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Macroeconomic Information and Stock Prices

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The paper analyzes the response of stock prices to the announcements of 15 representative macroeconomic variables. Stock prices respond primarily to announcements of monetary variables. Stocks of financial companies are the most sensitive to monetary news. Implicit in the stock price reactions are the market perceptions that the Federal Reserve plays an important role in future macroeconomic developments. The post-October 1982 change in the operating target of the Federal Reserve did not affect the stock price responses substantially, although it did affect the corresponding responses of short-term interest rates.

I. Introduction

Many authors have analyzed the response of stock prices to the weekly announcements of the stock of money, M1. Berkman (1978), Lynge (1981), Cornell (1983), and Pearce and Roley (1983) find that stock prices respond negatively to the unanticipated component of M1, and that interest rates respond positively (see Cornell 1983). There are two major hypotheses to explain these responses. The first hypothesis (*Expected Real Interest Rate*) claims that stock prices decrease because the real component of nominal interest rates is expected to increase. This affects stock prices both directly because the real discount rate at which future cash flows are capitalized is expected to increase, and indirectly because real output is adversely affected by higher real interest rates and thus future cash flows are expected to decrease. The second hypothesis (*Expected Inflation*) claims that stock prices decrease because the inflation premium in nominal interest rates increases, which decreases the after tax real dividends.[1] The two hypotheses depend, among other things, on how markets perceive future Federal Reserve policy and have, therefore, attracted a lot of attention in the literature.

Pearce and Roley (1985) extend the analysis by examining the stock price reactions to more macroeconomic announcements: the Federal discount and surcharge rate, the consumer and the producer price indexes, the unemployment rate, and the industrial production index. They

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[1] See Palmon and Yaari (1981) or Feldstein (1980) for an elaborate discussion on the relationship between stock prices and inflation.

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find statistically significant negative responses for the producer price index before October 1979, and for the discount and surcharge rate from October 1979 to October 1982. Smirlock and Yawitz (1985) find similar reactions to discount rate changes. The overall conclusion appears to be that monetary news affect stock prices while nonmonetary news do not have any significant effects.

This paper focuses on the distinction between monetary and nonmonetary news and on the role expected future Federal Reserve behavior may play both after monetary and nonmonetary announcements. It also analyzes the period after October 1982, when the Federal Reserve switched from non-borrowed reserves to borrowed reserves targeting. Huizinga and Mishkin (1986) present evidence of shifts in the behavior of real interest rates both after October 1979 and after October 1982. It is interesting to reexamine their evidence on interest rates for the post-October 1982 period using announcement effects and to examine if a similar shift occurs in stock price reactions. Previous authors have reported that after October 1979, interest rates (but not stock prices) have shown a shift in their reaction to money announcements.

The paper adds one monetary (bank free reserves) and seven nonmonetary variables in order to provide a representative set of macroeconomic variables that are closely watched by professional forecasters. It examines the responses of four representative stock price indexes and two representative interest rates. The stock price indexes are: the Standard and Poor 500 (large companies), the AMEX Major Market index (small companies), the Value Line index (small company stocks traded outside a major financial center), and the New York Stock Exchange (NYSE) Financial index (financial companies). Among the stock price indexes, the NYSE Financial index is of special interest because we expect monetary news to have a more direct impact on financial companies. The two interest rates are the three-month Treasury bill rate and the 20-year Treasury bond rate.[2]

II. Data and Statistical Methodology

The empirical analysis is based on the stock price reactions from the market close before each announcement to the next market close. The estimated equations have the following form:

$$DS_t = a_0 + \sum_{i=1}^{15} a_i x_{it}^u + u_t. \tag{1}$$

DS_t represents the percentage change in a stock price index from the market close of business day $t-1$ to the market close of business day t.[3] The sub-index i runs across the 15 announced macroeconomic variables. x_{it}^u is the unanticipated component of economic series x_i, which is announced during business day t (or after the market close of business day $t-$

[2] If output prices are rigid in the short run by flexible in the long run, then an expected change in the real rate of interest will affect primarily the short-term rate and a change in the inflation premium will affect primarily the long-term rate.

[3] For the two interest rates, DS_t represents the daily change rather than percentage change. This makes the results comparable to the results of the numerous previous articles. Smirlock and Yawitz (1985) argue for using percentage changes. Of course, the choice has no important bearing on our conclusions since we are primarily interested in the algebraic sign of the reactions and their statistical significance.

