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# Pseudo Market Timing and the Long-Run Underperformance of IPOs

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**ABSTRACT**

Numerous studies document long-run underperformance by firms following equity offerings. This paper shows that underperformance is very likely to be observed *ex-post* 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 seem to time the market because offerings cluster at market peaks. Simulations based on 1973 through 1997 data reveal that when *ex-ante* expected abnormal returns are zero, median *ex-post* underperformance for equity issuers will be significantly negative in event-time. Using calendar-time returns solves the problem.

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. Keloharju (1993), Levis (1993), Lee, Taylor, and Walter (1996), Arosio, Giudici, and Paleari (2001), and others report poor long-run performance in a number of other countries. Gompers and Lerner (2003) show that IPOs issued between 1935 and 1972 performed poorly in the years after issue when event-time buy-and-hold abnormal returns are used. 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

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take advantage of overpricing by selling stock to overly optimistic investors. While this explanation is broadly consistent with the evidence, it is 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 those of similar nonissuing firms. Eckbo, Masulis, 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.

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 and implicitly tests a strategy of investing equal amounts in each offering. 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. It implicitly tests a strategy of investing equal amounts in IPOs each month. 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. Thus, a strategy of investing equal amounts in each offering should result in particularly poor performance.

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 through 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. This has nothing to do with managers predicting future returns. Firms could issue more equity at higher prices because higher prices imply more investment opportunities and firms go public to take projects. Alternatively, firms could issue more equity when prices are higher because they believe it results in less earnings dilution, because they incorrectly believe stock prices are too high, or for any other reason. The reason why higher stock prices result in more offerings is unimportant for the pseudo market timing explanation. 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 0 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 0 and 1, 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

**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. Each row of the table provides results for one path.

| 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 | 0.10 | 110 | 3 | 0.10 | 4 | 4/0 | 0.10 |
| 100 | 1 | 0.10 | 110 | 3 | −0.10 | 4 | 1/3 | −0.05 |
| 100 | 1 | −0.10 | 90 | 0 | 0.10 | 1 | 0/1 | −0.10 |
| 100 | 1 | −0.10 | 90 | 0 | −0.10 | 1 | 0/1 | −0.10 |

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 at peaks *ex-post*. This is illustrated in the second row of the table. On this path, excess returns are positive for IPOs that go public at time 0 and negative for IPOs from time 1. Because of the rise in stock prices, however, 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.

Another characteristic of IPO performance is that offerings that occur during heavy offering periods are more likely to underperform than offerings that take place during periods of light offering activity. This is also found in our example. The heavy offering period is period 1 for the first two paths and period 0 for the last two paths. In three of the four cases, the heavy offering period is followed by poor returns. This comes about because we define heavy offering periods *ex-post*. If we did not observe poor returns after a period of heavy offering activity, there would be even more offers the following period and the heavy offering activity period would no longer be defined as a period of heavy offering activity.

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 time 1 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 it, 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 ("doubles") 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 for recent issuers are either positive five percent or negative five percent, and that 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 prices rise, the number of offerings the next period increases by $\Delta\%$. If prices fall, the number of offerings decreases by $\Delta\%$. 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 $\Delta = 20\%$, the likelihood of observing underperformance is high, reaching 84.2 percent with 100 observations and 98.6 percent with 5,000. When $\Delta = 10$ percent, the likelihood of underperformance is

**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 positive five percent or negative five percent 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 Δ%. After a negative excess return the number of offerings falls by Δ%. The lengths of the time series vary from 20 to 5,000 periods. I simulate paths of each length 5,000 times.

| | Δ = 10 percent | | Δ = 20 percent | |
|---|---|---|---|---|
| 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% |

69.7 percent with 100 observations and 97.0 percent 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:

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

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 market or matching stock for event month $e$.

Now consider the expected cumulative abnormal return. In the past, researchers have assumed that $N$, the number of offerings, is an exogenously determined constant. It is not. The number of offerings is itself a random variable that is correlated with excess returns. Thus the expected cumulative abnormal return 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. That is,

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

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.

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

Ritter's (1991) finding of abnormally poor long-run returns following IPOs inspired a number of papers on the estimation of long-run abnormal returns. Researchers have found that factors that can be ignored in calculating short-run abnormal performance become very important is assessing long-run performance. In the words of Lyon, Barber, and Tsai (1999, p. 198): "analysis of long-run abnormal returns is treacherous."

Calculating the level of abnormal returns is problematic. Fama (1998) notes that bad model problems are exacerbated when long-run abnormal returns are calculated. Kothari and Warner (1997) show that cumulative abnormal returns are biased upward as a result of bid-ask bounce. Barber and Lyon (1997) show that bid-ask bounce can result in a rebalancing bias when equal-weighted portfolios of securities are examined. In effect, each period the portfolio is rebalanced to put more weight on stocks that have declined in price (traded last at the bid) and less weight on stocks that have increased in price (traded last at the ask).

