Pseudo Market Timing and the Long-Run Underperformance of IPOs

Paul Schultz

University of Notre Dame

April, 2002.
PRELIMINARY. DO NOT QUOTE WITHOUT AUTHORS PERMISSION.

Comments of Robert Battalio, Utpal Bhattacharya, Long Chen, Shane Corwin, Eugene Fama, Margaret Forster, Charles Hadlock, Craig Holden, Naveen Khanna, Tim Loughran, David Mayers, Wayne Mikkelson, Ralph Walkling and an anonymous referee and seminar participants at the University of Notre Dame, Indiana University and Michigan State University are gratefully acknowledged. Special thanks go to Jay Ritter for encouragement and numerous comments. Blunders etc are the sole preserve of the author.

Abstract

Numerous authors document long-run underperformance by firms following initial public offerings or seasoned equity offerings. In this paper, I show that such underperformance is very likely to be observed ex-post even in an efficient market. The premise is that more firms issue equity at higher stock prices even though they cannot predict future returns. Ex-post, issuers will seem to time the market because there will usually be more offerings at market peaks than when stock prices are low. Simulations using parameters estimated from 1973-1997 data reveal that when ex-ante expected abnormal returns are zero, median ex-post underperformance for equity issuers will be significantly negative when calculated in event-time.

In a seminal study, Ritter (1991) shows that initial public offerings (IPOs) underperform relative to indices and matching stocks in the three to five years after going public. Similar underperformance following seasoned offerings is reported by Loughran and Ritter (1995), Spiess and Affleck-Graves (1995), Lee (1997) and others. At the aggregate level, Baker and Wurgler (2000) find that stock market returns are lower following years when equity accounts for a large proportion of total financing.

The poor performance of IPOs has also been documented for other markets and other times. Arosio, Giudici and Paleari (2001), Keloharju (1993), Lee, Taylor and Walter (1996), Levis (1993) and others report poor long-run performance in a number of other countries. Gompers and Lerner (2000) show that IPOs issued between 1935 and 1972 performed poorly in the years after issue. Schlag and Wodrich (2000) report poor long-run performance even for German IPOs issued before World War I.

Ritter (1991), Lerner (1994), Loughran and Ritter (1995, 2000), Baker and Wurgler (2000) and Hirshleifer (2001) discuss a behavioral explanation for poor performance subsequent to equity offerings. They suggest that stock prices periodically diverge from fundamental values, and that managers and investment bankers take advantage of overpricing by selling stock to overly optimistic investors. While this explanation is broadly consistent with the evidence, it is an anathema to those who believe markets are efficient. Indeed, it strikes at the reason market efficiency matters - without it, markets will fail to allocate capital optimally.

Others suggest that when we measure excess returns properly, the evidence for long-run underperformance following offerings disappears. Brav, Geczy and Gompers (2000) find that post-issue IPO returns are similar to those of firms with similar size and book-to-market characteristics, and that seasoned equity offering (SEO) returns covary with similar nonissuing firms. Eckbo, Maulis and Norli (2000) show that leverage and its attendant risk is significantly reduced following equity offerings while liquidity is increased. They claim that, as a result of these changes in leverage and liquidity, firms that have recently issued equity are less risky than benchmark firms. Those who favor behavioral explanations for underperformance point out that IPOs have significantly underperformed market indices however, and few would claim that IPOs are less risky than an average stock.

Much of the empirical work on long-run performance following equity issues is based on event-time returns. That is, performance statistics are calculated across stocks for periods of time following offerings even though the offerings took place at different times. This technique weights offerings equally. An alternative is to use calendar-time returns. That is, performance is calculated for recent equity issuers for calendar months. This technique weights months equally, even though offerings cluster in time. Poor performance has been found in both calendar-time and event-time, but it is well established that underperformance is much greater when calculated in event time. Risk-based explanations for underperformance are silent on why equity issuers should perform particularly poorly in event-time but behavioralists consider it a key piece of evidence for their explanation. If managers can time the market, offerings should cluster when stock prices are particularly high and returns should be particularly poor following periods of heavy issuance.

In this paper, I examine a phenomenon that I refer to as pseudo market timing and show that it can explain the poor event-time performance of stocks that have recently issued equity. The premise of the pseudo market timing hypothesis is that the more firms can receive for their equity, the more likely they are to issue stock even if the market is efficient and managers have no timing ability. In this case, equity sales will be concentrated at peak prices ex-post, even though companies cannot determine market peaks ex-ante. As a result of this pseudo market timing, the probability of observing long-run underperformance ex-post in event time may far exceed 50 percent. Simulations using the distribution of market and IPO returns and the relation between the number of offerings and market levels over 1973-1997 reveal that underperformance of more than 25 percent in the five years following an offering is neither surprising nor unusual in an efficient market.

The remainder of the paper is organized as follows. Section I provides a simple example of pseudo market timing. In Section II I estimate the relation between the number of IPOs and the level of indices of past IPOs and the market. I then simulate sample paths of stock returns and IPOs and show that observed underperformance is not unusually large given realistic parameters. In Section III I discuss how other aspects of IPO and SEO performance are consistent with the pseudo market timing explanation for long-run underperformance. Section

IV offers a summary and conclusions.

I. Pseudo Market Timing

A. A simple example.

The premise of the pseudo market timing hypothesis is that more firms issue equity as stock prices increase even though managers cannot predict future returns. This could be because higher stock prices imply more investment opportunities and firms go public to take projects. However, the reason why higher stock prices result in more offerings is unimportant for the pseudo market timing explanation. Firms could issue more equity at higher prices because they believe it results in less earnings dilution, because they incorrectly believe stock prices are too high, or for any other reason. What is important is that managers in effect use trigger prices to determine when to issue equity. Empirical evidence is consistent with this assumption. Pagano, Panetta and Zingales (1998) show that the median market to book ratio of publicly traded firms in the same industry is an important determinant of when Italian firms go public. Loughran, Ritter and Rydqvist (1994) find that the number of IPOs increases with the level of the market in 14 of the 15 countries they study.

Pseudo market timing is best explained with an example. To keep things as simple as possible, I examine one-period returns following offerings rather than multiperiod returns. I assume that the market earns a return of zero and the aftermarket return of IPOs is equal to the market return plus an excess return of either + 10 percent or - 10 percent. Positive and negative excess returns are equally likely, and are unpredictable. Private firms that are potential IPOs are assumed to earn the same returns as recent IPOs. For simplicity, the price of all recent IPOs and the per share value that all private firms could get for an IPO is the same. At time zero it is $100. For this example, we assume that no companies go public if stock prices for potential IPOs are $95 or less, there is one IPO if prices are between $95 and $105, and three IPOs if prices exceed $105. We consider the number of IPOs issued in periods zero and one, and examine their single-period aftermarket excess returns. With two possible IPO excess returns each period, there are $2^2 = 4$ equally likely possible paths offerings and excess returns. Each row of Table I corresponds to one of these paths.

Consider the price path shown in the first row of the table. This is the one in which the IPOs earn positive excess returns each period. At time 0, IPO stock prices are $100 and one firm goes public. The IPO earns an excess return of 10 percent the following period. At time 1, with an IPO price of $110, three additional firms go public. Each of these IPOs earns an excess return of 10 percent. In total, for this path, there are four IPOs; one at time 0 and three at time 1. If we calculate event-time average excess returns, we weight each individual IPO equally and find mean excess returns of 10 percent following IPOs.

Of course, there are four equally likely stock price paths and only one will occur. Table I reveals that when average aftermarket excess returns are calculated in event time, that is weighting each IPO's return equally, mean excess returns are positive for one path and negative for three paths. Thus even though the expected aftermarket return for any individual IPO is zero, there is a 75 percent probability that the observed mean aftermarket return will be negative. This occurs because of pseudo market timing: there are more offerings when IPO prices are higher. This is illustrated in the second row of the table. On this path, excess returns are positive for IPOs that go public in period 0 and negative for IPOs in period 1. However, because of the rise in stock prices, there are more IPOs issued at time 1 than at time 0. Thus in event time, the mean excess return across all IPOs on this path is negative. Notice however that if excess returns were calculated in calendar time, that is weighting each of the two months equally, the mean excess returns of the IPOs would be zero.

I reiterate that managers have no timing ability. In this example, the decision to go public is a response to current price levels; it is not made because future returns are predictable. As an illustration, two of the paths in the example have a stock price of $110 at time 1. On each of the paths, three IPOs are issued at time 1. The aftermarket excess return for IPOs issued at time1 is positive for one of the paths and negative for the other. Ex-ante, the number of IPOs is uncorrelated with future excess returns.

I emphasize that although the probability of observing a price path where equal-weighted aftermarket returns are negative is 75 percent, an IPO is never a bad investment ex-ante. To see this, note that if you weight each of the four price paths by the number of IPOs on each, the expected return is zero. Those price paths with the highest excess returns also have the most offerings.

Although this example is simple, it captures the key features of pseudo market timing. First, the likelihood of observing negative abnormal returns in event time far exceeds 50 percent even though the ex-ante expected excess return of every IPO is zero. This is because the number of IPOs increases with higher stocks prices and, ex-post, IPOs will cluster when prices are near their peak. Second, excess returns are negative in event time and zero in calendar time.

This example, and pseudo market timing, rely on two important but realistic assumptions. First, it is assumed that at higher levels of stock prices, more firms will go public. Second, it is assumed that excess returns of IPOs are positively correlated cross-sectionally. Other simplifying assumptions are unimportant. The results are unchanged if more than two periods are considered, if aftermarket returns are calculated over more than one period or if the market earns a non-zero return. The example becomes much more complicated though.

Another way to think of pseudo market timing is that investing in IPOs is like a game in which you double your bet if you win. If IPOs perform well, the market increases (Adoubles@) its bet the next period as even more firms go public than in the previous period. With a strategy of doubling your bets, the probability of going broke approaches 100 percent even though each bet is fair. Similarly, if the number of IPOs increases after IPOs have done well in the aftermarket, the likelihood of losing money on average is high, even though each IPO is a fair bet.

Although the example employed here used only two periods, pseudo market timing is not a small sample bias. In fact, underperformance is more likely to be observed in a long time series than a short one. To demonstrate this, I rely on simulations of a binomial model like the one in the example of Table I. I assume that each period, excess returns on recent issuers will be either +5% or - 5%, and positive and negative excess returns are equally likely. I assume that the number of offerings each period is determined solely by the price level of potential issuers. If stock price rise, the number of offerings the next period increases by ? %. If prices fall, the number of offerings decreases by ? %. Results of these simulations are shown in Table II.

The length of time series used in the simulations varies from 20 to 5,000. As shown in the table, the likelihood of observing underperformance increases steadily with the length of the time series. When ? = 20%, the likelihood of observing underperformance is high, reaching

84.2% with 100 observations and 98.6% with 5,000. When ? = 10%, the likelihood of underperformance is 69.7% with 100 observations and 97.0% with 5,000. Pseudo market timing is not a small sample problem.

B. Pseudo Market Timing and Expected Long-Run Abnormal Returns

It is very difficult to calculate the effect of pseudo market timing on the likelihood of observing negative abnormal returns following IPOs. Hence a simple binomial example was used in the previous section to illustrate that the chances of observing negative abnormal returns may far exceed 50 percent. It is much easier to show how pseudo market timing affects the expected value of long-run abnormal returns. Ritter (1991), Spiess and Affleck-Graves (1995) and others estimate average long-run cumulative abnormal returns around equity offerings as follows:

$$\overline{CAR} = \sum_{e=1}^{E} \frac{\left[\sum_{j=1}^{N} (r_{j,e} - r_{m,e}) \right]}{N} \qquad (1)$$

Where N is the total number of IPOs or SEOs, E is the number of event months, $r_{j,e}$ is the return of stock j for event month e and $r_{m,e}$ is the return of the of the market or matching stock for event month e.

