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Do Initial Public Offering Firms Purchase Analyst Coverage with Underpricing?

MICHAEL T. CLIFF and DAVID J. DENIS*

ABSTRACT

We report that initial public offering (IPO) underpricing is positively related to analyst coverage by the lead underwriter and to the presence of an all-star analyst on the research staff of the lead underwriter. These findings are robust to controls for other determinants of underpricing and to controls for the endogeneity of underpricing and analyst coverage. In addition, we find that the probability of switching underwriters between IPO and seasoned equity offering is negatively related to the unexpected amount of post-IPO analyst coverage. These findings are consistent with the hypothesis that underpricing is, in part, compensation for expected post-IPO analyst coverage from highly ranked analysts.

INVESTMENT BANKERS PROVIDE a wide range of services to firms issuing new shares through an initial public offering (IPO). These services include pre-IPO activities, related to the pricing, marketing, and distribution of the offering, as well as post-IPO activities such as price stabilization, market making, and analyst research coverage. Despite the variety of services provided to issuers and the variation in issuer characteristics, there is surprisingly little variation in the direct costs of completing an IPO. Chen and Ritter (2000) and Hansen (2001) show that underwriter spreads in IPOs are clustered at 7% for all but the very smallest and very largest offerings. Moreover, a 15% overallotment option is a standard feature of IPO contracts.

Both anecdotal and academic evidence indicate that research coverage has become an essential element of the security issuance process in recent years. Press reports indicate that star analysts play an important role in securing

*Michael T. Cliff is from Virginia Tech, Pamplin College of Business. David J. Denis is from Purdue University, Krannert School of Management. The authors gratefully acknowledge the contribution of Thomson Financial for providing earnings per share forecast data, available through the Institutional Brokers Estimate System. These data have been provided as a part of a broad academic program to encourage earnings expectations research. We thank Raj Aggarwal, Mike Cooper, Diane Denis, Rob Hansen, Greg Kadlec, Laurie Krigman, Alexander Ljungqvist, Tim Loughran, Michelle Lowry, John McConnell, Raghu Rau, Jay Ritter, Per Stromberg, an anonymous referee, and seminar participants at Concordia University, Michigan State University, the University of Pittsburgh, and the second Conference on Entrepreneurship, Venture Capital, and IPOs, for helpful comments. We also thank Laura Field and Jay Ritter for providing data, and Matt Barcaskey, Valeriy Sibilkov, and Mira Straska for research assistance.

underwriting business.[1] This view is confirmed by Dunbar (2000), who reports that underwriters increase their market share of IPOs if they have an analyst who is highly rated in the annual *Institutional Investor* survey, and Clarke, Dunbar, and Kahle (2003), who report that underwriters adding an all-star analyst gain greater IPO market share (though losing an all-star is not associated with a decline in market share). Further confirmation of the importance of research coverage in the choice of underwriter is provided by Krigman, Shaw, and Womack (2001). They report survey evidence indicating that improved research coverage is the most important element in the decision to switch underwriters between a company's IPO and its subsequent seasoned equity offering (SEO). The bottom line is that issuing companies appear to place a value on securing research coverage from sell-side analysts, especially those who are highly ranked.[2]

If companies value research coverage, it follows that they are willing to allocate resources to acquire this coverage. Yet it is unclear how the payment for such service is made in IPOs. In this study, we empirically examine the hypothesis that issuing firms pay for analyst coverage via the underpricing of the offering. Lead underwriters can benefit from underpricing by allocating IPOs to preferred clients (perhaps in exchange for future investment banking business or high future trading commissions) and by serving as the primary market maker for the high aftermarket trading volume that typically follows underpriced IPOs. Thus, we hypothesize that issuers purchase analyst coverage by giving up greater underpricing at the time of the IPO. A corollary of this hypothesis is that if the lead underwriter does not deliver the expected research coverage, the issuing company is more likely to switch to a new underwriter for subsequent SEOs. Although ours is not the first study to examine the relation between analyst research coverage and IPO underpricing, nor the first to examine the link between analyst coverage and the decision to switch underwriters, we are to our knowledge the first to examine the interconnections among these three aspects of the equity issuance process.

Our sample consists of 1,050 firms completing IPOs between 1993 and 2000 and also completing at least one subsequent SEO. We find that the analysts of lead underwriters make post-IPO recommendations in 839 of the 1,050 offerings. Of these 839 recommendations, 793 (95%) are either strong buy or buy recommendations. Despite the apparent uniformity in buy recommendations, however, there is a strong correlation between IPO underpricing and both the frequency and the perceived quality of subsequent recommendations. For companies in the lowest quintile of IPO underpricing, the lead underwriter makes

[1] For example, Das, Guo, and Zhang (2002) report the following quote from Todd Wagner, former CEO of Broadcast.com, on the company's decision to hire Morgan Stanley as the lead underwriter in its 1998 IPO. "Our rationale was, if we went with Morgan Stanley, we'd get Mary Meeker (star analyst), and we'd get a lot of attention" (p. 1).

[2] Whether such research is indeed valuable is open to debate. (For recent evidence on the information content of analyst research reports, see Mikhail, Asquith, and Au (2002) and Jegadeesh et al. (2002)).

a recommendation (possibly including unfavorable ones) only 75% of the time. This rate increases to 86% for the highest quintile of underpricing. The difference is significant at the 0.01 level. Similarly, the lead underwriter has an all-star analyst (as defined by *Institutional Investor*) following the industry of the IPO firm in 16% of the firms in the lowest quintile of underpricing. This rises to 35% for the firms in the highest quintile of underpricing. These findings from univariate tests are robust to controls for other determinants of underpricing and continue to hold when we control for endogeneity using a two-stage procedure.

The positive relation between underpricing and analyst coverage is consistent with the hypothesis that issuing firms compensate investment banks for high-quality analyst coverage via the underpricing of the offering. That is, issuers knowingly choose an underwriter with a highly ranked analyst with the expectation that there will be more money left on the table than if they had chosen a different underwriter. This is consistent with Loughran and Ritter's (2002b) analyst lust hypothesis. An alternative (though not mutually exclusive) explanation, offered by Aggarwal, Krigman, and Womack (2002), is that managers strategically underprice IPOs in order to attract interest from analysts and the media, thereby building price momentum.

Our analysis of the likelihood that an IPO issuer will switch lead underwriters between its IPO and its SEO helps distinguish the analyst lust hypothesis from the strategic underpricing hypothesis. Although we confirm Krigman et al.'s (2001) finding that firms with lower underpricing are more likely to switch underwriters, we find that, controlling for underpricing, issuing companies are significantly more likely to switch lead underwriters if the lead underwriter does not have a recommendation outstanding at the 1-year anniversary of the IPO. To our knowledge, the strategic underpricing hypothesis makes no predictions regarding the relation between the analyst coverage and the likelihood of switching underwriters. Collectively, therefore, we believe our findings are most consistent with the hypothesis that underpricing is in part compensation for expected post-IPO analyst coverage. If underwriters do not deliver the expected analyst coverage (conditional on underpricing), the IPO firm is more likely to switch underwriters when it issues shares in its subsequent SEO.

The remainder of the paper is organized as follows. In Section I, we detail our testable hypotheses and discuss how our study relates to other recent studies that examine IPO underpricing and post-IPO analyst coverage. Section II describes our sample and experimental design. Section III describes our main empirical results. Section IV discusses the implications of our findings and offers concluding remarks.

I. Hypothesis Development and Relation to Prior Studies

We hypothesize that issuing companies purchase analyst coverage by deliberately underpricing the IPO. In this section, we develop this and other hypotheses and discuss how our study relates to prior work in the IPO literature.

A. Hypotheses

A necessary condition for the hypothesized link between underpricing and analyst coverage is that analyst recommendations are perceived by issuing companies to be valuable. Analyst recommendations might be valuable for several reasons. First, analyst coverage can generate publicity for the issuing company, thereby potentially increasing firm value by generating more customers.[3] Second, both Chen and Ritter (2000) and Aggarwal et al. (2002) note that post-IPO analyst recommendations that boost share price can be especially important for insiders wishing to sell their shares in the open market following expiration of the lock-up period.[4] Third, greater analyst coverage might lead to greater investor recognition of the IPO company. According to Merton's (1987) model, this greater investor recognition can lead to a higher company value.

Loughran and Ritter (2002b) argue that analyst coverage has become more important to issuers over time. They base this argument on three observations: (1) the use of co-managers in IPO underwriting has increased over time. According to Loughran and Ritter, investment bankers claim that co-managers are present in underwriting syndicates almost exclusively to provide additional research coverage; (2) growth options have become a larger percentage of firm value, thereby increasing the importance of analyst's forecasts of future growth, and (3) analysts are increasingly more visible via the internet and the cable television.

Analyst recommendations are costly for the underwriter to provide. These costs include not only the direct costs of investigation, but also any reputation costs associated with incorrect recommendations. This implies that underwriters will, ceteris paribus, demand greater compensation to underwrite deals that are subsequently accompanied by greater, more reputable, or more favorable analyst coverage. One way to compensate underwriters for greater analyst coverage would be to increase the underwriter fee. However, the fact that underwriter fees are a uniform 7% for the majority of IPOs during our sample period (75% of our sample) suggests that differential underwriter fees are not used as compensation for differential analyst coverage. We therefore hypothesize that underwriters are compensated for analyst coverage via greater underpricing.

Why wouldn't firms compensate underwriters for analyst coverage via the underwriter spread? One possibility is that uniform underwriter fees offer unique economic advantages in serving IPOs. Hansen (2001) offers several conjectures as to why the 7% underwriter fee has evolved as an efficient contract. These include reduced information externalities that arise in valuing IPOs, reduced moral hazard in underwriter placement efforts, and lower contracting costs. Alternatively, for reasons described below, underwriters may perceive greater benefits from receiving compensation in the form of underpricing.

