THE STOCK MARKET AND MONETARY POLICY: THE ROLE OF MACROECONOMIC STATES

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I. Introduction

In 1994, the Federal Open Market Committee raised the federal funds rate six times to prevent the economy from overheating and inflation from accelerating. Those actions made a great stir in the stock market, with the compound return for S&P 500 plunging to -4.94 percent from 4.04 percent in the previous year. Many people began to doubt the "bull's" claim that the Fed tightening should always boost stock prices because it lowers expected inflation, which in turn would lead to lower costs and higher corporate profits. For the pessimistic "bears," this was one of the many incidents when Fed tightening was an ill omen for holding stocks.

The standard story for a negative effect of Fed tightening on stock prices goes like this: Because the Fed tends to change policy incrementally, a tightening move creates an expectation of future tightening moves. As interest rate expectations rise, the net present value of future dividends falls, which depresses stock prices. The problem with this incomplete story is that it ignores what happens to the future macroeconomy. Previous studies[1] have demonstrated that macro state variables are important in explaining asset pricing equilibrium and have significant effects on stock returns. There is even more evidence of the power of monetary policy variables for forecasting real economic activity. We would argue that macro state variables have reacted differently in each of identified episodes of monetary tightening or easing. Investors, anticipating the change in macro states, might respond positively, or less negatively, to the tightening episodes.

[1] See Lucas (1978); Brock (1982); Cox, Ingersoll, and Ross (1985); Fama and French (1989); Schwert (1989); and Chen (1991).

After the Fed started raising interest rates at the beginning of 1994, many investors thought they were in a market environment similar to the other post-World War II tightening episodes. In retrospect, stock market declines did coincide with some episodes of monetary tightening. However, the reaction of the market to the Fed action, particularly tightenings, is not as self-evident as either the bulls or the bears claim. Charts 1 and 2 display the stock market's performance for the twelve months before and after each tightening action of the Fed. In Chart 1, a tightening is defined as beginning in the month when the Fed raised the discount rate for the third consecutive month, based on the "three-steps rule." Chart 2 identifies the episodes of monetary contractions to be the Romer/Romer dates.[2] The plotted S&P price is indexed by the price at the selected date. The real compound rate of return over the subsequent twelve months is also shown in each panel.[3]

Some characteristics of these plots are noteworthy. In Chart 1, we obviously have mixed behavior in the stock market in the wake of each rate-raising episode. The positive stock return for the next twelve months appears in four out of eight postwar tightening episodes. The episode in January 1978 is noteworthy. The market had a persistently downward trend for the previous months but went up after the Fed jacked up the discount rate. The market ended up with a 0.41-percent gain for the next twelve months. Particularly interesting is the comparison of the episodes in 1980 and 1989. Both

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[2] Romer and Romer (1989, 1993) identified seven dates of the Fed tightening from both the published accounts of the decisions of the Federal Open Market Committee and, when available, the minutes of the FOMC Meetings.

[3] The horizontal axis shows the indexes over a span of twenty-five months, which includes the specified date, indicated by 0, and twelve months forward and backward. The calculated stock return is the compound rate of return of S&P 500 over twelve months after the specified date.

show an upward movement in stock prices prior to the tightening, but a completely different subsequent return. The 1980 episode led to a 15-percent loss, but the 1989 episode was followed by a 6-percent gain. Chart 2 basically tells the same story. The tightening episode in 1988 was followed by a gain of more than 20-percent over the next twelve months. In sharp contrast, the tightenings in 1968 and 1974 resulted in a loss of almost 20-percent over one year afterward. Compared with these losses, last year's stock market return was minor. Nevertheless, the evidence that rate increases or Fed tightenings always lead to stock market losses is not robust. There must be some other factors that are not taken into account.

Table 1 presents the short-term and long-term macroeconomic states[4] after each date of tightening, identified by the "three-steps rule." Each row reports the average value of real stock returns and each state variable for eight episodes, based on three, six, and twelve month horizons corresponding to the upper, middle, and lower panels, respectively. The tightening episode in January 1978 still stands out as an exception. Over the six months following the Fed's action, the economy was in a boom. The spread between long-term bonds and short-term bills was the widest across the episodes, and default risk was the second smallest of these episodes. Although the inflation and 3-month T-bill rates were not relatively lower, the growth rate of industrial production was the highest across all the episodes.

The last two rows in each panel display the averages for two groups, the episodes

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[4] Throughout this paper, we use the following macroeconomic variables: NBER recession dates, term structure, default risk, CPI inflation, nominal three month Treasury bill rate, and the growth rate of industrial production. A detailed discussion of each variable can be found in the next section.

leading to positive returns and those leading to negative returns. NBER, term structure, and output growth (except for one case in the panel of six months) all show uniformly larger values for the group of positive returns. Risk, inflation, and short-term bill rate all show smaller values for the same group. Evidence in Table 1 confirms the potential importance of macroeconomic states.

This paper investigates the reaction of stock returns to monetary policy disturbances. Two main issues are addressed here. First, we examine empirically whether macroeconomic variables transmit monetary shocks to the stock market. Unlike other studies which use macro variables as explanatory variables, our study shows that the effect on stock returns of the change in monetary policy is contingent on the macroeconomic "state." Second, to better understand the role of macro variables, we test for asymmetric effects of monetary policy based on recent studies. The rest of the paper proceeds as follows. The next section describes the variables used in the subsequent tests. In section three, we conduct preliminary tests of whether the effect of past monetary shocks on stock returns depends on macroeconomic states. In section four, we discuss the problem of statistical inference related to the "nuisance" parameters and bring up a proper Sup-Wald test for nonlinearity. We also confirm that our findings are robust to whether episodes of Fed tightening or easing are considered. Section Five concludes by interpreting our findings.

