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STOCK PRICES, NEWS, AND BUSINESS CONDITIONS

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ABSTRACT

Previous research finds that fundamental macroeconomic news has little effect on stock prices. This study shows that after allowing for different stages of the business cycle, a stronger relationship between stock prices and news is evident. In particular, the empirical results suggest that the effect of news about real economic activity depends on the varying responses of expected cash flows relative to equity discount rates. When the economy is strong, for example, the stock market responds negatively to good news about real economic activity, reflecting the larger effect on discount rates relative to expected cash flows.

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Apart from some types of monetary information, little empirical evidence supports the hypothesis that stock prices respond to macroeconomic news. Schwert (1981), for example, using both a time series and a Treasury bill model to estimate expectations, finds that the daily response of stock prices to news about inflation from 1953 to 1978 is weak and slow. Pearce and Roley (1985) use survey data to measure expectations and find that daily stock prices respond to monetary information between September 1977 and October 1982, but news about the consumer price index, unemployment, and industrial production have no significant effect on prices. In the same type of study, Hardouvelis (1987) considers a somewhat broader set of nonfinancial information and updates the sample through August 1984. He again concludes that stock prices respond primarily to monetary news. Finally, in a study not restricted to economic announcements, Cutler, Poterba, and Summers (1989) use innovations from vector autoregressions to measure news about macroeconomic time series from 1871 to 1986. They conclude that less than one third of the monthly return variance can be

explained from these sources. As a consequence, they suggest that a variety of other factors not related to economic fundamentals determines stock returns.[1]

Each of these studies makes an implicit assumption about how investors respond to news. If this assumption is false, it could explain the lack of support for the effect of aggregate economic information. Specifically, these studies assume that investors' response to news is the same over different stages of the business cycle. For instance, Cutler, Poterba, and Summers (1989) implicitly assume that a positive surprise in industrial production at the end of the Great Depression invokes the same response as a surprise in late 1969, after nearly a decade of expansion.[2] A surprise in industrial production during the depression, a time of record unemployment and excess industrial capacity, could indicate both the end of the depression and higher forecasts of firm cash flows. Such an announcement would likely be "good news" for the stock market. In late 1969, with low unemployment and factories running near full capacity, a surprise in industrial production may result in fears of an over-heating economy, inflation, and possible efforts by policymakers to increase real interest rates. Such an announcement could then be "bad news"

for the stock market. If the same type of news is considered good in some states of the economy and bad in others, the response coefficient on the surprise in previous studies will be biased toward zero.[3]

The popular press uses this good news/bad news story to interpret daily stock price movements. For example, on February 4, 1983, after sixteen months of recession, the Labor Department reported that the unemployment rate fell to 10.4 percent. This represented a rate of 0.2 or 0.3 percentage points below what was expected. This news was used by the media to explain the 13.25 point jump in the Dow Jones Industrial Average, and prompted the Chairman of the Council of Economic Advisers, Martin Feldstein, to comment from Switzerland that "a recovery is either beginning or already here."[4] In contrast, on November 4, 1988, after six years of expansion, the Labor Department reported that the unemployment rate fell to 5.3 percent, matching a fourteen year low. This represented a rate of 0.1 or 0.2 percentage points below what was expected. The media's interpretation in this instance was: "bond market investors reacted with gloom, sending interest rates higher on fears of tighter Fed policy. The stock market also fell."[5]

The purpose of this paper is to examine whether the response of stock prices to macroeconomic news varies over different stages of the business cycle. In the process, earlier studies are extended in several ways. First, by allowing the response to vary over different states of the economy, tests of the good news/bad news story popular in the media can be explicitly examined. Moreover, given different responses, unbiased tests of the value of fundamental information about the economy also can be conducted. Second, in addition to using daily percentage changes in closing values of the Standard & Poors' 500 Index, several variables related to equity discount rates and cash flows are used as dependent variables. By considering these other variables, the sources of any business-condition effect on the response of stock prices can be examined. Third, a somewhat broader set of economic variables is used in comparison to Pearce and Roley (1985), and the sample is about twice as long as the samples used by Pearce and Roley (1985) and Hardouvelis (1987).

Following this introductory section, the first section presents a simple theoretical framework to consider how news affects stock prices and how this effect can vary over different stages of the business cycle. Then, the possible impact of real economic

activity, foreign trade, inflation, and monetary news on stock prices is examined. The asset return, economic announcement, and expectations data are described in the second section. In the third section, the empirical results are presented, and tests of different responses over business cycles are conducted. The main conclusions are summarized in the fourth section.

I. THEORETICAL FRAMEWORK

In this section, a simple model is first presented to consider the relationships between stock prices and news. Then, four specific types of news -- real economic activity, foreign trade, inflation, and money -- are analyzed with respect to possible business-cycle effects.

A. Model

A common model that links stock prices to information posits that stock prices equal the present value of rationally forecasted future dividends discounted by risk-adjusted interest rates. This model can be represented as

$$(1) \qquad P_t = \sum_{\tau=1}^{\infty} \frac{E[D_{t+\tau}|\Omega_t]}{(1 + r_{t+\tau}|\Omega_t)}$$

where P_t is the price of the stock at time t, E denotes the mathematical expectation conditional on information available at time t (Ω_t), $D_{t+\tau}$ is the dividend paid at time $t+\tau$, and $r_{t+\tau}$ is the discount factor for cash flows that occur at time $t+\tau$, determined in the market on the basis of information known at time t.

The efficient markets hypothesis specifies that stock prices reflect all known information, Ω_t. As a consequence, daily stock price movements are attributed to new information that impacts either expectations of future dividends or discount rates, or both. The relative size of the effects on these two factors determines the ultimate impact on stock prices. For an unexpected increase in an economic fundamental to have a positive influence on stock prices, for example, the rise in future dividends must outweigh any increase in the discount rate.

