ANNOUNCEMENT EFFECTS OF NEW EQUITY ISSUES AND THE USE OF INTRADAY PRICE DATA

by

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ABSTRACT

This paper examines the within day pattern of common stock returns surrounding announcements of new issues of equity and debt by industrial fims. During the first fifteen minutes following new equity issue announcements, there is an abnormally large number of transactions, high volume, and a −1.3% average return. There is also a small, but statistically significant negative average return one hour preceding the announcement. The size of the offering, the stated purpose of the issue and the estimated profitability of new investments do not have a significant impact on stock returns. New debt issue announcements also do not have a significant impact on stock returns. After the issuance of new shares, there is a significant price recovery of 1.5%. This evidence is not consistent with many theoretical rationales for the negative market reaction to new equity issue announcements.

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1. Introduction

The market reaction to new issues of corporate securities has been the focus of a number of empirical investigations.[1] The results of these studies suggest that new equity issue announcements have a negative average effect on common stock prices.[2] At a superficial level, this negative market reaction appears anomalous. New equity issues are voluntary actions at the discretion of firm managers. If managers act in the best interests of shareholders, they will issue new securities only when the net benefits to shareholders are positive. Several hypotheses have been suggested in the literature to explain this negative average market reaction. This paper reexamines these hypotheses and develops a number of empirical tests to distinguish between them.

Intraday transaction prices and exact announcement times are used to examine the within day pattern of common stock returns surrounding announcements of new issues of seasoned equity and debt by industrial firms. Previous studies are based on daily data and do not directly identify the announcement day. Instead, they identify the date of publication of the announcement in the Wall Street Journal. Since the first public announcement could have occurred before, during, or after trading hours on the last day prior to the Wall Street Journal announcement, these studies equate the announcement effect with the cumulative return over a two day interval including the publication day and the preceding trading day. The use of intraday data and the exact time of the announcement has several advantages over the methodology used in these previous studies.

First, intraday data permit more efficient estimation of the effects of new information on common stock prices. The longer the measurement period, the greater are sources of variability attributable to extraneous factors unrelated to the event under study. Measuring returns over shorter intervals of time reduces this component of the variance of the stock returns and increases the power of the statistical tests.

The power of the statistical tests is critically important to the interpretation of this event. Previous studies find that the average abnormal stock return following new equity issue announcements is negative and statistically significant. However, our understanding of the cause of this negative market reaction is based on a set of cross-sectional tests most of which fail to reject the null hypothesis or produce conflicting results reflecting particular samples and/or measurement techniques. By increasing the power of the statistical tests, we increase our confidence in null hypotheses that cannot be rejected by the data.

While the use of intraday data increases the power of the statistical tests, it also raises a number of methodological questions concerning the appropriate measurement of within day returns and the corresponding significance tests. In particular, because the intervals are short, most securities do not trade in every interval on every day. We propose measurement techniques and significance tests that account directly for the problem of missing observations.

In addition to supplying greater statistical power to reexamine previously tested hypotheses, this study also examines whether the market reaction to new equity issue announcements differs according to the estimated

are undertaken, then investors would consider new investment spending to be "good news." On the other hand, if managers overinvest in projects with negative net present value, then new investment spending would be "bad news." In either case, the market reaction should reflect investors' beliefs about the net present value of these incremental projects. This hypothesis is tested for a sample of common stock issues using Tobin's Q ratio as a gross present value (profitability) index for the firm's investment opportunities.

The use of intraday data also permits examination of the within day pattern of common stock price adjustments to new information. For example, there is a statistically significant negative return during the one hour interval prior to the first public announcement. This may have important implications for the enforcement of exchange guidelines and SEC regulations concerning insider trading and the public disclosure of material information.

The remainder of the paper is organized as follows: The competing hypotheses are discussed in Section 2; methodological issues concerning the measurement of within day returns and the development of significance tests are discussed in Section 3; the empirical results are reported in Section 4; and Section 5 concludes the work with a brief summary of the main results.

2. Announcement Effect Hypotheses

A number of hypotheses have been advanced in the literature to explain the negative market reaction to new issues of corporate securities. Many of these hypotheses overlap to some degree, but they are restated here in a way that results in distinct testable hypotheses concerning the price response of the common stock. The hypotheses are categorized as information hy-

2.1. Information Hypotheses

The information hypotheses are the "Existing Asset Value Signaling Hypothesis" loosely based on Myers and Majluf (1984), the "Cash Flow Signaling Hypothesis" from Miller and Rock (1985), and the "Wasteful Investment Hypothesis" related to the work of Berle and Means (1932) on the separation of ownership from control of the corporation and more recent extensions by Jensen (1986) and others.

The Existing Asset Value Signaling Hypothesis is based on the premise that managers have more information than investors about the intrinsic value of the firm's existing assets. When there is need for external financing, managers issue new equity if they believe that the market value of the firm is above its intrinsic value and they issue debt if they believe that the market value of the firm is below its intrinsic value. Although an overvaluation of the firm's assets results in both risky debt and equity being overvalued, the overvaluation of the debt is less. The decision to use external financing of any type and the magnitude of that external financing is determined by the level of the firm's planned investment and the magnitude of the firm's internally generated cash flow. Thus, assuming symmetric information about current investments and current internal cash flow, new equity issue announcements will have a negative impact on the stock price and debt issue announcements will have a positive impact on the stock price.[3] The intended use of the funds, the expected profitability of planned investment, and the size of the issue will have no impact on the magnitude of the price drop if

symmetric information about investment plans and internal cash flow is assumed.

The Cash Flow Signaling Hypothesis assumes asymmetric information about the magnitude of the firm's current internal cash flow, but symmetric information about both the level of the firm's planned investment and the value of the firm's assets conditional on current cash flow. Unanticipated announcements of new security issues then signal that the firm has inadequate internally generated funds to finance its planned investment. Both equity and debt issues used to finance new investment cause negative stock returns, and the absolute value of the percentage price decline is directly related to the size of the issue. Since new external financings are assumed to contain no information about the level of the firm's planned investment, the stock price response is unrelated to the expected profitability of the investment. Equity issues that are used to retire existing debt are zero net external financings and do not convey information about the magnitude of the firm's current internal cash flow. Consequently, they have no impact on stock prices.

The Wasteful Investment Hypothesis is based on the premise that one of the agency costs associated with the separation of ownership from control of the corporation is a tendency for managers to overinvest, accepting negative net present value projects. Assuming symmetric information about the firm's current internal cash flow and symmetric information about the intrinsic value of existing assets, unexpected new security issues signal a higher level of planned investment. If the net present value of this incremental investment is less than zero, the stock price will fall and the magnitude of the percentage price decline will be directly related to the size of the issue and inversely related to the gross present value of the incremental investment

impact on the stock price.[4] However, new stock issues used to retire existing debt will have no impact on the stock price since they convey no information about the level of planned investment.

2.2. Price Pressure Hypotheses

Financial practitioners have long argued that increasing the supply of a given security causes the price of that security to fall. This view is labelled the "Price Pressure Hypothesis" by Scholes (1972). Price Pressure Hypotheses can be categorized as the "Downward Sloping Demand Curve Hypothesis" and the "Transaction Cost Hypothesis."

The Downward Sloping Demand Curve Hypothesis is based on the assumption of an incomplete capital market with restricted short sales. Under these conditions, perfect substitutes for a firm's securities do not exist in the market. In the absence of perfect substitutes, firms face downward sloping demand curves for their securities. This hypothesis predicts that an increase in quantity caused by a new issue of common stock will result in a permanent decrease in the stock price and the absolute value of the percentage price decline will be positively related to the size of the issue. The hypothesis also predicts that new debt issues will have no impact on the stock price.

The Transaction Cost Hypothesis predicts a temporary price pressure effect associated with new issues of common stock even if near-perfect substitutes for the firm's securities exist in the market. Under this hypothesis, the stock price decline following new equity issue announcements reflects a discount that must be offered to compensate investors for the

transaction costs they bear in adjusting their portfolios to absorb the new shares. After the underwriting syndicate markets the new issue, the price recovers to its original value. Since the transaction costs and the value of the discount are both proportional to the size of the issue, this hypothesis predicts no correlation between the size of the issue and the magnitude of the price decline.

2.3. Leverage Hypotheses

The final set of hypothesis are the "Tax Advantage of Debt Hypothesis" from Modigliani and Miller (1963) and the "Redistribution Hypothesis" based on the analysis of risky debt in Merton (1974), Galai and Masulis (1976), and Smith and Warner(1979).

