

The Pricing of Initial Public Offerings: Tests of Adverse-Selection and Signaling Theories

Roni Michaely
Cornell University

Wayne H. Shaw
University of Colorado at Boulder

We test the empirical implications of several models of IPO underpricing. Consistent with the winner's-curse hypothesis, we show that in markets where investors know a priori that they do not have to compete with informed investors, IPOs are not underpriced. We also show that IPOs underwritten by reputable investment banks experience significantly less underpricing and perform significantly better in the long run. We do not find empirical support for the signaling models that try to explain why firms underprice. In fact, we find that (1) firms that underprice more return to the reissue market less frequently, and for lesser amounts, than firms that underprice less, and (2) firms that underprice less experience higher earnings and pay higher dividends, contrary to the models' predictions.

We would like to thank Franklin Allen, Michael Barclay, Randolph Beatty, Pradeep Chintagunta, Bob Gibbons, Maureen O'Hara, Tim Opler, Jay Ritter, Ivo Welch, William Wilhelm, Kent Womack, and seminar participants at the University of Colorado at Boulder, the Cornell-Rochester Symposium, MIT, New York University, Rice University, the Stockholm School of Economics, the University of Texas-Austin, the University of Waterloo, the Wharton School, the Workshop in International Corporate Finance at the HEC Group, Tel-Aviv University, and the University of Utah for many helpful comments, and Barbara Lougee and Heather Wier for their research assistance. Special thanks are due to an anonymous referee and Rick Green (the editor) for extensive comments and suggestions that improved the article markedly. An earlier version entitled, "Asymmetric Information, Adverse Selection, and the Pricing of Initial Public Offerings," was presented at the 1992 Western Finance Association meetings. Address correspondence to Roni Michaely, Johnson Graduate School of Management, Cornell University, Ithaca, NY 14853-4201.

The underpricing of initial public offerings (IPOs) is a well-documented phenomenon.¹ For example, Ibbotson, Sindelar, and Ritter (1988) find that the average first-day IPO return is 16.3 percent in the years 1960-1987. Several reasons why a firm would willingly underprice its securities at the cost of limiting the funds received have been proposed. This article tests the implications of several such theoretical explanations of IPO underpricing. We derive empirical implications for the winner's curse [Rock (1986), Beatty and Ritter (1986), Carter and Manaster (1990)] and signaling-based models [Allen and Faulhaber (1989), Grinblatt and Hwang (1989), Welch (1989)] and test them using a sample of IPOs from the years 1984-1988.²

Rock (1986) constructs a model for the IPO market with two types of investors. The first consists of outside investors who have better knowledge about the prospective cash flow than does the entrepreneur. The second type, uninformed outside investors, lack special knowledge about the firm's future cash flow. This information asymmetry may lead to a "lemons problem," where the uninformed investors end up primarily with the less successful IPOs. Keeping them in the market, therefore, requires an additional premium—the average underpricing of all IPOs. Ibbotson (1975) conjectures that new issues may be underpriced to "leave a good taste in investors' mouths." In a formalization of this statement, Allen and Faulhaber (1989), Grinblatt and Hwang (1989), and Welch (1989) hypothesize that the owner's incentive to leave a good taste is due to the possibility of coming back to the market to sell securities on more favorable terms.

The basic idea behind the tests of the adverse-selection models is quite simple. First, underpricing should decrease as information becomes less heterogeneous across investor groups. At the extreme, when all outside investors possess the same information about the firm, there should not be any underpricing, according to Rock's model. Second, through the choice of the underwriter, the firm can reduce some of the uncertainty about its prospects and therefore reduce the need for underpricing [Carter and Manaster (1990)].

To test these propositions, we compare the underpricing in two markets in which the degree of information heterogeneity differs substantially. Our sample consists of two data sets: (1) a sample of IPO master limited partnerships (MLPs) and (2) a sample of "regular"

¹ Logue (1973) and Ibbotson (1975) were among the first to document the apparent underpricing. Ritter (1984) shows that the underpricing in the oil and gas industry in 1980 was much larger than the average underpricing; Ibbotson and Jaffe (1975) conclude that the level of underpricing is cyclical. See Smith (1986) for a review of empirical evidence on this issue.

² Both classes of models rely on asymmetric information. However, in the adverse-selection models the uninformed investor moves first, and in the signaling model the informed participant moves first. See Kreps (1990, pp. 630,638).

IPOs. The special feature of the MLP IPOs that enables us to test Rock's model is that institutional investors largely avoid them and the market knows that. The main reason for institutional investors' lack of interest is that the income received from the MLPs is classified as unrelated business income. Hence, even non-tax-paying entities such as pension funds would have to pay tax on earnings from MLPs they own. In addition, corporations do not get the dividend exclusion from taxes on income from MLPs.

Investment bankers tend to favor their large and established customers in allocating shares of initial public offerings [see Rock (1986), Benveniste and Spindt (1989), Benveniste and Wilhelm (1990), among others]. These customers are also more likely to be the better informed investors. We associate these investors with institutions.³ The retail (or uninformed) investors will face an allocation bias whether the institutional investors receive larger allocations in the better IPOs because they bid more for them (as a result of their superior information) or because they are favored by the investment bankers.⁴ Prior knowledge of the absence of the informed investors reduces the winner's curse problem and consequently the need for underpricing. We find that although the regular IPO group shows a mean initial-day return of 8.5 percent, statistically significantly different from zero, the MLP IPO group has a mean initial-day return of -0.04 percent, insignificantly different from zero. Even when controlling for the ex ante level of uncertainty (approximated by the dollar value of the IPO and the line of business in which the firm operates), we find that non-MLP IPOs experience significantly greater underpricing than MLP IPOs. Our findings support the explanation that the ex ante difference in market structure between MLP IPOs and non-MLP IPOs (i.e., investors in the MLP IPOs know a priori that they are competing to a much smaller extent with other investors who possess superior information) is the reason for the lack of MLP IPO underpricing. These results are consistent with Rock's (1986) winner's curse explanation of why firms underprice.

³ The claim that institutional investors have access to better information than retail investors because of their size and continuing relationship with the investment bankers also appeared in the April 26, 1992, *New York Times* (page 1):

Privileged information given to institutional investors puts less sophisticated investors at a disadvantage. Mainly because of the potential liability of an unfulfilled forecast, few new issuers publish earnings-per-share projections in their offering prospectuses, which brokers are confined to using to sell a new issue to the public. But our research shows that the vast majority of the 358 issuers that raised \$15.8 billion through IPOs last year provided earnings projections during the "road shows" held for institutional investors weeks in advance of the offering. (In IPOs, the more data the better.)

⁴ It is likely that other, noninstitutional investors are informed as well, but as long as the fraction of informed investors is higher among the institutional investors our analysis holds.

Using Rock's framework, Carter and Manaster (1990) model the role of the investment banker's reputation. They show that more prestigious investment bankers are associated with less risky IPOs. To preserve its reputation, the prestigious underwriter screens the firms that go public and selects the less risky ones, using information unavailable to the general public. This, in turn, reduces the uncertainty and information asymmetry between informed and uninformed investors. Investors know that by subscribing to issues of reputable investment banks they face less risk, and, consequently, the initial-day return is lower for these issues. Using investment bankers' capital as a proxy for their reputation (investment bankers with greater capital have more to lose from a loss of reputation), we find that reputation plays an important role in explaining the initial-day return. Although our findings indicate that the investment banker's reputation and the issue size are highly correlated (the correlation coefficient is .75), controlling for reputation we find that larger issues experience greater underpricing. We also show that IPOs issued by more reputable investment banks perform significantly better in the long run.

In Section 2.3 we test several empirical implications of the signaling-based models of IPOs underpricing. Empirically, these models imply a positive association between underpricing and the probability and amount of a seasoned equity (or debt) issue. The decisions on how much to underprice and whether to reissue equity, however, are not separate. In considering whether to underprice, an issuer takes into account the possibility of reentering the market for a seasoned issue some time in the future. Hence, the decision on the amount offered to the public in the seasoned issue is endogenous and made simultaneously with the decision of what signal to send to the market during the IPO through underpricing. We test this proposition using a simultaneous equations model. Contrary to the signaling models' predictions, we find that firms that underprice more enter the reissue market less frequently, and for smaller amounts, than firms that underprice less.

Allen and Faulhaber (1989) argue that earnings performance and dividend policy after the IPO help the market revise its views about the firm's quality. They suggest the market views firms that underprice and pay high dividends (high earnings) more favorably than firms that follow the same dividend policy (earnings) but do not underprice. Consequently, their model implies that (1) firms that underprice more are more likely to have higher dividends (earnings), and (2) the market reacts more favorably to dividend announcements by firms that underprice more. We examine the relationship between underpricing, dividend policy, earnings, and firm value. We find that firms that pay dividends or experience higher earnings during the

first two years of trading show significantly lower underpricing, contrary to the model's prediction. Not surprisingly, a dividend increase results in a significant price reaction in the three days around the announcement. There is no relationship, however, between the market reaction to the dividend announcement and the degree of underpricing. In Grinblatt and Hwang (1989), insider holdings as well as underpricing signal the firm's value. Their model's predictions of positive relationships between insider holdings and underpricing (for a given level of variance), and between the firm's value and the degree of underpricing, are not supported by the data.

In summary, our results support the winner's curse argument proposed by Rock (1986) that the purpose of underpricing is to entice less informed investors into the IPO market. We also show that larger IPOs and those issued by more reputable investment bankers experience less underpricing. For a given level of underwriter prestige, however, larger, more diffuse issues require greater underpricing to ensure successful placement. In contrast, we find little evidence that high-quality IPOs "leave money on the table" to signal their quality. Finally, we provide evidence that IPOs issued by more prestigious investment banks significantly outperform those issued by less prestigious underwriters.

The article is organized as follows. We describe the data and sample selection in Section 1. The empirical implications of the IPOs models are developed and tested in Section 2 and Section 3 concludes the study.

1. Sample Description

Our sample firms are obtained from the 1984-1988 editions of the *Directory of Corporate Financing*. Firms are selected from the list of corporate security offerings if (1) they make a firm commitment offering of at least \$1 per unit, (2) the unit contains only a single share of stock (no warrants attached), (3) the issue is an initial public offering, and (4) the firm is subsequently listed on COMPUSTAT. A total of 947 firm offerings meet all four requirements.⁵

The return data are extracted from the 1990 Center for Research in Security Prices (CRSP) daily tapes. Initial return is calculated using the offer price and the first-day closing price. The offer price is taken

⁵ A total of 1180 firm-commitment IPOs with a unit price above \$1 were found. A total of 187 IPOs were eliminated from the sample because they included other rights such as warrants. Twenty-five offerings of ADRs on foreign stocks and 24 IPOs that did not appear on COMPUSTAT were excluded. Out of the 24 non-COMPUSTAT firms, 22 still traded in 1991, one merged into another firm, and one stopped trading after one year. No closed-end funds or REITs are included in the sample.

from the *Directory of Corporate Financing*, and the first-day closing price is taken from the 1990 CRSP tapes when available; otherwise, it is collected from the *Wall Street Journal* (WSJ). The long-run performance, defined as the two-year excess return, is calculated as the stock's geometric return, starting with the day after the firm goes public, minus the value-weighted geometric market return for the same period.⁶ If a firm goes bankrupt during the period (21 firms out of 889 non-MLP IPOs), it is assumed that its return is equal to zero for the remaining days in the period. If a firm is acquired (six firms in our sample), the cash purchase price is used as the final market price.