[3] Hakenes and Nevries (2000) make a similar argument for IPO underpricing, while Grullon, Kanatas, and Weston (2004) show that firm visibility (as measured by product market advertising) increases liquidity.

[4] At the time of an IPO, insiders typically commit to a lock-up provision that restricts them from selling their shares for 180 days following the IPO without the explicit written permission of the lead underwriter.

There are several ways in which underwriters might benefit from underpricing. First, underwriters can allocate more underpriced IPOs to favored clients, perhaps in return for future investment banking business. According to this hypothesis, labeled the corruption hypothesis by Loughran and Ritter (2002b), the money left on the table in an underpriced deal is currency with which investment bankers can compensate other venture capitalists and issuing company executives. This practice, known as spinning, has been the subject of recent congressional investigations of CSFB, Goldman Sachs, and Salomon-Smith Barney. The recently proposed NASD Rule 2712 clarifies and strengthens the prior Rule 2710 that prohibits spinning.[5] Second, underwriters can allocate shares to hedge funds and other large investors who then do more of their trading with the investment bank. Some claim that these investors pay higher than normal commissions.[6] Third, because underpricing is positively correlated with subsequent trading volume (Krigman et al. (2001)) and because lead underwriters are the primary market makers (Ellis, Michaely, and O'Hara (2000)), underwriting firms can benefit from underpricing.

This discussion leads to several empirical predictions. First, we hypothesize that analyst coverage by the lead underwriter is positively related to initial underpricing. While coverage can be measured in several ways, our analysis focuses on (1) the existence of analyst recommendations by lead underwriters, and (2) the perceived quality of the lead underwriter's analyst. We focus on lead underwriters because they have the most to gain from underpricing through their primary role in allocating IPOs and through their subsequent role as the primary market makers. We focus on analyst recommendations rather than short-term earnings forecasts because recommendations are longer term, and hence, more difficult to compare to actual outcomes. Presumably, reputation effects will constrain analyst forecasts of near-term earnings to be close to actual outcomes. Consistent with this conjecture, Lin and McNichols (1998) report significant differences in the recommendations of lead underwriters of seasoned equity offerings versus those of unaffiliated analysts, but report no evidence of differences in short-term earnings forecasts.

Second, we hypothesize that underwriters from investment banks with higher research reputations demand greater underpricing as compensation for their services (i.e., they earn rents). That is, conditional on making a recommendation, underpricing should be greater in IPOs underwritten by more prestigious investment banks or those with higher-rated analysts.

Third, we hypothesize that the likelihood of switching underwriters between the company's IPO and its SEO is associated with the unexpected amount of

[5] The proposed Rule 2712 can be found at www.nasdr.com/pdf-text/0255ntm.pdf.

[6] In one well-publicized case, CSFB is alleged to have allocated an additional 15,450 shares of VA Linux Systems' IPO to Ascent Capital based on Ascent's recent and expected future trading activity. Based on the record 698% increase in the value of in VA Linux's shares on the first day of trading, Ascent's total allocation of shares produced paper profits of $3.8 million. That same day, Ascent traded large blocks of shares in several stocks through CSFB at commissions far higher than normal. For example, Ascent is alleged to have paid $2.70 per share to trade 50,000 shares of Citgroup, a trade that would normally be done for fees of a few cents per share. See "At CSFB, Lush Profits from IPOs Found Their Way Back to Firm," *Wall Street Journal*, November 30, 2001.

analyst coverage. That is, if analysts do not deliver the expected coverage (conditional on underpricing), companies are more likely to switch to a different underwriter for their SEO.

B. Relation to Prior Studies

At least three prior studies report a positive correlation between underpricing and some measure of analyst coverage. Rajan and Servaes (1997) find that, controlling for the post-IPO market value of equity, the number of analysts following an IPO stock is positively related to underpricing. This finding is consistent with Chemmanur (1993), who predicts that equilibrium offer prices may involve underpricing in order to maximize outsider information production. In other words, unlike our hypothesis, Chemmanur's model predicts that the direction of causality runs from underpricing to analyst coverage. Similarly, Bradley, Jordan, and Ritter (2003) find that the likelihood of coverage being initiated following the expiration of the so-called "quiet period" is positively related to the degree of underpricing. However, their focus is on the stock price reaction to the analyst recommendations.

Aggarwal et al. (2002) find that underpricing is positively correlated with analyst research coverage by *non-lead* underwriters. However, their focus is on testing the hypothesis that managers strategically underprice to maximize the proceeds from open market sales following the expiration of the lockup period. In other words, their study emphasizes the benefits to issuing company managers from underpricing. In contrast, our study focuses on analyst coverage of the *lead* underwriter and emphasizes potential benefits to the underwriter from underpricing.

Other studies establish that post-IPO analyst coverage is typically abnormally favorable, particularly for lead underwriters. For example, Bradley et al. (2003) report that when analyst coverage is initiated, it is almost always with a favorable recommendation. Michaely and Womack (1999) study a sample of 391 IPOs from 1990 to 1991 and report that lead underwriters are significantly more likely than non-lead underwriters to issue buy recommendations in the year following the IPO. However, long-run performance following lead bank recommendations is inferior to that following the recommendations of other banks. These studies do not, however, investigate the link between underpricing and analyst coverage, nor do they test whether this link affects the likelihood of switching underwriters in the company's subsequent SEO.

Krigman et al. (2001) investigate the reasons why firms switch underwriters for their SEO. Based on large-sample and survey evidence, they conclude that the timeliness and perceived quality of research coverage is an important determinant of the decision to switch. However, they do not investigate underpricing as a means of compensation for this research coverage. In fact, they conclude that issuing companies "allocate their resources in the form of underwriting fees, to increase and improve this coverage (p. 278)." Because underwriting fees do not vary much across issues, it is not clear how fees are used as compensation for differential research coverage.

II. Sample Selection and Data Description

A. Sample Formation

We obtain our sample of issuing firms by first selecting all firms that completed an initial public offering between 1993 and 2000. This information is from the Securities Data Corporation (SDC) New Issues database. Because we are interested in the dynamics of the relations among underpricing, analyst recommendations, and subsequent underwriter choice, we also require that the sample firms complete at least one SEO. We then match these firms against the Center for Research and Securities Prices (CRSP) and IBES databases. We exclude financial firms (SIC codes 6xxx), firms that the SDC lists as having multiple IPOs or concurrent offers, and issues with SDC share types other than Common Shares, Class A Shares, Ordinary Shares, or Ord./Common Shrs. We also exclude nine offers for which Merrill Lynch is the lead underwriter in 1993 and 1994.[7] This results in a final sample of 1,050 IPOs during this period.

Although we choose the sample period of 1993–2000 to maximize the availability of analyst recommendations on IBES, Bradley et al. (2003) report that IBES coverage is less complete in the early years of our sample period. This raises the possibility that we label some firms as having received no analyst coverage when, in fact, they did receive coverage. Although we are unaware of any reason why such errors would be systematically related to underpricing, we later test the robustness of our findings to the exclusion of offerings completed in the first part of our sample period—that is, the years in which the likelihood of errors in recording analyst coverage is greatest.

By imposing the requirement that the sample firms complete at least one SEO, we potentially bias the sample towards more successful companies. If analysts are more likely to cover successful companies, this increases the likelihood that our sample companies will receive analyst coverage. Note, however, that if anything, this lack of dispersion in analyst coverage makes it less likely that we find any connection between IPO underpricing and analyst coverage. Moreover, as we later show in Table I, the sample IPOs exhibit levels of underpricing that are quite similar to that of the population of IPOs issued during the same time period.

We use CRSP for data on share prices, including the initial trading price and trading volume. From SDC, we identify the lead underwriter(s) for each offering and attempt to find IBES coverage of the issuer by that investment bank. In all of our analysis we make an effort to match investment banks, taking into account acquisitions. For example, Bankers Trust acquired Alex.

[7] Merrill Lynch is not covered in the IBES database prior to 1998. For offers in 1996 and 1997, we are able to identify whether Merrill Lynch provides analyst coverage by hand collecting data from Investext. However, these data are not available prior to 1996. In order to avoid mislabeling some Merrill Lynch-led IPOs as having no analyst coverage, we exclude all Merrill Lynch offers for which the 1-year anniversary of the IPO occurs prior to 1996. Our results are not sensitive to this choice. In addition, we verify that other major underwriters are covered by IBES for our entire sample period.

Table I
Time Profile

Shown here are the time profile and selected characteristics of a sample of 1,050 IPOs completed between 1993 and 2000. Underpricing is measured as the percentage return from the offer price to the closing price on the first day of trading. We define a firm as having an IBES SDC link if we are able to match the lead underwriter of the IPO from SDC with an investment bank listed on IBES. The IPOs in the sample all complete a subsequent SEO between 1993 and 2001.

Year	No. of IPOs	Average Underpricing (%)	Average Frequency of IPOs in Current or Prior Month	Average Underpricing of IPOs in Current or Prior Month	Percent with an IBES/SDC Link	Percent that Switch Lead Underwriter at SEO
1993	191	13.0	108.0	15.8	93.7	40.3
1994	163	9.5	99.5	14.0	85.3	48.5
1995	155	18.2	102.0	20.0	98.7	31.0
1996	210	17.8	147.7	17.9	99.0	33.8
1997	108	16.7	104.9	14.6	97.2	33.3
1998	63	48.0	71.8	21.2	100.0	20.6
1999	122	91.2	89.9	65.3	100.0	18.0
2000	38	61.0	76.3	52.7	100.0	15.8
All	1,050	27.5	108.0	23.8	95.9	33.5

Brown in 1997. For an IPO in 1996 with Alex. Brown as the lead underwriter, we would consider analyst coverage by both Alex. Brown and Bankers Trust in 1997. For an IPO done by Alex. Brown in 1995, we would not consider Bankers Trust as affiliated with the lead underwriter in 1996. We are able to determine a match for 96% of the issues in our sample. Those IPOs for which we are not able to find a match are treated as if there is no analyst coverage. For IPOs that have joint lead managers (i.e., more than one underwriter that help manage the book—SDC codes BM, JB, or LM), we treat all lead managers as one. We do not treat co-managers as the lead, however, since these underwriters are not book-runners, leaving the lead manager to allocate the vast majority of shares (see Chen and Ritter (2000, Table V)).