Now consider the expected cumulative abnormal return. It is the expectation of the product of the total abnormal return, that is the numerator of (1), and 1/N. From elementary statistics, the expectation of a product is the product of the expectations plus the covariance. Thus

$$E(\overline{CAR}) = E\left(\frac{1}{N}\right) E\left[\sum_{e=1}^{E} \sum_{n=1}^{N} (r_{j,e} - r_{m,e})\right] + Cov\left(\left(\frac{1}{N}\right)\left[\sum_{e=1}^{E} \sum_{n=1}^{N} (r_{j,e} - r_{m,e})\right]\right) \qquad (2).$$

Equation (2) does not appear in the literature in discussions of expected cumulative abnormal returns because researchers make the implicit assumption when calculating (1) that N, the number of offerings, is constant and exogenous. It is not. Because the number of offerings over the sample period is positively related to earlier abnormal returns, there is a positive covariance between the excess returns in the early part of the sample period and the total number of offerings N. Or, equivalently, there is a negative correlation between the excess returns and 1/N. Consider an efficient market where the expected return of the IPO firms is equal to the expected return of the market or matching firm. In this case, the first term in (2) is zero and there is no real market timing.

It is the second term, the covariance between the returns and the inverse of the number of offerings that leads to a negative expected value for the cumulative abnormal returns. This is the effect of pseudo market timing on ex-post returns.

Equation (2) can be used to calculate the expected abnormal return in the example of Table I. The expected average excess return in (2) is equivalent to the average of excess returns across possible paths. Averaging across the mean IPO excess returns in the second to last column of Table I across the four rows yields a mean of -3.75 percent. The critical negative covariance between the reciprocal of the number of offerings and the sum of the excess return in (2) can be obtained for the example of Table I. First, the sum of the excess returns, that is

$$\sum_{e=1}^{E} \sum_{n=1}^{N} (r_{j,e} - r_{m,e}),$$

is calculated for each price path by multiplying the mean IPO excess return in the last column by the number of IPOs. The covariance between the sum of the excess returns and the reciprocal of the number of offerings shown in the last column is -3.75 percent, the expected average excess return.

II. Can Pseudo Market Timing Explain the Poor Event-Time Performance of IPOs and SEOs?

Before turning to the question of how well pseudo market timing explains the poor long-run performance of IPOs, it is worthwhile to contrast pseudo market timing with other explanations that have been offered. Several papers examine mismeasurement of risk or returns and how that may affect the measurement of long-run performance following equity offerings. Eckbo, Masulis and Norli (2000) show that leverage is significantly reduced following seasoned offerings while liquidity is increased. Both of these changes reduce expected returns of equity issuers. They conclude that as a result, the commonly used matched firm technique does not provide a proper control for risk. Brav and Gompers (1997) and Brav et al (2000) employ a variant of the Fama-French three factor model. Brav et al (2000) show that underperformance is concentrated among small firms with low book-to-market ratios while Brav and Gompers (1997) show that underperformance is further concentrated among IPOs without venture capital backing. Both studies find that in calendar time, IPO underperformance is similar to that of other small, high book-to-market firms. This leads to the conclusion that, at least in calendar time, the poor long-run performance is not associated with equity issuance per se, but begs the question of why small firms with high book-to-market ratios have performed poorly.

Pseudo market timing is completely different from these other explanations for the poor performance of equity issuing firms that have appeared in the literature. Unlike explanations based on mismeasurement of risk or statistical significance, the pseudo market timing hypothesis says that, ex-post, the poor performance of equity issuers is real and significant. However, this is consistent with an efficient market. Even if the ex-ante expected abnormal return is zero following equity offerings, a positive covariance between abnormal returns and the number of future offerings means that the probability of observing negative abnormal returns in event-time following offerings may far exceed 50 percent. Pseudo market timing is also different from the methodological concerns raised Kothari and Warner (1997), Barber and Lyon (1997), and Lyon, Barber and Tsai (1999) in recent studies of long-run performance measurement.

A limitation of the pseudo market timing hypothesis is that it applies only to event-period abnormal returns. That is, it applies only to tests where all offerings are weighted equally. Calendar-time abnormal returns based on weighting calendar periods equally are not affected[1]. However, it is in event time that IPO and SEO underperformance is particularly severe. For example, Table I of Brav and Gompers (1997) shows that nonventure-backed IPOs earn buy-and-hold returns of 22.5 percent in the first five years of trading. This is equivalent to an annual return of 4.14 percent. However, in Table III of the same paper, we see that nonventure-backed IPOs earned an annual return of 15.5 percent over 1976-1992 when returns are calculated on a calendar-time basis. Similarly, Gompers and Lerner (2001) show that over 1976-1992 IPOs perform poorly in event-time, but perform about as well as the market in calendar-time.

I use simulations to see if pseudo market timing produces underperformance that is comparable to the observed underperformance of IPOs and SEOs over 1973-2000. As a first step, I create IPO and SEO indices by compounding aftermarket returns of recent IPOs and

[1] The exception is that calendar time returns may be affected if poor IPO performance is followed by such a long period of time with no IPOs that some calendar months are thrown out because there were no offerings in prior months. This hasn't occur in practice in the U.S. since 1973.

SEOs. I then estimate the relation between levels of the Center for Research in Securities Prices (CRSP) value-weighted market index and the IPO (SEO) index and the number of offerings. Then, using estimated relations between index levels and the number of offerings and between market and IPO returns, I simulate long-run aftermarket abnormal returns of IPOs and SEOs over 1973 -2000 under the assumption that the ex-ante abnormal return is zero. I find that the median simulated underperformance is similar to actual abnormal returns over the 1973-2000 period. In other words, the observed underperformance of IPOs and SEOs is not surprising even if the ex-ante excess returns of all stocks making offerings is zero as long as pseudo market timing results in more equity sales when stock prices are high.

A. Data

Securities Data Corporation (SDC) is the source of information on the number of IPOs and SEOs over the 1973-1997 period. I exclude all offerings by funds, investment companies and REITs (SIC codes 6722, 6726 and 6792) as well as offerings by utilities (SIC codes 4911-4941), and banks (6000-6081). Table III provides data on the distribution of the number of offerings each month. The mean number of IPOs per month is 26.8 while the mean number of SEOs is 26.0. The distribution of each is right-skewed as evidenced by a median of 21 IPOs and 20 SEOs. The number of IPOs per month ranges from 0 to 107 while the number of SEOs ranges from 1 to 104. The first-order autocorrelation is .85 for the monthly number of IPOs and .83 for the monthly number of SEOs.

For comparison with the simulations to follow, I use the CRSP tapes to calculate returns for each IPO or SEO for up to 60 months following the offering. Many studies of long-run performance after equity offerings use sophisticated techniques for estimating abnormal performance. Here, to focus attention on the issue of pseudo market timing, I use the simplest possible way of calculating abnormal performance: each month I subtract the CRSP value or equal-weighted index return from the stock return.

Panel A of Table IV presents statistics on returns and abnormal returns of firms making equity offerings. The first three rows of the table report calendar-time returns. Here, the return and abnormal returns are averaged across stocks for each calendar month, and the equal-weighted mean of the calendar month means is reported. The mean excess return for IPOs is 0.02 percent relative to the CRSP value-weighted index and -0.12 percent relative to the CRSP equal-weighted index. Neither excess return is significantly different from zero. There is no evidence in Table IV of underperformance by IPOs in calendar time. For SEOs, calendar-time excess returns based on the value-weighted index are not significant, while excess returns calculated with the equal-weighted index are -0.30 percent per month, with a t-statistic of -2.40.

The next three rows report mean returns and excess returns calculated for each event-period month. That is, I calculate the mean return and excess return across all offerings for the first month following the IPO (SEO), second month following the offering and so forth. Grand means are then calculated across the 60 months of the event period, and are reported in the table. In this case, the evidence for underperformance by IPOs is strong. The mean excess return per month is -0.49 percent for IPOs when measured against the value-weighted index and -0.194 percent when measured against the equal-weighted index. This implies cumulative abnormal returns of -29 percent relative to the CRSP value-weighted index and -11 percent relative to the CRSP equal-weighted index over 60 months.

Results for SEOs are weaker. Mean raw returns are the same in calendar time and event time. Abnormal returns relative to the value-weighted index decrease from -.15 percent per month in calendar time to -.38 percent per month in event time. Abnormal returns based on the CRSP equal-weighted index are actually less negative when we move from calendar time to event time.

It is interesting that the market as a whole also performs poorly after equity offerings. Panel B of Table IV lists correlations between the number of IPOs in a month and the return on the CRSP value-weighted index over the next month, the next three months, and the next twelve months. Each row of Panel B reports correlations for one five year period. In each case, the correlations are negative; a large number of offerings is followed by poor returns on the market. In general, correlations between the number of offerings and the succeeding market returns grow large in absolute value as the market return is measured over a longer time period. For 1978 - 1982, the correlation between the number of IPOs in a month and the return of the market over the next twelve months is -.5998. For 1983 to 1987 it is -.5084.

Panel C is analogous but lists correlations between the number of SEOs in a month and the return on the CRSP value-weighted index over the next month, the next three months, and the next twelve months. Each of these correlations is negative, but they are generally of smaller magnitude than the correlation between the number of IPOs and the return on the CRSP value-weighted index in the succeeding months. For 1983 - 1987, the correlation between the number of SEOs in a month and the return of the market over the following twelve months is -.3386.

B. Estimating the Relation Between Price Levels and Number of Offerings

The premise of pseudo market timing is that more firms issue equity at higher prices. To make the simulations realistic, I first estimate the relation between the number of IPOs or SEOs and stock prices over 1973-1997. I compile an index of recent IPOs as a proxy for the value of potential IPOs. Similarly, I compile an index of SEOs to proxy for the value of those stocks that could conduct SEOs. The values of the IPO and SEO indices are set to 100 at the beginning of February 1973.

For each month, an average return is calculated for all firms listed on CRSP that had an IPO (SEO) in the 60 prior months. The index level at the beginning of the month is multiplied by one plus the average return during the month to get an index level for the beginning of the succeeding month. I also calculate a market index that is set equal to 100 at the beginning of February 1973, and then changed by the return on the CRSP value-weighted index each month. The number of IPOs (or SEOs) is then regressed on the levels of the market and the IPO (or SEO) index at the beginning of each month from February 1973 through December 1997.[2]

Results are reported in TableV. The first row of Panel A describes the regression of the number of IPOs on the level of the IPO index and market index at the beginning of the month,

[2]The regressions are similar to those reported by Loughran, Ritter and Rydqvist (1994). A difference is that my regressions include the level of past IPOs as well as the market level, and excludes future GNP growth.

and a time variable that increments by one each month. The coefficient on the IPO index is .1533, indicating that the number of IPOs increases with the index of past IPO returns. The coefficient on the market index is -.0571, suggesting that, holding the level of the IPO index constant, the number of IPOs decreases with the level of the market. Both coefficients are highly significant. The IPO and market indices are highly correlated, and thus the regression can be interpreted to mean that the number of IPOs is determined more by the portion of returns that are specific to IPOs than the portion of returns common to the market as a whole. The second row of the table reports results of a regression that also includes levels of the market and IPO index three and twelve months before. The adjusted R^2 is slightly higher in this regression, and thus the coefficients from this regression are used to determine the number of IPOs in the simulations to follow. The last two rows of the table show analogous regressions for the number of SEOs during a month. Results are similar in that coefficients are positive on the SEO index and negative on the market index. Adjusted R^2's are smaller though, and the standard errors of the coefficients are much larger.