1). It equals $x_{it} - x_{it}^e$, where x_{it}^e is a survey forecast of the announced series x_{it}.[4] Each vector of observations x_i^u contains zeroes for the business days the series x_i is not announced. Business days during which none of the 15 series is announced are not part of the sample. u_t is the error term.

I estimate Equation (1) separately for each stock price index and interest rate using ordinary least-squares (OLS). Although the daily changes in the various stock price indexes are highly correlated, the OLS estimates are as efficient as the estimates from a seemingly unrelated regression (SUR) procedure because the set of independent variables is identical in each equation. However, whenever I impose or test restrictions across the different equations (as in the results of Table 3), OLS ceases to provide the correct standard errors, and thus I use SUR.

The interest rate data are annualized yields to maturity and represent market rates as of 3:30 p.m. Eastern Standard Time. The stock price data are closing prices (4:10 p.m.).[5] As a measure of expectations I used survey median forecasts provided by Money Market Services Incorporated. In Hardouvelis (1985a), I describe in detail the macroeconomic announcements and show that the survey medians, although not always unbiased or efficient, forecast better than proxies of expectations which are based on autoregressive models.

III. Empirical Evidence

Tables 1 and 2 contain the estimation results of Equation (1) for the time periods from October 11, 1979 to October 5, 1982 and from October 6, 1982 to August 16, 1984.[6] Table 2 also contains tests of structural change across the two subperiods.[7] Table 3 contains tests of the hypothesis that the reaction of NYSE Financial index is the same as the reaction of the other three indexes.

A. Monetary Announcements

Monetary announcements have a significant impact on stock prices during the first subperiod, but a much weaker one during the second subperiod (hypothesis H2). However, formal tests of structural change do not show a significant change across the two subperiods (observe the F

[4] The only exception is announcements of prospective Federal discount and surcharge rate changes, which are treated as unanticipated. Roley and Troll (1984) provide supporting evidence. However, if some of these changes were anticipated, say, because of official statements or rumors, our two independent variables would suffer from the usual errors in variables problem which tends to bias them towards zero. Dallas Batten and Daniel Thornton (1984) emphasize that many of these changes prior to October 1979 reflect technical adjustments (lagged responses of the Federal Reserve to changing market conditions) and have no informative content. Smirlock and Yawitz (1985) find that reactions to nontechnical adjustments are, indeed, stronger, apparently because these coefficients are not biased downward.

[5] Announcements which occur between 3:30 p.m. and 4:10 p.m. of business day t fall in unit interval t in the stock price regressions, but in unit interval $t + 1$ in the interest rate regressions. Thus, the stock price and interest rate sample sizes are slightly different.

[6] The observations for M1 and free reserves end in January 1984, at the end of the period of lagged reserve accounting.

[7] The tests of structural change were calculated using a dummy variable that takes the value of 1 after October 1982, and multiplying it by each explanatory variable. To allow for the heteroschedasticity of the interest rates across the two subperiods, the tests of structural change for the two interest rates do not restrict the error variances to be the same across the two subperiods; this was done by performing weighted least-squares with weights equal to one over the standard error of estimate (SEE) of each subperiod. In small samples, the F distribution that I use is more cautious in rejecting the null hypothesis than the χ^2-distribution (see, for example, Theil (1971, p. 402).

Table 1. Reactions to the Unanticipated Component of Announced Macroeconomic Series (October 1979–October 1982)

