BOARD OF GOVERNORS
OF THE
FEDERAL RESERVE SYSTEM
WASHINGTON, D.C. 20551

August 19, 1980

TO:     Federal Open Market Committee

FROM:   Murray Altmann

Attached for your information is a copy of a memorandum to the Board of Governors from Messrs. Cohen and Madigan of the Board's Division of Research and Statistics. The memorandum, entitled "The Behavior of Real Interest Rates in the Postwar U.S. Economy," and dated July 2, 1980, was mentioned by Governor Wallich at the meeting of the Committee on August 12.

Attachment

BOARD OF GOVERNORS
OF THE
FEDERAL RESERVE SYSTEM

# Office Correspondence

Date___August 18, 1980_____

To_____Murray Altmann_____

Subject:_____

From___Henry C. Wallich_____

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      I would appreciate it if you would mail out to the members of the FOMC the attached memo by Cohen and Madigan on real interest rates. You may want to do this with a note referring to the discussion of the subject at the last FOMC meeting and my offer to send this memo.


Attachment

BOARD OF GOVERNORS
OF THE
FEDERAL RESERVE SYSTEM

# Office Correspondence

Date___July 2, 1980_____

To_____Board of Governors_____

From___Division of Research & Statistics___
(Darrel Cohen and Brian Madigan)

Subject:___The Behavior of Real_____
Interest Rates in the
_____Postwar U.S. Economy_____

In this memorandum the behavior of real interest rates in the post-war U.S. economy is investigated. Such an investigation raises a number of controversial issues because real rates are not directly observable. In what follows, some of these issues are briefly discussed, but rather than attempt to fully resolve these long-debated issues, a number of alternative estimated real interest rate series are presented.

## I. Calculation of Real Interest Rates

### Problems

Recent experience has demonstrated that, in an environment of inflationary expectations, nominal interest rates can give a misleading impression of the incentives to save or invest. Moreover, economic theory suggests that nominal interest rates will tend to incorporate an "inflation premium" that reflects the general expectation of future changes in the price level. As a consequence, analysts have resorted to the notion of the real rate of interest as a means of assessing the implications of observed nominal rates. The real rate of interest is obtained by subtracting the expected rate of inflation from the nominal interest rate. However, since the interest income of some lenders is taxable and interest payments of borrowers are deductible, a more useful calculation of the real rate probably

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would take account of taxes; in this case the appropriate construct would
be the after-tax nominal interest rate less the expected rate of inflation.
Measures of both before- and after-tax real rates are presented in this
memorandum.

The practical calculation of real interest rates--both before-
and after-tax--is made difficult by a number of factors. First, the
relevant concept of real interest rates is one that is related to ex ante
expectations of inflation. However, expectations of inflation are unobservable [1]
and require the development of measures to approximate these expectations.
Economists, though, have not yet agreed on the proper method to calculate
such measures.

Further, it is not obvious what summary measure of prices is most
relevant for the economic decisions of consumers and firms. For example, in
analyzing saving decisions by individuals planning for retirement, an
appropriate price index might be one associated with a market basket of
goods typically consumed by retirees. In the case of firms, on the other
hand, a price index which reflects the expected cost of its inputs might
be more appropriate.

Finally, in the calculation of after-tax real rates, it is theoret-
ically desirable to use marginal tax rates for both investors and borrowers in
order to obtain the relevant rate of return and cost of capital. However, the vast
array of household, institutional, and corporate participants involved in the

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1. Livingston's price expectations data, discussed below, might be considered
to be an exception to this statement.

saving-investment decision makes calculation of a single, aggregate tax rate very difficult.

## Measures Selected

In order to abstract from differences in risk, liquidity, and other characteristics of investments, only nominal interest rates on Treasury securities were used. Specifically, nominal rates on 3-month Treasury bills and on long-term Treasury bonds were selected.[1]

Since theory provides little guidance in the selection of a price index or the measurement of inflation expectations, calculations were made using several measures of each in order to determine whether inferences regarding the behavior of real rates depend on the particular measure chosen. The indexes used were the Consumer Price Index, the Personal Consumption Expenditure deflator, and the Gross Business Product Fixed Weight deflator. The following techniques for estimating price expectations were used:

- Contemporaneous: this measure simply assumes that the rate of inflation experienced during the current period will continue throughout the term of the security. In this case, then, the real rate of interest is calculated by subtracting the contemporaneous rate of inflation from the nominal rate of interest.

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1. However, 6-month Treasury bills were used instead of 3-month bills in the case of the Livingston price expectations data, since the term of the price expectations is six months.

