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## The Monetary Policy Transmission Mechanism?

Despite the fact that the Federal Open Market Committee (FOMC) has increased its target for the federal funds rate by 25 basis points at each of its previous ten meetings, and markets anticipate still further increases, the 10-year Treasury yield has remained largely unchanged. (See p. 9.) Chairman Greenspan recently suggested that the behavior of long-term rates in the face of such changes in the funds rate is “clearly without precedent in our recent experience.”<sup>1</sup>

In his final speech before leaving the Fed, former Governor Ben Bernanke gave an explanation for this “unprecedented” experience. Specifically, Bernanke provides strong evidence that “the relatively low level of long-term real interest rates in the world today” is the result of structural change over the past decade that “has created a significant increase in the global supply of saving—a global saving glut.”<sup>2</sup> One possible implication of Bernanke’s analysis is that domestic real long-term interest rates are determined in a global market, whereas short-term interest rates are determined in domestic markets by monetary policy actions. If real long-term yields are determined in the global market, the core real rate in each country would be the same. Cross-country differences would be due to idiosyncratic risk factors. This possibility is supported by the fact that the inflation index yields on long-term bonds in the United States, France, and the United Kingdom have been relatively close to each other and behaved similarly in recent years. (See p. 11.)

The possibility that domestic real long-term interest rates are segmented from domestic short-term rates has strong implications for perhaps the most widely held theory of the monetary policy transmission mechanism—the interest rate channel of monetary policy.

The interest rate channel of monetary policy exists if monetary policy actions affect interest rates that cause individuals and businesses to alter their spending decisions that, in turn, bring about changes in output and prices. While consumption accounts for more than two thirds of gross domestic product (GDP), it is relatively stable over time and is thought to be relatively insensitive to changes in interest rates. In contrast, GDP’s most variable component, investment, is thought to be more interest sensitive.

Investment spending might be more sensitive to long-term interest rates than to short-term rates, such as the overnight federal funds rate, which the FOMC targets. The crucial link between the federal funds rate and the long-term rate is the expectations hypothesis (EH), which states that at each point in time the long-term rate is equal to the average of the short-term rate expected to prevail over the maturity of the long-term asset plus a constant risk premium. If the EH is correct, policy-makers affect long-term rates by changing current and expected future short-term rates. There is virtually no empirical support for empirical implications of the EH, however. The possibility that domestic real long-term interest rates are segmented from domestic short-term rates provides a new reason to question its validity and, consequently, the interest rate channel of monetary policy.

If long-term real interest rates are determined in a global market, the FOMC’s scope for affecting domestic real long-term yields by adjusting its target for the federal funds rate may be limited. It seems unlikely that changes in U.S. monetary policy would have no impact on conditions in the global market. Nevertheless, to the extent that long-term rates are affected by conditions other than the market’s expectation of short-term interest rates, both the magnitude and timing of the effect of FOMC actions on long-term rates would be limited—hence, so would any impact that monetary policy has on inflation and output through the adjustment of long-term interest rates.

Of course, if the Fed affects inflation and output mainly through short-term interest rates, rather than long-term rates, the FOMC’s ability to influence economic activity via the interest rate channel would not be impaired. Finally, the possible segmentation of the long-term rate from the effect of policy actions on the short-term rate may not impair the FOMC’s effectiveness if monetary policy works through other channels.

—Daniel L. Thornton

<sup>1</sup>Greenspan, Alan. Monetary Policy Report to the Congress before the Committee on Financial Services, U.S. House of Representatives, July 20, 2005; <http://www.federalreserve.gov/boarddocs/hh/2005/july/testimony.htm>.

<sup>2</sup>Bernanke, Ben S. “The Global Saving Glut and the U.S. Current Account Deficit.” Speech presented as the Sandridge Lecture, Richmond, Virginia, April 14, 2005; <http://www.federalreserve.gov/boarddocs/speeches/2005/20050414/default.htm>.

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## Conventions used in this publication:

1. Unless otherwise indicated, data are monthly.
2. Shaded areas indicate recessions, as determined by the National Bureau of Economic Research.
3. *Percent change at an annual rate* is the simple, not compounded, monthly percent change multiplied by 12. For example, using consecutive months, the percent change at an annual rate in  $x$  between month  $t-1$  and the current month  $t$  is:  $[(x_t/x_{t-1})-1] \times 1200$ . Note that this differs from *National Economic Trends*. In that publication, monthly percent changes are compounded and expressed as annual growth rates.
4. The *percent change from year ago* refers to the percent change from the same period in the previous year. For example, the percent change from year ago in  $x$  between month  $t-12$  and the current month  $t$  is:  $[(x_t/x_{t-12})-1] \times 100$ .

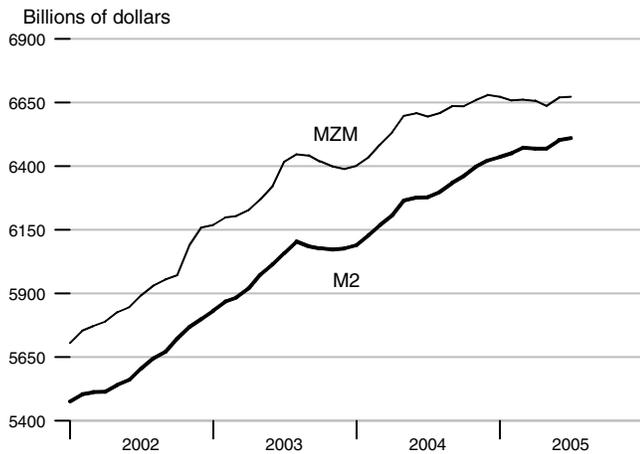
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Editor, *Monetary Trends*  
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St. Louis, MO 63166-0442

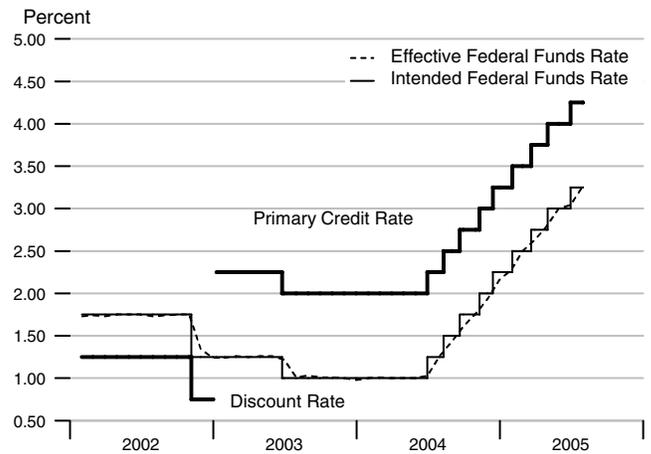
or to:

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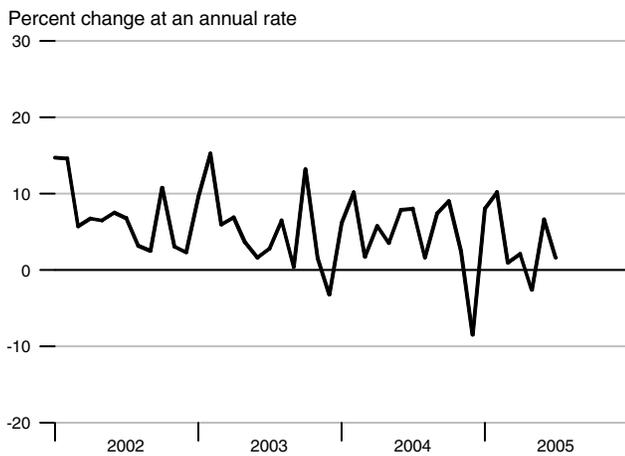
### M2 and MZM



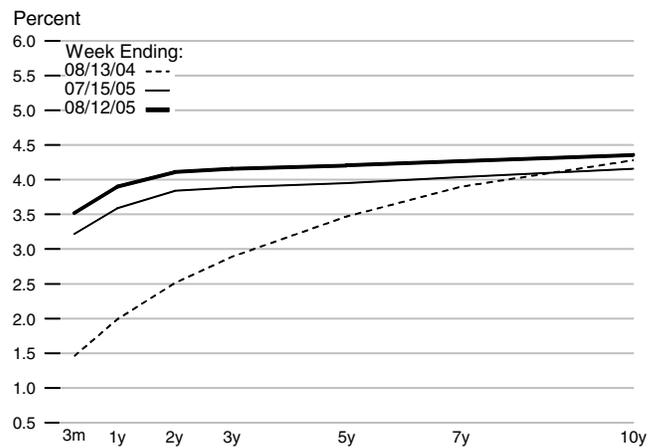
### Reserve Market Rates



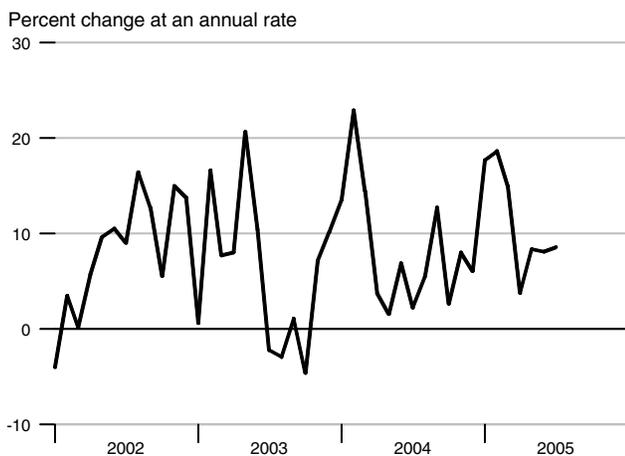
### Adjusted Monetary Base



### Treasury Yield Curve



### Total Bank Credit

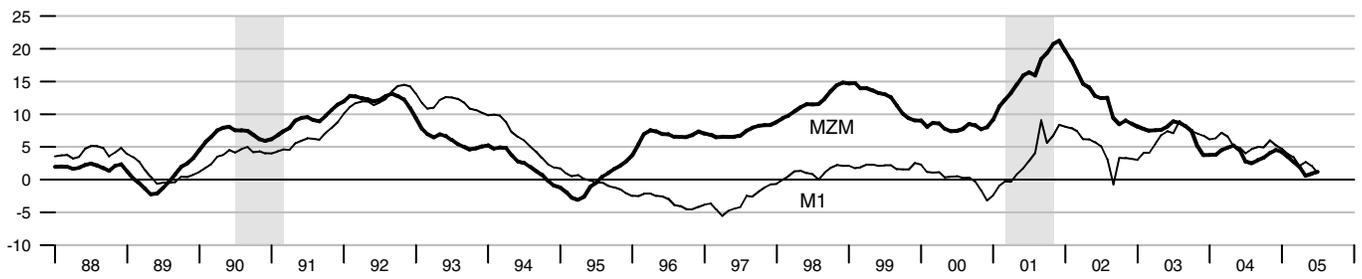


### Interest Rates

|                            | May 05 | Jun 05 | Jul 05 |
|----------------------------|--------|--------|--------|
| Federal Funds Rate         | 3.00   | 3.04   | 3.26   |
| Prime Rate                 | 5.98   | 6.01   | 6.25   |
| Primary Credit Rate        | 3.98   | 4.01   | 4.25   |
| Conventional Mortgage Rate | 5.72   | 5.58   | 5.70   |
| <b>Treasury Yields:</b>    |        |        |        |
| 3-Month Constant Maturity  | 2.90   | 3.04   | 3.29   |
| 6-Month Constant Maturity  | 3.17   | 3.22   | 3.53   |
| 1-Year Constant Maturity   | 3.33   | 3.36   | 3.64   |
| 3-Year Constant Maturity   | 3.72   | 3.69   | 3.91   |
| 5-Year Constant Maturity   | 3.85   | 3.77   | 3.98   |
| 10-Year Constant Maturity  | 4.14   | 4.00   | 4.18   |

