Information Asymmetry and the Dealer's Bid-Ask Spread: A Case Study of Earnings and Dividend Announcements
Author(s): P. C. Venkatesh and R. Chiang
Source: *The Journal of Finance*, Vol. 41, No. 5 (Dec., 1986), pp. 1089-1102
Published by: Blackwell Publishing for the American Finance Association
Stable URL: http://www.jstor.org/stable/2328165
Accessed: 26/11/2009 08:34

THE JOURNAL OF FINANCE • VOL. XLI, NO. 5 • DECEMBER 1986

# Information Asymmetry and the Dealer's Bid-Ask Spread: A Case Study of Earnings and Dividend Announcements

P. C. VENKATESH and R. CHIANG*

## ABSTRACT

Recent theoretical work on the bid-ask spread asserts that the dealer should widen the bid-ask spread when he or she suspects that the information advantage possessed by informed traders has increased. Thus, the dealer's spread can be employed to test for an increase in information asymmetry prior to an anticipated information event. In this paper, the method is applied to earnings and dividend announcements, which have been documented to be information events. The authors study three groups of announcements: (a) joint announcements—i.e., earnings and dividend announcements that are made on the same day, (b) initial (first) announcements—earnings or dividend announcements that were not preceded by another announcement in the prior thirty days, and (c) following (second) announcements—those announcements that follow the first announcement by at least ten days but by no more than thirty days. The authors find a strong increase in information asymmetry only before the second announcements and virtually no increase before the joint and first announcements. This is consistent with the hypothesis that there is, on average, normal information asymmetry before announcements, but that the dealer will suspect a nonroutine announcement (with an attendant increase in information asymmetry) when the second announcement is separated from the first by more than ten days. Other possible explanations for the results are discussed, and suggestions for future research are outlined.

IT IS WIDELY ACCEPTED that some traders in securities markets may possess nonpublic information about future events that may affect security prices.[1] The degree of information asymmetry between the informed and the uninformed traders parallels observed patterns of information arrival. Thus, there exists at most times a "normal" degree of asymmetry. However, on infrequent occasions, prior to the release of significant firm-specific information, the degree of information asymmetry may become larger. Examples of firm-specific information events that can lead to greater information asymmetry include merger announcements and a firm's earnings and dividend announcements. During such periods of increased information asymmetry, the trading behavior of both the uninformed and the informed traders is likely to change. In particular, the dealer-specialist in a firm's stock can be thought of as an uninformed market participant who can

* University of Houston and University of Miami, respectively. The authors would like to thank members of the Finance faculties at the Universities of Houston and Florida and an anonymous referee of this Journal for helpful comments and suggestions. Special thanks are due A. A. Heggestad, M. P. Narayanan, R. Pettit, M. Rzepczynski, and K. Sawyer. We are especially grateful to Ron Singer for his substantial contributions to the style and substance of this paper.

[1] Corporate insiders are the most obvious examples of individuals with access to nonpublic information. However, the class of informed traders need not be restricted to that group.

suffer especially heavy losses to informed traders because he or she must stand ready to trade. Jaffe and Winkler [8], Copeland and Galai [3], and Glosten and Milgrom [6] show that when the dealer suspects an increased degree of information asymmetry, he or she should widen the bid-ask spread (the dealer's source of revenue) to offset the higher expected losses to informed traders.

The dealer can anticipate greater information asymmetry prior to firm-specific events that have the potential for revealing important information *and* that have a date of occurrence that is reasonably easy to predict. Earnings and dividend announcements satisfy these criteria. They are periodic, firm-specific events that have been widely documented to convey new information (Rendleman, Jones, and Latane [17], Aharony and Swary [1], Watts [22], and Pettit [16]), and their approximate date of occurrence is predictable.[2] One should therefore observe that the dealer's spread is wider, *ceteris paribus*, prior to earnings and dividend announcements. We present in this paper an empirical test of this proposition. An affirmative finding would provide evidence that uninformed traders perceive an increase in information asymmetry around these announcements. On the other hand, a finding that the spreads are not significantly wider could indicate that informed traders are deterred from using their information in such periods or that much of the information uncertainty about the announcements had been resolved earlier.

We study three groups of announcements: (a) joint announcements—i.e., the earnings and dividend announcements that are made on the same day, (b) initial (first) announcements—earnings or dividend announcements that were not preceded by another announcement in the prior thirty days, and (c) following (second) announcements—those announcements that follow the first by at least ten days (for computational reasons) but by no more than thirty days. This classification scheme uses only information that is available ex ante. It allows us to study the primary question of whether information asymmetry increases before earnings and dividend announcements and also provides some evidence (albeit indirect) as to whether the two announcements are substitutes or complements and whether the timing separation between them has an impact on the information asymmetry.

