The Long Term Performance of Initial Public Offerings

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Abstract

In this study, I examine the long-run performance of a sample of 1,011 firms that made initial public offerings in 1994 and 1995. I find that these firms significantly underperform the market in the three years following their IPO. I also examine a number of cross-sectional patterns observed in previous literature and find that underwriter reputation, first-day returns, the market return prior to the offering and venture capital ownership have statistically and economically significant relationships with long run returns. These results are consistent with Miller's (1977) and Jarrow's (1980) models of asset pricing in a market where short selling is restricted and investors have heterogeneous expectations.

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Introduction

In the past decade, the number and size of initial public offerings of securities has greatly increased, as more firms issue equity to the general public to raise their capital. Ritter (1999) reports that there were 4,124 IPOs in the United States between 1990 and 1999, with gross proceeds of nearly $300 billion. Compared to the 1980s, there were twice as many IPOs involving six times as much capital during this period.[1] Furthermore, the average first-day return for IPOs during the 1990s was 20.9%, far above the average during the previous decade of 6.9%. While always an important element of capital markets, initial public offerings have become even more so.

Although researchers have identified a number of phenomena related to IPOs, the long-term performance of new issues has attracted significant attention in recent years.[2] In particular, some researchers contend that IPO firms underperform relative to the market and to non-issuing firms in the years immediately following their initial public offering. The existence and persistence over time of this difference has led these researchers to conclude that investors in IPO markets are overly optimistic. Other studies have attempted to explain the long run performance of IPOs by relating it to characteristics of the firm, the offering and the market.

Studies of the long run performance of initial public offerings have generally used data from the 1980s. The market for IPOs, however, has grown dramatically in recent years. Indeed, between 1994 and 1996, there were more initial public offerings than in the previous six years combined. In light of this, it is important to re-evaluate previous findings using more recent data.

In this paper, I examine a sample of 1,011 firms that made initial public offerings in 1994 and 1995. I find that these firms significantly underperform the market in the three-year period following their IPO. Furthermore, I examine a number of cross-

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[1] Ritter's figures are not adjusted for inflation, but this is nonetheless impressive.
[2] Ritter (1997) provides a non-technical yet thorough overview of initial public offerings and related phenomena.

sectional patterns in the performance of IPOs and find that underwriter reputation, first-day returns, the market return prior to the offering and venture capital ownership have statistically and economically significant relationships with the long run performance of IPOs. These findings are consistent with previous research and suggest that the patterns observed in previous studies have continued beyond the periods studied in previous research. Furthermore, they are consistent with Miller's (1977) and Jarrow's (1980) models of security prices in a market with restricted short selling.

This paper is organized as follows. Section I provides an overview of the IPO process. Section II is a review of existing literature on the performance of initial public offerings. Section III describes the model I use in my analysis and Section IV examines the data obtained for this study. In Section V, I present evidence of long-run underperformance of IPOs, and in Section VI, I estimate the relationships between a number of variables and long-run returns using linear regression techniques. Section VII concludes.

Section I : The IPO Process

The process of making an initial public offering of securities in the United States is a long, complicated and costly affair, and many proposed offerings are delayed or withdrawn before the offering date. The process typically takes four to six months and generally costs the firm over 20 per cent of the market value of the securities issued (Ritter 1987). Furthermore, firms must follow a strict set of regulations and provide detailed information about their finances and strategy before their equity is ever traded on a public exchange.[3]

Firms begin the process by retaining one or more underwriters. Typically, the underwriters receive a percentage of the gross proceeds from the offering (the "gross spread"), as well as an overallotment option permitting them to sell an additional

[3] More detailed examinations of the IPO process can be found in Ellis,Michaely and O'Hara (1999) and Ritter (1997).

percentage (usually 15 percent) of offering.[4] In exchange, the underwriters conduct due diligence on the firm on behalf of investors, assist in the preparation of the necessary regulatory documents, manage the marketing and pricing of the stock and support the price after the initial offering.

Firms seeking to go public must file a number of documents, including a prospectus, with the Securities and Exchange Commission (SEC), which regulates the securities industry and financial markets in the United States. The prospectus details the firm's financial situation, its ownership structure and its intended plans for the capital raised in the offering. Investors must rely heavily on the prospectus when valuing the firm, as there is often little publicly available information about the firm prior to its IPO (Teoh, Welch and Wong 1998).

The underwriters and the firm's management market the stock to institutional buyers and other large investors through a "road show." At this time, the underwriters attempt to gauge the demand for the stock, which will influence the eventual offering price.

On the day prior to offering date, the firm will meet with the lead underwriter to decide on an offering price and the number of shares to be sold. The next day, the underwriting syndicate will distribute the shares and the stock will begin trading on an exchange.

After trading begins, the lead underwriter may intervene in the market to keep the aftermarket price above the offering price. Aggarwal (1999) describes two price support mechanisms commonly employed by underwriters. The lead underwriter will take a short position on the offering, which it covers by buying shares in the aftermarket, supporting the price. Alternatively, the lead underwriter may assess penalties on other underwriting firms in the syndicate whose customers "flip" their shares (i.e. immediately sell their shares in the aftermarket to make a quick profit).

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[4] Chen and Ritter (1999) find that the gross spread is almost always 7 percent.

More often than not, the closing first-day market price for new issues is above the offering price. This phenomenon, known as new issues underpricing, has received a great deal of academic attention.[5] Loughran and Ritter (1999b) report that the average IPO leaves $9.1 million "on the table," in the sense that if the closing first-day market price reflects the true value of the firm, then the firm has forgone the difference by underpricing the issue.[6]

The SEC requires that all firms conducting IPOs enter into a "quiet period" before the offering that continues until 21 days afterwards. After this time, the firm and the underwriters are free to make earnings projections and seek analyst recommendations.

In almost all offerings, some or all of the existing shareholders of a firm agree not to sell their shares for a certain period following the offering, ensuring an orderly supply of shares to the market. This "lock-up" period generally lasts 180 days, though longer (or shorter) periods are possible.

Section II : Previous Research

Using a sample of 1,526 US firms which went public between 1975 and 1984, Ritter (1991) finds that the average return on a firm's stock over the three years following its IPO was significantly lower than the average return on firms matched by size and industry. Ritter suggests that overoptimism on the part of investors is the most likely explanation for long-run underperformance, contending that investors in the IPO market are systematically fooled into paying too high a price.[7]

Loughran and Ritter (1995) extend the results in Ritter (1991) in two ways. Whereas Ritter (1991) only examined returns in the three years after the IPO, Loughran

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[5] Ritter (1997) provides a summary of the various hypotheses proposed to explain new issues underpricing.
[6] Ritter (1999b) lists the 97 largest offerings in terms of money left on the table. In recent years, some of these numbers have been extremely high. United Parcel Service, for example, left over *$1.5 billion* on the table in its recent offering.
[7] Underperformance of IPOs does not appear to be limited to US securities markets. Ritter (1997) provides a listing of papers that document long-run underperformance of IPOs for eleven other countries.

and Ritter show that underperformance of IPOs persists for over five years. They also find that a similar pattern exists for firms making seasoned equity offerings (SEOs), and hence they label this wider phenomenon the "new issues puzzle."

Both Ritter (1991) and Loughran and Ritter (1995) find that underperformance of IPOs is particularly severe for firms which went public during periods of heavy issuance, commonly referred to as "hot markets." They interpret this as being consistent with the view that firms time their IPOs to coincide with "windows of opportunity", periods when their market valuations is highest. Lerner (1994) provides further evidence of the "windows of opportunity" hypothesis, finding that venture capitalists time IPOs to coincide with a firm's peak market valuation.

Helwege and Liang (1996) compare two samples of IPOs from 1983 and 1988, which are considered a hot market and a cold market, respectively. Although they find evidence of investor overoptimism during hot markets, they do not find that hot market firms are inferior to cold market firms. Jain and Kini (1994), however, find that, in general, firms undergo a decline in operating performance following their IPO. They provide further evidence that investors value IPOs based on the expectation that earnings growth will continue, when in fact earnings deteriorate. This is consistent with the view in Ritter (1991) and Loughran and Ritter (1995) that investors are overoptimistic at the time of the IPO.

Brav and Gompers (1997) challenge the view that IPO firms underperform in the long run. They provide evidence that underperformance is typical of small firms with low book-to-market ratios and find that when returns are weighted equally, firms backed by venture capitalists outperform non-venture-backed firms. Furthermore, they show that the observed underperformance of IPOs is concentrated in small, non-venture-backed firms. As these firms are more likely to underperform, regardless of whether they are IPO firms are not, Brav and Gompers conclude that underperformance is not an IPO effect.

Brav et al. (1999) reach similar conclusions, and contend that tests of underperformance based on buy-and-hold returns are biased towards rejecting the null hypothesis of no underperformance. Using the three-factor asset pricing model developed in Fama and French (1993), they find no significant evidence of underperformance and conclude that findings of long-run underperformance are not robust to alternative methodologies.

Ritter and Loughran (1999) respond that as alternative methodologies have different powers to identify anomalous returns, there will be predictable differences in the magnitude and possibly even the sign of the anomaly depending on the methodology employed. Furthermore, they argue that the Fama-French three-factor model, as it is commonly applied, will have low power to identify abnormal returns. They argue that this problem can be somewhat alleviated by weighting firms and returns equally and ensuring no firms that are the subject of the test are also included in the benchmark portfolio. Under these conditions, the Fama-French model does show evidence of underperformance.

Teoh, Welch and Wong (1998) propose a possible explanation for the underperformance of IPO firms. They argue that as little information about IPO firms is known at the time of their initial offering, investors must rely on information contained in a firm's prospectus when judging the firm's value. Firms, however, can retroactively adjust accruals, increasing their reported earnings. Consequently, if investors assess the firm primarily on the prospectus, then they may be willing to pay more for the firm's shares than its fundamental value. After the IPO, however, it will become apparent that the firm cannot maintain this level of earnings and the firm's stock price will fall. Thus, the more a firm manages its earnings prior to the IPO, the further its price will fall and hence the greater the underperformance will be. Teoh, Welch and Wong find that this is indeed reflected in the data; firms with unusually high accruals in the year of the IPO exhibit lower returns in the three years following the offering.

Chaney and Lewis (1998) find a slightly different relationship between earnings management and long run returns. They contend that firms signal their quality by using accruals to "smooth" earnings; that is, firms use accruals to minimize the variability in their earnings, providing a smoother trend. Chaney and Lewis argue that this makes it easier for investors to judge the true value of firms. They show that firms that perform well tend to smooth earnings more, whereas firms that report their earnings with greater variability tend to have poor long-run returns.

Field (1997) finds that IPO firms that have a higher level of institutional ownership following the IPO tend to exhibit superior long run performance compared to firms with lower levels of institutional ownership. Indeed, she finds that there is no significant difference between the performance of IPO firms with relatively higher levels of institutional ownership and seasoned firms (i.e. firms which have not issued equity in recent years). She interprets this as evidence that institutional investors are better able to gauge the true value of a newly public firm, perhaps because they are better informed than non-institutional investors.

Similarly, Krigman, Shaw and Womack (1999) observe that institutional investors routinely "flip" issues that later underperform the market. Flipping, they argue, is a significant predictor of future performance. Furthermore, they find that hot IPOs – those IPOs that have high first-day returns – exhibit the best performance over the first year, whereas cold IPOs underperform. However, "extra-hot" IPOs – those IPOs with initial returns of greater than 60 per cent – are the worst performers over the first year.

Houge et al. (1999) also find that the flipping ratio is negatively related with long run returns, but they find that both institutional and non-institutional traders flip IPOs in nearly the same proportions. Moreover, they find that the percentage opening spread and the opening delay are negatively correlated with long run performance.[8] They contend

[8] The percentage opening spread is the first quoted spread divided by the bid-ask midpoint, and the opening delay is the time of day that the issue begins trading on the offering date.

that these three variables reflect the divergence of opinion among IPO investors, and argue that in the immediate post-offering aftermarket, where short selling is limited, investors pessimistic about the offering will be unable to move against more optimistic investors. Thus, the firm's price will rise in initial trading, later falling as more information becomes available about the firm and the optimistic investors revise their outlook on the firm. The greater the divergence of opinion between investors, the greater the short-run overreaction and hence the poorer the long run performance.

