THE INFORMATION CONTENT OF THE PAPER-BILL SPREAD

Kenneth M. Emery
Senior Economist

August 1994

RESEARCH DEPARTMENT

WORKING PAPER

94-12

Federal Reserve Bank of Dallas

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by

Kenneth M. Emery*

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Abstract

In a series of articles, Benjamin M. Friedman and Kenneth N. Kuttner argue that the difference between the commercial paper rate and the Treasury bill rate has highly significant predictive value for real output even in the presence of money and regardless of sample. The results presented in this paper cast doubt on these claims.

JEL Classification: E44, E47.

* Senior Economist, Federal Reserve Bank of Dallas, 2200 N. Pearl St., Dallas, TX 75201, (214) 922-5162.

I would like to thank Nathan S. Balke, John V. Duca, and Evan F. Koenig for helpful comments and Chih-Ping Chang for providing excellent research assistance. The views expressed are those of the author and do not necessarily reflect those of the Federal Reserve Bank of Dallas or the Federal Reserve System. This paper was motivated by my discussion of a paper presented by Mark A. Thoma and Jo Anna Gray at the Texas Conference on Monetary Economics in Dallas on April 24, 1994.

1. Introduction

Building on the money-income link literature that dates back to Sims (1972, 1980) and more recently Stock and Watson (1989), Benjamin M. Friedman and Kenneth N. Kuttner in a series of articles (1989, 1992, 1993a, 1993b), claim that the difference between the commercial paper rate and the Treasury bill rate has highly significant predictive value for real output (as measured by industrial production), even in the presence of money and regardless of sample.[1] Friedman and Kuttner also claim that including the 1980s in their analysis results in a breakdown of the predictive content of money for real output, while the spread retains its predictive content.

This paper shows that the data cast doubt on Friedman and Kuttner's contentions. The data indicate that the predictive content of the spread arises mostly from two outliers in the data. In many samples which exclude these outliers, including most of the 1980s, the spread has no predictive information for output.

2. The Results

Friedman and Kuttner (1992, 1993a) estimate regressions of the form

$$y_t = \alpha + \sum_{i=1}^{6} \beta_i y_{t-i} + \sum_{i=1}^{6} \gamma_i p_{t-i} + \sum_{i=1}^{6} \delta_i m_{t-i} + \sum_{i=1}^{6} \psi_i sp_{t-i} + f(t) \qquad (1)$$

where y is the growth of industrial production, m is the growth of M1, sp is the spread, p is producer price inflation, and f(t) is a linear time trend. As part of their evidence that the predictive power of the spread has survived the 1980s, Friedman and Kuttner (F-K) estimate (1) over 1960:2-1979:9 and

[1] See also Friedman (1993).

1960:2-1990:12. Their results indicate that the spread variable remains significant when the sample period is extended, while M1 growth is insignificant in the presence of the spread.

Using data through 1992:3, the results in the first two rows of Table 1 give roughly the same F-K results using M2 growth and consumer prices.[2] The third and fourth rows of Table 1, however, indicate that the 1979:10-82:12 period is very influential for the extended sample results. When (1) is run only over 79:10-92:3, the spread is significant while M2 growth is not. Using the 83:1-92:3 sample, however, the spread is insignificant while M2 growth is significant.[3] Examining the 1983:1-92:3 sample is natural given that the Federal Reserve targeted the federal funds rate during this period. By contrast, during the 1979:10-82:12 period the Federal Reserve used a reserves targeting procedure. With the potential for Lucas Critique problems, it is reasonable to separate out the post-82 period.

Table 2 presents the same results as in Table 1 except that M1 growth is used in place of M2 growth and a linear time trend is included. The main

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[2] All data are from Citibase and include industrial production (IP), the CPI less shelter (PUXHS), the 6-month T-bill rate (FYGM6), the 6-month commercial paper rate (FYCP), M1 (FM1), and M2 (FM2).

