THE JOURNAL OF FINANCE • VOL. XLVI, NO. 1 • MARCH 1991

The Long-Run Performance of Initial Public Offerings

JAY R. RITTER*

ABSTRACT

The underpricing of initial public offerings (IPOs) that has been widely documented appears to be a short-run phenomenon. Issuing firms during 1975–84 substantially underperformed a sample of matching firms from the closing price on the first day of public trading to their three-year anniversaries. There is substantial variation in the underperformance year-to-year and across industries, with companies that went public in high-volume years faring the worst. The patterns are consistent with an IPO market in which (1) investors are periodically overoptimistic about the earnings potential of young growth companies, and (2) firms take advantage of these "windows of opportunity."

NUMEROUS STUDIES HAVE DOCUMENTED two anomalies in the pricing of initial public offerings (IPOs) of common stock: (1) the (short-run) underpricing phenomenon, and (2) the "hot issue" market phenomenon. Measured from the offering price to the market price at the end of the first day of trading, IPOs produce an average initial return that has been estimated at 16.4%.[1] Furthermore, the extent of this underpricing is highly cyclical, with some periods, lasting many months at a time, in which the average initial return is much higher.[2] In this paper, I document a third anomaly: in the long-run, initial public offerings appear to be overpriced. Using a sample of 1,526 IPOs that went public in the U.S. in the 1975–84 period, I find that in the 3 years after going public these firms significantly underperformed a set of comparable firms matched by size and industry.

*Associate Professor of Finance, University of Illinois at Urbana-Champaign. I wish to thank Clifford Ball, Chris Barry, Stephen Buser (the editor), Donald Keim, Josef Lakonishok, Gita Rao, Nejat Seyhun, René Stulz, Michael Vetsuypens, Ivo Welch, Joseph Williams, an anonymous referee, participants in workshops at Illinois, Iowa, Vanderbilt, and Wharton, and especially Harry DeAngelo for helpful suggestions. An earlier version of this paper was presented at the December 1988 AFA meetings, the September 1989 Garn Institute conference on The Capital Acquisition Process, the November 1989 CRSP Seminar on the Analysis of Security Prices, and the October 1990 Q Group meetings. Navin Chopra, Tim Loughran, and Tae Park provided extensive and very able research assistance. The research is partially supported by a grant from the Institute for Quantitative Research in Finance.

[1]A few of the many recent studies documenting positive initial returns include Carter and Manaster (1990), Miller and Reilly (1987), Ritter (1984, 1987), and Tinic (1988). Much of the recent work is discussed in Smith (1986) and Ibbotson, Sindelar, and Ritter (1988). The 16.4% average initial return figure is from Ibbotson, Sindelar, and Ritter, where the sample includes 8,668 IPOs going public in 1960–87.

[2]The "hot issue market" phenomenon is documented in Ibbotson and Jaffe (1975), Ritter (1984), and Ibbotson, Sindelar, and Ritter (1988).

There are several reasons why the long-run performance of initial public offerings is of interest. First, from an investor's viewpoint, the existence of price patterns may present opportunities for active trading strategies to produce superior returns. Second, a finding of nonzero aftermarket performance calls into question the informational efficiency of the IPO market. It provides evidence concerning Shiller's (1990) hypothesis that equity markets in general and the IPO market in particular are subject to fads that affect market prices. Third, the volume of IPOs displays large variations over time. If the high volume periods are associated with poor long-run performance, this would indicate that issuers are successfully timing new issues to take advantage of "windows of opportunity." Fourth, the cost of external equity capital for companies going public depends not only upon the transaction costs incurred in going public but also upon the returns that investors receive in the aftermarket. To the degree that low returns are earned in the aftermarket, the cost of external equity capital is lowered for these firms.

To summarize the empirical findings of this paper, the average holding period return for a sample of 1,526 IPOs of common stock in 1975–84 is 34.47% in the 3 years after going public, where this holding period return is measured from the closing market price on the first day of public trading to the market price on the 3 year anniversary. However, a control sample of 1,526 listed stocks, matched by industry and market value, produces an average total return of 61.86% over this same 3 year holding period. In other words, every dollar invested in a portfolio of IPOs purchased at the closing market price on the first day of trading results in a terminal wealth of \$1.3447, while every dollar in the matching firms results in \$1.6186, a ratio of only 0.831. In the long run, IPOs underperformed.

Possible explanations for this underperformance include (1) risk mismeasurement, (2) bad luck, or (3) fads and overoptimism. To ascertain whether risk mismeasurement could account for the poor long-run performance, alternative benchmark portfolios are used. To distinguish between the bad luck explanation and the fads and over optimism explanation, various cross-sectional and time-series patterns are documented. The pattern that emerges is that the underperformance is concentrated among relatively young growth companies, especially those going public in the high-volume years of the 1980s. While this pattern does not rule out bad luck being the cause of the underperformance, it is consistent with a scenario of firms going public when investors are irrationally over optimistic about the future potential of certain industries which, following Shiller (1990), I will refer to as the "fads" explanation.[3] Further support for this interpretation is contained in Lee, Shleifer, and Thaler (1991) who find that the annual number of operating companies going public in the 1966–85 period is strongly negatively related

[3]Miller (1977) and Blazenko (1989) present models in which overoptimistic investors are the marginal investors in IPOs. Their models predict the long-run underperformance that is documented here.

to the discount on closed-end mutual funds, which they interpret as a measure of individual investor sentiment.

At least three published academic studies, plus a series of articles in *Forbes* magazine, have examined the long-run performance of IPOs. Stoll and Curley (1970), focusing on 205 small offers, found that, "in the short run, the stocks in the sample showed remarkable price appreciation.... In the long run, investors in small firms did not fare so well...." (pp. 314–315.)

Ibbotson (1975), using one offering per month for the 10-year period 1960–69, computed excess returns on IPOs with an offer price of at least $3.00 per share. He concludes that the "results generally confirm that there are no departures from market efficiency in the aftermarket." (p. 265.) However, he does find evidence that there is "generally positive performance the first year, negative performance the next 3 years, and generally positive performance the last [fifth] year," (p. 252), although the standard errors of his estimates are high enough to make it difficult to reject market efficiency. In his Table 12 he reports initial public offerings underperforming by an average of approximately 1% per month in the second through fourth years of public trading, with positive excess returns in the first and fifth years.[4]

Buser and Chan (1987) evaluate the two-year performance of over 1,078 NASDAQ/National Market System (NMS)-eligible initial public offerings in 1981–1985.[5] Their sample has a positive average initial return of 6.2% and a mean 2-year market-adjusted return of 11.2% (exclusive of the initial return) where they use the NASDAQ Composite Index for their market adjustment.

The cover story of the December 2, 1985 *Forbes* magazine, entitled "Why New Issues Are Lousy Investments," reports the results of a study that finds, for the period from January 1975 through June 1985, that initial public offerings have underperformed the market in the long run. Stern and Bornstein (1985) find as reported on p. 152 that "from its date of going public to last month, the average new issue was down 22% relative to the broad Standard & Poor's 500 stock index." *Forbes* analyzed 1,922 issues with an offering price of $1.00 or more. Unlike academic research, which typically uses event time, *Forbes* used calendar time, so their excess returns are computed over a period of anywhere from 10 years to a few months.

In summary, Stoll and Curley (1970), Ibbotson (1975), and Stern and Bornstein (1985) present evidence which suggests that at some point after going public the abnormal returns on initial public offerings may be negative. Ibbotson conducts the most satisfactory formal statistical tests, but his small sample size (120 issues) results in such large standard errors that he is unable to reject the hypothesis of market efficiency after a stock goes public. Only the Buser and Chan (1987) study does not find evidence of negative aftermarket performance after the initial return period.

[4]In Ibbotson's (1975) Table 12 (p. 253), the months 43–48 alpha coefficient has a minus sign omitted, as can be seen from comparison with his Tables 11 and 13.

[5]The primary qualification for National Market System (NMS) eligibility among the NASDAQ stocks is income of $300,000 or more in the most recent fiscal year prior to going public.

The structure of this paper is as follows. Section I describes the data and methodology. Section II presents evidence regarding the aftermarket performance. Section III presents cross-sectional and time-series evidence on the aftermarket performance. Section IV concludes the paper with a summary and interpretation of the findings.