Table 1 provides a distribution of the sample firms by year. As Ibbotson, Sindelar, and Ritter (1988) document for an earlier period, the number of offerings varies greatly by year, from a low of 106 in 1984 to a high of 314 in 1986. As indicated in the last column of Table 1, the initial return is significantly different from zero for each year in the sample period. The level of underpricing is positively correlated with the number of offerings in that year. For example, the average underpricing in 1984, the year with the lowest number of IPOs, is 4.51 percent, compared with average underpricing of 8.13 percent in 1986, the year with the most IPOs. The firms in the sample come from a variety of industries (Table 1, Panel B). At the one-digit Standard Industrial Classification (SIC) level, all industry groups are represented, with the largest number of firms in technical manufacturing (255), service (142), and financial services (130). At the four-digit SIC level, 284 industries are represented, with a maximum of 31 firms from an industry. Seventeen industries contain 10 or more firms. Included in the sample are 58 master limited partnership IPOs. The majority of the MLP IPOs are in 1986 and 1987. The initial return on the MLPs is insignificantly different from zero in four of the five years in the sample period. Because MLPs are treated differently by the federal income tax laws (for example, they do not pay an entity-level tax), they will be analyzed separately to gain further insights into the return behavior of IPOs.

Table 2 provides descriptive statistics for the 947 sample firms. The average return for the first trading day is 7.27 percent, significant at the .001 level.⁷ The range, however, is dramatic, with a minimum first-day return of -29.87 percent and a maximum of 136.81 percent.

⁶ Calculating the performance over a three-year period instead of a two-year period yields similar results.

⁷ We also calculate the first-day return using the average high-low prices. The mean initial return is 7.43 percent.

Table 1
Initial return and the distribution of IPOs across years (1984-1988) and industry

A: The distribution of initial public offerings, in our sample period, across years

Year	Number of firms		Initial-day return	
	MLPs	Total	MLPs	Total
1984	2	106	-0.0206 (-0.435)	0.0451 (4.008)
1985	8	152	0.0002 (0.085)	0.0705 (7.154)
1986	18	314	-0.0009 (-0.347)	0.0813 (7.957)
1987	25	257	0.0033 (0.728)	0.0791 (8.168)
1988	<u>5</u>	<u>118</u>	0.0093 (2.04)	0.0634 (5.618)
	58	947		

B: The distribution of IPOs across industry groups using the one-digit Standard Industrial Classification code

SIC code	Industry type	Number of firms	
		MLPs	Total
0	Agriculture production	2	10
1	Mineral production	8	32
2	Heavy industry	3	117
3	Technical manufacturing	1	255
4	Regulated industries	9	70
5	Service	6	142
6	Financial services	19	130
7	Commercial services	9	117
8	Miscellaneous services	<u>1</u>	<u>74</u>
		58	947

All IPOs are firm-commitment single-unit offers with an offer price of at least \$1 per share. The initial return is calculated using the offer price and the closing price on the first trading day (taken from the CRSP tapes). t-Statistics appear in parentheses.

Nearly two-thirds (65.4 percent) of the firms experienced positive first-day returns, and 21.4 percent incur negative returns. No price movement is experienced by 13.2 percent of the firms. The size of the IPO varies greatly across the sample. The mean dollar value of the transaction is \$32.158 million, with a range from \$675,000 to \$1.456 billion. The price per share ranges from \$1 to \$56.50.

The percentage of common stock owned by insiders and institutions is obtained from *Spectrum* and 10K reports.⁸ Data are available on insider holdings for 621 firms and on institutional holdings for 844 firms. Both groups have significant average holdings: 38 percent

⁸ Insider and institutional holdings are defined by *Spectrum* as beneficial holdings as reported under SEC requirements in the proxies.

Table 2
Univariate descriptive statistics on selected variables for 947 initial public offerings between 1984 and 1988

A: 947 Initial public offerings between 1984-1988								
	Initial return	IPO size ¹	Percent- age of shares held by insiders	Percent- age of shares held by institu- tions	Long-term debt to total assets	Net in come to total assets	Earnings- to-price ratio ²	
Mean	0.0727	32.158	0.3895	0.2618	0.2230	0.0126	0.0378	
Minimum	-0.2987	0.675	0.0000	0.0000	0.0000	-3.6413	-0.8540	
Maximum	1.3681	1456.000	1.0000	1.0000	1.7858	1.4231	5.6700	
Number of observations	(947)	(947)	(621)	(844)	(944)	(944)	(944)	
B: Comparison of financial and nonfinancial IPOs (means)								
	Initial return	IPO size	Percent- age of shares held by insiders	Percent- age of shares held by institu- tions	Number of share- holders relative to IPO size	Long-term debt to total assets	Net in- come to total assets	Earnings- to-price ratio
Financial	0.0236 (111)	55.978 (111)	0.2851 (69)	0.2835 (72)	0.0496 (110)	0.2119 (110)	0.0157 (110)	0.0457 (110)
Nonfinancial	0.0850 (778)	23.594 (778)	0.3972 (495)	0.2740 (717)	0.0682 (776)	0.2190 (776)	0.0113 (776)	0.0396 (776)
t-Test of the difference ³	6.863	3.146	2.925	0.276	1.290	0.306	0.274	0.387

Descriptive statistics on selected variables for 947 initial public offerings between 1984 and 1988 (Panel A). The initial-day return is calculated using the offer price and the price at the end of the first trading day. The IPO size is calculated as the offer price multiplied by the number of shares offered. The percentage held by insiders and institutions and the number of shareholders (relative to the IPO size) are taken from the Spectrum books published within a quarter of the IPO date. The accounting variables are taken from the first annual reports after the IPO. In Panel B, the sample is separated into financial and nonfinancial IPOs (excluding MLPs). The number of observations appears in parentheses.

¹ In millions of dollars.

² First annual earnings reported after the IPO relative to the offer price.

³ When the assumption of equal variance between the two groups is rejected, test statistics are calculated under the assumption of an unequal variance.

by insiders and 26 percent by institutions. The range for both groups extends from 0 to 100 percent.

Table 2 also includes some selected accounting data and ratios for the first year-end after the IPO for 944 of the 947 sample firms. One of the three missing firms was acquired before filing an annual report, and two firms filed for bankruptcy shortly after the IPO. The data shown were collected from COMPUSTAT, with missing values obtained from copies of firms' annual reports. Long-term debt averages only 22 percent of total assets. Extreme observations are obvious on both ends, however, since 118 firms have no long-term debt, and

six firms have long-term debt exceeding their total assets. Table 2 also provides information on the firms' earnings performance in the year after they go public. Although they earn a median 5.5 percent return on total assets, approximately 22.4 percent of the firms lose money in the first year of operations. The mean earnings-to-price ratio statistic, reported in the last column of the table, is 3.78 percent.

Following Ritter's (1984) findings, we separate the non-MLP IPOs sample into financial and nonfinancial firms. Indeed, as Table 2, Panel B reveals, there are substantial differences between the two groups of IPOs. The majority of the IPOs are nonfinancial (778 versus 111), and their initial return is significantly higher than that of the financial IPOs, 8.50 percent compared with 2.36 percent. The mean issue size of the financial IPOs is more than double the nonfinancial size, \$55.9 million versus \$23.6 million. The average debt-to-total-assets ratios are almost identical, at about 21 percent. Among the ownership variables, only the average portion held by insiders differs: 39.7 percent in the nonfinancial firms, compared with 28.5 percent in the financial firms.

Finally, we record the lead underwriter in each public offering, as disclosed in the *Directory of Corporate Financing*. For this sample, 179 different underwriters are employed. Only 22 underwriters lead in more than 10 transactions, but six underwriters lead in approximately one-third of the transactions. To compute the underwriter reputation variable, we collect information about their capital position from the 1986 *Securities Industry Yearbook*. Underwriters are ranked from high to low according to their capital.

2. Hypotheses and Empirical Results

2.1 The winner's curse hypothesis

Rock (1986) develops a model that relies on information asymmetry between investors, some of whom are informed and others of whom are not. The outside informed investors possess better knowledge about the future prospects of the firm than uninformed investors. Consequently, they will bid for more shares of the more successful firms, which will leave the uninformed investors with a disproportionate amount of the less successful issues. In addition, since the allocation is not on a pro rata basis, the bias against uninformed investors can be even larger if the investment bankers favor the informed investors. Because market participants are rational, the uninformed investors require a higher average return to compensate them for their allocation disadvantage—hence the underpricing in the IPO market. If, however, there are issues in which the uninformed traders

have a priori knowledge that the informed traders will not participate, they do not face an allocation disadvantage, and underpricing is not required to induce them to participate in the market.

Implication 1. In issues with an a priori knowledge of information homogeneity, the “lemons problem” does not exist and there is no need for underpricing.

In most instances, however, there is no such a priori knowledge, and the trading population differs in its information. Then underpricing is necessary to attract the disadvantaged uninformed investors, who will not consider the new issue unless its price is low enough to compensate them for the winner’s curse problem.

We associate the informed investors in the IPO market with the institutional investors. Institutional investors hold and trade large quantities of shares, and are most likely to be the better informed shareholders.⁹ As large traders, they are also the most likely to be favored by the investment bankers when an issue is oversubscribed, and since there are no restrictions on how the shares of the newly formed firm should be distributed, their advantage is magnified.¹⁰

2.1.1 An analysis of master limited partnerships IPOs. The unique feature of MLP IPOs is that institutions are minor participants in them.¹¹ There are several reasons why institutions and corporations find MLPs unattractive. First, MLPs are taxed as partnerships, with the only tax applied at the unitholders’ level on income earned. Because of this taxation difference, all equity holders, including tax-free institutions, must pay taxes on earnings from MLPs they own. Second, corporations do not qualify for the tax exemption on dividends received from MLPs. Third, owners of MLPs cede control to the MLP general partner. For example, investors do not have any voting power or power to remove management from office. Institutions and other large investors may find it unattractive to invest in entities in which they have to cede so much control to management. Fourth, there are significant administrative costs associated with institutional holdings of MLPs. For example, the general partner has the sole authority to agree to changes made upon audit by the IRS even though the limited partners must pay tax on their pro rata share of the income. Finally, even the

⁹ See, for example, Grossman and Hart (1980) and Shleifer and Vishny (1986) for a discussion of why large shareholders are more likely to possess more information. Also see note 3.

¹⁰ It is reasonable to expect some noninstitutional traders to be informed or some institutional investors to be uninformed. We merely assume that the concentration of informed traders is higher among the institutional investors.

¹¹ For a more detailed description of the distinctive characteristics of MLPs, see the Appendix.

filing deadlines can cause administrative inconveniences for the limited partners. While corporate partners must file tax returns, or at least pay the tax due to avoid an underpayment penalty, by March 15, the partnership return is not due until April 15. This filing difference may cause a corporation to file for an extension even if it is ready to file on time. In addition, given that institutional investors are not the natural holders of MLPs, Benveniste and Spindt (1989) show that investment bankers are unlikely to be willing to award them MLP IPOs, since they know they will try to resell them immediately.

The minor role of institutional investors as buyers of MLP IPOs and the market's *a priori* knowledge of this role reduce the potential bias against individual investors that exists in other IPOs.¹² This characteristic of the MLP IPO sample enables us to test Rock's assertion that the degree of underpricing is positively related to the degree of information heterogeneity among market participants. To make the analysis of the MLP IPOs more informative, we compare the MLP IPO sample results with those for the non-MLP IPOs.

Table 3 compares the samples of nonfinancial MLP and corporate IPOs.¹³ The table contains summary statistics on the initial performance of the two samples and some fundamental characteristics of the firms. The mean initial-day return is insignificantly different from zero (-0.04 percent) for the MLP group but positive and significant for the corporate sample (8.50 percent).¹⁴ The difference between the two returns is significant ($t = 13.62$). The 8.5 percent return for the corporate sample is similar to the figure reported by Ibbotson, Sindelar, and Ritter (1988) for IPOs with an initial price exceeding \$3 per share for the years 1975-1984. In the second column of the table, we compare offer size for the two samples. The mean MLP offer is more than four times the size of the mean offer of the corporate sample (\$115.68 million compared with \$23.6 million). This differ-

¹² There is also evidence in the popular press that MLPs are designed for individual investors. For example, an article from the June 11, 1987, *WSJ* states: "Limited partnership sales are surging as sponsors cast their products for middleclass investors." Finally, our test of Implication 1 goes through even if some institutions participate in the MLP market. As long as the informed participation in this market is significantly lower than in the "regular" IPO market, and this fact is known *a priori* to market participants, Rock's model predicts less underpricing in this market.

