Underwriter Manipulation in IPOs*

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This version: November 13, 2004

Abstract

We provide a new explanation for the extremely high level of IPO underpricing during the Internet bubble years of the late 1990s. Our explanation is based on the manipulative practices adopted by underwriters during the IPO process. By requiring their customers to buy the stock in the aftermarket in return for IPO allocations (a tie-in agreement), the underwriters created artificial excess demand for the IPOs, leading to distorted (manipulated) price levels in the immediate after-market. First we provide a theoretical model of IPO manipulation in the presence of tie-in agreements and derive predictions on the after-market price patterns of manipulated and non-manipulated IPOs. Then, empirically, we show that IPOs with tie-in agreements exhibit a significantly different pattern for the first-day and long-term returns than the rest of the IPOs during the 1998-2000 period, consistent with the model. IPOs with tie-in agreements experience 10 times higher filing-to-offer return, 7 times higher first-day return and 15 times higher first-day trading volume. However, these stocks begin to under-perform significantly compared to non-tie-in IPOs starting five months after the IPO. Lower returns persist for two years post the IPO. We find that the tie-in IPOs experience significantly higher volume and lower returns around the lock-up expiration period. Our main result is that even after controlling for hot market conditions and issuer characteristics such as issue size, underwriter quality, and whether the IPO is a technology stock, we find that manipulation explains most of the unusually high level of underpricing during the late 1990s.

* We thank Jay Ritter, Alexander Ljungqvist, and seminar participants at University of Michigan and University of Minnesota for discussions and comments. We are responsible for all remaining errors.
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1. Introduction

The average first-day return on IPOs increased from 7% in the 1980s to 15% during 1990-1998, before jumping to 65% during the Internet bubble years of 1999-2000 (see Loughran and Ritter (2004)).[1] What explains such a high level of IPO underpricing during the late 1990s? Ljungqvist and Wilhelm (2003) argue that changes in IPO ownership structure such as decreased CEO ownership and increased ownership fragmentation led to reduced incentives of insiders to maximize IPO proceeds in this period. Loughran and Ritter (2004), on the other hand, argue that the objective function of the issuers changed during the Internet bubble period, which in turn led to very high levels of first-day returns. As per their argument, issuers were more willing to "leave money on the table" in return for greater analyst coverage or side payments in this period.[2]

In this paper, we provide an alternative explanation for the extremely high level of IPO underpricing during this period. Our explanation is based on the manipulative practices in the form of tie-in agreements adopted by the underwriters during the IPO process. By requiring their IPO customers to buy the stock in the aftermarket (the tie-in agreements or laddering) in return for IPO allocations, the underwriters can create artificial excess demand for the IPOs, leading to distorted price levels in the immediate after-market. Since these manipulated prices cannot be sustained in the long run, the manipulated IPOs under-perform significantly when fundamental values are finally reflected in prices. We show that these practices can explain a significant portion of the extremely high level of IPO underpricing in the Internet bubble period.

The manipulative practices, though prohibited by Securities and Exchange Commission (SEC) regulations, were prevalent during the 1998-2000 period as is evident from numerous lawsuits that followed in subsequent years. In our sample of 904 IPOs during 1998-2000, a total of 249 IPOs were the subjects of private class-action lawsuits for tie-in agreements. Of these, 144 were sued as well by regulators such as the SEC and the National Association of Securities Dealers (NASD). While there has been a considerable debate about such practices in the popular press, there has been little attempt in the academic literature to understand the

[1] In our sample of firms from 1998 to 2000, the mean first-day return is 58%.
[2] Aggarwal, Krigman, and Womack (2002) argue that insiders might have been willing to underprice IPOs if increased underpricing generated more attention from analysts and the media, resulting in higher prices when insiders sold shares at the expiration of the lockup period.

effect of such manipulative practices on the performance and functioning of the IPO market.[3] That manipulative practices such as tie-in agreements may be very important is exemplified by a striking fact—in our sample, median underpricing for IPOs subject to regulator lawsuits is 123.41%. By contrast, for IPOs that were not sued, median underpricing is 17.26%, not much different from underpricing of 15% that prevailed from 1990 to 1998. In this paper, we document and explain this and other facts about price manipulation in IPOs.

We first present a model of underwriter manipulation of IPOs through tie-in agreements. In the model, there are three types of investors in addition to the underwriter. First, there is an investor (the ladderer) affiliated with the underwriter. This investor gets information from the investment banker about the future value of stock that can be high or low. If the affiliated investor learns that the stock value in the future will be high, then the affiliated investor chooses to trade on this information by buying shares. If the affiliated investor learns that the stock value in the future will be low, then he may still choose to buy shares in order to manipulate the stock via a laddering or tie-in arrangement with the underwriter. The second group of investors is momentum investors. One can also think of them as being arbitrageurs, day-traders, sentiment investors, or information seekers (as in Aggarwal and Wu (2004)). The momentum investors can observe past prices and volume, but they have no access to fundamental information themselves. Instead, they try to infer from prices and volumes whether an affiliated (informed) investor is buying the stock, and whether they should be buying the stock as well, i.e., trading on momentum. Aside from having limited information, they are in all other respects completely rational. The third group of investors is a continuum of noise or uninformed traders. These traders do not update or condition on any information, and they provide liquidity to the market.

We show that there exists a pooling equilibrium where price manipulation is successful and profitable for the ladderer. The key to this argument is information asymmetry. The momentum traders are uncertain whether an affiliated investor who buys the share does so because he knows it is undervalued or because he intends to manipulate the price through laddering. It is this pooling that allows manipulation to be profitable (see also Allen and Gale (1992)). An important comparative static that emerges is that the possibility of pooling is increasing in the number of momentum investors. To the extent that we think of momentum

[3] An exception is a recent paper by Hao (2004), which we discuss in more detail later.

investors as sentiment investors, this suggests that in periods of high investor sentiment, manipulation through laddering will be more likely. There are several important predictions from the model. For example, manipulated stocks have higher prices (returns) during aftermarket trade and this eventually reverses itself in the long-run. In addition, the price differentials between manipulated and non-manipulated stocks in early aftermarket trading are increasing in the number of momentum investors in the market.

Our results can be compared with those in Hao's (2004) model of IPO manipulation through laddering arrangements. Similar to the predictions in our model, Hao finds that laddering is more likely in hot markets and that laddering is associated with the possibility of kickbacks from the ladderer to the underwriter. She also finds that laddering leads to greater IPO underpricing, especially in the presence of kickbacks. Perhaps the largest distinction between Hao's model and ours is that her model generates intentional IPO underpricing, while our model generates price run-ups for manipulated IPOs that are eventually corrected as the true value of the firm is revealed. Thus, our model can explain the long-run underperformance of manipulated IPOs as well. Another important difference between the two models is that we assume there is information asymmetry between the ladderer and the "rational" momentum traders, and price momentum is derived in equilibrium. In contrast, there is no information asymmetry in Hao's model and price momentum is assumed to be present for laddering to be profitable.

Empirically, to ascertain whether an IPO was subject to tie-in agreements by the underwriters or not, one needs to have access to the underwriters' books and their exact allocation procedure. In the absence of such information, we consider lawsuits alleging the presence of such practices as the best available proxy for tie-in agreements. There are two kinds of lawsuits that we consider in this paper – (a) lawsuits by the SEC and NASD (regulator lawsuits), and (b) lawsuits brought forward by the investing public (class-action lawsuits). An obvious concern about class-action lawsuits is that investors or attorneys might target IPOs with high first day returns and subsequent poor performance for class-action lawsuits. Therefore, this proxy for tie-in agreements may overstate the extent to which there actually are such agreements in place. It is safer to assume that the SEC/NASD lawsuits are based on harder evidence of tie-in agreements than the first day and longer-run returns of the IPOs. However, it is also likely that the SEC/NASD lawsuits miss instances of tie-in or laddering arrangements due to limited SEC enforcement (see Aggarwal and Wu (2004) for a general discussion of SEC enforcement). As a result, we consider the SEC/NASD lawsuits to be a lower bound on the prevalence of tie-in agreements and the class-action lawsuits to be an upper bound on the prevalence of tie-in agreements. There are 144 IPOs that were the subjects of regulator lawsuits and 249 that were the subject of class-action lawsuits. We perform all our analyses based on both definitions of tie-in agreements and the results are qualitatively similar.

We find that the IPOs with tie-in agreements (called sued IPOs or manipulated IPOs in the rest of the paper) exhibit a significantly different pattern for the first-day and long-term returns than the rest of the IPOs during the same period. As compared to the non-sued IPOs, the median sued IPO based on regulator lawsuits earned about 7 times higher first-day return (123.41% for sued IPOs vs. 17.26% for the rest) and experienced 15 times higher first-day trading volume. The extremely high level of underpricing during these years can be attributed to the sample of sued IPOs since the extent of underpricing for the remaining sample is comparable to earlier periods (see Loughran and Ritter (2004)). Excluding the first day return, the sued IPOs continue to earn significantly higher returns than the non-sued firms in the first month after the IPO. The sued IPOs earn higher returns for four months after the IPO, although these differences for months two through four are not statistically significant. However, there is a significant reversal of the pattern in the sixth month, which coincides with the lockup expiration period of most IPOs. In the sixth month, the sued IPOs underperform non-sued IPOs by over 8%. In subsequent periods (months six through twelve and years one through two post-IPO), the sued IPOs continue to significantly under-perform the non-sued IPOs by a significant margin.

We argue that manipulative tie-in agreements explain these patterns. The difference in underpricing across the sued and non-sued sample is not explained by known determinants of IPO underpricing such as the size of the firm, venture capital backing, firm-age, and whether the firm is an Internet/technology firm. We also control for the effect of perceived hotness on the underpricing of IPOs. We use the filing-to-offer return as well as a relative valuation proxy based on the offer-price to comparable based valuation of the firm to control for these effects (see Purnanandam and Swaminathan (2004)). The sued IPOs have significantly higher filing-to-offer returns and are considerably overvalued at the offer as compared to their industry peers. Thus, these IPOs are perceived to be "hot" or "glamour" IPOs. But even after controlling for such characteristics, the tie-in agreements explain the largest portion of cross-sectional variation in IPO underpricing. In summary, our results establish a strong link between the high first day return and the existence of tie-in agreements. Further, the abnormal trading volume in the first-day of trading lends additional support to the manipulation hypothesis. Finally, similar to Lowry and Shu (2001), we instrument for the likelihood of lawsuits to address potential endogeneity concerns.

If underwriters adopt such manipulative practices, how does it benefit the insiders of the firms and their initial investors? To answer this question, we analyze the return and trading pattern around the lock-up expiration. We find significantly higher trading volume and price drop around the lock-up expiration month (i.e., sixth month after the IPO) for the sued firms as compared to the rest. While the sued IPOs earn significantly higher returns during the first five months, in a five-day window surrounding the lock-up expiration (which is typically 180 days after the IPO date), they earn –5.62% as compared to –1.66% for the non-sued IPOs. This finding is consistent with the hypothesis that in IPOs with tie-in agreements, initial investors subject to lock-up arrangements sold a significant portion of their holdings at the first possible opportunity. Thus, the initial run-up in prices benefits these investors.