I. Data and Methodology

The sample is comprised of 1,526 initial public offerings in 1975–1984 meeting the following criteria: (1) an offer price of $1.00 per share or more, (2) gross proceeds,[6] measured in terms of 1984 purchasing power, of $1,000,000 or more, (3) the offering involved common stock only (unit offers are excluded), (4) the company is listed on the CRSP daily Amex-NYSE or NASDAQ tapes within 6 months of the offer date,[7] and (5) an investment banker took the company public. These firms represent 85.1% of the aggregate gross proceeds of all firms going public in 1975–84.

Table I presents the distribution of the sample by year, both in terms of the number of offers and the gross proceeds. Inspection of Table I shows that the number and value of IPOs were not evenly distributed over the 1975–84 sample period. Only 143 of the 1,526 sample offers occurred during the first half of the period. Fifty-seven percent ($12,060.4 million of the $21,066.9 million total) of the aggregate gross proceeds in the sample was raised in 1983 alone.

To evaluate the long-run performance of initial public offerings, two measures are used: (1) cumulative average adjusted returns (CAR) calculated with monthly portfolio rebalancing, where the adjusted returns are computed using several different benchmarks, and (2) 3-year buy and hold returns for both the IPOs and a set of matching firms. The matching firms are represented by American and New York stock exchange-listed securities that are to some extent matched by industry and market capitalization with each IPO.[8]

[6]The gross proceeds numbers are computed based upon the actual number of shares sold, including overallotment options, if exercised. Most firm commitment offers include overallotment options in which the underwriter has the option of selling additional shares (limited to a maximum of 10% prior to August 1983 and 15% thereafter) at the offer price within 30 days of the offering.

[7]Of the 1,526 sample offers, 36 were initially traded on the American or New York stock exchanges, and the rest on NASDAQ. Of the 1,490 NASDAQ-listed issues, 128 changed to the American or New York stock exchanges within 3 years of going public. Of the 1,526 sample offers, 1,362 used a firm commitment contract, 157 used a best-efforts contract, and 7 used a combination firm commitment/best-efforts contract in going public. Only 13 of the 1,526 sample offers were not listed on the CRSP tapes within 1 month of the offer date. This sample of 1,526 firms is available from the author upon request.

[8]Details of the matching procedure are provided in the appendix. Because the industry composition of Amex-NYSE firms differs so dramatically from that of the IPOs, only 36% of the matching firms are in the same three-digit SIC code industry as their IPO (57% at the two-digit level). Also, the matching firms have, on average, larger market capitalizations. Sensitivity tests (not reported here) done using subsets that are more closely matched by size and industry show qualitatively similar results to those reported in this paper. See footnote 16.

Table I

Distribution of Initial Public Offerings by Year, 1975–84

The number of total offers is based upon *Going Public: The IPO Reporter's* listings, after excluding closed-end mutual funds and real estate investment trusts. Gross proceeds calculations are based upon the amount sold in the United States, including the proceeds from overallotment options, if exercised. No price level adjustments have been made in this table.

	Total of 2,476 offers		1,526 offers in sample		Total included	
Year	No. of IPOs	Aggregate gross proceeds, $ millions	No. of IPOs	Aggregate gross proceeds, $ millions	No. of IPOs %	Aggregate gross proceeds %
1975	14	264.0	12	262.4	85.7	99.4
1976	33	237.3	28	213.9	84.8	90.1
1977	32	150.6	19	132.3	59.4	87.8
1978	48	247.3	31	218.4	64.6	88.3
1979	78	429.0	53	347.1	67.9	80.9
1980	234	1,408.3	129	1,097.9	55.1	78.0
1981	438	3,200.3	300	2,689.5	68.5	84.0
1982	199	1,335.0	93	1,104.2	46.7	82.7
1983	865	13,247.8	589	12,060.4	68.1	91.0
1984	535	4,237.1	272	2,940.8	50.8	69.4
Total	2,476	24,756.7	1,526	21,066.9	61.6	85.1

Returns are calculated for two intervals: the initial return period (normally 1 day), defined as the offering date to the first closing price listed on the CRSP daily return tapes (both NASDAQ and Amex-NYSE), and the aftermarket period, defined as the 3 years after the IPO exclusive of the initial return period. The initial return period is defined to be month 0, and the aftermarket period includes the following 36 months where months are defined as successive 21-trading-day periods relative to the IPO date. Thus, month 1 consists of event days 2–22, month 2 consists of event days 23–43, etc. For IPOs in which the initial return period is greater than 1 day, the month 1 period is truncated accordingly, e.g., if the initial return period is 6 days, month 1 consists of event days 7–22. For IPOs that are delisted before their 3-year anniversary, the aftermarket period is truncated, and the 3-year buy and hold return ends with CRSP's last listing. Firms which moved from NASDAQ to the American or New York stock exchanges during the 3 years after their offering date are not removed unless they are subsequently delisted from the Amex-NYSE tape. The CRSP NASDAQ daily returns file and the CRSP Amex-NYSE daily returns file are the source of the returns data.

Monthly benchmark-adjusted returns are calculated as the monthly raw return on a stock minus the monthly benchmark return for the corresponding 21-trading-day period. The benchmarks used are (1) the CRSP value-weighted NASDAQ index, (2) the CRSP value-weighted Amex-NYSE index, (3) listed firms matched by industry and size, and (4) an index of the smallest size

decile of the New York Stock Exchange. The benchmark-adjusted return for stock i in event month t is defined as

$$ar_{it} = r_{it} - r_{mt}.$$

The average benchmark-adjusted return on a portfolio of n stocks for event month t is the equally-weighted arithmetic average of the benchmark-adjusted returns:

$$\mathrm{AR}_t = \frac{1}{n}\sum_{i=1}^{n} ar_{it}.$$

The cumulative benchmark-adjusted aftermarket performance from event month q to event month s is the summation of the average benchmark-adjusted returns:

$$\mathrm{CAR}_{q,s} = \sum_{t=q}^{s} \mathrm{AR}_t.$$

When a firm in portfolio p is delisted from the CRSP data, the portfolio return for the next month is an equally-weighted average of the remaining firms in the portfolio. The cumulative market-adjusted return for months 1 to 36, $\mathrm{CAR}_{1,36}$, thus involves monthly rebalancing, with the proceeds of a delisted firm equally allocated among the surviving members of the portfolio p in each subsequent month. For the month in which an IPO is delisted, the return for both the IPO and the benchmark includes just the days from the start of the month until the delisting.

As an alternative to the use of cumulative average benchmark-adjusted returns, which implicitly assumes monthly portfolio rebalancing, I also compute 3-year holding period returns, defined as

$$R_i = \prod_{t=1}^{36} (1 + r_{it})$$

where r_{it} is the raw return on firm i in event month t. This measures the total return from a buy and hold strategy where a stock is purchased at the first closing market price after going public and held until the earlier of (i) its 3-year anniversary, or (ii) its delisting.[9] To interpret this 3-year total return, I compute wealth relatives as a performance measure, defined as

$$WR = \frac{1 + \text{average 3-year total return on IPOs}}{1 + \text{average 3-year total return on matching firms}}.$$

A *wealth relative* of greater than 1.00 can be interpreted as IPOs outperforming a portfolio of matching firms; a *wealth relative* of less than 1.00 indicates that IPOs underperformed.

[9]Unlike the Amex and NYSE in the 1975–1984 period, where mergers and takeovers are the predominant reasons for delisting, most NASDAQ delistings during this period are due to firms failing to meet the minimum capital requirements for continued listing. Because of early delistings, the average holding period is 34 months, rather than 36 months.

In this paper, I have calculated performance measures without explicitly adjusting for betas. While I do not report them here, the betas of the IPO firms display the same time-series patterns documented in Ibbotson (1975), Chan and Lakonishok (1990), and Clarkson and Thompson (1990), i.e., the average beta is greater than 1.00, and the average betas decline with the length of time since the IPO. This is true when betas are calculated using either the CRSP value-weighted NASDAQ or Amex-NYSE indices. The matching firms also have betas greater than 1.00. For post-issue months 1–12, 13–24, and 25–36, respectively, the average betas for IPOs are 1.39, 1.24, and 1.14 and the average betas for matching firms are 1.14, 1.13, and 1.04, using the CRSP value-weighted Amex-NYSE index.[10] Although the IPO betas are greater than 1.00 on average, the difference in betas between the IPOs and matching firms is too small to have economically significant effects on the conclusions. To the degree that the IPO betas are higher than the betas of control portfolios, computing adjusted returns without explicitly adjusting for beta differences results in conservative estimates of IPO underperformance when the market risk premium is positive, as it is for this paper's sample.[11]

II. Aftermarket Performance

Table II reports the average matching firm-adjusted returns (AR_t) and cumulative average matching firm-adjusted returns ($CAR_{1,t}$) for the 36 months after the offering date for 1,526 IPOs in 1975–84. Thirty-one of the 36 monthly average adjusted returns are negative, with 13 of them having *t*-statistics lower than −2.00. The negative average adjusted returns are reflected in a steady decline in the cumulative average adjusted returns, which, after a slight increase in the first 2 months of seasoning, falls to −29.13% by the end of month 36, exclusive of the initial return, with an associated *t*-statistic of −5.89. The underperformance of the IPOs is both economically and statistically significant.