As a first step, we examine the raw spreads prior to each type of announcement. However, the dealer's spread is based on anticipated losses to informed traders (the information trading cost) as well as holding costs stemming from the inventory that he or she is obliged to assume. (The anticipated holding costs depend mainly on the anticipated price variability and trading volume.) Thus, one cannot make valid inferences about information asymmetry around an-

[2] Numerous studies have documented that quarterly earnings and dividend announcements have information content. The study by Rendleman, Jones, and Latane [17] covers quarterly earnings announcements over a span of ten years (1971 to 1981) for a large sample of firms. They find strong evidence of statistical association between "surprise" announcements and large price changes. The surprise element of an announcement is measured by the standardized forecast error from an expected earnings model. Briefly, their model says that expected earnings for any quarter can be proxied by a seasonally adjusted trend of earnings in the preceding 20 quarters.

In the same vein, Aharony and Swary [1] find that dividend announcements contain information, even after the information effects of nearby earnings announcements have been filtered out.

nouncements simply by examining the raw spreads around announcement dates; it is necessary to adjust for the holding cost.[3] To account for the holding cost, we adapt Stoll's [18] model to explain the variation of the spread over time in terms of the anticipated holding cost. In a time-series regression, the widening of the spread attributable to greater information asymmetry in pre-announcement periods will manifest itself as a positive shift of the intercept term present in a standard linear regression. We test for such a shift by including a dummy variable in pre-announcement periods and noting whether or not the associated coefficient is significantly positive.

We find that raw spreads increase significantly before second announcements and hardly at all before first and joint announcements. While these results are consistent with a large increase in information asymmetry before second announcements and a small or no increase before the other types of announcements, they also could arise from differences in holding costs. After adjusting for the holding cost, we are able to confirm that the change in the degree of information asymmetry is indeed systematically different for each type of announcement; it is large (and statistically significant) before second announcements and very small before first and joint announcements. To the best of our knowledge, such differences have not been alluded to in the literature. The results for first and joint announcements suggest that there is, on average, normal information asymmetry before earnings and dividend announcements. The increase in information asymmetry before second announcements is consistent with the hypothesis that the dealer suspects a nonroutine announcement (with an attendant increase in information asymmetry) whenever the second announcement is delayed from the first by at least ten days. This also provides some indirect support for the belief that earnings and dividend announcements are not perfect substitutes.

The paper is organized as follows. Section I contains a review of our adaptation

[3] A recent paper by Morse and Ushman [15], published after this study was well under way, bears some superficial similarities to the research conducted here. Their broad purpose is to "examine empirically the relationship between information announcements and the market microstructure (i.e. bid-ask spreads)" ([15], p. 247). According to them, three of the factors that influence the size of the bid-ask spread (insider trading, total trading volume, and price variance) are also associated with information announcements. Therefore, they expect the bid-ask spread to be linked to information announcements via these factors. No attempt is made, however, to disentangle the separate influences of these variables, which may be in opposite directions. The objectives of our study render such a decomposition vital to obtaining meaningful results. The problem may not be as acute with the Morse and Ushman study if one regards it as an overall exploratory analysis. They test whether the level of the bid-ask spread is larger than "usual" around (a) earnings announcements and (b) days of large price changes. They find no significant changes in the spread around earnings announcements but observe significant increases around days of large price changes.

This is not to deny that certain aspects of the holding cost may also be associated with the information trading cost—for example, higher price variability around announcements will impose a higher holding cost on the dealer but *may* also be suggestive (under certain circumstances) of informed trading. The important point, however, is that the holding cost and the information trading costs are separate and distinguishable (at least, in principle) cost components, so their effects on the spread are also distinguishable. Our empirical procedures attempt to distinguish these costs and their separate effects on the spread. Our tests will be *conservative* to the extent that a higher information trading cost is subsumed in the holding cost (as we measure it); there is little possibility of wrongly rejecting the null hypothesis.

of Stoll's model of the dealer's spread. The data are discussed in Section II. Section III contains a discussion of the methodology and the results. Concluding comments and outlines for future research are offered in Section IV.

## I. A Model of the Dealer's Spread

The dealer is one who stands ready to buy and sell shares at the dealer's quoted bid and ask prices, respectively. The dealer incurs a number of costs in conducting this business. First, as a supplier of immediacy, he or she is frequently obliged to assume an inventory of shares. The price risk and the opportunity cost of funds tied up in the inventory give rise to what has been called a holding cost. The dealer's anticipated holding cost will vary over time as its components change. Second, the dealer faces information trading costs, which are the dealer's expected losses to informed traders. These expected losses are an increasing function of the degree of information asymmetry that the dealer suspects and thus can change over time. These two costs are the only time-varying costs the dealer faces and as such the only ones useful for the empirical objectives of this study.[4]

In this paper, we follow Stoll's [18] treatment of the holding cost and its relationship to the spread.[5] He obtains an equation connecting the percentage holding cost (dollar cost divided by dollar value of transaction) with the following variables:

1. Dealer characteristics—relative risk aversion and dealer equity.
2. Characteristics of the stock—anticipated price variability per time period and the holding period, which is the number of periods the stock is expected to be held.