Figures 1 and 2 graph the actual and fitted number of IPOs and SEOs for the regressions that use the levels of the market and IPO (SEO) indices at the beginning of the month, three months before, and twelve months before. It is apparent that the regressions do a very good job of fitting the number of offerings in-sample, particularly for IPOs.

C. Simulations of Aftermarket Performance

For the simulations, I estimate the distributions of the monthly return on the CRSP value-weighted index using all months from February 1973 through December 1997[3]. Over this time, the mean monthly return is 1.116 percent and the standard deviation is 4.517 percent. I also estimate the relation between the returns on IPOs and SEOs by regressing an equal-weighted average return from all IPOs (or SEOS) from the previous 60 months on the CRSP value-weighted index return using all months from February 1973 through December 1997. The slope coefficient for IPOs is 1.31 with a residual standard deviation of 4.27 percent. The slope

[3]The sample includes IPOs and SEO s starting January 1973 and thus aftermarket returns start with February 1973.

coefficient for the SEO portfolio is also 1.31 but with a residual standard deviation of 2.62 percent.

I run 5,000 simulations of sample paths for both IPOS and SEOs. To simulate returns of the market each month, I first generate a return from the normal distribution using the mean and standard deviation of the monthly return on the CRSP value-weighted index over 1973-1997. The return on the portfolio of IPOs is generated by multiplying the market return by the slope coefficient of 1.31 and adding a residual return that is generated from a normal distribution with a mean of zero and a standard deviation of 4.27 percent. I do not add the intercept coefficient from the regression to the simulated IPO portfolio return, but instead subtract .3454 percent from the IPO return each month so that the expected return on the IPO portfolio and the market are identical.

For the beginning of the first month of a simulated sample path of returns and offerings, the level of the IPO index and market index are both set to 100. At the beginning of each succeeding month, the simulated level of the market portfolio and of the IPO portfolio are calculated by multiplying the previous month's level by one plus the previous month's simulated return. The number of IPOs in a month is then obtained from the simulated levels of the IPO index and market using the estimated coefficients from the regression of the monthly number of IPOs on time, and the levels of the market and IPO indices. Each simulated sample path of returns and offerings is 300 months (25 years) long. The procedure for SEOs is identical but uses the coefficients and standard deviations estimated for SEOs.

Excess returns for IPOs during a calendar month are the difference between the IPO index return and the market return during a month. It is worth emphasizing that ex-ante expected excess returns for each month are set equal to zero by construction. Event-period abnormal returns are obtained for each IPO in a simulated sample path by cumulating abnormal returns in the calendar months before or after the offering as in (1).

Simulation results are reported in Table VI. For each of 5,000 simulations, mean cumulative abnormal returns are calculated for a variety of event periods. Panel A of Table VI reports the distribution of simulated mean cumulative abnormal returns across the 5,000 simulations. The distribution of cumulative excess returns in the 36 months prior to an IPO is described in the second column of the table. The median excess return across the 5,000 simulations is 11.15 percent over that period. I emphasize medians rather than means in this table because I want to convey the underperformance that is likely to be observed in one observation of a 25 year time-series of IPOs. In this case, the mean excess return is 11.26 percent over the 36 months prior to an IPO, with a t-statistic of 57.88. Further examination of Panel A reveals that excess returns are positive in periods prior to IPOs even though the ex-ante excess returns are zero. This is simply a result of the number of IPOs increasing as the level of the IPO index rises.

Of more interest are the excess returns following IPOs. Table VI shows that cumulative abnormal returns following IPOs decline monotonically with the length of the holding period. The last column of the table shows the distribution of the cumulative excess returns in the 60 months after an IPO. The median across the 5,000 simulated samples of the average excess returns is -18.14 percent. This means that *even when ex-ante excess returns are zero*, we will observe mean event period excess returns for the 60 months after IPOs below -18.14 percent half of the time. The likelihood of finding that IPOs underperform in the 60 months after the offering is 77.1 percent, and there is a ten percent chance of observing excess returns less than -46.25 percent.

Given the relation between the number of offerings and the levels of the IPO and market indices, it is not surprising that IPOs underperform. Even in an efficient market, where IPOs are not systematically under- or overpriced, it is the most likely result.

Panel B of Table VI reports simulated buy-and-hold abnormal returns before and after IPOs. Buy-and-hold abnormal returns are calculated as

$$BHAR = \prod_{t=1}^{60}(1+r_t^{IPO}) - \prod_{t=1}^{60}(1+r_t^{Mkt}) \qquad (3)$$

Buy-and-hold abnormal returns are probably the most common measure of excess returns used in long-run performance studies because they measure returns earned by investors following a buy-and-hold strategy, and because their use avoids the rebalancing bias in cumulative abnormal returns.

As a result of compounding, buy-and-hold excess returns following IPOs are lower than cumulative abnormal returns over the same time periods. Over the 60 months following IPOs, median buy-and-hold abnormal returns are -31.8% as compared to the median cumulative abnormal returns of -18.1%. More than 80% of the simulations produce negative buy-and-hold abnormal returns for the periods following IPOs.[4]

Panel C of Table VI provides the distributions of wealth relatives and market returns across the 5,000 simulations. The median wealth relative for the 36 months following an IPO is .8529. This means that the ratio of the wealth from investing in IPOs to the wealth from investing in the market at the same time is .8529. At the end of the 60 months subsequent to an IPO the median wealth ratio across all simulated sample paths is .7781. For comparison, Loughran and Ritter (1995) report average wealth ratios of .80 at the end of the three years after an IPO and .70 at the end of the five years after an IPO.

The next column in Panel C reports the distribution of the average market return across the 5,000 25-year sample paths. Recall that the mean return in the simulations is set equal to 1.116 percent per month, the observed return on the value-weighted index over 1973-1997. Thus it is not surprising that both the median and mean of the average market returns are 1.11 percent. However, market returns are lower following offerings. The next column shows that the median market return in the 36 months following IPOs is 0.88 percent while the mean is 0.87 percent. Similar results are reported in the next column for the 60 months following IPOs. Paired sample t-tests of the returns on the market in all sample months with the mean returns of the market following IPOs are 48.14 for 36 months and 46.26 for 60 months. That market returns are low subsequent to IPOs is an artifact of more firms going public when the level of the IPO index is high, and of the high correlation between the IPO index and the level of the

[4] In the simulations, I set the mean return on the IPO (SEO) portfolio equal to the mean return on the market just as I did in calculating cumulative abnormal returns. Since the IPO (SEO) portfolio has a higher variance, there is a slight downward bias to the buy-and-hold excess returns. The magnitude of the bias is revealed by the calendar period buy-and-hold excess returns. For IPOs, the median buy-and-hold excess return for 60 calendar months is -3.35%, while the mean is 0.43%. For SEOs, the median 60 month buy-and-hold excess return is -2.34% while the mean is 0.21%.

market. Pseudo market timing creates an appearance that managers and investment bankers can determine not only when their stock is overpriced, but when the entire market is overpriced as well.

The last column of Panel C reports the distribution of the number of IPOs per month across the 1,000 simulations The median number is 16.5 while the mean is 59.9. Recall that over 1973-1997 the number of IPOs per month averaged 26 with a range from 0 to 107. That the mean is far higher than the median is a result of a right-skewed distribution for the simulated number of IPOs. The mean of 59.9 offers per month is not an unreasonable number however if, say, the market had performed well in 1973-1974 or the 1987 crash had not occurred. The correlation between the number of IPOs in a simulation and the mean excess return in the 60 months after IPOs is .3043.

Results of the same simulations of returns around SEOs are reported in Table VII. The simulated number of SEOs in a month is generated using the estimated coefficients from the last equation in Panel A of Table V. The market return is again assumed to be normally distributed with a monthly mean of 1.116 percent and a standard deviation of 4.52 percent. As before, the return on the SEO portfolio for a month is simulated by multiplying the return on the market index by the coefficient from a regression of SEO returns on market returns and adding a constant chosen so that the ex-ante excess returns on SEOs equal zero. The idiosyncratic return of the SEO portfolio is simulated from a normal distribution with a mean of zero and a standard deviation of 2.62 percent per month. This is the standard deviation of the residuals from the regression of SEO returns on the market over 1973-1997. Excess returns are again calculated by subtracting the market return from the return of the SEO portfolio.

In practice, as Table IV shows, event time underperformance is much more severe for IPOs than SEOs. Thus it is not surprising that the results for SEOs are similar to, but weaker than the findings for IPOs. Panel A of Table VII reveals that the median and mean of the excess returns from the 5,000 simulated sample paths are positive before SEOs and negative afterward. The last column of the table, showing cumulative abnormal returns in the 60 months following an SEO, is particularly instructive. The median aftermarket performance across the 1,000 sample paths is -6.80 percent. The last column also indicates that there is a 69.3 percent chance that the researcher will observe negative abnormal returns in the 60 months after SEOs even if the ex-ante excess returns are zero. There is a 10 percent chance that the researcher will observe returns less than -23.73 percent and a 25 percent chance of returns less than -15.71 percent.

Panel B of Table VII reports simulated buy-and-hold abnormal returns around SEOs. As with IPOs, buy-and-hold abnormal returns are lower than cumulative abnormal returns following SEOs. Using this measure, SEOs underperform the market by 14.8% in the five years after the offering. SEOs underperform in about 75% of the simulations. Larger underperformance is not uncommon. In more than 10% of the simulations, SEOs underperform by more than 34%.

Panel C of Table VII provides the distribution of wealth relatives and aftermarket returns for the 36 and 60 months following SEOs. For any given sample path of 25 years worth of stock returns and SEOs, there is a 50 percent chance of observing a wealth relative of less than .8908 for 60 months following SEOs even when the ex-ante excess returns are zero. There is a 25 percent chance of observing a wealth relative less than .8169 and a 10 percent chance of observing a wealth relative of less than .7549. Panel C also shows that the return on the market as a whole is likely to be lower than normal following SEOs.

The number of SEOs generated in each simulation varies widely, but is typically higher than was actually observed. The correlation between aftermarket excess returns and the number of offerings is .8160.

Some behavioralists cite the clustering of IPOs at market and stock price peaks as evidence that investment bankers and corporate managers are able to time the market and take advantage of investors by issuing securities at price that they know are too high. However, clustering of this type occurs in my simulations even though future returns are unpredictable. This is a natural consequence of the number of offerings increasing with the level of stock prices. When we look back at a time series of stock prices and offerings, we would expect to see the largest number of offerings when stock prices are near their peak. This doesn't mean investment bankers can time the market. If stock prices were not at a peak, but instead continued to rise, we would expect to see even more offerings later and thus we would still see the largest number of offerings at a market peak.

For each of the 5,000 IPO simulations shown in Table VI, and each of the 5,000 SEO simulations shown in Table VII, I divide all months with at least one IPO (SEO) into deciles by number of offerings. I then calculate the average market return in the 60 months following IPOs (SEOs) in each decile of offering activity. Fig. 3 graphs the median market return in the 60 months following the IPO (SEO) for each decile across the 5,000 simulations. For both IPOs and SEOs, median market returns in the five years after an offering decline monotonically with the level of offering activity. The result is particularly strong for SEOs, as the correlation between SEO returns and market returns is stronger than the correlation between IPO returns and market returns.

