January 2003

MonetaryTrends

THE FEDERAL RESERVE BANK of ST. LOUIS

How Effective Is Monetary Policy?

The sluggish recoveries from the past two recessions suggest that monetary policy might have limited impact on economic activity. The figure below shows that the Fed reduced its policy instrument—the effective federal funds rate—by 525 basis points during each recession. During the most recent recession, the Fed was preemptive, reducing the effective funds rate in advance of the business cycle peak. Moreover, the Fed was aggressive, reducing the effective funds rate 475 basis points in the span of a year. Uncertainty about the strength of the expansion caused the Fed to reduce the rate an additional 50 basis points in November 2002—bringing the federal funds rate to it lowest level since the mid to late 1950s.

In both recession episodes the economy's response to the Fed's aggressive policy actions appears to have been anemic. Economic activity coming out of the 1990-91 recession was weak relative to previous post-WWII recessions. The same is true of economic activity after the recent recession—which, indeed, may be somewhat weaker.

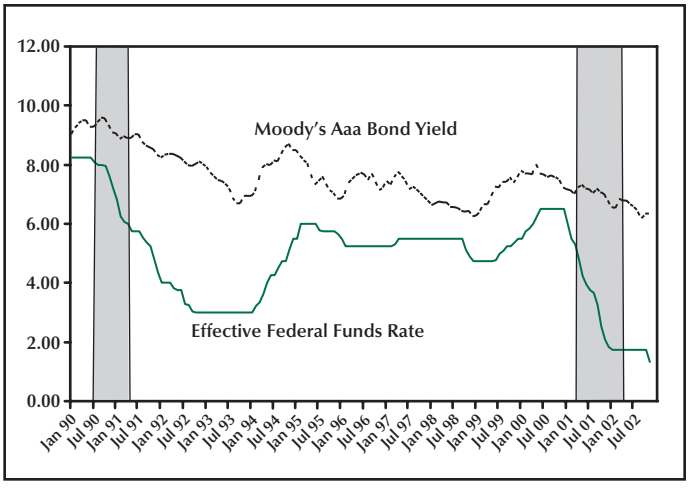
Why is it that monetary policy appears to have produced such modest results? One possibility is that the Fed's actions have had only a limited effect on long-term interest rates. According to the standard view of the monetary transmission process, monetary policy affects real economic activity by changing interest rates; but it is long-term rates that are important for spending decisions (especially investment) and not short-term rates, which are more directly affected by policy actions.

While there are several reasons why the Fed's ability to influence spending through the interest rate channel may be limited, recent experience suggests that the Fed's inability to directly affect long-term rates may be important. The figure shows that despite the Fed's aggressive policy actions during the two recent recessions, long-term rates, illustrated by Moody's Aaa bond yield, declined only modestly. Bond yields declined much less than the funds rate during both recessions and during the specific months over which the effective funds rate was cut. The decline in bond yields was smaller during the recent recession, suggesting that the more aggressive policy actions this time around had a smaller impact on long-term yields.[1]

Why long-term rates responded only modestly to these policy actions is unclear. The conventional wisdom is that monetary policy affects long-term rates by changing the market's expectation for future short-term rates. Hence, it could be that market participants expected the reduction in the funds rate to be relatively short-lived. However, the effective funds rate remained more than 200 basis points below its pre-recession peak for nearly a decade after the 1991 trough. Of course, long-term rates may be determined by factors other than simply the market's expectation for short-term rates. Whatever the explanation, recent policy actions appear to have had only a limited impact on long-term yields, which affect spending decisions and thus economic activity.

—Daniel L. Thornton

[1]For the purpose of this discussion, I assumed that the recent recession ended in February 2002.



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Conventions used in this publication:

1. Unless otherwise indicated, data are monthly.

2. Shaded areas indicate recessions, as dated by the National Bureau of Economic Research.

3. The *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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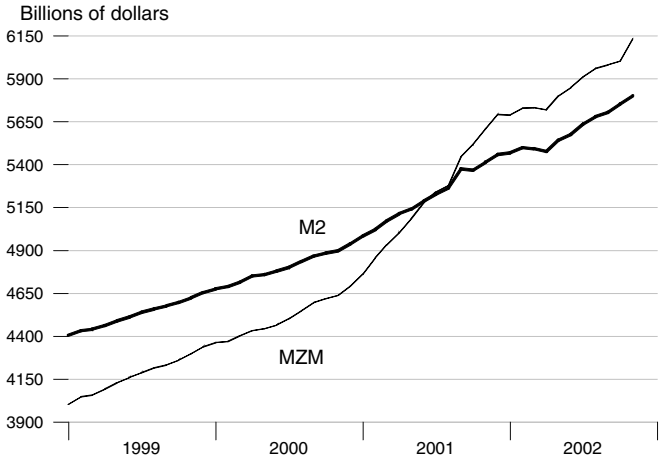
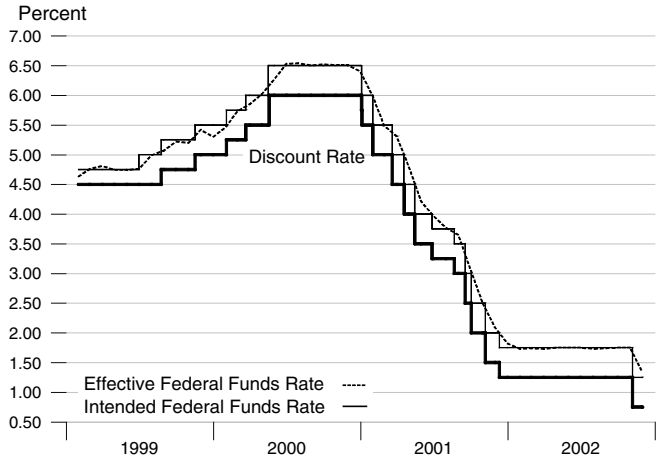
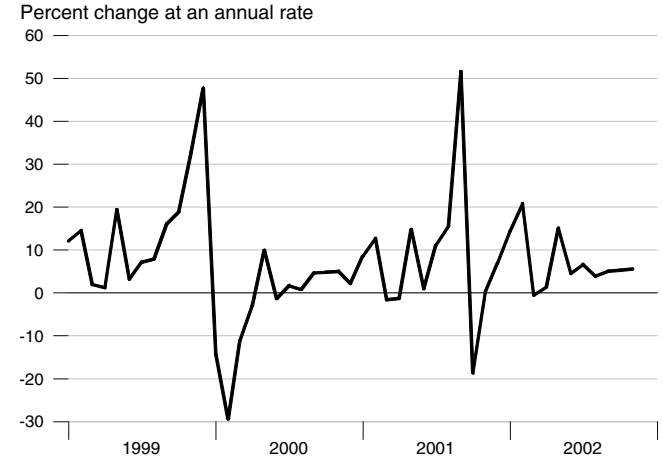
M2 and MZM



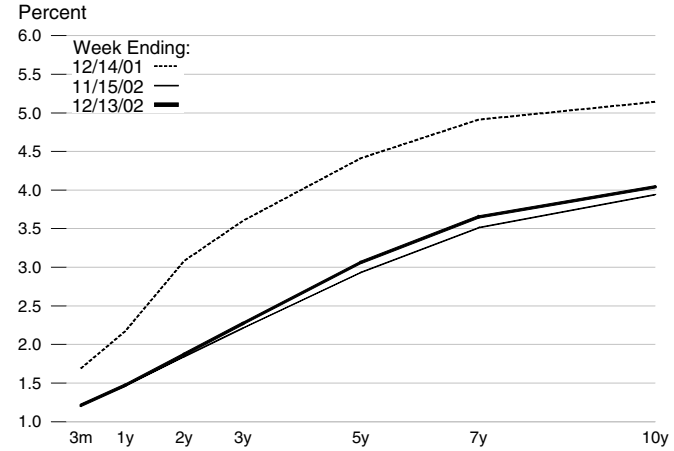
Reserve Market Rates



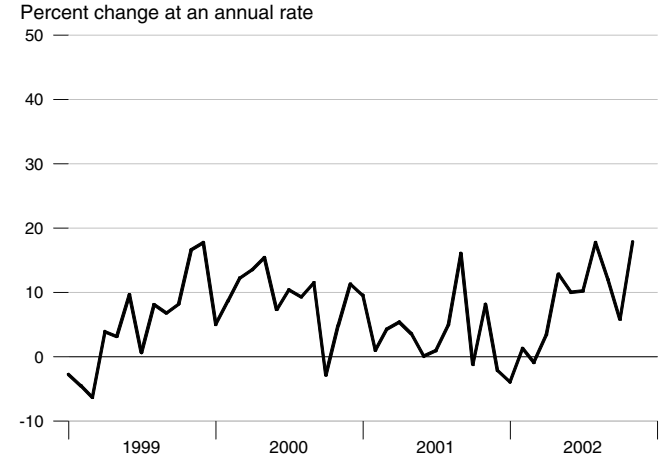
Adjusted Monetary Base



Treasury Yield Curve



Total Bank Credit



Interest Rates

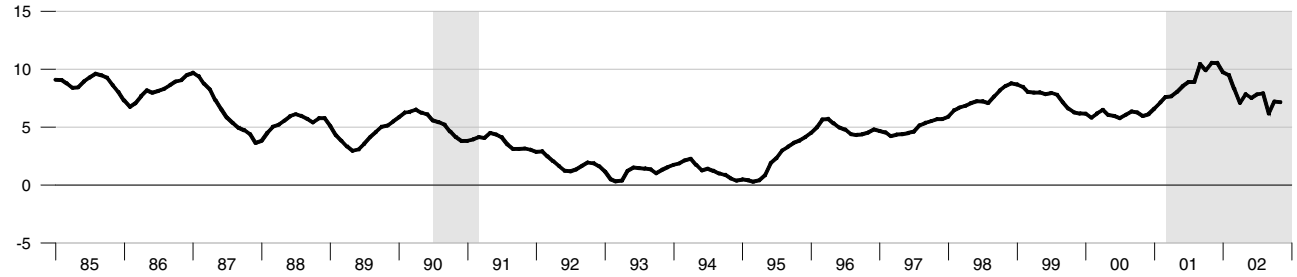
	Sep 02	Oct 02	Nov 02
Federal Funds Rate	1.75	1.75	1.34
Discount Rate	1.25	1.25	0.83
Prime Rate	4.75	4.75	4.35
Conventional Mortgage Rate	6.09	6.11	6.07
Treasury Yields:			
3-Month Constant Maturity	1.66	1.61	1.25
6-Month Constant Maturity	1.64	1.59	1.30
1-Year Constant Maturity	1.72	1.65	1.49
3-Year Constant Maturity	2.32	2.25	2.32
5-Year Constant Maturity	2.94	2.95	3.05
10-Year Constant Maturity	3.87	3.94	4.05

