

This issue of *Monetary Trends* will be the final printed copy.  
Future issues will be available at [research.stlouisfed.org/publications/mt](http://research.stlouisfed.org/publications/mt).

## A Neutral Federal Funds Rate?

The stance of monetary policy with respect to aggregate demand is widely measured in terms of the Federal Reserve Open Market Committee's (FOMC) federal funds rate target. Too low a target, it is suggested, will cause the Open Market Desk to inject too much liquidity, "overstimulating" aggregate demand and increasing the inflation rate. Too high a target will result in undue pressures on liquidity, unnecessarily high market interest rates, and slower-than-desired economic activity. Like Goldilocks exploring the three bears' forest home, many analysts appear to believe there exists a "just right," or neutral, target between the two extremes. But what exactly is a neutral monetary policy and is it possible to achieve it?

A neutral level of the federal funds rate often is discussed as having two properties. First, it is a level that neither stimulates nor slows output relative to potential. Second, it is a moving target that varies from one period to another. But such a characterization raises an interesting question: If the neutral rate changes frequently, can it be measured accurately and does the concept have any value for policymakers?

Arguments for the existence of a steady-state neutral federal funds rate frequently begin with the assertion that the historical record suggests bounds for the neutral rate, say, greater than 1 percent and less than 10 percent, and that the task is to narrow that range, perhaps to a single number. One oft-made claim is that the neutral rate, in the long run, should equal the sum of the growth rate of potential real GDP plus the target inflation rate. The Congressional Budget Office projects that real potential GDP will grow at approximately a 3.1 percent rate during 2004-05, with similar growth rates in later years. If measured inflation is to be in the neighborhood of 2 percent with no expectation of an increase or decrease, then a neutral funds rate target might be slightly greater than 5 percent.

This analysis, however, does not allow for the typical upward slope of yield curves—that is, for a positive term premium. Macroeconomic steady-state growth models often assume a horizontal yield curve, thereby excluding

such a premium. In financial markets, however, yields on longer-term assets typically are higher than those on shorter-term assets. To estimate a neutral overnight federal funds rate target, we need to isolate the maturity-related term premium from the inflation-related risk premium that is included in longer-maturity yields as a result of uncertainty regarding future inflation. One possibility is to observe maturity-related Treasury rate spreads during a period when market participants expect future inflation rates to be approximately unchanged from their then-current pace. The figure shows the rate spread between the 10-year Treasury constant-maturity yield and the bond-equivalent yield on 3-month Treasury bills. It seems likely that the inflation-uncertainty risk premium was approximately zero during the early 1960s and the mid-1990s, suggesting a maturity-related rate spread of approximately 150 to 200 basis points. Subtracting this spread from the previous 5 percent rate suggests a neutral overnight federal funds rate of approximately 3 to 3½ percent.

Recent public statements by FOMC members have suggested a range for a neutral funds target of between 3½ and 5½ percent. Allowing for the typical positive slope of the yield curve suggests that the neutral federal funds target is more likely to be near the lower than the upper end of this range.

—Richard G. Anderson, Jason J. Buol, and Robert H. Rasche

### Slope of Treasury Yield Curve

10-Year Constant Maturity Minus 3-Month T-Bill



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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:  $[(x_t/x_{t-12})-1] \times 100$ .

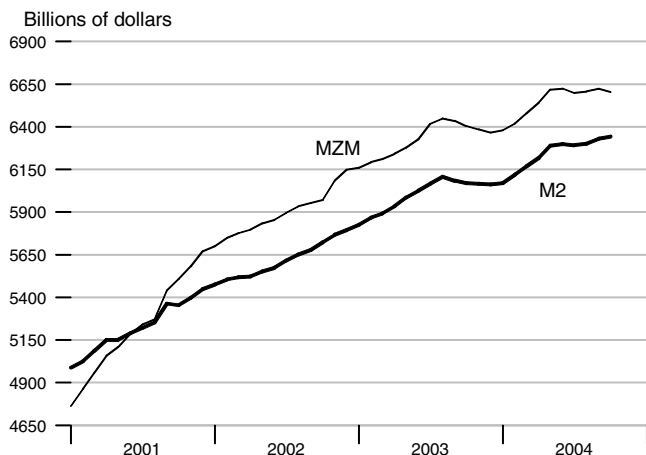
We welcome your comments addressed to:

Editor, *Monetary Trends*  
Research Division  
Federal Reserve Bank of St. Louis  
P.O. Box 442  
St. Louis, MO 63166-0442

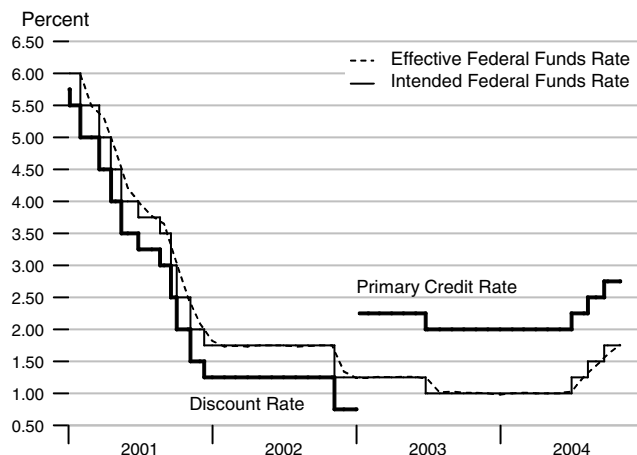
or to:

stlsFRED@stls.frb.org

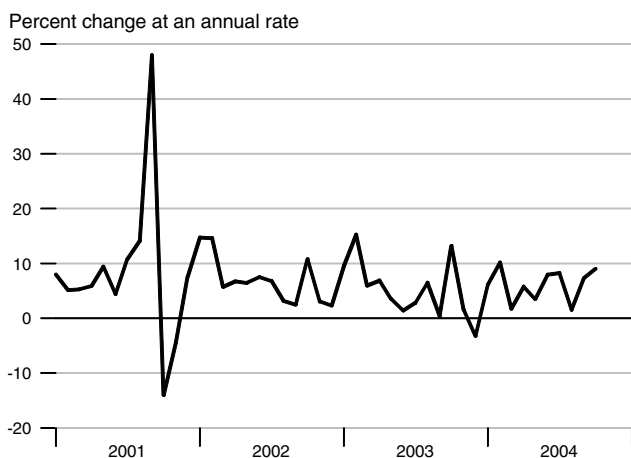
### M2 and MZM



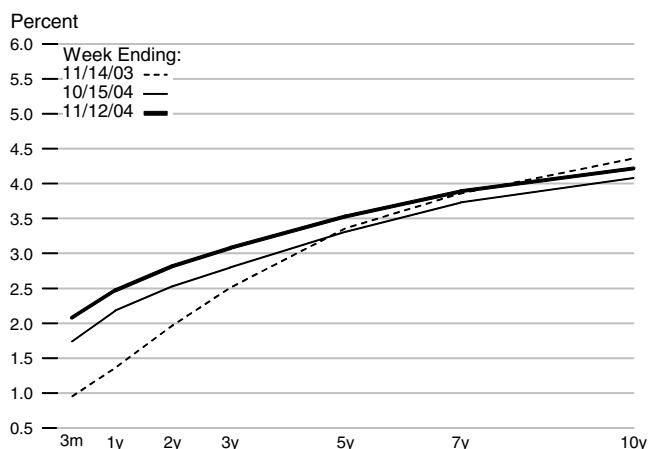
### Reserve Market Rates



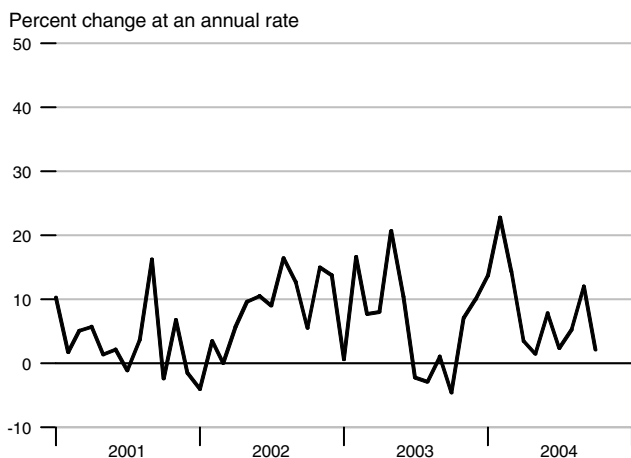
### Adjusted Monetary Base



### Treasury Yield Curve



### Total Bank Credit



### Interest Rates

	Aug 04	Sep 04	Oct 04
Federal Funds Rate	1.43	1.61	1.76
Prime Rate	4.43	4.58	4.75
Primary Credit Rate	2.43	2.58	2.75
Conventional Mortgage Rate	5.87	5.75	5.72
<b>Treasury Yields:</b>			
3-Month Constant Maturity	1.50	1.68	1.79
6-Month Constant Maturity	1.76	1.91	2.05
1-Year Constant Maturity	2.02	2.12	2.23
3-Year Constant Maturity	2.88	2.83	2.85
5-Year Constant Maturity	3.47	3.36	3.35
10-Year Constant Maturity	4.28	4.13	4.10

