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The Opening Price Performance of Initial Public Offerings of Common Stock

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■ Abundant empirical evidence indicates that initial public offerings (IPOs) of common stock generate large short-run returns, on average, for investors fortunate enough to purchase the stock at the offer price. Logue [16], Ibbotson [11], Ibbotson and Jaffe [12], Ritter [22], Miller and Reilly [18], and Ibbotson, Sindelar, and Ritter [13] are examples of research that provides empirical evidence of an extraordinary short-run return. While the early studies used monthly data, the latter work narrows the return window to a single day. Ibbotson, Sindelar, and Ritter [13], for example, find an average return of 16.4% for 4,534 IPOs from 1977-1987, computed from the offer price to the closing price on the first day of trading. We propose to further narrow the return horizon by dividing the first day into an opening price return and an intraday return. The existence of significant first day, secondary market trading volume in our IPO sample (as high as 100% of the offer size) calls into question who gains the benefits of IPO underpricing. Previous empirical work has not addressed this question directly because it uses offer-to-close returns. It is possible that market-making effects may result in a large return during the course of the first trading day, which would imply secondary market traders may participate in the return. The analysis in this paper indicates that the benefits of underpricing accrue almost entirely to the subscribers.

Several theoretical explanations have been suggested for the underpricing of IPOs. Baron [2] posits that an informational asymmetry between the underwriters and the issuers causes the large first-day return. However, Muscarella and Vetsuypens [19] find evidence that investment bankers underprice stock in their own firms when going public. Rock [23] also attributes underpricing to asymmetrically distributed information, but he focuses on the advantage informed investors enjoy over the unin-

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formed. His model is supported by the results of Koh and Walter [15]. Benveniste and Spindt [3], Chemmanur [5], and Sherman [24] suggest that the underpricing is a mechanism to induce investors to produce and reveal private information. Tiniç [27] posits that the underpricing provides an insurance premium against potential legal action by disgruntled investors, and Hughes and Thakor [10] formalize this notion. Finally, Allen and Faulhaber [1], Grinblatt and Hwang [6], and Welch [29] argue that high-quality issuers purposely underprice initial public offerings to pave the way toward a more successful seasoned offering in the future. This hypothesis is not supported by Jegadeesh, Weinstein, and Welch [14], however.

Each of the above explanations of underpricing suggests that the market is likely to immediately recognize and correct the situation upon the start of trading in the security. Indeed, in the scenarios suggested by Rock [23] and Benveniste and Spindt [3], it is crucial that those investors receiving the initial allocation of the securities reap the benefit associated with the underpricing. In those cases, we expect the large initial return to be realized at the opening of the market because the underpricing represents a payment to those investors participating in the presale market and in the initial allocation.

An alternative explanation leaves open the possibility of a large intraday return. Welch [30] develops the notion of informational cascades in which individuals ignore their private information and follow the behavior of the preceding individual. In the context of IPOs, Welch's arguments suggest that an issue may be underpriced in order to induce decisions by early investors solicited to purchase a forthcoming IPO. Extending Welch's cascade arguments to the aftermarket suggests that those issues enjoying a larger-than-average initial (offer-to-open) or early return would also enjoy a larger-than-average intraday return as investors attempt to "get on the bandwagon." Consistent with this view, evidence from experimental markets (e.g., Smith, Suchanek, and Williams [25]) suggests a tendency for speculative bubbles to develop in early trading rounds using a double continuous-auction market-making scheme and allowing demand to be determined endogenously.

In this paper, we obtain initial day opening (as well as closing) prices for 229 recent IPOs. This allows us to isolate the intraday timing of the first day's return. As with previous work, we find significant first-day offer-to-close returns associated with initial public offerings of common stock in operating companies. Examining opening prices, we find that, on average, about 90% of the initial day's mean return is earned on the opening transaction and that the subsequent average intraday return is smaller than conventional estimates of transactions costs. This result also holds for the subsample of issues that are underpriced, indicating that price stabilization does not have a significant effect on our overall conclusions.[1] Furthermore, there is no evidence from high and low prices of intraday price "trends" from the overpriced sample or from the underpriced sample. Thus, only original purchasers in the offering benefit from the underpricing of the IPO. This observation is consistent with the view that underpricing is a device to reward the individuals who participate in the issue. In contrast with those results, IPOs for closed-end funds in our sample have no statistically significant returns either on the opening of the market or during the first day's trading. The market for closed-end fund IPOs is apparently distinct from the market for IPOs by operating companies.