The Tax Advantage of Debt Hypothesis assumes that new equity issues cause an unanticipated decrease in financial leverage. Because of the tax advantages of debt financing, a decrease in financial leverage causes the stock price to decline and the absolute value of the percentage price decline is directly related to the size of the issue. Stock issues intended to retire existing debt have a larger negative effect than issues intended to finance new investment spending since they have a greater effect on financial leverage. Under this hypothesis, new issues of debt have a positive effect on stock prices.

In contrast to the Tax Advantage of Debt Hypothesis, if an optimal capital structure exists, as argued by Kraus and Litzenberger (1973) and DeAngelo and Masulis (1980), then, with symmetric information about the firm's current and future cash flows, movement along the optimal leverage-value curve

The Redistribution Hypothesis is based on the observation that with a fixed investment policy, an unexpected decrease in leverage makes a firm's debt less risky. If the total market value of the firm remains unchanged, bondholders experience an increase in value at the expense of the shareholders. This effect is most easily understood if the firm's common stock is viewed as a call option on the assets of the firm as in Merton (1974). The redistribution hypothesis predicts that new equity issue announcements will have a negative effect on stock prices and new debt issue announcements will have a positive effect on stock prices. The magnitude of the effect will be directly related to the size of the issue and will be larger for issues intended for pure capital structure changes than for issues intended for new investment spending.

The predictions of these competing hypotheses are summarized at the end of the paper in the Table 5.

3. Methodological Issues Related to Measuring Intraday Returns

3.1. The Continuous Time Approach

Consider dividing the trading day into intervals of fixed length with interval 0 beginning at the time of day that an event occurred. Let $P_{i,t}$ denote the price of security i, t minutes following (or preceding) the event. True stock prices vary continuously; however, we observe price changes only when transactions occur. Thus, while we wish to estimate expected interval returns, $E(P_{i,t_1}/P_{i,t_0})$, we only observe $P_{i,s_{i,1}}$ and $P_{i,s_{i,0}}$ where $s_{i,0} < t_0$

$$\frac{dP_i(t)}{P_i(t)} = (\alpha(t)'X_i)dt + \sigma(t)dz_i \qquad (3.1.1)$$

where z_i is a standard Brownian process, X_i is a vector of exogenous variables, $\alpha(t)$ is a vector of time dependent parameters, and $\sigma(t)$ is a time dependent scalar. It is not possible to estimate $\alpha(t)$ and $\sigma(t)$ as general functions of time. However, if we assume they are constant over some interval (say 15 minutes), then we can estimate them as a piecewise linear functions of time. The assumption that the mean and variance of the returns are constant within a given interval is reasonable if the intervals are sufficiently short.

This procedure assumes that the conditional variance of the returns is the same for all stocks in the sample. Clearly, the unconditional time series variance is not the same for all stocks. However, little is known about the within day variance of the returns, especially the within day variance conditional on a new equity issue announcement. The alternative is to assume that the conditional variance is equal to the unconditional variance. We offer evidence later in the paper that suggests that the conditional variance is significantly greater than the unconditional variance and we show that incorrectly assuming that the conditional and unconditional variances are equal would bias the statistical tests towards rejecting the null hypothesis that the mean (excess) return, conditional on the event, is equal to zero.

Let $m_{i,j}$ be the number of minutes between two transactions that fall into interval j, and let I be the total number of intervals over which the returns are measured. Then, $\log(P_{i,s_{i,1}}/P_{i,s_{i,0}})$ is normally distributed with mean

$$\sum_{I}$$

likelihood procedure. If the observations are independent, the log of the likelihood function has the following form:

$$\log(L) = -\sum_{i=1}^{N}\left(\frac{1}{2}\log\left(2\pi\sum_{j=1}^{I}\sigma^2(j)m_{i,j}\right) + \frac{\left[R_i - \sum_{j=1}^{I}(\alpha(j)'X_i - (1/2)\sigma^2(j))m_{i,j}\right]^2}{2\sum_{j=1}^{I}\sigma^2(j)m_{i,j}}\right) \qquad (3.1.2)$$

where $R_i = \log(P_{i,s_{i,1}}/P_{i,s_{i,0}})$. Closed form solutions do not exist for this maximization problem (except for the special case where $\alpha(t)$ and $\sigma(t)$ are time independent scalars) so the parameters are estimated using numerical methods. Given the distributional assumptions above, this procedure yields consistent estimates of the parameters as the number of securities in the sample becomes large.

The principle advantage of this methodology is that it handles the problems of nontrading securities in a very natural way. When a return accrues over more than one interval, rather than excluding that return or assigning the return across intervals in an arbitrary fashion, this technique assigns a fraction of the return to each interval in a way that maximizes the overall likelihood of the sample.

3.2. The Cumulative Return Technique

For comparison, cumulative returns are also estimated. If a security trades in consecutive event time intervals $t-1$ and t, then the return $r_{i,t}$

$\bar{R}_t = \frac{1}{N}\sum_{i=1}^{N} R_{i,t}$ and cumulative average return from interval j to interval k is equal to $\overline{CR}_{j,k} = \sum_{t=j}^{k} \bar{R}_t$.

If a security does not trade in consecutive event time intervals, t-1 and t, its return for interval t is undefined and that observation is excluded from the sample. This causes a large number of missing observations when using this technique. Several alternative techniques that result in a smaller number of missing observations (reflecting different assumptions about returns during intervals when stocks did not trade) were considered in an earlier draft of the paper. The qualitative results are robust to these different specifications. However, the magnitude of the measured effect is sensitive to the choice of technique.

3.3. Transaction Return Technique

An alternative to measuring returns over intervals of fixed length in minutes is to measure returns over a fixed number of transactions. Transaction returns are calculated by $TR_{i,k,t} = (P_{i,t} - P_{i,k})/P_{i,k}$ where $P_{i,t}$ is the price of security i, t transactions following (or preceding) the event and $TR_{i,k,t}$ is the transaction return for security i from transaction k to transaction t. Average transaction returns are given by $\overline{TR}_{k,t} = \frac{1}{N}\sum_{i=1}^{N} TR_{i,k,t}$ and the corresponding t-statistics are calculated as $t(\overline{TR}_{k,t}) = \overline{TR}_{k,t}/S(\overline{TR}_{k,t})$ where $S(\overline{TR}_{k,t})$ denotes the estimated cross-sectional standard deviation of $\overline{TR}_{k,t}$.

The cross-sectional standard deviation of the transaction returns is

information is properly measured in terms of the number of transactions that have occurred rather than the elapsed time in minutes from the announcement. This is consistent with the observed price of actively traded stocks reflecting new information more quickly than infrequently traded stocks.

An alternative approach is to assume that the variance per minute is constant across securities and that the variance over a transaction interval is equal to a scalar times the length of that interval in minutes. Let $m_{i,k,t}$ denote the number of minutes over which $TR_{i,k,t}$ is measured. Then the BLUE (best linear unbiased) estimate of the mean return over k transactions is obtained by weighting each observation, $TR_{i,k,t}$, by $1/m_{i,k,t}$ which is proportional to the reciprocal of the variance of that observation.

3.4. Bootstrap Algorithms for Statistical Significance Tests

Little is known about the distribution of intraday stock returns, especially the distribution of returns conditional on some event like a new equity issue announcement. Thus, it is appropriate to test the robustness of the parametric results discussed above with nonparametric tests. The bootstrap, developed by Efron (1982) and others, is one of several resampling plans that can be applied in situations where standard parametric techniques for statistical inference are inappropriate. To illustrate the basic bootstrap technique, consider a sample of 15 minute returns in event time, $(R_1, R_2, \ldots, R_n)$, and the sample mean $\bar{R}(R_1, R_2, \ldots, R_n)$. Since the returns accrue at different calendar times, they may be viewed as independent drawings from an unknown distribution F. A common problem of statistical inference is

(1) Estimate the distribution function F with the nonparametric empirical distribution $\hat{F}$ putting probability mass 1/n on each R_i.

(2) Draw a "bootstrap" sample from $\hat{F}$, $(R_1^*, R_2^*, \ldots, R_n^*)$, where each R_i^* is drawn randomly, with replacement from the observed values $(R_1, R_2, \ldots, R_n)$, and calculate $\bar{R}^* = \bar{R}(R_1^*, R_2^*, \ldots, R_n^*)$.

(3) Independently repeat step (2) a large number B of times obtaining $\bar{R}^{*1}$, $\bar{R}^{*2}, \ldots, \bar{R}^{*B}$, and calculate

$$p = \underset{\hat{F}}{\text{Prob}}\{\bar{R}(R_1, R_2, \ldots, R_n) < K\} = \frac{\text{number of times } \bar{R}^* < K}{B}.$$

This algorithm, as well as standard parametric statistical procedures assumes a fixed sample size. However, when there are missing observations, the sample size is random and reflects the number of securities that traded in a given interval. When measuring returns over 15 minute intervals the problem of missing observations is severe. The basic bootstrap algorithm can be extended to account directly for these missing observations.

