilding process. During the road show, the issuer conveys information regarding the future prospects of the firm (to be limited to the information in the prospectus), and investors provide feedback on the proposed offer price via indications of interest on the proposed price range. (See, for example, Benveniste and Spindt, 1989, and Sherman and Titman, 2002 who argue that investors are compensated for revealing information about the value of the firm to the issuer and underwriter.)

The issuing firm must decide whether to revise the offer price and disclose the information learned during the offering process. If the issuing firm is concerned about potential litigation, it will choose a combination of disclosure and underpricing that jointly minimizes the two conditions for a lawsuit to be brought: a material omission in the prospectus and damages in the form of investment losses. Increased disclosure will lower the likelihood of a material omission, while underpricing can reduce the damages of IPO investors and influence whether the lawsuit is brought under Section 11.

Both of these mechanisms, however, are costly. Underpricing leaves money on the table (Loughran and Ritter, 2002) while enhanced disclosure could reveal proprietary or strategic information to rivals (Darrough and Stoughton, 1990; Bhattacharya and Chiesa, 1995; Maksimovic and Pichler, 2001). Whether the firm places greater emphasis on enhanced disclosure or underpricing is likely related to the type of information revealed during the offering process.

Issuing firms that receive bad information from investors have initial offer prices that are too high. To generate sufficient demand for the IPO, these firms will need to revise their offer prices downward. By reducing the offer price, the issuing firm may not have sufficient flexibility (for example, to meet its capital raising goals) to hedge against litigation risk using initial returns. Reducing the offer price to increase underpricing can also impact the probability of withdrawal of the offering (Dunbar, 1998; Edelen and Kadlec, 2005). Hence, underpricing could be expensive as insurance against a lawsuit. Finally, if offer prices are revised downward, the issuing firm will likely need to file an amendment with the SEC that discusses the effect of lower-than-expected proceeds. Issuing firms with bad information revealed, therefore, have strong incentives to increase disclosure rather than reduce the offer price to mitigate liability.

Since bad information was revealed to the issuing firm *by investors*, it would be especially risky to withhold such information from the offering document. If the information is revealed shortly after the IPO, both conditions for a lawsuit are immediately met: investors will experience damages when the stock price declines following the announcement, and there will be evidence of a material omission. Since bad information has potentially low proprietary value to rivals and is unlikely to be concealed for long, there is little benefit and much cost in withholding negative information.

Ascent Pediatrics is an example of increased disclosure following the receipt of bad information during the offering period. In an amendment to the initial prospectus, the company disclosed "the Company is aware of one United States patent issued to a pharmaceutical company that may be alleged to be infringed by the Company's prednisolone sodium phosphate syrup that is being developed." Subsequently, the firm had a $-25\%$ decline in the offer price and a low 4% initial return.

Issuing firms that receive good information have initial offer prices which are too low. Because these IPOs have additional flexibility in pricing, they can substitute initial returns for disclosure, which may be costly, to mitigate potential liability risk. For example, disclosure can be

costly because it might reveal proprietary information to rivals or delay the IPO.

It can be counterintuitive to think that issuers with good information would be concerned about litigation risk. After all, the new information was unexpectedly positive. However, the information learned at the time of the offering most likely represents a distribution of possible outcomes, some of which might be ex post negative. Consider the following example: an IPO firm in industry X learns from investors during bookbuilding that its product can be potentially modified to solve a costly problem in industry Y. The IPO firm might wish to withhold this information because disclosing it might alert its industry X rivals. However, it is possible that existing firms in industry Y might solve the problem on their own. If existing firms in industry Y beat the IPO firm to the solution, the IPO firm's investment would be lost and its ex post value will decline. Plaintiffs could argue that the issuing firm should have disclosed both the good information (new opportunities in industry Y) and the associated risk factor (industry Y solves the problem before the issuing firm can act). However, from a strategic disclosure perspective, neither can be disclosed in the IPO prospectus without essentially revealing the full information to rivals.

Another relevant factor is that the information learned during the offering process might be intangible or nonspecific. For example, the issuing firm may only know that investors have valued their offering substantially above the expected offer price but cannot determine whether the difference of opinion is due to information about the issuing firm, market conditions, or even exuberance about the stock.[3] In this case, it would be difficult to use disclosure as a hedge against litigation because the issuer's ability to disclose the information in a legally meaningful way is compromised. Thus, the issuer would prefer to use underpricing to reduce its liability risk rather than increase disclosure.

Our finding that IPO firms are more likely to withhold good information and disclose bad information is opposite to the findings in the literature regarding non-IPO firms, which tend to conceal bad information and disclose good information. The above discussion highlights the complex interactions between incentives, regulation, and the legal environment that are unique to the IPO process, which can account for this difference. Because information asymmetry is highest when a firm goes public, specific protections have been put into place to protect IPO investors, including an SEC review and legal recourse for material omissions in the prospectus. Further, the involvement of an underwriter, who can be named along with the issuer in a lawsuit, further affects the decision of the issuer to disclose or withhold information. Finally, unlike seasoned firms, IPO issuers have some control over pricing decisions which can be used to mitigate the litigation risk associated with the disclosure strategy.

[3] Wang, Winton, and Yu (2010) find that fraud (lawsuit incidence) is related to investors' beliefs about future business conditions.

## 3. Data

### 3.1. Sample and word vector construction

Our initial list and characteristics of all U.S. IPOs issued between January 1, 1996 and October 31, 2005 is from the Securities Data Company (SDC) U.S. New Issues Database. We eliminate American Depositary Receipts (ADRs), unit issues, Real Estate Investment Trusts (REITs), closed-end funds, financial firms, and firms with offer prices less than five dollars. A Center for Research in Security Prices (CRSP) permno must also be available for an observation to remain in the sample, and the IPO must also have a valid founding date, as identified in the Field-Ritter data set, as used in Field and Karpoff (2002) and Loughran and Ritter (2004). These initial exclusions reduce the sample to 2,112 IPOs.

For each IPO passing these initial screens, we use a Web crawling algorithm to download the initial prospectus, and all subsequent amendments. In order for an IPO to remain in our sample, it must have available SEC EDGAR filings online, which must also be machine readable. To satisfy our definition of machine readable, a Table of Contents pagination algorithm must be able to detect and accurately identify, the start and end of the entire prospectus (see Hanley and Hoberg, 2010 for additional information). This additional screen eliminates 69 IPOs, leaving us with 2,043 machine readable IPOs. Because these 69 IPOs are a small fraction of our sample, and because most are also small firms that file using Form SB-2 (larger firms generally file Form S-1), we do not believe that omitting these firms is problematic.[4]

Our estimation of each IPO's initial prospectus similarity to past sued IPOs (a measure of ex ante litigation risk) requires prospectus information from other IPOs that were sued in the past year. To have sufficient data for the estimation of this key variable, we further restrict the sample to IPOs that were issued on or after January 1, 1997. IPOs issued prior to that date (from 1996) are used only to compute starting values for this variable and are otherwise discarded. This requirement reduces our sample to 1,623 IPOs which have a total combined document count (initial prospectus plus amendments) of 8,199.

Our algorithm to read each prospectus is written in a combination of PERL and APL. Once a document is downloaded and paginated, our algorithm's next step is to purge the document of attachments, headers, and exhibits so that we can focus on the prospectus itself. The parsing of the prospectus is achieved using a three-prong approach which ensures a high degree of accuracy: (1) we use the pagination implied by the Table of Contents to identify the beginning and end of the document, (2) we examine the placement of the "additional information" statement, and the placement of accounting statements (exhibits) to confirm accuracy, and (3) we hand-check the

[4] Prior to 2008, "small business issuers" or companies that had less than $25 million in public float and less than $25 million in annual revenues had the option to register using Form SB-2. All issuers, regardless of size, are eligible to use Form S-1.

algorithm's accuracy for most documents and include exception handling when necessary.

For each IPO $i$, we store the text of the prospectus in separate word vectors, which we define as $words_i$. These vectors are based on word roots rather than actual words, and we also exclude certain types of words such as common words and/or articles. (For additional information on the word vector construction, see the Appendix.) Note that all word vectors have the same length (5,803) as they are based on the same global word list of 5,803 word roots. Each element of the vector is first populated by the count of the number of times the word is used in the given document. Because we use the cosine similarity method to normalize vectors prior to using them in calculations, our final variables are based on relative word frequencies and not nominal word counts (consistent with other studies).

### 3.2. IPO and lawsuit variables

We compute a number of variables which are common to the existing IPO literature. $\Delta P$ is underwriter's price adjustment from the filing date to the IPO date, and $IR$ (initial return) is the market's price adjustment from $P_{ipo}$ to $P_{mkt}$. Investors who purchase shares at the IPO price, $P_{ipo}$, can realize returns equal to $IR$ by selling their shares at the closing price on the first day of public trading.

$$\Delta P = \frac{P_{ipo} - P_{mid}}{P_{mid}}, \quad IR = \frac{P_{mkt} - P_{ipo}}{P_{ipo}}. \tag{1}$$

$P_{mid}$, $P_{ipo}$, and $P_{mkt}$ are the filing date midpoint, the IPO price, and the aftermarket trading price, respectively.

We also control for the following variables identified in the existing IPO literature:

$\Delta P+$: The positive component of $\Delta P$ equal to max[$\Delta P$,0]. This variable controls for the partial adjustment phenomenon documented in Hanley (1993) and first used in Lowry and Schwert (2002).

$\Delta P-$: The negative component of $\Delta P$ equal to min[$\Delta P$,0].

*Firm age*: IPO year minus the firm's founding date, where founding dates are obtained from the Field-Ritter data set, as used in Field and Karpoff (2002) and Loughran and Ritter (2004).

*Lead UW $ market share*: Lead underwriter's dollar market share in the past calendar year as calculated by Megginson and Weiss (1991).

*Law $ market share*: The dollar market share of legal counsel in the past calendar year, and a separate variable is constructed for the lead underwriter's legal counsel and the issuer firm's legal counsel.

*VC dummy*: Dummy variable equal to one if the firm is venture capital (VC)-backed and zero otherwise, as in Barry, Muscarella, Peavy, and Vetsuypens (1990).

*Nasdaq return*: We construct two measures of this variable. Our first is the Nasdaq return for the 30 trading days preceding the filing date. Our second is the Nasdaq return for the 30 trading days preceding the issue date. Logue (1973) first examined whether past market returns can predict future underpricing, and this measure has been used more recently by Loughran and Ritter (2002).

*IPO size*: We construct two measures of this variable. Our first is the natural logarithm of the original filing amount. Our second is the natural logarithm of the offering amount.

*Tech dummy*: Dummy variable equal to one if a firm resides in a technology industry as identified in Loughran and Ritter (2004).

*Risk*: Equal to ($1/P_{mid}$) as in Bradley and Jordan (2002).

*Volatility*: Firm risk using the matching method in Lowry and Shu (2002).