¹³ The comparison of the financial MLP IPOs with the financial corporate IPOs yields similar results and is omitted from this table for the sake of brevity. Muscarella (1988) reports an initial-day return of 0.24 percent, insignificantly different from zero, for a sample of 50 MLPs, but stops short of providing an explanation for the lack of underpricing.

¹⁴ If the average initial return for the MLP sample is zero, but the dispersion of initial return is high, institutional investors could capture a positive initial return by purchasing the appropriate issues at the offering. However, this is not the case: the maximum initial return is 6.1 percent and the minimum is -3.5 percent. Fifty-three out of 58 MLPs exhibit initial returns lower than 2.1 percent. We examined whether the very small price movement on the first day of trading in the MLP IPOs sample is due to lack of trading activity. The mean (median) first-day turnover in the MLP sample is 9.28 percent (8.90 percent), with an average of 619,970 shares traded.

Table 3

A comparison of the characteristics of MLP IPOs and non-MLP IPOs

	Initial return	IPO size	Percent held by insiders	Percent held by institutions	Number of shareholders relative to IPO size
MLP (nonfinancial IPOs)	-0.0004 (39)	115.682 (39)	0.5247 (38)	0.0765 (37)	0.0843 (39)
Corporate (nonfinancial IPOs)	0.0850 (778)	23.594 (778)	0.3972 (495)	0.2740 (717)	0.0624 (773)
t-Statistics of the difference ¹	13.620	8.469	1.824	6.478	0.774

A comparison of initial-day return, IPO size, insiders and institutional holdings, and the number of shareholders relative to the IPO size, between nonfinancial MLP IPOs and nonfinancial IPOs, in the years 1984-1988. The initial-day return is calculated using the offer price and the price at the end of the first trading day. The IPO size is calculated as the offer price multiplied by the number of shares offered. The percentage held by insiders and institutions and the number of shareholders are taken from the *Spectrum* books published within a quarter of the IPO date. The number of observations appears in parentheses.

¹ When the assumption of equal variance between the two groups is rejected, test statistics are calculated under the assumption of an unequal variance.

ence is significant at the 1 percent level. As subsequent analyses will reveal, the size of the IPO plays a significant role in determining the degree of underpricing.¹⁵ In columns 3, 4, and 5, we report the mean value of three ownership variables for the two samples, insider and institutional holdings, and number of shareholders relative to dollar value of the IPO. The mean insider holding is higher for the MLP sample than for the corporate sample: 52.5 percent compared with 39.7 percent (the t-statistic of the difference is 1.824). In contrast, the holdings of institutional investors are almost four times larger in the corporate group than in the MLP group: 27.4 percent versus 7.5 percent, with a t-statistic of the difference of 6.48.¹⁶ The dispersion of shares (measured as the postoffering total number of shareholders divided by the dollar value of the IPO) is not significantly different across the two groups, with a mean value of 0.0843 for the MLP sample and 0.0624 for the corporate sample.

¹⁵ Beatty and Ritter (1986) find that the level of uncertainty affects the degree of underpricing, consistent with a cross-sectional implication of Rock's (1986) model that they develop. They estimate uncertainty as the inverse of issue size. Indeed, Ritter (1987) finds that more speculative firms tend to raise smaller amounts of money than less risky firms; that is, uncertainty and size are correlated. Our results show that issue size has a significant role in explaining the degree of underpricing, but that it is not the only factor that accounts for the cross-sectional differences in underpricing across IPOs.

¹⁶ In all MLP IPOs where institutions hold more than 10 percent of equity after the IPO, we further investigate the institutions' identities. In seven of the eight cases, the institutions holding the MLP are affiliated with the corporate sponsor of the MLP, even before the MLP IPO. For example, Fine Homes International, a real estate limited partnership, was created in May 1987 by Merrill Lynch. Merrill Lynch manages several mutual funds. The institutional investors for Fine Homes were the mutual funds managed by Merrill Lynch.

The results thus far reveal significant differences between the MLP IPOs and the corporate IPOs, both in their initial-day return and in some of their fundamental characteristics. Most notable are the differences in the issue size and the institutional holdings. The fact that the market recognizes *a priori* that institutional investors are not major participants in the MLP IPOs is of crucial importance to our experiment, since it gives us an opportunity to test Implication 1. This implication states that the winner's curse will be less pronounced in a market in which agents have prior knowledge of the absence of informed investors.

Given the results of Table 3, we construct three corporate IPO control samples and compare their initial return with the MLP IPOs' initial return. First, we control for industry effect. Ritter (1984) has shown that underpricing varies dramatically across industries. Since MLPs tend to concentrate in the oil and gas and real estate industries (see Table 1, Panel B), a comparison with a sample of IPOs from diverse industries may not be appropriate. For each MLP IPO, we matched a corporate IPO with the same four-digit SIC code and with the closest IPO size.¹⁷ The results are reported in Table 4, Panel A. The initial return for the MLP IPOs (both financial and nonfinancial) is 0.12 percent, insignificantly different from zero. The matched sample shows a mean initial return of 4.5 percent, significantly different from zero. The t-statistic of the difference between the mean initial return of the two samples is 4.821.¹⁸ Second, we control for the size of the IPO. It has been shown that larger IPOs show less underpricing [see, for example, Beatty and Ritter (1986)], presumably because larger IPOs have lower uncertainty. Table 4, Panel B indicates that even when we control for *ex ante* uncertainty, the corporate IPOs show significant underpricing while the MLP IPOs do not. The initial day return is 2.9 percent for the non-MLP group and -0.04 percent for the MLP group. On the other hand, the institutional holdings are significantly higher for the corporate group, 38 percent versus 7.6 percent, with a t-statistic of the difference of 4.572. That is, IPO size in and of itself cannot be used as an *ex ante* proxy for whether informed (institutional) investors participate in an IPO in a significant way. As shown in Table 4, Panel C, however, it is not the *ex post* fraction held by institutions that causes the difference in the initial return between

¹⁷ In Instances where a matched IPO cannot be found using the four-digit SIC code, we use the two-digit SIC code instead. We are able to find a match for 80 percent of the MLPs at the four-digit SIC code level. We repeat the experiment with this subsample. The results do not change in a significant way.

¹⁸ The t-statistic of the difference is based on a pairwise comparison. In the last column of Table 4 we report the results of the rank statistics. They are practically identical to the results achieved using the parametric test.

the two groups. Even when the fraction held by institutions is held constant, the non-MLP group shows a significantly higher initial return.¹⁹ This result is consistent with our assertion that the ex ante knowledge of lack of participation by informed investors in the MLP IPO market is important in explaining why MLPs are not underpriced. It seems that even when we control for asset structure (Panel A) and ex ante risk (Panel B), MLP IPOs show significantly lower initial returns than equivalent corporate IPOs.

2.1.2. Discussion. There are several possible objections to our explanation of why MLP IPOs are not underpriced, in that the experiment reported in Table 4 does not control for additional fundamental differences between MLP IPOs and corporate IPOs. First, the lack of underpricing in the MLP sample may be consistent with the higher fraction of equity held by insiders [Leland and Pyle (1977)]. Second, MLP IPOs are generally issued by the most prestigious underwriters, which might suggest less underpricing.²⁰ Third, since the parent corporation of the MLP IPO is publicly traded, it may be easier to obtain information about MLPs than about other IPOs, thus lowering the uncertainty and underpricing. Fourth, the organizational form per se may create an equity security that is less risky than an otherwise identical security.

We try to address the first two points using regression analysis. The log of the gross proceeds, insider holdings, a set of dummy variables for industry affiliation and the year in which the IPO was issued, a dummy variable that takes the value of 1 if the firm is non-MLP and 0 otherwise, and a proxy for the prestige of the underwriter are the independent variables; the initial return is the dependent variable. The MLP dummy coefficient is 0.061, which implies that corporate IPOs experience an initial-day return of 6.1 percent above MLP firms (significant at the 1 percent level). This result is similar to that reported in Table 4, Panel B. The insider holdings variable is negative and insignificantly different from zero. The prestige and gross proceeds coefficients are positive and significant at the 5 percent level.²¹

The third objection can be analyzed by comparing our results with those of Schipper and Smith (1986), Muscarella and Vetsuypens

¹⁹ Given a corporate IPO sample of 889, we were able to match the MLP sample quite accurately. When matching by size (Panel B), the mean size is 121.357 and 115.68 for the corporate and MLP samples respectively, with a t-statistic of the difference of -0.26. When matching by institutions (Panel C), the mean institutional holdings are 7.59 percent and 7.65 percent, respectively, with a t-statistic of the difference of 0.0134.

²⁰ The role of the underwriter's reputation in determining the degree of underpricing is discussed in much more detail in the next section.

²¹ Robust t-statistics [White (1980)] yield identical results.

Table 4
Differences in initial-day returns for MLP IPOs and non-MLP IPOs matched by industry, size, and institutional holdings

		MLP	Non-MLP	t-Statistics of the difference ¹	Rank statistics ²
A: Matched by SIC code					
<i>n</i> = 58	Initial return	0.0012 (0.558)	0.0451 (5.126)	4.821	4.447
B: Matched by size					
<i>n</i> = 39	Initial return	-0.0004 (0.198)	0.0291 (3.479)	3.386	3.884
	Fraction held by institutions	0.0765	0.3801	4.572	3.373
C: Matched by percentage held by institutions					
<i>n</i> = 39	Initial return	-0.0004 (0.198)	0.0679 (2.809)	2.818	3.113

A comparison of the initial-day return for MLP IPOs and a sample of corporate IPOs issued between 1984-1988, matched by industry classification (Panel A), size (Panel B), and the fraction of institutional holdings (Panel C). In Panel A, each MLP IPO is matched with a non-MLP IPO with the same four-digit SIC code, closest in size. If no match is found using the four-digit SIC code, the MLP IPO is matched using the two-digit SIC code. In Panels B and C, only nonfinancial IPOs are included. t-Statistics are in parentheses.

¹ t-Statistics of the difference are calculated on the basis of pairwise comparison.

² Wilcoxon rank statistics.

(1989), and Wang, Chan, and Gau (1992). Schipper and Smith (1986) find a mean initial return of 4.9 percent for 41 equity carve-outs during the period 1963-1983, and Muscarella and Vetsuypens (1989) report an initial return of 2.1 percent for 76 reverse LBOs during the period 1986-1987. The feature common to their samples and ours is that the firms involved are larger than the average corporate IPOs and that prior knowledge about their quality is more readily available. In the case of MLP IPOs and equity carve-outs, the parent company is publicly traded, which enables investors to gather more information about the newly traded firm, and in the case of reverse LBOs, the firm itself has been traded publicly. Indeed, all three samples show lower average returns than the “regular” IPO sample. Both the equity carve-out sample and the reverse LBO sample have an initial return significantly different than zero, whereas the MLP IPOs sample does not. This difference is consistent with the assertion of a positive association between information heterogeneity and the underpricing of IPOs (Implication 1).

As with MLP IPOs, institutional investors do not generally invest in IPOs of real estate investment trusts (REITs). Indeed, Wang, Chan, and Gau (1992) find that for a sample of 87 REIT IPOs the average initial day return is -2.82 percent, even though there is considerable uncertainty about their value. This result is consistent with the expla-

nation that when the winner's-curse problem does not exist, there is no incentive for the issuer to underprice.

The fourth point is related to the uniqueness of the MLP organizational form. To analyze this question, we examine the differences in profitability and expenditures for corporations and MLPs in the oil and gas industry. We find MLPs have acquisition and development costs commensurate with those of corporations. MLP IPOs underperform similar corporate IPOs in several ways, however. The MLPs are less profitable primarily because of higher operating costs for a given level of sales. The MLPs also underperform the corporations in terms of stock returns for the two years after going public. For example, matching MLPs and corporations by SIC code (as in Table 4, Panel A), we find that, whereas MLPs experience a two-year excess return of -21 percent, the SIC matched set of non-MLP IPOs experiences only a -2 percent excess return. In addition, the business failure rate of oil and gas industry MLPs is approximately 50 percent during the period we examine, significantly higher than the rate for corporations. That is, we find no evidence that MLPs' equity is in any way less risky than that of otherwise identical corporations.²²

Finally, if MLPs have no intention of reissuing equity after the IPO, the results presented here may also be consistent with the signaling models. That is, if there is no reissue, there is no incentive to send the costly signal of underpricing. This is not the case, however: 9 out of 58 MLPs reissue equity in the first two years of operation.