For example, consider the problem of estimating the statistical significance of the mean common stock return following an event from a sample of N securities when only $n < N$ of the securities traded in the relevant event time interval. The bootstrap probability can be calculated from existing observations using the following algorithm:

(1) Sample with replacement from the set of all securities associated with the given event. If the chosen security traded in the relevant event time interval, include it in the sample; otherwise do not include it.

4. Empirical Results

4.1. Sample Data

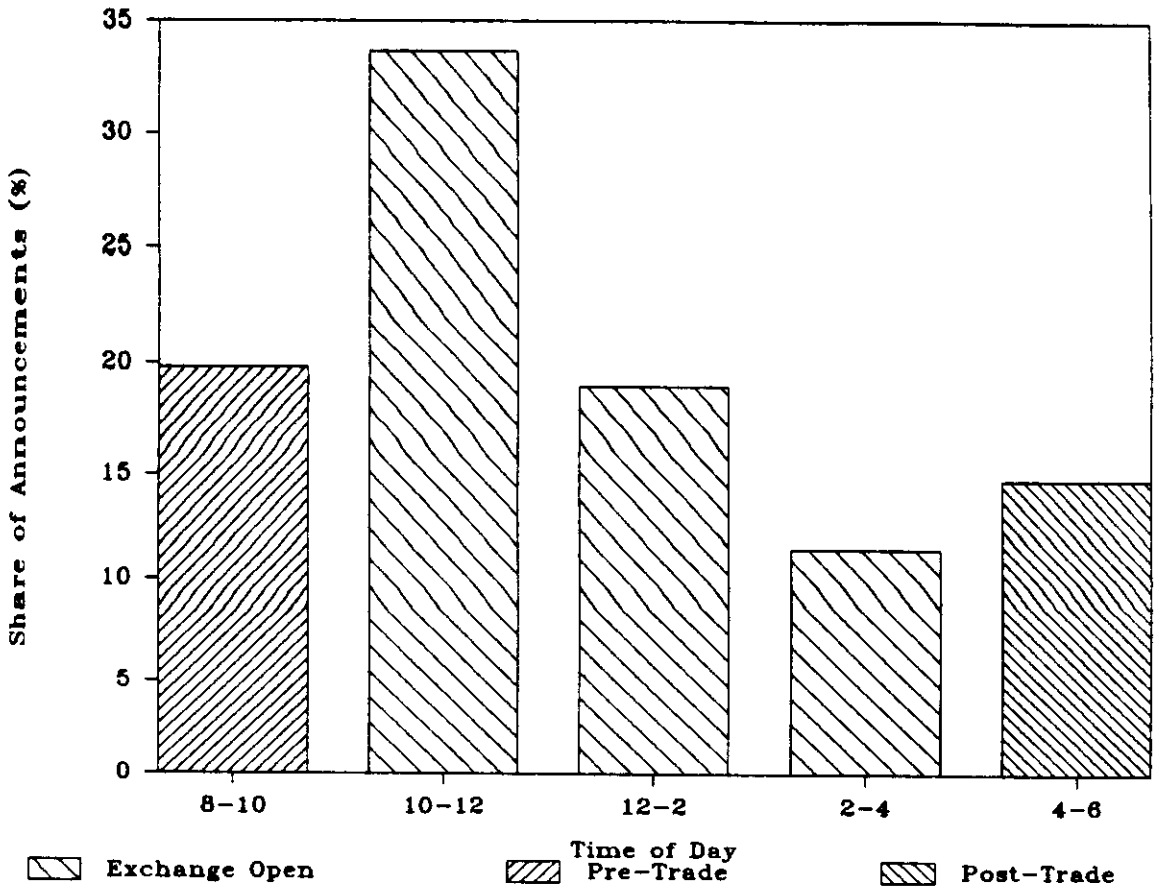
Our sample consists of 218 new issues of common equity and 85 new issues of straight, long-term debt offered between January 1981 and December 1983 by industrial firms listed on the New York or American Stock Exchange. Firms issuing new debt or equity during this period are identified in an annual publication by Drexel Burnham Lambert entitled *Public Offerings of Corporate Securities*. Common stock offerings are included in the sample if the value of the offering is at least $15 million or at least 5% of the shares outstanding. Primary issues combined with large secondary distributions are excluded from the sample. Scholes (1972) argues that large sales by insiders or other "informed" traders signal their assessment that the shares are overvalued. The exclusion of combined primary and secondary distributions helps to insulate the sample from the information revealed by a large sale of stock by insiders. The first public announcement of each new issue is obtained from the Dow Jones News Service (the Broad Tape). Each news release that appears on the Dow Jones News Service is stamped with the date and time (to the nearest minute) that the release was transmitted over the wire service.[5]

Announcements of new equity and debt issues occur throughout the day with a slightly greater number occurring in the morning than in the afternoon (see Figure 1). Since the Dow Jones News Service operates from 8:00 am until approximately 6:30 pm Eastern time, a number of announcements occurred either before the opening of trade on the exchanges at 10:00 or [illegible]

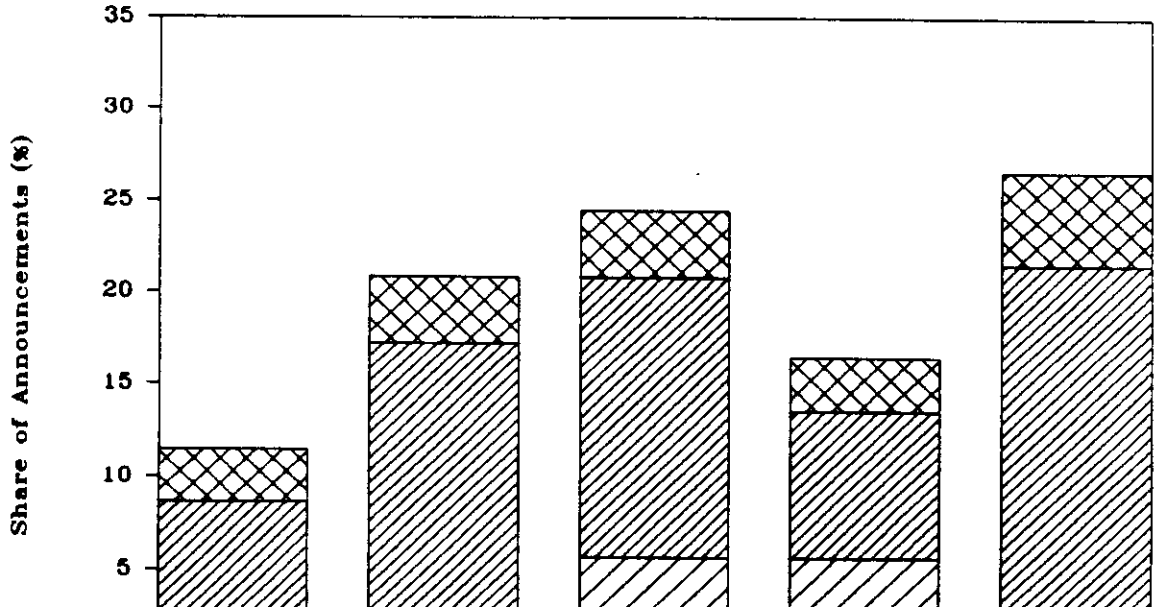
FIGURE 1

Distribution of announcements for 218 new issues of seasoned equity by industrial firms between 1981 and 1983 by time of day and day of week.

Panel A: Distribution of Announcements by Time of Day



Panel B: Distribution of Announcements by Day of Week



trade at 4:00 pm Eastern time. To avoid problems from mixing intraday and overnight returns, the intraday analysis uses only those announcements that occurred within the trading day (139 equity issue announcements and 43 debt issue announcements).

Intraday stock price data are obtained from a data file provided by Francis Emory Fitch, Inc. The data consist of a time ordered record of each stock transaction made at the New York or American Stock Exchange. The date and time (to the nearest minute) of each transaction is recorded along with the price and number of shares transacted.