I construct the spread using the 6-month Treasury bill rate, rather than the 3-month rate used by Friedman and Kuttner, because it imparts more information content to the spread and comes closer to supporting their claims. Because M2 growth does not contain a linear trend, f(t) is excluded from (1). The use of consumer prices rather than producer prices does not affect the results. Additionally, the inferences regarding the spread where qualitatively unaffected when twelve lags of the right-hand-side variables were used rather than six.

[3] Although the spread is stationary, the methodology outlined by Johansen and Juselius (1992) indicates a unique cointegrating vector between the level of consumer prices, industrial production, and M1 or M2. However, including the error-correction term in (1) does not qualitatively alter the results.

qualitative difference between the results from the two specifications is the insignificance of M1 growth for the 1983:1-92:3 sample. Because the results for inferences regarding the spread are unaffected by the choice of monetary aggregate, and because M2 growth has more information content over most samples examined, I report only results using M2.[4]

To further investigate the influence of the 1979:10-82:12 sample on the predictive power of the spread, Figure 1 plots the F-statistics for the exclusion of lags of the spread and lags of M2 growth from rolling regressions of (1) with the modification that only **either** lags of money **or** lags of the spread are included. The regressions are initially estimated over the 1960:2-65:2 sample and then observations are added one at a time moving forward through the sample. As evidenced by the spike of the F-statistic for exclusion of lags of the spread in 1974, Figure 1 confirms earlier work by Hafer and Kutan (1992) and Thoma and Gray (1993) that the period surrounding the collapse of the Franklin National Bank in 1974 is an outlier which boosts the predictive content of the spread.

Figure 2 plots the same F-statistics except that the regression is initially estimated over the 1987:3-92:3 sample and observations are then added one at a time moving **backwards** through time. The rolling backwards technique is more likely to detect outliers later in the sample than is the forward-rolling technique. The reason is that as observations are added in the rolling regressions, each additional observation comprises a smaller percentage of the total observations. Detecting more recent outliers or more recent changes in relationships is arguably more important for policymakers

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[4] This is consistent with Hafer and Kutan (1992) and Thoma and Gray (1993) who also use M2.

and forecasters than is detecting historical outliers. Figure 2 indicates that the period around 1980 appears to be an additional outlier which the rolling-forward F-statistics do not detect. In fact, Figure 2 shows that unless 1980 is included in the sample, the spread does not contain significant information content for the growth of industrial production during the 1980s.

Interestingly, the 1980 outlier coincides with the imposition of the Carter Credit controls. Thus, both the 1974 and 1980 outliers coincide with perceived disruptions in credit markets.[5]

Figures 3 and 4 are similar to Figures 1 and 2 except that M2 growth and the spread are included in (1) together.[6] Again, not only does 1974 appear to be an outlier for the predictive power of the spread, but Figure 4 indicates that 1980 is also an outlier. In fact, Figures 2 and 4 show that the spread has no predictive content for industrial output growth for samples that include only periods after 1980. While M2 growth does not fair much better, the F-statistics for its exclusion are greater than those for the spread during the early and middle 1980s. Reflecting the results in Table 1, M2 growth is significant at the 5% confidence level for the sample period 1983-92, while the spread is not.

In general, the results in Figures 1 through 4 imply that before 1974 and after 1980 it is not readily apparent whether the spread or M2 growth has relatively more predictive power for the growth of industrial production.

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[5] See Bernanke (1990) for various hypotheses concerning why the spread may have predictive information. Bernanke (1990), in out-of-sample exercises, also documents some deterioration in the spread's ability to predict real activity during the 1980s.

[6] Figures qualitatively similar to those in 3 and 4 are derived when an error-correction term is included to account for the cointegrating vector between industrial production, consumer prices, and M2.