The plan of the paper is as follows. In Section I, we describe the database used in the study. Section II contains our empirical results on initial returns and intraday returns. Section III contains an analysis of the predictability of initial returns based on price adjustment prior to the offering, and Section IV contains our summary.

I. Data

To obtain a sample of sufficient size to conduct statistically reliable empirical work and be representative of the cross-section of firms going public, we could not limit the study to exchange-listed firms. However, obtaining price data other than closing prices on OTC firms was difficult. After contacting several potential data suppliers, including the National Association of Security Dealers, we found one firm that could provide historical opening prices. Dial/Data, a division of Track Data Corporation in New York, provides a database with daily opening (as well as high, low, and closing) prices and trading volume on NYSE, AMEX, and OTC firms. The opening price data for OTC firms begins in December of 1988. This formed the initial point in our sample period.

The *Investment Dealers' Digest* (*IDD*) was examined to identify initial public offerings of common stock. We began our examination with the "offered" section of the first issue of the *IDD* in December of 1988 and ended with the last issue in December of 1990. For each offering, we used the *IDD* to collect data on the firm issuing the common stock, including the name of the issuer, the registra-

[1] We note that measured returns can be systematically high, on average, due to the process of underwriter stabilization. This (legal) price support tactic can dampen returns on the downside. Hanley, Kumar, and Seguin [8] provide evidence of price stabilization during the first two or three weeks of aftermarket trades of new issues, and they find evidence of predictable price declines for issues most likely to have been stabilized.

tion and offer date, the expected and actual number of shares, the expected and actual offer price, the (co-)managing underwriter(s), and the issuing costs. By virtue of their source (*IDD*), all of the issues in our sample are firm commitment offerings.

We excluded four issues of American Depository Receipts, two conversions of mutual savings banks to stock corporations, two royalty trusts, and 45 unit offerings. From the Dow Jones News Retrieval Service we obtained the Media General industry number in order to identify closed-end funds. And, finally, from Dial/Data we collected trading data, including opening, high, low, and closing prices, and trading volume for the first two trading days. Twenty-six issues had missing price and/or volume data and were deleted from the sample. After collecting these data, we had a sample of 229 IPOs for our 25-month sample period. Exhibit 1 provides some descriptive statistics for the sample offerings.

The most common type of firms in our sample is closed-end funds, which constitute more than 23% of the sample firms. Given the lack of uncertainty about the value of closed-end fund assets and given the poor aftermarket performance of such funds documented for other time periods (see Peavy [21] and Weiss [28]), we expect the initial returns to be lower for the closed-end fund issues. Therefore, we separate the closed-end funds from the operating firms in our tests using returns.

Almost two-thirds of our sample firms' shares traded over-the-counter, with the closed-end funds comprising a majority of the exchange-listed firms. Our sample IPOs exhibited a wide range of capital raised, from about two million dollars to nearly one billion dollars. The offerings in our sample are larger (on average) than the typical offerings in some other studies (compare, for example, the offerings in Ibbotson, Sindelar, and Ritter [13]). Prices ranged from $1.00 to $30.00, but the closed-end funds had prices tightly clustered in the range from $10.00 to $15.00. We also identified the Carter and Manaster [4] underwriter reputation ratings from their appendix for the most prestigious managing underwriter. Over 88% of the lead managers in our sample were rated by Carter and Manaster [4], and most were managed by underwriters that were highly ranked by Carter and Manaster [4].[2]

[2]There is, of course, some likelihood that underwriter reputations changed between the end of the Carter and Manaster [4] observation period in 1983 and the start of ours in 1988. However, we report the ranking data only for information; they are not used in any of the tests conducted in the paper.