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- Autoregressive: this measure emphasizes the role played by historical experience in the formulation of expectations, and is obtained by calculating an average of past inflation--a simple average of the past three years of inflation data is used here.[1] Further, it has been suggested that the autoregressive measure used here is superior to the contemporaneous technique as a proxy for long-term expectations, and that the contemporaneous technique is superior for short-term expectations.

- Perfect foresight: this measure assumes that economic agents are able to perfectly forecast the rate of inflation during the term of the security. For example, the realized rate of inflation during the term of a 3-month bill would be subtracted from its nominal rate.

- Survey data: Joseph Livingston, a _Philadelphia Inquirer_ reporter, has collected 6- and 12-month price expectations data from a panel of economists and businessmen semiannually since 1946. His 6-month expectations data was subtracted from the nominal 6-month bill rate, and his 12-month expectations data was used as a proxy for long-term expectations of inflation in calculating real bond yields.

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1. More complicated weighting schemes could be used. Standard ones would place the greatest weight on the most recent observations, with the contribution of past observations dying out over time.

Computation of real after-tax rates would ideally utilize estimates of marginal tax rates. Such estimates are difficult to obtain, however, because tax rates vary so much among borrowers and lenders. We have not attempted to develop such measures for this memorandum. Instead, a much simpler procedure based on National Income and Product Accounts data is used here. The tax rate computed is the effective corporate tax rate, i.e., the ratio of total corporate profits tax liability to corporate profits before tax. It should be noted, though, that this is not a marginal rate, but may nevertheless be a reasonable approximation. Also, the effective rate calculated here is not directly applicable to households, but may again be a satisfactory approximation.

## II. Summary of Findings

Many real interest rate series, both before- and after-tax, were computed based on the various price indexes and inflation expectations proxies described above. It was found that the timing and magnitude of cyclical changes in real rates were similar enough across the calculated series that the important features could be captured in the two charts presented in the text. Charts of other series are presented in the appendix.

Some of the specific findings are that, for the current period, short-term real rates are very low by historical standards, approaching at an extremely rapid pace the deeply negative levels reached during the last recession and in the early 1950's; and long-term real rates have fallen recently but are still positive and well above the levels reached during the last recession and in the early 1950's. In addition to these findings, the level and cyclical characteristics of the series over the entire postwar

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period are discussed below.

## Level

As evidenced by Charts 1 and 2 (and several charts in the appendix), real interest rates do not appear to have had a marked underlying trend since World War II, either in an upward or downward direction. Although no overall trend is apparent, the series suggest that the level of real rates rose during the 1950s and early 1960s and fell somewhat between the late 1960s and mid-1970s. Also, except for series derived from Livingston data, real rates were often negative during the 1950s and 1970s; in all the series, real rates were seldom negative during the 1960s. Moreover, it appears that the most deeply negative real rates of interest experienced in the postwar United States occurred in the early 1950s and in the mid-1970s. During the current cyclical downturn, short-term real interest rates have been negative, but have not yet fallen to the levels reached, for example, during 1975; and long-term real rates have fallen recently but are still positive and well above the levels reached in earlier periods.