Fig. 4 is similar to Fig. 3 but shows excess returns following IPOs and SEOs by deciles of offering activity. We again see a monotonic decline in excess returns as offering activity increases. It is interesting that the excess returns are positive for IPOs and SEOs issued during periods with light offering activity. The reason is that light and heavy activity is defined ex-post. If excess returns were not positive following light activity, even fewer IPOs would be issued in the following months and the periods would no longer be defined as having light activity. Nevertheless, the clustering of offerings at market peaks makes it appear that investment bankers and managers can time the market. This is pseudo market timing.

D. Sensitivity Analysis

Changing the assumptions used in the simulations provides insight into what drives pseudo market timing and what researchers can do to mitigate its effects. Table VIII reports the distribution of simulated cumulative abnormal returns in the 60 months following offerings under different assumptions. Panel A shows results for IPOs. For comparison, the second column of the table provide, as a base case, the distribution of 60 month simulated cumulative abnormal returns from Table VI. The subsequent columns provide the distribution of the cumulative abnormal returns in the 60 months following IPOs when the simulations are altered in some way. Buy-and-hold abnormal returns are not shown, but in all cases are lower than the cumulative abnormal returns shown in Table VIII.

The third column of the table shows cumulative abnormal returns in the 60 months following IPOs when the simulations are based on bootstraps of the actual market and excess returns rather than drawing simulated returns from a normal distribution. It is well known that stock returns are skewed and fat-tailed relative to a normal distribution. By using the actual returns of the market and the actual excess returns of IPOs in the simulations, I incorporate these departures from normality. In each simulation, I draw 396 months (300 plus 36 before and 60 after) of market returns with replacement from the actual distribution of monthly returns on the market over 1973 through 1997. I separately draw 396 months of excess returns for the same period. The number of IPOs each month are then determined as in the base simulations.

Little is changed when the observed distribution of returns is used rather than normally distributed returns. The mean and median cumulative abnormal returns are about 1% higher over 60 months, but still represent economically significant underperformance.

The next column shows results when the cumulative abnormal returns are calculated using the market model rather than as a simple difference between the return on IPOs and the market. The market model parameters are the constant of -.00345 and the coefficient on the market returns of 1.3084 that are used to determine IPOs returns in the simulations.

In the 60 months following IPOs, median (mean) abnormal returns are -13.2% (-13.4%) when estimated with the market model as compared to -18.1% (-17.2%) in the base case. It is interesting that abnormal returns are not as low when estimated with the market model, even though ex-ante expected returns are the same as for market-adjusted returns. The reason is that market returns tend to be lower than normal following IPOs and, with a coefficient greater than one on the market return, IPOs will underperform even more than the market. The implication for researchers is clear: market model returns are preferable to market adjusted returns.

In the base case simulations, the levels of the market and IPO indices that are used to determine the number of offerings are based on nominal returns. Thus the model predicts an increase in the number of companies issuing stock as stock prices increase even if the changes are only a result of inflation. If companies go public at higher prices because higher stock prices reflect better investment opportunities, we would expect the real, not nominal level of stock prices to determine the number of offerings.

The next column reports results from simulations based on real rather than nominal returns and market levels. Simulations are conducted exactly as in the base case in Table VI except that real returns and real stock price levels are used. For each month over 1973 to1997, real market returns and the real excess returns of IPOs are calculated by deflating nominal returns using that month's change in the CPI. Real market and IPO levels are obtained by cumulating the real returns, and the relation between the number of offerings and the level of the real market index and real IPO index are estimated by a regression. The simulations are then based on the observed distributions of real market returns and real excess returns.

When real returns and real stock index levels are used in the simulations, IPOs continue to underperform the market. The median (mean) underperformance is now only -11.9% (-12.5%), but that is an underperformance in real terms and is not strictly comparable to the base case.

The final column of the table shows results of simulations where excess returns are calculated relative to the equal-weighted CRSP index. For these simulations, the relation between the market level and the number of offerings is calculated using the equal-weighted index. Similarly, the relation between the return on the market and the return on IPOs is calculated by regressing IPO returns on equal-weighted index returns.

Underperformance is much reduced when the equal-weighted index is used. This seems counterintuitive. Why would underperformance be greater when a value-weighted index is used if we would expect the value-weighted index to be less risky and have a lower rate of returns? Indeed, as Table IV shows, the mean monthly return on the value-weighted index over the 1973-1997 period was about 15 basis points less than the mean monthly return on the equal-weighted index. Underperformance is reduced when the equal-weighted index is used because it has a higher correlation with IPO returns than does the value-weighted index. When, ex-post, a large number of IPOs have been issued and the IPO index performs poorly, the highly correlated equal-weighted index is also likely to perform poorly.

This result has important implications for researchers. When pseudo market timing is an issue, it is not enough to use a benchmark with a similar expected return. The benchmark should be as highly correlated as possible. With a high correlation, the poor returns following the clustering of events will be matched by poor returns from the benchmark.

Panel B of Table VIII does the same sensitivity analysis on the SEOs' simulated returns and results are much the same as for IPOs. When the observed distribution of returns is used rather than a normal distribution, returns are scarcely affected. When the market model is used to calculate abnormal returns, the underperformance of SEOs is not as great. Again, the coefficient of the SEO return on that of the market is above one, and thus part of the underperformance comes from the high loading on the market before the market underperforms. Using an equal-weighted index rather than value-weighted index also reduces underperformance because the correlation between the SEO returns and the equal-weighted index is greater than the correlation between the SEO returns and the value-weighted index.[5]

E. What Determines the Level of Underperformance?

Two factors are critical in determining the expected level of abnormal returns from pseudo market timing. The first is the variance of the excess returns. To see this, consider what would happen if the variance of the excess returns was zero, or equivalently, if the IPO returns were perfectly correlated with the benchmark returns. Ex-post, IPOs will cluster when the prices received by companies going public is highest. If these prices are perfectly correlated with a benchmark, then it will appear that IPOs time the benchmark, but excess returns will be zero. The greater the variance of the excess returns, the more the issuing firms will appear to underperform the benchmark. The second factor is the sensitivity of the number of offerings to the IPO (or SEO) index level. The more sensitive, the greater the reduction in offerings following a decline in the IPO or SEO index.

This is illustrated by simulations reported in Table IX. The table reports medians of the cumulative abnormal returns for 60 months following IPOs. The simulations are equivalent to the simulations in Table VI, except that I change the variance of the IPO excess returns and the coefficients on the level of the market and IPO index that determine the number of offerings. The empirically estimated variance used in the base case of Table VI is .00183. The regression

[5] In earlier versions of the paper other I tried other variations on the simulations. The number of offers was determined using Poisson regressions, and using the square roots of the level of the IPO (SEO) and market indices. Excess returns were calculated using size-matched portfolios. I also tried omitting months with very large or small number of offers. In all cases, results were essentially unchanged.

coefficients used in the base case are .1195 for the IPO index and -.0337 for the market index. The variance of the monthly IPO excess returns used in the simulations of Table IX ranges from .0000 to .0036. The coefficient on the level of the IPO index in month t varies from .06 to .18. The coefficient on the market level varies inversely with the coefficient on the IPO index and ranges from .03 to -.09. For each combination of variance and regression coefficients, 5,000 simulations are run. Table IX reports median cumulative abnormal returns for each group of simulations.

The table reveals that the median abnormal returns following IPOs become more and more negative as the variance of the IPO excess returns increases. For example, when the coefficient on the IPO index level is .12 and the variance of the excess returns is zero, the median abnormal return is only -4.03%. On the other hand, when the coefficient on the level of the IPO index that is used to determine the number of offerings is the same, but the variance is .0036, the median cumulative abnormal return is -27.02%. It may be surprising that abnormal performance is negative even when the variance of excess returns are zero, but remember that the coefficient of the IPO returns on the market returns is greater than one. More IPOs will tend to be issued before the market falls, and when it does the IPOs will fall even more and market-adjusted excess returns will be negative. Table IX also shows that the more sensitive the number of IPOs is to the level of the IPO index, the greater is the median underperformance following offerings.

III. Pseudo Market Timing and Other Characteristics of Long-Run Performance

In this section I discuss other characteristics of the long-run performance of equity issuers and how they fit with the pseudo market timing hypothesis and other explanations for the long-run underperformance of IPOs and SEOs.

A. Measures of Operating Performance are Also Poor Following Equity Offerings

Jain and Kini (1994) find that operating return on assets and operating cash flows deflated by assets decline post-offering for IPO firms compared to firms in the same industry. Mikkelson, Partch, and Shah (1997) also find that operating returns on assets decline following IPOs and that the decline is especially large for the smallest and newest companies. Similarly, Loughran and Ritter (1997) report that in the four years following an SEO, operating income divided by assets, profit margins, and return on assets decline for firms that conduct SEOs compared to matched firms that did not issue equity. The decline in operating income following equity offerings suggests that the poor return performance is not just a symptom of inadequate risk adjustment. It is consistent with both the behavioral and the pseudo market timing explanations for long-run underperformance.

B. Poor Aftermarket Performance is Observed in Other Countries and at Other Times

Ritter (1998) summarizes studies of long-run performance in 13 countries following IPOs. IPOs underperform in 11 of them. In one of these studies, Lee, Taylor and Walter (1996) find that Australian IPOs underperform by over 46 percent in the subsequent three years. In another, Keloharju (1993) finds that Finnish IPOs underperform the Finnish value-weighted index by 26.4 percent in the three years following their offerings. Similarly, Aussnegg (1997) shows that IPOs of Austrian firms cluster after bull markets and that IPOs underperform by an average of 74 percent in the five years after an offering. In a paper since Ritter (1998), Arosio, Giudici and Paleari (2001) report mean buy-and-hold abnormal returns of -11.53 percent over three years for Italian IPOs over 1985 to 1999.

Studies of IPOs in earlier periods also document underperformance. Gompers and Lerner (2000) study the aftermarket performance of over 3,600 IPOs between 1935 and 1972. Buy-and-hold returns calculated in event time are 12.6 percent less than the CRSP value-weighted index in the three years following IPOs and 29 percent less over a five year period. Schlag and Wodrich (2000) report that German IPOs between 1870 and 1914 underperformed relative to indices of seasoned equities in the same industry groups in the three to five years following their IPOs.

These results again suggest that the ex-post underperformance of IPOs and SEOs is real and not an artifact of data mining or a chance occurrence. The consistency of the results across countries and times presents a challenge to the behavioral explanation for underperformance.

Don't people ever learn?[6]

C. Offerings Occur at Market Peaks

Lerner (1994) examines 350 privately held biotech firms between 1978 and 1992. He shows that they are more likely to go public rather than get private venture capital financing when the level of a biotech index is near a local peak. Keloharju (1993) studies Finnish IPOs over 1984-1989. Over half of the IPOs in his sample were issued in 1988. He notes that the Finnish market peaked in April 1989, and the value-weighted index declined 58.1 percent from then until December 1991. Korajczyk, Lucas and McDonald (1990) observe that U.S. seasoned offerings cluster in some years and that these years follow market wide price runups. On average, the difference between the market return and the return on T-bills is about 48 percent in the two years prior to a seasoned offering. Likewise, Loughran and Ritter (1995) find a mean return on issuing firms in the year preceding a seasoned offering of 72 percent; and about half of this is from a marketwide runup.