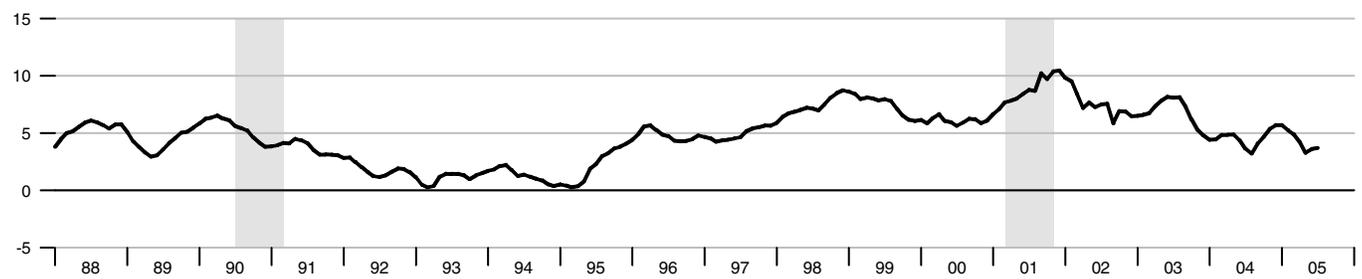
### MZM and M1

Percent change from year ago



### M2

Percent change from year ago



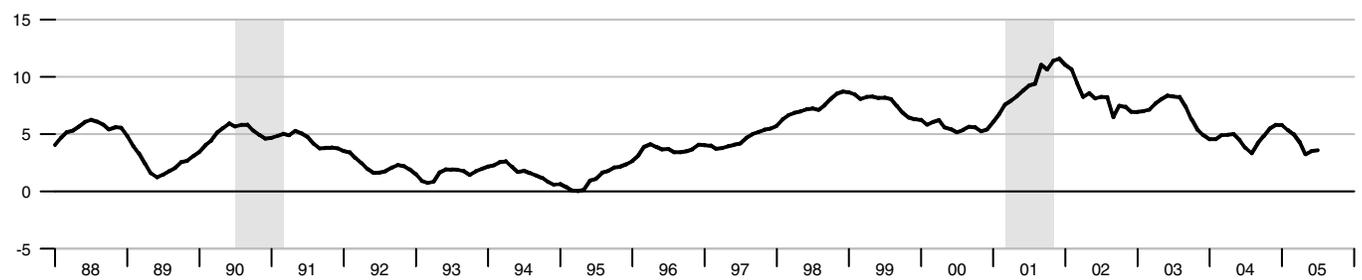
### M3

Percent change from year ago



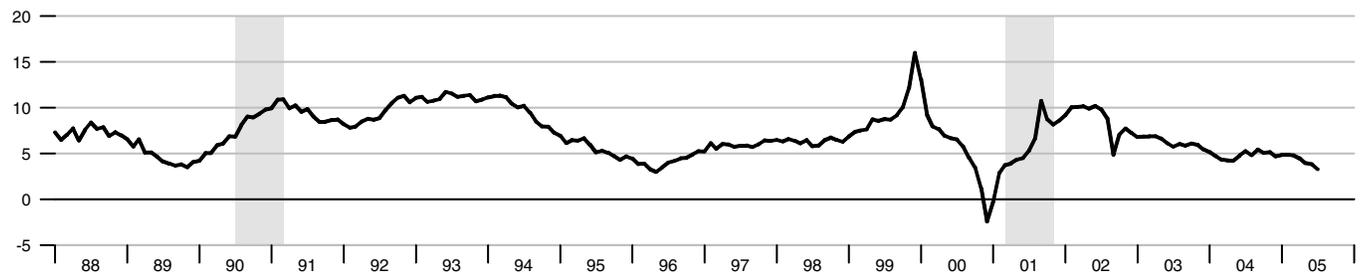
### Monetary Services Index - M2

Percent change from year ago



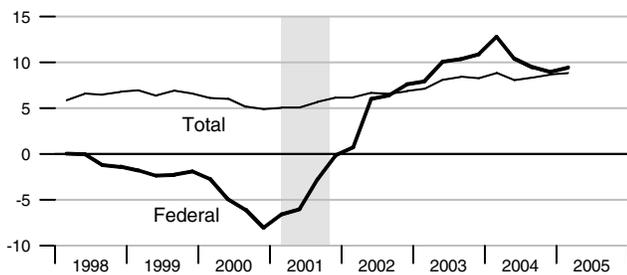
### Adjusted Monetary Base

Percent change from year ago



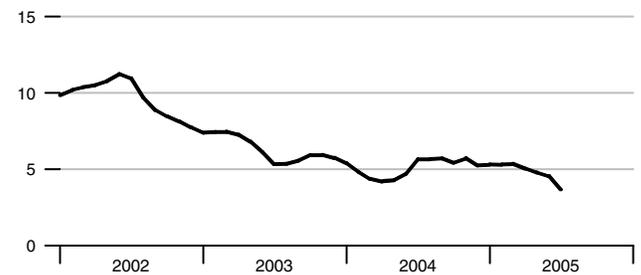
### Domestic Nonfinancial Debt

Percent change from year ago



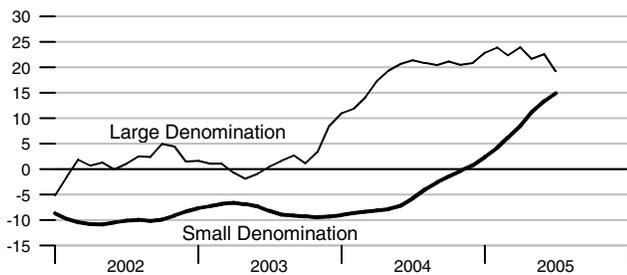
### Currency Held by the Nonbank Public

Percent change from year ago



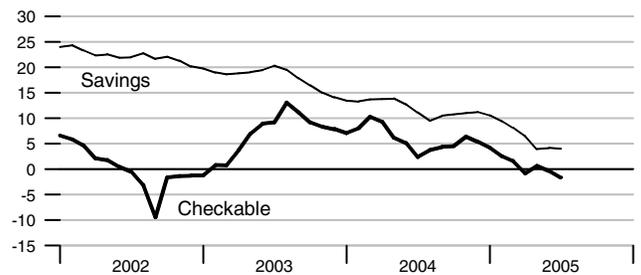
### Time Deposits

Percent change from year ago



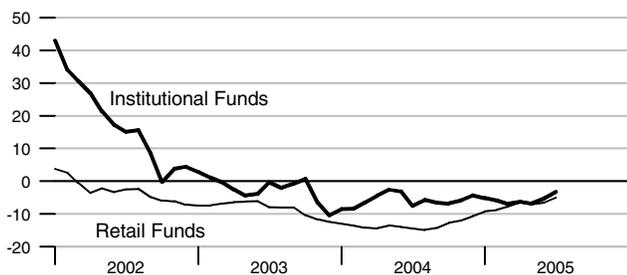
### Checkable and Savings Deposits

Percent change from year ago



### Money Market Mutual Fund Shares

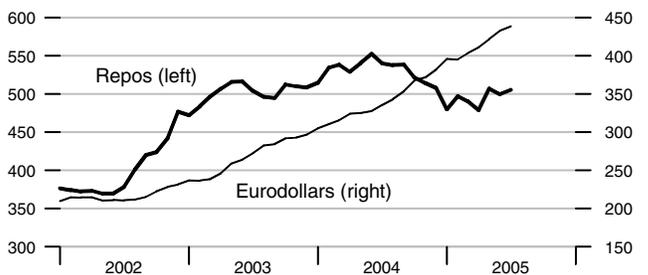
Percent change from year ago



### Repurchase Agreements and Eurodollars

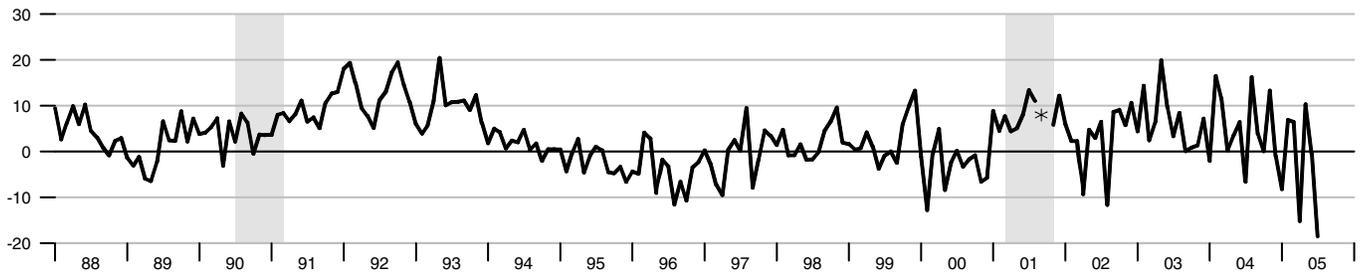
Billions of dollars

Billions of dollars



**M1**

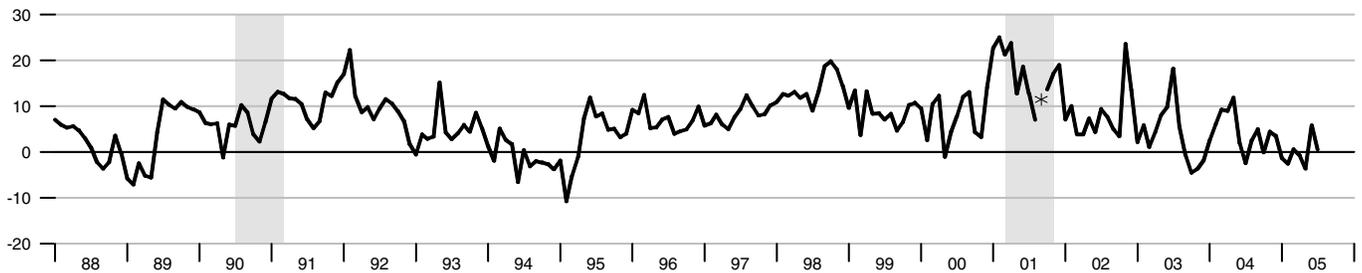
Percent change at an annual rate



\*Actual values for September and October 2001 are 55.87 and -38.35 percent rate, respectively.

**M2M**

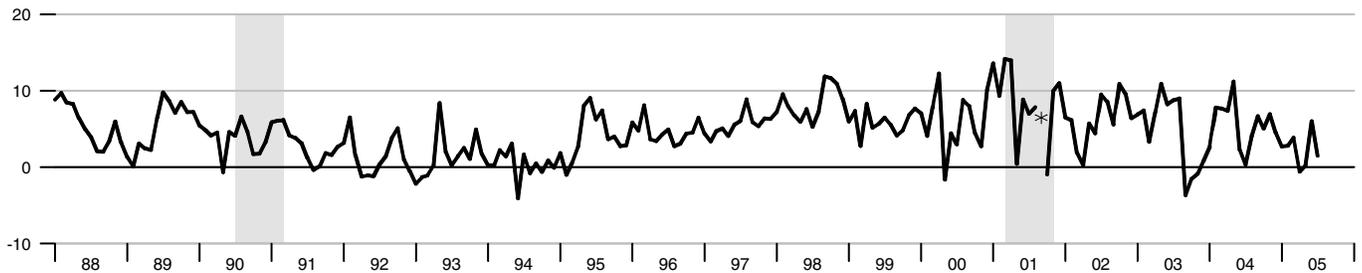
Percent change at an annual rate



\*Actual value for September 2001 is 39.41 percent rate.

**M2**

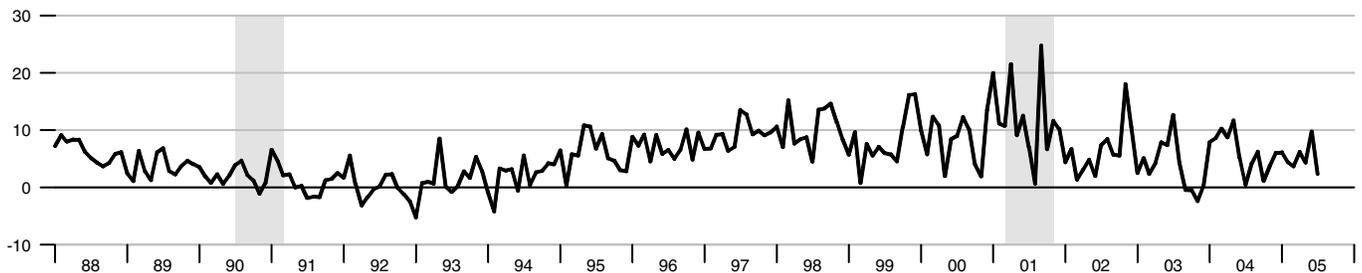
Percent change at an annual rate



\*Actual value for September 2001 is 24.90 percent rate.

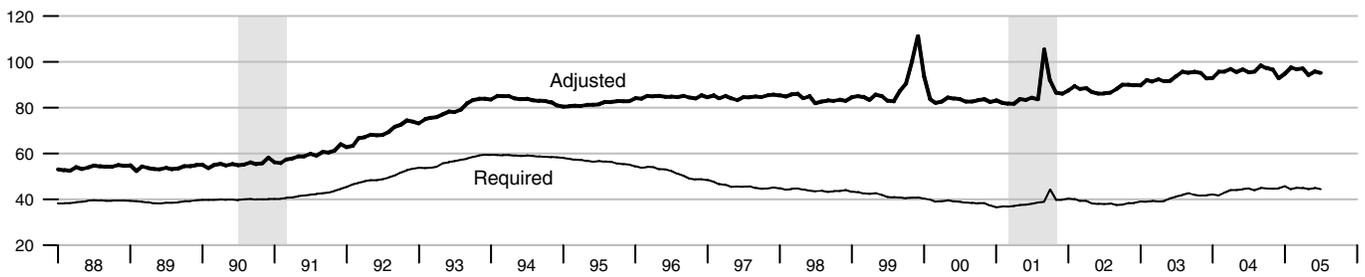
**M3**

Percent change at an annual rate



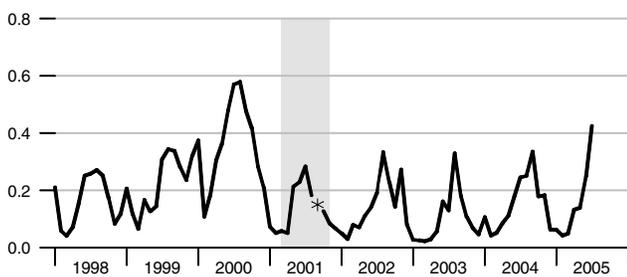
### Adjusted and Required Reserves

Billions of dollars



### Total Borrowings, nsa

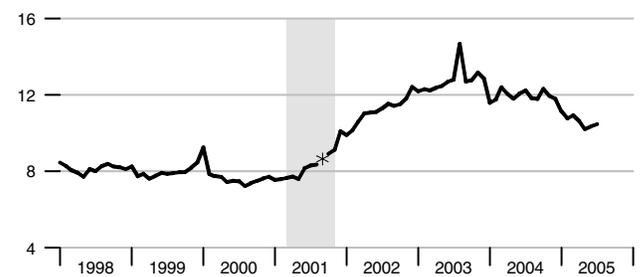
Billions of dollars



\*Actual value for September 2001 is \$3.4 billion.