II. Data

In this section, we explain what motivates the choice of monetary policy variables and the state variables used in this study. Our choice of the monetary variables rests on the assumption of their exogeneity. Until recently, the conventional practice was to use different measures of money stock such as M1 or M2 as the policy instrument. We do not pursue this strategy for two reasons. First, Duca (1993, 1995) argues that M2 is not an appropriate policy indicator because of rapid innovations in financial markets that have led to large portfolio shifts away from conventional monetary aggregates. Second, Gordon and Leeper (1992) show that, measured by the aggregate stock, contractionary monetary shocks are followed by decreases in short-term interest rates. To avoid these problems, we then choose the log of the ratio of non-borrowed reserves to total reserves (RES) to be our monetary variable based on the work of Christiano and Eichenbaum (1992) and Strongin (1995).[5]

As regards our second policy indicator, we base ours on the Federal Funds rate. A number of authors have found that the Federal Funds rate is a better measure of monetary policy shocks. Since this is a nominal rate, and since it is usually difficult to observe expected inflation, we use the spread between the rate of ten-year Treasury bond yield and the Fed Funds rate (FFBOND) as our policy proxy.[6]

The first state variable (NBER) we choose is the peak and trough cycle for the U.S. economy indicated by NBER dates. Those dates are based on the postwar business-cycle chronology of the National Bureau of Economic Research as a measure of business

[5] Christiano and Eichenbaum (1992) suggests non-borrowed reserves (NBR) as the monetary aggregate. Strongin (1992) argues that the ratio of NBR to total reserves provides an even sharper measure of exogenous money supply shocks.

[6] Bernanke and Blinder (1992) argue persuasively that the federal funds rate, as well as the spread between federal funds and Treasury bonds, are good indicators of monetary policy.

cycle conditions. NBER equals 1 during expansions and 0 during contractions.

The term structure (STRU) is defined as the difference between the ten-year Treasury bond yield and the one-year Treasury bill rate.[7] Default risk (RISK) is measured by the spread between the six-month commercial paper and six-month Treasury bill rates. Recent studies[8] have shown that this spread has been a good indicator of real economic activity, with a rise in the spread signaling an imminent economic downturn. The inflation rate (INF) is measured using the consumer price index, and is annualized. Real stock returns are usually considered to be negatively related to expected inflation.[9] Here we use the previous three-month moving average as a proxy of the current expected inflation rate. The nominal three-month Treasury bill rate (SINT) is also included to capture movements in three-month expected inflation.[10]

The last state variable is the growth rate of industrial production (PROD). Fama (1990) has shown that leads of production growth help explain stock returns.[11] Consequently, we take three-month moving average for the current and next two months to be our state variable. The dependent variable in this paper is the real rate of return on stocks using the S&P 500 composite price index deflated by the CPI.

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[7] See Breeden (1986) and Fama (1990) for the implication of the term spread in the asset pricing model.

[8] See Stock and Watson (1989) and Friedman and Kuttner (1992).

[9] Fama (1981) shows evidence of a negative relation between both expected and unexpected inflation, and the real stock return.

[10] Fama and Schwert (1977) use the nominal return on a default-free bond over a given period as their measure of expected inflation over that same period.

[11] See Fama (1981), Geske and Roll (1983), Kaul (1987), Barro (1990), and Shah (1989) for the strong relationship between stock returns and future real activity.

III. A Preliminary Test

As mentioned earlier, the effect of past monetary tightenings on stock returns depends on the state of the macroeconomy. This section tests this proposition using monthly data from 1958 to 1994. The criterion we adopt to discern the upper state and the lower state in the economy is as follows: The economy is in the upper state if the state variable has been "substantially" higher than average; otherwise, it is in the lower state. Based on the results in Table 1 and discussion in the previous section, we will name the upper states for PROD and STRU "good" states, and the lower states for them are named "bad" states. The reverse is true for the other three variables.

The following reduced-form stock return equation is used to test the "state-dependent" hypothesis:

$$R_t = \theta_0 + \sum_{i=0}^{2} \theta_i R_{t-i} + \sum_{j=1}^{k} (\alpha_j + \beta_j S_t) M_{t-j} + \epsilon_t, \tag{1}$$

where M is the chosen monetary variable, FFBOND or RES, k is equal to six with FFBOND, and twelve with RES.[12] We choose the lag length of R to be two because longer lags are never significant, and two lags are sufficient to eliminate serial correlation.[13] According to the regression, the coefficient of each change of monetary variable in the past depends on the dummy variable S_t, which equals 1 if the economy is in good state at time t and is otherwise 0. Hence, the key proposition to be tested is the

[12] The Akaike Information Criterion is used to determine the lag length of the monetary variable. We found that six is the optimal lag length compared with those greater than six in the model with FFBOND. However, the optimal lag length is twelve in the model with RES.

[13] Ljung-Box Q statistics are checked for serial correlation, and the Newey and West (1987) method is used to correct for heteroskedasticity.

joint significance of all ß's and the sum of all ß's.

We first need to define S_t for each macro variable:

S_t = 1 if MACRO < (or >) $\mu + j\sigma$; 0 otherwise.

