Response of Hourly Stock Prices and Trading Volume to Economic News

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I. Introduction

The purpose of this article is to examine hourly stock prices and hourly trading volume to investigate the response of the market participants to announcements about the money supply, consumer price index (CPI), producer price index, industrial production, and unemployment rate. Although previous studies have examined daily stock market prices around these announcements, trading volume around these announcements has not been analyzed. Moreover, more precise estimates of stock market response can be obtained by using hourly prices. In particular, using daily data, Pearce and Roley (1985) did not find an association between surprises in CPI announcements and stock market reaction whereas Schwert (1981) has reported a negative association. This difference may be resolved by examining hourly data.

An interesting aspect of the analysis not researched earlier is the comparison of the money supply announcement effects in the periods before and after the Federal Reserve's changes

This paper examines hourly stock returns and trading volume response to announcements about the money supply, consumer price index (CPI), producer price index, industrial production, and the unemployment rate. The empirical results indicate that surprises in announcements about money supply and CPI are significantly associated with stock price changes. The announcements of the other three variables do not affect stock prices significantly. Trading volume is not affected by any of the five economic variable announcements, indicating that market participants do not differ substantially in the interpretations of the effects of announcements. The speed of adjustment analysis indicates that the effect of information on stock prices is reflected in a short period of 1 hour or so.

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in operating procedures in October 1979 and October 1982. Since October 1982, the Federal Reserve has de-emphasized the reserve-aggregate monetary control procedure. If the new policy indeed diminishes the importance of changes in money supply announcements, the price response to these announcements should decline. The empirical results indicate that the money supply announcement effect is the same in the latter period.

Announcements about economic variables may also affect trading volume if the market participants rebalance their portfolios based on new information. If market participants disagree about the effects of surprises in announcements, there should be increased trading activity in the market soon after the announcements. In contrast, if they are in consensus about the effects of new information, trading activity may not be abnormal even when prices change. Thus, examining the trading activity provides useful information about the actions taken by the market participants based on macroeconomic news that stock returns alone can not. Trading-volume response to economic news has not been examined before.

This article also presents direct evidence on the validity of the efficient market theory by examining the speed of adjustment of stock prices to economic news. Empirical evidence on the speed of adjustment is indeed sparse. Pearce and Roley (1983, 1985), on the one hand, have found the response of prices to announcements to be essentially consistent with the efficient markets theory. On the other hand, results in Schwert (1981) imply a slow adjustment of stock prices to information on inflation. The analysis of hourly data should be further informative especially if the market takes less than a day to fully reflect the surprises in certain announcements.

The rest of the article has been organized as follows. Section II outlines the theoretical framework of the study. Section III decribes the data, followed by the empirical analyses in Section IV. Section V concludes.

II. Theoretical Framework

A. The Model

The impact of new economic information on stock prices is examined by estimating the following model:

$$\Delta SP_t = a + b1 \cdot M_t^u + b2 \cdot CPI_t^u + b3 \cdot PPI_t^u + b4 \cdot IP_t^u$$
$$+ b5 \cdot RU_t^u + b6 \cdot (D1 \cdot M_t^u) + b7 \cdot (D2 \cdot M_t^u) + e_t, \tag{1}$$

where ΔSP_t = percentage change in stock prices from the close of trading on the day before the announcement to the first hour of trading after the announcement. Since the money supply announcements are

made in the late afternoon after the closing of the exchange, and other economic announcements are usually made in the morning before opening of the exchange, the first hour of trading in the morning is the most relevant one for the present analysis. The five economic variables are money supply announcements (M_t), two measures of inflation represented by the consumer price index (CPI) and the producer price index (PPI), industrial production (IP), and the rate of unemployment (RU).[1] The coefficients a and b1–b7 are regression parameters for the appropriate independent variables, and e_t is a random term.

