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Long Run Underperformance of Initial Public Offerings: An Explanation

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Abstract

Initial public offerings, even though risky, typically underperform the indices for the first few years after offering. This can be explained by high divergence of opinion raising the initial market price, and by this divergence of opinion declining over time. With time, the valuation of the price setting marginal investor comes closer to the average investor's valuation. This theory also explains why the firms with the greatest underperformance are those with a short operating history, low sales, low prestige underwriters, low institutional ownership, high volatility, high underpricing at the time of issuance, listing on regional exchanges, and those in certain industries.

In the well researched US market, it has been discovered that initial public offerings (IPO's) underperform the market for the first few years after the offering, when return is measured from the start of trading until three to five years later. Such long run underperformance has also been reported for other markets.

This effect should be distinguished from the better known tendency for initial public offerings to be underpriced, and to hence undergo a sharp initial rise from the initial offering price to the start of trading (and hence to the first days close), an effect discussed in the same studies that document the long run underperformance (see references).

The argument will proceed in several stages. First the evidence for low returns from US initial public offerings will be summarized. Greater divergence of opinion will then be shown to raise prices. Higher prices alone lower the rate of return for any given stream of dividends. In addition, the divergence of opinion about the typical initial public offering declines over time, and this produces a decline in the stock price. It will then be argued that divergence of opinion declines after an initial public offering and that this can explain the long run underperformance.

It will be shown that a number of otherwise puzzling facts related to the cross-sectional variation in the magnitude of the long run price declines can be explained. These include the relationships between return and company size, age, industry, underwriter prestige, institutional ownership, exchange of listing, and initial volatility.

Long Run Returns to IPO's

Ibbotson (1975), after examining one random selected security from each month in the sixties, found a saucer shaped pattern. There were positive returns near the offering, followed by below market returns, with the fourth year returns tending towards normal. Performance for the first 48 months was below normal. The distribution of returns was highly skewed (most returns negative, but a few very high), indicating that these investments were individually very risky. Given the small sample size and the high standard deviations, the shortfall in performance was not statistically significant.

Ritter (1991) examined the returns from 1,526 initial public offerings made between 1975 and 1984. The three-year return was 34.47%. A control sample of 1,526 firms matched for industry and size returned 61.86% over the same three years.

Loughran (1993) examined the returns from 3,556 IPO's during 1967-1987 and found an average six year total return of 17.29% compared with 76.23% for the NASDAQ index during an identical period, showing results appreciably worse than Ritter had found for his three year tests. Strong underperformance was also found in comparison with firms of similar size on both the New York Stock exchange and on NASDAQ. A regression equation for July 1973- December 1988 had a statistically significant negative coefficient for having had a IPO within six years, even though the exchange and the book to market ratio were controlled for.

Later, Loughran & Ritter (1995) examined initial public offering from 1970-1990. They found that the average rate of return was only 5% per year for the five years after issuance, compared to 12 percent for firms of comparable size. The results are even worse for the median firms, where after five years, the 4,753 initial public offerings had a negative return of 39%, while the size matched firms had a positive return of 16% for the five years. The authors calculate that the forgone return was $39 billion dollars, making the underperformance of economic significance.

Servaes & Rajan (1997) examined initial public offerings from 1975-1987. They found a found a five year raw return of 24%. This represented a 47% underperformance when compared against NYSE/AMEX index, a 17% underperformance against the smallest decile from the NYSE/AMEX, and a 41% underperformance against firms matched by size and industry.

Research by Bravo & Gompers (1997; Gompers & Lerner, 1999) using a slightly different set of years found essentially the same magnitude of underperformance effects, with the underperformance greater for non-venture capital-backed companies. Teo, Welch, and Wong (1998) using firms going public between 1975 and 1984 found underperformance, showing in addition that firms using more aggressive accounting had greater underperformance. Aggarwal & Rivoli (1990) found that 1598 IPO's offered from 1977 to 1987 underperformed the US market by 13.73% over the first 250 trading days.

The underperformance has persisted even though it has been publicized in the business press. Forbes magazine (Stern, Richard & Bernstein, 1985, as cited in Ritter, 1991) found, after analyzing 1,922 IPO's priced over $1.00 issued from January 1975 to June 1985, that

"from its date as going public to last month, the average new issue was down 22% relative to the broad Standard & Poors 500 stock index."

It might be noted that most of these US studies involve overlapping time periods, and to a large extent are reporting on the same IPO's. The effect is robust because differing methodologies come to the same conclusions despite using different statistical methods (including controlling for a range of other variables). However, two US studies covered earlier periods. Simon (1989) found that IPO's offered from 1926 to 1933 listed on regional exchanges showed substantial underperformance over 60 months. Stoll & Curley (1970) found underperformance for 205 small issues in the fifties and sixties.