It is plainly the case that the number of equity offerings varies a great deal over time, and that equity offerings are more common when the market is high. The poor risk adjustment hypothesis is silent on this, but the pattern is predicted by both the behavioral and pseudo market timing explanation.

D. Excess Returns After Equity Offerings are Much More Significant in Event-Time than Calendar-Time

Loughran and Ritter (1995) and Loughran and Ritter (2000) observe that excess returns

[6] My simulations imply that equity issuers should underperform more than 50 percent of the time but certainly not always. Ritter (1998) cites 13 studies of long run performance of IPOs and notes that 11 of the 13 find underperformance. It is possible that 2 of 13 is a lower bound on the likelihood that IPOs will perform as well as other stocks. Studies that fail to find that IPOs perform significantly different from other firms may be less likely to be published.

following equity offerings are much lower when measured in event time than in calendar time. When returns are measured in calendar time, each month is weighted equally; in event time each issue is weighted equally. Loughran and Ritter (2000) suggest that if issuers are able to time their offerings to take advantage of mispricings, we would expect more offerings prior to poor returns, and weighting each month rather than each offering equally will understate the abnormal returns.

The difference between returns measured in calendar time and event time is also observed in studies of offerings in other countries and at other times. Schlag and Wodrich (2000), in a study of German IPOs over 1870-1914, find significant underperformance in event time but not in calendar time. Álvarez and González (2001) find that Spanish IPOs issued over 1985-1997 also underperform in event time but not in calendar time. Gompers and Lerner (2000) determine that over 1935-1972, buy-and-hold abnormal returns are negative in event-time following IPOs, but disappear when calculated in calendar time. Over the entire time period, IPO returns measured on a calendar time basis are very similar to returns on the market.

These results are predicted by the behavioral explanation for poor long-run performance. They are also consistent with pseudo market timing. Indeed, pseudo market timing only predicts that equity issuing firms will underperform in event time. In calendar-time, equity issuers are not predicted to underperform. On the other hand, poor risk-adjustment does not explain why issuers would be expected to perform worse in event-time than calendar-time.

E. Performance is Particularly Poor Following Periods of Heavy IPO Issuance

Ritter (1991) and others observe that long-run performance is particularly poor for IPOs issued during periods when many companies are going public. In contrast, IPOs issued during cold markets perform well. Behavioralists claim that this is evidence that firms issue equity when they know their stock is overpriced. My simulations also show that pseudo market timing results in especially poor performance following periods of heavy IPO market activity even when ex-ante abnormal returns on all IPOs are zero. Particularly poor performance following periods of heavy issuance is not predicted or explained by the poor risk adjustment explanation for IPO underperformance.

F. Performance is Also Poor After Debt and Convertible Debt Issuance

Spiess and Affleck-Graves (1998) examine stock returns around offerings of straight and convertible debt. They report large positive excess returns for companies= stock prior to debt issues. Holding-period returns in the five years following an offering are 14 percent less for straight issues than for matching stocks. Following the issuance of convertibles, the stocks underperform matching firms by 37 percent.

Poor long-run performance following debt issues is consistent with the pseudo market timing explanation for poor performance. It appears inconsistent with the behavioral explanation. If managers can time the market and issue stock when it is overpriced, why would they instead issue debt?

G. Managers do not Exploit Underperformance for Personal Gain

If firms can time equity issuance to take advantage of overvaluation of their stock, we would expect managers to also gain by taking advantage of misvaluations. Yet Lee (1997) shows that stocks underperform following seasoned equity offerings of primary stock, but when insiders sell their own shares in a secondary seasoned offering, subsequent performance is not significantly different from that of matching firms. He also shows that, while SEOs of primary shares perform poorly in the three years following the offering, performance is unrelated to insider trading around the offering.

Lee=s results are consistent with the pseudo market timing explanation for long-run underperformance. On the other hand, his evidence contradicts the assertion of behavioralists that managers are able to time the market with equity issues.

To summarize, researchers have documented a number of regularities about the long-run performance of equity issuers. Among these regularities are that operating performance is poor following IPOs, offerings occur at market peaks, underperformance is greater in event-time than calendar-time, and that performance is particularly poor following periods of heavy issuance. All of these regularities are consistent with pseudo market timing.

IV. Summary and Conclusions

I propose that the poor long-run performance of equity-issuing firms in event-time is real, but that it is not indicative of any market inefficiency. The premise of the pseudo market timing explanation for underperformance is that more firms go public when they can receive a higher price for their shares. As a result, ex-post there are more offerings at peak valuations than at lower prices. This is pseudo market timing. The issuing companies didn't know prices were at a peak when they issued stock. If prices had kept rising, even more offerings would have been forthcoming until prices eventually fell and offerings dried up. Using simulations with parameters estimated from historical data, I show that pseudo market timing can easily lead to a level of ex-post underperformance similar to that documented for IPOs and SEOs over the past 25 years.

Researchers who believe that firms intentionally issue equity when they know their shares are overpriced point to several pieces of evidence to support their view. One is that underperformance is much stronger in event-time than in calendar-time. They claim that this is because firms successfully time the market and conduct more offerings at market peaks. The pseudo market timing explanation also has more firms issuing equity at market peaks, but notes that this will occur ex-post if managers choose to issue more equity when prices are higher even if prices are correct ex-ante. A second piece of evidence is that IPOs issued during the periods when the most firms go public underperform far more than IPOs issued when few firms go public. This is also consistent with pseudo market timing. If IPOs performed well after periods of heavy equity issuance, even more firms would go public and the heavy issuance periods would no longer be defined as periods of heavy issuance.

Pseudo market timing is also consistent with observations that seem to contradict the behavioral explanation for long-run underperformance. One of these observations is that stocks underperform following issues of straight or convertible debt as well as equity. If managers can tell when their stock is overpriced, and can regularly fool investors by selling overpriced equity, why would they choose to issue debt? The pseudo market timing explanation says that managers raise cash when stock prices are high but have no particular incentive to issue equity because they cannot time the market. A second apparent contradiction for the behavioral hypothesis is that managers do not seem to exploit mispricing by selling their own shares at the same time that firms issue equity. Again, this is consistent with pseudo market timing. Managers do not take advantage of mispricing in their personal trades because corporate decisions to issue equity are not driven by mispricing of equity.

While this paper has concentrated on pseudo market timing around equity offerings, other events that are preceded by large stock price increases or decreases may also be subject to this phenomenon. Agrawal, Jaffe and Mandelker (1992) report that acquiring firms in mergers earn large positive abnormal returns before mergers and negative abnormal returns afterwards. Webb (1999) finds that stocks that move from Nasdaq to the NYSE perform well before listing but underperform afterwards. Lakonishok and Vermaelen (1990) find that stocks earn positive abnormal returns after repurchase tender offers. Presumably, these firms underperformed prior to tender offers. Hand and Skantz (1998) find that firms carve out divisions after a period of abnormally high market returns and before the market performs poorly. Most of these authors conclude that their findings are suggestive of market inefficiency, but in each case, pseudo market timing may be the culprit. These events and others like them should be reexamined.

What should a researcher do to avoid biases from pseudo market timing? The easy way to avoid the problem is to use calendar-time returns rather than event-time returns. Of course, if managers are able to time the market, abnormal performance is more likely to appear in event-time. If event time returns are used, the results here suggest that the problem can be mitigated by using benchmarks that are as highly correlated with the firms being studied as possible. Also, as the simulations included here show, market model returns are preferable to market adjusted returns.

The most important implication of this work is that IPOs and SEOs are not bad investments, and should not be avoided. It is true that over the last 25 years they have underperformed market indices. The probability is much greater than 50 percent that, on average, they will underperform over the next 25 years as well. But, ex-ante, any individual IPO or SEO can be expected to provide a fair rate of return.

Table I.
An Example of Pseudo Market Timing.

Each period, zero IPOs occur if prices are less than \$95; one IPO occurs if prices are between \$95 and \$105 and three occur for prices greater than \$105. Each period the market earns a return of zero. IPOs earn an excess return of either +10 percent or -10 percent. Each excess return is equally likely. Over two periods there are 2^2=4 equally likely paths of IPO excess returns and IPO issues.

Price at 0	Issued at 0	Excess Return 0 to 1	Price at 1	Issued at 1	Excess Return 1 to 2	Number of IPOs	# IPOs Followed by +/- Excess Return	Mean Excess Return
100	1	.10	110	3	.10	4	4 / 0	.10
100	1	.10	110	3	-.10	4	1 / 3	-.05
100	1	-.10	90	0	.10	1	0 / 1	-.10
100	1	-.10	90	0	-.10	1	0 / 1	-.10

Table II.

The Probability of Observing Underperformance in Long and Short Time-Series.

I simulate a binomial process in which excess returns of IPOs are either +5% or -5% per period. The number of offerings is determined solely by the prices of potential IPOs. After a positive excess return, the number of offerings increases by ?%. After a negative excess return the number of offerings falls by ?%. The lengths of the time series vary from 20 to 5,000 periods. I simulate paths of each length 5,000 times.

	? = .1		? = .2	
Number of Periods in the Time Series	Probability of Observing Underperformance	Mean Underperformance per Period	Probability of Observing Underperformance	Mean Underperformance per Period
20	58.12%	-0.425%	64.06%	-0.837%
100	69.72%	-0.481%	84.18%	-0.911%
500	86.78%	-0.478%	94.95%	-0.913%
1,000	92.72%	-0.483%	97.09%	-0.919%
5,000	97.01%	-0.476%	98.59%	-0.909%

Table III.
The Distribution of the Number of Offerings per Month.

The number of offerings is obtained for each month from January 1973 through December 1997 from Securities Data Corporation. Offerings with SIC codes 4911-4941 (utilities), 6000-6081 (banks), and 6722, 6726 and 6792 (funds and investment cos) are excluded.

	Monthly Number of Initial Public Offerings	Monthly Number of Seasoned Equity Offerings
Mean	26.80	26.02
Median	21	20
Minimum	0	1
Maximum	107	104
1st Order Autocorrelation	.85	.83

Table IV.
Aftermarket Returns for IPOs, SEOs, and the Market.

Market-adjusted excess returns are calculated for the 60 calendar months and 60 event months following every offering from January 1973 through December 1997. Excess returns are the difference between the IPO or SEO returns and the CRSP value-weighted or equal-weighted index. Average excess returns are calculated weighting excess returns in each of the 300 calendar months or each of the 60 event months equally. T-statistics are based on the standard deviation of calendar or event month abnormal returns. I exclude offerings by firms with SIC codes 4911-4941 (utilities), 6000-6081 (banks), and 6722, 6726 and 6792 (funds and investment companies).

