February 2000

MonetaryTrends

THE FEDERAL RESERVE BANK of ST. LOUIS

An Experiment Is Underway

The United States is now issuing a new golden dollar coin (the coin is gold in color, but has no gold content) with the image of Sacagawea—the only woman on the Lewis and Clark expedition.[1] This is the latest in a series of dollar coin designs.

Over the years, many countries have replaced their low-denomination paper currency with metal coins. Indeed, when the Euro begins circulation in 2002 the smallest denomination banknote will be €5—worth approximately $5 at the current exchange rate. Governments prefer low-denomination coins to low-denomination notes because, in the long run, coins are less expensive. On average, coins have a projected life of 30 years while dollar bills are replaced about every 18 months. Hence, while the dollar bill costs about 3.5 cents to produce, compared to 12 cents for the dollar coin, the relatively short life of bills makes them more expensive over the long run.

There are currently about seven billion one-dollar bills in circulation; hence, the federal government will realize considerable savings if the public were to use dollar coins instead of dollar bills. Unlike other countries that removed the corresponding notes when low-denomination coins were introduced, in the legislation that authorized the golden dollar, Congress expressly stated that the dollar bill would not be removed from circulation. Therefore, the public may continue to use the dollar bill rather than the new coin.

None of the previous dollar coins found widespread use. The last attempt was the Susan B Anthony (SBA) dollar, which was introduced in 1979. While most of the nearly 890 million SBAs produced are now in circulation, only about half were in circulation by 1993.[2]

Two reasons for the lack of widespread use of the SBA have been offered. One is that they are too difficult to distinguish from the quarter. The other is that people find coins inconvenient to use, relative to bills, and most people prefer to use bills if they are available. Advocates of the latter explanation note that countries that have successfully replaced small-denomination bills with coins have removed the bills from circulation.

The extent to which the golden dollar is used will indicate which of these reasons is the most valid. If the first reason accounts for the relative failure of the SBA, the golden dollar will be much more successful. The golden dollar is the same size as the SBA, but has smooth edges and is bright gold in color. Tests show that the golden dollar is easily distinguished from the quarter by touch alone.

If the second reason accounts for the lack of widespread use of the SBA, however, past experience here and elsewhere in the world suggests the golden dollar might not displace dollar bills significantly in daily transactions. The Canadian experience may be suggestive. The Royal Canadian Mint introduced its dollar coin, the "loonie" on July 1, 1987. Despite its distinctive eleven-sided outer edge and gold color, the loonie did not circulate widely until the Bank of Canada began to withdraw the $1 bill from circulation in June of 1989.[3]

—Daniel L. Thornton

[1] More information about the golden dollar can be found at www.usmint.gov.

[2] About 41 million SBAs were minted in 1999. As of December 31, 1999, 22.7 million were in Federal Reserve Bank vaults.

[3] For more details, see Caskey, John P. and Simon St. Laurent. "The Susan B. Anthony Dollar and the Theory of Coin/Note Substitution," *Journal of Money, Credit and Banking* (August 1994), pp. 495-510.

Views expressed do not necessarily reflect official positions of the Federal Reserve System.

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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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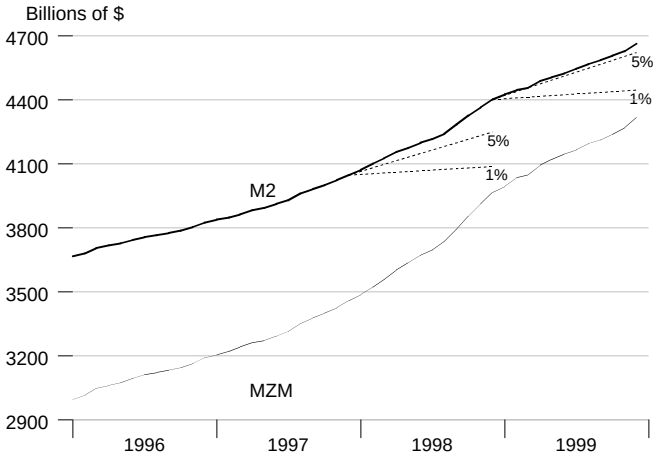
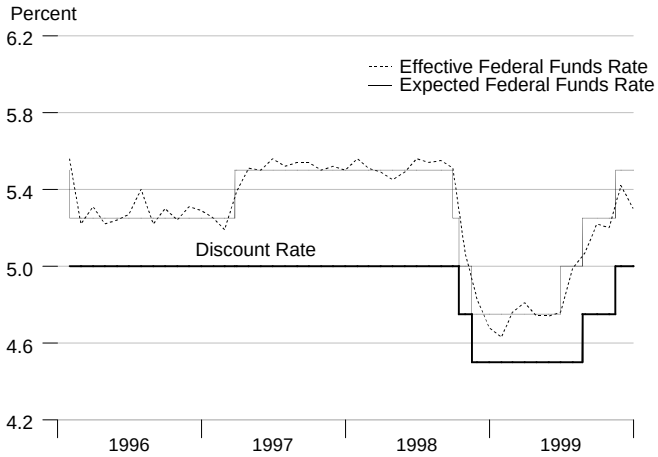
M2 and MZM

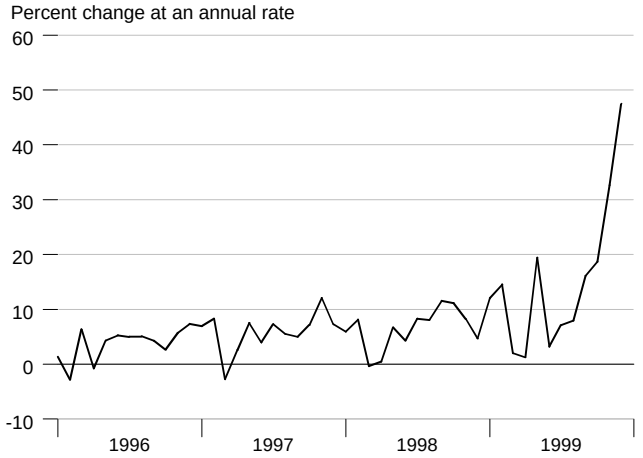


Dotted lines indicate the FOMC target ranges.

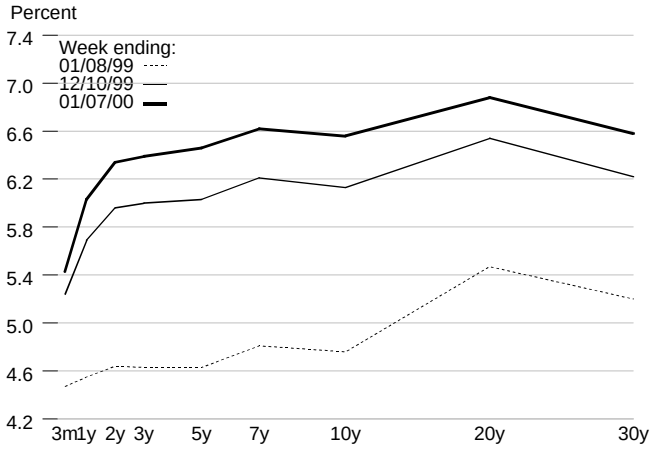
Reserve Market Rates



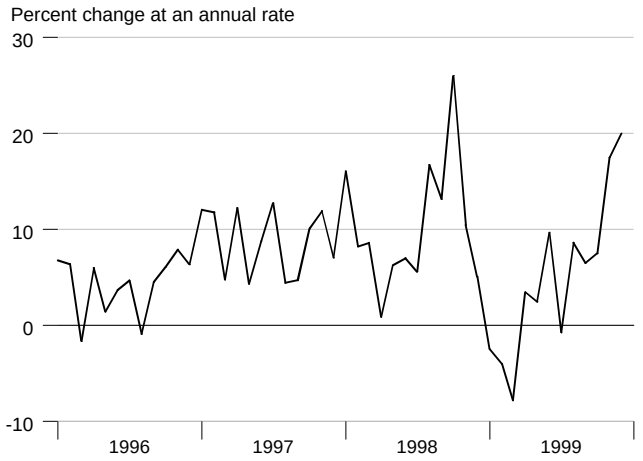
Adjusted Monetary Base



Treasury Yield Curve



Total Bank Credit

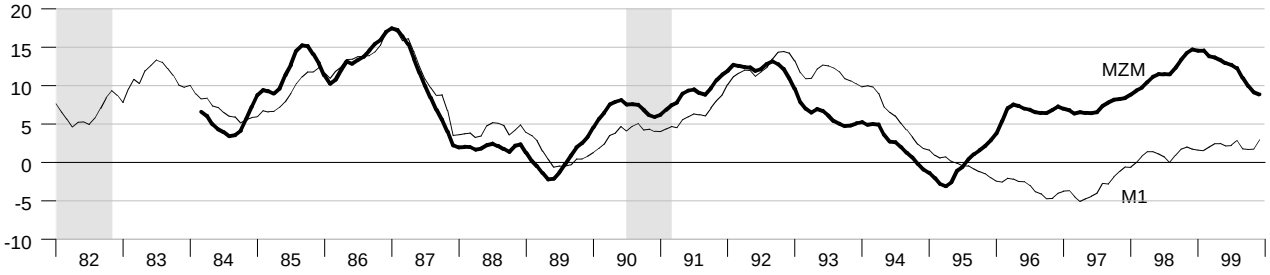


Interest Rates

	Oct 99	Nov 99	Dec 99
Federal Funds Rate	5.20	5.42	5.30
Discount Rate	4.75	4.86	5.00
Prime Rate	8.25	8.37	8.50
Conventional Mortgage Rate	7.85	7.74	7.91
Treasury Yields:			
3-month constant maturity	5.02	5.23	5.36
6-month constant maturity	5.20	5.43	5.68
1-year constant maturity	5.43	5.55	5.84
3-year constant maturity	5.94	5.92	6.14
5-year constant maturity	6.03	5.97	6.19
10-year constant maturity	6.11	6.03	6.28
30-year constant maturity	6.26	6.15	6.35

