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The Really Long-Run Performance of Initial Public Offerings: The Pre-Nasdaq Evidence

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ABSTRACT

Financial economists have intensely debated the performance of IPOs using data after the formation of Nasdaq. This paper sheds light on this controversy by undertaking a large, out-of-sample study: We examine the performance for five years after listing of 3,661 U.S. IPOs from 1935 to 1972. The sample displays some underperformance when event-time buy-and-hold abnormal returns are used. The underperformance disappears, however, when cumulative abnormal returns are utilized. A calendar-time analysis shows that over the entire period, IPOs return as much as the market. The intercepts in CAPM and Fama–French regressions are insignificantly different from zero, suggesting no abnormal performance.

RITTER (1991) AND LOUGHRAN AND RITTER (1995) document severe underperformance of initial public offerings (IPOs) during the past 20 years. In discussing these results, they suggest that investors may systematically be too optimistic about the prospects of firms that are issuing equity for the first time. Their results have inspired countless articles in the popular press about the danger of investing in IPOs, as well as academic research that has shown that underperformance extends to other countries as well as to seasoned equity offerings.

The results concerning IPO performance, however, are controversial. Brav and Gompers (1997) show that firms that go public do not perform worse than benchmarks matched on the basis of size and book-to-market ratios. In addition, they show that value weighting IPO returns dramatically reduces the measured underperformance. Finally, they argue that weighting returns in event time by the number of IPOs may overstate underperformance. Schultz (2003) argues that if more firms go public after stock prices have risen, event-time analyses may indicate that IPOs underperform, even if the ex ante expected return of these offerings is zero.

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The debate about the underperformance of IPOs, however, may not easily be answered without out-of-sample tests. Most studies on the underperformance of IPOs have examined the same post-Nasdaq time period. Data from non-U.S. markets is not conclusive because of the shorter time periods employed and the cross-sectional correlation between returns of IPOs in the United States and the return of IPOs in these other markets. Common economic shocks or common movements in fads and sentiment potentially drive these correlations.

In this paper, we undertake a large, out-of-sample investigation of IPO underperformance. In particular, we gather information on the universe of firm-commitment IPOs in the United States from 1935 to 1972 and measure their returns for up to five years after listing. To compile this information, we hand-collected over 150,000 observations from such publications as the *Bank and Quotation Record*, the *S&P Dividend Guide*, and the various *Moody's* manuals. This is the first large-scale examination of IPO returns prior to the creation of the Nasdaq exchange, and more than doubles the period over which the performance of U.S. IPOs can be observed. As such, it represents a potentially powerful sample to examine the performance of equity issuers.

The results demonstrate that the performance of IPOs from 1935 to 1972 depends upon the method of return measurement used. While the nominal returns on IPOs are low, and our sample shows underperformance when performance is measured using value-weighted event-time buy-and-hold abnormal returns, this underperformance disappears when either equal-weighted buy-and-hold abnormal returns or cumulative abnormal returns are utilized. The calendar-time analysis shows that over the entire sample period—that is, from 1935 to 1976—IPOs return as much as the market. Finally, in simple capital asset pricing model (CAPM) and Fama–French three-factor regressions, the intercepts are insignificantly different from zero or even significantly positive. The difference between the event-time and calendar-time results stems from the clustering of IPOs in periods immediately preceding poor IPO performance.

The results raise questions concerning the interpretation of the underperformance of IPOs seen in the Nasdaq era. The long-run performance of pre-Nasdaq IPOs depends considerably on the method for calculating returns and performance. In addition, as Ritter and Welch (2002) argue, many of the phenomena found in the IPO literature depend upon the time period examined. While the results do not rule out the possibility of more broad-based sentiment-driven mispricing, they provide little support for a distinct IPO effect.

The rest of the paper is organized as follows. Section I reviews the relevant earlier literature. The data are described in Section II. The empirical analysis is discussed in Section III. Section IV concludes the paper.

I. Literature Review

A. IPOs and Long-Run Underperformance

Behavioral economists have demonstrated that individuals often violate Bayes' rule and rational choice theories when making decisions under uncertainty in

experimental settings (Kahneman and Tversky (1982)). In a similar vein, financial economists have also discovered long-run pricing anomalies that have been attributed to investor sentiment. Behavioral theories posit that investors give too much weight to recent results and trends. Eventually, overoptimistic investors are disappointed and subsequent returns decline.

To cite several important illustrations, DeBondt and Thaler (1985, 1987) demonstrate that buying past losers and selling past winners is a profitable trading strategy. Risk, as measured by beta or the standard deviation of stock returns, does not seem to explain the results. Lakonishok, Shleifer, and Vishny (1994) show that many "value" strategies also seem to exhibit abnormally high returns. These authors form portfolios based on earnings-to-price ratios, sales growth, earnings growth, or cash-flow-to-price and find that "value" stocks outperform "glamour" stocks without appreciably affecting risk. These papers imply that investors are too optimistic about stocks that have had good performance in the recent past and are too pessimistic about stocks that have performed poorly.

In addition to examining trading strategies based on accounting or stock market performance, researchers have examined financing events as sources of potential trading strategies. Theoretical work by Ross (1977) and Myers and Majluf (1984) suggests that the choice of financing strategy can send a signal to the market about firm valuation. Initial studies (e.g., Asquith and Mullins (1986) and Mikkelson and Partch (1986)) focused on the market reaction around the time that equity or debt issues were announced. These works implicitly assumed that all information implied by the financing choice was fully and immediately incorporated into the company's stock price. The literature on long-run abnormal performance, on the other hand, examines the possibility that the market underreacts to the informational content of the financing event.

In particular, Ritter (1991) and Loughran and Ritter (1995) show that nominal five-year buy-and-hold returns are 50 percent lower for recent IPOs (which earned 16%) than they are for comparable size-matched firms (which earned 66%). Teoh, Welch, and Wong (1998) show that IPO underperformance is positively related to the size of discretionary accruals in the fiscal year of the IPO. Larger accruals in the IPO year are associated with more negative performance. Teoh et al. believe that the level of discretionary accruals is a proxy for earnings management and that the boosted earnings systematically fool investors. On the other hand, as noted above, Brav and Gompers (1997) show that IPOs appear to perform like other long-standing public companies.

B. Performance Measurement

Another area of relevant research considers the choice of metric to measure firms' performance. Several recent papers inform our choice of tests of long-horizon abnormal performance. Barber and Lyon (1997), Kothari and Warner (1997), and Lyon, Barber, and Tsai (1999) provide thorough evidence about various methods of measuring abnormal performance. These papers do not find that one method is always preferred.

Fama (1998) and Mitchell and Stafford (2000) provide an additional assessment regarding the merits of such methodologies. They argue that abnormal performance measures such as cumulative abnormal returns (CARs) and time-series regressions are less likely to yield spurious rejections of market efficiency than methodologies that calculate buy-and-hold returns (BHARs) by compounding single-period returns at a monthly frequency. First, the buy-and-hold method can magnify underperformance—even if it occurs in only a single period—as a consequence of compounding single-period returns. Second, distributional properties and test statistics for cumulative abnormal returns are better understood.

These problems can be illustrated by considering a firm that had a return of -50 percent in the first year and $+10$ percent in the second and third years, while the market benchmark was flat during the first year and also returned $+10$ percent during the second and third years. A buy-and-hold calculation will suggest that the company underperforms the index by over 60 percent (a return of -39.5 percent for the company versus that of 21 percent for the market), while the CARs will differ only by 50 percent. The choice of CARs or BHARs largely depends upon the implicit trading strategy that is being assumed. We will report returns using both methodologies throughout the paper.[1]

II. Data

One of the main barriers to research in this area is the identification and characterization of IPOs prior to 1973. This section describes the procedures that we followed.

A. *Identifying the Sample*

While researchers examining IPOs undertaken in 1973 and thereafter can identify offerings through electronic databases and filings with the U.S. Securities and Exchange Commission (SEC), research into earlier periods is more challenging. The Securities Data Company's Corporate New Issues database only extends back to 1970, and the detail of the information collected is scanty in earlier years. SEC filings prior to 1973 were not distributed by Disclosure Incorporated and are stored in at least two poorly documented government archives.

Thus, we rely on a variety of secondary sources to identify the IPOs. We will review these in chronological order. For the period between July 1934 (the effective date of the Securities Act of 1933) and December 1949, we rely on the compilation *Issuer Summaries* (Dean, Piel, and Steyer (1951)). This two-volume set was prepared by the defense counsel for the 17 investment banks in the antitrust case *United States v. Henry Morgan et al.*[2] As part of this litigation, in which the govern-

[1] Among the concerns with the use of CARs is the methodology's tendency to misrepresent performance when returns are highly volatile. Consider a case where a firm had returns of -50 percent in the first period and $+100$ percent in the second period while the benchmark was flat in both periods. A buy-and-hold calculation would suggest that the excess return was zero, while the CARs would be computed to be $+50$ percent.

[2] 118 F. Supp. 621 (S.D.N.Y. 1953).

ment alleged that the banks had conspired to monopolize underwriting activities, the banks compiled a listing of all U.S. security issues during this period. We only include underwritten IPOs of common stock that were executed with the services of an investment banker and were fully registered with the SEC, and where there was at least some primary component to the offering.[3]

For the period between 1950 and 1959, we employed the compilation *Corporate Financing* (Dealers' Digest Publishing Company (1961)), which was prepared by the publisher of the magazine *Investment Dealers' Digest*. The information from this volume was compiled from the semiannual summaries of activity printed in that magazine. The editors explicitly modeled their compilation after the earlier *Issuer Summaries*. One exception was in its coverage. The volume eliminated offerings that were (a) not underwritten, (b) unregistered, (c) filed but not fully registered with the SEC (during this period, the issuers of offerings under $300,000 could instead simply file a letter of notification with the SEC), and (d) certain classes of secondary offerings that were not freely tradable after the offering. Since we had eliminated similar offerings from the offerings reported in *Issuer Summaries*, these deletions produce minimal biases. We again only included the IPOs of common stock in our sample.

Offerings in the period from 1960 through 1969 were identified from the volume, *A Decade of Corporate and International Finance: 1960–1969* (Hillstrom and King (1970)). This volume was also compiled from the records of *Investment Dealers' Digest* in conjunction with the Investment Bankers Association of America (the predecessor to the Securities Industry Association). The volume did not include nonregistered offerings, those under $300,000 (entitled to abbreviated registration under Regulation A), or nonunderwritten offerings. We again only included the IPOs of common stock in our sample.[4]

The final period for which data was compiled was the years 1970 through 1972. In these years, the records of *Investment Dealers' Digest* were computerized. These are now available through Securities Data Company (SDC), which acquired the magazine's database business in 1992. The criteria for the inclusion of offerings in the SDC compilation appear identical to those employed by *Investment Dealers' Digest*, reflecting the common origin of this data source. We again only included the IPOs of common stock in our sample. Unfortunately, the records available through SDC are not complete. Thus, we hand-collected the missing information from the "New Market Names" section of the *Investment Dealers' Digest*, which summarized IPOs on a monthly or bimonthly basis during this period.

[3] The purely secondary IPOs during this period were almost entirely of the type known as "special offerings," where trading was limited to the members of the exchange on which it was listed. These were not strictly comparable to the other offerings, and hence were deleted from the sample.