The main hypothesis examined in this paper is that news influences expected cash flows and discount rates differently in different stages of the business cycle. As a result, the effect of news on stock prices also varies. The remainder of this section focuses on these potential business-cycle effects.[6]

B. Impact of Real Economic Activity Surprises

The category of news that may have the largest differential effect on stock prices depending on the stage of the business cycle is unanticipated announced changes in real economic activity. When the economy is operating below capacity, real economic activity surprises are likely to affect expected cash flows more than discount rates, causing stock prices to rise. On the other hand, when the economy is operating above its long-run potential, a real economic activity surprise could result in a large increase in discount rates relative to cash flows, causing stock prices to fall.

Evidence of real economic activity surprises influencing daily asset prices is weak. Pearce and Roley (1985) and Hardouvelis (1987), for example, find that the response of aggregate stock prices to unemployment and industrial production news is insignificantly different from zero. These studies do not, however, allow for possible business-cycle effects.[7]

C. Impact of Foreign Trade Surprises

In recent years, foreign trade deficit announcements have received considerable attention in the popular press. Their effect on stock prices may operate through any of several channels. First, if an unanticipated increase in the trade deficit is attributed

to a drop in foreign demand for domestic products, the cash flows of U.S. firms with international sales are potentially lower than previously expected. Second, trade deficit surprises may increase the likelihood of protectionism. Third, if policymakers resolve to lower future deficits by encouraging exports with a weaker dollar, they may attempt to lower real interest rates. Finally, a higher-than-expected trade deficit may ultimately make foreign goods more expensive, raising expected inflation. In turn, interest rates would increase and stock prices would decline. These inflation effects could be more pronounced if the economy is operating near its long-run potential. Moreover, policymakers may be less likely to lower interest rates in this situation. As a consequence, trade deficit announcement surprises may have more adverse effects in the latter parts of economic expansions.

Hardouvelis (1987) finds that trade deficit news has no effect on stock prices over the 1979-1984 period. His study, however, does not allow for possible business cycle effects. He also omits the period in the late 1980s when trade deficit news became more prominent in the media.

D. Impact of Inflation Surprises

Following the empirical studies of Nelson (1976) and Fama

and Schwert (1977), several explanations for the negative relationship between inflation and stock returns have been proposed. Among these, Feldstein (1980) argues that the tax treatment of depreciation and inventories results in lower real after-tax corporate profits and hence lower stock prices during times of inflation. In contrast, Fama (1981), Geske and Roll (1983), and Kaul (1987) explain the negative relationship by appealing to real output effects. Finally, stock prices could respond negatively to inflation news if investors expect policymakers to respond directly to the same news. That is, more restrictive policies could be adopted, resulting in higher real interest rates and lower cash flows to firms. This latter channel again allows possible business cycle effects, as the expected policy response may be different depending on the condition of the economy.

Schwert (1981) and Pearce and Roley (1985) find only limited evidence that aggregate stock returns respond to inflation announcement surprises. Pearce and Roley (1988), however, present evidence that individual stocks are significantly affected by inflation announcements, depending on the nature of the firm's nominal contracts.

E. Impact of Monetary Surprises

The Federal Reserve's willingness to adhere to its monetary targets and to offset money surprises may depend on the state of the economy. Consequently, at the end of a long expansion, when concern about future inflation is growing, a money surprise could have very different effects on stock prices than if the same surprise occurred at the bottom of a recession. Such business cycle effects are not considered in previous studies, although money surprises are estimated to affect stock prices significantly [e.g., Pearce and Roley (1983, 1985), Cornell (1983), and Hardouvelis (1987)].

In addition to money announcements, news about the Federal Reserve's discount rate also could affect stock prices. Such changes could coincide with a new assessment of monetary policy, and therefore different equity discount rates and cash flows. The net effect on stock prices also may depend on the stage of the business cycle, similar to money announcement effects.

II. DATA

The sample period begins in September 1977 and ends in May 1988. The start of the sample period coincides with the initial availability of survey data from Money Market Services

International (MMS). While the sample could be extended using time-series methods to form expected values, such approaches would smooth any asymmetric effects from different business conditions. Alternatively, time-series models could be estimated over different economic states, but the results could be biased toward finding business-cycle effects in this case. Consequently, the sample period is chosen to conform with the survey data.[8]

A. Asset Prices and Yields

Daily percentage changes in the closing value of the S&P 500 Index are used to estimate the response of stock prices to new macroeconomic information. For economic announcements occurring either before or while the stock market is open, the percentage change in the index from the previous business day's closing price to the closing price on that day is used. For announcements made after the stock market is closed, the percentage change in the index from that day's closing quote to the next business day's closing quote is used. Throughout the sample, the stock market closed at 4:00 p.m., eastern time.[9]

To measure the response of equity discount rates to new information, several proxies are considered. These include daily changes in the 3-month Treasury bill and 10-year Treasury bond

yields. Following Fama and French (1989) and Fama (1990), variables denoted as the term spread and the default spread also are included as equity discount rate proxies. The term spread is represented by Moody's Aaa corporate bond yield minus the 3-month bill yield, and the default spread is Moody's Baa corporate bond yield minus the Aaa yield. These yield data are from the Federal Reserve's H.15 release, and they correspond to yields based on bid prices prevailing at 3:30 p.m.[10]

B. Economic Announcements

Data on industrial production, IP, are initially released seasonally-adjusted monthly percentage changes in the Federal Reserve Industrial Production Index, all items. Between January 1979 and October 1985, the announcements were made at 9:30 a.m., and since October 1985 at 9:15 a.m. Before 1979, the industrial production press releases give no specific announcement time, stating only "for immediate release." However, the announcements were made before the market opened since at least October 1977.