Two dummy variables, D1 and D2, are employed to separate the 1978–84 period of study in three parts. The dummy variable D1 is equal to one for the pre–October 6, 1979 period and zero elsewhere. The dummy variable D2 is equal to one for the post–October 5, 1982 period and zero elsewhere. This allows us to examine whether the two policy changes by the Federal Reserve have affected the nature of the stock price responses to money announcements. Two important policy changes made by the Federal Reserve were in October 1979 and October 1982. Prior to October 1979, the Federal Reserve followed the federal funds rates procedure, which was changed to reserve-aggregate procedure during the 3-year period from October 1979 to October 1982. After October 1982, the Fed de-emphasized control of M1. In particular, we test whether the diminished emphasis by the Fed on controlling M1 reduces the information content of the money supply announcements and results in a smaller stock price response after the 1982 policy change. The superscript u denotes the unexpected component of the economic announcement, which is defined as the actual minus the market survey data on the expected announced value. This approach is similar to that of Pearce and Roley (1985) and earlier research for examining stock returns. Urich and Wachtel (1984) and Smirlock (1986) also use similar models for examining effects of such announcements on interest rates.

A second model analyzed in this paper examines the response of trading volume on the New York Stock Exchange (NYSE) to these unexpected announcements. A number of analytical papers have investigated the role of information on the volume of trade. Although these models differ in details, the basic common underlying notion prevalent in these models is that most trades in financial markets occur because of differing beliefs. A summary and extension of earlier research (Hellwig 1980; Diamond and Verrecchia 1981; and Admati 1985) in this area is presented in Karpoff (1986). Thus, if the unexpected component in the economic announcements induces divergent beliefs, the trading volume around the announcements may be abnormally

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1. Details of economic data announcements are available in Pearce and Roley (1985). For brevity, a detailed description is not presented here.

high. However, if the market participants agree on the effects of announcements, they may not engage in additional trading; that is, the observed abnormal volume will be insignificantly different from zero. This framework allows us to interpret the extent of consensus among traders about the effects of surprises in economic announcements by examining trading volume in the market.[2] The effect of economic announcements on trading volume is studied by the following model:

$$
\begin{aligned}
\text{VOL}_t = a + b1 \cdot |M_t^u| + b2 \cdot |\text{CPI}_t^u| + b3 \cdot |\text{PPI}_t^u| + b4 \cdot |\text{IP}_t^u| \\
+ b5 \cdot |\text{RU}_t^u| + b6 \cdot |D1 \cdot M_t^u| + b7 \cdot |D2 \cdot M_t^u| \qquad (2) \\
+ b8 \cdot |\Delta\text{SP}_t| + e_t,
\end{aligned}
$$

where VOL_t = percentage of outstanding common stocks traded on the New York Stock Exchange. Since volume is expected to increase when actual announcements differ from expectations either positively or negatively, it is desirable to take the absolute value of the independent variables. Furthermore, the empirical findings of Jain and Joh (1986) indicate that trading volume and absolute value of price changes are correlated, and, therefore, $|\Delta\text{SP}_t|$ has been included as an additional explanatory variable for a better specification of the model.[3] The other independent variables are the same as those used in equation (1). The coefficients a and b1–b8 are regression parameters for the appropriate independent variables, and e_t is a random error term.

B. Expected Signs of Coefficients

A number of previous studies have postulated and examined the impact of unexpected changes in economic variables on stock prices. To keep the discussion brief, only the essential arguments are presented here. Pearce and Roley (1985) and other articles referenced there provide additional explanation.

For the money stock announcements, the previous research has found a negative relation between unexpected money growth and stock returns. Since hourly data are more timely, a more precise estimate of the impact of money stock surprises should be obtained. For the CPI announcements, research findings on stock price reactions have not been in complete agreement. Although Fama and Schwert (1977) and Schwert (1981) document a negative effect of inflation surprises,

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2. Although investors interpreting the information differently is commonly argued as a possible reason for increase in trading volume, other possibilities exist. For example, a volume increase can indicate that investors interpret the information identically but begin with diverse prior expectations.

3. One more version of model 2 was estimated for all the results reported in this article. The model included an additional independent variable allowing different coefficients for $|\Delta\text{SP}|$ when ΔSP is positive and negative. Since the inferences are not affected, only one set of results are reported. In addition, the results are the same when the intercept term is also allowed to be different for positive and negative ΔSP's.