The manipulation explanation is unlikely to be valid if underwriters are not able to benefit from price manipulation. Do underwriters gain from their manipulative activities? The answer is yes. Underwriters have an incentive to artificially influence aftermarket activity because they have underwritten the risk of the offering, and a poor aftermarket performance could result in reputational and subsequent financial loss. Indeed, initially laddering or tie-in agreements could have been viewed as a form of price stabilization. More directly, if manipulation is likely to lead to higher after-market prices and increase the perceived hotness of an IPO, the underwriters are in a good position to extract benefits due to increased demand for allocations. In order to receive hot IPO allocations, investors often are willing to pay excess commissions and other forms of kickbacks. IPOs involved in tie-in agreements are also frequently involved in excess commission lawsuits. Reuter (2003) finds the existence of a quid pro quo between underwriters and investors in IPO allocations. He finds a positive relation between the commissions paid to lead underwriters and reported holdings of their IPOs. He further interprets this relation as evidence that lead underwriters use IPO allocations to compete for brokerage business from mutual fund families.

Our results are consistent with the corruption hypothesis of Loughran and Ritter (2004), where the objective function of the issuing firm is to maximize not only the IPO proceeds but also the proceeds from the subsequent sale by the insiders. Our findings suggest that one mechanism of channeling money to the insiders and other decision-makers through side-payments is by means of these manipulative practices by the underwriters.

Our findings have interesting implications for research in this area. They complement existing research on short-term underpricing and long-term underperformance issues. Perhaps most surprisingly, our results suggest that the high levels of IPO underpricing in the late 1990s can be attributed primarily to price manipulation by underwriters and ladderers. The rest of the paper is organized as follows. In Section 2, we discuss tie-in agreements and the regulatory environment governing securities issues (Regulation M) in further detail. In Section 3, we present a theoretical model of manipulation by underwriters using tie-in agreements with affiliated investors. We derive testable implications of the model. In Section 4, we describe the data and the characteristics of the sample IPOs. In Section 5, we conduct empirical tests on the relationship between underpricing, turnover, returns, and tie-in agreements. Section 6 contains concluding remarks.

2. SEC Regulations and Examples of Tie-in Agreement

In this section we first review SEC regulations against tie-in agreements. We then provide some examples of tie-in agreements based on SEC litigation releases and media reports.

2.1. SEC Regulations against Tie-in Agreements

On August 25, 2000, the Division of Market Regulation at the SEC published a reminder that solicitations and tie-in agreements for aftermarket purchases are prohibited under SEC rules. Specifically, the staff legal bulletin reminded underwriters, broker-dealers, and any other person who is participating in a distribution of securities that they are prohibited from soliciting or requiring their customers to make aftermarket purchases until the distribution is completed. This action was prompted by an increase in complaints that some underwriters had required their customers to agree to buy additional shares in the aftermarket as a condition for being allocated shares in the distribution. These practices are prohibited by Rules 101 and 102 of Regulation M[4] and may violate other anti-fraud and anti-manipulation provisions of the federal securities laws.[5]

As an anti-manipulation regulation, Regulation M is intended to protect the integrity of the offering process by precluding activities that could artificially influence the market for the offered security. In particular, Regulation M prohibits participants in the distribution from directly or indirectly attempting to induce any person to bid for or purchase any security that is the subject of a distribution other than through the distribution itself. The SEC has noted that tie-in agreements are a particularly egregious form of solicited transaction prohibited by Regulation M. Such practices are not a completely recent phenomenon. As far back as 1961, the SEC addressed reports that certain dealers participating in distributions of new issues had been making allotments to their customers only if such customers agreed to make some comparable purchase in the open market after the issue was initially sold. The SEC prohibits solicitations for aftermarket purchases since they give other purchasers in the offering the impression that there is a scarcity of the offered securities. This can stimulate demand and support the price of the offering. Moreover, traders in the aftermarket will not know that the aftermarket demand, which may appear to validate the offering price, has been stimulated by the distribution participants.

2.2. Examples of Tie-in Agreement Practices

On October 1, 2003 the SEC announced that J.P. Morgan Chase agreed to settle charges of unlawful IPO allocation practices and paid a penalty of $25 million. In its complaint, the SEC alleged that J.P. Morgan violated Rule 101 of Regulation M under the Securities Exchange Act of 1934 by attempting to induce some customers who received allocations of IPOs to place purchase orders for additional shares in the aftermarket by engaging in the following activities (source: SEC documents):[6]

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[4] Regulation M applies to a "distribution" of securities, which is defined to mean any offering of securities that is distinguished from ordinary trading transactions by the magnitude of the offering and the presence of special selling efforts and selling methods.

[5] The SEC has held that tie-ins are fraudulent devices that violate Section 17(a) of the Securities Act of 1933 and Section 10(b) of the Securities Exchange Act of 1934 (Exchange Act), and Rule 10b-5 under the Exchange Act, because they facilitate material omissions in connection with the offer or sale of securities.

[6] The complaint further alleged that J.P. Morgan succeeded and the solicited customers often purchased stock during the new issues' first few trading days.

1. J.P. Morgan solicited customers to provide information about whether and at what price and in what quantity they intended to place aftermarket orders for IPO stock. J.P. Morgan communicated to certain customers that expressing an interest in buying shares in the aftermarket would help them obtain allocations of hot and oversubscribed IPOs. For example, in the Large Scale Biology IPO, a sales representative reported in an e-mail that she "was very aggressive in pushing the customer for aftermarket action - stressing how important it was going to be for the process."
2. J.P. Morgan encouraged certain customers that had provided aftermarket interest to increase the prices they had told J.P. Morgan they were willing to pay in the aftermarket typically because other customers seeking allocations had provided aftermarket interest at higher price limits. For example, a sales representative told a customer that its aftermarket price limit was "sort of out of the game" and there was "interest at much higher levels." In the Dyax IPO, a sales representative told the syndicate desk in an e-mail, "If the customer gets 50,000 IPO shares, he will buy 50,000 more (up to $16). If need be, I will tell him to increase his aftermarket price sensitivity to a higher number."
3. J.P. Morgan solicited aftermarket interest from certain customers who J.P. Morgan knew had no interest in owning the stock of the IPO companies for the long term. J.P. Morgan knew that some of these customers usually or always immediately sold their IPO allocations. Nevertheless, J.P. Morgan expected these customers to follow through and buy in the aftermarket when they provided aftermarket interest. A number of these customers bought in the aftermarket and then sold their allocation or closed out their entire position within days of the IPOs.
4. After the restricted period, J.P. Morgan solicited aftermarket orders by making follow-up calls to customers who had previously indicated aftermarket interest. Further, J.P. Morgan often tracked whether customers followed through on their aftermarket interest and actually purchased in the aftermarket. When customers did not follow through, J.P. Morgan encouraged its sales force to place follow-up calls to these customers to solicit orders to purchase stock. For instance, on Aug. 6, 1999, the day after the Interactive Pictures IPO started trading, the head of Global Equity Capital Markets sent an e-mail to regional sales managers and the head of syndicate, which included the following comments: (1) one customer "owes it to us to be in buying the stock today"; (2) "we should push another

customer today and if they don't show up, keep them out of these tiers going forward"; and (3) "let's make another customer show up today." In addition, in a number of instances, J.P. Morgan described certain customers' aftermarket interest as promises, obligations and commitments. For example, in an e-mail about the Genentech IPO, a sales representative said that an institutional customer "followed up in the aftermarket exactly as promised."

The media reported instances of tie-in agreements even before the SEC took any actions. The *Wall Street Journal* reported on April 14, 2003 that the SEC notified Morgan Stanley formally that it may face civil charges of awarding hot IPO shares to investing clients who signaled plans to buy additional shares at higher prices in after-market trading. In fact, Morgan Stanley's tie-in agreements practice was reported in the online technology newsletter *RedHerring* on May 2, 2001 in an article titled "The Art of the Tie-in."

3. A Model of Underwriter Manipulation

To provide some theoretical guidance in understanding tie-in agreements, we consider a simple model of IPO price manipulation, based on Aggarwal and Wu (2004). There are three types of investors in our model. First, there is an investor affiliated with the underwriting investment banker. This investor gets information from the investment banker about whether the stock value in the future will be high (V_H) or low (V_L). If the affiliated investor learns that the stock value in the future will be high, then the affiliated investor (superscripted I in this case) will choose to trade on this information by buying shares. If the affiliated investor learns that the stock value in the future will be low, then the affiliated investor (superscripted M in this case) may still choose to buy shares in order to manipulate the stock via a laddering arrangement with the underwriter.[7]

The second group of investors is N symmetric momentum investors (superscripted A^i, $i \in N$). One can also think of them as being arbitrageurs, day-traders, sentiment investors, or information seekers. The momentum investors are limited to several types of information.

[7] One may wonder why the affiliated investor, knowing that the stock value will be low in the future, does not short sell to take advantage of this information. Here the affiliated investor is affiliated with the investment bank that has taken the company public. Short-selling would undercut the underwriter's price-stabilization efforts and so it will not be observed. Our point here is to examine what other mechanisms (specifically, manipulation by laddering) exist for underwriters and affiliated investors to profit from their information.

They can observe past prices and volume. They have no access to fundamental information themselves. Instead, they try to infer from prices and volumes whether an affiliated (informed) investor is buying the stock, and whether they should be buying the stock as well, i.e., trading on momentum. Aside from having limited information, they are in all other respects completely rational.

The third group of investors is a continuum of noise or uninformed traders (superscripted U). These traders do not update or condition on any information. They simply stand ready to sell shares, so their role is to provide liquidity to the market. We model the uninformed traders as providing a supply curve to the market that determines the market price:

$$P(Q) = a + bQ\,, \tag{1}$$

where P is the market price of the stock, Q is the quantity demanded, and b is the slope of the supply curve. We assume that initially all IPO shares are allocated to the uninformed traders and the affiliated investor, who comprises part of the supply curve. If no one wishes to purchase the stock, then the price of the stock is simply *a*. For completeness, we assume that the total shares outstanding after the IPO are:

$$\frac{V_H - a}{b}.$$

This implies that if someone wished to buy all of the shares outstanding after the IPO, the price would be V_H. It is important to note that this is not because the uninformed update about the stock's value. Instead, it is simply governed by the uninformed's willingness to sell more if offered a higher price.

The timing of the model is as follows. At time 0, all shares are held by the uninformed investors and the affiliated investor. We can think of *a* as being the time 0 price (IPO offer price). We will say more shortly about what this IPO offer price is.

At time 1, the affiliated investor can enter the market. The affiliated investor is the ladderer (has information that the value is low) with probability γ, and has information the value is high with probability δ. Since telling the affiliated investor the future stock value is high (V_H) is clearly a profitable strategy for the underwriter when the future stock value is in fact high, this is equivalent to saying the probability the future stock value is high is δ. With probability $1-\gamma-\delta$ the affiliated investor does not enter the market and the future stock value is V_L. It is worth noting that the underwriter through the affiliated investor will not always try to manipulate the IPO by laddering when the future stock value is low. If the probability of laddering is too high, then the market will break down in the sense that momentum investors will not be willing to purchase shares. The momentum investors observe the stock price and the quantity demanded at time 1.

At time 2, the momentum investors can buy shares. They will condition the number of shares they purchase on what they observed at time 1. If there is no purchase of shares at time 1, it is natural to assume that the stock will be short sold until its value is driven to V_L. At time 2, the affiliated investor can buy or sell shares. Here we focus on the case in which the affiliated investor sells shares. At times 1 and 2, the uninformed investors stand ready to sell shares.