[4] At one point, there was an electronic data set of IPOs during the 1960s as well (Ibbotson (1975), Ibbotson and Jaffe (1975)). This file has now apparently been lost. The count of offerings in this data set by month, however, is reported at http://bear.cba.ufl.edu/ritter/ipodata.htm. Our sample mirrors the patterns of offerings in that data set, but consists only of 81 percent as many IPOs.

Table I

Sample of Initial Public Offerings

The sample is 3,661 identified IPOs from 1935 through 1972. Panel A presents the year of the IPOs in our samples. Panel B presents the average, median, 25th percentile, and 75th percentile rankings of market capitalization at the close of the month of the IPO (in constant 1999 dollars adjusting for the Consumer Price Index) and the ratio of book equity value to market equity value.

Panel A: Dates of IPOs

Year	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944
Number of IPOs	1	12	22	3	4	8	8	3	1	7
Year	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954
Number of IPOs	19	51	24	15	5	33	31	29	23	27
Year	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Number of IPOs	49	45	41	47	122	216	321	236	31	66
Year	1965	1966	1967	1968	1969	1970	1971	1972		
Number of IPOs	66	62	92	378	683	228	204	448		
Total	3,661									

Panel B: Summary Statistics

	Mean	25th Percentile	Median	75th Percentile
Market value	$89,089,000	$15,454,000	$31,706,000	$66,756,000
Book-to-market	0.443	0.143	0.305	0.552

Three methodological issues deserve notice. One complication was introduced by the fact that the volumes for the period 1934 through 1959 did not clearly distinguish between IPOs and seasoned equity offerings. To determine this, we checked the issues of *Moody's* and the *Bank and Quotation Record* to determine if the firm had been publicly traded before the offering. If either source indicated such trading, we eliminated it as a possible IPO.

Firms that are recorded as having gone public, but never appeared in the compilation of stock data discussed below, introduced a second complication. In many cases, it appears that the compilations (particularly during the 1930s and 1940s) included proposed offerings that were subsequently withdrawn for lack of investor interest. If the firm did not appear in the *Bank and Quotation Record* within 12 months of the reported IPO date, we deleted it from the sample.[5]

Finally, assessing the completeness of the sample is exceedingly difficult. In particular, while the SEC produced at least three compilations of IPO activity during this period (U.S. Securities and Exchange Commission (1941), U.S.

[5] The two sets of deletions led to a substantial reduction in the sample. In total, we were able to identify 19 percent of the prospective offerings from the 1930s and 1940s as IPOs, 21 percent of the offerings from the 1950s, 75 percent of the offerings in the 1960s, and 100 percent of the prospective offerings in the 1970s. The reason for eliminating almost 90 percent of the deleted offerings was that they were actually seasoned equity offerings.

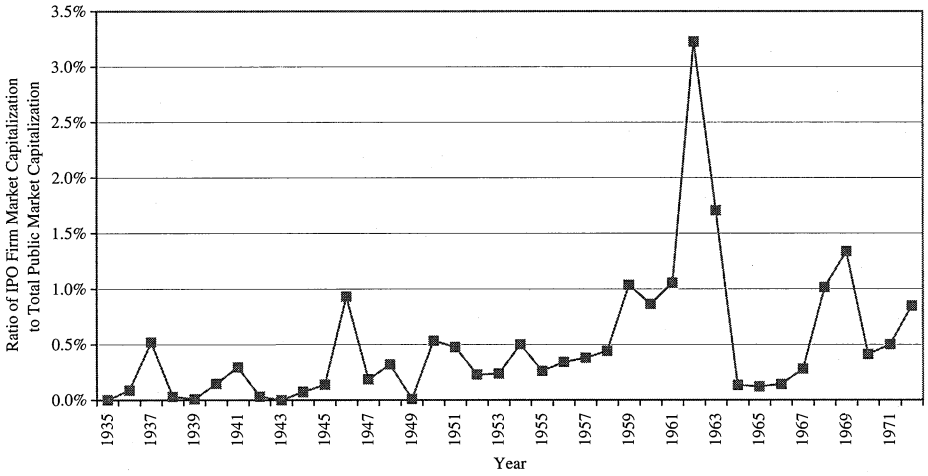

Figure 1. Ratio of IPO equity market capitalization to market valuation. The figure depicts the ratio of the equity market capitalization of initial public offerings in each year (with the valuation determined by multiplying the shares outstanding after the offering and the first price observation in the *Bank and Quotation Record* after the IPO) and the market valuation of the equity of all firms in the CRSP database at the end of the year.

Congress (1963), U.S. Small Business Administration (1980)), their compilations are quite different in nature. In particular, most of the tabulations are of all unseasoned firms to file with the SEC, whether the offering was underwritten or not. The tabulations also include many private placements and Regulation A offerings that were not fully registered with the SEC. Thus, it is very difficult to assess how comprehensive the sample is.

Table I summarizes the final sample of IPOs. There are a total of 3,661 offerings in the sample. The distribution over time is highly uneven. There is little IPO activity during the Great Depression and World War II. The number of offerings surged in the late 1950s and early 1960s and again in the late 1960s and early 1970s. The average IPO firm had a market value (at the first available trading price) of $89.1 million in constant 1999 dollars (using the Consumer Price Index as a deflator), while the median firm had a market capitalization of $31.7 million. Much like the recent samples of IPOs, the IPOs from 1935 to 1972 also had relatively low book-to-market ratios. The mean (median) book-to-market ratio in our sample is 0.443 (0.305), indicating that the firms are primarily growth companies. Figure 1 shows the ratio between the market capitalization of IPO firms in each year and the total CRSP market capitalization at the end of that year. Using this measure, peaks in offering activities occur immediately after World War II, and in the late 1950s, the early 1960s, and the late 1960s.

In Table II, we present the industry breakdown at the two-digit SIC code level of the IPO sample by time period: 1935 to 1949, 1950 to 1959, 1960 to 1969, and 1970 to 1972. For SIC codes for issues after 1954, we use the company's SIC code

Table II

Industry Breakdown for IPO Sample

The sample is 3,661 identified IPOs from 1935 through 1972. Industries are defined at the two-digit Standard Industrial Classification code level.

1935–1949		1950–1959		1960–1969		1970–1972	
Food and Beverage	14.1%	Electronics	13.4%	Electronics	10.5%	Business Services	8.4%
Industrial Machinery	8.0%	Oil and Gas	8.1%	Business Services	10.3%	Industrial Machinery	8.1%
Electronics	7.4%	Chemicals	7.4%	Industrial Machinery	7.0%	Electronics	6.6%
Air Transportation	7.4%	Depository Institutions	5.1%	Investment Companies	4.9%	Durable Wholesale	4.4%
Transportation Equipment	7.4%	Electric, Gas, and Sanitary Svs.	4.5%	Chemicals	3.4%	Measuring and Control Equip.	4.2%
Electric, Gas, and Sanitary Svs.	6.7%	Primary Metals	4.0%	Transportation Equipment	3.2%	Food and Beverage	3.4%
Primary Metals	4.9%	Food and Beverage	3.6%	Durable Wholesale	2.9%	Investment Companies	3.2%
Oil and Gas	4.3%	Industrial Machinery	3.4%	Real Estate	2.8%	Misc. Retail	3.0%
Fabricated Metals	4.3%	Transportation Equipment	3.4%	Food and Beverage	2.7%	Real Estate	2.6%
Chemicals	4.3%	Metal Mining	2.9%	Fabricated Metal	2.7%	Chemicals	2.6%
				Measuring and Control Equip.	2.7%		

listed in the *Moody's* manuals. To classify IPOs from 1935 to 1954, we looked up the description of the company's business as reported in the *Standard Corporation Records* that were published by Standard and Poors. From the description of the business, we assigned the firms to a two-digit SIC code.

Table II shows the evolution of IPO industry composition over time. During the 1930s and 1940s, food and beverage companies were the largest single class of firms going public. The vast majority of these IPOs were breweries and distilleries that went public after the end of prohibition. For all other time periods, food and beverage does not make the top five industries. During the 1950s and 1960s, electronics emerged as the dominant industry for IPOs. Many of these were technology companies that played a major role in the growth of the computer and telecommunications industry. We also see the growth of business services in the 1960s and 1970s. Most of these business service firms were software companies developing applications for the growing number of corporate computer users.

A natural question is the extent to which the IPOs identified in this manner overlap with the new listings included on the CRSP tapes. An implicit assumption in some discussions of the economics literature is that these two populations are one and the same. For instance, Jovanovic and Rousseau (2001) note that the age of the new companies listed on the CRSP tapes dropped dramatically in the 1970s, and use this fact to justify a model in which standards for IPOs have shifted over time.[6]

A review of *Institutional Dealers' Digest* (and its predecessor publications) and SEC publications, as well as conversations with practitioners, suggests a more complex picture. In particular, these accounts suggest that private firms between the 1930s and the 1970s typically did not go public by listing on the major exchanges. Rather, they would initially list on one of the regional exchanges or the over-the-counter market (also known as the New York Curb Exchange). Only after trading successfully on one of these exchanges would firms "graduate" to one of the major exchanges.[7] Because of the barriers to listing directly on a major exchange, private firms would sometimes merge with an unhealthy company that was already traded on the NYSE or AMEX, even though such transactions often dramatically diluted the equity stakes held by the private firm's shareholders. As noted above, securities traded over the counter and on regional exchanges were not included in CRSP until 1972. Thus, these accounts suggest that the populations of IPOs and CRSP new listings may be quite distinct.

To assess the overlap more systematically, we examine two aspects of the data: (a) how many of the CRSP new listings are IPO firms and (b) how many of our firms show up on CRSP. In Panel A of Table III, we examine the causes of new listings on CRSP between January 1, 1933, and December 31, 1972. Given the number of new listings, and the time required to research the circumstances

[6] By way of contrast, Fama and French (2001), who systematically examine the universe of CRSP new listings, acknowledge that their sample may not represent IPO firms.

[7] A notable exception occurred during the height of the technology frenzy of the late 1960s, when a number of computer firms listed directly on the American Stock Exchange.

Table III

CRSP New Lists Trading History

The sample is 9,086 new listings of firms on CRSP between January 1933 and December 1972. Panel A reports the event that was the trigger for the listing of the firm, based on an analysis of a four percent sample of the new listings. The same tabulation is presented excluding new listings in December 1972 and in all of 1972. Panel B presents the time that the CRSP new listings had been publicly traded prior to the date of the new listing, based on an analysis of a four percent sample of the new listings. Tabulations are presented for all new listings on CRSP between January 1933 and December 1972, excluding all new listings in December 1972, and excluding all new listings in 1972.

Panel A: Apparent Cause of CRSP New Listings, 1933–1972

	Time Period of CRSP New Listings Analyzed		
	1/1/33–12/31/72	1/1/33–11/30/72	1/1/33–12/31/71
Acquisition or merger*	15.1%	21.1%	20.5%
Addition or shift of exchange	14.4%	22.1%	21.6%
Change of state of incorporation or reorganization	2.0%	3.0%	3.2%
Inclusion of AMEX listings, July 1962	13.4%	20.6%	22.2%
Inclusion of AMEX listings, Dec. 1972	4.9%	0.0%	0.0%
Inclusion of Nasdaq listings, Dec. 1972	27.9%	0.0%	0.0%
Initial public offering**	4.3%	6.5%	5.9%
Other events***	1.3%	2.0%	2.2%
Unclear****	16.7%	24.6%	24.3%
Number of Observations*****	9,086	5,030	4,836

*A frequent way in which private firms would access the public markets in this year was to merge with an ailing firm. In many cases, CRSP includes the combined entity as a new listing.