## Cyclical Pattern

The pattern of real interest rates over NBER reference cycles is presented in Tables 1 and 2 below. The most pronounced cyclical pattern revealed by the tables is the tendency for real rates to fall markedly from peaks to troughs in cyclical activity. This may reflect both countercyclical monetary policy and the tendency for credit demands to slacken during a downturn.
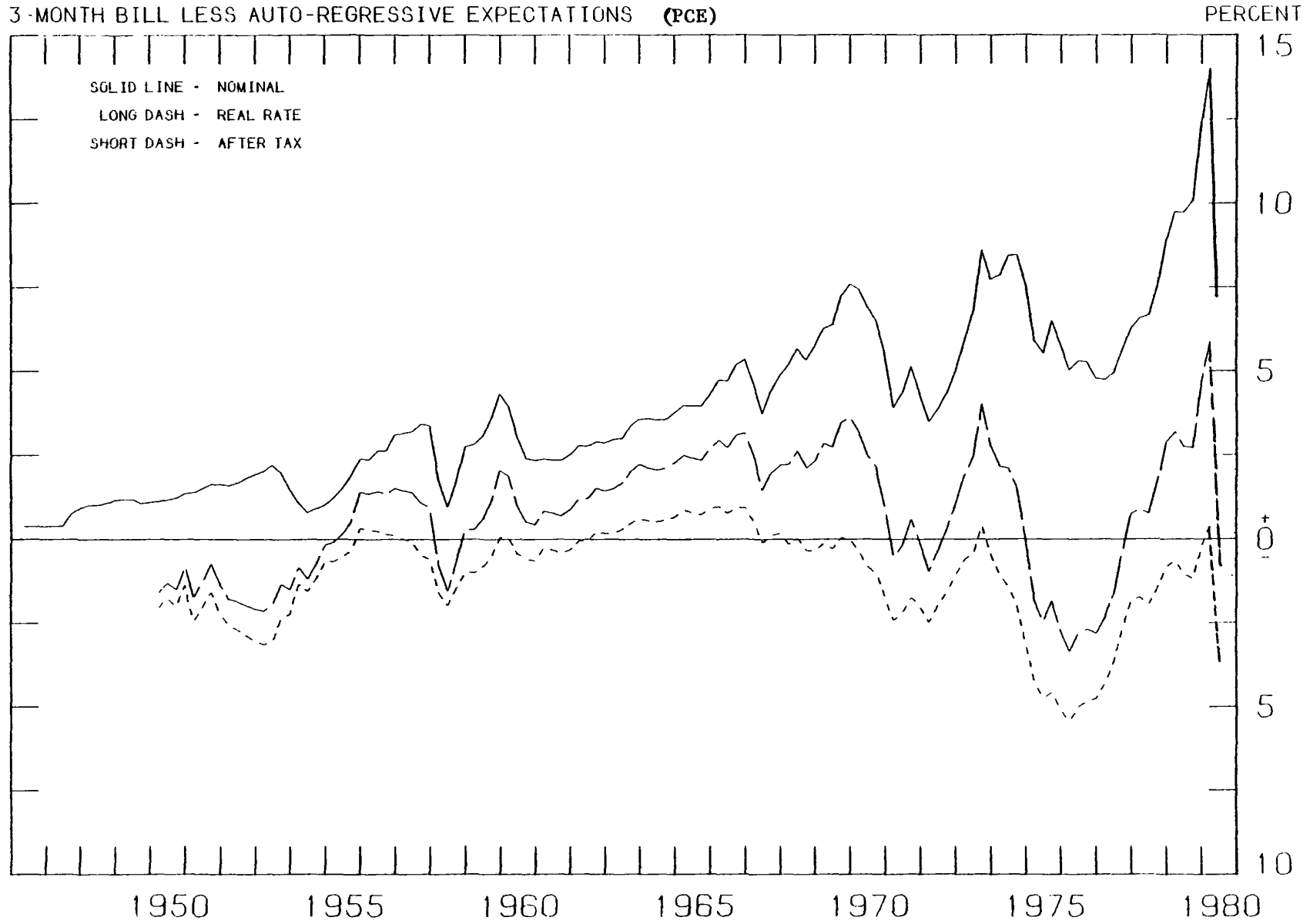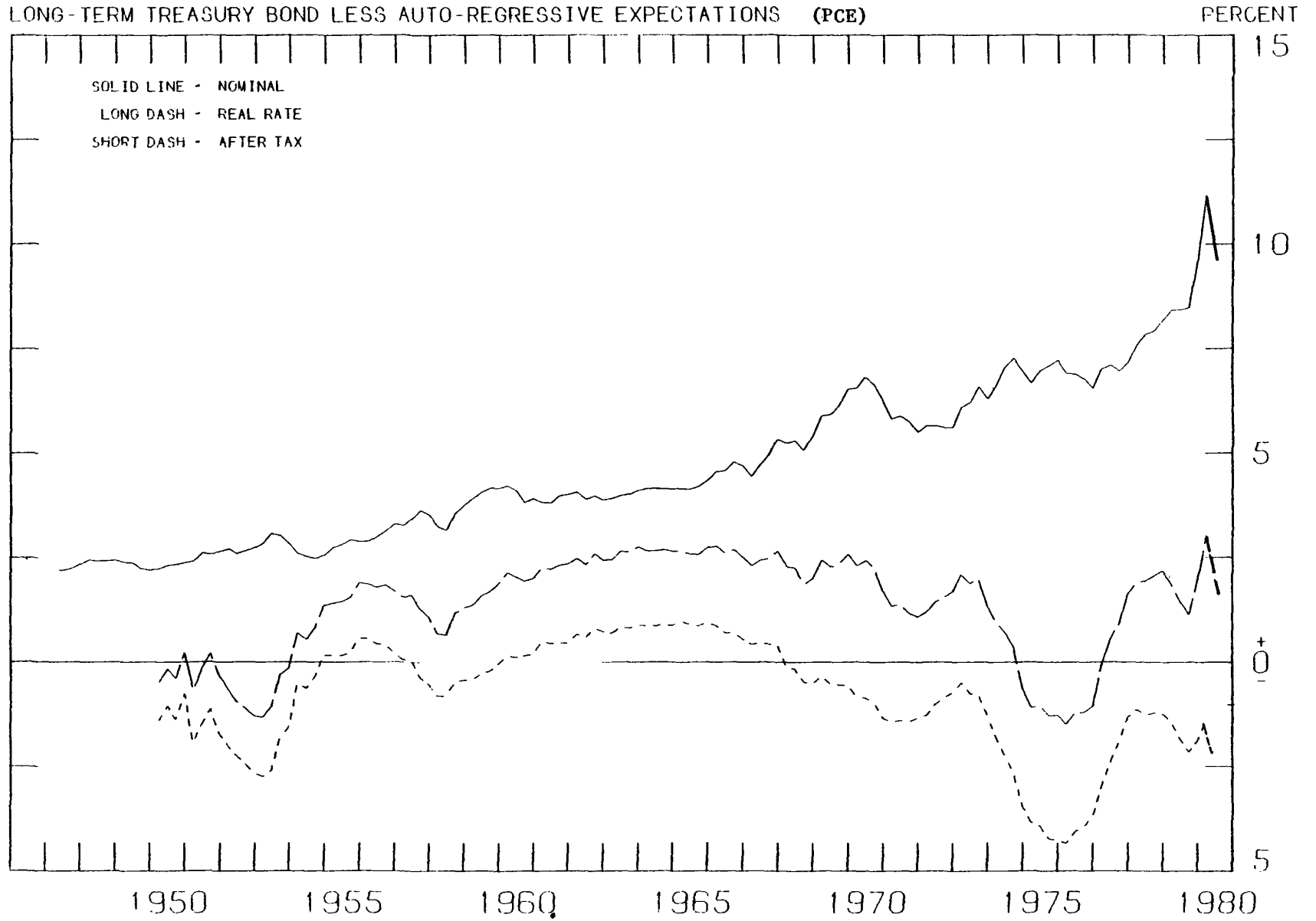
Chart 1