At time 3, the fundamental stock price is revealed to be either V_H or V_L. We make an additional assumption about the affiliated investor. We assume that the affiliated investor dislikes holding shares until time 3. Time 3 represents the long-run, when stock prices have adjusted to fundamental values. The long-run may be very long, and thus it may be costly to hold shares for the affiliated investor. In particular, the affiliated investor is typically not a buy-and-hold investor (nor is the investment bank that provides the information). We model the cost of holding shares until time 3 as a scalar k. If the stock price at time 3 is V_H, the value to the affiliated investor of a share is V_H-k. In order for our problem to be meaningful, it must be the case that $V_H-k-a>0$, otherwise no affiliated investor would ever buy shares at the IPO (time 0) price and hold them until time 3, and this would be then be fully anticipated. There is no cost for the affiliated investor to holding a share until time 2. Note that if the affiliated investor learns that the stock value is low, then he would not want to hold shares until time 3 because the value of the share will be V_L.

Now we consider what happens when the affiliated investor can potentially manipulate the stock price through a tie-in agreement. The affiliated investor is a ladderer with probability γ. We demonstrate later that, in equilibrium, $\gamma<1-\delta$. We solve the model backwards.

The momentum investors condition their demand at time 2 on what they observe at time 1. They explicitly account for the possibility that the purchaser of the shares is a ladderer. In this case there is a multiplicity of equilibria. We focus on the pooling equilibrium here.[8] It

[8] A discussion of other equilibria and a complete derivation of the results for the pooling equilibrium we discuss here can be found in Aggarwal and Wu (2004).

is convenient to talk about the affiliated investor who knows the value is high (the informed) and the affiliated investor who knows the value is low (the ladderer) as separate entities, rather than just as the affiliated investor with different information (high or low future stock value).

The ladderer and the informed pool in their strategies by buying the same quantity of shares at time 1 and selling these shares at time 2. Since the ladderer and the informed choose to purchase the same number of shares at time 1, the momentum investors' posterior beliefs that the purchaser of the shares is the ladderer are:

$$\beta = \frac{\gamma}{\gamma + \delta} \ .$$

The aggregate demand from the N momentum investors at time 2 is:

$$q_2^{A*} = \frac{N}{N+1}\frac{(1-\beta)V_H + \beta V_L - a}{b}. \tag{2}$$

The time 2 price is:

$$p_2^M = a + \frac{N}{N+1}\left((1-\beta)V_H + \beta V_L - a\right). \tag{3}$$

Each momentum investor makes expected profits of:

$$\pi^{A_i*} = \frac{\left((1-\beta)V_H + \beta V_L - a\right)^2}{(N+1)^2 b}. \tag{4}$$

The time 1 quantity demanded by the informed and the ladderer is:

$$q_1^{M*} = \frac{N}{N+1}\frac{(1-\beta)V_H + \beta V_L - a}{2b}. \tag{5}$$

and the price is:

$$p_1^M = a + \frac{N}{N+1}\frac{(1-\beta)V_H + \beta V_L - a}{2}. \tag{6}$$

It is straightforward to see that as long as there is at least one momentum investor, the quantity of shares bought by the momentum investors at time 2 is greater than the quantity of shares bought at time 1 and sold at time 2 by the informed or the ladderer. Both the informed and the ladderer's expected profits from shares bought *at time 1* are:

$$\pi_1^{M*} = \frac{N^2}{(N+1)^2}\frac{\left((1-\beta)V_H + \beta V_L - a\right)^2}{4b}. \tag{7}$$

Next we consider the underwriter's decisions at time 0. The underwriter makes two choices at the time of the IPO. First, the underwriter chooses the IPO offer price. Second, the underwriter chooses an allocation to go to the affiliated investor. We assume that the underwriter can extract some of the profits from the affiliated investor in the form of higher than normal commissions, agreements for future business or simple kickbacks. We begin by noting that the affiliated investor's profits are maximized by allocating some shares in the IPO to the affiliated investor. The momentum investors demand more shares at time 2 than the affiliated investor bought at time 1. The difference is the maximum number of shares that can be allocated to the affiliated investor in the IPO so that the affiliated investor is able to sell all of his shares at time 2 to the momentum investors. Therefore, the number of shares allocated to the affiliated investor in the IPO is:[9]

$$q_0^{M*} = \frac{N}{N+1}\frac{(1-\beta)V_H + \beta V_L - a}{2b}. \tag{8}$$

This is the number of shares allocated to the affiliated investor if the future stock value is high or if the underwriter wants the affiliated investor to manipulate the stock by buying additional shares at time 1 (laddering).[10] The underwriter does not allocate shares to the affiliated investor otherwise.[11] Given this number of shares allocated to the affiliated investor, the affiliated investor's profit from these shares, assuming they are sold at time 2 is:

$$\pi_0^{M*} = \frac{N^2}{(N+1)^2}\frac{\left((1-\beta)V_H + \beta V_L - a\right)^2}{2b}. \tag{9}$$

The other choice for the underwriter is the IPO offer price. We assume that the underwriter gets a standard fraction λ of the IPO proceeds (typically 7%, see Chen and Ritter (2000)). The underwriter knows the distribution of stock values as well as the actual values for the firms going public. That is, the investment bank (and the market as a whole) knows that a

[9] Note that we can also think of shares held by insiders at the time of the IPO (time 0) and then sold at time 2 in this light—they are shares allocated by the underwriter to the insiders in the IPO who then sell at the manipulated time 2 price.

[10] One interesting feature of the number of shares allocated to the ladderer is that it equals the number of shares that the ladderer purchases at time 1. This is consistent with anecdotal evidence about laddering arrangements in which underwriters allocated shares to investors on the condition that they purchase an equivalent number of shares in the aftermarket.

[11] This is immaterial. We could just as easily assume that the underwriter always allocates the same number of shares to the affiliated investor, whether the future stock value is high or low. This will simply reduce the affiliated investor's net profits, as he now loses on some low value IPOs.

fraction δ of the firm's going public will have high future stock values V_H (good firms) and a fraction 1- δ will have low future stock values V_L (bad firms). In addition, the investment bank knows which specific companies are good and bad. The investment bank can choose two pricing policies—either price at the expected value or try to price credibly according to the actual future firm value. Pricing credibly is difficult as the underwriter has the incentive to try to price a low value firm as if it were high value. However, even if the underwriter could price credibly, the underwriter's profits from the IPO proceeds are, in expectation, identical for pricing at the expected value or the actual value:

$$\lambda\left(\delta V_H + (1-\delta)V_L\right) = \delta\lambda V_H + (1-\delta)\lambda V_L. \tag{10}$$

By pricing at the actual value, the underwriter foregoes the possibility of there being future trade because all price relevant information has been revealed. By contrast, pricing at the expected value allows for price relevant information to be revealed over time, and allows the underwriter to profit from this information revelation and manipulation. Thus, the underwriter prices the IPO at its long-run expected value. In expectation, there is no IPO underpricing:

$$p_0^M = \delta V_H + (1-\delta)V_L = a. \tag{11}$$

The preceding analysis is predicated on the existence of a pooling equilibrium. In order for the pooling equilibrium to be sustainable, it must be incentive compatible for the informed not to deviate and thus separate from the ladderer. The incentive compatibility condition requires that the informed will want to sell shares at time 2 rather than hold them until time 3. The value to holding shares until time 3 for the informed is V_H-k, so the incentive compatibility condition is:

$$p_2^M = a + \frac{N}{N+1}\left((1-\beta)V_H + \beta V_L - a\right) \geq V_H - k. \tag{12}$$

The key comparative static that emerges from this condition is that the possibility of pooling is increasing in the number of momentum investors. To the extent that we think of momentum investors as sentiment investors, this suggests that in periods of high investor sentiment, manipulation through laddering will be more likely.

Our model generates some other empirical predictions as well. The first of these is the time path of prices for manipulated versus non-manipulated stocks. For manipulated stocks, we should see:

$$p_3^M < p_0^M < p_1^M < p_2^M.$$

Prices first rise, then fall when the true value of the stock is revealed over time, because the manipulated stocks were, by definition, bad firms. This price pattern is also predicted by the model of Ljungqvist, Nanda, and Singh (2002). In that paper, the price run-up between the IPO offer price and aftermarket trade (between time 0 and time 1) is attributed to investor sentiment. Our model has both investor sentiment (momentum investors) and laddering. As a result, we are able to generate different price dynamics for manipulated and non-manipulated stocks. We next show what those dynamics are for non-manipulated stocks and then later, we demonstrate that the price dynamics generated by our model can match the data for both manipulated and non-manipulated IPOs.

For non-manipulated stocks, expected prices will differ. As an empirical matter, for non-manipulated stocks, we do not observe high-value firms and low-value firms separately. Therefore, we must compute expected prices for the non-manipulated stocks. The time 0 (IPO offer) price will be the same for both manipulated and non-manipulated stocks, $p_0^M = p_0^{NM}$. The time 1 expected price is composed of the prices from the high-value firms (that pool with the manipulated stocks) and the prices from the non-manipulated low-value firms. The time 1 expected price is:

$$p_1^{NM} = \frac{\delta}{1-\gamma}\left(a + \frac{N}{N+1}\frac{(1-\beta)V_H + \beta V_L - a}{2}\right) + \frac{1-\gamma-\delta}{1-\gamma}V_L. \qquad (13)$$

The time 2 expected price for non-manipulated stocks is similarly composed of the prices from the high-value firms and the non-manipulated low-value firms:

$$p_2^{NM} = \frac{\delta}{1-\gamma}\left(a + \frac{N}{N+1}\big((1-\beta)V_H + \beta V_L - a\big)\right) + \frac{1-\gamma-\delta}{1-\gamma}V_L. \qquad (14)$$

The time 3 (when the true values are realized) expected price for non-manipulated stocks is:

$$p_3^{NM} = \frac{\delta}{1-\gamma}V_H + \frac{1-\gamma-\delta}{1-\gamma}V_L. \qquad (15)$$

The time path of prices we should see for non-manipulated stocks is:

$$p_1^{NM} < p_2^{NM} < p_0^{NM} < p_3^{NM}.$$

This last result may seem counterintuitive at first. The non-manipulated stocks consist of both the high-value firms in which the affiliated investor was able to invest as well as the low-value firms that the affiliated investor did not manipulate. Because some of the low-value firms were manipulated, the group of non-manipulated stocks has fewer low-value firms as a fraction of the group than does the population as a whole. However, prices for the high-value firms do not converge to their true values until the long-run (time 3) because of the possibility of manipulation through laddering. Thus, there are two offsetting effects. As a result, prices first fall from the IPO offer price and then rise with trade for the non-manipulated stocks, before ultimately the true values are revealed.

As a consequence, the model has the following additional predictions:

$$p_0^{NM} = p_0^{M}$$
$$p_1^{NM} < p_1^{M}$$
$$p_2^{NM} < p_2^{M}$$
$$p_3^{NM} > p_3^{M}$$
$$\frac{\partial(p_1^{M} - p_1^{NM})}{\partial N} > 0$$
$$\frac{\partial(p_2^{M} - p_2^{NM})}{\partial N} > 0.$$

The first statement is simply that the IPO offer price is the same for manipulated and non-manipulated stocks. The second and third statements are that manipulated stocks have higher prices (returns) during aftermarket trade in the short-run. The fourth statement is that this eventually reverses itself in the long-run, when non-manipulated stocks have higher prices than manipulated stocks. The fifth and sixth statements are important comparative statics. They say that the price differentials between manipulated and non-manipulated stocks at times 1 and 2 are increasing in the number of momentum investors in the market.