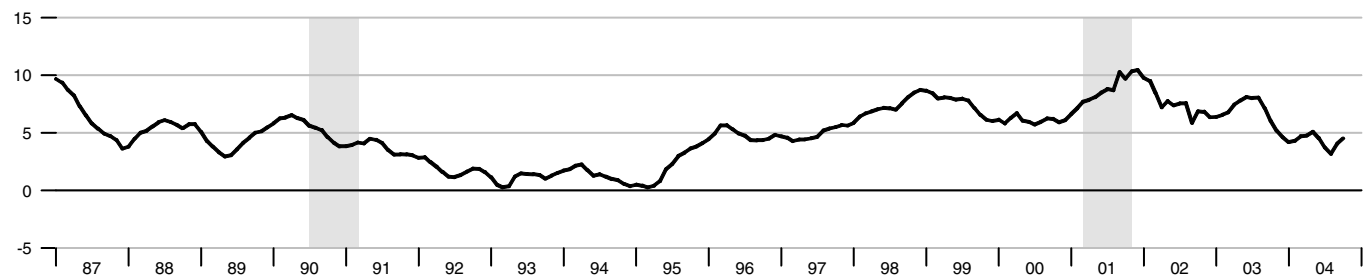
**MZM and M1**

Percent change from year ago



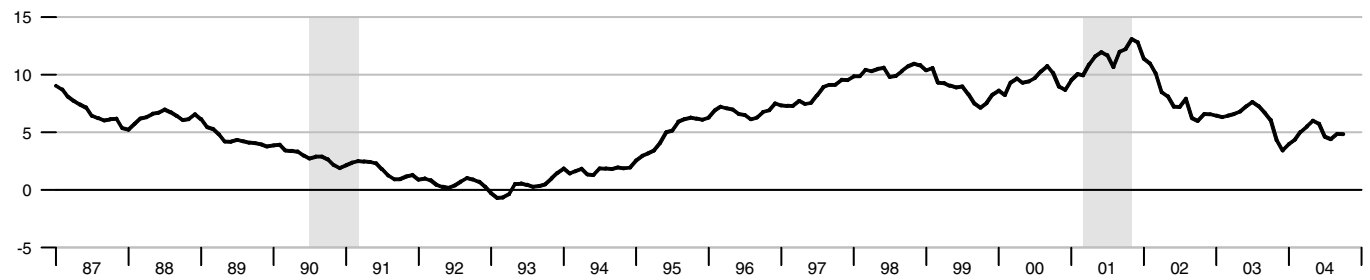
**M2**

Percent change from year ago



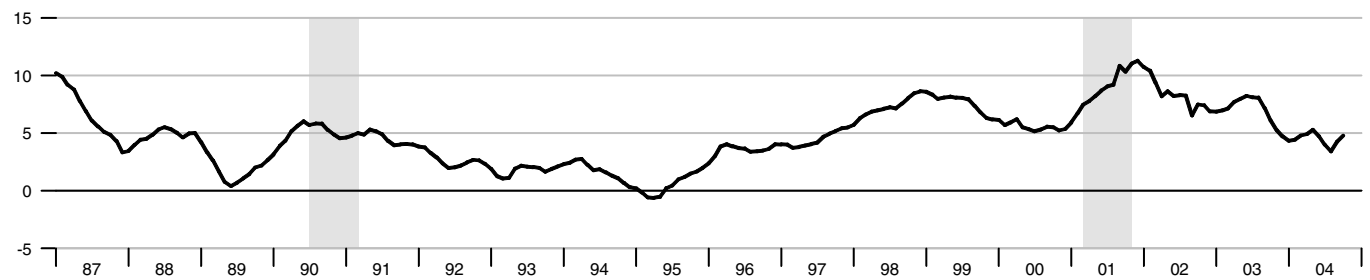
**M3**

Percent change from year ago



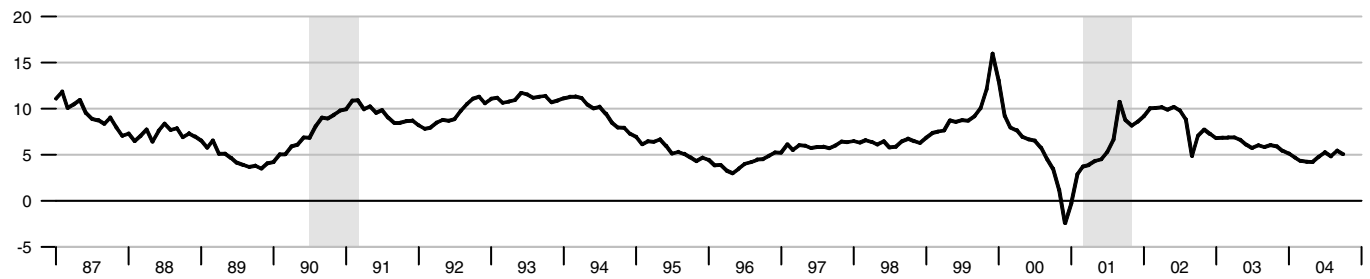
**Monetary Services Index - M2**

Percent change from year ago



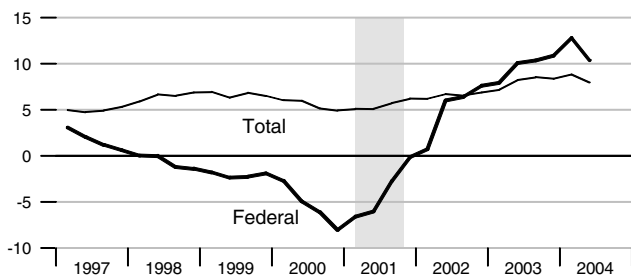
### Adjusted Monetary Base

Percent change from year ago



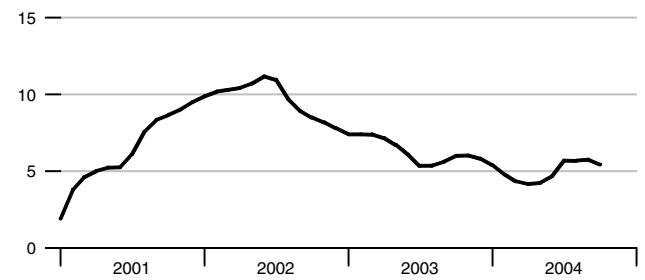
### Domestic Nonfinancial Debt

Percent change from year ago



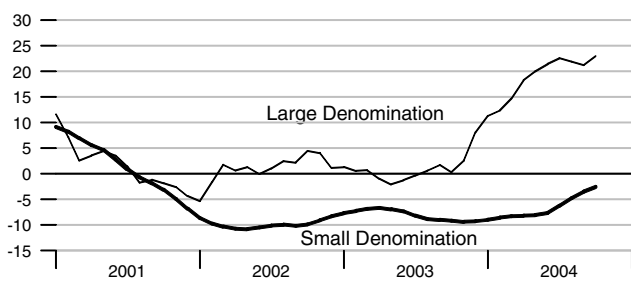
### Currency Held by the Nonbank Public

Percent change from year ago



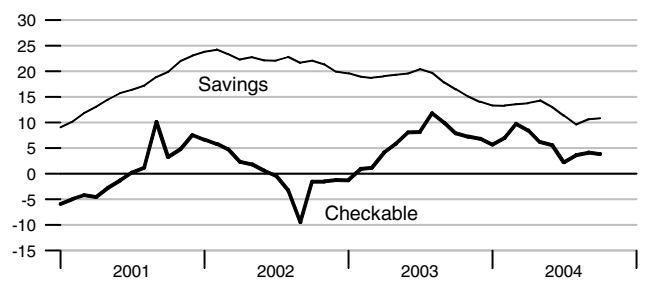
### Time Deposits

Percent change from year ago



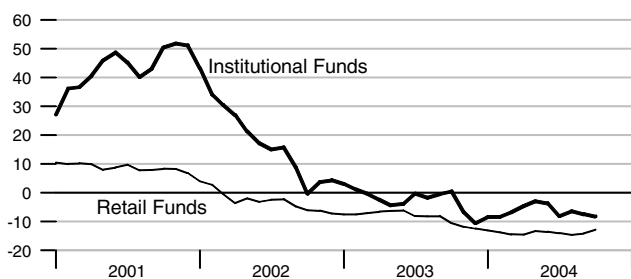
### Checkable and Savings Deposits

Percent change from year ago



### Money Market Mutual Fund Shares

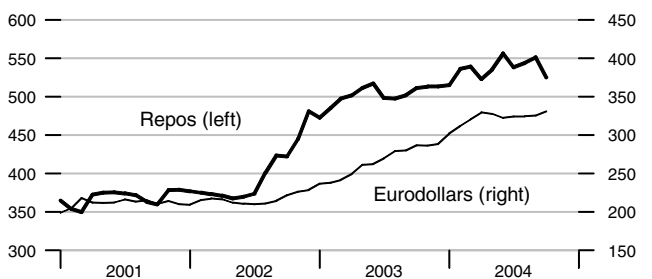
Percent change from year ago



### Repurchase Agreements and Eurodollars

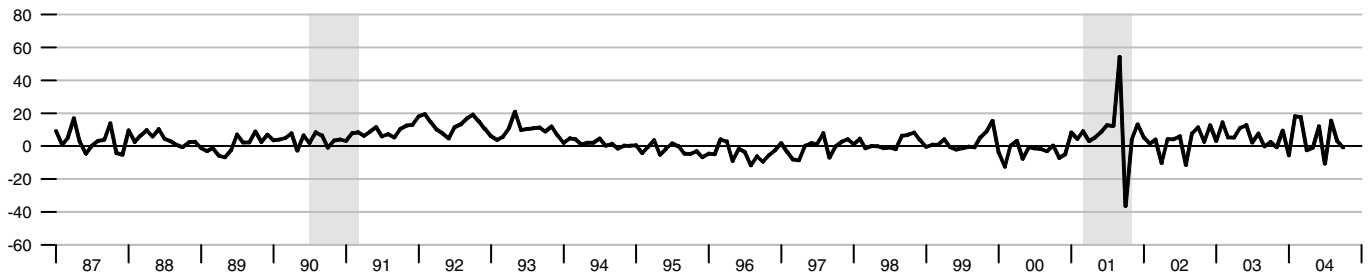
Billions of dollars

Billions of dollars



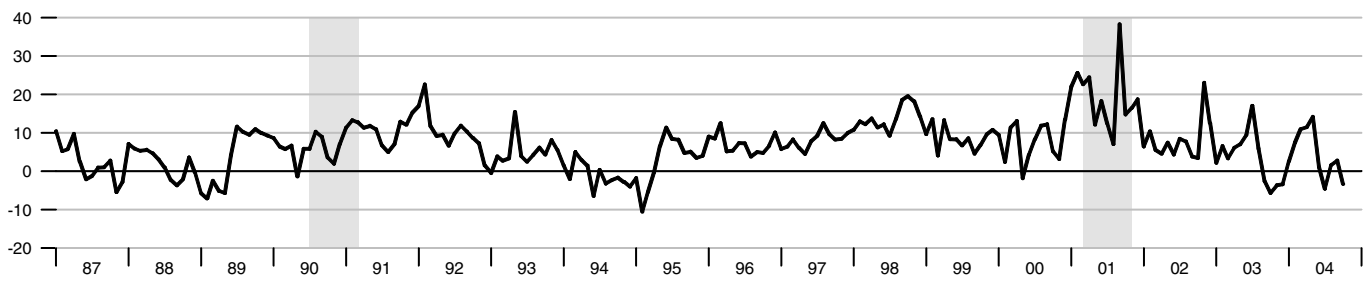
**M1**

Percent change at an annual rate