3-MONTH BILL LESS AUTO-REGRESSIVE EXPECTATIONS    (PCE)                        PERCENT

SOLID LINE - NOMINAL
LONG DASH - REAL RATE
SHORT DASH - AFTER TAX

Chart 2



LONG-TERM TREASURY BOND LESS AUTO-REGRESSIVE EXPECTATIONS     (PCE)                    PERCENT

SOLID LINE  -  NOMINAL

LONG DASH  -  REAL RATE

SHORT DASH  -  AFTER TAX

Table 1:   Real Interest Rates, Three-Month Treasury Bills, Six Recessions

| | | Levels | | | | | | | | | | Changes | | |
| | | Quarters from Peak (P) or Trough(T) | | | | | | | | | | | | |
| Peak | Trough | P-4 | P-3 | P-2 | P-1 | P | T | T+1 | T+2 | T+3 | T+4 | P-4 to P | P to T | T to T+4 |
|------|--------|-----|-----|-----|-----|---|---|-----|-----|-----|-----|----------|--------|----------|
| 1953:2 | 1954:2 | -1.87 | -1.98 | -2.09 | -2.14 | -1.95 | -1.18 | -0.77 | -0.18 | -0.09 | 0.14 | -0.08 | +0.77 | +1.32 |
| 1957:3 | 1958:1 | 1.35 | 1.51 | 1.45 | 1.38 | 1.04 | -0.77 | -1.54 | -0.68 | 0.29 | 0.28 | -0.31 | -1.81 | +1.05 |
| 1960:1 | 1960:4 | 0.28 | 0.59 | 1.15 | 2.04 | 1.88 | 0.44 | 0.83 | 0.77 | 0.69 | 0.86 | +1.60 | -1.44 | +0.42 |
| 1969:3 | 1970:4 | 2.12 | 2.32 | 2.83 | 2.74 | 3.48 | 0.95 | -0.54 | -0.17 | 0.58 | -0.09 | +1.36 | -2.53 | -1.04 |
| 1973:4 | 1975:1 | 1.06 | 1.86 | 2.47 | 4.02 | 2.78 | -1.84 | -2.47 | -1.84 | -2.71 | -3.34 | +1.72 | -4.62 | -1.50 |
| 1980:1 | * | 3.19 | 2.75 | 2.71 | 4.69 | 5.87 | -1.45* | | | | | +2.68 | -7.32* | |

Source:   Derived from nominal three-month bill yield (coupon equivalent basis) and an autoregressive estimation of inflation expectations (simple average of past three years of inflation data.)  Personal Consumption Expenditure (PCE) deflator used.  These are before-tax rates.