We choose > for PROD and STRU and < for the other three variables. μ and σ are the mean and the standard deviation of MACRO over the entire sample. Based on the previous studies on the relationship between stock returns and each macro variable, we define the macro state variables ($MACRO_{x,t}$) as follows:

(Production Growth)	$MACRO_{prod,t} = (PROD_t + PROD_{t+1} + PROD_{t+2})/3$	
(Inflation)	$MACRO_{inf,t} = (INF_{t-1} + INF_{t-2} + INF_{t-3})/3$	
(Term Structure)	$MACRO_{stru,t} = STRU_{t-1}$	
(Default Risk)	$MACRO_{risk,t} = RISK_{t-1}$	
(Short-Term Rate)	$MACRO_{sint,t} = SINT_{t-1}$	
(Business Cycle)	$MACRO_{nber,t} = NBER_t$.	(2)

If, for example, j is set at 1, the equation says that the current economy is in the upper (lower) state whenever the $MACRO_t$ is "one standard deviation higher (or lower) than average." In the results of Table 2, j is selected so as to minimize the sum of squared residuals of the stock return equation (1).[14]

Table 2 reports the outcome for the chosen k and the test results for ß's in each regression. Regressions were estimated with two alternative monetary variables and five different macro state measures. Also reported is the calculated "threshold" value of each

[14] We also restrict the search interval to be [-1,1]. The macro variable NBER does not involve the search procedure. St is 1 if NBER dates are in expansion, and is 0 if dates indicates recession.

MACRO variable of the selected k given in the parenthesis. Based on the threshold value, we can split the sample into good and bad states. The key point to note is that the ß's in most regressions turn out to be significant. This implies that the dummy variable S_t contains significant information about how each monetary policy variable affects the stock market.

Table 2 also provides test results for the significance of the sums of α's and ß's in each regression. The value of sum and t-statistics are reported from the first to the fifth column. The results are mixed. The sum of ß's indicates the accumulated effect of past changes in the monetary variable if the current state is "good" based on the chosen macro variable. With FFBOND as the monetary variable, the state variable generated by NBER, PROD, STRU, and RISK yields a significant sum of ß's at the 5-percent level. With RES, three state variables based on NBER, INF, and STRU also result in a significant sum of ß's. Only in the regression with FFBOND are both sums of α's and ß's significant if the state variables are $MACRO_{nber,t}$, $MACRO_{prod,t}$, and $MACRO_{stru,t}$. For those three models, we can conclude that the change in FFBOND in the past six months should have a significantly different effect on the current stock return, depending on whether the current period is in expansion, expected industrial production growth for the next three months is positive, or the yield curve spread (term structure) in the previous month is larger than 1.69.

IV. A Formal Test of Nonlinearity

This section will present a formal test for possible changes in estimated parameters of monetary variables over two different macro states. The test considered in the previous section poses two problems in terms of statistical validity. The structure of each macro-state variable described above is assumed to be known. In other words, we define the state variable to be either three-month average or the actual level. The "delays," -- How long ago did the value of a variable reveal better information about its current state? -- are also a priori determined. One can easily argue that those choices are arbitrary. Related to the first problem is the appropriateness of the Chow-type test used in section three for parameter change. This test is applied after we specify a value for j. As recent statistical literature[15] has shown, this test is crippled if the threshold value of each MACRO, determined by j, is known only under the alternative hypothesis but not under the null. In our model, another "nuisance parameter" undefined under the null is the "delay" for each MACRO.[16] Since the selection of these nuisance parameters is conditional on data, the standard critical values are severely biased in favor of rejecting the null of no break or linearity in parameters.

To test for nonlinearity, we consider the following model:

$$R_t = \theta_0^1 + \sum_{i=0}^{2}\theta_i^1 R_{t-i} + \sum_{j=1}^{k}\beta_j^1 M_{t-j} + \epsilon_t^1 + [\theta_0^2 + \sum_{i=0}^{2}\theta_i^2 R_{t-i} + \sum_{j=1}^{k}\beta_j^2 M_{t-j} + \epsilon_t^2]\bullet I[MACRO_{t-d} \geq \gamma], \quad (3)$$

where I[ ] is an indicator function equal to 1 if $MACRO_{t-d} \geq \gamma$, and to 0, otherwise. Both the delay value d and the threshold value γ distinguishing the states are unknown under the null hypothesis that the effect of monetary variables does not depend on the

[15] See Davis (1987), Hansen (1991), Andrews and Ploberger (1992), and Andrews (1993).

[16] One way to understand "delays" is that people might not have sufficient information about the current period. Their expectation of macro states need to be based on its past values.

macro states.[17] Since they have to be estimated, a non-standard testing procedure is needed. We first impose a range for the possible values of γ, which covers 80-percent of the sample for each macro variable.[18] The threshold variable, MACRO, is defined to be the actual value or the three-month moving average of PROD, INF, STRU, RISK, and SINT. The searched delays are from 1 to 4 months for the actual value, and from 0 to 2 months for the moving average. For example, MACRO for inflation is one of the following seven variables: INF_{t-d} (d=1, 2, 3, 4), and $MA_{inf,t-d}$ (d=0, 1, 2).[19] For each threshold variable, the Sup-Wald statistics can be calculated over the possible threshold values of γ. Then both d and γ can be determined by the maximum of the Sup-Wald statistics for each of the seven choices.

As was stated above, the standard critical values for χ^2 are not appropriate to determine the significance level of calculated Sup-Wald statistics. Based on Generalized Method of Moment estimators, Andrews (1993) constructs test statistics that do not take the change point as given and provides critical values of Sup-Wald statistics for a wide range of different search intervals. In Table 3, we report the selected threshold variable, its values and its Sup-Wald statistics. The hypothesis of linearity is still tested in the models with FFBOND and RES. Because the Federal Reserve changed its operating procedures for monetary policy during the early Volcker years, the new policy led to an abnormal increase in interest rates. We drop the period between October 1979 and

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[17] If both d and γ are identified, the null hypothesis is whether all θ^2's and β^2's are significantly different from 0. Then the standard F-test or Maximum Likelihood test for one-time structural break can be applied.

[18] Andrews (1993) suggests the search interval to be 80-percent of the observations if no knowledge of the change point is available.

[19] The three-month moving average at time t is defined to be $(INF_t+INF_{t-1}+INF_{t-2})/3$.