*Informative content* and *Standard content*: The amount of informative and standard content in the initial prospectus from Hanley and Hoberg (2010).

*Carter/Manaster rank*: Underwriter rankings by Carter and Manaster (1990) and Carter, Dark, and Singh (1998), as updated by Loughran and Ritter (2004).

*Fraction secondary shares*: Percent of secondary shares or shares sold by insiders.

Table 1 presents summary statistics on the various measures we employ in this paper. Panel A has information on the price variables, and our sample is similar to other studies which include the bubble period of 1999 and 2000. On average, this sample of IPOs has an average initial return of 38% with a much lower median of 15%. The average change in the offer price from the first initial price range midpoint to the final offer price is 5.0%. $\Delta P+$, the positive component of offer price changes, averages 12% while $\Delta P-$, the negative component of offer price changes, averages −7%. Almost half of the IPOs in our sample have positive revisions in the offer price while 36% have negative revisions. The remaining IPOs have no change in the offer price.

Panel B displays statistics for IPO characteristics. The mean IPO files an offer amount of approximately $214 million. The average age of the firm is almost 14 years but the median is significantly smaller at seven years. Half of the IPOs have venture capital backing and 46% are classified as tech firms as defined in Loughran and Ritter (2004). The average market share of the underwriter in the year prior to the offer is 3.0%. Consistent with Lowry and Schwert (2002), IPOs are brought to market when prior returns are high, with an average return in the 30 days prior to filing of approximately 5%.

Panel C presents summary statistics describing the prospectus and revision variables. The average document has a total of almost 10,000 root words. Since the number of possible unique root words is 5,803, an average number of root words for the document as a whole of almost 10,000 means that some root words appear more frequently. The average issuer files four amendments to the initial prospectus for a total of five prospectus filings.

We collect information on all class action lawsuits for up to three years after the IPO date from Stanford Law School's *Securities Class Action Clearinghouse*. We require that the lawsuit be disclosure-based (material omission) which results in 165 IPOs with a class action lawsuit that meets our criteria. Our class action lawsuit dummy is one if an IPO is sued based on this sample of lawsuits.

It should be noted that during our sample time period, many IPOs were sued for IPO allocation abuses. Approximately 10% of our sample has, simultaneously, both a

**Table 1**
Sample summary statistics.

Summary statistics are reported for 1,623 IPOs issued in the U.S. from January 1997 to October 2005 excluding: firms with an issue price less than five dollars, ADRs, financial firms, unit IPOs, dual class IPOs, and REITs. *Initial return* is the actual return from the IPO offer price to the first CRSP reported closing price. $\Delta P$ is the return from the filing date midpoint to the IPO offer price, and $\Delta P+$ and $\Delta P-$ are its positive and negative truncated components. The *IPO size at filing* is the original filing amount in millions. *Firm age* is the IPO year minus the firm's founding date, where founding dates are obtained from the Field-Ritter data set, as used in Field and Karpoff (2002) and Loughran and Ritter (2004). The *VC dummy* is equal to one if a firm is VC financed. The *Technology dummy* is equal to one if a firm resides in a technology industry as identified in Loughran and Ritter (2004). *Underwriter dollar market share* is the lead underwriter's dollar market share in the past calendar year. *Pre-offer Nasdaq return* is the return for the 30 trading days preceding the issue date. *Risk* is equal to $(1/P_{mid})$ as in Bradley and Jordan (2002). *Matched volatility* is the log of firm risk as measured using the matching method in Lowry and Shu (2002). *Informative content* and *Standard content* measure the informativeness of the initial prospectus, and the degree to which the prospectus has content related to past filings, respectively, as documented in Hanley and Hoberg (2010). The *Carter/Manaster rank* is underwriter prestige, as used in Loughran and Ritter (2004). The *% Secondary shares* is the fraction of shares offered which are secondary shares (sold by pre-IPO shareholders). *Document root words* ($words_i$) is the number of root words used in the prospectus. The *Number of prospectus filings* is the number of amendments in the given IPO's sequence of filings. An IPO is a *Low revisor* if at least two-thirds of its issuer-driven (ID) revisions are below the median among all ID revisions of IPOs issued in the same year (see Section 4). The *Class action lawsuit dummy* is one if a class action lawsuit is filed against the IPO firm in the three-year period following its IPO, and *Section 11 dummy* is a dummy variable indicating whether the lawsuit was brought under Section 11.

| Variable | Mean | Std. dev. | Minimum | Median | Maximum |
|---|---|---|---|---|---|
| Panel A: Price variables | | | | | |
| Initial return (IR) | 0.38 | 0.71 | −0.40 | 0.15 | 6.27 |
| Price adjustment ($\Delta P$) | 0.05 | 0.28 | −0.66 | 0.00 | 2.20 |
| $\Delta P+ = \text{Max}[0,\Delta P]$ | 0.12 | 0.22 | 0.00 | 0.00 | 2.20 |
| $\Delta P- = \text{Min}[0,\Delta P]$ | −0.07 | 0.12 | 0.00 | 0.00 | −0.66 |
| $\Delta P > 0$ Dummy | 0.49 | 0.50 | 0.00 | 0.00 | 1.00 |
| $\Delta P < 0$ Dummy | 0.36 | 0.48 | 0.00 | 0.00 | 1.00 |
| Panel B: IPO variables | | | | | |
| IPO size at filing ($M) | 213.6 | 1294 | 3.8 | 64.00 | 46,926 |
| Firm age | 13.74 | 20.37 | 0.00 | 7.00 | 165 |
| VC dummy | 0.50 | 0.50 | 0.00 | 0.00 | 1.00 |
| Technology dummy | 0.46 | 0.50 | 0.00 | 0.00 | 1.00 |
| Underwriter dollar mkt share | 0.03 | 0.03 | 0.00 | 0.02 | 0.15 |
| Pre-offer Nasdaq return | 0.05 | 0.09 | −0.27 | 0.06 | 0.36 |
| Risk | 0.08 | 0.03 | 0.01 | 0.08 | 0.25 |
| Matched volatility | −1.68 | 0.42 | −3.45 | −1.65 | −0.15 |
| Informative content | 0.61 | 0.18 | 0.00 | 0.64 | 1.05 |
| Standard content | 0.94 | 0.26 | 0.00 | 1.01 | 1.38 |
| Carter/Manaster rank | 5.24 | 2.54 | 1.00 | 5.00 | 9.00 |
| % Secondary shares | 0.08 | 0.19 | 0.00 | 0.00 | 1.00 |
| Panel C: Prospectus variables | | | | | |
| Document root words ($words_i$) | 9,969 | 3,291 | 4,338 | 9,341 | 35,942 |
| Number of prospectus filings | 5.05 | 1.58 | 1.00 | 5.00 | 12.00 |
| Low revisor dummy | 0.38 | 0.48 | 0.00 | 0.00 | 1.00 |
| Panel D: Lawsuit variables | | | | | |
| Class action lawsuit dummy | 0.10 | 0.30 | 0.00 | 0.00 | 1.00 |
| Section 11 dummy | 0.05 | 0.21 | 0.00 | 0.00 | 1.00 |

relevant disclosure-based lawsuit and an additional lawsuit related to IPO allocation. IPO allocation lawsuits would technically be considered disclosure-based because the plaintiffs claim that the underwriter should have disclosed their spinning and allocation activity to investors in the prospectus. However, we do not consider this type of lawsuit as relevant given our hypotheses, and we exclude allocation-based lawsuits from our definition of disclosure-based lawsuits.

Unlike prior studies of litigation in IPOs, we include both Section 11 and Section 10b-5 lawsuits. Section 11 lawsuits differ from 10b-5 lawsuits in two important ways. First, under Section 11, any omission in the prospectus must only be considered material, while under Section 10b-5, the omission must be the result of an intent to deceive or defraud. Second, plaintiffs in Section 11 lawsuits are limited to purchasers of the securities at the time of the offering, while all investors, regardless of whether they participated in the IPO or not, are potential plaintiffs under Section 10b-5. In our sample, all Section 11 lawsuits are also accompanied by a claim under Section 10b-5 but the reverse is not true. The Section 11 lawsuits are based upon a history of disclosure that begins at the time of the IPO and continues through other public filings. Thus, both IPO shareholders and aftermarket purchasers are potentially harmed. In contrast, the sample of Section 10b-5 only lawsuits occur either because there was no material omission in the prospectus or because the amount of insurance purchased in the form of underpricing was effective.

Differentiating between these two types of lawsuits is important, because under Section 11, IPO shareholders will be members of the lawsuit class and there is a greater

**Table 2**
Lawsuit summary statistics.

Summary statistics on lawsuits are reported for 1,623 IPOs issued in the U.S. from January 1997 to October 2005 excluding: firms with an issue price less than five dollars, ADRs, financial firms, unit IPOs, dual class IPOs, and REITs. Data on disclosure-based class action lawsuits for the sample of IPOs, both Section 11 and Section 10b-5, for up to three years after the IPO date are from Stanford Law School's *Securities Class Action Clearinghouse*.

| Year of IPO | Number of IPOs issued | Number of IPOs sued | Fraction of IPOs sued | Number of suits dismissed | Avg. settlement all IPOs | Avg. settlement sued IPOs | Settlement as % of proceeds all IPOs | Settlement as % of proceeds sued IPOs | Number days from IPO to suit |
|---|---|---|---|---|---|---|---|---|---|
| 1997 | 315 | 23 | 0.07 | 8 | $2,551,348 | $4,513,923 | 0.05 | 0.09 | 590 |
| 1998 | 217 | 28 | 0.13 | 21 | $12,741,071 | $20,985,294 | 0.23 | 0.38 | 516 |
| 1999 | 401 | 44 | 0.11 | 16 | $6,263,886 | $10,600,423 | 0.07 | 0.12 | 623 |
| 2000 | 297 | 26 | 0.09 | 5 | $5,666,346 | $7,015,476 | 0.05 | 0.06 | 573 |
| 2001 | 62 | 11 | 0.18 | 4 | $6,359,091 | $9,992,857 | 0.04 | 0.07 | 603 |
| 2002 | 58 | 7 | 0.12 | 3 | $1,828,571 | $3,200,000 | 0.02 | 0.04 | 402 |
| 2003 | 46 | 5 | 0.11 | 1 | $3,475,000 | $4,343,750 | 0.07 | 0.08 | 279 |
| 2004 | 132 | 14 | 0.11 | 9 | $1,428,571 | $4,000,000 | 0.04 | 0.11 | 397 |
| 2005 | 95 | 7 | 0.07 | 3 | $3,514,286 | $8,200,000 | 0.02 | 0.06 | 475 |

probability that the underwriter will be named in the lawsuit. Indeed, we find that the underwriter is named 70.3% of the time when the lawsuit is filed under Section 11, but just 3.3% of the time when the lawsuit is filed only under Section 10b-5. This distinction enables us to test our hypothesis that the deterrence effect of underpricing is limited to excluding IPO investors from the class (and reducing the likelihood that the underwriter will be named) but not in preventing aftermarket purchasers from initiating a lawsuit. Overall, 10% of IPOs in our sample are subsequently involved in a shareholder lawsuit, and roughly half of these lawsuits are Section 11 lawsuits. Thus, our sample of lawsuits is broader than Lowry and Shu (2002), who concentrate only on Section 11 lawsuits.