Calculating the significance of long-run abnormal returns presents even more difficulties. Kothari and Warner (1997) report that the postevent standard error of abnormal returns is biased downward if a minimum number of observations in the preevent period are required to estimate parameters. Kothari and Warner, Barber and Lyon (1997), Lyon et al. (1999), and others show that buy-and-hold abnormal returns, while not subject to the rebalancing bias, are severely skewed. Lyon et al. suggest that researchers use buy-and-hold abnormal returns with a bootstrapped version of a skewness-adjusted $t$-statistic or with empirically estimated $p$-values. In contrast, Mitchell and Stafford (2000) recommend cumulative abnormal returns in calendar-time. They contend that the significance levels of all returns calculated in event-time are greatly overstated with even moderate cross-sectional correlation.

Several papers look specifically at how mismeasurement of risk or returns may affect the measurement of long-run performance following equity offerings. Eckbo et al. (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. show that underperformance is concentrated among small firms with low book-to-market ratios while Brav and Gompers 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. 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. That is, IPOs have underperformed relative to their *ex-ante* expected return. Nevertheless, 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 by Kothari and Warner (1997), Barber and Lyon (1997), and Lyon et al. (1999). The simulations to follow will show poor performance following IPOs even when the problems that these authors discuss are absent. That is, IPOs can be expected to underperform even with the proper benchmark, no bid-ask bounce, correctly estimated standard errors, and normally distributed returns.

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] This is not a serious limitation. Although Loughran and Ritter (1995) and others find underperformance in calendar-time, it is in event-time that IPO and SEO underperformance is particularly severe. For

[1] The exception is that calendar-time returns may be affected if poor IPO performance is followed by a very long period of time with no IPOs. This may result in some calendar months being thrown out because there were no offerings in the prior 36 or 60 months. This has not occurred in practice since 1973.

**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 through 4941 (utilities), 6000 through 6081 (banks), and 6722, 6726,and 6792 (funds and investment companies) 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 |
| First order autocorrelation | 0.85 | 0.83 |

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. 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 through 2000. As a first step, I create IPO and SEO indices by compounding aftermarket returns of recent IPOs and 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 the number of offerings over 1973 through 1997 and the long-run aftermarket abnormal returns of IPOs and SEOs over 1973 through 2000. In the simulations, the *ex-ante* abnormal return is zero. I find that the median simulated underperformance is similar to actual abnormal returns over the 1973 through 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 through 1997 period. To be consistent with previous studies, 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 through 4941) and banks (6000 through 6081). Table III provides data on the distribution of the number of offerings each month. The mean number of IPOs

**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 through 4941 (utilities), 6000 through 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 12 Months After |
|---|---|---|---|
| 1973 through 1977 | – 0.2479 | – 0.2910 | – 0.4091 |
| 1978 through 1982 | – 0.1427 | – 0.3681 | – 0.5998 |
| 1983 through 1987 | – 0.1739 | – 0.3181 | – 0.5084 |
| 1988 through 1992 | – 0.0595 | – 0.2075 | – 0.1971 |
| 1993 through 1997 | – 0.1122 | – 0.1251 | – 0.1056 |

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 12 Months After |
|---|---|---|---|
| 1973 through 1977 | – 0.0276 | – 0.0157 | – 0.1348 |
| 1978 through 1982 | – 0.0871 | – 0.1643 | – 0.1928 |
| 1983 through 1987 | – 0.0412 | – 0.0827 | – 0.3386 |
| 1988 through 1992 | – 0.1167 | – 0.1617 | – 0.2908 |
| 1993 through 1997 | – 0.1823 | – 0.0062 | – 0.1795 |

per month is 26.8 while the mean number of SEOs is 26.0. The number of IPOs per month ranges from 0 to 107 while the number of SEOs ranges from 1 to 104.

I use the CRSP tapes to calculate returns for each IPO or SEO for up to 60 months following the offering. These returns are provided to allow the reader to compare the simulation results with the actual performance of IPOs and SEOs. As in the simulations, 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. 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. 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 SEO returns are the same in calendar-time and event-time. Abnormal returns relative to the value-weighted index decrease from $-0.15$ percent per month in calendar-time to $-0.38$ percent per month in 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 3 months, and the next 12 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 through 1982, the correlation between the number of IPOs in a month and the return of the market over the next 12 months is $-0.5998$. For 1983 to 1987 it is $-0.5084$. Panel C is analogous, but lists correlations between the number of SEOs in a month and the subsequent returns of the CRSP value-weighted index. Results are somewhat weaker than for IPOs, but each of the correlations is negative.

### *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 through 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 Table V. 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, and a time variable that increments by one each month. The coefficient on the IPO index is 0.1533, indicating that the number of IPOs increases with the index of past IPO returns. The coefficient on the market index is $-0.0571$, 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 3 and 12 months before. Lagged index values are included to capture the effects of delays in bringing IPOs to market. 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.