December 1982 from the sample when the model with FFBOND is tested. The results provide strong evidence of nonlinearity in the equation of stock returns with PROD, STRU, and RISK as the state variables, regardless of the choice of the monetary variable. In other words, there is a different response of stock returns to lagged monetary variables when the current macro state is "good", versus when it is "bad."[20] For instance, the selected threshold variable for production growth for the model with FFBOND is $PROD_{t-2}$, and its value is -0.32. We can then say that the effect on R_t of $FFBOND_{t-i}$ (i=1 to 6) differs, depending upon whether industrial production is declining at a fast enough rate (i.e., $PROD_{t-2} < -0.32$).

We note that although the statistical evidence generally shows nonlinearity in our stock return equation, we also need to test whether stock returns react differently to the monetary variable across two states. Since both d and γ have been estimated formally, we may take them as given and test for the differential effect of the change in monetary policy. The model we test is similar to the one in section 2:

$$R_t = \alpha_0 G_t + G_t(\sum_{i=1}^{k} \alpha_i M_{t-i}) + \beta_0 B_t + B_t(\sum_{j=1}^{k} \beta_j M_{t-j}) + \epsilon_t, \tag{4}$$

where G_t is a dummy variable that equals 1 when the macro state at t is "good" based on the threshold values in Table 3, and B_t is a dummy variable indicating the "bad" state. To test the estimated coefficients properly, we use the Newey and West (1987) method with a truncation lag of 2 to correct for serial correlation and heteroskedasticity. The months

[20] According to our definition of the threshold variable, the current macro state may depend on its past performance.

between October 1979 and December 1982 are omitted from the sample when M_t is chosen to be FFBOND. What we are interested in is the accumulated effect of the past changes in monetary variables on the current stock return, i.e., the significance of $\Sigma\alpha_i$ (i=1 to k) and $\Sigma\beta_j$ (j=1 to k). We then test the hypothesis that there is no difference between the estimated coefficient sums for the sample split by two different macro states, i.e., $\Sigma\alpha_i$-$\Sigma\beta_j$ =0 (j=1 to k). Rejecting this hypothesis will be interpreted as evidence that the relationships between monetary variables and stock returns are different in the good and bad states.

Table 4 reports the results from the tests described above. The upper panel presents the tests for the regression with FFBOND and the lower one for the regressions with RES. Except in one regression with STRU, the results in the upper panel generally show that macroeconomic states significantly affect how stock returns respond to exogenous monetary policy variables. This can be seen from the test statistics in the fourth column. Moreover, the accumulated effect of FFBOND is more important when the current realized macro state is "bad." (The t-ratios in the third column are uniformly significant at the 5-percent level.) The results with RES are somewhat less strong. $\Sigma\alpha_i$ and $\Sigma\beta_j$ are significantly different in the regressions with INF and STRU. Surprisingly, the regression with RISK fails to show any significant results at all.

The discussion so far has highlighted the fact that the state of the macro economy significantly affects how the market reacts monetary policy actions. What we have yet to test is whether the absolute size of monetary policy effects on stock prices depends on whether the monetary policy actions are tightening or easing moves. It has been widely held that monetary policy has an asymmetric effect on real output and prices.[21] As some may argue, monetary tightening might result in a "bad" state. Similarly, monetary easing might also lead to a "good" state. However, it is not appropriate to say that a decline in FFBOND or a rise in RES can be construed as a tightening action by the Fed. Hence, the previously reported sign or magnitude of the sums of α's and β's in the tests of nonlinearity may be confusing.

To appropriately implement and evaluate the market response due to a tightening or easing of monetary policy, a model is required to identify the tightening episodes and separately measure the effect of monetary variables. As a first step of carrying out this task, we use an index of monetary policy constructed by Boschen and Mills (1995) based on FOMC directives and the associated policy discussion in The Record of Policy Actions of the FOMC.[22] They assign to each month integers ranging from -2 to 2 to show the intention of the Fed. The tightenings are represented by -2 and -1, and easings by 1 and 2. We plot FFBOND and RES in Chart 3, with shaded areas indicating months of tightening. The chart generally confirms that FFBOND declines and RES rises during the tightening episodes. We create two dummy variables: T_t for the tight periods in which the assigned number is negative and L_t for the expansionary periods whose number is greater than or equal to 0. Combining with the dummy variables, G_t and B_t, we then can test the following model:

[21] See Ball and Mankiw (1992), Cover (1992), and Morgan (1993).
[22] We thank L. O. Mills for generously providing us the extension of the data.

$$R_t = \alpha T_{t-k} G_t + ßT_{t-k} B_t + \gamma L_{t-k} G_t + \theta L_{t-k} B_t + \epsilon_t, \tag{5}$$

where k is chosen to be three, six, nine, and twelve to capture the possible lagged reaction in the market.[23] G_t and B_t are constructed based on the results from the tests of nonlinearity in section IV. α and ß equal the average values of R k months after the Fed tightens, corresponding to whether the macro state is "good" and "bad" at month t. By rejecting the hypothesis $\alpha = ß$; we can confirm that the means of stock return significantly differ over two subsamples -- periods in which we can find a "good" current state and tight policy k months ago, and periods in which we can find a "bad" current state and tight policy k months ago. Rejection of the hypothesis $\gamma = \theta$ implies that the means of stock returns differ significantly over another two subsamples -- periods in which we can find a "good" current state and expansionary policy k months ago, and periods in which we can find a "bad" current state and expansionary policy k months ago.