Our results can be compared with those in Hao's (2004) model of IPO manipulation through laddering arrangements. Similar to the predictions in our model, Hao finds that laddering is more likely in hot markets and that laddering is associated with the possibility of kickbacks from the ladderer to the underwriter. She also finds that laddering leads to greater IPO underpricing, especially in the presence of kickbacks. Perhaps the largest distinction between Hao's model and ours is that her model generates intentional IPO underpricing, while our model generates price run-ups for manipulated IPOs that are eventually corrected as the true value of the firm is revealed. Thus, our model can explain the long-run performance of manipulated IPOs as well.

4. Data Description and Analysis

To empirically examine the importance of tie-in agreements, we obtain data on common stock IPOs from the Thompson Financial Securities (SDC) database for the 1998-2000 period. Consistent with the prior literature, we remove unit offerings, REITs, ADRs, closed-end funds, and financial firms from the sample. To be covered in our sample, a firm must be covered by the CRSP and COMPUSTAT databases. We obtain accounting data from COMPUSTAT and the returns data from CRSP. The resulting sample consists of 904 IPOs. Next we describe the SEC/NASD civil lawsuits and the private class action lawsuits we use in our analysis and relate these to other IPO characteristics.

4.1. Regulator and Class Action Lawsuits

To measure if a particular IPO is subject to manipulative activities such as tie-in agreements, we look for legal actions by the SEC and NASD and class-action lawsuits against underwriters alleging such activities.

(1) Regulator action: These are SEC/NASD actions against underwriters for tie-in agreements. We obtain the data from the SEC and NASD websites, litigation releases, and reports on the Wall Street Journal of Wells notices sent to underwriters on tie-in activities. These notices were then subsequently followed by legal actions or settlements with penalties. We construct a dummy variable equal to one for the IPO if there was regulator legal action against the IPOs underwriter and 0 otherwise.

(2) Private action: These are class action suits against underwriters for tie-in agreements. We get the data from IPOSecuritiesLitigation.com and Securities Class Action Clearinghouse. We construct a dummy variable equal to one if the IPO was included in class action suits alleging tie-in activities and 0 otherwise.

Out of our total of 904 sample IPOs, 144 have been sued by regulators and 249 have been the subject of class action lawsuits alleging the presence of tie-in agreement by the underwriters. Table 1 provides the yearly distribution of sample IPOs and the number of firms that were sued by regulators as well as firms subject to class action lawsuits. The regulator-sued IPOs are a subset of the class action lawsuit IPOs. The majority of lawsuits pertain to IPOs conducted during years the 1999 and 2000. The sued firms (based on class action lawsuits) accounted for 34% of the total proceeds raised by IPOs during the sample period. As shown in the table, there are 619 Internet and technology stocks in the period.[12] The vast majority (over 95%) of sued firms belong to Internet/technology sector.

Table 2 provides descriptive statistics of the sample firms. In Panel A, we provide the mean and median characteristics of 'sued' and 'non-sued' firms based on regulator lawsuits. Panel B provides the corresponding statistics for litigation under class action lawsuits. We focus on Panel A for our discussion. All results are qualitatively similar in both panels. Several interesting patterns emerge from Table 2. The sued firms have significantly higher offer prices (median of $17) and raised significantly higher proceeds from the market (median of $78 million) as compared to the non-sued firms (medians of $13 and $52.50 million). However, when we investigate accounting numbers, we find that the median sued firm is about half the size of the non-sued firms in terms of their sales. Sued firms are less profitable and a higher proportion of these firms have the backing of a venture capitalist. These findings show that the firms involved in litigation have relatively inferior operating performance at the time of IPO, but they raised significantly higher proceeds in their public issue. These findings are consistent with the fact that the sued IPOs are primarily Internet/technology firms.

The first day return (calculated as the return from the offer price to the first-day closing price) for the median sued IPO is 123.41% (mean of 149.93%) versus 17.26% (mean of 39.71%) for the median non-sued IPO. The median return of a sued firm is about 7 times higher than that of a non-sued firm on the first day of trading, which is significant both in economic and statistical terms. We find similar patterns for the trading volume on the first day of trading as well. While sued IPOs exhibit median turnover (shares traded divided by the shares offered) of 142.40% (mean of 140.92%), the non-sued IPOs have much lower median turnover of 9.54% (mean of 47.58%). We find a distinct pattern in the price revisions from the filing date to the offer date for sued and non-sued IPOs. While the median sued IPO revises its price up 33.33% from the suggested range (mid-point of filing to offer price), the median non-sued IPO revises its price up by only 3.13%.

[12] We combine all of our Internet firms (firms such as uBID and Priceline.Com) with the technology stocks in our later analysis. Thus, in defining technology stocks as Internet plus other technology stocks, we are following the SIC code based classification of Loughran and Ritter (2004).

The median underwriter ranking based on Carter, Dark and Singh (1998) and as modified by Loughran and Ritter (2004), is 9.10 for sued firms as against 8.10 for the other firms. The sued firms are underwritten by large and prestigious underwriters such as Goldman Sachs, JP Morgan, Morgan Stanley and CSFB. This finding is consistent with the deep pockets hypothesis of lawsuits, which argues that investors (and possibly government regulators) are more likely to sue firms and underwriters with more capital in order to profit from the lawsuit. Of course, these are the underwriters who have the ability to enforce tie-in agreements with their investors as well. It is also worth noting that there are other equally prestigious underwriters such as Merrill Lynch and Lehman Brothers who were not sued by either the SEC or NASD.

In summary, our univariate results suggest that the sued-IPOs were underwritten by more prestigious and bigger underwriters, had significantly higher filing-to-offer and first day returns and were traded very actively on the first day of trading relative to non-sued IPOs. Further, the sued IPOs are smaller, less profitable, and are actively backed by venture capitalists.

4.2. Post-IPO Returns and Turnovers

In Tables 3A and 3B we provide the mean buy-and-hold returns for various holding periods after the IPO, starting from the close of the first day of trading. Table 3A uses regulator lawsuits for the definition of sued firms and Table 3B uses class-action lawsuits for the definition of sued firms. We focus on the results of Table 3A in this section since the results are qualitatively similar in both tables.

To analyze the price and return dynamics more precisely after the IPO date, we break the first six month period into six monthly intervals. After the first six months, we provide returns for (a) the period starting from the end of the six month till the first anniversary of the IPO; (b) the period from one year to the second year after the IPO and (c) the period from the second year to the third year after the IPO. We analyze the first and second six-month periods after the IPO separately since the majority of IPOs have lock-up expirations in the sixth month from the IPO date. If the lock up expiration provides insiders with the first possible opportunity to sell the stock and insiders profit from the manipulation, then we expect to see higher trading and larger price drops during the sixth month after an IPO for the firms involved in manipulation.

For each holding period, we provide raw compounded returns as well as buy-and-hold abnormal returns (BHAR) with respect to two benchmark portfolios: (a) returns on the value-weighted market index and, (b) returns on a size-controlled matching firm. This second benchmark follows Ritter (1991) who uses a size-adjusted approach in computing the long-term performance of IPOs. To find a size-controlled firm, we select a seasoned firm that is closest to the market value of IPO firm (based on the offer price) on the IPO date as the benchmark. We make sure that the benchmark firm is at least 5 years old (i.e., it did not go public in the last 5 years). If the benchmark firm delists, we use the next closest market capitalization firm as of the offer date and so on. To compute the BHAR, we first compute the buy and hold return for the control firm and then subtract it from the IPO firm's return for the same holding period. We do this for the various holding periods.

There is a clear pattern that emerges from the analysis of post-IPO returns across sued and non-sued IPOs. In the first month after the IPO the sued firms earn average raw returns (excluding the first day return) of 19.87% against 10.11% earned by the non-sued firms. The difference of 9.76% is statistically significant. Further, as seen from Panels B and C the difference remains significant after adjusting for the market return or the return on the size benchmark. The difference between sued and non-sued groups remains positive till the end of fourth month after the IPO. However the monthly differences in months 2, 3 and 4 are not significant. In the fifth month, the sued firms marginally underperform the non-sued firms, and finally in the sixth month, they significantly underperform the non-sued firms. In all three panels of Table 3A, we find that the sued firms significantly underperform the non-sued firms by 8 to 11% in the sixth month. This underperformance continues for the second half of the first year and in the second year after the IPO. In the third year, these two groups earn almost equal returns.

The returns across various holding periods provide remarkably different pictures of the sued and non-sued IPOs [see Figure 1]. The IPOs with tie-in agreements start with a big run-up in their prices which continues for the first four to five months, after which there is a significant underperformance as compared to the non-sued firms. This pattern is consistent with the implications of the underwriter manipulation model presented in Section 3. In Figure

2, we plot how the wealth of an IPO investor changes over time if she invested $1 in an IPO at the offer price. While the investor in a manipulated IPO experiences a large price run-up soon after the offer, eventually this is reversed and she loses in the medium to long run.

Our model of underwriter manipulation predicts that manipulated stocks trade more often than non-manipulated stocks. For manipulation to be successful, the momentum investors must be present and buying in the aftermarket. The ladderers must also buy and sell shares. Table 4 provides the average turnover across sued and non-sued firms for the first six months after the IPO. We noted earlier that on the first day of trading, sued IPOs trade about 15 times higher than the non-sued IPOs. In the following months, they continue to trade more as shown in Table 4. This finding is consistent with the manipulation hypothesis and previous studies on stock market manipulation. Aggarwal and Wu (2004) find that manipulated stocks exhibit higher turnovers than stocks matched on size and measures of risk. Mei, Wu and Zhou (2004) also find that the turnover of stocks subject to pump-and-dump manipulative schemes is much higher than that of non-manipulated stocks. As reported in Tables 3B and 4, the pattern of returns and trading volume across various holding periods becomes more pronounced if we classify firms into manipulated vs. non-manipulated groups based on class action lawsuits.

4.3. Return around Lock-up Expiration

If underwriters create artificial demand for some IPOs, do insiders benefit? We investigate the returns around the lock-up expiration for a sub-sample of 473 firms for which the lock-up expiration date is available on SDC. Since our sample size drops significantly due to non-availability of lock-up expiration dates, we focus our attention on class action lawsuits for this analysis. Out of 473 firms for which we have data available, 87 were sued for tie-in agreements under class-action lawsuits.[13]

We report the results in Table 5. For our sample of 473 firms, we find a negative market adjusted return of –2.51% (raw return of –2.39%) in the event window starting three days prior to the lock-up expiration date and ending three days after. For the same event window, Brav and Gompers (2003) find market-adjusted returns of –1.08% in their sample of over 2,700 IPOs for the 1988-1996 period. The price-drop around the lock-up expiration date

[13] We only have 40 sued firms if we classify firms by regulator lawsuits. Results from this smaller sub-sample are similar, but statistically weaker due to the small sample size.

has increased during our sample period relative to earlier periods. Cross-sectionally, we find that the sued IPOs experience market-adjusted cumulative returns of -5.96% in the (t-3 to t+3) event window versus -1.73% for the non-sued IPOs. Thus, while the price drop for the non-sued IPOs is comparable to the earlier Brav and Gompers sample period, the sued IPOs exhibit a significantly larger price-drop around the lock-up expiration.