Since the dealer characteristics are unlikely to change over the short time span considered, they will not play a major role in the empirical section.

The information trading cost is the dealer's expected loss to informed traders. While most papers on bid-ask spreads contain casual references to this type of cost, it has also been formally analyzed by Jaffe and Winkler [8], Copeland and Galai [3], and Glosten and Milgrom [6].

They have shown that (a) the dealer always expects to lose to informed traders,[6]

[4] In the body of the paper we shall be using the percentage spread, which is more suitable for theoretical and empirical purposes. It is defined as

$$S = \frac{(\text{Ask Price} - \text{Bid Price})}{(\text{Ask Price} + \text{Bid Price})/2} \times 100.$$

[5] The dealer's spread can also be influenced by the structure and characteristics of the market or exchange in which the dealer operates. From an empirical standpoint, this factor becomes important only if one is interested in exploring the relationship between spreads and market structure. Our analysis is based on time-series data (of short span) of individual dealers, so changes in market structure are unlikely.

[6] We have ignored the special information to which the dealer has privileged access, namely the accumulation of limit orders (the state of the book). The book provides the dealer with a better idea of the demand and supply conditions (i.e., an information advantage over average traders), which he or she can exploit. However, the presence of other brokers and traders at the dealer's trading post limits the profits somewhat. In a similar vein, the dealer does obtain some information about a

(b) the dealer always expects to gain from liquidity traders, and (c) the expected loss to informed traders increases the marginal cost to the dealer, implying that the dealer should widen the bid-ask spread when he or she suspects an increase in information asymmetry.

The extent of information asymmetry, and hence the information trading cost, can vary over time. The dealer faces a "normal" information trading cost most of the time but expects much higher losses in periods when he or she suspects a large degree of information asymmetry.

### *The Empirical Model*

The basic version of the empirical model describes the spread as a function of the anticipated holding cost and the normal information trading costs.[7] It is written as follows:

$$S_{t+} = \alpha_0 + \alpha_1 P_t + \alpha_2 VA_t + \alpha_3 HL_t + u_t. \tag{1}$$

$S_{t+}$, the percentage spread, is the dependent variable and is defined as

$$S_{t+} = \frac{(A_{t+} - B_{t+})}{(A_{t+} + B_{t+})/2} \times 100,$$

where $A_{t+}$ and $B_{t+}$ are the closing ask and bid prices on day $t$, respectively, and the time subscript $t+$ indicates that the dealer sets these prices after observing all the independent variables through day $t$.

The independent variables are discussed below:

1. The variable $P_t$ is the closing price of the stock on day $t$. It is included to remove the suggestion of any apparent trends in the spread due to trends in the stock price (for example, a steadily declining price and a fixed dollar spread would give the appearance of an increasing percentage spread).
2. The variable $VA_t = (V_t + V_{t-1} + V_{t-2})/3$ is a measure of the anticipated dealer holding period, where $V_t$ stands for the volume observed on day $t$; this moving average can be regarded as an anticipated volume figure. The higher the volume of trading, the easier it is for the dealer to reverse his position and thus the shorter his holding period. Since we use closing bid-ask quotes, $V_t$ is known when the dealer sets the spread.
3. The variable $HL_t = (\text{High Price}_t - \text{Low Price}_t)/((\text{High Price}_t + \text{Low Price}_t)/2)$ is a measure of the anticipated price variability. The price risk, a part of

particular order and thus about the transactor. This gives rise to the possibility that the dealer may be able to distinguish some information traders from liquidity traders. While it is true that a dealer acquires a considerable amount of information about every transaction sooner or later (see Jaffe and Winkler [8] for a description of such information), it is generally the case that such information takes a while to be digested and, even then, this information may not necessarily reveal the information traders and trades. Hence, a wider spread to offset the losses to information trading is still called for.

[7] Alternative specifications of the model (in terms of functional transformations of the variables) were explored, with no material effect on the ultimate results; to keep the exposition simple and minimize the number of attachments, we present only a single, simple but effective specification.

the holding cost, is greater when it is anticipated that the price will fluctuate more.

4. The error term, $u_t$, is assumed to meet the standard OLS specifications.
5. The intercept term, $\alpha_0$, performs a very important function here. We have assumed that the normal information trading cost and the ordering cost are constant over the time span of estimation (so that the portion of the spread accounting for these costs is also constant over time); therefore, their effects should be captured in the intercept term.

This basic model can be easily modified to test for unusual information asymmetry. This is discussed later in Section III.