In Figure 1, I have plotted the matching firm-adjusted CAR, where the initial return is also included. Also plotted are four other cumulative average returns with different adjustments. The five series plotted, in order of their

[10]For all of the beta calculations, I use Ibbotson's (1975) RATS procedure. As Chan and Lakonishok (1990) document, I also find that the initial return betas are much higher when the market return is positive rather than negative. Rao (1989) notes that one reason for the decline in average betas with the time since the IPO is that riskier firms are more likely to be delisted and so are less likely to be included in the averages the longer the time since the IPO.

[11]The average total return, exclusive of the initial return, during the 3 years after going public is 34.47% for the IPOs in this sample, as reported in Table III of this paper. The average total return that an investor would have earned by rolling over T-bills for 3 years is approximately 28%. Thus, in spite of most of these IPOs going public before substantial market rises, the IPO investors outperformed T-bills by only about 2% per year. The betas of the IPOs would have to be implausibly low to reverse the conclusion that these IPOs underperformed in the 3 years after going public.

Table II

Abnormal Returns for Initial Public Offerings in 1975–84

Average matching firm-adjusted returns (AR_t) and cumulative average returns ($CAR_{1,t}$), in percent, with associated *t*-statistics for the 36 months after going public, excluding the initial return. The number of firms trading begins at less than 1,526 because some firms have a delay of more than one month after going public before being listed. $AR_t = 1/n_t \sum_{i=1}^{n_t}(r_{ipo,it} - r_{match,it})$ where $r_{ipo,it}$ is the total return on initial public offering firm i in event month t, and $r_{match,it}$ is the total return on the corresponding matching firm. The *t*-statistic for the average adjusted return is computed for each month as $AR_t \cdot \sqrt{n_t}/sd_t$, where AR_t is the average matching firm-adjusted return for month t, n_t is the number of observations in month t, and sd_t is the cross-sectional standard deviation of the adjusted returns for month t. The cross-sectional standard deviations vary from a low of 19.02 percent in month 10 to a high of 25.24 percent in month 16. The *t*-statistic for the cumulative average adjusted return in month t, $CAR_{1,t}$, is computed as $CAR_{1,t} \cdot \sqrt{n_t}/csd_t$, where n_t is the number of firms trading in each month, and csd_t is computed as $csd_t = [t \cdot var + 2 \cdot (t-1) \cdot cov]^{1/2}$, where t is the event month, var is the average (over 36 months) cross-sectional variance, and cov is the first-order autocovariance of the AR_t series. Var has a value of 0.04453 (21.10 percent squared) and cov has a value of 0.02097, representing an autocorrelation coefficient of 0.471.

Month of seasoning	Number of firms trading	AR_t %	*t*-stat	$CAR_{1,t}$ %	*t*-stat
1	1,512	0.38	0.63	0.38	0.70
2	1,514	1.49	2.81	1.88	2.02
3	1,517	−0.12	−0.24	1.75	1.46
4	1,518	−1.07	−2.21	0.69	0.48
5	1,519	−0.81	−1.63	−0.12	−0.08
6	1,519	−0.55	−1.06	−0.67	−0.38
7	1,518	−1.59	−3.13	−2.27	−1.18
8	1,516	−1.10	−2.21	−3.37	−1.63
9	1,514	−1.73	−3.38	−5.10	−2.31
10	1,513	−1.63	−3.32	−6.72	−2.88
11	1,508	−1.59	−3.08	−8.32	−3.39
12	1,501	−1.91	−3.66	−10.23	−3.97
13	1,496	−0.32	−0.56	−10.55	−3.92
14	1,492	−0.82	−1.60	−11.37	−4.06
15	1,486	−1.19	−2.30	−12.56	−4.32
16	1,478	−1.26	−1.92	−13.82	−4.59
17	1,469	−0.47	−0.85	−14.29	−4.58
18	1,463	−0.49	−0.88	−14.78	−4.59
19	1,449	0.37	0.61	−14.42	−4.43
20	1,440	0.30	0.55	−14.11	−4.12
21	1,429	−0.94	−1.66	−15.05	−4.27
22	1,416	−0.20	−0.33	−15.25	−4.21
23	1,403	−0.56	−0.92	−15.80	−4.24
24	1,397	−1.09	−1.97	−16.89	−4.43
25	1,388	0.30	0.50	−16.59	−4.25
26	1,372	−0.26	−0.44	−16.85	−4.20
27	1,354	−1.66	−2.87	−18.51	−4.50
28	1,347	−1.02	−1.72	−19.54	−4.65
29	1,339	−0.97	−1.84	−20.51	−4.78
30	1,324	−1.51	−2.74	−22.01	−5.01
31	1,309	−1.02	−1.57	−23.03	−5.13
32	1,296	−0.63	−1.00	−23.66	−5.16
33	1,283	−1.31	−2.16	−24.96	−5.33
34	1,270	−1.39	−2.39	−26.35	−5.52
35	1,260	−1.10	−1.89	−27.45	−5.64
36	1,254	−1.67	−2.80	−29.13	−5.89

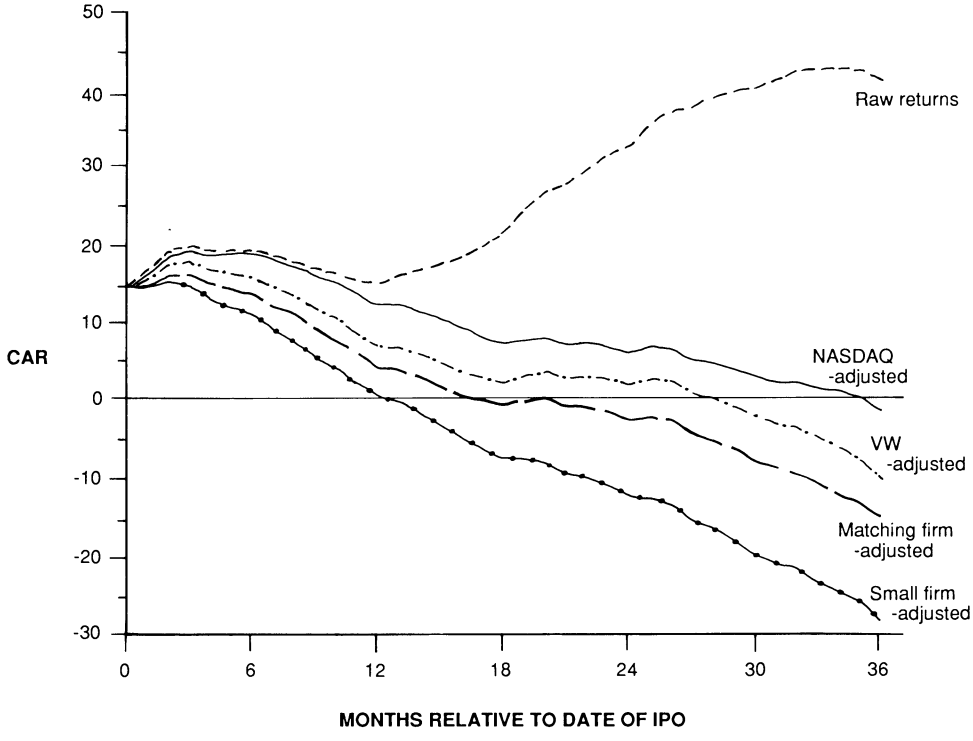

Figure 1. Cumulative average adjusted returns for an equally-weighted portfolio of 1,526 initial public offerings in 1975–84, with monthly rebalancing. Five CAR series are plotted for the 36 months after the IPO date: 1) no adjustment (raw returns), 2) CRSP value-weighted NASDAQ index adjustment (NASDAQ-adjusted), 3) CRSP value-weighted Amex-NYSE index adjustment (VW-adjusted), 4) matching firm adjustment (matching firm-adjusted), and 5) lowest decile of NYSE market capitalization index adjustment (small firm-adjusted). Month 0 is the initial return interval.