**Includes rights offerings and best efforts offerings.

***Includes divestitures and large-block trades, among other events.

****These largely appear to be AMEX and Nasdaq firms that were included around but not in the three months where most of these firms were added to CRSP.

*****This row reports the entire sample size. The other tabulations are based on an analysis of a four percent random sample.

Panel B: Extent of Prior Public Trading History of CRSP New Listings, 1933–1972

Date of First Listing	Date of Last Listing	Public for <1 Year Before New List Date	Between 1 and 2 Years?	Between 2 and 3 Years?	Between 3 and 4 Years?	Between 4 and 5 Years?	Between 5 and 10 Years?	Between 10 and 20 Years?	More than 20 Years?	Observations*
1/1/33	12/31/72	4.9%	1.7%	3.8%	0.9%	3.5%	9.5%	22.0%	53.8%	9,086
1/1/33	11/30/72	8.2%	2.1%	4.1%	1.5%	3.1%	10.3%	25.1%	45.6%	5,030
1/1/33	12/31/71	7.7%	2.2%	4.4%	1.1%	2.2%	9.3%	25.1%	48.1%	4,836

*This column reports the entire sample size. The other tabulations are based on an analysis of a four percent sample of these new listings.

surrounding the listings (which was done using *Moody's* manuals published before and after the listing, as well as the *Wall Street Journal Index*), we selected a four percent sample of these offerings to analyze.

Because of the large number of listings in 1972 and especially in December 1972 (when the bulk of Nasdaq firms were added to CRSP), we examine the composition of new listings over three different time-frames. These periods are all new listings between January 1933 and December 1972, all listings in that period except for those in December 1972 (which account for some 44 percent of all new listings during the entire period), and all listings except for those in 1972 (which account for 47 percent of new listings).[8] We find that for the entire sample period, the top reasons for inclusion on CRSP include acquisition or merger by a private firm into an already public company, a shift in exchange on which the firm is listed (typically from a regional exchange to the NYSE or the AMEX), or the several occasions when AMEX or Nasdaq firms got added en masse. Even when we eliminate the mass listings in 1972, only about six percent of the new listings appear to be IPOs.

We can also examine the characteristics of CRSP new listings by tabulating the length of time that they had been publicly traded at the time that they were included on CRSP. In Panel B of Table III, we once again use three different sample periods. Across all sample periods, more than 70 percent of the firms had already been public for more than 10 years. Only between 5 and 8 percent of CRSP new listings had been public for less than 1 year: The firms listed on CRSP during these years are not primarily IPOs. Moreover, many of the young firms listed had not undertaken traditional underwritten offerings, but rather rights offerings or mergers with shell companies.

Another way to compare our sample to the CRSP new listings is to tabulate how many of our firms end up being listed on CRSP and how long it takes them to achieve that status. At first blush, it appears from Table IV that the coverage in CRSP is fairly good: Nearly 20 percent are listed in CRSP at some point. But as the second and third lines report, this pattern is almost entirely driven by the mass inclusion of Nasdaq stocks in 1972. When listings through the end of 1971 are considered, only 4 percent of our IPOs were listed in CRSP at any point. The median offering included in CRSP was only picked up several years after its IPO.[9]

Thus, while CRSP new listings are doubtless an interesting population in their own right and well worthy of study, such listings are quite distinct from IPOs

[8] While the bulk of Nasdaq stocks were listed in CRSP in December 1972, some were listed earlier in the year. We thus calculate the percentage listed in the entire period, through November 1972, and through December 1971. We employ a similar scheme later in the paper.

[9] CRSP's failure to capture these IPOs reflects the fact that the overwhelming share of the offerings was initially traded on regional exchanges or the over-the-counter market. Less than one percent of the IPOs was traded immediately on the New York Stock Exchange. The calculations in this table only include those firms that could have been listed in a given period. For instance, in the rows examining offerings through 1972, we would not include an IPO from 1970 in a calculation of the probability that firms were listed 20 years or more after the offering.

Table IV

Listings of Sample of New Listings on CRSP

The sample is 3,661 identified IPOs from 1935 through 1972. The tabulation reports the percentage of the IPOs in the sample that are listed on CRSP at various periods after the date of IPO. The percentages are only calculated based on those firms that could have been listed in a given period.

Sample	Listed in CRSP as of	Listed?	< 1 Year of IPO?	Between 1 and 2 Years?	Between 2 and 3 Years?	Between 3 and 4 Years?	Between 4 and 5 Years?	Between 5 and 10 Years?	Between 10 and 20 Years?	> 20 Years after IPO?	Observations
All sample IPOs	12/31/00	19.9%	11.0%	4.0%	0.8%	0.4%	0.5%	1.3%	1.4%	0.4%	3,661
All IPOs prior to 12/1/72	12/1/72	4.5%	1.9%	0.6%	0.6%	0.3%	0.2%	0.6%	0.4%	0.1%	3,621
All IPOs prior to 1/1/72	1/1/72	3.8%	1.2%	0.4%	0.6%	0.3%	0.3%	0.6%	0.4%	0.1%	3,213

during the years prior to 1973. The new listings were significantly more seasoned, and the inclusion of these offerings in CRSP appears to be triggered by considerations other than the inception of trading.

B. Identifying the Stock Returns

For each IPO, we sought to compute the five-year calendar and anniversary return. To do so, we needed to obtain 11 stock prices. These included the stock price immediately after the offering, on the five anniversaries of the offering, and at the end of the five Decembers after the offering.

The primary source of this information was the *Bank and Quotation Record*, a specialized publication of the *Commercial and Financial Chronicle*.[10] This monthly periodical reports the prices of a wide array of securities at the close of the previous month. The *Bank and Quotation Record* also indicates stock splits, name changes, and delistings, but its coverage of these changes does not appear to be comprehensive.

The use of the *Bank and Quotation Record* poses a variety of issues. First, not all securities appear in the listing immediately after their reported IPO date. We treat the first observation as the price immediately after the IPO, as long as it appears within 12 months of the reported IPO date. (If it does not appear within 12 months, we do not include the IPO in the sample, as discussed above.) In some cases, a stock price does not appear in a given anniversary month or December, but does so in the month immediately before and after the anniversary of the offering or December. In this case, we use the average of the two prices. Occasionally, a company disappears for an extended period (e.g., one year) and then reappears. In the case of absences of longer than three months, we check with the *Wall Street Journal Index* and *Moody's* guides to ensure that this is not a new firm using the same name as an acquired or delisted firm.

Due to the poor coverage of stock splits and delistings by the *Bank and Quotation Record*, as well as its failure to record dividends, we supplemented its information with the *Standard & Poors' Dividend Record*. We record from this volume all cash or stock dividends paid by the firm through its fifth anniversary. This compilation also has a much more comprehensive coverage of name changes, acquisitions, stock splits, and so forth.

Finally, for some of the firms that went public in our sample in 1968 and thereafter, we are able to obtain some returns data for the final observations from the CRSP tapes, primarily after December 1972 when Nasdaq firms were included on CRSP.

[10] This was the same source used by Jarrell (1981) and Simon (1989), who examined the returns of IPOs and seasoned offerings between 1926 and 1940. In each case, the sample consisted of fewer than 100 IPOs. This source was also used for at least three studies of returns during the 1960s. Ibbotson (1975) examined returns from 120 IPOs between 1960 and 1969. Logue (1973) examined the returns of 250 IPOs issued between 1965 and 1969. McDonald and Fisher (1972) examined 142 IPOs issued in 1969. This may have also been the source of the data used by Stigler (1964), who examines the return of several hundred IPOs relative to the overall market (but does not compute traditional risk-adjusted returns).

C. Supplemental Information

A variety of additional data was collected about the firms from two data sources. The first of these were the various *Moody's* manuals, including the industrial, over-the-counter, and utility editions. We determined from this source the book value of the common stock as well as the number of shares outstanding, using the edition published immediately after the IPO. Because of the difficulty of obtaining information on the market value of preferred stock in the early years, we computed the market and book value of the common stock only. In computing book equity, we included all forms of retained earnings, surplus, paid-in capital associated with common stock, and minority interests. We did not include reserves, contributions in aid, and other "liability-like" balance sheet entries. The market value was computed as the product of the number of shares of common stock outstanding after the IPO (or at the first period after the offering where this information could be ascertained from *Moody's*) and the first price observation of the common stock in the *Bank and Quotation Record* after the IPO.[11]

We also checked firms that disappeared from the *Bank and Quotation Record* using the *Wall Street Journal Index* and *Moody's* guides. In particular, we sought to discern whether the firm was acquired (and if so, the acquisition price), liquidated, or delisted (and the final price in that case). We employ slightly different approaches to address the problem of delisted firms in the event-time (that is, when we measure performance relative to the date of the IPO) and the calendar-time analyses. For the event-time analysis, our approach was as follows:

- When we can confirm an exit price (e.g., when a firm is acquired), we use this to compute the delisting return for the firm. We then handle the subsequent returns until the third or fifth anniversary in one of two ways. First, following the delisting month, we set the return on the firm and the return on the benchmark equal to zero. In an alternative specification, we splice in the return of the IPO firm's matched size and book-to-market portfolio from the delisting month to the third or fifth anniversary.
- If we confirm that a firm goes bankrupt or if it disappears with a very low stock price (less than one dollar), we assume a -100 percent delisting return for the last year even if the delisting occurs midyear. We compute the benchmark through the third or fifth anniversary in one of two ways. First, following the delisting month, we set the benchmark equal to zero. In an alternative specification, we use as the benchmark the return of the IPO

[11] Some IPOs in the sample had no listing in *Moody's* or the *S&P Dividend Record*. If there is no listing in *Moody's*, we assume that the firm was in the lowest quintile of book-to-market firms. (The median firm fell into that quintile.) If there was no listing in the *S&P Dividend Record* (which only includes dividend-paying firms), we assume the firm paid no dividends. (The median firm in the sample never paid dividends in the five years after the offering.) If we assume that firms that have no record of dividend payments instead paid the median dividend (conditional on a dividend being paid), we would very slightly reduce the underperformance. The companies in our sample that pay dividends have very low dividend-to-price ratios.

Table V
Sample of Firms and Frequency of Disappearance

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Number of firms	3,661	3,102	2,832	2,516	2,195	1,905
Number of firms disappearing		560	270	316	321	290
Fraction remaining		84.7%	77.3%	68.7%	59.9%	52.0%
Number assigned –100% return*		124	134	93	67	33
Number of delists with verified return**		336	136	223	254	257
Fraction of delists that are assigned –100% return		22.1%	49.6%	29.4%	20.9%	11.4%

*This row includes those offerings that disappeared prior to the fifth anniversary and whose share price was less than one dollar per share at the time of the last observation.
**This row includes those offerings that were liquidated, acquired, or disappeared prior to the fifth anniversary and whose share price was one dollar per share or higher at the time of the last observation.

firm's matched size and book-to-market portfolio from the delisting month to the third or fifth anniversary.