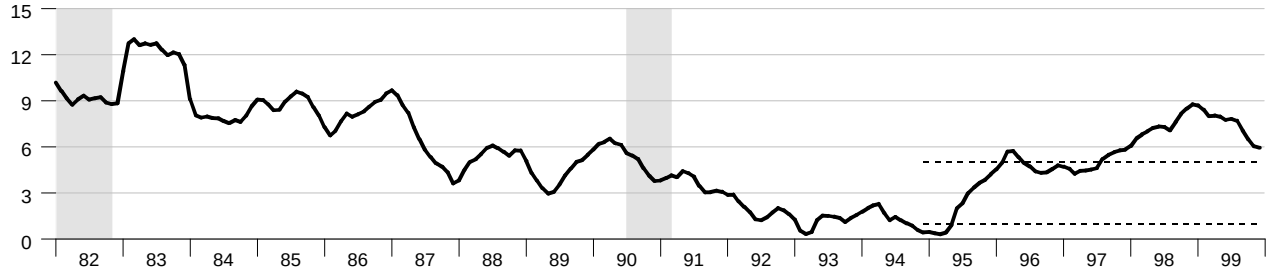
MZM and M1

Percent change from year ago



M2

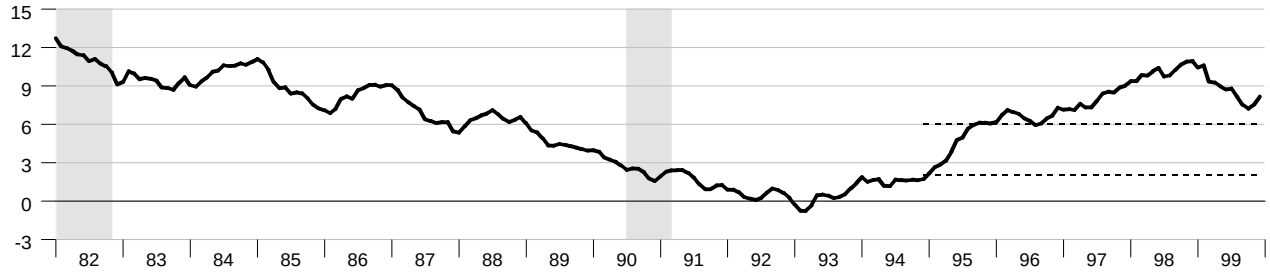
Percent change from year ago



Dotted lines indicate the FOMC target ranges.

M3

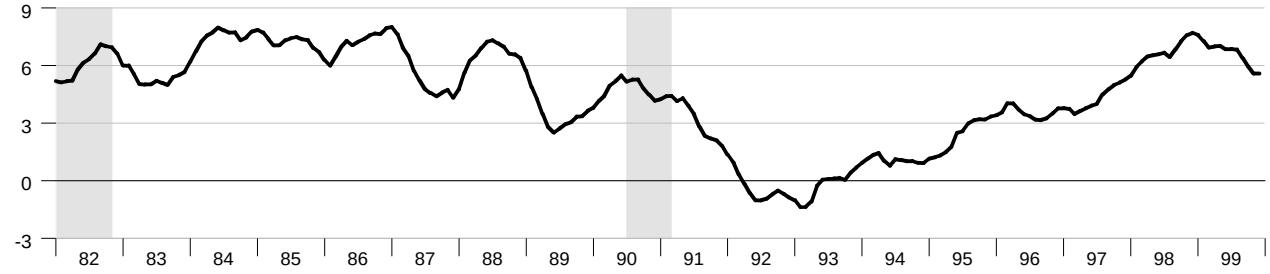
Percent change from year ago



Dotted lines indicate the FOMC target ranges.