$CAR_{0,36}$, are, from top to bottom: (1) raw returns, (2) CRSP value-weighted NASDAQ-adjusted returns, (3) CRSP value-weighted Amex-NYSE-adjusted returns, (4) matching firm-adjusted returns, and (5) small firm-adjusted returns.

Focusing first on the raw returns, a positive initial return of 14.32% is followed by monthly average raw returns varying between negative 1.20% and positive 2.96%. The cumulative average raw return peaks at 42.49% in month 34. This rise can be at least partly attributed to the bull market prevailing from August 1982 to August 1987, a period comprising the three post-issue years for the vast majority of sample firms.

Figure 1 also plots cumulative average market-adjusted returns, formed by subtracting the market return each month, for two different market indices: (1) the CRSP value-weighted NASDAQ index, and (2) the CRSP value-weighted index of Amex-NYSE stocks. These indices are nearly identical to the NASDAQ Composite and S&P 500 index returns, respectively. The

resulting CAR's display different patterns, which can be attributed to the different performance of the two indices, especially in 1984. During 1984, the total return on the CRSP value-weighted Amex-NYSE index was 5.02%, whereas the CRSP value-weighted NASDAQ index produced a total return of −8.96%.

The difference in the performance of the various indices sheds light on the discrepancy between Buser and Chan's (1987) findings of positive aftermarket performance and this study's findings of negative performance. Buser and Chan's use of the NASDAQ Composite index as their benchmark portfolio for a sample period in which this index substantially underperformed other indices accounts for part of the difference in findings. Furthermore, since much of the underperformance documented in Figure 1 occurs in the third post-issue year, their use of 2 years of aftermarket data, rather than the 3 years of this study, accounts for another part of the difference in findings. The rest of the difference in findings can largely be attributed to two differences in the sample selection criteria. Their restriction to NMS-qualifying issues removes many of the more speculative issues that this study includes, in which, as I will document in later tables, the poorest long-run performance occurs. Furthermore, a slight survivorship bias in their sample removes some of the issues that were subsequently delisted; these issues display a tendency to perform especially poorly, pulling down the average long-run performance.

In addition to the raw returns, market-adjusted returns, and matching firm-adjusted returns, Figure 1 also plots average small firm-adjusted returns, formed by subtracting a benchmark portfolio of the equally-weighted return on the smallest decile of NYSE stocks from the raw returns. Because many of the firms going public have low market capitalizations (measured in terms of 1984 purchasing power, the median gross proceeds are only $7.59 million, and the median post-issue market capitalization, valued at the closing market price on the first day of trading, is only $28.4 million), a small firm index may be appropriate to use as a benchmark portfolio. Using an equally-weighted index of small stock returns, as represented by the lowest decile of market capitalization stocks trading on the NYSE, the months 1–36 cumulative average small firm-adjusted return is −42.21%.

As Figure 1 shows, while all four adjustments display negative post-initial return performance, the quantitative measurement of the long-run performance of initial public offerings is very sensitive to the benchmark employed. This is not unusual in event studies using long windows, as indicated by Dimson and Marsh (1986). For evaluating the long run performance of IPOs, it is not at all clear what constitutes the appropriate benchmark portfolio. Since the vast majority of the IPOs trade on NASDAQ, a natural candidate would be the NASDAQ index. This index has the advantage that the industry mix more closely matches that of the sample IPOs than does the Amex or NYSE. However, the reason that the NASDAQ index's industry mix so closely matches is because in the mid-1980s so many of the firms in the index had recently gone public. Hence, using the NASDAQ index as a

benchmark would tend to bias the results in favor of finding no abnormal market-adjusted returns.

To have a quantitative measure of long-run performance, *some* benchmark must be used. Throughout the rest of the paper, I will focus on *wealth relatives*, defined as the average gross total return on IPOs divided by the average gross total return on the matching firms, where both of these are measured over the 3 years after the IPO, excluding the initial return, as the primary measure of IPO aftermarket performance.[12]

Table III reports the distribution of 3-year holding period returns for both the 1,526 IPOs and the matching firms. The median IPO 3-year return is −16.67% contrasted with 38.54% for the median matching firm. The distribution of IPO 3-year holding period returns is more skewed than that of the matching firms, but the mean IPO 3-year holding period return is only 34.47% compared to a mean of 61.86% for the matching firms.

The highest 3-year total return of 3964.43%, excluding the initial return of −3.23%, belongs to This Can't Be Yogurt, Inc. (now TCBY Enterprises), a March 28, 1984 IPO at $7.75 per share. After six 3 for 2 stock splits, its market price on NASDAQ was $27.50 on March 27, 1987, the equivalent of $313.25 on a pre-split basis. For 272 firms that were delisted before their 3-year anniversary, the mean 3-year holding period return, exclusive of their mean 17.02% initial return, is −13.34%, with a wealth relative value of 0.581. For the 1,254 firms that were not delisted, the mean 3-year holding period return, exclusive of their mean initial return of 13.42%, is 44.79%, with a wealth relative value of 0.880. As one might expect, delisted firms have lower mean gross proceeds than nondelisted firms: $10.9 million versus $16.0 million when measured in terms of 1984 purchasing power.

III. Cross-Sectional and Time-Series Patterns in the Aftermarket Performance of IPOs

A. Aftermarket Performance Categorized by Issue Size and Initial Returns

To investigate possible explanations for the long-run underperformance of IPOs, this section documents various cross-sectional and time-series patterns.

In Table IV, firms are segmented by the gross proceeds of the offer. This permits examination of the generality of the negative aftermarket performance of IPOs. Inspection of Table IV discloses that there is a tendency for the smaller offers, which have the highest average matching firm-adjusted initial returns (henceforth, "adjusted initial returns"), to have the worst aftermarket performance. All gross proceeds categories display long-run underperformance.

In addition to reporting mean initial and aftermarket returns, Table IV also reports median initial and aftermarket returns. For the initial returns,

[12]For IPOs that are delisted prior to their 3-year anniversary, the total return is computed up to the delisting date.

Table III

Distribution of Three-Year Holding Period Returns, Exclusive of the Initial Return, for 1,526 Initial Public Offerings and Matching Firms in 1975–84

Three-year holding period returns are calculated as $[\Pi_{t=1}^{756}(1 + r_{idt}) - 1] \times 100\%$ where r_{idt} is the daily return on stock i, with the CRSP daily NASDAQ returns tape and the daily Amex-NYSE returns tape being the source of the daily returns. For initial public offerings that were delisted before the 3-year anniversary, the total return is calculated until the delisting date. If the initial return period lasted for more than 1 day, the total return is calculated from the first CRSP-reported closing price until the 756th trading day after the IPO. The corresponding matching firm's total return is calculated over the same truncated return interval. If the matching firm is delisted early, a second (and possibly third) matching firm's return is spliced onto the first matching firm. For firms with no dividends and no stock splits the total return corresponds to $[(P_3/P_t) - 1] \times 100\%$ where P_3 is the price on the 3-year anniversary, and P_t is the first closing market price after the IPO.

	Three-year holding period total return, in percent	
Rank	Initial public offerings	Matching firms
1 (lowest)	−99.02	−94.59
77	−92.27	−61.11
153	−85.80	−44.53
229	−79.16	−31.58
306	−72.98	−19.05
382 (25th percentile)	−66.25	−9.49
458	−57.98	0.00
535	−48.06	8.79
611	−38.28	18.75
687	−28.20	27.67
764 (median)	−16.67	38.54
840	−2.54	51.14
916	13.25	63.14
992	29.07	75.82
1,069	46.85	87.56
1,145 (75th percentile)	69.59	103.16
1,222	99.96	120.42
1,298	138.03	148.86
1,374	205.33	187.01
1,450	320.53	240.78
1,526 (highest)	3,964.43	1,268.56
Mean	34.47	61.86

the median is a positive 4.61%, with only 368 of the 1,526 offers (22.2%) having negative adjusted initial returns.