In summary, we find support for the notion that there is a link between the heterogeneity of investors' information and IPO underpricing. For MLP IPOs, in which institutional (informed) investors scarcely participate, we find no underpricing. We attribute this result to the more homogeneous individual investor clientele of the MLP IPOs. We also provide evidence that the lack of underpricing is not due to size differences, industry affiliation, or lesser uncertainty about the future value of the MLPs.

2.2 Investment banker's reputation hypothesis

In Carter and Manaster (1990), the reputable investment banks take the less risky IPOs and less reputable investment banks underwrite the more risky IPOs. Consequently, their model predicts that the initial return on the IPO is negatively correlated with the investment banker's reputation.

²² Since the general partner in MLPs has full control over the operation, cannot be voted out by the unitholders, and has only a small equity stake in the entity, the agency problem may be more severe in this organizational form than in corporations, consistent with our findings of poorer long-run performance and a higher failure rate for the MLPs.

Implication 2. *The more prestigious the investment bank, the lower the expected initial return on the IPO.*

2.2.1 Empirical analysis. The value of the underwriter's reputation depends not only on its activity in the IPO market, but on the entire array of activities with which it is involved. With each new issue the investment bank undertakes, it risks the present value of its distribution channels: the bigger the investment bank, the more severe the consequences of lost reputation. Therefore, we use the investment bank's capital as a proxy for its prestige.²³ The investment bank with the largest capital is ranked first, and the one with the smallest amount of capital is ranked last. For the 889 IPOs in the sample (MLP IPOs are excluded), there are 179 lead underwriters.²⁴

Table 5 reports several tests of the hypothesis that there are significant differences in the characteristics of IPOs led by prestigious and less prestigious underwriters. Twenty-three out of 179 underwriters, who handled 50.05 percent of the transactions, are classified as prestigious. Indeed, the IPOs associated with more prestigious underwriters (449 out of 889 issues) exhibit significantly lower initial returns than the IPOs associated with the less prestigious group: 4.5 percent versus 10.9 percent. This is not the only significant difference, however. Issues are more than five times as large for the prestigious underwriters group as for the less prestigious group, \$46.24 versus \$8.65 million. Insiders hold 34.6 percent and 42.7 percent in the prestigious and less prestigious groups, respectively. There is no significant difference between the two groups in the percentage of equity held by institutions, although the absolute amount held by institutions is naturally larger for the prestigious underwriters group.²⁵

²³ Using capital as a proxy for reputation is also consistent with the implication of the certification hypotheses [Booth and Smith (1986)].

²⁴ Using multivariate regression analysis, and using rank on the tombstone announcement as a proxy for underwriters' prestige, Carter and Manaster (1990) find the reputation variable to be significant, whereas James and Wier (1990) find it to be insignificant. We also compare our ranking with the one used by Carter and Manaster (1990). Seventy-six underwriters are in both groups. We divide our sample into nine equal groups. All underwriters in the first group are assigned a rank of 9, and those in the last group are assigned a rank of 1. The Spearman rank correlation coefficient between the Carter and Manaster ranking and ours is .86.

²⁵ Carter and Manaster (1990) argue that "... since informed investor capital migrates to the highly uncertain IPOs [issued by the less prestigious underwriter], the underpricing and subsequent run-up for these firms are greater" (p. 1046). The results in Table 5 indeed show that underpricing for the IPOs in the less prestigious group is greater. However, the fraction held by informed investors (the institutions) is the same, which seems to invalidate either Carter and Manaster's conjecture or our proxy for informed traders. Since, as Carter and Manaster argue, informed traders maximize the value of their information acquisition, they will take into account not only the degree of uncertainty in a given issue, but also its size: the bigger the IPO, the greater the potential gains from acquiring information about the issue. Since the prestigious underwriters offer larger issues, our finding of similar fractional holdings by institutions in the two groups is not surprising.

Table 5

A comparison of the characteristics of IPOs issued by prestigious and less prestigious underwriters

Variable	Less prestigious underwriter	Prestigious underwriter	t-Statistics of the difference ¹
Return	0.1097 (440)	0.0452 (449)	6.221
IPO size	8.65 (440)	46.24 (449)	8.056
INSID	0.4276 (259)	0.3460 (346)	3.2395
INSTIT	0.2856 (389)	0.2694 (400)	1.063
SHHOLD	0.0821 (433)	0.0422 (448)	4.583
Two-year excess return	-0.2682 (440)	-0.0152 (449)	3.760

A comparison of initial-day return, IPO price, IPO size, and insider and institutional holdings between IPOs handled by reputable underwriters and IPOs handled by less reputable underwriters. Underwriters are ranked according to the size of their capital. Twentythree underwriters out of 179 are classified as prestigious. The initial-day return is calculated using the offer price and the price at the end of the first trading day. IPO size is calculated as the offer price multiplied by the number of shares offered. The percentage held by insiders (INSID) and institutions (INSTIT) and the number of shareholders relative to the IPO size (SHHOLD) are taken from the *Spectrum* books published within a quarter of the IPO date. The number of transactions is in parentheses.

¹ When the assumption of equal variance between the two groups is rejected, test statistics are calculated under the assumption of an unequal variance.

The difference in long-run performance between the IPOs issued by the prestigious and the less prestigious underwriters is striking. The latter group shows a two-year negative excess return of 26.8 percent, whereas the former group shows a 1.5 percent negative excess return. The difference is statistically significant at the 1 percent level. It seems that prestigious underwriters indeed issue “better” IPOs (significantly better long-run performance), and the initial return of these IPOs is lower because of lower uncertainty. Because of the substantial difference in the size of the IPOs (a mean issue size of 8.65 and 46.24 million for the less prestigious and the prestigious groups respectively), however, it is hard to discern thus far whether the difference in performance is due to the size of the IPO or issuer’s prestige. This distinction is important for evaluating the validity of the reputation-based models. If by observing the issue size alone, potential investors can infer the same information about the uncertainty level they can gain by observing the underwriter’s reputation, issuers will not have an incentive to pay the additional costs associated with dealing with the more reputable investment bankers.

To examine this issue, we first rank all IPOs by issue size, beginning with the largest. Then for each firm, we assign the prestige rank of

Table 6
The distribution of IPOs and their initial-day return categorized by size and underwriters' prestige

Issue size (v) →		1	2	3	4	5
		All	$v < 4.91$	$4.91 < v < 8.90$	$8.90 < v < 15.19$	$15.19 < v < 28.9$
All		0.1472 (8.462) [176]	0.0681 (8.294) [179]	0.0611 (7.550) [178]	0.0590 (5.710) [178]	0.0521 (4.854) [178]
Underwriter						
1 Most capital	0.0366 (4.462) [193]	0.0100 (—) [1]	0.0483 (2.609) [6]	0.0191 (2.363) [32]	0.0258 (3.349) [61]	0.0470 (3.095) [93]
2	0.0487 (6.470) [179]	-0.0388 (-8.052) [2]	0.0078 (0.667) [16]	0.0592 (3.819) [58]	0.0628 (4.377) [53]	0.0408 (3.259) [58]
3	0.0583 (6.900) [161]	0.0538 (2.225) [11]	0.0596 (4.108) [41]	0.0596 (4.795) [50]	0.0422 (4.066) [38]	0.0883 (1.900) [21]
4	0.0816 (7.010) [176]	0.0759 (3.464) [37]	0.0570 (5.460) [173]	0.0820 (3.862) [42]	0.1838 (2.597) [20]	0.0701 (1.375) [4]
5 Least capital	0.1618 (8.415) [180]	0.1806 (7.897) [125]	0.1204 (5.119) [43]	0.1306 (2.220) [9]	0.0000 (—) [1]	0.0983 (22.953) [2]

The sample of IPOs from 1984 to 1988 is divided into 25 groups according to issue size (in millions of dollars) and the reputation of the issuing underwriter. *t*-Statistics of the null hypothesis that the initial return equals zero appears in parentheses. The number of IPOs appears in brackets.

the underwriter and calculate the Spearman rank correlation between the two. The Spearman correlation is positive (.752) and significant at the .0001 level. Next, we partition the sample into quintiles by issue size and brokerage prestige, resulting in a 5×5 matrix of initial-day returns. The results are reported in Table 6 and in Figure 1. The results reveal three interesting phenomena. First, reputable investment banks issue large IPOs, while less reputable investment banks issue small IPOs. For example, the underwriters with the most capital (first quintile) issue 93 IPOs from the largest issue quintile and only one from the smallest issue quintile. The underwriters with the least capital issue only three IPOs from the two largest-size IPO quintiles. Second, initial-day return increases monotonically as the reputation of the investment bank decreases (first column), from 3.7 to 16.2 percent. A similar pattern is maintained within each size-based group (columns 2 through 6). Third, initial IPO return decreases as the issue size increases (first row), from 5.21 percent for the largest size group to 14.72 percent for the smallest size group. This relationship between size and initial return is not always maintained, however, when we control for the reputation of the underwriter. For example, for the second most prestigious group of underwriters, the mean

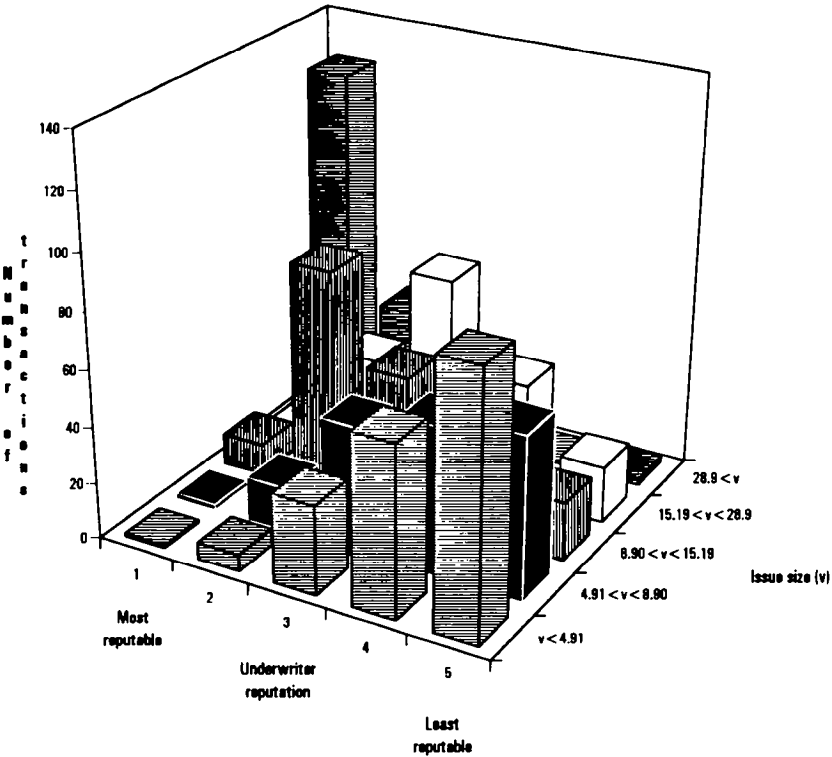


Figure 1
Number of IPOs by value and underwriter size quintiles
The reputation of underwriters is based on the equity capital. The issue size of the IPO offerings is in millions.

initial returns are $-3.8, 0.78, 5.9, 6.3$, and 4.1 percent from the smallest to the largest IPO issues group. Only for the IPO group issued by the least reputable investment bankers does the initial return decrease with size. These conclusions also emerge from a regression analysis for each size and prestige quintile: for all but the largest size quintile, the prestige coefficient is positive and significantly different from zero. The size coefficient is positive for the first four prestige groups (and significantly different from zero for groups 3 and 4), and negative but insignificant for the least reputable quintile.