Test results from equation (5) are presented in Table 5. To check for the equality of the means of stock returns across two states, we perform χ^2 tests for the hypotheses $\alpha = ß$ or $\gamma = \theta$. Based on the results in Table 3, we generate two different sets of G_t and B_t. In Panel A, the dummy variables for the states are constructed from the model with FFBOND. In Panel B, they are constructed from the model with RES. In Panel A, we cannot reject the hypotheses of equality at the 5-percent level if the dummies are based on RISK, SINT, and STRU. In Panel B, the evidence of significantly different means is

[23] The method of Newey and West (1987) is also used to correct for serial correction and heteroskedasticity. We also dropped the periods between October 1979 and December 1982 to estimate the model if the dummy variables G_t and B_t are constructed by the results from the model with FFBOND.

found in the models with the state dummies generated from PROD, STRU, and RISK. Although there is mixed evidence that the absolute impact of monetary policy may differ depending on whether the Fed is easing or tightening monetary policy, some macro state variables still significantly affect the response of stock returns to monetary policy moves.

V. Conclusion

Previous studies have found that macroeconomic variables have significant effects on stock returns. Further, people usually regard a Fed tightening action as a signal that stock returns will fall. Nonetheless, previous research has not established a state-dependent linkage between stock returns and the changes in monetary policy. In this paper, we have used a new approach to modeling the response of the stock market to macroeconomic variables. We have formally tested a nonlinear time-series model to ascertain whether macroeconomic states affect the propagation of monetary shocks on stock returns. We also investigated whether the state-dependent assumption is still sustained if Fed tightening and loosening moves are considered separately.

Our results indicate that the macroeconomic states have the potential to explain why the stock market and policy actions might move differently than people expect. We also find that this result is robust to whether contractionary and expansionary monetary episodes are considered separately. We have shown that using the proper statistical strategy allows one to consider nonlinear behavior in stock prices, which is impossible to address using the linear models of the previous studies.

Our methodology here can also be widely applicable to the analysis of financial data. Another class of nonlinear models, ARCH (autoregressive conditional heteroskedasticity) has been well adapted to the empirical studies in the literature of finance. However, the state-dependent model has usually been ignored. In this paper, we use the threshold model, a special case of the state-dependent model, to test for the dependence of estimated coefficients upon a threshold variable and its value. In most studies of the stock market, it can be reasonably argued that the possible threshold variables include macroeconomic variables, market volatility, trading volume, firm's capital structure, and so on. Most of the linear models done in the past can be easily reexamined using this approach.

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TABLE 1: Stock Returns and Macroeconomic Variables

	DATE	RET	NBER	STRU	RISK	INF	SINT	PROD
Three-month:								
	5509	1.90	1.00	0.38	.	0.30	2.38	0.77
	5903	1.81	1.00	0.34	0.23	1.93	3.07	1.24
	6512	-4.22	1.00	-0.16	0.20	4.12	4.73	0.99
	6804	3.28	1.00	-0.23	0.58	5.77	5.65	0.44
	7305	-5.67	1.00	-1.03	1.13	9.90	8.23	0.44
	7801	0.71	1.00	0.71	0.12	7.58	6.54	1.33
	8012	-2.84	1.00	-1.16	0.87	10.06	15.14	-0.04
	8902	4.72	1.00	-0.17	1.04	6.84	8.95	0.17
Average(+)		2.49	1.00	0.20	0.39	4.48	5.32	0.79
Average(-)		-4.25	1.00	-0.78	0.73	8.03	9.37	0.46
Six-month:								
	5509	6.33	1.00	0.36	.	0.30	2.38	0.34
	5903	0.45	1.00	0.12	0.15	1.92	3.34	-0.38
	6512	-8.03	1.00	-0.16	0.45	3.30	4.72	0.76
	6804	5.55	1.00	-0.11	0.56	5.17	5.50	0.36
	7305	-9.45	0.83	-0.96	1.29	8.91	8.14	0.42
	7801	2.91	1.00	0.55	0.22	8.74	6.73	0.92
	8012	-5.57	1.00	-1.27	0.97	9.23	15.42	0.04
	8902	13.01	1.00	-0.11	0.95	5.65	8.68	-0.16
Average(+)		5.64	1.00	0.16	0.47	4.35	5.32	0.21
Average(-)		-7.68	0.94	-0.79	0.90	7.16	9.42	0.40
Twelve-month:								
	5509	2.85	1.00	0.28	.	1.84	2.50	0.35
	5903	-3.82	1.00	-0.04	0.22	1.51	3.75	0.37
	6512	-14.89	1.00	-0.28	0.49	3.30	4.99	0.53
	6804	0.00	1.00	-0.13	0.49	5.38	5.82	0.45
	7305	-25.41	0.42	-0.79	1.29	10.17	8.11	0.05
	7801	0.41	1.00	-0.10	0.47	8.85	7.68	0.64
	8012	-15.56	0.50	-0.87	0.96	8.54	14.74	-0.17
	8902	6.36	1.00	0.02	0.71	5.13	8.27	-0.01
Average(+)		3.2	1.00	0.07	0.59	5.27	6.15	0.32
Average(-)		-11.83	0.78	-0.42	0.69	5.78	7.48	0.24

Notes: The dates are chosen based on the "Three-Steps Rule," which states that three successive rises in the discount rate must be followed by a tumble in the stock market. RET is the compound real stock return during the specified periods. The notations of macro variables are defined in section two of the text. Average(+) and average(-) is the average value of each variable if RET is positive and negative across these eight spisodes, respectively.