*Current cyclical trough has not yet been dated and may not have yet occurred.  Figure shown is average yield for statement week of June 18, 1980.  Inflation expectation figure used was that for 1980:I, because PCE data for 1980:II were not yet available.

Table 2:   Real Interest Rates, Long Term Treasury Bonds, Six Recessions

| | | Levels | | | | | | | | | | Changes | | |
| | | Quarters from Peak (P) or Trough (T) | | | | | | | | | | | | |
| Peak | Trough | P-4 | P-3 | P-2 | P-1 | P | T | T+1 | T+2 | T+3 | T+4 | P-4 to P | P to T | T to T+4 |
|------|--------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1953:2 | 1954:2 | -0.96 | -1.12 | -1.28 | -1.32 | -1.07 | 0.54 | 0.82 | 1.35 | 1.41 | 1.44 | -0.11 | +1.61 | +0.90 |
| 1957:3 | 1958:1 | 1.84 | 1.71 | 1.56 | 1.61 | 1.29 | 0.68 | 0.64 | 1.18 | 1.30 | 1.36 | -0.55 | -0.61 | +0.68 |
| 1960:1 | 1960:4 | 1.36 | 1.59 | 1.68 | 1.88 | 2.14 | 1.99 | 2.26 | 2.23 | 2.32 | 2.36 | +0.78 | -0.15 | +0.37 |
| 1969:3 | 1970:4 | 1.86 | 1.99 | 2.44 | 2.28 | 2.36 | 1.72 | 1.35 | 1.36 | 1.18 | 1.08 | +0.50 | -0.64 | -0.64 |
| 1973:4 | 1975:1 | 1.67 | 2.09 | 1.88 | 1.99 | 1.33 | -1.08 | -1.06 | -1.28 | -1.28 | -1.48 | -0.34 | -2.41 | -0.42 |
| 1980:1 | * | 1.88 | 1.45 | 1.14 | 1.92 | 3.01 | 1.40* | | | | | +1.13 | -1.61* | |

Source:   Derived from nominal long term Treasury bond yield and autoregressive estimation of inflation expectations (simple average of past three years of inflation data.)   Personal Consumption Expenditure (PCE) deflator used.   These are before-tax rates.

*Current cyclical trough has not yet been dated and may not yet have occurred.   Figure shown is average yield for statement week of June 18, 1980.   Inflation expectation figure used was that for 1980:I, because PCE data for 1980:II were not yet available.

Another important aspect is that real short-term rates in recent business cycles have moved up substantially during the year before the peak, again probably reflecting the influence of monetary policy and real economic activity. However, the movement of real long-term rates during the final quarters of the expansion is not as consistent.

Finally, there is no easily discernible pattern in real rates during the initial quarters of an expansion. In recent expansions, real rates have continued the decline that began in recession, while in earlier expansions real rates tended to increase in the intial quarters.

The NBER has dated the first quarter of 1980 as the peak of the expansion phase of the most recent business cycle. Tables 1 and 2 illustrate that real rates increased more sharply during the four quarters preceding this peak than they had over any corresponding interval in the past.

Also, short-term real rates have already fallen from their peaks more rapidly than they had in any previous downturn. However, while long-term real rates have already fallen significantly, they have not fallen by the amount experienced during the 1974-1975 recession.

## Real After-Tax Interest Rates

Nominal interest rates have shown a pronounced upward trend since the data series began in 1946 (charts 1 and 2). However, as described above, real interest rates do not appear to have a marked underlying trend. Similarly, real after-tax rates do not suggest an underlying trend over the entire sample period, although a decline since the mid-1960s is evident. This downtrend over the last 15 years reflects the relatively trendless nature of real interest rates in the context of accelerating inflation and the fact that taxes are levied on nominal rather than real interest rates.