DeBondt and Thaler (1985, 1987) have presented evidence that, at least for low-capitalization stocks, there is a negative relation between past and subsequent abnormal returns on individual securities using holding periods of a year or more, which they interpret as evidence of market overreaction. Table V tests whether the IPO market is subject to overreaction by comput-

Table IV

Mean Performance Measures for 1,526 IPOs in 1975-84 Categorized by Gross Proceeds

Gross proceeds are measured in dollars of 1984 purchasing power using the U.S. GNP deflator. Initial returns are computed as $r_{ipo} - r_{matching\ firm}$ over the initial return interval (one day for 1,203 of the 1,526 firms). The three-year holding period return is calculated excluding the initial return. For IPOs that are delisted prior to their three-year anniversary the matching firms' return is ended on the same date as the IPO. Total returns include both capital gains and dividends. The *wealth relative* is the ratio of one plus the mean IPO 3-year holding period return (not in percent) divided by one plus the mean matching firm 3-year holding period return (not in percent). For the smallest gross proceeds category, 1.1794/1.6754 = 0.704.

Gross proceeds, $	Average adjusted initial return %	Excluding initial returns: Average 3-year holding period total return			Sample Size	
		IPOs %	Matching firms %	*Wealth relative*	Month 0	Month 36
1,000,000- 2,999,999	27.45	17.94	67.54	0.704	221	146
3,000,000- 4,999,999	18.00	20.89	58.72	0.762	296	238
5,000,000- 9,999,999	11.28	40.06	69.87	0.825	379	316
10,000,000- 14,999,999	7.51	46.25	55.99	0.938	211	183
15,000,000- 24,999,999	10.09	43.97	50.56	0.956	200	179
25,000,000-353,950,260	9.96	39.81	62.50	0.860	219	193
All (mean)	14.06	34.47	61.86	0.831	1,526	1,254
All (median)	4.61	-16.67	38.54	0.601	1,526	1,254

ing mean aftermarket returns for quintiles of adjusted initial returns for both small and large offers.[13] There is some tendency for firms with high adjusted initial returns to have the worst aftermarket performance. This tendency is stronger for smaller issues than larger issues. The evidence is mildly supportive of the overreaction hypothesis.

In some respects, the finding that there is a tendency for the offerings with the highest initial returns to do worst in the long run may be a manifestation of a desire by issuers to avoid future lawsuits (see Ibbotson (1975, p. 264) and Tinic (1988)), by not fully exploiting the market's overoptimism at the time of the offering. This may also shed light on the "partial adjustment" phenomenon which refers to a positive correlation between initial returns and changes in the offering price between the preliminary and final prospectuses (see Ibbotson, Sindelar, and Ritter (1988), Sternberg (1989), and Weiss (1990) for discussions).

[13]Carter and Dark (1990) examine the correlation between initial returns and 18-month aftermarket returns for a sample of 911 firm commitment offers that went public between January 1, 1979 and November 11, 1984. They find that the abnormal 18-month aftermarket returns for firms having the highest initial returns tend to be slightly lower than for firms having the lowest initial returns which they interpret as evidence of valuation errors.

Table V

Aftermarket Performance Categorized by Initial Return Quintiles, with Results for Small and Large Offerings, for 1,526 IPOs in 1975-84

Gross proceeds are measured in dollars of 1984 purchasing power. $7.59 million is the median gross proceeds for the 1,526 offerings. The *wealth relative* is the ratio of one plus the mean IPO 3-year holding period return (not in percent) divided by one plus the mean matching firm 3-year holding period return (not in percent), exclusive of the initial return.

Matching firm-adjusted initial return quintile %	All offers			Segmented by gross proceeds			
				Proceeds < $7.59 million		Proceeds > $7.59 million	
	IPO average 3-year total return %	Matching firm avg. 3-year total return %	*Wealth relative*	*Wealth relative*	Sample size	*Wealth relative*	Sample size
23.70 < IR < 373.98	9.45	61.39	0.678	0.606	198	0.818	108
8.10 < IR < 23.70	27.94	65.52	0.773	0.702	157	0.848	148
2.37 < IR < 8.10	41.56	55.82	0.908	0.800	142	1.004	163
−0.84 < IR < 2.37	45.51	60.88	0.904	0.794	101	0.955	204
−92.38 < IR < −0.84	47.95	65.70	0.893	0.829	164	0.985	141

B. Aftermarket Performance by Industry

Tables VI and VII segment firms by industry classifications based upon three-digit Standard Industrial Classification (SIC) codes.[14]. Where two or more SIC codes represent industries that are very similar, I have grouped them into a single industry. The 13 industries for which there were at least 25 IPOs in my sample are listed with the remaining 420 other firms grouped together. As inspection of Table VI demonstrates, companies going public in 1975-84 were not evenly distributed over all industries. Oil and gas firms are heavily represented (with most of these offers conducted in 1980 and 1981) as are financial institutions. Following the deregulation of the airline industry in 1978, several dozen young airlines went public. High technology firms in the computer and biomedical fields also have high representation. On the other hand, very few auto and steel companies went public in 1975-84. The industry representation represents capital flowing into growing industries in a dynamic economy.[15]

[14]The SIC codes are compiled from the CRSP NASDAQ database, the January 1987 *NASDAQ Company Directory*, and other sources. Where there are discrepancies between various sources (due, for example, to a company's having changed the nature of its business after going public), I have assigned an SIC code based upon *Going Public: The IPO Reporter*'s description of its business at the time of the offer.

[15]In the 1975-84 period, only 15 of the 1,526 companies going public represented "reverse LBOs," defined as a company going public that had been involved in a leveraged buyout. Among companies going public in 1986 and later, reverse LBOs have been more common. The industry representation of reverse LBOs is concentrated in mature industries, such as retailing and food companies. See Muscarella and Vetsuypens (1989a) for an analysis of these reverse LBOs.

Table VI

Mean and Median Sales, Gross Proceeds, and Age of 1,526 Sample Offers Categorized by Industry

Both sales and gross proceeds are expressed in terms of dollars of 1984 purchasing power. Sales are measured as 12-month revenues for the most recent 12-month period prior to going public. Gross proceeds are measured including, for firm commitment offerings, the proceeds from overallotment options, if exercised. The age of the issuing firm is measured as the calendar year of going public minus the calendar year of founding. The year of founding is the same or earlier than the year of incorporation or reincorporation. The 39 firms with a founding date prior to 1901 have their age computed as the offer year minus 1901.

Industry	SIC codes	Number of offers	Annual sales, $ millions		Gross proceeds, $ millions		Age of issuing firm	
			Mean	Median	Mean	Median	Mean	Median
Computer manufacturing	357	144	18.78	14.36	21.40	13.46	6.20	5
Communications and electronic equipment	366, 367	138	14.16	8.26	11.25	6.21	9.28	7
Oil and gas	131, 138 291, 679	127	19.05	0.53	9.57	6.33	4.83	2
Financial institutions (banks and S&L's)	602, 603 612, 671	125	120.20	49.43	27.41	12.00	43.13	49
Computer and data processing services	737	113	16.40	11.50	13.98	9.83	9.55	7
Optical, medical, and scientific instruments	381-384	111	10.89	2.23	9.29	4.66	8.08	5
Retailers	520-573 591-599	70	74.70	34.74	17.28	11.10	12.89	7
Wholesalers	501-519	63	56.58	13.41	12.32	4.72	9.65	6
Restaurant chains	581	54	34.54	10.98	10.34	5.55	7.33	4
Health care and HMOs	805-809	50	35.20	7.42	14.96	6.80	4.88	3
Drugs and genetic engineering	283	44	21.14	1.98	19.70	11.55	7.68	3
miscellaneous business services	739	42	14.27	2.38	7.75	4.93	8.55	8
Airlines	451	25	20.65	14.33	11.68	6.00	7.84	4
All other firms	-	420	61.24	18.07	15.04	7.32	14.58	8
All firms	-	1, 526	42.82	11.55	15.06	7.59	12.66	6

Also reported in Table VI are the mean and median gross proceeds and annual sales, expressed in terms of 1984 purchasing power, and the mean and median age of the issuing firm, categorized by industry. As can be seen, there are substantial industry differences. The overall median age at the time of issue is only 6 years. For oil and gas firms, however, the median age is only 2 years, while for financial institutions the median age is 49 years. Most of the financial institution IPOs involve mutual savings banks and mutual savings and loan associations converting to stock companies after a 1982 regulatory change. Masulis (1987) analyzes this process. Also noteworthy is the fact that the median oil and gas IPO raised 12 times its annual revenue when it went public.