Carter, Dark and Singh (1997) find that long run underperformance is less severe for IPOs handled by underwriters with better reputations. They contend that more prestigious underwriters protect their reputation by selecting only those IPOs that they expect to show the best long run returns.

Section III : Model

Miller (1977) describes a model in which more risky securities can have higher prices (and hence lower returns) than less risky securities. He argues that if investors have different opinions of a security's future value and short selling is restricted, then the price of the security can be driven above its fundamental value. Under these conditions, he argues that the price of a security is set by the minority of investors who value the security highly enough to include it in their portfolio. Although most investors may feel a security is overpriced, restrictions on short selling prevent them from bidding against the most optimistic investors and driving the price down. Thus, the greater the divergence of opinion amongst investors as to the value of a security, the higher the price. As time progresses, the divergence of opinion will narrow and the price will drop. Therefore, those securities for which investors have the greatest divergence of opinion will exhibit lower long-run returns.

Jarrow (1980) points out a number of shortcomings in Miller's model. He shows that if investors disagree about both the mean vector and the covariance matrix of future asset prices, then security prices can rise, fall or remain constant under restricted short selling depending on the elements of the covariance matrix. For example, investors may

hold less of a security than they would under no restrictions, since they are constrained to hold zero quantity of a substitute security that they would prefer to sell short. This substitution effect would lower the price of the former security below its price under unrestricted short selling.

Jarrow also considers the implications of restricted short selling under Williams' (1977) model of asset pricing. In Williams' model, investors can accurately estimate the variances and covariances of expected future returns using past returns, but their expectations of mean future returns will differ due to incomplete information. The initial variance of the distribution of expected mean returns will depend on the information sources used by investors to generate their predictions. Additional information does not generate inferior estimators, so in general, the more information, the lower the initial variance. As investors accumulate information and update their expectations, the variance is reduced and portfolios converge towards those predicted by a model where investors have homogeneous expectations.

Jarrow shows that under the conditions of Williams' model, restricted short selling will increase asset prices. As all investors agree upon the portfolio risk of each security, they agree upon the expected return required to include the asset in their portfolios. Investors therefore adjust their portfolios based solely on their expectations of each security's future return, holding a security only if their expected future return is greater than the "required" return. However, if short selling is restricted, investors who feel that a security is overvalued compared to their expectation of its future return are constrained to hold zero quantity. Thus, consistent with Miller's intuition, the price of the securities will be determined by the optimists. The degree to which securities are overvalued relative to the mean expected future return will depend on the variance of the distribution of expected future returns. If there is a wide divergence of opinion among investors as to the future prospects of a security, then the price increase under restricted short sales will be higher.[9]

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[9] Jarrow (1980) shows that the increase in price is a function of the shadow costs of the restricted short selling constraint for each investor. For investors who are not affected by the constraint, the shadow cost is

The assumption of restricted short selling is crucial to the above model. If unrestricted short selling is permitted, then investors who believe the stock is overpriced can sell the stock short and drive the price down to that commensurate with the mean expected return. I argue that due to securities regulations, the costs and risks of short selling and additional restrictions on selling imposed by underwriters, this assumption is closely met in the period immediately following an initial public offering.

Short selling is permitted in US financial markets, but it is subject to certain conditions that limit its use.[10] According to the SEC's Rule 10a, securities may only be sold short if the sale meets the two conditions described by the "tick test." Under the "plus tick" rule, a security can be sold short at a price above the last sale price. The "zero-plus tick" rule allows short sales at the last price if it is higher than the last different price. In other words, short sales are not permitted in a retreating market, in order to prevent market manipulation by repeated short selling (Securities and Exchange Commission 1999).[11]

Short selling is also costly to investors. Funds received from a short sale are held in escrow and yield no interest; an investor cannot short a stock and invest the proceeds in another security. Should the price of the security rise after a short sale, the investor must deposit funds to cover the difference (Jarrow 1980). As the prices of most stocks tend to rise with time, short sellers generally have a shorter investment horizon than investors with a long position. Transaction costs are therefore amortized over a shorter period and hence reduce returns. Investors seeking to short a stock must also locate a lender. For more illiquid stocks, the search costs may be significant. Finally, since a short seller must replace the borrowed securities on demand, there is a risk that the short seller

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zero. If an investor is pessimistic about a security and feels that it is overvalued, then the shadow cost will be positive. If the variance of the distribution is large, then there are many investors for whom the shadow cost is high. Thus, the price under short selling restrictions will be much higher.

[10] Similar rules apply in Canadian securities markets.

[11] The NASDAQ Exchange is not subject to this SEC rule, but on September 6, 1994 it implemented a similar (and arguably more restrictive) rule (Danielsen 1999).

may have to cover the short position prematurely. The cost and risk of short sales therefore limits their use (Danielsen 1999).

Other restrictions constrain the actions of some investors who own a firm's shares after its IPO. To minimize flipping, underwriters discourage their clients from selling their allocated shares by threatening to shut them out of future offerings, by requiring them to hold onto the shares for a specified period or otherwise penalizing them (Houge et al. 1999). Investors in the offering are therefore constrained from selling their shares unless the difference between the market value and their assessment of the share's value is greater than the cost of the underwriter's penalties.

In general, underwriters also require current shareholders to retain their shares for an extended period after the offering – the so-called "lock-up period." As this period lasts 180 days on average (Field and Hanka 2000), current shareholders who feel the stock is overpriced are prevented from selling and thereby registering their opinion in the market.

Underwriter penalties and lock-up restrictions therefore restrict the real supply of shares in the market immediately following the IPO. Restrictions on short sales also limit the effective supply of shares by preventing investors from "creating" stock through short selling. As time passes, these restrictions are eased and participants in the IPO and original shareholders can act on their beliefs. If they feel the stock is overpriced, they will sell their shares, lowering the price and hence returns.[12] Furthermore, as additional information becomes available following the IPO, the optimistic investors who hold the stock will tend to reduce their expectation of future returns. As they adjust their expectations downwards, some investors will feel the stock is now overpriced and sell their holdings.

[12] One might argue that other investors should foresee the easing of these restrictions and build the effect into the current price. However, Field and Hanka (2000) provide evidence that the market fails to anticipate the effects of lock-up expirations. They find a statistically significant negative abnormal return around the expiration date.

Using this model as the basis for my analysis, I assume that the systematic risk of a firm is correlated with the uncertainty surrounding its future prospects (eg., the variance of expected future returns). Clarkson and Thompson (1990) find that "low information" firms tend to be riskier investments and that this risk (measured by beta) declines with time. In particular, they find that the average beta for IPO firms is greater than one. Given this, I assume that systematic risk and hence uncertainty is greater for IPO firms than for the market as a whole. The model therefore predicts that IPO firms will have lower returns than the market.

Furthermore, the variance of expected future returns of investors will differ between securities depending on certain characteristics. If the divergence of opinion about a security is large, then the model predicts that the security will be more severely overpriced immediately following the offer and hence will exhibit poorer long run performance than other new issues. I argue that the initial uncertainty surrounding each IPO firm's long run prospects will vary depending on a number of factors, and hence offerings with certain characteristics will exhibit superior or inferior performance than other IPOs.

Section IV : Data

In this section, I describe the sources of data used in this paper and define the variables I will use in my analysis in Sections V and VI.

Data Sources

Information on 1,395 initial public offerings between January 1, 1994 and December 31, 1995 was obtained from IPO Data Systems, Inc. From this, I selected a sample of 1,011 offerings. To be included in the sample, an offering had to meet the following criteria: (1) the offering consisted only of common stock (unit offerings, preferred shares and offerings of American Depository Receipts were excluded); (2) the firm is included in theCentre for Research in Security Prices database within five days of the offer date; (3) the number of shares offered and the offer price are known; (4) an investment banker took the company public; and (5) the firm was not an Investment Trust

or a utility.[13] [14] Appendix A documents the sample selection criteria and the number of firms excluded by each restriction.

Data on security prices were obtained from the Center for Research in Security Prices (CRSP) US Equity database. Utilities included with the database were used to calculate the raw and adjusted returns.[15] Data on the delisting of firms were also taken from the CRSP database.

Carter-Manaster ratings from Carter et al. (1997) were used to measure the prestige of the lead underwriter of each offering.[16] These ratings are based on offerings between 1985 and 1991, but I assume these ratings are fairly constant over time. Underwriters are designated "prestigious" if they have a Carter-Manaster rating equal to or greater than 7.0. Although ratings are unavailable for many of the smaller underwriters, it is unlikely their rating would be above this threshold.

To determine whether firms had venture capital ownership, I consulted the SEC's Ownership Reporting System database.[17] For each firm, I obtained a list of the shareholders required to report their ownership to the SEC. I then excluded all individuals from this list, as venture capitalists generally operate through a corporation or

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[13] Brav and Gompers (1997) note that unit offerings (i.e offerings consisting of both shares and warrants) tend to be made by very small and risky companies. Furthermore, it is difficult to calculate the return on a unit offering, as only the share component of the unit is publicly traded.

[14] Although the sample includes 72 per cent of the firms going public during 1994 and 1995, the gross proceeds of the offerings in the sample ($44.9 billion) account for only 53 per cent of the total proceeds raised by all offerings ($84.8 billion). This discrepancy is primarily due to the exclusion of investment trusts and foreign firms issuing American Depository Receipts, which together account for $32.6 billion of the difference.

[15] To verify the accuracy of the calculation of raw returns, returns were calculated using the closing prices from the first and last days of the return period. The average difference between the CRSP returns and the calculated return was 0.0000712%. I feel this is an acceptable level of error.

[16] Carter and Manaster (1990) develop an index with range 0 (lowest) to 9 (highest) for measuring underwriter reputation based on the relative position of participating underwriters in "tombstone" announcements of new offerings. Carter et al. (1997) compares the Carter-Manaster rating with a number of other measures of underwriter reputation and find that it has superior explanatory power.

[17] All officers, directors and other beneficial owners of an issuing firm are required to report their ownership to the SEC before the effective date of the new issue (i.e. the offering date).

partnership.[18] All remaining owners were compared against lists of venture capital firms obtained from PriceWaterhouseCoopers and the National Venture Capital Association. There are two possible sources of error in this method. Firstly, venture capitalists often place their ownership stake in holding companies, making it difficult to identify venture capitalist owners by name alone. Secondly, it is unlikely that these directories include all venture capital firms. Consequently, some venture capital-backed companies may be erroneously identified as non-venture capital-backed.

Sample Statistics

As Figure 2 demonstrates, the number of offerings in each month is not evenly distributed throughout the two-year sample period. In particular, there were a large number of offerings in the first quarter of 1994 and the second quarter of 1995. Together, these two periods account for 40 per cent of the total offerings.

The vast majority of firms in the sample went public on the NASDAQ exchange. There were 201 offerings on the NASDAQ Small Capital Market and another 687 on the NASDAQ National Market.[19] The New York Stock Exchange (NYSE), by contrast, accounted for merely 99 offerings and the American Exchange (AMEX) for only 24.

The gross proceeds for each offering in the sample ranged from $787,500 (International Nursing Services Inc.) to over $1.1 billion (Nabisco Holdings Corp.) The mean offering size was $44.4 million and the median was $23.4 million, suggesting that a number of offerings were extremely large. Indeed, there were 83 offerings with gross proceeds greater than $100 million, and seven netting over $500 million.

Of the 1,011 offerings, 552 were brought to market by prestigious underwriters and 225 had venture capital backing. Interestingly,76 per cent of offerings by venture capital-backed firms were underwritten by prestigious underwriters, compared to 49 per

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[18] This criteria may exclude some “angel investors” – individual investors who provide startup capital to a firm.

[19] Hereafter, I consider securities from the NASDAQ National Market and the NASDAQ Small Capital Market to be part of the same exchange (NASDAQ).

cent of non-venture capital-backed firms. This suggests that either venturecapitalists have access to top-tier underwriters or that both venture capitalists and prestigious underwriters look for similar qualities in firms.

Of the 1,011 firms in the sample, 214were delisted within three years of their IPO.[20] Of these, 127 merged with other firms, and the other 87 were delisted by their exchange for failure to meet listing requirements.[21]

Offerings are categorized by industry inTable 6. As one might expect, there are a large number of offerings by firms in high-tech industries, such as computers, telecommunications and electronics. There were 159 offerings by firms providing computer and data processing services (15.7%); 85 by communications and electronic equipment providers (8.4%); and 49 by computer manufacturers (4.8%). By comparison, there were few offerings by firms in traditional US industries such as mining, steel or automobiles.