B. Variable Construction

The Appendix provides a summary of the key variables used in our analysis and the data sources. We briefly discuss some of the most important variables here. We measure underpricing as the percentage return from the SDC offer price to the first closing price on CRSP. If the first CRSP price is more than three days after the SDC issue date, we delete the issuer.

Measuring analyst coverage requires some subjective decisions on our part. Ideally, our measure indicates whether the lead underwriter provides research coverage that is both timely and ongoing. Our primary measure is a dummy variable indicating whether the lead underwriter provides a recommendation

on the issuer 1 year after the IPO.[8] Throughout the paper, when we refer to a company receiving coverage, we are referring to this measure. We also consider the strength of the recommendation, but since 95% of the leads' recommendations are strong buy or buy, we focus primarily on the existence of a recommendation. We recognize that our time cutoff is arbitrary, but the 1-year window should provide a reasonable opportunity for the lead underwriter to initiate coverage. As we discuss later, our results are robust to using 6-month or 2-year windows.

We also collect data on *Institutional Investor's* all-star analyst team. We match an IPO to an all-star if the lead underwriter has an all-star (first-, second-, or third-team) in the same industry as the issuer in the year of the issue or the prior year.[9] To measure the quality of the underwriter, we use Jay Ritter's updated Carter-Manaster (1990) underwriter reputation measures. We also use Ritter's data to construct variables to measure whether an issue was completed during a hot market.[10] Specifically, for each IPO, we measure market conditions in two ways—as the total number of all IPOs (including those not in our sample) conducted during the month of and the month prior to the IPO, and as the average underpricing across all IPOs during the same two-month period. To get a firm-specific measure of a hot deal, we calculate a turnover variable as the ratio of average daily volume over the 30 trading days following the IPO to the number of shares issued.

C. Data Description

Table I reports a time profile of the sample IPOs along with selected characteristics. The number of offerings for which at least one SEO was conducted by the end of 2001 ranges from a low of 38 in 2000 to a high of 210 in 1996.[11] Consistent with the data reported in Ritter and Welch (2002), average underpricing increases dramatically in the late 1990s. Although underpricing averages 28% for the full sample, it averages 91% in 1999. Interestingly, although the late 1990s exhibit the greatest underpricing, this period was not the most active period from the point of view of number of deals, even before we apply our SEO

[8] We also measure whether the lead underwriter provides an earnings forecast during the year following the IPO, and whether the lead underwriter provides either a recommendation or a forecast. Banks that have stopped coverage 1-year post-IPO, but covered the firm before or after the 1-year mark, are counted as not receiving coverage. In the former case, we argue that the coverage is not ongoing, while in the latter case, we argue that the coverage is not timely.

[9] We recategorize the Institutional Investor industry definitions. For example, they consider managed care and health care facilities separately, while we aggregate these into a single health care industry, SIC 80xx.

[10] We thank Jay Ritter for making these and other data available on his website (http://bear.cba.ufl.edu/ritter/). If there are multiple lead managers we use the average reputation measure. The volume and underpricing series used are those including all IPOs, including penny stocks.

[11] The low figure in 2000 is due in part to our requirement that the firm also complete an SEO by December 2001. In Section III.G., we provide evidence that our results are robust to the exclusion of IPOs completed in 1999 and 2000.

requirement. In unreported results, we also find that the proportion of IPOs by technology companies in our sample was much greater in the late 1990s than earlier (73% in 1999 vs. 31% in 1993). Columns four and five of Table I show that the patterns of frequency and underpricing for our sample of IPOs are representative of the overall population of IPOs issued during the same time period.

The sixth column of Table I shows the fraction of IPOs for which we can definitively establish a link to the IBES database.[12] It is clear that in the first 2 years of our sample there are more unmatched deals. This means that we are potentially counting a deal as having no coverage, when in fact there may be coverage that we were simply unable to identify. In Section III.G, we show that our results are robust to excluding these deals. Overall, we match the lead underwriter to IBES for 96% of our IPOs. Our match rates and coverage frequencies are similar to those found in Krigman et al. (2001).

Finally, in the last column we report the fraction of issuers who switch underwriters for their SEO. We define an issuer as having switched if it does not employ the lead IPO underwriter (or a subsequent affiliate through merger or acquisition) as the lead managing underwriter in the first SEO following the IPO. An issuer that uses the IPO lead as a co-manager or general syndicate member in the SEO is classified as switching. This definition of switching is consistent with Krigman et al. (2001). Our data indicate that 34% of issuing firms switch the lead underwriter for their first SEO. Of the firms that switch lead underwriters, approximately half employ the IPO lead underwriter as a co-manager in the SEO, and half do not employ the underwriter in the SEO at all. (These data are not reported in the table.) It is very rare for the lead underwriter from the IPO to be demoted to the position of a general syndicate member in the SEO.

The rate of underwriter switching in our sample declines over time, from 40% in 1993 to 16% in 2000. Of course, this pattern is likely due to the fact that (1) firms are more likely to switch underwriters if there is a long time between their IPO and their SEO, and (2) if IPOs in the early part of our sample potentially have a longer time period between the IPO and the SEO. We later control for the length of this period in the logit regressions predicting the likelihood of switching underwriters, and verify that the correlation between analyst coverage and switching underwriters is similar, if we limit the sample to those cases in which the firm completes its SEO within 3 years of its IPO.

Table II reports summary statistics on a few other key variables. Across all IPOs, underpricing ranges from a low of −29% to a high of 606%. The presence of some extreme positive underpricing makes the median of 11.6% much less than the mean of 27.5%. The average IPO uses an underwriter with a reputation measure of 7.5.[13] About 22% of the issues employ a lead underwriter who has an

[12] Typically, this means that a bank listed on SDC is matched to an IBES bank. However, it also includes a few cases in which the SDC bank is known not to make recommendations (e.g., Allen & Co).

[13] To help interpret the meaning of this ranking, BB&T and Legg Mason are rated 7, while Bear Stearns and UBS Warburg are rated 8.

Table II
Descriptive Statistics for IPOs

Shown here are summary measures for a variety of sample characteristics. The sample includes 1,050 IPOs completed between 1993 and 2000 for which a subsequent SEO is made between 1993 and 2001. Underwriter rank is based on Jay Ritter's updated Carter-Manaster (1990) measure.

Characteristic	Mean	Median	Minimum	Maximum
Underpricing (%)	27.5	11.6	−29.2	605.6
Underwriter rank	7.5	8.0	1.0	9.0
Percent with all-star analyst	22.4	n.m.	n.m.	n.m.
Percent with analyst forecast or recommendation at 1-year anniversary of IPO	89.2	n.m	n.m.	n.m.
Percent with analyst recommendation at 1-year anniversary of IPO	79.9	n.m.	n.m.	n.m.
Proceeds (in $millions)	65.5	41.0	2.5	2,853.1
Underwriter spread	7.1	7.0	4.0	10.2
Percentage of offerings with non-7% spread	25.6	n.m.	n.m.	n.m.
Percent technology companies	44.9	n.m.	n.m.	n.m.
Offer price revision between filing and offering (%)	3.1	0.0	−60.0	140.0
Percent not listed on organized exchange	3.8	n.m.	n.m.	n.m.
Age of company	11.6	6.0	0.0	145.0

n.m., not meaningful.

all-star in that industry. Issuers raised a mean of $66 million (in 2000 dollars), with a range from $2.5 million to $2.9 billion. As first documented by Chen and Ritter (2000), the underwriting spread is clustered at 7%, with 74% of the IPOs having a spread of exactly 7%. We also observe clustering at other integers such as 8% and 10% in our sample. Forty-five percent of the sample firms are defined as technology companies, and 96% are traded on a major market (e.g., NYSE, AMEX, or Nasdaq NMS). Finally, the average offer price revision (i.e., the percentage difference between the offer price and the midpoint of the filing range) is 3.1%, though the median IPO is issued at the midpoint of the filing range. We observe large deviations in this variable, ranging from –60% to 140%.

III. Empirical Results

We begin our empirical analysis by reporting the frequency and distribution of post-IPO analyst recommendations. We then examine the link between underpricing and analyst coverage via univariate comparisons, ordinary least squares regressions, and two-stage OLS and logit models that control for the endogeneity of underpricing and analyst coverage. Finally, we examine whether the likelihood of switching underwriters for the company's SEO is related to the unexpected (conditional on underpricing) amount of post-IPO analyst coverage.

A. Analyst Coverage and Recommendations

Table III reports the extent of post-IPO analyst coverage and the strength of their recommendations. The data in Panel A indicate that most (75%) of the

Table III
Analyst Coverage and Recommendations

Shown here are the frequency of analyst coverage and the nature of recommendations 1 year after the IPO. The sample includes 1,050 IPOs completed between 1993 and 2000 for which a subsequent SEO is made between 1993 and 2001. For each offering we identify whether the offering company is covered either by the lead underwriter(s), non-lead underwriters, or neither, according to the IBES. For multiple recommendations from joint lead underwriters, the average is used, with rounding to the nearest integer.