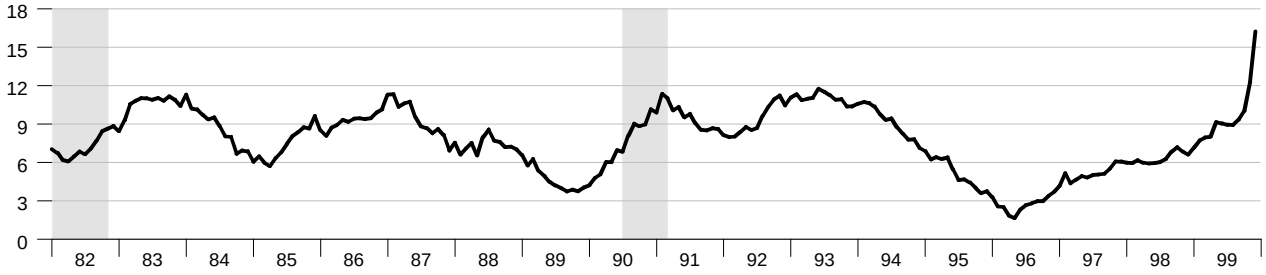
Monetary Services Index - M2

Percent change from year ago



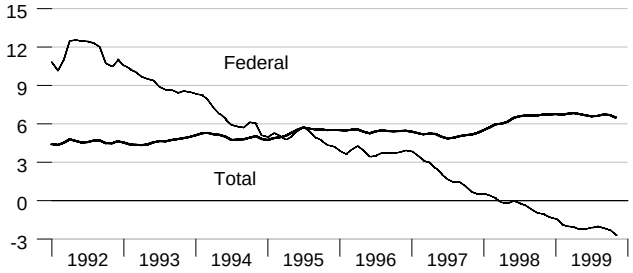
Adjusted Monetary Base

Percent change from year ago



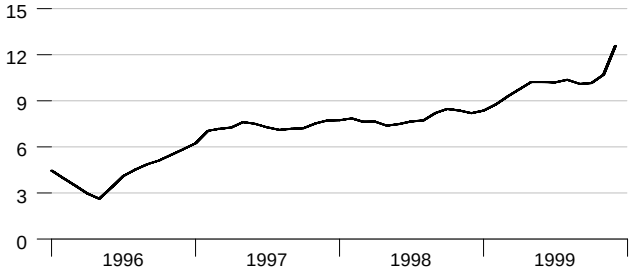
Domestic Nonfinancial Debt

Percent change from year ago



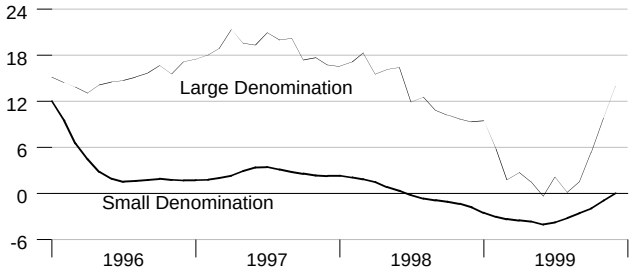
Currency Held by the Nonbank Public

Percent change from year ago



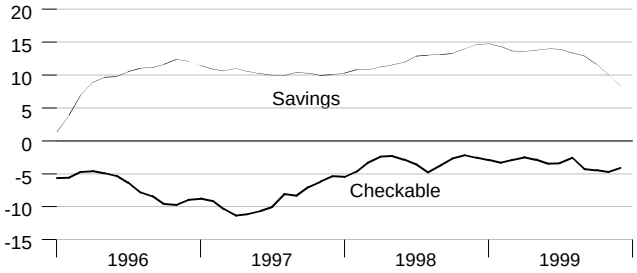
Time Deposits

Percent change from year ago



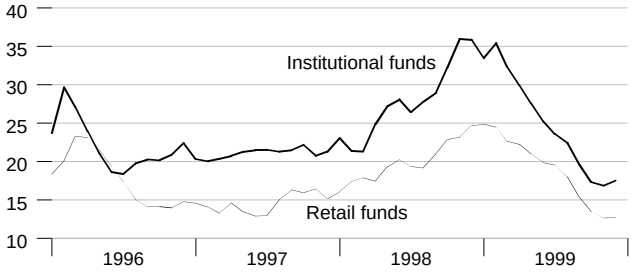
Checkable and Savings Deposits

Percent change from year ago



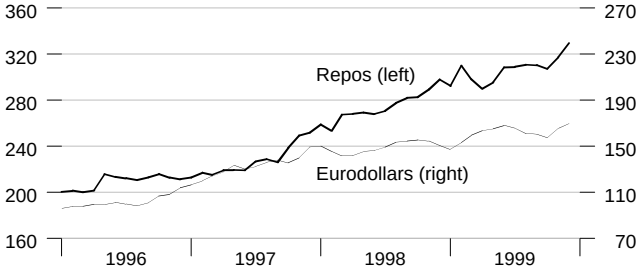
Money Market Mutual Fund Shares

Percent change from year ago



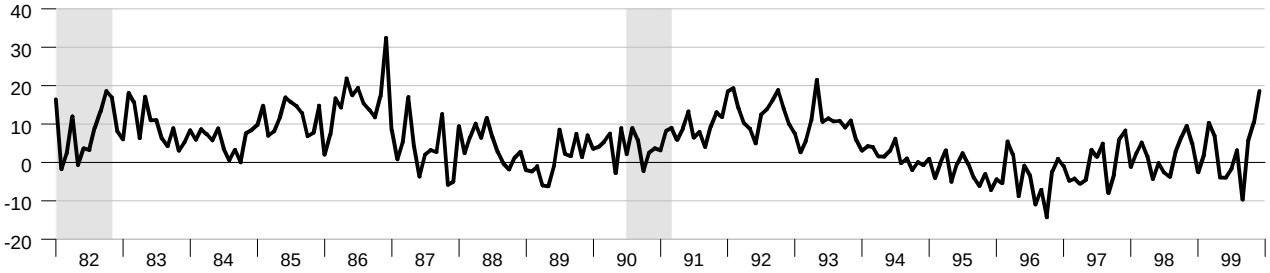
Repurchase Agreements and Eurodollars

Billions of dollars Billions of dollars



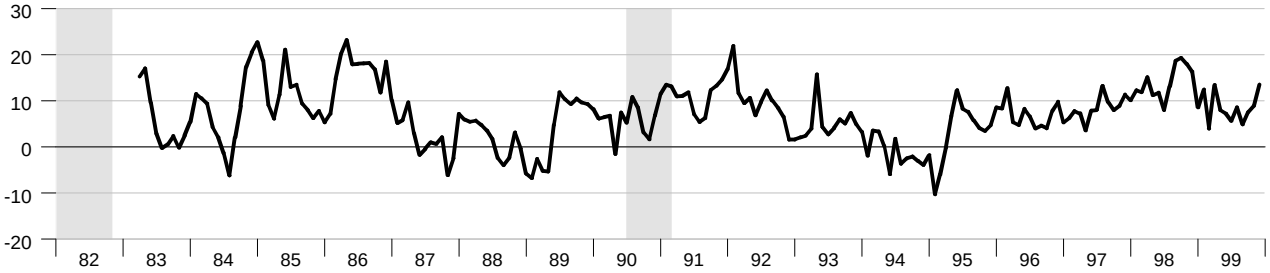
M1

Percent change at an annual rate



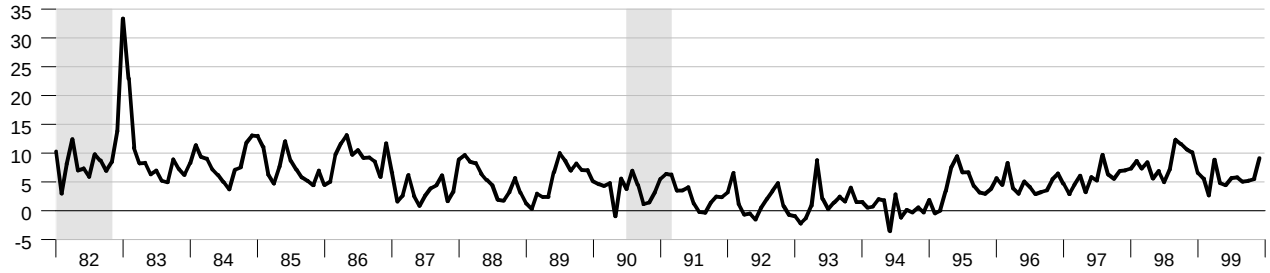
MZM

Percent change at an annual rate



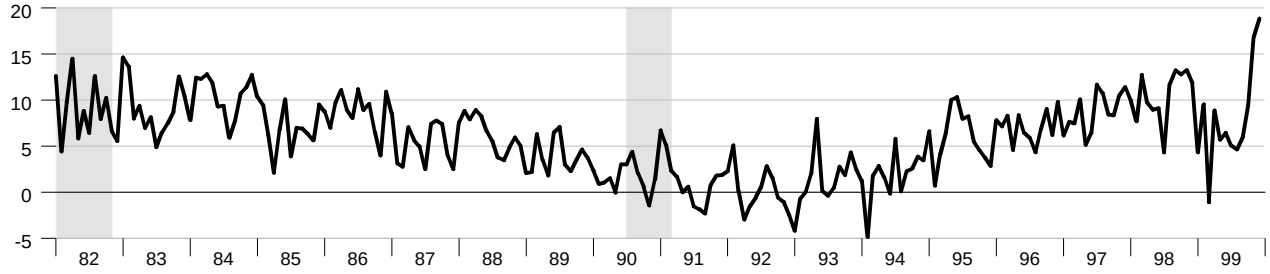
M2

Percent change at an annual rate

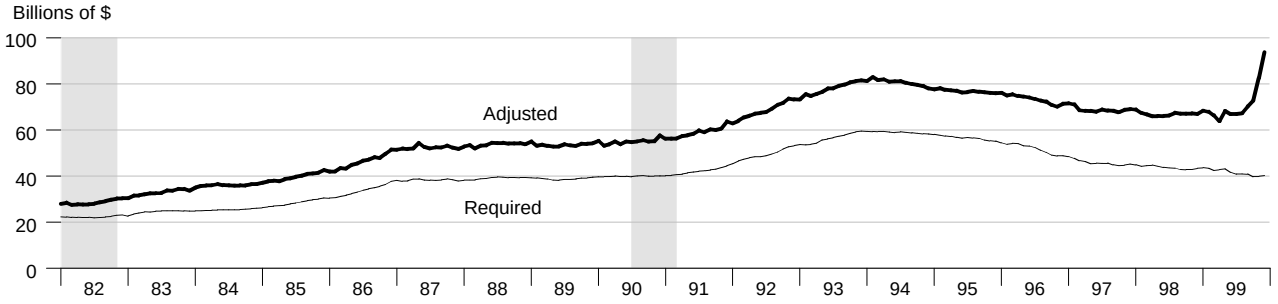


M3

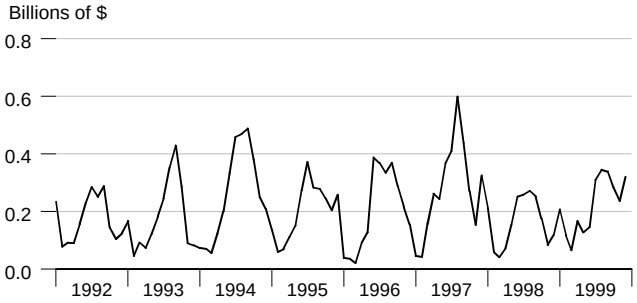
Percent change at an annual rate