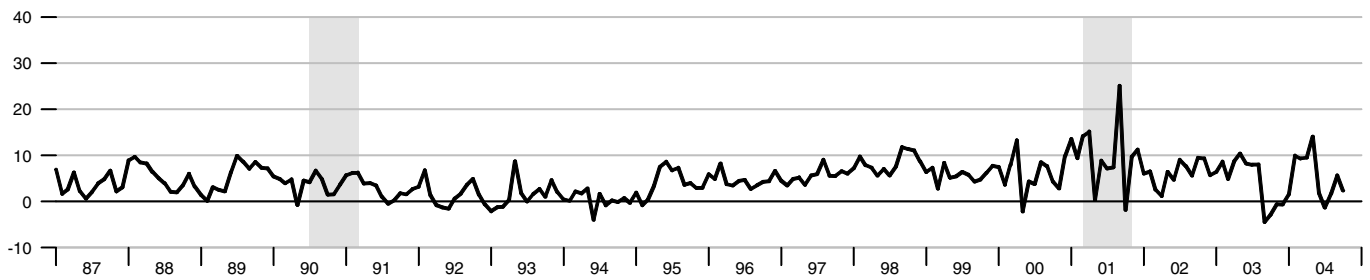
**M2M**

Percent change at an annual rate



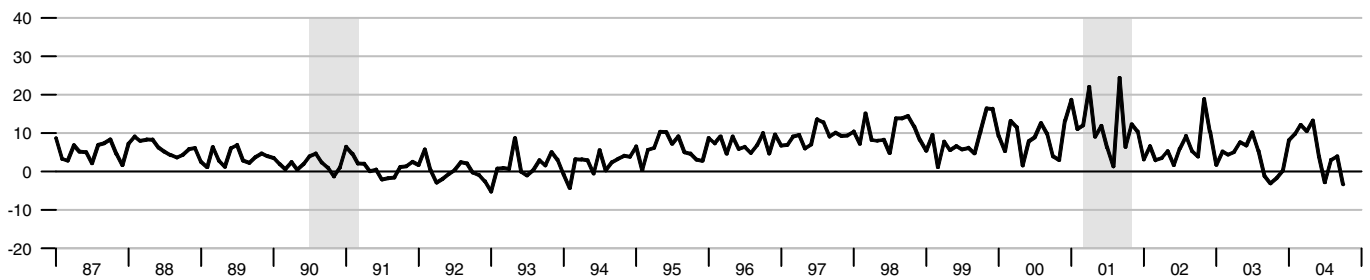
**M2**

Percent change at an annual rate



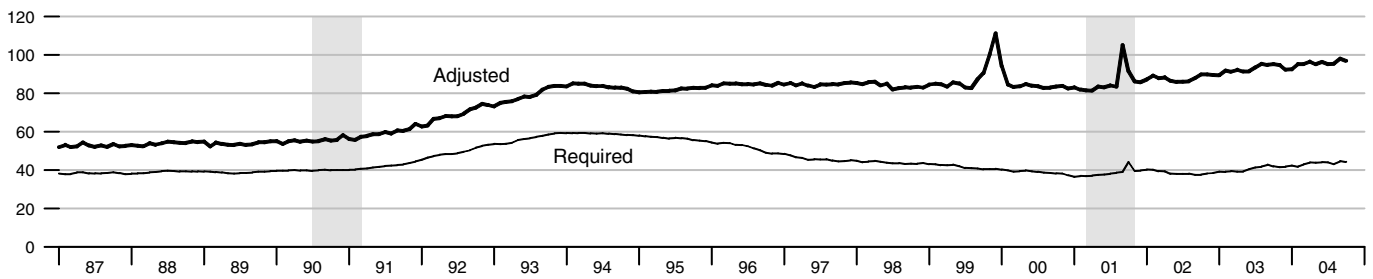
**M3**

Percent change at an annual rate



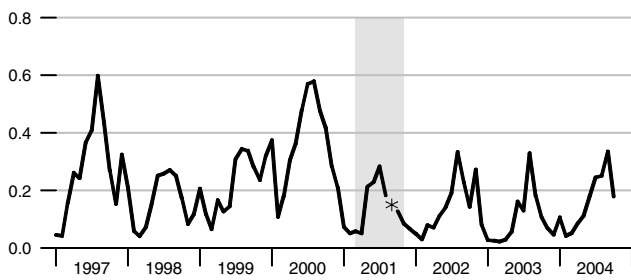
### Adjusted and Required Reserves

Billions of dollars



### Total Borrowings, nsa

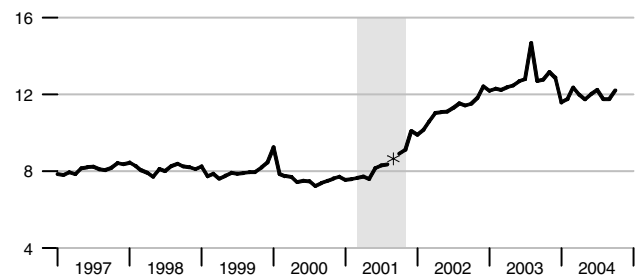
Billions of dollars



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

### Excess Reserves plus RCB Contracts

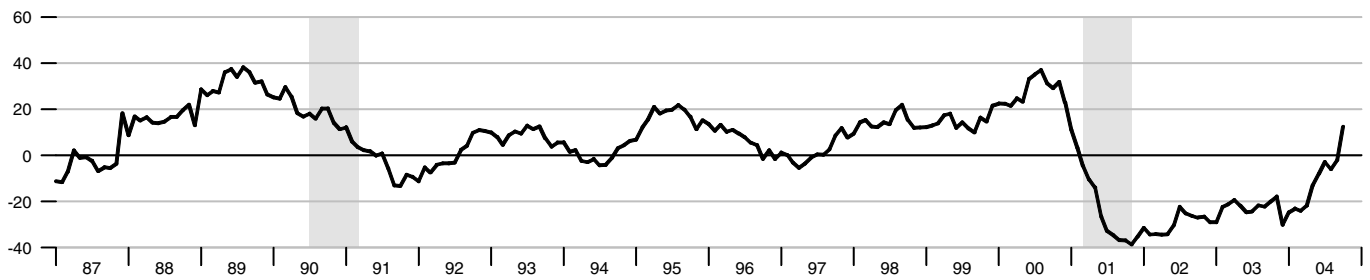
Billions of dollars



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

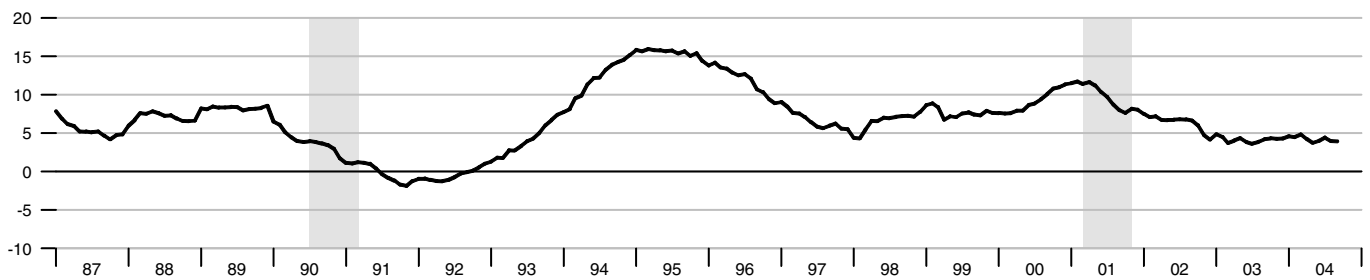
### Nonfinancial Commercial Paper

Percent change from year ago

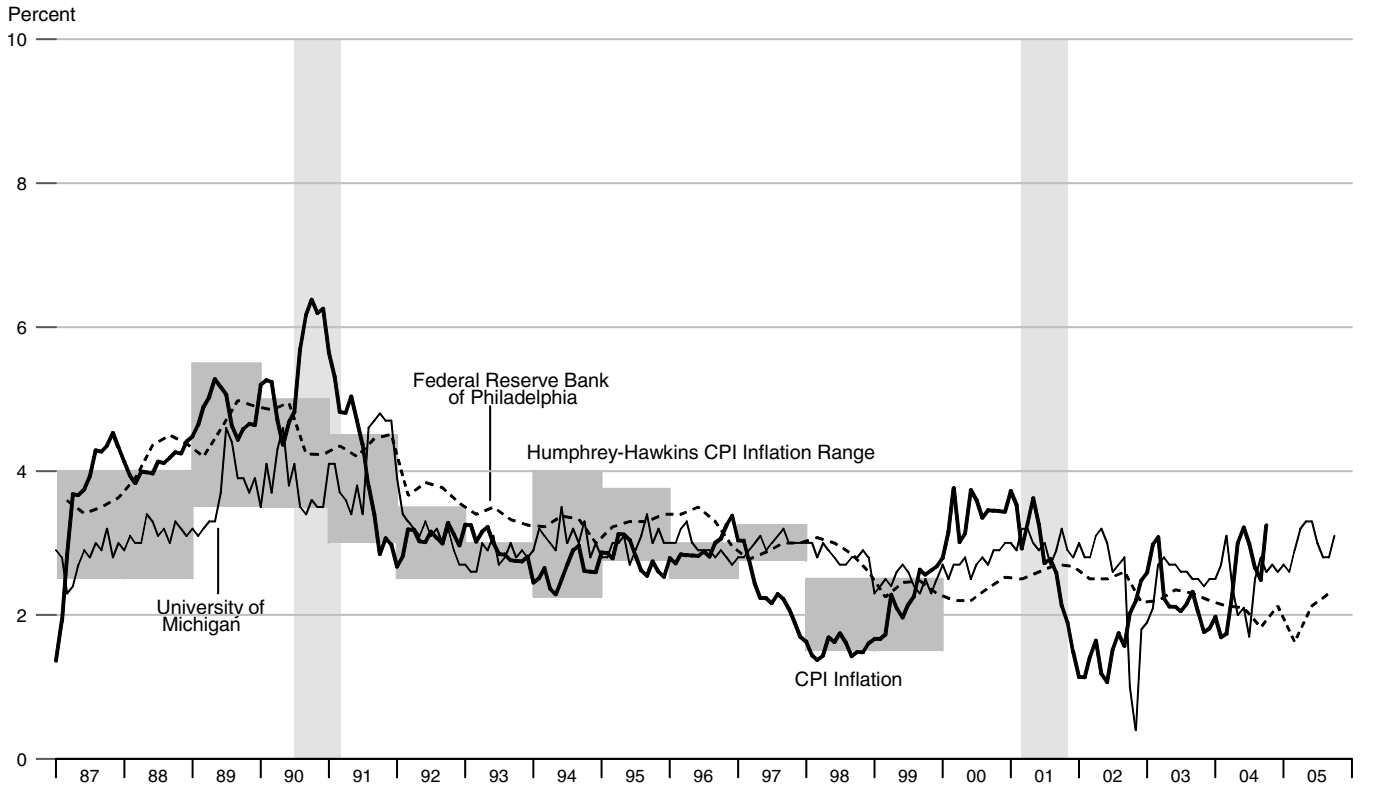


### Consumer Credit

Percent change from year ago

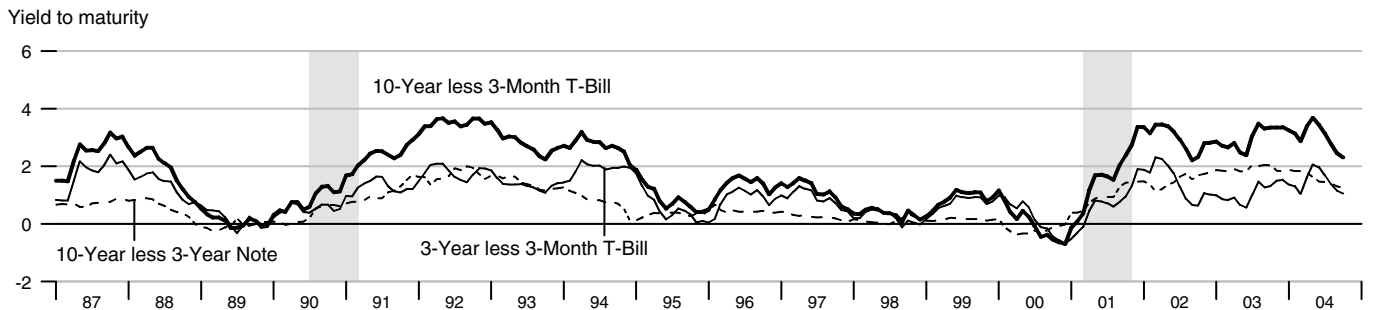


**Inflation and Inflation Expectations**

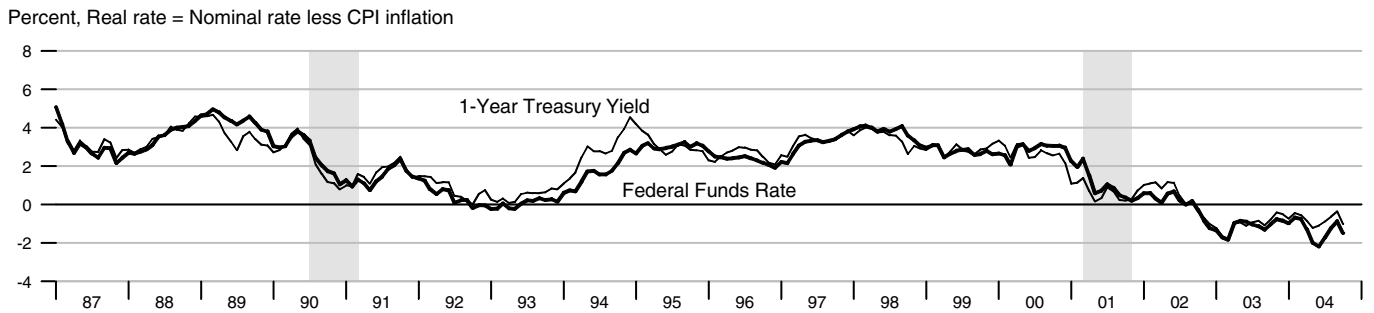


The shaded region shows the Humphrey-Hawkins CPI inflation range. Beginning in January 2000, the Humphrey-Hawkins inflation range was reported using the PCE price index and therefore is not shown on this graph. See notes on page 19.