Panel A: Frequency of Coverage

	Number	Total Percentage	Mean Underwriter Rank	Percent with All-star
Lead and non-lead underwriter	791	75.3	8.0	24.7
Lead underwriter only	48	4.6	5.8	14.6
Non-lead underwriter only	117	11.1	7.4	23.9
Neither lead nor non-lead	51	4.9	4.8	9.8
Unable to link IBES with SDC	43	4.1	2.7	

Panel B: Distribution of Recommendations

	Lead Underwriters		Non-Lead Underwriters	
	Number	Percent of Recommendations	Number	Percent of Recommendations
Strong buy (5)	455	54.2	454	44.8
Buy (4)	338	40.3	424	52.0
Hold (3)	46	5.5	40	3.2
No recommendation	211		132	
Average recommendation[a]	4.49		4.37	
t-test of difference	4.74			
(*p*-value)	(0.0000)			

[a]Includes only those IPOs in which both the lead and the non-lead make a recommendation.

sample IPOs receive coverage from a lead underwriter and at least one other analyst 1 year after the IPO date. Only 48 (4.6%) IPOs have coverage by the lead underwriter only.

Somewhat surprisingly, 117 offerings (11.1% of the sample) have no coverage by the lead, but do have coverage by another analyst (which may include co-managers or other syndicate members).[14] The last two columns of the table provide some interesting information about these deals. When the lead underwriter is the only bank providing coverage, the lead bank tends to be of lower quality, as shown by an average reputation rank of 5.8 and 14.6% frequency

[14] Consistent with Bradley et al. (2003), this is more common in the earlier years of our sample period. Of the 117 IPOs in which there is no coverage by the lead underwriter, but there is coverage by non-leads, 67 are completed between 1993 and 1995. Only 14 are completed in 1999 or 2000. Similarly, Bradley, Jordan, and Ritter report that 209 of the 496 IPOs completed in 1996 did not have immediate initiation of analyst coverage, while this was true for only 12 of the 273 IPOs completed in 2000.

of all-stars. When the lead makes no recommendation but other banks do, the lead tends to be of higher quality (7.4 reputation rank and 23.9% all-star frequency). These facts are consistent with a situation in which underwriters value their reputation and lead underwriters would rather not offend their clients by issuing unfavorable recommendations.

Finally, the last two rows present data on the IPOs for which there are no analyst recommendations. There are 51 issuers for which we can determine a match between the SDC and the IBES databases, but for which there is no coverage by the lead or any other analyst. In addition, there are 43 IPOs for which we are unable to definitively determine an SDC/ IBES match. In all likelihood, most of these unmatched issuers probably do not get coverage, as they tend to be very small IPOs ($9.9 million average proceeds), in small industries, have low share turnover, and are done by less prestigious underwriters (2.7 average reputation). These issuers also are very likely (76%) to switch underwriters for the SEO. Our results are robust to the exclusion of these 43 observations.

Panel B of Table III reports the frequency of different recommendations at the 1-year anniversary by lead and non-lead analysts. When there are multiple lead managers with recommendations, we use the average recommendation, rounded to the nearest integer. Thus, for example, if strong buy = 5, buy = 4, and so on, and if there are two lead managers, one of whom issues a buy recommendation (4) and one of whom issues a strong buy (5), this would average to 4.5. We would then round this to 5, a strong buy. Consistent with Bradley et al. (2003), it is apparent that analysts either say something nice or say nothing at all. Analysts issue no sell or strong sell recommendations and only 5.5% of the recommendations made by the lead (3.2% of those made by the non-lead) are to hold. Both leads and non-leads tend to split the remaining recommendations fairly evenly between strong buy and buy. For the issuers for which both lead and non-lead underwriters make recommendations, the average recommendation by a lead underwriter is a 4.49, versus a 4.37 for a non-lead underwriter. This difference is statistically significant at the 0.01 level ($t = 4.7$).

B. Univariate Comparisons of Underpricing and Analyst Coverage

In Panel A of Table IV, we first sort the sample IPOs into quintiles based on underpricing, then compare the average values of key variables across the quintiles. Some of these data are also depicted graphically in Figure 1. Average underpricing ranges from −2.5% in the lowest quintile to 98.7% in the highest quintile. Consistent with our hypothesis, analyst coverage (recommendation or forecast) is positively related to underpricing. Ninety-four percent of the firms in the highest quintile receive some coverage (recommendation or earnings forecasts), as compared to about 85% in the lowest two quintiles. The pattern for lead recommendations is similar, ranging from about 73% up to 86%. A test of equality across quintiles rejects the hypothesis that underpricing is unrelated to analyst coverage at the 0.01 level.

These findings support the hypothesis that underwriters agree to provide coverage to those issuers who agree to greater underpricing. However, consistent

Table IV

IPO Characteristics Sorted Based on Underpricing and Lead Coverage Status

Shown here are the average characteristics of analyst coverage, underwriter characteristics, underwriter fees, the propensity to switch underwriters at the time of an SEO, the price revision between the IPO offering filing and offering date, and the fraction of technology firms by quintile of IPO underpricing. The sample includes 1,050 IPOs completed between 1993 and 2000 for which a subsequent SEO is made between 1993 and 2001. The *p*-values are reported for the significance of a test of equal means values across quintiles. KW *p*-values are Kruskal-Wallis *p*-values for tests of equal medians.

Panel A: Underpricing Quintiles

Underpricing Quintile	Underpricing (%)	Percent with Lead Analyst Forecast or Recommendation	Percent with Lead Analyst Recommendation	Percent with a Non-lead Recommendation	Underwriter Rank	Percent with an All-star Analyst	Percent that Switch Underwriter at SEO	Underwriter Spread	Offer Price Revision (%)	Percent in Technology Industry
Low	−2.5	87.1	74.8	81.4	7.2	15.7	46.2	7.1	−12.0	45.2
Q2	3.8	83.5	71.2	82.1	7.1	16.0	44.8	7.1	−8.0	37.7
Q3	12.1	92.3	82.7	86.5	7.3	18.3	33.7	7.0	0.9	33.7
Q4	25.4	89.0	85.2	91.0	7.7	26.7	26.2	7.1	8.7	36.2
High	98.7	94.3	85.7	96.7	8.2	35.2	16.7	7.1	26.0	71.4
p-value	0.0000	0.0031	0.0001	0.0000	0.0000	0.0000	0.0000	0.8195	0.0000	0.0000
KW *p*-value	0.0000	0.0032	0.0002	0.0000	0.0000	0.0000	0.0000	0.9128	0.0000	0.0000

Panel B: Recommendations by Lead Underwriter

Recommendations by Lead Underwriter	Underpricing (%)	Underwriter Rank	Percent with an All-star Analyst	Percent that Switch Underwriter at SEO	Underwriter Spread	Offer Price Revision (%)	Percent in Technology Industry
No	15.7	5.8	15.6	62.6	7.7	−1.9	42.7
Yes	30.5	7.9	24.1	26.2	6.9	4.4	45.4
p-value	0.0002	0.0000	0.0086	0.0000	0.0000	0.0003	0.4721
KW *p*-value	0.0000	0.0000	0.0086	0.0000	0.0000	0.0002	0.4718

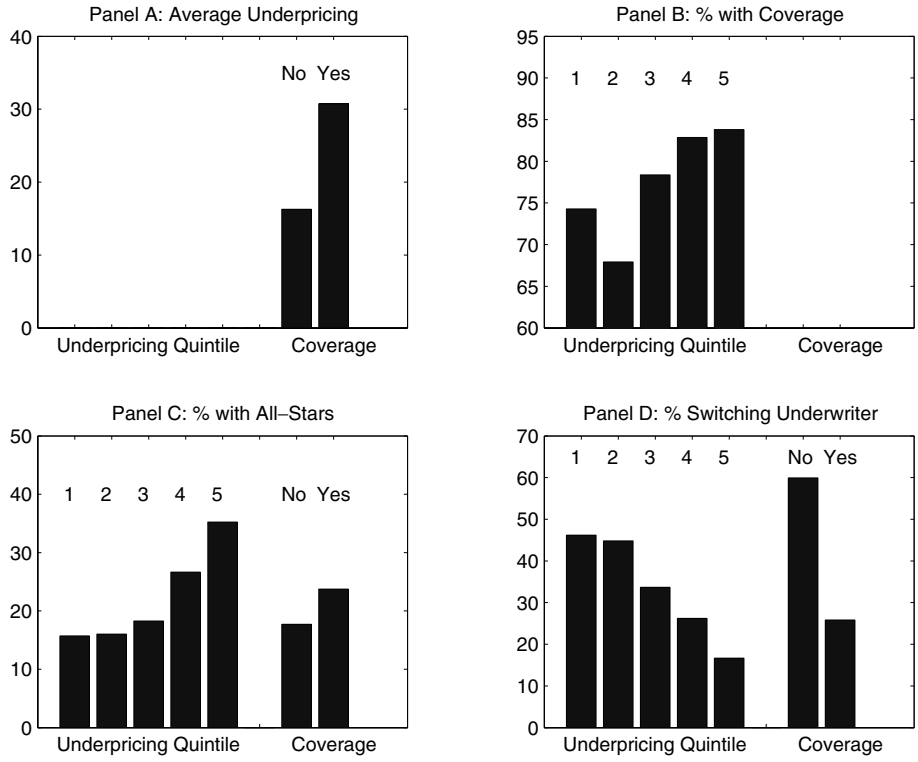

Figure 1. The sample is partitioned into quintiles based on underpricing, and into two groups on the basis of whether or not the company receives analyst coverage. The figure then depicts average underpricing, the percentage of companies with analyst coverage, the percentage of companies in which the lead underwriter has an all-star analyst covering the company's industry, and the percentage of companies switching underwriters between their IPO and their SEO within each group. The full sample includes 1,050 IPOs completed between 1993 and 2000 for which a subsequent SEO is made between 1993 and 2001.

with Rajan and Servaes (1997) and with Krigman et al. (2001), the next column shows that non-lead underwriters are also more likely to cover deals that have large underpricing. Although the set of non-lead underwriters includes co-managers who may also benefit from underpricing, this result indicates that our subsequent tests will need to control for the possibility that greater underpricing leads to greater coverage.