The underperformance is not limited to the United States. Levis (1993) examined the three year performance of 712 UK IPO's issued between 1980 and 1988 and found underperformance that varied between 8.3% and 23.0%, depending on the benchmark chosen. Uhlir (1988) found an underperformance of 7.4% after one year for German issues 1977-1987. Finn & Higham's (1988) examined 93 Australian IPO's for 1966-1978. They found that buying at the end of the listing month and holding to the end of the first year earned 6.52% below the indices, but that this loss was not quite statistically significant. Kunz & Aggarwal (1994) found 42 Swiss IPO's between 1983 and 1989 experienced an underperformance of 6.1%. Keloharju (1993) found that the average Finnish IPO lost 22.4% from the first market trading to three years later, versus 1.6% average decline for the market index. The US pattern of underperformance appears to extend to other countries.

The underperformance effect is not limited to developed countries, but also extends to emerging markets. Aggarwal, Leal, & Hernandez (1993) found that Brazilian IPO's had an underperformance of 47% after three years. For Chile, the underperformance after three years averaged 23.7%, while for Mexico the underperformance after one year was 19.6%.

Dawson (1987) examined the one year market adjusted returns for initial public offerings in Hong Kong, Singapore, and Malaysia during 1978-1984, and found those in Hong Kong were down 9.3%, and those in Singapore were down 2.7%. However, neither decline was statistically significant. In contrast, there was a positive, statistically significant overperformance in Malaysia of 18.2%. The author points out that the Malaysian index he used was not a market wide one, but an industrial one. The one exception to the pattern of underperformance is India where

Shah (1995) finds (in a large data set with 2056 IPO's from 1991-1995), that the IPO's typically outperform the market for the first 200 trading days, and then decline. After 400 days they are approximately at the level of the first trading day.

Thus, it appears that in most countries, IPO's underperform the market over periods of one to five years. The IPO studies mentioned typically do not adjust for risk (due to the difficulty of measuring risk when there is no trading history), but compare them to other stocks. IPO returns are much more variable than most stocks, with the mean return usually exceeding the median (a few large winners raise the average). Thus, because of their high risk (especially for undiversified individual investors who can not count on a portfolio with only a few securities including any of the big winners among the IPO's) one would expect them to outperform the indices. Even on a systematic risk basis (beta), IPO's appear to be riskier than average (see below). The major problem, which this article aims to provide a solution for, is to explain this long run underperformance.

The problem is to explain why this happens. A theory will now be proposed.

Divergence of Opinion and Price

The theory being offered to explain long run underperformance of initial public offerings is that the divergence of opinion about the value of the initial public offering typically declines over time. This causes the price of the stock to decline relative to its fair price (taken here to be the true present value of its future dividends). This effect is augmented by the IPO's typically having a large divergence of opinion, which in itself tends to raise the price and to lower the rate of return. To make this argument it is necessary to first show that divergence of opinion tends to raise prices.

The key empirical fact is that investors differ about the valuation of securities. This is not surprising given the difficulty of estimating the value of a security. While there is general agreement among theoreticians that the value should equal the present value of all future cash flows (see standard texts such as Elton & Gruber, 1995; Haugen, 1997; or Reilly & Brown 1994), disagreement occurs about relevant discount rates, and the estimates of dividends for each particular year. Thus, the usual efficient markets theory assumption of homogeneous expectations is unrealistic. It will be replaced here with heterogeneous expectations.

However, to make it clear that the argument does not depend on systematic errors, each investor's estimates will be assumed to be unbiased. If we averaged the estimates of value made by each investor, they would correctly estimate the present value of future dividends, although the investor may be wrong about any particular stock.

The bell shaped curve in the top panel of Figure 1 shows the distribution of investors' opinions about the stock's value. The value estimates are along the horizontal axis. The estimates reflect the maximum amount an investor will pay for the stock. The vertical axis shows the number of investors who hold a certain estimate of the stock's value.

<Insert Figure 1 about here>

Imagine for a moment that all investors who like a stock (i.e. believe it belongs in their portfolio at the current price) purchase one shares. Now start on the right hand part of the curve, and calculate the area under the curve to the right of the vertical line from the market-clearing rate. This area indicates the number of investors who believe the stock is worth purchasing at the current price. When multiplied by the typical number of shares an investor purchases (assumed to be one for the moment), the total number of shares bought is determined.

A demand curve can be derived from this data. The stock's price is where this demand curve intersects the supply curve (a vertical line indicating the number of shares issued). This is the economist's traditional model of price determination applied to stocks.

However, it is not necessary to actually draw the demand curve. Imagine an auction where the rate of return is dropped until there are just enough investors willing to hold the stock to fully absorb the existing shares. If each investor purchases one share, this is the number of shareholders the company will have. In practice, investors purchase more than one share, with the number depending on the size of the investor's portfolio and how diversified he wishes it to be. However, one can easily weight the investors by their wealth, or the number of shares they will purchase if they choose to include it in their portfolio. At the equilibrium rate price, the area marked represents the weighted number of investors required to hold the issued shares.