**Treasury Security Yield Spreads**

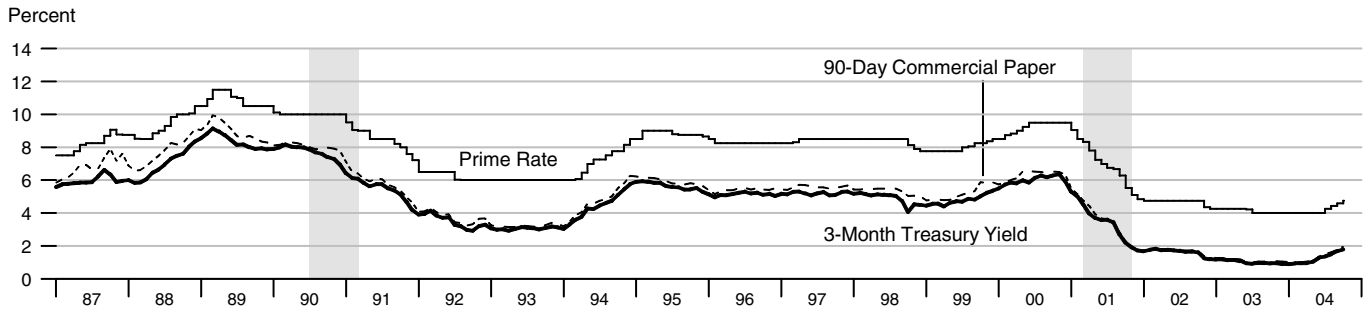


**Real Interest Rates**

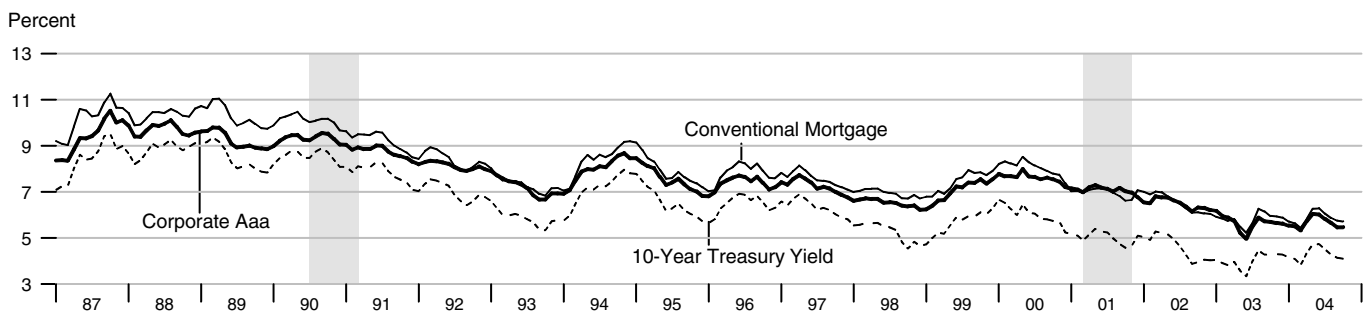




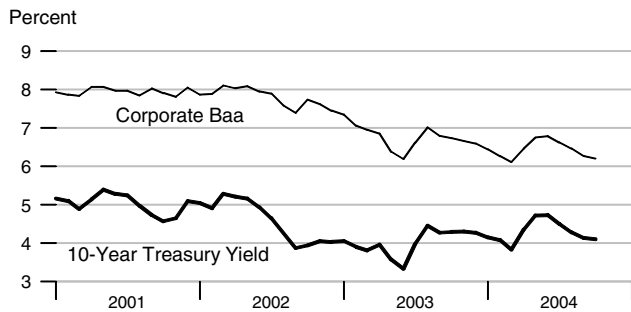
### Short-Term Interest Rates



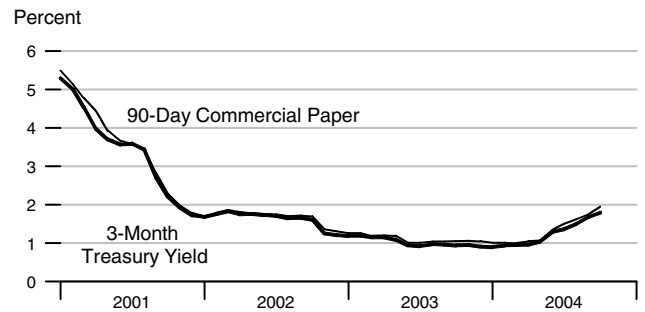
### Long-Term Interest Rates



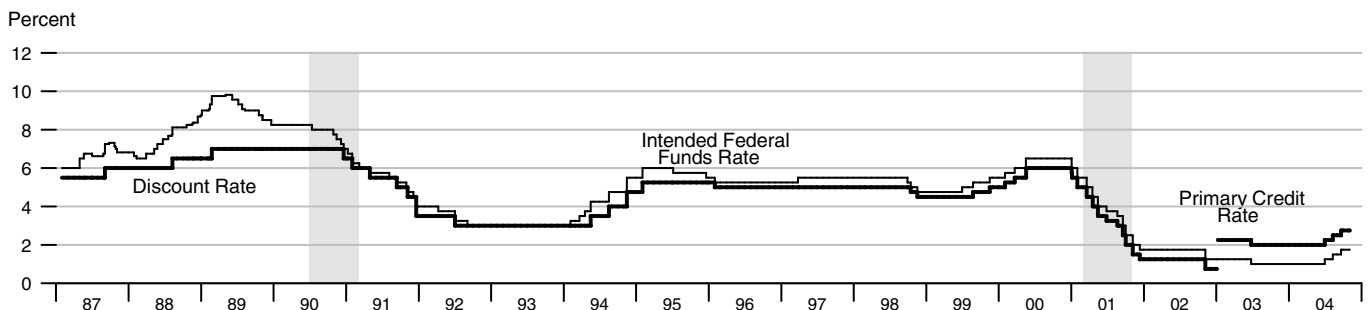
### Long-Term Interest Rates



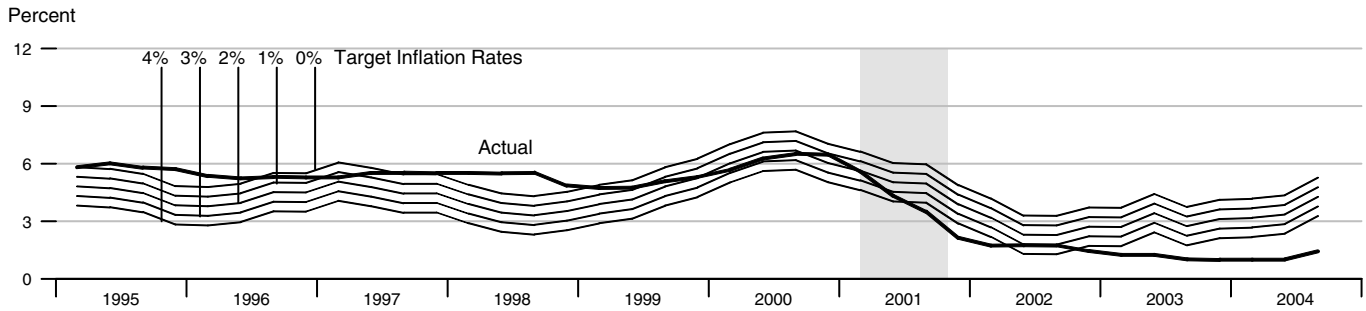
### Short-Term Interest Rates



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



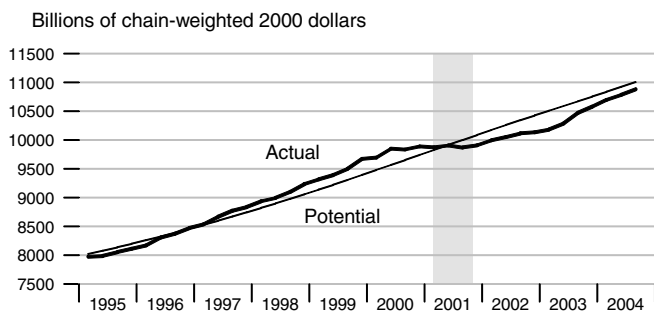
### Federal Funds Rate and Inflation Targets



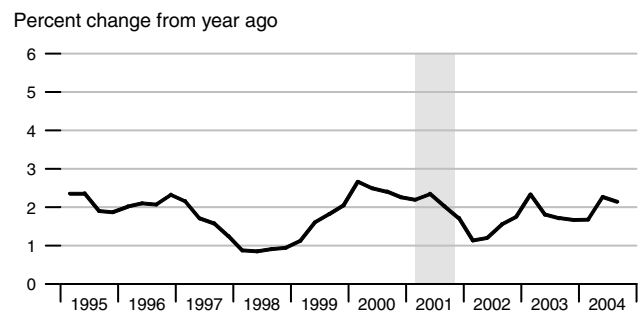
Calculated federal funds rate is based on Taylor's rule. See notes on page 19.

### Components of Taylor's Rule

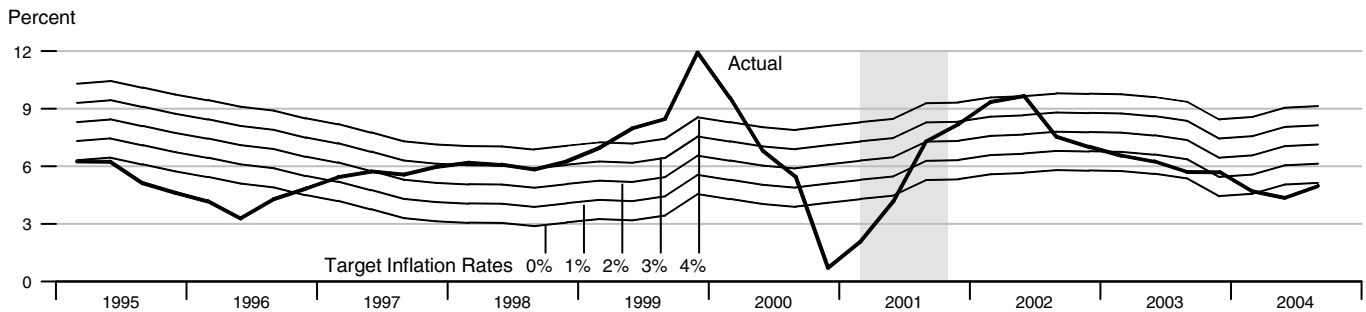
#### Actual and Potential Real GDP



#### PCE Inflation



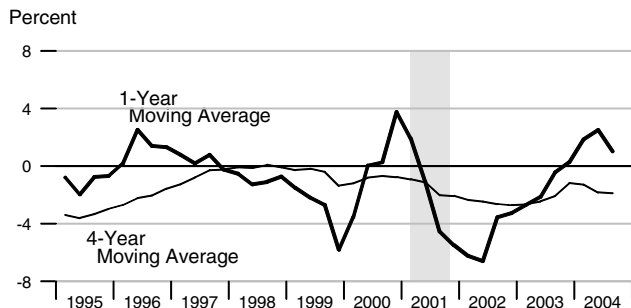
