Monetary*Trends*

THE FEDERAL RESERVE BANK of ST. LOUIS

Quality Spreads in the Bond Market

Modern option-pricing theory shows that corporate bonds are equivalent to default-risk free government bonds with the same promised payment streams (and thus the same maturities) except that a corporate bond conveys an implicit put option to the firm's shareholders. This put option is the right to default with limited liability, that is to walk away from the firm and leave it to the bondholders. The option can be exercised any day up to and including the bond's maturity date. The value of the corporate bond to its holder thus equals the value of the default-risk free bond minus the value of the shareholders' put option.
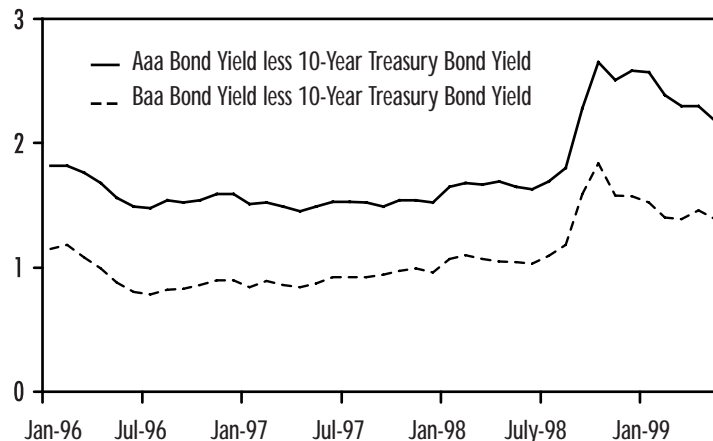
The value of the put option increases with the probability that the option will be "in the money" on the maturity date or any prior day. The option is in the money if (and only if) the value of the firm's assets is lower than the present value of the promised payments to the bondholders (discounted at the default-risk free rate of return). All else being equal, the value of the put increases with the volatility of the firm's earnings and a decrease in the expected level of its earnings. The market value of the put option implicit in corporate debt is reflected in the quality spread: the difference between the market yields of a corporate bond and of a comparable default-risk free government bond.

The Russian default on domestic debt in late August 1998 sharply increased volatility in financial markets (see *Monetary Trends*, May 1999). As the chart indicates, the quality spread between corporate bonds and U.S. treasury bonds increased from 1.09 percent (Aaa-rated bonds) and 1.69 (Baa-rated bonds) in July 1998 to 1.84 percent (Aaa) and 2.65 percent (Baa) in October 1998. More than half a year later, Aaa and Baa spreads of 1.39 percent and 2.18 percent, respectively, are still well above the January 1996 - July 1998 average values of 0.95 percent and 1.59 percent.

Many observers have suggested that illiquidity in corporate bond markets explains the increased quality spreads, at least initially. This explanation no longer seems compelling, however, as spreads remain high in mid-1999. It is possible that the sharp increase of the quality spread in the wake of the Russian default was due in part also to a downward revision of expected corporate earnings. As U.S. economic growth accelerated in the last quarter of 1998 and remained high in the first quarter of 1999, however, a near-term decline in expected earnings appears to be an unlikely explanation for the persistence of large quality spreads. More plausibly, bond investors have recognized a heightened and persisting degree of fundamental business risk that makes the right of corporate owners to default on debt payments—the put option—more valuable. This, in turn, depresses corporate bond prices and generates the higher quality spreads that prevail today.

—Frank A. Schmid

Quality Spreads in the U.S. Bond Market
(Monthly Observations, January 1996-May 1999)

— Aaa Bond Yield less 10-Year Treasury Bond Yield
- - Baa Bond Yield less 10-Year Treasury Bond Yield

Notes: Corporate Bond Yields are Moody's Seasoned Yields.
Treasury Bond Yields are Constant Maturities Yields.

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: $[(x_t / x_{t-12}) - 1] \times 100$.
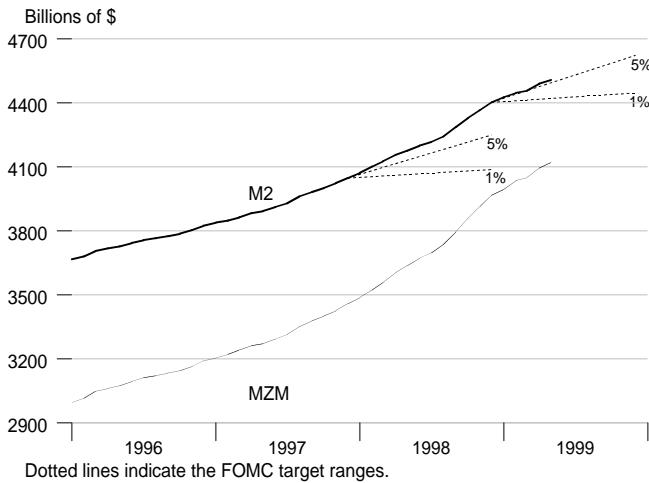
We welcome your comments addressed to:
Editor, *Monetary Trends*
Research Division
Federal Reserve Bank of St. Louis
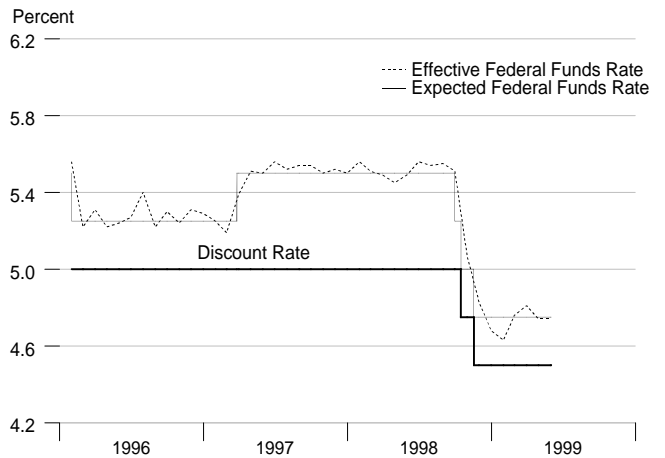P.O. Box 442
St. Louis, MO 63166
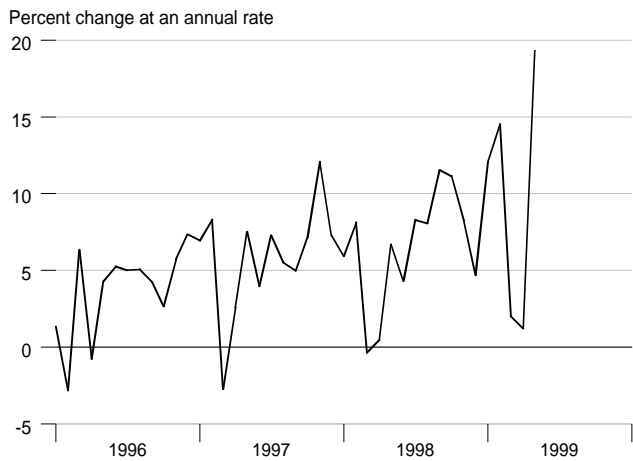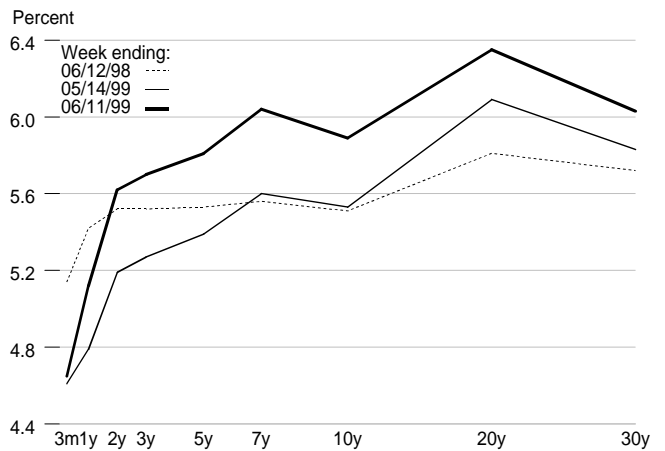
or to:
webmaster@stls.frb.org

M2 and MZM

Billions of $

M2

MZM

5%

1%

5%

1%

Dotted lines indicate the FOMC target ranges.