MZM and M1

Percent change from year ago

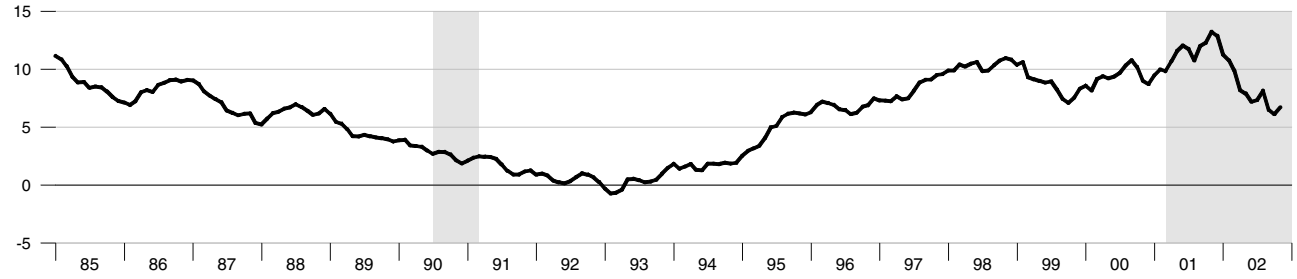
M2

Percent change from year ago



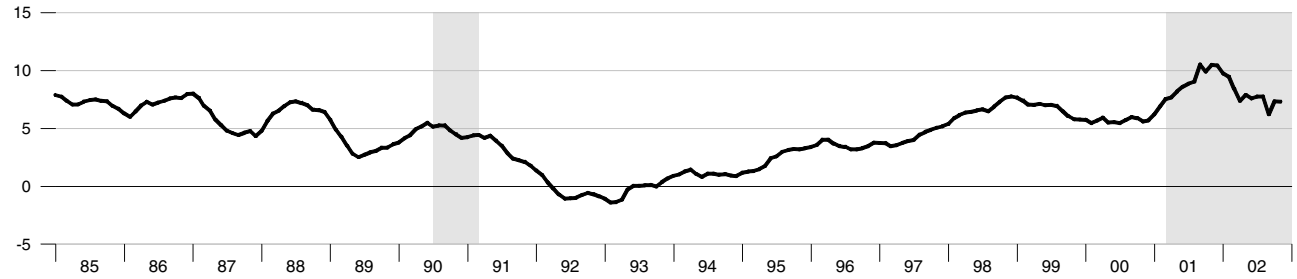
M3

Percent change from year ago



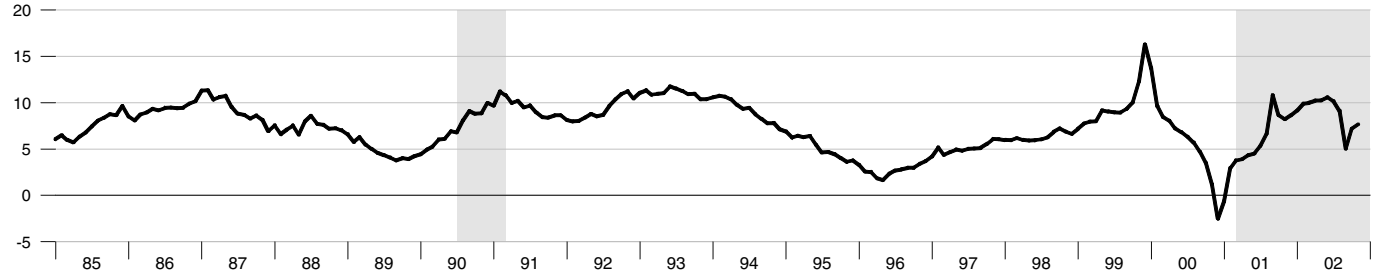
Monetary Services Index - M2

Percent change from year ago



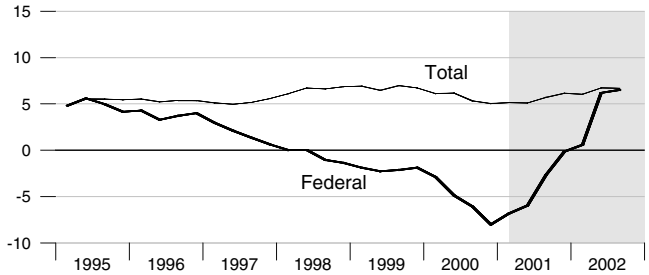
Adjusted Monetary Base

Percent change from year ago



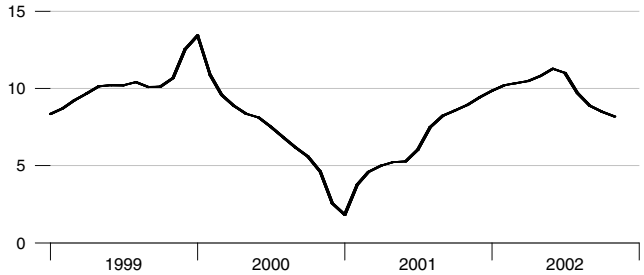
Domestic Nonfinancial Debt

Percent change from year ago



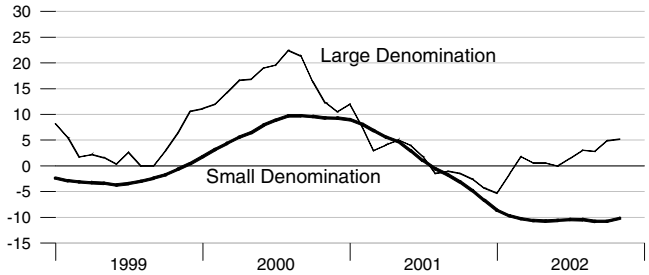
Currency Held by the Nonbank Public

Percent change from year ago



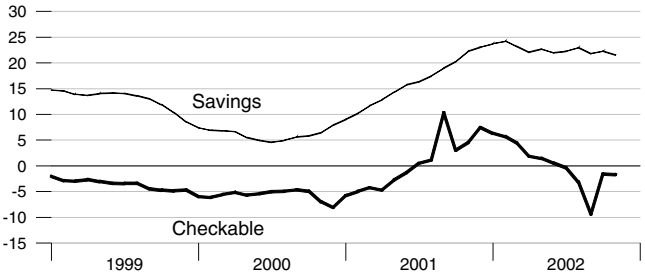
Time Deposits

Percent change from year ago



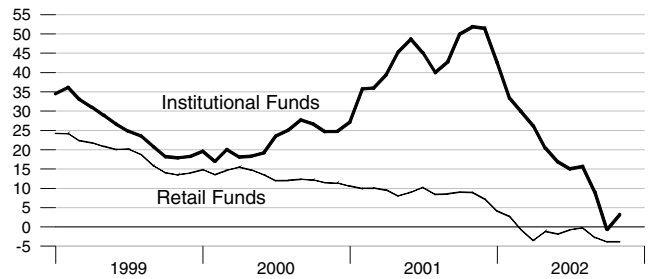
Checkable and Savings Deposits

Percent change from year ago



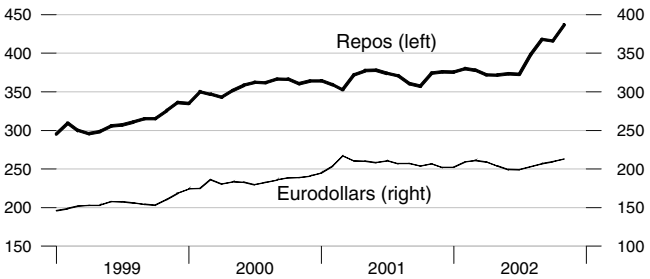
Money Market Mutual Fund Shares

Percent change from year ago



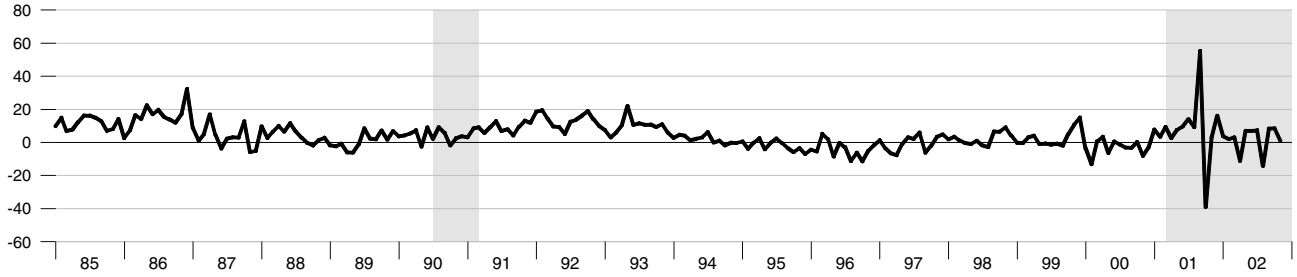
Repurchase Agreements and Eurodollars

Billions of dollars Billions of dollars



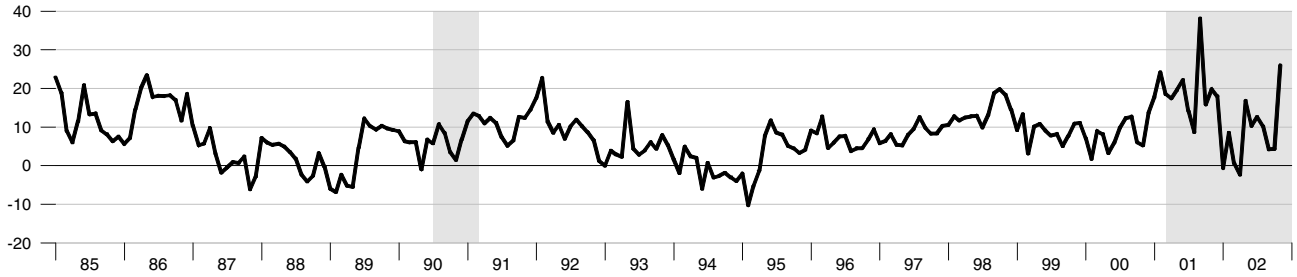