- When a firm was priced at one dollar or above in its last observation and disappears, and we cannot confirm that it was acquired (or determine the acquisition price), we compute the return until the last price in the *Bank and Quotation Record*. We then undertake one of two processes to compute subsequent returns. First, we set the return on the IPO firm and the benchmark equal to zero for subsequent months. In an alternative specification, we splice in the return of the IPO firm's matched size and book-to-market portfolio from the delisting month to the third or fifth anniversary.

In the calendar-time analysis, we use a similar approach. We use the delisting return until the delisting month and then splice in the IPO firm's size and book-to-market benchmark return to get the annual return for the IPO in its delisting year. (As above, if we confirm that a firm goes bankrupt or if it disappears with a stock price of less than one dollar, we assume a -100 percent delisting return for that year even if the delisting occurs midyear.) The delisted firm is then not included in subsequent calendar-time portfolios after the delisting year.

Table V and Figure 2 summarize the disappeared firms. The table indicates the number of firm observations at each anniversary. As it makes clear, there is considerable attrition. It also indicates the fraction in each year that we assume are liquidated using the algorithm above. The figure highlights the fact that disappearances are more common towards the end of the period. We attribute this to the "frothiness" of the IPO market in the late 1960s. Many of the firms that went public during this period appear to have disappeared in the years that followed.

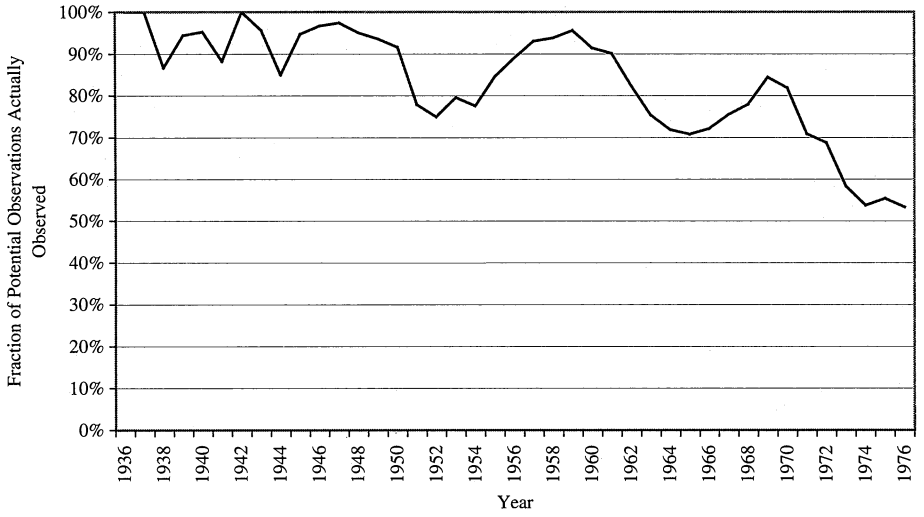

Figure 2. Fraction of potential observations actually observed. The sample is 3,661 identified IPOs from 1935 through 1972. The figure reports the fraction of firms that had gone public in the previous five years of the sample for which a stock price could be identified in the *Bank and Quotation Record* in December of the reported year. The denominator is the sum of the total number of IPOs from the previous four years (i.e., these are the potential number of observations in the year). The numerator is the number of IPOs from the last four years that have traded in and have a return in a given year.

Previous research on post-Nasdaq IPOs demonstrates a strong pattern of performance when firms are sorted on the basis of size and book-to-market. We explore whether pre-Nasdaq IPOs exhibit a similar pattern. We classify the IPOs into quintiles based on their market capitalization and book-to-market ratio. We utilize the quintile breakpoints created by Davis, Fama, and French (2000).[12] To get size breakpoints, firms are grouped on the basis of market capitalization at the beginning of a particular trading month. Davis et al. create breakpoints using only stocks trading on the NYSE. Hence, they allocate an equal number of NYSE stocks to one of five size quintiles. The size quintile breakpoints for each month are recorded. Similarly, each June, they calculate the ratio of book equity to market equity for each firm on the NYSE. An equal number of firms are allocated to one of five book-to-market quintiles. The annual book-to-market breakpoints are then intersected with the size breakpoints to create 25 size and book-to-market portfolios. Once we have the breakpoints, we allocate all of our IPOs to one of the size and book-to-market portfolios, even though the majority of them do not trade on the NYSE.

Panel A of Table VI summarizes the distribution of firms. Not surprisingly, more than one-half of the IPO sample falls into the (1,1) portfolio, which is the collection of the smallest firms with the lowest book-to-market ratio. Overall,

[12] These data are available at: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

Table VI

Size and Book-to-Market Portfolio Breakdown for IPO Sample

The sample is 3,661 identified IPOs from 1935 through 1972. Size breakpoints are formed monthly by dividing all NYSE stocks into five size groups with an equal number of firms in each group. Book-to-market breakpoints are formed annually with equal numbers of NYSE firms allocated to each of five book-to-market portfolios. The intersection of these quintile breakpoints results in 25 possible allocations. Panel A presents the fraction of our IPO sample that is allocated to each size and book-to-market portfolio. Panel B gives the average market value of the IPOs (in constant 1999 dollars) in each portfolio. Panel C presents the average book-to-market ratio for our IPOs by portfolio.

Panel A: Distribution of IPOs

	Book-to-Market Quintile					
Size Quintile	Lowest	2	3	4	Highest	Total
Smallest	53.0%	16.1%	8.8%	4.6%	6.6%	89.1%
2	4.5%	1.1%	0.6%	0.4%	0.1%	6.6%
3	1.8%	0.4%	0.4%	0.1%	0.0%	2.8%
4	0.7%	0.1%	0.1%	0.0%	0.0%	1.0%
Biggest	0.5%	0.0%	0.0%	0.0%	0.1%	0.6%
Total	60.5%	17.7%	10.0%	5.1%	6.8%	100.0%

Panel B: Size by Portfolio

	Book-to-Market Quintile				
Size Quintile	Lowest	2	3	4	Highest
Smallest	$45,600,000	$33,700,000	$35,400,000	$28,600,000	$17,400,000
2	$198,900,000	$137,600,000	$134,700,000	$140,400,000	$200,600,000
3	$378,500,000	$250,300,000	$242,300,000	$175,300,000	—
4	$812,400,000	$307,700,000	$288,000,000	—	—
Biggest	$5,398,200,000	$795,200,000	—	—	$490,800,000

Panel C: Book-to-Market Ratio by Portfolio

	Book-to-Market Quintile				
Size Quintile	Lowest	2	3	4	Highest
Smallest	0.180	0.474	0.687	0.978	2.174
2	0.205	0.648	0.807	1.114	1.125
3	0.213	0.513	0.799	0.792	—
4	0.151	0.793	0.846	—	—
Biggest	0.136	0.783	—	—	0.732

almost 90 percent of our IPOs are in the smallest size quintile of stocks when breakpoints are based on NYSE stocks. Less than 2 percent of our firms are in the largest two size quintiles. Similarly, 61 percent of our firms are in the lowest book-to-market quintile. In addition, Panels B and C present the average size and book-to-market ratios for the IPOs in each of the 25 size and book-to-market portfolios.

III. Results

A. Event-Time Returns

In this section we present analyses of the returns of IPOs in event time. Figure 3 provides an initial look at the results. We compute the abnormal return on the IPO in each year by subtracting from the return (including any dividends) one of two benchmarks: the CRSP value-weighted index and the return on the portfolio of firms with the same size and book-to-market ratio as the IPO.[13] The data show that abnormal returns are quite high in the first year relative to both benchmarks. Abnormal returns relative to the CRSP value-weighted index are negative in years 2 and 3, but are positive in both years 4 and 5. The abnormal returns relative to matched size and book-to-market portfolios follow a somewhat different pattern. Abnormal returns are high in the first year, negative in years 2, 3, and 5, but positive in year 4.

In Table VII, we compute the three- and five-year buy-and-hold return of the IPOs by compounding the annual return on the issuer firm (once again including any dividends). We follow the procedure for handling delisted firms delineated above. In Panels A and B, if the IPO is acquired or delisted before the third or fifth anniversary, both the IPO returns and benchmark/market returns are set to zero in subsequent years. In Panels C and D, if the IPO firm is acquired or delisted before the third or fifth anniversary, we splice in the return of the IPO firm's matched size and book-to-market benchmark from the delisting month to the third or fifth anniversary.

The results in Panels A and B show that the returns to IPOs severely underperform the market on a buy-and-hold return basis. IPOs return 8.5 percent over three years and only 11.4 percent over five years. The underperformance relative to the CRSP value-weighted index is -16.7 percent after three years and -21 percent after five years. These patterns largely match the results found in the data after 1972.

In the last two columns of Table VII, we compute the value-weighted returns over three- and five-year periods. (Throughout the paper, we use the real market capitalization of the firm as weights, computed using the first market price found in the *Bank and Quotation Record*.) Unlike during the post-1972 period, performance is even worse for the larger IPOs. Returns drop to 6.3 percent after three years and 11 percent after five years. Underperformance relative to the CRSP value-weighted index is -20 percent after three years and -33 percent after five years. (See below for a discussion of the statistical significance of the results.)

Brav and Gompers (1997) show that the underperformance of IPOs after 1972 is eliminated when firms are matched to portfolios based on size and book-to-market. In our sample of IPOs, we find mixed evidence of a similar reduction in underperformance. Underperformance after three years is smaller (-8.4 percent), but underperformance after five years is larger (-33 percent) when IPO

[13] We do not report additional results using equal-weighted market returns because Barber and Lyon (1997) find that using an equal-weighted market index leads to long-horizon tests that are misspecified. The equal-weighted market portfolio return suffers from a rebalancing bias. As such, Barber and Lyon recommend using value-weighted market returns.

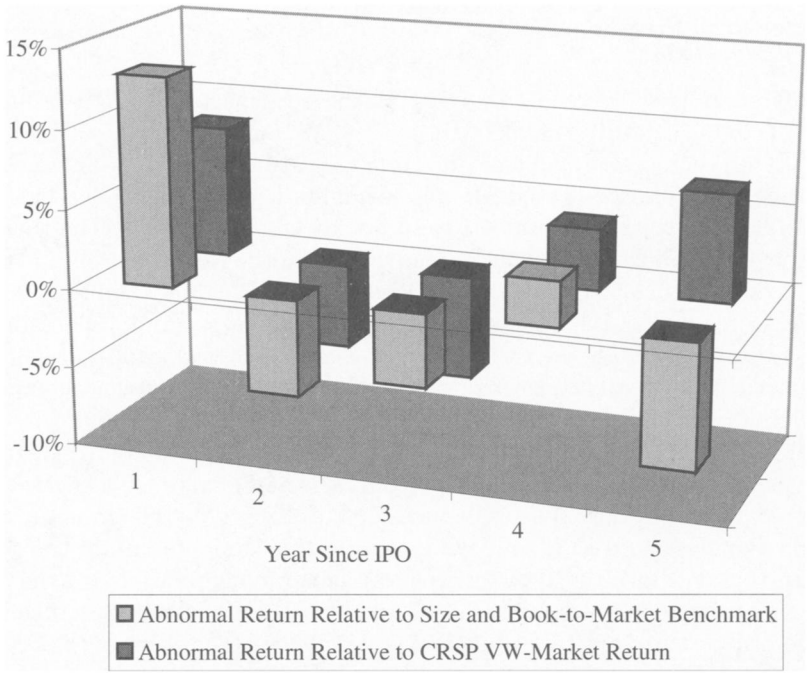

Figure 3. Average annual abnormal return. The sample is 3,661 identified IPOs from 1935 to 1972. The equal-weighted average event-time annual abnormal return is plotted for years 1 through 5 after the IPO. Abnormal returns are calculated by taking the equal-weighted average annual return on the IPOs minus the equal-weighted annual return on the CRSP value-weighted index or the appropriate size and book-to-market matched portfolio over the same time period.

returns are adjusted for size and book-to-market benchmark returns. This indicates that the returns of IPO firms initially mimic the poor performance of small, low book-to-market firms, but perform worse over longer time horizons (see Figure 3). The matched size and book-to-market portfolios in our sample are relatively free from IPO firms because Davis et al. (2000) only allocate NYSE firms to the benchmark portfolios. It was very rare for firms that had recently gone public to list on the NYSE during these years, and our results in Table III showed that few CRSP-listed firms during this time period were actually IPOs.