Reserve Market Rates

Percent

Effective Federal Funds Rate
Expected Federal Funds Rate

Discount Rate

Adjusted Monetary Base

Percent change at an annual rate

Treasury Yield Curve

Percent

Week ending:
06/12/98
05/14/99
06/11/99

3m 1y 2y 3y   5y   7y   10y   20y   30y

Total Bank Credit

Percent change at an annual rate
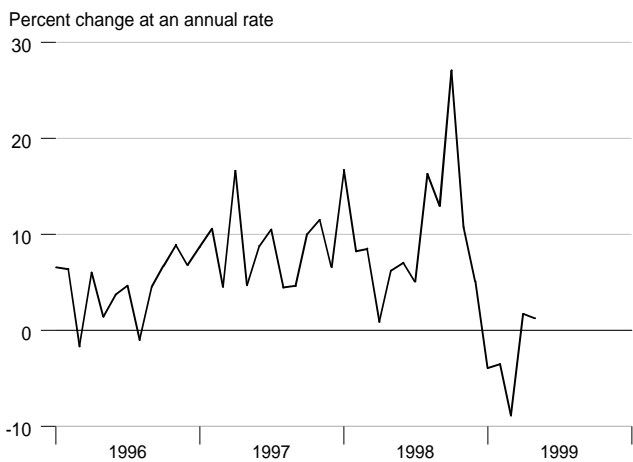
Interest Rates

	Mar 99	Apr 99	May 99
Federal Funds Rate	4.81	4.74	4.74
Discount Rate	4.50	4.50	4.50
Prime Rate	7.75	7.75	7.75
Conventional Mortgage Rate	7.04	6.92	7.15
Treasury Yields:			
3-month constant maturity	4.57	4.41	4.63
6-month constant maturity	4.65	4.54	4.75
1-year constant maturity	4.78	4.69	4.85
3-year constant maturity	5.11	5.03	5.33
5-year constant maturity	5.14	5.08	5.44
10-year constant maturity	5.23	5.18	5.54
30-year constant maturity	5.58	5.55	5.81

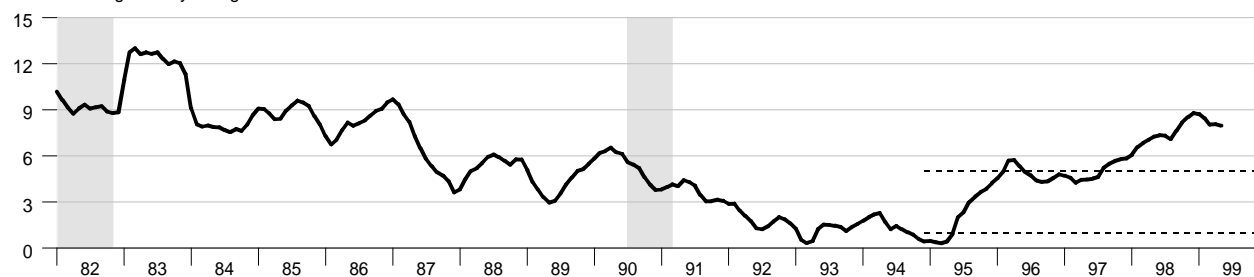**Federal Reserve Bank of St. Louis**

MZM and M1
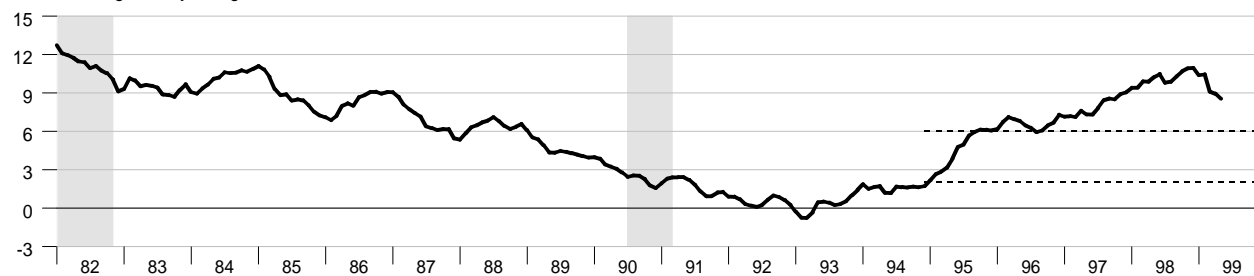
Percent change from year ago

MZM

M1

M2
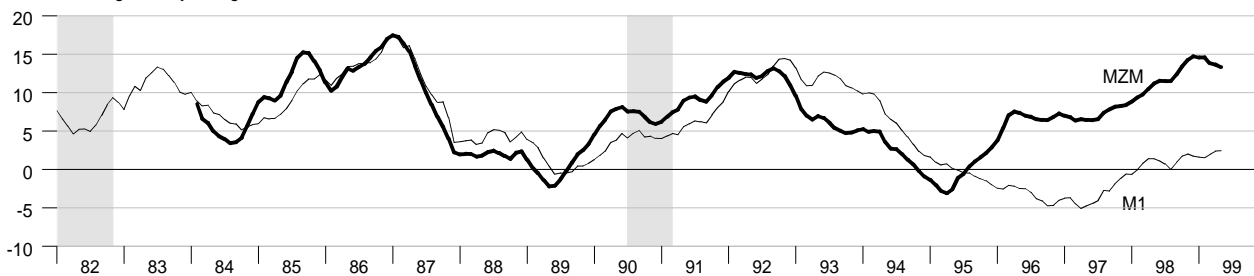
Percent change from year ago

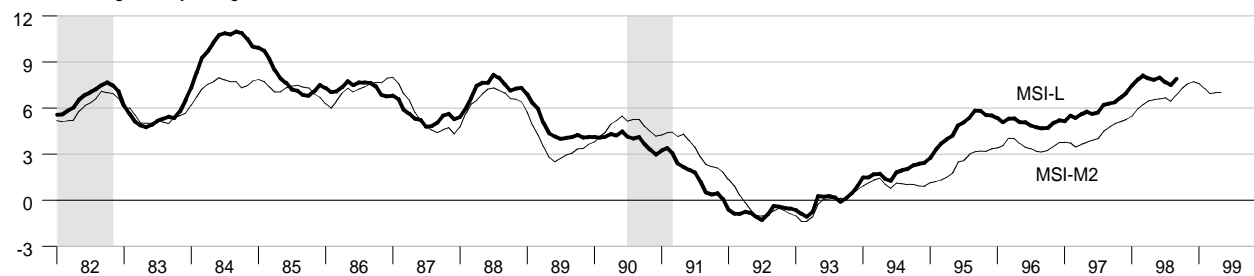Dotted lines indicate the FOMC target ranges.

M3

Percent change from year ago

Dotted lines indicate the FOMC target ranges.