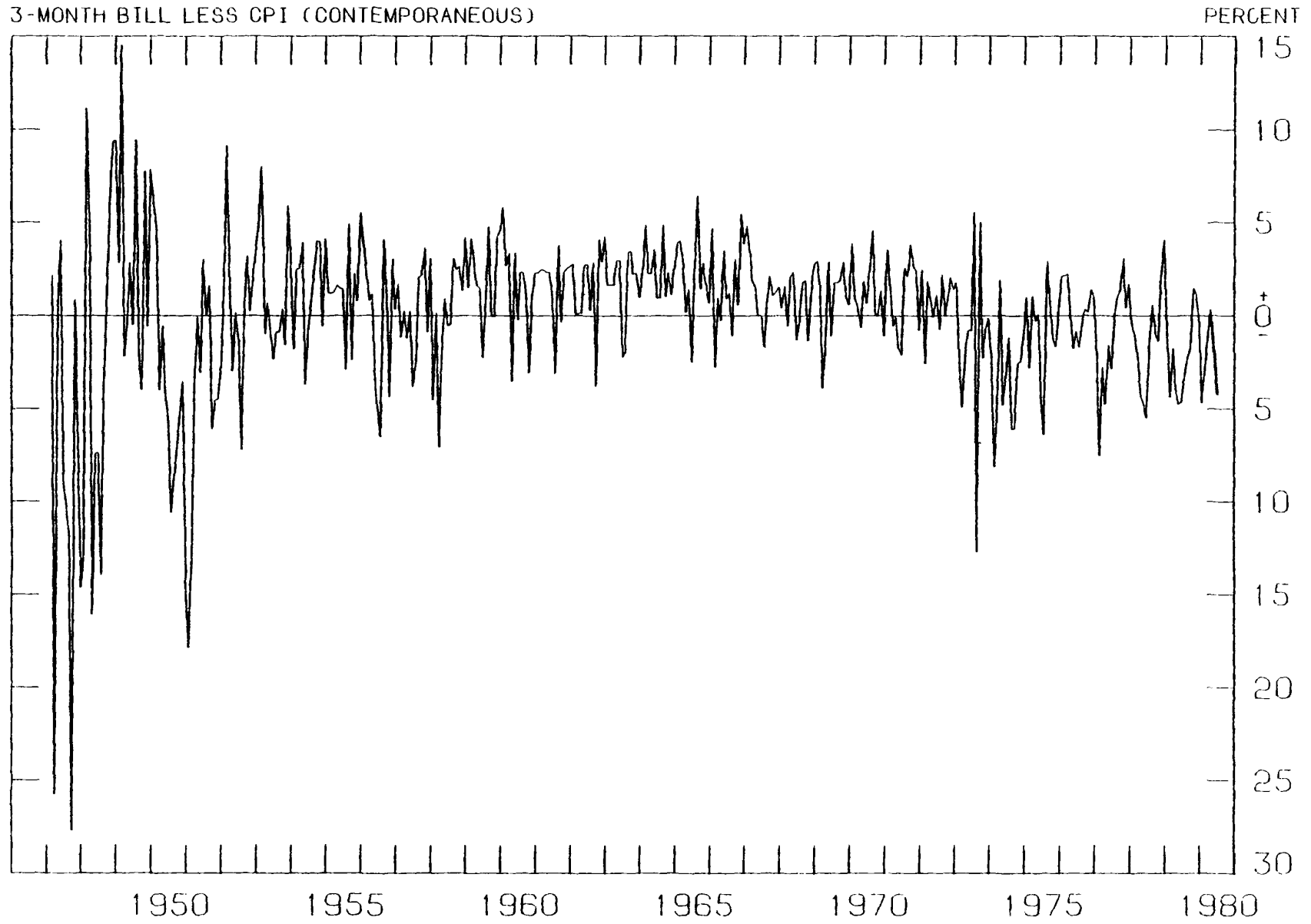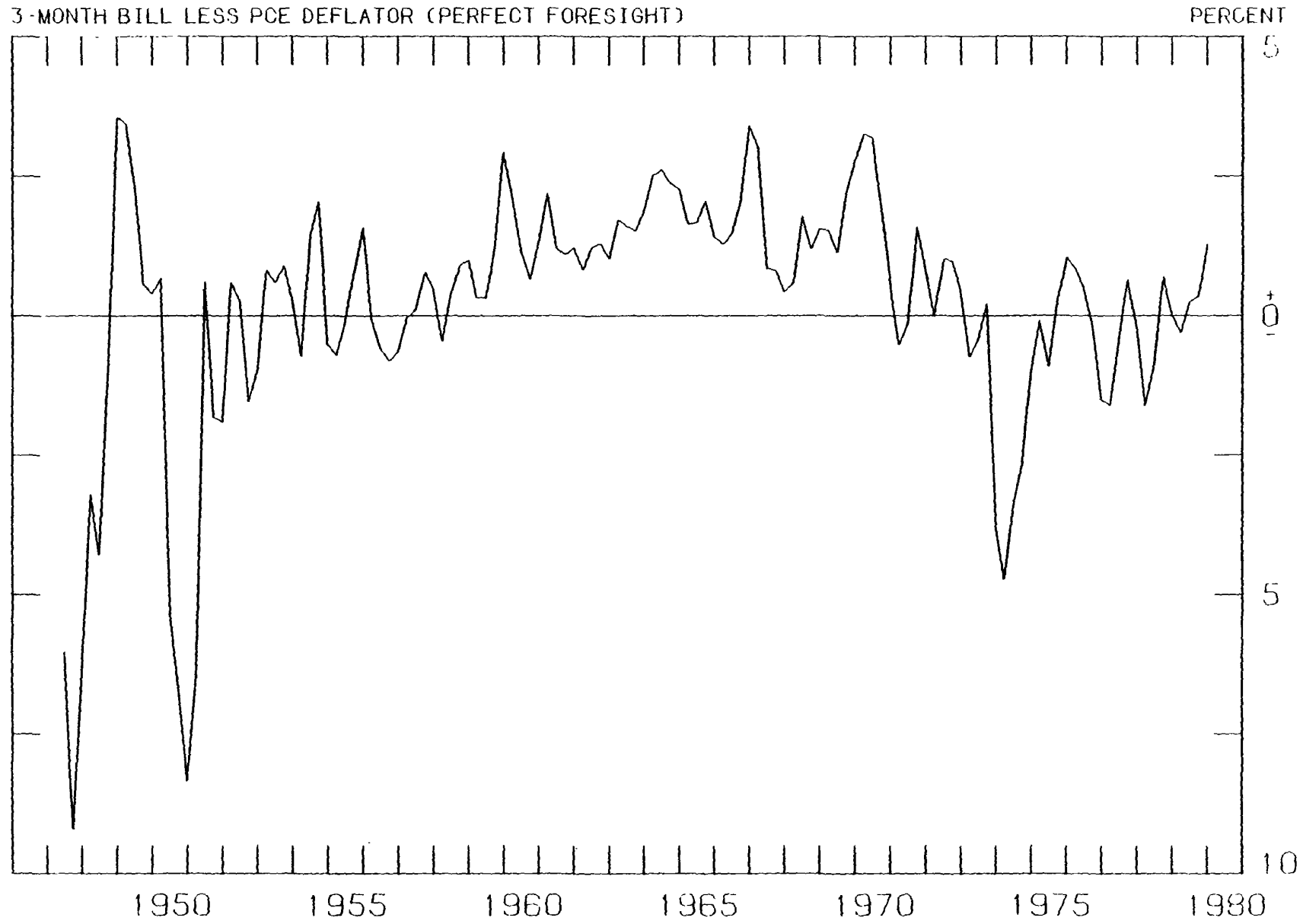