

Budget Deficits and Interest Rates

On February 2, 2004, President Bush released his budget proposals for fiscal year 2005, along with an estimate of the 2004 budget deficit of \$521 billion. The return of substantial deficits has reignited debate on the implications of budget deficits for the economy.

Warnings about the consequences of U.S. budget deficits, while not new, have shifted in emphasis over time. During the 1970s, emphasis was on the *inflationary* consequences of deficits. For example, in 1975, Ronald Reagan stated that inflation “has one cause and one cause alone: government spending more than government takes in.” By contrast, the concern voiced since the 1980s about deficits rests on the argument that they put upward pressure on *real interest rates*.

Deficits can be a source of inflation if they are accommodated by monetary policy—that is, if higher deficits provoke an increase in money growth. This can occur if the securities issued by the government to finance deficits are purchased by the central bank. It also occurs if the securities are sold to the private sector, but the central bank then attempts to offset any resulting upward pressure on interest rates. Under either scenario, the occurrence of deficits leads to greater money growth, creating excess aggregate demand and inflationary pressure.

The present-day emphasis on the implications of the deficit for interest rates, and not inflation, reflects an expectation that the Federal Reserve will not accommodate deficits with money creation, but instead will allow nominal and real interest rates to rise to whatever levels are consistent with keeping aggregate demand and inflation under control. This expectation reflects the experience since 1982, during which inflation has been controlled despite several years of high deficits (including fiscal year 1983’s \$208 billion deficit of approximately 6 percent of GDP, above the 4.5 percent estimated for 2004). This experience confirms that monetary policy is capable of keeping inflation low even in the face of large changes in the government’s budgetary position.

To see how deficits might matter for interest rates, it is useful to remember that nominal interest rates are the sum of an expected inflation component and a real rate of return. A non-accommodative monetary policy stance implies that the expected-inflation component of nominal rates will be unchanged in the face of higher deficits. But it also implies that monetary policy will not resist any upward pressure on real interest rates that arises from greater government borrowing.

Why might real interest rates rise in response to deficit financing? With monetary accommodation of the deficit ruled out, the government needs to induce the private sector to increase its subscriptions to government bonds. If the private sector’s volume of saving has not increased one-for-one with the higher deficit, extra government borrowing must take place at the expense of the financing of private projects, such as investment in residences or factory equipment. Real interest rates rise as the government attracts funds away from these sources. The higher interest rate has the effect of reducing the private sector’s demand for capital, which is thus brought down in line with the reduced supply of saving available for private use. The lower private capital accumulation underlies what Douglas Holtz-Eakin, the director of the Congressional Budget Office, has summarized as a “modestly negative” effect of budget deficits on long-term economic potential.

Much empirical evidence for the United States has found little relation between deficits and interest rates. However, a recent study¹ does detect a “statistically and economically significant” relationship between higher deficit projections and expected future long-term interest rates, after controlling for other factors that determine real interest rates, including the long-term rate of economic growth. According to the author’s estimates, an increase in the projected deficit-to-GDP ratio of 1 percentage point “raise[s] long-term interest rates by roughly 25 basis points.” These estimates suggest that if the deficit-to-GDP ratio were sustained at present levels, the eventual result would be real interest rates 1 percentage point higher than would prevail under a balanced budget.

—Edward Nelson

¹ Laubach, Thomas. “New Evidence on the Interest Rate Effects of Budget Deficits and Debt” Finance and Economics Discussion Series Paper No. 2003-12, Board of Governors of the Federal Reserve System, May 2003.

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

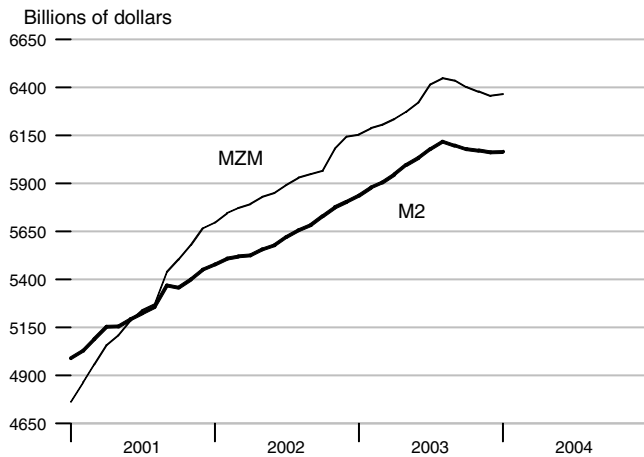
We welcome your comments addressed to:

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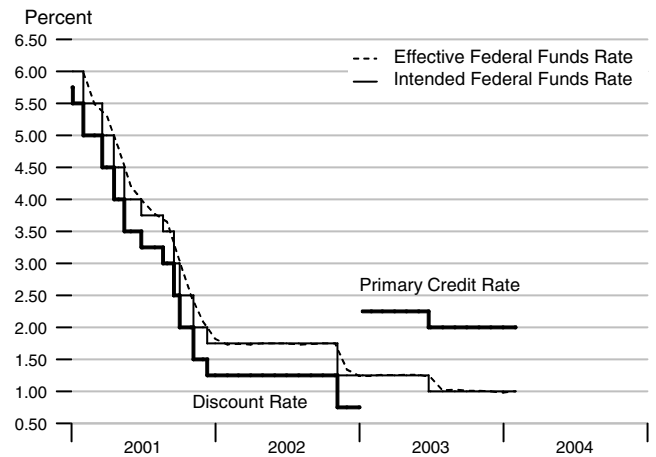
or to:

stlsFRED@stls.frb.org

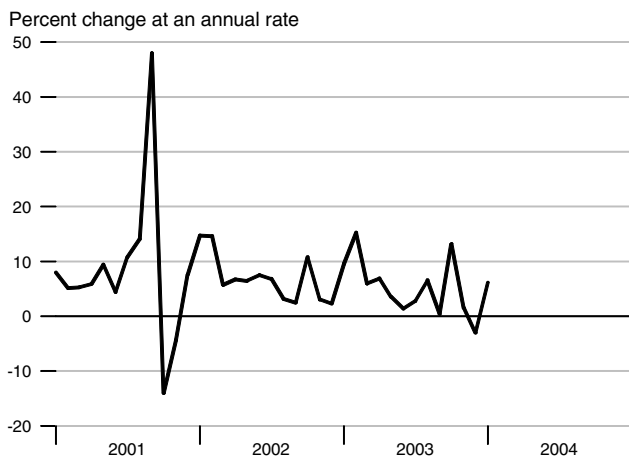
M2 and MZM



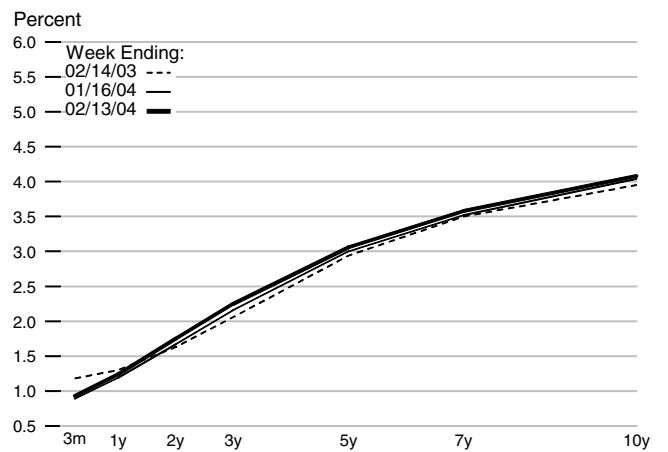
Reserve Market Rates



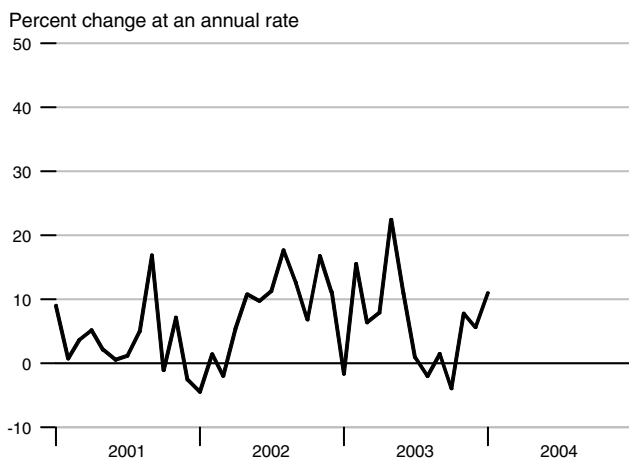
Adjusted Monetary Base



Treasury Yield Curve



Total Bank Credit



Interest Rates

	Nov 03	Dec 03	Jan 04
Federal Funds Rate	1.00	0.98	1.00
Prime Rate	4.00	4.00	4.00
Primary Credit Rate	2.00	2.00	2.00
Conventional Mortgage Rate	5.93	5.88	5.74
Treasury Yields:			
3-Month Constant Maturity	0.95	0.91	0.90
6-Month Constant Maturity	1.04	1.01	0.99
1-Year Constant Maturity	1.34	1.31	1.24
3-Year Constant Maturity	2.45	2.44	2.27
5-Year Constant Maturity	3.29	3.27	3.12
10-Year Constant Maturity	4.30	4.27	4.15