Data on the unemployment rate, UNEM, and the percentage change in non-farm payroll employment, NFP, are based on the initial announcements by the Bureau of Labor Statistics, and both

are seasonally adjusted. The announced non-farm payroll employment data are converted into percentage changes from the previous month's announced level. During the sample period used here, both the unemployment rate and payroll employment announcements were made at the same time, typically the first Friday in the month. Each announcement may, however, contain unique information since they are based on two different surveys. The unemployment data are collected from a survey of households, conducted and tabulated by the Bureau of the Census for the Bureau of Labor Statistics. The payroll employment data are collected by state agencies from payroll records of employers and are tabulated by the Bureau of Labor Statistics. Moreover, non-farm payroll employment is classified as a "coincidental" economic indicator by the Bureau of Economic Analysis, whereas the unemployment rate has several classifications, including "lagging" indicator. These employment data were announced before the stock market opened, specifically at 9:00 a.m. before March 1982, and at 8:30 a.m. from April 1982 to present.

The merchandise trade deficit, MTD, is announced by the Foreign Trade Division of the Department of Commerce, and it represents the seasonally-adjusted monthly trade deficit in billions

of dollars (trade surpluses are negative). For most of the sample period, these announcements give information on the preceding month's deficit. Starting in March 1987, however, the announcements were delayed several weeks. So, an announcement in March, for example, would give information on January's trade deficit. Between February 1979 and November 1983, the announcement was made at 2:30 p.m. Since January 1984, the announcement has been made at 8:30 a.m., before the stock market was open.[11]

The data on inflation are seasonally-adjusted monthly percentage changes in the consumer price index, CPI, and producer price index, PPI, as announced by the Bureau of Labor Statistics. Beginning in February 1978, the CPI-U (all urban consumers) is used, consistent with the MMS expectations data. The PPI series corresponds to all finished goods, again consistent with the MMS expectations data. The PPI and CPI announcements were made on various days near the middle of each month. The PPI announcement is, however, made earlier in the month than the CPI announcement. With three exceptions, the inflation announcements were made before the stock market opened, specifically at 9:00 a.m. before March 1982, and at 8:30

a.m. from April 1982 to present.[12]

The money stock data consist of seasonally-adjusted weekly percentage changes in the narrowly defined money stock, M1, as announced in the Federal Reserve's H.6 release. The M1 data actually announced are converted into percentage changes from the previous week's announced level. Before January 31, 1980, the announcements were made on Thursdays at 4:10 p.m. and they correspond to changes in "old M1." Then, the announcements were made at 4:10 p.m. on Fridays and they corresponded first to M1-B and then to M1, where this latter M1 is equivalent to M1-B.[13] Beginning on November 29, 1982, money announcements were made at 4:15 p.m. Starting on February 16, 1984, money announcements were switched back to Thursdays, and since March 22, 1984, they have been made at 4:30 p.m. Changes in the Federal Reserve's discount rate and surcharge were announced intermittently with no constant day or announcement time.

C. Expected Values of Announcements

The survey data compiled by MMS International are used in forming measures of the market's expectation of economic announcements. For M1, the survey data start on September 27, 1977. The survey data for the CPI, PPI, and the unemployment

rate begin in November 1977. For industrial production, the data begin in December 1977. For the merchandise trade deficit and non-farm payroll employment, the survey data begin in February 1980 and February 1985, respectively. No survey data are available for discount rate and surcharge announcements. As a consequence, all such changes are treated as unanticipated.[14] Finally, the survey data for M1 and non-farm payroll employment are converted into expected percentage changes from the previously announced level.

Although not reported here, the survey data were subjected to the usual set of unbiasedness and efficiency tests for the entire sample period and over various subsamples [e.g., Pearce and Roley (1985)]. The overall results of these tests are mixed. While the survey data are not always unbiased and efficient, they generally have smaller root-mean-square errors than autoregressive models. To correct for any systematic biases, as well as to update the survey data with new information, revised expectations are formed [e.g., Roley (1983, 1985)]. Since the survey can be taken up to five business days prior to an announcement, the change in the 3-month Treasury bill rate over the four business days prior to an announcement is used as the new information proxy. Equations

used to form the revised expections were estimated for each calendar year.[15] Finally, in addition to the revised expectations measure, all of the empirical results reported in the next section were obtained using unadjusted survey data, with estimation results similar to those reported.

D. Classification of Economic States

To test the hypothesis that the stock market's response to news differs conditional on the stage of the business cycle, some classification of different levels of economic activity is required. This is accomplished using the seasonally-adjusted monthly industrial production index, all items (1977=100). First, a trend in the log of industrial production is found by regressing the actual log of industrial production on a constant and a time trend from September 1977.[16] Second, a constant is added and subtracted from the trend, creating the upper and lower bounds illustrated in Figure 1. The constant 0.028 is chosen so that the actual log of industrial production is above the upper bound, "high" economic activity, 25 percent of the time. As a consequence, the actual log of industrial production is below the lower bound, "low" economic activity, about 25 percent of the time as well. "Medium" economic activity is represented by the

remaining observations between the bounds. This classification scheme is, of course, somewhat arbitrary. Wider bounds eliminate any part of the 1980 recession from the low state, while narrower bounds place more than half of the observations in high and low states. In any event, the empirical results are not very sensitive to moderate changes in the bounds.[17]

III. EMPIRICAL RESULTS

In this section, empirical tests of the effects of economic information on stock prices are presented. The impact of economic information without any allowances for business cycles is first examined. Next, tests of whether stock prices respond to news differently in high and low economic states are considered. Finally, the responses of proxies for expected cash flows and equity discount rates are estimated to determine the source of the varying response of stock prices.