M1

Percent change at an annual rate



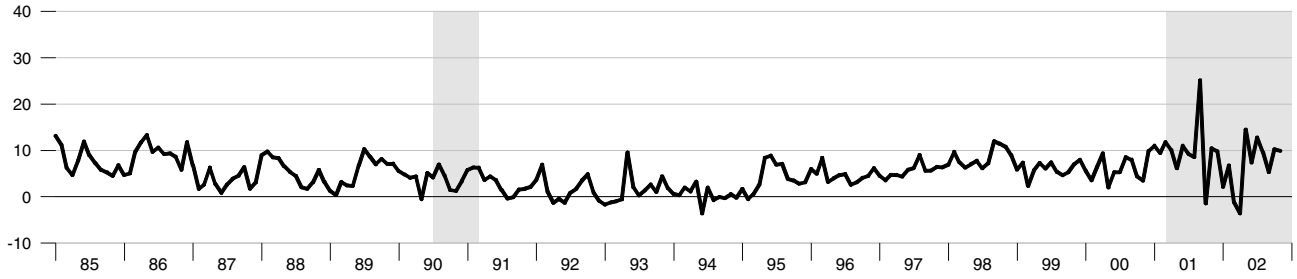
MZM

Percent change at an annual rate



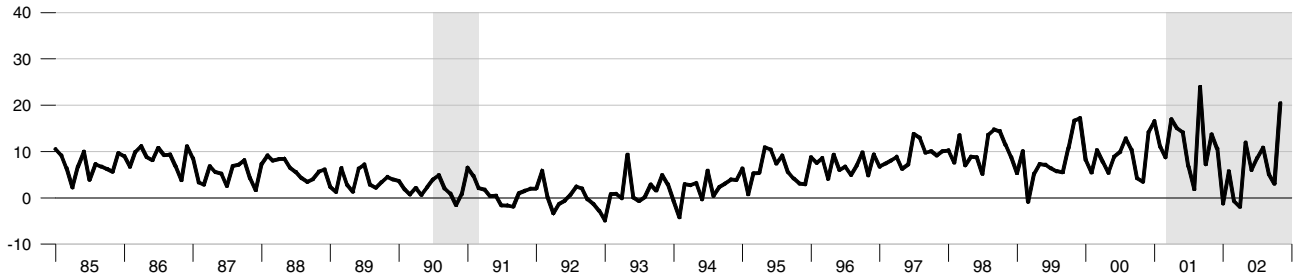
M2

Percent change at an annual rate



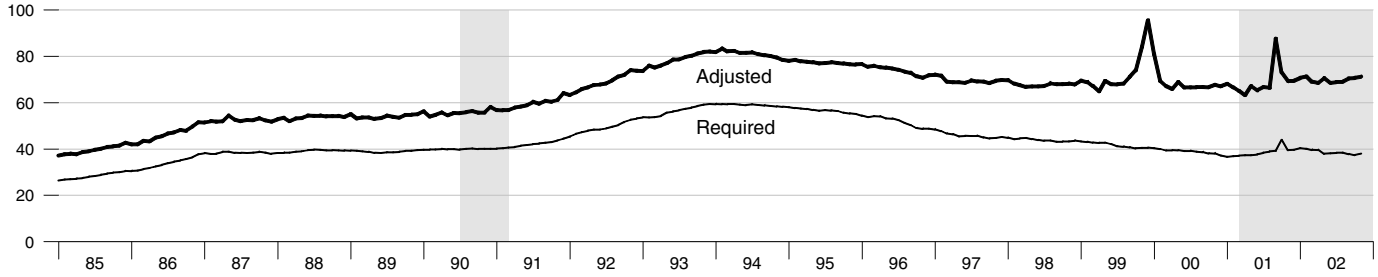
M3

Percent change at an annual rate



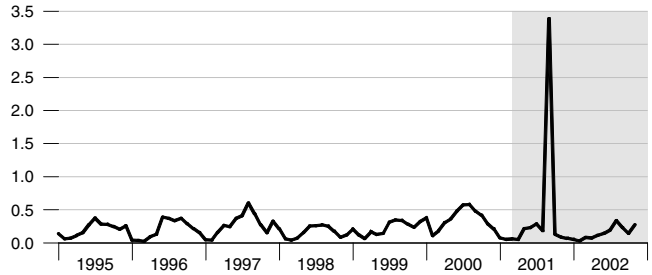
Adjusted and Required Reserves

Billions of dollars



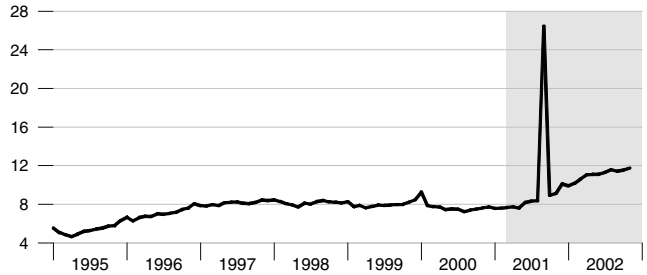
Total Borrowings, nsa

Billions of dollars



Excess Reserves plus RCB Contracts

Billions of dollars

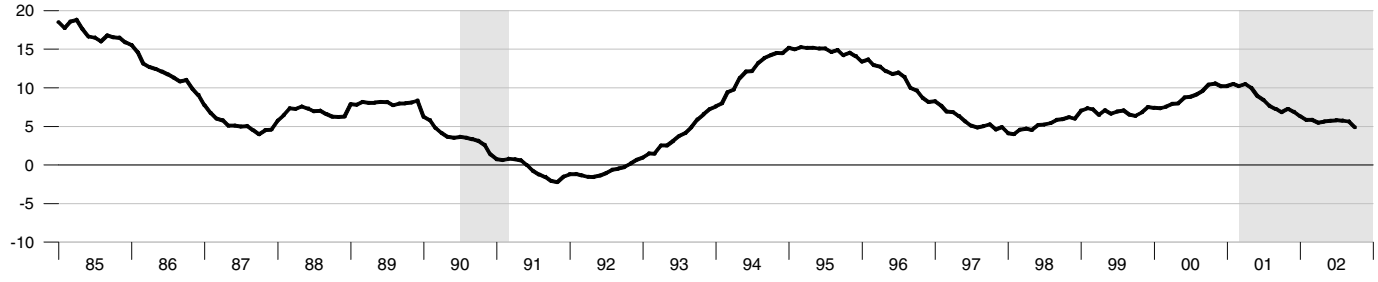


Nonfinancial Commercial Paper

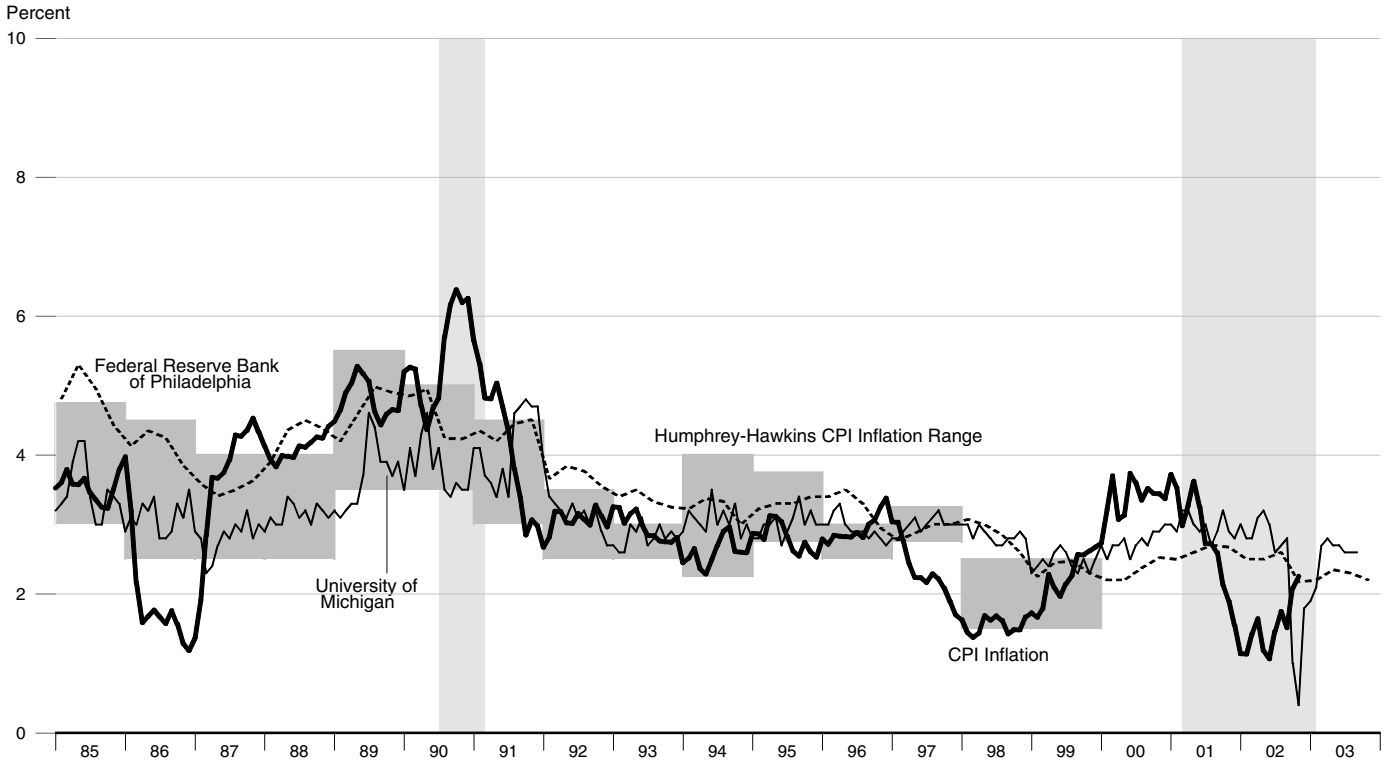
Percent change from year ago

Consumer Credit

Percent change from year ago

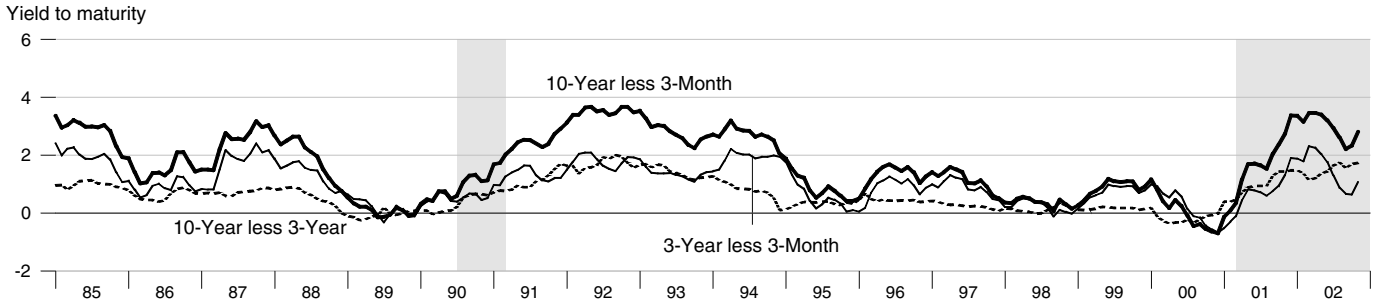


Inflation and Inflation Expectations

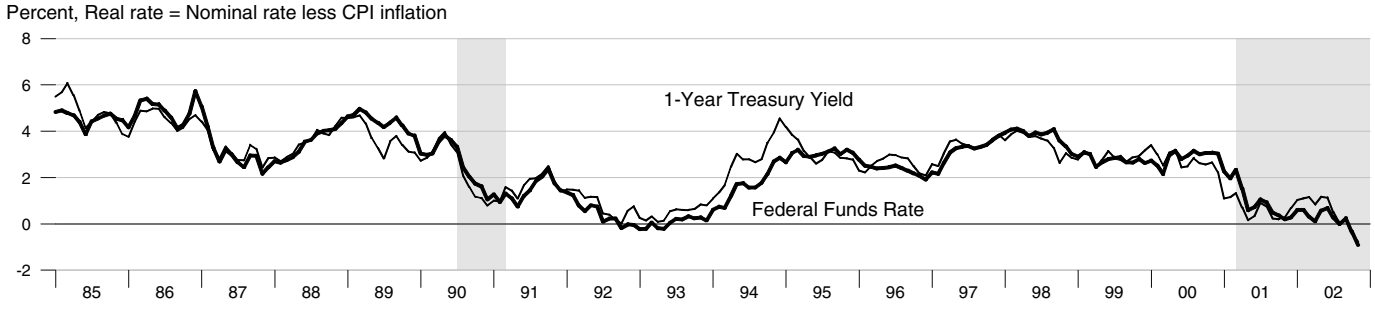


The shaded region shows the Humphrey-Hawkins CPI inflation range. Beginning in January 2000, the Humphrey-Hawkins inflation range was reported using the PCE price index and therefore is not shown on this graph. See notes on page 19.