Figures 1 and 3 indicate that before 1974 there are periods when the spread dominates M2 growth and periods when the opposite is true. Figures 2 and 4 indicate that after 1980 both the spread and M2 growth appear to lose predictive content, although the F-statistics for significance of M2 growth are of larger magnitude than those for the spread as this breakdown occurs.[7]

F-K (1992) also use variance decompositions from vector autoregressions to argue that the predictive power of money breaks down in the 1980s, while the spread retains its power. The variance decompositions presented in the first two rows of Table 3 present their evidence: when data from the 1980s are included in the analysis, M2 growth explains a smaller percentage of the variation in the growth of industrial production at various forecast horizons.[8] However, as with the single-equation results, the 1979-82 sample is playing a large role for the power of the spread. The bottom part of Table 3 indicates that if the period since 1983 is examined, M2 growth explains a larger proportion of the variance in the growth of industrial production than does the spread.

Conclusions

The findings presented in this paper indicate that the predictive content of the spread for industrial production growth is not as robust as the Friedman-Kuttner results would suggest. While Hafer and Kutan (1992) and Thoma and Gray (1993) have identified the importance of the 1974 Franklin

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[7] For the 1975-79 sample between the two outliers, neither the spread nor M2 growth has significant information content for the growth of industrial production, regardless of whether they are included together or individually in (1).

[8] The ordering used in the Choleski decomposition is y, p, M2, spread. The results were not sensitive to the ordering y, p, spread, M2.

National Bank episode in explaining the ability of the spread to predict economic activity, the results in this paper identify a second outlier: the 1980 episode surrounding the imposition of the Carter Credit controls. When both outliers are excluded from the analysis, there is no evidence that the spread dominates M2 growth in terms of the information content for industrial production.

Additionally, the results in this paper indicate that while Friedman and Kuttner are correct that the predictive content of money growth diminishes during the 1980s, the deterioration in the spread's information content is even more dramatic. In general, the results presented here reiterate the importance of the Lucas Critique in estimating reduced-form relationships among macroeconomic variables.

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Table 1

F-statistics for exclusion of M2 and Spread from (1)

Variable	1960:2 - 1979:9	1960:2 - 1990:12
M2	2.35*	1.85
	(0.032)	(0.088)
$\overline{\text{SPREAD}}$	4.54**	4.62**
	(0.000)	(0.000)
Variable	1983:1 - 1992:3	1979:10 - 1992:3
M2	2.48*	1.03
	(0.029)	(0.407)
$\overline{\text{SPREAD}}$	1.42	3.38**
	(0.217)	(0.004)

Table 2

F-statistics for exclusion of M1 and Spread from (1)

Variable	1960:2 - 1979:9	1960:2 - 1990:12
M1	1.51	0.90
	(0.176)	(0.494)
$\overline{\text{SPREAD}}$	4.80**	6.51**
	(0.000)	(0.000)
Variable	1983:1 - 1992:3	1979:10 - 1992:3
M1	1.25	0.45
	(0.288)	(0.843)
$\overline{\text{SPREAD}}$	1.25	2.64*
	(0.288)	(0.019)

Marginal significance levels in parentheses
* (**) denotes significant at 5% (1%) level.

Table 3

Variance Decompositions

	1960:2 - 1979:9		1960:2 - 1990:12	
	M2	SPREAD	M2	SPREAD
6 months	4.2	1.9	3.0	3.4
12 months	12.6	9.1	9.0	8.8
24 months	12.7	8.8	9.3	8.5

	1983:1- 1992:3		1979:10 - 1992:3	
	M2	SPREAD	M2	SPREAD
6 months	7.1	2.3	1.9	13.8
12 months	16.9	2.5	6.1	13.3
24 months	17.6	4.7	6.2	13.2