In examining the diagram, notice that the valuation of the marginal investor does not equal the valuation of the average investor (except by coincidence). For a symmetrical bell shaped curve, the average opinion is the valuation at the peak of the curve (the mode). Normally there are enough different stocks in a market that any one stock is purchased by only a minority of all investors. Thus, it follows that the marginal investor's estimate of value will be on the right hand side of the bell curve, as is shown in the diagram.

Given our assumption that the investor's opinions are unbiased estimates of the stock's value, it implies that the price setting marginal investor will have a willingness to pay that exceeds the typical market participant's valuation. If the typical market participant is presumed to have a correct estimate for the present value of all future dividends, it follows the price will exceed the present value of future dividends.

Marginal investors set the price of stocks, and these are the more optimistic investors. In simple terms, the optimists set the price. Who the optimistic investors are depends on the stock. An investor who is optimistic about one stock may be pessimistic about another stock. In the model being discussed here, where every investor has unbiased return estimates,[1] it is still possible for any particular investor to be wrong about a certain stock. The stocks in his portfolio will not be a random selection of all stocks, but will be those he is relatively optimistic about. The unbiasedness just means that over all stocks, the estimates are correct on average.

At times, the opinions of the optimists can differ sharply from the average opinion. A recent example of this is provided by the Internet stocks, which most current investors feel are grossly overvalued. Yet these stocks find buyers, and their prices remain high. This theory explains this overpricing by noting that the optimists about these stocks set the prices, and they are much more optimistic about these stocks than the average investor.

The basic idea here is merely an application of the idea of the winner's curse to the stock market (see Thaler 1992 for a discussion of the winner's curse).

Now let us do the thought experiment of imagining that the shape of the bell curve in the top panel of Figure 1 remains constant as the standard deviation of the curve declines. The lower panel of Figure 1 shows a stock with the same mean estimate of value as the stock in the

upper panel, but with a narrower distribution. The market-clearing price is marked on both diagrams. As can be seen, the price in the bottom panel is lower.

This diagram demonstrates a very important point. Holding all things equal, the lower a stock's divergence of opinion, the lower the price. The price is influenced not merely by factors that affect the average estimate of its future value and risk, but by the extent of the divergence of opinion. This is a factor that is not in the traditional capital asset pricing model.

It should also be noted that even when the divergence of opinion does not change over time, the greater the divergence of opinion the lower the anticipated return on the stock. This can be easily seen. The return over a period of time (here taken as one year for convenience) is by definition (Dividend + Capital Gain)/Purchase Price. The above argument shows that (all things equal) the greater the divergence of opinion, the higher the price of the security. However, from the definition of the rate of return, the higher the price of the security, the lower the rate of return.

Explaining Long Run Underperformance

Figure 1 shows that with a smaller divergence of opinion, the price is lower. It follows that if the divergence of opinion should decline (all other things equal), the stock price should also decline.

Divergence of opinion often declines in the years following an initial public offering. When a company is new, there is often great uncertainty about its future. Some investors will be much more optimistic than others. These optimistic investors will set the price. As a result, the divergence of opinion will be greater for an initial public offering than for the typical seasoned stock. The effect of this greater divergence of opinion is to raise the stock price and lower the return.

In addition, as the company develops an operating history, it becomes easier to forecast its future earnings and dividends. The divergence of opinion shrinks. This lowers the price relative to well-seasoned stocks given the same mean valuations by investors (as depicted in the diagram).

The above argument shows that speculators can expect to be disappointed. Even if their estimates of value are unbiased, they will suffer from a winner's curse effect in which the securities whose values they overestimate are disproportionately represented in their portfolio. The more speculative the security, as measured by the divergence of

opinion, the worse the performance is likely to be. Since risk and uncertainty are correlated with divergence of opinion (Miller 1977), divergence of opinion might be measured by the uncertainty about the returns from a security. To test this prediction it would be nice to have a measure of uncertainty. Such a measure is not readily available, but several surrogates will be discussed below.

Short selling

In countries where short selling is permitted, an additional effect may occur. The stock of initial public offerings cannot be sold short (except by the underwriters) at the start of trading. The reason is that the short selling process requires borrowing the certificates in order to make delivery. However, it takes a while for the underwriter to actually distribute the shares, and until this process is completed the stock is not available for lending. Of course, in many countries short selling will appear after the start of trading, and this short selling will lower the price a little. However, since the quantity of short selling in all countries is small, this effect is limited, even in countries where there are institutions for short selling. In many emerging markets short selling is not possible.

Going through the descriptions of third world markets in Price (1994), among the markets for which security borrowing is not available are Brazil, Chile, Columbia, Hungary, Poland, Greece, Turkey, Korea, Taiwan, Indonesia, Malaysia, Philippines, Thailand, India, Pakistan, and China. In other countries it is indicated as available, but rare. For instance, the phrase describing securities lending for Argentina is "permitted, but not frequently used," and for Venezuela "While securities lending is not specifically prohibited by law, it is rarely practiced". Selling short requires, among other things, the ability to borrow securities to deliver after the short sale. Later, securities are bought in the open market to replace the borrowed securities, and the short position is closed out. Institutions for borrowing are available in the US and other developed markets (although not all stocks can be borrowed, and the borrower frequently sacrifices part or all of the return on the proceeds of the short sale).