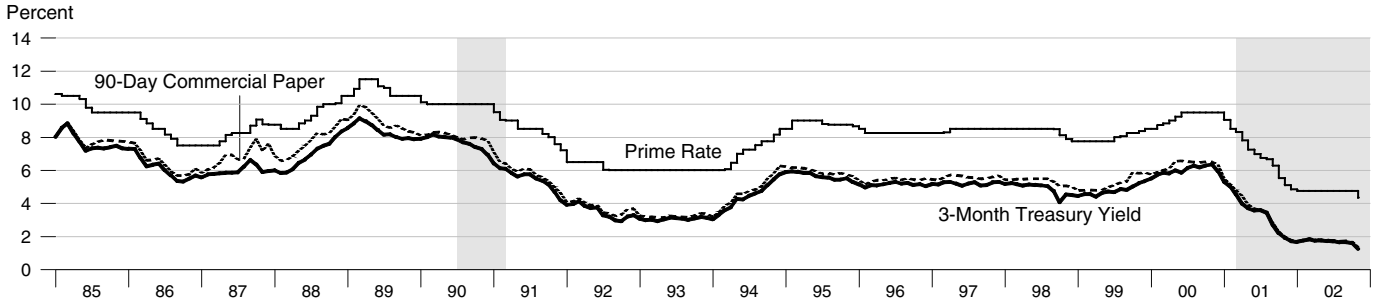
Treasury Security Yield Spreads



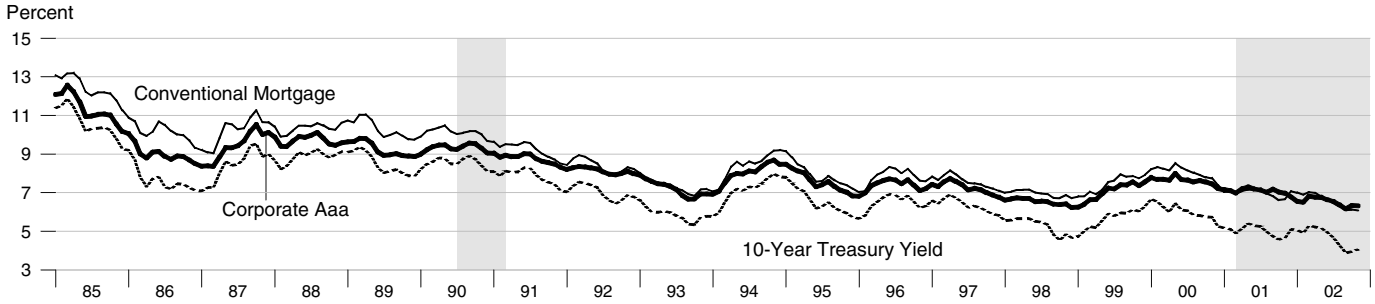
Real Interest Rates



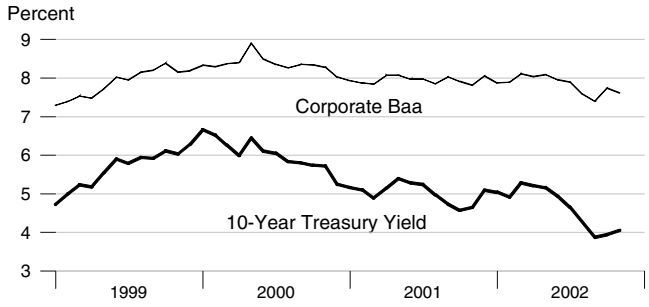
Short-Term Interest Rates



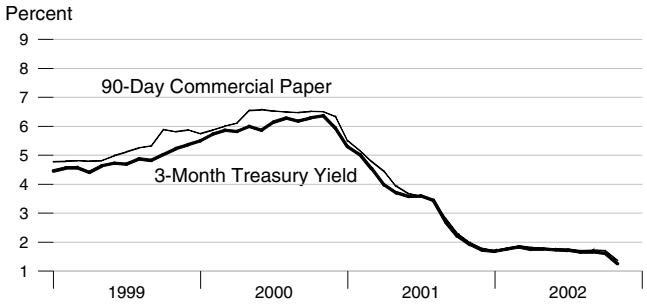
Long-Term Interest Rates



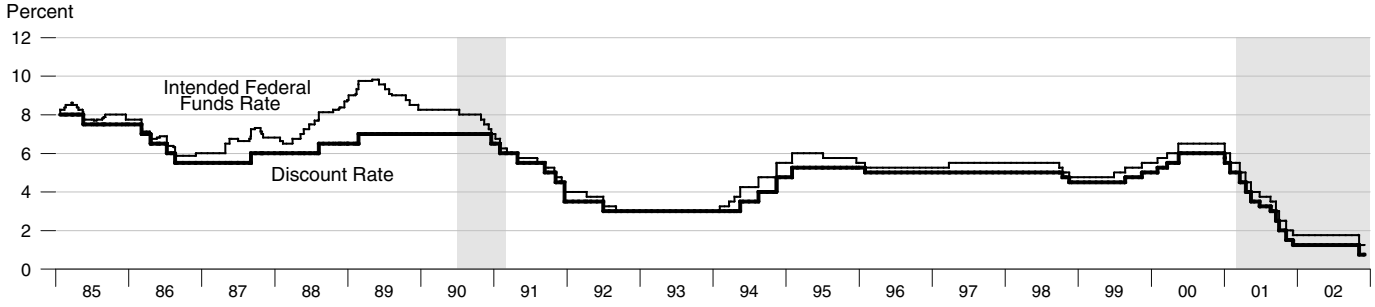
Long-Term Interest Rates



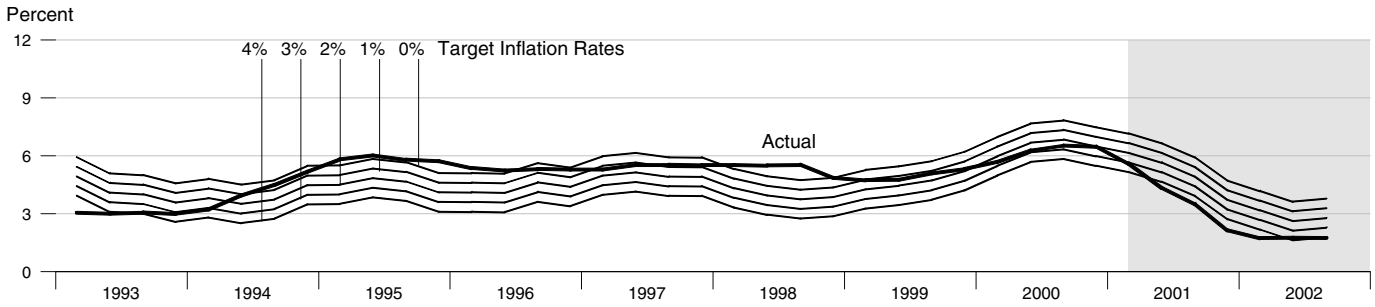
Short-Term Interest Rates



FOMC Intended Federal Funds Rate and Discount Rate



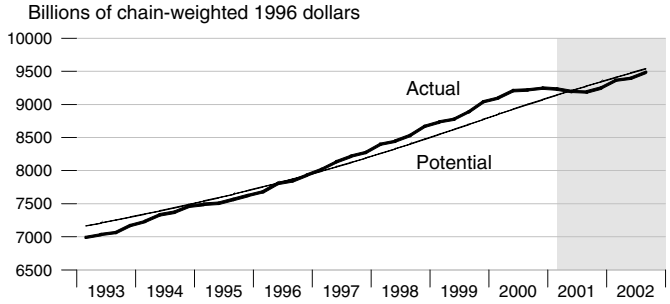
Federal Funds Rate and Inflation Targets



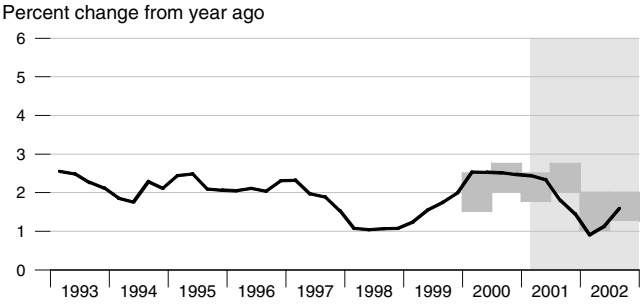
Calculated federal funds rate is based on Taylor's rule. See notes on page 19.