TABLE 2: Stock Return Regressions

	$\Sigma\alpha_i$	t_α	$\Sigma\beta_i$	t_β	χ^2	Sig.	Threshold value (j)
			FFBOUND (i=6)				
(NBER)	17.12	4.33	-15.88	-3.64	25.75	0.00	
(Inflation)	5.05	1.38	-2.54	-0.64	13.92	0.03	7.75 (1.00)
(Production Growth)	8.43	2.62	-7.34	-2.22	10.78	0.09	0.00 (-0.40)
(Short-Term Rate)	4.09	1.05	0.03	0.01	21.34	0.00	8.46 (0.80)
(Term Structure)	6.36	2.91	-5.96	-2.95	18.06	0.00	1.69 (0.90)
(Default Risk)	-0.37	-0.21	5.13	2.56	25.53	0.00	0.24 (-0.60)
			RES (i=12)				
(NBER)	-14.55	-0.25	3.89	2.31	9.83	0.13	
(Inflation)	-30.24	-0.42	2.99	3.51	28.50	0.00	4.13 (-0.10)
(Production Growth)	-77.22	-1.12	-1.02	-0.64	74.31	0.00	-0.00 (-0.80)
(Short-Term Rate)	-184.0	-2.25	-0.11	-0.09	39.04	0.00	8.46 (0.80)
(Term Structure)	34.38	0.50	4.13	2.67	34.65	0.00	-0.24 (-0.90)
(Default Risk)	-27.42	-0.43	-2.49	-1.53	51.85	0.00	0.97 (1.00)

Notes: The reported χ^2 statistics are the results from the tests for the joint significance of all β_i's in each regression.

TABLE 3: Tests for Nonlinearity

Monetary Variable:	FFBOND			RES		
Macro Variable	Threshold Variable	Value	Sup-Wald	Threshold Variable	Value	Sup-Wald
(Inflation)	$MA_{inf,t}$	3.4602	22.80	INF_{t-3}	6.2665	47.63***
(Production Growth)	$PROD_{t-2}$	-0.3249	27.25**	$MA_{prod,t-1}$	0.2082	38.21**
(Short-Term Rate)	$SINT_{t-2}$	5.5000	19.24	$MA_{sint,t}$	8.1433	49.68***
(Term Structure)	$STRU_{t-4}$	1.5900	29.72**	$STRU_{t-4}$	-0.1562	64.84***
(Default Risk)	$RISK_{t-3}$	0.6194	27.93**	$MA_{risk,t}$	0.7870	55.23***

Notes: In the tests, k is chosen to be 6 for the model with FFBOND and 12 for the model with RES. The critical values based on the 70-percent search interval and 9 degrees of freedom are 23.15, 25.47, and 30.52 at the 10-percent, 5-percent, and 1-percent level for the model with FFBOND. The critical values based on the 70-percent search interval and 15 degrees of freedom are 32.51, 35.06, and 40.56 at the 10-percent, 5-percent, and 1-percent level for the model with RES. The critical values are shown on Table 1 in Andrews (1993).

*** indicates significance at the 1-percent level.

** indicates significance at the 5-percent level.

* indicates significance at the 10-percent level.

TABLE 4: Stock Return Regressions

	$\Sigma\alpha_i=0$	$\Sigma\beta_i=0$	$\Sigma\alpha_i - \Sigma\beta_i=0$
FFBOND(i=1 to 6)			
(Inflation)	-2.59 (-1.73)*	5.41 (3.27)***	-8.01 (-3.70)***
(Production Growth)	4.31 (3.06)***	9.91 (4.27)***	-5.60 (-2.34)**
(Short Interest, Rate)	-0.82 (-0.41)	6.26 (2.51)**	-7.08 (-2.19)**
(Term Structure)	1.69 (0.19)	7.78 (3.85)***	-6.08 (-0.67)
(Default Risk)	0.16 (0.10)	9.36 (3.24)***	-9.19 (-2.19)**
RES(i=1 to 12)			
(Inflation)	54.26 (0.82)	-382.43 (-4.51)***	436.69 (4.31)***
(Production Growth)	-228.77 (-3.25)***	-258.82 (-2.13)**	30.05 (0.24)
(Short Interest Rate)	-241.10 (-2.82)**	-182.64 (-0.88)	-58.46 (-0.28)
(Term Structure)	107.26 (1.44)	-848.22 (-4.62)***	955.53 (4.82)***
(Default Risk)	19.15 (0.26)	-352.22 (-1.30)	371.37 (1.32)

Notes: The t-ratios are reported in the parentheses.
*** indicates significance at the 1-percent level.
** indicates significance at the 5-percent level.
* indicates significance at the 10-percent level.

TABLE 5: Testing for Different Effects of Monetary Easings and Tightenings

	PANEL A		PANEL B	
Testing Hypothesis:	$\alpha = \beta$	$\theta = \gamma$	$\alpha = \beta$	$\theta = \gamma$
(Inflation)				
k=3	4.20**	3.85**	1.56	0.19
k=6	7.86**	4.89**	2.83*	0.69
k=9	4.39**	7.55**	2.21	1.64
k=12	8.89***	4.29**	3.63*	0.74
(Production Growth)				
k=3	0.11	11.57**	0.69	2.22
k=6	1.08	5.67**	1.14	2.69*
k=9	8.97***	0.19	4.43**	0.76
k=12	5.88**	1.05	3.95**	2.00
(Short-Term Rate)				
k=3	5.53*	0.69	0.34	0.09
k=6	3.15*	0.02	0.23	0.00
k=9	0.85	0.89	0.14	0.34
k=12	1.54	0.31	0.34	0.62
(Term Structure)				
k=3	0.79	0.50	1.38	2.85*
k=6	0.28	0.41	5.58**	2.43
k=9	0.51	0.93	7.44**	4.43**
k=12	0.02	0.72	6.38**	2.74*
(Default Risk)				
k=3	3.14*	1.75	7.28***	0.80
k=6	0.59	0.09	4.33**	0.00
k=9	0.05	0.08	0.85	0.58
k=12	0.09	0.41	0.21	1.55

Notes: The reported test statistics are χ^2_1.
*** indicates significance at the 1-percent level.
** indicates significance at the 5-percent level.
* indicates significance at the 10-percent level.