Variables

Based on the model outlined in Section III, I expect initial returns, the pre-issue market return, the size of the offering, the volume of offerings, the prestige of the underwriter and venture capital ownership to have significant relationships with long-run returns. I also consider a number of variables that have been used in previous studies but whose theoretical grounding is less clear. Descriptive statistics for all variables are shown in Table 2.

RAWRET is the raw buy-and-hold return on a firm's stock during theaftermarket return period. The aftermarket return period includes the 36 months after the security is listed in the CRSP database, where a month is defined as 21 trading days. Thus, I follow all securities for 756 days after the IPO. If a security is delisted within this period, its aftermarket period is truncated on the delisting date and its return is calculated up until

[20] One firm was delisted on the 756th day.

that date. RAWRET therefore reflects the return an investor would receive by purchasing a firm's stock at the end of the first day and selling it at the end of the 756th day or the date on which the firm is delisted. To eliminate any bias introduced by compounding daily or monthly returns, each firm's buy-and-hold return is calculated based on the closing prices at the beginning and end of the aftermarket period. Returns are thus calculated using the following formula:

$$RAWRET_{i,t} = \left(\frac{(p_{i,t} - p_{i,1})}{p_{i,1}} \right)$$

where $p_{i,1}$ is the closing price of the stock i on the first day and $p_{i,t}$ is the price on day t, which is the earlier of the delisting date or the 756-day anniversary. As this return is based on the price of the security at the beginning and ending of the return period, it excludes any dividend payments, which is consistent with Ritter (1991).[22]

INITRET is the firm's initial return. The initial return period is defined as the period between the date of the offering and the date on which the security is first listed in the CRSP database. In most cases, the firm's stock will begin trading on the same day as the offering. Thus, INITRET is calculated based on the offering price and the first day closing price:

$$\text{INITRET}_i = \left(\frac{(p_{i,1} - p_{i,0})}{p_{i,0}} \right)$$

where p_{i0} is the offering price for each firm and p_{i1} is the first day closing price.
The initial return reflects the return earned by those purchasing shares in the IPO and is generally positive (i.e. the offering is underpriced). Beatty and Ritter (1986) argue that the uncertainty of an IPO's value is positively correlated with the expected underpricing of the issue. In other words, greater uncertainty implies greater underpricing. Hence, I expect a negative relationship between an IPO's initial return, which approximates the expected underpricing, and the firm's long run return. In other words, I expect that the

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[21] The reasons for delisting range from "insufficient number of market makers" to "protection of investors and the public interest."
[22] It is unlikely that any of the firms issued a dividend during the aftermarket period.

greater the underpricing of an offering (and hence the larger the initial returns), the more likely the firm is to have lower long run returns.

MARKET is the return on the CRSP Value-Weighted Index over the same period used to calculate the firm's buy and hold return (RAWRET). It is calculated as follows:

$$\text{MARKET}_i = \left(\frac{(w_{i,t} - w_{i,1})}{w_{i,1}} \right)$$

where $w_{i,1}$ is the value of the index at the end of the security's first day and $w_{i,t}$ is the value of the index at the end of the security's aftermarket period. This variable reflects changes in the market during the aftermarket period. As almost all firms tend to move with the market to some degree, I expect this variable to be positively associated with long run returns.

Miller (1977) notes that investor optimism and willingness to bear risk increase during periods of high stock prices. If this is the case, investors should be willing to pay more for an IPO during a rising market, and hence firms that go public at these times should exhibit lower long run returns. I test this by defining PREISSUE as the return on the CRSP Value-Weighted Index for the six months prior to the offering. As there are approximately 126 trading days in six months, the pre-issue market return is calculated based on the value of the index at the end of the first day and its value 126 trading days prior.

$$\text{PREISSUE}_i = \left(\frac{(w_{i,1} - w_{i,-126})}{w_{i,-126}} \right)$$

This variable reflects the market conditions prior to the offering. As investors are prepared to pay more for IPOs during a rising market and as poorer quality firms are more likely to go public at such time, I expect this variable to be negatively related to long-run returns.

SIZE is the gross proceeds of the offering in dollars, which is calculated by multiplying the number of shares offered by the offer price. I also consider the natural

logarithm of the gross proceeds (LSIZE). Both of these variables are proxies for the size of the firm. As it takes time for a firm to grow to a large size, larger firms are generally older than smaller ones, and hence there should be more information available about them. Furthermore, simply by surviving for a longer period of time, older, larger firms are generally less risky investments than younger, smaller ones.[23] Larger offerings are also more likely to attract the attention of institutional investors and analysts. For these reasons, there should be less uncertainty about the prospects of larger firms. I therefore expect the offering size to be positively related with aftermarket performance.

In addition to providing capital for developing firms, venture capitalists generally take an active role in the firms in which they invest. Venture capitalists often have particular knowledge or previous experience in an industry and use it to benefit firms in which they have an ownership stake. Furthermore, by investing their financial and reputational capital in a firm, venture capitalists certify the firm's quality (Megginson and Weiss 1991). Given this, there should be less uncertainty about the future returns of venture capital-backed firms. I therefore expect venture capital ownership to be positively related to long run returns. To test this, I define VENCAP as a [0, 1] dummy variable that takes value 1 when the firm has venture capital backing prior to the IPO.

According to Carter and Manaster (1990), underwriters are organized in a rigid hierarchy, with the most prestigious firms jealously guarding their reputation and often passing on profitable deals to protect their position. Firms seek out underwriters with the highest reputation, as this minimizes the IPO underpricing and hence the firm's cost of raising capital. The first-tier underwriters such as CreditSuisse First Boston and Merrill Lynch can therefore select those offerings that they feel are most likely to do well, as managing a successful IPO enhances the underwriter's reputation. Having a prestigious underwriter therefore validates a firm's quality, so underwriter reputation should be positively correlated with long run returns. To test this, I define PRESTIGE as a [0, 1]

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[23] Ritter (1991) finds that age is significantly positively related to long run returns. However, due to lack of data, I am unable to include explicitly the age of the firm in my analysis. SIZE and SECOND are weak proxies for the age of the firm, but they also reflect factors other than age.

dummy variable that takes value 1 if the lead underwriter has a Carter-Manaster rating equal to or greater than 7.0.

I define VOLUME as the number of IPOs in the month of each offering. As discussed in Section II, there is some evidence that firms time new issues to take advantage of periods when investors value their equity more highly and hence the firm's cost of raising capital is lower. In general, investors will value IPOs more highly during periods of high stock prices, but there may also be periods when firms go public to take advantage of higher valuations of firms in their industry. Chemmanur and Fulghieri (1999) describe a model in which productivity shocks in an industry may cause firms in that industry to go public earlier, resulting in so-called "hot markets." Firms that go public during such periods are more likely to have poorer long run returns. As hot markets are generally associated with a high volume of IPOs, I expect the volume of IPOs to be negatively related with long run returns.

I define STDRET as the standard deviation of daily raw returns for the security over the first 252 trading days (i.e. the first year):

$$STDRET_i = \sqrt{\frac{n\sum_{t=1}^{n} r_{it}^{\,2} - \left(\sum_{t=1}^{n} r_{it}\right)^2}{n(n-1)}}$$

where r_{it} is the return for firm i on day t. Carter et al. (1997) suggest that this variable represents the uncertainty surrounding the firm's future cash flows, and hence I expect this variable to be negatively related with long run returns.

As the returns on lower-priced securities are more likely to be biased by bid-ask spreads, the standard deviation of daily raw returns may exaggerate the volatility of such stocks. To compensate for this bias, I also consider the coefficient of variation of the absolute value of daily raw returns (COVRET) over the same period (n = 252):

$$COVRET_i = \frac{\sqrt{\frac{n\sum_{t=1}^{n}|r_{it}|^2 - \left(\sum_{t=1}^{n}|r_{it}|\right)^2}{n(n-1)}}}{\frac{1}{n}\left(\sum_{t=1}^{n}|r_{it}|\right)}$$

I use the absolute value of daily raw returns because the mean daily return for some stocks may be very close to zero. In this case, COVRET would be very high, exaggerating the volatility of the stock. The absolute value of daily raw returns measures the daily change in the stock's price, regardless of sign.

In their analysis, Carter et al. (1997) also include the percentage of secondary shares sold in the offering.[24] I therefore define SECOND as:

$$\text{SECOND}_i = \frac{\text{SECONDARY}_i}{\text{SHARES}_i}$$

where SHARES_i is the number of shares offered by firm *i* and SECONDARY_i is the number of secondary shares offered. Generally only older, more established firms include secondary shares in their IPOs, so this variable is a weak proxy for the age of the firm. I therefore expect this variable to be positively related to long run returns.

Houge et al. (1999) note that high trading volume following the issue indicates a wide divergence of opinion in the immediate aftermarket. They argue that the greater the divergence of opinion amongst investors, the more likely they are to trade. Thus, the volume of trading following the offering should be negatively correlated with long run returns. I define TURNOVER as:

$$TURNOVER_i = \frac{\sum_{t=1}^{15} VOL_{i,t}}{\text{SHARES}_i}$$

[24] Secondary shares are shares sold by existing shareholders in an offering. Primary shares are newly issued shares.

where $VOL_{i,t}$ is the volume for firm *i* on day *t* and $SHARES_i$ is the number of shares offered by firm *i*. This variable measures the average number of times the shares sold in the offering traded hands in the first three weeks following the offering.[25]

To capture other factors that differ between industries, I consider a number of dummy variables for particular industries.

Table 1 - Industry Groups

Industry Group	Variable Name	Standard Industry Classification (SIC) Codes
Airlines	AIRLINE	451
Communications and electronic equipment	COMM	366, 367
Computer and data processing services	COMPSVC	737
Computer manufacturing	COMPMFG	357
Drugs and genetic engineering	DRUGS	283
Financial institutions (banks and S&L's)	BANK	602, 603
Health care and HMOs	HEALTH	805-809
Hotels and motels	HOTELS	701
Miscellaneous business services	BUSINESS	738
Oil and gas	OIL	131,138,291,679
Optical, medical and scientific instruments	MEDSCI	381-384
Restaurant chains	RSTRNT	581
Retailers	RETAIL	520-573, 591-599
Telephone, cellular and pager communications	TELECOM	481
Trucking and courier services	TRUCKING	421
Wholesalers	WHOLESAL	501-519

To facilitate comparison with Ritter's (1991) results, I divide the sample based on his industry groups.[26] There are 379 firms that are not included in any of the industry groups listed in Table 1. These firms come from a wide range of industries, though many are from traditional industries such as construction, manufacturing, mining and food production.

[25] This assumes that all other shares outstanding are held under lock-up provisions, which may be an unreasonable assumption with some firms.

[26] Ritter (1991) did not include hotels, trucking and courier services and telephone, cellular and pager communications as separate groups. I separate them here because they each constitute more than one per cent of my sample.

Section V: Post-IPO Performance

As discussed in Section II, a number of authors have argued that IPO firms tend to underperform for an extended period following their IPO (see Ritter 1991, Loughran and Ritter 1997). In this section, I present evidence that IPO firms underperform a number of commonly used benchmarks over the three years following the offering. I considertwo measures of long run performance: cumulative adjusted returns and buy-and-hold returns.

Cumulative Adjusted Returns

Cumulative average adjusted returns (CAR) are one method of evaluating the long run performance of a portfolio of securities. The return on a security or index is defined as:

$$r_{i,t} = \frac{p_{i,t} - p_{i,t-1}}{p_{i,t-1}}$$

where $p_{i,t}$ and $p_{i,t-1}$ are the prices of the security at the end of the current and previous periods, respectively. The benchmark-adjusted return for stock i in event month t is defined as:

$$ar_{i,t} = r_{i,t} - w_{i,t}$$

where r_{it} is the return for firm i in period t and $w_{i,t}$ is the return on a benchmark for the same period. The average adjusted return for a portfolio of n stocks in period t is the mean of the benchmark-adjusted returns.

$$AR_t = \frac{1}{n}\sum_{i=1}^{n} ar_{i,t}$$

The cumulative adjusted return is therefore the sum of the average adjusted returns for each period:

$$CAR_t = \sum_{s=1}^{t} AR_s$$

If a firm is delisted before the end of the observation period, the average adjusted return on the portfolio for the period in which the firm isdelisted and subsequent periods is the mean return for the remaining firms. Thus, the cumulative adjusted return on a portfolio is the equal-weighted return on the portfolio with monthly rebalancing.