Exhibit 1. Descriptive Statistics for Sample of 229 Firm Commitment Initial Public Offerings of Common Stock From December 1988 Through December 1990

Panel A. Offer Sizes[a]

	Operating Companies[b] (In Millions)	Closed-End Funds (In Millions)	Full Sample (In Millions)
Mean offer size	$39.44	$157.1	$67.2
Median offer size	22.5	106.5	28.0
Range of offer sizes	2.1 - 960	24 - 750	2.1 - 960
Number of observations	175	54	229

Panel B. Offer Prices

	Operating Companies (In Millions)	Closed-End Funds (In Millions)	Full Sample (In Millions)
Mean offer price	$11.16	$12.42	$11.50
Median offer price	10.00	12.00	11.50
Range of offer prices	1.00 - 30.00	10.00 - 15.00	1.00 - 30.00

Panel C. Underwriter Quality (C-M Rank)[c]

	Operating Companies (In Millions)	Closed-End Funds (In Millions)	Full Sample (In Millions)
Number listed[d]	152	50	202
Mean C-M rank	7.3	8.1	7.5
Median C-M rank	7.5	8.0	8.0
Range of C-M rank	0.5 - 9.0	4.0 - 9.0	0.5 - 9.0

Notes:

[a]Offer size is defined as the gross proceeds of the offering, excluding the overallotment option.

[b]"Operating Companies" includes all IPOs in the sample such that the issuer is not a closed-end fund.

[c]Underwriter quality is equal to the ordinal value assigned to the highest rated lead underwriter in the Carter-Manaster [4] appendix.

[d]Number listed is defined as the number of offerings such that the lead underwriter is assigned a rank in the Carter-Manaster [4] appendix.

Exhibit 2 provides information about trading activity; it demonstrates that there was substantial trading activity on the first trading day, especially for operating-company IPOs. The fact that initial volume is high is consistent with Hegde and Miller [9], who find that high volume is maintained for two weeks. On the first day, about 35% of the newly issued stock changed hands, on average. For the operating companies, the average is nearly 43%. This is somewhat higher than the 22% average noted in Miller and

Exhibit 2. Volume of First Day Trades as a Fraction of Number of Shares Offered (Excluding the Overallotment Option) for a Sample of 229 Firm Commitment Initial Public Offerings of Common Stock From December 1988 Through December 1990

	Operating Companies[b]	Closed-End Funds	Full Sample
Mean volume[a]	42.7%	9.8%	34.9%
Median volume	29.8%	2.0%	22.7%
Range of volume	0.01-126.42%	0.07-78.94%	0.01-126.42%
Number with volume > 50%	61	2	63
Number of observations	175	54	229

Notes:

[a]Volume is defined as the volume of first day transactions of the security divided by the number of shares offered excluding the overallotment option.

[b]"Operating Companies" include all IPOs in the sample such that the issuer is not a closed-end fund.

Reilly [18]. In extreme cases, trading volume was as large as (or larger than) the size of the initial offering of shares.[3]

Although the median figures suggest that some outliers affect the mean, first day turnover is large for operating company IPOs. If the high trading volume for operating company IPOs occurs during the day, it suggests the possibility that a portion of the gain to investors in IPOs may accrue to those who buy the offering in the secondary market rather than in the offering itself. We explore that possibility in the next section by examining the opening price performance of the IPOs.

Interestingly, for the 54 closed-end funds, the median first day volume is only two percent of the offer size. Of those 54 funds, only 18 had first day volume of more than five percent. Seventeen of those 18 funds were foreign equity funds. Peavy [21] and Weiss [28] show that foreign equity funds have experienced more favorable performance in the first few months following their IPOs than have domestic equity funds.

[3]It should be noted that OTC volume is "overstated" in some sense because many trades are broken into a buy with the dealer and a sale with the dealer and are reported as two "trades." We do not know how many trades include such transactions. As a conservative estimate of volume, we divide the OTC volume by two. This results in a mean first day turnover of 20.4% and a range of 0.005% to 78.9%. Thus, even accounting in an extreme way for an overstatement of volume, first day turnover is sizeable.

II. Results on Initial Returns

We compute six different rates of return for various subsets of the data. The return in previous IPO studies has been the offer-to-close return, computed from the closing price on the first trading day and the offering price. Two new return measures are used in this study. The offer-to-opening return compares the first day's opening price (rather than the closing price) with the offer price. We also compute the intraday return, which is computed from the opening and closing prices on the first day of trading.[4] We compute the second day returns in a similar manner, starting from the first day's closing price.

In examining first and second day returns, we do not adjust for possible effects of price stabilizing activities by investment banker-dealers. For issues with positive opening returns, price stabilization is less likely to influence the returns over the first day of trades than for issues that decline in opening transactions (see Hanley, Kumar, and Seguin [8]).