These results can be interpreted as follows. The reputation of the investment banker resolves some of the uncertainty about the quality of the IPO. The better the investment banker's reputation, the less risky the issue is, and the lower the required initial-day return. Larger issues, however, require greater distribution efforts by the investment banker [Baron (1982)] and the dispersion of the issue to a larger

group of investors; hence, there is larger underpricing.²⁶ (We estimate the dispersion by the total number of shareholders in relation to the dollar value of the IPO.)

Indeed, the regression results reported below indicate that the marginal effect of the number of shareholders (in relation to the dollar value of IPO) has a positive effect on the initial-day return.

$$\begin{aligned} \text{Initial return} = & -0.0312 + 0.0012\text{BROK} + 0.021\text{SIZE} \\ & (0.533) \quad (6.566) \quad (3.019) \\ & + 0.0219\text{SHHOLD} + \text{industry and year} \\ & (4.622) \quad \text{dummy variables,} \quad (1) \\ \bar{R}^2 = & 0.111 \quad (\text{number of observations is } 881), \end{aligned}$$

where SIZE = log of the gross proceeds (millions of dollars)

BROK = prestige variable based on the investment banker's capital; the first-ranked investment banker has the highest prestige and the last-ranked has the lowest prestige

SHHOLD = number of shareholders in relation to the IPO size

$\bar{R}^2$ = adjusted R^2 ; t-statistics are reported in parentheses

The brokerage prestige coefficient is positive and highly significant, indicating that IPOs issued by less reputable bankers experience higher initial-day returns.²⁷ The positive size coefficient is consistent with the assertion that, for a given brokerage prestige-level, larger issues show more underpricing.^{28,29} Finally, the number-of-shareholders variable shows that the larger the dispersion of the stockholdings, the greater the underpricing. That is, given the investment

²⁶ One may argue that the IPO size can be used as an indicator of the degree of information heterogeneity. For example, it may be that the fraction held by informed (institutional) investors in large IPOs is trivial, which may affect equilibrium underpricing, according to Rock. However, we do not find support for such a relationship. The fraction held by institutions is almost uniformly distributed across size deciles.

²⁷ We rerun Equation (1) with the fraction of shares held by insiders as an additional independent variable. The prestige, size, and shareholders coefficients are almost identical to what has been reported above. The insider-holdings coefficient is negative (-0.013) but insignificantly different from zero ($t = -0.656$). Because of data limitations, the number of observations in this regression is 621 instead of 889. We also added the Carter and Manaster reputation variable to Equation (1). Its coefficient is found to be insignificantly different from zero, while the capital-based reputation coefficient is highly significant.

²⁸ We also checked whether size affects initial return in a nonlinear way by adding size squared as an additional independent variable in Equation (1). Its coefficient is found to be insignificant.

²⁹ The positive and significant size coefficient may also be a manifestation of the "partial adjustment" phenomenon [Ibbotson, Sindelar, and Ritter (1988)]. After the investment banker is chosen and the preliminary prospectus is issued, if demand is strong, there is a higher initial return and the offering price and number of shares are sometimes adjusted upward.

banker's prestige, larger IPOs require more effort to distribute; hence, the underpricing is greater and the investor base is wider.³⁰

Finally, we examine the relationship between the reputation variable and the long-run performance of the IPOs, measured by their two-year excess returns over the market portfolio. We divide the sample into two groups based on brokerage prestige and calculate the two-year excess return for each group. As reported in the last row of Table 5, long-run performance is significantly better for the more prestigious group than for the less prestigious group, -1.52 and -26.8 percent respectively.³¹ Controlling for time and industry variation, the regression analysis reported below indicates that IPOs issued by more reputable brokerages perform better in the long run:

$$\begin{aligned}
 2 \text{ yr. EXR} &= 0.0668 - 0.0028\text{BROK} \\
 &\quad (0.406) \quad (-2.32) \\
 &\quad + 0.0665\text{SIZE} + \text{industry and year} \quad (2) \\
 &\quad (1.514) \quad \text{dummy variables,} \\
 R^2 &= 0.034 \quad [\text{number of observations} \\
 &\quad \text{is 889 and variables} \\
 &\quad \text{definitions are as in} \\
 &\quad \text{Equation (1)}].^{32}
 \end{aligned}$$

In summary, using investment banks' capital as a measure of prestige, we find that IPOs underwritten by more prestigious investment banks experience less underpricing than IPOs underwritten by less prestigious banks. Consistent with prior literature, we show that larger IPOs experience less underpricing. However, we show that for a given

³⁰We also run two univariate regressions when the dependent variable is the initial return. In the first, the independent variable is the brokerage prestige, resulting in a positive and highly significant coefficient. In the second regression, the independent variable is the issue size. Its coefficient is -.0252 with a *t*-statistic of -5.39, illustrating that size alone is negatively associated with initial return. However, its marginal effect is positive when controlling for issuer's reputation, as has been demonstrated in the text. Given a correlation of .75 between the issue size and the prestige variable, it is likely that the regressors are collinear. Belsley, Kuh, and Welsch (1980) describe a procedure for detecting collinearity. The procedure calculates a condition number that provides a measure of the potential sensitivity of the solution vector, *b*, of the linear system $Y = b \cdot X$ to small changes in the elements of *X* and *Y*. Using this procedure, we find that a principal component associated with a high condition index contributes strongly to the variance of both the issue size and the broker variable, indicative of some linear dependencies between the two variables.

³¹Ritter (1991) finds that issuing firms underperform the value-weighted index by about 12 percent in the first three years of operation.

³²We rerun Equation (2) with the fraction held by insiders and the fraction held by institutions (at the time of the IPO) as additional independent variables. The insider's coefficient is positive but insignificant (*t* = 0.82), and the institutions' coefficient is insignificantly negative (*t* = 0.275). The prestige coefficient remains significant. Because of data limitations the sample size is reduced by more than one-third. *t*-Statistics for the variables in Equations (1) and (2) are also calculated using the White (1980) procedure. The results are virtually identical to what has been reported in the text.

level of underwriter prestige, the larger IPOs experience greater underpricing. This may be a result of the greater distribution efforts by the investment banker for these issues. Finally, we show that in the long run, IPOs issued by prestigious investment bankers perform significantly better than those issued by less prestigious investment bankers.

2.3 The signaling hypothesis

2.3.1 Allen and Faulhaber (1989). In Allen and Faulhaber (1989), Grinblatt and Hwang (1989), and Welch (1989), “good” firms try to distinguish themselves from “bad” firms by incurring a cost that the less successful firms cannot profitably sustain. This cost is the underpricing of the initial issue. In Allen and Faulhaber’s model, investors update their prior beliefs about the value of the firm through its earnings or dividend policy. High dividends (earnings) tend to upgrade their valuation of the firm, and low dividends (earnings) tend to downgrade it. High dividends (or earnings) after the IPO will be more effective in revising the market’s prior beliefs for firms that underprice more. The model implies that the better firms will underprice more, will have higher earnings, will initiate dividends earlier, will have a higher payout ratio, and will experience a more favorable market reaction to the dividend announcement.

Implication 3A. *There is a positive relation between the degree of underpricing and the subsequent earnings performance and dividend policy of the firm.*

We define dividend policy in this context in terms of the interval between the IPO and the dividend initiation, and by the dividend yield, calculated at the first dividend payment.

Implication 3B. *The effect of the dividend announcement should be positively related to the IPO underpricing. That is, firms that are less underpriced should experience a less favorable price reaction when the dividend is announced.*³³

Our test of Allen and Faulhaber’s model consists of three experi-

³³ Allen and Faulhaber’s (1989) model suggests that underpricing is a consequence of a separating equilibrium. When a pooling equilibrium occurs, firms will not underprice. Since in each year of our sample period we observe significant underpricing, our test of Allen and Faulhaber concentrates on their separating equilibrium implications. Among other things, a separating equilibrium is more likely to occur when the probability of successful implementation is low. In such a case investors will be surprised to see high dividends after the implementation, and they will revise their prior beliefs dramatically. Good firms that do **not** underprice will not experience the same change in beliefs when they pay a high dividend.

ments. First, we test whether greater underpricing is associated with higher earnings or with higher dividend yield. Second, we examine whether greater underpricing is associated with distributing dividends sooner rather than later. Finally, we test whether the market reaction to changes in dividend policy is related to the degree of underpricing. According to the theory, in equilibrium, firms that underprice more will experience a more positive market reaction to a dividend increase than firms that do not underprice.” The other major implications of the model concern the timing and the size of the seasoned equity issue. The reward for being perceived as a good firm rather than a bad firm is a more favorable environment for an issue of seasoned equity. This feature is common to all the signaling models discussed here and will be dealt with when we test the Welch (1989) model in the next section.

In Table 7, Panel A, we divide the sample of IPOs into two groups. The first group (685 firms) has positive earnings in the first year of public operation, and the second group (196 firms) has negative earnings. The initial return is 6.8 percent for the positive earnings group and 10.87 percent for the negative-earnings group, both significantly different from zero. Contrary to the model prediction, the initial return of the group with negative earnings is significantly higher than the initial return of the positive-earnings group. The results using regression analysis, where the dependent variable is the first-year net income normalized by the IPO size, leads to the same conclusion. The first-day return coefficient is negative (-.0492) and significant ($t = 2.84$). That is, greater underpricing is associated with lower earnings.³⁵

In Table 7, Panel B, we again divide the IPO sample into two groups. The first group (704 firms) does not pay any cash dividend in the first three years of public operation; the 185 companies in the second group pay cash dividends in this period. Both initial returns are positive and significantly different from zero. Contrary to the implications of the Allen and Faulhaber model, however, the zero-yield group has an initial-day return significantly higher than that of the positive-yield group, with a t -statistic of the difference of 4.2. In Panel C, we divide the dividend-paying stocks into high- and low-yield groups. The initial return decreases as the yield increases, from 6.0 percent for the low-yield group to 2.31 percent for the high-yield group.

³⁴In the Allen and Faulhaber model, investors condition their beliefs on the degree of underpricing. Firms that underprice more are considered better firms. However, good firms face a positive probability of unsuccessful implementation, and of then becoming bad firms. High earnings (dividends) help investors revise their prior beliefs about whether the implementation was successful.

³⁵Inclusion of year and industry dummy variables does not affect this result.

Table 7

Initial return measured for 889 IPOs between 1984 and 1988 categorized by earnings (panel A) and dividend yield (panels B and C)

Panel A			
	Earnings > 0	Earnings < 0	t-Statistic of the difference ¹
Initial-day return	6.804 (12.287) [685]	10.870 (8.140) [196]	2.770
Panel B			
	Yield = 0	Yield < 0	t-Statistic of the difference ¹
Initial-day return	8.676 (14.131) [704]	4.150 (4.689) [185]	4.201
Panel C			
	Yield = 0	Yield < 0.0246	Yield > 0.0246
Initial-day return	8.676 (14.131) [704]	6.007 (4.234) [92]	2.313 (2.232) [93]

A comparison of the mean initial-day return when the sample is divided according to whether the firm has positive or negative earnings in the first year of operation (Panel A). In Panel B, we compare the mean initial-day return when the sample is divided according to whether the firm does or does not pay dividends in the first three years of public operation. In Panel C, we divide the IPOs that pay dividends in the first three years of operation into high- and low-yield groups. The dividend yield is calculated using the first dividend over the price on the day prior to the announcement. All dividends are annualized. t-statistics are in parentheses and number of observations is in brackets.

¹When the assumption of equal variance between the two groups is rejected, test statistics are calculated under the assumption of an unequal variance.