One problem with using equal-weighted portfolios of securities when calculating CARs is that few investors would ever invest the same amount of money in each security they held. An alternative portfolio strategy would be to hold a quantity of each security proportional to the firm's market capitalization. Thus, I define the value-weighted average adjusted return (VWAR) as:

$$VWAR_t = \frac{\sum_{i=1}^{n} MKTCAP_{i,t-1} \times ar_{i,t}}{\sum_{i=1}^{n} MKTCAP_{i,t-1}}$$

The value-weighted average adjusted return is calculated by weighting each adjusted return by the firm's market capitalization ($MKTCAP_i$) in the previous period.[27] The cumulative value-weighted average adjusted return is thus:

$$CVWAR_t = \sum_{s=1}^{t} VWAR_s$$

Again, if a firm isdelisted before the end of the three-year observation period, it is excluded from the calculation of value-weighted average returns in subsequent months. This measure reflects the return an investor would obtain by investing in IPO firms in proportion to each firm's market capitalization with monthlyrebalancing.

I consider a number of market indices when calculating adjusted returns: (1) the CRSP NYSE/AMEX/NASDAQ Value-Weighted Market Index, (2) the NASDAQ Composite Index, and (3) the Standard & Poor's 500 Composite Index.[28] All three indices weight component securities by their market capitalization and exclude dividends when calculating returns (CRSP 1998).[29] The CRSP Value-Weighted Index is based on

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[27] The market capitalization of each firm in a period is defined as the number of shares outstanding multiplied by the price of the firm's stock at the end of the period.

[28] In an earlier version of this paper, I used the CRSP NYSE/AMEX/NASDAQ Equal-Weighted Index as one of my benchmarks. However, Canina et al. (1998) report that this index is unsuitable for calculating long-run excess returns since compounding daily returns of the index can lead to significantly large positive biases. Furthermore, since the monthly periods used in calculatingCARs rarely coincide with calendar months, I cannot use monthly returns. I have therefore dropped the CRSP Equal-Weighted Index as a benchmark when calculatingCARs, as it would exaggerate the underperformance of IPOs.

[29] Returns on the CRSP market indices are calculated both with and without dividends. I use the version of the CRSP Value-Weighted index with dividends excluded.

all securities (excluding ADRs) followed in the database and is therefore a good measure of "market" performance. The S&P 500 index is composed of large capitalization stocks from a range of industries and exchanges and hence reflects the performance of large, mature firms. The NASDAQ Composite includes only securities that trade on the NASDAQ exchange. As most IPOs in the past thirty years have been listed on the NASDAQ exchange (see Ritter 1991), the NASDAQ Composite index reflects the returns of new firms and industries. Ritter (1991) notes that the industry mix on the NASDAQ market is more similar to that of IPOs than other exchanges, which may make it a better benchmark than broader market indices.[30] Figure 4, however, shows that all three indices tend to move together; indeed, the correlation coefficient between any two of the three indices is greater than 0.99. Adjusted returns are therefore very similar for all three indices, and so I only report adjusted returns using the CRSP Value-Weighted Index.

Figure 4 also shows that all three indices began a rapid, sustained rise in early 1995, midway through the IPO sample period. The CRSP Value-Weighted Index, for example, rose 164 per cent over the four years beginning January 1, 1995, which equates to an average annual return of 27.5 per cent.

Table 5 shows the monthly average adjusted returns (AR_t) and value-weighted average adjusted returns ($VWAR_t$) for the 36 months following the offering.[31] Although IPOs tend to outperform the market in the months following the offering, they underperform the market by 36.95 per cent over the three-year aftermarket period. If average returns are weighted by market capitalization, this underperformance is reduced to 25.19 per cent. This suggests that larger firms (i.e. those with a high market capitalization) do not underperform the market by as much as smaller firms.

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[30] Ritter (1991) notes that many of the firms included in the NASDAQ Composite may themselves be relatively recent IPOs, so using it as a benchmark may bias the results towards finding no underperformance.

[31] The average return in the first month excludes the first day return; in other words, the return for the first month is calculated based on the first day closing price, rather than the offering price.

Figure 3 reinforces this conclusion by showing the raw and adjusted cumulative adjusted returns for the sample over the 36 months following the offering. On an equal-weighted-basis, IPOs do not underperform the market until approximately twelve months following the offering, whereas on a value-weighted basis, theunderperformance is not large until the third year following the IPO.

These results are consistent with the assumption that the divergence of opinion converges over time as investors adjust their assessment of the firm in response to new information. Furthermore, constraints imposed on the original shareholders and participants in the IPO during the immediate post-offering period are generally no longer relevant after the first year, allowing those investors to act on their beliefs.

In calculating benchmark-adjusted returns, I have not adjusted for the systematic risk of each stock.[32] However, the average beta for each stock would have to be well below one to reverse the finding of underperformance. Indeed, Ritter (1991) notes the average beta of IPO firms is greater than one, which suggests IPO firms should outperform, not underperform the market.

Buy-and-Hold Returns

As an alternative measure to Cumulative Adjusted Returns (CAR), I also consider three-year buy-and-hold returns. The calculation of buy-and-hold returns is discussed in Section IV.

As firms that survive the entire three-year aftermarket period will tend to have higher returns than those that are delisted, I compute the wealth relative for each firm using the CRSP Value-Weighted Index as the benchmark. The wealth relative is defined as:

$$WR_i = \frac{1 + RAWRET_i}{1 + MARKET_i}$$

[32] To account for risk, I would calculate adjusted returns as follows:

$$ar_{i,t} = r_{i,t} - (a_i + b_i w_{i,t})$$

IPOs which outperform the market will have a wealth relative greater than 1.00, while those which underperform the market will have a wealth relative less than 1.00.

Table 6 and 7, which show the number of offerings and average wealth relatives for IPOs categorized by certain criteria, reveal a number of trends in long-run performance of IPOs. In particular, larger offerings tend to have better long-run performance, as do those firms in industries such as computer manufacturing, oil and gas and banking, among others. Consistent with Brav and Gompers (1997), venture-capital backed firms tend to exhibit better long-run performance, particularly if they are underwritten by a prestigious underwriter. Overall, however, few of the sub-samples outperform the market on average, and the average wealth relative for the entire sample is only 0.76. In other words, an investor would have to invest $1.32 in every IPO for every dollar invested in the market in order to have the same wealth at the end of the aftermarket period.

In Table 9, I test the hypothesis that the average wealth relative is equal to or greater than one for various sub-samples. For many of the sub-samples, the null hypothesis that the average wealth relative is equal to or greater than one can be rejected at the five per cent confidence level. These results must be interpreted with caution, however, as the distribution of wealth relatives is highly non-normal and the sub-samples are not independent.

One criticism of equal-weighted average wealth relatives is that it is unlikely that an investor would invest an equal amount of money in every offering. As discussed above, a more likely investment strategy would be to invest an amount in each offering proportional to the issue's gross proceeds. Table 8 reports value-weighted average wealth relatives across industry groups. Using this metric, the underperformance of IPOs is less severe – the value-weighted average wealth relative for the entire sample is 0.85, compared to 0.76 when wealth relatives are weighted equally. This suggests that the underperformance is greater for small firms than for larger firms, but overall, IPO firms still underperform the market.

Section VI: Cross-Sectional Results

To determine the cross-sectional effects of various firm and offering characteristics, I estimate the relationship between the long-run returns of IPO firms and the variables described in Section IV. Equation 1 describes a linear regression model based on the discussion in Section III and IV :

$$LRAWRET_i = a + b_0 INITRET_i + b_1 LSIZE_i + b_2 MARKET_i + b_3 PREISSUE_i + b_4 PRESTIGE + b_5 VOLUME_i + b_6 VENCAP_i + e_i$$

Equation 1 - Basic Model

The explanatory variables and their expected signs are discussed in Section IV. The coefficients of each variable are estimated using the method of Ordinary Least Squares.[33]

Reliable estimation of the coefficients in the above model is complicated by the skewness of the distribution of returns. The errors are highly non-normal, reducing the reliability of the t-statistics. Carter et al. (1997) attempt to correct for this problem by using the natural logarithm of one thousand plus the raw return as the dependent variable. Following this, I adopt a log-linear specification for the model by using the natural logarithm of one plus the raw return (LRAWRET) as the dependent variable.

Table 11 reports the results. For each of the ten regressions, the estimated coefficient for each variable is reported in the row corresponding to the variable's name. The t-statistics for each estimated coefficient are reported in parentheses. To correct for heteroscedasticity, the standard errors are calculated using White's (1980) Heteroscedastic-Consistent Covariance matrix estimation method.

In Regressions 1 and 2, I consider otherwise identical models that differ only in the variable reflecting the size of the offering. Whereas Regression 1 includes the total gross proceeds of the offering (SIZE), Regression 2 uses the natural logarithm of the gross proceeds (LSIZE). As the latter reflects percentage changes in the offering size, it has a

[33] All regressions were performed using the SHAZAM computer program (see White 1987)

stronger theoretical basis.[34] Indeed, based on the R^2 values of the two regressions, Regression 2 is a better fit, and so I adopt it as the basis for the extended models.

The signs of the estimated coefficients of the explanatory variables in Regressions 1 and 2 agree with the predictions of the model. Furthermore, with the exception of the coefficient of the monthly volume of IPOs (VOLUME), all of the coefficients are significant at the five per cent level.[35] The coefficient of initial returns (INITRET) is negative, implying that offerings with better first-day performance have poorer long-run returns. The size of the offering (SIZE and LSIZE) is positively related to long-run returns, suggesting that larger offerings (and hence larger firms) are better long-run prospects. Consistent with Carter et al. (1997), who find that offerings managed by prestigious underwriters have superior long-run performance, the coefficient of the prestigious underwriter dummy variable (PRESTIGE) is positive and statistically significant. Venture capital backing (VENCAP) also appears to be positively related to long-run returns, which supports the findings of Brav and Gompers (1997). The coefficient of the volume of IPOs (VOLUME) is negative, implying that firms that come to market during periods of heavy issuance have worse long run performance. However, this coefficient is not statistically significant at conventional levels, which reduces the strength of this conclusion.

In Regressions 3 through 10, I examine the effects of introducing other explanatory variables to the basic model. In Regression 3, I add the standard deviation of daily returns (STDRET) to Equation 1. As expected, the estimated coefficient of STDRET is negative and it is significant at a very high level. Under this new specification, however, the coefficient of SIZE is negative and insignificant. Furthermore, the coefficient of MARKET is no longer significantly different from zero.

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[34] One would not expect the difference in size between a $50 million offering and a $60 million offering to have the same relationship with long-run returns as the difference between a $10 million deal and a $20 million deal.

[35] The t-statistics shown in Table 9 should be interpreted with caution. As noted above, the distribution of long run returns is highly right-skewed. Even when using the log-linear form of the model, the Jarque-Bera statistic is sufficiently high that the null hypothesis of normality of the residuals can be rejected at very high levels of confidence.

One possible explanation for this effect is that the returns on small firms with low share prices are more likely to be biased by the bid-ask spread. The standard deviation of daily returns (STDRET) is therefore very high for small firms, which are more likely to perform poorly. In this case, however, this variable reflects size, not volatility, which may explain why the coefficient of size (LSIZE) is negative when STDRET is included.

To correct for any size-related bias in the measure of volatility, I replace STDRET with the coefficient of variation of the daily raw returns (COVRET) in Regression 4. As expected, the estimated coefficient of COVRET is negative and significant at very high levels, suggesting that firms with more volatile stocks are more likely to exhibit poor long run performance. Unlike Regression 3, however, the coefficients of the other explanatory variables retain their expected signs.

The results of Regression 5 suggest that firms whose stock is heavily traded following the IPO have poorer long-run returns. The coefficient of TURNOVER, which reflects the trading volume in the first two weeks of the post-IPO period relative to the number of shares offered, is negative and significant. All of the other coefficients have the expected sign and are significant, with the exception of the coefficient of the monthly volume of IPOs (VOLUME).