## II. Data and Hypotheses

We first selected a random sample of 75 NYSE stocks and collected closing bid and ask quotes on each stock from the Francis Emory Fitch publications for the period January 1, 1973, to December 31, 1973, which included 251 trading days. After correcting obvious data coding and entry errors, the daily average of the bid-ask quotes was checked against the closing price for the same day, as reported on the CRSP Daily Stock Master files. The daily trading volume and the high and low prices were obtained from the ISL tapes. Earnings and dividend announcement dates were obtained from the *Wall Street Journal.*

In the process of selecting announcement dates from the *Wall Street Journal Index*, we also applied other criteria for retention and classification of announcements and firms. First, we dropped those firms that were actively involved in lawsuits, mergers, and the like. Second, we dropped those announcements for which management forecasts were made a few weeks prior to the formal announcement date. Of the remaining, we adopted the following classification scheme: (a) joint announcements—i.e., earnings and dividend announcements that are made on the same day, (b) initial (first) announcements—earnings or dividend announcements that were not preceded by another announcement in the prior thirty days, and (c) following (second) announcements—those announcements that follow the first announcement by at least ten days but by no more than thirty days. We require a ten-day separation between the first and second announcements because we are examining pre-announcement spreads; thus, it is necessary to avoid contamination from the first announcement. The sample eventually contains thirty firms with joint announcements, forty-nine firms with first announcements, and forty firms with second announcements.

This classification scheme uses only information that was available to the investor ex ante. It allows us to investigate the principal question of whether information asymmetry increases before earnings and dividend announcements, and also some related issues. Specifically, we test the following hypotheses:

a. Suppose that earnings and dividend announcements are good substitutes for each other, in the sense that after one is revealed there is relatively little uncertainty about the other. Then, we would expect information asymmetry to be high only before the first announcement (regardless of whether it is an earnings or a dividend announcement) and much less before the succeeding one. This would be consistent with the analysis in Miller and Rock [12]. However, empirical results seem to suggest that earnings and dividend announcements are complements rather than perfect substitutes (Kane, Lee, and Marcus [9]).

b. Suppose, instead, that there is, *on average*, normal information asymmetry before these announcements *and* that firms customarily make the two announcements jointly or within a few days of each other. Then, if on the expected date the firm makes only one announcement, and the second announcement is not made within the expected time interval, the market may suspect that a nonroutine announcement is impending. This would give rise to higher information asymmetry before the second announcement. Under this scenario, we would observe increases in information asymmetry only before the second announcement. The evidence in Aharony and Swary [1] on the timing separation of earnings and dividend announcements is not inconsistent with the notion that firms generally make the two announcements within ten days of each other. There is also some evidence of observable market reaction when earnings announcements are delayed (Chambers and Penman [2]). Our analysis will shed light on which of these two hypotheses is better supported by the data.

For the series of bid-ask quotes on each firm's stock, we computed the following summary statistics for the percentage spread: the mean, the standard deviation, the first-order autocorrelation, the skewness, and the maximum, minimum, and median values. For most of the firms, autocorrelation is not present. Table I presents a condensed summary of the data, classified by each firm's median spread over the sample period.[8]

## III. Tests and Results

This section is divided into two parts. In Part A, we present results about the behavior of spreads around announcements, before adjustment for the holding cost. In Part B, equation (1) is used to adjust for the holding cost and to test whether the adjusted spread is significantly wider.

The results of studies on announcements have almost uniformly found that substantial price adjustment begins approximately two days before the formal announcement (see, e.g., Aharony and Swary [1]). Thus, some of the information uncertainty (and asymmetry) may be resolved during this period. To accommodate this we conducted the analysis with and without the two days. For the sake of brevity, we present only the results based on excluding the two days; the other set of results (when the two days are retained) is consistent with a slight decrease in information asymmetry over the two days but is not materially different. The analysis is done separately for each announcement group.

### *A. Spreads without Adjustment for Holding Cost*

For each firm, we use the distributions of spreads over the entire sample period (251 trading days) as the benchmark and employ the median of this distribution as the representative statistic. We compute the percentage deviations of the pre-

[8] Stem-leaf plots were also generated, which indicated that the spreads may not be symmetrically distributed. The assumption of normality of distribution may therefore be questioned. Strictly speaking, either the data should be transformed or robust estimators should be used. However, the costs of implementing these procedures are high and the benefits quite uncertain.

**Table I**

Overview of Data[a]

| Classification by Median Spread | Spread (%) | | Price ($) | | Volume[b] | | Price Variability[c] | | Number of Firms |
|---|---|---|---|---|---|---|---|---|---|
| | Median | Range[d] | Median | Range | Median | Range | Median | Range | |
| Low | 0.38 | 0.19 | 65 | 45 | 434 | 248 | 2.2 | 0.81 | 18 |
| Medium | 0.93 | 0.20 | 25 | 12 | 144 | 236 | 1.9 | 0.88 | 20 |
| High | 1.60 | 0.65 | 14 | 10 | 18 | 39 | 2.2 | 1.32 | 20 |

[a] First, for each firm, an average (median) over time is computed for each variable. Firms are sorted by the average spread and classified as low, medium, and high spread firms. Table contains summary, cross-sectional statistics for each classification.