### Excess Reserves plus RCB Contracts

Billions of dollars



\*Actual value for September 2001 is \$26.43 billion.

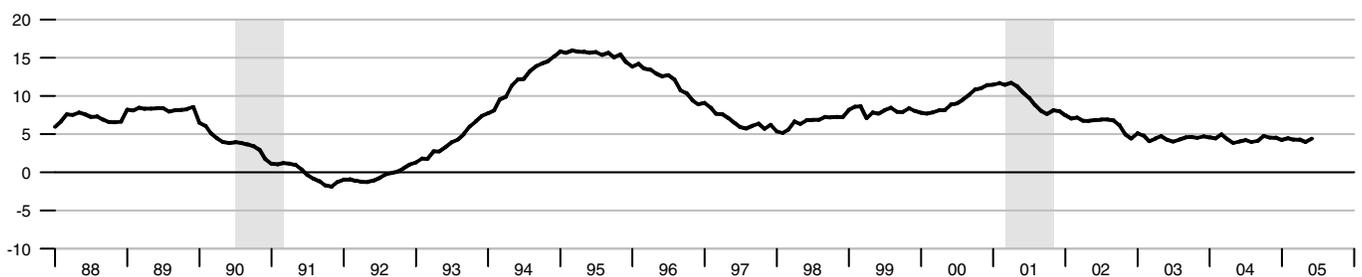
### Nonfinancial Commercial Paper

Percent change from year ago

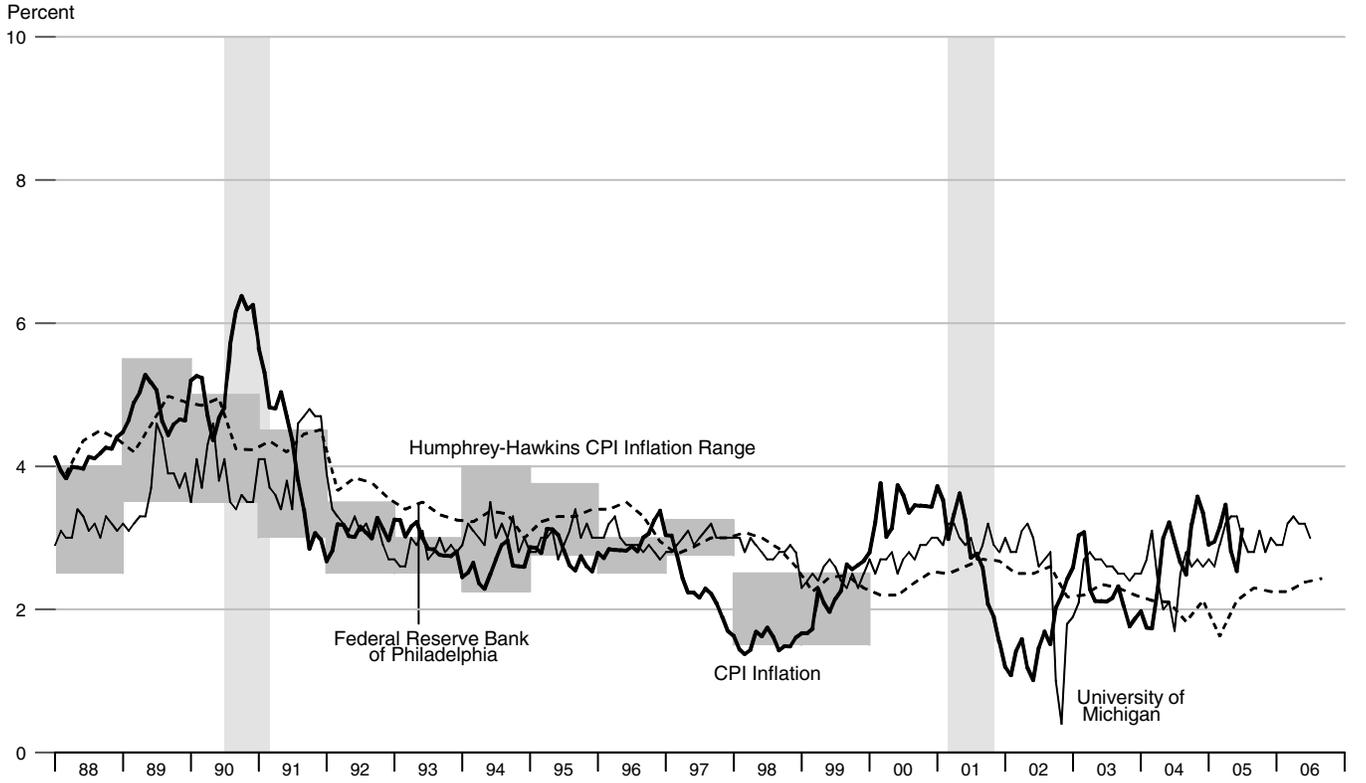


### Consumer Credit

Percent change from year ago

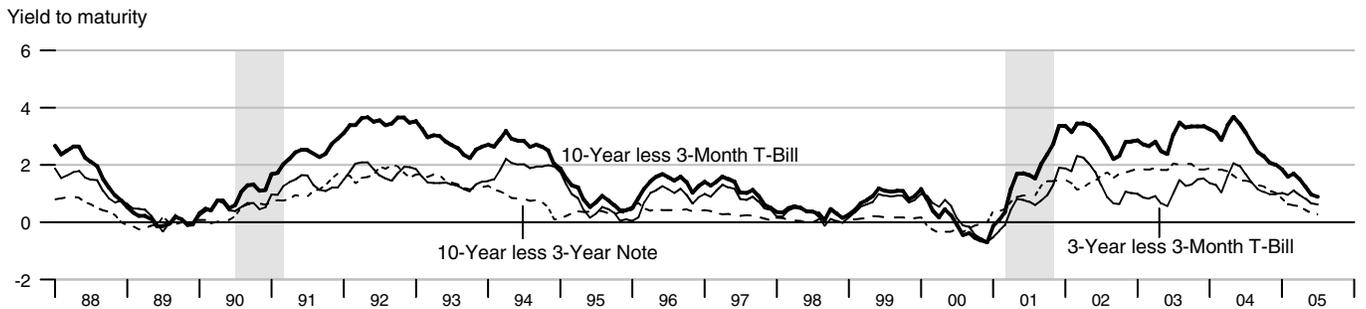


**Inflation and Inflation Expectations**

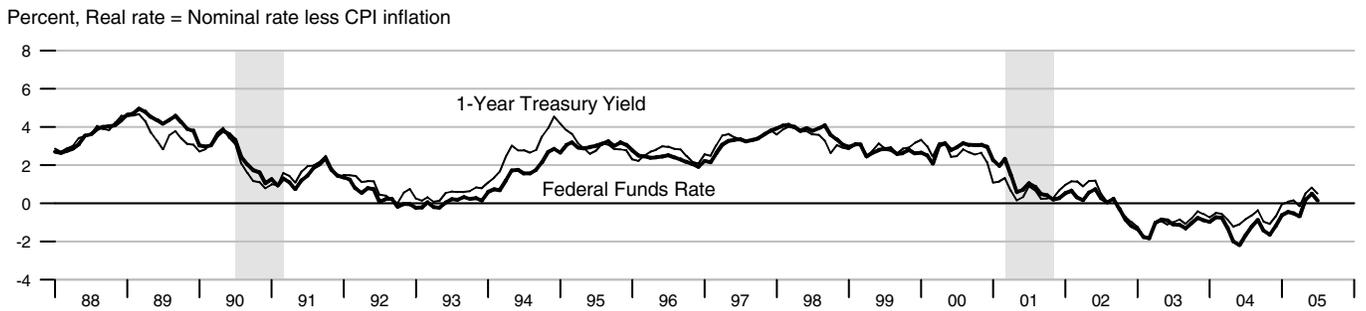


The shaded region shows the Humphrey-Hawkins CPI inflation range. Beginning in January 2000, the Humphrey-Hawkins inflation range was reported using the PCE price index and therefore is not shown on this graph. See notes on page 19.