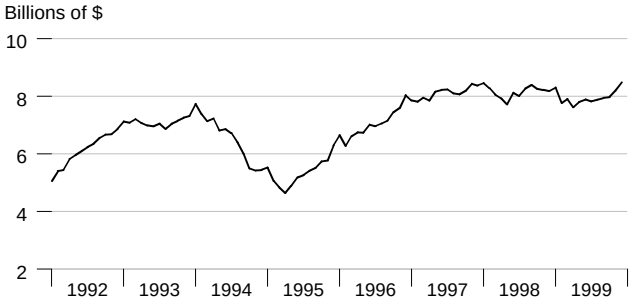
Adjusted and Required Reserves



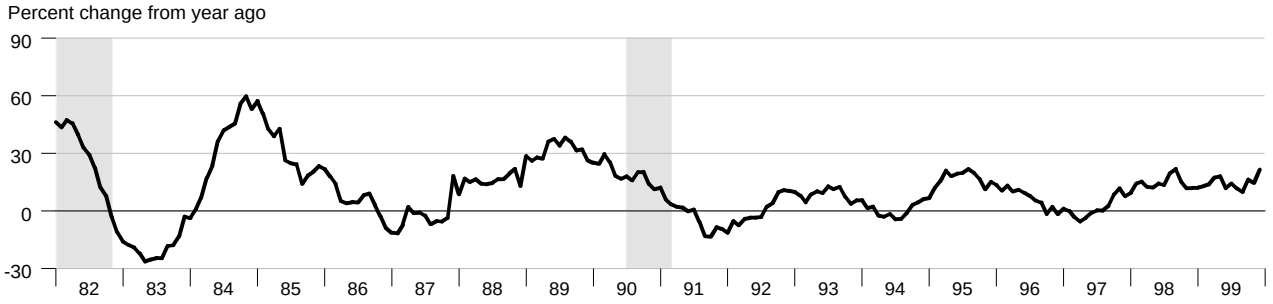
Total Borrowings, nsa



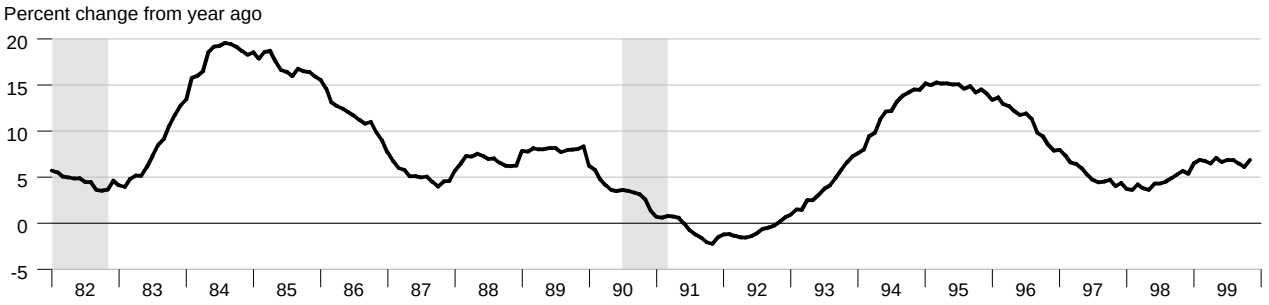
Excess Reserves plus RCB Contracts



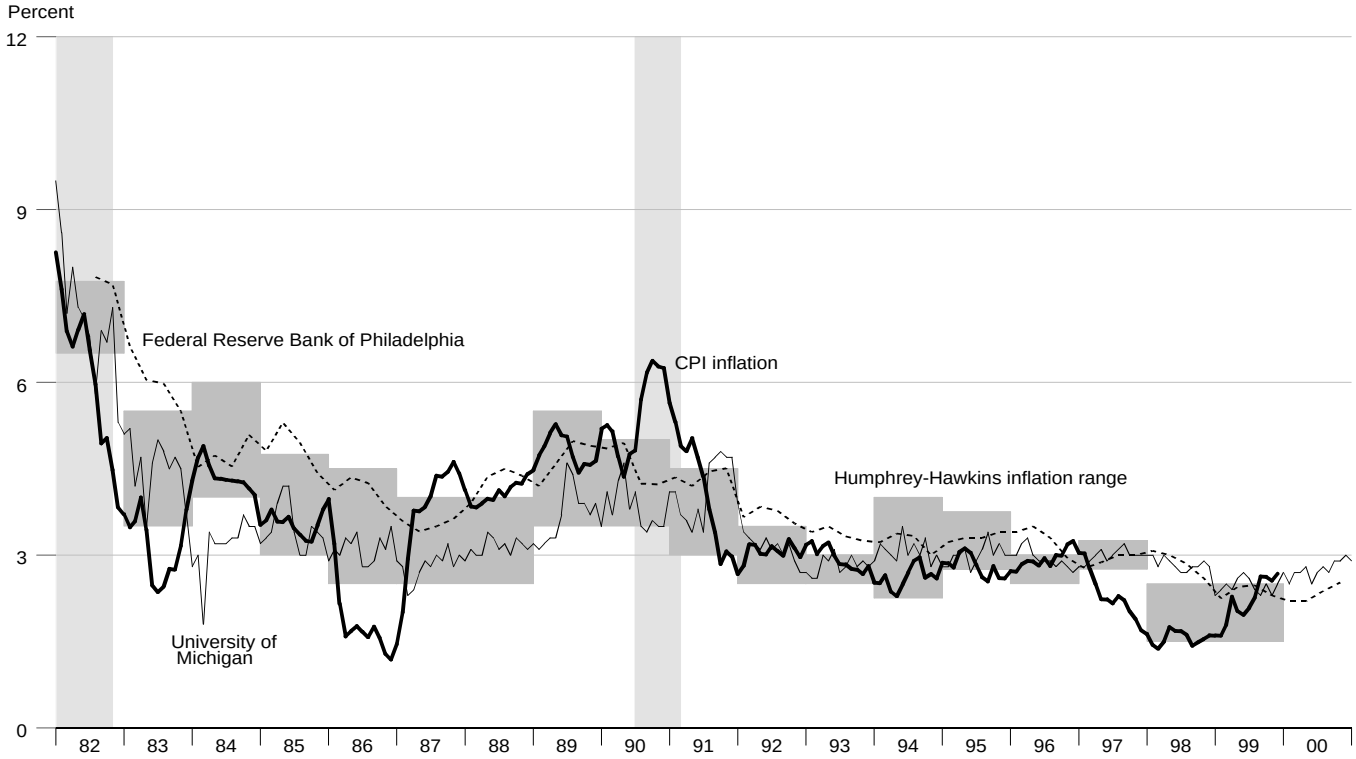
Nonfinancial Commercial Paper



Consumer Credit

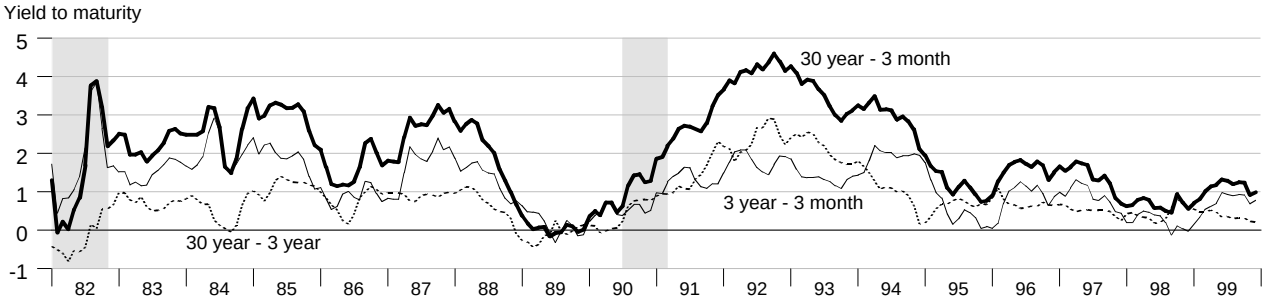


Inflation and Inflation Expectations

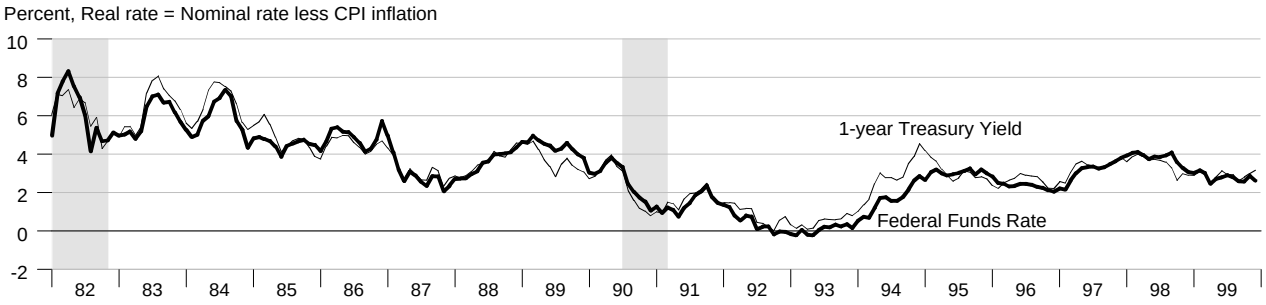


The shaded region shows the Humphrey-Hawkins CPI inflation range. See page 19 for information.

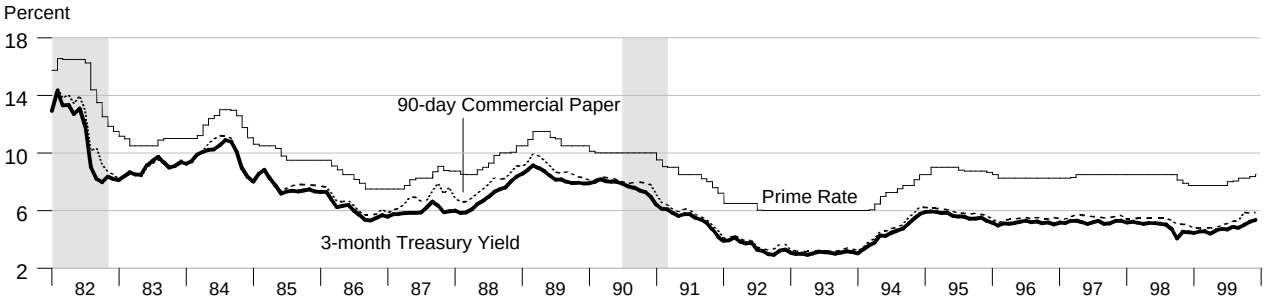
Treasury Security Yield Spreads



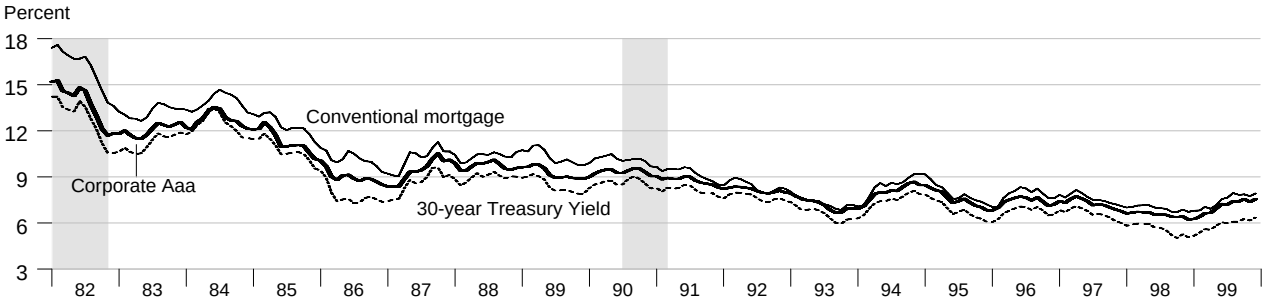
Real Interest Rates



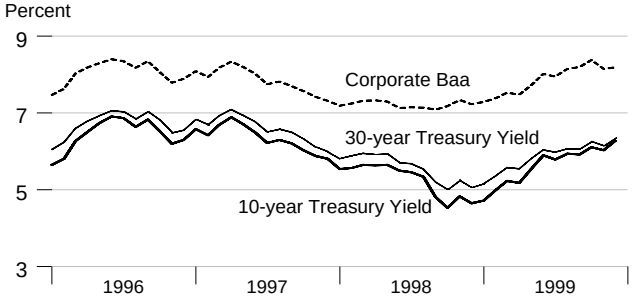
Short Term Interest Rates



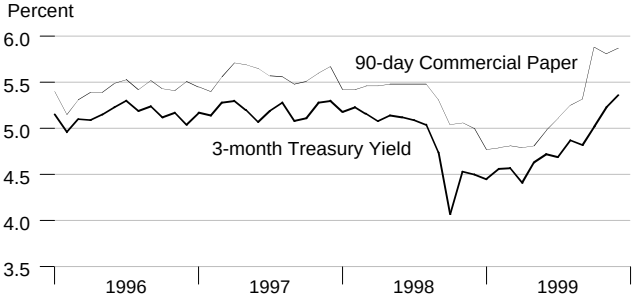
Long Term Interest Rates



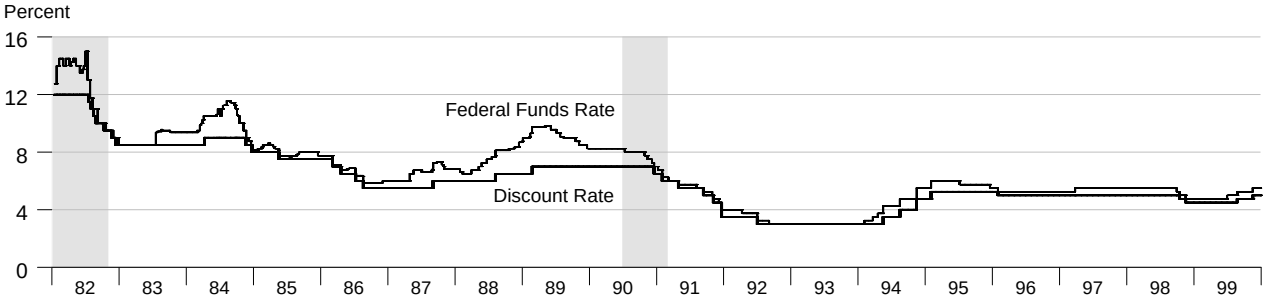
Long Term Interest Rates



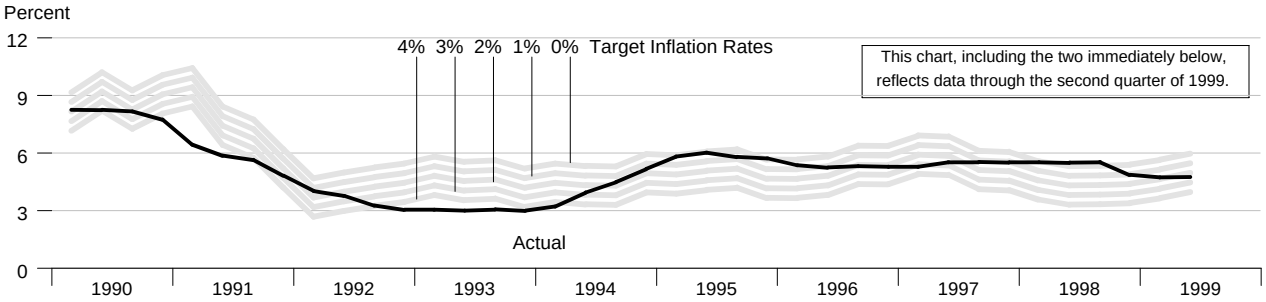
Short Term Interest Rates



FOMC Expected Federal Funds Rate and Discount Rate

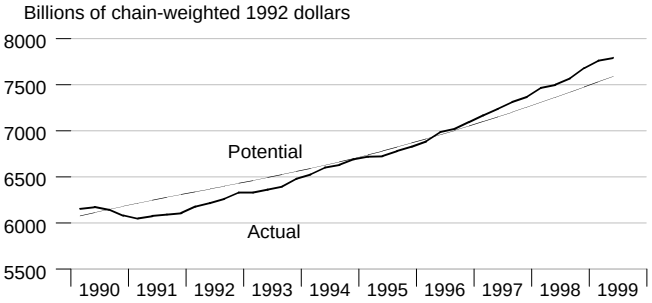


Federal Funds Rate and Inflation Targets

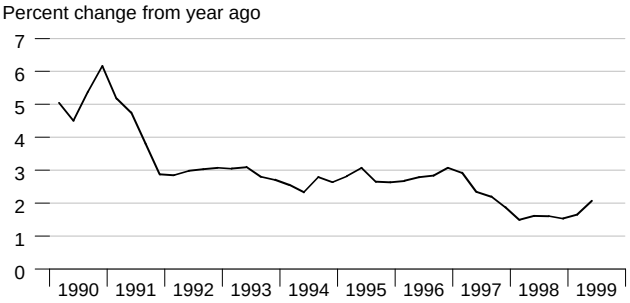


Calculated federal funds rate is based on Taylor's rule. See notes on page 19.