Table 2 presents summary statistics, by year, describing lawsuit characteristics. Not surprising, the largest number of lawsuits are brought against IPOs that are issued at the height of the technology bubble. As a percentage, however, the highest percentage of lawsuits occurs for IPOs issued in 2001.

Settlements yield roughly 8–10% of sued IPO proceeds. Note that this calculation of the average settlement size is biased downward because many firms do not disclose the exact amount of the settlement. In addition, at the time of the analysis, one lawsuit was still pending.

The average length of time between the IPO date and the initiation of the lawsuit is approximately one and a half years, a bit longer than in Lowry and Shu (2002). This is because our sample includes both Section 11 and Section 10b-5 lawsuits. If we restrict the sample to Section 11 lawsuits only, the median number of days between IPO and filing of lawsuit is similar to Lowry and Shu (2002).

## 4. Classification of disclosure strategy

Our measure of disclosure is based on classifying how intensely an issuer revises its prospectus during bookbuilding. We suggest that the greater the revision intensity, the higher is the issuer's disclosure of new information learned after the filing of the initial prospectus. The issuer's revision intensity incorporates both the time series of prospectus amendments and the severity of the revisions to the initial prospectus and each amendment.

Consistent with Hanley and Hoberg (2010) and Hoberg and Phillips (2010), we measure how similar document content is using the cosine similarity method. Its opposite, one minus the document similarity, is how dissimilar or distant is the content between two documents. This method is also widely used in studies of information processing (see Sebastiani, 2002 for more information), and its name is due to its measuring the angle between two word vectors on a unit sphere (see the Appendix for more details).

To characterize revision intensity, we must first expand our notation. Let $words_{i,1}$ denote the word usage in IPO $i$'s initial prospectus, and $words_{i,n}$ is analogously defined for IPO $i$'s $n$-th prospectus. An IPO with $N$ total filings (including the initial prospectus and all amendments with the exception of the final prospectus filed after the IPO date) is thus described by the series of vectors $\{words_{i,1}, \ldots, words_{i,N}\}$.

We denote the series of $N-1$ document distances (which is simply one minus document similarity) summarizing the time series of revisions from the initial prospectus to the final version as $\{D_{i,1}, \ldots, D_{i,N-1}\}$. Since distance is measured using two adjacent pairs of documents in a given time series, $D_{i,j}$ is the document distance between IPO $i$'s $j$-th filing and its $j+1$ th filing.

Table 3 presents a summary of prospectus and amendment filing patterns. As can be seen in Panel A, the majority of IPOs in the sample have an initial prospectus and at least three amendments. The total distance from the previous amendment, which is measured as $D_{i,j}$, is highest for the first revision after the initial prospectus. By the second and third amendments, approximately 94% of change in content has occurred.

After the filing of the initial prospectus with the SEC, there are two primary reasons for a substantial prospectus revision: (1) regulators request revisions through the comment letter process (Ertimur and Nondorf, 2009) and (2) the issuer can decide to revise the prospectus voluntarily. We refer to the former type as "RD-revisions" (regulation-driven) and the latter type as "ID-revisions"

**Table 3**
Summary of prospectus and amendment filing patterns.

The table reports the average number of raw words and the severity of revision since the last amendment for each series of prospectus amendments for each IPO. Panel A is based on all IPOs, and Panels B and C are based on low and high revision IPOs, respectively. To categorize low and high revisors (used to create the subsamples used in Panels B and C, respectively), we first compute the raw revision distance for each prospectus amendment as one minus the similarity (based on cosine similarities) between the given prospectus and the preceding one. The normalized revision distance is this distance scaled by the maximum distance among the first two revisions (which is likely regulation-driven). An IPO is a *Low revisor* if at least two-thirds of its issuer-driven (ID) revisions are below the median among all ID revisions of IPOs issued in the same year. Otherwise, it is deemed a *High revisor*. The *Total distance from previous* is the raw revision distance between the current amendment and the previous filing. *Cumulative fraction* is the fraction of total revisions that have occurred for the given IPO as of the given amendment. The *Days since last amendment* is the number of days that have elapsed between the previous prospectus and the current amendment. The total number of IPOs for which the given number of prospectuses are filed is reported in the last column. All columns are based on the actual order in which amendments are filed.

| Amendment | Total number raw words | Total dist from prev | Cumuative fraction | Days since last amendment | Obs. |
|---|---|---|---|---|---|
| Panel A: All IPOs | | | | | |
| Initial | 34,749 | 0.000 | 0.000 | 0.0 | 1623 |
| 2 | 36,725 | 0.032 | 0.612 | 45.3 | 1,620 |
| 3 | 37,841 | 0.014 | 0.844 | 24.1 | 1,599 |
| 4 | 38,925 | 0.009 | 0.939 | 18.9 | 1,376 |
| 5 | 40,410 | 0.006 | 0.975 | 14.0 | 984 |
| 6 | 42,425 | 0.004 | 0.991 | 12.0 | 530 |
| 7 | 42,578 | 0.004 | 0.997 | 10.7 | 277 |
| 8 | 43,438 | 0.002 | 0.999 | 7.9 | 123 |
| 9 | 49,100 | 0.002 | 1.000 | 8.7 | 45 |
| 10 | 48,415 | 0.001 | 1.000 | 7.3 | 15 |
| 11 | 47,068 | 0.001 | 1.000 | 11.8 | 4 |
| 12 | 50,033 | 0.000 | 1.000 | 2.3 | 3 |
| Panel B: Low revisors | | | | | |
| Initial | 33,574 | 0.000 | 0.000 | 0.0 | 610 |
| 2 | 35,415 | 0.047 | 0.759 | 48.9 | 607 |
| 3 | 36,183 | 0.013 | 0.941 | 22.0 | 586 |
| 4 | 36,952 | 0.004 | 0.978 | 13.2 | 501 |
| 5 | 37,779 | 0.002 | 0.992 | 8.4 | 416 |
| 6 | 39,758 | 0.002 | 0.997 | 7.7 | 167 |
| 7 | 40,212 | 0.001 | 0.999 | 6.4 | 82 |
| 8 | 41,632 | 0.001 | 1.000 | 5.0 | 47 |
| 9 | 48,534 | 0.001 | 1.000 | 3.2 | 13 |
| 10 | 46,863 | 0.000 | 1.000 | 1.0 | 5 |
| 11 | 38,050 | 0.000 | 1.000 | 1.0 | 1 |
| 12 | | | 1.000 | | |
| Panel C: High revisors | | | | | |
| Initial | 35,457 | 0.000 | 0.000 | 0.0 | 1,013 |
| 2 | 37,510 | 0.023 | 0.524 | 43.2 | 1,013 |
| 3 | 38,801 | 0.014 | 0.787 | 25.4 | 1,013 |
| 4 | 40,055 | 0.012 | 0.916 | 22.1 | 875 |
| 5 | 42,336 | 0.009 | 0.965 | 18.1 | 568 |
| 6 | 43,652 | 0.005 | 0.987 | 14.0 | 363 |
| 7 | 43,573 | 0.006 | 0.996 | 12.4 | 195 |
| 8 | 44,554 | 0.003 | 0.999 | 9.7 | 76 |
| 9 | 49,330 | 0.003 | 1.000 | 11.0 | 32 |
| 10 | 49,191 | 0.002 | 1.000 | 10.4 | 10 |
| 11 | 50,073 | 0.001 | 1.000 | 15.3 | 3 |
| 12 | 50,033 | 0.000 | 1.000 | 2.3 | 3 |

(issuer-driven). This dichotomy is important because our primary hypothesis relates to the voluntary, rather than involuntary or potentially SEC-driven, component of disclosure during the IPO process. Conversations with practitioners indicate that the first major revision (usually appearing as the first or second amendment to the initial filing) is the primary RD-revision in the U.S. That is, the SEC generally comments on every IPO, and their requests are usually factored in by issuers in amendments filed soon after the initial prospectus.

We define the major RD-revision in each IPO's time series as the largest revision among the first two revisions (where $RD_i = MAX[D_{i,1}, D_{i,2}]$). Our results do not change materially if we simply use the first amendment rather than the maximum of the first two. Because issuers generally address SEC comments prior to distributing the prospectus to prospective investors, the variable $RD_i$ which focuses on the first two revisions, likely captures the issuer's response to these comment letters. We omit this revision from our series of ID-revisions as our

hypothesis only relates to voluntary revisions based upon information generated during bookbuilding.

Because each series is likely to contain a large firm-specific revision effect, we scale the series of ID-revisions by $RD_i$. Scaling controls for firm characteristics and writing style in the measurement of specific ID-revisions. Scaling also removes potentially substantial author-specific fixed effects from each time series of revisions. For example, a long-winded author might write 50 sentences to explain a new business opportunity, whereas a concise writer might use only five sentences. In addition, this scaling has the nice property that the regulator (the SEC) is held constant across all IPOs in our sample.

We denote ID-revisions for each IPO $i$'s $j$-th time series pair of amendments (not including the RD-revision) as

$$ID_{i,j} = \frac{D_{i,j}}{RD_i} \tag{2}$$

with a maximum of $N-2$ possible $ID_{i,j}$'s.

As can be seen from Fig. 1, there is a significant amount of clustering close to zero for the value of any individual $ID_{i,j}$. For example, a large number of revisions are near zero, but the median normalized revision is between 0.05 and 0.06. To control for this clustering, we classify whether an issuer is a "low" revisor or "high" revisor using a dummy variable. The low revisor dummy takes the value of one if at least two-thirds of the given IPO's ID-revisions are below the median among all ID-revisions for all IPOs issued in the same year. The high revisor dummy is equal to one minus the low revisor dummy. The value of two-thirds is based upon Table 3 in which many IPOs in our sample have at least three revisions. Our results, however, are robust to classifying high and low revisors using one-half instead of two-thirds of the revisions as a cutoff. Approximately 38% of sample IPOs are classified as low revisors.

The main idea behind the revisor dummy is to identify issuers which do or do not revise their prospectus as they learn new information during bookbuilding. An issuer who files mainly price-change-only amendments, for example, will have ID-revisions below the median size, and will, thus, be categorized as a low revisor. A key idea is that an issuer which has a large price adjustment, but is also a low revisor, is likely to have a material omission in the prospectus as the issuer did not disclose the information underlying the price change.

Returning to Table 3, interesting differences in the revision patterns of high and low revisors are shown in Panels B and C. Low revisors have higher content revisions on the first amendment but converge much quicker to a final document than high revisors. By the fourth amendment after the initial prospectus, low revisors have almost completely converged to the final amendment. In contrast, high revisors take until the sixth amendment to reach the same degree of convergence.