CHART 1
Stock Prices Around 8 Tightening Episodes

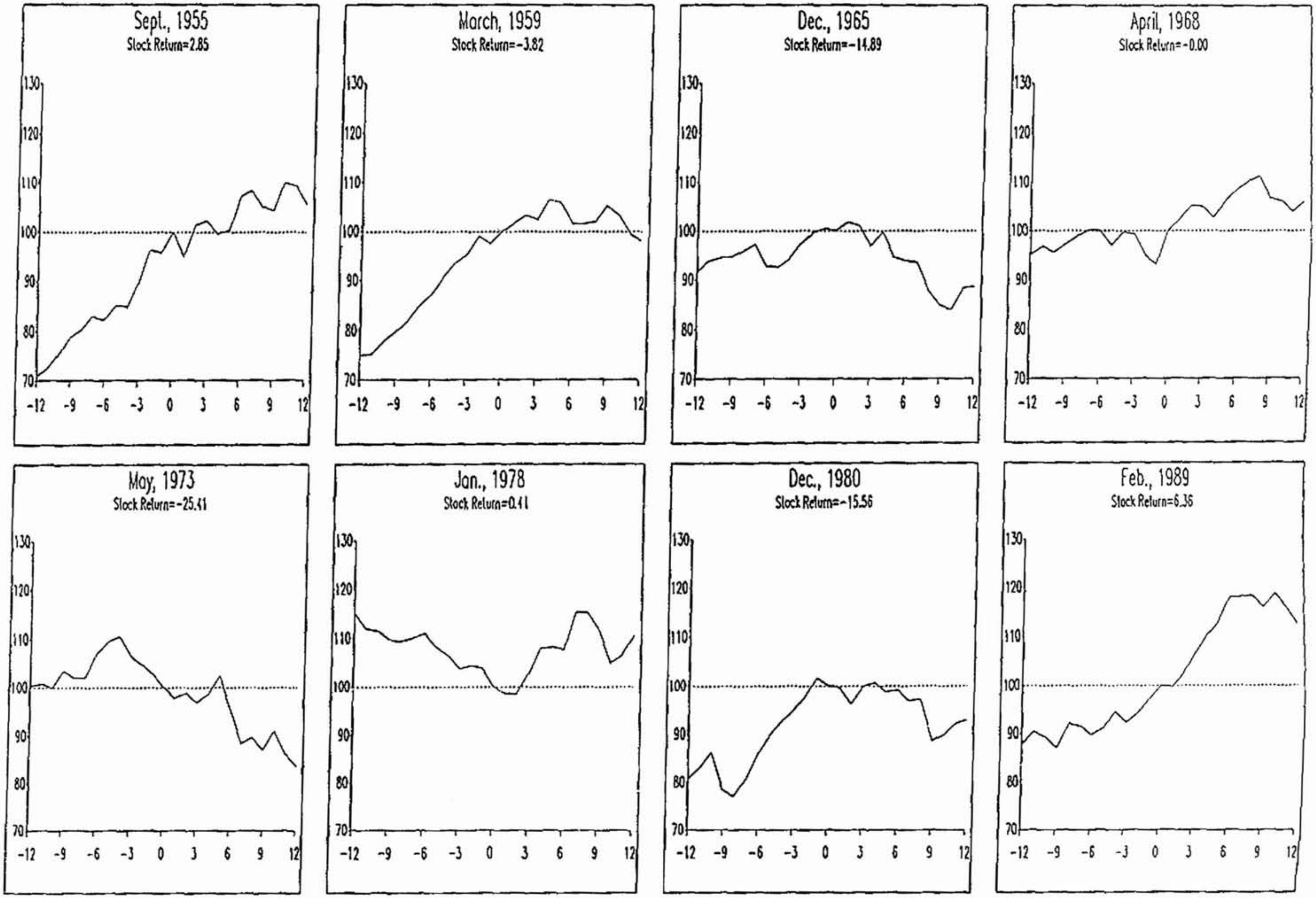


CHART 2
Stock Prices Around "Romer" Tightening Dates