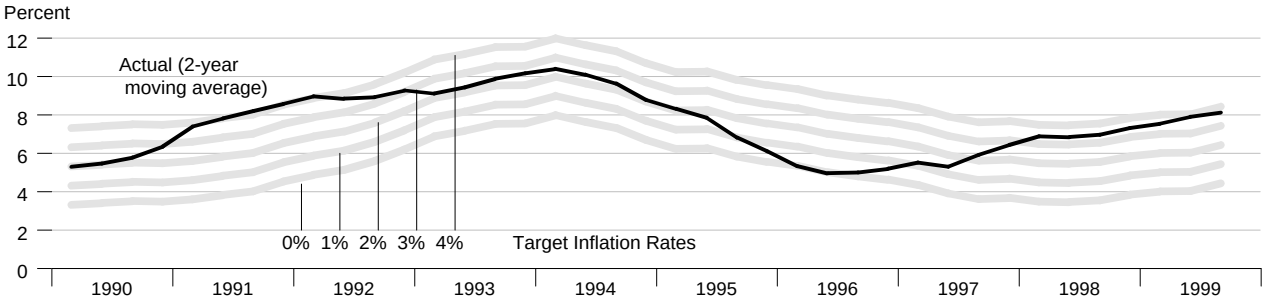
Actual and Potential Real GDP



Actual CPI Inflation

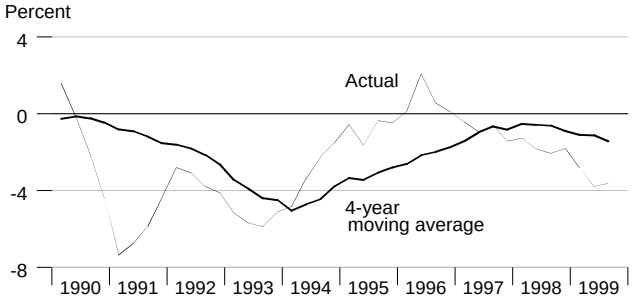


Monetary Base Growth* and Inflation Targets

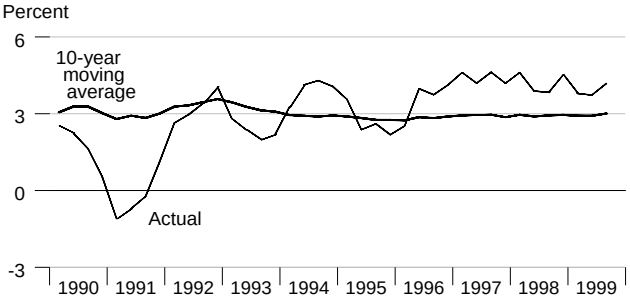


*Modified for the effects of sweeps programs on reserve demand.
Calculated base growth is based on McCallum's rule. See notes on page 19.

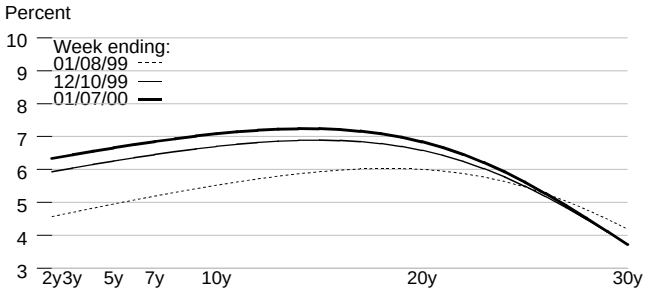
Monetary Base Velocity Growth



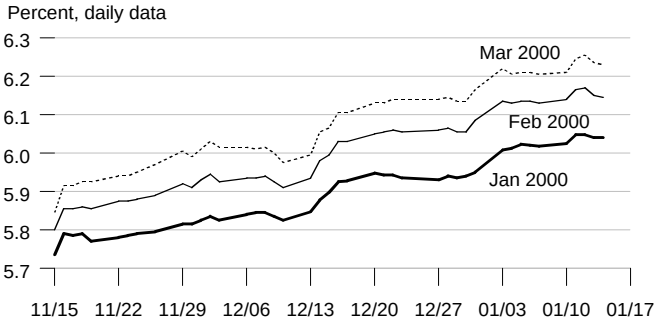
Real Output Growth



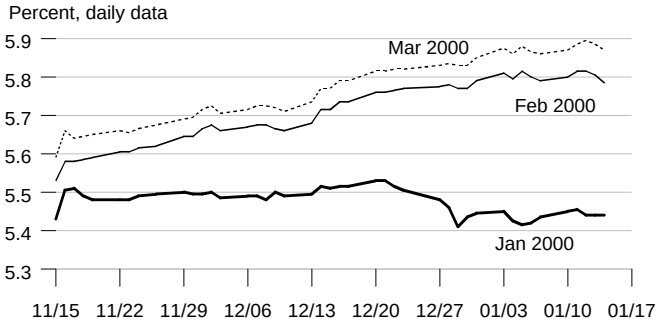
Implied One-Year Forward Rates



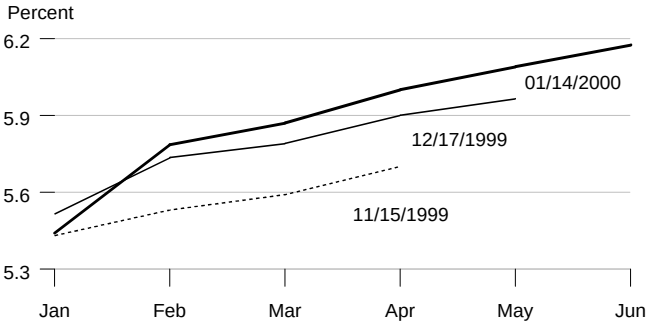
Rates on 3-Month Eurodollar Futures



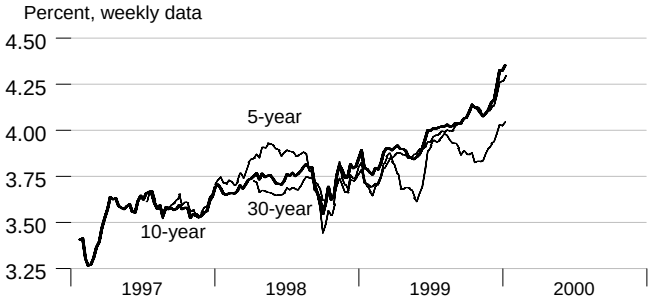
Rates on Selected Fed Funds Futures Contracts



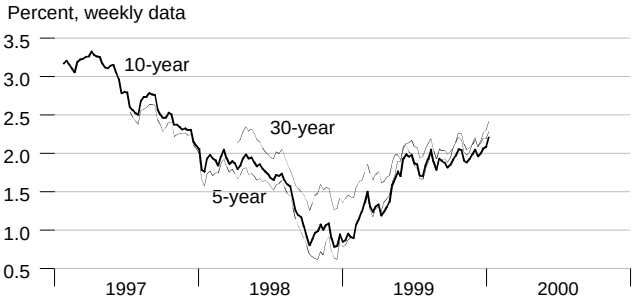
Implied Yields on Fed Funds Futures



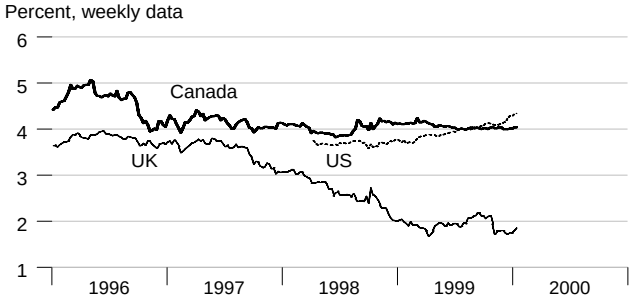
Inflation-Protected Treasury Yields



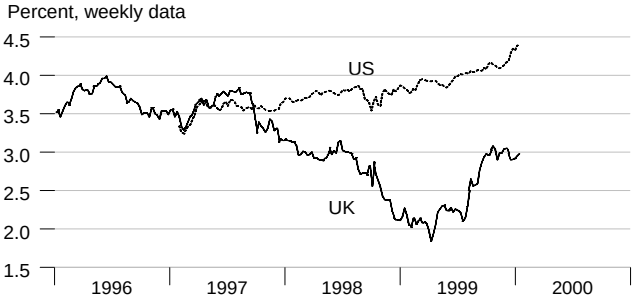
Inflation-Protected Treasury Yield Spreads