Exhibit 3 presents mean returns and an estimate of the standard deviation of returns for the full sample and for two subsets of the sample. The offer-to-close return averages 6.78% for the full sample and 8.69% for the sample of operating companies. The corresponding offer-to-open returns are 6.16% and 7.77%, respectively. Thus, the offer-to-open return averages about 90% of the initial return for IPOs in our sample. The open-to-close returns are only 0.60% for the full sample and 0.87% for the sample of operating companies. While the mean open-to-close return is significantly different from zero at the five percent level for the operating companies, its absolute value is less than one percent. Therefore, operating company IPOs create trading opportunities only for traders able to obtain unusually favorable transactions costs, if at all.

While the average offer-to-open return accounts for about 90% of the average initial return, this could be an artifact of offsetting effects of underpriced and overpriced issues that cause the averages to have a relative size that is unmatched by the set of individual observations. To examine this issue, we also estimated the following ordinary least squares regression equation for the first day's returns for our operating company subsample:

$$R_{OC} = \alpha + \beta R_{OO} + \varepsilon . \qquad (1)$$

[4]Note that we do not have information about the time of day at which a given issue begins trading. It is possible that some of the issues began trading late in the trading day, in which case the open-to-close return would encompass very little clock time.

Exhibit 3. Mean Returns Over Various Time Intervals Following Completion of the Offering for 229 Firm Commitment IPOs Conducted Over the Period December 1988 through December 1990

	Operating Companies	Closed-End Funds	Full Sample
Day One			
Offer-to-open[a,h]	7.77%***	0.97%	6.16%***
Offer-to-close[b]	8.69%***	0.56%	6.78%***
Open-to-close[c]	0.87%**	-0.28%	0.60%*
Standard deviation[d]	5.6%	1.9%	4.3%
Day Two			
Close-to-open[e]	0.12%	0.60%	0.23%
Close-to-close[f]	-0.08%	0.44%	0.04%
Open-to-close[g]	-0.19%	-0.17%	-0.18%
Standard deviation[d]	4.3%	1.5%	3.6%
Number of observations	175	54	229

Notes:

[a]Mean return from the offering price to the opening price on the first day of trading.

[b]Mean return from the offering price to the closing price on the first day of trading.

[c]Mean return from the opening price on the first day of trading to the closing price on the first day of trading.

[d]Standard deviation ≡ ln(high price/low price) × 100 for the day. Reported value is the cross-sectional mean of this standard deviation estimate.

[e]Mean return from the closing price on the first day of trading to the opening price on the second day of trading.

[f]Mean return from the closing price on the first day of trading to the closing price on the second day of trading.

[g]Mean return from the opening price on the second day of trading to the closing price on the second day of trading.

[h]Statistical significance results all assume that observations are cross-sectionally independent and that the underlying return distributions are normal.

*Significantly different from zero at the 10% level.

**Significantly different from zero at the 5% level.

***Significantly different from zero at the 1% level.

In Equation (1), R_{OC} is the offer-to-close return, and R_{OO} is the offer-to-open return. Our point estimate of the intercept is positive but not significantly different from zero (intercept is 1.4%; t-value is 0.2). The estimated slope coefficient is 0.97, which is insignificantly different from 1.00 at ordinary levels of significance. The R^2 exceeds 79%. Thus, the offer-to-open return accounts for nearly 80% of the variability in offer-to-close returns, and the average unexplained return is insignificantly different from zero.

The returns for day two demonstrate that all of the initial return performance of the IPOs in our sample is eliminated by the first day's price changes. All of the returns for the full sample, the operating firm sample, and the closed-end fund sample are small, and none are significantly different from zero at conventional levels of significance. This is consistent with the findings of Miller and Reilly [18].

We also estimate a standard deviation of the intraday returns. Parkinson [20] notes that, given the assumption that the logarithm of price follows a random walk, standard deviation can be estimated from the log of the ratio of the high and the low price for the day. Exhibit 3 also reports the average of estimates based on Parkinson's approach for the operating company and closed-end fund subsamples. As one might expect, the volatility decreases from day one to day two and is lower for closed-end funds than for operating companies. The average of the standard deviation estimates is 5.6% for the operating company IPOs on their first day versus 4.3% on their second day. For closed-end funds, the mean values are 1.9% and 1.5% on the first and second days, respectively.