One possible explanation for such a large price drop is that insiders and other investors subject to lock-up restrictions sell a large quantity of shares at the first possible opportunity in those IPOs with artificial manipulation of prices. We showed earlier that the sued IPOs exhibit higher returns for the first four months after the offer date. Subsequently, starting from the sixth month, these firms exhibit significant drops in their prices for the following two years. Using our full sample of 904 IPOs and using returns in the sixth month as a crude proxy for the lock-up event window return, we find that cumulative returns for sued firms (based on regulator lawsuits and using size-adjusted returns) from the end of the first-day of trade to six months post-IPO are 3.67%. The comparable figure for non-sued firms is –2.38%. If we include the first-day return as well, for sued IPOs, the cumulative return is 159.09%, while for non-sued IPOs, the cumulative return is 36.39%. These differences are even more pronounced if we use raw returns or market-adjusted returns or class-action lawsuits. These results suggest that insiders do profit from the manipulation. The return dynamics around the lock-up expiration suggest that insiders know the stock is being manipulated and the stock is overvalued. They are selling the stock in expectation of lower prices when the true value of the stock is revealed in the long run.[14]

4.4. Fundamental Valuations

In Table 6, we provide a summary of the fundamental valuation of the sample IPOs based on the methodology of Purnanandam and Swaminathan (2004). For each IPO firm, we find a comparable seasoned firm in the same industry (based on the Fama-French industry classification) with similar sales and profit margin. IPOs are then valued using the Price-to-

[14] If insiders are unable to fully trade out of their positions at the lock-up expiration, then they will clearly receive lower returns over the subsequent eighteen months. As a matter of theory, for manipulated stocks, since the true value was low, any shares insiders are able to sell prior to the revelation of the true value allows the insiders to profit. As an empirical matter, while Figure 2 does show that in the long-run, non-sued IPOs perform better than sued-IPOs, it is worth recalling that the non-sued IPOs are composed of both high-value stocks and non-manipulated low-value stocks. The sued IPOs are composed of manipulated low-value stocks, so insiders of sued IPOs profit whenever they can sell for more than the low value.

Sales and Price-to-EBITDA multiples of these comparable firms. We then compute the ratio of IPO's offer price to the comparable value and use it as the overvaluation (price-to-value) measure. IPOs in our sample are considerably overvalued compared to their seasoned industry peers. The median overvaluation is 4.59 times for valuation based on the Price-to-Sales ratio. The median overvaluation is 2.69 times for valuations based on the Price-to-EBITDA ratio. These numbers are much higher than the overvaluation of about 1.50 times reported by Purnanandam and Swaminathan (2004) for the 1980-1997 period.

While sued IPOs are overvalued by 11.17 times based on the Price-to-Sales ratio, the corresponding number for non-sued IPOs is 4.01 times. The patterns are similar for valuation based on the Price-to-EBITDA ratio. The Price-to-Value ratio is an objective measure of firm's overvaluation. We take it as a proxy for the perceived hotness of an IPO in our analysis. The sued IPOs command a much higher premium as compared to their industry peers. This, along with the fact that offer price is set at a much higher price than the mid-point of the filing range, indicates that sued IPOs are perceived to be more glamorous than the rest of the IPOs. This is not surprising since the vast majority of our sued IPOs are Internet firms. The first day return and trading volume can be partly attributed to these characteristics of the IPOs. However, as we show later in the analysis, these characteristics alone cannot fully explain the differences between the sued and non-sued IPOs.

5. Tie-in Agreements and IPO Underpricing

In the previous section, we showed that the price patterns for sued IPOs are dramatically different from the price patterns for non-sued IPOs. Further, differences in returns around the lock-up expiration and differences in turnover suggest that there are very different forces that influence sued IPOs relative to non-sued IPOs. In this section, we provide more formal tests of the relations between tie-in agreements, underpricing, turnover, and longer run returns. In particular, we want to control for general market conditions and issuer characteristics to better understand the patterns we observe. An obvious concern is that these results may simply be a function of the fact that the majority of the firms sued were Internet/technology stocks. We now show that this is not the case.

5.1. Multivariate Regressions of First-Day Returns

To assess the impact of manipulative practices of underwriters on IPO underpricing, we run a cross-sectional OLS regression with the first-day return as the dependent variable. Our primary variable of interest is a dummy variable "tie-in" that equals 1 if a firm was sued for tie-in agreements and 0 otherwise. We provide results based on both regulator lawsuits and class action lawsuits.

We use several control variables that have been documented in the literature as explanatory variables for the IPO underpricing. Critically, we include a dummy variable "Tech" that equals one if the firm is an Internet/technology firm, and zero otherwise. We want to separate the effect of tie-in agreements from the effect of simply being an Internet/technology firm. In addition, we include the log of proceeds raised by the firm as a measure of issue-size.[15] The dummy variable "VC" equals one if the firm is backed by a venture capitalist, and zero otherwise. It has been argued in the literature (see Barry (1989) and Habib and Ljungqvist (2001)) that IPO underpricing is higher if firms sell purely primary shares in the IPO. When existing shareholders offer their own shares in the IPO, they have an incentive to minimize the extent of underpricing. We include the fraction of shares sold by the pre-IPO shareholders to control for this affect. This variable, called "insider sale," is defined as the ratio of (total shares offered minus primary shares offered) to (total shares offered). We include the ranking of the underwriter as an explanatory variable to capture the effect of underwriter prestige on IPO underpricing. It has been documented in the literature that there was a negative relation between underwriter prestige and underpricing in the 1980s, which then changed in the 1990s (see Beatty and Welch (1996), and Loughran and Ritter (2004)).

To capture the effect of market conditions at the time of an IPO, we include the return on NASDAQ stocks over a holding period of 15 days prior to the IPO date. A dummy variable, which equals one if there was a positive price revision and zero otherwise, captures the relative hotness of each IPO in the sample. Revision from the filing price to offer price proxies for the investor's interest in an IPO and provides a control for perceived hotness of an IPO in our sample.[16] Finally, we also include year dummies.

[15] We have also repeated our analysis with prior year sales as a measure of size and obtained similar results.
[16] As a robustness check, in unreported results, we also include the Offer-Price-to-Value ratio as described in the previous subsection as a measure of an IPO's perceived hotness and our results are similar.

Our results are reported in Table 7. As before, Panel A provides the results based on regulator lawsuits whereas Panel B provides results for class-action lawsuits. In each panel, we report the results of two models – with and without the year dummies. We do this because virtually all of the sued IPOs are from 1999 and 2000, which coincides with the Internet bubble period. Thus, we want to separately assess the impact of years on our results. Our results indicate that the "tie-in" dummy has positive and significant coefficients in all regression models. Tie-in agreements explain underpricing of 75-85% relative to IPOs without such agreements, even after controlling for various known determinants of IPO underpricing, such as whether the firm is an Internet company. This result is both economically and statistically significant for all four models. In terms of magnitude, the effect of tie-in agreements is larger than any of the other factors. From Table 2, the mean difference in first-day return (underpricing) between sued and non-sued IPOs is 110.22%. Of this, 75 to 85% remains after controlling for characteristics thought to influence underpricing.

We find in our analysis that IPO underpricing is positively affected by the state of the market (NASDAQ return variable) and hotness of the issue (as proxied by the filing revision dummy). We do not find a significant relation between insider sales and IPO underpricing. Similarly the relation between underwriter ranking and underpricing is insignificant. Depending on the model, the technology and Internet stocks earned 10-17% higher returns on first day as compared to other stocks. In our estimation, the coefficient on the year 2000 dummy is insignificant, whereas the year 1999 dummy is significant in only one model. This is a significant result, which indicates that once we control for the existence of manipulative practices, there is hardly any effect attributable to the bubble period of 1999-2000.

We have established that tie-in agreements positively affect the first day returns of IPOs. There is a possibility of endogeneity between tie-in lawsuits and IPO underpricing. It maybe argued that investors sued these IPOs for tie-in arrangements only when the first day returns were very high, followed by subsequent poor performance. The issue of such endogeneity can be addressed in two ways. First, in all of our analysis, we emphasize results for firms that were sued by the SEC/NASD. Given the SEC's and/or NASD's superior access to information and regulatory power, it is hard to imagine that lawsuits brought forward by SEC/NASD were driven solely by returns and not by some degree of merit to the case. The second way in which we address the issue of endogeneity is by instrumental variables, discussed below.

5.2. Two-Stage Regression of Tie-in Lawsuits and First-Day Returns

Lowry and Shu (2001) use a two-stage approach to address the issue of endogeneity between IPO underpricing and IPO lawsuits. They argue that the trading volume on a matching firm (a firm similar to the IPO firm) can be used as an instrument for the probability of lawsuits. Our theoretical model provides an economic motivation for such an instrument. In our context, volume from a matching IPO tells us about the number of momentum investors in the market (or investor sentiment). We argue that matching IPO volume is a good proxy for when there are more momentum traders in the market, and thus is a good instrument for when manipulation happens. For every IPO, we look at the most recent IPO brought to the market by the same underwriter in the last six months and take the first-day turnover of that IPO as an instrument for the probability of tie-in associated with the IPO. In a few cases, we are unable to find an IPO by the same underwriter in the last six months. In these cases, we take the turnover on the most recent (in calendar time) IPO as an instrument.[17] We take a log transformation of this variable to remove the skewness in turnover data.

Aside from our theoretical motivation, there is no other economic reason to believe that there would be any correlation between the first-day return on an IPO and the trading volume of another IPO brought to the market by the same underwriter after controlling for general market conditions. Our theoretical motivation is that if underwriters engage in manipulative practices requiring IPO investors to buy additional shares on the first-day of trading, the probability of lawsuits could be correlated with the turnover on the matched IPO, since turnover on the matched IPO (investor sentiment) will indicate when it is worthwhile to have tie-in agreements. Indeed, we find such a statistical correlation in the data. While trading volume on the matched IPO has explanatory power for the probability of lawsuits, it has no such power to explain the first-day return after controlling for know determinants of IPO underpricing.

[17] Our results remain similar if in our analysis we do not include IPOs for which we could not find a matched IPO by the same underwriter.

With this instrument, we estimate the following regression model in a two-stage instrumental variable regression framework:

$$R_0 = \sum \alpha_k X_k + \beta_{tie-in} TieIn + \varepsilon_r$$

$$TieIn = \sum \gamma_k X_k + \delta Turnover_{Match} + \varepsilon_t$$

In the above structural equations, R_0 refers to the first day return on IPO, X_k*'s* are all the control variables discussed earlier, "*TieIn"* is a dummy variable that equals 1 for manipulated stocks and zero otherwise. $Turnover_{Match}$ refers to the turnover on matched IPO from the same underwriter in the recent past. Since the equation of interest (the first day return model) is linear, we can estimate the model simultaneously by using a 2SLS approach (see Wooldridge (2002)). In the first stage we regress the "tie-in" dummy on all exogenous variables and the instrument and obtain the predicted "Tie-In Probabilities" which are subsequently used in the second stage as the explanatory variable in the first day return model. As a further robustness check, we re-estimate all models by first running a probit model with the occurrence of a lawsuit as the dependent variable and all other explanatory variables including the instrument (turnover on the matched IPO) as independent variables. The predicted value of the probability of tie-in lawsuits from the first stage regression is used as an independent variable in the second stage and errors are corrected since the predicted values are used in the second stage regression (see Maddala (1983)). Our results from both models are similar. To conserve space, we provide and discuss results based on the 2SLS model only. All t-statistics are based on heteroskedasticity corrected robust standard error.