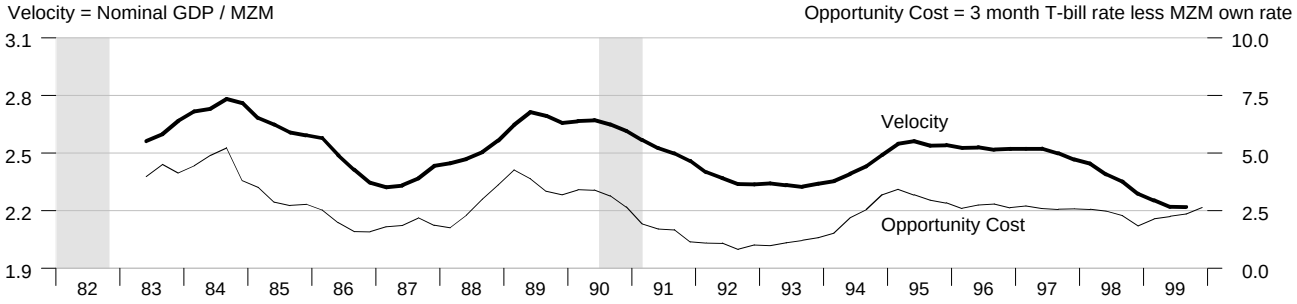
Inflation-Indexed 30-Year Bonds



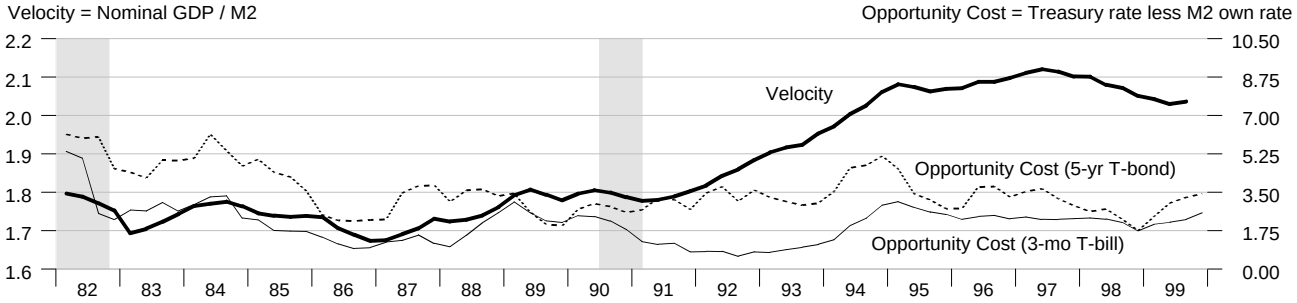
Inflation-Indexed 10-Year Bonds



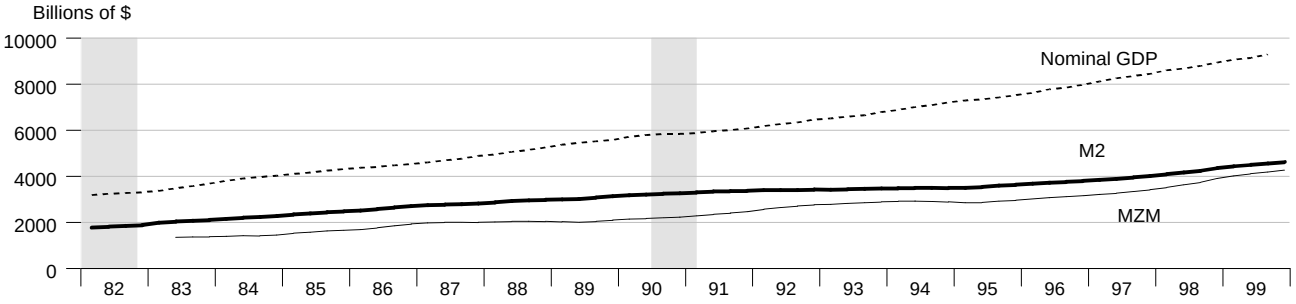
MZM Velocity and Opportunity Cost



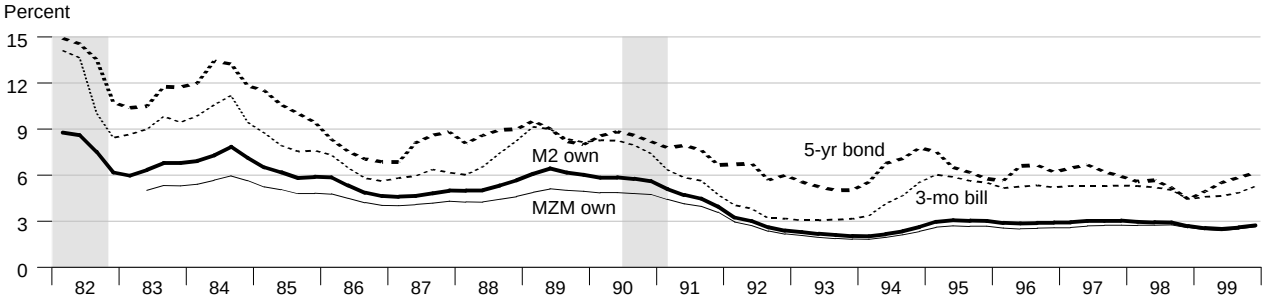
M2 Velocity and Opportunity Cost



M2, MZM and Nominal GDP

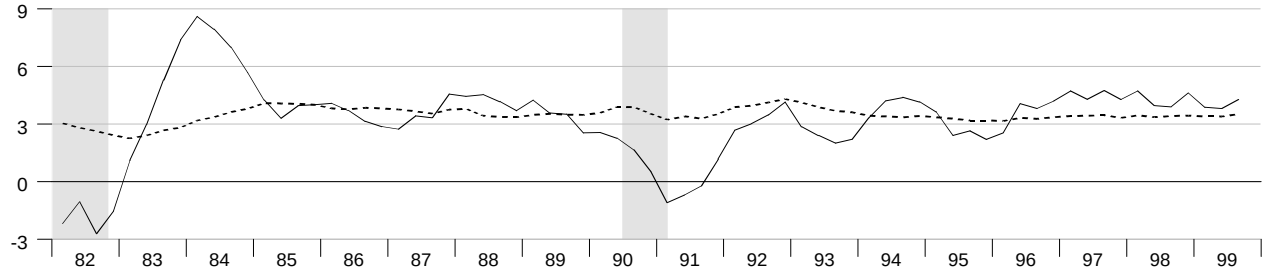


Interest Rates



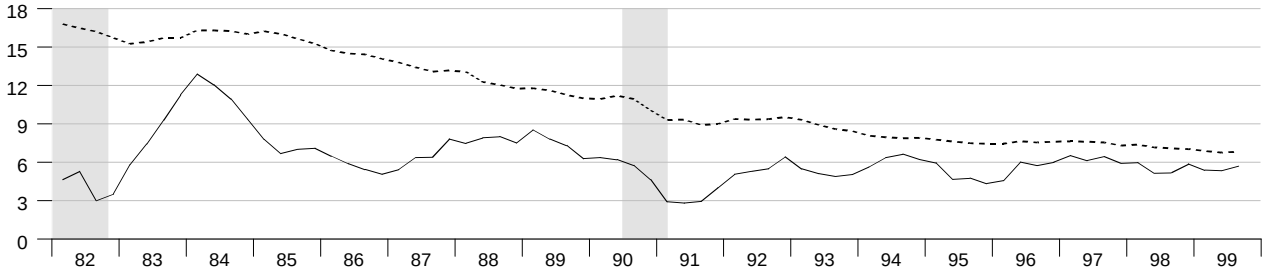
Real Gross Domestic Product

Percent change from year ago



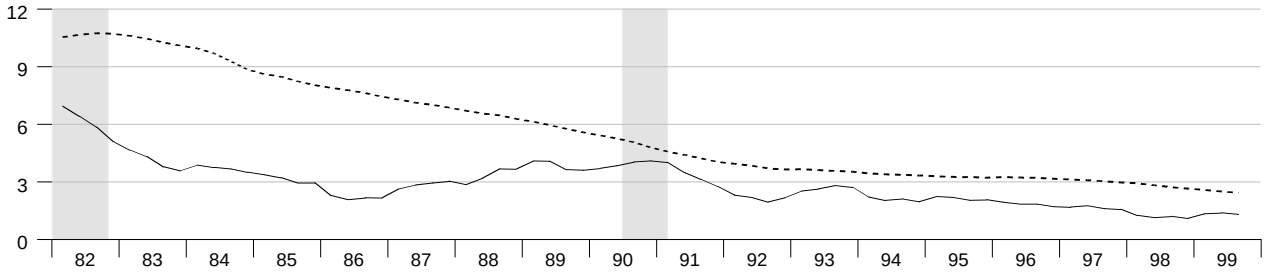
Gross Domestic Product

Percent change from year ago



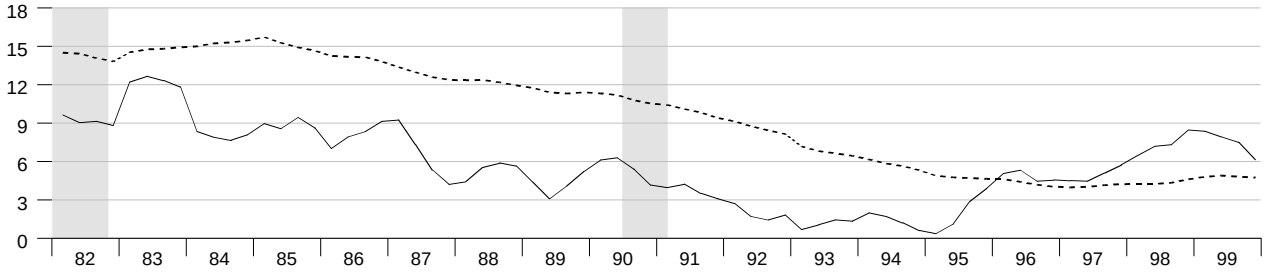
Gross Domestic Product Price Index

Percent change from year ago



M2

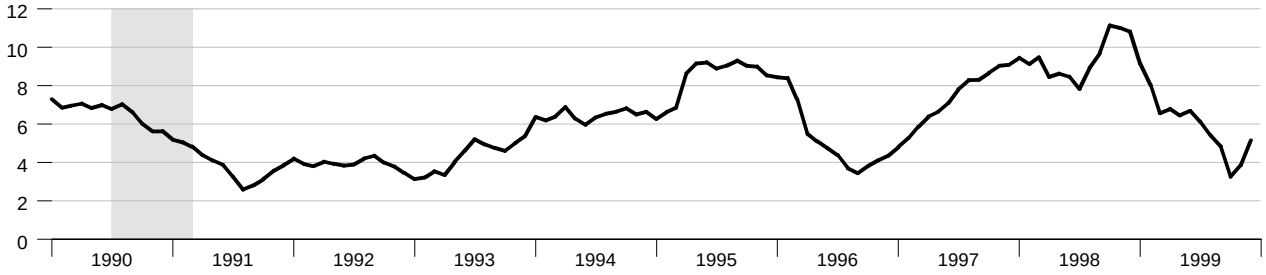
Percent change from year ago



Dashed lines indicate 10-year moving averages

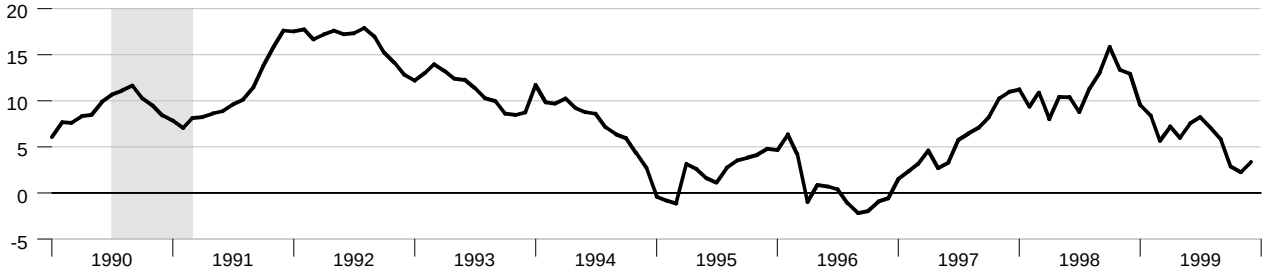
Bank Credit

Percent change from year ago



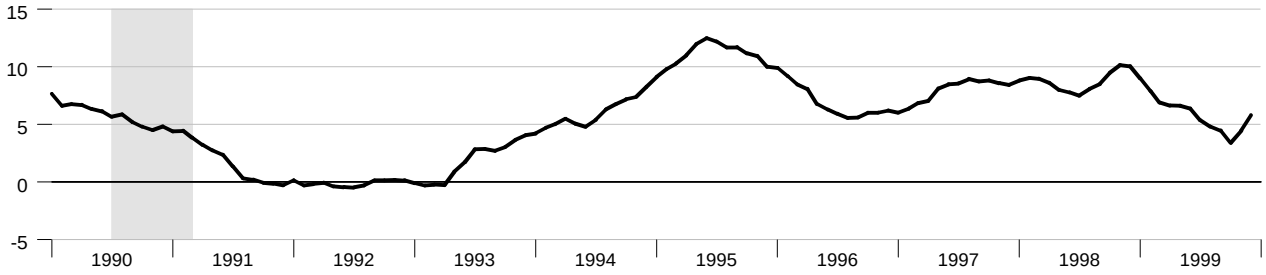
Investment Securities in Bank Credit at Commercial Banks