Monetary Services Indexes - M2 and L

Percent change from year ago

MSI-L

MSI-M2

Federal Reserve Bank of St. Louis

Adjusted Monetary Base

Percent change from year ago

Domestic Nonfinancial Debt

Percent change from year ago
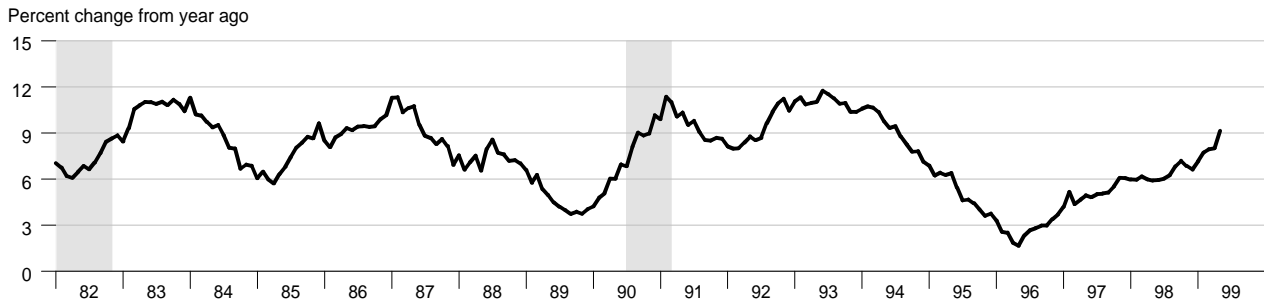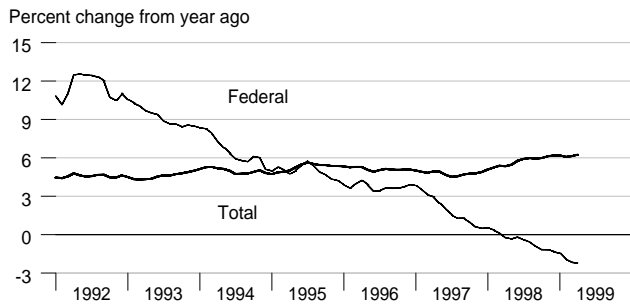
Currency Held by the Nonbank Public

Percent change from year ago

Time Deposits

Percent change from year ago
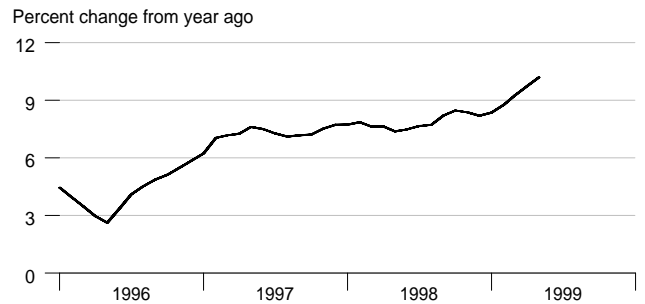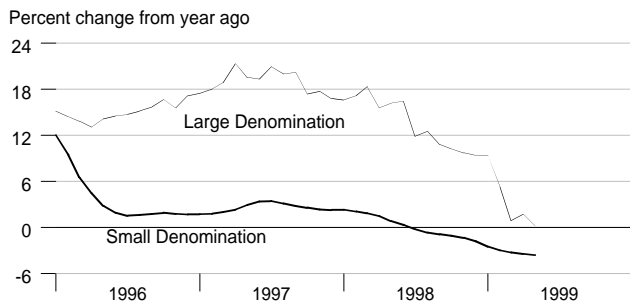
Checkable and Savings Deposits

Percent change from year ago

Money Market Mutual Fund Shares

Percent change from year ago
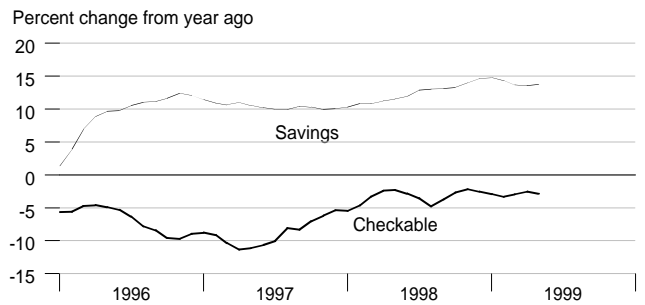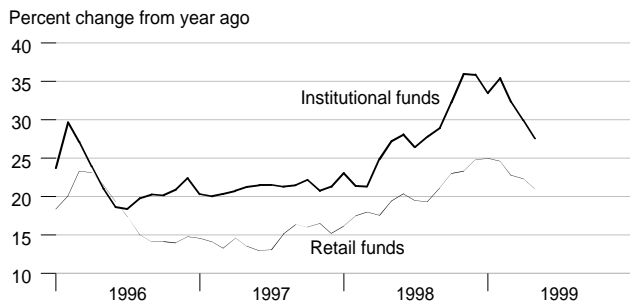
Repurchase Agreements and Eurodollars

Billions of dollars   Billions of dollars
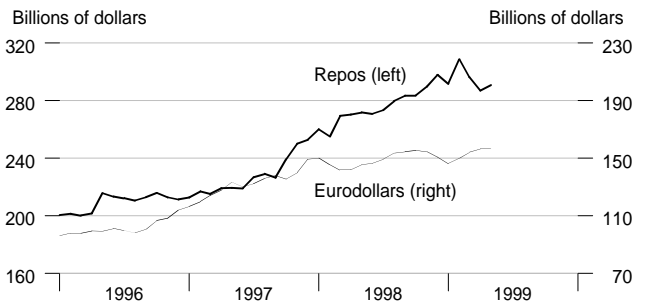
MZM and M1