From a statistical standpoint, the $t$-stat of the difference in means of the cumulative convergence by the second filing between high and low revisors is 16.36. The $t$-stats on the differences in convergence from the third to sixth filings are 14.76 (third), 8.95 (fourth), 6.13 (fifth), and 3.88 (sixth). These statistics suggest a marked difference in prospectus revision strategy between our classifications of high and low revisors.

Table 4 examines differences in IPO characteristics based on whether the issuer is a low or a high revisor. The table presents evidence of the strong relation between disclosure strategy, $\Delta P$, initial returns, and litigation outcomes. IPOs which are low revisors (those which are hypothesized to withhold information learned during bookbuilding) have significantly higher initial returns and are more likely to have positive changes in the offer price. IPOs which are high revisors have much lower initial returns and are more likely to have negative revisions to the offer price. Low revisors are also more likely to be sued. These univariate comparisons support our initial conjecture that firms with positive information generated during bookbuilding are more likely to withhold information for proprietary or strategic reasons and use underpricing as a hedge.

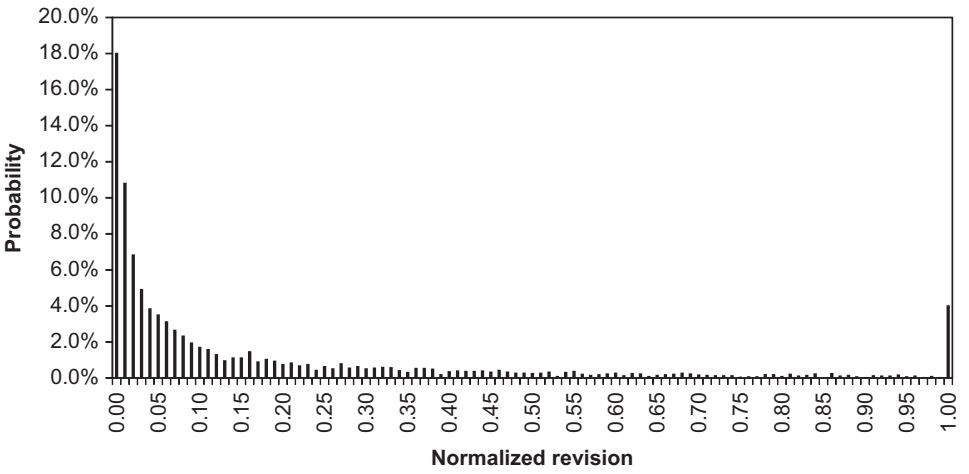


**Fig. 1.** The figure displays the empirical density of normalized revisions for 1,623 IPOs issued in the U.S. from January 1997 to October 2005 excluding: firms with an issue price less than five dollars, ADRs, financial firms, unit IPOs, dual class IPOs, and REITs. One observation is one amendment to the prospectus (excluding the largest revision among the first two revisions, which is likely to be the response to the regulatory comments). The normalized revision is the document distance between the given revised prospectus and the preceding version, scaled by the regulatory revision distance.

**Table 4**
Difference in means by revision intensity.

Summary statistics are reported for various subsamples of 1,623 IPOs issued in the U.S. from January 1997 to October 2005 excluding: firms with an issue price less than five dollars, ADRs, financial firms, unit IPOs, dual class IPOs, and REITs. To identify high and low revisors, we first compute the raw revision distance for each prospectus amendment as one minus the similarity (based on cosine similarities) between the given prospectus and the preceding one. The normalized revision distance is this distance scaled by the maximum distance among the first two revisions (which is likely regulation-driven). An IPO is a *Low revisor* if at least two-thirds of its issuer-driven (ID) revisions are below the median among all ID revisions of IPOs issued in the same year. Otherwise, it is deemed a *High revisor*. *Initial return* is the actual return from the IPO offer price to the first CRSP reported closing price. $\Delta P$ is the return from the filing date midpoint to the IPO offer price, and $\Delta P+$ and $\Delta P-$ are its positive and negative truncated components. The *Class action lawsuit dummy* is one if a class action lawsuit is filed against the IPO firm in the three-year period following its IPO. The *Log IPO proceeds* is the log of the proceeds raised. *Underwriter $ market share* is the lead underwriter's dollar market share in the past calendar year. The *VC dummy* is equal to one if a firm is VC financed. The *Technology dummy* is equal to one if a firm resides in a technology industry as identified in Loughran and Ritter (2004). *Informative content* and *Standard content* measure the informativeness of the initial prospectus, and the degree to which the prospectus has content related to past filings, respectively, as documented in Hanley and Hoberg (2010). The *Fraction secondary shares* is the fraction of shares offered which are secondary shares (sold by pre-IPO shareholders). The *Carter/Manaster rank* is underwriter prestige, as used in Loughran and Ritter (2004). *Pre-offer Nasdaq return* is the return for the 30 trading days preceding the issue date. *Firm age* is the IPO year minus the firm's founding date, where founding dates are obtained from the Field-Ritter data set, as used in Field and Karpoff (2002) and Loughran and Ritter (2004).

| Variable | Low revisor | High revisor | Difference *t*-stat |
|---|---|---|---|
| Initial return | 0.466 | 0.326 | 3.872 |
| $\Delta P$ | 0.086 | 0.028 | 4.033 |
| $\Delta P+$ | 0.148 | 0.105 | 3.810 |
| $\lvert\Delta P-\rvert$ | 0.062 | 0.078 | −2.520 |
| $\Delta P > 0$ Dummy | 0.543 | 0.465 | 3.038 |
| $\Delta P < 0$ Dummy | 0.338 | 0.379 | −1.678 |
| Class action lawsuit dummy | 0.125 | 0.088 | 2.374 |
| Log IPO proceeds | 4.277 | 4.339 | −1.060 |
| UW $ market share | 0.028 | 0.030 | −1.669 |
| VC dummy | 0.482 | 0.504 | −0.877 |
| Technology dummy | 0.467 | 0.448 | 0.746 |
| Informative content | 0.619 | 0.598 | 2.390 |
| Standard content | 0.960 | 0.933 | 2.010 |
| Fraction secondary shares | 0.067 | 0.093 | −2.591 |
| Carter/Manaster rank | 5.246 | 5.239 | 0.054 |
| Pre-offer Nasdaq return | 0.057 | 0.050 | 1.504 |
| Log firm age | 2.102 | 2.179 | −1.547 |

Other firm characteristics, such as venture capital backing, underwriter market share, and whether or not the IPO is a tech firm, do not differ. These relationships confirm our finding that our results are robust to including numerous controls including technology firms, venture capital backing, and industry and time fixed effects.

## 5. The effect of disclosure strategy and litigation risk on underpricing

The prior literature on liability risk and underpricing has shown a positive relation between initial returns and subsequent lawsuits that Lowry and Shu (2002) term the "insurance effect." We conjecture, however, that insurance in the form of initial returns is only needed when the issuer withholds information learned during bookbuilding and has a high probability of a material omission. The amount of insurance purchased (underpricing) should be related to both the issuer's disclosure strategy as well as its exposure to liability risk.

We begin by replicating the traditional initial return regression which includes a dummy variable indicating whether or not the IPO had a subsequent lawsuit as an independent variable. This regression is presented in row 1 in Panel A of Table 5. Like Drake and Vetsuypens (1993) and Lowry and Shu (2002), we find no difference in initial returns between sued IPOs and non-sued IPOs using an ex post class action lawsuit dummy. However, as Lowry and Shu (2002) correctly note, the relation between initial returns and liability risk is endogenous. Firms with greater liability risk will underprice more (positive relation between liability risk and initial returns) while firms which underprice more will have a lower incidence of lawsuits (negative relation between liability risk and initial returns).

We control for this endogeneity by following the simultaneous-equation approach of Lowry and Shu (2002) for assessing the effect of litigation risk on initial returns. We construct an instrumental variable which measures how similar a given IPO's prospectus is to the prospectuses of past IPOs which were sued in the one year prior to the current IPO's filing. Our logic is similar to Field, Lowry, and Shu (2005) who use, as an instrument, a dummy variable equal to one if the firm is in a high legal exposure industry.

Specifically, for a given IPO "*i*," suppose *N* past IPOs were sued in the one-year period ending on IPO *i*'s filing date. We measure similarity using the cosine similarity method (described in Section 4 and in the Appendix), and denote the cosine similarity between the initial prospectuses of IPO *i* and one of the past *N* sued IPOs (IPO *n*) as $S_{i,n}$. We then define "*Sued IPO similarity*" for IPO *i* as follows.

$$\textit{Sued IPO similarity}_i = \sum_{n=1\ldots N} \frac{S_{i,n}}{N}. \tag{3}$$

The greater the similarity to past sued IPOs, the greater is the IPO's exposure to future liability.

Because this variable is based on public information known at the time of initial filing, its impact should be factored into the initial offer price (or range). The ex ante nature of the variable is a key requirement for making it a valid instrument for litigation risk in regressions examining initial returns. In addition, this variable significantly predicts ex post litigation activity, satisfying a second key requirement. A logistic regression with the class action lawsuit dummy variable as the dependent variable and *Sued IPO similarity*, along with our control variables as independent variables, yields a significant coefficient, at the 1% level, on the *Sued IPO similarity* variable (see Section 6).