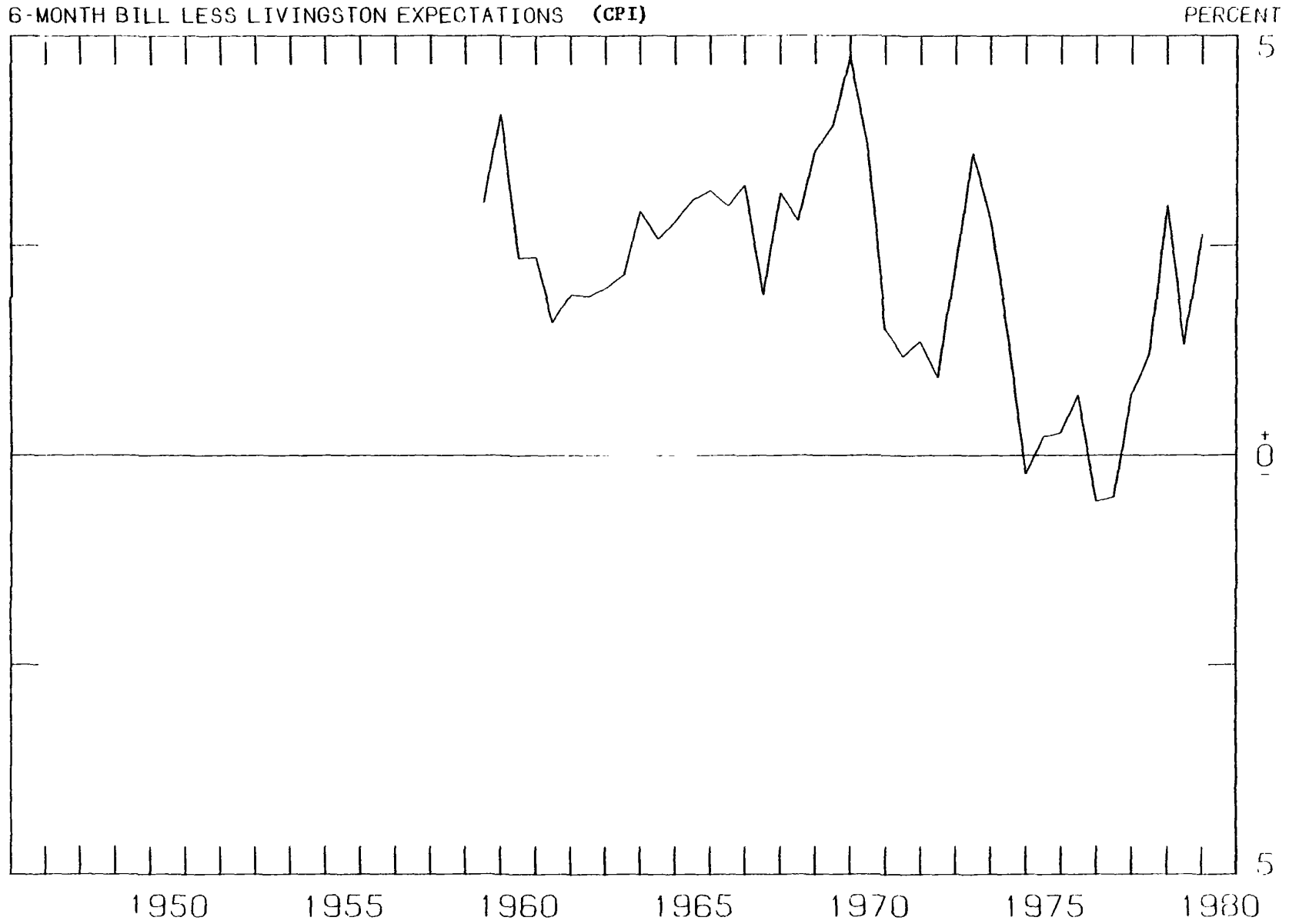Appendix:  Additional Charts