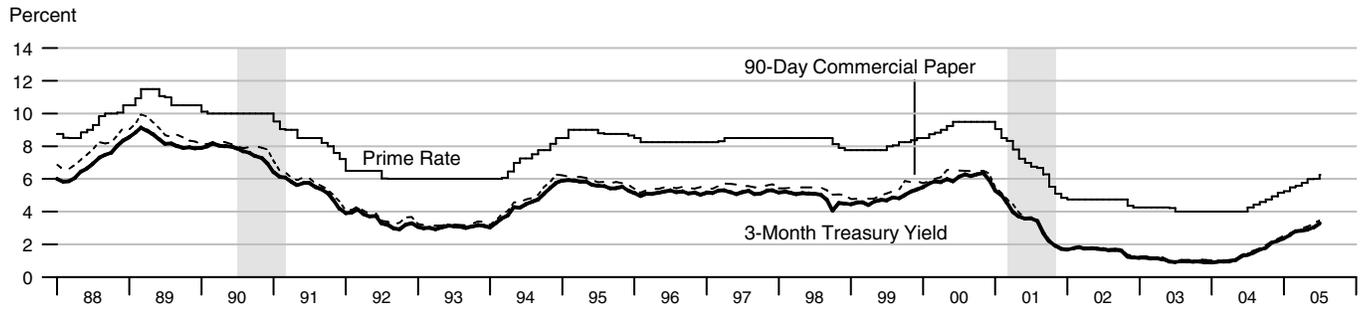
**Treasury Security Yield Spreads**



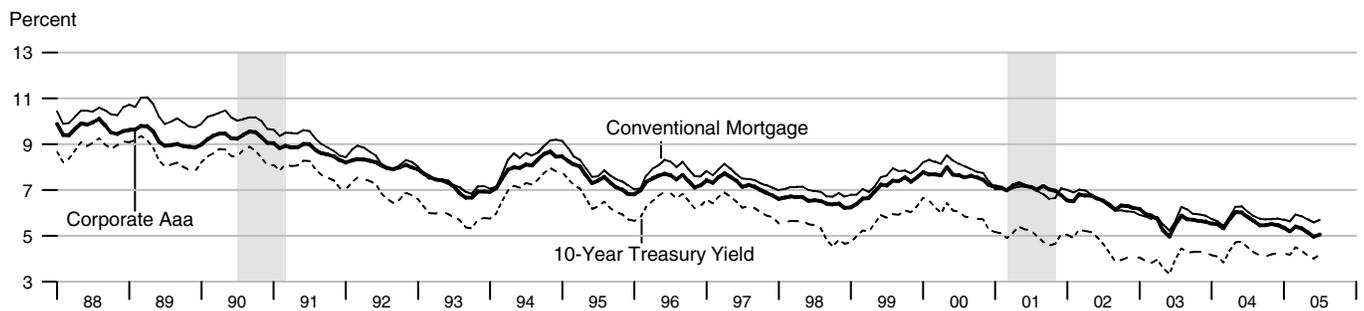
**Real Interest Rates**



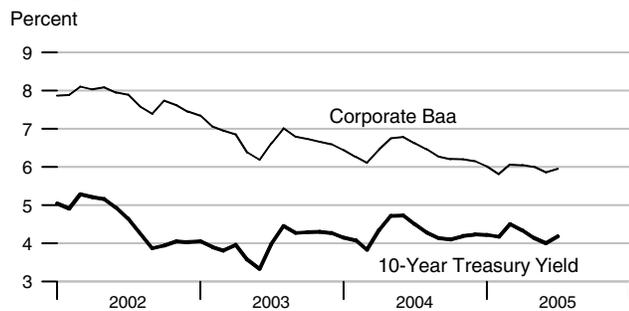
### Short-Term Interest Rates



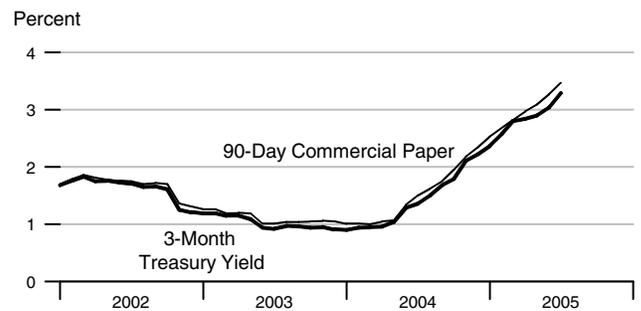
### Long-Term Interest Rates



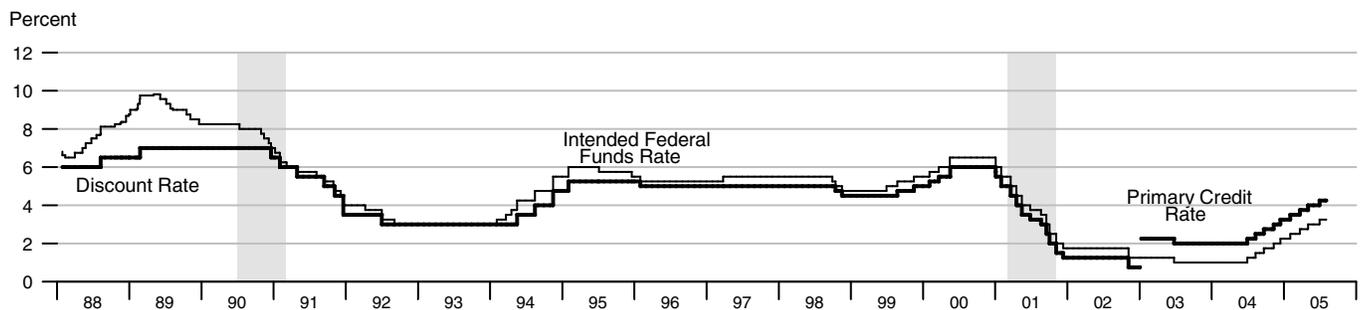
### Long-Term Interest Rates



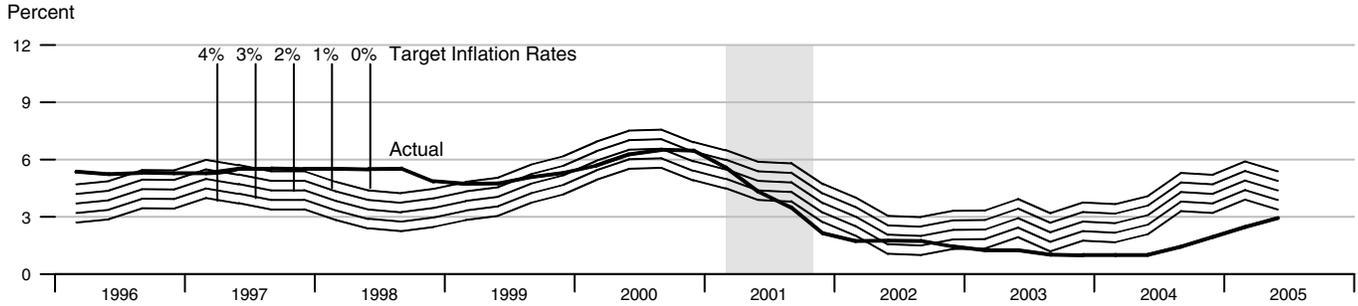
### Short-Term Interest Rates



### FOMC Intended Federal Funds Rate, Discount Rate, and Primary Credit Rate



### Federal Funds Rate and Inflation Targets

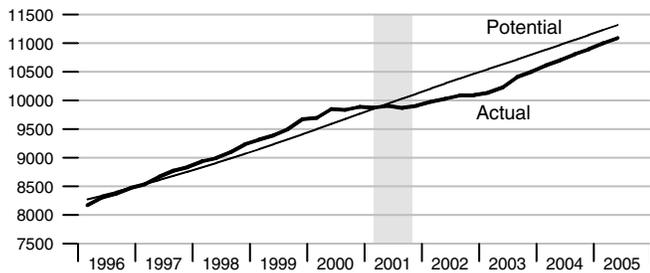


Calculated federal funds rate is based on Taylor's rule. See notes on page 19.

### Components of Taylor's Rule

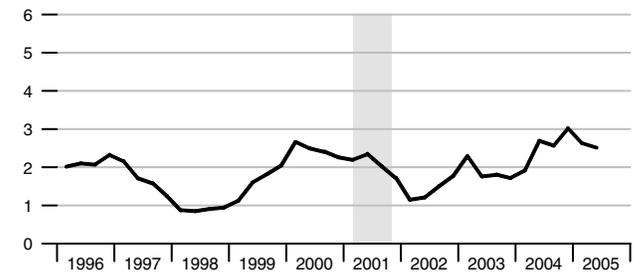
#### Actual and Potential Real GDP

Billions of chain-weighted 2000 dollars



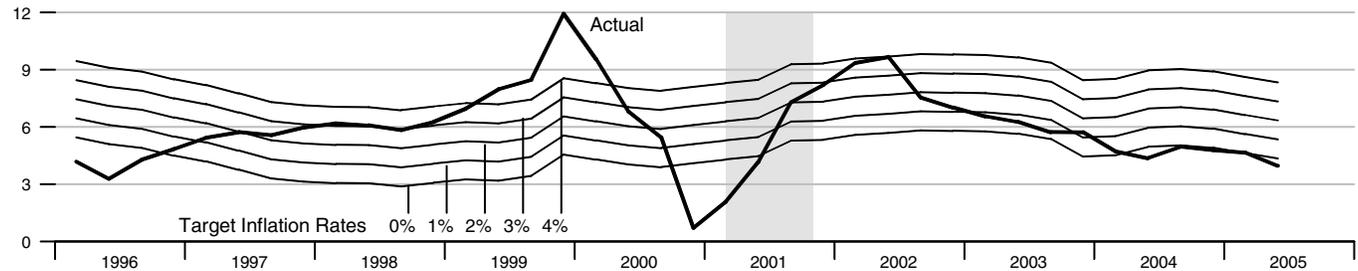
#### PCE Inflation

Percent change from year ago



### Monetary Base Growth\* and Inflation Targets

Percent



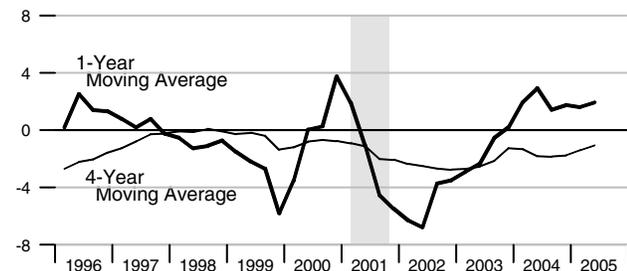
\*Modified for the effects of sweeps programs on reserve demand.

Calculated base growth is based on McCallum's rule. Actual base growth is percent change from year ago. See notes on page 19.

### Components of McCallum's Rule

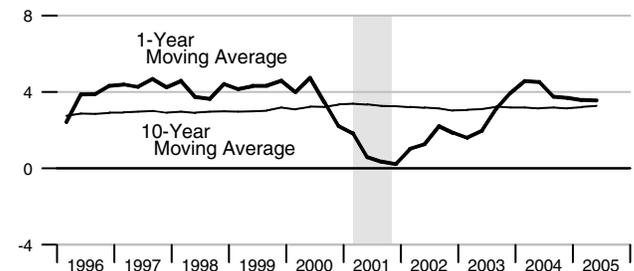
#### Monetary Base Velocity Growth

Percent

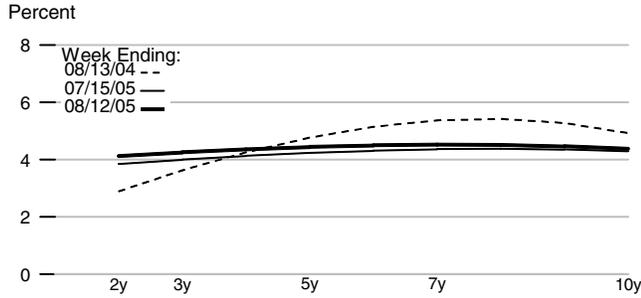


#### Real Output Growth

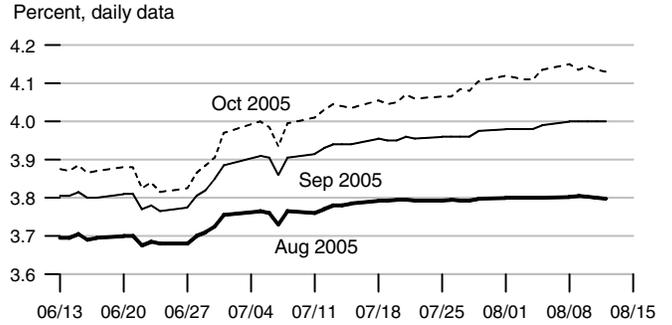
Percent



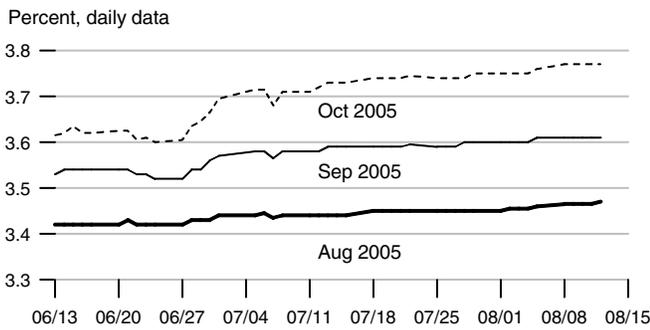
### Implied One-Year Forward Rates



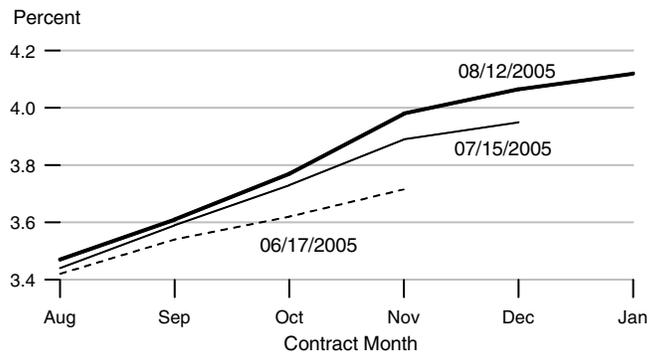
### Rates on 3-Month Eurodollar Futures



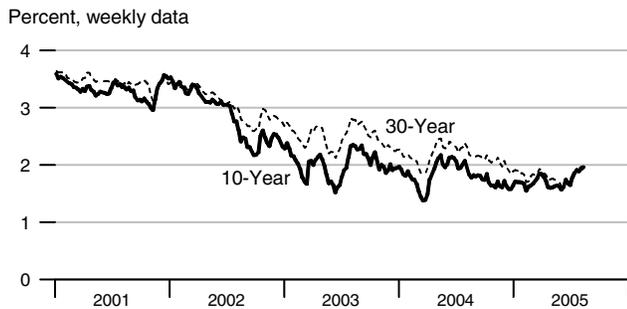
### Rates on Selected Federal Funds Futures Contracts



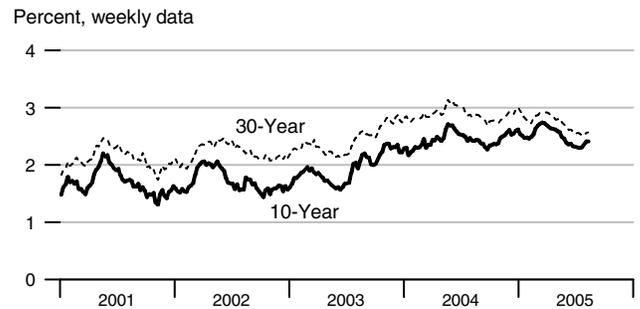
### Rates on Federal Funds Futures on Selected Dates



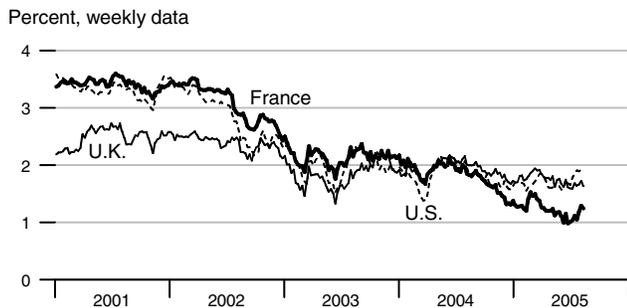
### Inflation-Indexed Treasury Securities



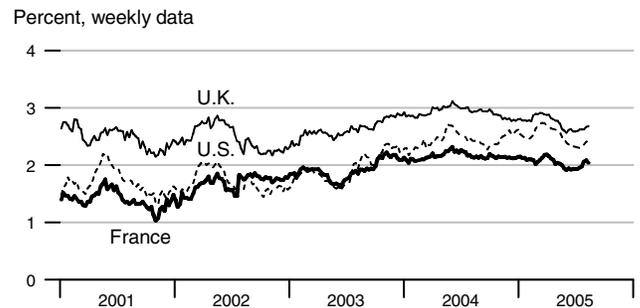
### Inflation-Indexed Treasury Yield Spreads