### Monetary Base Growth\* and Inflation Targets



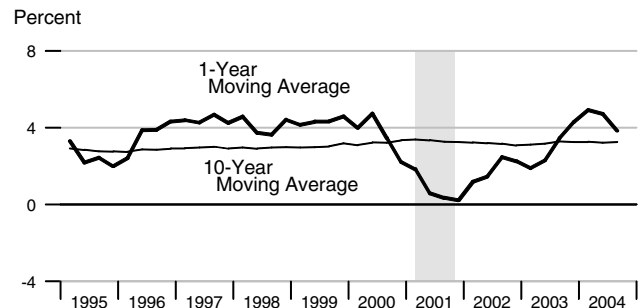
\*Modified for the effects of sweeps programs on reserve demand. Calculated base growth is based on McCallum's rule. Actual base growth is percent change from year ago. See notes on page 19.

### Components of McCallum's Rule

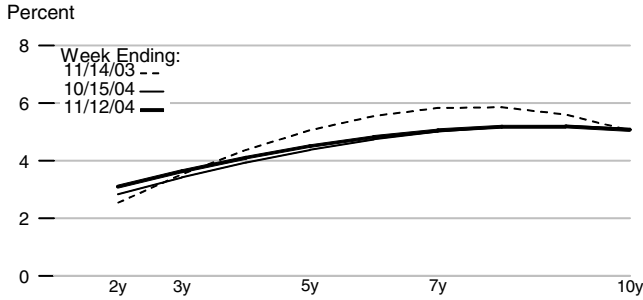
#### Monetary Base Velocity Growth



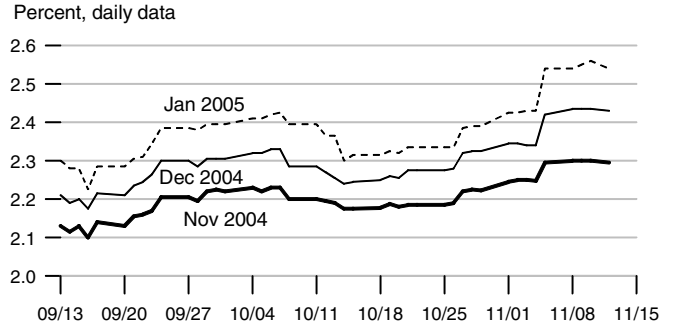
#### Real Output Growth



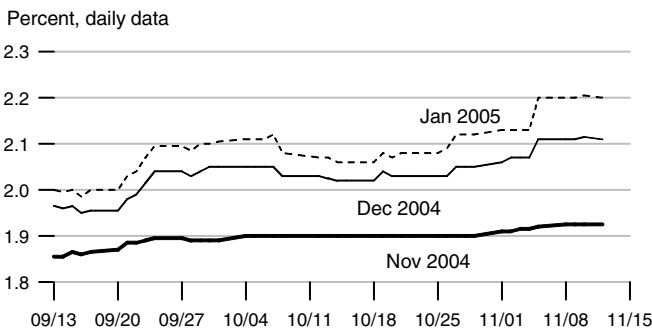
### Implied One-Year Forward Rates



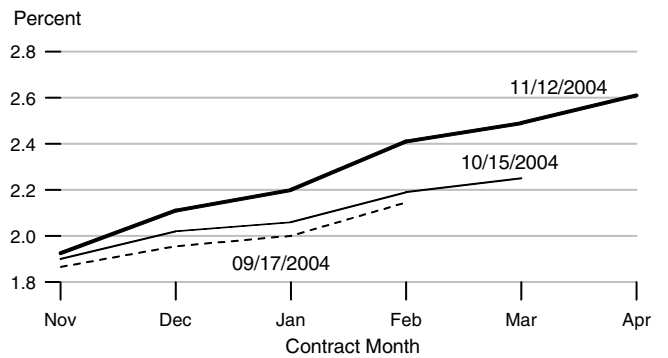
### Rates on 3-Month Eurodollar Futures



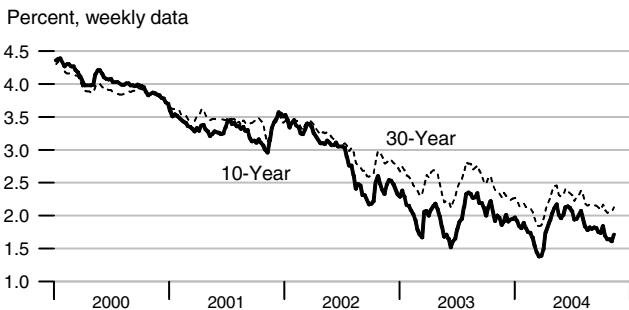
### Rates on Selected Federal Funds Futures Contracts



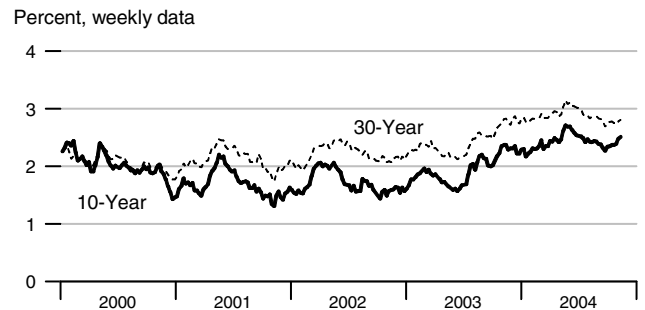
### Rates on Federal Funds Futures on Selected Dates



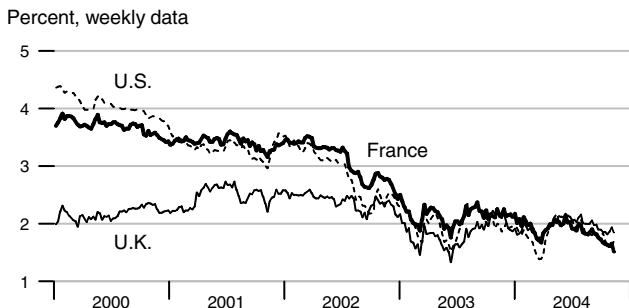
### Inflation-Indexed Treasury Securities