A. Response to Economic Announcements

The impact of new economic information on both stock prices and interest rates is estimated. The results for interest rates are useful at this point as they provide evidence that economic announcements contain relevant information for financial markets.

The responses are estimated using the following specification:

(2) $$\Delta P_t = a + \underline{x}_t^{u}\underline{b} + \underline{d}\,\underline{1} + e_t \quad ,$$

where ΔP_t = percentage change in stock prices or change in interest rates (measured in basis points) from business day t-1 to business day t,

$\underline{x}_t^{u}$ = 1x9 vector of unanticipated components of economic announcements, calculated as $\underline{x}_t^{a} - \underline{x}_t^{e}$,

$\underline{x}_t^{a}$ = 1x9 vector of economic announcements,

$\underline{x}_t^{e}$ = 1x9 vector of expected components of economic announcements,

e_t = random error term uncorrelated with information known at the end of business day t-1,

a, $\underline{b}$ = scaler and 9x1 vector of coefficients, respectively,

$\underline{d}$ = 1x4 vector of day-of-the-week dummy variables,[18]

$\underline{1}$ = 4x1 vector with each element equal to unity.

In addition to this specification, estimation results also were obtained for a specification including the expected values of economic announcements, $\underline{x}_t^e$. The inclusion of these variables has virtually no effect on the estimated response coefficients, $\underline{b}$, since the unanticipated announced changes are uncorrelated with any information available to the public under rational expectations. Because the main focus is on the response to news, the expectations variables are deleted from the regressions.[19]

The estimation results for equation (2) are reported in Table 1 for the entire September 1977 - May 1988 sample. In this and all subsequent tables, White's (1980) procedure is used to calculate the standard errors of the estimated coefficients. The first row in the table shows, for example, that the S&P 500 index falls by 0.1 percent in response to an unanticipated increase in industrial production of one percentage point. The 10-year bond yield and the 3-month Treasury bill yield increase by 5.5 and 9.5 basis points, respectively, in response to this same announcement. While interest rates exhibit statistically significant responses to most of the new economic information, stock prices do not. The S&P 500 index has an estimated response significant at the 5 percent level for only unanticipated components of M1

announcements. This result is similar to that of other studies using much shorter sample periods [e.g., Pearce and Roley (1985)].[20]

B. Response Conditional on the State of the Economy

The responses to economic news conditional on the business cycle are estimated using the following specification:

$$\Delta P_t = a + H \cdot \underline{x}_t^u \underline{b}^H + M \cdot \underline{x}_t^u \underline{b}^M + L \cdot \underline{x}_t^u \underline{b}^L + \underline{d}\,\underline{1} + e_t \quad , \tag{3}$$

where H=1 if economic activity is in the high state and zero otherwise, M=1 if economic activity is in the medium state and zero otherwise, and L=1 if economic activity is in the low state and zero otherwise. The other variables and coefficients are as defined in equation (2).

The estimation results of equation (3) are reported in Table 2. In contrast to the previous tables, the S&P 500 index now responds significantly to a variety of economic information when the response is made conditional on the state of the economy. In particular, the results suggest that good news about economic activity in the high state is bad news for the stock market. For a

one percentage point unanticipated increase in industrial production, stock prices decline by about 0.8 percent in this instance. Similarly, an unanticipated decline in the unemployment rate of one percentage point is estimated to cause stock prices to decline by about 2.2 percent in the high state. Although not significantly different from zero, the point estimates of the responses to these two economic announcements are the opposite signs in the low state. This result implies that previous estimates obtained without any allowances for business-cycle effects are biased toward zero, contributing to the insignificant estimated responses reported in earlier studies.

Other economic information also is estimated to affect stock prices significantly conditional on the state of the economy. Unanticipated increases in both the merchandise trade deficit and the PPI are estimated to have significant negative effects in the high state. Moreover, money announcement surprises affect stock prices significantly in both high and medium states, but the sign of the response is the same across all three states. Finally, CPI announcements are estimated to affect stock prices significantly only in the medium state.[21]

Differences in the estimated stock-price responses across the

business cycle are formally tested in the right-hand columns of Table 2. In the first row, the hypothesis that all estimated coefficients in the high and low economic states are the same ($\underline{b}^H = \underline{b}^L$) is tested. This hypothesis can be rejected at less than the 10 percent significance level. In the next four rows (H2 - H5), the effects of different types of economic information are examined. The hypothesis that the stock market's responses to industrial production and unemployment rate surprises are the same across high and low states (H2) can be rejected at low significance levels. However, hypotheses that the stock market's response to other types of information -- merchandise trade deficit (H3), inflation (H4), and monetary (H5) -- differs over high and low states cannot be rejected at the 10 percent significance level. As a whole, the results indicate that the response of stock prices to news about economic activity depends on business conditions, but the response to other types of news does not. Specifically, good news about the economy is not always good news for stocks since unexpectedly high industrial production or low unemployment can lead to lower stock prices if the economy is strong.

C. Discount Rates or Expected Cash Flows?

Several variables related to equity discount rates and expected

cash flows are examined to determine the source of the varying stock-price response reported above. Proxies for discount rates consist of the 10-year Treasury bond yield, the 3-month Treasury bill yield, the term spread, and the default spread. The growth rate of industrial production is used as the proxy for expected cash flows [e.g., Fama and French (1989) and Fama (1990)].