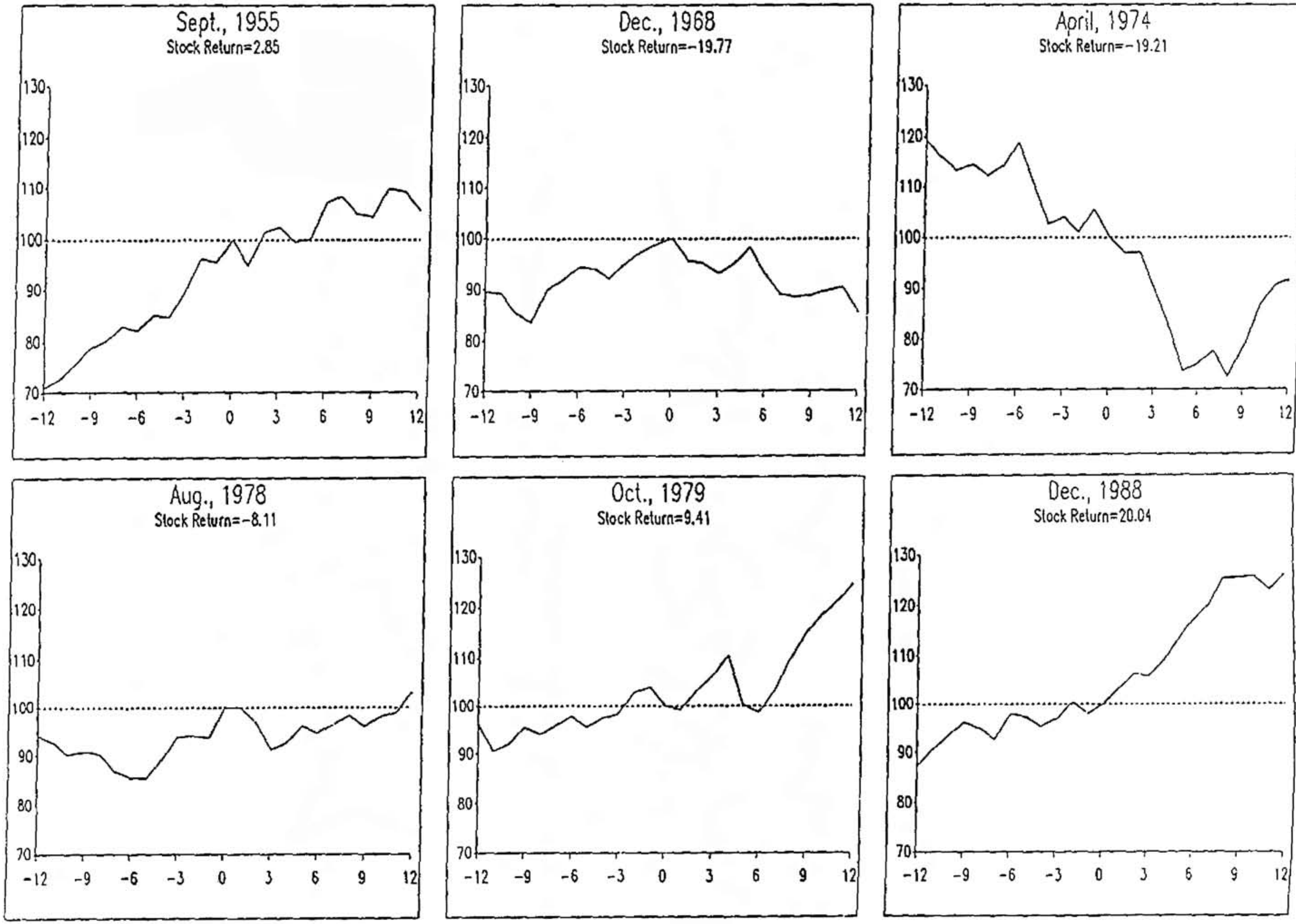
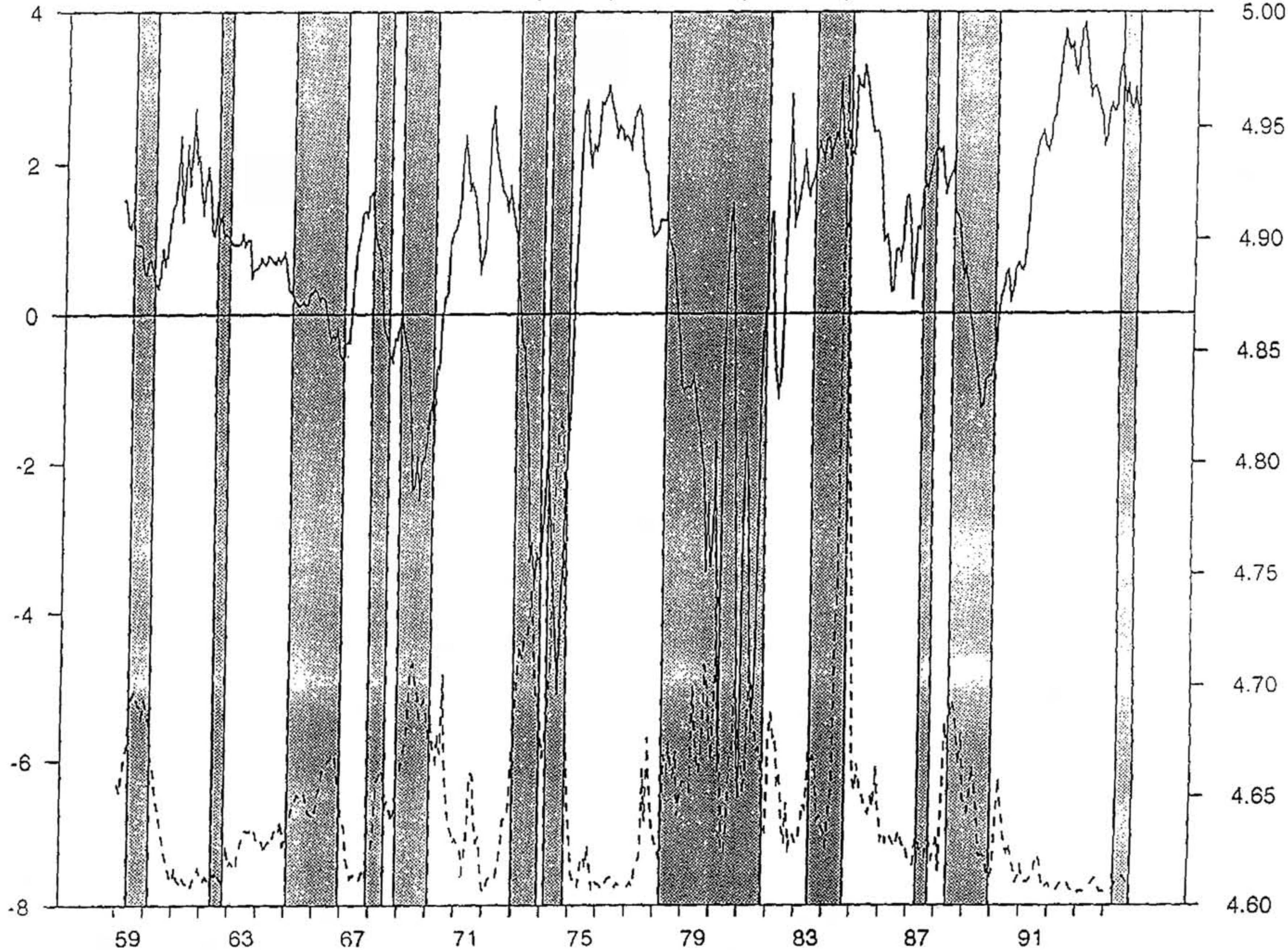


CHART 3
FFBOND(Solid) and RES(Dashed)



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