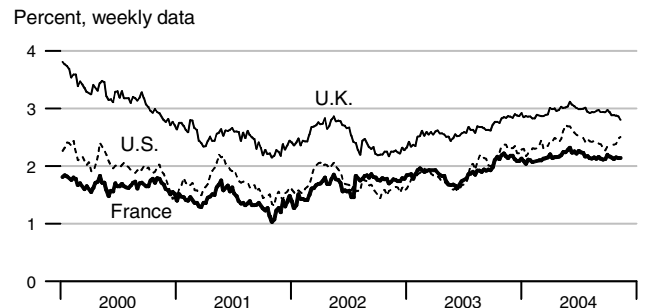
### Inflation-Indexed Treasury Yield Spreads



### Inflation-Indexed 10-Year Government Notes

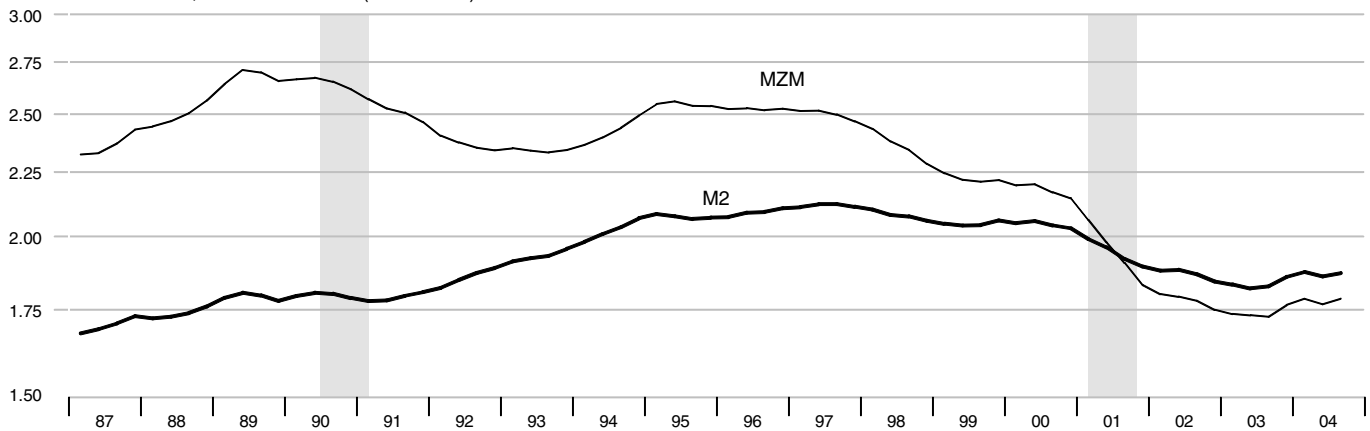


### Inflation-Indexed 10-Year Government Yield Spreads



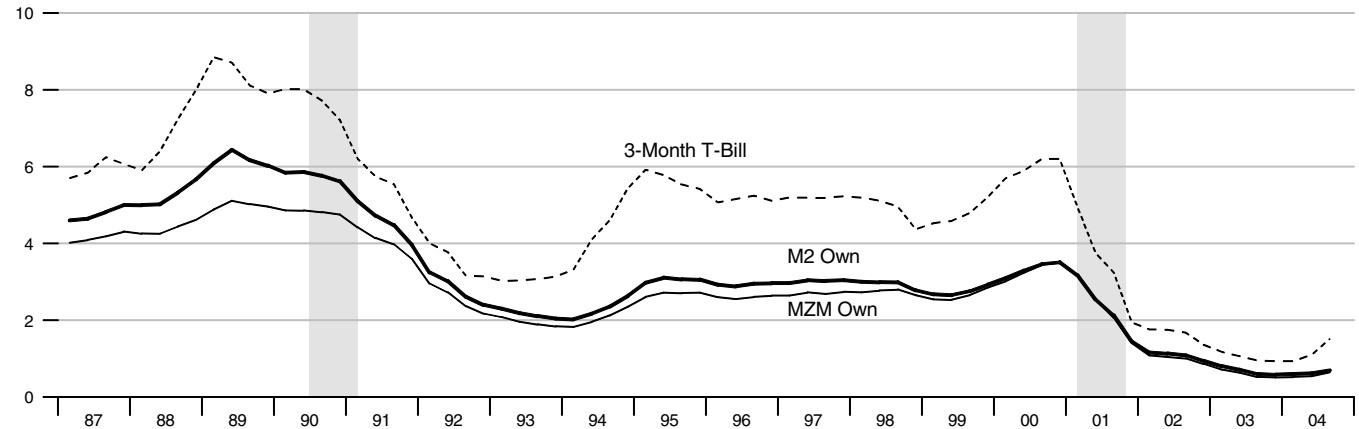
Velocity

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



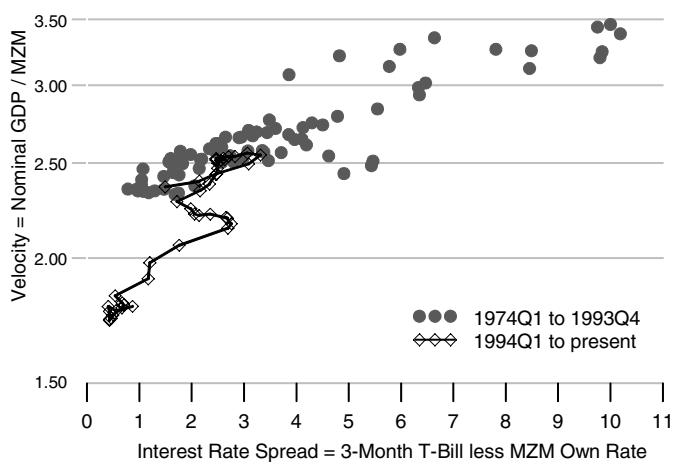
Interest Rates

Percent



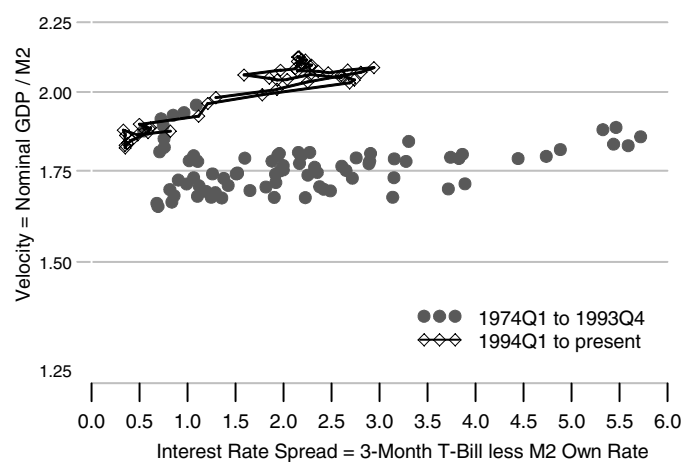
MZM Velocity and Interest Rate Spread

Ratio Scale



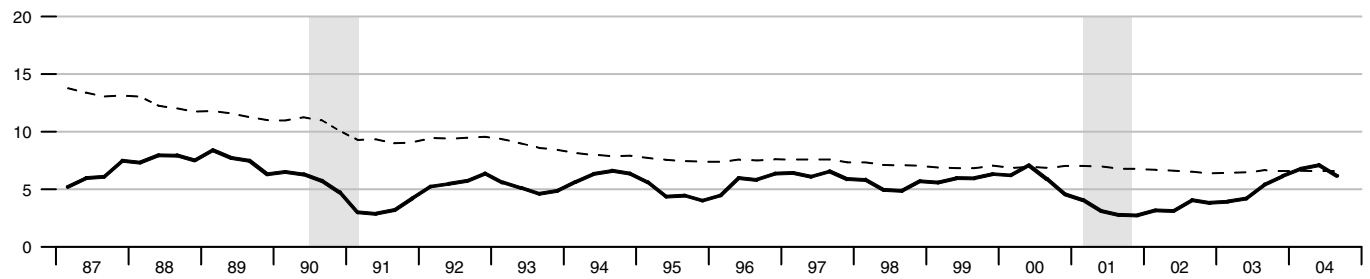
M2 Velocity and Interest Rate Spread

Ratio Scale



### Gross Domestic Product

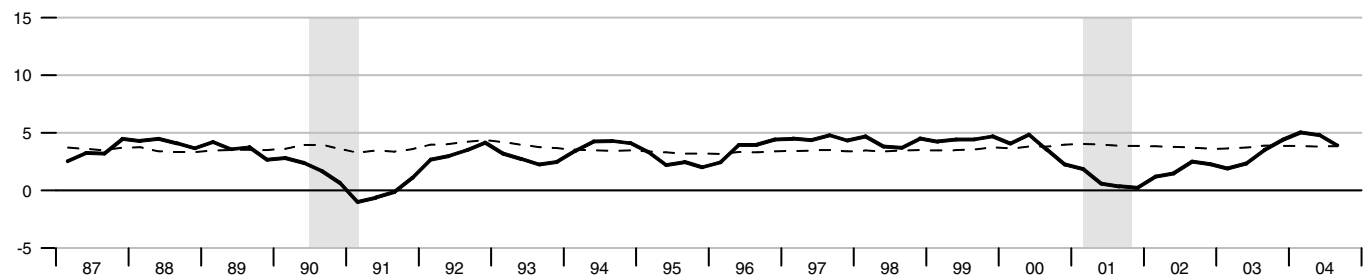
Percent change from year ago



Dashed lines indicate 10-year moving averages.

### Real Gross Domestic Product

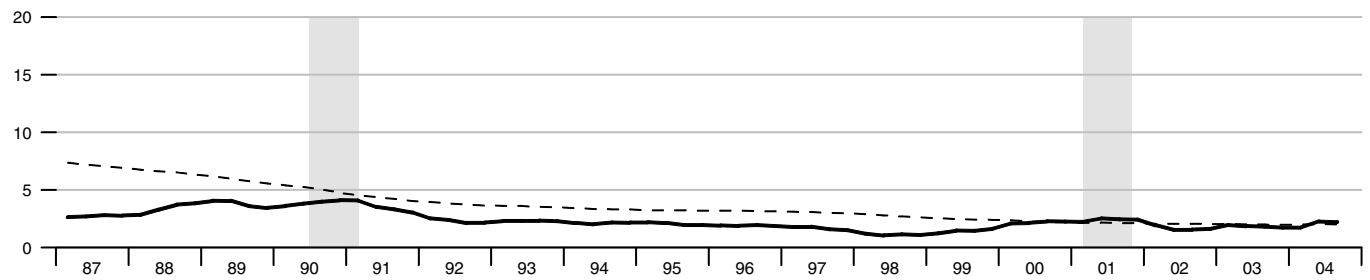
Percent change from year ago



Dashed lines indicate 10-year moving averages.