Consistent with Beatty and Welch (1996), there is a positive relation between underpricing and the reputation of the underwriter. Similarly, the frequency of all-star coverage roughly doubles as one moves from the lower three underpricing quintiles to the highest quintile. Apparently the issuers don't mind the underpricing. Consistent with the findings in Krigman et al. (2001), almost half of the low-underpricing firms switch underwriters, while only one sixth of the high-underpricing firms switch. To the extent that highly underpriced IPOs

receive greater analyst coverage, this finding supports our hypothesis. However, another explanation for this pattern, offered by Loughran and Ritter (2002a), is that the issuers with the greatest underpricing are happy because they ended up with greater proceeds (and wealth) than they originally anticipated. Consistent with this view, we (like others) find a positive relation between offer price revisions and underpricing. The least underpriced deals have a 12% reduction from the midpoint of the filing range, whereas the most underpriced issues have a 26% increase prior to the IPO. Finally, there is a strong industry effect in the underpricing quintiles. Seventy-one percent of the IPOs in the highest quintile are technology firms, compared to about 35% to 45% for the other quintiles.

Panel B of the table repeats the exercise for many of the same variables, now splitting the sample based on whether the lead underwriter makes a recommendation. When the lead makes a recommendation, the average underpricing is 30.5%, which is significantly larger than the average of 15.7% when there is no lead recommendation. IPOs without lead coverage tend to be underwritten by lower quality banks, have higher underwriting spreads, and have lower offer price revisions. Consistent with our hypothesis, issuers who do not get a recommendation from their lead IPO underwriter tend to be much more likely to use a different underwriter for their first SEO (63% of them switch) than issuers who do get recommendations (26% of them switch).

C. Ordinary Least Squares Regression Results

To facilitate comparison of our results with the existing literature, we estimate ordinary least squares (OLS) regressions in which underpricing is the dependent variable. Table V shows three specifications, starting with one in which we do not include any analyst coverage-related variables. All three models contain calendar year dummy variables to control for intertemporal variation in average pricing. Consistent with our univariate findings, underpricing is positively related to underwriter reputation and to the offer price revision. The offer price revision variable is a particularly strong determinant of IPO underpricing, consistent with the partial adjustment phenomenon first reported in Hanley (1993).

We find weak evidence (t-statistics of about -1.7) of a negative relation between issue size and underpricing, a significant negative relation for offerings not traded on a major exchange, a significant positive relation for both the market-wide level of average IPO underpricing and the CRSP value-weighted return, and a significant negative relation with firm age.[15] We find no relation

[15] As pointed out by Habib and Ljungqvist (1998), underpricing is mechanically related to offer size. Thus, the interpretation of this variable as a proxy for uncertainty is problematic. We include it in order to facilitate comparison of our findings to those of prior studies and to control for possible economies of scale in underwriting. In unreported regressions, we also measure issue size as the log of expected proceeds, where expected proceeds are equal to the midpoint of the original filing price range times the number of shares offered. Our results are virtually identical using this alternate size measure.

Table V
OLS Regression Results with Underpricing as the Dependent Variable

Shown here are the cross-sectional regressions of percentage IPO underpricing on calendar year dummy variables (not reported); the log of real proceeds in year 2000 dollars; underwriter rank; the frequency of IPOs in the market during the current or prior month; the average underpricing of IPOs over the current or prior month; the underwriter spread; the price revision between the midpoint of the initial filing range and the offer price; a dummy variable for offerings not listed on NYSE, AMEX, or Nasdaq NMS, a dummy variable for technology companies; the average CRSP value-weighted index return over the three weeks up to issuance; the standard deviation of CRSP value-weighted index return over the three weeks up to issuance; the log of one plus firm age at issuance; a dummy variable equal to one if the lead underwriter makes a recommendation; and a dummy variable equal to one of the lead underwriter has an all-star analyst covering the industry of the IPO company. Coefficients are reported with heteroskedasticity-consistent t-statistics in parentheses below. The sample includes 1,050 IPOs completed between 1993 and 2000 for which a subsequent SEO is made between 1993 and 2001.

Variable	Model (1)	Model (2)	Model (3)
Log (proceeds)	−3.88	−3.69	−4.14
	(−1.68)	(−1.59)	(−1.77)
Underwriter rank	2.25	2.07	1.45
	(3.50)	(3.28)	(2.26)
IPO frequency	−0.02	−0.03	−0.03
	(−0.39)	(−0.41)	(−0.44)
IPO returns	0.58	0.58	0.60
	(2.03)	(2.02)	(2.07)
Underwriter spread	3.41	3.84	3.33
	(1.60)	(1.75)	(1.52)
Offer price revision	0.89	0.89	0.88
	(8.42)	(8.32)	(8.08)
Non-exchange traded	−7.41	−7.28	−7.88
	(−2.17)	(−2.14)	(−2.30)
Technology dummy	4.14	4.27	3.79
	(1.51)	(1.55)	(1.41)
Pre-IPO market return	0.25	0.25	0.25
	(2.95)	(2.96)	(2.92)
Pre-IPO market std	0.04	0.04	0.04
	(0.64)	(0.64)	(0.70)
Log(1 + age)	−1.76	−1.85	−1.78
	(−1.95)	(−2.01)	(−1.94)
Lead underwriter recommendation		3.01	3.41
		(1.25)	(1.38)
All-star analyst			8.73
			(2.18)
Year dummies	Yes	Yes	Yes
Adjusted R^2	0.440	0.440	0.444

to the frequency of IPOs in the market, the underwriter spread, technology firms, or the volatility of market returns prior to the issuance. These findings are generally consistent with those reported in the literature, providing further assurance that our sample is representative of the population of issuing firms.

Moreover, the regression model explains a large portion of the cross-sectional variation in underpricing, as evidenced by the adjusted R^2 of 0.44.

To give some sense of the economic relevance of the significant coefficient estimates, an increase in the underwriter reputation variable from a 7 (e.g., Legg Mason) to a 9 (e.g., Goldman Sachs) is associated with an increase in underpricing of 4.5%. The point estimate of 0.89 on the offer price revision variable indicates that as the offer price is revised up by 10% (say from $20 to $22), underpricing tends to rise by 8.9 percentage points.

In model (2), we add a dummy variable equal to one if the lead underwriter provides an analyst recommendation. The inclusion of this variable essentially has no effect. The point estimate is not significantly different from zero and is small in economic magnitude, the other variables are not affected, and the adjusted R^2 actually drops. This is inconsistent with our first hypothesis, which predicts a positive relation between underpricing and coverage. However, as we demonstrate in the next section, it is important to control for the endogeneity between underpricing and coverage.

Finally, in model (3) we add a dummy variable for the presence of an all-star analyst. Consistent with our second hypothesis, this variable is both statistically and economically significant. The point estimate indicates that underpricing is 9% higher in IPOs in which the lead underwriter has an all-star analyst covering the industry of the IPO firm. This finding supports the view that issuing companies value the presence of an all-star analyst and pay for this prestige via underpricing. Most of the remaining coefficients are unaffected, although the role of underwriter reputation is somewhat muted in the presence of the all-star dummy (almost all all-stars are at banks rated 8 or 9).

D. Two-stage Estimation to Control for Endogeneity

One criticism of the OLS regressions in Table V is that they assume that analyst coverage is exogenous. Based on the discussion in Section I, however, it is clear that underpricing and analyst coverage may be endogenous. Similar to the approach adopted in Lowry and Shu (2002), we attempt to mitigate the bias that this endogeneity induces in the regression coefficients by using a two-stage estimation procedure. We estimate first-stage models of underpricing and analyst coverage, including the same set of exogenous variables in each equation. Our choice of variables is motivated by the large literature on the determinants of underpricing, as well as the determinants of analyst coverage. Specifically, we include variables for the log of real proceeds; the lead underwriter's reputation; the relative size of the industry; average trading volume for the 30 trading days following the IPO, scaled by the number of shares offered; the number of co-lead managers; the number of IPOs by any firm in the month of the issue and the prior month; the average underpricing during this period; the gross underwriting spread; the offer price revision; the average and standard deviation of returns on the value-weighted CRSP index during the 3 weeks prior to the issuance; the log of one plus firm age, and dummy variables for technology firms; all-star coverage by the lead underwriter; and whether the firm is not

listed on a major exchange. The underpricing regression is estimated by OLS and the coverage model is estimated by logit. The coefficient estimates from these first-stage models are reported in the first two columns of Table VI.

We then use the fitted values from these models as instruments in the second-stage estimation. The second-stage models also include as independent variables those exogenous variables that have a strong theoretical justification. The standard errors for the second-stage estimates correct for estimation error in the first stage using the procedure described in Maddala (1983).