	S&P-500	NYSE Financial	AMEX-MM	Value Line	Treasury Bill	Treasury Bond
Constant	−0.060	−0.040	−0.010	−0.072	0.015	0.008
	(0.052)	(0.046)	(0.054)	(0.045)	(0.017)	(0.008)
M1	−0.207*	−0.402**	−0.273**	−0.293**	0.219**	0.095**
	(0.121)	(0.108)	(0.124)	(0.104)	(0.043)	(0.020)
RES	0.275**	0.176**	0.240**	0.203**	−0.115**	−0.022
	(0.091)	(0.082)	(0.094)	(0.079)	(0.032)	(0.015)
DISC	−0.783**	−0.787**	−0.763**	−0.677**	0.370**	0.090*
	(0.311)	(0.278)	(0.321)	(0.268)	(0.109)	(0.051)
SUR	−0.246	−0.480**	−0.157	−0.397**	0.108*	0.020
	(0.182)	(0.163)	(0.188)	(0.157)	(0.065)	(0.031)
CPI	−0.385	−0.973	−0.203	−0.725	0.092	0.190*
	(0.685)	(0.610)	(0.705)	(0.590)	(0.243)	(0.115)
PPI	−0.460	−0.629	−0.332	−0.426	0.294	0.295**
	(0.533)	(0.475)	(0.548)	(0.459)	(0.189)	(0.089)
UN	0.129	−0.123	0.136	−0.312	−0.577**	−0.094
	(0.714)	(0.636)	(0.735)	(0.615)	(0.253)	(0.120)
IP	0.146	0.111	0.092	0.054	0.037	0.052
	(0.209)	(0.187)	(0.216)	(0.180)	(0.074)	(0.035)
PI	0.539	0.659**	0.782**	0.516*	−0.232*	−0.179**
	(0.362)	(0.322)	(0.372)	(0.312)	(0.128)	(0.060)
DG	0.025	0.001	0.020	0.024	0.214	−0.003
	(0.047)	(0.042)	(0.048)	(0.040)	(0.166)	(0.008)
LI	−0.189	0.023	−0.098	0.019	−0.096	0.003
	(0.182)	(0.162)	(0.187)	(0.157)	(0.064)	(0.030)
CC	−0.018	0.039	−0.106	−0.081	−0.053	−0.021
	(0.214)	(0.191)	(0.220)	(0.184)	(0.075)	(0.035)
RS	−0.098	−0.162	−0.226	−0.174	0.060	0.028
	(0.350)	(0.312)	(0.360)	(0.301)	(0.042)	(0.020)
HS	1.33	0.915	1.54	1.70	0.992*	0.093
	(1.44)	(1.29)	(1.49)	(1.24)	(0.511)	(0.242)
TD	0.222	0.323**	0.286*	0.270*	−0.094**	−0.021
	(0.165)	(0.147)	(0.169)	(0.142)	(0.035)	(0.016)
$\bar{R}^2$	0.046	0.103	0.040	0.076	0.160	0.089
SEE	0.97	0.87	1.00	0.84	0.34	0.16
H1: F(15,N-16)	2.16**	3.76**	2.00**	2.98**	6.16**	3.65**
H2: F(4,N-16)	6.41**	11.63**	5.67**	9.01**	17.46**	4.97**
H3: F(11,N-16)	0.75	1.32	0.94	1.07	2.62**	1.53

Notes: (a) Standard errors are in the parentheses. Double asterisk (**) denotes statistical significance at the 95% level, and single asterisk (*) at the 90% level. $\bar{R}^2$ is the coefficient of determination adjusted for degrees of freedom. SEE is the regression standard error. H1 is the hypothesis that all slope coefficients are zero; H2 is similar for M1, RES, DISC, and SUR; and H3 for the other eleven coefficients. (b) The dependent variables are % change in the Standard and Poor 500, the New York Stock Exchange Financial index, the AMEX Major Market index, the Value Line index, and the change in the three-month Treasury bill and 20-year Treasury bond yields to maturity. (c) The independent variables are: M1 (% change); free reserves (% of non-borrowed reserves); Federal discount rate and surcharge rate (change); consumer price index and producer price index (% change); unemployment rate (level); industrial production index, personal income, durable goods, index of leading indicators (% change); consumer credit (change in $ billions); retail sales (% change); housing starts (millions of units); and trade deficit ($ billions). All nonmonetary series are monthly, M1 and RES are weekly; DISC and SUR are actual (not unanticipated) changes. (d) Sample size $N = 362$ observations for the stock indexes, and $N = 409$ for Treasury bill and Treasury bond.

Table 2. Reactions to the Unanticipated Component of Announced Macroeconomic Series (October 1982–August 1984)