Pearce and Roley (1985) did not find an association between inflation surprises and daily stock returns. The use of hourly data should help us obtain more precise estimates of the relation between inflation surprises and stock returns.

Pearce and Roley (1985) argue that the likely impact of output surprises on stock prices cannot be determined a priori. They do not find a significant association between surprises in industrial production (IP) or the rate of unemployment (RU) announcements and stock prices. We reexamine their results using hourly data.

For trading volume there is no previous empirical evidence to draw upon to determine the expected signs of the coefficients. From the available theoretical arguments presented earlier, if the market participants interpret the announcements differently (differing beliefs), the volume should be positively related to the absolute values of surprises in announcements.

For the speed-of-adjustment analysis, the use of hourly data is expected to provide additional evidence on the speed with which the stock market absorbs the impact of surprises. In particular, if the market absorbs most of the impact over several hours but in less than a day, daily data would not be precise enough to identify the slow speed of adjustment during the day, whereas the hourly data examined here would reveal this.

III. Data

The sample period used in this study covers a 7-year period beginning at the start of 1978 and ending at the close of 1984. The hourly trading-volume data for the entire NYSE are obtained from the *Wall Street Journal*. Standard and Poor's 500 Stock Index returns are used as a proxy for the market index. The hourly returns data were obtained directly from the Standard and Poor's corporation. During the 7-year period of the study, the number of shares outstanding and the number of shares traded have increased steadily. The entire analysis was therefore performed by scaling the number of shares traded by the number of shares outstanding.[4] The number of shares outstanding for the entire NYSE was obtained from the Master tape provided by the Center for Research in Security Prices of the University of Chicago (CRSP).

Economic data announcements and expected values of announcements are similar to those described in Pearce and Roley (1985).[5] One

4. Jain and Joh (1986) present evidence that trading volume, represented by the fraction of outstanding shares traded, reflects a stationary series over the period of our study. As recommended by them, I further divide the 7-year period into 7 subperiods and subtract the subperiod means from the raw data to obtain mean adjusted data for this analysis.

5. I am grateful to Doug Pearce for providing the announcement and expectation data for the five economic variables used in here.

important point to note is that expectations data are obtained from Money Market Services, Inc., which surveys about 60 money market participants each week. Pearce and Roley (1985) present a detailed analysis of the data, concluding that these data exhibit desirable properties, especially in comparison to other survey data.

IV. Response of Stock Prices and Trading Volume: Empirical Results

A. Initial Responses to Announcements

The estimated response of stock prices to announcement surprises is presented in table 1. The entire analysis was performed with and without adjusting the returns by the mean return for the day of the week and the hour of the day.[6] Since the results are almost identical with and without adjusting the returns, only one set (with adjustment) of the results is reported.

The results reported in table 1 indicate that surprises in money stock announcements and in CPI announcements affect the stock prices significantly. For the money stock announcements, the t-statistic of -6.0 for coefficient b1 reported in table 1 is significant at any reasonable level of significance. The estimated coefficient implies that a \$1 billion money surprise during the 1979–82 period caused stock prices to fall by about 0.11%. The responses of the stock market for the pre–October 1979 as well as the post–October 1982 periods are statistically the same as the intermediate period in that the coefficients b6 and b7 are not significant (t-statistics of 1.3 and -0.7, respectively). The response of the stock market for the pre–October 1979 period is given by b1 + b6 and equals about -0.06, which is only slightly different from -0.0868, reported by Pearce and Roley (1985) using daily data. For the post–October 1982 period, the response is given by b1 + b7 and equals about -0.13, which is quite close to -0.11 for the intermediate period. This evidence indicates that the financial market participants have not reacted differently to money supply announcements after the October 1982 policy change.[7] Although Pearce and Roley (1985) also find the money surprises to be a significant variable affecting stock returns, the significance in their result was of much lower order. This indicates the usefulness of hourly data.