The results in the third column of Table VI identify two main determinants of coverage. The first is the reputation of the lead underwriter, which is positive and highly significant ($t = 6.0$). To interpret the economic magnitude, we compare the estimated probability of coverage at the sample mean, where the underwriter reputation is 7.5, to the probability when the reputation rank increases to the maximum of 9. Our estimates indicate that moving from an average underwriter to the most reputable underwriter increases the likelihood of coverage by 6.5%. The all-star variable is negative and significant, with a t-statistic of -2.2. Again, we evaluate the economic impact of moving from having no all-star to having an all-star. The impact of having the all-star is a drop in the likelihood of coverage of 8.2%. This comparative static is somewhat misleading, since it is unlikely that a firm would have an underwriter with an average reputation and an all-star. When we combine these two effects, they largely offset one another. In comparing an issuer using an average reputation underwriter with no all-star to an otherwise identical issuer using a highly reputable underwriter with an all-star, the likelihood of coverage drops by 0.4%. Finally, we note that the underpricing instrument is positive, but not significantly different from zero. Overall, the model has a pseudo-R^2 of 0.173, correctly classifying 84.9% of the IPOs.

The last column of Table VI shows the results for the underpricing regression. Consistent with our second hypothesis, we find that the presence of an all-star analyst increases underpricing by an economically large 13.9 percentage points (t-statistic of 3.6). However, partially offsetting this effect, a one-point increase in the underwriter's rank lowers underpricing by 1.52 percentage points. In comparing an issuer with an underwriter of average reputation (7.5) and with no all-star analyst to an identical issuer with a highly reputable underwriter (9) and an all-star analyst, we find that underpricing is increased in the second case by 11.6 percentage points.

We also observe a strong positive relation between the spread and the underpricing ($t = 2.8$). Increasing the spread by a percentage point increases underpricing by 11%. As other researchers have shown, the offer price revision is a strong predictor of underpricing ($t = 9.7$). Given the point estimate of 0.78, a 1 *SD* increase in the revision raises underpricing by 17.4%.[16] Underpricing is related to pre-issuance conditions in the IPO market. Underpricing is higher when average underpricing across all recent IPOs is high ($t = 5.9$), and

[16] We assume that the offer price revision is exogenous. Ljungqvist and Wilhelm (2002) and Benveniste et al. (2003) model the revision as an endogenous variable.

Table VI
Two-stage Regression Results

Shown here are the results of two-stage estimation of coverage and underpricing equations to control for endogeneity. Coverage equations are estimated by logit and underpricing is estimated by OLS. In the coverage equations, the dependent variable is equal to one if the lead underwriter makes a recommendation as of the 1-year anniversary of the IPO. First-stage estimates include all exogenous variables. Second-stage estimates include subsets of exogenous variables, plus the fitted instrument (X'β) from the first stage regressions. Coefficients are reported with t-statistics in parentheses below. The t-statistics from the second-stage account for estimation error in the first stage following Maddala (1983). The sample includes 1,050 IPOs completed between 1993 and 2000 for which a subsequent SEO is made between 1993 and 2001.

	First Stage		Second Stage	
Variable	Coverage Logit	Underpricing OLS	Coverage Logit	Underpricing OLS
Constant	7.16	−73.77	−5.69	−39.44
	(1.61)	(−1.45)	(−2.04)	(−0.59)
Log (proceeds)	−0.26	2.18	0.24	−1.45
	(−1.27)	(0.91)	(1.35)	(−0.49)
Technology dummy	−0.31	0.90	−0.11	7.48
	(−1.09)	(0.27)	(−0.42)	(2.40)
Underwriter rank	0.33	0.51	0.38	−1.52
	(5.07)	(0.85)	(6.03)	(−1.05)
All-star analyst	−0.31	9.01	−0.54	13.92
	(−1.26)	(2.49)	(−2.17)	(3.64)
Non-exchange traded	−0.11	−6.99	−0.53	
	(−0.23)	(−2.31)	(−1.11)	
Industry size	−0.02	0.28	−0.00	
	(−0.39)	(0.29)	(−0.09)	
Share turnover	0.02	1.64	0.01	
	(1.10)	(2.56)	(0.41)	
Number of co-lead managers	0.11	−3.09	0.12	
	(0.73)	(−1.77)	(0.96)	
IPO frequency	0.00	0.00		−0.15
	(1.23)	(0.09)		(−2.69)
IPO returns	0.02	0.48		0.70
	(1.57)	(1.89)		(5.91)
Underwriter spread	−0.78	4.05		10.96
	(−3.74)	(2.10)		(2.79)
Offer price revision	0.01	0.71		0.78
	(1.23)	(5.09)		(9.65)
Pre-IPO mkt avg ret	−0.02	23.36		17.11
	(−0.04)	(3.10)		(2.15)
Pre-IPO market std return	−0.03	3.70		8.60
	(−0.06)	(0.73)		(1.58)
Log(1+age)	0.23	−0.46		−3.75
	(2.44)	(−0.56)		(−2.42)
Year dummies	Yes	Yes	No	No
Underpricing instrument			0.00	
			(0.54)	
Coverage instrument				9.76
				(3.23)
Pseudo or Adjusted R^2	0.2366	0.5162	0.1728	0.4455

consistent with Benveniste et al. (2003), it is lower when the volume of IPOs is high ($t = -2.7$).[17] Underpricing is also positively related to the preissuance value-weighted market return ($t = 2.2$). Old firms have lower underpricing than young firms ($t = -2.4$), consistent with the notion that underpricing is related to uncertainty about the issuer. We also find evidence that technology firms have greater underpricing after controlling for other determinants of underpricing.

Of primary interest is the coefficient on the instrument for analyst coverage. Consistent with our hypothesis, we find a strong positive relation between the coverage instrument and the underpricing ($t = 3.2$). Unfortunately, it is not possible to determine the economic impact of expected analyst coverage on underpricing since the unidentifiable volatility of residuals in the first-stage logit introduces a nuisance parameter. Overall, the regression has an adjusted R^2 of 0.45. These findings support the view that the likelihood of subsequent analyst coverage is an important determinant of the magnitude of underpricing. One interpretation of this finding is that issuing companies pay for expected analyst coverage by discounting the price at which they sell new shares.

We caution the reader that because some of the exogenous variables that predict underpricing also predict analyst coverage, part of their impact on underpricing may be picked up by the coverage instrument. If so, collinearity with the coverage instrument will increase the standard errors of the coefficient estimates. One should, therefore, interpret with caution the magnitude and statistical significance of the coefficients on the exogenous variables. We note, however, that the coefficient estimates, with the exception of underwriter rank, are similar in sign and statistical significance to those reported for the OLS regressions in Table V. This provides some reassurance that our findings are not driven by our instrumental variables approach. Nonetheless, it should be noted that the significance of the coverage instrument is sensitive to the inclusion of year dummies in the second-stage models. Because we attempt to capture time trends in the data by including year dummies in the first stage, inclusion of the year dummies in the second stage induces fairly severe collinearity problems. This shows up in the form of substantially larger standard errors on the coefficient estimates after having made the adjustment for the first-stage estimation. Consequently, virtually nothing is statistically significant if we include the year dummies in the second stage.

E. Subperiod Results

Because the 1998 to 2000 period exhibits dramatically higher underpricing, and since Loughran and Ritter (2002b) document non-stationarities in some of the cross-sectional determinants of underpricing, we also estimate the models in Table VI for three separate subperiods: 1993–1994, 1995–1997, and 1998–2000. The first subperiod represents the period in which we are less able to

[17] This first result is slightly biased since our measure of average underpricing across all IPOs includes the specific IPO being analyzed. However, this bias will be quite small given the large number of IPOs per month over our sample period.

Table VII
Subperiod Results

Shown here are descriptive statistics and two-stage regression coefficients for each of three subperiods, 1993–1994, 1995–1997, and 1998–2000. Panel A reports average underpricing, the percentage of issues in which the lead underwriter has an all-star analyst, and the percentage of issues for which the analyst from the lead underwriter provides a recommendation as of the 1-year anniversary of the IPO. Panel B reports coefficient estimates with *t*-statistics in parentheses below for selected independent variables from two-stage regression models identical to those estimated in Table VI.

	1993–1994	1995–1997	1998–2000	Full Sample
Panel A: Descriptive Statistics				
Average underpricing	11.4%	17.7%	73.8%	27.5%
% with all-star analyst	16.9%	18.2%	39.9%	22.4%
% with coverage from lead underwriter	66.9%	86.3%	87.8%	79.9%
Number of IPOs	354	473	223	1050
Panel B: Coefficients from Two-Stage Regressions				
All-star analyst (1^{st} stage)	5.92	0.43	21.13	9.01
	(2.37)	(2.08)	(1.84)	(2.49)
All-star analyst (2^{nd} stage)	7.99	2.72	15.14	13.92
	(1.53)	(0.79)	(1.45)	(3.64)
Coverage instrument	11.86	5.80	5.16	9.76
	(2.33)	(2.05)	(0.62)	(3.23)

link the SDC data with the IBES data, thereby raising the possibility that we incorrectly conclude that the issuing firm receives no coverage. The third subperiod represents the period of unusually high underpricing, as well as greatly increased analyst coverage.

In Panel A of Table VII, we report descriptive statistics for the three subperiods. Not surprisingly, average underpricing is approximately four times larger in the 1998 to 2000 subperiod than in the 1995 to 1997 period. Perhaps more interestingly, the 1998 to 2000 period also exhibits a large increase in the percentage of issuing companies that choose a lead underwriter with an all-star analyst (39.9% vs. 18.2%), but little difference in the frequency with which the lead underwriter provides analyst coverage (87.8% vs. 86.3%).

In Panel B, we report selected coefficients from two-stage underpricing regressions identical to those estimated in Table VI. We note at the outset that these coefficients should be interpreted with caution due to the smaller sample sizes. For example, because there are only 31 issues that do not receive analyst coverage in the 1998 to 2000 period, the power of the test of the coverage instrument in these models is fairly low. Nonetheless, the analysis yields some interesting results. Although we observe little change in the coefficient on the coverage instrument, the coefficient on the all-star analyst in the first-stage underpricing regression is substantially larger in the third subperiod than in the second subperiod (21.13 vs. 0.43). This is also true in the second-stage regressions (15.14 vs. 2.72), but the coefficients lack statistical significance.