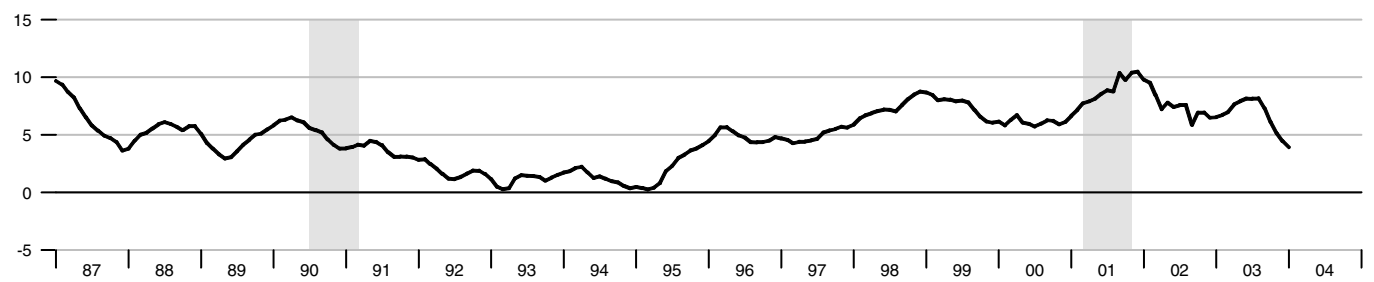
MZM and M1

Percent change from year ago



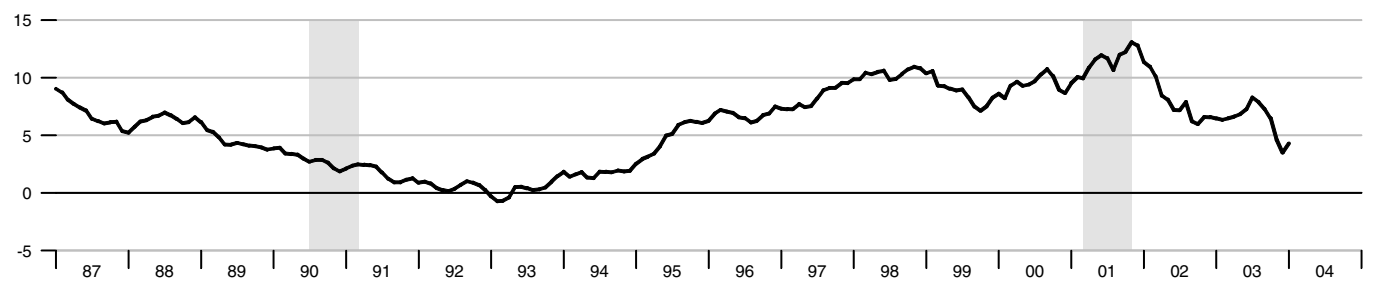
M2

Percent change from year ago



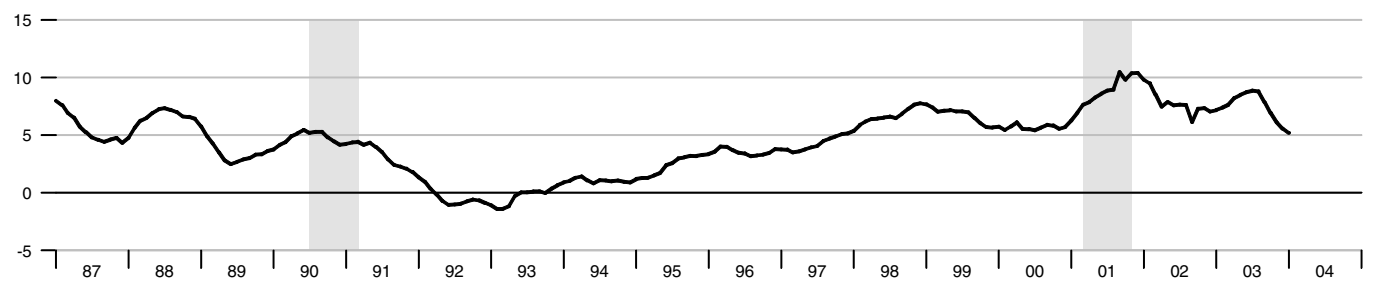
M3

Percent change from year ago



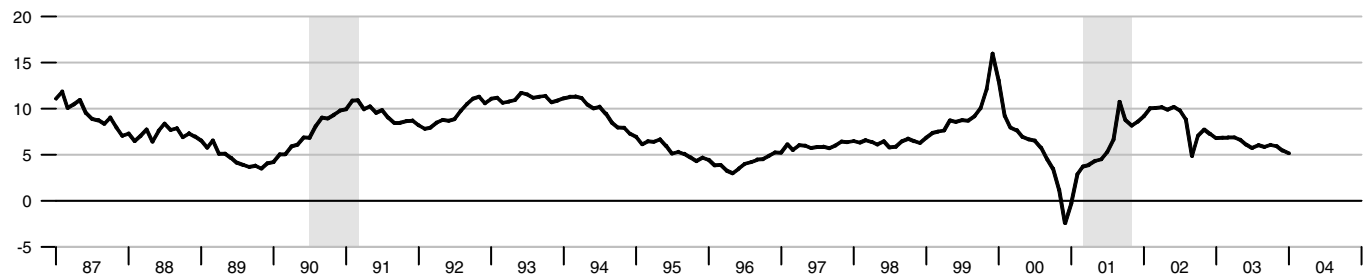
Monetary Services Index - M2

Percent change from year ago



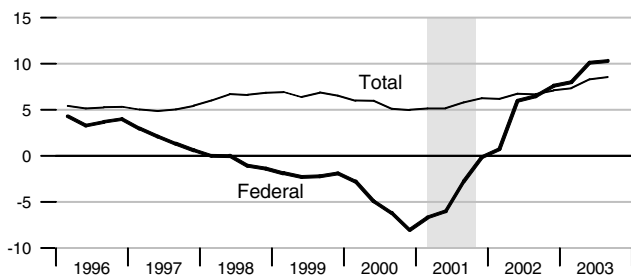
Adjusted Monetary Base

Percent change from year ago



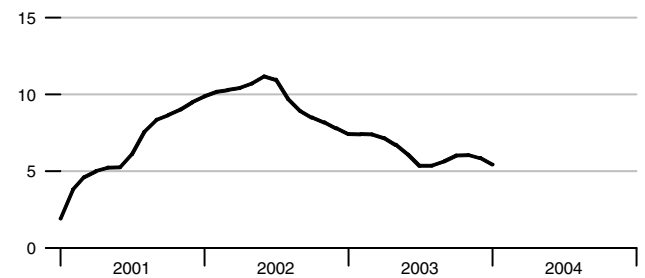
Domestic Nonfinancial Debt

Percent change from year ago



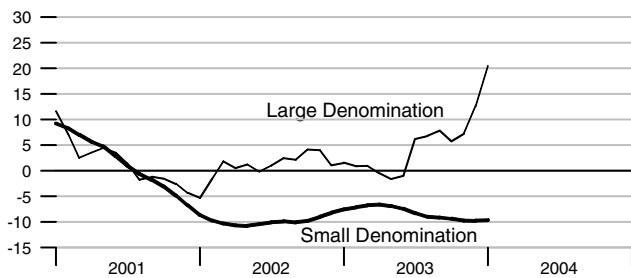
Currency Held by the Nonbank Public

Percent change from year ago



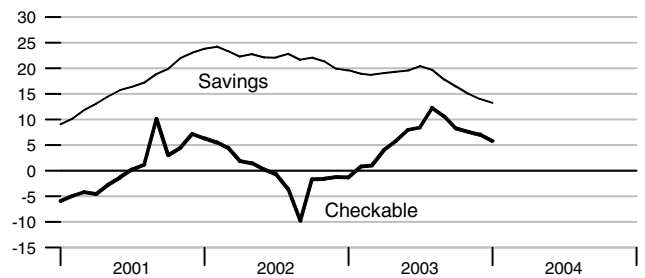
Time Deposits

Percent change from year ago



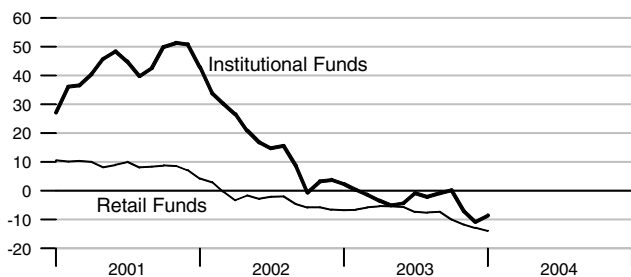
Checkable and Savings Deposits

Percent change from year ago



Money Market Mutual Fund Shares

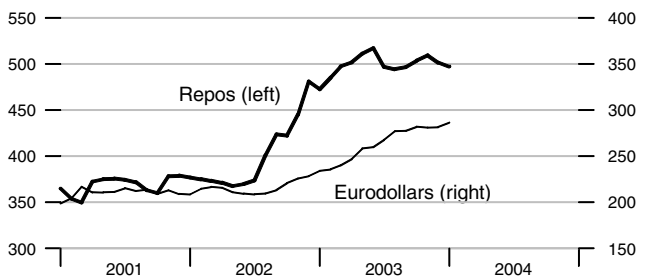