### Gross Domestic Product Price Index

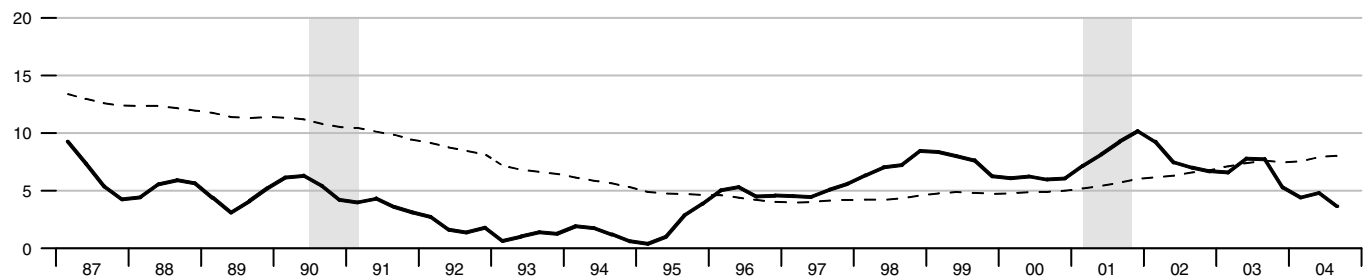
Percent change from year ago



Dashed lines indicate 10-year moving averages.

### M2

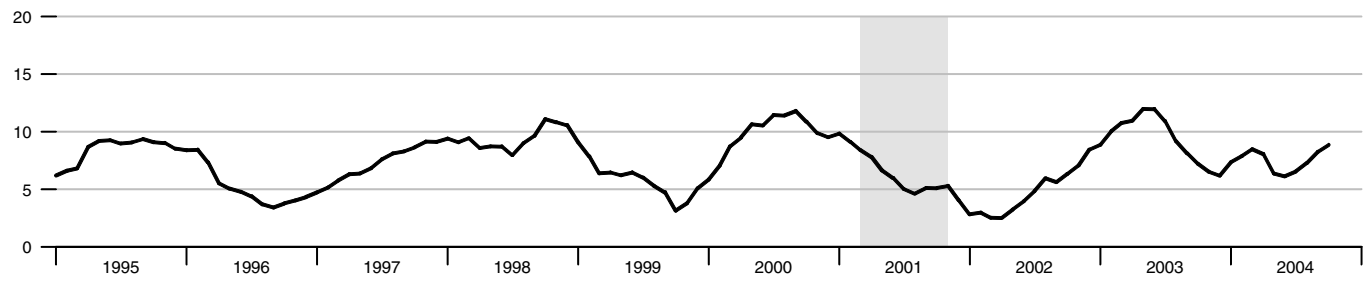
Percent change from year ago



Dashed lines indicate 10-year moving averages.

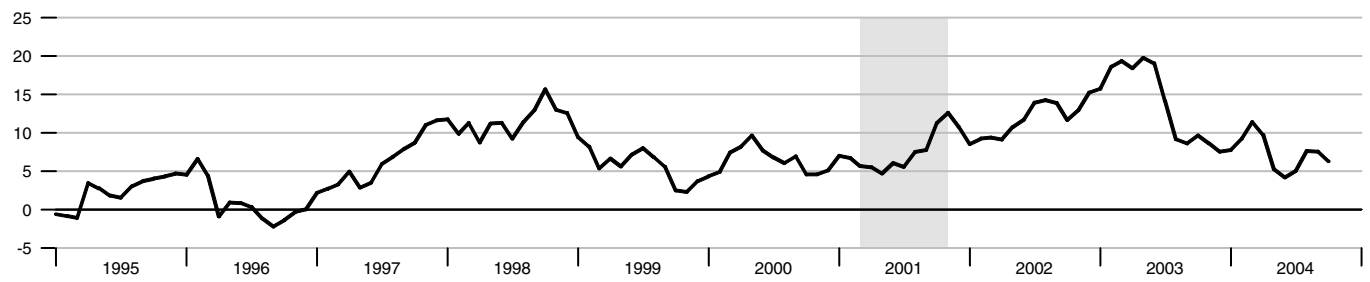
**Bank Credit**

Percent change from year ago



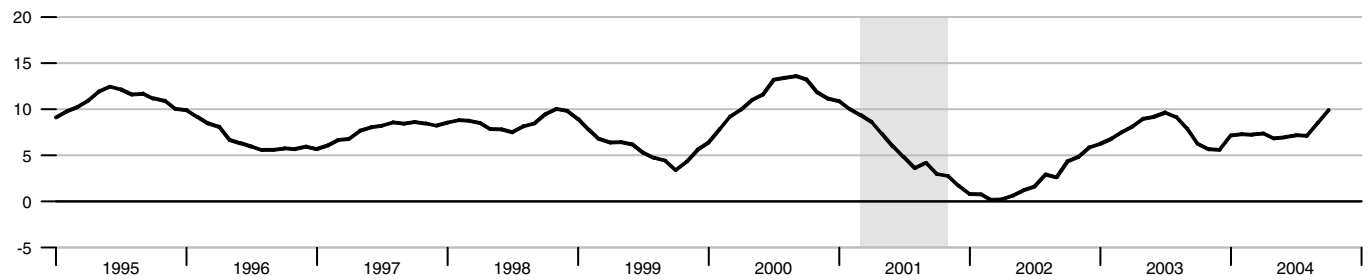
**Investment Securities in Bank Credit at Commercial Banks**

Percent change from year ago



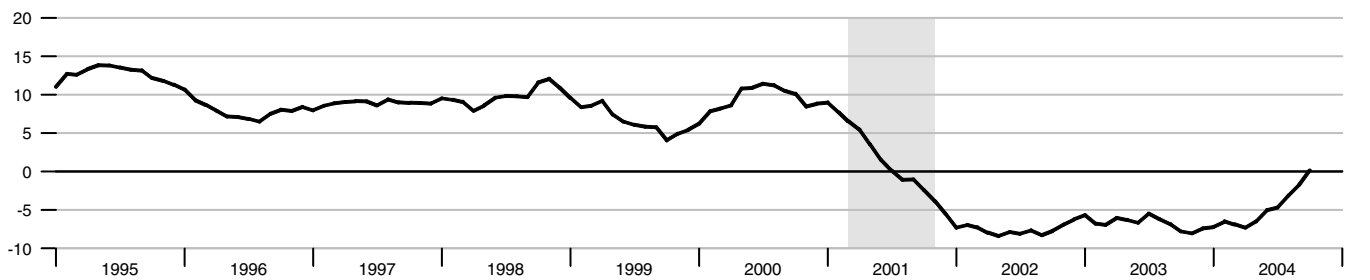
**Total Loans and Leases in Bank Credit at Commercial Banks**

Percent change from year ago

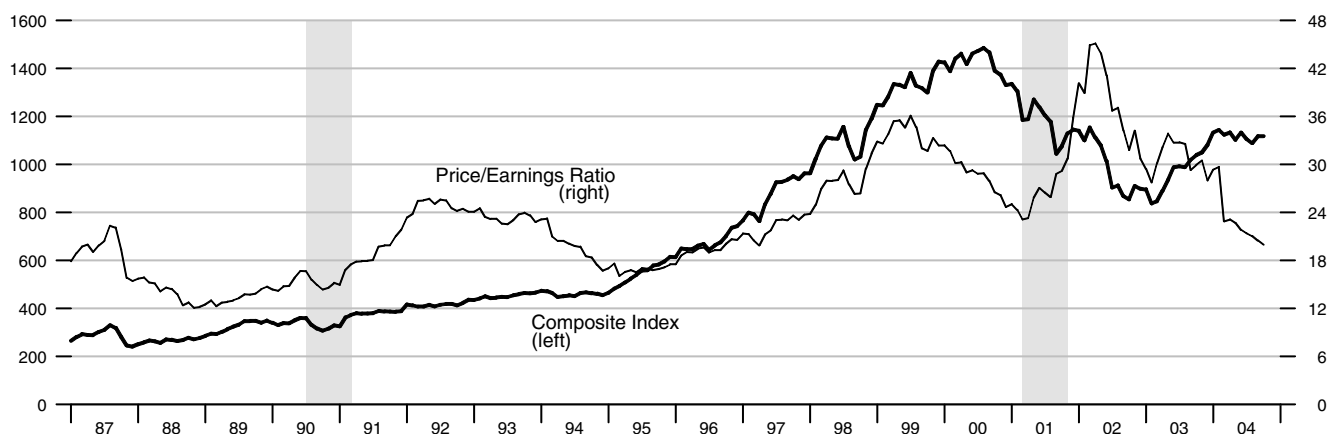


**Commercial and Industrial Loans at Commercial Banks**

Percent change from year ago



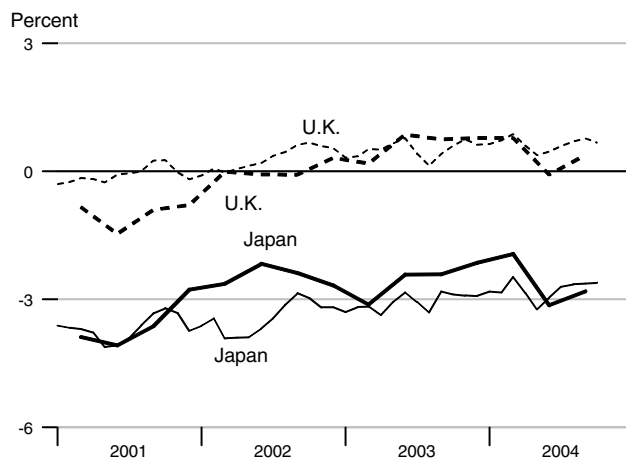
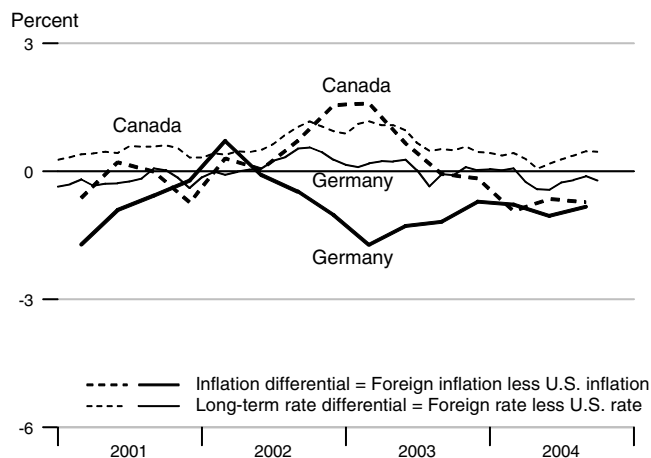
### Standard & Poor's 500