Focusing on the first day returns only, and again using Parkinson's estimation procedure, we were interested in whether underpriced issues tend to be more volatile than overpriced issues. Among operating firm IPOs, the average of the estimated standard deviations of the underpriced and overpriced issues was 6.37% and 4.25%, respectively. While these values are consistent with the findings of other researchers that underpricing is associated with aftermarket volatility, the difference between the means of these two subsamples is not statistically significant at conventional levels.

The performance of closed-end funds on day one confirms results based on earlier work in Peavy [21] and Weiss [28]. Closed-end funds, unlike other IPOs, show no abnormal performance in the first two days and are not underpriced. That is consistent with pricing conventions for closed-end funds. They are priced in the IPO at their initial net asset value plus the underwriter's discount.[5]

Nonparametric tests provide striking evidence that the first day's return on IPOs is earned at the opening transaction. We report results based on median returns in Exhibit 4. The only statistically significant performance is that of operating companies and the full sample (77% of which are operating companies) for the first day's initial return. For operating companies, the median offer-to-open return is the same as the median offer-to-close return, 3.85%. The first day's intraday return has a median value of zero.

[5]Mauer and Senbet [17] present an analysis of IPOs from a market spanning perspective. In their analysis, closed-end funds would not add opportunities to the market that were not already available in existing portfolios. Their analysis would suggest that closed-end funds would not be underpriced.

Exhibit 4. Median Returns and Percentage of Positive Returns for Initial Public Offerings Over Various Time Intervals Following Completion of the Offering for 229 Firm Commitment IPOs Conducted Over the Period December 1988 Through December 1990

	Operating Companies		Closed-End Funds		Full Sample	
	Median	% > 0	Median	% > 0	Median	% > 0
Offer-to-open[a]	3.85%	64%***	0.00%	26%	2.00%	55%*
Offer-to-close[b]	3.85%	65%***	0.00%	30%	1.47%	56%**
Open-to-close[c]	0.00%	39%	0.00%	17%	0.00%	34%
Close-to-open[d]	0.00%	29%	0.00%	15%	0.00%	26%
Close-to-close[e]	0.00%	34%	0.00%	20%	0.00%	31%
Open-to-close[f]	0.00%	26%	0.00%	19%	0.00%	24%
Number of observations	175		54		229	

Notes:

[a]Median return from the offering price to the opening price on the first day of trading.

[b]Median return from the offering price to the closing price on the first day of trading.

[c]Median return from the opening price on the first day of trading to the closing price on the first day of trading.

[d]Median return from the closing price on the first day of trading to the opening price on the second day of trading.

[e]Median return from the closing price on the first day of trading to the closing price on the second day of trading.

[f]Median return from the opening price on the second day of trading to the closing price on the second day of trading.

*Significantly greater than 0.5 at the 10% level.

**Significantly greater than 0.5 at the 5% level.

***Significantly greater than 0.5 at the 1% level.

Exhibit 4 also shows the fraction of each sample that had positive returns. Among the operating firms, 64% had positive initial returns (both on an offer-to-open basis and on an offer-to-close basis), while only 38% had positive intraday (open-to-close) returns on the first day. In other words, significantly more than half of the firms were underpriced at the offer price, but fewer than half had positive first day returns after the opening transaction. For the typical firm, the opening price eliminated the underpricing phenomenon. Similar results hold for the full sample, but the closed-end funds do not appear to be underpriced on any basis.[6]

The average returns reported in Exhibits 3 and 4 are not conditioned on the offer being underpriced. We repeat the analysis conditioning on the sign of the offer-to-open return, with a positive return indicating an underpriced issue. The results for the first day are displayed in Exhibit 5. None of the second day returns were significant. Those operating company issues that are underpriced, i.e., have an opening return greater than zero, obtain almost 94% of the offer-to-close return at the opening. Closed-end funds actually have a negative intraday return implying the opening return exceeds the offer-to-close return. Thus, even when restricting our attention to only the underpriced issues, we find that the positive first-day return is a phenomenon associated with the opening price.[7]