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6. Harris (1986) and Jain and Joh (1986) have reported that trading volume and stock returns are not identical across days of the week and hours of the day. To take this into account, the hourly data have been adjusted by the average for the relevant day and hour. This is similar to incorporating dummy variables for days of the week and for hours of the day. French (1980) and Gibbons and Hess (1981) have earlier reported daily returns to be different across days of the week.

7. An alternative approach used to estimate the change in the stock market response was to run the regressions separately for different periods instead of the dummy-variable approach outlined above. The response coefficients are similar to those reported here.

TABLE 1   Response of Stock Prices to New Information during the First Hour after Announcement

$$\Delta SP_t = a + b1 \cdot M_t^u + b2 \cdot CPI_t^u + b3 \cdot PPI_t^u + b4 \cdot IP_t^u + b5 \cdot RU_t^u$$
$$+ b6 \cdot (D1 \cdot M_t^u) + b7 \cdot (D2 \cdot M_t^u) + e_t$$

A. Estimated Coefficients and *t*-Statistics

	Estimated Coefficient	*t*-Statistic
Intercept	.0042	.2
b1	−.1103	−6.0***
b2	−.5528	−2.0**
b3	−.3087	−1.6
b4	−.0300	−.3
b5	.1487	.5
b6	.0530	1.3
b7	−.0215	−.7
	R^2 (adjusted) = .10; $F(7,557)$ = 10.3***	

B. Test Results

Null Hypothesis	*F*-Statistic	Marginal Significance Level
b1 = b2 = b3 = b4 = b5 = 0	8.7	.0001
b1 = b2 = 0	20.2	.0001
b3 = b4 = b5 = 0	1.1	.3698

NOTES.—ΔSP represents the percentage change in Standard and Poor's 500 Stock Index. The dummy variables D1 and D2 divide the 7-year (1978–84) period into three segments: D1 = 1 for the pre–October 6, 1979 period, else D1 = 0; and D2 = 1 for the post–October 5, 1982 period, else D2 = 0. Superscript *u* denotes the unexpected component of the economic announcement = actual − market survey data on the expected announced value. *M* = the weekly change in the narrowly defined money supply in billions of dollars; CPI = the percentage change in the consumer price index; PPI = the percentage change in the producer price index; IP = the percentage change in the industrial production index; and RU = the percentage of the labor force that is unemployed.
** Significant at the 5% level.
*** Significant at the 1% level.

The CPI announcements are also statistically significantly related to stock returns. A 1-percentage-point surprise in the CPI results in a decline in stock prices of about 0.55%. This result is consistent with the findings of Fama and Schwert (1977) and Schwert (1981) for earlier periods.[8] Note that Pearce and Roley (1985) also report a negative coefficient that coincides with Schwert's work, but their finding was statistically insignificant. Thus, the insignificant results reported by Pearce and Roley (1985) are probably due to higher variance in daily data compared to hourly data.[9] Surprises in announced values of the

8. Fama and Schwert (1977) find that, for the 1953–77 period, monthly returns to a broad group of New York Stock Exchange common stocks are negatively related to both the expected and unexpected components of the consumer price index. Schwert (1981) extends the earlier study by using daily returns to the Standard and Poor's composite portfolio.
9. The entire analysis was also performed using daily data. The impact of money-supply surprises is signficant, but, even for the entire 7-year period, the *t*-statistic is

remaining three economic variables (PPI, industrial production, and the unemployment rate) are statistically unrelated to stock returns, at least during this period. For the PPI variable, the coefficient is close to being significant at the 10% level of significance. Thus, this analysis suggests that, among the five economic variables examined, money stock announcements and inflation announcements are apparently more important for stock market participants.[10]

Table 2 reports results when the dependent variable is hourly trading volume on the NYSE. The results reported are for the case when the volume variable has been subtracted by the mean trading volume for the day and the hour to account for the possible differences across day of the week and the hour of the day. The regression results do not indicate a significant association between economic announcement surprises and trading volume. Only one of the variables (unemployment) is significant at the 10% level of significance, and the overall regression is not significant. I conclude that trading volume on the NYSE does not change significantly around these economic announcements. The coefficient on absolute value of returns is significant, as expected from the results of previous research. These results are consistent with the hypothesis that these announcements do not induce significantly different beliefs across market participants. This conclusion, however, should be interpreted with the caution that the announcements occur when the market is closed, and the traders may have a reasonably long period of 1 hour to half a day to evaluate the consequences of the announcements.