Chart 3



3-MONTH BILL LESS CPI (CONTEMPORANEOUS)   PERCENT

Chart 4

3-MONTH BILL LESS PCE DEFLATOR (PERFECT FORESIGHT)          PERCENT

Chart 5

6-MONTH BILL LESS LIVINGSTON EXPECTATIONS   (CPI)                                    PERCENT

Chart   6



3-MONTH BILL LESS PCE DEFLATOR (CONTEMPORANEOUS)                    PERCENT

Chart 7

3-MONTH BILL LESS AUTO-REGRESSIVE EXPECTATIONS (PCE)          PERCENT

**Chart 8**

LONG-TERM TREASURY BOND LESS AUTO-REGRESSIVE EXPECTATIONS  (PCE)          PERCENT



1950          1955          1960          1965          1970          1975          1980

Chart 9



6-MONTH BILL LESS PCE DEFLATOR (PERFECT FORESIGHT)　　　　　　　　　　　PERCENT

Chart 10



LONG-TERM TREASURY BOND LESS LIVINGSTON EXPECTATIONS (CPI)

Chart 11



3 MONTH BILL LESS GBP DEFLATOR (AUTO-REGRESSIVE EXP.)                    PERCENT

Chart 11



3 MONTH BILL LESS GBP DEFLATOR (AUTO-REGRESSIVE EXP.)                      PERCENT

Chart 12

LONG-TERM TREAS BOND LESS GBP DEFLATOR (AUTO-REGRESSIVE EXP)                    PERCENT

Chart 13



3-MONTH BILL LESS PCE DEFLATOR (CONTEMPORANEOUS, AFTER-TAX)    PERCENT

Chart 14



3-MONTH BILL LESS PCE DEFLATOR (PERFECT FORESIGHT, AFTER-TAX)    PERCENT

Chart 15

6-MONTH BILL LESS LIVINGSTON EXPECTATIONS (AFTER-TAX, CPI)          PERCENT



1950          1955          1960          1965          1970          1975          1980

Chart 16

LONG-TERM TREASURY BOND LESS LIVINGSTON EXP. (AFTER-TAX , CPI)                    PERCENT

Chart 17

LONG-TERM TREAS BOND LESS AUTO-REGRESSIVE EXP. (AFTER-TAX, PCE)    PERCENT