Seasoning

However, there is another factor. In financial theory, the value of the stock is the present value of the future dividends. Admittedly, the greatest divergence of opinion about an initial public offering will be about its future operating success, and hence its dividends. However, the

present value also depends on the rate of discount. The rate of discount in turn depends on the beta of the stock, and on how easily and at what cost it can be traded (its liquidity, for short). For seasoned companies with a trading history, the beta and the liquidity can be estimated fairly well from historical statistics, and investors do not disagree much. However, an initial public offering, by definition, lacks a trading history. Investors may differ in their estimates of the beta, and how easily and at what cost the stock could be traded in the future. Those that think it will have an illiquid market will be willing to pay much less than those who anticipate a very liquid market. Occasionally, there is even uncertainty about whether it will be accepted for exchange listing. After the public offering, a trading history develops and the divergence of opinion diminishes about the cost of trading the security, its liquidity, and its beta. Divergence of opinion theory predicts, all things equal, that this seasoning should lower the price. In contrast, the capital asset pricing model predicts that seasoning should raise the price by reducing the uncertainty.

Testing the Theory

As was pointed out in the introduction, what is predicted here is just what is observed. IPO's underperform the market for the first few years.

The above model makes other predictions, predictions that deal with which initial public offerings would decline most over time. The theory can be tested not only by observing whether initial public offerings show long run underperformance. It can also be tested by whether it can explain the cross sectional (across IPO's) pattern of underperformance.

The theory predicts that the greater the initial divergence of opinion and uncertainty, and the greater the diminution over time, the more the security should underperform the market. Because most initial public offerings represent relatively new businesses, and are frequently in new industries, the divergence of opinion typically diminishes over time. However, initial public offerings differ as to how uncertain their futures are.

The model predicts that the underperformance should be greatest for the initial public offerings having greatest initial uncertainty about their true value. Since there are no direct measures of uncertainty about the value at the time of the initial offering, it is necessary to find variables

that proxy for the degree of initial uncertainty. An obvious proxy for the degree of risk at the time of issuance is the risk right after the IPO.

Evidence that seasoning occurs and risk declines over time

Shah (1995) calculates the standard deviation of returns as a function of the days from the start of trading for a large sample of Indian IPO's and shows that the returns are much more variable for the first few days of trading, which he interprets as a period during which the market is seeking the proper price for a security.

Direct evidence that the risks of IPO's decline over time is provided by Finn & Higham's (1988) study of 93 Australian IPO's. They found the beta was a very high 3.35 for stocks in their first month, but only 1.45 for all stocks within two months of their issue. It is clear that the economic risk of the business does not decline this much over the first month. This reduction in beta reflects a process of seasoning that is probably due to a reduction in the divergence of opinion about the stock. After the first few months, the beta varies month to month with a low of 1.12 in the fifth month (and with beta through the twelfth and last month of the study being 1.32). Similar results were reported by Clarkson & Thompson (1990) who found that beta declined over the first 25 days and the first 20 months for a 1976 to 1985 sample of 198 US IPO's. For the daily data, the beta declined from about 3.1 for the first day to slightly over one. For the monthly data it declined from 3.5 month to about 1.2 (read from the graphs) after 10 months.

Ritter (1991) reports that the beta averaged 1.39 for the first year, 1.24 for the next year, and 1.14 for the third year, again showing the tendency for beta risk to decline over time. Betas for all three years are above unity. Part of these higher betas probably reflect the industry and size of the firms, since the betas for the matched firms were 1.14, 1.13, and 1.04 respectively. However, the betas for IPO's still appear to be higher than for seasoned firms.

By definition, beta is the correlation coefficient of the stock's return with the market's return multiplied by the ratio of the standard deviation of the stock to the market's standard deviation. It is likely that the beta decline is primarily due to a decline in the variability of the stock price, and the process of seasoning. Seasoning in the model presented is accompanied by a decline in uncertainty and in divergence of opinion. It might be noted that the capital asset pricing model would predict that the decline in beta with time would be accompanied by an increase in price,

which would cause initial public offerings to outperform the market, which is the opposite to what is observed.

If the variability in the stock price is interpreted as a measure of the divergence of opinion, the prediction is that the price will decline over time with the variance. This is what is observed.

Volatility

In finance, price and return volatility is frequently used as a measure of risk and uncertainty, surrogates for the divergence of opinion. Also, the greater the divergence of opinion, the greater the sensitivity to random buying and selling (reflecting a greater slope to the demand curve). Thus price and return volatility can serve as surrogates for divergence of opinion. Of course, volatility cannot be measured before a company goes public, but it can be measured afterwards.