The estimation results are provided in Table 8. In this table, we replace the 'tie-in' dummy with the estimated tie-in probability from the first stage regression. Our main results remain similar. Consistent with the manipulation hypothesis, we find a positive and significant coefficient on the tie-in probability variable. Firms with higher likelihood of tie-in manipulation earn significantly higher first-day returns. The economic magnitude of this effect is broadly in line with the model without endogeneity correction (Table 7). In the instrumental variable regression, we find that the year dummies have become completely insignificant and in some cases even negative. This provides evidence that the extremely high level of underpricing of years 1999 and 2000 is successfully explained by the subset of manipulated IPOs.

5.3 First-day Trading Volume

The determinants of the trading volume of an IPO in the immediate aftermarket are not well understood since the current theoretical models and empirical studies have mostly focused on explaining the observed pattern of first day return. Our model predicts that in the presence of manipulation, manipulated stocks will exhibit higher trading volume than other IPOs. Consistent with this hypothesis, we showed earlier that indeed manipulated IPOs have significantly higher turnover than the non-manipulated group in the aftermarket. In this section, we provide a more formal test of this hypothesis.

First day turnover is defined as the shares traded on the IPO date scaled by the shares offered in the public issue. We take a log transformation of the variable to remove the skewness from the data. As in our first day return analysis, we consider the probability of lawsuits and first day trading volume as endogenous variables in our model. We obtain the probability of lawsuit in first stage regression by fitting a linear probability model on all exogenous variables that enter our first day return regression, i.e., the probability of tie-in variable that we use for the turnover model is the same as in the return model. Subsequently in the second stage regression, we regress the first-day turnover on the predicted probability of lawsuits and control variables. Unlike the return model, however, we do not have well developed theoretical guidance on the cross-sectional determinants of the trading volume. Therefore, we use proxies for market condition (NASDAQ return on prior 15 days), the perceived hotness of the IPO (filing to revision offer dummy) and the size of the offer (log proceeds) as our control variables in the regression. We also use yearly dummies to control for year effects in a separate model.

We provide the results of this analysis in Table 9. As before, Panel A is based on regulator lawsuits and Panel B is based on class action lawsuits. Our results strongly support the hypothesis that IPOs with tie-in agreements have significantly higher turnover than the other IPOs on the first day of trading. Our results also indicate that the glamour IPOs (those with positive revision in filing to offer) have higher turnover. The effect of market conditions and size of the issue on first day turnover is inconclusive.

5.4. Short, Medium and Long Run Returns

As a final test, we extend our instrumental variable specification to longer-term returns. We want to see if the estimated tie-in probabilities explain returns over several time horizons: 1) between the end of the first day of trade and one month post-IPO (short term), 2) between two months and six months post-IPO (medium term), and 3) between six months and three years post-IPO (long term). Consistent with existing empirical work, we control for the market returns, firm size and book-to-market value of IPO in these cross-sectional regressions. The results are in Table 10. The tie-in agreement probability is at best marginally significantly related to returns in the first month excluding the first day of trade. Interestingly, the tie-in agreement probability is negatively and significantly related to returns between two and six months post-IPO (medium term). One interpretation of this result is that the manipulators (ladderers) have unwound their positions by the end of the first month by selling to the momentum investors and as a result, the stock is reverting to its true value. The tie-in agreement probability is negatively and significantly related to returns between six months and three years post-IPO. This result is consistent with the idea that reversion to the true value occurs over a fairly long time horizon.

Overall our results establish a strong connection between manipulation and first day IPO returns and turnover. Further, the price patterns during the first few months, in the lock-up expiration month, as well as in the long-term provide additional evidence in support of our key hypothesis that tie-in agreements explain a large part of the IPO underpricing during the late 1990s.

6. Conclusion

We provide an alternative explanation for the extremely high level of IPO underpricing during the Internet bubble years of 1999-2000. Our explanation is based on manipulative practices in the form of tie-in agreements adopted by the underwriters during the IPO process. By requiring their IPO customers to buy the stock in the aftermarket in return for IPO allocations, the underwriters created an artificial excess demand for the IPOs, leading to distorted price levels in the immediate after-market. First we provide a theoretical model of IPO manipulation in the presence of tie-in agreements and derive predictions on the aftermarket price patterns of manipulated and non-manipulated IPOs. Then, we show empirically that the IPOs with tie-in agreements exhibit a significantly different pattern for the first-day and long-term returns than the rest of the IPOs during the same period. IPOs with tie-in agreements experience considerably higher filing-to-offer return, about 7 times higher first-day return, and 15 times higher first-day trading volume. However, these stocks under-perform significantly as compared to non-tie-in IPOs in the subsequent periods. We find that the tie-in IPOs experience significantly higher volume and lower returns around the lock-up expiration event window. Our results remain robust after controlling for hot market conditions and issuer characteristics such as insider ownership, age of the firm, underwriter quality, venture capitalist backing, and whether the firm is an Internet/technology. Our main result is that manipulation explains most of the unusual IPO underpricing from the late 1990s.

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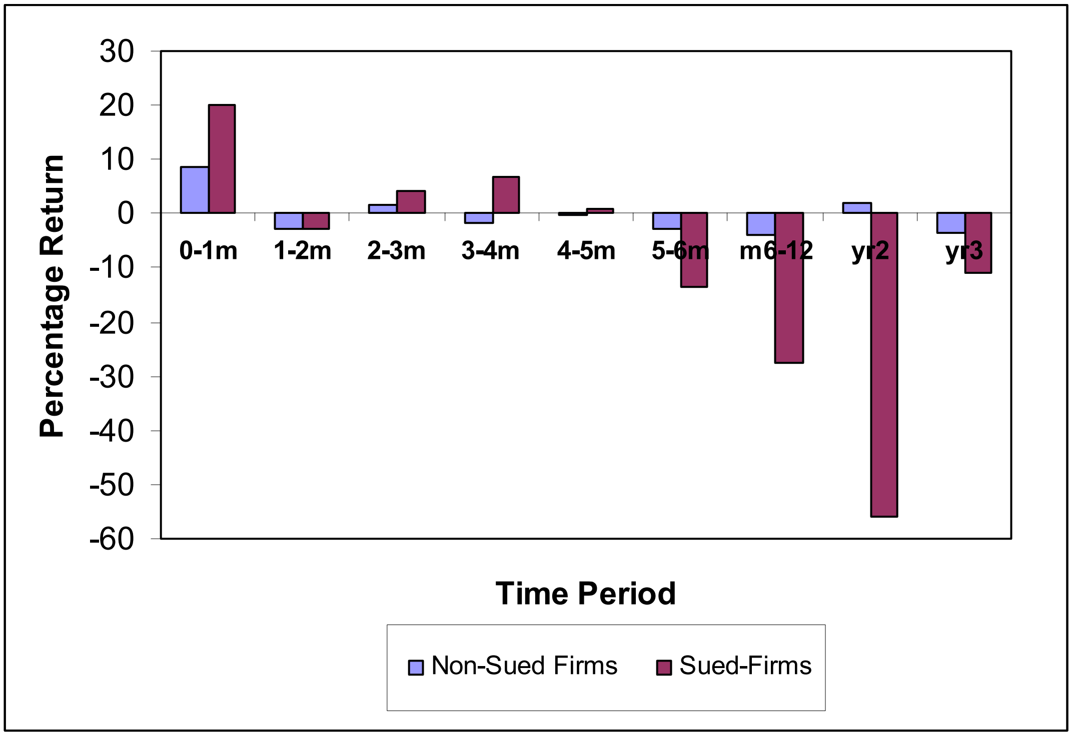
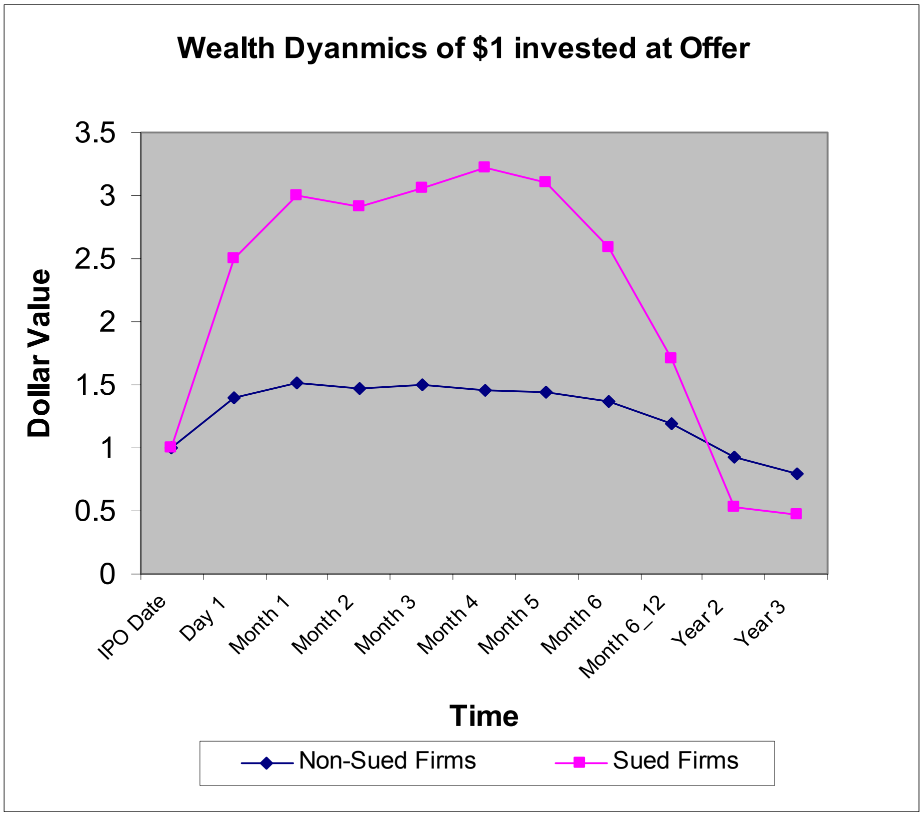
Figure 1
Post IPO Returns



In this figure we plot the raw buy and hold return earned by 'sued' and 'non-sued' IPOs. We plot monthly returns for first six months followed by returns second half of the first calendar year (month 6-12), year 2 and year 3.

Figure 2
Return Earned by a Buy and Hold IPO Investor



We plot the cumulative return earned by a buy and hold investor who buys the IPO at the offer price. The IPO investor invests $1 in the IPO at the offer price and earns the average return for the given holding period. We plot the dynamics of this investor's wealth if she invested in 'sued' or 'non-sued' group. The classification of firms in 'sued' vs. 'non-sued' category, for this figure, is based on regulator's lawsuit.

Table 1
Yearly Distribution of IPOs

In this table, we report the yearly distribution of IPOs in the sample. We follow Loughran and Ritter (2004) to classify firms into Internet/Technology stocks. The table provides the number of IPOs that were sued for tie-in agreements by the underwriters both by the regulators and with class-action lawsuits. The last column provides the proceeds raised by sued-IPOs (based on class action lawsuit) as a percentage of total proceeds raised by sample IPO firms in a given year.