Independent Variable	Dependent Variable: S&P-500	NYSE Financial	AMEX-MM	Value Line	Treasury Bill	Treasury Bond
Constant	0.025	−0.021	0.041	0.017	0.004	−0.002
	(0.069)	(0.068)	(0.075)	(0.055)	(0.007)	(0.006)
M1	−0.692**	−0.602**	−0.589**	−0.678**	0.163**	0.129**
	(0.297)	(0.294)	(0.324)	(0.240)	(0.031)	(0.027)
	[−1.48]	[−0.72]	[−0.95]	[−1.39]	[−0.71]	[1.21]
RES	0.143	0.155	0.170	0.093	−0.013	−0.005
	(0.297)	(0.169)	(0.186)	(0.138)	(0.018)	(0.015)
	[−0.60]	[−0.07]	[−0.29]	[−0.55]	[2.60]	[0.59]
DISC	0.702	0.481	1.30	0.634	0.264**	0.136
	(0.969)	(0.958)	(1.05)	(0.782)	(0.100)	(0.088)
	[1.42]	[1.34]	[1.91]	[1.47]	[−0.53]	[0.61]
SUR	—	—	—	—	—	—
CPI	0.011	−0.262	−0.336	0.602	0.066	0.351**
	(1.89)	(1.87)	(2.06)	(1.53)	(0.193)	(0.170)
	[0.37]	[0.70]	[0.05]	[1.03]	[−0.03]	[0.22]
PPI	0.356	−0.592	−0.055	−0.204	0.063	0.135**
	(0.854)	(0.844)	(0.929)	(0.689)	(0.087)	(0.076)
	[0.69]	[−0.04]	[0.18]	[0.14]	[−0.95]	[−1.08]
UN	1.79*	2.35**	2.09*	1.75*	−0.211**	−0.185**
	(1.01)	(1.00)	(1.10)	(0.819)	(0.104)	(0.091)
	[1.32]	[2.16]	[1.49]	[1.96]	[1.37]	[−0.60]
IP	0.099	−0.054	0.059	−0.098	0.025	−0.010
	(0.395)	(0.391)	(0.430)	(0.319)	(0.040)	(0.035)
	[−0.03]	[−0.37]	[−0.03]	[−0.32]	[−0.16]	[−1.15]
PI	0.360	−0.022	0.670	0.150	0.079	0.031
	(0.859)	(0.085)	(0.934)	(0.693)	(0.088)	(0.077)
	[−0.12]	[−0.78]	[−0.06]	[−0.37]	[1.62]	[2.16]
DG	−0.002	−0.034	−0.002	0.007	0.011	0.016**
	(0.080)	(0.085)	(0.087)	(0.065)	(0.008)	(0.007)
	[−0.41]	[−0.71]	[−0.20]	[−0.70]	[−0.56]	[1.59]
LI	0.098	0.145	0.011	0.125	0.002	0.002
	(0.116)	(0.114)	(0.126)	(0.093)	(0.012)	(0.011)
	[1.41]	[0.65]	[0.54]	[0.68]	[1.36]	[−0.09]
CC	−0.122	−0.143	−0.158	−0.134	0.002	0.009
	(0.120)	(0.119)	(0.131)	(0.097)	(0.012)	(0.011)
	[−0.34]	[−0.81]	[−0.17]	[−0.20]	[0.59]	[0.69]
RS	0.104	−0.067	0.072	0.003	0.016	0.016
	(0.183)	(0.181)	(0.199)	(0.148)	(0.014)	(0.013)
	[0.59]	[0.30]	[0.78]	[0.63]	[−0.88]	[−0.60]
HS	1.65	1.20	1.95	0.861	−0.005	0.014
	(1.16)	(1.15)	(1.27)	(0.942)	(.119)	(.105)
	[0.23]	[0.17]	[0.24]	[−0.45]	[−1.76]	[−0.37]
TD	0.101	0.143	0.072	0.142	−0.002	0.003
	(0.256)	(0.252)	(0.277)	(0.206)	(0.014)	(0.012)
	[−0.37]	[−0.65]	[−0.67]	[−0.46]	[2.31]	[1.12]
$\bar{R}^2$	−0.001	0.010	−0.004	0.009	0.117	0.100
SEE	0.96	0.95	1.05	0.78	0.10	0.09

Table 2. (*continued*)

	Dependent Variable					
	S&P-500	NYSE Financial	AMEX-MM	Value Line	Treasury Bill	Treasury Bond
H1: F(14,207)	0.99	1.15	0.94	1.36	3.30**	2.93**
H2: F(3,207)	2.14	1.72	1.77	2.94**	12.46**	8.82**
H3: F(11,207)	0.69	1.00	0.74	0.94	0.84	1.37
H11: F(15,568)	0.70	0.66	0.57	0.81	1.96**	1.08
H22: F(4,579)	1.48	0.62	1.30	1.48	2.17**	0.85
H33: F(12,572)	0.40	0.50	0.24	0.50	1.09	0.72

Notes: (a) See notes of Table 1. Sample size $N = 222$ for the stock price indexes, and $N = 244$ for the two interest rates. (b) Numbers in brackets are t statistics testing the hypothesis that the coefficient is equal across the subperiods October 79–October 82 and October 82–August 84. Hypotheses H11, H22, H33 are null hypotheses of no structural change in all coefficients, the coefficients of the three monetary variables (M1, RES, DISC) plus the constant, and the coefficients of all the nonmonetary variables plus the constant across the two subperiods. The tests of structural change for Treasury bill and Treasury bond do not restrict the error variances to be the same across the two subperiods.