Next, we use a linear regression analysis to test the hypothesis that firms that underprice more pay a higher dividend. The dependent variable is the initial-day return. The explanatory variables are the dividend yield (measured at the first dividend announcement day) and a dummy variable that takes the value of 1 if the firm pays dividends and zero otherwise. The relationship between underpricing and subsequent dividend policy may manifest itself not only through the amount of dividends paid but also through how soon after the IPO a dividend is paid. A more successful implementation will allow the firm to pay dividends sooner. Therefore, we add time as an explanatory variable to the regression. The time variable is measured as the reciprocal of the interval between the initial public offering and the first dividend announcement. If no dividend is paid, the time variable takes the value of zero. The results are reported in Table 8. Contrary to Implication 3A, both the dividend yield and the dividend dummy coefficients have negative signs, implying a lower initial return for

Table 8
The relationship between dividend payout and initial-day return of IPOs

	Constant	Dividend yield	Yield dummy	Time ¹	$\bar{R}^2$	<i>N</i>
(1)	0.0868 (14.144)	-0.5546 (-4.349)	-0.0242 (-1.755)		.0151	889
(2)	0.0806 (14.639)			-0.7025 (-3.589)	.0059	889
(3)	0.0868 (14.142)	-0.5801 (-4.381)	-0.0156 (-0.964)	-0.3395 (-2.188)	.0173	889

The dependent variable is the degree of underpricing. The explanatory variables are the dividend yield, a dummy variable that takes the value of 1 if the firm pays dividends in the first two years of operation and 0 otherwise, and a time variable that measures the time between the IPO and the dividend yield. Standard errors are adjusted for heteroskedasticity using White's (1980) procedure. t-Statistics are reported in parentheses. The degree of underpricing is measured using the closing price on the first trading day and the price at which the IPO is offered. The dividend yield is calculated using the first dividend over the price on the day prior to the dividend announcement. The time variable is measured in days.

¹The time variable is measured as the reciprocal of the interval between the initial public offering and the first dividend announcement. If no dividend is paid, the time variable takes the value of zero.

dividend-paying stocks.³⁶ The coefficient of the interval between the IPO and the first dividend is negative and significant. It seems that firms that underprice less tend to pay higher dividends and to pay them sooner rather than later. There is no indication that greater underpricing is positively related to subsequent dividend policy.³⁷

Allen and Faulhaber's (1989) model also implies that dividend payment causes investors to revise their expectations about the firm's prospects—the greater the underpricing, the greater the effect of the dividend announcement in revising the market's expectations (Implication 3B). To test this hypothesis, we calculate the excess return on the three days surrounding the announcement of the first dividend for each dividend-paying stock in the sample.³⁸ The return behavior around the dividend announcement day cannot be analyzed with a linear regression since its estimators may be inconsistent as a result

³⁶The finding that firms with high dividends or high earnings also underprice less is consistent with the legal liability hypothesis as well (Tinic (1988). Hughes and Thakor (1992)).

³⁷Examining only the dividend-paying stocks, we divide the sample into two groups according to initial return. The first group contains all stocks with a nonpositive initial-day return (82 securities), and the second group contains all stocks with a positive initial-day return (103 securities). The mean dividend yields are 7.25 percent for the nonpositive return group and 4.37 percent for the positive return group, insignificantly different from each other ($t = 1.58$).

³⁸Announcements of dividend initiation cause a significant stock-price reaction [see, for example, Michaely et al. (1994)] The excess return in the three days around the dividend initiation announcement is 0.85 percent, significant at the 5 percent level (see Table 10, Panel B). We exclude companies that pay the first dividend within 60 days of the IPO, since most of those companies had paid dividends prior to the IPO. Inclusion of those announcements, however, does not change the results.

of the truncation bias.³⁹ The decision to pay dividends is endogenous, which is not reflected in the cross-sectional estimator. Eckbo, Maksimovic, and Williams (1990) derive consistent estimators using a latent variables model. These estimators account for the presence of the potential truncation bias. Let D be a dummy variable that has a value of 1 if a dividend is paid and a value of 0 otherwise. Suppose that D^* , the latent counterpart of D , is generated by the model

$$D^* = Z\gamma - \epsilon_D, \quad (3)$$

where Z is a vector of instruments (initial return, brokerage prestige, and percentage held by institutions) that are related to the likelihood that a dividend will be paid and ϵ_D is an error term. The estimator for γ is a probit. Consistent estimates of the parameters are obtained from

$$\begin{aligned} ER_i = & \beta_0 + \beta_1 \cdot \text{Yield}_i + \beta_2 \cdot \text{Init Ret}_i + \beta_3 \cdot \text{time}_i \\ & + \beta_4 E[\epsilon_D | \epsilon_D < Z\gamma] + \epsilon_R. \end{aligned} \quad (4)$$

The specification (4) indicates that the cross-sectional structure of announcement returns comprises information associated with the decision to announce any dividend as well as the information transmitted by the dividend yield and the degree of underpricing.

The explanatory variables in (4) are the stock dividend yield, the IPO initial return, the length of time between the IPO and the dividend initiation, and Mill's ratio $\phi(Zr)/\Phi(Zr)$, where ϕ is the normal density function and Φ is the normal cdf. As reported in Table 9, the initial-return coefficient is negative (insignificant), implying that a higher initial return is associated with a smaller dividend announcement effect. Mill's ratio coefficient is positive but insignificant, suggesting that the insider's superior knowledge does not play an important role in this context. These variables do not seem to have any power in explaining the market reaction around the dividend announcement. These results are inconsistent with Implication 3B.

Overall, we find no support for a hypothesis that initial underpricing is used to signal underlying IPO quality or that it can be translated into better understanding of future dividends and earnings announcements. Whereas Allen and Faulhaber (1989) predict a positive relation between underpricing and future earnings performance and dividend levels, we find the opposite result holds. Firms with higher earnings and those that initiate dividends experience less initial underpricing. Also, the market does not apparently react differently to the announcements of dividend initiation by firms that underprice and those that do not.

³⁹We would like to thank the referee for pointing this out to us

Table 9
The effect of initial underpricing and dividend yield on stock prices at announcement of the 51% dividend after the IPO

	Constant	Dividend yield	Time	Initial return	Mill's ratio	$\bar{R}^2$	<i>N</i>
(1)	-0.0759 (-1.247)			-0.0949 (-1.03)	0.056 (1.42)	.0015	118
(2)	0.0459 (-0.847)	-0.0354 (-0.167)			0.035 (1.04)	-.0094	118
(3)	-0.0525 (-0.974)	-0.057 (-0.267)	0.00005 (1.560)		0.032 (0.015)	.0059	118
(4)	-0.0795 (-1.308)	-0.1015 (-0.475)	0.00004 (1.478)	-0.0919 (-0.968)	0.053 (1.22)	.0052	118

The dependent variable is the excess return on the three days surrounding the announcement of the first dividend. The explanatory variables are the dividend yield, the degree of underpricing, the time between the IPO and the announcement of the first dividend, and Mill's ratio, estimated from the Probit model [Equation (3)]. (Implication 3B states that the higher the underpricing, the more positive should be the market reaction to the dividend initiation announcement.)

2.3.2 Welch (1989). Welch's model, as well as Grinblatt and Hwang's (1989) and Allen and Faulhaber's (1989), formalizes the notion that good firms underprice to "leave a good taste in investors' mouths." The hypothesis is that the owner's incentive to leave a good taste is the possibility of coming back to the market for the sale of additional securities on more favorable terms.⁴⁰ Welch's model explicitly accounts for the possibility of subsequent issuance of equity or debt in the secondary market. The entrepreneur of a high-quality firm will underprice to distinguish his firm from the low-quality firm. He will be rewarded at the time of the seasoned issue by a higher price for the shares. The underpricing is a credible signal if the imitation costs for the low-quality firm are high enough. In fact, the entrepreneur faces a joint decision of how much to underprice and whether to reenter the market at a later time for the subsequent issue of equity or debt.⁴¹

Implication 4A. *There is a positive relationship between the degree of initial underpricing and the amount of the subsequent seasoned issue.*

In addition, Welch's model implies that good firms, which underprice

⁴⁰This justification for underpricing appears in the popular press as well. For example, the March 4, 1992, "Heard on the Street" column in the *Wall Street Journal* states "...companies may be receptive to a low price because they will be back to sell stock in a year or so" (p. C1).

⁴¹Indeed, Welch (1989) presents evidence that about one fourth of the IPO firms came back to the market to raise capital through seasoned equity offerings in the 10 years following the IPO. From January 1977 to December 1987, 395 seasoned offerings were found. Of these, 288 were for firms that went public between 1977 and 1982.

more, experience a less unfavorable price response at the time of the seasoned issue.

Implication 4B. *The price reaction at the time of a seasoned issue announcement will be less unfavorable for firms that underprice more.*

Empirically, the model implies a positive association between underpricing and the success of the seasoned equity issue (or a debt issue). We measure success in terms of the size of the seasoned issue in relation to the initial public offering and the market reaction to the seasoned issue. Of the 889 non-MLP IPOs, 84 firms issue debt and 216 firms issue seasoned equity in the first three years of operation. As reported in Table 10, neither type of issue is clustered in any particular year, with 78, 63, and 75 seasoned equity offerings, and 30, 20, and 34 debt offerings in the first, second, and third years of operation. Consistent with the existing evidence, both seasoned equity offerings and debt offerings are perceived as bad news about the firm, and consequently the stock price drops at their announcement.⁴² In our sample, the three-day excess return is -0.79 percent with a t-statistic of -1.805 around the seasoned equity offerings, and -0.88 percent with a t-statistic of -1.363 for the debt offerings (Table 10, Panel B).

To test the relationship between underpricing and subsequent issuance decisions, we first divide the sample into two groups. The first group comprises all firms that issue additional equity in the first three years of operation. All firms that do not have an equity offering are included in the second group. A comparison of the two groups' initial-return and long-run performance is shown in Table 11, Panel A. The results are striking. Although there is no significant difference in initial underpricing between the two groups (8.84 percent for the firms that issue and 7.38 percent for the firms that do not), the two-year excess return is 38.3 percent for the firms that issue, compared with -39.4 percent for the firms that do not. The t-statistic of the difference is 11.55. Likewise, in Table 11, Panel B, the IPO firms are divided according to whether they issue public debt in the three years after the IPO. As with the seasoned equity issue, there is no significant difference in the initial return between the two groups (7.94 percent for the firms that issue debt and 7.71 percent for the firms that do not), but the two-year excess return is 16.7 percent for the firms that

⁴²See, for example, Asquith and Mullins (1986). Eckbo (1986). Masulis and Korwar (1986), and Mikkelson and Panch (1986).

Table 10
Frequency and timing of future dividend payments and equity or debt offerings

	A			Total
	1st year	2nd year	3rd year	
Dividends	142	20	23	185
Seasoned equity	78	63	75	216
Debt issue	30	20	34	84

	B		No. of observations
	Excess return (%)	t-Statistics	
Dividend initiations ¹	0.8455	2.15	118
Seasoned equity offerings ²	-0.79	-1.805	197
Debt issue ³	-0.88	-1.363	72

In Panel A we report the number of firms that initiated dividends or issued additional securities (equity or debt) in the three years following their IPOs. Panel B presents the cumulative excess return in the three days around each of these events and its significance.

¹Excess return is calculated for all dividend initiations in the first two years of public operations, excluding dividends that were announced in the first 60 days after the IPO.

²Nine seasoned offerings by MLPs and 10 offerings without identifiable announcement days are excluded.

³Debt offerings by MLPs and offerings without identifiable announcement days are excluded.

issue, compared with -24.23 percent for the firms that do not. The difference is significant with a t-statistic of 8.3. These results seem to indicate that while there is no relationship between initial underpricing and subsequent debt or equity issues, only firms that perform well reissue equity. The former finding is inconsistent with Implication 4A of a positive association between underpricing and seasoned equity issue policy.⁴³

The decisions on how much to underprice and whether to reissue equity are not independent. Whether the issuer desires to “leave a good taste in investors’ mouths” by underpricing depends on whether he thinks he will subsequently go back to the market to raise more capital. That is, the issuer faces two simultaneous decisions: how much to underprice, and whether and how much he would like to reissue. The decision about the amount offered in the seasoned issue is endogenous and is made simultaneously with the decision about what signal to send to the market during the IPO through underpricing. This is the major implication of all the IPO signaling models.

Using a simultaneous equations model, we test the proposition of

⁴³A priori, one may expect the opposite relationship between issuance decisions and performance (or earnings). Firms with high earnings have less need for cash flow and therefore will go to the market less often. Our findings are consistent with the assertion that “better” firms also face more positive NPV projects and hence need outside financing above and beyond their internally generated cash flow.