Percent change from year ago



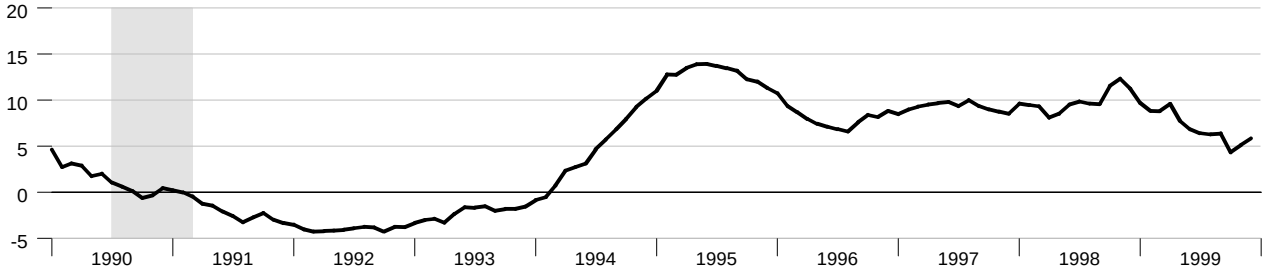
Total Loans and Leases in Bank Credit at Commercial Banks

Percent change from year ago

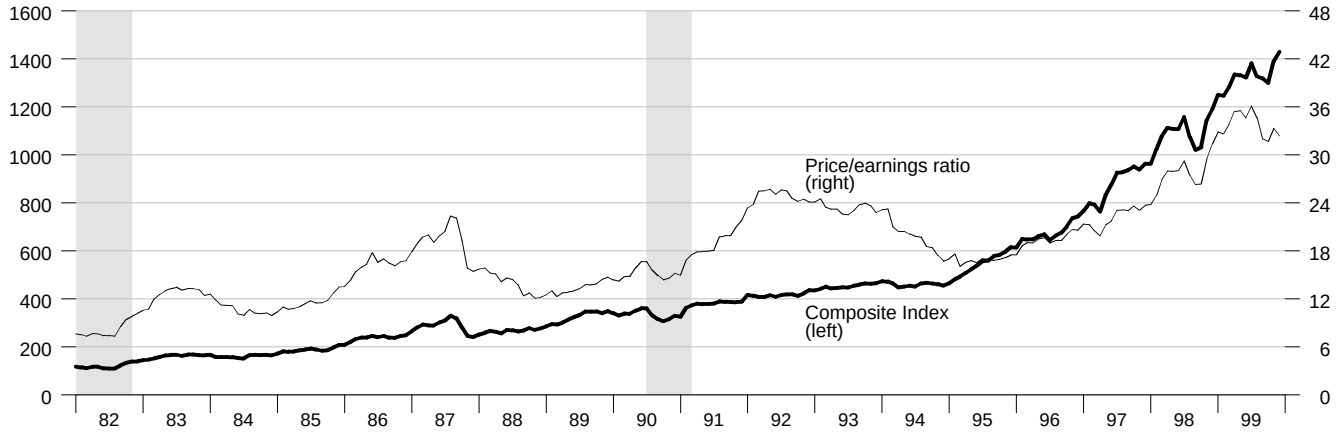


Commercial and Industrial Loans at Commercial Banks

Percent change from year ago



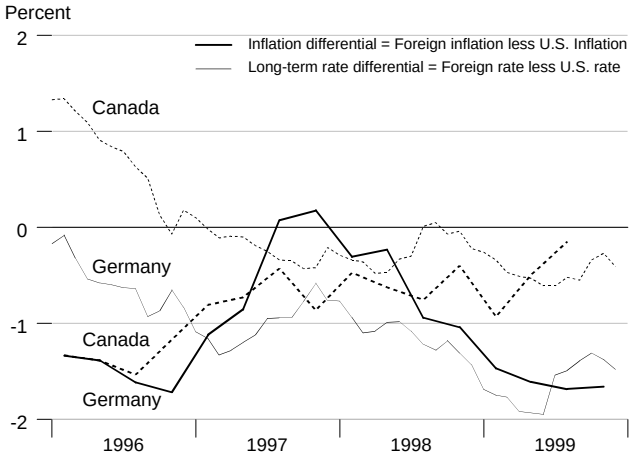
Standard and Poor's 500

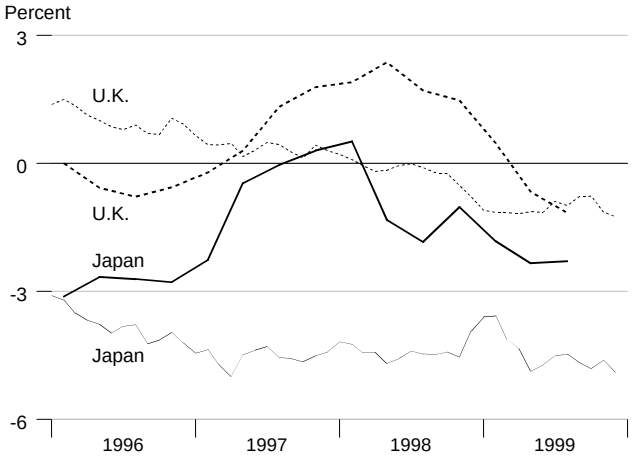


Inflation and Long-Term Interest Rates

	Trend in Consumer Price Inflation Rates Percent change from year ago				Recent Long-Term Government Bond Rates Percent			
	1999Q1	1999Q2	1999Q3	1999Q4	Sep99	Oct99	Nov99	Dec99
United States	1.73	2.09	2.32	2.62	6.43	6.60	6.42	6.63
Canada	0.80	1.59	2.18	.	5.88	6.26	6.15	6.22
France	0.26	0.36	0.53	0.97	5.35	5.67	5.66	5.81
Germany	0.26	0.48	0.64	0.96	5.04	5.29	5.04	5.15
Italy	1.39	1.44	1.72	2.06	5.32	5.56	5.29	5.40
Japan	-0.10	-0.25	0.03	.	1.76	1.79	1.81	1.74
United Kingdom	2.20	1.42	1.17	.	5.65	5.83	5.28	5.38

Inflation and Long-Term Interest Rates Differentials





		Money Stock				Bank			
		M1	MZM	M2	M3	Credit	Monetary Base	Reserves	MSI M2
	1995	1143.019	2905.586	3572.576	4499.820	3501.096	443.511	76.849	210.318
	1996	1106.383	3095.731	3745.859	4796.310	3684.031	455.586	73.415	217.754
	1997	1069.906	3317.813	3931.627	5176.509	3952.234	478.753	68.918	227.017
	1998	1079.864	3702.546	4221.546	5700.815	4324.920	508.978	66.952	242.122
	1999	1102.720	4152.698	4536.855	6197.580	4583.589	557.852	71.250	258.214
1997	1	1076.664	3221.986	3850.129	5012.818	3830.534	470.027	70.409	222.803
	2	1066.034	3274.537	3895.825	5110.248	3911.281	473.896	68.177	225.113
	3	1068.452	3347.329	3957.232	5229.041	3991.693	480.945	68.565	228.303
	4	1068.474	3427.399	4023.324	5353.928	4075.427	490.144	68.519	231.847
1998	1	1077.176	3521.816	4099.386	5490.879	4188.648	498.387	67.711	235.880
	2	1079.774	3635.858	4175.811	5628.222	4244.225	502.060	66.084	239.820
	3	1074.554	3741.543	4247.085	5749.300	4343.720	511.592	66.951	243.507
	4	1087.952	3910.968	4363.903	5934.859	4523.088	523.871	67.063	249.280
1999	1	1095.623	4025.823	4442.424	6047.390	4519.557	536.301	67.557	253.027
	2	1105.165	4119.896	4506.496	6134.792	4526.103	545.930	66.311	256.510
	3	1098.949	4190.250	4566.239	6218.821	4580.654	558.018	68.128	259.817
	4	1111.142	4274.824	4632.259	6389.319	4708.043	591.160	83.002	263.503
1997	Dec	1075.206	3457.332	4046.717	5403.387	4104.806	493.756	69.076	233.180
1998	Jan	1074.163	3486.484	4071.429	5448.166	4159.658	496.198	68.918	234.460
	Feb	1076.373	3522.058	4100.802	5483.147	4188.152	499.555	67.414	235.920
	Mar	1080.992	3556.907	4125.927	5541.325	4218.133	499.408	66.801	237.260
	Apr	1082.435	3601.620	4154.867	5586.180	4221.247	499.601	66.000	238.890
	May	1078.527	3635.198	4174.291	5627.880	4243.351	502.385	66.134	239.680
	Jun	1078.359	3670.756	4198.274	5670.606	4268.077	504.193	66.117	240.890
	Jul	1075.991	3695.161	4215.724	5691.051	4287.996	507.677	66.366	242.010
	Aug	1072.625	3735.720	4240.969	5746.763	4347.744	511.093	67.434	243.200
	Sep	1075.046	3793.748	4284.561	5810.087	4395.419	516.006	67.052	245.310
	Oct	1080.787	3854.736	4325.929	5872.044	4490.606	520.803	67.055	247.360
	Nov	1089.326	3912.516	4364.406	5936.880	4529.770	524.379	67.183	249.330
	Dec	1093.742	3965.652	4401.374	5995.653	4548.888	526.432	66.952	251.150
1999	Jan	1091.402	3993.906	4425.361	6017.356	4539.489	531.713	68.375	252.260
	Feb	1093.055	4035.140	4445.978	6065.135	4524.314	538.145	67.918	253.090
	Mar	1102.412	4048.424	4455.933	6059.680	4494.868	539.045	66.379	253.730
	Apr	1108.792	4093.607	4488.901	6104.453	4507.791	539.623	63.827	255.600
	May	1105.163	4120.700	4506.892	6133.497	4517.102	548.349	68.239	256.520
	Jun	1101.541	4145.380	4523.696	6166.425	4553.417	549.818	66.868	257.410
	Jul	1100.002	4164.821	4545.134	6192.482	4550.644	553.082	66.902	258.640
	Aug	1102.865	4194.463	4567.156	6216.514	4583.263	556.746	67.283	259.820
	Sep	1093.981	4211.466	4586.426	6247.466	4608.055	564.226	70.198	260.990
	Oct	1099.122	4237.881	4606.385	6296.701	4636.830	573.011	72.729	262.080
	Nov	1108.568	4269.304	4627.562	6385.480	4704.476	588.594	82.541	263.250
	Dec	1125.735	4317.286	4662.831	6485.775	4782.823	611.876	93.737	265.180