Ritter (1984) measured volatility by the daily standard deviation of the returns in the first 20 days after the initial public offerings. He documented that as this measure of volatility correlates with the return on the initial offering (The return rises from 6.4% on the least volatile issues up to 59.5% for the most volatile issues).

Carter, Dark, & Singh (1998) have also found that the standard deviation of 2, 292 1979-1981 IPO's (over the first 225 days commencing 6 days after the offer) has a statistically significant (one in a hundred level) effect on the initial underpricing of IPO's (i.e. how much they jump from the offering price to the price on the first day of trading. More relevant to the subject of this article, the same standard deviation also predicts the underperformance found over the first three years. This observation is as predicted by divergence of opinion theory.

Initial return, uncertainty, and underperformance

Beatty and Ritter (1986, p. 216) have argued that "the expected underlying underpricing of an initial public offering increased as the ex ante uncertainty increased." In an appendix they use Rock's (1986) theory[2] for the equilibrium underpricing to show this mathematically. His 1986 paper provides empirical support for this proposition.

Ritter (1991, Table V) divides the initial public offers in his 1975-1984 sample into five quintiles by the extent of the initial underpricing, and shows that the underperformance in the quintile with the greatest initial return (over 23.7%) had the lowest total return over three years. These firms return was only 9.45%, while the matched firms had averaged a three year return of 61.39%. For the next quintile (initial

returns from 23.70% to 8.105%), the IPO's had a three year performance of 27.94%, while the matched firms were up 65.52%. The remaining three quintiles did not differ greatly in the extent of their three year performance (from 41% to 48%), although they still showed appreciable underperformance. Interestingly, the effect was concentrated among the smaller IPO's, those with gross proceeds under $7.5 million. Size is itself another surrogate for difficulty of predicting the future of a company, and for divergence of opinion. (The offerings with lower gross proceeds are often of start up firms who do not yet have an established history of operations.)

In a multiple regression for explaining three-year returns, Ritter (1991) found that initial return had the predicted negative sign, but the effect was not statistically significant. This is probably because the other variables in the equation (market return, age, volume of IPO's in that year, and oil and financial institution dummies) picked up much of the effect of uncertainty about the offering. Let us discuss these other variables.

Size and underperformance

In discussing the initial underpricing of IPO's, Ritter (1984, p222-223) comments that "One proxy for the difficulty of valuing a firm is how established it is, where one could use the age of the firm, the book value of equity, its annual sales, or some combination of these to define established. For small firms with little or no operating history, it seems clear that there would be a great deal of uncertainty regarding the appropriate price per share, subjecting an uninformed investor to the adverse selection problem that ,. . . forces issues to underprice their offerings substantially. More established firms are presumably easier to value, and one would expect that, on average, less money would have to be left 'on the table' to compensate investors for evaluating established firms than for startups." He notes that the firms with low sales tended to be startup firms with a long history of operations.

On this reasoning Ritter (1984) uses sales as a surrogate for risk.[3] He finds that the firms that had sales of less than $500,000 (in the most recent twelve month period before going public) had an initial return of 43.4% while firms with sales over $4,000,000 had an initial return of 9.6% (the intermediate category had returns of 18.3%). Sales is one measure of size, value is another.

Later, Loughran & Ritter (1995) reported that when all the initial public offerings (in their sample) from 1970 to 1990 were weighted by value, the value weighted buy and hold return over five years was 34% (versus 67% for the matching firms). They (p. 38) comment that, "This is higher than the equally weighted 16% average returns for the 4,753 IPO's going public from 1970-1990, reflecting the pattern that the smaller offerings (frequently more speculative firms) underperform by more than the large firms." This is as the theory would predict.

Bravo & Gompers (1997) also found that the underperformance was greatest for the smallest (by market value) initial public offerings. For non-venture capital backed firms in the smallest size quintile, the five-year return was actually negative. Likewise, Keloharju (1993) found that for Finland the smaller IPO's did appreciably worse than the other IPO's, compared to an equally weighted index.

The smallest issues are likely to be from the newest, least established firms. A firm starts as an idea in someone's head. The closer a firm is to the idea stage of its life history, the smaller the sales, the smaller the total investment, and the lower its market value. The same conclusion would be reached if one discounts the present value of operating profits. The further in time the firm is from its anticipated full size, the smaller the present value of its future profits. Thus, by several arguments it appears the small initial public offerings will be the most speculative ones, the ones with the greatest divergence of opinion, and the ones expected to underperform the most.

Firm age

Ritter (1984, p223) comments on the relationship between difficulty in valuation and long run underperformance that "this relation is not sensitive to the categorization adopted, and it also holds for other risk proxies, such as the age of the firm." The age of the firm is probably the best proxy for the initial uncertainty about its future. The future of start-ups and near start-ups is notoriously hard to predict.