FIGURE 1: M2 OR CPBILL

Roll Forward

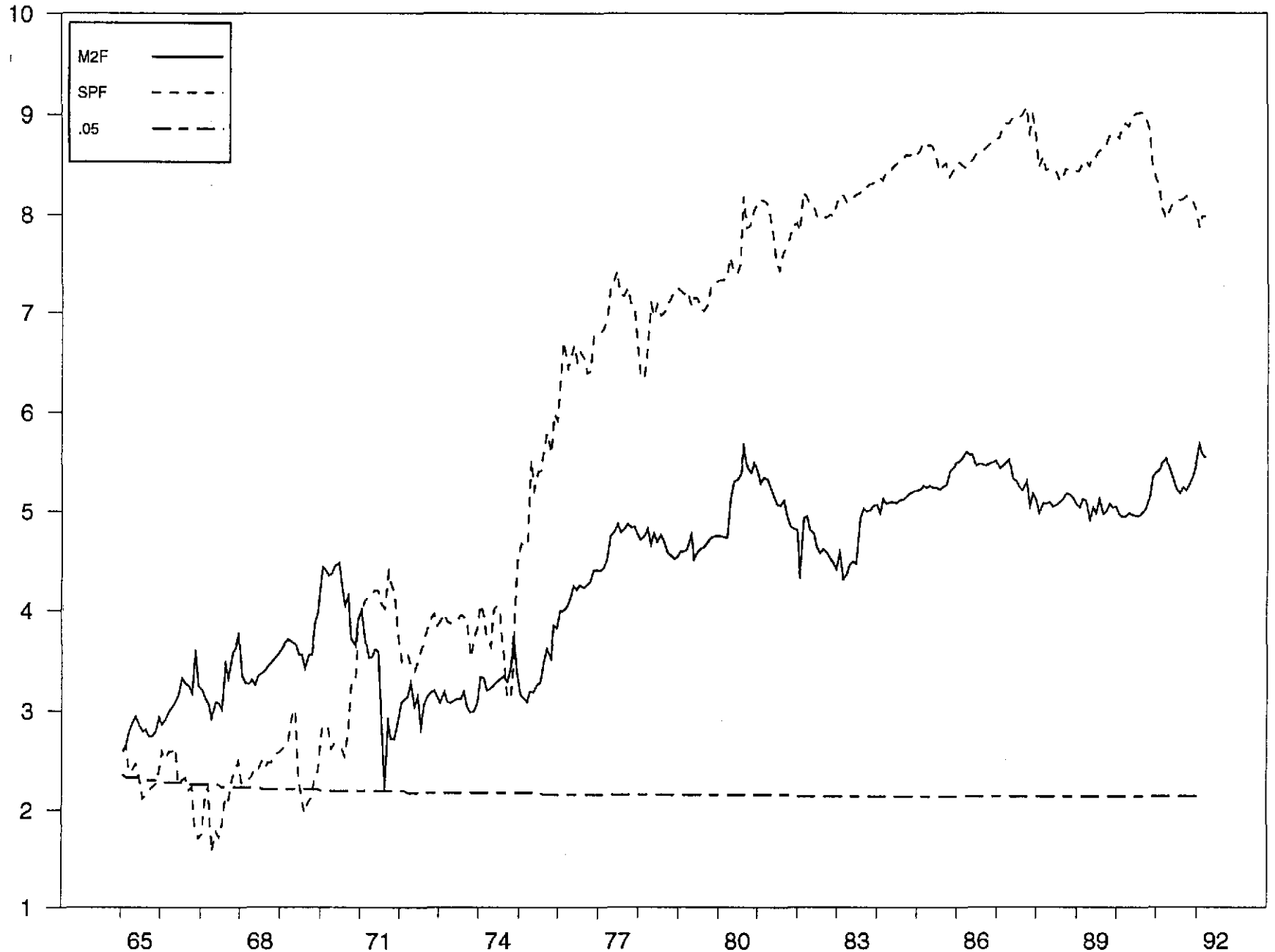


FIGURE 2: M2 OR CPBILL