Panel A: Calendar and Event Time Returns

	IPOs		SEOs	
	Mean	t-statistic	Mean	t-statistic
Calendar-Time Returns	1.13%	2.73	0.95%	2.68
Calendar-Time Value-Weighted Excess Returns	0.02%	0.08	-0.15%	-0.90
Calendar-Time Equal-Weighted Excess Returns	-0.12%	-0.89	-0.30%	-2.40
Event-Time Returns	0.85%	13.66	0.96%	17.52
Event-Time Value-Weighted Excess Returns	-0.49%	-8.10	-0.38%	-7.07
Event-Time Equal-Weighted Excess Returns	-0.19%	-3.39	-0.19%	-3.59

Panel B: Correlations between the Number of IPOs and the Value-Weighted Market Return Afterwards

	Market Return First Month After	Market Return First Three Months After	Market Return First Twelve Months After
1973 - 1977	-.2479	-.2910	-.4091
1978 - 1982	-.1427	-.3681	-.5998
1983 - 1987	-.1739	-.3181	-.5084
1988 - 1992	-.0595	-.2075	-.1971
1993 - 1997	-.1122	-.1251	-.1056

Panel C: Correlations between the Number of SEOs and the Value-Weighted Market Return Afterwards			
	Market Return First Month After	Market Return First Three Months After	Market Return First Twelve Months After
1973 - 1977	-.0276	-.0157	-.1348
1978 - 1982	-.0871	-.1643	-.1928
1983 - 1987	-.0412	-.0827	-.3386
1988 - 1992	-.1167	-.1617	-.2908
1993 - 1997	-.1823	-.0062	-.1795

Table V.
Determinants of the Number of IPOs and SEOs Each Month

The numbers of offerings each month is regressed on time, the CRSP value-weighted portfolio, and indices based on returns of past IPOs or SEOs. The time variable is one for January 1973, and is incremented by one each month. The market, IPO and SEO indices are set to 100 for the end of January 1973 and are incremented every month by the return of the portfolio of all firms with IPOs or SEOs in the prior 60 months. T-statistics are in parentheses under coefficient estimates. Offerings by utilities, banks, funds and investment companies are excluded

Dependent Variable	Intercept	Time	$Market_t$	$Market_{t-3}$	$Market_{t-12}$	IPO (SEO) $Index_t$	IPO (SEO) $Index_{t-3}$	IPO (SEO) $Index_{t-12}$	Adj R^2
Monthly Number	-1.9744	-0.1439	-0.0571			0.1533			.778
IPOs 2/73 - 12/97	(-1.28)	(-6.21)	(-11.66)			(19.43)			
Monthly Number	-2.7114	-0.1132	-0.0337	-0.0239	0.0041	0.1194	0.0551	-0.0348	.787
IPOs 2/73 - 12/97	(-1.53)	(-3.67)	(-1.40)	(-0.83)	(0.21)	(8.21)	(3.51)	(-3.51)	
Monthly Number	-0.4819	-0.2041	-0.0776			0.3004			.670
SEOs 2/73 - 12/97	(-0.28)	(-8.31)	(-10.19)			(14.97)			
Monthly Number	1.8538	-0.1285	-0.1376	0.0975	-0.0155	0.4174	-0.1660	-0.0332	.704
SEOs 2/73 - 12/97	(1.00)	(-3.92)	(-4.45)	(2.63)	(-0.63)	(11.98)	(-4.33)	(-1.31)	

Table VI.
Simulations of IPO Aftermarket Excess Returns.

I run 5,000 simulations of a 25-year period of IPO returns. Mean event-time excess returns are calculated for each IPO in each simulation for periods before and after the IPO. Estimates are based on actual data for 1/73 - 12/97. The expected return on the market each month is .0112, with a variance of .00204. The return on the portfolio of recent IPOs is -.00345 +1.3084 x market return. The constant is chosen so that IPOs have the same expected return as the market. The variance of the residuals is .00183. The relation between the number of IPOs and the level of the CRSP value-weighted index and the IPO index is estimated over 1973-1997. The number of IPOs in a month is given by -2.711 - .1132(month) -.0337 (value of $market_{t-1}$) + .1195 (IPO $index_{t-1}$) -.0239 (value of $market_{t-3}$) + .0551 (IPO $index_{t-3}$) +.0004 (value of $market_{t-12}$) - .0348 (IPO $index_{t-12}$). Cumulative abnormal returns are obtained for event periods by summing abnormal returns for each month. Buy-and-hold abnormal returns are obtained by compounding IPO returns and subtracting compounded market returns. Calendar excess returns are an equal weighted average of excess returns across all months. Wealth relatives are obtained by dividing 1 plus the total return on the IPOs by 1 plus the total return by the simulated market.

Panel A: Cumulative Abnormal Returns

Months	-36 -1	-24 -1	-12 -1	-3 -1	-1	1	1 - 3	1 - 12	1 - 24	1 - 36	1 - 60
Median	11.15%	8.29%	5.10%	0.72%	0.25%	-0.41%	-1.22%	-4.64%	-8.71%	-12.15%	-18.14%
Mean	11.26%	8.40%	5.15%	0.65%	0.22%	-0.47%	-1.37%	-4.94%	-8.80%	-11.94%	-17.17%
Std. Error	0.19%	0.14%	0.08%	0.02%	0.01%	0.01%	0.03%	0.09%	0.17%	0.23%	0.34%
t-statistic	57.88	58.99	65.65	30.29	29.37	-51.41	-51.86	-52.28	-52.48	-51.86	-50.30
10^{th} Percentile	-2.87%	-1.37%	0.01%	-0.54%	-0.19%	-1.14%	-3.37%	-12.54%	-23.11%	-31.45%	-46.25%
25^{th} Percentile	4.37%	3.59%	2.63%	0.12%	0.04%	-0.73%	-2.13%	-8.14%	-14.91%	-21.24%	-32.35%
75^{th} Percentile	18.28%	13.38%	7.56%	1.26%	0.47%	-0.13%	-0.37%	-1.23%	-1.77%	-2.79%	-2.70%
90^{th}	27.09%	19.59%	11.20%	2.13%	0.72%	0.21%	0.63%	2.63%	5.55%	8.27%	13.57%

Percentile											
Percent < 0	14.0	12.8	10.0	21.1	21.5	81.8	81.7	80.2	79.6	78.9	77.1

Panel B: Buy-and-Hold Abnormal Returns

Months	-36 -1	-24 -1	-12 -1	-3 -1	-1	1	1 - 3	1 - 12	1 - 24	1 - 36	1 - 60
Median	14.19%	9.79%	5.58%	0.72%	0.25%	-0.41%	-1.26%	-5.29%	-10.97%	-17.06%	-31.75%
Mean	17.05%	11.15%	5.91%	0.67%	0.23%	-0.47%	-1.38%	-5.26%	-10.18%	-15.18%	-26.50%
Std. Error	0.37%	0.22%	0.10%	0.02%	0.01%	0.01%	0.03%	0.10%	0.19%	0.29%	0.55%
t-statistic	46.36	50.90	60.60	30.69	29.54	-51.21	-52.68	-54.77	-54.35	-52.74	-47.94
10^{th} Percentile	-9.49%	-4.39%	-0.78%	-0.58%	-0.19%	-1.14%	-3.36%	-13.10%	-25.34%	-37.17%	-65.37%
25^{th} Percentile	2.45%	2.78%	2.49%	0.11%	0.04%	-0.72%	-2.17%	-8.67%	-17.45%	-27.00%	-48.50%
75^{th} Percentile	28.73%	18.63%	9.29%	1.40%	0.47%	-0.12%	-0.37%	-1.57%	-3.51%	-5.83%	-11.12%
90^{th} Percentile	48.53%	29.43%	13.72%	2.22%	0.72%	0.21%	0.64%	2.71%	5.82%	8.95%	17.06%
Percent < 0	20.7	17.8	12.4	21.7	21.4	81.6	82.0	81.8	82.1	82.7	82.8

Panel C. Event Period Wealth Relatives and Monthly Market Returns Following IPOs.						
	Wealth Relative 1-36	Wealth Relative 1-60	Market Return	Market Return 1-36[a]	Market Return 1-60[b]	Number of IPOs per Months[c]
Median	.8529	.7781	1.11%	0.88%	0.92%	16.5
Mean	.8643	.8082	1.11%	0.87%	0.91%	59.9
Std. Error	.0020	.0029	0.00%	0.01%	0.01%	1.9
10^{th} Percentile	.6987	.5829	0.77%	0.34%	0.42%	0.6
25^{th} Percentile	.7794	.6760	0.94%	0.61%	0.66%	2.3
75^{th} Percentile	.9383	.9070	1.31%	1.13%	1.16%	62.3
90^{th} Percentile	1.0466	1.0653	1.45%	1.42%	1.41%	153.2

[a] The difference between return on market overall and return in the 36 months after an IPO is .00241 per month with a t-statistic 48.14.

[b] The difference between return on market overall and return in the 60 months after an IPO is .00204 per month with a t-statistic 46.26.

[c] Correlations of total number of offerings and 5-year excess returns: .3043.

Table VII.

Simulations of Aftermarket SEO Cumulative Abnormal Returns.

I run 5,000 simulations of a 25 year period of SEO returns. I calculate the mean event excess return for each SEO in each simulation for periods before and after the SEO. Estimates are based on actual data for 1/73 - 12/97. The expected return on the market each month is .0112, with a variance of .00204. The return on the portfolio of recent SEOs is -.0035 +1.3143 (market return). The constant is chosen so that SEOs have the same expected return as the market. The variance of the residuals is .00069. The relation between the number of SEOs and the level of the CRSP value-weighted index and the SEO index is estimated over 1973-1997. The number of SEOs in a month is given by 1.8538 - .1285 (month) -.1376 ($market_{t-1}$) + .4174 (SEO $index_{t-1}$) +.0975 ($market_{t-3}$) - .1660 (SEO $index_{t-3}$) -.0155 ($market_{t-12}$) - .0332 (SEO $index_{t-12}$). Cumulative abnormal returns are cumulated over event periods by summing abnormal returns for each month. Buy-and-hold abnormal returns are obtained by compounding SEO returns and subtracting compounded market returns. Calendar excess returns are an equal weighted average of excess returns across all months. Wealth relatives are obtained by dividing 1 plus the total return on the SEOs by 1 plus the total simulated market return.

Panel A. Cumulative Abnormal Returns Around SEOs

	-36 -1	-24 -1	-12 -1	-3 -1	-1	1	1 - 3	1 - 12	1 - 24	1 - 36	1 - 60
Median	3.94%	3.15%	2.18%	0.91%	0.30%	-0.17%	-0.49%	-1.83%	-3.34%	-4.66%	-6.80%
Mean	4.58%	3.53%	2.36%	0.94%	0.32%	-0.15%	-0.45%	-1.67%	-3.12%	-4.40%	-6.58%
Standard Error	0.10%	0.07%	0.04%	0.01%	0.00%	0.00%	0.01%	0.04%	0.09%	0.12%	0.20%
t-statistic	44.34	49.53	64.86	101.43	101.17	-39.41	-39.18	-37.83	-36.39	-35.37	-33.32
10^{th} Percentile	-3.15%	-1.79%	-0.35%	0.22%	0.08%	-0.46%	-1.35%	-5.28%	-10.25%	-14.85%	-23.73%
25^{th} Percentile	0.06%	0.43%	0.82%	0.56%	0.19%	-0.31%	-0.94%	-3.61%	-6.98%	-10.05%	-15.71%
75^{th} Percentile	8.67%	6.31%	3.77%	1.31%	0.44%	0.01%	0.03%	0.21%	0.65%	1.18%	2.53%
90^{th} Percentile	13.70%	9.78%	5.56%	1.76%	0.59%	0.19%	0.55%	2.27%	4.60%	6.86%	10.88%
Percent < 0	24.6	21.2	13.7	5.2	5.1	74.1	73.9	73.1	72.0	71.0	69.3

Panel B. Buy-and-Hold Abnormal Returns Around SEOs											
	-36 -1	-24 -1	-12 -1	-3 -1	-1	1	1 - 3	1 - 12	1 - 24	1 - 36	1 - 60
Median	4.41%	3.53%	2.35%	0.92%	0.30%	-0.17%	-0.50%	-2.09%	-4.52%	-7.44%	-14.76%
Mean	6.67%	4.57%	2.67%	0.97%	0.32%	-0.15%	-0.46%	-1.84%	-3.76%	-5.88%	-10.60%
Standard Error	0.19%	0.11%	0.05%	0.01%	0.00%	0.00%	0.01%	0.05%	0.10%	0.17%	0.34%
t-statistic	34.42	41.44	58.42	98.56	101.17	-39.41	-39.4-8	-38.49	-36.75	-35.35	-31.35
10^{th} Percentile	-7.16%	-3.56%	-0.80%	0.22%	0.08%	-0.46%	-1.37%	-5.66%	-11.83%	-18.54%	-34.64%
25^{th} Percentile	-2.02%	-0.38%	0.65%	0.55%	0.19%	-0.31%	-0.95%	-3.97%	-8.39%	-13.38%	-25.35%
75^{th} Percentile	13.09%	8.56%	4.41%	1.35%	0.44%	0.01%	0.02%	0.06%	0.09%	-0.07%	-0.26%
90^{th} Percentile	23.37%	14.27%	6.70%	1.82%	0.59%	0.19%	0.57%	2.44%	5.40%	8.64%	17.68%
Percent < 0	32.8	27.4	16.9	5.4	5.1	74.1	74.4	74.4	74.7	75.3	75.4

Panel C. Event Period Wealth Relatives and Monthly Market Returns Following SEOs.