Undoubtedly, the regressions in Table V are crude estimates of the relation between stock prices and the number of companies issuing equity. Industry differences are ignored as are nonlinearities in the relations and intertemporal changes in the parameters. Nevertheless, they provide simple but useful models of the relationships between stock prices and the frequency of equity offerings. Figure 1 graphs the actual and fitted number of IPOs for the regressions that use the levels of the market and IPO indices at the beginning of the month, 3 months before, and 12 months before. It is apparent that the regressions do a very good job of fitting the number of offerings in-sample.

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

**Table V**

**Determinants of the Number of IPOs and SEOs Each Month Over February 1973 Through December 1997**

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 | $\text{Market}_t$ | $\text{Market}_{t-3}$ | $\text{Market}_{t-12}$ | IPO (SEO) $\text{Index}_t$ | IPO (SEO) $\text{Index}_{t-3}$ | IPO (SEO) $\text{Index}_{t-12}$ | Adj $R^2$ |
|---|---|---|---|---|---|---|---|---|---|
| Monthly Number | – 1.9744 | – 0.1439 | – 0.0571 | | | 0.1533 | | | 0.778 |
| IPOs | ( – 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 | 0.787 |
| IPOs | ( – 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 | | | 0.670 |
| SEOs | ( – 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 | 0.704 |
| SEOs | (1.00) | ( – 3.92) | ( – 4.45) | (2.63) | ( – 0.63) | (11.98) | ( – 4.33) | ( – 1.31) | |

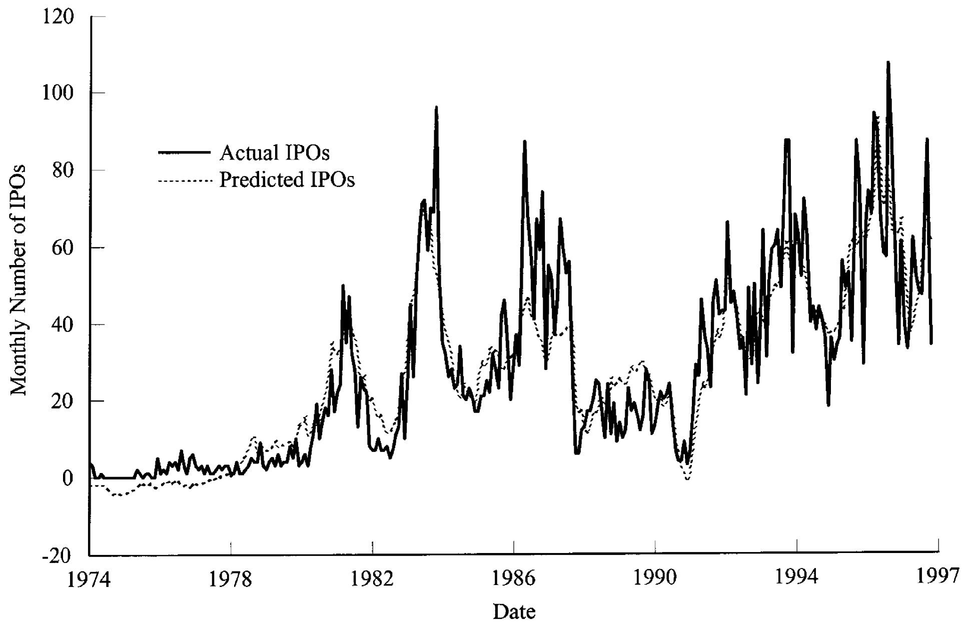


**Figure 1. The actual and predicted number of IPO.** The predicted number is obtained by regressing the number of IPOs on the levels of an IPO index and the value-weighted index at the beginning of the month, 3 months before, and 12 months before.

### *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 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 through 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

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

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 0.3454 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 estimated coefficients and standard deviations 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).

As an aid to evaluating the realism of the simulations, Figure 2 shows the actual number of IPOs each month and the simulated numbers from 3 of the 5,000 simulations. The simulations shown are those with 60-month aftermarket abnormal returns closest to the median of the 5,000 simulations. Examination of Figure 2 reveals that the total number and pattern of IPOs varies greatly across simulations. It also reveals that the simulated numbers of IPOs, like the actual numbers, are variable, highly autocorrelated, and subject to abrupt declines.