### Inflation-Indexed 10-Year Government Notes

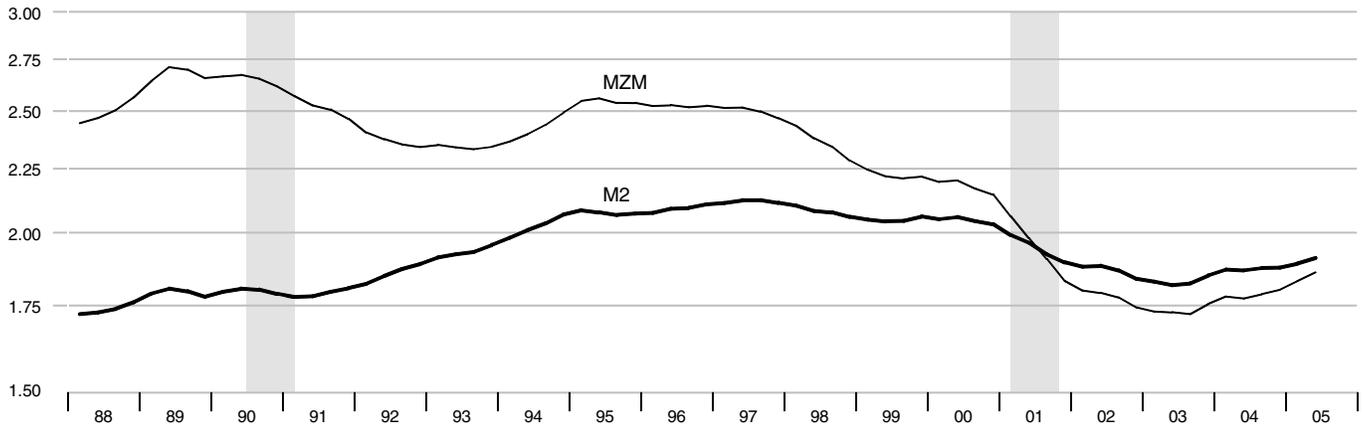


### Inflation-Indexed 10-Year Government Yield Spreads



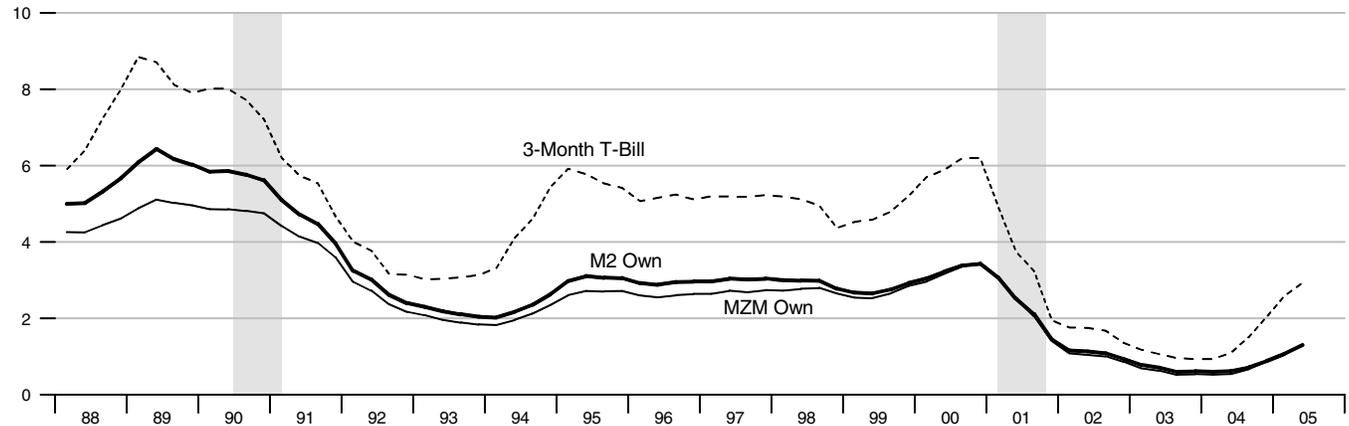
Velocity

Nominal GDP/MZM, Nominal GDP/M2 (Ratio Scale)



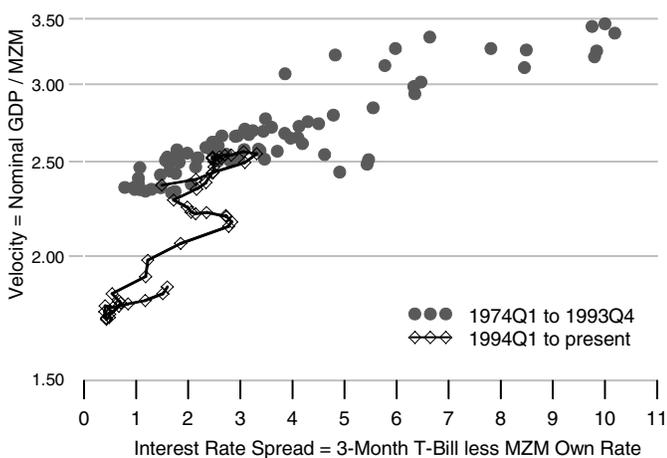
Interest Rates

Percent



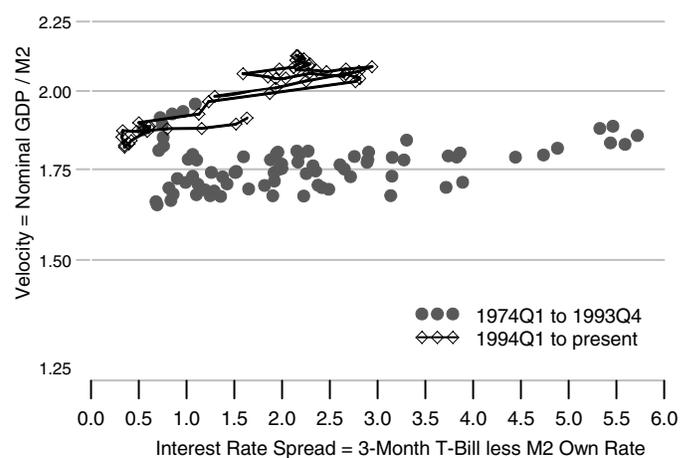
MZM Velocity and Interest Rate Spread

Ratio Scale



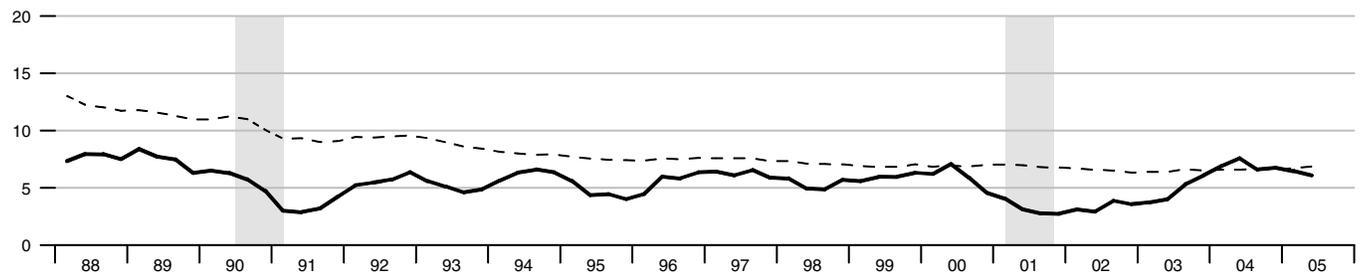
M2 Velocity and Interest Rate Spread

Ratio Scale



### Gross Domestic Product

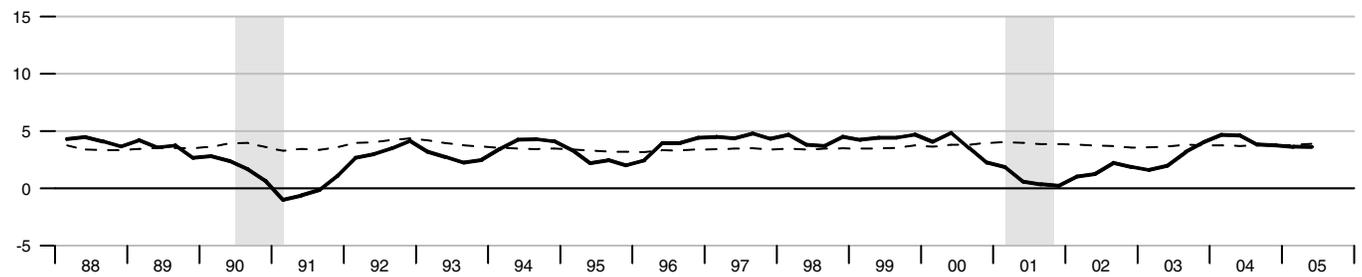
Percent change from year ago



Dashed lines indicate 10-year moving averages.

### Real Gross Domestic Product

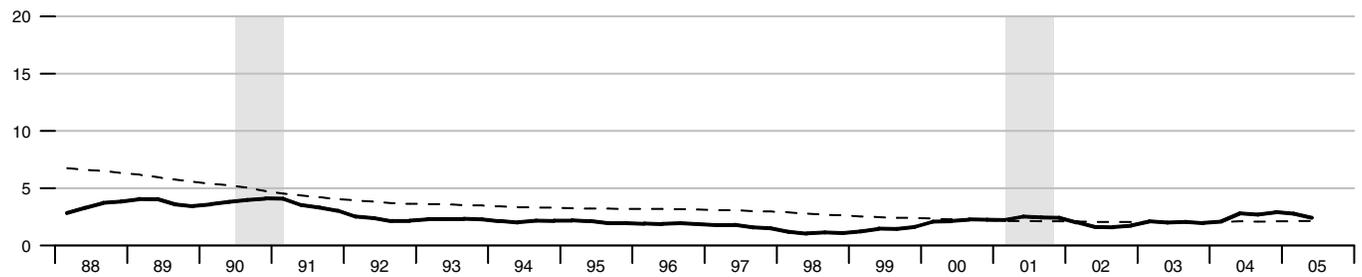
Percent change from year ago



Dashed lines indicate 10-year moving averages.

### Gross Domestic Product Price Index

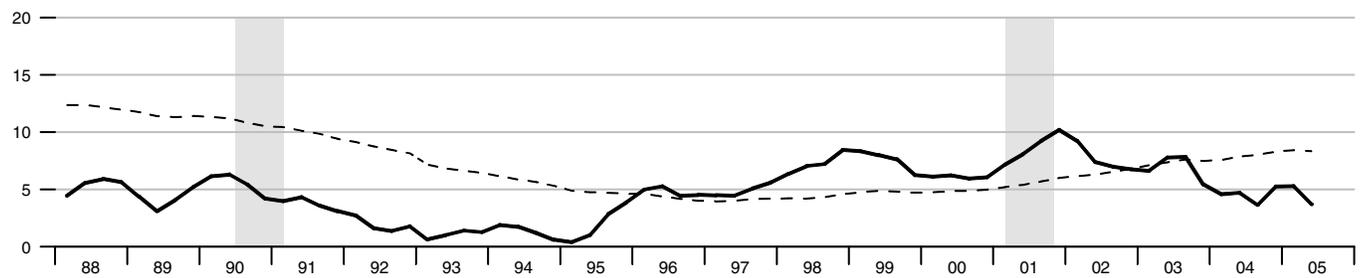
Percent change from year ago



Dashed lines indicate 10-year moving averages.

### M2

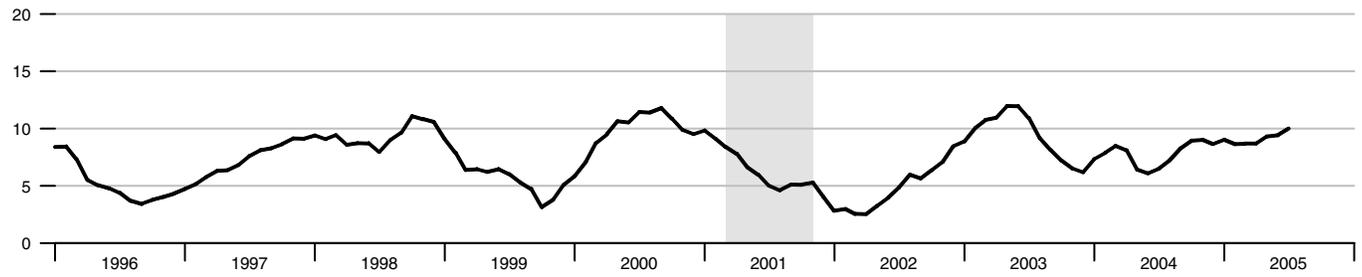
Percent change from year ago



Dashed lines indicate 10-year moving averages.