Test results for the discount rate proxies are reported in Table 3. To perform these tests, equation (3) is estimated for each of the four proxies. The same five tests as those reported in Table 2 are then conducted for each of the four dependent variables. In contrast to the results for stock prices, the hypothesis that the response is the same across high and low economic states for the set of announcements as a group (H1) cannot be rejected at high significance levels for any of the proxies. The hypothesis that the response to news about economic activity is the same across states (H2) also cannot be rejected. Similarly, the remaining tests in the table do not indicate any significant variation in the response. Consequently, the variation in the response of stock prices to economic news does not appear to be due to the response of equity discount rates.

To consider the role expected cash flows play in the stock

market's response, a simple autoregressive model is initially considered. The effect of lagged industrial production, however, is allowed to vary over different economic states. The specific model is

$$(4) \qquad IP_t^i = \alpha^H \cdot H + \alpha^M \cdot M + \alpha^L \cdot L + \beta^H \cdot H \cdot IP_{t-1}^a + \beta^M \cdot M \cdot IP_{t-1}^a + \beta^L \cdot L \cdot IP_{t-1}^a + \epsilon_t \quad (i = a,e),$$

where IP_t^i = announced industrial production (IP_t^a) or expected industrial production (IP_t^e) in month t,

α^j, β^j (j = H, M, L) = estimated coefficients,

ϵ_t = random error term.

The other variables are as previously defined. As indicated, both the announced and expected changes in industrial production are considered.[22]

Estimation and test results of equation (4) are presented in Table 4. In the high economic state, lagged industrial production in month t-1 does not provide significant information in predicting current announced or expected changes. In contrast, significant

predictive ability is estimated in medium and low states. In particular, the higher the growth of industrial production in month t-1, the higher the announced and expected values in month t. Tests of whether the estimated coefficients in high and low states are the same also are reported in Table 4, and this hypothesis can be rejected at the 5 percent level in each case. Thus, the evidence is consistent with information about real economic activity having different effects on expected cash flows across economic states.

To examine the effects of economic news on the expected cash-flow proxy directly, equation (4) is transformed using the implied expression for IP^{a}_{t-1}. Then, unanticipated announced values of the economic variables are included in place of ϵ_{t-1}. In particular, the specification is

$$
\begin{aligned}
(5) \qquad IP^{i}_{t} \;=\; & a^{H}\cdot H + a^{M}\cdot M + a^{L}\cdot L \\
& + \gamma^{H}\cdot H \cdot IP^{a}_{t-2} + \gamma^{M}\cdot M \cdot IP^{a}_{t-2} \\
& + \gamma^{L}\cdot L \cdot IP^{a}_{t-2} + H \cdot \underline{x}^{u}_{t-1}\,\underline{b}^{H} \\
& + M \cdot \underline{x}^{u}_{t-1}\,\underline{b}^{M} + L \cdot \underline{x}^{u}_{t-1}\,\underline{b}^{L} \\
& + \epsilon_{t-2} \quad (i = a,e),
\end{aligned}
$$

where γ^H, γ^M, and γ^L are estimated coefficients, and the other variables are as defined in equations (3) and (4). The vector $\underline{x}^u_{t-1}$ includes the previous month's industrial production surprise (IP^u_{t-1}), as well as the unanticipated components of the other variables closest to this surprise. Because money announcements are weekly, money surprises four and five weeks prior to IP^a_t are included ($M^u_{t-1,4}$ and $M^u_{t-1,5}$).

Test results of equation (5) for announced and expected industrial production are summarized in Table 5. Five hypotheses analogous to those in Tables 2 and 3 are tested. The hypothesis that the information content of economic announcements in month t-1 in predicting industrial production in month t is the same across high and low economic states (H1) can be rejected at extremely low significance levels. The remaining rows in the table indicate that the real economic activity variables (H2) are responsible for this rejection. This pattern is the same as that exhibited by the response of stock prices in Table 2.[23] Consequently, the evidence suggests that stock prices respond differently across economic states because expected cash flows respond differently.

IV. SUMMARY AND CONCLUSIONS

Previous research finds that fundamental macroeconomic news has little effect on stock prices. This study provides evidence that the stock market's response to macroeconomic news depends on the state of the economy. In particular, news of higher-than-expected real activity when the economy is already strong results in lower stock prices, whereas the same surprise in a weak economy is associated with higher stock prices. This result helps to explain the insignificance of macroeconomic news, apart from monetary information, in previous empirical studies.

The source of the varying response of stock prices across economic states appears to be expected cash flows. The responses of equity discount-rate proxies to new economic information were not significantly different across economic states. In contrast, unanticipated increases in economic activity in a weak economy raised expectations about future economic activity and cash flows. This same information in a strong economy did not lead to higher expected cash flows.

Footnotes

1. Chen, Roll, and Ross (1986) also investigate whether monthly stock returns co-vary with various macroeconomic variables. They again find that the explanatory power is low. The main focus of their study, however, is whether the covariance of economic variables with stock returns can explain ex ante returns.

2. Positive surprises are simply referred to as surprises hereafter. Symmetry is assumed for negative surprises.

3. Several recent studies find significant effects from business conditions on stock returns. Ferson and Merrick (1987), for example, find shifts in consumption-based asset-pricing parameters across stages of the business cycle measured by recession versus non-recession. Fama and French (1989) and Fama (1990) consider term premium and default risk premium variables as determinants of equity discount rates. They suggest that the term premium is related to NBER business cycles while the risk premium is related to business conditions over longer periods.

4. See The Wall Street Journal, Monday, February 7, 1983, for a further description of the market response to the unexpected drop in unemployment.

5. See The Wall Street Journal, Monday, November 7, 1988, for a further description of how the market interpreted the unexpected drop in unemployment as bad news.