[b] Based on daily trading volume, in 100's of shares.

[c] Based on variable $HL_t = 100 \times (\text{High Price}_t - \text{Low Price}_t)/((\text{High Price}_t + \text{Low Price}_t)/2)$.

[d] Interquartile range = 75th percentile − 25th percentile.

**Table II**

**Behavior of Excess Spreads Around Announcements**

A. Cumulative distribution, across firms, of $\hat{S}^p_j$ (percentage deviations from median as defined in equation (3)).

| Announcement Type | Percentile 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | Number of Firms |
|---|---|---|---|---|---|---|---|---|---|---|
| Joint | −16 | −15 | −7 | −4 | −0.20 | 3 | 8 | 9 | 16 | 30 |
| First (initial) | −22 | −14 | −10 | −4 | −2 | 0.8 | 5 | 12 | 19 | 49 |
| Second | −20 | −5 | 1 | 3 | 6 | 11 | 13 | 24 | 34 | 40 |

B. Summary statistics of $\hat{S}^p_j$ (%).

| Announcement Type | All Observations | | | Positive Observations | | | Negative Observations | | |
|---|---|---|---|---|---|---|---|---|---|
| | Number | Median | Mean | Number | Median | Mean | Number | Median | Mean |
| Joint | 30 | −0.2 | 1.3 | 15 | 8 | 12 | 15 | −8 | −9 |
| First | 49 | −2 | 0.06 | 22 | 11 | 14 | 27 | −11 | −11 |
| Second | 40 | 6 | 9 | 30 | 12 | 17 | 10 | −10 | −14 |

C. Tests for whether pre-announcement spreads are larger than usual, i.e., whether location parameter of excess spread, $\hat{S}^p_j$, is > 0. $H_0$: There is no increase in spreads. $H_a$: There is an increase in spreads.

| Announcement Type | Significance Level at Which $H_0$ Can Be Rejected (%): Wilcoxon Signed Rank Test | $t$-test |
|---|---|---|
| Joint | 47 | 50 |
| First | 67 | 50 |
| Second | 0.2 | 0.6 |

announcement spreads from the median.[9] The percentage deviations assess the magnitude of change in the spread. If we let $M_j$ = the median spread of the parent population of the $j$th firm, then the percentage deviation on day $t$ is given by

$$S^p_t = \frac{S_t - M_j}{M_j}, \tag{2}$$

where $S_t$ is the percentage spread on day $t$. The average of the percentage deviations, $S^p_t$, over a five-day period preceding each announcement, denoted by $\bar{S}^p_{ij}$ (the $i$th announcement of the $j$th firm), is taken to be representative of spreads around that announcement.

To get a company level pre-announcement "excess" spread, we average $\bar{S}^p_{ij}$ over all announcements (of a given type) by firm $j$;

$$\hat{S}^p_j = \textstyle\sum_{i=1}^{n_i} \bar{S}^p_{ij}/n_i, \tag{3}$$

where the hat ( $\hat{}$ ) indicates a company-level average and $n_i$ is the number of announcements of a type by firm $j$. The cross-sectional (across firms) distribution of $\hat{S}^p_j$ will be used to study whether spreads increase before announcements.

Table II presents summary information and the results of tests based on this

[9] The results are unchanged when the mean rather than the median is used. We also computed "standardized" values of these deviations, which may be preferable for cross-sectional comparisons. These results are virtually identical and are not reported here so as to economize on length.

measure. Panel A gives the cumulative distribution, across firms, of $\hat{S}_{\cdot}^{p}$. The distribution of excess spreads around second announcements lies well to the right of the distributions for the other two types of announcements.[10] Panel B summarizes this information. The difference between the second and the other two types of announcements is apparent in the overall means and medians and the number (and proportions) of positive observations (i.e., increases in the spread relative to the median) versus negative observations. The distribution of excess spreads around joint announcements is "tighter" in the sense that the average magnitude of both increases and decreases is smaller. Panel C contains the results of formal tests of whether spreads are larger than usual, i.e., whether the location parameter of excess spreads is positive. We use the standard $t$-test as well as a nonparametric test, the Wilcoxon signed rank test (which is less sensitive to distributional assumptions and robust against outliers). The rejection levels reaffirm the conclusions drawn from Panels A and B.

The results are suggestive of and consistent with a strong increase in information asymmetry before second announcements and hardly any increase before first and joint announcements. However, if there were differences in holding costs around the three types of announcements, these same results could be obtained even if the same degree of information asymmetry existed before all three announcements. To be able to distinguish between these two explanations, we have to adjust for the holding cost.