Later, Ritter (1991) tabulated returns by age to find that the three year wealth relatives (value compared to a portfolio of matching firms) increased monotonically with age. His wealth relatives measure how the wealth from investing in IPO's compares to the wealth one would have had from investing in the comparison firms. Wealth relatives rose from a low of .623 for firms aged 0 –1 year (at the time of the IPO) to 1.142 for firms aged over 20 years. The pattern was still montonically increasing

when oil and gas firms (which had the worst performance of any industry, combined with an average age of only 2 years) and financial institutions (which had the best performance, combined with an average age of 49 years) were excluded. Thus, the effect was not due to these two industries. In a multi-variable equation for explaining three-year IPO returns, the log of 1 plus age was statistically significant (.01 level).

Fields (1995) investigated the role of age, using even more IPO's, (2793) IPO's from 1979-1989. Wealth relatives (Table 9) after three years were .76 for firms 0-1 years in age at the time of going public, and .72 for firms 2-5 years in age when they went public. These were essentially startups. In contrast, firms aged over 16 years, which were presumably well seasoned, actually outperformed her comparison firms, with a wealth relative of 1.07.

The finding she emphasized was that IPO's with the larger institutional ownership (another measure that can be viewed as a surrogate for risk and divergence of opinion) outperformed those with smaller institutional ownership. She, as have others, found that three year buy and hold returns were highest for the largest IPO's (measured by capitalization, another surrogate for divergence of opinion).

In a multiple regression framework with one digit industry dummy variables and 43 dummy variables for time, institutional ownership, age (in log form), and size were all statistically significant. The statistically significant effect for age is predicted by divergence of opinion theory, but not by other theories. As noted, institutional ownership and size can be interpreted as surrogates for the degree of uncertainty about a stock's value.

Industry

Industry is another plausible surrogate for difficulty in forecasting. Certain industries (notably the high tech ones) are notoriously hard to forecast, while other industries are easier to predict. Bravo (1998) found that statistically significant underperformance was found in all but three industries: financial institutions, insurance, and restaurant chains. These are industries where people might agree more about methods of valuation and the future of companies, than for other industries. Ritter (1991) also found that financial institution's IPO's outperformed the matching firms (achieving a three-year wealth relative of 1.433). The difference between financial institutions' IPO's and other IPO's was statistically significant (at the one in a thousand level). He comments (p.

17) “Most of the financial institution IPO’s involve mutual saving banks and mutual saving and loan associations converting to stock companies after a 1982 regulatory change.” The average age of the issuing financial institutions was 49 (no other industry had an average age of over 8 years). There is probably relatively little divergence of opinion about the futures of such long established firms, and the little that exists is unlikely to diminish much after the offering. Thus the absence of underperformance for this industry is quite consistent with divergence of opinion theory.

Underwriter reputation

Carter, Dark, & Singh (1998) and Nanda, Yi, & Yun (1995) have shown that underwriter reputation is related to the long run performance of IPO's. It is very likely that the underwriter’s reputation reflects the quality of the information available, and that the IPO’s underwritten by lower reputation underwriters have greater divergence of opinion. The reason is that the underwriters with better reputations have more to lose from a failed underwriting, and as a result they refrain from underwriting IPO’s whose future is very uncertain or whose returns are hard to predict.

Exchange of listing

Simon (1989) found that IPO's offered from 1926 to 1933 listed on regional exchanges showed substantial underperformance over 60 months, while this was not true for IPO's listed on the New York Stock Exchange. The IPO's listed on the regional exchanges had a cumulative 60 month performance of -52% (a footnote states this was a simple sum of the monthly abnormal returns, and that these compounded to -39%), with over 85% of the firms (30 out of 35) suffering significant losses. A simpler model where returns were only adjusted for the market return (no adjustment for beta, industry etc.) showed a cumulative negative performance for the regionally listed firms of 74%, but a negative performance of 22% for the NYSE listed firms (statistically significant at 10%). The most likely reason for the performance varying with the exchange is that the New York Stock Exchange had listing and disclosure requirements, but the regional exchanges did not. These listing requirements would have forced the most speculative IPO's onto the regional exchanges. In particular, the New York Stock Exchange’s requirements for historical data would have eliminated start up firms with only a short operating history. Also, the information disclosed probably served to reduce the divergence of opinion for the New York

Stock Exchange listed IPO's. After the imposition of the Security and Exchange Commission regulations, the difference in performance among the exchanges disappeared.

Implications

The empirical evidence shows that IPO's typically underperform the markets. This paper has explained why. The obvious implication for investors is that they should avoid investing in initial public offerings if they cannot get them at the issuance price (which is typically below the price at which they begin trading). If they do get them at the issuance price, it would probably be wise to "flip" them at the first practical opportunity (i.e. once there is no longer a threat of the underwriter penalizing them). In quantitative models (Jacobs & Levy 1988, for instance) for predicting returns from stocks, one variable should be whether the issue has had an initial public offering in the last few years.