Subject to the caveat noted above, these findings are broadly consistent with Loughran and Ritter's (2002b) analyst lust hypothesis. It appears that in the latter part of the 1990s, issuing companies (1) exhibited a stronger demand for all-star analyst coverage and (2) were willing to give up greater underpricing for this coverage. Both effects potentially contribute to the large increase in underpricing in the 1998 to 2000 period, though they are clearly not large enough to be the only explanation.

It is also noteworthy that the coefficient on the coverage instrument is significant in both of the first two subperiods. This provides some reassurance that our overall finding of a significant relation between underpricing and coverage is not driven by the 1998 to 2000 period.

F. Switching of Underwriters

Our final hypothesis predicts that issuing companies will switch underwriters between their IPO and their subsequent SEO if they believe that they have received less analyst coverage than expected. To test this hypothesis, we examine how coverage and underpricing jointly affect an issuer's decision to switch underwriters at the SEO.

Recall from Table VI that there is an inverse relationship between underpricing and the likelihood of switching underwriters. To further address why the issuers leaving the most money on the table are the least likely to switch underwriters, Table VIII compares the switching rates in underpricing quintiles of firms with and without lead analyst recommendations. Within a given underpricing quintile, firms that get lead coverage are much less likely to switch. For example, in the low underpricing quintile, where issuers are very likely to switch underwriters, 74% of the issuers who do not get coverage switch, as

Table VIII
Switching Propensity

Shown here are the tabulation of IPOs by underpricing quintile and presence of a recommendation by the lead underwriter as of the 1-year anniversary of the IPO. The table also shows the percentage of firms in each cell that switch underwriters for the SEO. The sample includes 1,050 IPOs completed between 1993 and 2000 for which a subsequent SEO is made between 1993 and 2001. The *p*-values are reported for the significance of a test of equal switching rates across cells.

	No Lead Recommendation		Lead Recommendation		
Underpricing Quintile	Count of Issuers	Percentage of Issuers Switching Underwriters	Count of Issuers	Percentage of Issuers Switching Underwriters	*p*-Value
Low	53	73.58%	157	36.94%	0.0000
Q2	61	59.02%	151	39.07%	0.0081
Q3	36	72.22%	172	25.58%	0.0000
Q4	31	61.29%	179	20.11%	0.0000
High	30	40.00%	180	12.78%	0.0002
p-value		0.0251		0.0000	

compared to a 37% switching rate among the issuers who receive lead coverage. The other quintiles exhibit a similar pattern, with the switching rate of firms with lead analyst coverage being roughly 30 percentage points below that of firms without analyst coverage. For all five quintiles, the difference in the percentage of firms switching underwriters between those with a lead analyst recommendation and those without such a recommendation is significant at the 1% level.

On the other hand, splitting issuers into coverage categories does not remove the spread across underpricing quintiles. For firms with recommendations from the lead underwriter, the 37% switch rate for the low-underpricing quintile is three times that of the high-underpricing quintile. Similarly, among firms without recommendations from the lead underwriter, the 74% switching rate in the low-underpricing quintile is nearly double the rate for the high-underpricing quintile. These findings suggest that analyst coverage is only part of the explanation why issuing firms switch underwriters.

To provide further evidence about the determinants of underwriter switching, we estimate logit models to predict switching behavior. Our analysis is similar to that in Krigman et al. (2001), with one important addition. We include in our model the unexpected analyst coverage (actual coverage minus the predicted probability) from our second-stage estimates in Table VI. The results are reported in Table IX.[18]

We consider a base model using a constant, the log of offer proceeds, offer price revision, share turnover, underwriter spread, dummy for an all-star analyst at the IPO and SEO lead underwriter, IPO and SEO underwriter rank, the number of calendar days from IPO to SEO, the log of one plus firm age, and IPO underpricing. We find that switching is more likely for firms that have a small offer price revision, firms whose IPO underwriters have a lower reputation, firms whose SEO underwriters have a high reputation, and firms for which there is a long time between IPO and SEO.

The economic impact of changes in the explanatory variables is shown in the third column. From this analysis, it is clear that the underwriter's reputation is a primary determinant of the likelihood of switching. A one standard deviation increase in the rank of the IPO underwriter reduces the probability of switching by 20%. Similarly, a one standard deviation increase in the reputation of the SEO underwriter increases the likelihood of switching by 19%. These findings are consistent with the graduation story in Krigman et al. (2001). Firms appear to gravitate toward the more reputable underwriters for their SEO if they used a less prestigious underwriter for their IPO. The chance of switching is also reduced by the offer price revision, perhaps because these issuers tend to be pleased that they raised more funds than they originally anticipated. Increasing the offer price revision by one standard deviation reduces the chances of switching by 7%. Finally, a one standard deviation change in the number of days between the IPO and the SEO increases the likelihood of switching by 20%. It

[18] We correct for estimation error induced by the generated regressor using equation (34) in Murphy and Topel (1985).

Table IX
Probability of Switching Lead Underwriters

Shown here are the results of a logit model predicting whether an issuer switches lead underwriters from IPO to the first SEO. The table reports the estimated coefficient and *t*-statistic for the test of a zero coefficient, as well as the predicted magnitude of impact on the probability of switching. Each magnitude is calculated by comparing the predicted change in probability of switching from perturbing the variable of interest while holding all other values at their sample means. For IPO or SEO lead all-star, the perturbation is changing from zero to one. For all other variables, the perturbation is a change from the mean to the mean plus one standard deviation. Unexpected coverage is the residual (actual coverage dummy minus predicted probability of coverage) from the second-stage coverage model in Table VI, where coverage is defined as having an analyst recommendation at the 1-year anniversary of the IPO. Standard errors in this regression correct for first-stage estimation error using the method in Murphy and Topel (1985). The sample includes 1,050 IPOs completed between 1993 and 2000 for which a subsequent SEO is made between 1993 and 2001.

	Coefficient	*t*-stat	Magnitude	Coefficient	*t*-stat	Magnitude
Constant	−0.4224	−0.11		1.6265	0.36	
Log(proceeds)	−0.1285	−0.81	−0.0232	−0.1937	−0.90	−0.0345
Offer price revision	−0.0158	−3.17	−0.0703	−0.0158	−2.45	−0.0701
Share turnover	0.0078	0.84	0.0171	0.0076	0.39	0.0167
Spread	0.2667	1.41	0.0438	0.1510	0.73	0.0244
IPO lead all-star	−0.0693	−0.29	−0.0147	−0.0875	−0.24	−0.0185
SEO lead all-star	0.2504	1.08	0.0550	0.2878	1.16	0.0632
IPO underwriter rank	−0.6446	−7.43	−0.1974	−0.6945	−6.15	−0.2060
SEO underwriter rank	0.5214	5.87	0.1873	0.5490	5.47	0.1975
Days from IPO to SEO	0.0020	9.53	0.2029	0.0019	8.96	0.2010
Log(1+age)	−0.1231	−1.53	−0.0256	−0.0941	−1.12	−0.0196
Underpricing	−0.0037	−1.22	−0.0392	−0.0033	−1.03	−0.0351
Unexpected coverage				−1.0154	−4.75	
Pseudo R^2	0.2644			0.2816		

seems plausible that the strength of the relationship between underwriters and issuers would decay over time.

The last set of columns in Table IX augments the base model with a measure of unexpected coverage. Our third hypothesis predicts that if a firm receives less coverage than expected, it will be more likely to use a different underwriter for its SEO. We find that this is indeed the case. The unexpected coverage variable has a *t*-statistic of −4.8. Unfortunately, we are unable to assess the economic significance for the same reason as in Table VI.[19]

G. Robustness Checks

To ensure that our results are not driven by methodological choices or a small number of influential observations, we run a battery of robustness checks. One

[19] In untabulated results, we also include a variable measuring the annualized stock return between the IPO and the SEO. This variable is statistically insignificant and does not affect the significance of the other independent variables.

group of tests replicates all our analyses after filtering the sample in a variety of ways. First, we exclude the 160 observations in which the IPO was completed in 1999 or 2000. This addresses the concern that our findings are biased by the fact that firms completing their IPO in these years did SEOs quickly, relative to the rest of the sample. Truncating the sample in 1998 allows each firm 3 years to complete an SEO, which is approximately double the average of 1.55 years between the IPO and the SEO for firms in this subsample. Second, we exclude firms with offer prices below $8, as in Loughran and Ritter (2002a). This reduces our sample to 920 firms. Third, we exclude observations in the extreme 1% tails of the underpricing distribution. Fourth, we exclude the 111 observations in which the company's SEO takes place more than 3 years after the IPO. Fifth, because IBES's coverage of analyst recommendations may have been less complete prior to 1995, we exclude 354 offerings completed in 1993 and 1994.[20] Sixth, we restrict the sample to include only IPOs completed after 1994 *and* those for which the company's SEO takes place more than 3 years after the IPO. This reduces the sample by 402 observations. Seventh, we restrict the sample to include only those firms that initially trade on the NYSE, AMEX, or Nasdaq NMS. In all cases, our main results are not affected in any material way. Specifically, we continue to find a positive relation between underpricing and predicted coverage, and continue to find that the likelihood of switching underwriters at the time of the SEO is negatively related to unexpected analyst coverage following the IPO.