Percent change from year ago



Repurchase Agreements and Eurodollars

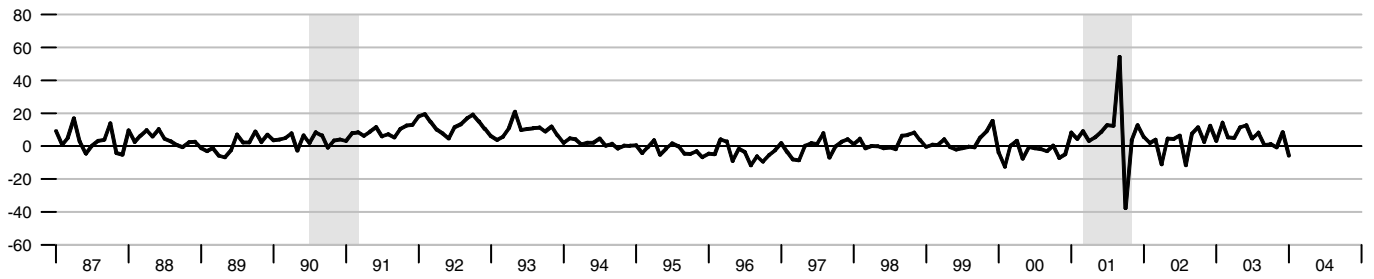
Billions of dollars

Billions of dollars



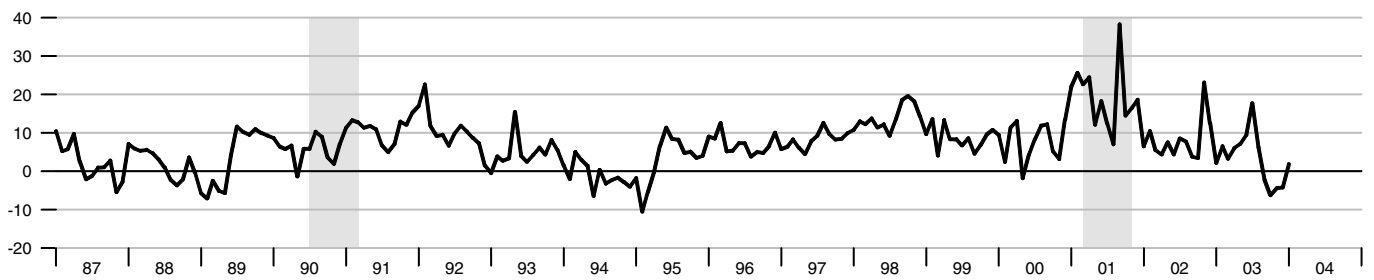
M1

Percent change at an annual rate



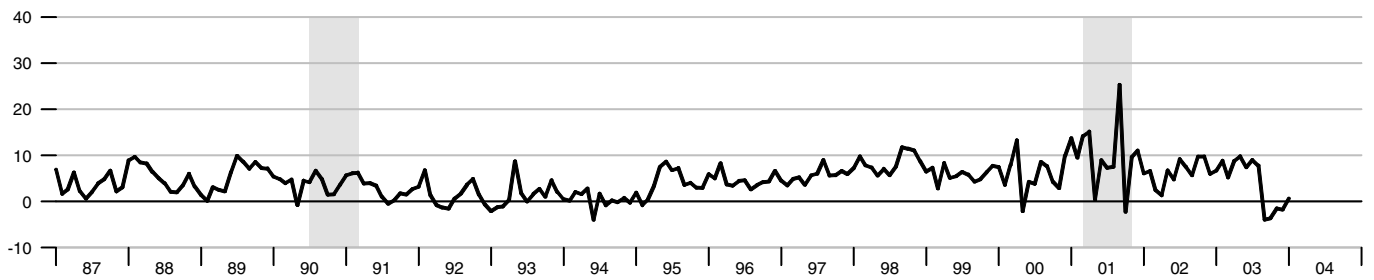
M2M

Percent change at an annual rate



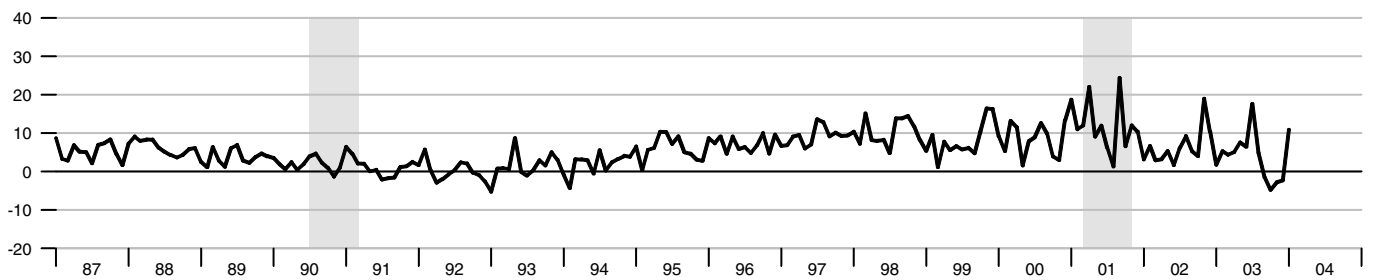
M2

Percent change at an annual rate



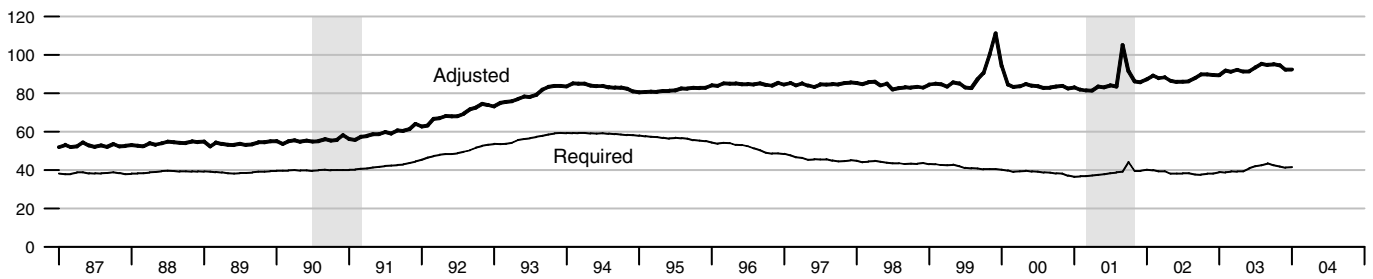
M3

Percent change at an annual rate



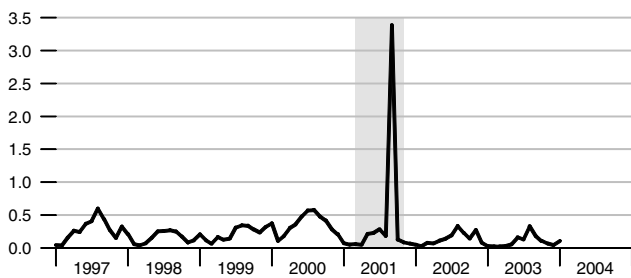
Adjusted and Required Reserves

Billions of dollars



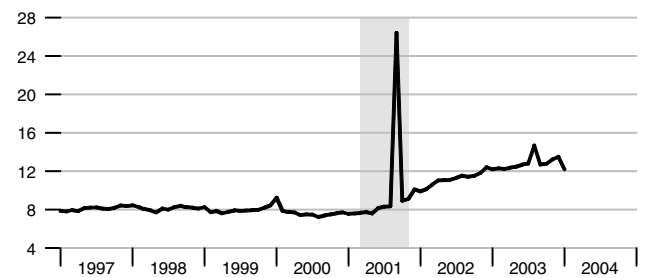
Total Borrowings, nsa

Billions of dollars



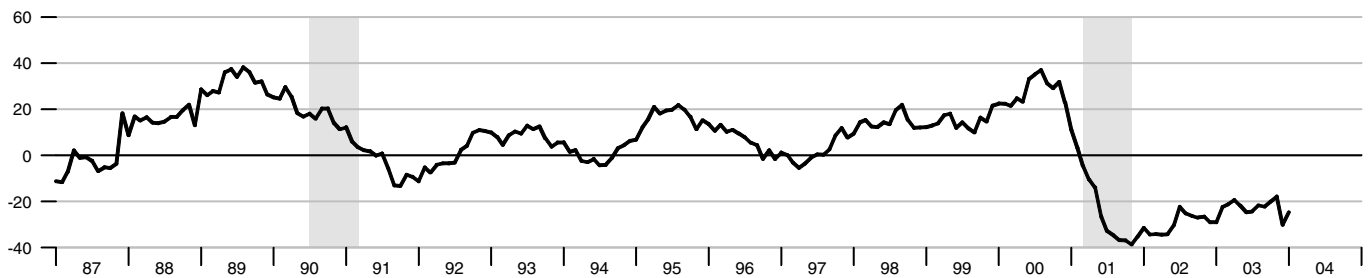
Excess Reserves plus RCB Contracts

Billions of dollars



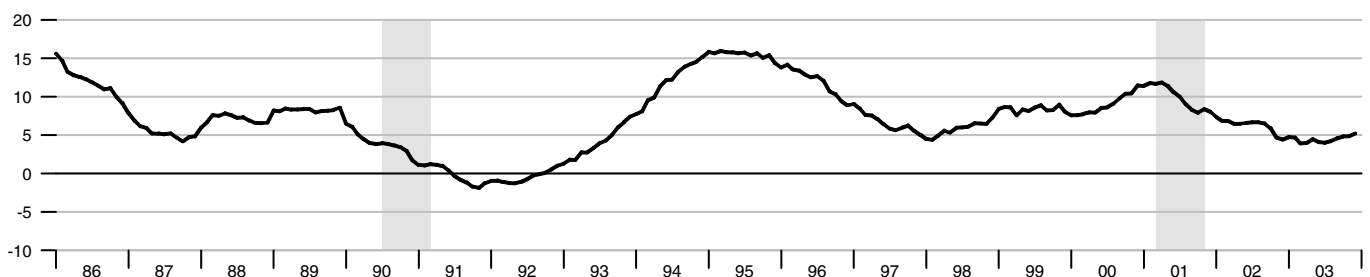
Nonfinancial Commercial Paper

Percent change from year ago

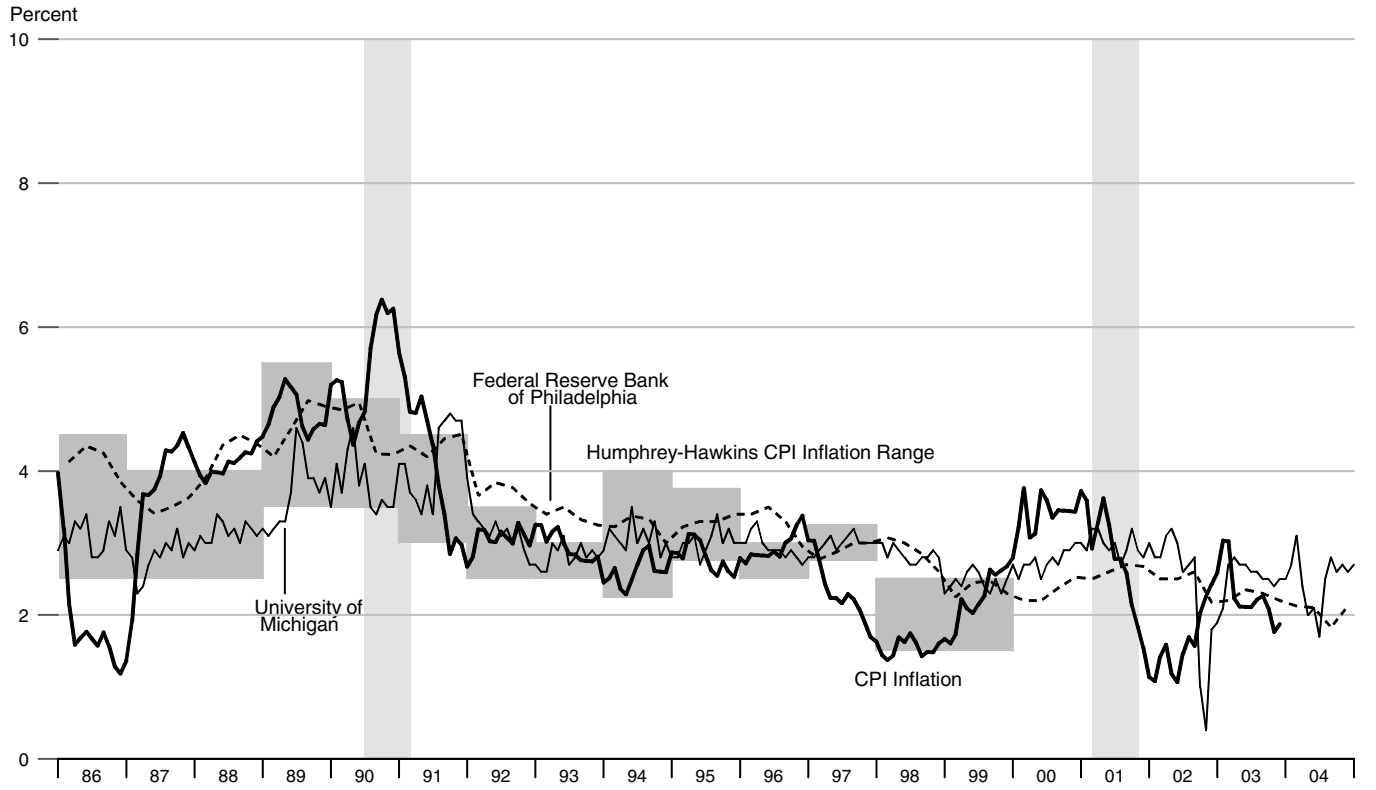


Consumer Credit

Percent change from year ago