4.2. Common Stock Issues

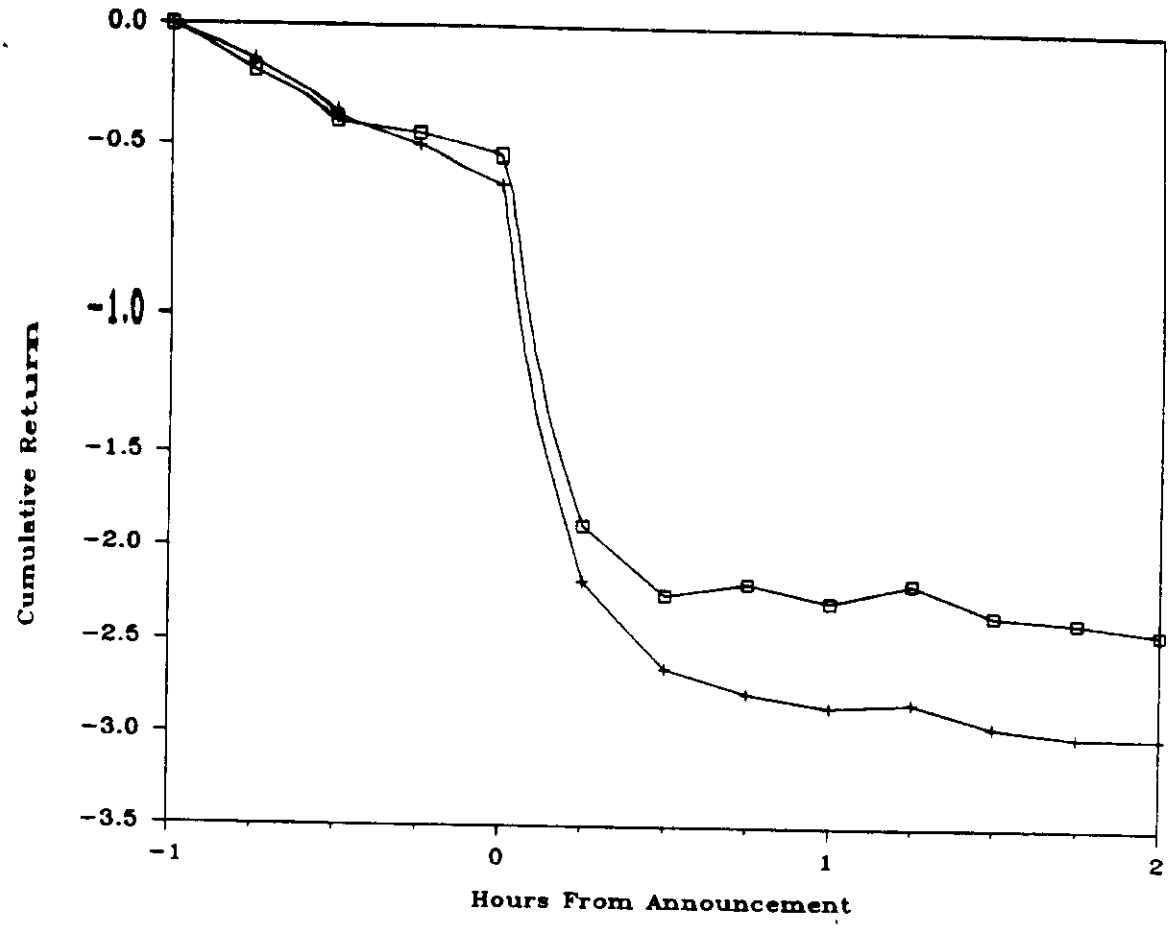
Figure 2 and Table 1 report the average intraday stock returns surrounding announcements of new issues of common equity by industrial firms. This evidence suggests that the stock market reacts rapidly to this new information. During the first 15 minutes following the announcement, stock prices fall, on average, by 1.34%. This negative return is significant at the 1% level. During a three hour period surrounding the announcement, the average return is −2.44%.

While the average return is not significantly different from zero during any single 15 minute interval preceding the announcement, the average return is negative and significant at the 1% level during the one hour period preceding the time that announcements appear on the Broad Tape. During this one hour period, there are twice as many negative returns as positive returns, and the hypothesis that positive and negative returns are equally likely during this interval can be rejected at the 5% level of significance.

The exchanges have taken great care to restrict transactions based on information that is unavailable to the general public. Explicit guidelines

FIGURE 2

Average intraday stock returns surrounding 139 announcements of new issues of equity by industrial firms between 1981 and 1983.



□ Returns measured using the continuous time maximum likelihood technique.

\+ Returns measured by summing the average return for those stocks that traded in consecutive 15 minute intervals.

TABLE 1

Average intraday stock returns and number of negative, zero and positive returns surrounding 139 announcements of new issues of equity by industrial firms between 1981 and 1983.

Continuous Time Technique[a]				Cumulative Return Technique[b]						Negative (-) Zero (0), and Positive (+) Returns			
Cumulative Return (%)	Interval Return (%)	t	$\sigma^2 \times 10^5$	Cumulative Return (%)	Interval Return (%)	t	t-test[c] p-value	Standard[d] Bootstrap p-value	Adjusted[e] Bootstrap p-value	(-)	(0)	(+)	X^2
-0.19	-0.19	-0.96	0.52	-0.15	-0.15	-0.96	.169	.180	.174	16	12	12	0.57
-0.38	-0.19	-1.99*	0.12	-0.36	-0.21	-2.40**	.008	.007	.006	15	21	4	6.37*
-0.44	-0.06	-0.46	0.45	-0.50	-0.14	-1.15	.125	.103	.106	19	13	11	2.13
-0.54	-0.10	-0.53	0.73	-0.67	-0.17	-1.29	.099	.102	.083	22	19	13	2.31
-1.88	-1.34	-5.33**	1.87	-2.18	-1.51	-7.98**	.000	.000	.000	56	6	5	42.64**
-2.24	-0.36	-2.77**	0.52	-2.65	-0.47	-3.47**	.000	.000	.000	42	15	18	9.60**
-2.18	0.06	0.49	0.62	-2.78	-0.13	-0.98	.164	.165	.156	28	14	23	0.49
-2.28	-0.10	-0.65	0.61	-2.85	-0.07	-0.56	.288	.289	.294	25	16	20	0.56
-2.18	0.10	0.80	0.47	-2.82	0.03	0.23	.591	.601	.593	17	24	18	0.03
-2.35	-0.17	-1.10	0.63	-2.95	-0.13	-1.01	.156	.157	.166	23	16	15	1.68
-2.38	-0.03	-0.31	0.26	-3.00	-0.05	-0.62	.268	.269	.254	20	24	16	0.44
-2.44	-0.06	-0.48	0.28	-3.00	0.00	-0.01	.496	.513	.486	16	16	19	0.26
	-.51	-2.33**			-0.67	-2.65	.004	.003	.004	27	14	14	4.12*
	-.17	-0.50			-0.35	-1.29	.099	.097	.089	20	8	15	0.71
					-3.00	-6.83	.000	.000	.000	21	2	1	29.12**

asured using the continuous time maximum likelihood technique.
asured by summing the average return for those stocks that traded in consecutive intervals.
ce level for one tailed parametric t-test of the hypothesis that the interval return than or equal to zero.
probability (from 1,000 samples) that the interval return is greater than or equal th no adjustment for missing observations.
probability (from 1,000 samples) that the interval return is greater than or equal ing an algorithm that accounts for the number of missing observations.
me series variance per minute of the natural log of the stock return.
c for one tailed test of the hypothesis that the interval return is equal to zero.
d statistic with one degree of freedom to test the hypothesis that positive returns ve returns are equally likely.
test significant at the 5% level.
test significant at the 1% level.

have been established by the exchanges with the intent to provide all traders with equal access to information from public disclosures. In keeping with the spirit of these guidelines, when new information is to be disclosed through several channels (a press conference and the wire services, for example), it is general corporate practice to release the information through all channels simultaneously. The negative average return preceding the appearance of the announcements on the Broad Tape is consistent with the hypothesis that the exchanges are not successful in their efforts to have information released simultaneously to all market participants.

Also of interest from Table 1 is the fact that the variance of the stock returns is more than twice as large during the first 15 minutes following the announcement than in any other 15 minute interval. This increase in variance caused by the announcement has important implications for the significance tests in this and other event studies. A popular technique for event studies using daily data is to scale the event day returns by the standard deviation estimated during some period not including the event day, and then assume that this standardized return has unit variance. Standardized returns can be used to test the hypothesis that the mean event day return is drawn from the same unconditional distribution as nonevent day returns. However, to test whether the mean (excess) return is equal to zero conditional on the event, the conditional variance should be used. In this example, if the variance estimate is constrained to be the same in every interval, the t statistic for the first 15 minutes following the announcement increases from 5.33 to 16.95. This latter statistic is overstated (since the

FIGURE 3

Average transaction interval returns surrounding 139 announcements of new equity issues by industrial firms between 1981 and 1983.