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

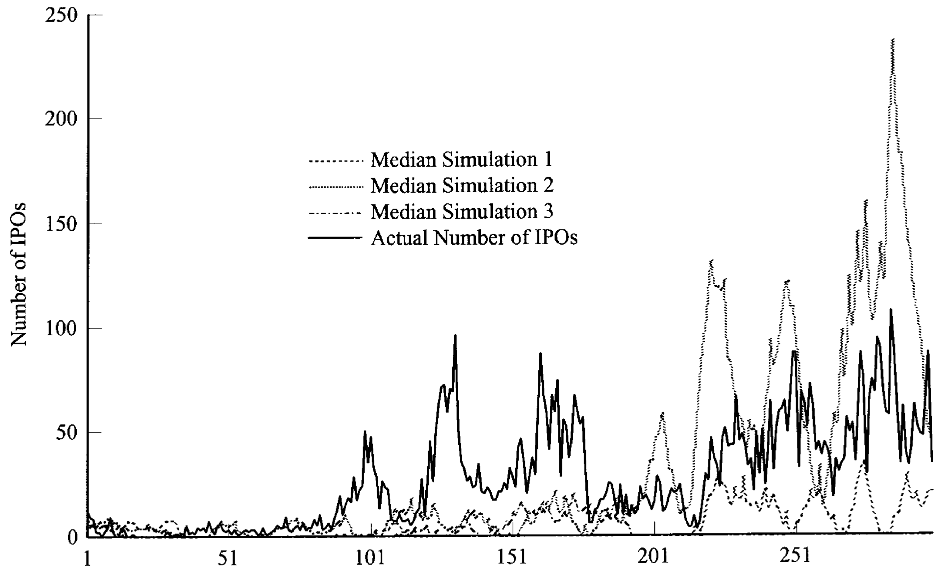


**Figure 2. The actual number of IPOs per month and the number per month from the three simulations with abnormal returns closest to the median.** Simulations use actual parameters of the return distributions of the CRSP value-weighted index and the excess returns of IPOs. The simulated number of IPOs each month is based on the simulated levels of the IPO index and market index at the beginning of the month, 3 months before, and 12 months before.

− 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 10 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 for the $T$ months following an offering are calculated as

$$BHAR = \prod_{t=1}^{T}(1 + r_t^{IPO}) - \prod_{t=1}^{T}(1 + r_i^{Mkt}). \quad (3)$$

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.

**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 through 12/97. The expected return on the market each month is 0.0112, with a variance of 0.00204. The return on the portfolio of recent IPOs is $-0.00345+1.3084\times$ market return. The constant is chosen so that IPOs have the same expected return as the market. The variance of the residuals is 0.00183. The relation between the number of IPOs and the level of the CRSP value-weighted index and the IPO index is estimated over 1973 through 1997. The number of IPOs in a month is given by $-2.711-0.1132$(month) $-0.0337$ (value of market$_{t-1}$)$+0.1194$ (IPO index$_{t-1}$) $-0.0239$ (value of market$_{t-3}$)$+0.0551$ (IPO index$_{t-3}$)$+0.0041$ (value of market$_{t-12}$) $-0.0348$ (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. Wealth relatives are obtained by dividing one plus the total simulated return on the IPOs by one 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 |
| 10th percentile | –2.87% | –1.37% | 0.01% | –0.54% | –0.19% | –1.14% | –3.37% | –12.54% | –23.11% | –31.45% | –46.25% |
| 25th percentile | 4.37% | 3.59% | 2.63% | 0.12% | 0.04% | –0.73% | –2.13% | –8.14% | –14.91% | –21.24% | –32.35% |
| 75th percentile | 18.28% | 13.38% | 7.56% | 1.26% | 0.47% | –0.13% | –0.37% | –1.23% | –1.77% | –2.79% | –1.77% |
| 90th percentile | 27.09% | 19.59% | 11.20% | 2.13% | 0.72% | 0.21% | 0.63% | 2.63% | 5.55% | 8.27% | 13.57% |
| 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 |
| 10th percentile | –9.49% | –4.39% | –0.78% | –0.58% | –0.19% | –1.14% | –3.36% | –13.10% | –25.34% | –37.17% | –65.37% |
| 25th percentile | 2.45% | 2.78% | 2.49% | 0.11% | 0.04% | –0.72% | –2.17% | –8.67% | –17.45% | –27.00% | –48.50% |
| 75th percentile | 28.73% | 18.63% | 9.29% | 1.40% | 0.47% | –0.12% | –0.37% | –1.57% | –3.51% | –5.83% | –11.12% |
| 90th 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 |

Table VI—*continued*

| 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 | 0.8529 | 0.7781 | 1.11% | 0.88% | 0.92% | 16.5 |
| Mean | 0.8643 | 0.8082 | 1.11% | 0.87% | 0.91% | 59.9 |
| Std. error | 0.0020 | 0.0029 | 0.00% | 0.01% | 0.01% | 1.9 |
| 10th percentile | 0.6987 | 0.5829 | 0.77% | 0.34% | 0.42% | 0.6 |
| 25th percentile | 0.7794 | 0.6760 | 0.94% | 0.61% | 0.66% | 2.3 |
| 75th percentile | 0.9383 | 0.9070 | 1.31% | 1.13% | 1.16% | 62.3 |
| 90th 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 0.00241 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 0.00204 per month with a $t$-statistic 46.26.
[c]Correlations of total number of offerings and five-year excess returns: 0.3043.