While the buy-and-hold abnormal returns in Table VII are quite negative, suggesting severe IPO underperformance, conducting standard t-test measurements for statistical significance can produce misleading inferences. Consistent with the findings of Barber and Lyon (1997) and Kothari and Warner (1997), the buy-and-hold equal-weighted series exhibits large positive skewness, yielding misspecified t-statistics. In contrast, the five-year value-weighted buy-and-hold abnormal returns demonstrate negative skewness.

Following Lyon et al. (1999), we employ a bootstrapped skewness-adjusted t-statistic to correct the negatively biased t-statistics. We draw 5,000 resamples of size n (in this case, $n = 100$), with replacement, from each return series and calculate

TableVII

Three- and Five-Year Post-IPO Buy-and-Hold Returns Versus Various Benchmarks

The sample is 3,661 identified IPOs from 1935 through 1972. Three- and five-year buy-and-hold abnormal returns (both equal-weighted and value-weighted) are compared with alternative benchmarks. In the first row of each panel, we employ the CRSP value-weighted index as the benchmark. Value-weighted results are adjusted for inflation. Row 2 of each panel presents abnormal performance measured relative to attribute-based portfolios. Size and book-to-market portfolios are generated by first forming size quintile breakpoints using NYSE firms only. These quintiles are split further into book-to-market quintiles using NYSE breakpoints only. The universe of NYSE stocks is allocated into the resulting 25 portfolios and equal-weighted monthly returns are calculated. The breakpoints for these portfolios are recalculated annually. Buy-and-hold returns are generated by compounding annual returns starting in the first month that a stock price is found in the *Bank and Quotation Record* following the equity issue. Abnormal return is the simple difference between IPO three- or five-year average return and the corresponding benchmark. In Panels A and B, if the IPO delists before the fifth anniversary, we compound the return up until the delisting. In Panels C and D, if the IPO delists before the fifth anniversary, we splice in the return of the matched size and book-to-market benchmark.

Panel A: Raw and Buy-and-Hold Abnormal Return ($N = 3{,}661$)

	Three-Year Equal-Weighted		Three-Year Value-Weighted	
Benchmarks	Raw IPO Return	Abnormal BHAR	Raw IPO Return	Abnormal BHAR
CRSP VW index	8.5%	−16.7%	6.3%	−19.9%
(Skewness-adjusted t-statistic)		(−0.73)		(−3.63)
Size and Book-to-Market (5 × 5)	8.5%	−8.4%	6.3%	−11.5%
(Skewness-adjusted t-statistic)		(−0.52)		(−2.09)

Panel B: Raw and Buy-and-Hold Abnormal Return ($N = 3{,}661$)

	Five-Year Equal-Weighted		Five-Year Value-Weighted	
Benchmarks	Raw IPO Return	Abnormal BHAR	Raw IPO Return	Abnormal BHAR
CRSP VW index	11.4%	−21.0%	11.0%	−34.8%
(Skewness-adjusted t-statistic)		(−0.81)		(−3.87)
Size and Book-to-Market (5 × 5)	11.4%	−33.4%	11.0%	−31.7%
(Skewness-adjusted t-statistic)		(−0.31)		(−3.64)

Panel C: Raw and Buy-and-Hold Abnormal Return (with Spliced Data, $N = 3{,}661$)

	Three-Year Equal-Weighted		Three-Year Value-Weighted	
Benchmarks	Raw IPO Return	Abnormal BHAR	Raw IPO Return	Abnormal BHAR
CRSP VW index	11.2%	−16.1%	8.2%	−18.6%
(Skewness-adjusted t-statistic)		(−0.75)		(−3.05)
Size and Book-to-Market (5 × 5)	11.2%	−6.3%	8.2%	−8.4%
(Skewness-adjusted t-statistic)		(−0.40)		(−1.40)

Table VII—*Continued*

Panel D: Raw and Buy-and-Hold Abnormal Return (with Spliced Data, $N = 3{,}661$)

	Five-Year Equal-Weighted		Five-Year Value-Weighted	
Benchmarks	Raw IPO Return	Abnormal BHAR	Raw IPO Return	Abnormal BHAR
CRSP VW index	25.8%	−11.5%	17.2%	−32.0%
(Skewness-adjusted t-statistic)		(−0.62)		(−3.31)
Size and Book-to-Market (5 × 5)	25.8%	−34.8%	17.2%	−28.9%
(Skewness-adjusted t-statistic)		(−0.44)		(−3.05)

a skewness-adjusted t-statistic for each sample, given by

$$S = \frac{\overline{AR_t}}{\sigma(AR_t)}$$
$$\hat{\gamma} = \frac{\sum_{i=1}^{n} (AR_{it} - \overline{AR_t})^3}{n\sigma(AR_t)^3} \tag{1}$$

where

$$t = \sqrt{n}\left(S + \frac{1}{3}\hat{\gamma}S^2 + \frac{1}{6n}\hat{\gamma}\right) \tag{2}$$

Critical values for skewness-adjusted t-statistics are then calculated based on the resamples; these values represent the cutoffs at which a null hypothesis that average buy-and-hold returns are zero can be rejected for a give significance level. These critical values are obtained by solving:

$$\Pr[t_{sa}^b \leq x_1^*] = \Pr[t_{sa}^b \leq x_u^*] = \frac{\alpha}{2} \tag{3}$$

where x_1 is the critical lower value and x_u is the critical upper value for the bootstrapped t-test at the α percent significance level. The skewness-adjusted t-statistic calculated for each of the actual buy-and-hold return series is then compared to these bootstrapped critical values to determine whether any underperformance (or overperformance) is found to exist. The procedure for creating the bootstrapped skewness-adjusted t-statistics is similar in the equal-weighted and value-weighted cases, with the exception that in the latter analysis, we employ the returns weighted by the market capitalization of the firm in the previous period.

While Lyon et al. (1999) and Sutton (1993) find these bootstrapped critical values preferable to the standard normal distribution criterion, the effect in our study is minimal. For the equal-weighted buy-and-hold returns, applying the correction above produces transformed t-statistics that are insignificant using either the bootstrapped or normal critical values. Conversely, the five-year value-weighted returns are always significant at the one percent level, irrespective of the cutoff used.

The results in Panels C and D are consistent with the earlier results. Splicing in the size and book-to-market benchmark returns for delisted IPOs leaves underperformance relative to the CRSP value-weighted index quite significant. (No significant results appear relative to the equal-weighted index.) The performance of

the IPO portfolio is quite similar to that of the size and book-to-market matched firms for the three-year horizon, but not for the five-year time period. The effect of splicing in missing observations with the benchmark return is to somewhat increase the three-year returns, while increasing the five-year raw returns by 6 to 14 percent (a difference significant at the 1 percent confidence level).

In Table VIII, we calculate abnormal performance using the cumulative abnormal return methodology. As Fama (1998) and Mitchell and Stafford (2000) argue, CARs may be a better, less biased method to calculate long-horizon returns because they eliminate the compounding effect of a single year's poor performance (although they still suffer from cross-sectional correlation). Abnormal returns are calculated by subtracting benchmark returns from the IPO firm's return. We calculate CARs by summing annual abnormal returns over three or five years. In Panels A and B, returns are calculated for three and five years, with the IPO returns and benchmark/market returns set to zero in years following a firm's acquisition or delisting. In Panels C and D, we again splice in the return of the firm's matched size and book-to-market benchmark if the firm delists prior to its third or fifth anniversary.

Once performance is measured using CARs, we get a different picture of long-run performance. Half of the equal-weighted CARs in Panels A and B are actually positive. Value weighting tends to increase the returns somewhat. Nevertheless, none of the CARs are statistically different from zero. In Panels C and D, where we splice size and book-to-market benchmark returns for the IPO firm returns upon a delisting, the CARs are again insignificantly different from zero. The difference in the results between CARs and BHARs is due to the large skewness in the individual IPO firm returns.

We assess the pattern of returns by size and book-to-market portfolio in Table IX. We now look at the pattern of performance across various size and book-to-market cohorts. We know that the post-Nasdaq IPOs have strong patterns of performance across cohorts: The smallest and lowest book-to-market IPOs have the worst performance. Larger IPOs have performance that is reasonably close to the market and their industries. Our goal in Table IX was to discover if the same pattern of performance was prevalent in the pre-Nasdaq IPOs.

Using the same cutoffs that we employed to allocate IPOs to size and book-to-market portfolios in Table VI, we explore returns in each of these portfolios. Panel A calculates the three-year nominal return on IPOs in each of the size and book-to-market portfolios. We calculate nominal three-year equal-weighted buy-and-hold returns by portfolio and splice in the IPO's matched size and book-to-market benchmark return if the IPO disappears before the third anniversary. Nominal returns over three years appear to be low on average, but the pattern of returns does not appear to be monotonic or follow any pattern across portfolios.

Because more than half of the firms are in the smallest size and lowest book-to-market portfolio, we further divide these IPOs into five size quintiles, that is, we create five size portfolios *within* the (1,1) portfolio. We create these breakpoints by setting the subquintile breakpoints within the (1,1) portfolio, allocating an equal number of NYSE firms to each size subquintile. The smallest size subquintile in the (1,1) portfolio is denoted as portfolio 1A while the largest

Table VIII

Three- and Five-Year Post-IPO Cumulative Abnormal Returns Versus Various Benchmarks

The sample is 3,661 identified IPOs from 1935 through 1972. Three- and five-year cumulative abnormal returns (both equal-weighted and value-weighted) are compared with alternative benchmarks. In the first row of each panel, we employ the CRSP value-weighted index as the benchmark. Value-weighted results are adjusted for inflation. Row 2 of each panel presents abnormal performance measured relative to attribute-based portfolios. Size and book-to-market portfolios are generated by first forming size quintile breakpoints using NYSE firms only. These quintiles are split further into book-to-market quintiles using NYSE breakpoints only. The universe of NYSE stocks is allocated into the resulting 25 portfolios and equal-weighted monthly returns are calculated. The breakpoints for these portfolios are recalculated annually. Annual returns for the IPO firms are generated by calculating annual returns starting in the first month that a stock price is found in the *Bank and Quotation Record* following the equity issue. Abnormal return is the simple difference between IPO return in a given year and the designated benchmark. Cumulative abnormal returns are the simple three- or five-year sum of the annual abnormal returns. In Panels A and B, if the IPO delists before the fifth anniversary, we compound the return up until the delisting. In Panels C and D, if the IPO delists before the fifth anniversary, we splice in the return of the matched size and book-to-market benchmark.