Percent change at an annual rate
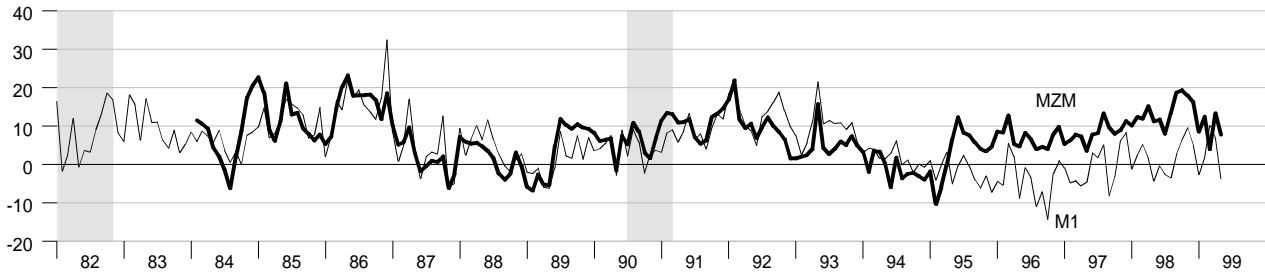
M2

Percent change at an annual rate
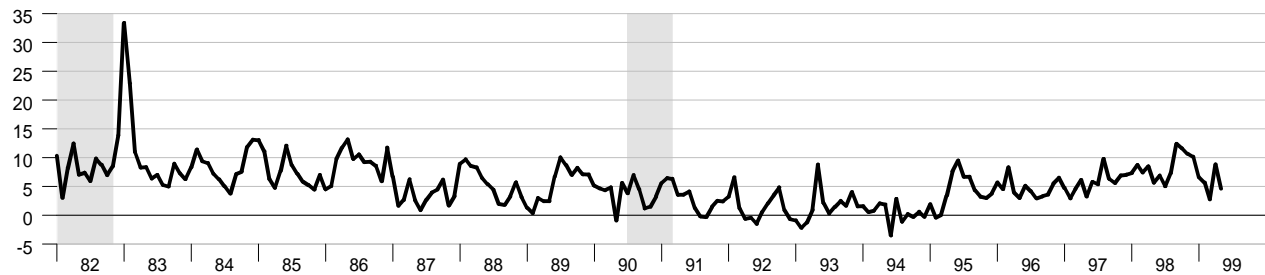
M3

Percent change at an annual rate

L

Percent change at an annual rate

Federal Reserve Bank of St. Louis
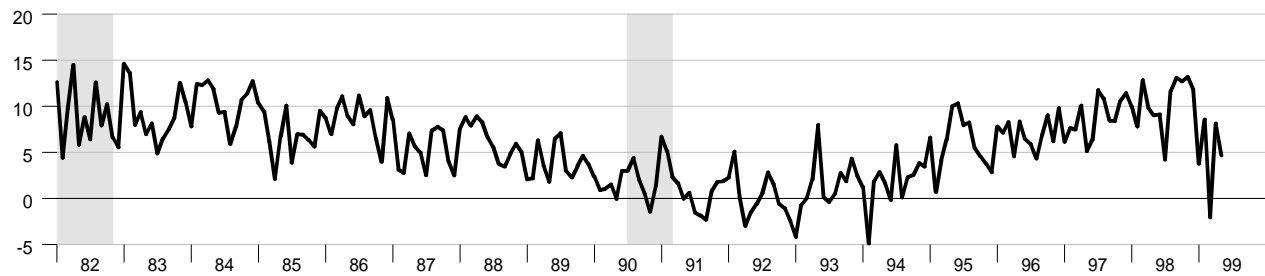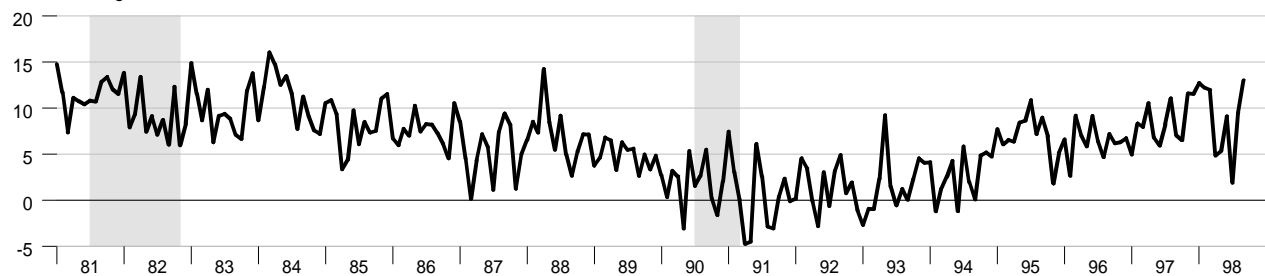
Adjusted and Required Reserves

Billions of $
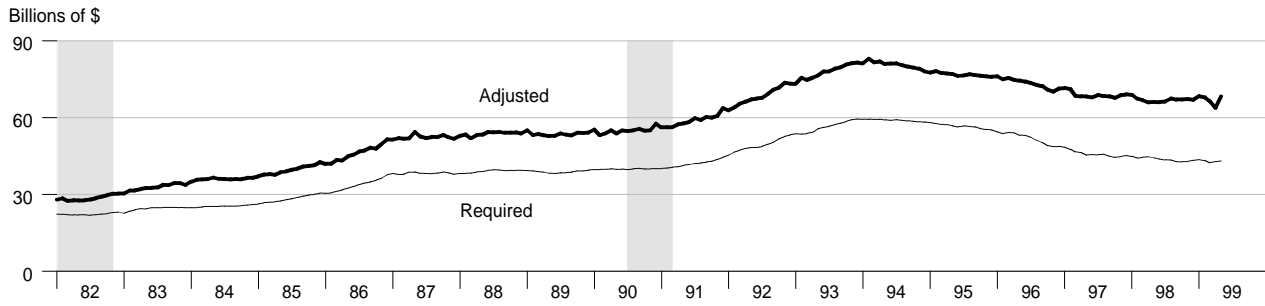
Total Borrowings, nsa

Billions of $
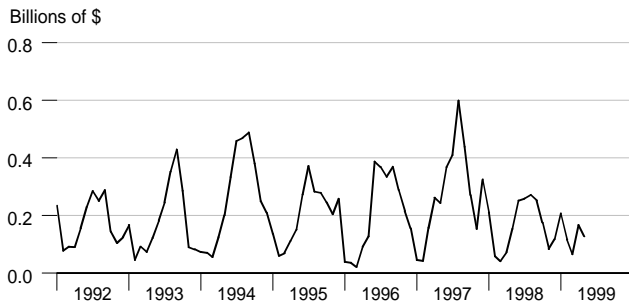
Excess Reserves plus RCB Contracts

Billions of $

Nonfinancial Commercial Paper

Percent change from year ago

Consumer Credit

Percent change from year ago

Federal Reserve Bank of St. Louis
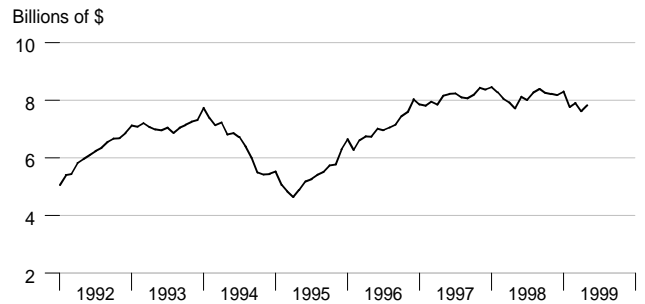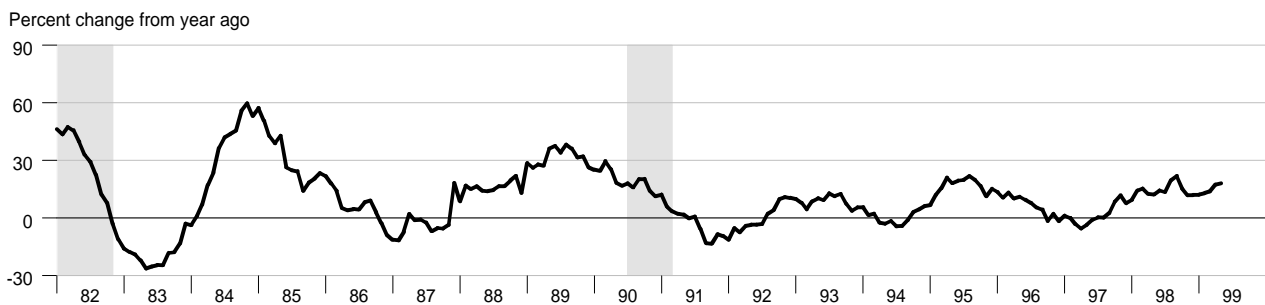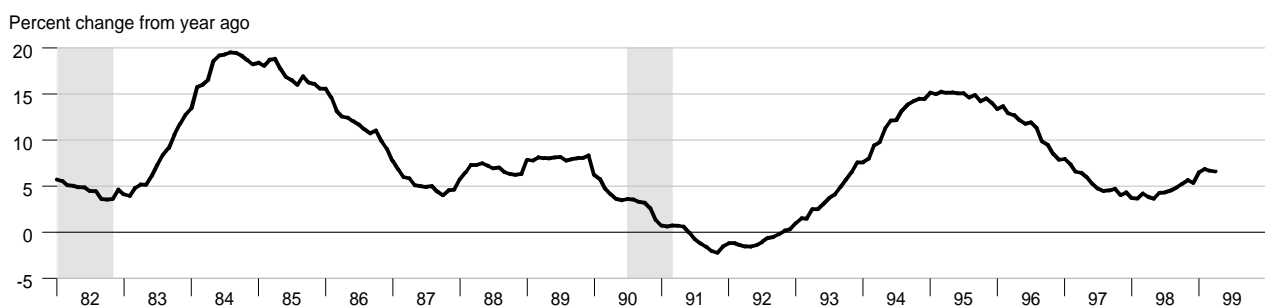
Inflation and Inflation Expectations