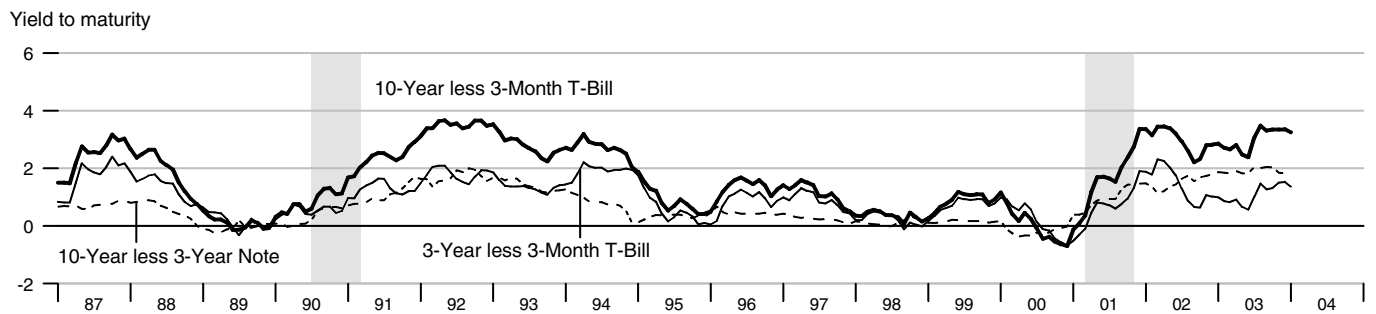


Inflation and Inflation Expectations

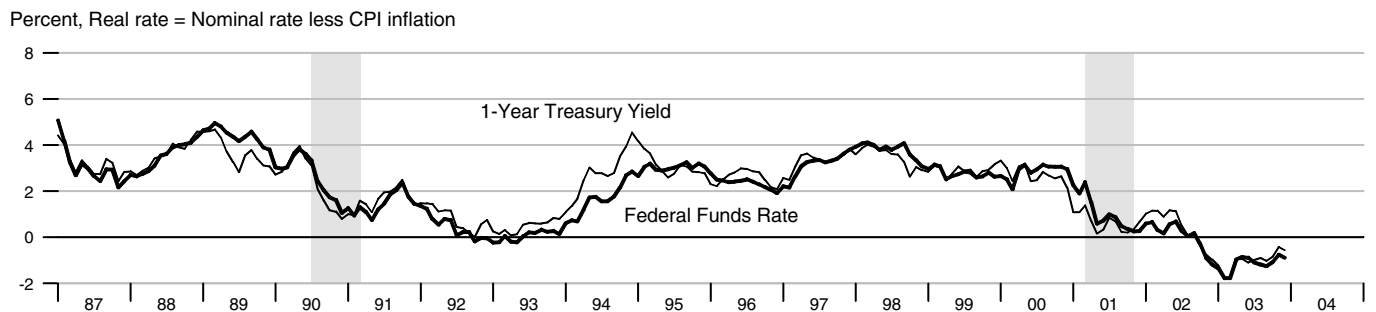


The shaded region shows the Humphrey-Hawkins CPI inflation range. Beginning in January 2000, the Humphrey-Hawkins inflation range was reported using the PCE price index and therefore is not shown on this graph. See notes on page 19.

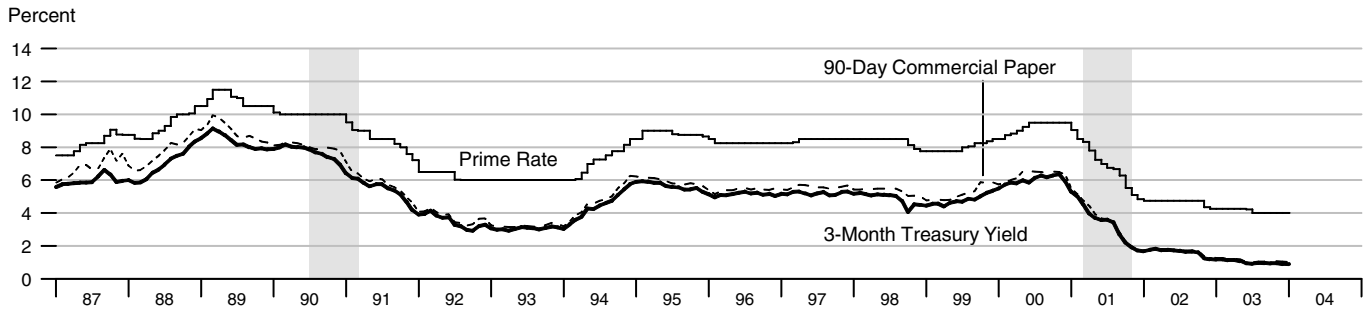
Treasury Security Yield Spreads



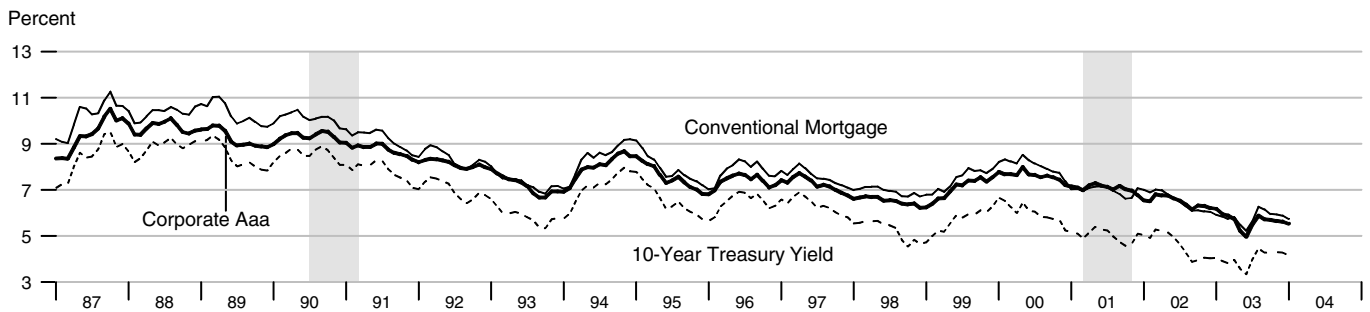
Real Interest Rates



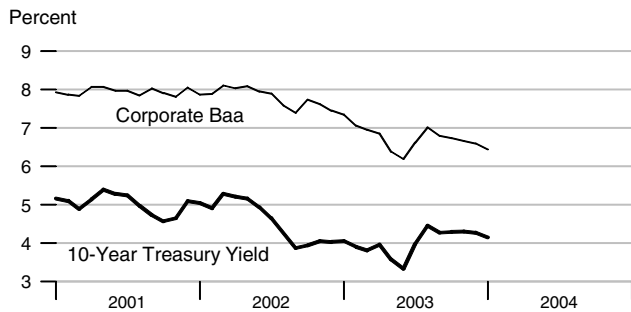
Short-Term Interest Rates



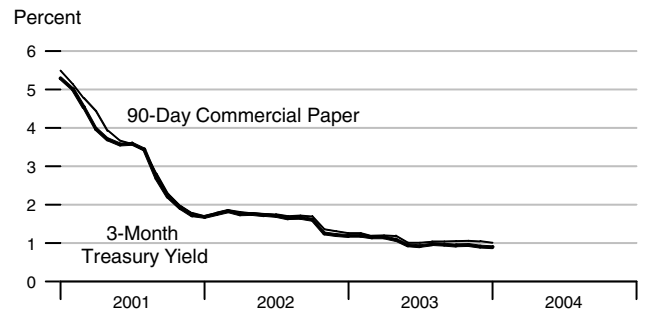
Long-Term Interest Rates



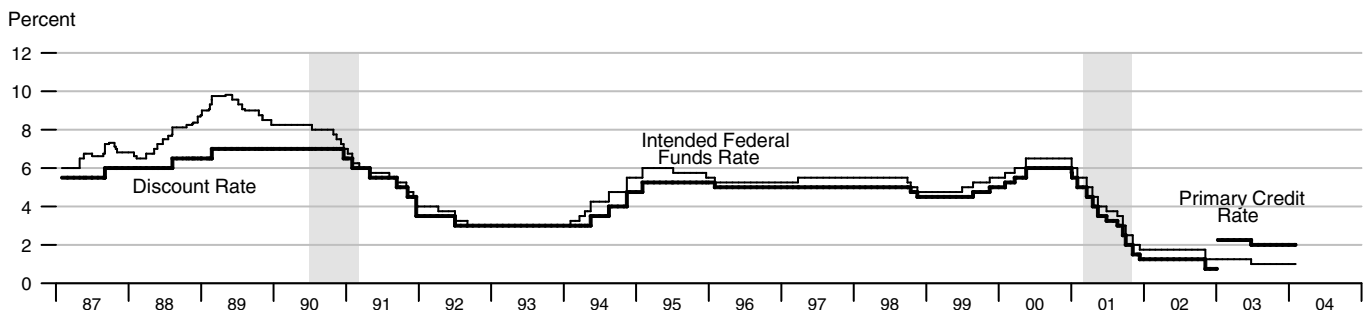
Long-Term Interest Rates



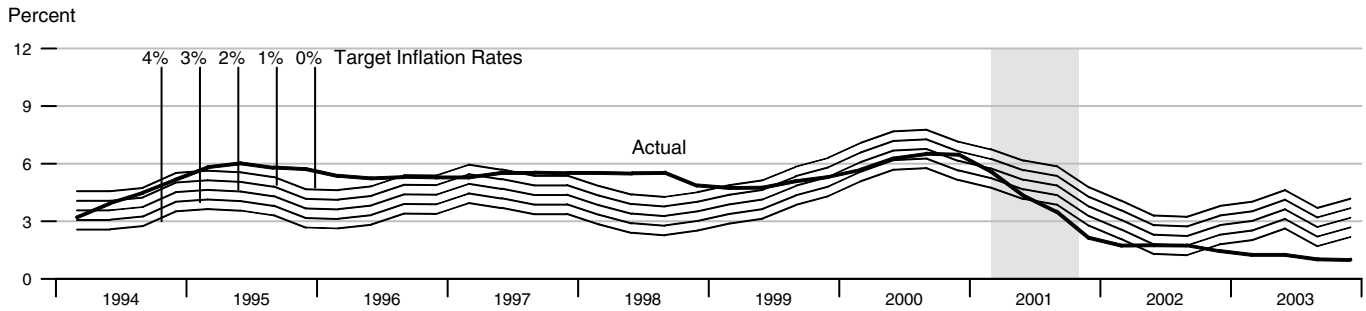
Short-Term Interest Rates



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



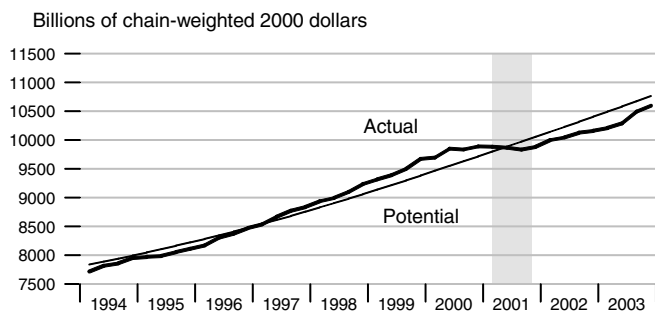
Federal Funds Rate and Inflation Targets