B. Speed of Adjustment

The above models for both returns and volume were reestimated using five alternative dependent variables to investigate whether effect of new information on stock prices persists beyond 1 hour. The dependent variables $\Delta SP1$–$\Delta SP5$ are percentage changes in Standard and Poor's 500 Stock Index for the first hour to the fifth hour after the initial announcement of economic data. Similarly, VOL1–VOL5 are trading volumes on the NYSE for the same five hours. Thus, the response of stock prices and trading volume over the five hours following an economic announcement is examined.

−2.4, instead of −6.0 reported in table 1 for hourly data. Also for daily data, the surprises in announced values of the other variables are statistically unrelated to stock prices.

10. Similar to the analysis of the money-supply announcement variable, the response to the other four variables was also examined separately for three subperiods. The only interesting finding was that PPI is significantly related to stock returns in the pre–October 1979 period but not in the two subperiods after October 1979. It should not be surprising to find PPI to be significant in one sub-period when it is close to being significant for the overall period. Moreover, PPI is also an inflation measure similar to CPI, which is significantly related to stock returns.

TABLE 2 **Response of Trading Volume to New Information during the First Hour after the Announcement**

$$\text{VOL}_t = a + b1 \cdot |M_t^u| + b2 \cdot | \text{CPI}_t^u| + b3 \cdot |\text{PPI}_t^u| + b4 \cdot |\text{IP}_t^u| + b5 \cdot |\text{RU}_t^u|$$
$$+ b6 \cdot |D1 \cdot M_t^u| + b7 \cdot |D2 \cdot M_t^u| + b8 \cdot |\Delta\text{SP}_t| + e_t$$

A. Estimated Coefficients and *t*-Statistics

	Estimated Coefficients	*t*-Statistic
Intercept	− .0059	−7.1***
b1	.0001	.2
b2	.0021	.3
b3	.0041	1.0
b4	.0022	1.1
b5	.0111	1.8*
b6	.0001	.2
b7	.0004	.5
b8	.0143	11.2***
	R^2 (adjusted) = .192; $F(8,554) = 17.737$***	

B. Test Results

Null Hypothesis	*F*-Statistic	Marginal Significance Level
b1 = b2 = b3 = b4 = b5 = 0	1.04	.39
b1 = b2 = 0	1.71	.16
b3 = b4 = b5 = 0	.06	.93

NOTES.—VOL represents the percentage of outstanding common stocks traded. The dummy variables D1 and D2 divide the 7-year (1978–84) period into three segments: D1 = 1 for the pre–October 6, 1979 period, else D1 = 0; and D2 = 1 for the post–October 5, 1982 period, else D2 = 0. Superscript *u* denotes the unexpected component of the economic announcement = actual − market survey data on the expected announced value. M = the weekly change in the narrowly defined money supply in billions of dollars; CPI = the percentage change in the consumer price index; PPI = the percentage change in the producer price index; IP = the percentage change in the industrial production index; RU = the percentage of the labor force that is unemployed; and ΔSP = the percentage change in Standard and Poor's 500 Stock Index.
  * Significant at the 10% level.
  *** Significant at the 1% level.

Table 3 reports results for the stock price response.[11] In the first hour after the announcement hour, two (money and unemployment-rate announcements) of the five coefficients are significant. Recall that the money stock variable was significant in the announcement hour but that the unemployment rate variable was not significant. Also, even for the money stock variable, the response in this hour is not as strong as that during the first hour of trading (table 1). Some autocorrelation in computed stock index returns may be observed even when true index returns are independent. This arises because all stocks do not trade synchronously (see Scholes and Williams 1977; Dimson 1979). In addi-

11. The speed of adjustment analysis was also performed without the two dummy variables to control for separate periods. This was motivated from the results of the earlier analysis, which did not indicate different responses across subperiods. The qualitative findings are the same.