Percent

Federal Reserve Bank of Philadelphia

CPI inflation

Humphrey-Hawkins inflation range

University of Michigan

The shaded region shows the Humphrey-Hawkins CPI inflation range. See page 19 for information.
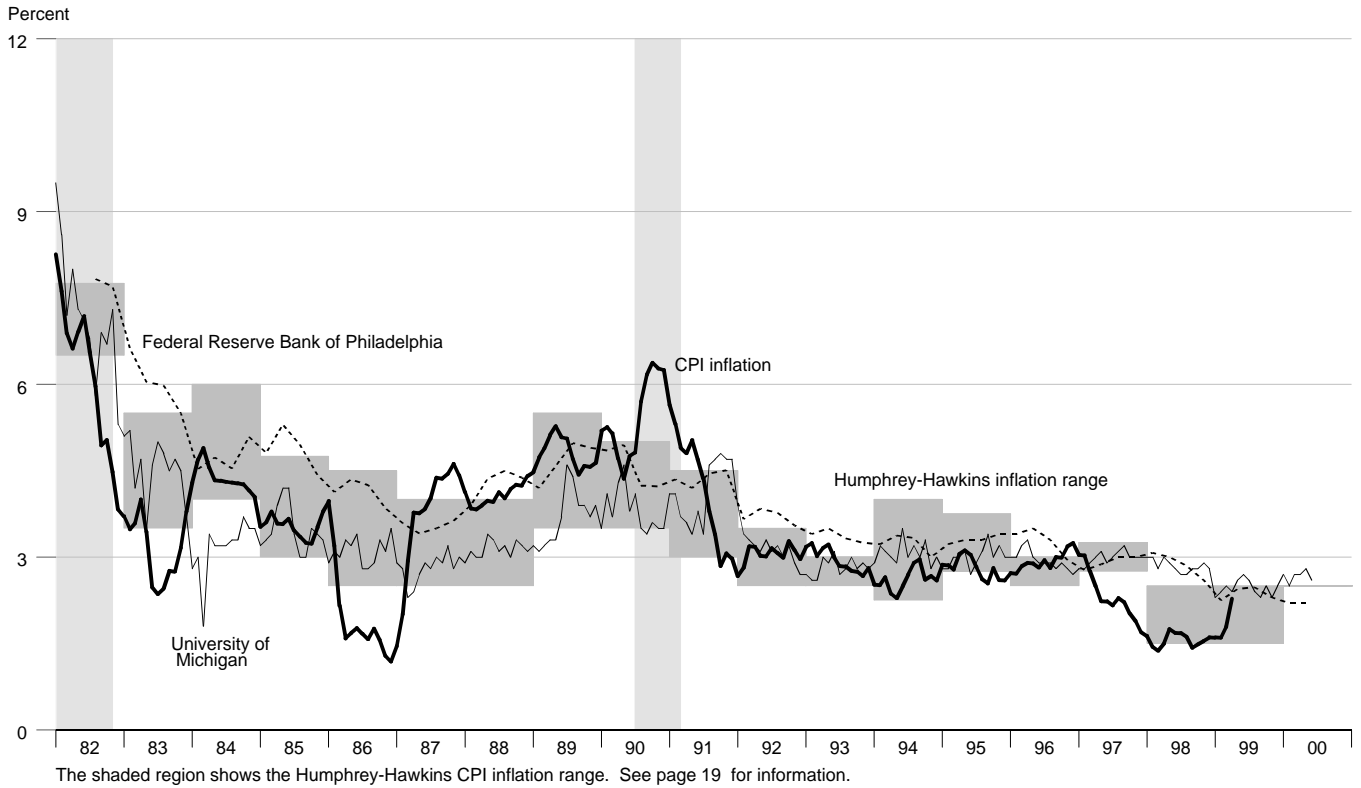
Treasury Security Yield Spreads
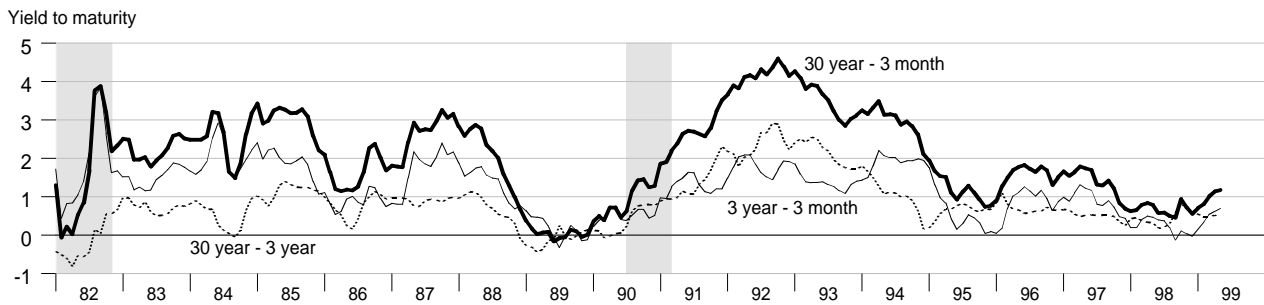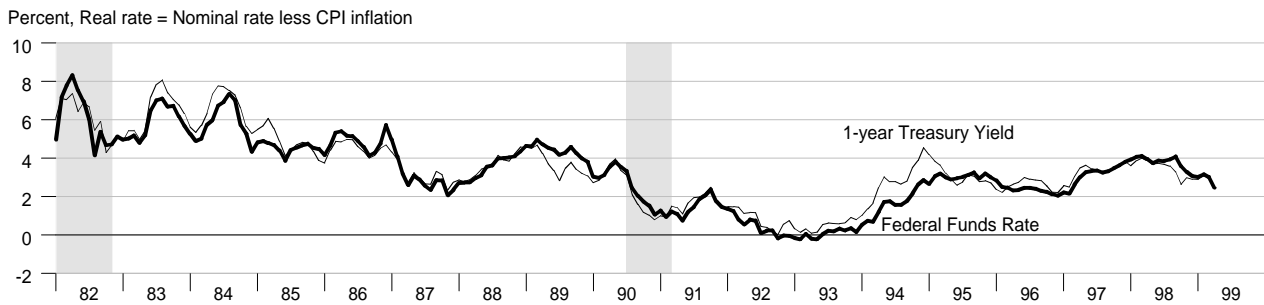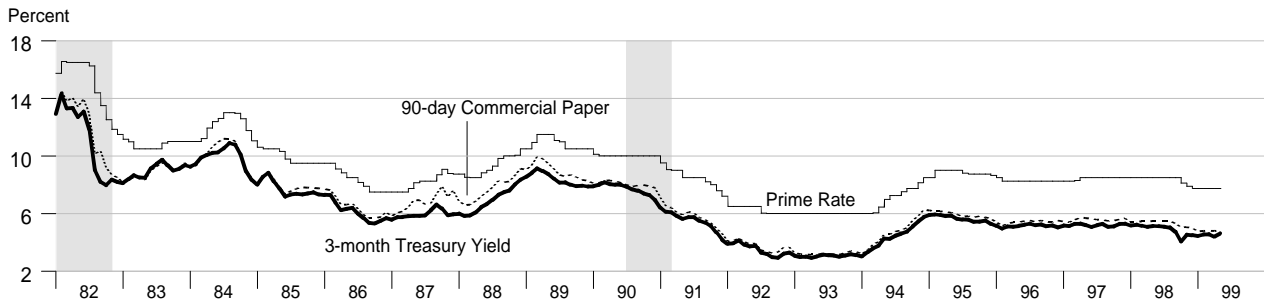
Yield to maturity