6. Given the evidence that both short- and long-term interest rates respond differently to money announcement surprises over different Federal Reserve policy regimes [e.g., Roley (1983, 1986), Cornell (1983), and Roley and Walsh (1985)], another potentially interesting hypothesis is that stock prices respond differently to economic news over these regimes. For the October 1979 and October 1982 regimes, however, Pearce and Roley (1983, 1985) and Hardouvelis (1987) find no significant difference in the stock market's response to money surprises. The effects of the monetary policy regimes in October 1979, October 1982, and February 1984 were

nevertheless investigated, and the hypothesis that the stock market's response is the same across regimes for the set of economic announcements considered here can be rejected only at the 25 percent significance level. Consequently, the effects of monetary policy regimes are not examined further.

7. Hardouvelis (1987) examines six real economic activity announcements in addition to unemployment and industrial production: personal income, durable goods orders, index of leading indicators, retail sales, housing starts, and consumer installment credit. He finds that these six variables do not significantly affect the S&P 500 Index.

8. Evidence presented in the next section indicates that estimated coefficients in an AR(1) model for industrial production vary significantly over different economic states. Again, the use of fitted values from this model instead of survey data could bias the response of stock prices to industrial production surprises toward finding business-cycle effects.

9. The eastern time zone is used for all reported closing and announcement times.

10. The 10-year Treasury bond yield also was used in the term and default spreads, replacing the Aaa yield. The test results reported in the next section are qualitatively the same using these alternative definitions.

11. The merchandise trade deficit announcement in December 1983 was made at 9:30 a.m.

12. The PPI announcements in October 1981 and August 1985 were made at 2:00 p.m., and the February 1979 CPI announcement was at 2:30 p.m.

13. Old M1 differs from the current definition mainly in that it excludes "other checkable deposits" at depository institutions. Following the introduction of nationwide NOW accounts in 1981, this category became substantial.

14. Roley and Troll (1984) also make this assumption. Other researchers, however, attempt to forecast discount rate

changes. See, for example, Smirlock and Yawitz (1985), Batten and Thornton (1984), and Hakkio and Pearce (1988). These approaches are not used here because they cannot isolate the specific day in which the change is expected to occur. In contrast to these approaches, Cook and Hahn (1988) simply classify changes into unexpected and expected categories based on Federal Reserve statements.

15. When an economic announcement x_t^a is made before the market opens, for example, the revised expectation is the fitted value of the following estimated equation:

$$x_t^a = a + b \cdot x_t^e + c \cdot (r_{t-1} - r_{t-5}) + e_t ,$$

where x_t^e is the survey measure, r_{t-i} is the 3-month Treasury bill yield at the close of day t-i, e_t is a random error term, and a, b, and c are estimated coefficients. The last few months of 1977 and the first five months of 1988 are included in the 1978 and 1987 calendar years when estimating the equations used to form revised expectations. Also, these measures are calculated over calendar years instead of economic states to avoid possible biases in later tests which examine the effects of business conditions. Even if economic states were used, however, the biases are likely to be small since the survey data should already capture any business-cycle effects. Estimation results for industrial production presented in the next section support this view.

16. Capacity utilization also was used to classify economic states, by adding and subtracting a constant from the average capacity utilization rate. The results were virtually the same as those for industrial production. Namely, market participants react differently to real activity news based on the condition of the economy. In addition, NBER business cycle turning points (illustrated in Figure 1) were considered, but the level of economic activity appears to be more important empirically than the direction (i.e., expansion or recession).

17. A key result in Table 2, for example, is that hypothesis H2 can be rejected at the 5 percent significance level. When the bounds are formed by adding and subtracting 0.040 to trend industrial production (12 percent high states), the p-value for

this test is 0.06. Alternatively, when plus and minus 0.024 is used to form the bounds (30 percent high states), the p-value is 0.11. Other bounds within these extremes formed by adding and subtracting 0.026, 0.030, 0.032, and 0.036 all lead to p-values less than 0.05. The insensitivity of H2 to the width of the bounds around trend industrial production, combined with similar strong rejections of H2 when the states are defined relative to average capacity utilization, suggests that the results of the paper are robust with respect to economic state definition.

18. Following Gibbons and Hess (1981), among others, day-of-the-week dummy variables are included. Thus, "a" represents the intercept for observations corresponding to Fridays, and d_1, d_2, d_3, and d_4 measure the differential intercepts for Monday through Thursday, respectively.

19. Correlations among the unanticipated components of economic announcements, with the exception of the correlation between the discount and surcharge rates, are not significantly different from zero. This result is not surprising since the announcements usually occur on different days.

20. Similar to other studies, the R^2 is very low for the S&P 500 regression. While Roll (1988) reports higher R^2's for daily data, his regressions relate individual stock returns to market returns. In contrast, the regression reported in Table 1 considers daily movements in a proxy for the market return. Because only eight types of economic announcements are considered, and all other news is ignored, it is not surprising that the R^2 is low.

21. Estimation results for a shorter sample period excluding the most recent high state from October 1987 through May 1988 are very similar to those in Table 2. The main difference is that the t-statistic on the stock market's response to unemployment rate surprises in the high state drops to 1.50. The hypothesis that the stock market's response to unemployment rate surprises in high and low states is the same can still be rejected at the 5 percent level. Also, following Garbade (1977), variable parameter regression (VPR) was used as an alternative way to estimate the pattern of temporal variation in the response coefficients. In

particular, this technique was used for industrial production and the unemployment rate separately in stock market regressions. In both cases, the parameter allowing temporal variation (P) was estimated to equal zero to four decimal points using an iterative grid search. For P = 0, the VPR model collapses to OLS. While stable coefficients cannot be rejected using this technique, this hypothesis can be rejected using the classification scheme reported in Table 2.