	Wealth Relative 1-36	Wealth Relative 1-60	Return on Market	Return on Market 1-36[a]	Return on Market 1-60	# of SEOs per Month
Median	.9288	.8908	1.11%	0.92%	0.94%	67.4
Mean	.9349	.9013	1.11%	0.93%	0.95%	122.2
Standard Error	.0012	.0018	0.00%	0.01%	0.01%	2.5
10th Percentile	.8404	.7549	0.77%	0.51%	0.54%	10.1
25th Percentile	.8808	.8169	0.94%	0.70%	0.72%	26.3
75th Percentile	.9836	.9748	1.29%	1.16%	1.18%	145.0
90th Percentile	1.0410	1.0615	1.45%	1.41%	1.41%	274.4

[a] The difference between return on market overall and return in the 36 months after an SEO is .00181 per month with a t-statistic 50.19.

[b] Difference between return on market overall and return in the 60 months after an SEO is .00161 per month with a t-statistic 45.44.

[c] The correlations of total number of offerings and 5-year excess returns is .8160.

Table VIII.
Sensitivity Analysis.

Ex-post excess returns for IPOs (SEOs) are simulated when ex-ante excess returns are zero. In each case, the excess returns are simulated for 60 months following an offering. The base case refers to the cumulative abnormal returns in Table V (or VI), where the number of IPOs (SEOs) each month is based on the levels of IPO (or SEO) and market indices at the beginning of the month, three months before, and twelve months before. Simulations that bootstrap actual returns involve simulating 25-year periods of returns and number of offerings by drawing market returns and excess returns (with replacement) from the observed returns over February 1973 through December 1997. Abnormal returns calculated with the market model are obtained by subtracting the market model expected return from the actual return rather than using the difference between the IPO (SEO) return and the market return. Real returns as well as real levels of the IPO, SEO and market indices are calculated by deflating nominal returns by changes in the consumer price index. Simulations based on the equal-weighted index use levels of the equal-weighted market index and levels of the IPO (or SEO) index to determine the number of offerings in a month. Abnormal returns are calculated by subtracting the return on the equal-weighted index from the return on the IPOs (SEOs).

	Panel A. IPOs				
	Base Case	Bootstrap Actual Returns	Market Model	Real Returns	Equal Weighted Index
Median	-18.14%	-17.03%	-13.21%	-11.85%	-5.83%
Mean	-17.17%	-16.21%	-13.39%	-12.49%	-5.78%
Standard Error	0.34%	0.34%	0.32%	0.31%	0.18%
t-statistic	-50.30	-47.00	-41.46	-40.16	-32.71
10^{th} Percentile	-46.25%	-46.02%	-41.26%	-39.41%	-21.31%
25^{th} Percentile	-32.35%	-31.09%	-27.48%	-25.73%	-14.01%
75^{th} Percentile	-2.70%	-1.11%	1.27%	1.58%	2.34%
90^{th} Percentile	13.57%	15.10%	15.29%	14.15%	10.00%
Percent < 0	77.1	76.3	82.8	72.3	68.0

Panel B. SEOs					
	Base Case	Bootstrap Actual Returns	Market Model	Real Returns	Equal Weighted Index
Median	-6.80%	-6.26%	-3.58%	-5.34%	-2.64%
Mean	-6.58%	-6.18%	-3.51%	-5.40%	-2.58%
Std. Error	0.20%	0.20%	0.17%	0.17%	0.15%
t-statistic	-33.32	-31.12	-21.18	-30.95	-17.75
10^{th} Percentile	-23.73%	-23.05%	-18.07%	-20.64%	-15.43%
25^{th} Percentile	-15.71%	-15.69%	-10.87%	-13.13%	-9.55%
75^{th} Percentile	2.53%	2.97%	4.05%	2.50%	4.16%
90^{th} Percentile	10.88%	11.74%	11.26%	10.08%	10.51%
Percent < 0	69.3	67.5	61.9	68.1	60.8

Table IX.

How the Variance of IPO Excess Returns and the Sensitivity of the Number of Offerings to the IPO Index Affect Long-run Performance

Median 60 month abnormal returns following IPOs for different variances of the IPO excess returns and different sensitivities of the number of IPOs to the level of the market and level of the IPO index. For each combination of variance and sensitivity, 5,000 simulations of 30 years of returns and offerings are run. The mean abnormal performance is calculated in each simulation. The medians displayed below are the medians across the 5,000 simulations.

	Sensitivity of the Number of IPOs to the Market Level and Level of the IPO Index		
Variance of IPO Excess Returns	.03 x Mkt. Level .06 x IPO Level	-.03 x Mkt. Level .12 x IPO Level	-.09 x Mkt. Level .18 x IPO Level
.0000	-3.18%	-4.03%	-5.06%
.0006	-5.36%	-8.54%	-11.11%
.0012	-7.55%	-13.18%	-16.13%
.0018	-9.67%	-17.37%	-20.29%
.0024	-11.86%	-20.67%	-23.87%
.0030	-14.01%	-23.96%	-26.81%
.0036	-16.05%	-27.02%	-29.56%

References

Agrawal, Anup, Jeffrey Jaffe, and Gershon Mandelker, 1992, The post-merger performance of acquiring firms: A re-examination of an anomaly, Journal of Finance 47, 1606-1621.

Álvarez, Susana, and Victor González, 2001, Long-run performance of initial public offerings in the Spanish capital market, Working paper, University of Oviedo.

Arosio, Roberto, Giancarlo Giudici and Stafano Paleari, 2001, The market performance of Italian IPOs in the long-run, Working paper, Università Politecnico di Milano.

Ausnegg, Wolfgang, 1997, Short and long-run performance of initial public offerings in the Austrian Stock Market, Working paper, Vienna University of Technology.

Baker, Malcolm, and Jeffrey Wurgler, 2000, The equity share in new issues and aggregate stock returns, Journal of Finance 55, 2219-2257.

Billett, Matthew, Mark Flannery and Jon Garfinkel, 2001, The long-run performance of firms following loan announcements, Working paper, University of Iowa.

Brav, Alon, Christopher Geczy, and Paul Gompers, 2000, Is the abnormal return following equity issuance anomalous?, Journal of Financial Economics 56, 209-249.

Brav, Alon, and Paul Gomper, 1997,Myth or reality? The long-run performance of initial public offerings: Evidence from venture and nonventure capital-backed companies, Journal of Finance 52, 1791-1821.

Eckbo, B.Espen, Ronald Masulis and Øyvind Norli, 2000, Seasoned public offerings: resolution of the ›new issues puzzle‹, Journal of Financial Economics 56, 251-291.

Fama, Eugene, 1998, Market efficiency, long-term returns, and behavioral finance, Journal of Financial Economics 49, 283-306.

Gompers, Paul and Josh Lerner, 2000, The really long-run performance of initial public offerings: The pre-Nasdaq evidence, Working paper, Harvard University.

Hand, John, and Terrance Skantz (1998), Market timing through equity carve-outs? Working paper, University of North Carolina.

Hirshleifer, David, 2001, Investor psychology and asset pricing, Journal of Finance 56, 1533-1597.

Ikenberry, David, Josef Lakonishok, and Theo Vermaelen, 1995, Market underreaction to open market repurchases, Journal of Financial Economics 39, 181-208.

Jain, Bharat A., and Omesh Kini, 1994, The post-issue operating performance of IPO firms' Journal of Finance 49, 1699-1726.

Keloharju, Matti, 1993, The winner=s curse, legal liability, and the long-run performance of initial public offerings in Finland, Journal of Financial Economics 34, 251-277.

Korajczyk, Robert, Deborah Lucas and Robert McDonald, 1990, Understanding stock price behavior around the time of equity issues, R. Glenn Hubbard, Ed.: Asymmetric Information, Corporate Finance and Investment (NBER and University of Chicago Press, Chicago, IL)

Lakonishok, Josef, and Theo Vermaelen, 1990, Anomalous price behavior around repurchase tender offers, Journal of Finance 45, 455-477.

Lee, Inmoo, 1997, Do firms knowingly sell overvalued equity? Journal of Finance 52, 1439 - 1466.

Lee, P., S. Taylor and T. Walter, 1996, Australian IPO underpricing in the short and long-run, Journal of Banking and Finance 20, 1189-1210.

Lerner, Joshua, 1994, Venture capitalists and the decision to go public, Journal of Financial Economics 35, 293-316.

Levis, Mario, 1993, The long-run performance of initial public offerings: The U.K. experience 1980-88, Financial Management 22, 28-41.

Loughran, Tim, and Jay Ritter, 1995, The new issues puzzle, Journal of Finance 50, 23-51.

Loughran, Tim, and Jay Ritter, 2000, Uniformly least powerful tests of market efficiency, Journal of Financial Economics 55, 361-390.

Loughran, Tim, Jay R. Ritter and Kristian Rydqvist, 1994, Initial public offerings: International insights, Pacific Basin Finance Journal 2, 165-199.

Loughran, Tim, and Anand Vijh, 1997, Do long-term shareholders benefit from corporate acquisitions?, Journal of Finance 52, 1765-1790.

Michaely, Roni, Richard Thaler and Kent Womack, 1995, Price reactions to dividend initiations and omissions: Overreaction or drift? Journal of Finance 50, 573-608.

Mikkelson, Wayne, Megan Partch, and Kshitij Shah, 1997, Ownership and operating performance of companies that go public, Journal of Financial Economics 44, 281-307.

Mitchell, Mark, and Erik Stafford, 2000, Managerial decisions and long-term stock price performance, Journal of Business 73, 287-320.

Ritter, Jay R., 1991, The long-run performance of initial public offerings, Journal of Finance 46, 3-27.

Ritter, Jay, 1998, Initial public offerings, Contemporary Finance Digest 2, 5-30.

Schlag, Christian, and Anja Wodrich, 2000, Has there always been underpricing and long-run performance? - IPOs in Germany before World War I, Working paper, Goethe University, Frankfurt, Germany.

Spiess, D. Katherine, and John Affleck-Graves, 1995, Underperformance in long-run stock returns following seasoned equity offerings, Journal of Financial Economics 38, 243-267.