Although the magnitude of the open-to-close return suggests a price process that reaches equilibrium quickly, it is possible that different intraday patterns emerge between the subsamples of Exhibit 5. For example, offers that open up (relative to the offering price) may tend to overshoot the closing price before falling to the observed closing price and offers opening down may undershoot. To get some feel for whether this is an issue, we examine the open-to-high and open-to-low returns and report the results on the last two lines in each panel of Exhibit 5. For both operating companies and closed-end funds, there appears to be a tendency for those issues opening up to exhibit more volatility: they seem to have "higher highs" and "lower lows." There is, however, little evidence that the equilibrium price process is different between those issues opening up and those opening down. For example, among the operating company IPOs, we test for differences in intraday returns between initially underpriced issues and initially overpriced issues (i.e., those with pos-

[6]For some of the return categories examined in Exhibit 4, the entries indicate that more than 50% of the returns are nonpositive. That does not mean that their median returns in those categories are negative. A substantial portion of the observations in each category actually register zero returns. There are no categories in Exhibit 4 for which the number of negative returns approaches one-half of the number of observations in the category.

[7]For the overpriced issues, i.e., those with negative opening returns, the mispricing is also "corrected" in the first trade.

Exhibit 5. Mean First Day Returns of Initial Public Offerings Conditioned on the Opening Return for 229 Firm Commitment IPOs Conducted Over the Period December 1988 Through December 1990 (t-statistics are in Parentheses)

Panel A. Opening Return > 0, Operating Companies (N = 112)[a]		
Offer-to-open[b]	13.46%	(11.33)***
Offer-to-close[c]	14.35%	(11.20)***
Open-to-close[d]	0.82%	(1.65)
Open-to-high	4.94%	(8.31)***
Open-to-low	-1.66%	(-3.31)***
Panel B. Opening Return < 0, Operating Companies (N = 22)		
Offer-to-open	-7.06%	(-2.86)***
Offer-to-close	-7.28%	(-2.77)***
Open-to-close	-0.32%	(-0.62)
Open-to-high	2.81%	(4.89)***
Open-to-low	-1.46%	(-2.35)***
Panel C. Opening Returns > 0, Closed-End Funds (N = 14)		
Offer-to-open	6.05%	(3.78)***
Offer-to-close	3.71%	(3.33)***
Open-to-close	-1.87%	(-1.31)
Open-to-high	0.70%	(1.47)
Open-to-low	-3.57%	(-3.04)***
Panel D. Opening Returns < 0, Closed-End Funds (N = 4)		
Offer-to-open	-8.13%	(-2.74)***
Offer-to-close	-8.05%	(-3.32)***
Open-to-close	-0.51%	(-0.73)
Open-to-high	0.64%	(1.95)**
Open-to-low	-1.16%	(-1.73)*

Notes:

[a]N is sample size.

[b]Mean return from the offering price to the opening price on the first day of trading.

[c]Mean return from the offering price to the closing price on the first day of trading.

[d]Mean return from the opening price on the first day of trading to the closing price on the first day of trading.

*Significantly different from zero at the 0.10 level, two-tailed test.

**Significantly different from zero at the 0.05 level, two-tailed test.

***Significantly different from zero at the 0.01 level, two-tailed test.

itive and negative initial returns, respectively). The largest absolute difference is in the open-to-high returns between the two subsamples: The mean open-to-high return is 4.94% for underpriced issues versus 2.81% for overpriced issues. With a t-test value of 1.58, the difference is insignificant at conventional levels. All of the other intraday returns have pairwise differences with much smaller t-scores. Thus, there is no evidence that the intraday returns are different between underpriced and overpriced issues.

Given the average operating company offering price of $11.16 (Exhibit 1) and the average opening returns, Exhibit 5 suggests that the stock price of the underpriced group of issues has an average high price about $0.63 above the open price, and the high stock price of the overpriced group averages about $0.29 higher than the open. The average low prices are $0.21 and $0.15 below the opening prices for the underpriced and overpriced groups, respectively. With a minimum tick size of $0.125, these differences do not seem dramatic. Thus, the opening price does seem to do a reasonable job of aggregating the information available on the first trading day.

An implication of the result that initial returns are largely earned at the open may be that studies that market-adjust the initial returns do so unnecessarily: The return is not due to the intraday behavior of the market since it is earned largely at the open. However, Wood, McInish, and Ord [31] have shown (in samples from 1971-1972 and 1982) that most of the market return is also an opening return. In results not reported here, we examined the correlation between each of the components of the first day's return and the return on a proxy for the market, the NYSE Composite Index. Neither the opening, the closing, nor the intraday returns on operating company, closed-end fund, or the full sample of IPOs is significantly correlated with the market return as measured by the market proxy. Thus, it appears that there is no need to market-adjust initial returns in studies of IPO price behavior that use intervals as short as a day.