22. To analyze how market participants respond to economic news, the unadjusted survey data are used in what follows. This also avoids any spurious correlation from the change in interest rates used to revise the survey measures.

23. The estimated coefficients also are consistent with the stock-price response. For unanticipated industrial production in month t-1 in the IP_t^a specification, for example, the estimated coefficients in the high and low states are -0.444 and 0.712, respectively, with t-statistics greater than two in absolute value.

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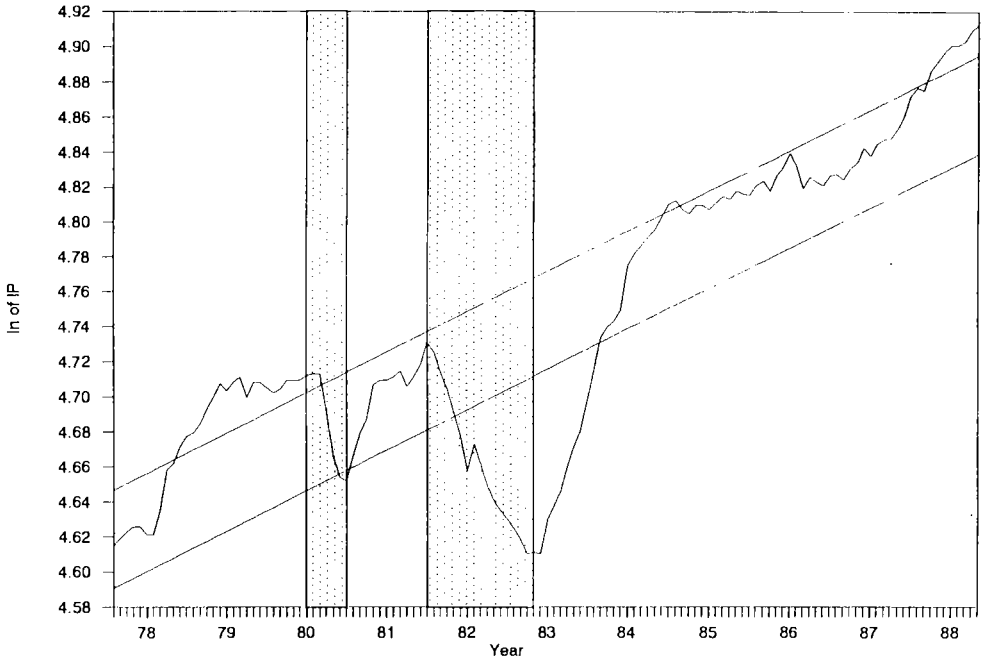

Figure 1
Natural Log of Industrial Production

Actual and Bounds (Trend + and - .028)

= NBER Peaks to Troughs

TABLE 1

Response of Stock Prices and Interest Rates to Economic News
(September 1977 - May 1988, 932 observations)

Announcement	S&P 500	10-year T-bond	3-month T-bill
IP^u	-0.104	5.50*	9.52**
	(0.171)	(3.11)	(4.53)
$UNEM^u$	0.695	-20.31**	-18.88**
	(0.500)	(6.61)	(8.13)
NFP^u	-1.088	54.92**	56.97**
	(1.508)	(12.83)	(11.87)
MTD^u	-0.070	-0.48	-0.39
	(0.066)	(0.50)	(0.74)
PPI^u	-0.455*	11.59**	7.61
	(0.252)	(4.07)	(4.63)
CPI^u	-0.490	10.18*	12.32*
	(0.410)	(5.21)	(6.86)
$M1^u$	-0.363**	8.18**	17.63**
	(0.097)	(1.40)	(2.64)
$DISC^u$	-0.308	8.71**	35.74**
	(0.364)	(3.82)	(8.63)
Summary Statistics			
$\bar{R}^2$	0.020	0.089	0.144
SE	0.996	12.06	19.70
DW	2.10	2.03	1.89

*Significant at the 10 percent level.

**Significant at the 5 percent level.

IP^u = unanticipated change in industrial production (12/77-5/88, 126 observations).

$UNEM^u$ = unanticipated change in the unemployment rate (11/77-5/88, 127 observations).

NFP^u = unanticipated change in non-farm payroll employment (2/85-5/88, 40 observations).

MTD^u = unanticipated change in the merchandise trade deficit (2/80-5/88, 100 observations).

PPI^u = unanticipated change in the producer price index (11/77-5/88, 127 observations).

CPI^u = unanticipated change in the consumer price index (11/77-5/88, 127 observations).

$M1^u$ = unanticipated change in the narrowly defined money stock (9/77-5/88, 557 observations).

$DISC^u$ = unanticipated change in the Federal Reserve's discount rate (9/77-5/88, 38 observations).

$\bar{R}^2$ = multiple correlation coefficient corrected for degrees of freedom.

SE = standard error.

DW = Durbin-Watson statistic.

Notes: Estimation results are for specification (2). The effects of day-of-the-week dummies and changes in the Federal Reserve's surcharge rate are estimated, but not reported. Due to the availability of the survey data used to form expectations, the starting dates for most of the variables begin after September 1977. Standard errors of estimated coefficients are in parentheses, and they are corrected for heteroscedasticity using White's (1980) procedure. Changes in yields are from 3:30 p.m. to 3:30 p.m. on the subsequent business day. Changes in stock prices are from close to close on adjacent business days.