Spiess, D. Katherine, and John Affleck-Graves, 1998, The long-run performance of stock returns following debt offerings, Journal of Financial Economics, forthcoming.

Webb, Gwendolyn P., 1999, Evidence of managerial timing: The case of exchange listings, Working paper, Baruch College.

White, Halbert, 1980, A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity, Econometrica 48,817-838.

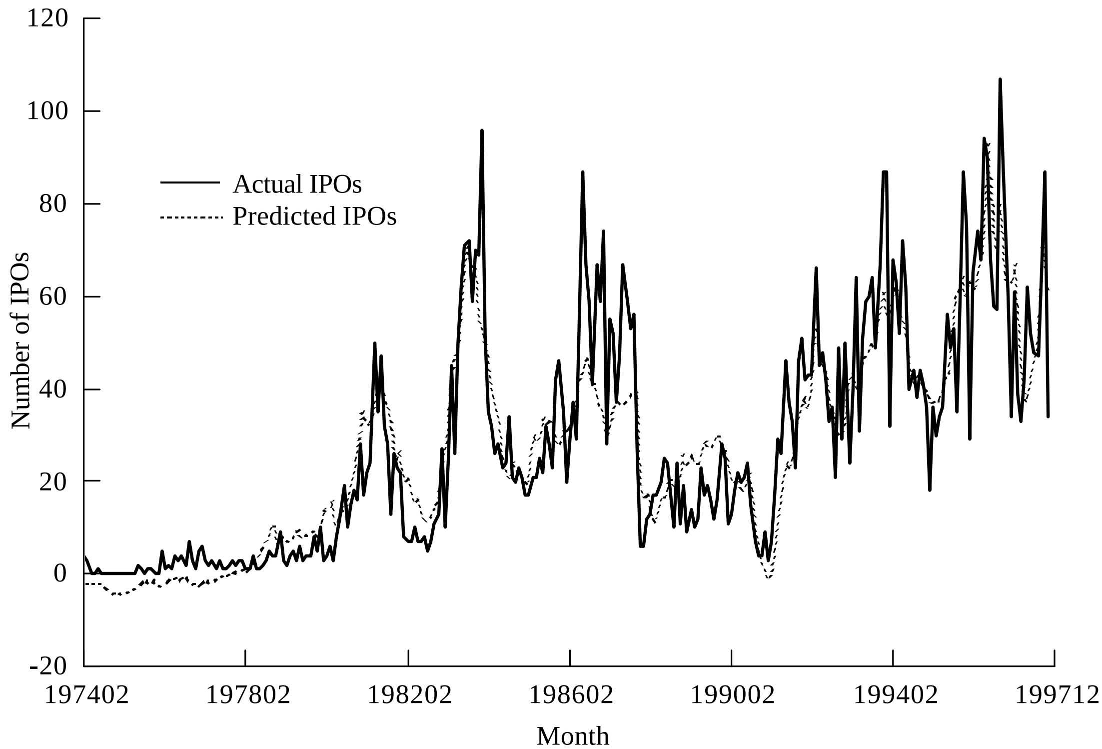

Figure 1. The actual and predicted number of IPOs. The predicted number is obtained by regressing the number of IPOs on the levels of an iPO index and value-weighted index at the beginning of the month, three months before, and twelve months before.

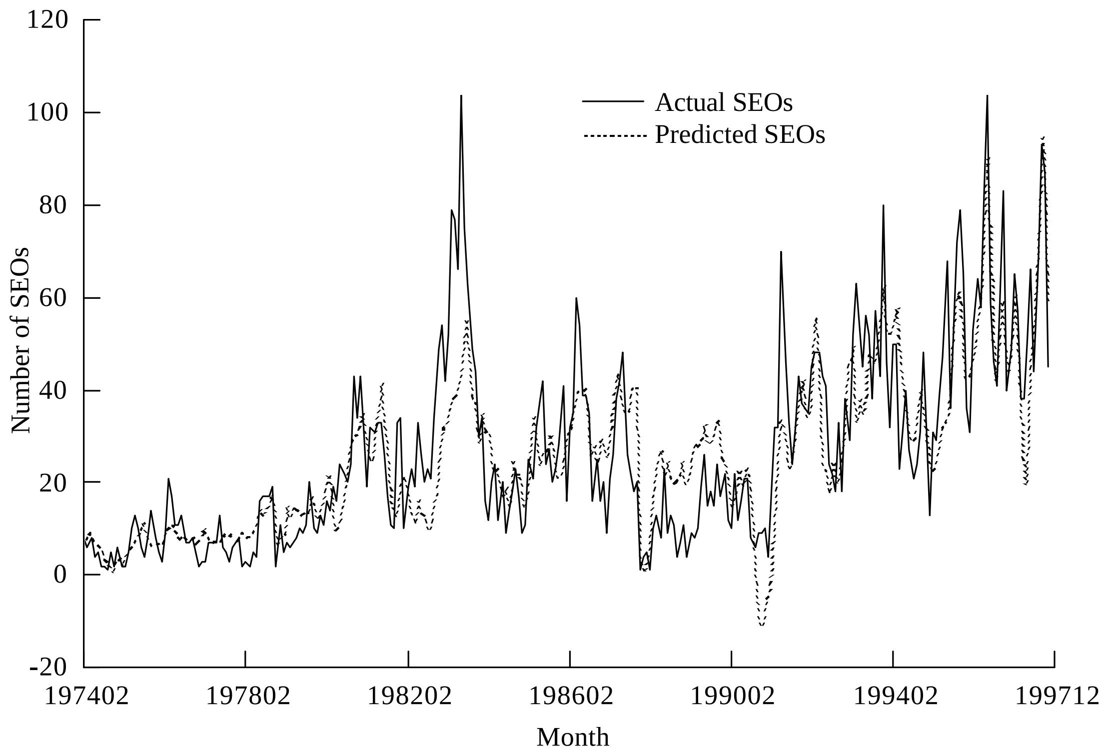

Figure 2. The actual and predicted monthly number of SEOs. The predicted number is obtained from a regression of the number of SEOs on the level of the value-weighted market index, the level of an index of past SEOs, and levels of the indices lagged three and twelve months.

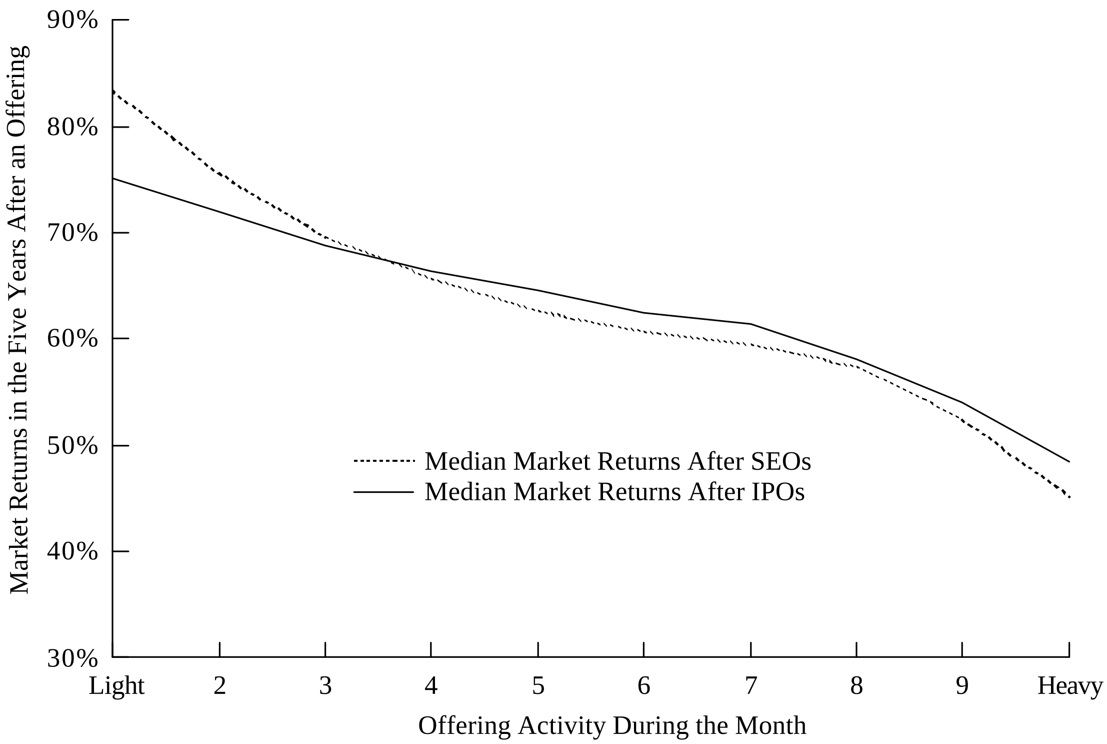

Figure 3. Market returns following months with varying levels of offering activity.

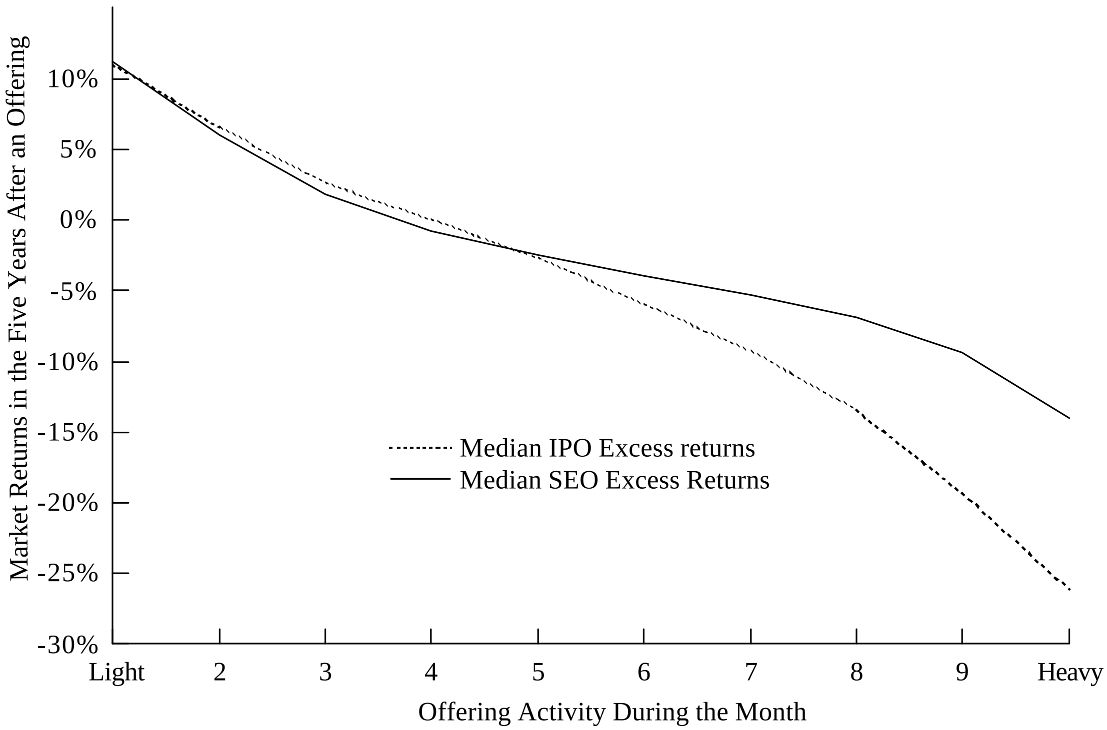

Figure 4. Cumulative abnormal returns following months with varying levels of offering activity.