In row 2 of Panel A of Table 5, we confirm the Lowry and Shu (2002) insurance effect, as there is a significant positive relation between our instrumented measure of

**Table 5**
Effect of litigation risk on pricing variables.

OLS regressions with Fama-French 48-industry and yearly fixed effects are presented for 1,623 IPOs issued in the U.S. from January 1997 to October 2005 excluding: firms with an issue price less than five dollars, ADRs, financial firms, unit IPOs, dual class IPOs, and REITs. The dependent variable is the *Initial return*. Panel A reports results for all IPOs, and Panel B reports results for IPOs with high ex ante litigation risk, i.e., those with above-median *Sued IPO similarity*. The independent variables include price adjustment variables based on $\Delta P$, which is the return from the filing date midpoint to the IPO offer price, and $\Delta P+$ and $\Delta P-$ are its positive and negative truncated components. The raw *Class action lawsuit dummy* indicates whether or not the given IPO was involved in a class action lawsuit in the three years after issuance, and we consider an instrumented version that is measurable ex ante at the time of the offer from a two-stage regression model as in Lowry and Shu (2002). The instrumental variable identifying litigation risk is *Sued IPO similarity*, which is the average document similarity between the current IPO's initial prospectus and the prospectuses of IPO firms which were sued in the year prior to the current IPO's filing date. To categorize firms by revision intensity, we first compute revision distance as one minus the similarity for each prospectus amendment in the time series of amendments for each IPO. The normalized revision distance is this raw distance scaled by the maximum raw distance among the first two revisions (which is likely regulation-driven). An IPO is a *Low revisor* if at least two-thirds of its issuer-driven (ID) revisions are below the median among all ID revisions of IPOs issued in the same year. Otherwise, it is deemed a *High revisor*. We also consider cross terms of this variable with the price adjustment variables $\Delta P+$ and $|\Delta P-|$. *Informative content* and *Standard content* measure the informativeness of the initial prospectus, and the degree to which the prospectus has content related to past filings, respectively, as documented in Hanley and Hoberg (2010). *Underwriter $ market share* is the lead underwriter's dollar market share in the past calendar year. *Firm age* is the IPO year minus the firm's founding date, where founding dates are obtained from the Field-Ritter data set, as used in Field and Karpoff (2002) and Loughran and Ritter (2004). The *VC dummy* is equal to one if a firm is VC financed. *Pre-offer Nasdaq return* is the return for the 30 trading days preceding the issue date. *Matched volatility* is the log of firm risk as measured using the matching method in Lowry and Shu (2002). Other independent variables: technology IPO dummy, firm risk (1/offer price), Carter/Manaster rank, fraction secondary shares, and log issue size are also included in the regression, but not displayed to conserve space (see online appendix for remaining coefficients). Control variables also include year and industry (Fama-French 48) fixed effects. *t*-statistics are in parentheses below each coefficient, and all standard errors are adjusted for clustering within year and industry.

| Row | Class action lawsuit dummy | Instrumented lawsuit dummy | Low revisor dum. × $\Delta P+$ | High revisor dum. × $\Delta P+$ | Low revisor dum. × $\lvert\Delta P-\rvert$ | High revisor dum. × $\lvert\Delta P-\rvert$ | Low revisor dummy | Informative content | Standard content | UW $ market share | Log firm age | VC dummy | Pre-offer Nasdaq return | Matched volatility | Obs. $R^2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Panel A: All IPOs | | | | | | | | | | | | | | | |
| (1) | 0.062 | | | | | | | | | 4.855 | −0.053 | 0.186 | 1.261 | −0.170 | 1,623 |
| | (0.97) | | | | | | | | | (2.39) | (−2.52) | (4.12) | (4.62) | (−2.83) | 0.26 |
| (2) | | 1.500 | | | | | | | | 4.780 | −0.038 | 0.120 | 1.154 | −0.127 | 1,623 |
| | | (3.04) | | | | | | | | (2.36) | (−1.71) | (2.93) | (4.49) | (−2.19) | 0.26 |
| (3) | | 0.808 | | | | | 0.080 | −1.104 | 0.832 | 4.922 | −0.048 | 0.108 | 1.194 | −0.157 | 1,623 |
| | | (1.82) | | | | | (3.04) | (−3.05) | (3.58) | (2.40) | (−1.97) | (2.86) | (4.85) | (−2.51) | 0.27 |
| (4) | | 0.274 | 2.118 | 1.481 | −0.169 | −0.340 | −0.068 | −0.555 | 0.443 | 2.537 | −0.027 | 0.069 | −0.114 | −0.059 | 1,623 |
| | | (0.60) | (20.62) | (12.64) | (−1.25) | (−2.93) | (−2.54) | (−2.09) | (3.06) | (1.72) | (−1.61) | (2.49) | (−0.59) | (−1.44) | 0.51 |
| Panel B: High ex ante litigation risk IPOs | | | | | | | | | | | | | | | |
| (5) | | 0.745 | | | | | 0.087 | −1.564 | 1.091 | 5.836 | −0.093 | 0.105 | 1.616 | −0.254 | 814 |
| | | (1.22) | | | | | (1.63) | (−2.38) | (2.32) | (3.10) | (−3.64) | (2.13) | (4.26) | (−1.99) | 0.33 |
| (6) | | 0.647 | 1.943 | 1.399 | −0.284 | −0.230 | −0.087 | −1.138 | 0.411 | 3.323 | −0.046 | 0.034 | −0.064 | −0.101 | 814 |
| | | (1.21) | (15.50) | (12.98) | (−1.30) | (−1.69) | (−2.70) | (−2.01) | (1.07) | (2.36) | (−2.80) | (0.84) | (−0.25) | (−1.03) | 0.58 |

**Table 6**
Revisor intensity and partial adjustment economic magnitudes.

Summary statistics are reported for various subsamples of 1,623 IPOs issued in the U.S. from January 1997 to October 2005 excluding: firms with an issue price less than five dollars, ADRs, financial firms, unit IPOs, dual class IPOs, and REITs. Panel A reports results for all $\Delta P > 0$ IPOs, and Panel B includes $\Delta P > 0$ IPOs with high ex ante litigation risk (above-median *Sued IPO similarity*). The table displays average $\Delta P$, initial returns, and residual initial returns for tercile-subsamples with low, medium, and high offer price adjustments ($\Delta P$). $\Delta P$ is the return from the filing date midpoint to the IPO offer price. Terciles are formed in each year. *Initial return* is the actual return from the IPO offer price to the first CRSP reported closing price. Residual initial returns are the residuals from a regression of raw initial returns on industry and year fixed effects, as well as the control variables from Table 5. To identify high and low revisors, we first compute the raw revision distance for each prospectus amendment as one minus the similarity (based on cosine similarities) between the given prospectus and the preceding one. The normalized revision distance is this distance scaled by the maximum distance among the first two revisions (which is likely regulation-driven). An IPO is a *Low revisor* if at least two-thirds of its issuer-driven (ID) revisions are below the median among all ID revisions of IPOs issued in the same year. Otherwise, it is deemed a *High revisor*.

| | Low revisors | | | | High revisors | | | |
|---|---|---|---|---|---|---|---|---|
| Variable | $\Delta P$ | Initial return | Residual initial return | Number of obs. | $\Delta P$ | Initial return | Residual initial return | Number of obs. |
| Panel A: All IPOs with $\Delta P > 0$ | | | | | | | | |
| Low $\Delta P+$ | 0.083 | 0.336 | −0.289 | 110 | 0.070 | 0.287 | −0.225 | 153 |
| Medium $\Delta P+$ | 0.216 | 0.641 | −0.055 | 111 | 0.170 | 0.546 | −0.062 | 165 |
| High $\Delta P+$ | 0.521 | 1.391 | 0.462 | 110 | 0.445 | 0.942 | 0.208 | 153 |
| Panel B: High ex ante litigation risk IPOs with $\Delta P > 0$ | | | | | | | | |
| Low $\Delta P+$ | 0.103 | 0.401 | −0.384 | 52 | 0.081 | 0.463 | −0.112 | 75 |
| Medium $\Delta P+$ | 0.259 | 0.784 | 0.022 | 63 | 0.189 | 0.574 | −0.098 | 83 |
| High $\Delta P+$ | 0.619 | 1.574 | 0.485 | 55 | 0.450 | 0.860 | 0.111 | 76 |

ex ante liability risk and initial returns. Thus, these findings indicate that initial returns are influenced by potential litigation.

However, we conjecture that initial returns are needed as insurance only when there is the potential for a material omission in the prospectus. Row 3 of Panel A includes, in addition to instrumented litigation risk, the low revisor dummy variable and shows that initial returns are greater when the issuer is classified as a low revisor. These findings point to a potential substitution effect between pricing and disclosure in hedging against liability risk.[5]

The type of information revealed should impact the issuer's choice when making the tradeoff between disclosure and underpricing as litigation hedges. Therefore, we include an interaction term between the disclosure strategy (revisor dummy) and the type of information ($\Delta P$) revealed during bookbuilding. In row 4, we find that substitution in favor of disclosure is most pronounced for IPOs with bad information revealed during bookbuilding. For example, IPOs with negative price changes ($\Delta P-$) and high revisions in the prospectus have significantly lower initial returns, all else equal. For example, the coefficient of −0.34 for the *High revisor* × ($\Delta P-$) variable is statistically significant.

In contrast, the substitution toward initial returns is most pronounced for IPOs with positive information revealed during bookbuilding. The largest initial returns are associated with IPOs having positive price changes which do not revise their prospectus (*Low revisor dummy* × $\Delta P+$) and this result is robust to the exclusion of tech IPOs (see online appendix). Because the standard deviation of the interaction between the revisor dummy and $\Delta P+$ for both high and low revisors is almost identical, we can simply compare the coefficients to ascertain the differences in economic magnitude. We find that the effect of a one-standard-deviation shift in positive information is 43% higher for low revisors (coefficient is 2.118 compared to 1.481) than for high revisors. Thus, the relation in the prior literature between underpricing and litigation risk is primarily due to IPOs which do not disclose positive information learned during bookbuilding. Overall, the results of Panel A indicate a strong substitution effect between disclosure and pricing decisions that is influenced by the type of information revealed during bookbuilding.

Panel B further parses the sample into IPOs which are hypothesized to be most affected by litigation risk. We define an IPO as having high ex ante litigation risk if its *Sued IPO similarity* is above the median. In this sample, the effect of a one-standard-deviation shift in positive information is 56% higher for low revisors than for high revisors (This difference is slightly larger than a comparison of the coefficients would indicate, because the standard deviation in this subsample now differs somewhat between *Low revisor dummy* × $\Delta P+$ (0.200) and *High revisor dummy* × $\Delta P+$ (0.179)). The large difference in initial returns suggests that a significant portion of the positive relation between $\Delta P$ and underpricing, the partial adjustment phenomenon, is due to the issuer's efforts to mitigate litigation risk.

Further evidence on the economic impact of litigation on the partial adjustment phenomenon is presented in Table 6. This table includes only IPOs with $\Delta P > 0$, and the sample is broken into terciles of $\Delta P+$ and by whether or not the IPO is classified as a low revisor or a high revisor. In addition to raw initial returns, we also show the residual initial returns, which are the residuals from a

[5] We also show in this table a relation between the 30-day Nasdaq return and initial returns. This relation is important because this variable is used as an instrument (as in Lowry and Shu, 2002) for initial returns later in the paper.

regression of raw initial returns on all variables from Table 5, excluding price adjustment and change in disclosure variables. The residual initial return is thus a measure of the unexpected initial return after controlling for firm, market, and offering characteristics.

For almost all subsets of low and medium $\Delta P+$, the residual initial return is either negative or close to zero. We interpret this finding to mean that when there is only a small amount of positive information generated during bookbuilding, there is little incentive to provide high initial returns and/or to revise the prospectus in response to new information.

This is not the case, however, for IPOs which increase their offer price substantially. These IPOs are likely to have a significant amount of unexpected new information generated during bookbuilding which is eventually incorporated into the final offer price. If there is a large price change, but no significant revision in the offering prospectus, there is a higher probability of a material omission, and we expect a greater reliance on underpricing to hedge litigation risk. The economic magnitude of the difference in initial returns between high revisors and low revisors supports this conjecture. For the tercile with the largest $\Delta P+$, residual initial returns for low revisors are twice as large as those for high revisors for the full sample and four times as large after excluding technology firms. Raw initial returns follow a similar pattern but with a lower magnitude.