Table 11

Initial underpricing conditional on the later issuance of a seasoned equity offering: A comparison of mean initial returns and two-year excess returns for firms that issue and do not issue seasoned equity (Panel A) or debt (Panel B) in the first three years of operation

A: Seasoned equity issues			
	Firms that issued seasoned equity	Firms that did not issue seasoned equity	t-Statistics of the difference ¹
Initial return	0.0884 (7.913) [216]	0.0738 (12.5) [673]	-1.1954
Two-year excess return	0.383 (4.54)	-0.394 (14.7)	-11.548
B: Debt issues			
	Firms that issued debt	Firms that did not issue debt	t-Statistics of the difference ¹
Initial return	0.0794 (4.1) [84]	0.0771 (14.22) [805]	-0.1221
Two-year excess return	0.162 (1.934)	-0.2423 (-7.615)	-8.304

t-Statistics are reported in parentheses, and numbers of observations are in brackets.

¹When the assumption of equal variance between the two groups is rejected, test statistics are calculated under the assumption of an unequal variance.

a positive association between the degree of underpricing and the seasoned equity issuance decision. In the first equation, the dependent variable is the initial underpricing (InitR), and the independent variables are the size of the seasoned issue in relation to the IPO size (Rel Size), the log of the dollar value of the IPO (SIZE), the brokerage prestige variable (BROK), and a set of industry and year dummy variables. In the second equation (Tobit), the dependent variable is the relative size of the seasoned equity issue (Rel Size), and the independent variables are the initial underpricing (InitR), the IPO size (SIZE), the excess return in the 60 days after the IPO (Ret 60) and the two years after the IPO (Ret 2), and a set of industry and year dummy variables. The 60-day excess return and the two-year excess return variables try to capture the effect of the after-market performance on the seasoned issuance decision. Given that one variable is observed (underpricing) and the other is censored (relative size of the seasoned equity offering), we estimate the regression coefficients and their asymptotic covariance matrix following Amemiya (1979).

$$\begin{aligned}
 \text{InitR} = & -0.06744 + 0.00221(\text{Rel Size}) + 0.009(\text{SIZE}) \\
 & (-1.15) \quad (1.18) \quad (1.56) \\
 & + 0.0013(\text{BROK}) + \text{industry and year} \quad (5a) \\
 & (6.95) \quad \text{dummy variables}
 \end{aligned}$$

$$\begin{aligned}
 \text{Rel Size} = & -4.556 - 7.686(\text{InitR}) + 0.059(\text{SIZE}) \\
 & (-1.455) \quad (-1.92) \quad (0.29) \\
 & + 2.321(\text{Ret } 60) + 0.971(\text{Ret } 2) \\
 & (4.06) \quad (6.22) \\
 & + \text{industry and year} \\
 & \text{dummy variables}
 \end{aligned} \tag{56}$$

The statistically insignificant coefficient of the relative issue size in Equation (5a) indicates that the decision on whether to reissue has no significant effect on the decision about how much to underprice ($t = 1.18$). Consistent with prior analysis, the brokerage prestige coefficient is positive and highly significant, indicating that firms going public with less reputable brokers show higher initial returns. Contrary to the implications of the signaling models, the coefficient of the initial return in Equation (56) is negative and significant, indicating that the likelihood of seasoned equity offerings is inversely related to initial return. That is, IPO firms that are less underpriced are more likely to reissue equity and for larger amounts. The 60-day return and the two-year return coefficients are positive and significant, indicating that firms that perform well after the IPO tend to reissue more equity.⁴⁴

The analysis reveals that the decision to reissue (or to pay dividends) is closely related to the firm's success in the market in its first years of public operation. Successful firms reissue (and pay dividends), and unsuccessful firms do not. On the other hand, our findings do not support the proposition that greater underpricing is associated with a higher likelihood of further reissuance of debt or equity.

Finally, we test the model's prediction that stocks with greater initial underpricing will experience a less unfavorable price reaction at the time of the seasoned equity issue. We account for management's superior information about the seasoned issue in the way described for Equations (3) and (4). The only difference is that the decision

⁴⁴Unlike in the linear regression model, heteroskedasticity results in biased estimators in the Tobit regression. The system of Equations (5a) and (56) is reestimated when the standard error of the Tobit model is assumed to be a function of the issue size and initial return [see, for example, Maddala (1983)] $\sigma_i^2 = \exp(\gamma + \lambda \beta)$. The results of the heteroskedastic Tobit are quite similar to those of the homoskedastic model. The only difference is that the asymptotic t -ratio of the initial return in Equation (5b) has changed from -1.92 to -1.66. We repeat the entire analysis when the IPO proceeds and the amount of seasoned equity issues are adjusted for inflation. None of the results change. Jegadeesh, Weinstein, and Welch (1991) test the relationship between underpricing and subsequent equity issue using a Tobit model. Contrary to our findings, their analysis indicates that firms that underprice more are more likely to return to the market for subsequent seasoned equity offerings. However, they do not take into account the inherent simultaneity in the seasoned equity issuance decision as described in Equations (5a) and (56) and in the text. When we run Equation (56) by itself, we still find the initial return to be negative, but it is insignificantly different from zero ($t = -1.54$). Hence, the null hypothesis of no relationship between underpricing and subsequent issuance decisions cannot be rejected.

variable is whether to reissue equity (debt) instead of the dividend decision analyzed in Equation (3). We try to explain the three-day excess return around seasoned equity and debt offerings (Table 12, first and second rows) by the relative size of the seasoned offering, the log size of the seasoned issue, the initial underpricing, the interval between the IPO and the announcement of the seasoned issue, and Mill's ratio. Contrary to the model's prediction, when the dependent variable is the excess return around the seasoned equity announcement, the initial-return coefficient is negative and significant, implying that stocks with more underpricing experience a less favorable price reaction at the time of the seasoned equity issue. The seasoned issue size coefficient is negative, indicating that the market reacts more severely to larger issues. Both the relative size of the seasoned issue and the time coefficients are insignificant. The excess return around debt issue announcements (second regression in Table 12) is lower for larger seasoned issues ($t = -2.918$). The initial underpricing has no significant effect on the excess return around the debt announcement, and the time coefficient is positive but insignificant.

In summary, according to the signaling models, the decisions about the extent of the initial underpricing and the subsequent reissuance are made simultaneously, so we test for the relationship between these two variables using a set of simultaneous equations. Contrary to the model's prediction, we find that firms that underprice more tend to go to the reissue market less often and for lesser amounts. These results hold even after we control for several variables that are important in the underpricing decision, such as firm size, underwriter prestige, the year of the IPO, and industry affiliation. Finally we find no support for the models' assertion that firms that underprice more will experience less unfavorable price reactions when they issue seasoned equity.

2.3.3 Grinblatt and Hwang (1989). In this model, a firm employs two signals to convey the mean and variance of its future cash flow: the degree of underpricing and the fraction of shares held by insiders. We test three empirical implications of the model that are related to the interaction between insider holdings, the degree of underpricing, and the value of the firm.⁴⁵

Implication 5A. *The initial return on the IPO is positively related to the fraction held by insiders for a given variance level.*

Implication 5B. *Firm value is positively related to the degree of underpricing for a given fraction held by insiders.*

⁴⁵See Grinblatt and Hwang (1989, p. 415).

Table 12
The relationship of excess returns around the seasoned equity offering and selected variables

		Constant	Relative size of seasoned offering	Log SO	Initial return	Log time	Mill's ratio	$\bar{R}^2$	N
(1)	Equity	0.1582 (2.240)	0.0013 (0.707)	-0.0105 (-1.687)	-0.0869 (-2.563)	-0.0089 (-1.297)	-0.064 (-1.526)	.0218	197
(2)	Debt	-0.032 (-0.751)	-0.0006 (-1.596)	-0.0163 (-2.918)	-0.032 (-0.499)	0.0078 (1.384)	0.0281 (1.695)	.1638	70

The dependent variable is the excess return for the three days around the announcement of the first seasoned equity offering (first row), or debt issue (second row) within the first three years after the IPO. The explanatory variables are the size of the offering relative to the IPO, the log size of the seasonal issue (SO), the initial day return on the IPO, the time between the IPO and the seasoned equity offering announcement, and Mill's ratio estimated from the Probit model.

Table 13
Comparison of the percent held by insiders for nonfinancial IPOs in the years 1984-1988

	1 Initial return		2 Two-year excess return		3 IPO size		4 Brokerage prestige	
	Negative (or zero)	Positive	Negative	Positive	Small	Large	Low	High
Percent held by insiders	0.3873	0.3819	0.3869	0.3768	0.4367	0.3349	0.427	0.346
Number of observations	278	611	601	288	445	444	440	449
t-Statistics of the difference ¹	0.1924		0.377		4.077		3.22	

In the last part of the table, we divide the IPO sample according to whether the first-day return is positive or negative. In the second part we divide the sample according to whether the two-year excess return is positive or negative. In the third part we partition the sample according to the IPO size, and in the fourth according to whether the issuing underwriter is in the high- or low-prestige group.

¹When the assumption of equal variance between the two groups is rejected, test statistics are calculated under the assumption of an unequal variance.

Implication 5C. Firm value is positively related to the degree of underpricing for a given variance level.

Given our prior findings about the effect of brokerage prestige and size, we compare the amount held by insiders when the sample is partitioned into two groups according to (1) positive or negative initial return, (2) positive or negative two-year excess return, (3) IPO size (small/large), and (4) brokerage prestige (high/low). The statistics are reported in Table 13. There is no significant difference in the amount held by insiders between the positive and the negative initial-return groups: 38.2 percent and 38.7 percent. The amount held by insiders does not vary significantly with long-run performance: 38.7 percent and 37.7 for the negative and positive two-year excess return. However, there are significantly more insiders in the small IPO group: 43.7 percent compared with 33.5 percent in the large group, as well as in the low-prestige group, 42.7 percent compared with 34.6 percent in the high-prestige group.

Direct tests of Implications 5A, 5B, and 5C of the Grinblatt and Hwang model consist of three regressions, reported in Table 14. Implication 5A states that the initial return is positively related to the fraction held by insiders, given a variance level. Using the variance of the securities in the 60 days after the initial offering, we regress the initial return on the estimated variance and the fraction held by insiders. The coefficients for both the variance and insider holdings are insignificant, and there is no indication that the percentage of shares held by insiders has any significant power to explain the initial-day return, even when the variance is held constant. James and Wier

Table 14
Test of the Grinblatt and Hwang (1989) model

	(1) Dependent variable	(2) Intercept	(3) Variance	(4) Insiders	(5) Initial return	(6) Adj. R^2	(7) N
1	Initial return	0.0579 (8.338)	3.9770 (0.428)	-0.0061 (-0.423)		-.0005	545
2	2-year return	-0.1368 (-2.051)		0.0869 (0.598)	0.0431 (0.084)	-.0031	545
3	2-year return	-0.1308 (-2.829)	-22.3790 (-1.096)		0.2429 (0.725)	-.0004	850
4	2-year return	-0.1001 (-2.258)	-31.6530 (-1.623)	0.1168 (0.760)	0.0548 (0.112)	.0016	545

Regressions of initial-day return and two-year excess return on the firm's variance, fraction held by insiders, and initial return. Initial return is calculated using the offering price and the closing price on the first trading day. The firm's variance is calculated as the variance of returns for the 60 days immediately following the IPO. The fraction held by insiders is taken from the *Spectrum* books in the month following the IPO date. The variance matrix is estimated using White's (1980) procedure. t -Statistics are reported in parentheses.

(1990), using a sample of firms with close borrowing relationships with banks, find similar results. One might argue that in their sample insider holdings are less useful as an instrument to reveal information, because more information is already known to the outsiders (banks and their customers) through their prior dealings. This objection does not apply to our sample and we find the same result.