Table VII reports the long-run performance measures for IPOs, categorized

Table VII

Mean Performance Categorized by Industry

The *wealth relative* is the ratio of one plus the mean IPO 3-year holding period return (not in percent) divided by one plus the mean matching firm 3-year holding period return (not in percent).

Industry	Average matching firm-adjusted initial return %	Excluding initial returns		
		Average 3-year holding period total return		
		IPOs %	Matching firms %	*Wealth relative*
Computers	13.67	19.22	47.84	0.806
Electronic equipment	14.59	29.93	61.46	0.805
Oil and gas	30.92	−43.86	34.67	0.417
Financial institutions	3.69	128.21	59.23	1.433
Computer services	16.07	13.13	50.38	0.752
Scientific instruments	20.96	18.14	72.20	0.686
Retailers	7.60	54.05	113.63	0.721
Wholesalers	16.95	1.42	47.14	0.689
Restaurant chains	13.51	73.86	82.36	0.953
Health care	14.12	36.93	53.25	0.894
Drugs	14.63	121.69	91.96	1.155
Miscellaneous services	10.20	26.61	80.50	0.701
Airlines	6.26	61.62	42.93	1.131
All other firms	11.13	33.40	64.24	0.812
All firms	14.06	34.47	61.86	0.831

by industry. As can be seen, the long-run performance of IPOs in different industries varies widely.[16] Financial institutions (almost all of which went public in 1983 and 1984) had the best long-run performance, benefiting from the large drop in interest rates in 1985–86. Oil and gas firms (most of which went public in 1980 and 1981) substantially underperformed the market. As is well-known, oil prices declined substantially during 1981–83, so the underperformance of oil and gas firms does not come as a surprise. However, the long-run underperformance of IPOs is present in all but three of the 14 industry groupings. The underperformance of the IPOs in so many industries relative to other firms in the same industries may be interpreted as evidence that is more consistent with a "fads" explanation than mere bad luck.

[16]Since only 57% of the matching firms are in the same two-digit industry as the IPOs, it is possible that the imperfect control for industry factors can account for the long-run underperformance. In tests not reported here, I restricted the long-run analysis to the IPOs for which I had a matching firm in the same two-digit industry (or the same industry as defined in Table VI). The wealth relative value for this subsample is 0.866 as contrasted with 0.831 for the entire sample. This indicates that IPOs tend to underperform relative to their industries, which in turn tend to underperform relative to the market in the 3 years after going public.

Table VIII

Performance Categorized by Year of Issuance for Initial Public Offerings in 1975-84

The average real gross proceeds, measured in dollars of 1984 purchasing power, is computed as the product of the U.S. GNP Deflator index and the average nominal gross proceeds. The *wealth relative* is the ratio of one plus the mean IPO 3-year holding period return (not in percent) divided by one plus the mean matching firm 3-year holding period return (not in percent), exclusive of the initial return.

						Excluding initial returns		
		Average gross proceeds, $ millions				Average 3-year holding period total return		
Year	GNP deflator	Nominal	Real	Number of issues	Average matching firm-adjusted initial return %	IPOs %	Matching firms %	*Wealth relative*
1975	1.76	21.87	38.49	12	−5.24	59.44	52.51	1.045
1976	1.67	7.64	12.76	28	6.38	122.58	124.11	0.993
1977	1.58	6.96	11.00	19	8.21	188.35	54.72	1.864
1978	1.47	7.05	10.36	31	31.78	134.60	97.37	1.189
1979	1.38	6.55	9.04	63	22.06	75.98	71.76	1.025
1980	1.26	8.51	10.72	129	38.27	46.28	68.56	0.868
1981	1.15	8.96	10.30	300	9.98	5.26	60.85	0.654
1982	1.08	11.87	12.82	93	15.18	26.07	119.92	0.573
1983	1.04	20.48	21.30	589	12.56	21.31	52.88	0.793
1984	1.00	10.81	10.81	272	8.40	52.03[a]	47.91	1.028[a]
All	-	13.81	15.06	1,526	14.06	34.47	61.86	0.831

[a]If one outlier (TCBY, Inc.) is removed, the average 3-year raw return falls to 37.59% and the 3-year *wealth relative* falls to 0.930.

C. Aftermarket Performance by Year of Issuance

In Table VIII, firms are categorized by their year of issuance. The results in Table VIII show that the long-run underperformance is not as general a phenomenon as the short-run underpricing that has been widely documented. The *wealth relatives* are less than one for only five of the ten sample years. Because the volume of new issues was much heavier in the early 1980s than in the late 1970s, however, the mean wealth relative is only 0.831 when all issues are weighted equally.

The negative relation between annual volume and aftermarket performance that is evident in Table VIII is consistent with the following scenario: firms choose to go public when investors are willing to pay high multiples (price-earnings or market-to-book) reflecting optimistic assessments of the net present value of growth opportunities. The negative aftermarket performance that then typically results is due to disappointing realizations of the subsequent net cash flows. This is due to either (1) bad luck or (2) irra-

Table IX

Aftermarket Performance Categorized by the Age of the Issuing Firm

Panel A includes all 1,526 IPOs. Panel B includes the 1,274 IPOs remaining after excluding the two industries with the most extreme wealth relatives: oil and gas (primarily very young firms) which did poorly, and financial institutions (primarily very old firms) which did well. Oil and gas firms are defined as firms with SIC codes of 131, 138, 291, and 679, representing oil and gas exploration, production, servicing, refining, and holding companies. Financial institutions are defined as firms with SIC codes of 602, 603, 612, and 671, representing commercial banks, savings banks, savings and loans, and bank holding companies. The *wealth relative* is the ratio of one plus the mean IPO 3-year holding period return (not in percent) divided by one plus the mean matching firm 3-year holding period return (not in percent).

			Excluding initial returns		
			Average 3-year holding period total return		
Age in years	Sample size	Average matching firm-adjusted initial return %	IPOs %	Matching firms %	*Wealth relative*
Panel A: All 1,526 firms					
0–1	252	29.42	5.34	68.98	0.623
2–4	381	14.51	15.69	48.69	0.778
5–9	328	13.15	28.47	62.33	0.791
10–19	312	9.05	40.74	66.70	0.844
20–up	253	5.42	91.81	68.03	1.142
Panel B: Excluding oil and gas firms and financial institutions					
0–1	177	23.87	16.19	76.31	0.659
2–4	338	14.87	19.22	53.20	0.778
5–9	305	13.71	33.01	65.47	0.804
10–19	300	9.32	42.97	67.66	0.853
20–up	154	5.41	63.76	70.37	0.961

tionally overoptimistic forecasts, or "fads." Tables VII and VIII are consistent with both interpretations.

D. Aftermarket Performance by Age

In Table IX, firms are segmented on the basis of their age at the time of going public, computed as the year of the offer minus the year of founding. There is a strong monotone relation between age and aftermarket performance. For the initial return, there is a strong monotone pattern in the other direction, consistent with the notions that risky issues require higher average initial returns and that age is a proxy for this risk.[17] The initial return and aftermarket performance patterns are much clearer in Table IX, using age as a measure of both ex ante uncertainty and investor optimism, than are

[17]Muscarella and Vetsuypens (1989b) also document a negative relation between initial returns and age.

Table X

Ordinary Least Squares Regression Results with the Three-year Total Return as the Dependent Variable, for 1,526 IPOs in 1975–84

$\text{Return}_i = b_0 + b_1\text{IR}_i + b_2\text{Log}(1 + \text{age}_i) + b_3\ \text{Market}_i + b_4\text{Vol}_i + b_5\text{Oil}_i + b_6\text{Bank}_i + e_i$. Return_i is the raw three year return, measured from the first aftermarket closing price to the earlier of the three-year anniversary or its CRSP delisting date. IR_i is the market-adjusted initial return, calculated using the CRSP value-weighted index of Amex-NYSE stocks as the market index. $\text{Log}(1 + \text{age}_i)$ is the natural logarithm of one plus the difference between the year of going public and the year of founding, with firms founded before 1901 assumed to be founded in 1901. Market_i is the CRSP value-weighted market return for the same return interval as the dependent variable. Vol_i is the annual volume of IPOs in the year of issuance, divided by 100. The gross number of IPOs, given in Table I, is used. Oil_i is a 0, 1 dummy variable taking on the value of 1 if the issuing firm has an SIC code of 131, 138, 291, or 679, representing oil and gas production, exploration, refining, and service companies, or oil and gas holding companies. Bank_i is a 0, 1 dummy variable taking on the value of 1 if the issuing firm has an SIC code of 602, 603, 612, or 671, representing banks, savings and loans, and associated holding companies. Bootstrapped *p*-values are in parentheses.