As expected, in Regression 6, the coefficient of SECOND is positive and significant. This implies that the greater the percentage of secondary shares in the offering, the better the long-run performance of the firm. In Regression 7, I examine the effects of including COVRET, TURNOVER and SECOND together. As before, the coefficients of all three variables have the expected sign.

In Regressions 8 and 9, I include dummy variables for sixteen industry groups. The signs of the coefficients of the dummy variables reflect their performance relative to the control group. Unfortunately, since the control group in these regressions consists of IPO firms that did not belong to any of the industry groups described inTable 1, its usefulness

as a benchmark is rather limited. Moreover, few of the coefficients of the dummy variables are statistically significant. In regression 8, only the coefficients of the financial insitutions (BANK), business services (BUSINESS), telecommunications (TELECOM) and trucking and courier services (TRUCKING) dummy variables are significant. In Regression 9, only the coefficients of BANK, TRUCKING and TELECOM are significant at the five per cent level.

The coefficient of the financial institutions dummy variable (BANK) is both highly statistically significant and quantitatively large. To estimate the performance of financial institutions relative to other IPO firms, I include only the financial institutions dummy variable in Regression 10. The estimated coefficient is positive and statistically significant, evidence that financial institutions tend to exhibit superior long-run performance compared to other IPOs.

The estimated coefficients of these regressions can be used to estimate the wealth relatives of firms based on their characteristics. For example, the coefficient of initial returns (INITRET) in Regression 10 implies that a firm whose stock rose 15 per cent on the first day will be worth 14 per cent more after three years than a firm with an initial return of 30 per cent, *ceteris parebis.* Similarly, the coefficient of the pre-issue market return (PREISSUE) indicates that if one compared a group of firms that went public after a five per cent increase in the market and a group that made IPOs after a ten percent rise, the former would be worth 11 per cent more after three years. The coefficient of LSIZE indicates that a firm whose offering was twice the size of another would be worth eleven per cent more after three years than its smaller counterpart. The coefficient of the monthly volume of IPOs (VOLUME) implies that firms that went public in January 1995 (20 IPOs) grew by 39 per cent more than those that went public in a December 1995 (78 IPOs). The coefficient of the venture capital dummy variable (VENCAP) suggests that venture-backed firms will be worth 29 per cent more than non-venture-backed firms after three years, and the coefficient of PRESTIGE implies that firms brought to market by prestigious underwriters will be worth 44 per cent more than other firms.

The magnitude of the coefficient of the dummy variable for financial institutions (BANK) in Regression 10 is puzzling, since it implies that financial institutions are worth nearly three times as much as other firms after three years. Certainly, financial institutions did perform slightlybetter than other firms (see Table 6), but the coefficient seems overly high. However, Table 10 may partially explain this result, as it shows that few financial institutionsare backed by venture capitalists or are brought to market by prestigious underwriters. Thus, banks appear to perform well relative to other IPO firms without the benefit of venture capital or underwriter prestige.

Section VII : Conclusions

I find that IPO firms for 1994 and 1995 tend to underperform a number of commonly used market indexes. On both a value- and equal-weighted basis, IPO firms are poor long run performers. I also identify a number of cross-sectional patterns in the long run performance of these firms. In particular, I find that underwriter reputation, first-day returns, the market return prior to the offering and venture capital ownership have significant relationships with long run returns.

In evaluating long-run performance, however, I have not considered book-to-market and size effects, which numerous authors have identified as a possible explanation for the underperformance of IPOs. Most IPOs are small firms with low book-to-market ratios, and Fama and French (1993) show that such firms tend to have low returns in general. The underperformance observed here may simply be a manifestation of a larger pattern of underperformance among small growth firms rather than an anomaly particular to IPOs (Brav and Gompers 1997, Fama 1998).

Even so, the implications of these results for investors are clear: IPOs are a poor long-run investment.[36] In particular, investors should avoid firms which have high first-day gains or which go public following market run-ups. Investors are more likely to have better luck with older, larger firms; firms that have venture capital backing and firms whose offering is underwritten by one of the first-tier underwriters.

For firms, the low returns on IPO firms imply that the cost of equity capital in public markets is not overly high (Ritter 1991). Although entering public equity markets is costly (Ritter 1987), these costs are partially offset by the low returns earned by investors in the years following the IPO. This may explain the dramatic increase in the number of firms entering public equity markets in recent years.

The strong relationship between first-day returns and long run returns suggest that there is a connection between new issues underpricing and long run underperformance. The model presented here explains high first-day returns as the consequence of the heterogeneous expectations of investors and constraints on trading behaviour. In other words, underwriters may not be underpricing new issues; the market may be overvaluing them. However, this does not explain why underwriters do not take advantage of this situation to extract a higher price from investors in the IPO. Regardless of whether high first days returns are caused by underpricing or overvaluation, they still represent a significant wealth transfer from the firm's owners to new investors. As agents of the firm, underwriters should be seeking to minimize this transfer by pricing offerings higher.

More broadly, unless one accepts the view that IPO underperformance is the result of size and book-to-market effects, there is no satisfactory explanation for the persistence of IPO underperformance over time. The underperformance of IPOs has been observed for the past thirty years and it is well known in both the academic and practitioner literature. Surely, investors in IPOs should observe the past poor performance of IPOs and adjust their expectations accordingly. Even under the institutional constraints that form the basis of the model presented here, investors should over time modify their expectations to take into account the uncertainty about IPOs and the behaviour of other investors. Loughran and Ritter (1995) suggest that perhaps investors are betting on longshots in hopes of finding the next big winner. It is, as they put it, "the triumph of hope over experience." Alternatively, Daniel, Hirshleifer and Subrahmanyan (1998) present a model in which psychological biases cause investors to overreact to information

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[36] In the words of Loughran and Ritter (1995), IPOs are hazardous to your wealth.

that confirms their private beliefs and underreact to disconfirming information. In other words, pessimistic investors whose expectation of the mean returns of IPO firms is later confirmed will become more overconfident in their abilities, whereas the confidence of optimistic investors whose expectations are inaccurate will fall only slightly, if at all. In this case, the market as a whole may not be adjusting expectations properly based on the past performance of IPOs. Clearly, however, more research into this question is required.

References

Aggarwal, Reena (1999) "Stabilization Activities by Underwriters after Initial Public Offerings" Available from World Wide Web: (http://www.gsb.georgetown.edu/faculty/aggarwal/jfstab.pdf)

Beatty, Randolph and Ritter, Jay R. (1986) "Investment Banking, Reputation, and the Underpricing of Initial Public Offerings"*Journal of Financial Economics* 15(1), 213-232

Brav, Alon, Geczy, Christopher and Gompers, Paul (1999) "Is the Abnormal Return Following Equity Issuances Anomalous?" Available from World Wide Web: (http://www.duke.edu/~brav/seolr.PDF)

Brav, Alon and Gompers, Paul A. (1997) "Myth or Reality? The Long-Run Underperformance of Initial Public Offerings: Evidence from Venture and Nonventure Capital-Backed Companies."*Journal of Finance* 52(5), 1791-1821

Canina, Linda, Michaely, Roni, Thaler, Richard and Womack, Kent (1998) "Caveat Compounder: A Warning About Using the Daily CRSP Equal-Weighted Index to Compute Long-Run Excess Returns" *Journal of Finance* 53(1), 403-416

Carter, Richard B., Dark, Frederick H. and Singh, Ajai K. (1997) "Underwriter Reputation, Initial Returns, and the Long-Run Performance of IPO Stocks" *Journal of Finance* 53(1), 285-311

Carter, Richard and Manaster, Steven (1990) "Initial Public Offerings and Underwriter Reputation" *Journal of Finance* 45(4), 1045-1067

Center for Research in Securities Prices (1998) "CRSP Data Definitions and Coding Schemes Guide" Available from World Wide Web: (http://gsbwww.uchicago.edu/research/crsp/file_guides/data_defs.pdf)

Chaney, Paul K. and Lewis, Craig M. (1998) "Income smoothing andunderperformance in initial public offerings."*Journal of Corporate Finance* 4, 1-29

Chemmanur, Thomas J. and Fulghieri, Paolo (1999) "A Theory of the Going-Public Decision" *The Review of Financial Studies* 12(2), 249-279

Chen, Hsuen Chi and Ritter, Jay R. (1999) "The Seven Percent Solution" Available from World Wide Web: (http://bear.cba.ufl.edu/ritter/SPS.pdf)

Clarkson, Peter M. and Thompson, Rex (1990) "Empirical Estimates of Beta When Investors Face Estimation Risk" *Journal of Finance* 45(2), 421-453

Daniel, Kent, Hirshleifer, David and Subrahmanyam, Avanidhar (1998) "Investor Psychology and Security Market Under- and Overreactions" *Journal of Finance* 53(6), 1839-1885

Danielsen, Bartley R. (1999) "Why Do Option Introductions Depress Stock Prices? Heterogeneous Beliefs, Market-Maker Hedging, and Short Sale" Available from World Wide Web: (http://www.cbot.com/points_of_interest/academic/proceedings/chicago99/danielsen.html)

Ellis, Katrina, Michaely, Roni and O'Hara, Maureen (1999) "When the Underwriter is the Market Maker: An Examination of Trading in the IPO Aftermarket" *Journal of Finance* forthcoming

Fama, Eugene (1998) "Market efficiency, long-run returns, and behavioral finance" *Journal of Financial Economics* 49, 283-306

Fama, Eugene and French, Kenneth (1993) "Common risk factors in the returns of stocks and bonds." *Journal of Financial Economics* 33, 3-55

Field, Laura C. (1997) "Is Institutional Investment in Initial Public Offerings Related to the Long-Run Performance of These Firms?" Working Paper

Field, Laura C. and Hanka, Gordon (2000) "The Expiration of IPO Share Lockups" Working Paper

Helwege, Jean and Liang, Nellie (1996) "Initial Public Offerings in Hot and Cold Markets." Available from World Wide Web: (http://www.federalreserve.gov/pubs/feds/1996/199634/199634abs.html)

Houge, Todd, Loughran, Tim, Suchanek, Gerry and Yan, Xuemin (1999) "Divergence of Opinion in IPOs" Available from World Wide Web: (http://parkercenter.johnson.cornell.edu/pdf_files/flipping.pdf)

Jain, Bharat A. and Kini, Omesh (1994) "The Post-Issue Operating Performance of IPO Firms" *Journal of Finance* 49(5), 1699-1726

Jarrow, Robert (1980) "Heterogeneous Expectations, Restrictions on Short Sales, and Equilibrium Asset Prices" *Journal of Finance* 35(5) : 1105-1113

Krigman, Laurie, Shaw, Wayne H. and Womack, Kent L. (1999) "The Persistence of IPO Mispricing and the Predictive Power of Flipping" *Journal of Finance* 54(3), 1015-1044

Lerner, Joshua (1994) "Venture capitalists and the decision to go public."*Journal of Financial Economics* 35, 193-316

Loughran, Tim and Ritter, Jay R. (1995) "The New Issues Puzzle." *Journal of Finance* 50(1), 23-51

Loughran, Tim and Ritter, Jay R. (1999) "Uniformly Least Powerful Tests of Market Efficiency." Available from World Wide Web: (http://bear.cba.ufl.edu/ritter/rittulp.htm)

Loughran, Tim and Ritter, Jay R. (1999b) "Why Don't Issuers Get Upset About Leaving Money on the Table in IPOs?" Available from World Wide Web: (http://bear.cba.ufl.edu/ritter/parnov.pdf)

Megginson, William L. and Weiss, Kathleen A. (1991) "Venture Capitalist Certification in Initial Public Offerings"*Journal of Finance* 46(3), 879-903

Miller, Edward M. (1977) "Risk, Uncertainty, and Divergence of Opinion"*Journal of Finance* 32(4), 1151-1168

Ritter, Jay R. (1987) "The Costs of Going Public" *Journal of Financial Economics* 19, 269-281

Ritter, Jay R. (1991) "The Long-Run Performance of Initial Public Offerings"*Journal of Finance* 46(1), 3-27

Ritter, Jay R. (1997) "Initial Public Offerings" Available from World Wide Web: (http://bear.cba.ufl.edu/ritter/rittipo.htm)

Ritter, Jay R. (1999) "Summary Statistics on 1975-1999 Initial Public Offerings with an Offer Price of $5.00 or more" Available from World Wide Web: (http://bear.cba.ufl.edu/ritter/killian.pdf)

Ritter, Jay R. (1999b) "Money Left on the Table in IPOs" Available from World Wide Web: (http://bear.cba.ufl.edu/ritter/money.htm)

Ritter, Jay R. (2000) "A Few Factoids about the 1999 IPO Market" Available from World Wide Web: (http://bear.cba.ufl.edu/ritter/fact99.pdf)

Securities and Exchange Commission (1999) "SEC Concept Release: Short Sales" Available from World Wide Web: (http://www.sec.gov/rules/concept/34-42037.htm)

Teoh, Siew Hong, Welch, Ivo and T.J. Wong (1998) "Earnings Management and the Long-Run Market Performance of Initial Public Offerings."*Journal of Finance* 53(6), 1935-74

White, H., (1980) "A heteroscedasticity consistent covariance matrix estimator and a direct test of heteroscedasticity" *Econometrica* 48, 817-838.