Table 3. Does the New York Stock Exchange Financial Index Respond Differently from the Other Stock Price Indexes? (October 1979–August 1984)

Independent Variable	$\chi^2(1)$	Significance Level
M1	4.74**	0.029
RES	0.49	0.485
DISC	0.66	0.415
SUR	4.05**	0.044
Four Monetary Variables $\chi^2(4) = 10.96$** (Significance Level = 0.027)		
CPI	2.49	0.115
PPI	2.00	0.158
UN	0.60	0.438
IP	0.11	0.738
PI	0.02	0.884
DG	3.63*	0.057
LI	1.22	0.270
CC	0.15	0.702
RS	1.28	0.258
HS	0.55	0.460
TD	0.65	0.419
Eleven Nonmonetary Variables $\chi^2(11) = 12.07$ (Significance Level = 0.358)		

The system of four equations was estimated using the seemingly unrelated regressions procedure, in which the coefficients of each explanatory variable across the S&P-500, AMEX-MM, and VL equations were restricted to be the same (a total of 32 restrictions for the 15 variables plus the constant term; these restrictions cannot be rejected: $\chi^2(32) = 40.08$).

statistic of hypothesis H22 in Table 2, as well as the t statistics of each regression coefficient in the brackets). As expected, among the four stock price indexes, the NYSE Financial index shows the strongest responses to monetary news, which are also statistically different from the responses of the other three indexes.

The individual series results for the period October 1979–October 1982 are similar to the ones found by previous authors. M1, the discount rate, and the surcharge rate have negative coefficients which are statistically significant. After October 1982 the stock price responses to M1 announcements continue to be negative and appear stronger in magnitude, but they are not statistically different from the first subperiod. The stock price responses to the discount rate announcements show a reversal in sign after October 1982, but the responses are not statistically significant.[8] The surcharge rate never changed (it stayed at zero) after October 1982 so the variable does not appear in Table 2.[9]

The stock price responses to free (excess minus borrowed) reserves announcements represent entirely new information for both subperiods. The responses are very strong during the first subperiod with t statistics that are much larger than those of M1. An unanticipated increase in free reserves by 1% (of non-borrowed reserves, which is approximately $400 million), increases the stock price indexes from 0.18% to 0.28%, and decreases the three-month Treasury bill by 12 basis points. During the second subperiod the reactions to free reserves are not significantly different from zero. However, parameter stability across the subperiods is only rejected by the three-month Treasury bill rate.

The market responses to free reserves announcements are consistent with the Expected Real Interest Rate hypothesis. To see this we have to explore the informational content of free reserves announcements. The announcement of free reserves refers to fiscal week $t - 1$, which ends only two days prior to the announcement of week t, while the simultaneous announcement of M1 refers to the fiscal week $t - 2$, which ends nine days prior to the announcement of week t. Thus, the announcement of free reserves provides entirely new information. Furthermore, prior to the announcement at week t, markets have a fairly accurate estimate of total reserves for week $t - 1$. This is because until January 1984 required reserves of week $t - 1$ were a function of demand deposits of week $t - 3$, which were already announced at $t - 1$. Assuming that excess reserves are predictable, there is no surprise about total reserves and, thus, a positive surprise about non-borrowed reserves equals a negative surprise about borrowed reserves. Similarly, we may treat positive surprises about free reserves as both positive surprises about non-borrowed reserves and negative surprises about borrowed reserves.[10] In the October 1979–October 1982 period non-borrowed reserves were both the intra-week and inter-week instrument of monetary control. Market participants

[8] For precise models on the interest rate response to M1 announcements see Engel and Frankel (1984), Nichols, Small, and Webster (1983), or Hardouvelis (1985b). Most authors have interpreted the market responses to M1 announcements as evidence of the Federal Reserve's credibility. When markets perceive that the Federal Reserve follows a steady money growth path, they believe that unanticipated changes in the stock of money will be counteracted soon. According to the Expected Real Interest Rate hypothesis, the expectation of a future restriction in money supply leads to an expected increase in the real rate of interest which is required to clear the money market.