Year	# of IPOs in Sample	Internet/ Technology Stocks	Firms with tie-in Lawsuits	Firms with SEC tie-in Lawsuits	% Proceeds raised by sued firms
1998	217	101	8	2	5.12%
1999	384	295	152	85	41.74%
2000	303	223	89	57	38.73%
Total	904	619	249	144	34.00%

Table 2
Characteristics of Sample IPOs

We provide the mean and median characteristics of sample firms in this table. Panel A is based on regulator lawsuits (i.e., lawsuits by SEC or NASD), whereas Panel B uses class action lawsuits. For both panels, we provide the mean and median characteristics of 'sued' and 'non-sued' firms. The last two columns report the difference and its t-statistics (Wilcoxson z-test for the median). Net proceeds are the amount of funds raised in the IPO net of underwriters' commissions. First-day return is computed from the offer price to the first day closing price. Filing to offer revision provides the percentage revision from the mid-point of filing range to the offer price. Underwriter ranking comes from Carter et al. (1998) as modified by Loughran and Ritter (2004). IPO Turnover represents the number of shares traded on first-day of trading as a percentage of shares offered in the IPO. Sales and EBITDA margins are from the fiscal year prior to the IPO. There are 144 firms (760) under 'sued firm' ('non-sued') category for Panel A and 249 (655) firms under that category for Panel B. Statistics based on accounting numbers (Sales, EBIDTA margin and %of firms with negative margin) are based on a smaller sample of 755 firms since we require coverage on COMPUSTAT for the prior fiscal year to compute these numbers.

Panel A: Based on Regulator Lawsuits

	Mean				Median			
	Sued Firms	**Non-Sued Firms**	**Difference**	**t-stat**	**Sued Firms**	**Non-Sued Firms**	**Difference**	**z-stat**
Offer Price ($)	18.61	13.26	5.35	11.58	17.00	13.00	4.00	10.07
Net Proceeds (mn $)	105.63	73.21	32.42	4.09	78.40	52.50	25.90	6.45
First Day Return (%)	149.93	39.71	110.22	16.04	123.41	17.26	106.15	13.84
Filing to Offer Revision (%)	42.33	5.98	36.35	12.04	33.33	3.13	30.21	11.41
Underwriter Ranking	9.08	7.80	1.28	8.30	9.10	8.10	1.00	10.97
IPO Turnover (%)	140.92	47.58	93.34	15.67	142.40	9.54	132.86	12.79
Sales(mn $)	107.79	146.47	-38.68	-0.38	7.80	15.09	-7.29	-3.42
EBITDA Margin	-10.55	-8.90	-1.65	-0.23	-0.80	-0.18	-0.62	-5.12
% of firms with negative margin	79.83%	58.49%	21.34%					
% of firms with VC backing	79.86%	52.58%	27.28%					
NOBS	144	760						

Panel B: Based on Class Action Lawsuits

	Mean				Median			
	Sued Firms	**Non-Sued Firms**	**Difference**	**t-stat**	**Sued Firms**	**Non-Sued Firms**	**Difference**	**z-stat**
Offer Price ($)	17.03	12.99	4.04	10.53	16.00	12.50	3.50	9.42
Net Proceeds (mn $)	95.48	71.59	23.89	3.64	72.00	49.70	22.30	5.84
First Day Return (%)	136.98	26.83	110.15	21.05	112.93	11.35	101.58	16.30
Filing to Offer Revision (%)	35.58	2.61	32.97	13.67	30.00	0.00	30.00	12.15
Underwriter Ranking	8.77	7.72	1.05	8.26	9.10	8.10	1.00	6.95
Turnover (%)	106.78	45.35	61.43	11.97	121.00	7.96	113.04	6.79
Sales(mn $)	70.07	167.40	-97.33	-1.17	7.68	17.00	-9.32	-5.30
EBITDA Margin	-19.03	-5.43	-13.60	-2.30	-0.92	-0.10	-0.82	-6.08
% of firms with negative margin	81.73%	54.29%	27.44%					
% of firms with VC backing	78.71%	48.62%	30.09%					
NOBS	249	655						

Table 3A
Holding Period Mean Return
Based on Regulator Lawsuits

This table presents the buy-and-hold returns for sued and non-sued IPOs (based on regulator's litigation) for various holding periods after the offer date. The first panel provides raw buy and hold returns. Panel B and C provide returns adjusted for (a) value weighted market index and (b) returns on a similar size firm. For size adjustment, first we consider all seasoned firms (firms without an IPO in the last five year) on the CRSP tape as of the offer date and take the firm with closest market cap to the IPO firm (based on IPO firm's offer price) as the control firm. If this firm delists within the holding period, we take the next closest firm as benchmark and so on. The size adjusted return is simply the difference between IPO buy and hold return and control firm's buy and hold return for the same period. In the first six columns of each panel, we provide the monthly returns. For example, column labeled '0-1m' corresponds to the return on various portfolios during the first month of an IPO (excluding the first day return), '1-2m' corresponds to return earned in month 2 (i.e., starting from the end of first month to the end of second month) and so on. Subsequent columns provide returns for (a) 6-12 months after the IPO, (b) second year after the IPO and (c) third year after the IPO. If an IPO delists within a given holding period, we compute returns from the beginning of the holding period till the delisting date. We provide the difference between the two groups and the corresponding t-stats in the table. The t-stats are corrected for heteroskedasticity.

Panel A: Raw Returns

	0-1m	1-2m	2-3m	3-4m	4-5m	5-6m	m6-12	yr2	yr3
All Firms	11.66	-2.71	2.29	0.66	-0.02	-5.62	-10.50	-14.50	-5.78
Non-sued	10.11	-2.84	1.74	-0.53	0.25	-4.21	-7.13	-5.90	-5.44
Sued	19.87	-2.06	5.16	6.93	-1.43	-13.00	-28.30	-58.00	-7.36
Difference	9.76	0.78	3.42	7.46	-1.68	-8.79	-21.17	-52.10	-1.92
t-stat	2.28	0.21	1.00	1.93	-0.50	-3.01	-2.73	-6.59	-0.22

Panel B: Market Adjusted Returns

All	10.37	-2.70	2.46	0.12	-0.89	-6.04	-11.20	-6.61	3.36
Non-sued	8.97	-2.71	1.84	-0.91	-0.78	-4.61	-8.58	0.40	3.29
Sued	17.80	-2.63	5.74	5.53	-1.46	-13.60	-24.80	-41.90	3.69
Difference	8.83	0.08	3.90	6.44	-0.68	-8.99	-16.22	-42.30	0.40
t-stat	2.15	0.02	1.21	1.75	-0.22	-3.25	-2.19	-5.54	0.05

Panel C: Size Adjusted Returns

All	10.63	-2.89	2.05	-1.23	-1.96	-6.96	-16.20	-30.00	-13.20
Non-Sued	8.89	-2.89	1.41	-2.44	-1.66	-5.11	-12.80	-22.50	-13.80
Sued	19.74	-2.92	5.41	5.10	-3.48	-16.60	-34.40	-69.00	-10.30
Difference	10.85	-0.03	4.00	7.54	-1.82	-11.49	-21.60	-46.50	3.50
t-stat	2.46	-0.01	1.14	1.75	-0.49	-3.63	-2.44	-5.01	0.41

Table 3B
Holding Period Mean Return
Based on Class Action Lawsuits

This table replicates Table 3A for classification of 'sued' and 'non-sued' firms based on class-action lawsuits.

Panel A: Raw Returns

	0-1m	1-2m	2-3m	3-4m	4-5m	5-6m	m6-12	yr2	yr3
All Firms	11.66	-2.71	2.29	0.66	-0.02	-5.62	-10.5	-14.5	-5.78
Non-sued	8.54	-2.69	1.52	-1.7	-0.42	-2.68	-4.02	2.14	-3.49
Sued	19.89	-2.77	4.31	6.87	1.04	-13.4	-27.5	-56.1	-10.9
Difference	11.35	-0.08	2.79	8.57	1.46	-10.72	-23.48	-58.24	-7.41
t-stat	3.22	-0.03	0.98	2.88	0.51	-4.53	-3.78	-7.24	-1.07

Panel B: Market Adjusted Return

All	10.37	-2.70	2.46	0.12	-0.89	-6.04	-11.2	-6.61	3.36
Non-sued	7.56	-2.33	1.73	-1.91	-1.37	-3.23	-6.09	6.94	4.43
Sued	17.78	-3.68	4.39	5.47	0.38	-13.40	-24.50	-40.40	0.98
Difference	10.22	-1.35	2.66	7.38	1.75	-10.17	-18.41	-47.34	-3.45
t-stat	3.02	-0.49	0.98	2.59	0.66	-4.61	-3.10	-6.04	-0.53

Panel C: Size Adjusted Return

All	10.63	-2.89	2.05	-1.23	-1.96	-6.96	-16.20	-30.00	-13.20
Non-Sued	7.16	-2.09	1.48	-3.52	-2.28	-3.58	-9.07	-16.00	-13.10
Sued	19.66	-4.99	3.56	4.73	-1.12	-15.8	-35.00	-66.30	-13.60
Difference	12.50	-2.90	2.08	8.25	1.16	-12.22	-25.93	-50.30	-0.50
t-stat	3.43	-0.93	0.71	2.59	0.37	-4.73	-3.64	-5.67	-0.06

Table 4
Average Turnover

This table provides the average daily turnover for first six months after an IPO for the sample of sued and non-sued firms. We compute the daily turnover as the ratio of shares traded divided by shares outstanding and report the average of these daily turnovers (in percentage) over the given month in the table below. Panel A provides the turnover for sued and non-sued firms based on regulator lawsuits for the tie-in agreements. Panel B provides corresponding numbers for the firms sued under class action lawsuits. The difference between the two samples and corresponding t-stats are provided in the table.

	0-1 Month	1-2Month	2-3Month	3-4Month	4-5Month	5-6Month
Panel A: Based on Regulator Lawsuits						
All	3.24	1.20	0.96	0.89	0.95	0.94
Non-Sued	3.16	1.18	0.92	0.84	0.90	0.88
Sued	3.69	1.27	1.14	1.12	1.20	1.24
Difference	0.53	0.09	0.22	0.28	0.30	0.36
t-stat	1.63	0.63	2.11	2.89	2.81	3.88
Panel B: Based on Class Action Lawsuits						
All	3.24	1.20	0.96	0.89	0.95	0.94
Non-Sued	2.83	1.07	0.82	0.76	0.81	0.79
Sued	4.33	1.54	1.33	1.21	1.31	1.31
Difference	1.50	0.47	0.51	0.45	0.50	0.52
t-stat	4.63	3.41	4.88	5.30	5.06	5.86

Table 5
Lock-Up Expiration Returns

We provide the average returns for the sample of sued and non-sued IPOs around the lock-up expiration date. We provide the statistics for four different event windows around the lock-up expiration date (the event date). These windows correspond to: (a) three days prior to the event date till three days after the event date (-3 to +3), (b) two days prior to two days after (-2 to +2), (a) one day prior to one day after (-1 to +1) and (d) the event day (0) itself. This table is based on a sample of 473 IPOs (87 sued under class action lawsuits, 386 non-sued) for which the data on lock up expiration was available in SDC.