Of particular interest is Panel B, which includes only $\Delta P>0$ IPOs which are most likely to be exposed to litigation risk. Low revisors with the largest amount of $\Delta P>0$ have residual initial returns of almost 49% compared to 11% for similar high revision IPOs. Raw initial returns for these low revisors are 157% while raw initial returns for high revisors are almost half as large, at 86%.

Overall, we confirm and strengthen Lowry and Shu's (2002) insurance effect in two ways. First, we find that only firms with a likely material omission have a strong insurance effect in initial returns. Second, this effect is primarily driven by firms with positive information revealed during bookbuilding: those IPOs with the strongest incentive to withhold information and the highest likelihood of a material omission. Consistent with our enriched litigation framework, we find evidence that only those IPOs which do not revise their prospectus in response to new information and have a greater likelihood of a material omission need to use underpricing as insurance against future lawsuits.

## 6. The effect of disclosure strategy and initial returns on lawsuit incidence

Table 7 presents a logistic regression designed to test the deterrence effect of initial returns on the probability of a subsequent lawsuit. As in Lowry and Shu (2002), we instrument initial returns using the 30-day Nasdaq return prior to the filing of the initial prospectus along with other control variables. Row 1 replicates the well-known result from Drake and Vetsuypens (1993), that the level of initial return is unrelated to the presence of a subsequent lawsuit. After initial returns are instrumented to control for endogeneity in row 2, we do not find a significant relation between instrumented initial returns and whether or not the IPO was subject to ex post litigation.

In row 3, we include the disclosure strategy of the IPO. Issuers classified as low revisors are significantly more likely to have a subsequent lawsuit. Analogously, issuers which increase disclosure, high revisors, are significantly less likely to be sued after the IPO. In contrast to initial returns, we find that disclosure of more information learned during bookbuilding does reduce the probability of a future lawsuit.

Row 4 presents the results related to the interaction between the type of information revealed during bookbuilding and disclosure strategy. Consistent with our prior findings, IPOs with negative changes in their offer price are less likely to be involved in subsequent lawsuits, although this relation is insignificant. In contrast, IPOs with positive changes in offer price which do not revise their prospectus, are significantly more likely to be subject to litigation. These findings are consistent for the panel of the table that includes IPOs which are more likely to have high ex ante litigation risk. Also note that the table shows that our measure of ex ante litigation risk, *Sued IPO similarity*, is positively related to the probability of a lawsuit, thus validating its use as an instrumental variable for lawsuit probability. In the online appendix, we report additional robustness tests.

The fact that IPOs with positive price changes are more likely to be sued can seem counterintuitive, as one might conjecture that firms learning bad information should be more likely to be involved in a lawsuit. However, this argument ignores the response of the issuing firms to both the information learned and the legal environment. Even though the information revealed is positive, there is a large possible distribution of outcomes, some of which could be negative. However, for strategic reasons, the issuing firm might not simply withhold the good information and disclose the risk factors as rivals will be able to reverse-engineer the good information. If the ex post outcome turns out to be negative, the issuing firm will have a material omission in the prospectus and will likely be sued because it did not discuss the risk factor or possible negative outcome. The results in Table 7 confirm this conjecture as only IPOs with good information revealed, but whose prospectus is not revised significantly, are at a greater risk of a lawsuit.

If bad information is revealed, there is little benefit to withholding information, particularly if it will be revealed in the short term, and the stock price will fall. As a result, firms learning bad information avoid this scenario by revising the prospectus and disclosing the information. In addition, underpricing becomes more expensive as a substitute to disclosure when bad information is revealed because the firm faces lower-than-expected proceeds to fund its planned uses of proceeds. Thus, firms with bad information revealed are not more likely to be involved in a lawsuit.

Overall, lawsuits are more likely when the likelihood of a material omission is higher (as proxied by *Low revisor dummy* $\times$ $\Delta P+$) and when the IPO looks more like an IPO which was sued in the past. Unlike disclosure, however,

**Table 7**
Lawsuit probability.

Logit regressions with Fama-French 48-industry and yearly fixed effects are presented for 1,623 IPOs issued in the U.S. from January 1997 to October 2005 excluding: firms with an issue price less than five dollars, ADRs, financial firms, unit IPOs, dual class IPOs, and REITs. The dependent variable is a dummy variable equal to one if the IPO firm was sued in a class action lawsuit in the three years after issuance. Panel A includes all IPOs and Panel B includes only IPOs with high ex ante litigation risk, as measured by the median ex ante *Sued IPO similarity*. The independent variables include the *Initial return*, the instrumented initial return, and the underwriter's upward price adjustment ($\Delta P+$). We consider both raw initial returns and instrumented initial returns from a two-stage regression model as in Lowry and Shu (2002). Our instrumental variable is the *Pre-offer Nasdaq return* (the Nasdaq return for the 30 trading days preceding the offer date). To categorize firms by revision intensity, we first compute revision distance as one minus the similarity for each prospectus amendment in the time series of amendments for each IPO. The normalized revision distance is this raw distance scaled by the maximum raw distance among the first two revisions (which is likely regulation-driven). An IPO is a *Low revisor* if at least two-thirds of its issuer-driven (ID) revisions are below the median among all ID revisions of IPOs issued in the same year. Otherwise, it is deemed a *High revisor*. We also consider cross terms of this variable with the price adjustment variables $\Delta P+$ and $|\Delta P-|$. *Sued IPO similarity* is the average document similarity between the current IPO's initial prospectus and the prospectuses of IPO firms which were sued in the year prior to the current IPO's filing date. *Informative content* and *Standard content* measure the informativeness of the initial prospectus, and the degree to which the prospectus has content related to past filings, respectively, as documented in Hanley and Hoberg (2010). *Issue size* is the natural logarithm of the offering amount. The *VC dummy* is equal to one if a firm is VC financed. Other independent variables such as firm age, underwriter market share, technology IPO dummy, firm risk (1/offer price), Carter/Manaster rank, fraction secondary shares, and matched volatility are also included in the regression, but not displayed to conserve space (see online appendix for remaining coefficients). Control variables also include year and industry (Fama-French 48) fixed effects. *t*-statistics are in parentheses below each coefficient, and all standard errors are adjusted for clustering within year and industry.

| Row | Initial return | Instrumented initial return | Low revisor dum. × $\Delta P+$ | High revisor dum. × $\Delta P+$ | Low revisor dum. × $\lvert\Delta P-\rvert$ | High revisor dum. × $\lvert\Delta P-\rvert$ | Low revisor dummy | Sued IPO similarity | Informative content | Standard content | Log issue size | VC dummy | Obs./$R^2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Panel A: All IPOs | | | | | | | | | | | | | |
| (1) | 0.138 | | | | | | | 5.400 | 1.917 | −1.219 | 0.129 | 0.487 | 1,623 |
| | (1.18) | | | | | | | (2.95) | (1.11) | (−0.56) | (1.24) | (1.91) | 0.12 |
| (2) | | 1.411 | | | | | | 5.444 | 3.367 | −2.188 | 0.160 | 0.309 | 1,623 |
| | | (1.63) | | | | | | (3.07) | (1.65) | (−0.99) | (1.43) | (1.17) | 0.12 |
| (3) | | | | | | | 0.409 | 5.375 | 1.753 | −1.007 | 0.131 | 0.543 | 1,623 |
| | | | | | | | (2.05) | (3.00) | (1.07) | (−0.47) | (1.30) | (2.22) | 0.12 |
| (4) | | | 0.856 | 0.192 | −1.507 | −1.412 | 0.260 | 5.450 | 2.061 | −1.211 | 0.146 | 0.505 | 1,623 |
| | | | (2.90) | (0.35) | (−0.90) | (−1.08) | (1.01) | (2.90) | (1.18) | (−0.57) | (1.35) | (1.99) | 0.13 |
| Panel B: High ex ante litigation risk IPOs | | | | | | | | | | | | | |
| (5) | | | | | | | 0.528 | 4.487 | 1.513 | −0.193 | 0.100 | 0.265 | 814 |
| | | | | | | | (2.21) | (1.05) | (0.76) | (−0.05) | (0.56) | (0.91) | 0.15 |
| (6) | | | 0.707 | −0.024 | −0.262 | −1.434 | 0.280 | 4.821 | 1.713 | −0.458 | 0.103 | 0.211 | 814 |
| | | | (2.40) | (−0.04) | (−0.13) | (−0.85) | (0.82) | (1.12) | (0.83) | (−0.13) | (0.56) | (0.72) | 0.16 |

initial returns have low power to deter subsequent lawsuits. What then, does underpricing deter? In the next section, we show that in the event of litigation, underpricing can be a strong hedge against IPO investor involvement in the lawsuit which can, in turn, prevent substantial damages to underwriter reputation.

### 6.1. What does underpricing deter?

Prior studies which examine litigation in IPOs often do not consider that the primary plaintiff in most lawsuits is aftermarket shareholders. Aftermarket investors are more likely to bring a lawsuit against the issuing firm because they often buy at higher prices than IPO purchasers and, therefore, have a lower threshold for claiming damages. Since the price paid by aftermarket investors is unaffected by, and does not include any underpricing, underpricing cannot insure against the incidence of litigation. In our sample of lawsuits, we do not have a single lawsuit that does not also include aftermarket purchasers.

What underpricing can do, however, is deter IPO investors from suing the issuer under Section 11. It is important to stress that unlike underpricing, which can only influence litigation from one type of investor (IPO shareholders), the deterrence effect of disclosure as a defense against a material omission applies equally to all plaintiffs regardless of when they purchased their shares. This conclusion is supported by the results previously shown in Table 7, in which issuers who disclose more information (high revisors) are indeed less likely to be sued.

A key benefit of insuring against Section 11 lawsuits is to significantly reduce the probability that the underwriter will be named in the suit, and ensure IPO investors will not be part of the class if a lawsuit does occur. The relevance of appeasing IPO shareholders is supported by the findings of Cheng, Huang, Li, and Lobo (2010), who show that lawsuits with an institutional lead plaintiff are less likely to be dismissed and have significantly larger settlements. As most IPO investors are institutional investors (Hanley and Wilhelm, 1995; Cornelli and Goldreich, 2003; Aggarwal, Prabhala, and Puri, 2002; Ljungqvist and Wilhelm, 2002; Jenkinson and Jones, 2004), the expectation of greater litigation success provides an additional motivation as to why issuers (and underwriters) would wish to exclude IPO investors from the class.

To examine if there is a link between Section 11 and naming the underwriter as a defendant, we reviewed each lawsuit to determine if the underwriter is named in the complaint. Among the 165 lawsuits in our sample, the underwriter is named in 55 lawsuits. Consistent with an unequivocal link to Section 11 lawsuits, 52 of the 55 lawsuits in which the underwriter is named are, in fact, Section 11 lawsuits. These 52 lawsuits constitute more than two-thirds of the 74 lawsuits which are filed under Section 11.