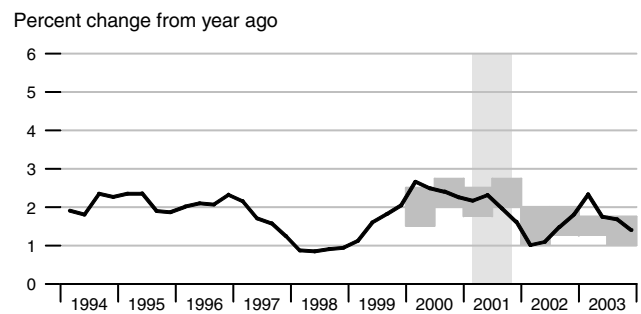
Calculated federal funds rate is based on Taylor's rule. See notes on page 19.

Components of Taylor's Rule

Actual and Potential Real GDP

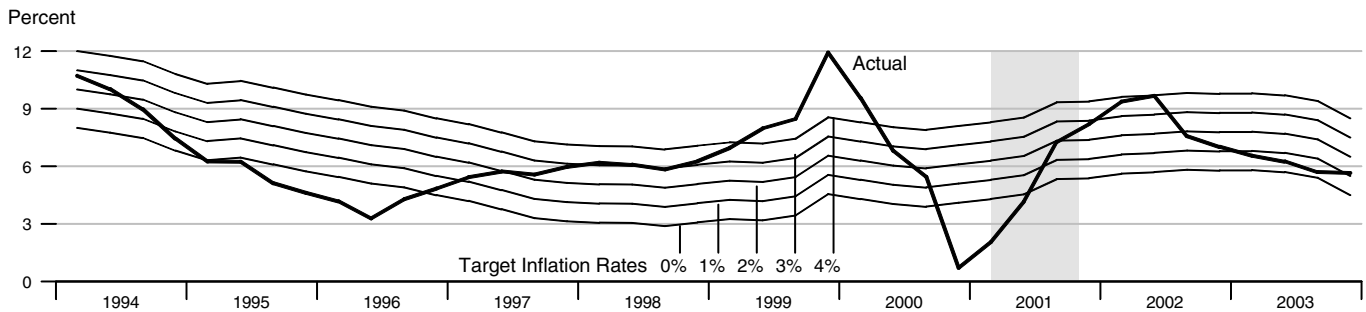


PCE Inflation and Projections



The shaded region shows the range of projections published in the Monetary Policy Report to the Congress.

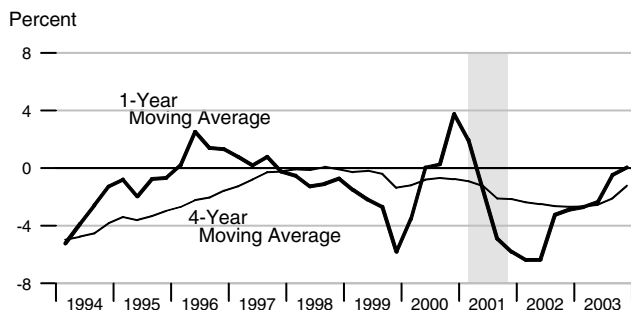
Monetary Base Growth* and Inflation Targets



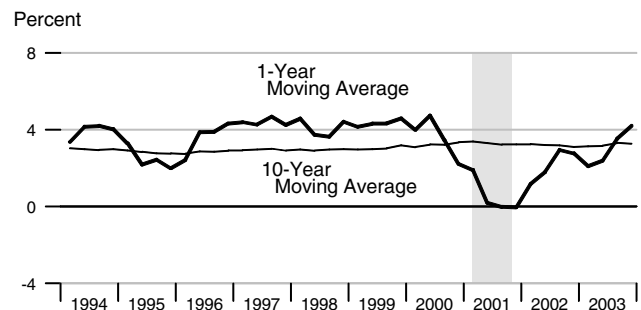
*Modified for the effects of sweeps programs on reserve demand. Calculated base growth is based on McCallum's rule. Actual base growth is percent change from year ago. See notes on page 19.

Components of McCallum's Rule

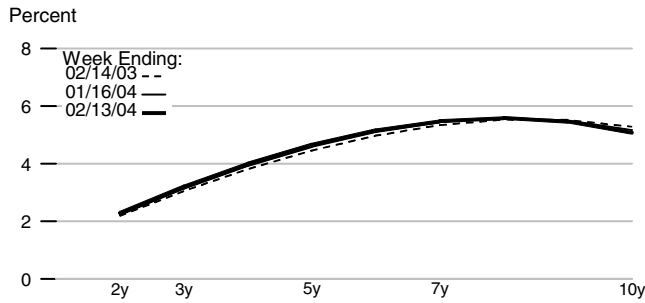
Monetary Base Velocity Growth



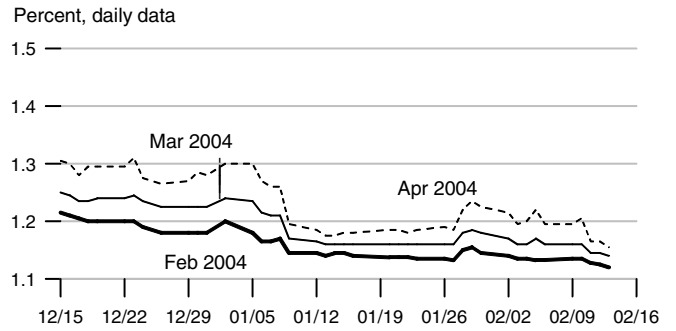
Real Output Growth



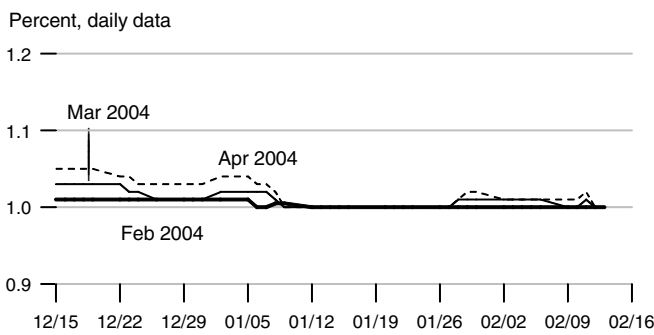
Implied One-Year Forward Rates



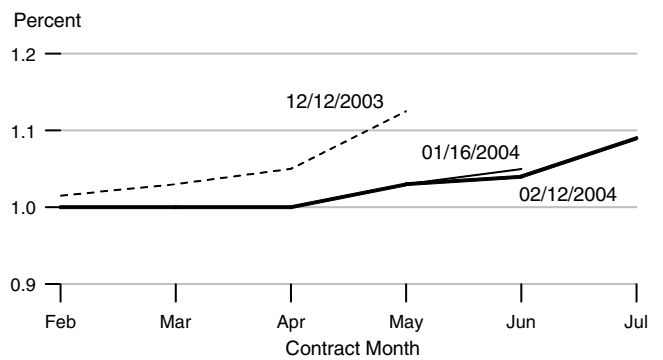
Rates on 3-Month Eurodollar Futures



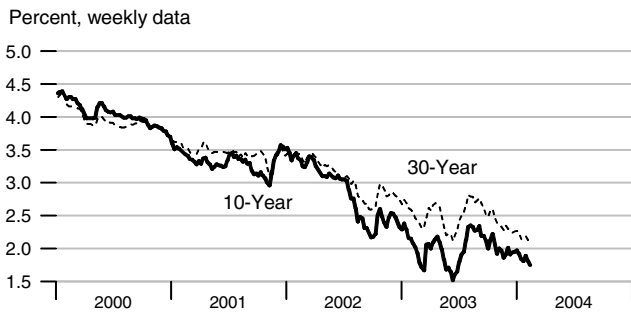
Rates on Selected Federal Funds Futures Contracts



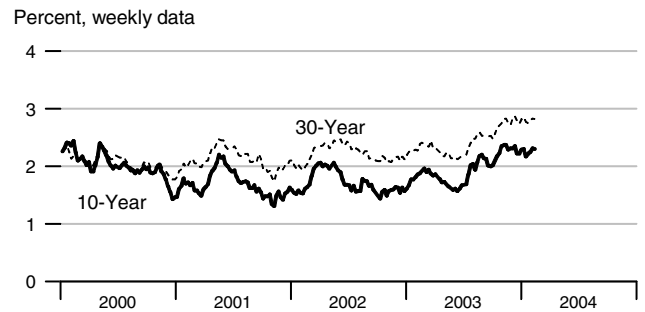
Rates on Federal Funds Futures on Selected Dates



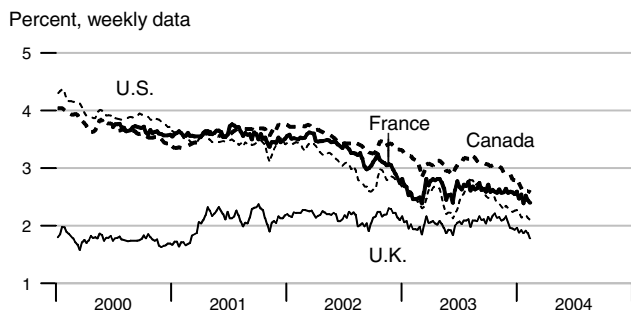
Inflation-Indexed Treasury Bonds



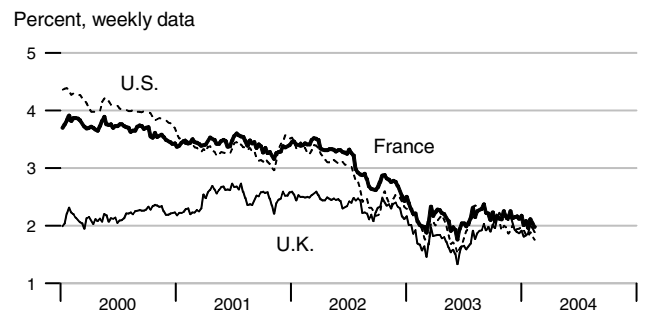
Inflation-Indexed Treasury Yield Spreads