	Cumulative Returns							
	Raw Return				**Market-Adjusted Return**			
Event Window	-3 to +3	-2 to +2	-1 to +1	0	-3 to +3	-2 to +2	-1 to +1	0
All Firms	-2.39%	-2.09%	-1.65%	-1.30%	-2.51%	-2.14%	-1.67%	-1.25%
Sued	-5.62%	-4.89%	-3.12%	-2.60%	-5.96%	-4.87%	-3.04%	-2.35%
Non-Sued	-1.66%	-1.46%	-1.32%	-1.01%	-1.73%	-1.53%	-1.36%	-1.00%
Difference	-3.96%	-3.43%	-1.80%	-1.59%	-4.23%	-3.35%	-1.68%	-1.34%
t-stat	*-1.54*	*-1.53*	*-0.97*	*-1.42*	*-1.71*	*-1.54*	*-0.93*	*-1.22*

Table 6
Fundamental Valuations

This table provides Median and Mean offer-price to fundamental value (P/V) ratios for the sample firms. Panel A is based on the regulator lawsuits while Panel B reports statistics based on class action lawsuits. We match each IPO to a seasoned firm in the same industry (based on Fama-French classification) and having similar sales and profit margin. IPOs are valued based on the Price-to-Sales and the Price-to-EBITDA margins of these comparable firms. This table reports the ratio of an IPO's offer price (P) to its value (V) computed in this manner. There are 753 IPOs for P/Sales based multiples and 252 IPOs for the P/EBITDA based multiples.

Panel A: Based on Regulator Lawsuits

Median

Multiples	All Firms	Sued	Non-Sued	Difference	Z-stat
P/Sales	4.59	11.17	4.01	7.16	*5.91*
P/EBIDTA	2.69	5.95	2.65	3.30	*1.56*

Mean

	All Firms	Sued	Non-Sued	Difference	t-stat
P/Sales	12.03	20.58	11.17	9.41	*4.44*
P/EBIDTA	7.99	26.07	5.95	20.12	*5.05*

Panel B: Based on Class Action Lawsuits

Median

Multiples	All Firms	Sued	Non-Sued	Difference	Z-stat
P/Sales	4.59	6.47	3.84	2.63	*5.03*
P/EBIDTA	2.69	4.74	2.60	2.14	*1.95*

Mean

	All Firms	Sued	Non-Sued	Difference	t-stat
P/Sales	12.03	16.67	10.35	6.32	*3.41*
P/EBIDTA	7.99	20.22	6.35	13.87	*4.49*

Table 7
Cross-Sectional Regression of First Day Return

In this table, we provide the results of OLS regressions with first-day return as dependent variable. The table provides the parameter estimates and t-statistics for two different models. The t-stats are corrected for heteroskadisticiy in the sample. The R-squared and the number of observations in each model are provided at the bottom of the table. In Panel A, tie-in dummy equals 1 if there is a regulator lawsuit, zero otherwise. In Panel B, tie-in dummy refers to class action lawsuits. NASDQ return measures the return earned on NASDAQ value weighted index in prior 15 day period from the issue date. Log Proceeds measures the proceeds raised in the IPO in millions of dollars. VC dummy equals 1 if the IPO is backed by a venture capitalist, zero otherwise. Tech dummy equals 1 if the firm belongs to high tech industry as defined by Loughran and Ritter (2004). Insider sale measures the percentage of IPO shares that were sold by the pre-IPO shareholders of the firm. When offer price is set above the filing price, we set positive revision dummy to 1, zero otherwise. Underwriter ranking measures the reputation of underwriter as described in Carter et al. (1998) and modified by Loughran and Ritter (2004).

Panel A: Based on Regulator Lawsuit

	Model 1		**Model 2**	
	Estimate	**t-stat**	**Estimate**	**t-stat**
Intercept	-28.41	-3.30	-29.68	-3.47
Tie-In Dummy	76.92	7.89	75.74	7.74
NASDAQ Return (last 15 days)	1.77	5.29	1.69	4.72
Log Proceeds	4.54	1.35	3.97	1.19
VC Dummy	17.13	3.37	16.00	3.17
Tech Dummy	17.10	3.66	15.69	3.21
Insider Sales	8.69	0.58	9.85	0.65
Positive Revision Dummy	43.39	10.10	42.98	10.17
Underwriter Ranking	0.74	0.45	0.62	0.38
Year 99 Dummy			11.48	2.13
Year 00 Dummy			4.43	0.79
R-squared	35.09%		35.21%	
No of observations	881		881	

Panel B: Based on Class Action Lawsuit

	Model 1		**Model 2**	
	Estimate	**t-stat**	**Estimate**	**t-stat**
Intercept	-17.91	-2.17	-18.37	-2.22
Tie-In Dummy	83.81	11.41	83.28	10.94
NASDAQ Return (last 15 days)	1.40	4.59	1.38	4.21
Log Proceeds	2.00	0.62	1.84787	0.58
VC Dummy	11.77	2.39	11.49	2.35
Tech Dummy	9.97	2.39	9.64	2.24
Insider Sales	18.42	1.29	18.75	1.30
Positive Revision Dummy	37.23	8.65	37.18	8.67
Underwriter Ranking	0.58	0.39	0.56	0.37
Year 99 Dummy			3.16	0.58
Year 00 Dummy			1.34	0.24
R-squared	40.99%		41.01%	
No of observations	881		881	

Table 8
First Day Return: Instrumental Variable Regression

This table provides the results of simultaneous equation estimation of the first day return and litigation probability. We provide the results of second stage estimation in Panel A and Panel B for regulator lawsuits and class action lawsuits respectively. The litigation probability is instrumented with the first day turnover (first day shares traded as a percentage of shares offered) on the most recent IPO by the same underwriter. In some cases where there is no recent IPO by the same underwriter, we take the turnover on any other most recent IPO. The two equations are estimated with two stage least square method with litigation probability in a linear probability model framework and the first day return in an OLS framework. All standard errors are robust.

Panel A: Based on Regulator Lawsuits

	Model 1		**Model 2**	
	Estimate	**t-stat**	**Estimate**	**t-stat**
Intercept	-17.60	-0.80	-21.65	-0.94
Tie-In Probability	102.90	2.31	94.52	1.96
NASDAQ Return (last 15 days)	1.69	4.58	1.64	4.21
Log Proceeds	4.08	1.06	3.79	0.97
VC Dummy	15.96	2.73	15.50	2.71
Tech Dummy	13.74	1.66	13.56	1.67
Insider Sale	0.01	0.04	0.04	0.17
Positive Revision Dummy	40.11	5.53	40.52	5.47
Underwriter Ranking	-0.08	-0.04	0.04	0.02
Year 99 Dummy			9.79	1.19
Year 00 Dummy			3.11	0.37
R-square	28.51%		28.99%	
No of observations	871		871	

Panel B: Based on Class Action Lawsuits

	Model 1		**Model 2**	
	Estimate	**t-stat**	**Estimate**	**t-stat**
Intercept	2.87	0.10	6.20	0.18
Tie-In Probability	126.07	2.35	132.79	1.97
NASDAQ Return (last 15 days)	1.08	2.05	1.04	1.73
Log Proceeds	0.12	0.03	0.43	0.1
VC Dummy	7.11	0.89	7.30	0.91
Tech Dummy	1.18	0.09	0.69	0.05
Insider Sale	0.12	0.62	0.11	0.49
Positive Revision Dummy	29.57	2.77	28.64	2.32
Underwriter Ranking	-0.70	-0.28	-0.83	-0.31
Year 99 Dummy			-6.28	-0.43
Year 00 Dummy			-4.52	-0.41
R-square	29.39%		29.24%	
No of observations	871		871	

Table 9
First Day Trading Volume: Instrumental Variable Regression

This table provides the results of two stage regression estimation of the first day trading volume. We model the first day trading volume and the probability of litigation as endogenous variables in the model. We provide the results of second stage estimation in Panel A and Panel B for regulator lawsuits and class action lawsuits respectively. The litigation probability is instrumented with the first day turnover (first day shares traded as a percentage of shares offered) on the most recent IPO by the same underwriter. In some cases where there is no recent IPO by the same underwriter, we take the turnover on the most recent IPO. The two equations are estimated with two stage least square method with litigation probability in a linear probability model framework and the first day turnover in an OLS framework. All standard errors are robust.

Panel A: Based on Regulator Lawsuits

	Model 1		**Model 2**	
	Estimate	**t-stat**	**Estimate**	**t-stat**
Intercept	3.79	21.35	3.62	22.66
Tie-In Probability	2.23	7.76	1.76	6.32
NASDAQ Return (last 15 days)	0.00	0.09	0.00	0.59
Log Proceeds	0.07	1.48	0.04	1.03
Positive Revision Dummy	0.21	2.51	0.25	3.30
Year 99 Dummy			0.47	5.37
Year 00 Dummy			0.40	4.34
R-squared	18.29%		26.46%	
No of observations	871		871	

Panel B: Based on Class Action Lawsuits

	Model 1		**Model 2**	
	Estimate	**t-stat**	**Estimate**	**t-stat**
Intercept	3.83	21.90	3.26	29.10
Tie-In Probability	2.05	9.05	0.15	2.45
NASDAQ Return (last 15 days)	-0.01	-1.55	0.01	2.40
Log Proceeds	0.03	0.66	0.12	3.96
Positive Revision Dummy	0.07	0.77	0.49	10.15
Year 99 Dummy			0.71	12.12
Year 00 Dummy			0.62	9.72
R-squared	20.11%		35.97%	
No of observations	871		871	

Table 10
Post-IPO Buy and Hold Returns: Instrumental Variable Regression

This table provides regression results for buy and hold return on IPOs over various holding period. In Model 1 (short term), the dependent variable is the log(1+First Month Return on IPOs excluding the first day return). In Model 2 (medium term) the dependent variable is log (1+Buy and Hold return during months 2 to 6 after an IPO). Finally in Model 3 (long term) the dependent variable is log(1+Buy and Hold return starting from the sixth month after the IPO till its 3 year anniversary). We regress these buy and hold returns on the log (1+ market return) for the corresponding calendar period, log of the size of IPO firm, its book to market ratio and predicted value of tie-in probability. The predicted tie-in probability comes from the first stage regression of tie-in dummy (based on the regulator lawsuit in Panel A and on class action lawsuit in Panel B). Market return is computed by compounding the returns on value weighted NYSE/AMEX/NASDAQ return. Size is computed as (shares outstanding x offer price of the IPO). B/M ratio is based on the book value as of the most recent fiscal year-end after the offer date. Market value for the computation of B/M ratio is same as the size variable described above. Due to a few missing observations on book-values, these regressions are estimated for 783 observations only.

Panel A: Based on Regulator Lawsuits

	Model 1 Short Term		**Model 2 Medium Term**		**Model 3 Long Term**	
	Estimate	**t-stat**	**Estimate**	**t-stat**	**Estimate**	**t-stat**
Intercept	0.0532	0.66	-0.6777	-4.03	-0.9949	-2.21
Log Market Return	3.0182	13.25	3.7221	15.80	2.2799	7.39
Log Size	-0.0144	-0.90	0.0650	1.93	0.0232	0.26
B/M Ratio	0.0277	1.41	0.0878	2.13	0.0268	0.19
Tie-in Probability	0.1837	1.89	-0.4627	-2.26	-1.5880	-2.96
R-square	20.47%		24.49%		16.95%	

Panel B: Based on Class-Action Lawsuits

	Model 1 Short Term		**Model 2 Medium Term**		**Model 3 Long Term**	
	Estimate	**t-stat**	**Estimate**	**t-stat**	**Estimate**	**t-stat**
Intercept	-0.0335	-0.48	-0.7269	-4.89	-0.7082	-1.88
Log Market Return	3.1047	13.49	3.9778	16.10	1.8360	5.29
Log Size	0.0058	0.42	0.0888	2.99	-0.0198	-0.27
B/M Ratio	0.0265	1.36	0.0853	2.06	0.0352	0.26
Tie-in Probability	0.0157	0.25	-0.5607	-4.21	-1.3796	-3.85
R-square	20.52%		25.26%		18.29%	