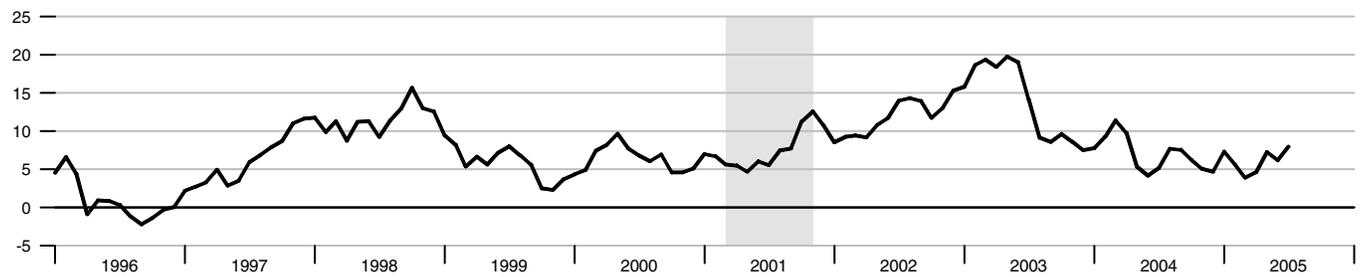
**Bank Credit**

Percent change from year ago



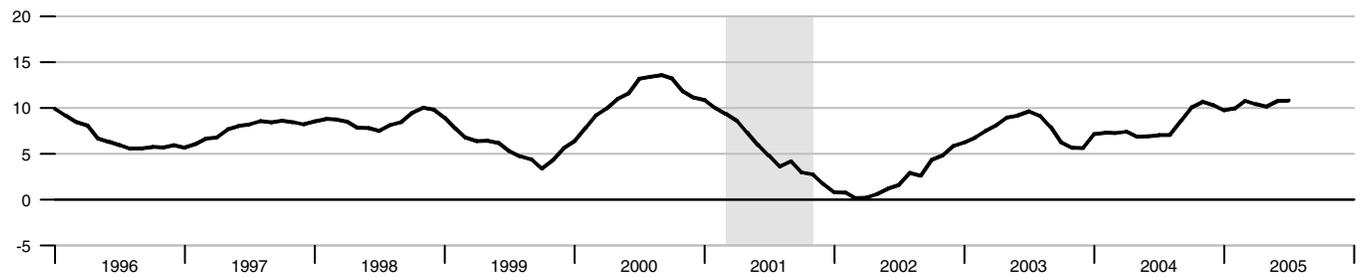
**Investment Securities in Bank Credit at Commercial Banks**

Percent change from year ago



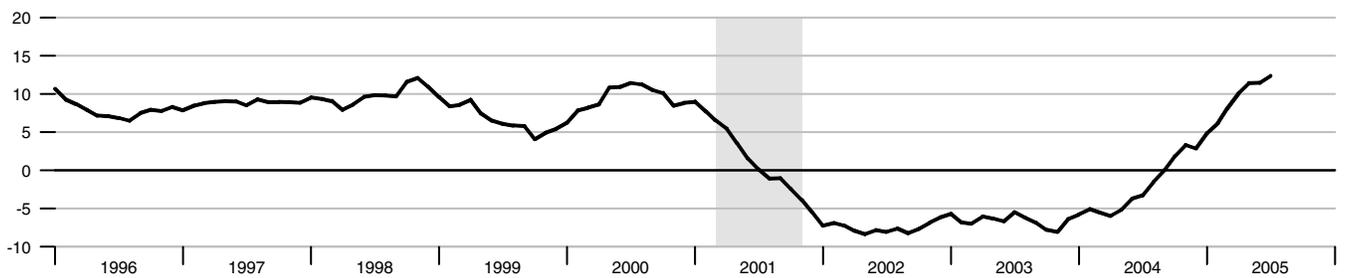
**Total Loans and Leases in Bank Credit at Commercial Banks**

Percent change from year ago

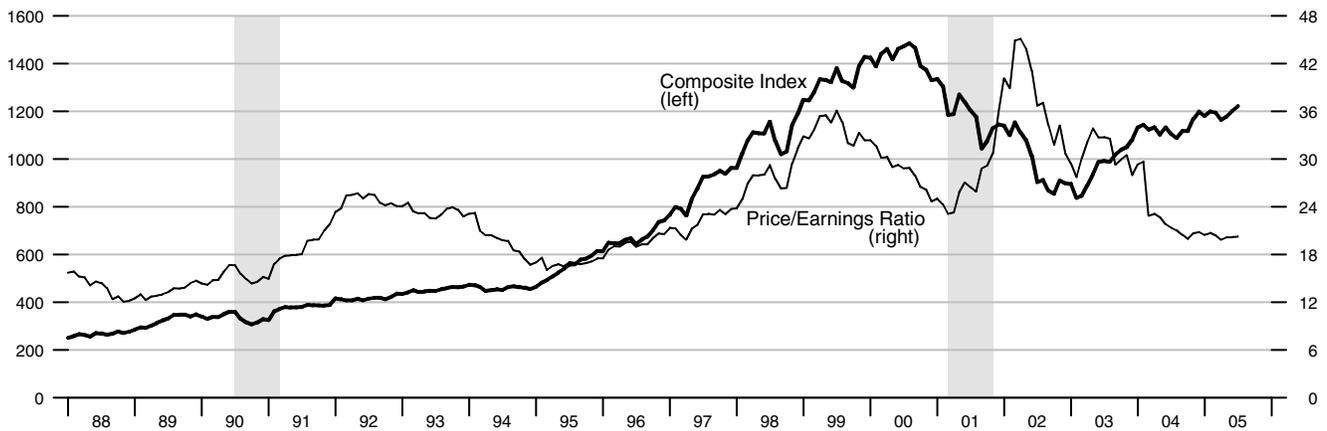


**Commercial and Industrial Loans at Commercial Banks**

Percent change from year ago



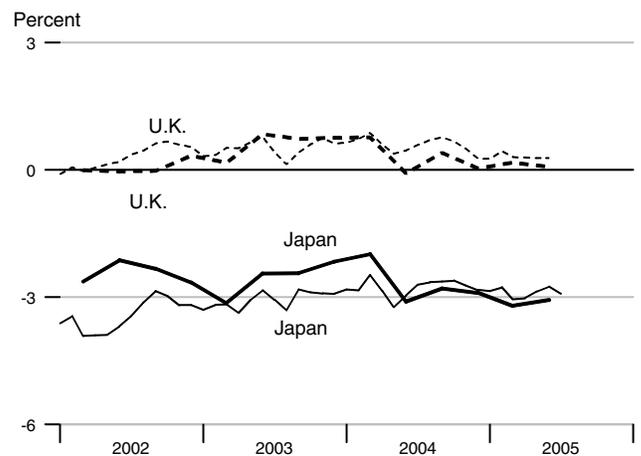
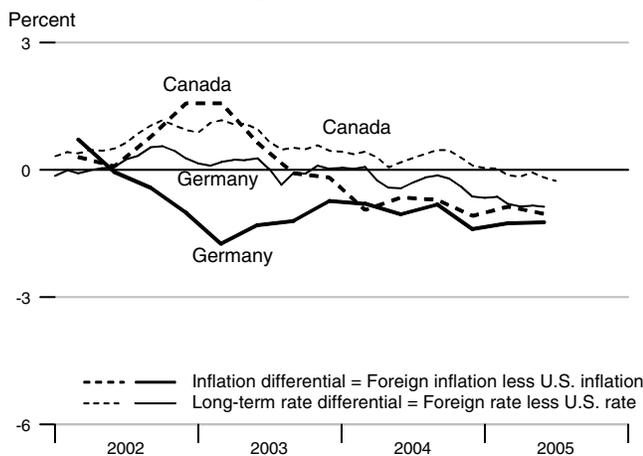
### Standard & Poor's 500



### Recent Inflation and Long-Term Interest Rates

|                | Consumer Price Inflation Rates |        |        |        | Long-Term Government Bond Rates |       |       |       |
|----------------|--------------------------------|--------|--------|--------|---------------------------------|-------|-------|-------|
|                | Percent change from year ago   |        |        |        | Percent                         |       |       |       |
|                | 2004Q3                         | 2004Q4 | 2005Q1 | 2005Q2 | Apr05                           | May05 | Jun05 | Jul05 |
| United States  | 2.69                           | 3.37   | 3.00   | 2.93   | 4.34                            | 4.14  | 4.00  | 4.18  |
| Canada         | 1.99                           | 2.29   | 2.13   | 1.90   | 4.18                            | 4.08  | 3.82  | 3.92  |
| France         | 2.28                           | 2.08   | 1.70   | 1.69   | 3.54                            | 3.38  | 3.20  | .     |
| Germany        | 1.88                           | 1.98   | 1.74   | 1.70   | 3.48                            | 3.30  | 3.13  | .     |
| Italy          | 2.23                           | 1.98   | 1.92   | 1.84   | 3.65                            | 3.55  | 3.41  | 3.44  |
| Japan          | -0.10                          | 0.48   | -0.20  | -0.14  | 1.32                            | 1.27  | 1.24  | 1.26  |
| United Kingdom | 3.09                           | 3.41   | 3.17   | 3.01   | 4.63                            | 4.42  | 4.28  | .     |

### Inflation and Long-Term Interest Rate Differentials



|      |     | Money Stock |          |          |          | Bank     | Adjusted      |          | MSI M2  |
|------|-----|-------------|----------|----------|----------|----------|---------------|----------|---------|
|      |     | M1          | MZM      | M2       | M3       | Credit   | Monetary Base | Reserves |         |
| 2000 |     | 1103.678    | 4508.490 | 4798.172 | 6860.767 | 5025.394 | 607.106       | 84.115   | 248.592 |
| 2001 |     | 1136.048    | 5220.145 | 5214.927 | 7642.562 | 5345.118 | 641.167       | 86.177   | 271.192 |
| 2002 |     | 1190.960    | 5890.892 | 5609.469 | 8256.046 | 5597.662 | 697.072       | 88.136   | 293.905 |
| 2003 |     | 1266.713    | 6325.605 | 5997.077 | 8783.042 | 6120.888 | 740.762       | 93.143   | 314.863 |
| 2004 |     | 1336.556    | 6573.341 | 6269.110 | 9241.173 | 6595.186 | 776.518       | 95.867   | 329.521 |
| 2003 | 1   | 1230.394    | 6191.256 | 5861.564 | 8618.652 | 5956.379 | 726.828       | 91.083   | 307.669 |
|      | 2   | 1260.790    | 6273.095 | 5969.138 | 8728.386 | 6136.554 | 738.281       | 91.944   | 313.329 |
|      | 3   | 1284.077    | 6435.714 | 6082.247 | 8895.660 | 6186.974 | 744.144       | 94.974   | 319.343 |
|      | 4   | 1291.592    | 6402.354 | 6075.361 | 8889.470 | 6203.643 | 753.796       | 94.570   | 319.110 |
| 2004 | 1   | 1311.109    | 6441.073 | 6129.380 | 9011.952 | 6427.355 | 761.243       | 94.840   | 322.050 |
|      | 2   | 1330.781    | 6579.909 | 6249.258 | 9223.462 | 6557.745 | 770.962       | 96.406   | 328.380 |
|      | 3   | 1342.897    | 6613.563 | 6304.062 | 9320.892 | 6641.406 | 782.591       | 96.596   | 331.396 |
|      | 4   | 1361.436    | 6658.818 | 6393.739 | 9408.386 | 6754.239 | 791.277       | 95.624   | 336.259 |
| 2005 | 1   | 1363.896    | 6664.333 | 6453.497 | 9531.010 | 6992.304 | 798.060       | 96.439   | 339.386 |
|      | 2   | 1361.602    | 6654.955 | 6480.680 | 9660.648 | 7157.490 | 802.447       | 95.743   | 340.517 |
| 2003 | Jul | 1278.056    | 6417.316 | 6058.250 | 8875.476 | 6195.266 | 741.389       | 93.811   | 318.073 |
|      | Aug | 1287.035    | 6446.848 | 6103.614 | 8907.438 | 6180.102 | 745.394       | 95.778   | 320.432 |
|      | Sep | 1287.140    | 6442.979 | 6084.876 | 8904.065 | 6185.555 | 745.648       | 95.332   | 319.525 |
|      | Oct | 1288.045    | 6418.660 | 6076.974 | 8900.509 | 6161.811 | 753.833       | 95.699   | 319.138 |
|      | Nov | 1289.524    | 6399.197 | 6072.484 | 8882.831 | 6198.346 | 754.786       | 95.220   | 318.966 |
|      | Dec | 1297.207    | 6389.206 | 6076.626 | 8885.069 | 6250.772 | 752.769       | 92.790   | 319.227 |
| 2004 | Jan | 1295.024    | 6402.845 | 6089.918 | 8943.387 | 6321.075 | 756.606       | 93.026   | 320.065 |
|      | Feb | 1312.792    | 6435.469 | 6129.479 | 9007.759 | 6441.658 | 763.012       | 95.738   | 322.045 |
|      | Mar | 1325.512    | 6484.905 | 6168.743 | 9084.709 | 6519.331 | 764.112       | 95.755   | 324.039 |
|      | Apr | 1325.842    | 6533.357 | 6206.673 | 9150.944 | 6539.555 | 767.768       | 96.901   | 326.106 |
|      | May | 1329.698    | 6597.850 | 6264.588 | 9240.044 | 6548.097 | 770.029       | 95.588   | 329.200 |
|      | Jun | 1336.804    | 6608.521 | 6276.512 | 9279.397 | 6585.584 | 775.088       | 96.729   | 329.835 |
|      | Jul | 1329.473    | 6595.183 | 6278.298 | 9283.141 | 6597.859 | 780.276       | 95.493   | 330.135 |
|      | Aug | 1347.436    | 6609.074 | 6299.453 | 9315.634 | 6628.075 | 781.339       | 95.823   | 331.099 |
|      | Sep | 1351.782    | 6636.432 | 6334.435 | 9363.900 | 6698.283 | 786.158       | 98.473   | 332.954 |
|      | Oct | 1351.858    | 6635.947 | 6361.180 | 9372.829 | 6713.026 | 792.055       | 97.355   | 334.510 |
|      | Nov | 1366.815    | 6660.394 | 6397.942 | 9402.571 | 6757.747 | 793.690       | 96.637   | 336.486 |
|      | Dec | 1365.634    | 6680.114 | 6422.094 | 9449.758 | 6791.945 | 788.085       | 92.881   | 337.780 |
| 2005 | Jan | 1356.267    | 6672.763 | 6436.558 | 9498.018 | 6891.922 | 793.357       | 94.890   | 338.607 |
|      | Feb | 1364.034    | 6658.570 | 6451.648 | 9532.870 | 6998.889 | 800.094       | 97.597   | 339.268 |
|      | Mar | 1371.388    | 6661.666 | 6472.284 | 9562.143 | 7086.101 | 800.730       | 96.830   | 340.282 |
|      | Apr | 1354.032    | 6657.669 | 6469.079 | 9611.383 | 7108.401 | 802.130       | 97.135   | 340.184 |
|      | May | 1365.658    | 6637.556 | 6470.314 | 9646.207 | 7157.868 | 800.401       | 94.253   | 339.892 |
|      | Jun | 1365.115    | 6669.640 | 6502.648 | 9724.354 | 7206.201 | 804.810       | 95.841   | 341.476 |
|      | Jul | 1344.026    | 6672.816 | 6510.684 | 9743.416 | 7257.655 | 805.890       | 95.255   | 342.008 |