Inflation-Indexed 30-Year Government Bonds

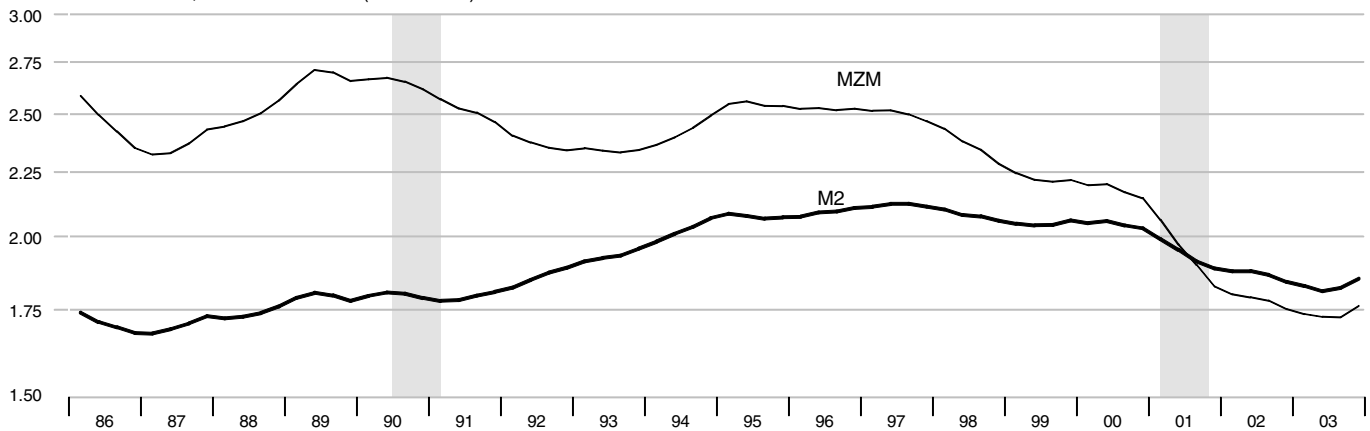


Inflation-Indexed 10-Year Government Bonds



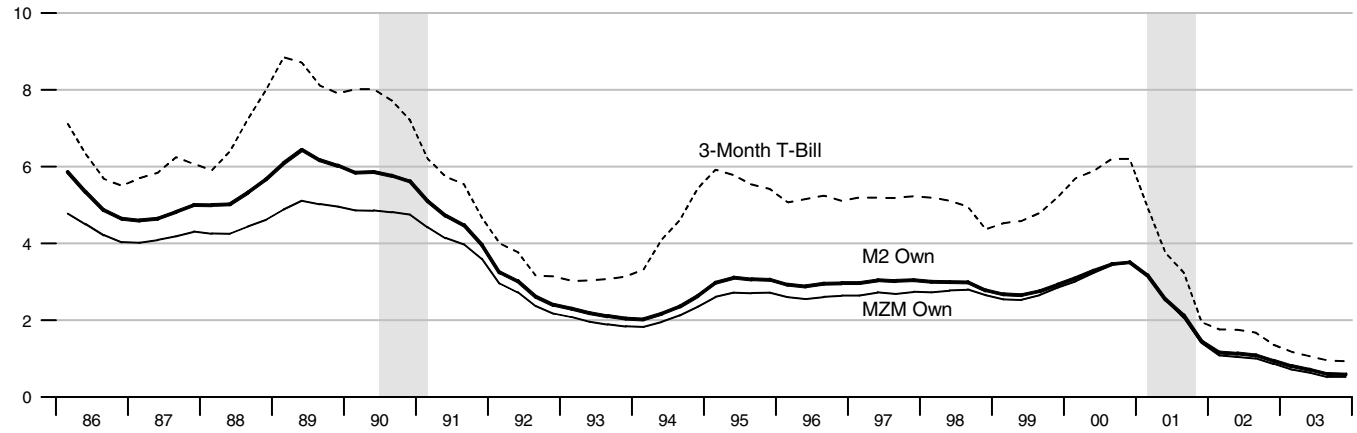
Velocity

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



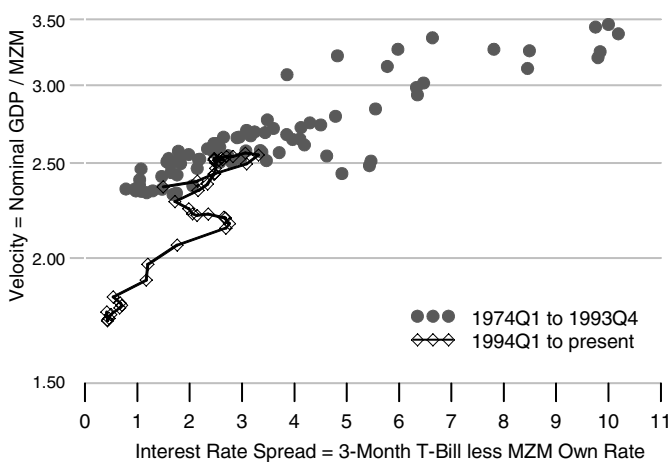
Interest Rates

Percent



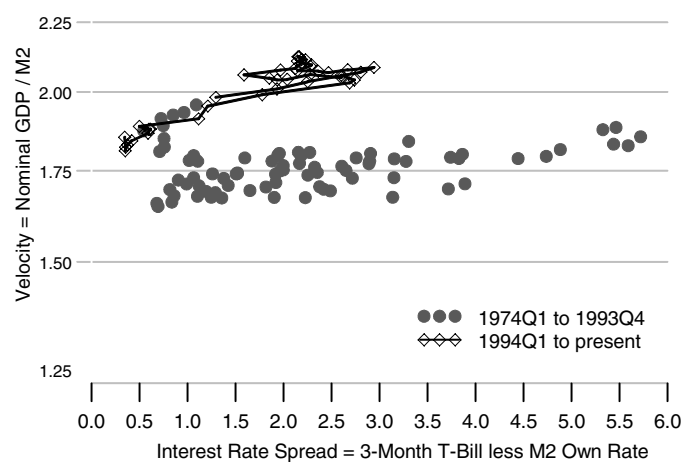
MZM Velocity and Interest Rate Spread

Ratio Scale



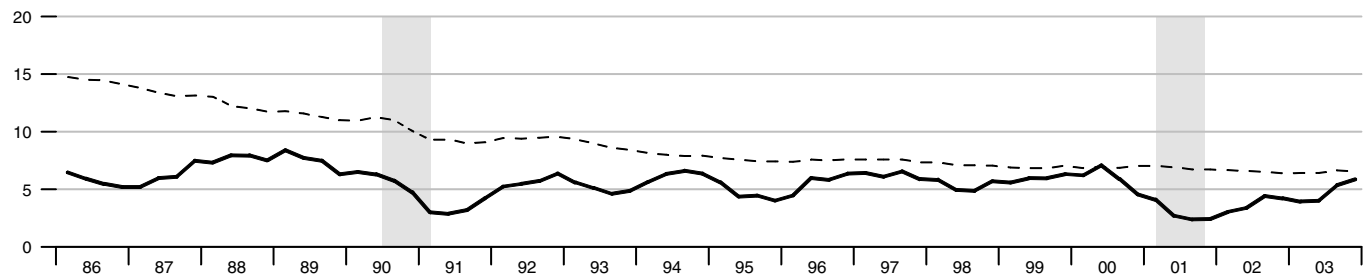
M2 Velocity and Interest Rate Spread

Ratio Scale



Gross Domestic Product

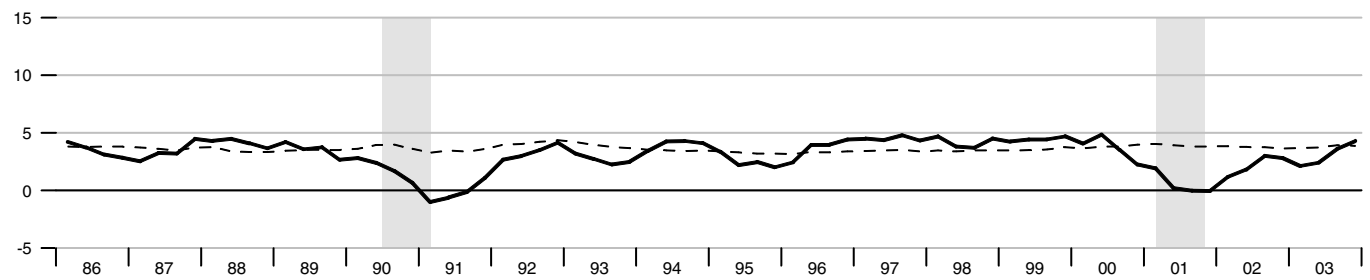
Percent change from year ago



Dashed lines indicate 10-year moving averages.

Real Gross Domestic Product

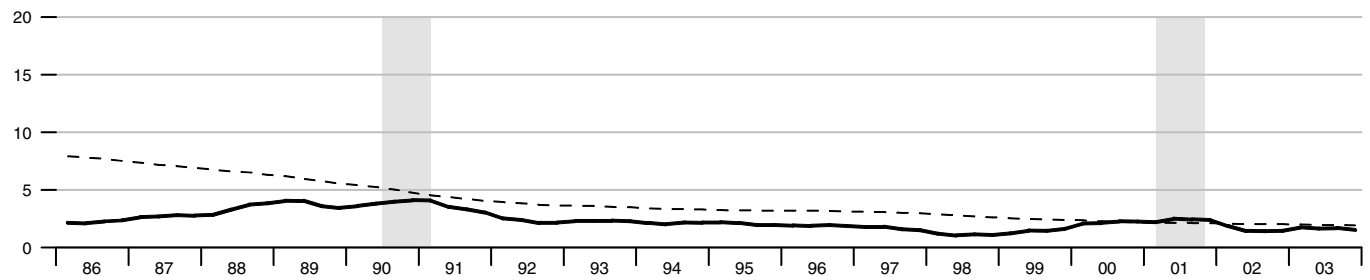
Percent change from year ago



Dashed lines indicate 10-year moving averages.