### *B. Spreads Adjusted for Holding Cost*

We use equation (1) to adjust for the holding cost and test for increase in information asymmetry. The intercept term in equation (1) impounds the cost due to normal levels of asymmetric information. An increase in the level of information asymmetry in pre-announcement periods implies a higher expected information trading cost and should be reflected in an upward shift of the intercept. We test for such an upward shift of the intercept by including a dummy variable. (See Maddala [11] for a detailed discussion of dummy variables in econometrics.)

For any given firm, suppose that there are $K$ announcements of a given type (joint, first, or second) during the sample period. Let $T_1, T_2, \cdots, T_k$ denote the associated trading dates. We introduce into equation (1) a dummy variable $D_t$, such that

$$S_{t+} = \alpha + \alpha_1 P_t + \alpha_2 VA_t + \alpha_3 HL_t + \alpha_4 D_t + \epsilon_t, \tag{4}$$

where

$$D_t = 1 \quad \text{if} \quad t = T_{j-3}, T_{j-2}, \cdots, T_{j-7}$$

for

$$j = 1, 2, \cdots, K.^{11}$$

[10] Using the Kruskal-Wallis test we can reject the hypothesis that the distribution of $\hat{S}_{\cdot}^{p}$ around second announcements is the same as that around the first or the joint at less than the 1% level; we cannot reject equality of the first and the joint distributions at any reasonable level.

[11] Results for other intervals in which $D_t = 1$ are available from the authors. They are not materially different from the results shown here.

A finding that $\alpha_4$, the coefficient associated with the dummy variable, is significantly greater than zero would be evidence that the spread, adjusted for the holding cost, is significantly greater in pre-announcement periods. We will interpret this to mean that the dealer suspects, on average, a substantial increase in information asymmetry prior to this type of announcement. Milder increases in information asymmetry will result in positive but insignificant $t$-values. We run the time-series regression given by equation (4) for each firm individually. Therefore, the sign and magnitude of $\alpha_4$ tell us only the reactions of the dealer of that particular stock. We discuss subsequently how to formally combine the test results from individual firms.

The results from regression equation (4) are presented in Table III. Panel A gives the cumulative distributions, across firms, of the $t$-values of the dummy coefficient, $\alpha_4$, and the corresponding significance levels. The positive $t$-values for second announcements are quite a bit larger than those for first and joint announcements. Part of the increase in raw spreads appears to be due to an increase in holding costs; we can see that 75% of the firms had increases in

**Table III**

**Spreads, Adjusted for Holding Cost, Around Announcements**

A. Cumulative distribution, across firms, of $t$-values of dummy coefficient, $\alpha_4$, in equation (2), and corresponding significance levels of rejecting $H_0$: $\alpha_4 = 0$ versus $H_a$: $\alpha_4 > 0$.

| | Percentile | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Announcement Type | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
| Joint | | | | | | | | | |
| $t$-value | −.95 | −.39 | −.29 | −.17 | −.02 | .05 | .22 | .51 | .81 |
| significance level (%) | 83 | 65 | 61 | 56 | 50 | 48 | 42 | 31 | 21 |
| First | | | | | | | | | |
| $t$-value | −1.17 | −.91 | −.49 | −.21 | .01 | .33 | .49 | .70 | 1.18 |
| significance level | 87 | 81 | 68 | 58 | 50 | 37 | 22 | 25 | 12 |
| Second | | | | | | | | | |
| $t$-value | −1.30 | −.76 | −.44 | .02 | .20 | .50 | .82 | 1.26 | 1.81 |
| significance level | 90 | 77 | 67 | 50 | 42 | 31 | 21 | 11 | 4 |

B. Summary statistics on $t$-values for $\alpha_4$.

| | All Observations | | | Positive Observations | | | Negative Observations | | |
|---|---|---|---|---|---|---|---|---|---|
| Announcement Type | Number | Median | Mean | Number | Median | Mean | Number | Median | Mean |
| Joint | 30 | −.02 | .00 | 15 | .50 | .50 | 15 | −.30 | −.53 |
| First | 49 | .01 | .01 | 25 | .63 | .76 | 24 | −.74 | −.77 |
| Second | 40 | .20 | .38 | 25 | 1.02 | 1.16 | 15 | −.85 | −.91 |

C. Overall probability (Fisher) test for increase in information asymmetry. $H_0$: There is no change in information asymmetry.

| Announcement Type | Chi-Squared Value ($\chi^2$)/ Degrees of Freedom | Test Statistic Using[a] Normal Approximation | Significance Level at Which $H_0$ Can Be Rejected |
|---|---|---|---|
| Joint | 51/60 | −.80 | 80% |
| First | 96/98 | −.09 | 54% |
| Second | 127/80 | 3.33 | .04% |

[a] $\sqrt{2x^2} - \sqrt{2(\text{d.o.f}) - 1}$ is approximately normally distributed. See Mood, Graybill, and Boes [13].

unadjusted spreads before second announcements (Table II), but, in Table III, only 62% of the $t$-values for second announcements are positive. The summary statistics in Panel B permit an easier comparison across the types of announcements. The proportions of positive and negative $t$-values are roughly equal for joint and first announcements. However, the distribution for joint announcements is tighter—the means (and medians) of both positive and negative $t$-values are smaller for joint announcements. For second announcements, 62% of the $t$-values are positive, and the mean and median of positive $t$-values are substantially larger than those for joint or first announcements.