30 year - 3 month

3 year - 3 month

30 year - 3 year

Real Interest Rates

Percent, Real rate = Nominal rate less CPI inflation

1-year Treasury Yield

Federal Funds Rate

Short Term Interest Rates

Percent

90-day Commercial Paper

Prime Rate

3-month Treasury Yield

Long Term Interest Rates

Percent

Conventional mortgage

Corporate Aaa

30-year Treasury Yield

Long Term Interest Rates

Percent

Corporate Baa

30-year Treasury Yield

10-year Treasury Yield

Short Term Interest Rates

Percent

90-day Commercial Paper

3-month Treasury Yield
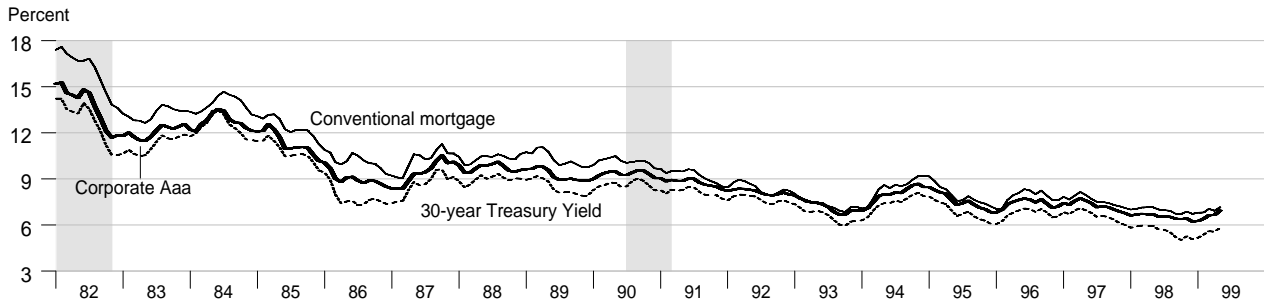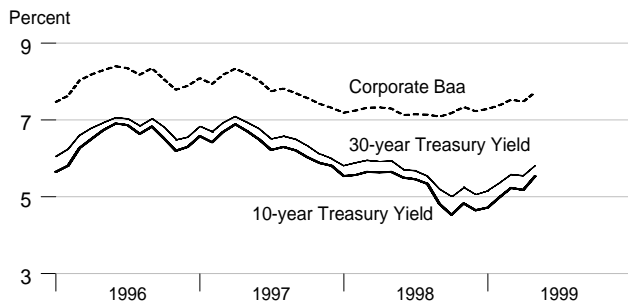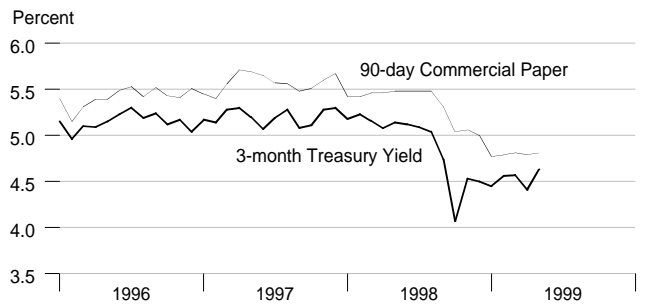
FOMC Expected Federal Funds Rate and Discount Rate

Percent

Federal Funds Rate

Discount Rate

Federal Funds Rate and Inflation Targets

Percent

4% 3% 2% 1% 0%   Target Inflation Rates

Actual

Calculated federal funds rate is based on Taylor's rule. See notes on page 19.
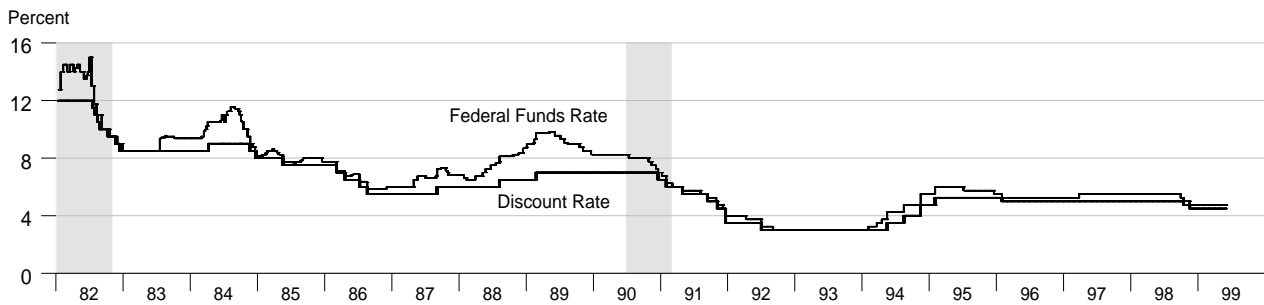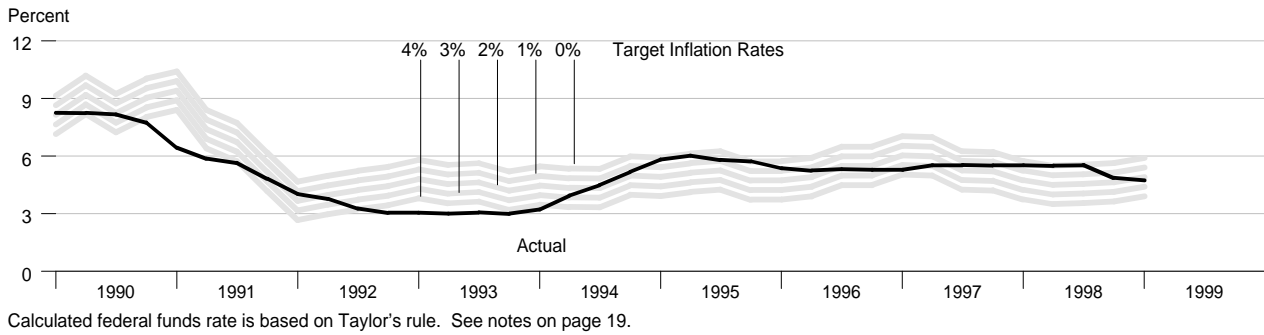
Actual and Potential Real GDP

Billions of chain-weighted dollars

Potential

Actual

Actual CPI Inflation

Percent change from year ago

Monetary Base Growth* and Inflation Targets

Percent

Actual (2-year moving average)
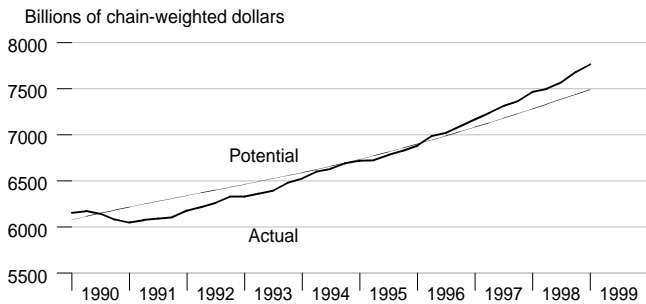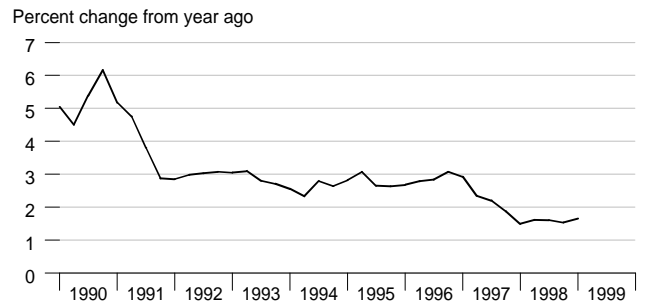
0% 1% 2% 3% 4%   Target Inflation Rates
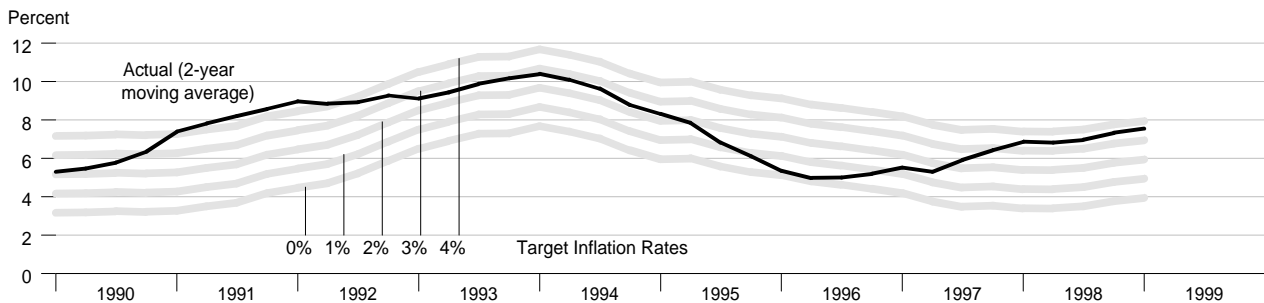
*Modified for the effects of sweeps programs on reserve demand.
Calculated base growth is based on McCallum's rule. See notes on page 19.