Gross Domestic Product Price Index

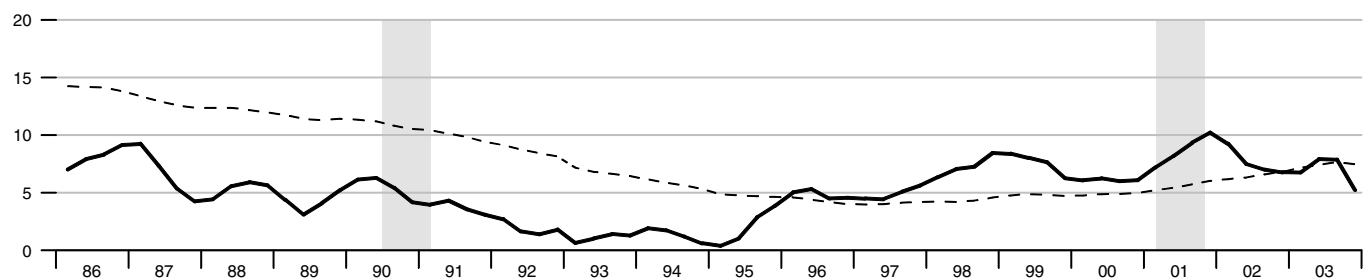
Percent change from year ago



Dashed lines indicate 10-year moving averages.

M2

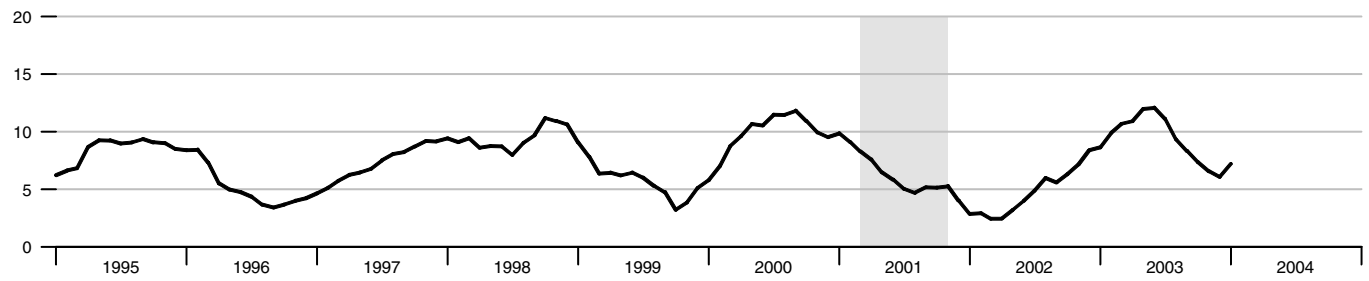
Percent change from year ago



Dashed lines indicate 10-year moving averages.

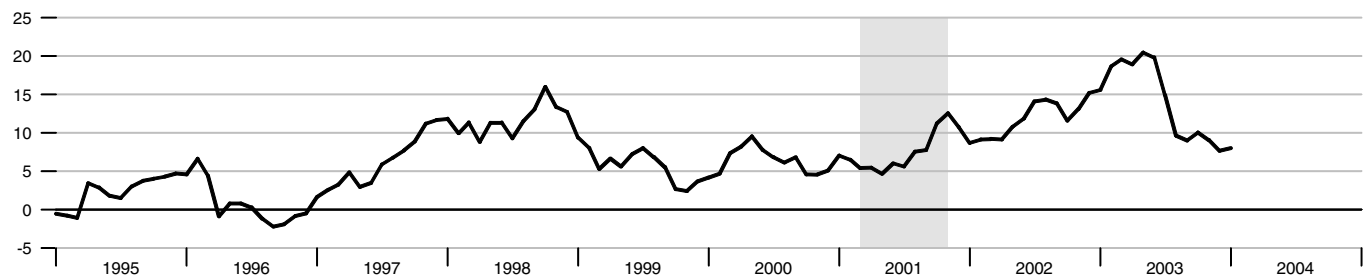
Bank Credit

Percent change from year ago



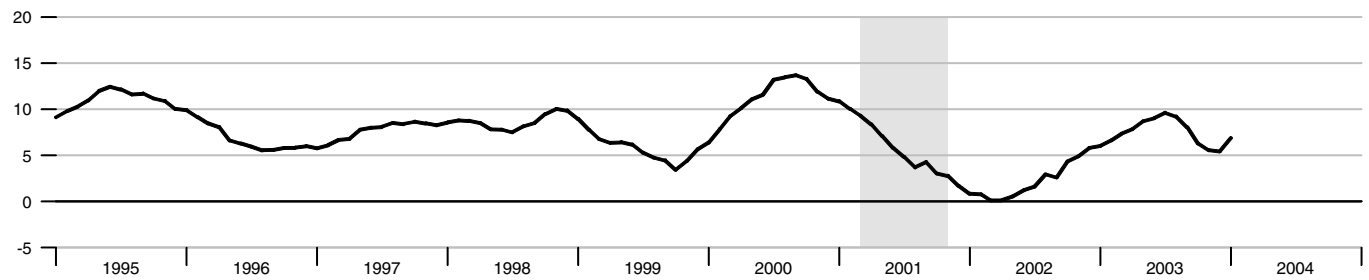
Investment Securities in Bank Credit at Commercial Banks

Percent change from year ago



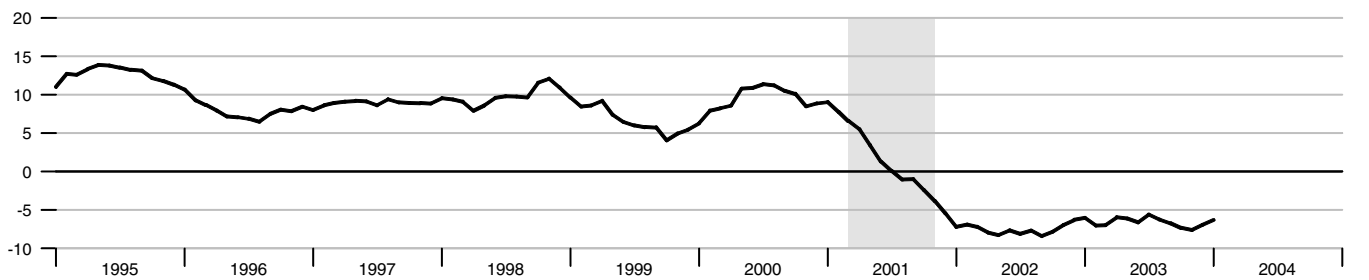
Total Loans and Leases in Bank Credit at Commercial Banks

Percent change from year ago

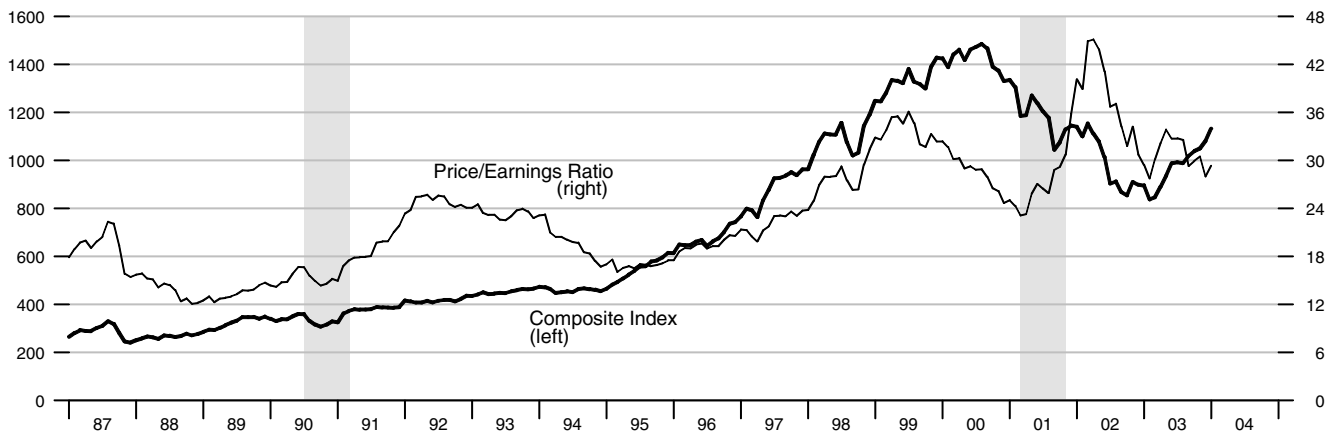


Commercial and Industrial Loans at Commercial Banks

Percent change from year ago



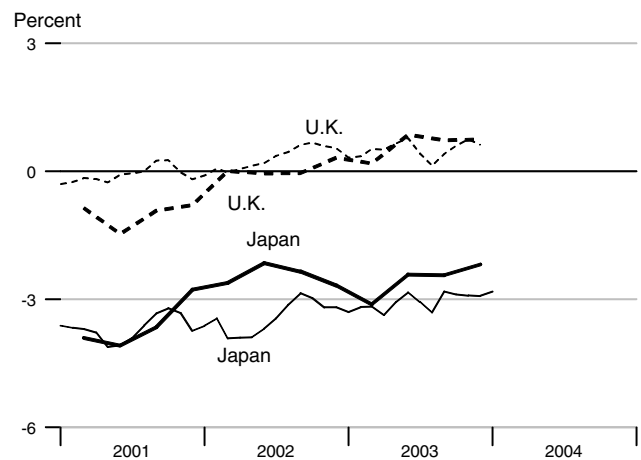
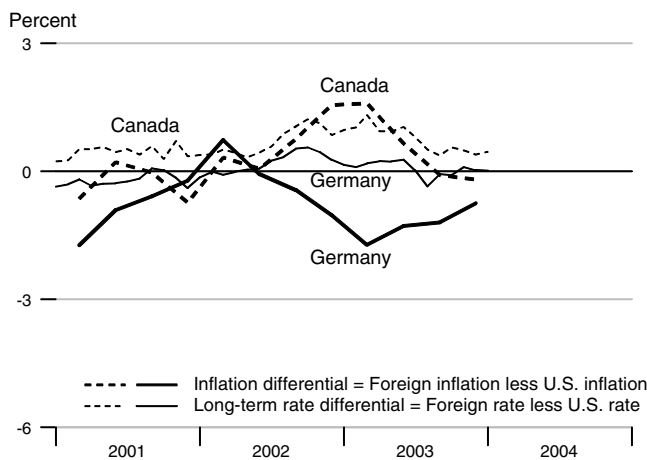
Standard & Poor's 500



Recent Inflation and Long-Term Interest Rates

	Consumer Price Inflation Rates				Long-Term Government Bond Rates			
	Percent change from year ago				Percent			
	2003Q1	2003Q2	2003Q3	2003Q4	Oct03	Nov03	Dec03	Jan04
United States	2.88	2.15	2.20	1.91	4.29	4.30	4.27	4.15
Canada	4.47	2.81	2.11	1.71	4.85	4.79	4.66	4.61
France	2.38	1.92	1.95	2.19	4.46	4.54	4.38	.
Germany	1.16	0.87	1.00	1.16	4.20	4.40	4.30	4.17
Italy	2.72	2.70	2.74	2.53	4.38	4.51	4.46	4.32
Japan	-0.23	-0.27	-0.24	-0.27	1.40	1.39	1.35	1.33
United Kingdom	3.07	3.01	2.93	2.66	4.89	5.05	4.89	.