White, Kenneth J. (1997) *SHAZAM User's Reference Manual Version 8.0* (Canada: McGraw-Hill)

Williams, Joseph T. (1977) "Capital Asset Prices with Heterogeneous Beliefs"*Journal of Financial Economics* 5, 219-319

Appendix A : Sample Selection Criteria

	Firms Excluded	Firms Remaining
All effective offerings between January 1, 1994 and December 31, 1995		1395
Exclude: Offerings of securities other than common shares	88	1307
Exclude: Offerings traded on securities not trading on exchanges followed by CRSP	22	1285
Exclude: Firms not followed in CRSP database	80	1205
Exclude: Offerings where number of shares offered or offer price unknown	14	1191
Exclude: Non-underwritten offerings	2	1189
Exclude: Offerings not tracked by CRSP within five days of the offer date	95	1094
Exclude: Investment Trusts (SIC Codes 679, 672) and utilities (SIC Codes 491, 492 and 493)	73	1021
Exclude: Securities with missing observations or trading as different securities prior to offering	7	1014
Exclude: Offerings with missing first day price	3	1011
Firms in sample		**1011**

Appendix B : Tables and Figures

Figure 1 - Frequency Distribution of Initial Returns

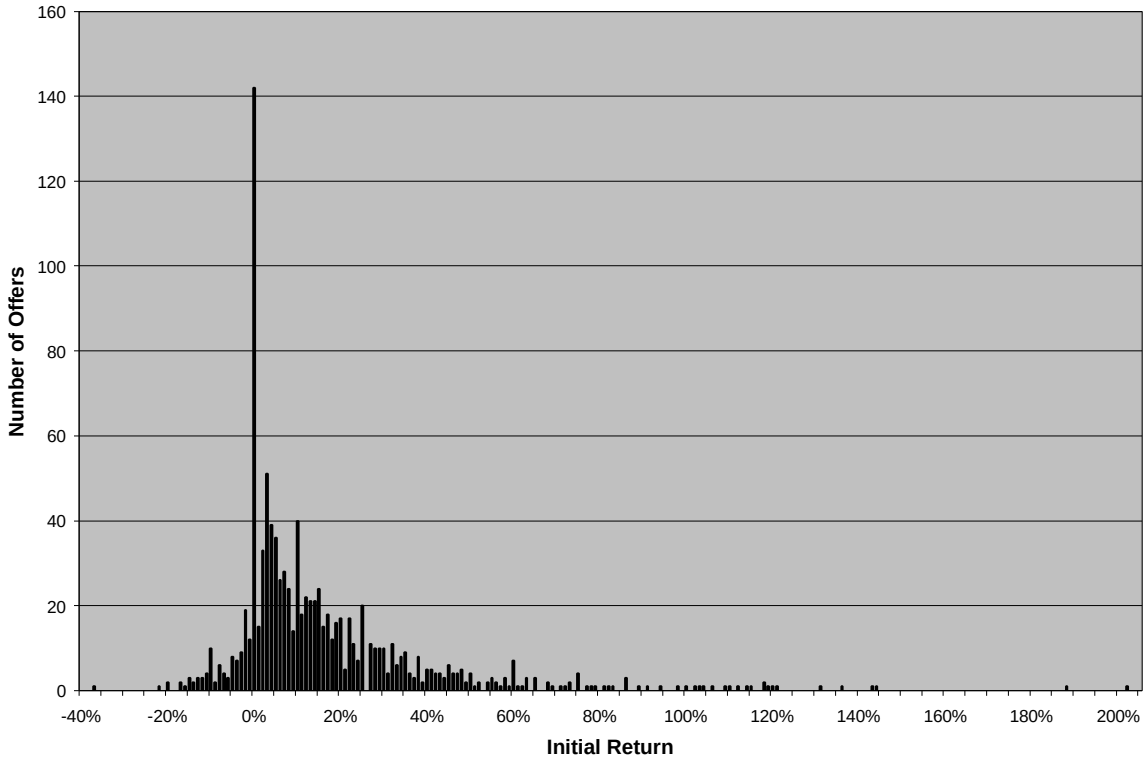

Figure 2 – Initial Public Offerings by Month – January, 1994 to December, 1995

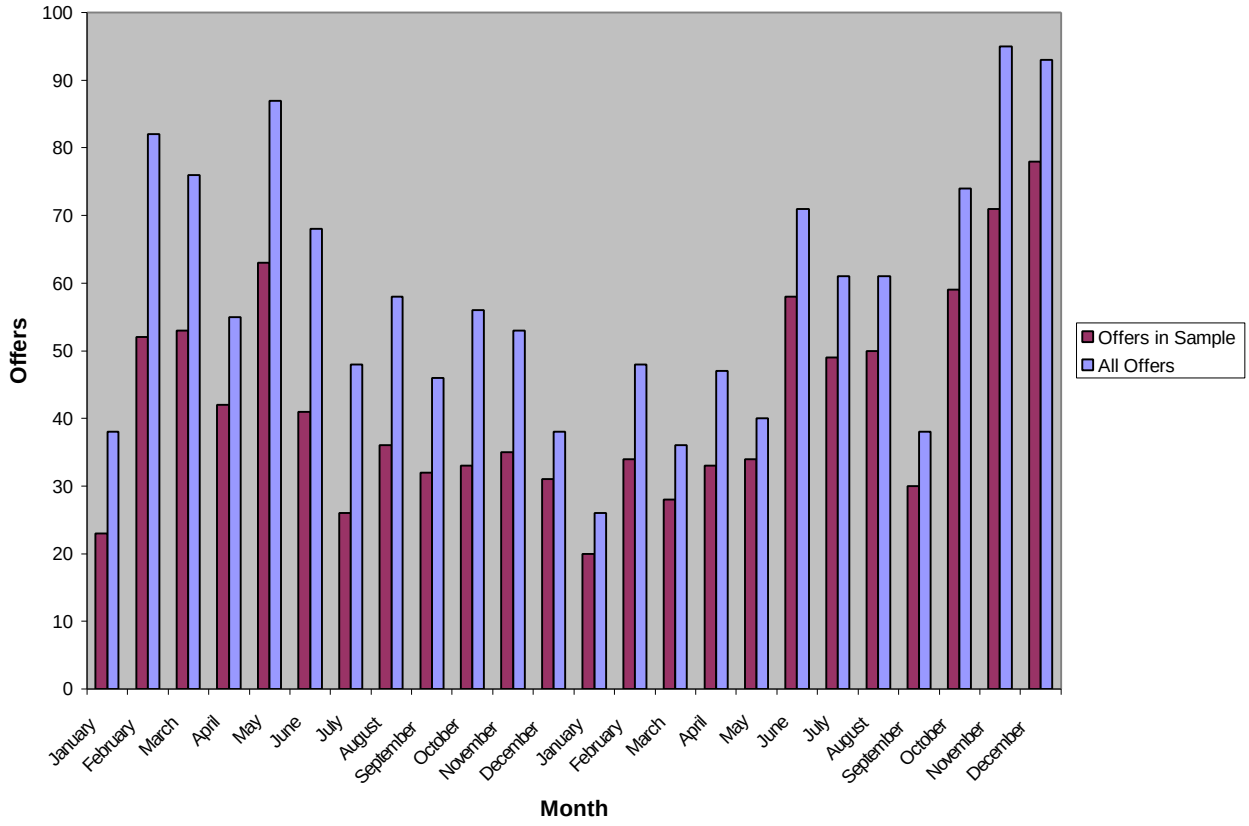

Figure 3 - Cumulative Raw and Adjusted Returns – The chart below show the cumulative raw and adjus
for IPOs on an equal- and value-weighted basis. The CRSP Value-Weighted Index is used as the benchmark

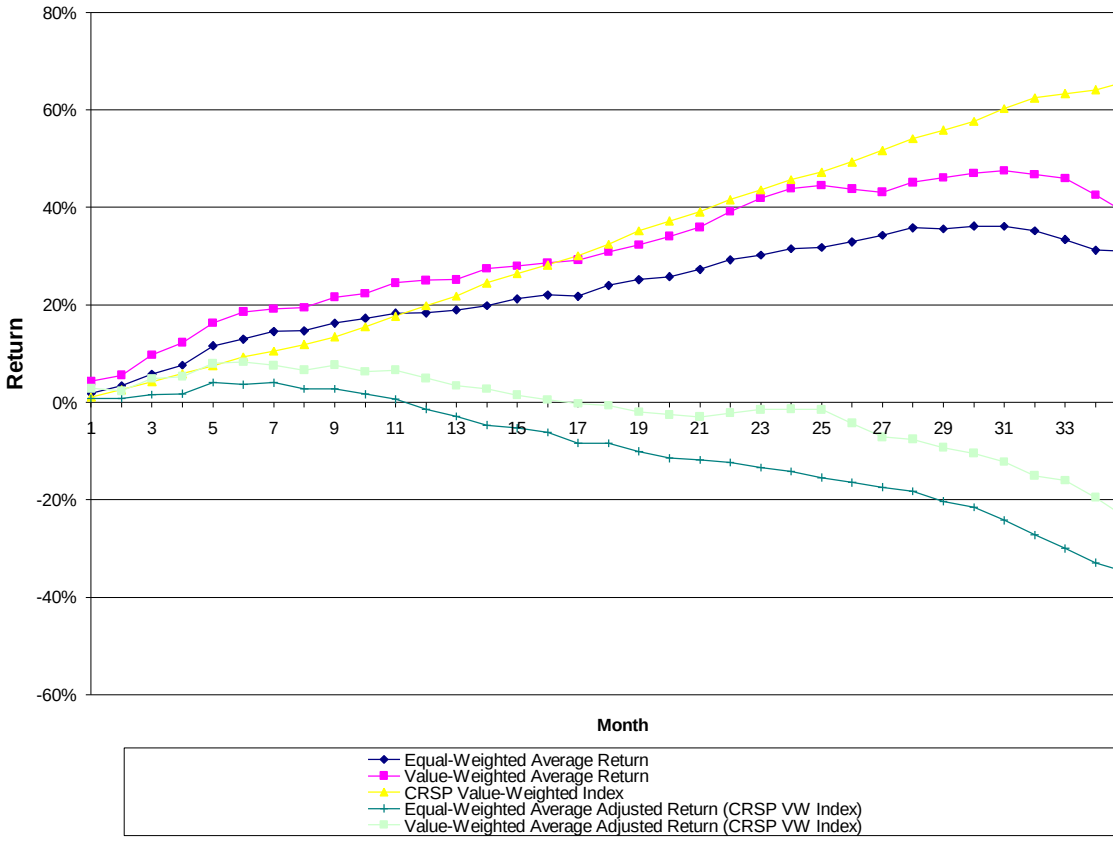

Figure 4 - Index Returns - 1993-1998 – This chart shows the cumulative returns on the three indices u
period January 1, 1993 to December 31, 1998. As the figure shows, the three indices are highly correla
correlation for any two of the indices is greater than 0.99. The figure also shows the dramatic rise in the
early 1995.

Table 2 - Descriptive Statistics – This table shows descriptive statistics for the variables defined in Section III.