TABLE 3   **Response of Stock Prices to New Information in Hours Following Announcements**

$$\Delta SP_t = a + b1 \cdot M_t^u + b2 \cdot CPI_t^u + b3 \cdot PPI_t^u + b4 \cdot IP_t^u + b5 \cdot RU_t^u$$
$$+ b6 \cdot (D1 \cdot M_t^u) + b7 \cdot (D2 \cdot M_t^u) + e_t$$

	$\Delta SP1$	$\Delta SP2$	$\Delta SP3$	$\Delta SP4$	$\Delta SP5$
Estimated coefficients:					
Intercept	− .006	− .006	.001	.001	− .007
	(− .5)	(− .3)	(.0)	(.1)	(− .4)
b1	.019	− .002	.008	.020	− .011
	(2.2)**	(− .1)	(.4)	(1.8)*	(− .8)
b2	.193	− .011	− .172	.040	− .116
	(1.4)	(− .04)	(− .6)	(.2)	(− .6)
b3	− .019	− .066	− .002	− .090	.062
	(− .2)	(− .4)	(− .0)	(− .8)	(.5)
b4	.039	− .033	.028	− .007	− .000
	(.9)	(− .39)	(.3)	(− .1)	(− .0)
b5	.219	− .042	.003	− .009	.160
	(1.7)*	(− .17)	(.0)	(− .1)	(.8)
b6	− .012	.037	− .081	.006	− .033
	(− .6)	(1.0)	(− 2.0)**	(.2)	(− 1.14)
b7	− .022	− .008	.013	.013	.022
	(− 1.5)	(− .3)	(.4)	(.7)	(.9)
Test results for b1 = b2 = b3 = b4 = b5 = 0:					
F	2.13	.07	.13	.77	.45
Marginal significance level for F	.06	.99	.98	.57	.82

NOTES.—$\Delta SP1$–$\Delta SP5$ are dependent variables; they represent the percentage change in Standard and Poor's 500 Stock Index in the first to fifth hours following the announcements. t-statistics are in parentheses. Superscript u denotes the unexpected component of the economic announcement = actual − market survey data on the expected announced value. M = the weekly change in the narrowly defined money supply in billions of dollars; CPI = the percentage change in the consumer price index; PPI = the percentage change in the producer price index; IP = the percentage change in the industrial production index; RU = the percentage of the labor force that is unemployed.
  * Significant at the 10% level.
  ** Significant at the 5% level.

tion, the money stock variable is not significant for the next 2 hours and for 3 out of the last 4 hours. Thus, the response does not appear to take place after the first hour. The response of the market appears to be fairly quick in that most of the reaction is impounded in the prices during the first hour, and much smaller adjustments, if any, take place in the subsequent hours.[12]

Table 4 reports the results when the dependent variable is trading volume for 5 hours after the first hour of announcement. For the five economic variables (coefficients b1–b5) over 5 hours each, only two out of twenty-five coefficients are significant, which can be expected

12. Of the remaining 25 cases, there is only one additional signficant t-statistic, which could simply occur randomly.

TABLE 4 **Response of Trading Volume (Percentage of Common Stock Outstanding) to New Information in Hours Following Announcements**

$$\text{VOL}_t = a + b1 \cdot |M_t^u| + b2 \cdot |CPI_t^u| + b3 \cdot |PPI_t^u| + b4 \cdot |IP_t^u| + b5 \cdot |RU_t^u|$$
$$+ b6 \cdot |D1 \cdot M_t^u| + b7 \cdot |D2 \cdot M_t^u| + b8 \cdot |\Delta SP_t| + e_t$$