We can also consider the number of individually significant $t$-values for each type of announcement. Using a 10% significance level (one-tailed test), which corresponds to a $t$-value of 1.29, we find eight firms (20% of the sample) for second announcements in this category, four firms (8% of the sample) for first announcements, and none for joint announcements. Thus, on an individual basis, there is evidence of substantial and significant increases in information asymmetry for 8% of the firms around first announcements and for 20% of the firms around second announcements. These proportions are not large in absolute terms; however, given that we are examining stocks from the NYSE, which tend to be relatively actively traded and well monitored, it is unlikely that a large proportion of firms would experience *substantial* increases in information asymmetry.

Furthermore, judging by the number of positive but statistically insignificant $t$-values, many firms experienced mild increases in information asymmetry, especially in the case of second announcements. Therefore, to test the hypothesis of whether there is an increase in information asymmetry on average (i.e., across firms), we have to consider all the $t$-values, not just the individually significant ones. The overall probability (Fisher) test provides a formal method of combining the individual results to test the null hypothesis of no increase in information asymmetry.

The test is based on the observation that the $t$-values from the regressions on individual firms constitute the results of independent tests of the same hypothesis. The Fisher test gives the probability of obtaining this set of results if the null hypothesis is true.[12] The results of the test are given in Panel C. We can conclude, with a high degree of confidence, that there is an increase in information asymmetry before second announcements. For first and second announcements, the test statistic is negative, although far from statistically significant.[13]

[12] The overall probability (Fisher's) test is a method for combining probabilities from independent tests of significance of the same hypothesis. It enables one to obtain a single test of significance of the overall results, based on the products of the individual significance levels. One calculates from each independent test the probability $p_i$ of obtaining the estimated coefficient if the null hypothesis is true. Then, if there are $k$ such tests, $\lambda = \sum_{i=1}^{k} (-2 \ln p_i)$ has a chi-squared ($\chi^2$) distribution with $2k$ degrees of freedom. This statistic can be used for overall rejection or acceptance of the null hypothesis. It is commonly referred to as Fisher's test, but Maddala attributes it to Pearson.

[13] The value of the dummy coefficient, $\alpha_4$, provides an estimate of the increase in the percentage spread attributable to an increase in information asymmetry. The median values of $\alpha_4$ are as follows: 0.005 for first, 0.028 for second, and 0.0125 for joint announcements. When we consider only the positive $\alpha_4$ values (i.e., those firms that did experience an increase in information asymmetry), the median increase is substantially larger. The median values of positive $\alpha_4$ observations are as follows: 0.05 for first, 0.06 for second, and 0.04 for joint announcements. (The number of positive observations is given in Table III.)

Our findings indicate that the change in the degree of information asymmetry in pre-announcement periods is systematically related to the type of announcement: it is high for second announcements and very low for first and joint announcements. These results support the second hypothesis sketched above. There is, on average, normal information asymmetry before earnings and dividend announcements, but market participants suspect a nonroutine announcement (and hence an increase in information asymmetry) when the second announcement is separated from the first by more than ten days. These results also provide indirect support for the belief that earnings and dividend announcements are not perfect substitutes.

Another possible explanation for the differences in the dealer's spread-setting behavior across the types of announcements could be that the dealer observed other signals that indicated differences in information asymmetry. Some authors have argued that unusual price variability could be indicative of asymmetric information (Morse [14]). If the dealer uses pre-announcement volume and price variability in this fashion, then the differential adjustments in the spread could be due to differences in pre-announcement trading characteristics. We tested for this and found that, although pre-announcement trading volume and price variability are higher than usual, there are no significant differences across types of announcements. We also do not find any support for the conjecture that the dealer uses pre-announcement volume as an indicator of information asymmetry.[14]

## IV. Summary and Conclusions

In this paper we have used the dealer's spread to test for an increase in information asymmetry before earnings and dividend announcements. We classified the announcements as (a) joint—earnings and dividend announcements that were made on the same day, (b) initial (first)—earnings or dividend announcements that were not preceded by another announcement in the prior thirty days, and (c) following (second)—those announcements that followed the first announcement by at least ten days but by no more than thirty days. We found a significant increase in information asymmetry only before second announcements. This suggests that there is, on average, normal information asymmetry before earnings and dividend announcements. However, market participants suspect a nonroutine announcement and an attendant increase in information asymmetry when the second announcement is separated from the first by more than ten days.