\*All values are given in billions of dollars.

|      |      | Federal Funds | Primary Credit Rate | Prime Rate | 3-mo CDs | Treasury Yields |      |       | Corporate Aaa Bonds | S & L Aaa Bonds | Conventional Mortgage |      |
|------|------|---------------|---------------------|------------|----------|-----------------|------|-------|---------------------|-----------------|-----------------------|------|
|      |      |               |                     |            |          | 3-mo            | 3-yr | 10-yr |                     |                 |                       |      |
| 2000 |      | 6.24          |                     | 9.23       | 6.46     | 6.00            | 6.22 | 6.03  | 7.62                | 5.58            | 8.06                  |      |
| 2001 |      | 3.89          |                     | 6.92       | 3.69     | 3.47            | 4.08 | 5.02  | 7.08                | 5.01            | 6.97                  |      |
| 2002 |      | 1.67          |                     | 4.68       | 1.73     | 1.63            | 3.10 | 4.61  | 6.49                | 4.87            | 6.54                  |      |
| 2003 |      | 1.13          | 2.11                | 4.12       | 1.15     | 1.03            | 2.11 | 4.02  | 5.67                | 4.52            | 5.82                  |      |
| 2004 |      | 1.35          | 2.34                | 4.34       | 1.56     | 1.40            | 2.78 | 4.27  | 5.63                | 4.50            | 5.84                  |      |
| 2003 | 1    | 1.25          | 2.25                | 4.25       | 1.26     | 1.18            | 2.07 | 3.92  | 6.00                | 4.60            | 5.83                  |      |
|      | 2    | 1.25          | 2.23                | 4.24       | 1.17     | 1.06            | 1.77 | 3.62  | 5.31                | 4.28            | 5.51                  |      |
|      | 3    | 1.02          | 2.00                | 4.00       | 1.07     | 0.95            | 2.20 | 4.23  | 5.70                | 4.68            | 6.01                  |      |
|      | 4    | 1.00          | 2.00                | 4.00       | 1.10     | 0.93            | 2.38 | 4.29  | 5.66                | 4.52            | 5.92                  |      |
| 2004 | 1    | 1.00          | 2.00                | 4.00       | 1.05     | 0.93            | 2.17 | 4.02  | 5.45                | 4.26            | 5.61                  |      |
|      | 2    | 1.01          | 2.00                | 4.00       | 1.25     | 1.10            | 2.98 | 4.60  | 5.93                | 4.82            | 6.13                  |      |
|      | 3    | 1.43          | 2.42                | 4.42       | 1.70     | 1.51            | 2.92 | 4.30  | 5.64                | 4.54            | 5.89                  |      |
|      | 4    | 1.95          | 2.94                | 4.94       | 2.25     | 2.04            | 3.05 | 4.17  | 5.48                | 4.39            | 5.73                  |      |
| 2005 | 1    | 2.47          | 3.44                | 5.44       | 2.78     | 2.58            | 3.61 | 4.30  | 5.32                | 4.23            | 5.76                  |      |
|      | 2    | 2.94          | 3.91                | 5.91       | 3.23     | 2.93            | 3.73 | 4.16  | 5.15                | 4.15            | 5.72                  |      |
| 2003 | Jul  | 1.01          | 2.00                | 4.00       | 1.05     | 0.92            | 1.93 | 3.98  | 5.49                | 4.59            | 5.63                  |      |
|      | Aug  | 1.03          | 2.00                | 4.00       | 1.08     | 0.97            | 2.44 | 4.45  | 5.88                | 4.82            | 6.26                  |      |
|      | Sep  | 1.01          | 2.00                | 4.00       | 1.08     | 0.96            | 2.23 | 4.27  | 5.72                | 4.63            | 6.15                  |      |
|      | Oct  | 1.01          | 2.00                | 4.00       | 1.10     | 0.94            | 2.26 | 4.29  | 5.70                | 4.64            | 5.95                  |      |
|      | Nov  | 1.00          | 2.00                | 4.00       | 1.11     | 0.95            | 2.45 | 4.30  | 5.65                | 4.50            | 5.93                  |      |
|      | Dec  | 0.98          | 2.00                | 4.00       | 1.10     | 0.91            | 2.44 | 4.27  | 5.62                | 4.41            | 5.88                  |      |
|      | 2004 | Jan           | 1.00                | 2.00       | 4.00     | 1.06            | 0.90 | 2.27  | 4.15                | 5.54            | 4.42                  | 5.74 |
|      |      | Feb           | 1.01                | 2.00       | 4.00     | 1.05            | 0.94 | 2.25  | 4.08                | 5.50            | 4.26                  | 5.64 |
|      |      | Mar           | 1.00                | 2.00       | 4.00     | 1.05            | 0.95 | 2.00  | 3.83                | 5.33            | 4.11                  | 5.45 |
|      |      | Apr           | 1.00                | 2.00       | 4.00     | 1.08            | 0.96 | 2.57  | 4.35                | 5.73            | 4.69                  | 5.83 |
|      |      | May           | 1.00                | 2.00       | 4.00     | 1.20            | 1.04 | 3.10  | 4.72                | 6.04            | 4.93                  | 6.27 |
|      |      | Jun           | 1.03                | 2.01       | 4.01     | 1.46            | 1.29 | 3.26  | 4.73                | 6.01            | 4.85                  | 6.29 |
| Jul  |      | 1.26          | 2.25                | 4.25       | 1.57     | 1.36            | 3.05 | 4.50  | 5.82                | 4.71            | 6.06                  |      |
| Aug  |      | 1.43          | 2.43                | 4.43       | 1.68     | 1.50            | 2.88 | 4.28  | 5.65                | 4.52            | 5.87                  |      |
| Sep  |      | 1.61          | 2.58                | 4.58       | 1.86     | 1.68            | 2.83 | 4.13  | 5.46                | 4.40            | 5.75                  |      |
| Oct  |      | 1.76          | 2.75                | 4.75       | 2.04     | 1.79            | 2.85 | 4.10  | 5.47                | 4.38            | 5.72                  |      |
| Nov  |      | 1.93          | 2.93                | 4.93       | 2.26     | 2.11            | 3.09 | 4.19  | 5.52                | 4.45            | 5.73                  |      |
| Dec  |      | 2.16          | 3.15                | 5.15       | 2.45     | 2.22            | 3.21 | 4.23  | 5.47                | 4.35            | 5.75                  |      |
| 2005 | Jan  | 2.28          | 3.25                | 5.25       | 2.61     | 2.37            | 3.39 | 4.22  | 5.36                | 4.24            | 5.71                  |      |
|      | Feb  | 2.50          | 3.49                | 5.49       | 2.77     | 2.58            | 3.54 | 4.17  | 5.20                | 4.16            | 5.63                  |      |
|      | Mar  | 2.63          | 3.58                | 5.58       | 2.97     | 2.80            | 3.91 | 4.50  | 5.40                | 4.29            | 5.93                  |      |
|      | Apr  | 2.79          | 3.75                | 5.75       | 3.09     | 2.84            | 3.79 | 4.34  | 5.33                | 4.18            | 5.86                  |      |
|      | May  | 3.00          | 3.98                | 5.98       | 3.22     | 2.90            | 3.72 | 4.14  | 5.15                | 4.20            | 5.72                  |      |
|      | Jun  | 3.04          | 4.01                | 6.01       | 3.38     | 3.04            | 3.69 | 4.00  | 4.96                | 4.08            | 5.58                  |      |
|      | Jul  | 3.26          | 4.25                | 6.25       | 3.57     | 3.29            | 3.91 | 4.18  | 5.06                | 4.18            | 5.70                  |      |

\*All values are given as a percent at an annual rate.

|   |     | M1     | MZM   | M2    | M3    |
|---|-----|--------|-------|-------|-------|
| <b>Percent change at an annual rate</b> |     |        |       |       |       |
| 2000                                    |     | 0.20   | 8.11  | 6.08  | 9.43  |
| 2001                                    |     | 2.93   | 15.78 | 8.69  | 11.40 |
| 2002                                    |     | 4.83   | 12.85 | 7.57  | 8.03  |
| 2003                                    |     | 6.36   | 7.38  | 6.91  | 6.38  |
| 2004                                    |     | 5.51   | 3.92  | 4.54  | 5.22  |
| <hr/>                                   |     |        |       |       |       |
| 2003                                    | 1   | 7.97   | 7.77  | 6.84  | 6.59  |
|   | 2   | 9.88   | 5.29  | 7.34  | 5.09  |
|   | 3   | 7.39   | 10.37 | 7.58  | 7.67  |
|   | 4   | 2.34   | -2.07 | -0.45 | -0.28 |
| 2004                                    | 1   | 6.04   | 2.42  | 3.56  | 5.51  |
|   | 2   | 6.00   | 8.62  | 7.82  | 9.39  |
|   | 3   | 3.64   | 2.05  | 3.51  | 4.23  |
|   | 4   | 5.52   | 2.74  | 5.69  | 3.75  |
| 2005                                    | 1   | 0.72   | 0.33  | 3.74  | 5.21  |
|   | 2   | -0.67  | -0.56 | 1.68  | 5.44  |
| <hr/>                                   |     |        |       |       |       |
| 2003                                    | Jul | 3.35   | 18.18 | 8.75  | 12.62 |
|   | Aug | 8.43   | 5.52  | 8.99  | 4.32  |
|   | Sep | 0.10   | -0.72 | -3.68 | -0.45 |
|   | Oct | 0.84   | -4.53 | -1.56 | -0.48 |
|   | Nov | 1.38   | -3.64 | -0.89 | -2.38 |
|   | Dec | 7.15   | -1.87 | 0.82  | 0.30  |
| <hr/>                                   |     |        |       |       |       |
| 2004                                    | Jan | -2.02  | 2.56  | 2.62  | 7.88  |
|   | Feb | 16.46  | 6.11  | 7.80  | 8.64  |
|   | Mar | 11.63  | 9.22  | 7.69  | 10.25 |
|   | Apr | 0.30   | 8.97  | 7.38  | 8.75  |
|   | May | 3.49   | 11.85 | 11.20 | 11.68 |
|   | Jun | 6.41   | 1.94  | 2.28  | 5.11  |
|   | Jul | -6.58  | -2.42 | 0.34  | 0.48  |
|   | Aug | 16.21  | 2.53  | 4.04  | 4.20  |
|   | Sep | 3.87   | 4.97  | 6.66  | 6.22  |
|   | Oct | 0.07   | -0.09 | 5.07  | 1.14  |
|   | Nov | 13.28  | 4.42  | 6.93  | 3.81  |
|   | Dec | -1.04  | 3.55  | 4.53  | 6.02  |
| <hr/>                                   |     |        |       |       |       |
| 2005                                    | Jan | -8.23  | -1.32 | 2.70  | 6.13  |
|   | Feb | 6.87   | -2.55 | 2.81  | 4.40  |
|   | Mar | 6.47   | 0.56  | 3.84  | 3.68  |
|   | Apr | -15.19 | -0.72 | -0.59 | 6.18  |
|   | May | 10.30  | -3.63 | 0.23  | 4.35  |
|   | Jun | -0.48  | 5.80  | 6.00  | 9.72  |
|   | Jul | -18.54 | 0.57  | 1.48  | 2.35  |

## Definitions

**M1:** The sum of currency held outside the vaults of depository institutions, Federal Reserve Banks, and the U.S. Treasury; travelers checks; and demand and other checkable deposits issued by financial institutions (except demand deposits due to the Treasury and depository institutions), minus cash items in process of collection and Federal Reserve float.