Name	Mean	St. Dev	Minimum	Maximum
RAWRET	0.41784	1.7782	-0.99966	25.267
LRAWRET	-0.29838	1.3322	-7.9859	3.2683
INITRET	0.15971	0.24608	-0.375	2.0156
SIZE	4.44E+07	8.41E+07	7.88E+05	1.10E+09
LSIZE	16.925	1.0805	13.577	20.821
MARKET	0.85737	0.24422	7.62E-02	1.2563
VOLUME	47.56	16.063	20	78
PREISSUE	8.42E-02	8.32E-02	-5.16E-02	0.22826
STDRET	4.25E-02	1.86E-02	9.89E-03	0.15665
COVRET	1.0521	0.16142	0.78234	2.1973
SECOND	0.11881	0.21465	0	1
TURNOVER	1.2216	0.86141	0	7.48
PRESTIGE	0.54599	0.49813	0	1
INTERACT	0.16815	0.37418	0	1
VENCAP	0.22255	0.41617	0	1
COMPMFG	4.85E-02	0.21486	0	1
COMM	8.41E-02	0.27764	0	1
OIL	1.29E-02	0.11272	0	1
BANK	5.14E-02	0.22099	0	1
COMPSVC	0.15727	0.36424	0	1
MEDSCI	4.25E-02	0.2019	0	1
RETAIL	4.55E-02	0.2085	0	1
WHOLESAL	3.36E-02	0.18036	0	1
RSTRNT	2.08E-02	0.14269	0	1
HEALTH	2.77E-02	0.16418	0	1
DRUGS	3.76E-02	0.19029	0	1
BUSINESS	7.91E-03	8.86E-02	0	1
AIRLINE	8.90E-03	9.40E-02	0	1
TELECOM	2.08E-02	0.14269	0	1
HOTELS	1.29E-02	0.11272	0	1
TRUCKING	1.29E-02	0.11272	0	1

Table 3 - Number of IPOs and Gross Proceeds by Month - This table shows the number and gross proceeds of IPOs in the years 1994 and 1995.

		Sample		All Offerings	
Month	**Year**	**Offers**	**Total Proceeds ($ millions)**	**Offers**	**Total Proceeds ($ millions)**
January	1994	23	1,402	38	3,048
February	1994	52	1,848	82	5,372
March	1994	53	2,219	76	5,304
April	1994	42	1,119	55	3,290
May	1994	63	1,763	87	2,465
June	1994	41	1,534	68	4,874
July	1994	26	679	48	3,272
August	1994	36	695	58	2,523
September	1994	32	1,023	46	2,449
October	1994	33	917	56	3,567
November	1994	35	1,858	53	2,901
December	1994	31	1,480	38	2,952
January	1995	20	1,327	26	1,345
February	1995	34	1,217	48	1,490
March	1995	28	1,358	36	1,720
April	1995	33	2,008	47	2,991
May	1995	34	1,499	40	1,946
June	1995	58	2,283	71	4,092
July	1995	49	2,281	61	2,578
August	1995	50	2,620	61	3,208
September	1995	30	1,955	38	2,505
October	1995	59	5,149	74	6,529
November	1995	71	3,653	95	10,367
December	1995	78	2,971	93	3,976
Total		1011	44,858	1395	84,765

Table 4 - Prestigious Underwriters – The following table shows the underwriters designated "prestigious" in this study, the number of offers, gross proceeds raised by each and their respective Carter-Manaster rating from Carter et al. (1997).[37]

Underwriter Name	Offers	Total Gross Proceeds	Mean Deal Size	Carter-Manaster Rating	Share of Total Gross Proceeds
Goldman, Sachs & Co.	43	$ 7,979,208,828	$ 185,562,996	9	17.8%
CS First Boston	20	$ 1,966,027,584	$ 98,301,379	9	4.4%
Hambrecht & Quist Incorporated	37	$ 996,440,708	$ 26,930,830	9	2.2%
Salomon Brothers Inc.	12	$ 862,017,500	$ 71,834,792	9	1.9%
Merrill Lynch & Co.	27	$ 4,371,224,992	$ 161,897,222	8.88	9.7%
Morgan Stanley & Co. Incorporated	41	$ 4,359,834,492	$ 106,337,427	8.88	9.7%
Alex. Brown & Sons Incorporated	51	$ 1,861,418,596	$ 36,498,404	8.88	4.1%
Wertheim Schroder & Co. Incorporated	5	$ 304,451,000	$ 60,890,200	8.83	0.7%
Kidder, Peabody & Co. Incorporated	6	$ 216,685,000	$ 36,114,167	8.83	0.5%
Smith Barney Shearson	3	$ 200,950,000	$ 66,983,333	8.83	0.4%
Donaldson, Lufkin & Jenrette Securities Corp.	35	$ 2,917,254,592	$ 83,350,131	8.75	6.5%
Smith Barney Inc.	30	$ 2,763,955,902	$ 92,131,863	8.75	6.2%
Robertson, Stephens & Company	43	$ 1,624,655,136	$ 37,782,678	8.75	3.6%
Montgomery Securities	25	$ 963,119,336	$ 38,524,773	8.75	2.1%
PaineWebber Incorporated	12	$ 694,786,248	$ 57,898,854	8.75	1.5%
Bear, Stearns & Co. Inc.	14	$ 626,758,200	$ 44,768,443	8.75	1.4%
Prudential Securities Incorporated	15	$ 407,438,044	$ 27,162,536	8.75	0.9%
Dillon, Read & Co. Inc.	10	$ 529,775,000	$ 52,977,500	8.63	1.2%
Wheat First Butcher & Singer Capital Markets	6	$ 255,629,000	$ 42,604,833	8.5	0.6%
Dean Witter Reynolds	5	$ 218,417,570	$ 43,683,514	8.5	0.5%
Keefe, Bruyette & Woods, Inc.	1	$ 33,000,000	$ 33,000,000	8.33	0.1%
Nomura Securities International Inc.	1	$ 55,000,000	$ 55,000,000	8.25	0.1%
D.H. Blair & Co Inc.	17	$ 134,775,000	$ 7,927,941	8	0.3%
A.G. Edwards & Sons, Inc.	1	$ 21,000,000	$ 21,000,000	8	0.0%
William Blair & Company	15	$ 475,087,954	$ 31,672,530	7.88	1.1%
Oppenheimer & Company, Inc.	12	$ 393,825,000	$ 32,818,750	7.88	0.9%
Piper Jaffray Incorporated	7	$ 164,667,068	$ 23,523,867	7.75	0.4%
Dain Bosworth Incorporated	6	$ 78,748,500	$ 13,124,750	7.63	0.2%
Lehman Brothers Incorporated	19	$ 1,420,325,960	$ 74,753,998	7.5	3.2%
J.C. Bradford & Co.	9	$ 217,202,500	$ 24,133,611	7.38	0.5%
Robinson-Humphrey Company, Inc., The	8	$ 165,412,500	$ 20,676,563	7.38	0.4%
Advest, Inc.	3	$ 135,937,504	$ 45,312,501	7.13	0.3%
Legg Mason Wood Walker, Inc.	2	$ 30,380,000	$ 15,190,000	7.13	0.1%
McDonald & Company Securities, Inc.	6	$ 159,782,500	$ 26,630,417	7	0.4%
Allen & Company Incorporated	3	$ 100,880,000	$ 33,626,667	7	0.2%
Tucker Anthony Incorporated	2	$ 45,500,000	$ 22,750,000	7	0.1%
Total for prestigious underwriters	552	$ 37,751,572,214	$ 68,390,529		84.2%
Total for all underwriters	1011	$ 44,858,292,839	$ 44,370,220		

[37] Tucker Anthony Incorporated is known as Tucker, Anthony and Day in Carter et al. (1998). The rating for Smith Barney Shearson is the rating given to Shearson Lehmann in Carter et al. (1998)

Table 5 - Cumulative Adjusted Average Returns – The following table shows cumulative and monthly equal- and value-weighted adjusted average returns. The CRSP Value-Weighted Index is used as the benchmark for adjustment.

Month	Firms	AR_t	t-statistic	$VWAR_t$	t-statistic	CAR_t	$CVWAR_t$
1	1011	0.84%	1.62	2.86%	4.06	0.84%	2.86%
2	1011	-0.02%	-0.04	-0.53%	1.43	0.82%	2.33%
3	1011	0.74%	1.25	2.54%	3.58	1.56%	4.87%
4	1011	0.22%	0.46	0.42%	2.49	1.78%	5.28%
5	1011	2.29%	4.10	2.69%	4.55	4.07%	7.98%
6	1011	-0.43%	-0.63	0.32%	2.56	3.63%	8.30%
7	1011	0.43%	0.77	-0.72%	0.42	4.06%	7.58%
8	1010	-1.26%	-2.20	-0.93%	0.25	2.80%	6.65%
9	1009	0.00%	-0.01	1.02%	2.21	2.79%	7.67%
10	1009	-1.10%	-2.05	-1.39%	0.77	1.69%	6.28%
11	1004	-1.06%	-1.84	0.37%	2.31	0.63%	6.65%
12	999	-2.09%	-3.65	-1.72%	0.49	-1.46%	4.93%
13	992	-1.40%	-2.58	-1.53%	0.14	-2.87%	3.40%
14	986	-1.83%	-2.92	-0.64%	2.41	-4.69%	2.76%
15	977	-0.56%	-0.98	-1.27%	0.57	-5.26%	1.49%
16	971	-0.91%	-1.36	-1.00%	0.53	-6.17%	0.49%
17	966	-2.15%	-3.64	-0.79%	0.65	-8.32%	-0.30%
18	959	-0.11%	-0.17	-0.38%	1.19	-8.43%	-0.68%
19	949	-1.62%	-2.80	-1.31%	1.49	-10.06%	-1.99%
20	936	-1.39%	-2.50	-0.53%	1.95	-11.45%	-2.51%
21	933	-0.35%	-0.55	-0.44%	1.83	-11.80%	-2.96%
22	927	-0.55%	-0.91	0.78%	3.86	-12.34%	-2.18%
23	922	-1.04%	-1.61	0.68%	2.29	-13.38%	-1.50%
24	912	-0.80%	-1.35	0.13%	1.98	-14.18%	-1.37%
25	901	-1.25%	-1.93	-0.15%	0.69	-15.44%	-1.52%
26	899	-1.00%	-1.56	-2.76%	-0.61	-16.44%	-4.27%
27	892	-0.98%	-1.37	-2.83%	-0.57	-17.42%	-7.10%
28	881	-0.84%	-1.28	-0.44%	1.79	-18.26%	-7.54%
29	869	-2.02%	-3.20	-1.75%	0.92	-20.28%	-9.29%
30	855	-1.26%	-1.95	-1.18%	0.89	-21.54%	-10.47%
31	849	-2.65%	-4.17	-1.73%	0.56	-24.19%	-12.21%
32	840	-3.04%	-4.83	-2.84%	-0.72	-27.23%	-15.05%
33	832	-2.72%	-4.06	-0.96%	-0.85	-29.95%	-16.01%
34	817	-2.96%	-3.69	-3.49%	-2.33	-32.91%	-19.50%
35	805	-1.90%	-2.58	-4.14%	-1.99	-34.81%	-23.64%
36	798	-2.15%	-2.82	-1.55%	0.55	-36.95%	-25.19%

Table 6 - Offerings by Industry and Gross Proceeds– This table shows the number of offerings and the av
groups of IPOs categorized by industry and size.