Components of Taylor's Rule

Actual and Potential Real GDP

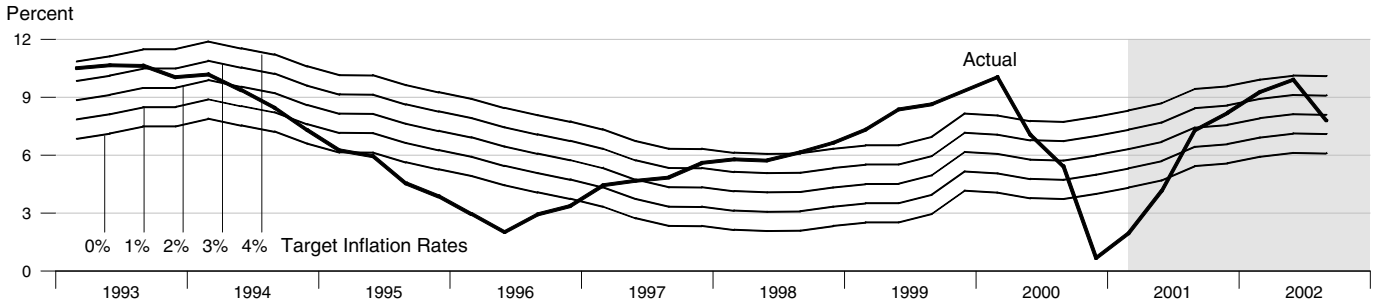


PCE Inflation and Projections



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

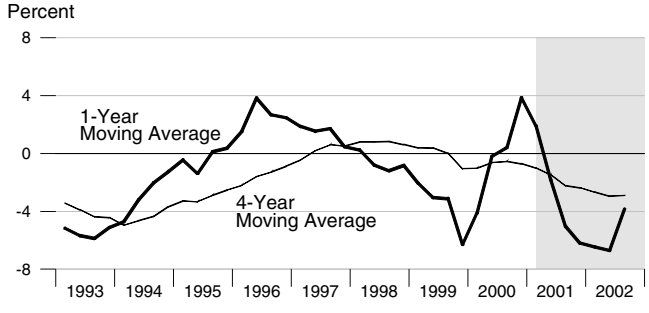
Monetary Base Growth* and Inflation Targets



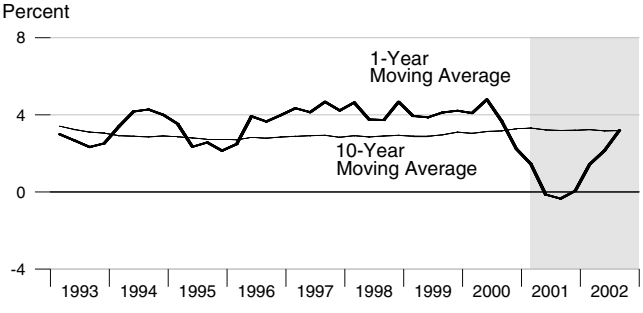
*Modified for the effects of sweeps programs on reserve demand.
Calculated base growth is based on McCallum's rule. Actual base growth is percent change from year ago. See notes on page 19.

Components of McCallum's Rule

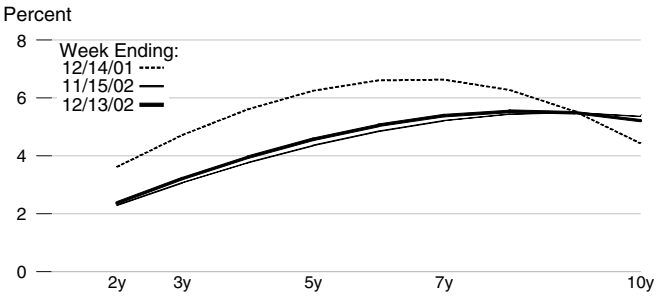
Monetary Base Velocity Growth



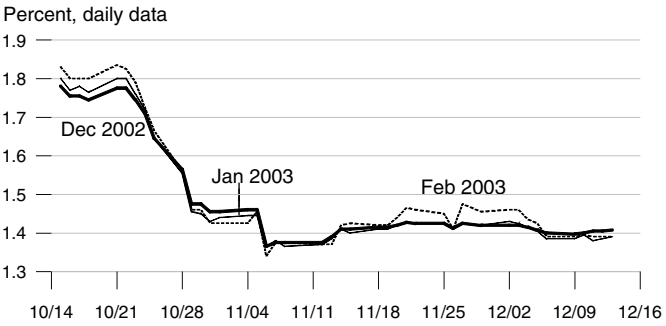
Real Output Growth



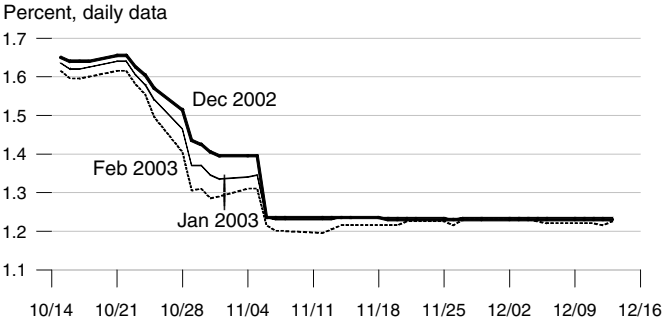
Implied One-Year Forward Rates



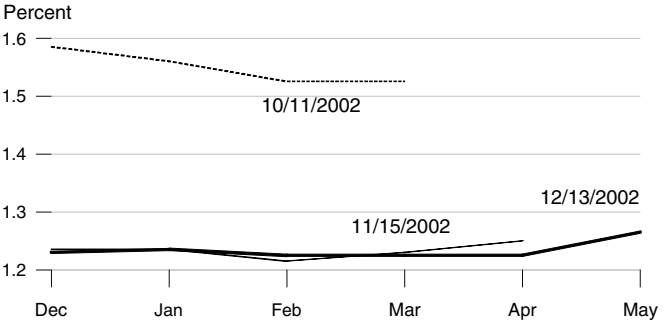
Rates on 3-Month Eurodollar Futures



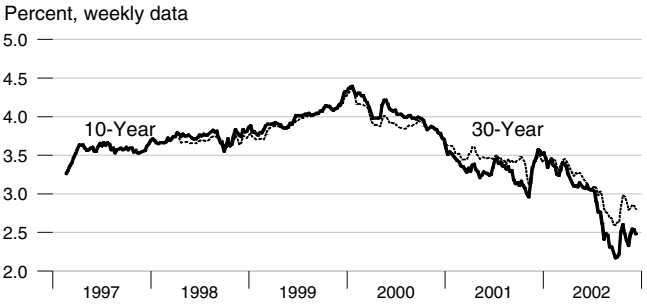
Rates on Selected Fed Funds Futures Contracts



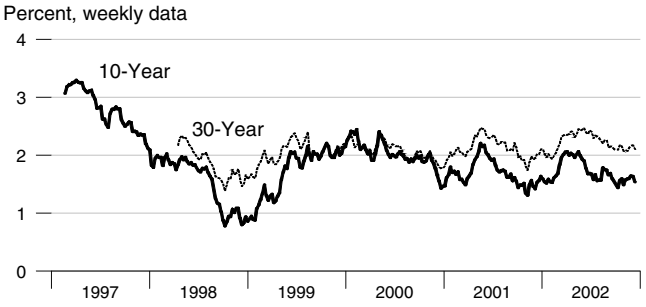
Implied Yields on Fed Funds Futures



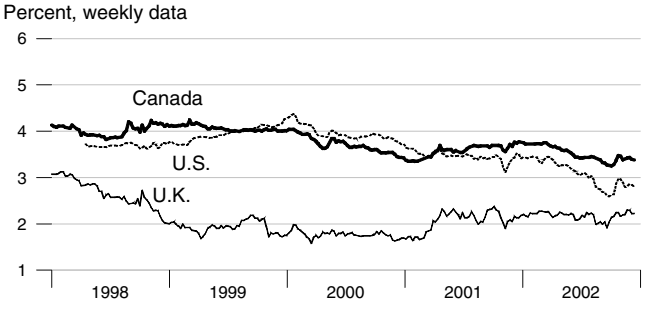
Inflation-Protected Treasury Yields



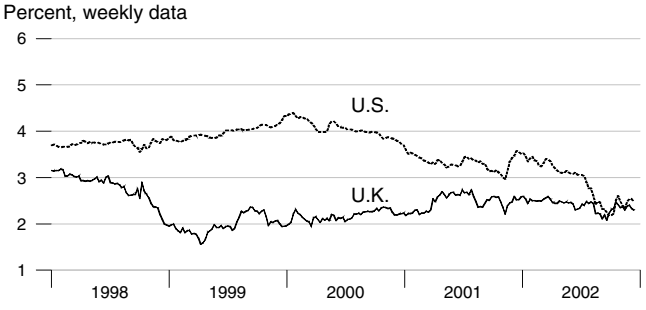
Inflation-Protected Treasury Yield Spreads