Buy-and-hold abnormal returns have their own problems though. Mitchell and Stafford (2000) show that the compounding involved in calculating buy-and-hold excess returns results in excess returns following IPOs that 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 percent as compared to the median cumulative abnormal returns of −18.1 percent. More than 80 percent 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 0.8529. At the end of the 60 months subsequent to an IPO, the median wealth ratio across all simulated sample paths is 0.7781. For comparison, Loughran and Ritter (1995) report average wealth ratios of 0.80 at the end of the three years after an IPO and 0.70 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 through 1997. Thus it is not surprising that both the median and mean of the average market returns are 1.11 percent. In contrast, 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 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. That the mean is far higher than the median is a result of a right-skewed distribution for the simulated number of IPOs. Recall that over 1973 through 1997, the number of actual IPOs per month averaged 26 with a range from 0 to 107. The mean of 59.9 offers per month is not an unreasonable number if, however, the market had performed well in 1973 through 1974 or the 1987 crash had not

[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 percent, while the mean is 0.43 percent. For SEOs, the median 60 month buy-and-hold excess return is −2.34 percent, while the mean is 0.21 percent.

occurred. The correlation between the number of IPOs in a simulation and the mean excess return in the 60 months after IPOs is 0.3043.

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 through 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 percent in the five years after the offering. SEOs underperform in about 75 percent of the simulations. In more than 10 percent of the simulations, SEOs underperform by more than 34 percent.

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 0.8908 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 0.8169 and a 10 percent chance of observing a wealth relative of less than 0.7549. 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 0.8160.

Some behavioralists cite the clustering of IPOs at market and stock price peaks as evidence that investment bankers and corporate managers are able to

**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-time excess return for each SEO in each simulation for periods before and after the SEO. Estimates are based on actual data for 1/73 through 12/97. The expected return on the market each month is 0.0112, with a variance of 0.00204. The return on the portfolio of recent SEOs is $-0.0035+1.3143$ (market return). The constant is chosen so that SEOs have the same expected return as the market. The variance of the residuals is 0.00069. The relation between the number of SEOs and the level of the CRSP value-weighted index and the SEO index is estimated over 1973 through 1997. The number of SEOs in a month is given by 1.8538 $-0.1285$ (month) $-0.1376$ (market$_{t-1}$)$+0.4174$ (SEO index$_{t-1}$)$+0.0975$ (market$_{t-3}$) $-0.1660$ (SEO index$_{t-3}$) $-0.0155$ (market$_{t-12}$) $-0.0332$ (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. Wealth relatives are obtained by dividing one plus the total simulated return on the SEOs by one 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 |
| 10th percentile | −3.15% | −1.79% | −0.35% | 0.22% | 0.08% | −0.46% | −1.35% | −5.28% | −10.25% | −14.85% | −23.73% |
| 25th percentile | 0.06% | 0.43% | 0.82% | 0.56% | 0.19% | −0.31% | −0.94% | −3.61% | −6.98% | −10.05% | −15.71% |
| 75th percentile | 8.67% | 6.31% | 3.77% | 1.31% | 0.44% | 0.01% | 0.03% | 0.21% | 0.65% | 1.18% | 2.53% |
| 90th 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 | −39.48 | −38.49 | -36.75 | −35.35 | −31.35 |
| 10th percentile | −7.16% | −3.56% | −0.80% | 0.22% | 0.08% | −0.46% | −1.37% | −5.66% | −11.83% | −18.54% | −34.64% |
| 25th percentile | −2.02% | −0.38% | 0.65% | 0.55% | 0.19% | −0.31% | −0.95% | −3.97% | −8.39% | −13.38% | −25.35% |
| 75th percentile | 13.09% | 8.56% | 4.41% | 1.35% | 0.44% | 0.01% | 0.02% | 0.06% | 0.09% | −0.07% | −0.26% |
| 90th 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 |

Table VIII—*continued*

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[b] | # of SEOs per Month[c] |
|---|---|---|---|---|---|---|
| Median | 0.9288 | 0.8908 | 1.11% | 0.92% | 0.94% | 67.4 |
| Mean | 0.9349 | 0.9013 | 1.11% | 0.93% | 0.95% | 122.2 |
| Standard error | 0.0012 | 0.0018 | 0.00% | 0.01% | 0.01% | 2.5 |
| 10th percentile | 0.8404 | 0.7549 | 0.77% | 0.51% | 0.54% | 10.1 |
| 25th percentile | 0.8808 | 0.8169 | 0.94% | 0.70% | 0.72% | 26.3 |
| 75th percentile | 0.9836 | 0.9748 | 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 0.00181 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 0.00161 per month with a $t$-statistic 45.44.

[c]The correlations of total number of offerings and five-year excess returns is 0.8160.

time the market and take advantage of investors by issuing securities at prices that they know are too high. Nevertheless, 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 does not 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. Figure 3 graphs the median, across the 5,000 simulations, of the mean market return in the 60 months following the IPO (SEO) for each decile. 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.