Inflation and Long-Term Interest Rate Differentials



		Money Stock				Bank	Adjusted		
		M1	MZM	M2	M3	Credit	Monetary Base	Reserves	MSI M2
1999		1101.461	4169.937	4525.763	6252.431	4577.111	574.181	88.664	257.932
2000		1103.437	4508.023	4801.620	6841.538	5025.725	607.106	84.511	272.580
2001		1136.500	5219.281	5221.963	7621.282	5343.662	641.167	85.931	296.359
2002		1190.124	5887.329	5619.261	8231.077	5595.013	697.071	87.927	319.470
2003		1262.932	6317.953	6008.556	8765.436	6119.217	740.704	92.800	343.857
2001	1	1100.804	4861.100	5035.561	7281.121	5270.407	619.676	82.207	285.554
	2	1116.621	5117.138	5166.553	7549.287	5311.739	629.484	82.722	293.208
	3	1160.698	5316.009	5282.951	7715.013	5361.261	651.930	90.905	300.165
	4	1167.878	5582.876	5402.785	7939.708	5431.241	663.578	87.887	306.510
2002	1	1185.211	5738.094	5501.579	8068.915	5415.096	680.264	88.156	312.038
	2	1181.936	5824.414	5553.187	8146.642	5482.935	692.937	86.979	315.612
	3	1187.477	5923.564	5653.131	8261.882	5655.398	702.753	86.821	321.565
	4	1205.872	6063.246	5769.148	8446.869	5826.622	712.330	89.753	328.665
2003	1	1229.731	6182.629	5873.213	8587.726	5942.673	726.821	90.845	335.119
	2	1255.661	6276.875	5992.305	8709.527	6122.216	738.225	91.745	342.359
	3	1279.488	6433.139	6097.803	8907.556	6197.151	744.023	94.577	348.910
	4	1286.849	6379.168	6070.903	8856.933	6214.828	753.748	94.034	349.041
2002	Jan	1182.689	5696.268	5477.750	8032.700	5413.877	673.713	87.295	310.563
	Feb	1184.554	5745.814	5507.883	8077.119	5420.175	681.914	89.237	312.332
	Mar	1188.391	5772.199	5519.103	8096.927	5411.236	685.165	87.937	313.219
	Apr	1177.508	5793.204	5525.247	8118.898	5435.551	689.008	88.352	313.900
	May	1181.982	5829.403	5556.129	8154.879	5484.325	692.736	86.586	315.774
	Jun	1186.317	5850.636	5578.184	8166.150	5528.930	697.068	85.999	317.161
	Jul	1192.608	5892.114	5620.738	8207.875	5580.858	701.032	86.101	319.407
	Aug	1181.130	5929.925	5655.974	8270.785	5662.922	702.878	86.383	321.675
	Sep	1188.693	5948.652	5682.682	8306.987	5722.413	704.350	87.978	323.612
	Oct	1200.029	5965.696	5728.598	8334.707	5755.031	710.665	89.827	326.355
	Nov	1202.601	6080.440	5775.064	8466.372	5835.333	712.473	89.839	328.972
	Dec	1214.985	6143.601	5803.783	8539.528	5889.501	713.851	89.594	330.668
2003	Jan	1218.299	6154.851	5836.155	8552.187	5881.453	719.527	89.443	332.855
	Feb	1232.724	6188.096	5878.971	8589.852	5957.469	728.658	91.817	335.424
	Mar	1238.170	6204.940	5904.512	8621.138	5989.097	732.279	91.275	337.079
	Apr	1243.331	6235.869	5947.668	8657.579	6028.489	736.486	92.278	339.697
	May	1255.196	6272.692	5996.102	8712.052	6141.144	738.662	91.418	342.547
	Jun	1268.457	6322.063	6033.144	8758.949	6197.015	739.526	91.540	344.833
	Jul	1273.421	6415.136	6078.241	8887.320	6201.565	741.236	93.471	347.715
	Aug	1282.118	6448.309	6117.671	8923.371	6191.173	745.282	95.410	349.977
	Sep	1282.925	6435.972	6097.498	8911.978	6198.716	745.552	94.851	349.039
	Oct	1284.321	6402.502	6079.124	8876.557	6178.460	753.729	95.173	348.997
	Nov	1283.603	6378.752	6071.281	8855.612	6218.372	754.692	94.634	349.072
	Dec	1292.622	6356.249	6062.304	8838.631	6247.651	752.823	92.295	349.053
2004	Jan	1286.435	6366.069	6065.334	8918.760	6304.688	756.654	92.434	350.143

*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
2001	1	5.59	5.11		8.62	5.26	4.95	4.64	5.05	7.08	5.03	7.01
	2	4.33	3.83		7.34	4.10	3.75	4.43	5.27	7.22	5.11	7.13
	3	3.50	3.06		6.57	3.34	3.24	3.93	4.98	7.11	4.95	6.97
	4	2.13	1.64		5.16	2.06	1.94	3.33	4.77	6.92	4.97	6.78
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
2002	Jan	1.73	1.25		4.75	1.74	1.68	3.56	5.04	6.55	5.05	7.00
	Feb	1.74	1.25		4.75	1.82	1.76	3.55	4.91	6.51	4.93	6.89
	Mar	1.73	1.25		4.75	1.91	1.83	4.14	5.28	6.81	5.09	7.01
	Apr	1.75	1.25		4.75	1.87	1.75	4.01	5.21	6.76	5.09	6.99
	May	1.75	1.25		4.75	1.82	1.76	3.80	5.16	6.75	5.03	6.81
	Jun	1.75	1.25		4.75	1.81	1.73	3.49	4.93	6.63	4.92	6.65
	Jul	1.73	1.25		4.75	1.79	1.71	3.01	4.65	6.53	4.81	6.49
	Aug	1.74	1.25		4.75	1.73	1.65	2.52	4.26	6.37	4.78	6.29
	Sep	1.75	1.25		4.75	1.76	1.66	2.32	3.87	6.15	4.58	6.09
	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		5.74

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

		M1	MZM	M2	M3
Percent change at an annual rate					
	1999	2.00	12.41	7.56	8.74
	2000	0.18	8.11	6.10	9.42
	2001	3.00	15.78	8.75	11.40
	2002	4.72	12.80	7.61	8.00
	2003	6.12	7.31	6.93	6.49
<hr/>					
2001	1	2.83	19.22	10.89	13.45
	2	5.75	21.07	10.41	14.73
	3	15.79	15.55	9.01	8.78
	4	2.47	20.08	9.07	11.65
2002	1	5.94	11.12	7.31	6.51
	2	-1.11	6.02	3.75	3.85
	3	1.88	6.81	7.20	5.66
	4	6.20	9.43	8.21	8.96
2003	1	7.91	7.88	7.22	6.67
	2	8.43	6.10	8.11	5.67
	3	7.59	9.96	7.04	9.09
	4	2.30	-3.36	-1.76	-2.27
<hr/>					
2002	Jan	5.58	6.48	6.08	3.15
	Feb	1.89	10.44	6.60	6.64
	Mar	3.89	5.51	2.44	2.94
	Apr	-10.99	4.37	1.34	3.26
	May	4.56	7.50	6.71	5.32
	Jun	4.40	4.37	4.76	1.66
	Jul	6.36	8.51	9.15	6.13
	Aug	-11.55	7.70	7.52	9.20
	Sep	7.68	3.79	5.67	5.25
	Oct	11.44	3.44	9.70	4.00
	Nov	2.57	23.08	9.73	18.96
	Dec	12.36	12.47	5.97	10.37
2003	Jan	3.27	2.20	6.69	1.78
	Feb	14.21	6.48	8.80	5.28
	Mar	5.30	3.27	5.21	4.37
	Apr	5.00	5.98	8.77	5.07
	May	11.45	7.09	9.77	7.55
	Jun	12.68	9.44	7.41	6.46
	Jul	4.70	17.67	8.97	17.59
	Aug	8.20	6.21	7.78	4.87
	Sep	0.76	-2.30	-3.96	-1.53
	Oct	1.31	-6.24	-3.62	-4.77
	Nov	-0.67	-4.45	-1.55	-2.83
	Dec	8.43	-4.23	-1.77	-2.30
2004	Jan	-5.74	1.85	0.60	10.88

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.

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 *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. **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/. See

also *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 *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 Humphrey-Hawkins Act testimony each year. Beginning February 2000, the FOMC began using the personal consumption expenditures (PCE) price index to report its inflation range and therefore is not 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, π_{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 ΔMB_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.

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 Bonds** are yields on the most recently issued inflation-indexed securities of 10- and 30-year original maturities. **Inflation-Indexed Treasury Yield Spreads** equal, for 10- and 30-year maturities, the difference between the yields on the most recently issued inflation-indexed securities and the unadjusted bond yields of similar maturity. **Inflation-Indexed 30-Year Government Bonds** shows the yield of an inflation-indexed bond that is scheduled to mature in approximately (but not greater than) 30 years. The current Canadian bond has a maturity date of 12/01/2031, the current French bond has a maturity date of 7/25/2032, the current U.K. bond has a maturity date of 7/22/2030, and the current U.S. bond has a maturity date of 4/15/2032. **Inflation-Indexed 10-Year Government Bonds** shows the yield of an inflation-indexed bond that is scheduled to mature in approximately (but not greater than) 10 years. The current French bond has a maturity date of 7/25/2013, the current U.K. bond has a maturity date of 8/16/2013, and the current U.S. bond has a maturity date of 1/15/2014.

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 inflation-indexed bond yields.

Bank of Canada: Canadian inflation-indexed bond yields.

Bank of England: U.K. inflation-indexed bond 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. inflation-indexed security yields.

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Note: *Available on the Internet at research.stlouisfed.org/publications/review/.