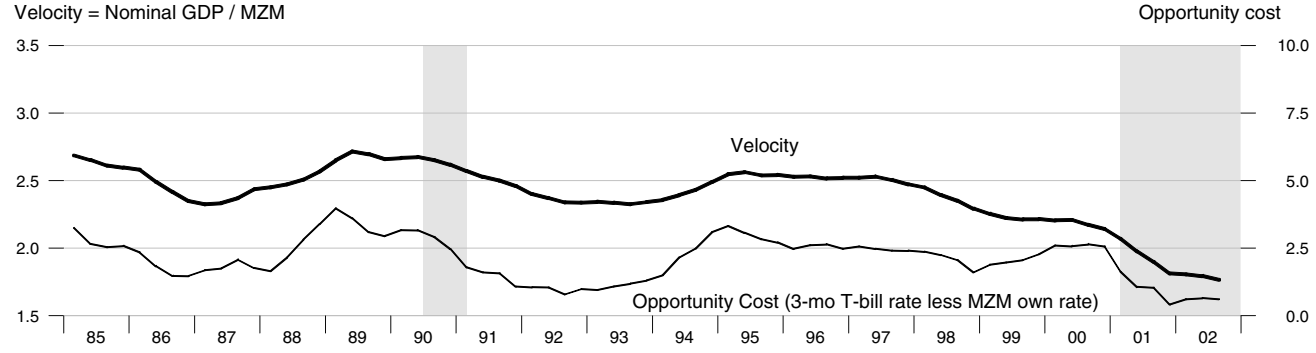
Inflation-Indexed 30-Year Bonds



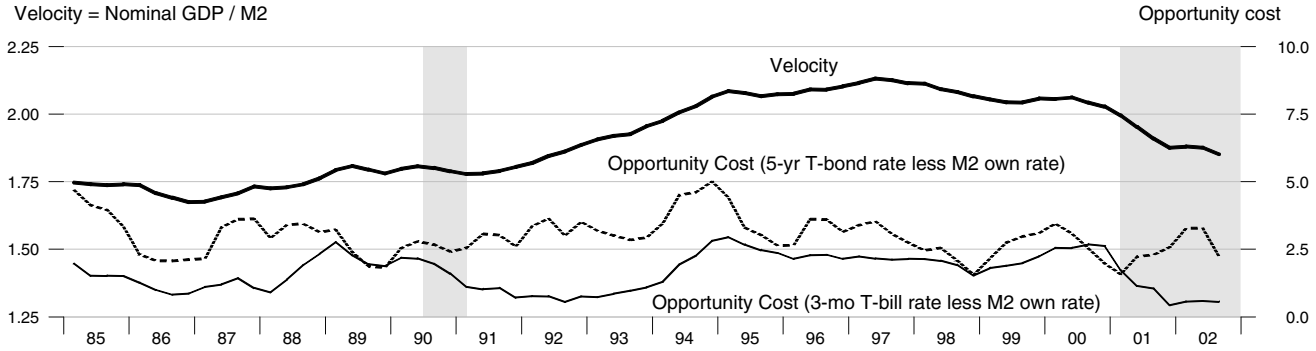
Inflation-Indexed 10-Year Bonds



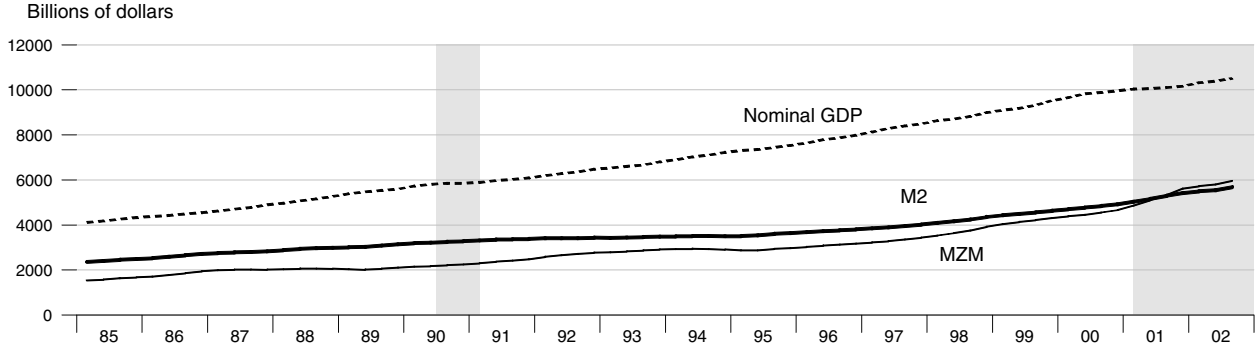
MZM Velocity and Opportunity Cost



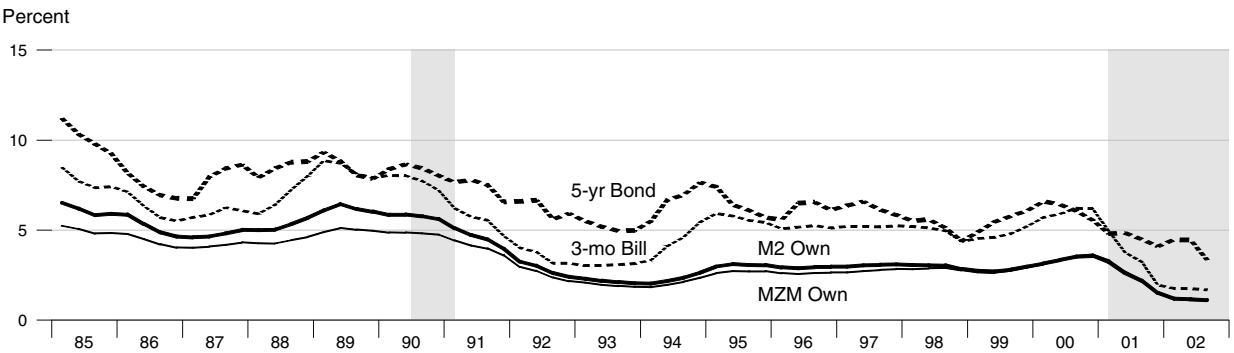
M2 Velocity and Opportunity Cost



M2, MZM, and Nominal GDP

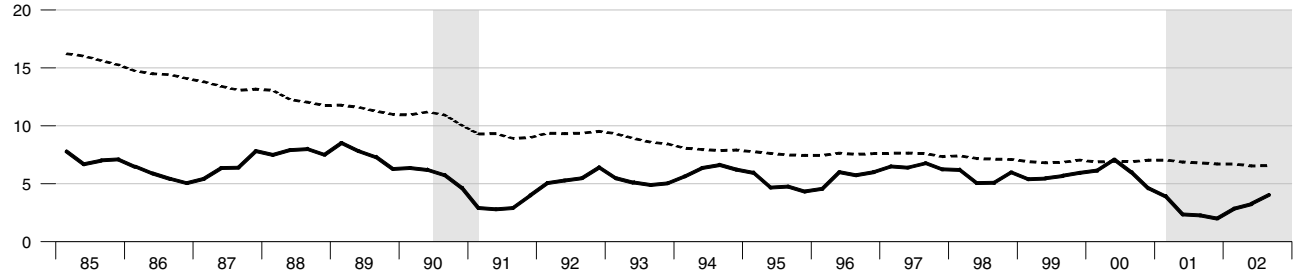


Interest Rates



Gross Domestic Product

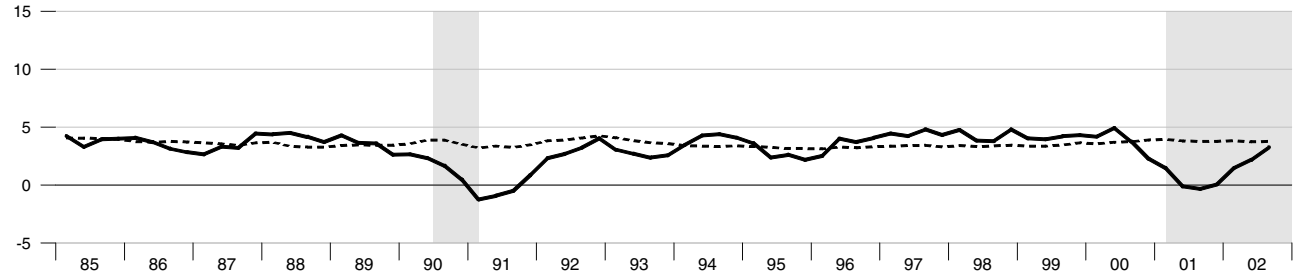
Percent change from year ago



Dashed lines indicate 10-year moving averages.

Real Gross Domestic Product

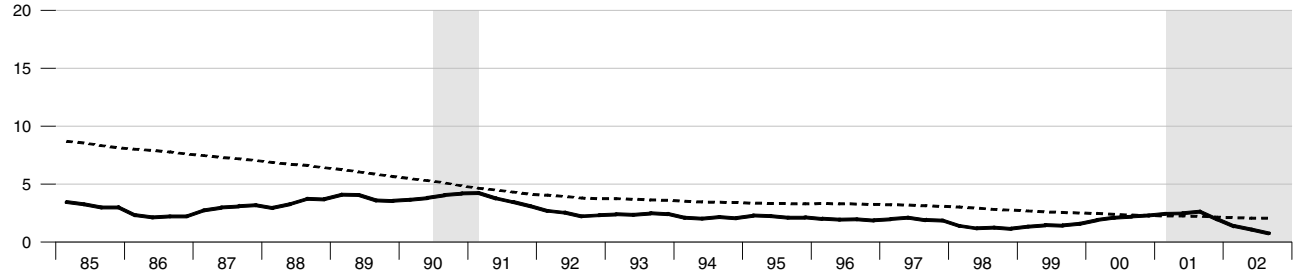
Percent change from year ago



Dashed lines indicate 10-year moving averages.

Gross Domestic Product Price Index

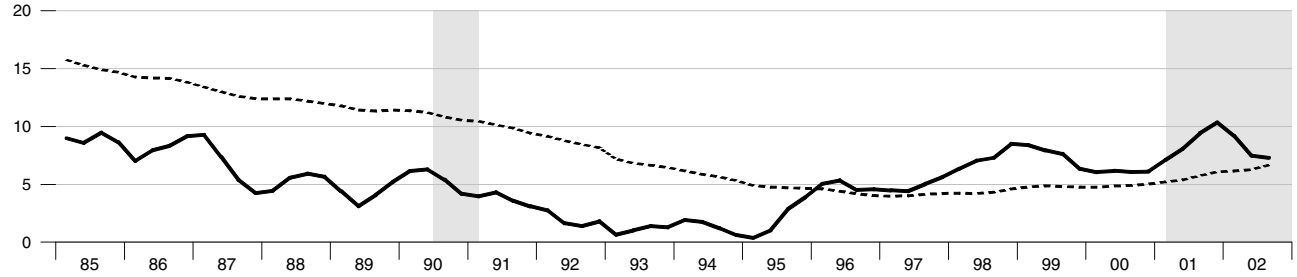
Percent change from year ago



Dashed lines indicate 10-year moving averages.

M2

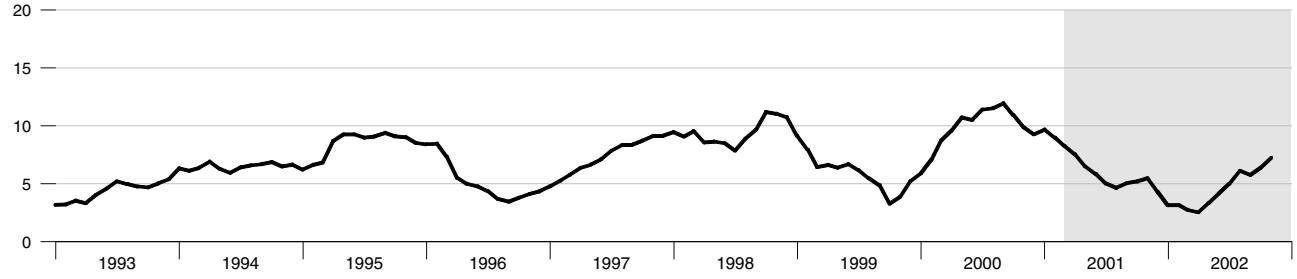
Percent change from year ago



Dashed lines indicate 10-year moving averages.