To test whether IPO investors can be deterred from initiating a Section 11 lawsuit using initial returns, we consider all disclosure-based class action lawsuits within three years of the IPO, both Section 11 and Section 10b-5, and then examine what factors influence a Section 11 filing. Our method differs from prior examinations of litigation risk in IPOs which restrict their sample to Section 11 lawsuits only.

In Table 8, using a logit model based on the sample of all sued IPOs, we estimate the effect of initial returns on the incidence of a Section 11 lawsuit filing. Because all Section 11 lawsuits are also filed under Section 10b-5 in our sample, the dependent variable is thus equal to one for lawsuits filed under both Section 11 and Section 10b-5, and zero for lawsuits filed only under Section 10b-5. Additional independent variables included in this specification are the log of days to lawsuit and the log of the post-issue return from the closing price on the first day of trading to the date the lawsuit is announced. We expect that the greater the number of days to the lawsuit, the less likely the suit will be brought under Section 11 because the reliance of a claim of a material omission in the prospectus is more likely to occur sooner rather than later. The more negative the stock price return, the more likely that the aftermarket trading price will fall below the offer price. Therefore, IPO shareholders are more likely to suffer damages even in the presence of underpricing.

Panel A of Table 8 includes all sued IPOs, Panel B includes only sued IPOs with positive price revisions, and Panel C includes only sued IPOs with high ex ante litigation risk. We include year and industry fixed effects in the first two rows, but exclude them in later rows due to the reduced number of observations. Regardless of the type of sample examined, the results indicate a strong deterrence effect for underpricing on the incidence of a Section 11 filing. Initial returns (instrumented or non-instrumented) are negatively and significantly related to the probability that the lawsuit will be brought under Section 11. As expected, this relation is strongest for IPOs with upward changes in their offer price. We report additional robustness tests in the online appendix.

These results support our enriched litigation framework, as we find that the deterrence effect of initial returns is not against preventing all types of lawsuits, but in providing a disincentive for IPO investors to bring a suit under Section 11. Deterring a Section 11 lawsuit can be important because we also find that it greatly reduces the probability that the underwriter will be named in the suit. The next section shows how underwriter damages differ by the type of lawsuit and, in particular, that such damages are related to whether or not the lawsuit is brought by IPO investors under Section 11 and whether the underwriter is named.

## 7. Economic effect of lawsuits

Given the considerable cost of insuring against potential lawsuits, we now examine whether it is worthwhile for the underwriter, in particular, to underprice an issue as a hedge against probability of a Section 11 lawsuit. The cost of litigation is likely to be high even if a settlement is not reached. Even frivolous lawsuits can have serious economic consequences to underwriter reputations through loss of market share which can be in addition to monetary damages. Given the competitive nature of the market for investment banking services, it would

**Table 8**
Section 11 probability.

Logit regressions are presented for 165 IPOs which were issued in January 1997 to October 2005 and subsequently sued in class action lawsuits in the three years after issuance. The dependent variable is a dummy variable equal to one if the lawsuit is a Section 11 lawsuit and zero otherwise. Results are also robust if we replace the logit model with a linear probability model. Panel A includes all IPOs and Panel B includes only IPOs with high ex ante litigation risk. The independent variables include the *Initial return*, and the instrumented initial return. We consider both raw initial returns and instrumented initial returns from a two-stage regression model as in Lowry and Shu (2002). Our instrumental variable is the *Pre-offer Nasdaq return* (the Nasdaq return for the 30 trading days preceding the offer date). We also include controls for the stock return realized from the closing price on the first day of trading to the date the lawsuit is announced (*Post-issue return*), as well as a control for the number of days from issuance until the lawsuit is announced (*Days to lawsuit*). To categorize firms by revision intensity, we first compute revision distance as one minus the similarity for each prospectus amendment in the time series of amendments for each IPO. The normalized revision distance is this raw distance scaled by the maximum raw distance among the first two revisions (which is likely regulation-driven). An IPO is a *Low revisor* if at least two-thirds of its issuer-driven (ID) revisions are below the median among all ID revisions of IPOs issued in the same year. Otherwise, it is deemed a *High revisor*. *Underwriter $ market share* is the lead underwriter's dollar market share in the past calendar year. *Issue size* is the natural logarithm of the offering amount. *Firm age* is the IPO year minus the firm's founding date, where founding dates are obtained from the Field-Ritter data set, as used in Field and Karpoff (2002) and Loughran and Ritter (2004). The *% Secondary shares* is the fraction of shares offered which are secondary shares (sold by pre-IPO shareholders). We include fewer variables in this table when compared to previous tables to preserve degrees of freedom given the reduced sample size (excluded variables are not significant). Control variables also include year and industry (Fama-French 48) fixed effects where indicated. *t*-statistics are in parentheses below each coefficient, and all standard errors are adjusted for clustering within year and industry.

| Row | Initial return | Instrumented initial return | Log days to lawsuit | Log post-issue return | Low revisor dummy | UW $ market share | Log issue size | Log firm age | % Secondary shares | Time + industry fixed effects | Obs./ pseudo $R^2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Panel A: All IPOs | | | | | | | | | | | |
| (1) | −2.581 | | −3.286 | −0.960 | 0.461 | 6.946 | 0.908 | 0.955 | 1.637 | Yes | 165 |
| | (−3.72) | | (−3.36) | (−1.38) | (0.54) | (0.34) | (1.95) | (2.20) | (0.61) | | 0.79 |
| (2) | | −3.242 | −2.367 | −0.664 | −0.068 | 5.149 | 0.860 | 0.652 | 1.564 | Yes | 165 |
| | | (−1.88) | (−3.97) | (−1.67) | (−0.09) | (0.26) | (1.99) | (1.79) | (0.54) | | 0.73 |
| (3) | −2.370 | | −2.987 | −0.881 | −0.129 | 21.507 | 0.289 | 0.552 | 2.369 | No | 165 |
| | (−5.61) | | (−4.38) | (−2.83) | (−0.25) | (1.78) | (0.90) | (1.30) | (1.81) | | 0.68 |
| (4) | | −2.716 | −2.231 | −0.706 | −0.281 | 22.061 | 0.276 | 0.350 | 1.870 | No | 165 |
| | | (−3.31) | (−4.24) | (−3.48) | (−0.63) | (1.93) | (1.07) | (0.86) | (1.59) | | 0.58 |
| Panel B: All IPOs with $\Delta P > 0$ | | | | | | | | | | | |
| (5) | −5.706 | | −5.889 | −3.514 | −0.106 | 51.184 | 0.708 | 2.102 | 5.509 | No | 100 |
| | (−3.12) | | (−3.69) | (−2.55) | (−0.10) | (1.40) | (0.83) | (2.74) | (2.30) | | 0.87 |
| (6) | | −5.974 | −3.122 | −1.743 | −0.580 | 38.903 | 0.462 | 0.934 | 4.786 | No | 100 |
| | | (−7.41) | (−4.52) | (−6.52) | (−0.81) | (2.47) | (0.94) | (1.42) | (2.16) | | 0.75 |
| Panel C: High ex ante litigation risk IPOs | | | | | | | | | | | |
| (7) | −2.632 | | −2.792 | −0.723 | 0.072 | 2.569 | 0.375 | 1.094 | 1.685 | No | 99 |
| | (−3.36) | | (−2.44) | (−1.79) | (0.13) | (0.19) | (0.89) | (1.54) | (0.78) | | 0.67 |
| (8) | | −3.242 | −1.892 | −0.675 | −0.115 | 10.549 | 0.228 | 0.670 | 1.036 | No | 99 |
| | | (−2.61) | (−2.86) | (−2.13) | (−0.25) | (0.66) | (0.65) | (1.14) | (0.53) | | 0.56 |

seem logical that competitors would use the existence of a lawsuit as a basis for gaining market share. Using a sample of 29 investigations, Beatty, Bunsis, and Hand (1998) find significant declines in IPO market share for underwriters after the announcement of an SEC investigation.

Building upon this work, we test the following hypotheses:

H1: Underwriters who are involved in more class action lawsuits experience subsequent lower market share.
H2: Underwriter market share is especially sensitive to lawsuits which are more easily linked to the underwriter. These include Section 11 lawsuits where IPO shareholders are plaintiffs and/or lawsuits in which the underwriter is named as a defendant.

To test these hypotheses, we construct a database in which one observation is one lead underwriter in a calendar year. We compute each underwriter's $ market share as the dollar proceeds of IPOs underwritten by the given underwriter divided by the total proceeds underwritten by all underwriters in the given year. The underwriter's past market share is adjusted for mergers among underwriters (Ljungqvist, Marston, and Wilhelm, 2006) by adding the sum of past market shares for all underwriters which were merged to form the current underwriter-year observation. We exclude, in any year, an underwriter that is inactive (i.e., if the underwriter was not involved in any IPOs in year $t$ or $t-1$).

Our key dependent variable of interest for all specifications is the change in underwriter $ market share from year $t$ to year $t+1$, which we predict using variables known, ex ante, in year $t$. To test our hypotheses, we construct independent variables measuring the frequency of past lawsuits associated with a given underwriter's past IPOs over the past three-year window (year $t-2$ to year $t$). To test Hypothesis 1, we compute an independent variable equal to the natural logarithm of one plus the number of these lawsuits. Hypothesis 1 predicts that underwriters with more lawsuits ex ante will experience declining market share ex post.