[9] Hafer (1986) has also examined independently the stock price reactions to M1 and discount rate announcements during the post-October 1982 period and reached similar conclusions.

[10] Ignoring possible surprises about excess reserves does not have any major implications. For example, in the interest rate reactions, a model-based surprise of non-borrowed reserves provides similar results as the surprise about free reserves; or adding a model-based surprise about total reserves has no effect on the coefficient estimates.

were, therefore, likely to interpret unanticipated changes in non-borrowed reserves as persistent changes, which were initiated by the Federal Reserve in its attempt to alter its intermediate targets. This explains the strong negative response of short-term interest rates during this period.[11] But after October 1982, non-borrowed reserves lost their significance as an inter-week instrument. Market participants did not attach much importance to unanticipated changes in non-borrowed reserves and, thus, the interest rate response weakened.[12]

B. Nonmonetary Announcements

The stock price responses to nonmonetary announcements are very weak. For none of the stock price indexes and during neither subperiod can we reject the null hypothesis that all 11 coefficients are jointly different from zero (H3). However, three of the 11 macroeconomic variables (trade deficit, unemployment rate, personal income) do show statistically significant responses.

From October 1979 to October 1982, an unanticipated increase in the U.S. trade deficit by one billion dollars increased the stock price indexes by 0.22% to 0.32% and decreased the three-month Treasury bill rate by 9 basis points. An increase in the trade deficit cannot be interpreted as good news about future cash flows, thus the increase in stock prices is most likely the result of the decrease in short-term interest rates alone.

The reactions to the unemployment rate become significant only in the second subperiod. Table 2 shows that an unanticipated increase in the unemployment rate by 1% increases stock prices by 1.75% to 2.35%; it also decreases the three-month Treasury bill rate by 21 basis points, and the 20-year Treasury bond rate by 19 basis points. In the first subperiod only the short-term interest rate shows a negative and significant response. A plausible hypothesis associated with the Federal Reserve's abandonment of strict M1 targets is the following: an increase in the unemployment rate provides a signal of weakening aggregate demand (relative to aggregate supply). In the absence of the Federal Reserve's intervention, as in the October 1979–October 1982 period, this results in a decrease in output and interest rates. The decrease in interest rates tends to increase stock prices, but the overall effect on stock prices is ambiguous because cash flows are expected to decrease. But after October 1982, markets expected the Federal Reserve to intervene and counteract the increase in the unemployment rate by expanding the money supply unconstrained by M1 targets. Thus, stock prices increase because real interest rates are expected to decrease and cash flows are no longer expected to decrease as in the pre-October 1982 time period.

From October 1979 to October 1982, an unanticipated increase in personal income by 1% increases the stock price indexes by 0.52% to 0.78%; it also decreases the three-month Treasury bill rate by 23 basis points and the 20-year Treasury bond rate by 18 basis points.

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[11] For a precise model, see Hardouvelis (1987). To get the observed negative response it is necessary that unanticipated changes in borrowed reserves are perceived to be less persistent than unanticipated changes in non-borrowed reserves.

[12] The slightly negative (or the absence of a positive) response of long-term interest rates is evidence against the Expected Inflation hypothesis as an explanation to reserve announcement responses. Apparently, markets did not perceive that the Federal Reserve was intending to alter the *growth rate* of M1. Had this been the case, we should have observed a positive response of long-term interest rates as the inflation premium would adjust (and the liquidity effect disappear in the long run). Also notice that unlike the case of M1 announcements, we cannot derive any conclusions about the Federal Reserve's credibility. Changing the intermediate targets in a specific direction can be either consistent or inconsistent with the Federal Reserve's credibility depending on the relative position of M1 with respect to its pre-announced growth path.

Given the algebraic sign of the responses, it appears that unanticipated changes in personal income provided a signal of a more persistent change in aggregate supply than aggregate demand. Thus, an increase in personal income was associated with an expansion in output and a decrease in interest rates. Both of these cause stock prices to increase. The reactions become weaker after October 1982 because the Federal Reserve began following countercyclical policy, reacting to future expansions in output by restricting the money supply, which opposes the decrease in interest rates and the increase in stock prices.