	VOL1	VOL2	VOL3	VOL4	VOL5
Estimated coefficients:					
Intercept	− .0029	− .0002	− .0003	− .0026*	− .0021
	(−4.9)***	(− .6)	(−1.0)	(−7.4)***	(−4.4)***
b1	.0003	.0002	.0001	.0002	− .0002
	(1.2)	(.9)	(.9)	(1.0)	(− .8)
b2	.0022	.0028	− .0006	.0022	.0052
	(.5)	(.8)	(− .3)	(.8)	(1.5)
b3	.0042	.0023	.0028	.0035	.0014
	(1.5)	(1.0)	(1.6)	(2.0)**	(.2)
b4	.0005	− .0004	.0002	.0003	.0001
	(.3)	(− .4)	(.3)	(.4)	(.1)
b5	.0093	.0049	.0044	.0022	.0051
	(2.3)	(1.5)	(1.7)*	(.9)	(1.5)
b6	− .0003	− .0004	− .0005	− .0000	.0000
	(− .5)	(−1.0)	(−1.6)	(− .0)	(.1)
b7	.0003	.0001	.0003	.0002	.0001
	(.8)	(.4)	(1.0)	(.8)	(.4)
b8	.0126	.0007	.0006	.0098	.0082
	(6.7)***	(1.3)	(1.5)	(11.4)***	(8.4)***
Test results for b1 = b2 = b3 = b4 = b5 = 0:					
F	1.65	.89	1.27	1.05	1.12
Marginal significance level for F	.14	.49	.27	.38	.34

NOTES.—VOL1–VOL5 are dependent variables; they represent trading volume of common stocks in the first to fifth hour following the announcements. t-statistics are in parentheses. Superscript u denotes the unexpected component of the economic announcement = actual − market survey data on the expected announced value. M = the weekly change in the narrowly defined money supply in billions of dollars; CPI = the percentage change in the consumer price index; PPI = the percentage change in the producer price index; IP = the percentage change in the industrial production index; RU = the percentage of the labor force that is unemployed; and ΔSP = the percentage change in Standard and Poor's 500 Stock Index.
* Significant at the 10% level.
** Significant at the 5% level.
*** Significant at the 1% level.

by chance. Certain different specifications of the model did not affect the findings. These results indicate that trading volume is not affected during 5 hours following the first hour of the announcement.

V. Summary and Conclusions

This article has examined the hourly response of stock prices and trading volume, in the period of 1978 to 1984, to announcements of money supply, the CPI, PPI, unemployment rate, and industrial production and extends the earlier work of Pearce and Roley (1985) by

using hourly returns data to obtain more precise estimates of stock price responses. Previous research has not examined trading-volume data. Two of the five announcement surprises have significant impact on stock prices. In particular, money-supply announcement and CPI-announcement surprises have significant negative effects on stock prices. Although Pearce and Roley (1985) reported the significant effect of money-supply announcement surprises, they did not find CPI announcements to be significant. Thus, their results were in contrast with the earlier findings of Fama and Schwert (1977) and Schwert (1981). Given the significant results reported here, the lack of significance in Pearce and Roley's (1985) investigation can be attributed to higher variance of daily data (compared to hourly data) examined by them. Also, the results for the money-supply announcement surprises are more precise (have higher t-statistics) than those of Pearce and Roley (1985), which increases confidence in earlier findings.

The empirical results also indicate that most of the effect of new information on stock prices is reflected in a reactively short period of 1 hour or so. This suggests that it is advantageous to use hourly stock returns data in research projects investigating the effects of announcements of economic variables. The analysis was extended to examine the possibly differential effects of announcements across three regimes in which the Federal Reserve exercised different levels of control on M1. The results indicate that the stock price response to money-supply announcements is statistically not different across regimes.

This article also reports the results of a trading-volume analysis around the announcements. The main motivation for this analysis arises from the various analytical articles that indicate that trading volume would increase if announcements were interpreted differently (future expectations of effects) by different market participants. The results indicate that trading volume is not associated with surprises in the announcements of the five variables examined. The results are consistent with the hypothesis that market participants interpret the surprises in announcements in an analogous manner and do not engage in additional trading.

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