Monetary Base Velocity Growth
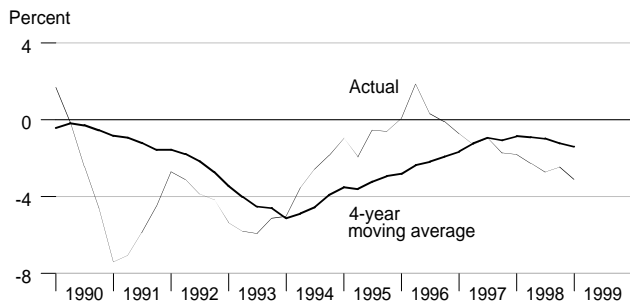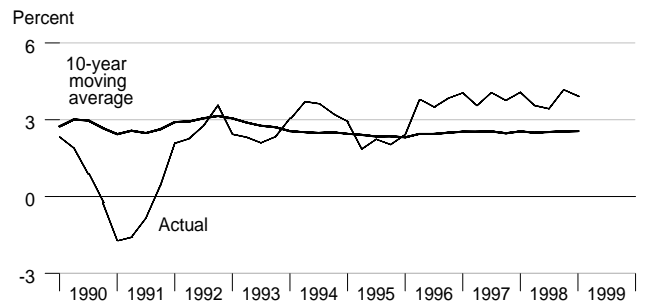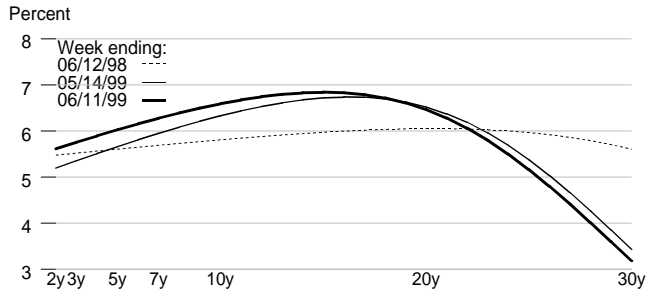
Percent

Actual

4-year moving average

Real Output Growth

Percent

10-year moving average

Actual

Implied One-Year Forward Rates

Percent

Week ending:
06/12/98
05/14/99
06/11/99

Rates on 3-Month Eurodollar Futures

Percent, daily data

Aug 1999

Jul 1999

Jun 1999

Rates on Selected Fed Funds Futures Contracts

Percent, daily data

Aug 1999

Jul 1999

Jun 1999

Implied Yields on Fed Funds Futures

Percent

06/11/1999

05/14/1999

04/16/1999

Inflation-Protected Treasury Yields

Percent, weekly data

5-year

30-year

10-year

Inflation-Protected Treasury Yield Spreads

Percent, weekly data

10-year

30-year

5-year
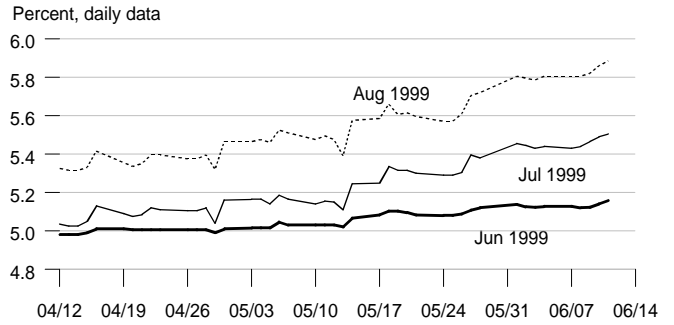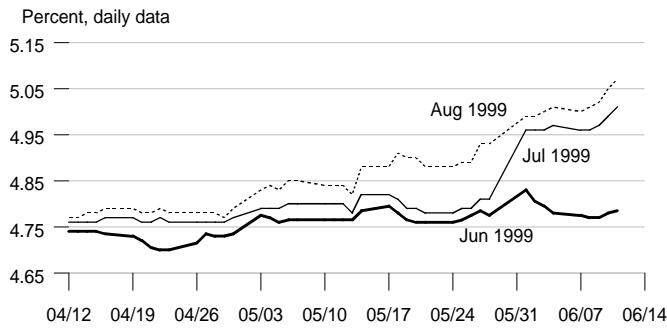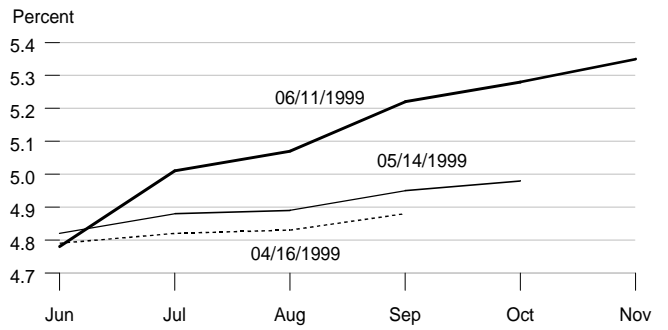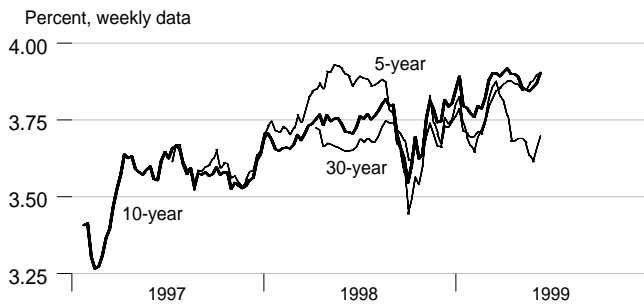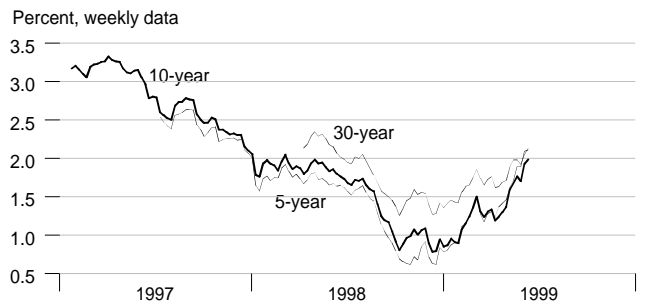
Inflation-Indexed 30-Year Bonds

Percent, weekly data

Canada

UK

US
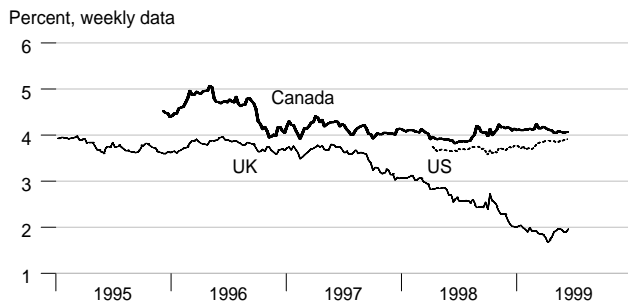
Inflation-Indexed 10-Year Bonds
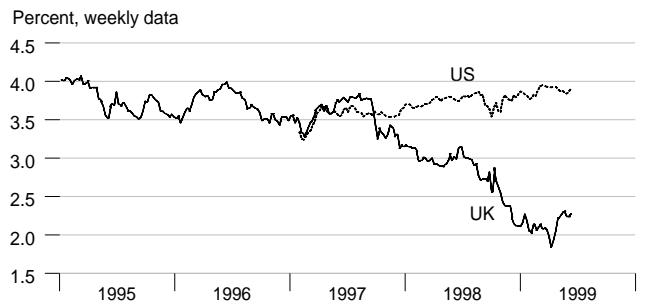
Percent, weekly data

US

UK

Federal Reserve Bank of St. Louis

MZM Velocity and Opportunity Cost

Velocity = Nominal GDP / MZM   Opportunity Cost = 3 month T-bill rate less MZM own rate