This research can be extended along at least two lines. First, it would be

[14] A more sophisticated approach might be to consider the joint occurrence of unusually high price variability and volume as an indicator of greater asymmetry. These, however, were not sufficiently common in our sample to justify detailed exploration.

If the dealer does use pre-announcement price variability and volume as indicators of increased asymmetry, there could be another consequence: the slope coefficients in equation (1) could be different around announcements. We tested for this by including slope-shift dummies in (1). We found very few instances of significant slope shifts, and in none of those cases was the information dummy significant in the base case.

interesting to inquire whether the dealer's estimate of information asymmetry is affected by the extent of information available about a firm, proxied, for example, by the number of analysts following that stock, the extent of institutional holdings, or both. Second, it would be informative to study in a more general context the price-change effects of delaying one announcement relative to another. In particular, one might wish to identify firms that habitually separate their announcements (if such firms exist) and those that habitually make joint announcements, and then test for differential effects of a delayed announcement.

## REFERENCES


1. Joseph Aharony and Itzhak Swary. "Quarterly Dividend and Earnings Announcements and Stockholders' Returns: An Empirical Analysis." *Journal of Finance* 35 (March 1980), 1-12.
2. A. E. Chambers and S. H. Penman. "Timeliness of Reporting and the Stock Price Reaction to Earnings Announcements." *Journal of Accounting Research* 22 (Spring 1984), 21-47.
3. T. E. Copeland and D. Galai. "Information Effects on the Bid-Ask Spread." *Journal of Finance* 38 (December 1983), 1457-69.
4. Thomas W. Epps. "The Demand for Brokers' Services: The Relation between Security Trading Volume and Transaction Cost." *Bell Journal of Economics* 7 (Spring 1976), 163-94.
5. R. A. Fisher. *Statistical Methods for Research Workers*, New York: Hafner Publishing Co., 1958.
6. L. R. Glosten and P. R. Milgrom. "Bid-Ask and Transaction Prices in a Specialist Market with Heterogeneously Informed Traders." *Journal of Financial Economics* 14 (March 1985), 71-100.
7. Thomas Ho and H. R. Stoll. "Optimal Dealer Pricing Under Transaction and Return Uncertainty." *Journal of Financial Economics* 9 (March 1981), 47-73.
8. J. F. Jaffe and R. L. Winkler. "Optimal Speculation against an Efficient Market." *Journal of Finance* 31 (March 1976), 49-61.
9. Alex Kane, Y. K. Lee, and A. Marcus. "Earnings and Dividend Announcements: Is There a Corroboration Effect?" *Journal of Finance* 39 (September 1984), 1091-1100.
10. R. C. Littell and J. L. Folks. "Asymptotic Optimality of Fisher's Method of Combining Independent Tests." *Journal of the American Statistical Association* 66 (March 1971), 802-06.
11. G. S. Maddala. *Econometrics*, New York: McGraw-Hill, 1977.
12. M. Miller and K. Rock. "Dividend Policy Under Asymmetric Information." *Journal of Finance* 40 (September 1985), 1031-52.
13. A. M. Mood, F. A. Graybill, and D. C. Boes. *Introduction to the Theory of Statistics*, New York: McGraw-Hill, 1974.
14. Dale Morse. "Asymmetrical Information in Securities Markets and Trading Volume." *Journal of Financial and Quantitative Analysis* 15 (September 1980), 1129-48.
15. ——— and M. Ushman. "The Effect of Information Announcements on the Market Micro-Structure." *Accounting Review* 58 (April 1983), 247-58.
16. R. Pettit. "Dividend Announcements, Security Performance and Capital Market Efficiency." *Journal of Finance* 27 (December 1972), 993-1007.
17. R. J. Rendleman, C. P. Jones, and H A. Latane. "Empirical Anomalies Based on Unexpected Earnings and the Importance of Risk Adjustments." *Journal of Financial Economics* 10 (June 1982), 268-87.
18. H. R. Stoll. "The Supply of Dealer Services in Securities Markets." *Journal of Finance* 33 (September 1978a), 1133-51.
19. ———. "The Pricing of Security Dealer Services: An Empirical Study of NASDAQ Stocks." *Journal of Finance* 33 (September 1978b), 1153-72.
20. R. J. Tewles and E. S. Bradley. *The Stock Market*, New York: John Wiley and Sons, Inc., 1982.
21. P. C. Venkatesh and R. Chiang. "Insider Trading around Earnings and Dividend Announcements." Unpublished paper, University of Houston, 1983.
22. R. L. Watts. "Systematic Abnormal Returns After Quarterly Announcements." *Journal of Financial Economics* 6 (June 1978), 127-50.