Roll Backwards

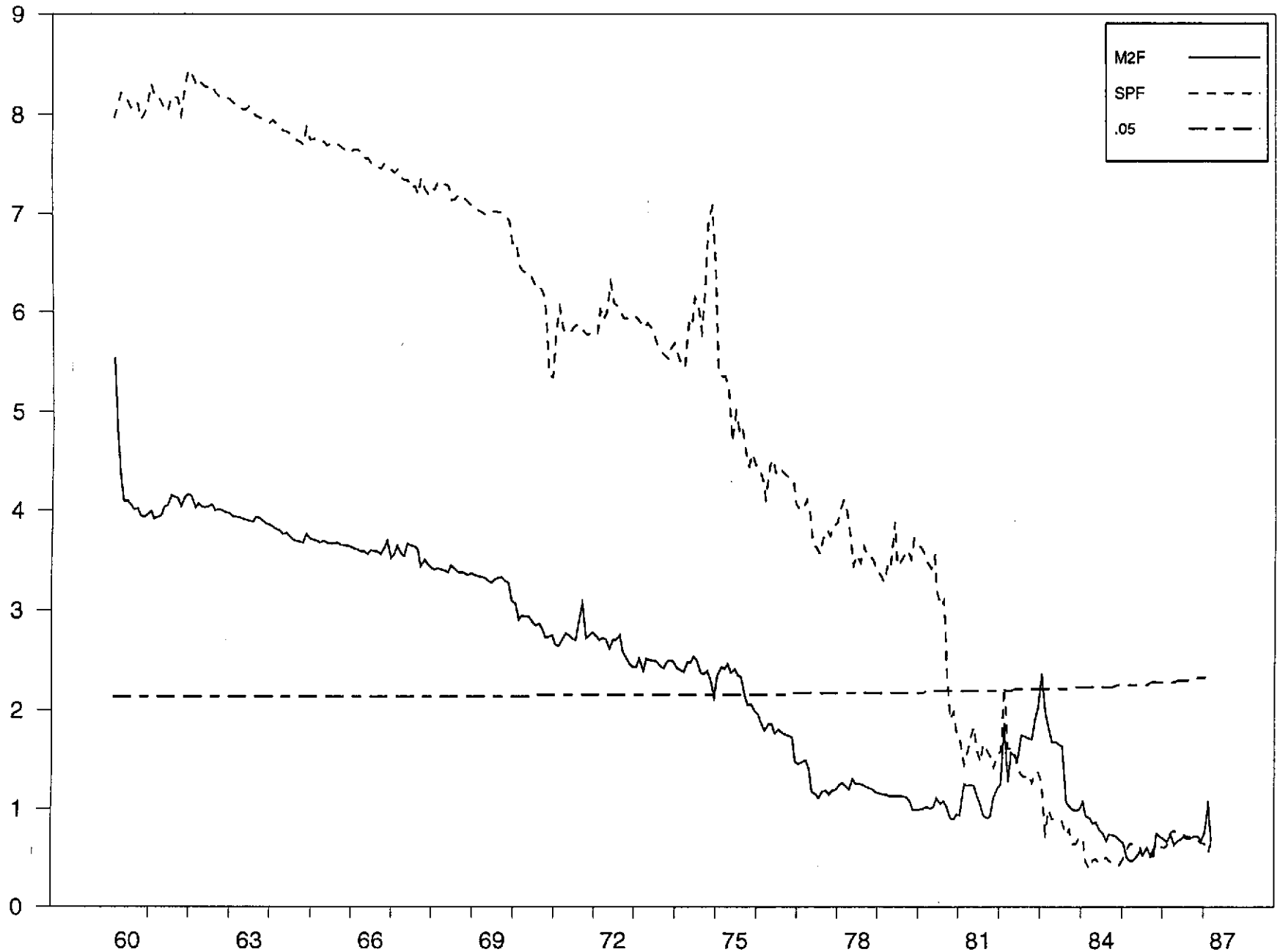


FIGURE 3: M2 AND CPBILL