	Gross Proceeds									
	$787,500 to $6,999,999		$7,000,000 to $13,499,999		$13,500,0000 to $22,499,999		$22,500,000 to $33,999,999		$34,000,000 to $53,999,999	
Industry	**Offerings**	**Avg WR**	**Offerings**	**Avg WR**	**Offerings**	**Avg WR**	**Offerings**	**Avg WR**	**Offerings**	**Avg WI**
Computer manufacturing	7	0.75	9	0.54	8	0.60	9	0.91	12	1.17
Communications and electronic equipment	10	0.73	16	0.54	11	0.77	26	0.99	18	0.60
Oil and gas	1	0.39	1	0.63			2	0.47	2	2.05
Financial institutions (banks and S&L's)	3	0.89	19	0.90	13	1.06	2	0.86	8	0.74
Computer and data processing services	25	0.25	17	1.00	22	1.04	47	0.97	33	0.82
Optical, medical and scientific instruments	7	0.47	4	0.89	9	0.63	14	0.70	5	0.85
Retailers	9	0.08	6	0.33	5	0.81	6	1.15	9	0.64
Wholesalers	3	0.05	6	1.36	9	0.63	8	0.63		
Restaurant chains	6	0.12	7	0.64	5	0.45	3	0.68		
Health care and HMOs	4	0.17	4	0.31	6	0.89	3	0.14	7	0.60
Drugs and genetic engineering	6	0.10	10	0.51	11	0.78	9	0.98		
Miscellaneous business services	2	0.57	2	0.48	1	6.25	2	2.70	1	0.76
Airlines			1	0.46	2	0.32	1	0.97	2	0.46
Telephone, cellular and pager communications	3	0.60	3	0.37	2	0.71	3	0.16	4	0.83
Hotels and motels			3	1.18	1	0.46			3	0.89
Trucking and courier services	1	0.11	3	0.23	2	0.70	3	0.32	2	0.41
All other firms	80	0.63	55	0.47	48	0.97	53	0.82	49	1.10
All Offerings	167	0.49	166	0.63	155	0.89	191	0.87	155	0.90

Table 7 - Offerings by Underwriter Reputation and Venture Capital Ownership

	Venture Capital-Backed		Non-Venture Capital Backed		All Offerings	
	Offers	**Avg WR**	**Offers**	**Avg WR**	**Offers**	**Avg WR**
Prestigious Underwriter	170	0.99	382	0.85	552	0.89
Other Underwriter	55	0.58	404	0.60	459	0.60
All Offerings	225	0.89	786	0.72	1011	0.76

Table 8 - Value-Weighted Buy and Hold Returns by Industry – Value-weighted average buy and hold returns are calculated by weighting each firm's wealth relative by the gross proceeds of the offering. Equal-weighted average wealth relatives are also shown for comparison.

Industry Group	Firms	Value-Weighted Average WR	Equal-Weighted Average WR
Computer manufacturing	49	0.99	0.81
Communications and electronic equipment	85	0.68	0.74
Oil and gas	13	0.68	0.96
Financial institutions (banks and S&L's)	52	0.82	0.90
Computer and data processing services	159	0.81	0.79
Optical, medical and scientific instruments	43	1.12	0.79
Retailers	46	0.91	0.64
Wholesalers	34	0.75	0.73
Restaurant chains	21	0.51	0.45
Health care and HMOs	28	0.60	0.52
Drugs and genetic engineering	38	1.40	0.71
Miscellaneous business services	8	2.11	1.81
Airlines	9	1.31	0.75
Telephone, cellular and pager communications	21	0.44	0.51
Hotels and motels	13	0.79	0.83
Trucking and courier services	13	0.46	0.40
All other firms	379	0.87	0.77
All Offerings	1011	0.85	0.76

Table 9 - Hypothesis Tests – The following table summarizes tests of the null hypothesis:

$$H_0 : \mu_{WR} \geq 1$$

against the alternative hypothesis:

$$H_1 : \mu_{WR} < 1$$

for various sub-samples divided by industry, offering size, underwriter reputation and venture capital ownership.

Industry	Offers	Avg WR	Std Dev WR	t-statistic	5% Critical Val	Result
Computer manufacturing	49	0.81	0.96	-1.41	-2.01	Do Not Reject
Communications and electronic equipment	85	0.74	0.78	-3.07	-1.99	Reject
Oil and gas	13	0.96	1.07	-0.14	-2.18	Do Not Reject
Financial institutions (banks and S&L's)	52	0.90	0.28	-2.61	-2.01	Reject
Computer and data processing services	159	0.79	1.34	-1.94	-1.98	Do Not Reject
Optical, medical and scientific instruments	43	0.79	0.73	-1.91	-2.02	Do Not Reject
Retailers	46	0.64	0.70	-3.54	-2.01	Reject
Wholesalers	34	0.73	0.73	-2.12	-2.03	Reject
Restaurant chains	21	0.45	0.63	-3.94	-2.09	Reject
Health care and HMOs	28	0.52	0.53	-4.80	-2.05	Reject
Drugs and genetic engineering	38	0.71	0.83	-2.13	-2.03	Reject
Miscellaneous business services	8	1.81	1.92	1.20	-2.36	Do Not Reject
Airlines	9	0.75	0.67	-1.14	-2.31	Do Not Reject
All other firms	379	0.77	0.87	-5.03	-1.97	Reject
Telephone, cellular and pager communications	21	0.51	0.48	-4.68	-2.09	Reject
Hotels and motels	13	0.83	0.77	-0.79	-2.18	Do Not Reject
Trucking and courier services	13	0.40	0.28	-7.84	-2.18	Reject

Gross Proceeds	Offers	AVG WR	Std Dev WR	t-statistic	5% Critical Val	Result
$787,500 to $6,999,999	167	0.49	0.78	-8.44	-1.97	Reject
$7,000,000 to $13,499,999	166	0.63	0.70	-6.76	-1.97	Reject
$13,500,0000 to $22,499,999	155	0.89	1.02	-1.32	-1.98	Do Not Reject
$22,500,000 to $33,999,999	191	0.87	1.22	-1.44	-1.97	Do Not Reject
$34,000,000 to $53,999,999	155	0.90	1.00	-1.31	-1.98	Do Not Reject
$54,000,000 and above	177	0.78	0.58	-5.10	-1.97	Reject

Venture Capital Ownership	Offers	AVG WR	Std Dev WR	t-statistic	5% Critical Val	Result
Yes	786	0.72	0.81	-9.59	-1.96	Reject
No	225	0.89	1.23	-1.31	-1.97	Do Not Reject

Prestigious Underwriter	Offers	AVG WR	Std Dev WR	t-statistic	5% Critical Val	Result
Yes	552	0.89	1.03	-2.45	-1.96	Reject
No	459	0.60	0.75	-11.46	-1.97	Reject

Table 10 - Venture Capital Backing and Underwriter Reputation by Industry – The following table sho
offerings in each industry which had venture capital backing and a prestigious underwriter.

	All	Venture Capital Backing		Prestigious Underwriter		
Industry Group	**Firms**	**Firms**	**Percentage**	**Firms**	**Percentage**	**F**
Airlines	9	1	11%	6	67%	
Communications and electronic equipment	85	27	32%	54	64%	
Computer and data processing services	159	64	40%	109	69%	
Computer manufacturing	49	16	33%	23	47%	
Drugs and genetic engineering	38	16	42%	17	45%	
Financial institutions (banks and S&L's)	52	1	2%	7	13%	
Health care and HMOs	28	8	29%	15	54%	
Hotels and motels	13	0	0%	8	62%	
Miscellaneous business services	8	3	38%	4	50%	
Oil and gas	13	2	15%	10	77%	
Optical, medical and scientific instruments	43	16	37%	24	56%	
Restaurant chains	21	2	10%	5	24%	
Retailers	46	2	4%	25	54%	
Telephone, cellular and pager communications	21	3	14%	14	67%	
Trucking and courier services	13	3	23%	8	62%	
Wholesalers	34	6	18%	20	59%	
All other firms	379	55	15%	203	54%	
All Firms	1011	225	22%	552	55%	

Table 111 - Regression Results

Dependent variable – The natural logarithm of one plus the raw three-year buy-and-hold return (LRAWRET)

	Regression					
Variable	1	2	3	4	5	6
INITRET	-1.2246	-1.185	-0.95115	-1.1394	-0.84976	-1.1877
	(-4.930)	(-4.807)	(-4.185)	(-4.948)	(-2.479)	(-4.794)
SIZE	1.33E-09					
	(3.927)					
LSIZE		0.25331	-2.01E-02	0.2086	0.25051	0.22227
		(6.641)	(-0.4763)	(5.457)	(6.575)	(5.578)
MARKET	0.51484	0.51367	8.18E-02	0.38448	0.50815	0.55188
	(3.176)	(3.244)	(0.5538)	(2.483)	(3.242)	(3.457)
VOLUME	-3.71E-03	-3.91E-03	-4.62E-03	-4.92E-03	-4.62E-03	-3.51E-03
	(-1.298)	(-1.396)	(-1.783)	(-1.769)	(-1.641)	(-1.256)
PREISSUE	-1.6786	-2.0553	-1.6841	-1.9286	-1.9408	-2.0344
	(-3.158)	(-3.852)	(-3.423)	(-3.711)	(-3.696)	(-3.828)
PRESTIGE	0.47969	0.20673	0.30115	0.23768	0.23742	0.18977
	(5.646)	(2.145)	(3.333)	(2.500)	(2.478)	(1.968)
VENCAP	0.22585	0.22725	0.30528	0.1792	0.25583	0.23467
	(2.361)	(2.393)	(3.465)	(1.916)	(2.669)	(2.472)
STDRET			-28.321			
			(-11.66)			
COVRET				-1.5402		
				(-6.231)		
SECOND						0.47582
						(3.211)
TURNOVER					-0.17526	
					(-2.271)	
CONSTANT	-0.59751	-4.6411	1.456	-2.1291	-4.4275	-4.2176
	(-2.630)	(-6.925)	(1.803)	(-2.724)	(-6.601)	(-6.150)
R^2	0.146	0.164	0.272	0.197	0.173	0.169
Sample Size	1011	1011	1011	1011	1011	1011
Jarque-Bera Statistic	161.078	168.127	196.203	182.639	169.049	158.371

Table 8 (continued) – Regression Results

	Regression			
Variable	7	8	9	10
INITRET	-0.79642	-1.2251	-0.90923	-0.86612
	(-2.415)	(-4.939)	(-2.848)	(-2.695)
SIZE				
LSIZE	0.17771	0.22706	0.15676	0.15009
	(4.496)	(5.990)	(3.935)	(3.903)
MARKET	0.41663	0.41508	0.33668	0.32093
	(2.690)	(2.612)	(2.169)	(2.091)
VOLUME	-5.27E-03	-4.60E-03	-5.78E-03	-5.67E-03
	(-1.895)	(-1.695)	(-2.146)	(-2.061)
PREISSUE	-1.7932	-2.45	-2.1808	-2.1693
	(-3.522)	(-4.631)	(-4.279)	(-4.296)
PRESTIGE	0.25308	0.33824	0.3693	0.36665
	(2.693)	(3.545)	(3.925)	(3.878)
VENCAP	0.2165	0.24756	0.223	0.25232
	(2.290)	(2.537)	(2.287)	(2.691)
STDRET				
COVRET	-1.5118		-1.4672	-1.4352
	(-6.233)		(-6.063)	(-6.096)
SECOND	0.4417		0.44525	0.51683
	(3.019)		(2.988)	(3.541)
TURNOVER	-0.18108		-0.13435	-0.13231
	(-2.398)		(-1.787)	(-1.774)
COMPMFG		0.13151	8.87E-02	
		(0.6588)	(0.4463)	
COMM		-5.69E-02	-0.15561	
		(-0.3351)	(-0.9624)	
OIL		-8.51E-02	-0.14189	
		(-0.2904)	(-0.5176)	
BANK		1.0905	0.99529	1.0753
		(11.60)	(9.768)	(11.45)
COMPSVC		2.29E-02	2.00E-02	
		(0.1954)	(0.1707)	
MEDSCI		7.57E-02	0.11399	
		(0.4391)	(0.7550)	
RETAIL		-0.28079	-0.29256	
		(-1.614)	(-1.695)	
WHOLESAL		-0.21137	-0.18943	
		(-0.9725)	(-0.9115)	
RSTRNT		-0.41995	-0.3803	
		(-1.534)	(-1.497)	
HEALTH		-0.44941	-0.48609	
		(-1.851)	(-1.954)	
DRUGS		-0.27854	-0.10984	

		(-1.336)	(-0.5255)	
BUSINESS		0.76278	0.65157	
		(2.085)	(1.782)	
AIRLINE		-0.33528	-0.41074	
		(-0.6475)	(-0.8329)	
TELECOM		-0.68914	-0.67303	
		(-2.089)	(-2.204)	
HOTELS		0.14303	0.16815	
		(0.3570)	(0.4163)	
TRUCKING		-0.41043	-0.34525	
		(-2.159)	(-2.032)	
CONSTANT	-1.5616	-4.1135	-1.2213	-1.2245
	(-1.997)	(-6.088)	(-1.546)	(-1.603)
R^2	0.210	0.217	0.255	0.238
Sample Size	1011	1011	1011	1011
Jarque-Bera Statistic	169.765	168.967	163.045	166.625