Figure 4 is similar to Figure 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

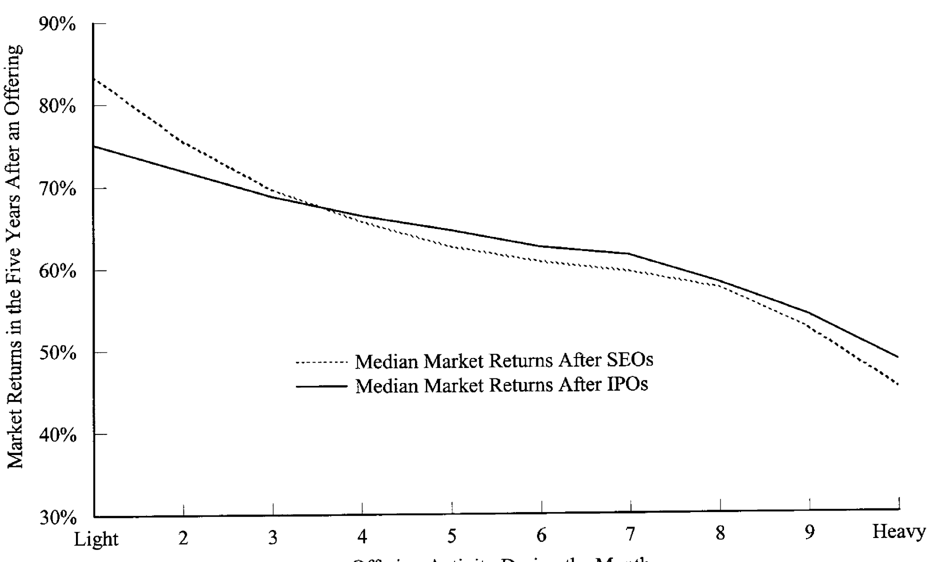


**Figure 3. Median market returns in the 60 months following IPOs and SEOs across deciles of offering activity.** For each simulation, months with at least one offering are divided into deciles based on the number of IPOs or SEOs during the month. The figure shows the medians, across 5,000 simulations of market returns following offerings.

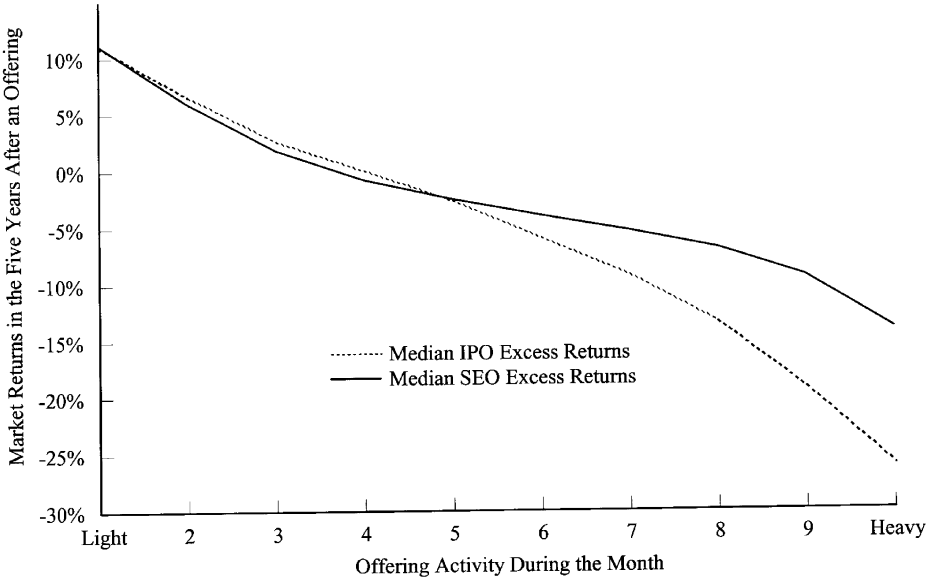


**Figure 4. Median excess returns over the 60 months following IPOs or SEOs.** In each simulation, months are divided up into deciles based on the number of offerings during the month. The graph shows the medians, across the 5,000 simulations, of the excess returns in the 60 months following months in different deciles of offering activity. Excess returns are the difference between the returns of the firms conducting offerings and the market return.

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 provides, as a base case, the distribution of the simulated cumulative abnormal returns in the five years following offerings. It is the same as the results reported in Table VI.

In the base case simulations, market returns and excess returns were assumed to be normally distributed. It is well known that stock returns are skewed and fat-tailed relative to a normal distribution. As an alternative, the simulations are rerun by drawing returns with replacement from the actual returns of the CRSP value-weighted index over 1973 through 1997. The excess returns are drawn with replacement from the excess returns of the IPOs over 1973 through 1997. In every other way, the simulations are identical to the base case.

The results are shown in the third column of Table VIII. 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 one percent higher over 60 months, but still represent economically significant underperformance.

Recall that in the base case, the simulated return of IPOs for each calendar month is generated by

$$R_{IPO,t} = -.00345 + 1.3084 \times R_{Mkt,t} + \varepsilon_t, \tag{4}$$

where $R_{IPO,t}$ is the simulated return for IPOs for month $t$ and $R_{mkt,t}$ is the simulated return on the market for month $t$. The intercept of $-.00345$ is chosen so that the *ex-ante* expected return of IPOs equals the *ex-ante* expected return on the market. In the base case, the simulated excess return for IPOs for a calendar month $t$ is the market-adjusted return

$$ER_{IPO,t} = R_{IPO,t} - R_{Mkt,t}. \tag{5}$$

For the next group of simulations, I use the simulated IPO returns from the base case but calculate excess returns using the market model. That is, excess returns are calculated as

$$ER_{IPO,t} = R_{IPO,t} + .00345 - 1.3084 \times R_{Mkt,t}. \tag{6}$$

The *ex-ante* expected market model excess returns, like the *ex-ante* expected market-adjusted excess returns, are set equal to zero by construction. Results from these simulations are shown in the fourth column of the table.