Roll Forward

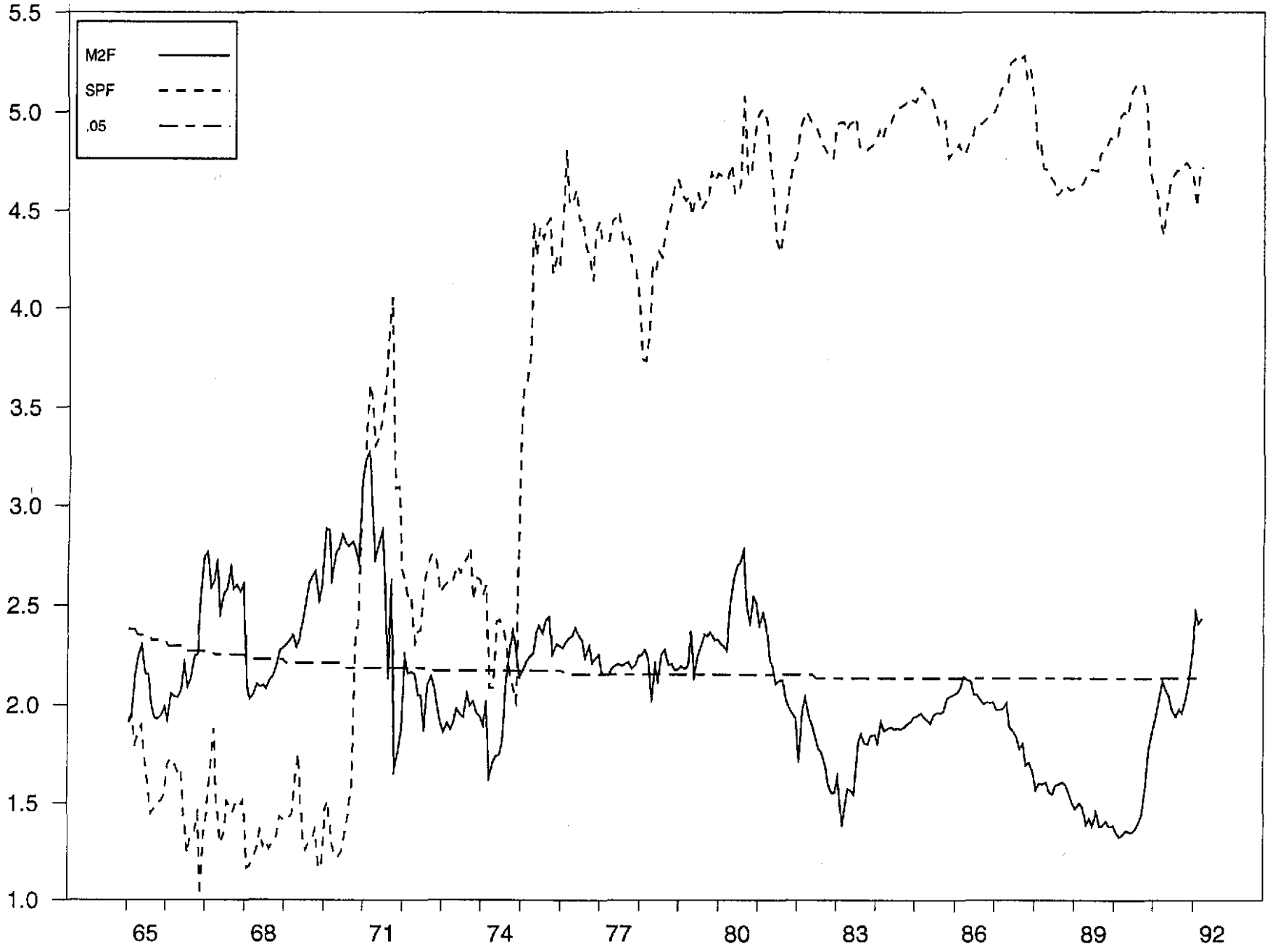
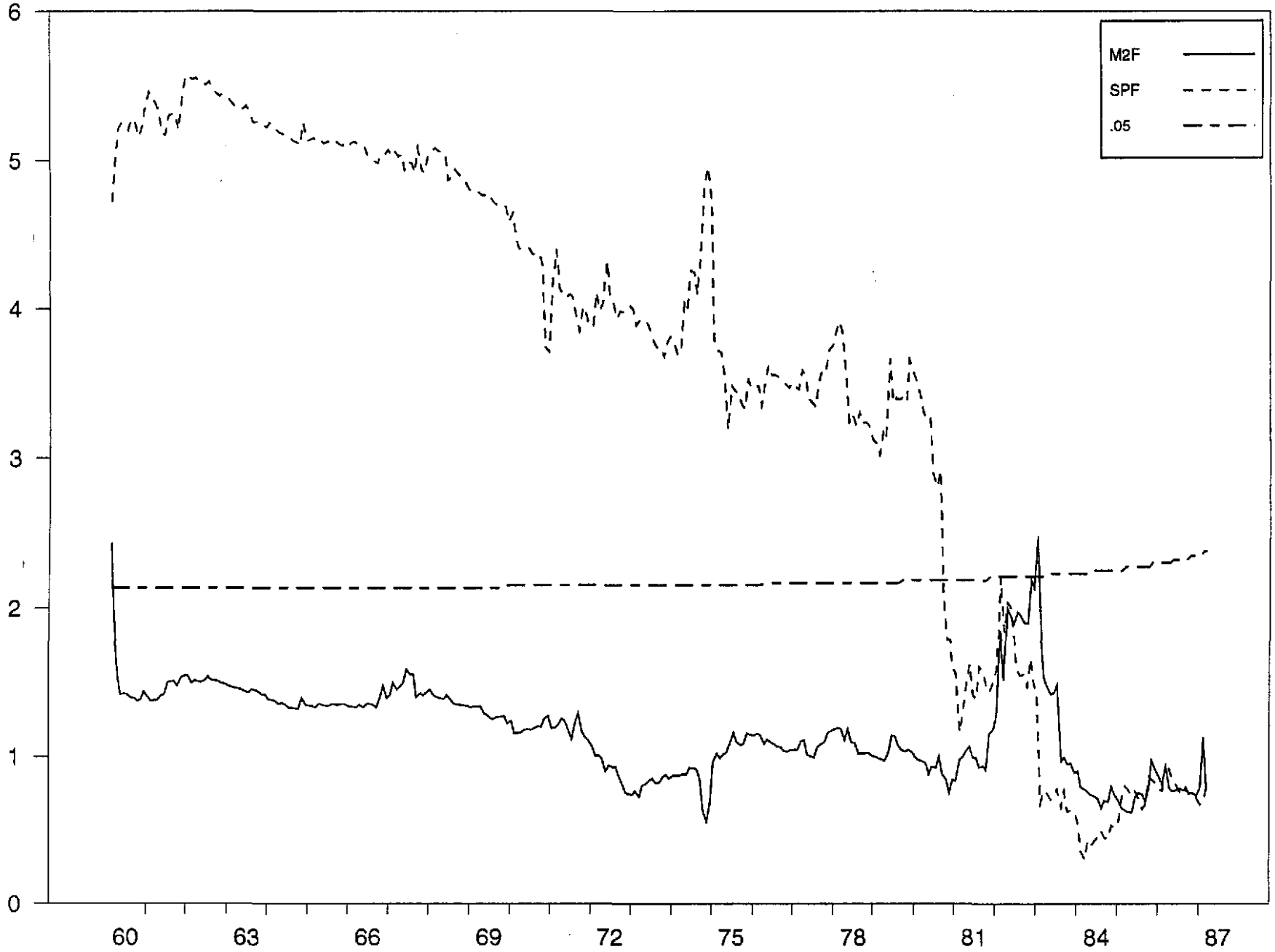


FIGURE 4: M2 AND CPBILL

Roll Backwards



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