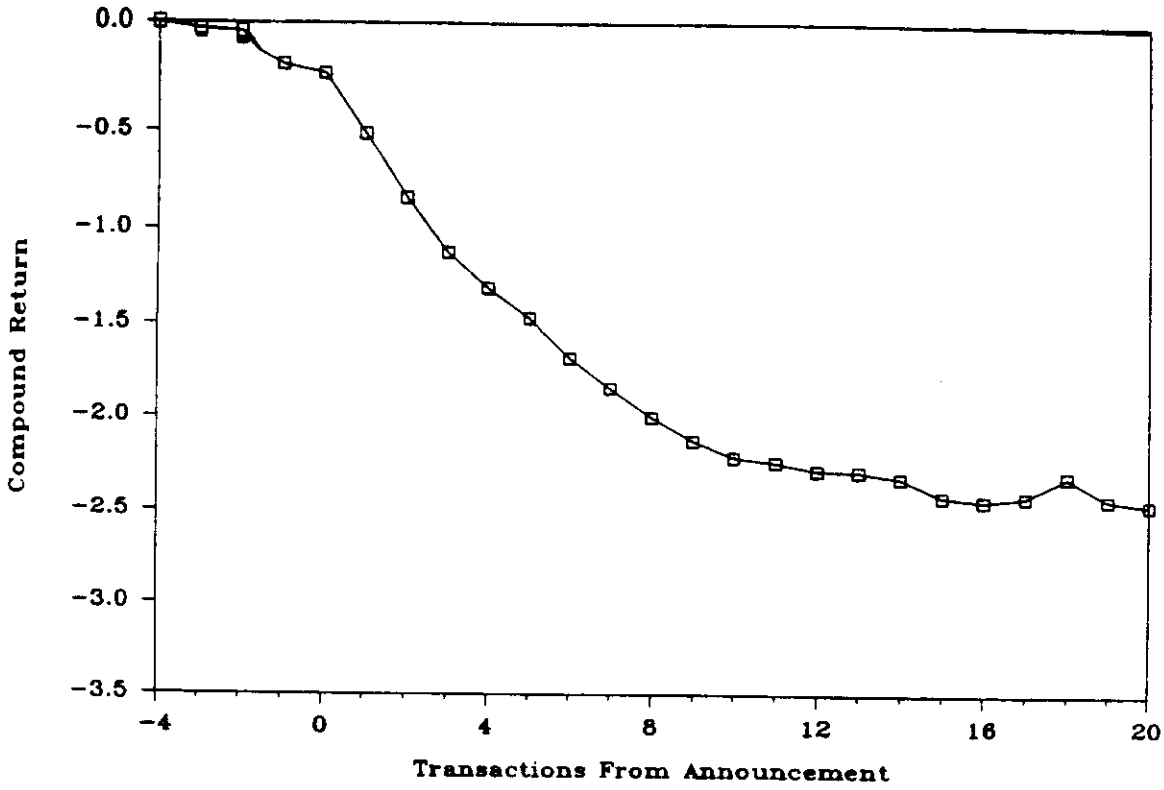


TABLE 2

Average transaction interval returns
surrounding 139 announcements of new issues of equity
by industrial firms between 1981 and 1983.

Transaction Interval	Cumulative Average Return %	Average Return (%)	t	Weighted Average Return (%)	t
-4 – -1	- .201	-0.201*	-2.119	-0.263**	-2.606
0	- .544	-0.343**	-4.601	-0.180*	-2.275
1	- .871	-0.327**	-6.989	-0.296**	-5.873
2	-1.145	-0.274**	-5.220	-0.239**	-4.026
3	-1.352	-0.207**	-4.002	-0.118**	-2.356
4	-1.481	-0.129*	-2.210	-0.152**	-2.499
5	-1.648	-0.167**	-3.328	-0.198**	-3.569
6	-1.765	-0.117**	-2.498	-0.100	-1.557
7	-1.925	-0.160**	-2.571	-0.187**	-3.469
8	-2.095	-0.170**	-3.564	-0.147**	-3.282
9 – 12	-2.296	-0.201*	-2.133	-0.417**	-4.000
13 – 16	-2.367	-0.071	-0.700	-0.435*	-2.247
17 – 20	-2.298	0.069	0.604	0.033	0.259

t t-statistic for one tailed test of the hypothesis that the transaction return is equal to zero.
* Significant at the 5% level.
** Significant at the 1% level.

The weighted average return is the best linear unbiased estimator assuming that the variance per minute is constant across all securities and that the variance over a transaction interval is proportional to the length of the interval in minutes.

security regardless of how long that interval was in minutes. The price decline in Figure 3 is smoother and more gradual than the decline in Figure 2. Under the efficient market hypothesis, all information available to market participants should be reflected in the current stock price. Figure 3, however, suggests the possibility of a systematic pattern in the returns following the announcement of a new issue of equity. Table 2 provides additional details about this result. The negative average return is statistically significant for each of the first nine transactions following the announcement. This pattern suggests the existence of profit opportunities for floor traders who have very low transaction costs and are able to act within the first 15 minutes following this public announcement. Profit opportunities of this type may reflect the normal rate of return on the time, expertise, and invested capital of these professional traders.

One of the recognized responsibilities of a specialist on the NYSE is to maintain an orderly market for the shares he trades. The concept of an orderly market has not been well defined. However, if an orderly market is defined as one in which price changes between consecutive transactions are small, then specialists have an incentive to avoid large price changes in order to maintain the appearance of an orderly market. Since the bid and ask quotes on a specialist's book are only binding for 100 shares, a low cost way to avoid large price changes is to complete multiple low volume transactions with a continuously changing price. Dann, Mayers and Raab (1977) propose this "orderly market hypothesis" to explain the type of intraday price behavior observed in Figure 3. Under this hypothesis, the quantity constraint imposed by the specialist forestalls any profit opportunities that are inconsistent with the efficient market hypothesis.

However, the pattern of trade is not consistent with this orderly market hypothesis. Figure 4 shows the average trading volume and number of transactions (measured relative to the daily totals) for each 15-minute interval relative to the event. During the first 15 minutes following an announcement there is an abnormally large number of transactions *and* correspondingly high volume. The first 5 transactions following the announcement have a median volume of 300 shares and a mean of 1,108 shares while the last 5 transactions preceding the announcement have a median volume of 300 shares and a mean of 968 shares. The first transaction following the announcement has a median volume of 400 shares and a mean of 2,258 shares. There is no evidence of quantity rationing by the specialists following these announcements.

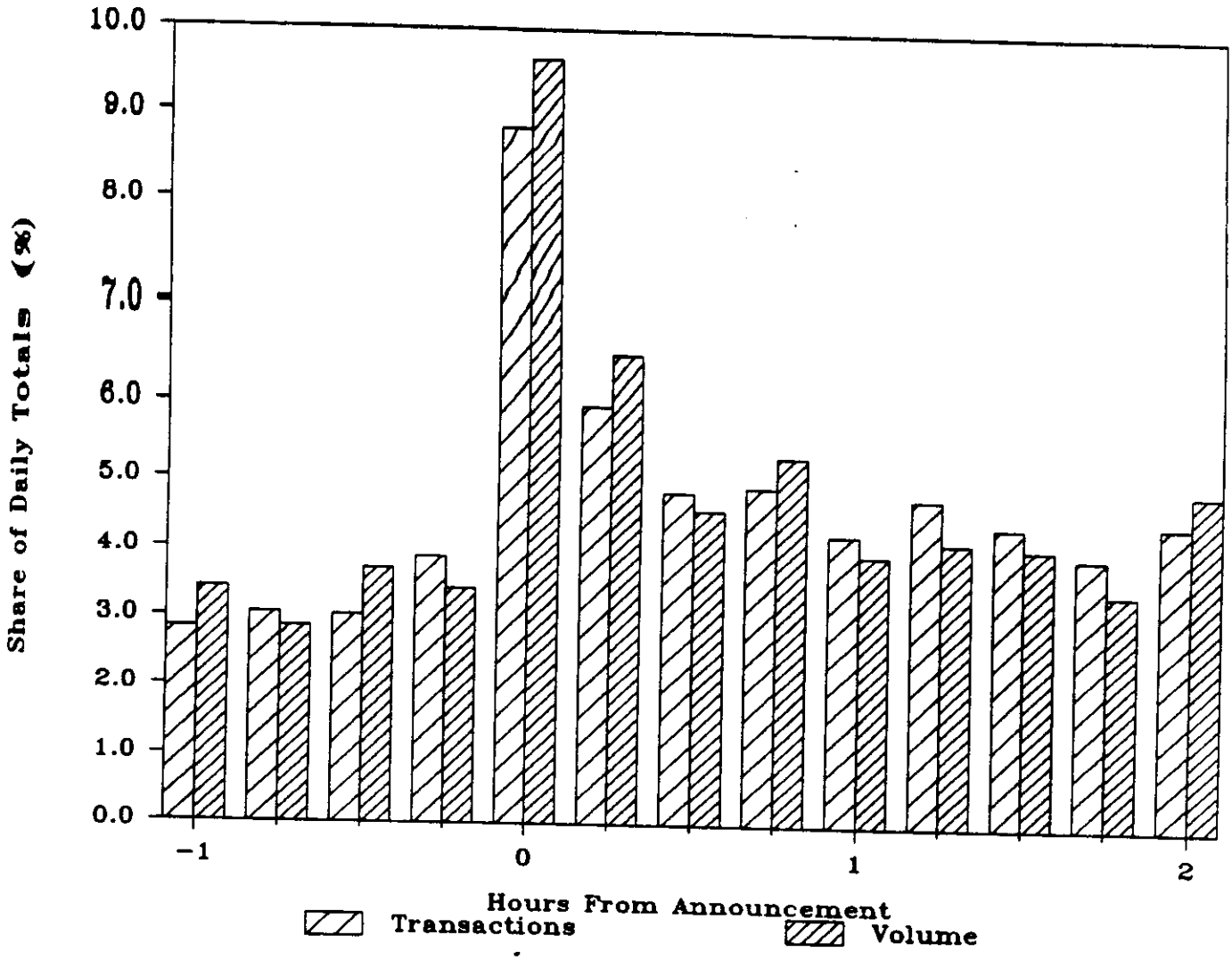
Asymmetric assessment of the information contained in these announcements would result in an increase in trading volume and number of transactions as depicted in Figure 4. Alternatively, the large number of transactions illustrated in Figure 4 and the price path in Figure 3 could result from specialists clearing their books by exercising a large number of stop loss or limit orders immediately following the announcement.