Panel A: Cumulative Abnormal Return ($N = 3{,}661$)

Benchmarks	Three-Year Equal-Weighted CAR	Three-Year Value-Weighted CAR
CRSP VW index	−4.5%	2.0%
(t-statistic)	(−0.54)	(0.41)
Size and Book-to-Market (5 × 5)	2.7%	8.0%
(t-statistic)	(0.32)	(1.66)

Panel B: Cumulative Abnormal Return ($N = 3{,}661$)

Benchmarks	Five-Year Equal-Weighted CAR	Five-Year Value-Weighted CAR
CRSP VW index	2.1%	−0.5%
(t-statistic)	(0.25)	(−0.10)
Size and Book-to-Market (5 × 5)	−0.1%	4.0%
(t-statistic)	(−0.01)	(0.79)

Panel C: Cumulative Abnormal Return (with Spliced Data, $N = 3{,}661$)

Benchmarks	Three-Year Equal-Weighted CAR	Three-Year Value-Weighted CAR
CRSP VW index	−5.0%	1.3%
(t-statistic)	(−0.60)	(0.26)
Size and Book-to-Market (5 × 5)	2.7%	8.0%
(t-statistic)	(0.32)	(1.66)

Table VIII—*Continued*

Panel D: Cumulative Abnormal Return (with Spliced Data, $N = 3{,}661$)

Benchmarks	Five-Year Equal-Weighted CAR	Five-Year Value-Weighted CAR
CRSP VW index	8.7%	0.3%
(t-statistic)	(1.02)	(0.06)
Size and Book-to-Market (5 × 5)	−0.1%	4.0%
(t-statistic)	(−0.01)	(0.79)

subquintile in the (1,1) portfolio is 1E. In Panel B, we tabulate the nominal three-year equal-weighted buy-and-hold return. The nominal returns of firms in the (1,1) portfolio appear to be very low, but there is no pattern within the portfolio.

To gauge the relative performance of firms in the various size and book-to-market portfolios, we calculate the three-year equal-weighted BHARs in Panels C and D. We compare the performance of each IPO portfolio to the size and book-to-market matched portfolio return as well as to the overall CRSP value-weighted market index return. While most of the portfolios have extremely negative BHARs, there are several portfolios with quite positive returns. Similarly, there does not appear to be a pattern of performance across either the size quintiles or the book-to-market quintiles.

Finally, in Panels E and F we tabulate the three-year equal-weighted CARs for the various IPO portfolios, once again relative to both the IPO's matched size and book-to-market portfolio as well as the CRSP value-weighted market index. We find that CARs are, in general, substantially less negative than the BHARs in Panels C and D. Nine of 20 portfolios have positive abnormal returns. Again, there does not appear to be a pattern of performance across either the size or book-to-market dimension.

Table X highlights the extent to which the event-time returns vary across time. The five-year buy-and-hold returns are calculated for all firms going public in a given year. These tables splice in the benchmark returns for firms that are acquired or delisted before the end of the period, as is done in Panels C and D of Tables VI and VII. The cohorts with the greatest number of offerings, from 1968 to 1972, have pronounced negative returns. (This pattern is particularly striking in the analysis of CARs.[14]) Because of the multiplicative effect discussed in Section II, the results tend to have greater deviations over time when buy-and-hold returns are calculated.[15]

[14] It should be noted, however, that the 1935 to 1949 period also has a very negative return, particularly in the buy-and-hold analysis.

[15] We also explore the effect of trimming the upper and lower one percent tails. Such an action reduces the overall performance by about three percent. This reduction is due to the large right-tailed skewness in the data. When we attempt a similar trimming of post-1972 IPOs, we find a very similar result. Because IPO firms tend to be small growth companies with right skewness in the distribution of their returns, trimming upper and lower tails will consistently reduce their measured performance.

Table IX

Three-Year Raw Returns, Buy-and-Hold Abnormal Returns, and Cumulative Abnormal Returns Versus Various Benchmarks

The sample is 3,661 identified IPOs from 1935 through 1972. Three-year equal-weighted returns are compared with both the CRSP value-weighted index and size and book-to-market benchmarks. Size and book-to-market portfolios are generated by first forming size quintile breakpoints using NYSE firms only. These quintiles are split further into book-to-market quintiles using NYSE breakpoints only. The sample of IPOs is allocated into the resulting 25 portfolios and equal-weighted monthly returns are calculated. The IPOs in the (1,1) portfolio—that is, the smallest and lowest book-to-market firms—are further split into five size subquintiles. The breakpoints for these portfolios are recalculated annually. Annual returns for the IPO firms are generated by calculating annual returns starting in the first month that a stock price is found in the *Bank and Quotation Record* following the equity issue. The buy-and-hold abnormal return is the simple difference between IPO three-year average return and the corresponding benchmark return. Abnormal return is the simple difference between IPO return in a given year and the designated benchmark. Cumulative abnormal returns are the simple three-year sum of the annual abnormal returns. If the IPO delists before the third anniversary, we splice in the return of the matched size and book-to-market benchmark. For Panels C and D, skewness-adjusted *t*-statistics are reported in parentheses. In Panels E and F, normal *t*-statistics are reported in parentheses. If there are insufficient observations to calculate a standard error, no *t*-statistic is reported.

Panel A: Raw Return by Size and Book-to-Market Portfolio

	Book-to-Market Quintile				
Size	Low	2	3	4	High
Small	− 6.0%	− 5.6%	37.3%	2.1%	331.6%
2	− 4.8%	56.1%	21.0%	74.7%	− 62.0%
3	12.2%	− 13.9%	25.3%	− 41.7%	—
4	20.7%	94.4%	8.2%	—	—
Big	18.7%	− 23.0%	—	—	− 11.3%

Panel B: Size Quintiles within the 1,1 Portfolio

		Low
Smallest (1,1)	1A	− 18.1%
	1B	− 2.1%
	1C	− 14.4%
	1D	− 13.3%
Biggest (1,1)	1E	− 2.4%

Panel C: Equal-Weighted Buy-and-Hold Abnormal Returns

Relative to CRSP Value-Weighted Market Index						Relative to Size and Book-to-Market Benchmarks					
	Book-to-Market						Book-to-Market				
Size	Low	2	3	4	High	Size	Low	2	3	4	High
Small	−33.50%	−31.00%	6.80%	−28.80%	301.40%	Small	−20.20%	−19.60%	9.00%	−35.90%	277.50%
	(−6.21)	(−3.58)	(0.43)	(−3.83)	(2.09)		(−5.84)	(−2.82)	(0.54)	(−4.51)	(1.90)
2	−33.00%	23.60%	−8.40%	25.70%	−95.10%	2	−19.90%	22.30%	−14.60%	13.80%	−96.50%
	(−1.58)	(1.08)	(−0.27)	(0.65)	(−8.09)		(−1.32)	(1.06)	(−0.46)	(0.43)	(−23.10)
3	−22.30%	−50.90%	−3.70%	−70.80%	—	3	−18.60%	−56.40%	−3.10%	−55.80%	—
	(−0.67)	(−4.59)	(−0.17)	(−2.47)			(−0.58)	(−6.08)	(−0.17)	(−1.96)	
4	−15.30%	41.80%	−75.30%	—	—	4	−4.50%	39.30%	−79.00%	—	—
	(−0.76)	(1.90)	(−3.53)				(−0.19)	(1.15)	(-3.24)		
Big	−28.90%	−114.70%	—	—	−63.70%	Big	−24.10%	−121.10%	—	—	−91.90%
	(−0.75)	—			—		(−0.61)	—			—

Panel D: Size Quintiles within the 1,1 Portfolio.

Smallest (1,1)	1A	−45.60%	Smallest (1,1)	1A	−20.90%
		(−3.83)			(−2.54)
	1B	−30.80%		1B	−8.60%
		(−1.56)			(−0.62)
	1C	−42.60%		1C	−27.40%
		(−4.55)			(−3.43)
	1D	−36.90%		1D	−19.30%
		(−3.14)			(−2.20)
Biggest (1,1)	1E	−30.20%	Biggest (1,1)	1E	−20.90%
		(−4.91)			(−4.70)

Table IX—*Continued*

Panel E: Equal-Weighted Cumulative Abnormal Returns

Relative to CRSP Value-Weighted Market Index						Relative to Size and Book-to-Market Benchmarks					
	Book-to-Market						Book-to-Market				
Size	Low	2	3	4	High	Size	Low	2	3	4	High
Small	− 22.4%	− 19.2%	4.4%	− 15.0%	288.9%	Small	− 11.4%	− 11.8%	4.9%	− 21.9%	268.1%
	(− 6.74)	(− 2.91)	(0.35)	(− 1.81)	(1.57)		(− 3.40)	(− 1.76)	(0.39)	(− 2.51)	(1.46)
2	21.4%	19.2%	102.5%	8.6%	− 71.5%	2	29.8%	18.4%	97.6%	0.0%	− 74.7%
	(0.39)	(0.84)	(0.94)	(0.29)	(− 1.24)		(0.54)	(0.81)	(0.89)	(0.00)	(− 1.41)
3	− 15.2%	− 32.7%	2.1%	− 79.5%	—	3	− 13.6%	− 38.3%	1.5%	− 67.0%	—
	(− 1.21)	(− 2.44)	(0.13)	(− 2.09)	—		(− 1.05)	(− 3.40)	(0.10)	(− 1.76)	—
4	28.9%	57.5%	− 66.2%	—	—	4	34.3%	54.1%	− 70.4%	—	—
	(0.90)	(5.28)	(− 1.72)	—	—		(1.07)	(2.66)	(− 1.68)	—	—
Big	− 18.5%	− 101.0%	—	—	− 58.1%	Big	− 15.1%	− 106.1%	—	—	− 85.3%
	(− 0.68)	—	—	—	—		(− 0.55)	—	—	—	—

Panel F: Size Quintiles within the 1,1 Portfolio.

Smallest (1,1)	1A	− 31.0%	Smallest (1,1)	1A	− 10.9%
		(− 3.66)			(− 1.26)
	1B	− 22.5%		1B	− 5.2%
		(− 2.04)			(− 0.47)
	1C	− 31.0%		1C	− 19.6%
		(− 3.47)			(− 2.15)
	1D	− 38.3%		1D	− 25.4%
		(− 4.93)			(− 3.17)
Biggest (1,1)	1E	− 17.3%	Biggest (1,1)	1E	− 9.0%
		(− 3.79)			(− 1.96)

B. Calendar-Time Returns

Both the BHAR and CAR calculations in event time suffer from cross-sectional correlation. Put another way, if there are common shocks in the returns of IPO firms, the t-statistics in event-time tests will be overstated. To address this

Table X
Subperiod Return Analysis

The sample is 3,661 identified IPOs from 1935 through 1972. Three-year buy-and-hold abnormal as well as three-year cumulative abnormal returns (both equal-weighted and value-weighted) are computed, with the CRSP value-weighted index and the size and book-to-market benchmark portfolios as benchmarks. Value-weighted results are adjusted for inflation. Size and book-to-market portfolios are generated by first forming size quintile breakpoints using NYSE firms only. These quintiles are split further into book-to-market quintiles using NYSE breakpoints only. The universe of NYSE stocks is allocated into the resulting 25 portfolios and equal-weighted monthly returns are calculated. The breakpoints for these portfolios are recalculated annually. Buy-and-hold returns are generated by compounding annual returns starting in the first month that a stock price is found in the *Bank and Quotation Record* following the equity issue. The buy-and-hold abnormal return is the simple difference between IPO three-year average return and the corresponding benchmark. Abnormal return is the simple difference between IPO return in a given year and the designated benchmark. Cumulative abnormal returns are the simple three-year sum of the annual abnormal returns.