In the 60 months following IPOs, median (mean) abnormal returns are $-13.2$ percent ($-13.4$ percent) when estimated with the market model as compared to $-18.1$ percent ($-17.2$ percent) 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. Because IPO returns are generated by (4), with a coefficient greater than one on the market return, IPOs will underperform even more than the market when the market performs poorly. When excess returns are calculated as the difference between the IPO return and the market return, part of the poor performance of IPOs that is due to the poor market performance following offerings is included in the excess returns. 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

**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 VI (or VII), 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, 3 months before, and 12 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). Simulations in the last column are based on parameters estimated over 1973 through 2001.

Panel A: IPOs

| | Base Case | Bootstrap Actual Returns | Market Model | Real Returns | Equal Weighted Index | Through 2001 |
|---|---|---|---|---|---|---|
| Median | – 18.14% | – 17.03% | – 13.21% | – 11.85% | – 5.83% | – 17.74% |
| Mean | – 17.17% | – 16.21% | – 13.39% | – 12.49% | – 5.78% | – 17.64% |
| Standard error | 0.34% | 0.34% | 0.32% | 0.31% | 0.18% | 0.39% |
| *t*-statistic | – 50.30 | – 47.00 | – 41.46 | – 40.16 | – 32.71 | – 45.49 |
| 10th percentile | – 46.25% | – 46.02% | – 41.26% | – 39.41% | – 21.31% | – 50.50% |
| 25th percentile | – 32.35% | – 31.09% | – 27.48% | – 25.73% | – 14.01% | – 34.43% |
| 75th percentile | – 2.70% | – 1.11% | 1.27% | 1.58% | 2.34% | – 0.06% |
| 90th percentile | 13.57% | 15.10% | 15.29% | 14.15% | 10.00% | 16.49% |
| Percent < 0 | 77.1 | 76.3 | 82.8 | 72.3 | 68.0 | 75.06 |

Panel B: SEOs

| | Base Case | Bootstrap Actual Returns | Market Model | Real Returns | Equal Weighted Index | Through 2001 |
|---|---|---|---|---|---|---|
| Median | – 6.80% | – 6.26% | – 3.58% | – 5.34% | – 2.64% | – 11.74% |
| Mean | – 6.58% | – 6.18% | – 3.51% | – 5.40% | – 2.58% | – 10.71% |
| Std. error | 0.20% | 0.20% | 0.17% | 0.17% | 0.15% | 0.35% |
| *t*-statistic | – 33.32 | – 31.12 | – 21.18 | – 30.95 | – 17.75 | – 30.51 |
| 10th percentile | – 23.73% | – 23.05% | – 18.07% | – 20.64% | – 15.43% | – 40.73% |
| 25th percentile | – 15.71% | – 15.69% | – 10.87% | – 13.13% | – 9.55% | – 27.17% |
| 75th percentile | 2.53% | 2.97% | 4.05% | 2.50% | 4.16% | 4.45% |
| 90th percentile | 10.88% | 11.74% | 11.26% | 10.08% | 10.51% | 20.58% |
| Percent < 0 | 69.3 | 67.5 | 61.9 | 68.1 | 60.8 | 68.3 |

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 through 1997, 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 percent (−12.5 percent), but that is an underperformance in real terms and is not strictly comparable to the base case.

The second to last 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 result from the simulations is consistent with findings of empirical studies of underperformance. The equal-weighted index places much more weight on small firms, and Brav and Gompers (1997) show that IPOs do not underperform relative to other small, low book-to-market stocks. 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 return should be as highly correlated with the securities as possible. With a high correlation, the poor returns following the clustering of events will be matched by poor returns from the benchmark.

The table's final column reports the distribution of simulated performance for the 60 months following IPOs when the simulation parameters are estimated over 1973 through 2001. There are two disadvantages of using this longer period. First, we do not have three years after the last IPO to estimate long-run performance. Second, the results may be harder to compare with results of earlier empirical studies of long-run performance. On the other hand, the longer period does allow inclusion of the hot market in dot.com stocks. Table VIII shows that simulations based on parameters estimated over the longer time period produce results that are very similar to the base case findings.

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. One difference between the IPO and SEO simulations is that SEO underperformance is greater when simulations use parameters estimated over 1973 through 2001 than in the base case.[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 0.00183. The regression coefficients used in the base case are 0.1195 for the IPO index and −0.0337 for the market index. The variance of the monthly IPO excess returns used in the simulations of Table IX ranges from 0.0000 to 0.0036. The coefficient on the level of the IPO index in month $t$ varies from 0.06 to 0.18. The coefficient on the market level varies inversely with the coefficient on the IPO index and ranges from 0.03 to −0.09. 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 for the 60 months following offerings.