At a more sophisticated level, investors need to recognize they are vulnerable to a winner's curse effect. For the investor in well seasoned stocks the bias is likely to be of similar effects at both the buying and selling ends, leaving little effect on the capital gain. However, as discussed above, investors in initial public offerings should expect that the divergence of opinion should decline over time, adversely affecting their returns. Thus, in making estimates of the returns to be expected from IPO's, some adjustment for this effect would be appropriate.

The problem is exactly how to adjust for the effect. As the above discussion showed, it is not enough to make unbiased estimates of the returns from investments. Even with these investors will typically be disappointed. The reason is that investments are not made randomly, but are conditional on the investor believing the stock offers high risk adjusted returns. This means that stocks whose returns have been overestimated are more likely to be included in the portfolio than stocks whose returns have been underestimated. As a result the returns on stocks conditional to being included in the portfolio tend to be less than expected. This effect is especially important for IPO's where the divergence of opinion is especially high.

How is the potential investor to protect himself against this effect. The problem has been discussed in the context of capital budgeting (Miller1978, forthcoming). Investing is after all merely another example of capital budgeting. A solution can be based on Bayesian methods. The estimates made with the traditional methods of security analysis are

combined with the prior information that arises from the knowledge that one is exposed to the winner's curve effect. Bayesian statistics provides an optimal way to combine information from the two sources. The combined information can then be used for making decisions about investing in IPO's.

Conclusions

The above shows that divergence of opinion is capable of explaining the underpricing of initial public offerings. Divergence of opinion theory had earlier been applied to explaining the long run underperformance of IPO's (Miller 1977), an explanation that had been noted by several commentators including Ritter (1991). It is now (and apparently for the first time) used to explain why firms with the greatest underperformance are those with a short operating history, low sales, low prestige underwriters, low institutional ownership, high volatility, high underpricing at the time of issuance, listing on regional exchanges, and in certain industries. This adds to the list of effects the theory can explain, since it had earlier been shown to be able to explain the discounts on closed end funds, the wealth creating effects of spin-offs (Miller 1995), and the flatness of the security market line (Miller 1999).

A decline in divergence of opinion can be expected to lower prices, all things equal. Normally the divergence of opinion declines during the years following an initial public offering. This causes the valuation of the price setting marginal investor to move closer to the valuation of the average investor. This is why initial public offering often underperform the overall markets

The extent of the long run underperformance is predicted by various variables that serve as surrogates for the extent of divergence of opinion. It is strongest for the firms with short operating histories, with low sales, low capitalization, underwritten by low prestige underwriters, avoided by institutional investors, very volatile at the start of trading, and very underpriced at the time of issuance. Divergence of opinion theory predicts all of these effects, while no other theory does so.