The second group of robustness tests focuses on methodological choices. Again, none of these checks meaningfully alters our main results. First, we estimate all logit models by probit. Second, we delete from our main sample the 43 offers for which we are unable to link SDC underwriters with IBES brokers. Our main analysis considers these IPOs as having received no coverage. However, it is possible that these deals do get coverage, but either IBES does not follow that brokerage firm or we did not properly identify the link between SDC and IBES bank codes. Third, we exclude observations in which the time between the IPO and the SEO is less than 1 year. Recall that we measure coverage as of 1 year after the issuance, so for these deals we are measuring coverage after the SEO. This results in a loss of about half our sample, reducing it to 518 firms, of which 370 have coverage. This subsample has much lower underpricing (13% on average) and much higher switching rates for the SEO underwriter (50% on average). However, our main results remain intact. Underpricing is positively associated with expected coverage, while the likelihood of switching underwriters is negatively related to unexpected coverage. These findings also indicate that our primary results are not driven by successful companies that quickly issue an SEO in the first year following their IPO. Fourth,

[20] Recall from Table I that we are able to link the lead underwriting bank from SDC with an analyst firm from IBES in only 94% of the cases in 1993, and in 85% of the cases in 1994. This percentage jumps to 99% in 1996. Of the 42 cases in which the lead underwriter has an all-star analyst, but for which we have no record of an analyst recommendation at the 1-year anniversary of the IPO, 14 occur in 1993. This is consistent with some of these cases being due to data errors induced by incomplete IBES coverage in 1993 and 1994.

we include the annualized stock returns between the IPO and the SEO as an explanatory variable. Again, our results are unaffected.

A third group of robustness checks reconstructs the sample using alternative windows for measuring analyst coverage. First, we record a firm as receiving recommendation coverage if it has a recommendation from the lead underwriter 6 months after the IPO. This increases the number of firms without coverage from 237 to 291. Our main results remain intact. Second, we repeat the analysis after measuring analyst coverage as of the 2-year anniversary of the IPO. Because this means we are checking for coverage well after many firms have done at least one SEO, we again filter out deals where there is less than a year between the IPO and the SEO. Although this reduces the sample to 518 observations, of which 350 have coverage, our main results are robust. Finally, we measure coverage as receiving a recommendation during *any* point in the first year following the IPO. By this measure, a firm that receives coverage for only a few months is counted as receiving coverage. This less restrictive measure records 874 deals with lead coverage, compared to 839 in the main sample, but does not change our results.

Finally, we examine the possibility that lead underwriters choose not to provide recommendations for some firms because they deem these particular issuers to be sufficiently unimportant to merit any analyst coverage. To examine this issue, we first create a subsample of IPOs for which the lead underwriter provides earnings forecasts. We know for sure that the analyst is following these firms. We then split these firms into two groups based on whether the analyst of the lead underwriter also makes a recommendation. Of the 928 firms with earnings forecasts from the lead underwriter, 830 also have a lead recommendation and 98 do not.[21] Those issuers receiving recommendations have an average underpricing of 30%, significantly greater than the 19% average for those who do not have recommendations. In addition, we observe that among those firms that do not receive a lead recommendation, 55% switch underwriters for their SEO. This happens in only 26% of the cases in which there is a lead recommendation. Thus, among the subset of firms for which the lead underwriter provides analyst coverage, (1) underpricing is significantly greater for firms receiving analyst recommendations, and (2) firms are significantly more likely to switch underwriters if the lead IPO underwriter chooses not to issue a recommendation. The fact that our main results continue to hold for the subsample of firms that clearly receive some analyst attention provides reassurance that our main findings are not driven by cases in which the analyst of

[21] It is possible that the cases in which we observe earnings estimates, but no recommendations, are IBES data errors. There are two reasons why we doubt that such errors are pervasive. First, the cases are not restricted to the early part of the sample period when IBES coverage was less complete. Ten of the 98 cases are from IPOs completed in 1999 or 2000. Second, we hand-checked a number of these cases with other data sources such as Investext, and did not uncover systematic problems with the IBES data. Of course, we can't completely rule out the possibility of some data errors. However, we note that in order for such data errors to be driving the positive association between coverage and underpricing, it would have to be the case that those cases with errors were systematically less underpriced than the others. We can think of no reason why this should be true.

the lead underwriter simply ignores issuers that they deem to be unimportant. Our results are more consistent with the view that the lack of a recommendation is driven by strategic considerations. That is, banks seek to avoid offending their clients by making negative recommendations, but also want to avoid ruining their reputations by providing favorable coverage to issuers with poor prospects.

IV. Discussion and Concluding Remarks

We examine the links among IPO underpricing, post-IPO analyst coverage, and the likelihood of switching underwriters. Our findings indicate a significant positive relation between underpricing and analyst coverage by the lead underwriter. This positive association is robust to controls for other determinants of underpricing previously documented in the literature and to controls for the endogeneity of underpricing and analyst coverage. In addition, after controlling for other potential determinants of switching underwriters, we find that the probability of switching underwriters between the IPO and the SEO is negatively related to the unexpected amount of post-IPO analyst coverage. We interpret these findings as being consistent with the hypothesis that underpricing is, in part, compensation for expected post-IPO analyst coverage. If underwriters do not deliver the expected analyst coverage (conditional on underpricing), the IPO firm is more likely to switch underwriters when it issues shares in its subsequent SEO.

An alternative explanation for the positive correlation between underpricing and analyst coverage is that issuers deliberately underprice IPOs in order to attract analyst attention and build price momentum for open market sales following the expiration of the lockup period (Aggarwal et al. (2002)). While this strategic underpricing explanation and our hypothesis are not necessarily mutually exclusive, some of our findings are difficult to reconcile with strategic underpricing. Specifically, it is not clear why there would be any connection between analyst coverage and the likelihood of switching underwriters. Moreover, under the strategic underpricing hypothesis, it is less clear why underpricing should be higher in deals underwritten by investment banks with an all-star analyst.

Our findings can help explain a few otherwise puzzling IPO phenomena. First, recent studies (e.g., Beatty and Welch (1996)) report that the correlation between underpricing and underwriter reputation has changed signs from negative in the 1970s and 1980s (Carter and Manaster (1990)) to positive in the 1990s. To the extent that analyst coverage has become more important in the past decade, as argued in Loughran and Ritter (2002b), our hypothesis predicts that more prestigious underwriters will be compensated for expected analyst coverage with greater underpricing.

Second, the increased importance of analyst coverage in recent years can help explain the large increase in the salaries of sell-side analysts during the late 1990s. Our hypothesis predicts that investment banks receive additional compensation, via underpricing, for the research coverage that they provide.

Presumably, a portion of this compensation is passed on to the analysts providing such coverage. Of course, as underwriting business and merger/acquisition activity has declined over the past couple of years, so too has analyst compensation. This has led to some high-profile departures of analysts and to large cutbacks in the research staff at Wall Street firms.[22]

Finally, our findings suggest a possible reason why issuing companies do not appear to be upset by the underpricing of their IPOs. If underpricing is in part compensation for subsequent research coverage, issuers might be getting exactly what they pay for, on average. Of course, as Loughran and Ritter (2002b) argue, underpricing may still be too large, thereby leading to excessive underwriter compensation. Our findings are silent on this issue.

Appendix

Construction of Variables

Variable	Data Sources	Description
Underpricing	SDC, CRSP	Percentage return from offer price (SDC) to first day close (CRSP).
IPO frequency	Ritter	Number of IPOs in month of issue and prior month.
IPO returns	Ritter	Average IPO underpricing in month of issue and prior month.
Underwriter rank	Ritter	1 (worst) to 9 (best) scale for underwriter reputation.
All-star dummy	Institutional investor	1 if lead underwriter has an all-star in issuer's industry during year of IPO or prior year.
Proceeds	SDC, Bureau of Labor Statistics	Offer proceeds (SDC) converted to 2,000 dollars based on CPI from BLS.
Underwriter spread	SDC	Gross underwriter spread, in percent.
Tech dummy	SDC	1 if issuer is a technology firm (SICs 2833, 2834, 2835, 2836, 3571, 3572, 3575, 3577, 3578, 3661, 3663, 3669, 3674, 3812, 3823, 3825, 3826, 3827, 3829, 3841, 3845, 4812, 4813, 4899, 7370, 7371, 7372, 7373, 7374, 7375, 7377, 7378, 7379).
Offer price revision	SDC	Percentage difference between offer price and midpoint of filing range.
Non-exchange traded	SDC	1 if exchange is not NYSE, AMEX, or Nasdaq NMS.
Recommendation dummy	IBES	1 if the lead has a recommendation for the issuer 1 year post-IPO. With joint managers, a 1 if any manager has a recommendation.
Recommendation level	IBES	Recommendation (5 = strong buy, 1 = strong sell) made by lead 1-year post-IPO. Average if there are joint managers.

(*Continued*)

[22] See, for example, "Some Analysts Leave Industry in Search of 'New Adventure,' *Wall Street Journal* Online, February 28, 2003, and "Miffed, Four CSFB Analysts Depart: Angered by Skimpy Bonus Payments, Healthcare Quartet Signs on at B of A," *Investment Dealers Digest*, March 3, 2003.

Appendix—*Continued*

Variable	Data Sources	Description
Industry size	CRSP	Market cap of 3-digit SIC as a percentage of the total market cap on CRSP, computed annually.
Share turnover	SDC, CRSP	Average trading volume first 30 trading days post-IPO (CRSP), divided by shares issued (SDC).
No. of co-lead managers	SDC	Number of co-managers (including lead manager(s)).
Age	Ritter, field	Year of IPO minus founding year. Most observations from Ritter, with 32 missing observations augmented from other sources (Business and Company Resource Center Database, 10-K reports).
Pre-IPO market return	CRSP	Average return on CRSP value-weighted index from 3 weeks pre-issuance to issuance date.
Pre-IPO market *SD*	CRSP	Standard deviation of returns on CRSP value-weighted index from 3 weeks pre-issuance to issuance date.

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