*All values are given in billions of dollars

		Federal Funds	Discount Rate	Prime Rate	3-mo CDs	Treasury Yields 3 mo	3 yr	30 yr	Corporate Aaa Bonds	S & L Aaa Bonds	Conventional Mortgage
	1995	5.84	5.21	8.83	5.92	5.66	6.26	6.88	7.59	5.80	7.95
	1996	5.30	5.02	8.27	5.39	5.15	5.99	6.70	7.37	5.52	7.80
	1997	5.46	5.00	8.44	5.62	5.20	6.10	6.61	7.26	5.32	7.60
	1998	5.35	4.92	8.35	5.47	4.91	5.14	5.58	6.53	4.93	6.94
	1999	4.97	4.62	7.99	5.33	4.78	5.49	5.87	7.04	5.28	7.43
1997	1	5.28	5.00	8.27	5.44	5.20	6.19	6.82	7.43	5.44	7.79
	2	5.52	5.00	8.50	5.69	5.19	6.42	6.93	7.57	5.49	7.93
	3	5.53	5.00	8.50	5.60	5.18	6.01	6.53	7.17	5.23	7.47
	4	5.51	5.00	8.50	5.73	5.23	5.78	6.14	6.88	5.14	7.20
1998	1	5.52	5.00	8.50	5.55	5.19	5.46	5.88	6.67	4.94	7.05
	2	5.50	5.00	8.50	5.59	5.11	5.57	5.85	6.64	5.00	7.09
	3	5.53	5.00	8.50	5.53	4.96	5.11	5.47	6.49	4.95	6.87
	4	4.86	4.66	7.92	5.20	4.37	4.41	5.11	6.33	4.82	6.76
1999	1	4.73	4.50	7.75	4.90	4.53	4.87	5.37	6.42	4.87	6.88
	2	4.75	4.50	7.75	4.98	4.59	5.35	5.80	6.93	5.05	7.20
	3	5.09	4.60	8.10	5.38	4.79	5.71	6.04	7.33	5.42	7.80
	4	5.31	4.87	8.37	6.06	5.20	6.00	6.25	7.49	5.79	7.83
1997	Dec	5.50	5.00	8.50	5.80	5.30	5.74	5.99	6.76	5.03	7.10
1998	Jan	5.56	5.00	8.50	5.54	5.18	5.38	5.81	6.61	4.88	6.99
	Feb	5.51	5.00	8.50	5.54	5.23	5.43	5.89	6.67	4.92	7.04
	Mar	5.49	5.00	8.50	5.58	5.16	5.57	5.95	6.72	5.03	7.13
	Apr	5.45	5.00	8.50	5.58	5.08	5.58	5.92	6.69	5.00	7.14
	May	5.49	5.00	8.50	5.59	5.14	5.61	5.93	6.69	5.04	7.14
	Jun	5.56	5.00	8.50	5.60	5.12	5.52	5.70	6.53	4.97	7.00
	Jul	5.54	5.00	8.50	5.59	5.09	5.47	5.68	6.55	5.01	6.95
	Aug	5.55	5.00	8.50	5.58	5.04	5.24	5.54	6.52	5.01	6.92
	Sep	5.51	5.00	8.49	5.41	4.74	4.62	5.20	6.40	4.84	6.72
	Oct	5.07	4.86	8.12	5.21	4.07	4.18	5.01	6.37	4.76	6.71
	Nov	4.83	4.63	7.89	5.24	4.53	4.57	5.25	6.41	4.87	6.87
	Dec	4.68	4.50	7.75	5.14	4.50	4.48	5.06	6.22	4.83	6.72
1999	Jan	4.63	4.50	7.75	4.89	4.45	4.61	5.16	6.24	4.85	6.79
	Feb	4.76	4.50	7.75	4.90	4.56	4.90	5.37	6.40	4.80	6.81
	Mar	4.81	4.50	7.75	4.91	4.57	5.11	5.58	6.62	4.96	7.04
	Apr	4.74	4.50	7.75	4.88	4.41	5.03	5.55	6.64	4.89	6.92
	May	4.74	4.50	7.75	4.92	4.63	5.33	5.81	6.93	5.05	7.15
	Jun	4.76	4.50	7.75	5.13	4.72	5.70	6.04	7.23	5.22	7.55
	Jul	4.99	4.50	8.00	5.24	4.69	5.62	5.98	7.19	5.24	7.63
	Aug	5.07	4.56	8.06	5.41	4.87	5.77	6.07	7.40	5.47	7.94
	Sep	5.22	4.75	8.25	5.50	4.82	5.75	6.07	7.39	5.56	7.82
	Oct	5.20	4.75	8.25	6.13	5.02	5.94	6.26	7.55	5.78	7.85
	Nov	5.42	4.86	8.37	6.00	5.23	5.92	6.15	7.36	5.77	7.74
	Dec	5.30	5.00	8.50	6.05	5.36	6.14	6.35	7.55	5.82	7.91

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

		M1	MZM	M2	M3
Percent change from previous period					
	1995	-0.21	-0.47	2.07	4.55
	1996	-3.21	6.54	4.85	6.59
	1997	-3.30	7.17	4.96	7.93
	1998	0.93	11.60	7.37	10.13
	1999	2.12	12.16	7.47	8.71
1997	1	-0.47	1.77	1.19	1.87
	2	-0.99	1.63	1.19	1.94
	3	0.23	2.22	1.58	2.32
	4	0.00	2.39	1.67	2.39
1998	1	0.81	2.75	1.89	2.56
	2	0.24	3.24	1.86	2.50
	3	-0.48	2.91	1.71	2.15
	4	1.25	4.53	2.75	3.23
1999	1	0.71	2.94	1.80	1.90
	2	0.87	2.34	1.44	1.45
	3	-0.56	1.71	1.33	1.37
	4	1.11	2.02	1.45	2.74
1997	Dec	0.69	0.94	0.59	0.95
1998	Jan	-0.10	0.84	0.61	0.83
	Feb	0.21	1.02	0.72	0.64
	Mar	0.43	0.99	0.61	1.06
	Apr	0.13	1.26	0.70	0.81
	May	-0.36	0.93	0.47	0.75
	Jun	-0.02	0.98	0.57	0.76
	Jul	-0.22	0.66	0.42	0.36
	Aug	-0.31	1.10	0.60	0.98
	Sep	0.23	1.55	1.03	1.10
	Oct	0.53	1.61	0.97	1.07
	Nov	0.79	1.50	0.89	1.10
	Dec	0.41	1.36	0.85	0.99
1999	Jan	-0.21	0.71	0.54	0.36
	Feb	0.15	1.03	0.47	0.79
	Mar	0.86	0.33	0.22	-0.09
	Apr	0.58	1.12	0.74	0.74
	May	-0.33	0.66	0.40	0.48
	Jun	-0.33	0.60	0.37	0.54
	Jul	-0.14	0.47	0.47	0.42
	Aug	0.26	0.71	0.48	0.39
	Sep	-0.81	0.41	0.42	0.50
	Oct	0.47	0.63	0.44	0.79
	Nov	0.86	0.74	0.46	1.41
	Dec	1.55	1.12	0.76	1.57

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). Due to distortions caused by regulatory changes, the largest of which was the introduction of money market accounts, data for MZM begin March 1983 in this publication.

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 firms except depository institutions and money market mutual funds.

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 http://www.stls.frb.org/research/newbase.html.

Monetary Services Index: an index which 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 http://www.stls.frb.org/research/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 http://www.stls.frb.org/research/swdata.html. For analytical purposes, MZM largely replaces M1. The **Discount Rate** and **Expected 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. **Treasury Yield Curve** shows constant maturity yields calculated by the U.S. Treasury Department for securities with 3 months and 1, 2, 3, 5, 7,10, 20 and 30 years to maturity. Daily data and a description are available at http://www.stls.frb.org/fred/data/wkly.html. See also *Federal Reserve Bulletin*, table 1.35.

Page 5: **Total Checkable Deposits** is the sum of demand and other checkable deposits. **Total Savings Deposits** is the sum of money market deposit accounts (MMDA), 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 range as reported to the Congress in the February Humphrey-Hawkins Act testimony each year. **CPI Inflation** is the percentage change from a year ago in the CPI for all urban consumers. **Real Interest Rates** are ex post measures, equal to nominal rates minus CPI inflation.

Page 9: **FOMC Expected Federal Funds Rate** is the level (or midpoint of the range, if applicable) of the federal funds rate that the staff of the Federal Open Market Committee expected to be consistent with the desired degree of pressure on bank reserve positions.

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

$$f_t^* = 2.0 + \pi_{t-1} + (\pi_{t-1} - \pi^*)/2 + 100 \times (y_{t-1} - y_{t-1}^P)/2$$

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 (CPI), y_{t-1} is the log of the previous period's level of real GDP, and y_{t-1}^P is the log of an estimate of the previous period's level of potential output. **Potential real output** 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

http://www.stls.frb.org/research/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 $m = 1,..., 30$ 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)

$$f(m) = [D(m)R(m) - D(m\text{-}1)] / [D(m) - D(m\text{-}1)]$$

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. 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 Yield Spreads** equal, for 5, 10, and 30 year maturities, the difference between the Treasury constant maturity yield and the yield on the most recently issued inflation-protected security. **Inflation-Indexed Bonds** for Canada are the 31-year bond with a maturity date of 12/01/2026; for the U.K., the 37.5-year bond with a maturity date of 07/17/2024 and the 12.1-year bond with a maturity date of 10/21/2004; and, for the U.S., the 30-year bond with a maturity date of 04/15/2028 and the 10-year bond with a maturity date of 01/15/2008.

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.

Sources

Bank of Canada
Canadian inflation-linked bond yields.

Bank of England
U.K. inflation-linked bond yields.

Board of Governors of the Federal Reserve System
Monetary aggregates and components, nonfinancial debt: 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 and G.13 releases; nonfinancial commercial paper: Board of Governors web site; M2 and MZM own rates.

Bureau of Economic Analysis
Gross domestic product.

Bureau of Labor Statistics
Consumer price index.

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

Federal Reserve Bank of St. Louis
Adjusted monetary base and adjusted total reserves, monetary services index, 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 and Poors Inc.
Stock price-earnings ratio, stock price composite index.

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

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Note: Articles from this Bank's *Review* are available on the Internet at www.stls.frb.org/research/reviewdat.html.