4.3. Non-Trading Problems and the Choice of Measurement Technique

Returns are included in the nonparametric statistics in Table 1 only if the stock traded within 15 minutes prior to the start of the interval and again within 15 minutes prior to the end of the interval. For any given 15 minute interval, only about 40% of the securities in the sample traded in both that and the previous interval. This fraction provides some indication of the

FIGURE 4

Average trading volue and number of transactions surrounding 139 announcements of new equity issues by industrial firms between 1981 and 1983.



maximum likelihood technique, that account for the nontrading problem directly.

Since the cumulative return technique uses only those securities that traded in the consecutive event time intervals, t-1 and t, to calculate the average return for interval t, it places a disproportionate weight on the most actively traded stocks. If the more actively traded stocks have a larger average price reaction to the new information (for example, less anticipated or more significant information may itself cause higher trading volume), or if the speed of adjustment to new information is more properly measured in the number of transactions rather than the number of minutes from the announcement (as suggested in Table 2), then this measurement technique will overstate the true effect. Using the cumulative return technique does result in a larger estimated stock price reaction to this particular sample of new equity issue announcements than the continuous time approach.

The nontrading problem also raises questions about the robustness of standard parametric tests of statistical significance since these tests assume a fixed sample size. Nonparametric significance tests were calculated for the cumulative returns using a standard bootstrap algorithm and an adjusted bootstrap algorithm that accounts directly for the missing observations. Table 1 reports significance levels based on 1,000 bootstrap samples. For selected intervals, bootstrap p-values were also calculated using sample sizes from 100 to 5,000 and the values tended to converge by 500 resamplings. The results indicate little difference between the parametric t-test, the standard bootstrap and the bootstrap adjusted for missing observations suggesting that the t-test is robust to the nontrading problem.

4.4. New Issues and Tobin's Q Ratio

When it is announced that a firm is issuing additional common stock in order to finance new investment projects, the market reaction should reflect investors' beliefs about the marginal rate of return on these incremental investments. Unfortunately, it is difficult to obtain objective information about investors' beliefs concerning the gross present value generated per dollar of new investment. One proxy for this present value profitability index is the ratio of a firm's market value to the replacement cost of its assets. This ratio, referred to as Tobin's Q ratio, is a measure of the present value of the future cash flows of the firm divided by the cost associated with starting the enterprise anew.

There is no necessary connection between Tobin's Q and the gross present value/cost ratio for a firm's incremental investments. Firms with large economic rents may have already fully exploited their profitable investment opportunities. On the other hand, firms with outdated or inefficient existing plant and equipment may have profitable opportunities for modernization or new product development. However, if marginal and average Q are positively correlated then knowledge of average Q will provide some information about marginal Q.

To test the hypothesis that investor beliefs about the profitability of new investment projects have a significant impact on the market reaction to new equity issue announcements, each new issue is classified according to the intended use of the proceeds and placed into one of the following four categories: (1) change in capital structure only; (2) new investment spending only; (3) mixed (capital structure change and new investment); or (4)

regress the 90 minute common stock return surrounding the announcement[6] on a dummy variable (*USE*) set equal to one for announcements indicating pure capital structure changes and zero for new investment spending using (the result is presented in Table 3). It is somewhat surprising that there is little difference between the negative average returns associated with these two very different uses of funds. Capital structure changes have no impact on the physical assets of the firm while new investments clearly affect real activity. Yet, on average, the market provides a similar negative response to each type of announcement. This result is not consistent with the cash flow signaling hypothesis, the wasteful investment hypothesis or the leverage hypothesis.

For each firm announcing that some portion of the proceeds of the new issue will be used for new investment spending, Tobin's Q ratio is calculated. The market value of the firm is estimated by summing the market value of the common and preferred stock, the market value of any publicly traded long-term debt, and the book value of nontraded debt. Replacement cost is estimated by the book value of assets adjusted for inflation to reflect current cost as reported in the annual report under FASB regulation 33.

The 90 minute common stock return surrounding the announcement is regressed on a dummy variable (DQ) set equal to one for firms with Q ratios larger than 1.0 and zero otherwise, using the maximum likelihood procedure (the results are reported in Table 3). The point estimate for the coefficient on this dummy variable is greater than zero which is consistent with the hypothesis that investors perceive new investments by small Q firms

TABLE 3

ss-sectional regressions of the 90 minute stock return surrounding 139 announcements of new issues of equity by industrial firms between 1981 and 1983 on Tobin's Q ratio and various size variables. The reported coefficients are the maximum likelihood estimates from the model $dP/P = (\alpha'X)dt + \sigma dz$ where X is the vector of exogenous regressors and z is a standard Brownian process.

USE	DQ	(Q-1)*RS	RS	LRS	LAS	DRS	DAS
-.679E-5							
(-.07)							
	.441E-4						
	(.57)						
		.519E-3	.318E-3				
		(.92)	(.36)				
				.956E-4			
				(1.69)			
					-.548E-4		
					(-1.31)		
						.145E-3	
						(1.80)	
							-.639E-4
							(-.82)

atural log of the relative size of the offering (number of shares offered divided by number f shares outstanding).

atural log of the dollar value of the offering.

ummy variable equal to 1 for offerings with relative size greater than the median and 0 therwise.

ummy variable equal to 1 for offerings with dollar value larger than the median and 0 therwise.

ummy variable equal to 1 for offerings used for pure capital structure changes and 0 for ew investment spending.

ummy variable equal to 1 for firms with Q>1 and 0 otherwise.

Q-1) times the relative size of the offering.

he relative size of the offering.

statistically significant. The fact that even firms with Q ratios larger than 1.0 experience negative average returns following new equity issue announcements is also inconsistent with the wasteful investment hypothesis and arguments based on the agency costs of free cash flow.

The marginal Q ratio for an incremental project (MQ) measures the gross change in firm value per dollar invested in the project. The net change in firm value (ΔV) is given by

$$\Delta V = (MQ - 1)I \qquad (4.4.1)$$

where I is the dollar value of the new investment. Assuming that new equity issues signal an increase in the level of planned investment equal to the value of the issue, and assuming that new the investment has no affect on the value of outstanding bonds, dividing both sides of equation (4.4.1) by the value of the firm yields

$$R = (MQ - 1)RS \qquad (4.4.2)$$

where $R = \Delta V/V$ is the common stocks return and $RS = I/V$ is the relative size of the new issue. If marginal Q can be expressed as a linear increasing function of average Q (i.e., $(MQ-1) = \alpha + \beta(Q-1)$), equation (4.4.2) can be rewritten as

$$R = \alpha(RS) + \beta(Q-1)(RS). \qquad (4.4.3)$$

There is no evidence from this data that the estimated profitability of the firm's incremental investments has a significant affect on the magnitude of the price decline following new equity issue announcements. Thus, these data offer no support for the wasteful investment hypothesis or for hypotheses based on the agency costs of free cash flow.

4.5. Cross-Sectional Analysis by Size of Offering

Several of the theories offered to explain the negative market reaction to new issues of common equity can be distinguished by the predictions they make about the effect of the size of the offering on the common stock return. Earlier studies using daily data find conflicting evidence on this effect. Mikkelson and Partch (1986) find that the relative size of the issue is not a significant explanatory variable while Asquith and Mullins (1986) find the same variable to be statistically significant in a multiple regression including the pre-announcement return as a second explanatory variable. Masulis and Korwar (1986) indicate that the relative size of the offering is statistically significant in two of the three multiple regressions that they report.