Panel A: Buy-and-Hold Abnormal Returns

Benchmarks	Three-Year Equal-Weighted		Three-Year Value-Weighted	
	Raw IPO Return	BHAR	Raw IPO Return	BHAR
	1935–1972 $N=3{,}661$			
CRSP VW index	11.2%	−16.1%	8.2%	−18.6%
(Skewness-adjusted t-statistic)		(−0.75)		(−3.05)
Size and book-to-market (5 × 5)	11.2%	−6.3%	8.2%	−8.4%
(Skewness-adjusted t-statistic)		(−0.40)		(−1.40)
	1935–1949 $N=183$			
CRSP VW index	12.7%	−30.0%	8.6%	−37.3%
(Skewness-adjusted t-statistic)		(−4.01)		(−5.71)
Size and book-to-market (5 × 5)	12.7%	−24.7%	8.6%	−38.6%
(Skewness-adjusted t-statistic)		(−3.68)		(−5.80)
	1950–1959 $N=447$			
CRSP VW index	27.5%	−20.4%	27.6%	−17.1%
(Skewness-adjusted t-statistic)		(−2.88)		(−0.73)
Size and book-to-market (5 × 5)	27.5%	−13.9%	27.6%	−10.5%
(Skewness-adjusted t-statistic)		(−2.10)		(−0.42)
	1960–1969 $N=2{,}151$			
CRSP VW index	25.5%	−9.3%	17.6%	−11.7%
(Skewness-adjusted t-statistic)		(−0.34)		(−1.44)
Size and book-to-market (5 × 5)	25.5%	−0.3%	17.6%	−0.1%
(Skewness-adjusted t-statistic)		(0.13)		(−0.02)
	1970–1972 $N=880$			
CRSP VW index	−29.1%	−27.6%	−39.1%	−37.8%
(Skewness-adjusted t-statistic)		(−4.36)		(−17.30)
Size and book-to-market (5 × 5)	−29.1%	−13.2%	−39.1%	−26.3%
(Skewness-adjusted t-statistic)		(−4.10)		(−9.42)

Table X—*Continued*

Panel B: Cumulative Abnormal Returns

Benchmarks	Three-Year Equal-Weighted CAR	Three-Year Value-Weighted CAR
	1935–1972 $N=3,661$	
CRSP VW index	−5.0%	1.3%
(*t*-statistic)	(−0.60)	(0.26)
Size and book-to-market (5 × 5)	2.7%	8.0%
(*t*-statistic)	(0.32)	(1.66)
	1935–1949 $N=183$	
CRSP VW index	−15.2%	−18.5%
(*t*-statistic)	(−1.64)	(−1.88)
Size and book-to-market (5 × 5)	−10.4%	−20.8%
(*t*-statistic)	(−1.08)	(−2.08)
	1950–1959 $N=447$	
CRSP VW index	−8.4%	−2.5%
(*t*-statistic)	(−1.56)	(−0.40)
Size and book-to-market (5 × 5)	−6.5%	1.3%
(*t*-statistic)	(−1.18)	(0.20)
	1960–1969 $N=2,151$	
CRSP VW index	4.8%	14.5%
(*t*-statistic)	(0.34)	(1.81)
Size and book-to-market (5 × 5)	12.6%	22.6%
(*t*-statistic)	(0.90)	(2.84)
	1970–1972 $N=880$	
CRSP VW index	−25.1%	−33.3%
(*t*-statistic)	(−7.36)	(−5.98)
Size and book-to-market (5 × 5)	−14.1%	−26.2%
(*t*-statistic)	(−3.95)	(−4.61)

potential problem with event-time returns, we examine calendar-time returns for our sample of IPO firms. We proceed in two parts. First, we compute the return of the portfolio of IPO firms in each calendar year. We then examine (in Section III.C) the Fama–French time series factor regressions. These factor regressions are a well-accepted method for testing time-series significance in the pattern of long-run returns.

The calendar-time performance is calculated for all firms that were already public at the beginning of the year and do not celebrate the fifth anniversary of their IPO by the end of the year.[16] If a firm delists in the middle of the year, the firm's size and book-to-market return is spliced in for the remaining months of the year to create a full year return. Returns are again equal and value weighted.

Table XI computes the returns of the IPO portfolios in each calendar year. For each year, we compute the equal- and value-weighted returns for all IPOs in the

[16] Therefore, the firm is not included in the calendar-time analysis during its first partial year of being public, but will be in the IPO calendar-time returns for the next four years. Similarly, a firm's last partial year (up to the fifth anniversary) is not included in the calendar-time results.

Table XI

Calendar-time Returns on IPOs

The sample is 3,661 identified IPOs from 1935 through 1972. The annual abnormal returns (both equal-weighted and value-weighted) are compared with alternative benchmarks in each year. Each year, the return on all IPOs in the sample that went public within the past five years is calculated. The returns are either equally weighted or weighted by market capitalization at IPO (in constant 1999 dollars). The annual benchmark returns are the annual returns on either the CRSP value-weighted index or the matched size and book-to-market index. The final column presents the annual excess return on small, low book-to-market nonissuing firms relative to the CRSP value-weighted index. The *t*-statistic is from a test of the null hypothesis that the average annual abnormal return does not differ from zero.

Year	EW IPOs–CRSP VW Index	VW IPOs–CRSP VW Index	EW IPOs–EW Size and Book-to-Market Benchmarks	VW IPOs–VW Size and Book-to-Market Benchmarks	Excess Return on (1,1) Portfolio
1936	– 46.4%	– 46.4%	– 37.5%	– 37.5%	– 6.8%
1937	10.7%	1.5%	35.8%	19.0%	– 32.2%
1938	– 1.3%	– 6.1%	– 12.1%	– 20.1%	4.9%
1939	28.8%	48.3%	34.2%	45.4%	– 17.8%
1940	17.2%	14.3%	19.2%	9.4%	– 7.1%
1941	1.1%	2.7%	18.4%	7.2%	– 45.3%
1942	– 6.7%	3.5%	– 15.1%	1.2%	7.8%
1943	25.9%	14.8%	– 0.8%	9.4%	9.3%
1944	8.6%	19.1%	– 22.9%	15.5%	50.8%
1945	50.8%	30.8%	8.4%	22.1%	50.3%
1946	– 4.4%	– 11.2%	– 1.1%	– 6.2%	2.5%
1947	– 8.8%	– 9.3%	– 0.5%	– 5.3%	– 8.9%
1948	– 6.0%	– 8.6%	3.7%	– 2.4%	– 8.1%
1949	8.0%	7.0%	12.0%	6.2%	– 12.8%
1950	– 3.2%	– 3.1%	– 8.2%	– 15.0%	– 0.6%
1951	– 4.2%	– 5.5%	1.2%	– 1.6%	– 2.5%
1952	– 7.8%	– 25.2%	6.0%	– 20.8%	– 27.3%
1953	– 6.8%	– 10.2%	1.3%	– 10.4%	– 16.7%
1954	– 21.7%	– 22.1%	– 20.6%	– 23.2%	– 14.5%
1955	– 2.1%	– 6.2%	5.6%	– 6.1%	– 13.8%
1956	– 11.6%	– 14.1%	– 3.7%	– 11.6%	– 13.6%
1957	0.2%	– 2.5%	0.8%	– 3.8%	– 2.1%
1958	– 2.3%	– 8.5%	– 50.4%	– 27.4%	70.8%
1959	8.3%	– 9.6%	2.3%	– 17.3%	– 1.0%
1960	4.1%	28.6%	16.8%	29.8%	– 20.0%
1961	5.3%	15.1%	1.7%	14.0%	3.4%
1962	– 29.3%	– 15.6%	– 22.3%	– 9.4%	– 7.6%
1963	– 8.4%	12.7%	– 23.5%	7.5%	23.5%
1964	7.1%	– 7.7%	3.7%	– 12.0%	2.9%
1965	52.5%	21.3%	24.1%	12.1%	27.2%
1966	9.7%	11.0%	0.3%	8.9%	10.8%
1967	109.7%	– 12.3%	15.8%	– 34.0%	115.3%
1968	47.9%	38.4%	13.2%	12.7%	31.1%
1969	– 1.8%	– 6.8%	12.8%	2.8%	– 15.1%
1970	– 29.4%	– 26.8%	– 6.2%	– 7.9%	– 28.2%
1971	19.6%	11.9%	8.5%	– 0.9%	12.7%

Table XI—*Continued*

Year	EW IPOs–CRSP VW Index	VW IPOs–CRSP VW Index	EW IPOs–EW Size and Book-to-Market Benchmarks	VW IPOs–VW Size and Book-to-Market Benchmarks	Excess Return on (1,1) Portfolio
1972	– 9.8%	– 6.8%	6.4%	6.1%	– 17.3%
1973	– 20.3%	– 22.9%	1.2%	– 3.2%	– 24.7%
1974	– 1.9%	– 5.6%	– 4.3%	– 6.5%	0.9%
1975	30.9%	44.7%	– 4.3%	13.1%	31.5%
1976	13.1%	13.3%	– 9.2%	– 6.1	21.8%
Average annual abnormal return	5.5%	1.1%	0.3%	– 1.1%	3.3%
Median annual abnormal return	– 1.3%	– 5.5%	1.2%	– 2.4%	– 2.1%
t-statistic	(1.34)	(0.10)	(0.10)	(0.43)	

sample that have gone public in the past five years, and compare it to various market benchmarks. The average return using three of the four approaches is positive. (Again, value weighting the IPOs reduces the level of returns.) It is important to note the implications of treating each calendar year equally: During the early and mid-1970s, when the most IPOs are in the sample, the returns were quite negative (at least relative to the CRSP value-weighted index).

We also report the return of the (1,1) portfolio net of the CRSP value-weighted index. This is highly correlated with the IPO returns. For instance, the correlation coefficient of the excess return of the (1,1) portfolio over the CRSP value-weighted index and the excess return of the value-weighted IPO return series (net of the CRSP value-weighted index) is 0.689 (with a p-value of 0.000).

C. CAPM and Fama–French Three-Factor Regressions

If IPOs underperform on a risk-adjusted basis, time series portfolios of IPOs should consistently underperform relative to an explicit asset-pricing model. Recent work by Fama and French (1992, 1993, 1995, 1996) indicates that a three-factor model may explain the time series of stock returns, although some researchers view both size and book-to-market as potential measures of sentiment. Their three factors are RMRF, the excess return on the value-weighted market portfolio; SMB, the return on a zero investment portfolio formed by subtracting the return on a large firm portfolio from the return on a small firm portfolio; and HML, the return on a zero investment portfolio calculated as the return on a portfolio of high book-to-market stocks minus the return on a portfolio of low book-to-market stocks.