Panel A: Parameter estimates

Intercept	IR	Log(1 + age)	Market	Vol	Oil	Bank	R^2_{adjusted}
0.238	−0.206	0.127	0.841	−0.109	−0.765	0.825	0.070
(0.186)	(0.143)	(0.010)	(0.001)	(0.001)	(0.001)	(0.001)	

Panel B: Summary statistics of variables

Variable	Mean	Median	Standard deviation
Return	0.345	−0.167	1.902
IR	0.141	0.040	0.309
Log(1 + age)	2.009	1.946	1.079
Market	0.566	0.580	0.246
Vol	5.520	5.350	2.831
Oil	0.083	0.000	0.276
Bank	0.082	0.000	0.274

the patterns in Table IV, in which firms are segmented by gross proceeds. The patterns using gross proceeds are not as clear because of two confounding effects—larger issues are typically issued by more established firms, but a given firm will choose to float a larger issue when the market conditions are characterized by strong demand.

A potential problem with interpreting Panel A of Table IX is that many of the oldest firms are financial institutions, which had exceptionally good aftermarket performance during this period, and many of the youngest firms are oil and gas firms, which had exceptionally poor aftermarket performance, as documented in Table VII. Thus, the pattern of aftermarket performance documented in Table IX is strengthened by these industry effects. To control for these effects, I report in Panel B of Table IX the initial and aftermarket performance for firms categorized by their age at the time of issue, with the 125 financial institutions and the 127 oil and gas firms deleted. The patterns

present in Panel A are still present in Panel B, demonstrating that the lack of underperformance by established companies is not merely a manifestation of strong aftermarket performance by financial institutions.[18] I interpret the poor long-run performance of the younger IPOs, which typically have higher market-to-book ratios than more established firms, as evidence consistent with the overoptimism and fads story.

E. Regression Results

The cross-sectional patterns documented in Tables IV through IX are not independent of each other. Among other correlations, the worst-performing industry in the long run (oil and gas) has the lowest median age and the highest average initial return, while the best-performing industry in the long run (financial institutions) has the highest median age and the lowest average initial return. To disentangle the effects, Table X reports the results of a multiple regression using the raw 3-year total return on IPOs as the dependent variable. The explanatory variables are the market-adjusted initial return, the 3-year total return on the market, the logarithm of one plus age, the volume of IPOs in the year of issuance, and dummy variables for the oil and financial institutions industries.[19]

The Table X results generally support the conclusions from earlier tables. The adjusted coefficient of determination is rather low at only 7%. Because the dependent variable (3-year total returns) is so skewed, the residuals are also highly nonnormal. Consequently, bootstrapped p-values are reported.[20] With the exception of the initial return, all of the coefficient estimates are statistically significant at conventional levels. The parameter estimates are also economically significant. The coefficient on annual IPO volume (divided by 100) of -0.109, for instance, indicates that the difference in 3-year total returns for a firm going public in a low volume year such as 1976 (33 offerings) rather than in a high volume year such as 1983 (865 offerings) is 0.907 (90.7%), ceteris paribus. The coefficient on the market return of 0.841

[18] In results not reported here I have prepared tables analogous to Panels A and B of Table IX using sales and market-to-book ratios rather than age for categorizing firms with similar results.

[19] Several additional variables were also included in other regressions (unreported) that were run, with no boost in the adjusted coefficient of determination. Among these other insignificant variables are the logarithm of sales and a dummy variable accounting for the use of a best-efforts contract.

[20] The approximate randomization bootstrapping procedure described in Noreen (1989) creates a coefficient vector under the null hypothesis of no relation by randomly reordering the 1,526 dependent variable observations (sampling without replacement) and running an OLS regression. This is repeated 10,000 times, creating a distribution of least-squares coefficient vectors. The bootstrapped p-values are calculated by finding the location of the original coefficient vector in the ranked empirical distribution, variable by variable. The two-tailed p-values reported are calculated by doubling the percentile location. Intuitively, this simulation procedure answers the question "How likely is it to observe a value at least as large (in absolute value) as the original least squares coefficient estimate if there is no true relation, given the empirical distribution of the dependent variable?" The bootstrapped p-values that are reported are similar to the ordinary least squares values.

is surprisingly low. I would have expected that the average beta would be slightly above 1.0, given the findings of Clarkson and Thompson (1990).

IV. Summary and Conclusions

This paper has documented the time- and industry-dependence of the long-run performance of initial public offerings. A strategy of investing in IPOs at the end of the first day of public trading and holding them for 3 years would have left the investor with only 83 cents relative to each dollar from investing in a group of matching firms listed on the American and New York stock exchanges. Younger companies and companies going public in heavy volume years did even worse than average. I have attempted to shed some light on the reason for this underperformance. In particular, do the firms in this sample underperform merely due to bad luck, or does the market systematically overestimate the growth opportunities of IPOs? The evidence presented here is broadly consistent with the notion that many firms go public near the peak of industry-specific fads. It should be noted, however, that since the sample involves IPOs going public in only a 10-year period, alternative interpretations cannot be ruled out.

With 20–20 hindsight, investors in the 1,526 IPOs in this sample were overoptimistic about the firms' prospects. There are other securities markets in which investors in new issues have systematically lost money. Weiss (1989) and Peavy (1990) document that investors in new issues of closed-end funds in 1985–87 suffered substantial losses as the funds moved from premiums over net asset value at the time of issue to substantial discounts 6 months later. Elton, Gruber, and Rentzler (1989) document that publicly offered commodity funds going public in 1979–83 performed poorly, in spite of extremely high monthly returns reported in their offering prospectuses. Uhlir (1989) documents a pattern of returns of IPOs of common stock in West Germany that is almost identical to that presented here for the 12 months after going public.

The finding that initial public offerings underperform, on average, implies that the costs of raising external equity capital are not inordinately high for these firms. The high transaction costs of raising external equity capital in an IPO, documented in Ritter (1987) and Barry, Muscarella, and Vetsuypens (1990), are partly offset by the low realized long-run returns, at least for those firms going public at times when investor sentiment is optimistic. Consequently, the small growth companies that predominate among firms going public do not necessarily face a higher cost of equity capital than is true for more established firms.

For issuers, it appears that the concentrations in volume in certain years are associated with taking advantage of "windows of opportunity." Kim and Stulz (1988) present evidence that issuers take advantage of differences in borrowing costs that periodically arise between the domestic and Eurobond markets. Lee, Shleifer, and Thaler (1991) present evidence that closed-end

funds are issued more frequently in periods when discounts are unusually small. Thus, evidence exists in several markets that issuers successfully time offers to lower their cost of capital.

Several issues have been left unresolved. In particular, I have analyzed the stock market returns in the 3 years after going public without finding any tendency for the underperformance to eventually end. My suspicion, however, is that the underperformance does not extend much beyond 3 years, based upon Ibbotson (1975) and Rao's (1989) findings. Ibbotson finds no underperformance in the fifth year after going public, the last year that he analyzes. Furthermore, Rao finds negative earnings announcement effects in the first 3 years after going public, but not in years 4 through 6.

A second issue that is unresolved is the generality of my findings. Only by extending the sample period beyond the 10 years of this paper can additional evidence be gained regarding some of the patterns that have been documented. In this regard, Aggarwal and Rivoli (1990) report that IPOs issued in the high-volume years of 1985 and 1986 had negative market-adjusted returns, using a NASDAQ index as the market, during their first year of trading.

A third issue that is unresolved is the relation of the long-run underperformance to the short-run underpricing phenomenon. It has always been somewhat of a mystery why IPOs are priced in a manner that results in such large positive average initial returns. This paper's evidence indicates that the offering price is not too low, but that the first aftermarket price is too high. If issuers and their investment bankers set the offering price in a manner that reflects the firm's underlying fundamental value, however, it is even more of a mystery why some offerings have extremely high initial returns.