To investigate the effect of the size of the offering on the stock price adjustment, both the absolute dollar size and the relative size of the offering are used in the regression equations. The appropriate choice of partition is not obvious. For example, the downward sloping demand curve hypothesis relates to the slope of the demand curve for the shares of an individual firm and the best comparison across firms is not clear.

The 90 minute common stock return surrounding the announcement is regressed on the log of the absolute size of the issue (LAS) and the log of

The return is also regressed on a dummy variable set equal to one for issues larger than the median and zero otherwise (DAS and DRS for absolute size and relative size, respectively). The results are presented in Table 3. None of the size variables in these regressions are statistically significant. In addition, coefficients on the relative size of the offering have the opposite sign from coefficients on the absolute size of the offering which is not predicted by any of the models.

The lack of correlation between the magnitude of the price drop and the size of the issue is consistent with the existing asset value signaling hypothesis and the transaction cost hypothesis. However, it is not consistent with the cash flow signaling hypothesis, the wasteful investment hypothesis, the downward sloping demand curve hypothesis or either of the leverage hypotheses.

4.6. Post Issue Day Returns

Thus far, the analysis has focused on the announcement effects of new equity issues. However, several of the hypotheses also have implications for stock price behavior following the issuance of the securities. In particular, the transaction cost hypothesis predicts a price recovery following the issue.

Table 4 presents the daily excess returns for five days prior to the issue day and the excess and cumulative excess returns for 20 days following the issue day.[7] If there is an excess supply of securities at the offer price, the underwriting syndicate may temporarily keep the stock price above the market clearing price by purchasing

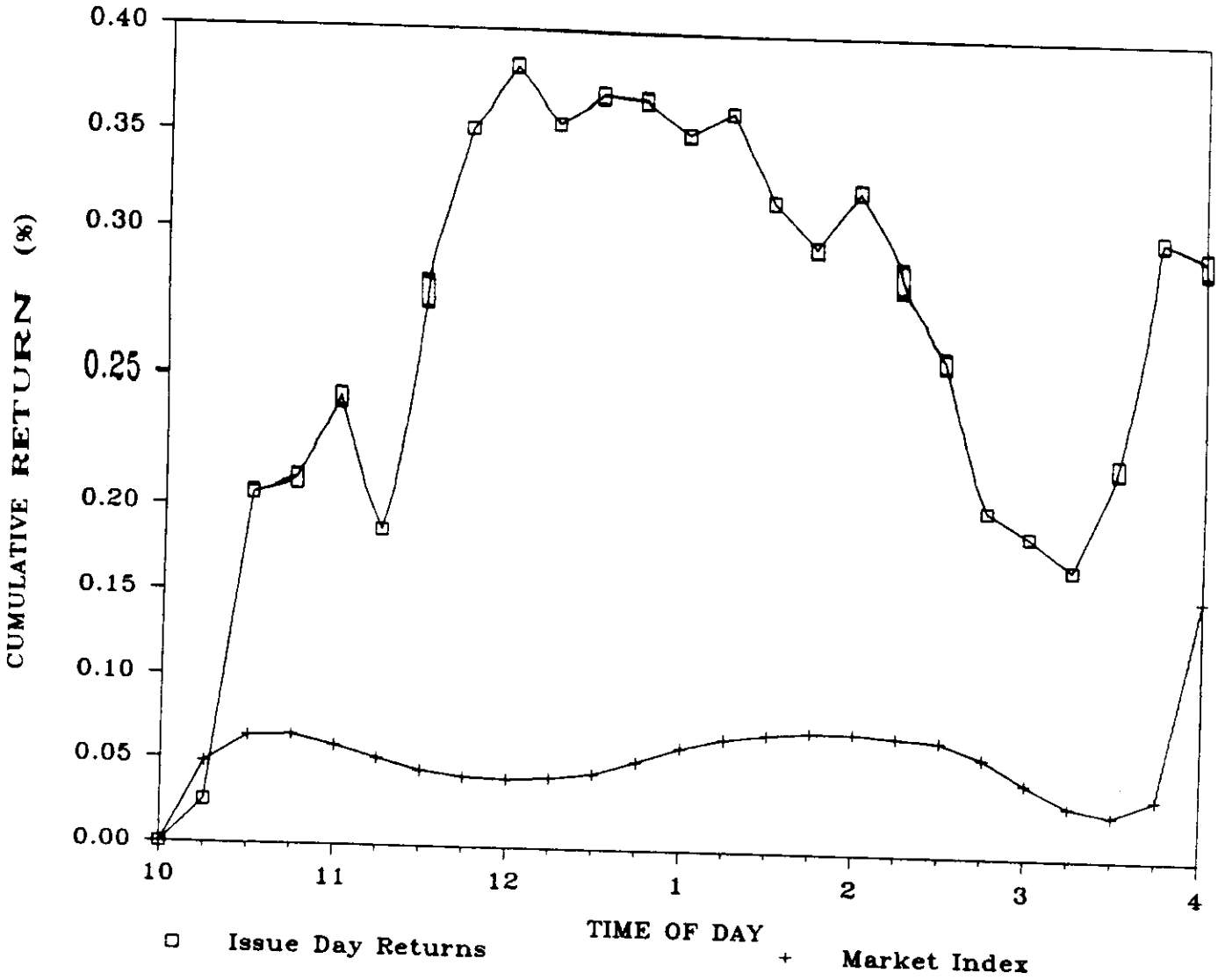
TABLE 4

Excess and cumulative excess returns following the issue day for 139 new issues of equity by industrial firms between 1981 and 1983.

Event Day	Excess Return %	t Statistic	Cumulative Excess Return %	t Statistic
-5	0.10	0.59		
-4	0.17	0.89		
-3	-0.06	-0.32		
-2	-0.12	-0.67		
-1	-0.43	-2.87		
close -1 to open 0	-0.33	-3.19		
open 0 to close 0	0.30	2.05	0.30	2.05
1	0.19	1.25	0.48	2.32
2	-0.15	-0.89	0.34	1.25
3	0.09	0.54	0.42	1.35
4	0.11	0.61	0.53	1.48
5	0.24	1.56	0.77	1.98
6	0.03	0.19	0.80	1.91
7	0.06	0.36	0.86	1.92
8	0.14	0.91	1.00	2.11
9	-0.13	-0.83	0.88	1.76
10	0.11	0.66	0.99	1.87
11	-0.19	-1.28	0.80	1.46
12	-0.09	-0.64	0.71	1.26
13	0.23	1.61	0.93	1.61
14	0.18	1.14	1.11	1.85
15	0.03	0.20	1.14	1.84
16	0.17	1.16	1.31	2.06
17	0.10	0.61	1.41	2.14
18	0.12	0.70	1.52	2.25
19	-0.02	-0.11	1.51	2.16
20	-0.04	-0.27	1.47	2.07

FIGURE 5

Average intraday stock returns following
218 new issues of equity by
industrial firms between 1981 and 1983.



However, this artificially high price cannot be maintained for long or the syndicate will break. Extending the analysis to 20 days beyond the issue day assures that the observed price is a true market price. Daily excess returns are estimated using market model residuals with β estimated from two years of daily data ending one month prior to the new issue announcement. Intraday and overnight returns are reported as gross (unadjusted) returns.