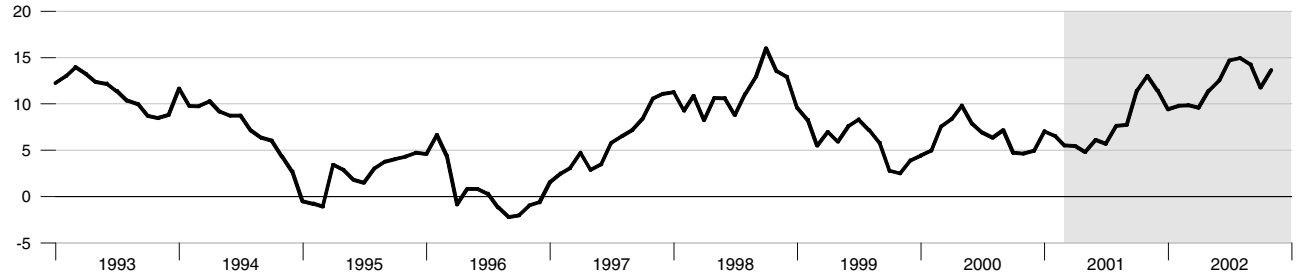
Bank Credit

Percent change from year ago



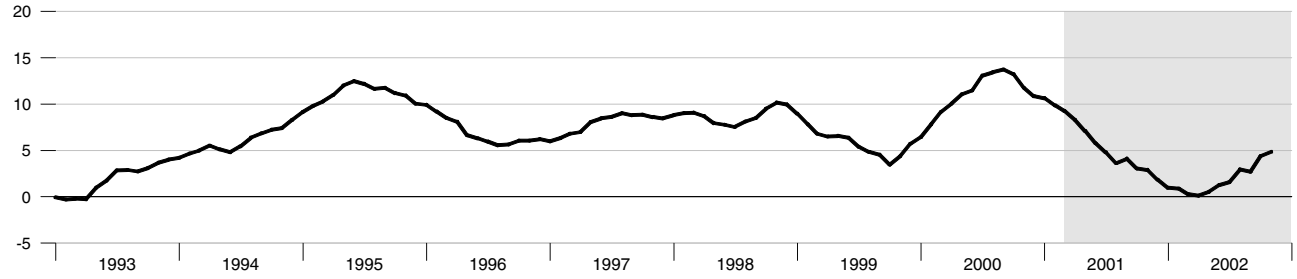
Investment Securities in Bank Credit at Commercial Banks

Percent change from year ago



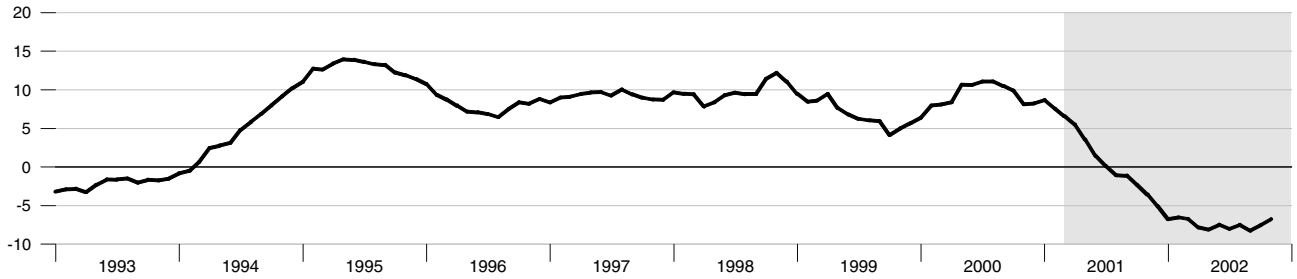
Total Loans and Leases in Bank Credit at Commercial Banks

Percent change from year ago

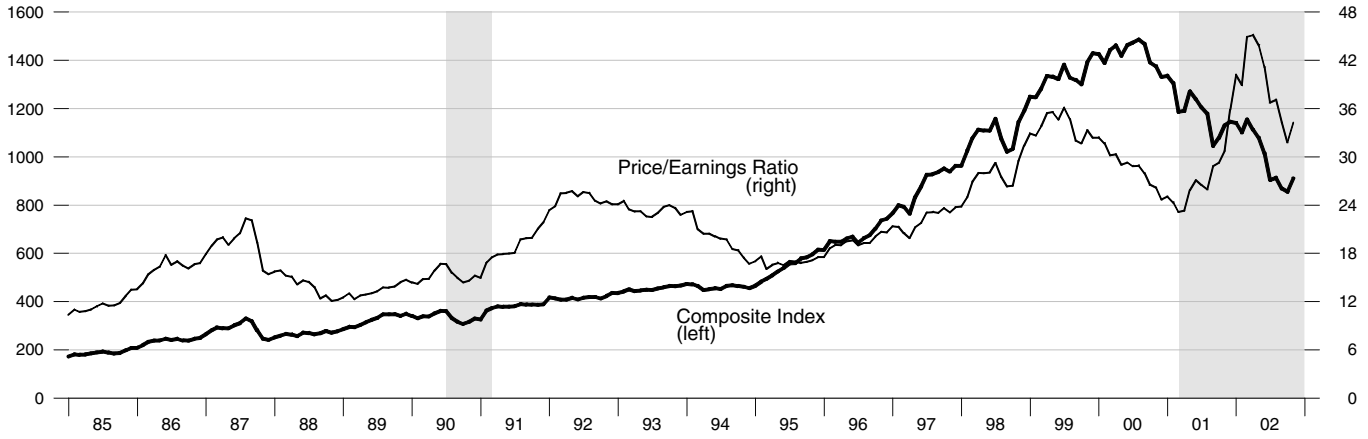


Commercial and Industrial Loans at Commercial Banks

Percent change from year ago



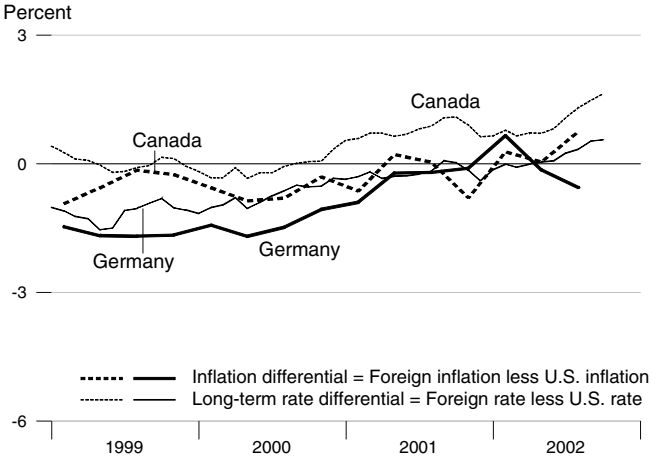
Standard & Poor's 500

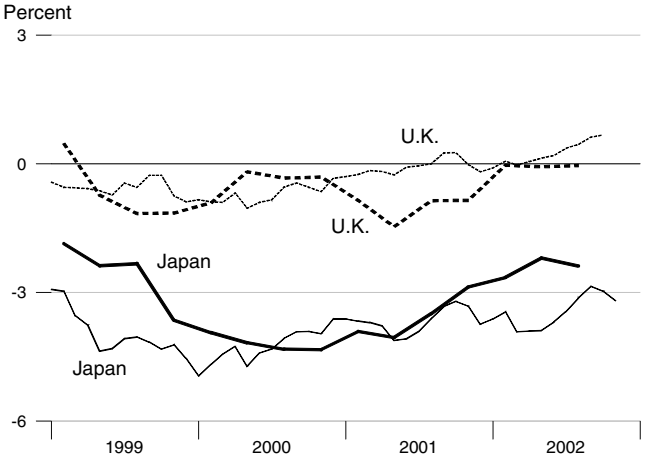


Recent Inflation and Long-Term Interest Rates

	Consumer Price Inflation Rates				Long-Term Government Bond Rates			
	Percent change from year ago				Percent			
	2001Q4	2002Q1	2002Q2	2002Q3	Aug02	Sep02	Oct02	Nov02
United States	1.89	1.25	1.30	1.58	4.26	3.87	3.94	4.05
Canada	1.10	1.53	1.33	2.33	5.57	5.35	5.57	.
France	1.43	2.13	1.63	1.75	4.99	4.89	5.14	.
Germany	1.79	1.90	1.16	1.03	4.60	4.40	4.50	.
Italy	2.40	2.41	2.27	2.41	4.83	4.62	4.76	.
Japan	-0.98	-1.40	-0.90	-0.80	1.13	1.01	0.97	0.86
United Kingdom	1.04	1.21	1.23	1.53	4.71	4.49	4.61	.

Inflation and Long-Term Interest Rate Differentials





		Money Stock				Bank	Adjusted		
		M1	MZM	M2	M3	Credit	Monetary Base	Reserves	MSI M2
	1997	1069.292	3320.197	3920.429	5208.410	3956.300	478.708	69.523	226.513
	1998	1079.990	3707.949	4206.682	5747.659	4329.592	508.942	67.808	241.522
	1999	1101.865	4167.952	4524.100	6248.388	4587.493	557.865	72.360	257.840
	2000	1104.050	4505.592	4799.395	6834.678	5036.311	590.821	68.319	272.476
	2001	1137.006	5216.325	5218.939	7613.913	5354.732	623.788	68.983	296.210
2000	1	1112.680	4377.898	4693.258	6622.972	4842.377	593.102	72.390	266.760
	2	1108.118	4446.691	4763.138	6750.256	4994.449	586.045	67.097	270.320
	3	1102.128	4548.194	4834.026	6917.742	5122.277	589.054	66.636	274.443
	4	1093.272	4649.584	4907.157	7047.741	5186.141	595.084	67.151	278.380
2001	1	1100.701	4849.804	5026.140	7269.589	5276.515	604.848	66.577	285.123
	2	1117.308	5089.141	5147.313	7521.986	5324.962	610.939	65.235	292.337
	3	1161.975	5320.842	5288.672	7713.919	5373.246	633.771	73.522	300.420
	4	1168.041	5605.512	5413.629	7950.155	5444.205	645.595	70.596	306.960
2002	1	1185.177	5716.295	5486.663	8042.526	5434.706	663.335	70.297	311.340
	2	1183.409	5789.876	5531.755	8105.466	5503.631	674.121	69.186	314.597
	3	1190.608	5951.036	5673.700	8278.426	5675.297	684.786	69.477	322.103
2000	Nov	1091.725	4638.707	4898.493	7026.794	5176.928	595.549	67.686	277.940
	Dec	1088.856	4691.531	4938.578	7109.896	5225.654	596.639	67.078	280.000
2001	Jan	1095.844	4760.944	4983.719	7207.843	5267.338	600.886	68.095	282.510
	Feb	1098.903	4856.693	5022.834	7273.953	5271.737	607.234	66.556	284.990
	Mar	1107.357	4931.776	5071.867	7326.972	5290.471	606.425	65.080	287.870
	Apr	1109.741	5003.402	5114.271	7430.463	5314.208	605.800	63.239	290.330
	May	1116.615	5085.158	5140.390	7523.442	5330.164	613.259	67.119	292.070
	Jun	1125.568	5178.862	5187.277	7612.054	5330.513	613.759	65.346	294.610
	Jul	1138.605	5239.737	5227.145	7655.010	5334.693	619.440	66.654	296.780
	Aug	1147.292	5277.691	5264.439	7666.959	5356.712	627.455	66.379	299.240
	Sep	1200.028	5445.098	5374.433	7819.789	5428.333	654.419	87.534	305.240
	Oct	1161.017	5516.976	5367.913	7866.927	5422.945	644.250	72.956	304.640
	Nov	1163.788	5607.837	5414.415	7956.546	5459.721	644.417	69.378	307.050
	Dec	1179.319	5691.722	5458.559	8026.992	5449.949	648.117	69.455	309.190
2002	Jan	1182.898	5688.596	5468.218	8018.794	5432.187	655.869	70.666	310.010
	Feb	1184.828	5728.762	5498.785	8056.964	5437.975	667.217	71.245	311.920
	Mar	1187.805	5731.527	5492.986	8051.819	5433.957	666.918	68.980	312.090
	Apr	1176.662	5720.256	5476.498	8038.739	5449.447	667.691	68.480	311.740
	May	1183.360	5799.832	5542.414	8118.504	5507.734	676.061	70.546	315.100
	Jun	1190.206	5849.541	5576.353	8159.154	5553.712	678.610	68.531	316.950
	Jul	1197.410	5910.685	5635.512	8217.310	5601.141	682.348	68.943	319.730
	Aug	1183.188	5960.837	5680.239	8291.294	5683.993	684.570	69.021	322.390
	Sep	1191.226	5981.587	5705.349	8326.673	5740.758	687.439	70.468	324.190
	Oct	1199.632	6003.034	5753.802	8347.894	5768.764	690.454	70.715	326.920
	Nov	1200.636	6132.811	5801.160	8489.970	5854.482	693.661	71.246	329.470

*All values are given in billions of dollars.