Summing up, we find that the underpricing of operating-company IPOs is a phenomenon that is largely restricted to the opening transaction. The underpricing is almost entirely "corrected" by the market at the open. The price adjusts to an equilibrium value through the interaction of buyers with market-makers and dealers in a single transaction. That suggests one of two explanations. Either it is only necessary for market-makers and dealers to know a portion of the demand curve for the stock in order to establish an equilibrium price, or the process works (as the Walrasian auctioneer model suggests) in such a way that the price-based demands listed by secondary market investors enable market-makers and dealers to learn sufficiently from the resulting price that no further "correction" is needed in the market (at least to within ordinary transactions costs), on average.

III. Price Adjustment and Initial Performance

Sternberg [25] analytically shows and Hanley [7] empirically documents that the process of adjusting the price from the preliminary filing range to the offering price does not fully adjust for the anticipated demand for a particular IPO. That is, investors revealing favorable private information in the presale period are not penalized by the is-

suer/underwriter with a revised offering price that eliminates the value of the information. In this section, we examine the relation between price adjustment prior to completion of the offering and the initial performance of operating company IPOs. We drop the closed-end funds from the sample in this section since these IPOs rarely adjust price and there is no uncertainty about the initial underlying assets.

Benveniste and Spindt [3] model the preliminary sales activities of the underwriter. The underwriter makes a preliminary determination of a quantity of shares for the offering and a pair of prices that create a range in which the final offer price is expected to fall. Hanley [7] examines the relation between the price adjustment from filing range to offer price and the initial returns on the offering. The Benveniste and Spindt [3] model implies that investors providing the underwriter with information that allows the underwriter to adjust the price should be rewarded for providing that information. Consistent with that argument, Hanley [7] finds that offers that are adjusted upward in shares offered and upward in price beyond the filing range experience greater underpricing than do other offers. As with other extant studies, she employs closing first day prices in her tests.

We examine the relation between the offer price and size adjustment and initial returns in our sample. The sample is reduced to 163 observations by virtue of deleting the 54 closed-end funds and deleting the 12 IPOs for which *IDD* did not report a preliminary filing range and/or an expected issue size.

For this subset of operating company issues with file range information, the mean offer-to-open return was 7.57%, and the mean open-to-close return was 0.91%. These values are nearly identical to the values associated with all operating companies (7.77% and 0.87%, respectively). Ignoring the overallotment option, the mean change in the number of shares offered from the preliminary to final prospectus was 0.36%.[8] We calculated the revision in price as the offer price minus the average of the low and high price in the filing range, divided by the average of the low and high prices in the filing range. The mean value of this variable was zero.

We conducted ordinary least squares regressions for offer-to-open and open-to-close returns against the size and price adjustment variables:

$$R = \alpha_0 + \alpha_1(DSize) + \alpha_2(DPrice) + \varepsilon_1 , \qquad (2)$$

where *DSize* is the relative change in the number of shares offered and *DPrice* is the relative difference between the offer price and the average price in the filing range. In the case of the intraday return, we also include the offer-to-open return as an explanatory variable. If the return is positively related to the change in shares or price (i.e., $\hat{\alpha}_1$ and/or $\hat{\alpha}_2$ is positive), then this suggests that the issuer/underwriter does not eliminate the value of private information by adjusting the filing parameters. The results are reported in Exhibit 6.

As shown in Regression 1 of Exhibit 6, price revision prior to the offering does not eliminate underpricing as measured by the opening return. The offer-to-open return is significantly and positively correlated with the price adjustment variable. The coefficient indicates, for example, that a 10% increase in the offer price is associated with a 3.6% increase in the opening (offer-to-open) return. This is consistent with the Benveniste and Spindt [3] argument that investors providing favorable information to the investment banker are allowed to share in the benefits of that information: the offer price is not fully adjusted for the information content of the gathered information.