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 0.12 and the variance of the excess returns is 0, the median abnormal return is only −4.03 percent. 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 0.0036, the median cumulative abnormal return is −27.02 percent. It may be surprising that abnormal performance is negative even when the variance of excess returns is

[5] In earlier versions of this paper, 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 from the base case.

**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 of the 5,000 simulation means.

| | Sensitivity of the Number of IPOs to the Market Level and Level of the IPO Index | | |
|---|---|---|---|
| Variance of IPO Excess Returns | 0.03 × Mkt. Level 0.06 × IPO Level | – 0.03 × Mkt. Level 0.12 × IPO Level | – 0.09 × Mkt. Level 0.18 × IPO Level |
| 0.0000 | – 3.18% | – 4.03% | – 5.06% |
| 0.0006 | – 5.36% | – 8.54% | – 11.11% |
| 0.0012 | – 7.55% | – 13.18% | – 16.13% |
| 0.0018 | – 9.67% | – 17.37% | – 20.29% |
| 0.0024 | – 11.86% | – 20.67% | – 23.87% |
| 0.0030 | – 14.01% | – 23.96% | – 26.81% |
| 0.0036 | – 16.05% | – 27.02% | – 29.56% |

0, but remember that the coefficient of the IPO returns on the market returns is greater than 1. 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 Underperformance

In this section, I discuss other characteristics of the long-run underperformance 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 postoffering 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 et al. (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 not discussed by Ritter, Arosio et al. (2001) report mean buy-and-hold abnormal returns of $-11.53$ percent over three years for Italian IPOs over 1985 to 1999. In a second recent paper, Foerster and Karolyi (2000) document underperformance of 8 percent to 15 percent in the three years following global equity offerings.

Studies of IPOs in earlier periods also document underperformance. Gompers and Lerner (2003) 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. Gompers and Lerner (2001) provide evidence that IPOs cluster in periods immediately preceding poor IPO performance. Korajczyk, Lucas, and McDonald

[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.

(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, about half from a market-wide 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 More Significant in Event-Time than 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 (1995, 2000) observe that excess returns following equity offerings are much lower when measured in event-time than in calendar-time. Gompers and Lerner (2003) determine that over 1935 through 1972, buy-and-hold abnormal returns are negative in event-time following IPOs, but disappear when calculated in calendar-time. Similarly, Ritter and Welch (2002) fail to find significant underperformance of IPOs in calendar time over 1993–2001. 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.

These results 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), Lowry (2003), 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 (1999) 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 (1997) 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.

This section is summarized in Table X. Each row of the table corresponds to one observation about performance subsequent to equity offerings. Each column corresponds to an explanation for the poor performance. A check mark at the intersection of a row and column indicates that the observation is consistent

**Table X**

**Explanations for the Underperformance of Equity Issuers and Whether They Predict Other Features of Equity Issuer Performance**

A $\surd$ indicates that the explanation for the long-run underperformance of equity issuers also predicts the other feature of equity issuer performance. A ? indicates that it is not clear whether the explanation for the long-run underperformance of equity issuers predicts the other characteristic of issuer performance.

| | Behavioral Explanation | Inadequate Risk Adjustment | Pseudo Market Timing |
|---|---|---|---|
| Underperformance after offerings | $\surd$ | $\surd$ | $\surd$ |
| Poor operating performance after offerings | $\surd$ | | $\surd$ |
| Underperformance: Other countries, other times | ? | ? | $\surd$ |
| Offerings cluster at market peaks | $\surd$ | | $\surd$ |
| Performance is worse in event-time | $\surd$ | | $\surd$ |
| Performance is worst after heavy issuance | $\surd$ | | $\surd$ |
| Performance is poor after debt issues | | ? | $\surd$ |
| Managers do not appear to profit | | | $\surd$ |

with the explanation for underperformance. All of the observations about the long-run performance of equity issuers are consistent with pseudo market timing. The behavioral explanation for underperformance predicts many of the regularities displayed by equity issuers, but fails to predict similar poor performance following debt issues or that managers do not appear to profit from their market timing ability. Inadequate risk adjustment predicts underperformance but little else. Pseudo market timing provides the most complete explanation for poor performance following equity issues.

## IV. Summary and Conclusions

I propose that the poor long-run performance of equity-issuing firms in event-time is real in the sense that IPOs and SEOs have underperformed relative to their *ex-ante* expectations, 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 did not 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 can avoid biases from pseudo market timing. Psuedo market timing, as well as the formidable problem of cross-sectional dependence, occur only in event-time. The easy way to avoid both of these problems is to use calendar-time returns rather than event-time returns. Behavioralists contend that if managers are able to time the market, abnormal performance is more likely to appear in event-time. If event-time returns must be 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.

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. 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.

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