Implication 5B states that the value of the firm is positively related to the degree of underpricing for a given fraction held by insiders. We estimate the firm's value as the percentage change in its equity value from its second day of trading to the two-year trading date, calculated as the two-year excess return including dividends. The results in Table 14, row 2 show that neither the initial-day return nor the percentage held by insiders has significant power to explain the two-year return. Finally, Implication 5C states that given a variance level, the firm's value is related to the degree of underpricing. Regressing the initial-day underpricing and the 60-day variance on the two-year return indicates that the initial-day return does not have significant marginal power ($t = 0.112$) to explain the two-year return when variance is held constant.⁴⁶

In summary, our results do not support the Grinblatt and Hwang (1989) model. The insider holdings variable has no significant power to explain the initial-day return even when variance is held constant. There is no evidence that insider holdings provide a credible signal of firm quality that reduces uncertainty and, therefore, initial under-

⁴⁶When the variance of the firm is calculated over two years instead of 60 days, or when its value is measured over three years instead of two, the results are essentially the same.

pricing. Neither the initial-day return nor the fraction held by insiders seems to explain the value of the firm two years after it goes public.

3. Concluding Remarks

The basic question addressed in these tests is whether firms going public underprice to compensate uninformed investors who end up with a disproportionate share of the weaker IPOs, or to send a signal, albeit a costly one, of their underlying strength.

Our findings support the adverse-selection models that attribute underpricing to the presence of information asymmetries between outside informed and uninformed investors. When investors are relatively homogeneous, as for MLP IPOs, we do not find any underpricing. Even when we control for size, the line of business in which the firm operates, the prestige of its investment banker, and the fraction of equity held by insiders, we find that the underpricing is significantly less in the MLP IPO market, where the uninformed investors do not face a winner's-curse problem. Second, we demonstrate that underwriter quality lessens the need to underprice, apparently by reducing the information asymmetries. The link between underwriter quality and IPO quality is also demonstrated by the fact that IPOs issued by more prestigious underwriters perform better over the two years after the IPO. Finally, we show that the most prestigious underwriters generally avoid taking smaller IPOs to market. We show, however, that for a given level of prestige, larger IPOs with more diverse shareholders require a greater underpricing. This suggests that larger IPOs may be more difficult to market.

We find little support for the models suggesting that firms underprice to signal their quality or because they intend to return to the market with secondary security issues. Instead, we find that firms that underprice more have weaker future earnings performance, fewer dividend initiations and smaller dividends, and less frequent trips to the market with secondary equity and debt issues.

These results suggest several guidelines that may be of interest to financial managers and investors at large. First, firms that go public should not underprice their offering because they may be considering subsequent securities issues. There is no need to underprice to "go back to the well." Second, firms issued by more reputable investment banks are required to leave less money on the table than firms issued by less reputable investment banks (excluding fees). All else being equal, therefore, issuing firms should have an incentive to use prestigious investment banks. This incentive is reinforced by our finding that shares issued by more reputable investment banks perform significantly better in the long run.

Appendix: Master Limited Partnerships

The first master limited partnership (MLP) was created in 1981 when Apache Oil rolled up 33 oil and gas partnerships into a publicly traded company, Apache Petroleum. By June 30, 1987, 99 MLPs were traded on the NYSE and AMEX. MLPs have generally been created in two ways. In the first, an entire corporation is converted into a partnership. In this case, the shareholders swap the stock they own in the corporation for limited ownership units in the MLP. The second and more popular method is for a corporation to spin off one line of business into an MLP. It then pays units in the new MLP as a dividend on its own stock or alternatively sells the units directly to the public.

In most instances, the sponsoring corporation maintains an interest in the MLP as the general partner. As general partner, the corporation receives a fee for operating the MLP. Virtually all of the remaining income (usually 99 percent) is credited to the partnership accounts of the limited partners. Most MLPs operate in two industries, oil and gas and real estate. One unique characteristic of the MLPs is that they are aggressively marketed on the basis of a high dividend yield, usually around 12 percent per annum, compared with an average 2 percent for corporations in the same industries.

From a corporate control standpoint, MLPs offer certain advantages to the general partner. All of the operating control is vested with the general partner. MLP unitholders have no vote on decisions made or on the makeup of the board of directors. Even if one person owned all the units of the MLP, he could not remove the general partner. In other words, a hostile takeover of an MLP is not feasible.

The advantages of the partnership structure are primarily tax motivated. First, the MLP does not pay a tax at the entity level. Instead, each limited partner pays tax at his own personal income tax rate on his share of the MLP's taxable income, computed on the basis of his ownership percentage. Second, since the unitholder pays tax on the income earned, any dividend received is not taxed. Therefore, the partnership escapes the double taxation of income incurred by corporations. Also, the tax incurred is at the personal rate, which since 1986 has been lower than the corporate rate.

There are some potential tax-related pitfalls in having a business classified as an MLP. First, the unitholder must pay tax on his share of the MLPs income even if no dividends are paid. Second, since 1988, if the MLP generates a loss, the loss cannot offset income from other ventures the unitholder is involved in. The losses can only be carried forward to offset future income from that MLP. Finally, since the income from MLPs is classified as unrelated business income for tax-

exempt entities, normally non-tax-paying entities such as pension funds must pay tax on earnings from MLPs they own. Corporations also do not get a dividends-received exclusion on income from MLPs. In contrast, 70 percent or more of dividends from corporations are excluded from income.

The units of MLPs have primarily been owned by individual investors, in part because of this unfavorable tax treatment of corporate and tax-exempt unitholders. MLPs are generally structured with only one line of business, usually with a passive income source such as royalties or rents. The Revenue Act of 1987 guarantees this type of structure will remain in the future. Any MLPs created after December 17, 1987, will be taxed as corporations unless that have only one passive line of business. Any existing MLPs that add a new line of business will lose their partnership designation. Also, in 1997 all MLPs except those with a passive line of business will lose their partnership taxation status.

References

- Allen, F., and G. Faulhaber, 1989, "Signaling by Underpricing in the IPO Market," *Journal of Financial Economics*, 23, 303-323.
- Amemiya, Takeshi, 1979, "The Estimation of a Simultaneous Equation Tobit Model," *International Economic Review*, 20, 169-181.
- Asquith, P., and D. W. Mullins, Jr., 1986, "Equity Issues and Offering Dilution," *Journal of Financial Economics*, 15, 61-89.
- Baron, D., 1982, "A Model of the Demand for Investment Banking Advising and Distribution Services for New Issues," *Journal of Finance*, 37, 955-976.
- Beatty, R., and J. Ritter, 1986, "Investment Banking, Reputation and the Underpricing of Initial Public Offerings," *Journal of Financial Economics*, 15, 213-232.
- Belsley, D., E. Kuh, and R. E. Welsch, *Regression Diagnostics*, Wiley, New York, 1980.
- Benveniste, L., and P. Spindt, 1989, "How Investment Bankers Determine the Offer Price and Allocation of New Issues," *Journal of Financial Economics*, 24, 343-362.
- Benveniste, L., and W. Wilhelm, 1990, "A Comparative Analysis of IPO Proceeds under Alternative Regulatory Environments," *Journal of Financial Economics*, 28, 173-208.
- Booth, J., and R. Smith, 1986, "Capital Raising, Underwriting and the Certification Hypothesis," *Journal of Financial Economics*, 15, 261-281.
- Caner, R., and S. Manaster, 1990, "Initial Public Offering and Underwriter Reputation," *Journal of Finance*, 45, 1045-1067.
- Eckbo, B. E., 1986, "Valuation Effects of Corporate Debt offerings," *Journal of Financial Economics*, 15, 119-151.
- Eckbo, B. E., V. Maksimovic, and J. Williams, 1990, "Consistent Estimation of Cross-Sectional Models in Event Studies," *Review of Financial Studies*, 3, 343-365.
- Grinblatt, M., and C. Hwang, 1989, "Signaling and the Pricing of New Issues," *Journal of Finance*, 44, 393-420.

- Grossman, S., and O. Hart, 1980, "Takeover Bids, The Free Rider Problem and the Theory of the Corporation," *Bell Journal of Economics*, Spring, 42-64.
- Hughes, P., and A. Thakor, 1992, "Litigation Risk, Intermediation, and the Underpricing of Initial Public Offerings," *The Review of Financial Studies*, 5, 709-742.
- Ibbotson, R., 1975, "Price Performance of Common Stock New Issues," *Journal of Financial Economics*, 2, 235-272.
- Ibbotson, R., and J. Jaffe, 1975, "Hot Issue Markets," *Journal of Finance*, 30, 1027-1042.
- Ibbotson, R., J. Sindelar, and J. Ritter, 1988, "Initial Public Offerings," *Journal of Applied Corporate Finance*, V1, 37-45.
- James, C., and P. Wier, 1990, "Borrowing Relationships, Intermediation, and the Cost of Issuing Public Securities," *Journal of Financial Economics*, 28, 149-173.
- Jegadeesh, N., M. Weinstein, and I. Welch, 1993, "An Empirical Investigation of IPO Underpricing and Subsequent Equity Offerings," *Journal of Financial Economics*, 34, 153-175.
- Koh, F., and T. Walter, 1989, "A Direct Test of Rock's Model of the Pricing of Unseasoned Issues," *Journal of Financial Economics*, 23, 251-272.
- Kreps, D., 1990, *A Course in Microeconomic Theory*, Princeton University Press, Princeton, NJ.
- Leland, H., and D. Pyle, 1977, "Information Asymmetries, Financial Structure and Financial Intermediation," *Journal of Finance*, 32, 371-387.
- Logue, D., 1973, "On the Pricing of Unseasoned Equity Issues, 1965-69," *Journal of Financial and Quantitative Analysis*, 8, 91-103.
- Maddala, G., 1983, *Limited Dependent and Qualitative Variables in Econometrics*, Cambridge University Press, London and New York.
- Masulis, R. W., and A. N. Korwar, 1986, "Seasoned Equity Offerings: An Empirical Investigation," *Journal of Financial Economics*, 15, 91-118.
- Michaely, R., R. Thaler, and J. K. Womack, 1994, "Price Reactions to Dividend Initiation and Omissions, Overreaction or Drift?" working paper, Cornell University.
- Mikkelsen, W. H., and M. M. Panch, 1986, "Valuation Effects of Security Offerings: An Empirical Investigation," *Journal of Financial Economics*, 15, 31-60.
- Muscarella, C., 1988, "Price Performance of Master Limited Partnership Units," *The Financial Review*, 23, 513-521.
- Muscarella, C., and M. Vetsuypens, 1989, "The Underpricing of 'Second' Initial Public Offerings," *Journal of Financial Research*, 12, 183-192.
- Ritter, J., 1984, "The 'Hot Issue' Market of 1980," *Journal of Business*, 57, 215-241.
- Ritter, J., 1987, "The Costs of Going Public," *Journal of Financial Economics*, 19, 269-282.
- Ritter, J., 1991, "The Long-Run Performance of Initial Public Offerings," *Journal of Finance*, 46, 3-27.
- Rock, K., 1986, "Why New Issues are Underpriced," *Journal of Financial Economics*, 15, 187-212.
- Schipper, K., and A. Smith, 1986, "A Comparison of Equity Carve-outs and Seasoned Equity Offerings: Share Price Effect and Corporate Restructuring," *Journal of Financial Economics*, 15, 153-186.
- Shleifer, A., and R. Vishny, 1986, "Large Shareholders and Corporate Control," *Journal of Political Economy*, 94, 461-488.
- Smith, C., Jr., 1986, "Investment Banking and the Capital Acquisition Process," *Journal of Financial Economics*, 15, 3-29.

Tinic, S., 1988, "Anatomy of Initial Public Offerings of Common Stock," *Journal of Finance*, 43, 789-022.

Wang, K., S. H. Chan, and G. Gau, 1992, "Initial Public Offerings of Equity Securities: Anomalous Evidence Using REITs," *Journal of Financial Economics*, 31, 381-410.

Welch, I., 1989, "Seasoned Offerings, Imitation Costs and the Underpricing of Initial Public Offerings," *Journal of Finance*, 44, 421-449.

White, H., 1980, "A Heteroscedasticity Consistent Covariance Matrix Estimator and a Direct Test of Heteroscedasticity," *Econometrica* 48, 817-838.