Regression 1 also confirms that Hanley's [7] result, based on closing prices, holds for the offer-to-open measure of underpricing. Regression 2 confirms Weiss' finding directly, although it seems that the price adjustment and not the share adjustment may drive her results. However, the information contained in the offer price adjustment process is fully reflected in the opening price. The first day's intraday (open-to-close) return is uncorrelated with the adjustment in price and in issue size, as reflected in Regression 3. The lack of correlation between offer-to-open return and open-to-close suggests that, on average, aftermarket trading following an IPO is not characterized by trading patterns consistent with the presence of informational cascades that extend past the opening of trading.

The opening price performance of the new issue does eliminate any intraday return predictability that could be gained by observing the process of adjusting the offer price. The purchasers of the IPO in the initial offer itself are the only consistent beneficiaries from the underpricing and from the price adjustment process.[9]

[8]The small mean change of 0.36% obscures the fact that there are relatively sizeable changes in either direction for some of the issues, but, on average, the increases in some offer sizes approximately offset the decreases in others. The mean absolute change is 9.2%.

[9]Price adjustment can be defined relative to the filing range instead of relative to the mean price within the filing range. We examined such a definition in tests not reported here. If the offer price was above the maximum of the filing range, we defined price adjustment as the percentage increase in price above the maximum; if the offer price was below the minimum of the filing range, we defined price adjustment as the

Exhibit 6. Coefficients of OLS Regressions of Offer-to-Open Percentage Returns and Intraday Percentage Returns for 163 Operating Company Firm Commitment IPOs Over the Period December 1988 Through December 1990 (*t*-statistics are in Parentheses)

			Independent Variables			
Regression	Dependent Variable	Intercept	Size Adjustment[c]	Price Adjustment[d]	Offer-to-Open Return	R^2
1	Offer-to-open[a] return	7.57%*** (7.89)	0.0166 (0.27)	0.3590*** (5.19)	—	0.18
2	Offer-to-close[b] return	8.55%*** (8.12)	0.0129 (0.19)	0.3452*** (4.55)	—	0.14
3	Open-to-close[b] return	0.88%* (1.86)	-0.0078 (-0.30)	-0.0110 (-0.35)	0.0042 (-0.13)	0.00

Notes:
[a]Percentage return from the offer price to the opening price on the first day of trading.
[b]Percentage return from the first day's opening price to the first day's closing price.
[c]Relative change in offer size from the filing number to the actual number of shares, excluding overallotments.
[d]Relative change from the mean of the high and low prices in the filing range to the offer price.
*Significantly different from zero at the 10% level.
***Significantly different from zero at the 1% level.

IV. Conclusions

We demonstrate in this paper that virtually all of the initial return due to the underpricing of initial public offerings occurs at the opening transaction. Alternatively, we show that "underpricing" is corrected (to within transactions costs) by the price-setting process that establishes the opening price. After the opening trade, continued price movement during the first day is not worth the cost of round-trip commissions except, perhaps, for the most advantaged customers. In fact, the median first day's intraday return is zero: fewer than half of all IPOs have positive returns on the first day after the opening transaction.

These results imply that only the purchasers of securities in the IPO itself (as opposed to purchasers in the aftermarket) benefit from the underpricing of IPOs. This is consistent with extant theories arguing that underpricing provides rewards to those who allow the IPO process to work by purchasing securities in the initial offering. Such theories include Rock's [23] model of asymmetric information and Benveniste and Spindt's [3] model of the price adjustment and information acquisition process.

We find that closed-end funds exhibit no abnormal price performance on either of the first two days of trading. This is consistent with Peavy [21] and Weiss [27]. The results emphasize the point that closed-end funds are indeed a different breed of IPO than are the IPOs of operating companies.

We also confirm Sternberg's [25] prediction and Hanley's [7] finding that the preliminary price adjustment process predicts the level of initial returns. Consistent with an implication of Benveniste and Spindt's [3] model, we observe that the initial return at the open of trading is positively associated with price (but not share) revision from the filing range to offer. Investors who reveal favorable demand are rewarded rather than penalized for doing so. However, all of the information contained in the price adjustment process is reflected in the opening transaction price: the intraday return on the first day from open to close is not associated with price or size revisions prior to the offering.

(negative) percentage by which offer price was below the minimum; and we defined price adjustment as zero if the offer price was within the filing range. We reran all of the price adjustment tests using this alternative definition, and it did not affect any of our conclusions.

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