As in Fama and French's work, we use the intercept from time-series regressions as an indicator of risk-adjusted performance of the pre-Nasdaq IPOs. The intercepts in these regressions have an interpretation analogous to Jensen's alpha in

the CAPM framework. This approach has the added benefit that we can make statistical inferences given the assumption of multivariate normality of the residuals.

This approach has a disadvantage, though: It weights each month equally in minimizing the sum of squares. If underperformance is correlated with the number of IPOs in our portfolios, the Fama–French results will reduce the measured underperformance. We address this deficiency by also estimating weighted least squares regressions using the square root of the number of IPOs in the portfolio as weights.

Table XII presents the three-factor time-series regression results. Annual returns of the IPO portfolio returns are regressed on either RMRF for CAPM analysis or on RMRF, SMB, and HML for the Fama–French three-factor analysis. The intercepts in the simple CAPM regressions are insignificantly different from zero. In the equal-weighted Fama–French three-factor regression, the intercept is actually positive and significant at the one percent confidence level. When the IPOs are value weighted, the performance is again poorer: The intercept is still positive but insignificant. Overall, these results confirm the time-series analysis above. IPOs do not appear to underperform on a calendar-time basis.

Panel B presents the Fama–French regressions weighted by the square root of the number of firms in the IPO portfolio in each year. Once again, the intercepts in the CAPM regressions are not different from zero, while in the three-factor regressions they are positive and significant in the equal-weighted case. The primary effect of weighting is to raise the coefficients on the RMRF factor, which suggests that the IPO firms reflected the overall market's movements in a particularly sharp way in the late 1960s and early 1970s.

Loughran and Ritter (2000) argue that the IPO performance varies across financial market cycles. They contend that IPO performance is particularly poor following "hot" IPO markets. To address this issue, we rerun the Fama–French three-factor regressions in Table XII by including a dummy variable for "hot" and "cold" IPO markets. Previous authors have used various schemes to classify these hot and cold periods. Ritter (1984) identifies hot and cold IPO markets as periods of high initial returns (underpricing) and low initial returns. Bayless and Chaplinsky (1996) classify periods according to scaled IPO volume, that is, the volume of IPO issues to total market capitalization of all public firms. Because we do not have the first day return for our IPOs, we use an approach based on Bayless and Chaplinsky.

Scaled IPO volume is defined as the nominal market value of IPOs going public in a given month divided by the total month-end nominal market value of outstanding equity listed on the CRSP database for that month. We then calculate a three-month moving average of scaled IPO volume and rank each month's value into quartiles. A hot IPO period is classified as one in which scaled IPO volume exceeded the upper quartile for at least three consecutive months. Similarly, cold IPO markets are defined as periods in which three consecutive months had scaled IPO volume that falls below the lower quartile.

Because the Fama–French regressions are run on an annual basis, we next classify years into hot and cold IPO years. A year is considered a hot IPO year if at least six months within the year are rated as hot IPO months by the above methodology. Similarly, a cold year is one in which at least six months are rated

Table XII

CAPM and Fama–French (1993) Three-Factor Regression on Initial Public Offering (IPO) Portfolios

The sample is 3,661 identified IPOs from 1935 through 1972. Portfolios of IPOs include all issues that were completed within the previous five years. RMRF is the value-weighted market return on all NYSE stocks (RM) minus the risk free rate (RF), which is the one-month Treasury bill rate. SMB (small minus big) is the difference each year between the return on small firms and big firms. HML (high minus low) is the difference each year between the return on a portfolio of high book-to-market stocks and the return on a portfolio of low book-to-market stocks. The first two columns present results for the CAPM regressions. The next two columns present Fama–French three-factor regressions (t-statistics are in parentheses). Panel A estimates ordinary least squares regressions while Panel B uses weighted least squares where observations are weighted by the square root of the number of IPO firms in the portfolio in a given year. In Panel C, we include dummy variables indicating whether the current year was either a hot IPO market or a cold IPO market. In Panel D, we include a dummy variable indicating whether the previous year was either a hot IPO market or a cold IPO market. Scaled IPO volume is defined as the nominal market value of IPOs going public in a given month divided by the total month-end nominal market value of outstanding equity listed on the CRSP database for that month. We calculate a three-month moving average of scaled IPO volume and rank each month's value into quartiles. A hot IPO period is classified as one in which scaled IPO volume exceeded the upper quartile for at least three consecutive months. Similarly, cold IPO markets are defined as periods in which three consecutive months had scaled IPO volume that falls below the lower quartile.

Panel A: Ordinary Least Squares

	Equal-Weighted	Value-Weighted	Equal-Weighted	Value-Weighted
Intercept	0.044	0.008	0.082	0.038
	(1.01)	(0.25)	(2.90)	(1.18)
RMRF	1.180	1.068	0.689	0.858
	(5.80)	(6.94)	(5.07)	(5.56)
SMB			1.831	0.855
			(8.43)	(3.47)
HML			−0.551	−0.444
			(−2.42)	(−1.71)
Adjusted R^2	0.449	0.541	0.824	0.669

Panel B: Weighted Least Squares (Weights Equal to Square Root of the Number of IPOs in Portfolio)

	Equal-Weighted	Value-Weighted	Equal-Weighted	Value-Weighted
Intercept	0.034	0.001	0.077	0.030
	(0.86)	(0.05)	(3.25)	(1.01)
RMRF	1.396	1.282	0.798	1.021
	(7.03)	(8.99)	(7.11)	(7.31)
SMB			1.542	0.801
			(10.42)	(3.57)
HML			−0.350	−0.297
			(−1.75)	(−1.19)
Adjusted R^2	0.548	0.666	0.891	0.757

Table XII—*Continued*

Panel C: Weighted Least Squares (Weights Equal to Square Root of the Number of IPOs in Portfolio)

	Equal-Weighted	Value-Weighted	Equal-Weighted	Value-Weighted
Intercept	0.064	0.021	0.077	0.033
	(1.39)	(0.65)	(2.97)	(1.03)
RMRF	1.378	1.267	0.797	1.022
	(7.01)	(9.07)	(7.14)	(7.33)
SMB			1.859	0.772
			(10.24)	(3.41)
HML			−0.307	−0.243
			(−1.53)	(−0.97)
This year was a hot IPO period	−0.038	−0.007	0.028	0.021
	(−0.42)	(−0.11)	(0.63)	(0.37)
This year was a cold IPO period	−0.201	−0.174	−0.104	−0.128
	(−1.51)	(−1.85)	(−1.56)	(−1.53)
Adjusted R^2	0.558	0.680	0.892	0.759

Panel D: Weighted Least Squares (Weights Equal to Square Root of the Number of IPOs in Portfolio)

	Equal-Weighted	Value-Weighted	Equal-Weighted	Value-Weighted
Intercept	0.069	0.019	0.083	0.030
	(1.37)	(0.52)	(2.77)	(0.80)
RMRF	1.216	1.155	0.798	0.984
	(5.36)	(7.12)	(6.45)	(6.42)
SMB			1.871	0.772
			(9.87)	(3.29)
HML			−0.376	−0.229
			(−1.70)	(−0.84)
Last year was a hot IPO period	−0.147	−0.094	−0.006	−0.033
	(−1.49)	(−1.33)	(−0.11)	(−0.51)
Last year was a cold IPO period	0.134	0.140	−0.024	0.064
	(0.98)	(1.42)	(−0.32)	(−0.68)
Adjusted R^2	0.554	0.674	0.885	0.747

as a cold IPO market by the above methodology. We estimate the Fama–French regressions using different definitions of hot and cold years and the results are qualitatively identical.

In Panel C of Table XII, we rerun the CAPM and Fama–French three-factor regressions using dummy variables that denote whether the current year was a hot or cold IPO market. The results from the previous regressions are largely unaffected. Intercepts in all regressions continue to be positive, and in the case of the equal-weighted Fama–French regressions, the intercept remains significant. Similarly, the coefficients on hot and cold IPO market dummies are insignificant.

If managers time their equity issuances when sentiment is high, the performance of IPOs might take some time to show negative performance because the overvaluation bubble may not burst immediately. To test whether performance falls in the years after hot markets, in Panel D we include dummy variables that equal one if the previous year was a hot or cold IPO market. In the CAPM regressions, the coefficients on whether the previous year's IPO market activity was "hot" or "cold" appear to be consistent with a market sentiment story. The coefficient on the previous year's status as a "hot" IPO market is negative and the coefficient on the previous year's status as a "cold" IPO market is positive: The point estimates are quite large, but statistically insignificant. This effect is even more modest in the Fama–French three-factor regressions: The point estimates are substantially smaller and the *t*-statistics are substantially lower. Overall, it appears that for our sample period, much of the effect of hot and cold IPO markets is captured by the various market factors used as independent variables.[17]

The performance patterns revealed in this analysis appear to closely reflect those of small growth firms more generally. The factor regressions show that IPO returns are highly correlated with the market as a whole (in all regressions) and that when the Fama–French factors are added, with small firms (large positive coefficient on SMB) and growth firms (large negative coefficient on HML). While broader-based underperformance may exist, there seems to be little evidence of a distinct IPO effect in these years prior to Nasdaq.

IV. Conclusion

This paper has sought to assess the performance of IPOs by examining the period before the creation of Nasdaq. By considering a period where returns of IPOs have not been systematically examined, we hope to shed light on whether the poor performance is driven by some fundamental behavioral anomaly or rather is just an idiosyncratic feature of the recent time period that has been the focus of prior academic studies. Pre-Nasdaq IPOs represent a potentially powerful out-of-sample test of IPO underperformance. Papers that examine IPO performance in other countries, as works such as Rouwenhorst (1998) highlight, may be finding similar patterns because of common economic factors or common investor biases across countries at the same time.

In a sample of 3,661 IPOs between 1935 and 1972, we find underperformance when event-time buy-and-hold abnormal returns are used, but even this result is not consistently statistically significant. The underperformance disappears when we use cumulative abnormal returns. A calendar-time analysis shows that IPOs return at least as much as the market over the entire sample period. Finally, the intercepts in CAPM and Fama–French three-factor regressions are insignificantly different from or even greater than zero. In short, the relative performance

[17] We also reestimated the results in Table XII using various alternative specifications of hot and cold markets. For example, we ran the regressions with multiple dummy variables (i.e., whether the previous year, two years ago, or three years ago was a hot or cold market). None of these specifications found a significant relationship between returns and scaled issue volume.

of an IPO sample depends on the method of examining performance. One methodology suggests that this sample underperforms; others suggest superior performance.

Our analysis of pre-Nasdaq IPOs serves to underscore the questions about IPO performance raised in Brav and Gompers (1997). The weakness of the evidence for underperformance and the failure to observe a consistent pattern raise doubts about whether a unique IPO effect indeed exists. Is there a real behavioral anomaly at work here, or rather is the poor performance of the offerings in the Nasdaq era simply a historical accident? Fama (1998) suggests that spurious anomalies can be anticipated when stock returns are examined repeatedly. Alternatively, systematic underperformance may be present in the data, but this systematic underperformance would then affect a much larger class of companies. Future tests of market efficiency need to look beyond individual anomalies and address broader market movements if they are to shed more light on this debate.

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