		Federal Funds	Discount Rate	Prime Rate	3-mo CDs	Treasury Yields 3-mo	3-yr	10-yr	Corporate Aaa Bonds	S & L Aaa Bonds	Conventional Mortgage
	1997	5.46	5.00	8.44	5.62	5.20	6.10	6.35	7.26	5.32	7.60
	1998	5.35	4.92	8.35	5.47	4.91	5.14	5.26	6.53	4.93	6.94
	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	4.99	6.97
2000	1	5.68	5.19	8.69	6.03	5.70	6.56	6.48	7.71	5.82	8.26
	2	6.27	5.74	9.25	6.57	5.89	6.52	6.18	7.77	5.72	8.32
	3	6.52	6.00	9.50	6.63	6.20	6.16	5.89	7.61	5.45	8.03
	4	6.47	6.00	9.50	6.59	6.20	5.63	5.57	7.40	5.32	7.64
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	4.87	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
2000	Nov	6.51	6.00	9.50	6.65	6.36	5.79	5.72	7.45	5.38	7.75
	Dec	6.40	6.00	9.50	6.45	5.94	5.26	5.24	7.21	5.11	7.38
2001	Jan	5.98	5.52	9.05	5.62	5.29	4.77	5.16	7.15	4.99	7.03
	Feb	5.49	5.00	8.50	5.26	5.01	4.71	5.10	7.10	5.09	7.05
	Mar	5.31	4.81	8.32	4.89	4.54	4.43	4.89	6.98	5.00	6.95
	Apr	4.80	4.28	7.80	4.53	3.97	4.42	5.14	7.20	5.14	7.08
	May	4.21	3.73	7.24	4.02	3.70	4.51	5.39	7.29	5.15	7.15
	Jun	3.97	3.47	6.98	3.74	3.57	4.35	5.28	7.18	5.03	7.16
	Jul	3.77	3.25	6.75	3.66	3.59	4.31	5.24	7.13	4.79	7.13
	Aug	3.65	3.16	6.67	3.48	3.44	4.04	4.97	7.02	4.89	6.95
	Sep	3.07	2.77	6.28	2.87	2.69	3.45	4.73	7.17	4.93	6.82
	Oct	2.49	2.02	5.53	2.31	2.20	3.14	4.57	7.03	4.89	6.62
	Nov	2.09	1.58	5.10	2.03	1.91	3.22	4.65	6.97	4.85	6.66
	Dec	1.82	1.33	4.84	1.83	1.72	3.62	5.09	6.77	5.18	7.07
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

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

		M1	MZM	M2	M3
Percent change at an annual rate					
	1997	-3.31	7.22	4.88	8.24
	1998	1.00	11.68	7.30	10.35
	1999	2.03	12.41	7.55	8.71
	2000	0.20	8.10	6.09	9.38
	2001	2.99	15.77	8.74	11.40
2000	1	0.29	7.40	5.92	10.82
	2	-1.64	6.29	5.96	7.69
	3	-2.16	9.13	5.95	9.92
	4	-3.21	8.92	6.05	7.52
2001	1	2.72	17.22	9.70	12.59
	2	6.03	19.74	9.64	13.89
	3	15.99	18.21	10.99	10.21
	4	2.09	21.40	9.45	12.25
2002	1	5.87	7.91	5.40	4.65
	2	-0.60	5.15	3.29	3.13
	3	2.43	11.13	10.26	8.54
2000	Nov	-8.20	5.25	3.46	3.47
	Dec	-3.15	13.67	9.82	14.19
2001	Jan	7.70	17.75	10.97	16.53
	Feb	3.35	24.13	9.42	11.01
	Mar	9.23	18.55	11.71	8.75
	Apr	2.58	17.43	10.03	16.95
	May	7.43	19.61	6.13	15.02
	Jun	9.62	22.11	10.95	14.13
	Jul	13.90	14.11	9.22	6.77
	Aug	9.16	8.69	8.56	1.87
	Sep	55.16	38.06	25.07	23.92
	Oct	-39.01	15.84	-1.46	7.23
	Nov	2.86	19.76	10.40	13.67
	Dec	16.01	17.95	9.78	10.62
2002	Jan	3.64	-0.66	2.12	-1.23
	Feb	1.96	8.47	6.71	5.71
	Mar	3.02	0.58	-1.27	-0.77
	Apr	-11.26	-2.36	-3.60	-1.95
	May	6.83	16.69	14.44	11.91
	Jun	6.94	10.28	7.35	6.01
	Jul	7.26	12.54	12.73	8.55
	Aug	-14.25	10.18	9.52	10.80
	Sep	8.15	4.18	5.30	5.12
	Oct	8.47	4.30	10.19	3.06
	Nov	1.00	25.94	9.88	20.42

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: M2 minus small-denomination time deposits, plus institutional money market mutual funds. The label MZM was coined by William Poole (1991) for this aggregate, proposed earlier by Motley (1988).

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

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 series, a 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) and research.stlouisfed.org/aggreg/newbase.html.

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; additional data are available 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: **MZM**, or "Money, Zero Maturity," includes the zero maturity, or immediately available, components of M3. MZM equals M2 minus small-denomination time deposits, plus institutional money market mutual funds (that is, the money market mutual funds included in M3 but excluded from M2). 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. For analytical purposes, MZM largely replaces M1. The **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 Department 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/fred/data/wkly.html. See also *Federal Reserve Bulletin*, table 1.35. The 30-year constant maturity series was discontinued by the Treasury Department 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

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

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 $((y_t - y_{t-40})/40) \times 4 \times 100$, where y_t is the log of real GDP. The four-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 available 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 $m = 1,\ldots, 10$ 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 Fed Funds Futures Contracts** each trace through time the yield on three specific contracts. **Implied Yields on Fed Funds Futures** displays a single day's snapshot of yields for contracts expiring in the months shown on the horizontal axis. **Inflation-Protected Treasury Yields** are yields on the most recently issued inflation-protected securities of 10- and 30-year original maturities. **Inflation-Protected Treasury Yield Spreads** equal, for 10- and 30-year maturities, the difference between the yields on the most recently issued inflation-protected securities and the unadjusted bond yields of similar maturity. **Inflation-Indexed 30-Year Bonds** shows the yield of an inflation-indexed bond that is scheduled to mature in approximately (but not greater than) 30 years. The current bond for Canada has a maturity date of 12/01/2031, 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 Bonds** shows the yield of an inflation-indexed bond that is scheduled to mature in approximately (but not greater than) 10 years. The current U.K. bond has a maturity date of 8/23/2011 and the current U.S. bond has a maturity date of 1/15/2011.

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. Two alternative opportunity costs are shown, one relative to the 3-month Treasury constant maturity yield, the other to the 5-year constant maturity yield.

Page 13: **Real Gross Domestic Product** is GDP as measured in chained 1996 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 1996 dollars.

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

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

Sources

Bank of Canada
Canadian inflation-linked bond yields and long-term interest rates.

Bank of England
U.K. inflation-linked 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.

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.

University of Michigan Survey Research Center
Median expected price change.

Congressional Budget Office
Potential real GDP.

Dow Jones and Co. (Wall Street Journal)
Federal funds futures contracts, Eurodollar futures.

Standard & Poors Inc.
Stock price-earnings ratio, stock price composite index.

U.S. Department of the Treasury
U.S. inflation-protected security yields.

References

Anderson, Richard G. and Robert H. Rasche (1996a). "A Revised Measure of the St. Louis Adjusted Monetary Base," Federal Reserve Bank of St. Louis *Review*, March/April, *78*(2), pp. 3-13.

____ and ____(1996b). "Measuring the Adjusted Monetary Base in an Era of Financial Change," Federal Reserve Bank of St. Louis *Review*, November/December, *78*(6), pp. 3-37.

____ and ____(2001). "Retail Sweep Programs and Bank Reserves, 1994-1999," Federal Reserve Bank of St. Louis *Review*, January/February, pp. 51-72.

____ , Barry E. Jones and Travis D. Nesmith (1997). "Special Report: The Monetary Services Indexes Project of the Federal Reserve Bank of St. Louis," Federal Reserve Bank of St. Louis *Review*, January/February 1997, *79*(1), pp. 31-82.

McCallum, Bennett T. (1988). "Robustness Properties of a Monetary Policy Rule," *Carnegie-Rochester Conference Series on Public Policy*, vol. 29, pp. 173-204.

____(1993). "Specification and Analysis of a Monetary Policy Rule for Japan," Bank of Japan *Monetary and Economic Studies*, November, pp. 1-45.

Motley, Brian (1988). "Should M2 Be Redefined?" Federal Reserve Bank of San Francisco *Economic Review*, Winter, pp. 33-51.

Nelson, Charles R. and Andrew F. Siegel (1987). "Parsimonious Modeling of Yield Curves," *Journal of Business*, October, pp. 473-89.

Poole, William (1991). Statement before the Subcommittee on Domestic Monetary Policy of the Committee on Banking, Finance and Urban Affairs, U.S. House of Representatives, November 6, 1991. Government Printing Office, Serial No. 102-82.

Sharpe, William F. (1997). *Macro-Investment Analysis*, on-line textbook available at www.stanford.edu/~wfsharpe/mia/mia.htm.

Shiller, Robert (1990). "The Term Structure of Interest Rates," *Handbook of Monetary Economics*, vol. 1, B. Friedman and F. Hahn, eds., pp. 627-722.

Taylor, John B. (1993). "Discretion versus Policy Rules in Practice," *Carnegie-Rochester Conference Series on Public Policy*, vol. 39, pp. 195-214.

Note: Articles from this Bank's *Review* are available on the Internet at research.stlouisfed.org/publications/review/.