**MZM (money, zero maturity):** M2 minus small-denomination time deposits, plus institutional money market mutual funds (that is, those included in M3 but excluded from M2). The label MZM was coined by William Poole (1991); the aggregate itself was proposed earlier by Motley (1988).

**M2:** M1 plus savings deposits (including money market deposit accounts) and small-denomination (under \$100,000) time deposits issued by financial institutions; and shares in retail money market mutual funds (funds with initial investments under \$50,000), net of retirement accounts.

**M3:** M2 plus large-denomination (\$100,000 or more) time deposits; repurchase agreements issued by depository institutions; Eurodollar deposits, specifically, dollar-denominated deposits due to nonbank U.S. addresses held at foreign offices of U.S. banks worldwide and all banking offices in Canada and the United Kingdom; and institutional money market mutual funds (funds with initial investments of \$50,000 or more).

**Bank Credit:** All loans, leases, and securities held by commercial banks.

**Domestic Nonfinancial Debt:** Total credit market liabilities of the U.S. Treasury, federally sponsored agencies, state and local governments, households, and nonfinancial firms. End-of-period basis.

**Adjusted Monetary Base:** The sum of currency in circulation outside Federal Reserve Banks and the U.S. Treasury, deposits of depository financial institutions at Federal Reserve Banks, and an adjustment for the effects of changes in statutory reserve requirements on the quantity of base money held by depositories. This series is a spliced chain index; see Anderson and Rasche (1996a,b, 2001, 2003).

**Adjusted Reserves:** The sum of vault cash and Federal Reserve Bank deposits held by depository institutions and an adjustment for the effects of changes in statutory reserve requirements on the quantity of base money held by depositories. This spliced chain index is numerically larger than the Board of Governors' measure, which excludes vault cash not used to satisfy statutory reserve requirements and Federal Reserve Bank deposits used to satisfy required clearing balance contracts; see Anderson and Rasche (1996a, 2001, 2003).

**Monetary Services Index:** An index that measures the flow of monetary services received by households and firms from their holdings of liquid assets; see Anderson, Jones, and Nesmith (1997). Indexes are shown for the assets included in M2, with additional data at [research.stlouisfed.org/msi/index.html](http://research.stlouisfed.org/msi/index.html).

**Note:** M1, M2, M3, Bank Credit, and Domestic Nonfinancial Debt are constructed and published by the Board of Governors of the Federal Reserve System. For details, see *Statistical Supplement to the Federal Reserve Bulletin*, tables 1.21 and 1.26. MZM, Adjusted Monetary Base, Adjusted Reserves, and Monetary Services Index are constructed and published by the Research Division of the Federal Reserve Bank of St. Louis.

## Notes

**Page 3:** Readers are cautioned that, since early 1994, the level and growth of M1 have been depressed by retail sweep programs that reclassify transactions deposits (demand deposits and other checkable deposits) as savings deposits overnight, thereby reducing banks' required reserves; see Anderson and Rasche (2001) and [research.stlouisfed.org/aggreg/swdata.html](http://research.stlouisfed.org/aggreg/swdata.html). **Primary Credit Rate**, **Discount Rate**, and **Intended Federal Funds Rate** shown in the chart **Reserve Market Rates** are plotted as of the date of the change, while the **Effective Federal Funds Rate** is plotted as of the end of the month. Interest rates in the table are monthly averages from the Board of Governors H.15 Statistical Release. The **Treasury Yield Curve** shows constant maturity yields calculated by the U.S. Treasury for securities with 3 months and 1, 2, 3, 5, 7, and 10 years to maturity. Daily data and descriptions are available at [research.stlouisfed.org/fred2/](http://research.stlouisfed.org/fred2/). See

also *Statistical Supplement to the Federal Reserve Bulletin*, table 1.35. The 30-year constant maturity series was discontinued by the Treasury as of February 18, 2002.

**Page 5:** **Checkable Deposits** is the sum of demand and other checkable deposits. **Savings Deposits** is the sum of money market deposit accounts and passbook and statement savings. **Time Deposits** have a minimum initial maturity of 7 days. **Large Time Deposits** are deposits of \$100,000 or more. **Retail and Institutional Money Market Mutual Funds** are as included in M2 and the non-M2 component of M3, respectively.

**Page 7:** **Excess Reserves plus RCB (Required Clearing Balance) Contracts** equals the amount of deposits at Federal Reserve Banks held by depository institutions but not applied to satisfy statutory reserve requirements. (This measure excludes the vault cash held by depository institutions that is not applied to satisfy statutory reserve requirements.) **Consumer Credit** includes most short- and intermediate-term credit extended to individuals. See *Statistical Supplement to the Federal Reserve Bulletin*, table 1.55.

**Page 8:** **Inflation Expectations** measures include the quarterly Federal Reserve Bank of Philadelphia *Survey of Professional Forecasters*, the monthly University of Michigan Survey Research Center's *Surveys of Consumers*, and the annual Federal Open Market Committee (FOMC) range as reported to the Congress in the February testimony that accompanies the Monetary Policy Report to the Congress. Beginning February 2000, the FOMC began using the personal consumption expenditures (PCE) price index to report its inflation range; the FOMC then switched to the PCE chain-type price index excluding food and energy prices ("core") beginning July 2004. Accordingly, neither are shown on this graph. **CPI Inflation** is the percentage change from a year ago in the consumer price index for all urban consumers. **Real Interest Rates** are ex post measures, equal to nominal rates minus CPI inflation.

**Page 9:** **FOMC Intended Federal Funds Rate** is the level (or midpoint of the range, if applicable) of the federal funds rate that the staff of the FOMC expected to be consistent with the desired degree of pressure on bank reserve positions. In recent years, the FOMC has set an explicit target for the federal funds rate.

**Page 10:** **Federal Funds Rate and Inflation Targets** shows the observed federal funds rate, quarterly, and the level of the funds rate implied by applying Taylor's (1993) equation

$$f_t^* = 2.5 + \pi_{t-1} + (\pi_{t-1} - \pi^*)/2 + 100 \times (y_{t-1} - y_{t-1}^P)/2$$

to five alternative target inflation rates,  $\pi^* = 0, 1, 2, 3, 4$  percent, where  $f_t^*$  is the implied federal funds rate,  $\pi_{t-1}$  is the previous period's inflation rate (PCE) measured on a year-over-year basis,  $y_{t-1}$  is the log of the previous period's level of real gross domestic product (GDP), and  $y_{t-1}^P$  is the log of an estimate of the previous period's level of potential output. **Potential Real GDP** is as estimated by the Congressional Budget Office.

**Monetary Base Growth and Inflation Targets** shows the quarterly growth of the adjusted monetary base (modified to include an estimate of the effect of sweep programs) implied by applying McCallum's (1988, 1993) equation

$$\Delta MB_t^* = \pi^* + (10\text{-year moving average growth of real GDP}) - (4\text{-year moving average of base velocity growth})$$

to five alternative target inflation rates,  $\pi^* = 0, 1, 2, 3, 4$  percent, where  $\Delta MB_t^*$  is the implied growth rate of the adjusted monetary base. The 10-year moving average growth of real GDP for a quarter  $t$  is calculated as the average quarterly growth during the previous 40 quarters, at an annual rate, by the formula  $((y_t - y_{t-40})/40) \times 400$ , where  $y_t$  is the log of real GDP. The 4-year moving average of base velocity growth is calculated similarly. To adjust the monetary base for the effect of retail-deposit sweep programs, we add to the monetary base an amount equal to 10 percent of the total amount swept, as estimated by the Federal Reserve Board staff. These estimates are imprecise, at best. Sweep program data are found at [research.stlouisfed.org/aggreg/swdata.html](http://research.stlouisfed.org/aggreg/swdata.html).

**Page 11:** **Implied One-Year Forward Rates** are calculated by this Bank from Treasury constant maturity yields. Yields to maturity,  $R(m)$ , for securities with  $m = 1, \dots, 10$  years to maturity are obtained by linear interpolation between

reported yields. These yields are smoothed by fitting the regression suggested by Nelson and Siegel (1987),

$$R(m) = a_0 + (a_1 + a_2)(1 - e^{-m/50})/(m/50) - a_2 \times e^{-m/50},$$

and forward rates are calculated from these smoothed yields using equation (a) in table 13.1 of Shiller (1990),

$$f(m) = [D(m)R(m) - D(m-1)] / [D(m) - D(m-1)],$$

where duration is approximated as  $D(m) = (1 - e^{-R(m) \times m})/R(m)$ . These rates are linear approximations to the true instantaneous forward rates; see Shiller (1990). For a discussion of the use of forward rates as indicators of inflation expectations, see Sharpe (1997). **Rates on 3-Month Eurodollar Futures** and **Rates on Selected Federal Funds Futures Contracts** trace through time the yield on three specific contracts. **Rates on Federal Funds Futures on Selected Dates** displays a single day's snapshot of yields for contracts expiring in the months shown on the horizontal axis. **Inflation-Indexed Treasury Securities** are yields on the most recently issued inflation-indexed securities of 10- and 30-year original maturities. **Inflation-Indexed 10-Year Government Notes** shows the yield of an inflation-indexed note that is scheduled to mature in approximately (but not greater than) 10 years. The current French note has a maturity date of 7/25/2015, the current U.K. note has a maturity date of 8/16/2013, and the current U.S. note has a maturity date of 1/15/2015. **Inflation-Indexed Treasury Yield Spreads** and **Inflation-Indexed 10-Year Government Yield Spreads** equal the difference between the yields on the most recently issued inflation-indexed securities and the unadjusted security yields of similar maturity.

*Page 12: Velocity* (for MZM and M2) equals the ratio of GDP, measured in current dollars, to the level of the monetary aggregate. **MZM and M2 Own Rates** are weighted averages of the rates received by households and firms on the assets included in the aggregates. Prior to 1982, the 3-month T-bill rates are secondary market yields. From 1982 forward, rates are 3-month constant maturity yields.

*Page 13: Real Gross Domestic Product* is GDP as measured in chained 2000 dollars. The **Gross Domestic Product Price Index** is the implicit price deflator for GDP, which is defined by the Bureau of Economic Analysis, U.S. Department of Commerce, as the ratio of GDP measured in current dollars to GDP measured in chained 2000 dollars.

*Page 14: Investment Securities* are all securities held by commercial banks in both investment and trading accounts.

*Page 15: Inflation Rate Differentials* are the differences between the foreign consumer price inflation rates and year-over-year changes in the U.S. all-items Consumer Price Index.

*Page 17: Treasury Yields* are Treasury constant maturities as reported in the Board of Governors of the Federal Reserve System's H.15 release.

## Sources

*Agence France Trésor*: French note yields.

*Bank of Canada*: Canadian note yields.

*Bank of England*: U.K. note yields.

*Board of Governors of the Federal Reserve System*:

Monetary aggregates and components: H.6 release. Bank credit and components: H.8 release. Consumer credit: G.19 release. Required reserves, excess reserves, clearing balance contracts, and discount window borrowing: H.4.1 and H.3 releases. Interest rates: H.15 release. Nonfinancial commercial paper: Board of Governors website. Nonfinancial debt: Z.1 release. M2 own rate.

*Bureau of Economic Analysis*: GDP.

*Bureau of Labor Statistics*: CPI.

*Chicago Board of Trade*: Federal funds futures contract.

*Chicago Mercantile Exchange*: Eurodollar futures.

*Congressional Budget Office*: Potential real GDP.

*Federal Reserve Bank of Philadelphia*: Survey of Professional Forecasters inflation expectations.

*Federal Reserve Bank of St. Louis*: Adjusted monetary base and adjusted reserves, monetary services index, MZM own rate, one-year forward rates.

*Organization for Economic Cooperation and Development*: International interest and inflation rates.

*Standard & Poor's*: Stock price-earnings ratio, stock price composite index.

*University of Michigan Survey Research Center*: Median expected price change.

*U.S. Department of the Treasury*: U.S. security yields.

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*Note*: \*Available on the Internet at [research.stlouisfed.org/publications/review/](http://research.stlouisfed.org/publications/review/).