### Recent Inflation and Long-Term Interest Rates

	Consumer Price Inflation Rates				Long-Term Government Bond Rates			
	Percent change from year ago				Percent			
	2003Q4	2004Q1	2004Q2	2004Q3	Jul04	Aug04	Sep04	Oct04
United States	1.87	1.80	2.84	2.71	4.50	4.28	4.13	4.10
Canada	1.71	0.87	2.18	1.99	4.78	4.65	4.60	4.56
France	2.19	1.80	2.38	2.28	4.27	4.11	4.09	.
Germany	1.16	1.02	1.79	1.88	4.24	4.08	4.02	3.89
Italy	2.53	2.29	2.33	2.23	4.44	4.28	4.25	4.13
Japan	-0.27	-0.14	-0.31	-0.10	1.79	1.63	1.50	1.49
United Kingdom	2.65	2.58	2.75	3.09	5.09	4.98	4.90	4.77

### Inflation and Long-Term Interest Rate Differentials



		Money Stock				Bank Credit	Adjusted		MSI M2
		M1	MZM	M2	M3		Monetary Base	Reserves	
1999		1101.461	4170.400	4525.990	6261.554	4577.659	574.181	88.664	229.389
2000		1103.415	4508.945	4801.682	6852.007	5025.436	607.106	84.511	242.177
2001		1136.880	5221.045	5219.653	7632.944	5345.437	641.167	85.923	263.729
2002		1191.998	5891.326	5614.803	8244.826	5597.301	697.072	87.914	285.723
2003		1263.997	6322.064	5998.586	8761.179	6120.519	740.674	92.828	305.770
2002	1	1186.889	5741.673	5499.716	8082.087	5420.075	680.264	88.149	279.213
	2	1184.073	5828.690	5549.617	8161.282	5496.265	692.937	86.970	282.329
	3	1189.213	5927.543	5648.402	8275.904	5655.519	702.753	86.805	287.729
	4	1207.817	6067.399	5761.477	8460.032	5817.344	712.332	89.733	293.619
2003	1	1232.004	6187.293	5861.339	8599.997	5955.926	726.828	90.856	298.747
	2	1258.261	6282.236	5981.702	8723.389	6136.149	738.230	91.757	304.838
	3	1278.765	6433.579	6085.531	8872.374	6186.738	743.993	94.581	310.160
	4	1286.957	6385.149	6065.773	8848.955	6203.262	753.644	94.119	309.336
2004	1	1306.895	6425.988	6119.429	8983.926	6426.606	761.085	94.363	312.257
	2	1327.274	6594.018	6268.531	9225.381	6556.289	770.821	96.014	319.999
	3	1336.550	6609.271	6307.677	9282.897	6641.803	782.543	96.269	322.227
2002	Oct	1201.818	5969.836	5722.696	8348.287	5747.294	710.666	89.805	291.621
	Nov	1204.472	6084.499	5767.200	8479.398	5818.978	712.475	89.818	293.937
	Dec	1217.161	6147.863	5794.536	8552.410	5885.759	713.854	89.575	295.299
2003	Jan	1220.382	6159.131	5825.525	8564.760	5888.802	719.531	89.449	296.929
	Feb	1235.054	6192.703	5867.344	8601.856	5970.305	728.668	91.828	299.044
	Mar	1240.575	6210.044	5891.147	8633.374	6008.671	732.286	91.291	300.268
	Apr	1246.093	6241.488	5933.849	8670.375	6048.932	736.491	92.283	302.429
	May	1257.661	6277.882	5985.144	8725.214	6153.042	738.664	91.428	305.002
	Jun	1271.030	6327.337	6026.113	8774.577	6206.474	739.536	91.559	307.082
	Jul	1273.435	6417.229	6066.128	8848.971	6194.841	741.241	93.485	309.153
	Aug	1281.496	6448.836	6106.591	8888.596	6180.050	745.242	95.383	311.207
	Sep	1281.363	6434.671	6083.873	8879.555	6185.323	745.496	94.876	310.121
	Oct	1284.074	6404.316	6069.055	8856.833	6161.765	753.680	95.231	309.422
	Nov	1283.390	6384.628	6065.799	8844.422	6198.260	754.634	94.768	309.369
	Dec	1293.407	6366.504	6062.465	8845.611	6249.761	752.618	92.359	309.217
2004	Jan	1287.453	6379.960	6070.139	8905.344	6321.002	756.452	92.550	309.808
	Feb	1306.954	6419.689	6120.266	8977.863	6440.957	762.848	95.239	312.308
	Mar	1326.279	6478.316	6167.882	9068.571	6517.858	763.956	95.299	314.655
	Apr	1323.478	6540.625	6216.864	9148.129	6536.665	767.619	96.485	317.266
	May	1322.552	6617.718	6289.642	9249.042	6544.825	769.877	95.187	321.127
	Jun	1335.793	6623.712	6299.086	9278.971	6587.378	774.968	96.369	321.604
	Jul	1324.030	6598.485	6292.024	9257.284	6600.417	780.297	95.251	321.500
	Aug	1341.100	6607.046	6300.753	9280.475	6629.386	781.300	95.502	321.837
	Sep	1344.521	6622.281	6330.254	9310.931	6695.606	786.032	98.054	323.345
	Oct	1343.661	6603.834	6342.637	9285.069	6707.425	791.916	96.963	324.180

\*All values are given in billions of dollars.



	Federal Funds	Discount Rate	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				
1999	4.97	4.62		7.99	5.33	4.78	5.49	5.64	7.04	5.28	7.43	
2000	6.24	5.73		9.23	6.46	6.00	6.22	6.03	7.62	5.58	8.06	
2001	3.89	3.41		6.92	3.69	3.47	4.08	5.02	7.08	5.01	6.97	
2002	1.67	1.17		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	
2002	1	1.73	1.25	4.75	1.82	1.76	3.75	5.08	6.62	5.02	6.97	
	2	1.75	1.25	4.75	1.83	1.75	3.77	5.10	6.71	5.01	6.81	
	3	1.74	1.25	4.75	1.76	1.67	2.62	4.26	6.35	4.72	6.29	
	4	1.44	0.94	4.45	1.49	1.36	2.27	4.01	6.28	4.71	6.08	
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	5.60
	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
2002	Oct	1.75	1.25	4.75	1.73	1.61	2.25	3.94	6.32	4.66	6.11	
	Nov	1.34	0.83	4.35	1.39	1.25	2.32	4.05	6.31	4.77	6.07	
	Dec	1.24	0.75	4.25	1.34	1.21	2.23	4.03	6.21	4.70	6.05	
2003	Jan	1.24		4.25	1.29	1.19	2.18	4.05	6.17	4.72	5.92	
	Feb	1.26		2.25	4.25	1.27	1.19	2.05	3.90	5.95	4.57	5.84
	Mar	1.25		2.25	4.25	1.23	1.15	1.98	3.81	5.89	4.51	5.75
	Apr	1.26		2.25	4.25	1.24	1.15	2.06	3.96	5.74	4.60	5.81
	May	1.26		2.25	4.25	1.22	1.09	1.75	3.57	5.22	4.16	5.48
	Jun	1.22		2.20	4.22	1.04	0.94	1.51	3.33	4.97	4.07	5.23
	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	5.71
	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

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

		M1	MZM	M2	M3
<b>Percent change at an annual rate</b>					
1999		2.00	12.41	7.54	8.74
2000		0.18	8.12	6.09	9.43
2001		3.03	15.79	8.70	11.40
2002		4.85	12.84	7.57	8.02
2003		6.04	7.31	6.84	6.26
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2002	1	5.94	11.13	7.35	6.54
	2	-0.95	6.06	3.63	3.92
	3	1.74	6.78	7.12	5.62
	4	6.26	9.44	8.01	8.90
2003	1	8.01	7.90	6.93	6.62
	2	8.53	6.14	8.21	5.74
	3	6.52	9.64	6.94	6.83
	4	2.56	-3.01	-1.30	-1.06
2004	1	6.20	2.56	3.54	6.10
	2	6.24	10.46	9.75	10.75
	3	2.80	0.93	2.50	2.49
<hr/>					
2002	Oct	11.38	3.43	9.47	3.89
	Nov	2.65	23.05	9.33	18.85
	Dec	12.64	12.50	5.69	10.33
2003	Jan	3.18	2.20	6.42	1.73
	Feb	14.43	6.54	8.61	5.20
	Mar	5.36	3.36	4.87	4.40
	Apr	5.34	6.08	8.70	5.14
	May	11.14	7.00	10.37	7.59
	Jun	12.76	9.45	8.21	6.79
	Jul	2.27	17.05	7.97	10.17
	Aug	7.60	5.91	8.00	5.37
	Sep	-0.12	-2.64	-4.46	-1.22
	Oct	2.54	-5.66	-2.92	-3.07
	Nov	-0.64	-3.69	-0.64	-1.68
	Dec	9.37	-3.41	-0.66	0.16
2004	Jan	-5.52	2.54	1.52	8.10
	Feb	18.18	7.47	9.91	9.77
	Mar	17.74	10.96	9.34	12.12
	Apr	-2.53	11.54	9.53	10.53
	May	-0.84	14.14	14.05	13.24
	Jun	12.01	1.09	1.80	3.88
	Jul	-10.57	-4.57	-1.35	-2.80
	Aug	15.47	1.56	1.66	3.01
	Sep	3.06	2.77	5.62	3.94
	Oct	-0.77	-3.34	2.35	-3.33

## 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 7/25/2013, the current U.K. note has a maturity date of 8/16/2013, and the current U.S. note has a maturity date of 7/15/2014. **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/).