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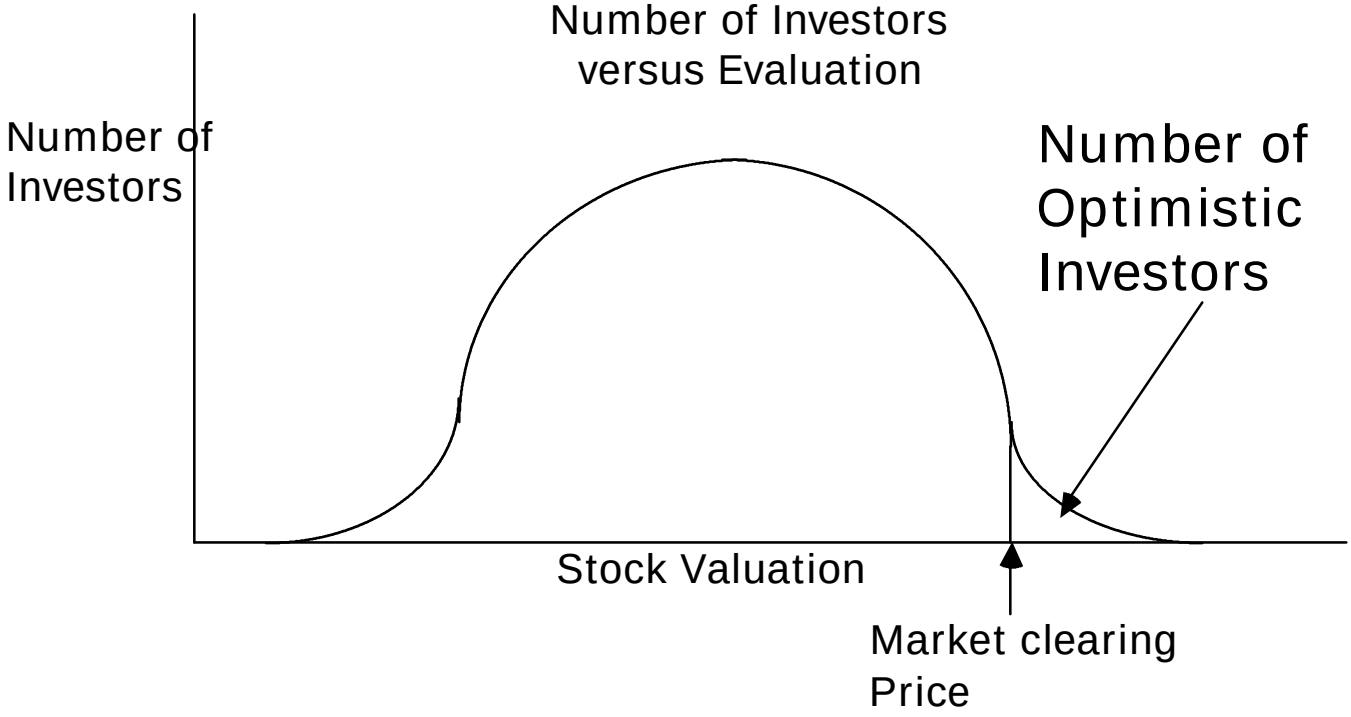
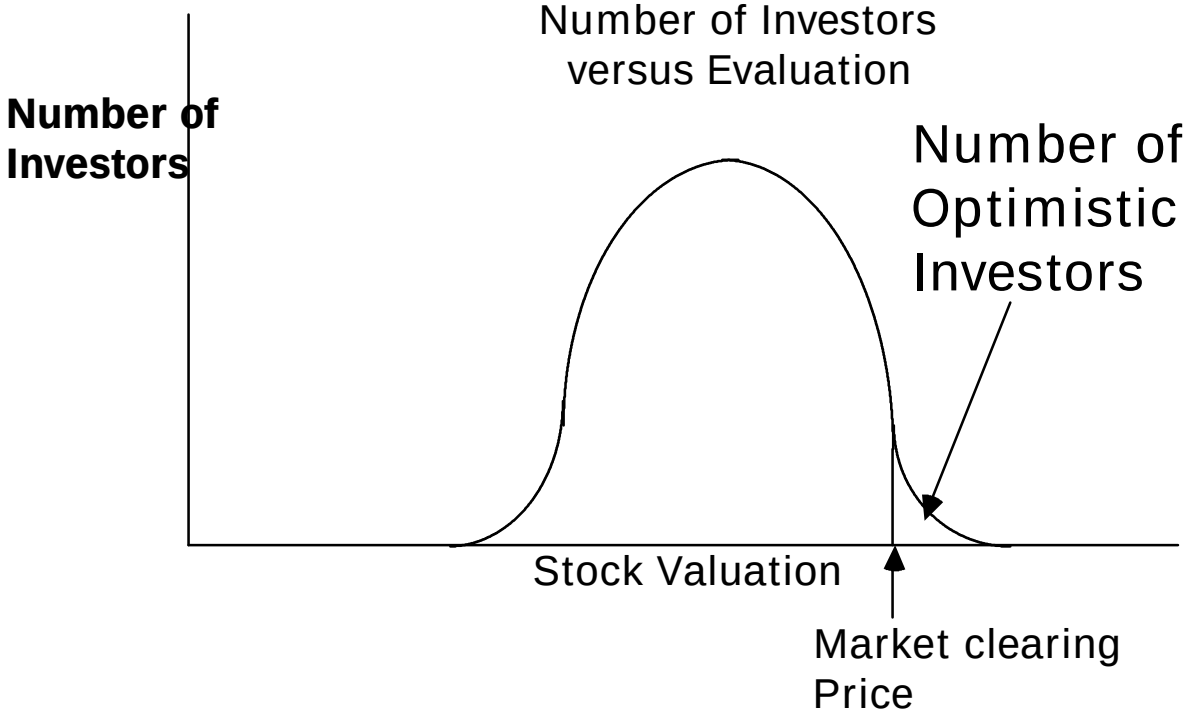
Figure 1
Number of Investors
versus Evaluation





Endnotes

[1] In this model, the potential (but not the actual) investor's estimates of the rates of return are presumed to be unbiased estimates of the returns actually to be earned. This is to say that if every investor's estimate of all returns are averaged, and the experiment is repeated many times, the average will approach the correct value. This is probably the most favorable assumption that could be made for the efficient market hypothesis. Notice, it is being presumed that errors are being made, but that for every positive error there is a equally common negative error.

[2] Since this is not a paper about the underpricing of IPO's, Rock's theory will not be discussed in detail. However, for those curious it also involves a winner's curse effect in which the less informed investor's get relatively less of the more oversubscribed IPO's. To keep them willing to purchase IPO's the investment banks must underprice, on average, IPO's. Notice that a winner's curse is involved in both the subject of this paper, and in Rock's theory, providing one reason why the initial underpricing and the long run underperformance should be correlated.

[3] For all firms sales would not be a good surrogate for risk. However, sales are a good surrogate for risk in initial public offerings because firms with expected sales as small as $500,000 would normally attract too little trading to support a public market. Thus, the only firms with recent sales this small that are taken public are those in a start up stage that are expected to eventually have much greater sales. It is notoriously hard to forecast the future sales, profits, dividends, and stock prices for such start-ups.