Appendix: Matching Firm Selection Procedure

To select matching firms for the 1,526 IPOs in 1975–84, the following procedure was employed: Among firms listed on the American and New York Stock Exchanges, their market values were computed on the dates December 31 of 1974, 1980, and 1983. Within each three-digit SIC code, these firms were ranked by market value. For firms going public in 1975–80 in a given three-digit industry, the listed firm with the closest (as of December 31, 1974) market value was chosen as the matching firm, with a matching firm used only once until 3 years had passed. If a matching firm in the same industry was not available, then a small firm in another industry was chosen, with preference given to firms in similar industries. For companies going public in 1981–83, the market value of listed firms at the end of 1980 was used. For firms going public in 1984, the market value of listed firms at the end of 1983 was used. This procedure resulted in 1,526 matching firms, of which 543 (36%) were in the same three-digit industry. An additional 328 firms (21%) were matched by either two-digit SIC codes or by the industry groups as defined in Table VI, resulting in a total of 57% of IPOs matched with a firm

Table AI

Distribution of Market Values for 1,526 IPOs and Matching Firms in 1975–84

Market values for IPOs are calculated using the post-offering number of shares multiplied by the CRSP-reported closing market price on the first day of trading. Market values for matching firms are calculated using the CRSP-reported number of shares for the prior December 31 multiplied by the market price on the date of the IPO. No price level adjustments have been made.

	Market values, $	
Percentile	IPOs	Matching firms
1st	971,014	695,625
10th	7,024,060	9,892,187
20th	10,810,811	17,626,000
30th	14,033,019	28,428,000
40th	18,724,091	43,064,000
50th (median)	25,987,887	67,816,000
60th	35,654,362	106,260,736
70th	50,818,888	181,082,000
80th	76,545,169	314,312,192
90th	130,024,824	719,505,920
100th	1,694,854,118	35,028,414,500

in roughly the same industry. The low rate of matching industries is attributable to the large difference in the industry mix between the IPOs and the listed companies. Also, as shown in Table AI, in spite of the overrepresentation of small firms among the matching firms, the matching firms (with market values calculated at the time of the IPO, rather than merely at three discrete dates) tend to be larger than the IPOs.

For 277 out of the 1,526 IPOs, the original matching firm was delisted before the earlier of (1) the 3-year anniversary date, or (2) the delisting of the IPO. For these firms, a second matching company was chosen, using the same criteria as above, for the remainder of the aftermarket performance interval. For 61 companies, a third matching firm was needed for the remainder of the interval due to the delisting of the second matching company. A given matching company could be matched with several different IPOs that went public more than 3 years apart. This procedure allowed matching firms with low market capitalizations in certain industries to be used multiple times.

For all of the matching firm choices, care was taken to avoid "survivorship bias." This was accomplished by choosing a matching firm regardless of when it was delisted, with some matching firms being delisted as soon as a week after the offering date of its matched IPO. Almost all of the Amex-NYSE delistings occurring during this period are due to takeovers and management buyouts. For IPOs that were delisted before the 36 month aftermarket period ended, the last month of returns involves fewer than 21 days. The matching

company's returns were matched up to end on exactly the same day as the IPO.

REFERENCES

Aggarwal, Reena and Pietra Rivoli, 1990, Fads in the initial public offering market? *Financial Management* 19 (Winter), 45-57.

Barry, Christopher B., Chris J. Muscarella, and Michael R. Vetsuypens, 1990, Underwriter warrants, underwriter compensation, and the costs of going public, Unpublished working paper, SMU and TCU.

Blazenko, George W., 1989, Underpricing of unseasoned equity issues, after-market performance, and the winner's curse, Unpublished working paper, Simon Fraser University.

Buser, Stephen A. and K. C. Chan, 1987, NASDAQ/NMS qualification standards, Ohio registration experience and the price performance of initial public offerings, Columbus, Ohio Department of Commerce and National Association of Securities Dealers, Inc.

Carter, Richard B. and Frederick H. Dark, 1990, Effects of differential information on the aftermarket valuation of initial public offerings, Unpublished working paper, Iowa State University.

—— and Steven Manaster, 1990, Initial public offerings and underwriter reputation, *Journal of Finance* 45, 1045-1067.

Chan, Louis and Josef Lakonishok, 1990, Robust measurement of beta risk, Unpublished working paper, University of Illinois.

Clarkson, Peter M. and Rex Thompson, 1990, Empirical estimates of beta when investors face estimation risk, *Journal of Finance* 45, 431-453.

DeBondt, Werner F. M. and Richard Thaler, 1985, Does the stock market overreact? *Journal of Finance* 40, 793-805.

—— and Richard Thaler, 1987, Further evidence of investor overreaction and stock market seasonality, *Journal of Finance* 42, 557-82.

Dimson, Elroy and Paul Marsh, 1986, Event study methodologies and the size effect: The case of UK press recommendations, *Journal of Financial Economics* 17, 113-142.

Elton, Edwin J., Martin J. Gruber, and Joel Rentzler, 1989, New public offerings, information, and investor rationality: The case of publicly offered commodity funds, *Journal of Business* 62, 1-15.

Howard & Co., 1975-84, *Going public: The IPO reporter*, (Philadelphia).

Ibbotson, Roger G., 1975, Price performance of common stock new issues, *Journal of Financial Economics* 3, 235-272.

—— and Jeffrey F. Jaffe, 1975, 'Hot issue' markets, *Journal of Finance* 30, 1027-1042.

——, Jody L. Sindelar, and Jay R. Ritter, 1988, Initial public offerings, *Journal of Applied Corporate Finance* 1, 37-45.

Kim, Yong Cheol and René M. Stulz, 1988, The Eurobond market and corporate financial policy: A test of the clientele hypothesis, *Journal of Financial Economics* 22, 189-205.

Lee, Charles, Andrei Shleifer, and Richard Thaler, 1991, Investor sentiment and the closed-end fund puzzle, *Journal of Finance* 46, 75-109.

Masulis, Ronald W., 1987, Changes in ownership structure: Conversions of mutual savings and loans to stock charter, *Journal of Financial Economics* 18, 29-60.

Miller, Edward M., 1977, Risk, uncertainty, and divergence of opinion, *Journal of Finance* 32, 1151-1168.

Miller, Robert E. and Frank K. Reilly, 1987, An examination of mispricing, returns, and uncertainty for initial public offerings, *Financial Management* 16, 33-38.

Muscarella, Chris J. and Michael Vetsuypens, 1989a, The underpricing of 'second' initial public offerings, *Journal of Financial Research* 12, 183-192.

—— and Michael Vetsuypens, 1989b, Initial public offerings and information asymmetry, Unpublished working paper, Southern Methodist University.

NASDAQ Company Directory, 1987, National Association of Securities Dealers, Inc., January number, (Washington, DC).

Noreen, E. W., 1989, *Computer Intensive Methods for Testing Hypotheses*, (John Wiley and Sons, Somerset, NJ).

Peavy, John W., 1990, Returns on initial public offerings of closed-end funds, *Review of Financial Studies* 3, 695-708.

Rao, Gita, 1989, The relation between stock returns and earnings: A study of newly-public firms, Unpublished working paper, University of Illinois.

Ritter, Jay R., 1984, The 'hot issue' market of 1980, *Journal of Business* 32, 215-240.

——, 1987, The costs of going public, *Journal of Financial Economics* 19, 269-281.

Shiller, Robert J., 1990, Speculative prices and popular models, *Journal of Economic Perspectives* 4, 55-65.

Smith, Clifford W., Jr., 1986, Investment banking and the capital acquisition process, *Journal of Financial Economics* 15, 3-30.

Stern, Richard L. and Paul Bornstein, 1985, Why new issues are lousy investments, *Forbes* 136, 152-190.

Sternberg, Theodore D., 1989, Bilateral monopoly and the dynamic properties of initial public offerings, Unpublished working paper, Vanderbilt University.

Stoll, Hans R. and Anthony J. Curley, 1970, Small business and the new issues market for equities, *Journal of Financial and Quantitative Analysis* 5, 309-322.

Tinic, Seha, 1988, Anatomy of initial public offerings of common stock, *Journal of Finance* 43, 789-822.

Uhlir, Helmut, 1989, Going public in the F.R.G., in Rui M. C. Guimaraes, B. Kingsman, and S. Taylor, eds.: *A Reappraisal of the Efficiency of Financial Markets*, (Springer-Verlag, New York).

Weiss, Kathleen A., 1989, The post-offering price performance of closed-end funds, *Financial Management* 18, 57-67.

——, 1990, Investor demand for initial public offerings and the relationship of the offer price to the preliminary file range, Unpublished working paper, University of Michigan.