IV. Conclusions

Stock prices respond primarily to monetary news. The strongest reactions were observed from October 1979 to October 1982, a period when the Federal Reserve followed strict annual M1 targets and adopted non-borrowed reserves as both the intra- and inter-week targets. During that period, unanticipated changes in free reserves had the strongest impact among the monetary variables because they were associated with conscious and persistent changes in non-borrowed reserves. Also, among all stock price indexes, the NYSE Financial index shows the strongest reactions to monetary news, apparently because the cash flows of financial companies are directly affected by monetary developments.

Consistent with the evidence of Huizinga and Mishkin (1986), the three-month Treasury bill rate reactions showed a statistically significant change after October 1982. However, neither the reactions of the 20-year Treasury bond rate nor the reactions of the four stock price indexes showed a structural break at that time.

Among the nonmonetary news, stock prices responded to the announcements of the trade deficit, the unemployment rate, and personal income. The response to the unemployment rate is significantly stronger in the post-October 1982 period and provides some evidence that during this period, markets were expecting the Federal Reserve to follow a more activist countercyclical policy.

Finally, although there is no overwhelming evidence against the Expected Inflation hypothesis, the stock price reactions are consistently consistent with the Expected Real Interest Rate hypothesis.

References

Batten, Dallas S., and Thornton, Daniel L. Dec. 1984. Discount rate changes and the foreign exchange market. *Journal of International Money and Finance 3*: 279–302.

Berkman, Neil G. May/June 1978. On the significance of weekly changes in M1. *Economic Review*, Federal Reserve Bank of Boston, pp. 5–22.

Cornell, Bradford. Sept. 1983. The money supply announcements puzzle: Review and interpretation. *American Economic Review* 73(4): 644–657.

Engel, Charles, and Jeffrey Frankel. Jan. 1984. Why interest rates react to money announcements: An explanation from the foreign exchange market, *Journal of Monetary Economics* 13: 31–39.

Feldstein, Martin. Dec. 1980. Inflation and the stock market. *American Economic Review* 70: 837–847.

Hafer, R. W. March 1986. The response of stock prices to changes in weekly money and the discount rate. *Review*, Federal Reserve Bank of St. Louis, 68(3): 5–14.

Hardouvelis, Gikas A. Feb. 1985a. Economic news, exchange rates, and interest rates. First Boston Working Paper Series #86-12, Columbia University Graduate School of Business. Forthcoming, *Journal of International Money and Finance.*

Hardouvelis, Gikas A. Dec. 1985b. Exchange rates, interest rates and money stock announcements: A theoretical exposition. *Journal of International Money and Finance* 4(4): 443–454.

Hardouvelis, Gikas A. June 1987. Reserves announcements and interest rates: Does monetary policy matter? Forthcoming, *Journal of Finance* 42(2).

Huizinga, John, and Mishkin, Frederic. Spring 1986. Monetary policy regime shifts and the unusual behavior of real interest rates. *Carnegie-Rochester Series on Public Policy* 24: 231–274.

Lynge, Morgan J. Jr. (Fall) 1981. Money supply announcements and stock prices. *The Journal of Portfolio Management* 8: 40–43.

Nichols, Donald, Small, David, and Webster, Charles. June 1983. Why interest rates rise when an unexpected large money stock is announced. *American Economic Review* 73: 383–388.

Palmon, Dan, and Yaari, Uzi. 1981. Share values, inflation, and escalating tax rates. *Journal of Banking and Finance* 5: 395–403.

Pearce, Douglas K., and Roley, V. Vance. Sept. 1983. The reaction of stock prices to unanticipated changes in money: A note. *Journal of Finance* 38: 1323–1333.

Pearce, Douglas K., and Roley, V. Vance. Jan. 1985. Stock prices and economic news. *Journal of Business* 58: 49–68.

Roley, V. Vance, and Troll, Rick. Jan. 1984. The impact of discount rate changes on market interest rates. *Economic Review,* Federal Reserve Bank of Kansas City, pp. 27–39.

Smirlock, Michael and Jess Yawitz. Sept. 1985. Asset returns, discount rate changes, and market efficiency. *Journal of Finance* 40(4): 1141–1158.

Theil, Henri. 1971. *Principles of Econometrics.* New York: John Wiley & Sons, Inc.