TABLE 2

Response of Stock Prices to Economic News in Different States of the Economy
(September 1977 - May 1988)

	Estimation Results				Test Results		
Announcement	high	medium	low	Hypothesis	F-stat	df	p-value
IP^u	-0.844**	0.227	0.119	H1	2.002*	7,903	0.052
	(0.368)	(0.316)	(0.241)				
$UNEM^u$	2.166**	0.558	-0.640	H2	4.332**	2,903	0.013
	(1.111)	(0.531)	(0.953)				
NFP^u	-5.020	0.786	n.a.	H3	2.577	1,903	0.109
	(3.352)	(1.540)					
MTD^u	-0.631**	0.029	-0.073	H4	1.717	2,903	0.180
	(0.299)	(0.052)	(0.178)				
PPI^u	-1.561**	-0.144	-0.333	H5	0.446	2,903	0.640
	(0.560)	(0.403)	(0.375)				
CPI^u	0.140	-0.775**	-0.242				
	(0.991)	(0.419)	(1.037)				
$M1^u$	-0.424**	-0.279**	-0.412				
	(0.172)	(0.121)	(0.273)				
$DISC^u$	0.549	-0.490	-0.486				
	(0.973)	(-0.458)	(0.458)				

Summary Statistics

$\bar{R}^2$	SE	DW
0.039	0.986	2.07

H1 = estimated responses are the same across high and low states for all economic announcements.

H2 = estimated responses to IP^u and $UNEM^u$ are the same across high and low states.

H3 = estimated responses to MTD^u are the same across high and low states.

H4 = estimated responses to PPI^u and CPI^u are the same across high and low states.

H5 = estimated responses to $M1^u$ and $DISC^u$ are the same across high and low states.

F-stat = F-statistic with (m,n) degrees of freedom.

df = degrees of freedom.

p-value = probability of obtaining that value of the F-statistic or higher under the null hypothesis.

Notes: See the notes to Table 1. Estimation results are for specification (3). "High," "medium," and "low" states of economic activity are calculated relative to trend industrial production, as described in section II.D.

TABLE 3

Tests of the Response of Interest Rates, the Term Spread, and the Default Spread to News Across Different States of the Economy

Hypoth-	10-year T-bond			3-month T-bill			Term Spread			Default Spread		
esis	F-stat	df	p-value	F-stat	df	p-value	F-stat	df	p-value	F-stat	df	p-value
H1	0.735	7,903	0.642	0.995	7,903	0.433	0.996	7,903	0.433	1.060	7,903	0.387
H2	1.001	2,903	0.365	0.482	2,903	0.617	0.483	2,903	0.617	1.294	2,903	0.275
H3	0.360	1,903	0.549	2.509	1,903	0.114	2.525	1,903	0.112	1.261	1,903	0.262
H4	1.218	2,903	0.296	0.651	2,903	0.522	0.648	2,903	0.523	0.314	2,903	0.731
H5	0.888	2,903	0.412	0.952	2,903	0.386	0.946	2,903	0.389	1.403	2,903	0.246

Term Spread = Moody's Aaa corporate bond yield minus the 3-month Treasury bill yield.

Default Spread = Moody's Baa corporate bond yield minus the Aaa yield.

Notes: See the notes to Tables 1 and 2. Test results are for specification (3).

TABLE 4

Industrial Production Autoregressive Model Results
(January 1978 – May 1988, 125 observations)

Estimation Results

	IP^a_t			IP^e_t		
	high	medium	low	high	medium	low
IP^a_{t-1}	-0.176	0.578**	0.632**	0.163	0.458**	0.580**
	(0.198)	(0.108)	(0.284)	(0.113)	(0.073)	(0.173)
Constant	0.334**	0.069	-0.027	0.254**	0.129**	-0.074
	(0.107)	(0.080)	(0.200)	(0.059)	(0.056)	(0.160)

Summary Statistics

	$\bar{R}^2$	SE	DW	$\bar{R}^2$	SE	DW
	0.335	0.696	2.13	0.493	0.463	2.06

Test Results

	IP^a_t			IP^e_t		
Hypothesis	F-stat	df	p-value	F-stat	df	p-value
$\beta^H=\beta^L$	5.461**	1,119	0.021	4.081**	1,119	0.046

IP^a_t = announced change in industrial production in month t.

IP^e_t = expected change in industrial production in month t from MMS survey data.

β^H, β^L = estimated coefficients on IP^a_{t-1} in high and low states, respectively.

Notes: See the notes to Tables 1, 2, and 3. Estimation and test results are for specification (4).

TABLE 5

Tests of the Information Content of Economic News In Predicting Future Industrial Production

	IP_t^a			IP_t^e		
Hypothesis	F-stat	df	p-value	F-stat	df	p-value
H1	7.244**	7,95	0.000	3.233**	7,95	0.004
H2	15.012**	2,95	0.000	7.025**	2,95	0.001
H3	0.033	1,95	0.856	0.019	1,95	0.891
H4	1.428	2,95	0.245	0.504	2,95	0.606
H5	1.151	2,95	0.321	0.305	2,95	0.737

H1 = estimated coefficients are the same across high and low states for all economic announcements made during month t-1.

H2 = estimated coefficients on IP^u_{t-1} and $UNEM^u_{t-1}$ are the same across high and low states.

H3 = estimated coefficients on MTD^u_{t-1} are the same across high and low states.

H4 = estimated coefficients on PPI^u_{t-1} and CPI^u_{t-1} are the same across high and low states.

H5 = estimated coefficients on $M1^u_{t-1,4}$ and $M1^u_{t-1,5}$ are the same across high and low states, where $M1^u_{t-1,4}$ and $M1^u_{t-1,5}$ are unanticipated changes in M1 four and five weeks before IP^a_t, respectively.

Notes: See the notes in Tables 1, 2, 3, and 4. Test results are for specification (5).