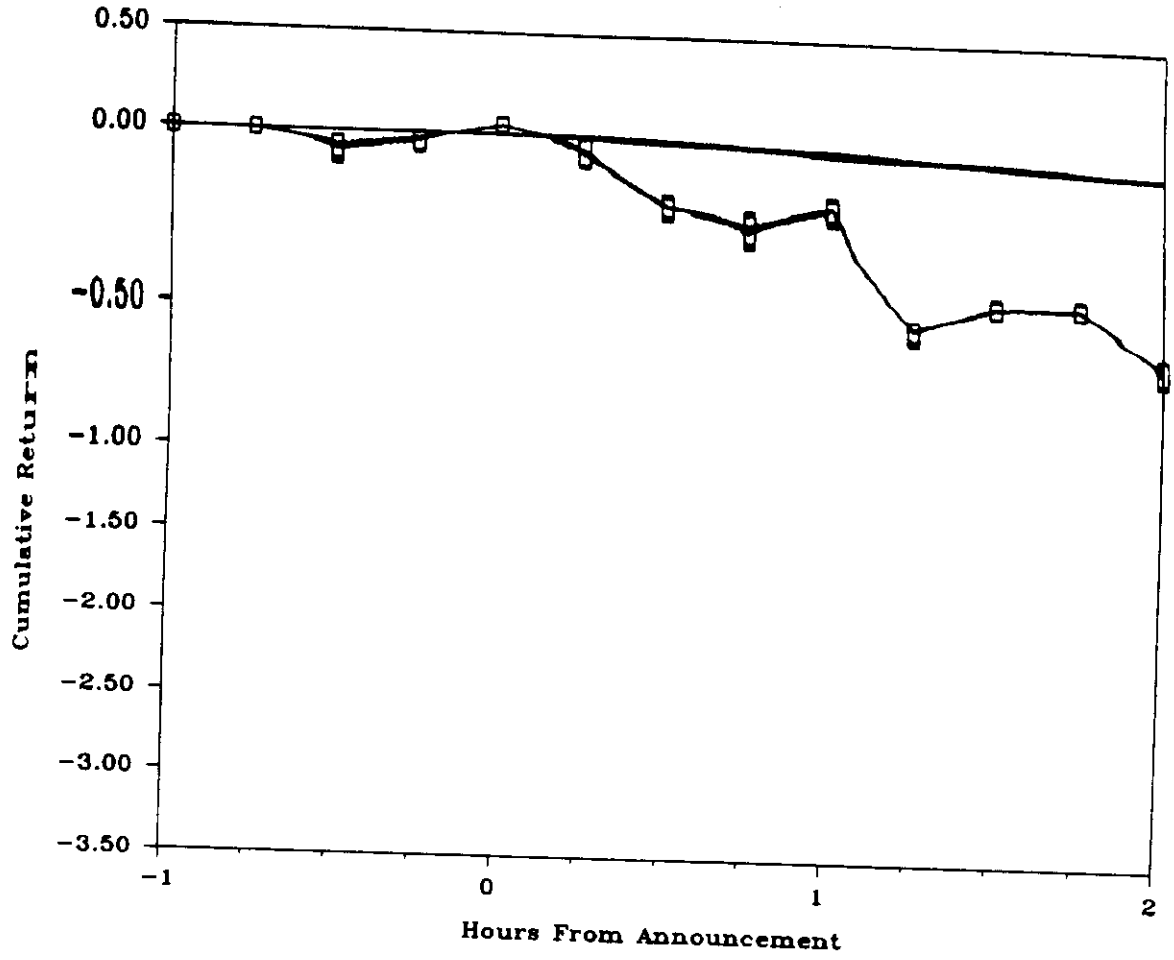
From the close of trade on day −2 until the opening of trade on day 0, there is a negative average return of .76% which is significant at the 1% level. However, starting at the opening of trade on the issue day, there is evidence of a significant price recovery. While the magnitude of the recovery (1.47% in 20 days) is smaller than the price drop at the announcement, this result is consistent with the hypothesis that transaction costs are at least partially responsible for the price drop at the announcement. Figure 5 displays the average intraday returns on the issue day. For the purpose of comparison, an intraday market index calculated from Harris (1985) is also presented.

4.7. New Issues of Straight, Long-Term Debt

Figure 6 contains a plot of the average stock price reaction to announcements of new issues of straight, long-term debt by industrial firms. Consistent with earlier studies, common stocks in this sample experience a small negative return near the time that the debt issue is announced, but the returns are not significantly different from zero. An insignificant stock price reaction to new issues of debt is consistent with the "price pressure" hypotheses but it is not consistent with the information hypotheses or the

FIGURE 6

Average intraday stock return surrounding 43 announcements of new issues of long-term debt by industrial firms between 1981 and 1983.



Smith (1986) argues that debt issues are more predictable than common stock issues. Regular debt repayment in the form of maturing issues and sinking fund provisions require the firm to issue debt at regular intervals to maintain its capital structure. In addition, since the flotation costs for publicly placed debt have a large fixed component, firms tend to draw on bank lines of credit until an efficient public issue size is reached and then issue public debt to retire the bank debt. Because stock price changes reflect only the unanticipated component of the announcement, the greater predictability of these announcements complicates the interpretation of these events.

5. Conclusions

This paper examines the within day pattern of common stock returns surrounding announcements of new issues of equity and debt by industrial firms. It is shown that the market reacts rapidly to new equity issue announcements. During the first 15 minutes following an announcement, stock prices fall, on average, by 1.3%. During a three hour period surrounding the announcement the average common stock return is −2.4%. An abnormally large number of transactions, correspondingly high volume and a high variance of the returns are observed during the first 15 minutes following the announcement. However, there is no evidence of significant abnormal trading activity (either positive or negative) or abnormal variance of the returns during any other interval on the announcement day. Stock prices fall by a small but statistically significant amount during the one hour period prior to the time that announcement appears on the Broad Tape. This evidence is consistent with the hypothesis that the exchanges are not successful in the

Several cross-sectional relations are tested with significantly more power than was previously possible. By measuring returns over shorter intervals of time, sources of variability attributable to extraneous factors are largely eliminated. Even when subjected to these more powerful tests, neither the size of the issue nor the intended use of the proceeds (between pure capital structure changes and new investment spending) has a statistically significant affect on the observed returns. For stock issues used to finance new investment projects, market perceptions of the firm's investment opportunities (estimated using Tobin's Q ratio) also have no statistically significant explanatory power. Stock returns following announcements of new issues of debt are negative, but small and not significantly different from zero. Finally, an analysis of the returns surrounding the issue day indicates significant negative returns preceding the issue day and a statistically significant positive return following the issue. The 1.5% price recovery is consistent with the hypothesis that transaction costs are at least partially responsible for the negative average return associated with the announcement.

Table 5 summarizes the predictions of the competing hypotheses and the empirical results. There is no strong evidence to support the information hypotheses, the downward sloping demand curve hypothesis, or the leverage hypotheses as explanations for the negative average stock return following new equity issue announcements. While these hypotheses are analyzed individually, the rejected hypotheses are also rejected in combination with others because they do not predict opposing effects. That is, when one hypothesis predicts a positive (negative) effect of a given variable, the other hypothesis either predicts a positive (negative) effect or no effect. The combination of a positive (negative) effect and no effect is a significant positive (negative)

TABLE 5
SUMMARY OF EMPIRICAL RESULTS

Accept: Indicates the Data are Consistent with the Hypothesis
Reject: Indicates the Data are Inconsistent with the Hypothesis

	STOCK ISSUES				
	INTENDED USE OF PROCEEDS	ESTIMATED PROFITABILITY OF NEW INVESTMENTS	SIZE OF ISSUE	PRICE RECOVERY FOLLOWING ISSUE DAY	DEBT ISSUES
1. Information Hypotheses					
a. Existing Asset Value Signaling Hypothesis	(Accept) No correlation with stock return	(Accept) No correlation with stock return	(Accept) No correlation with stock return	(Reject) No Recovery	(Reject) Positive effect on stock return
b. Cash Flow Signaling Hypothesis	(Reject) No effect for pure capital structure changes (Accept) Negative effect for new investment spending	(Accept) No correlation with stock return	(Reject) Negative correlation with stock return	(Reject) No Recovery	(Reject) Negative effect on stock return
c. Wasteful Investment Hypothesis	(Reject) No effect for pure capital structure changes (Accept) Negative effect for new investment spending	(Reject) Positive correlation with stock return	(Reject) Negative correlation with stock return	(Reject) No Recovery	(Reject) Negative effect on stock return
2. Price Pressure Hypotheses					
a. Downward Sloping Demand Curve	(Accept) No correlation with stock return	(Accept) No correlation with stock return	(Reject) Negative correlation with stock return	(Reject) No Recovery	(Accept) No effect on stock return
b. Transaction Cost Hypothesis	(Accept) No correlation with stock return	(Accept) No correlation with stock return	(Accept) No correlation with stock return	(Accept) Full Recovery	(Accept) No effect on stock return
3. Leverage Hypotheses					
a. Tax Advantage of Debt Hypothesis	(Reject) Smaller effect for new investment spending than for pure capital structure changes	(Accept) No correlation with stock return	(Reject) Negative correlation with stock return	(Reject) No Recovery	(Reject) Positive effect on stock return
b. Redistribution	(Reject)	(Accept)	(Reject)	(Reject)	(Reject)

The theoretical models examined in this paper predict the stock price reaction for an individual firm to an equity issue announcement by that firm. Even if a model accurately describes the stock price behavior of an individual firm, the theory might be rejected in our cross-sectional tests if the relation is not consistent across firms. However, the average announcement effect examined in this paper has been cited elsewhere as evidence consistent with these theories. In deed, several of the theories were developed inductively as explanations for this empirical phenomenon. The results in this paper indicate that these theories have little or no power to explain the negative average stock return following these announcements. While the recovery following the issue is smaller than the price drop at the announcement, the results are consistent with the hypothesis that a discount must be offered to compensate investors for the transaction costs they bear in adjusting their portfolios to absorb the new issue.

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