**Table 9**
Effect of observed litigation on underwriter market share.

Summary statistics and OLS regressions for 643 underwriter-year observations from January 1997 to October 2005 for which changes in underwriter dollar market share is the dependent variable. Panel A displays summary statistics for this underwriter-year database, and Panel B displays results of OLS regressions predicting the ex post change in underwriter $ market share based on ex ante litigation and market share variables. The *Change in underwriter $ market share* is the change in proceeds-weighted market share from year $t$ to year $t+1$. We construct lawsuit-based independent variables measuring the frequency of past lawsuits associated with a given underwriter's past IPOs over the past three-year window (year $t-2$ to year $t$). We compute *All lawsuits* as the natural log of one plus the number of these lawsuits. We then further restrict the independent lawsuit variable to those that are directly linked to the underwriter and lawsuits that are indirectly linked to the underwriter. We define directly linked lawsuits as those filed under Section 11 (*Section 11 lawsuits*), or as lawsuits in which the underwriter is named as a defendant (*UW-named lawsuits*). Indirectly linked lawsuits are the complement to each case (*Non-Section 11 lawsuits* and *UW-not-named lawsuits*). We therefore have five log lawsuit-based independent variables in total: (1) *All lawsuits*, (2) *Section 11 lawsuits*, (3) *Non-Section 11 lawsuits*, (4) *UW-named lawsuits*, and (5) *UW-not-named lawsuits*. Other independent variables include the given lead underwriter's market share in the previous three years. Year fixed effects are also included in the Panel B regressions, but are not reported. *t*-statistics are in parentheses below each coefficient, and all standard errors are adjusted for clustering by year and underwriter.

| Variable | Mean | Std. dev. | Min. | Median | Max. |
|---|---|---|---|---|---|
| Panel A: Summary statistics (underwriter × year database) | | | | | |
| $ UW market share | 0.011 | 0.027 | 0.000 | 0.027 | 0.162 |
| Change in $ UW market share | 0.000 | 0.018 | −0.098 | 0.018 | 0.125 |
| All lawsuits | 0.185 | 0.491 | 0.000 | 0.491 | 2.773 |
| Section 11 lawsuits | 0.113 | 0.342 | 0.000 | 0.342 | 1.946 |
| Non-Section 11 lawsuits | 0.113 | 0.368 | 0.000 | 0.368 | 2.398 |
| UW-named lawsuits | 0.093 | 0.290 | 0.000 | 0.290 | 1.792 |
| UW-not-named lawsuits | 0.128 | 0.407 | −0.000 | 0.407 | 2.565 |
| Annual mkt-wide IPO proceeds ($ billions) | 38.5 | 42.7 | 5.5 | 19.2 | 142.8 |

| Row | Lawsuit variable included in regression | Lawsuit variable | Lagged market share | Twice lagged market share | Thrice lagged market share | $R^2$ | Obs. |
|---|---|---|---|---|---|---|---|
| Panel B: OLS regressions (dependent variable = change in UW $ market share) | | | | | | | |
| (1) | All lawsuits | −0.454 | −42.812 | 3.219 | 36.453 | 0.203 | 643 |
| | | (−1.31) | (−4.99) | (0.35) | (3.82) | | |
| (2) | Section 11 lawsuits | −0.998 | −43.376 | 4.766 | 39.096 | 0.211 | 643 |
| | | (−2.10) | (−5.16) | (0.53) | (3.96) | | |
| (3) | Non-Section 11 lawsuits | −0.123 | −43.015 | 0.834 | 32.881 | 0.198 | 643 |
| | | (−0.31) | (−4.96) | (0.09) | (3.61) | | |
| (4) | UW-named lawsuits | −1.330 | −44.030 | 5.860 | 39.610 | 0.217 | 643 |
| | | (−2.87) | (−5.29) | (0.65) | (4.26) | | |
| (5) | UW-not-named lawsuits | 0.007 | −43.163 | 0.493 | 31.930 | 0.198 | 643 |
| | | (0.02) | (−4.97) | (0.06) | (3.31) | | |

To test Hypothesis 2, we separate the sample of lawsuits into lawsuits that are directly linked to the underwriter and lawsuits that are indirectly linked to the underwriter. We define directly linked lawsuits as those filed under Section 11 (*Section* 11 *lawsuits*), or as lawsuits in which the underwriter (UW) is named as a defendant (*UW-named lawsuits*). Indirectly linked lawsuits are the complement to each case (*Non-Section* 11 *lawsuits* and *UW-not-named lawsuits*). We therefore have five independent variables: (1) All lawsuits, (2) Section 11 lawsuits, (3) Non-Section 11 lawsuits, (4) UW-named lawsuits, and (5) UW-not-named lawsuits. If the primary motivation for underpricing is to reduce the incidence of lawsuits most damaging to the underwriter, then underwriter market share should be sensitive to only lawsuit types (2) and (4), those most directly linked to the underwriter, but not (3) or (5). As control variables, we also include the underwriter's past market share in each of the past three years.

Panel A of Table 9 displays summary statistics for the key variables used to test our hypotheses. Our sample includes 643 underwriter-year observations and the average market share is 1.1% (this number is smaller than the 3% reported in Table 1 because one observation is one IPO in Table 1, and underwriters with larger market share issue more IPOs). The average change in market share from year $t$ to year $t+1$ is near zero. However, the standard deviation of this change over time is 1.8%, indicating that dollar market shares change materially over time, which in turn gives us power to examine if these changes are linked to recent litigation variables. Panel A also shows summary statistics for our lawsuit variables, and we observe that our sample is evenly balanced among Section 11 and non-Section 11 lawsuits, as well as UW-named versus UW-not-named lawsuits. Hence, we likely have sufficient power to examine Hypothesis 2.

Panel B of Table 9 displays the results of the change in underwriter $ market share regressions. Weakly supportive of Hypothesis 1, row 1 in Panel B shows a negative relation between past class action lawsuits and subsequent market share. This result is not statistically significant ($t$-statistic is $-1.31$). However, comparing rows 2–5 reveals strong support for Hypothesis 2. Underwriters with exposure to more Section 11 lawsuits experience market share declines that are significant at the 5% level. We show in row 4 that underwriters who are specifically named in a lawsuit have even sharper declines. In contrast, rows 3 and 5 show that lawsuits that are only indirectly associated with the underwriter, including those not brought under Section 11 and those in which underwriter was not named, have little effect on ex post market share. These results confirm that only lawsuits that are most directly linked to the underwriter have a significant effect on underwriter market share.

The economic magnitude of underwriter damages from being sued can be inferred using the summary statistics in Panel A and the coefficients in Panel B. If an IPO firm associated with a lead underwriter is sued under Section 11, the dollar loss in proceeds to the lead underwriter in the following year is \$131 million [($-0.998$ (coefficient from Panel B) $\times$ 0.3418 (standard deviation from Panel A))/100 $\times$ \$38.5 billion (total proceeds from Panel A)]. Assuming a 7% commission and our average underpricing of 38%, the total amount of lost value to underwriters is almost \$59 million (\$9 million in fees and \$50 million in underpricing). This estimate increases roughly 13% if one uses lawsuits in which the underwriter is named. Thus, the potential economic loss due to lost market share is substantial, and underwriters have a strong incentive to use initial returns as a deterrent to limit the ability of plaintiffs to bring Section 11 lawsuits. If underwriters can ensure that IPO investors will not participate in a subsequent lawsuit and/or they will not be named, they can limit the damage to their reputation even if one of their IPO firms is sued.

It is important to note that the negative consequences to underwriters shown here could occur even outside the context of the legal system. One criticism of liability theories of underpricing is the fact that lawsuits are infrequent in countries with well-functioning IPO markets, such as Japan, whose offers exhibit both partial adjustment and high initial returns and whose disclosure requirements are similar to the U.S. (see Kerins, Kutsuna, and Smith, 2007; Kutsuna, Smith, and Smith, 2009).[6] Even in the absence of a lawsuit, the consequence for poor disclosure when investors experience major losses could still include loss in underwriter market share and other penalties such as a loss of prestige or personal societal status.

## 8. Conclusion

By using word content analysis, we are able to assess the disclosure strategy of IPO firms in response to information learned during bookbuilding. Our findings suggest that prior empirical findings place too much reliance on underpricing as a hedge against litigation risk. We show that disclosure and underpricing act as substitutes in hedging litigation risk, and only firms with a high risk of a material omission are likely to use initial returns as a hedge against lawsuits.

We also show an asymmetric response to information learned during the offering process. IPOs with good information revealed during bookbuilding have an incentive to withhold information for proprietary reasons and be subject to a material omission. Because, in this case, proceeds are greater than expected, the firm has pricing flexibility and underpricing is potentially "cheaper" as a hedge against lawsuits. Conversely, there is little benefit to withholding bad information as it has lower proprietary value to rivals and is difficult to conceal for any length of time. Under this scenario, proceeds are lower than expected, underpricing is "expensive," and these firms are more likely to use disclosure rather than underpricing to hedge litigation risk. We show that these relationships are more pronounced when the firm faces greater ex ante litigation risk.

[6] Like the U.S., the Securities and Exchange Law of Japan, Article 18 creates a civil remedy against the issuer for investor losses if the prospectus contains a false statement or material omission, and Article 21 extends that liability to the underwriters and auditors. A recent study by Ikeya and Kishitani (2009) finds that lawsuits in Japan are more prevalent than expected, and that litigation alleging misstatements in Japan is on the rise.

Consistent with the existing literature, we find an insurance effect in initial returns in which greater underpricing is associated with greater ex ante litigation risk, but our findings differ in two ways. First, we show that disclosure during bookbuilding has a strong deterrence effect against all types of lawsuits regardless of the type of plaintiff. Second, we find that high initial returns can deter IPO investors from bringing the lawsuit under Section 11. Thus, underpricing is a deterrent against the type of lawsuit that can most damage the underwriter, but not overall lawsuit incidence.

Importantly, we find that underwriters are the primary beneficiaries of deterring Section 11 lawsuits because this deterrence limits the plaintiff's ability to name the underwriter as a defendant. Our results suggest that underwriters have a strong incentive to underprice the issue aggressively to avoid the loss of reputational capital and to prevent a subsequent decline in market share in the event of a lawsuit.

Overall, our findings suggest that a good portion of the partial adjustment phenomenon can be attributed to issuer and underwriter efforts to mitigate exposure to litigation risk. In particular, partial adjustment arises as underwriters require very high levels of underpricing to preserve their reputation capital should issuers choose not to revise their prospectus after learning new information. Because these tradeoffs are based on rational economic incentives inherent to the legal system, our results provide an explanation as to why the partial adjustment phenomenon continues to be robust through time.

## Appendix A. Document similarity

This appendix explains how we compute the "document similarity" between two documents $i$ and $j$. We first take the text in each document and construct a numerical vector summarizing the counts of its English language word roots. This vector has a number of elements equal to the number of word roots, and one element is the number of times the given word root appears in the document. Word roots are identified by Webster.com, and we use a Web crawling algorithm to build a database of the unique word roots which correspond to all English language words which appear in the universe of all IPO prospectuses. For example, the words display, displayed, and displays all have the same word root "display." Methodologically, we first create a vector of all word counts in the document, and we then replace each word with its word root. We then tabulate the frequency vector for the given document based on the total counts of each word root. We exclude common words including articles, conjunctions, personal pronouns, abbreviations, compound words, and any words which appear fewer than a total of five times in the universe of all words, because they are not informative regarding content, leaving a vector of 5,803 possible words. We define this vector for the total document, $words_i$, as the total number of such root words used.

To measure the degree of similarity of documents $i$ and $j$, we simply take the dot product of the two word vectors normalized by their vector lengths. This quantity is widely used in studies of information processing and is known as the "cosine similarity" method (see Sebastiani, 2002 for more information), because it measures the angle between two word vectors on a unit sphere. We refer to this quantity as "document similarity."

$$Document\ similarity_{i,j} = \frac{words_i \cdot words_j}{\|words_i\| \|words_j\|}. \quad (4)$$

Because all word vectors $words_i$ have elements which are non-negative, this measure of document similarity has the nice property of being bounded in the interval (0,1). Intuitively, the similarity between two documents is closer to one when they are more similar and can never be less than zero if they are entirely different. We define document distance as one minus document similarity.

## Appendix B. Supplementary data

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.jfineco.2011.09.006.

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