M2 Velocity and Opportunity Cost

Velocity = Nominal GDP / M2   Opportunity Cost = Treasury rate less M2 own rate

M2, MZM and Nominal GDP

Billions of $
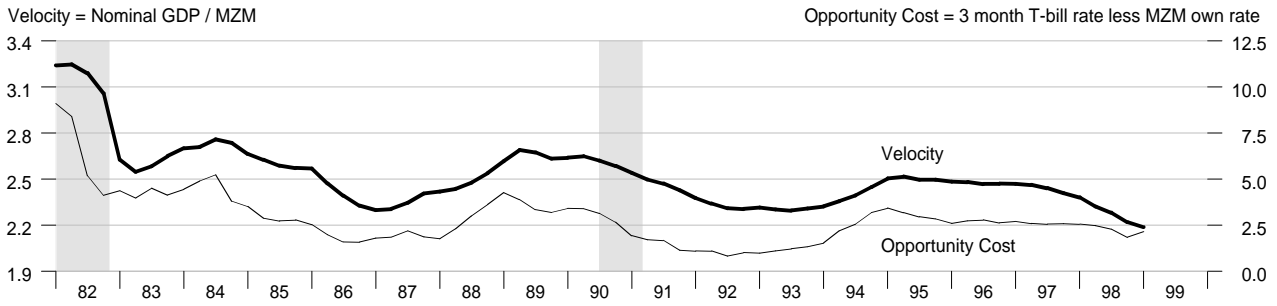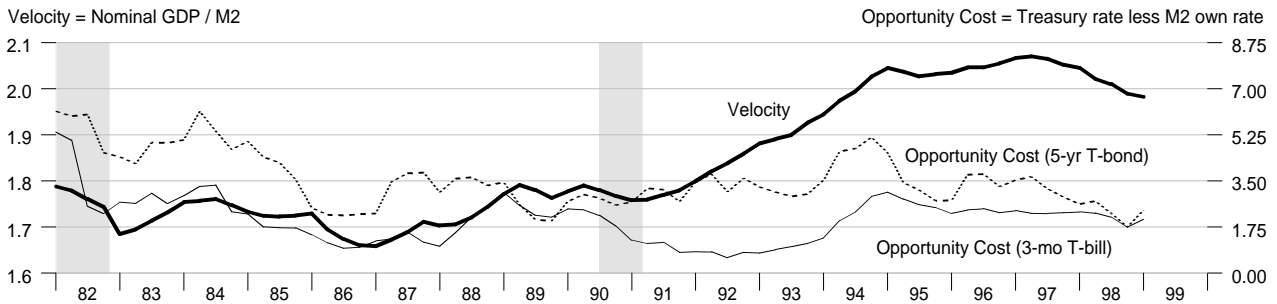
Interest Rates

Percent
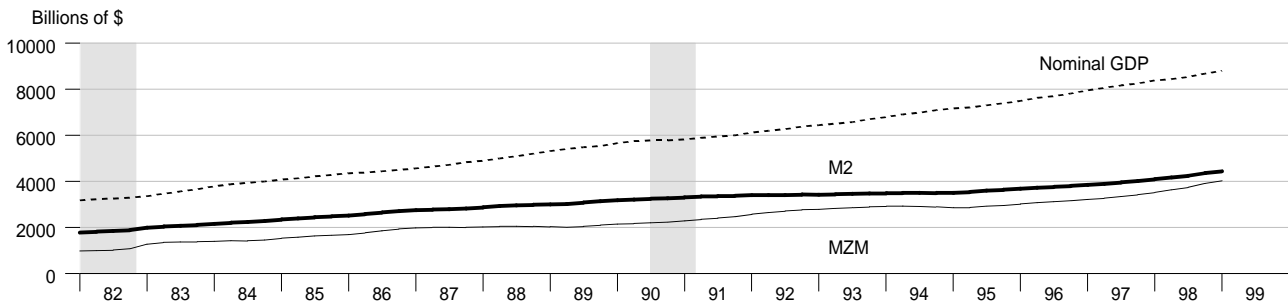
Federal Reserve Bank of St. Louis
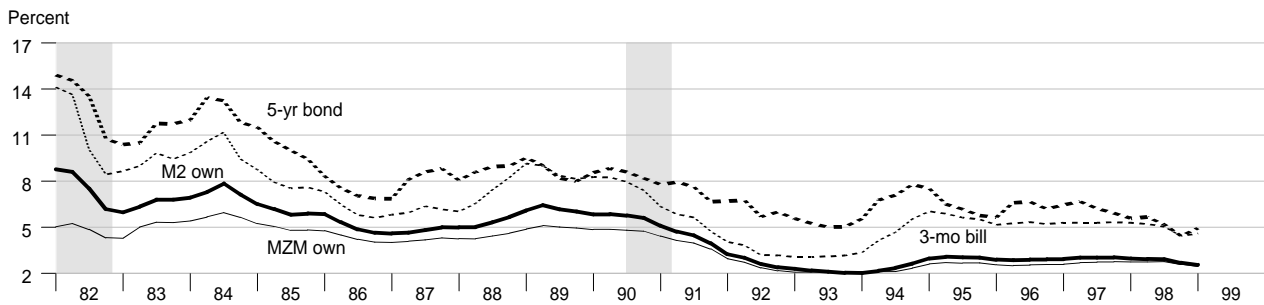
Real Gross Domestic Product

Percent change from year ago
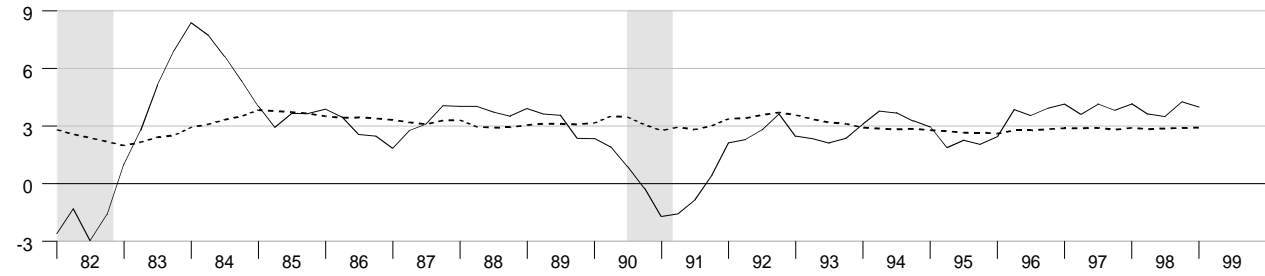
Gross Domestic Product

Percent change from year ago
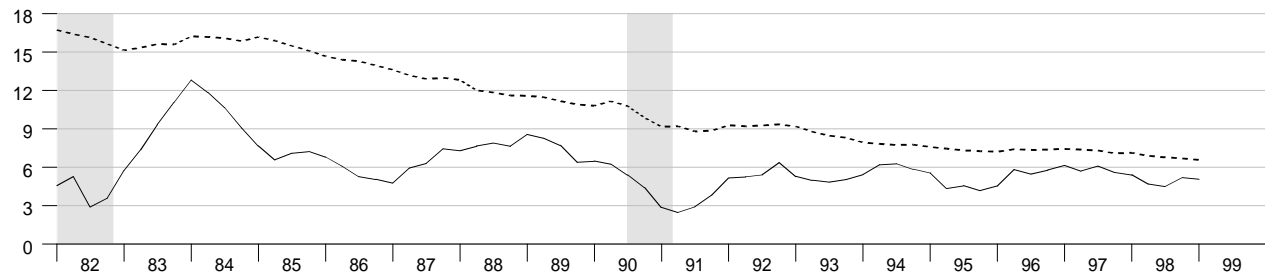
Gross Domestic Product Price Index

Percent change from year ago

M2
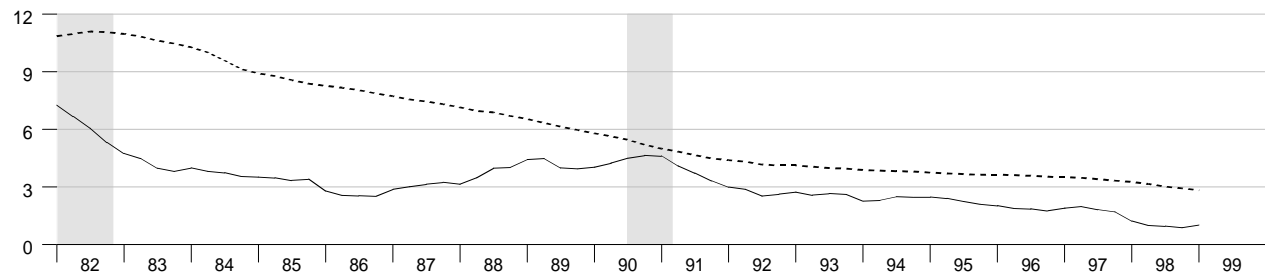
Percent change from year ago
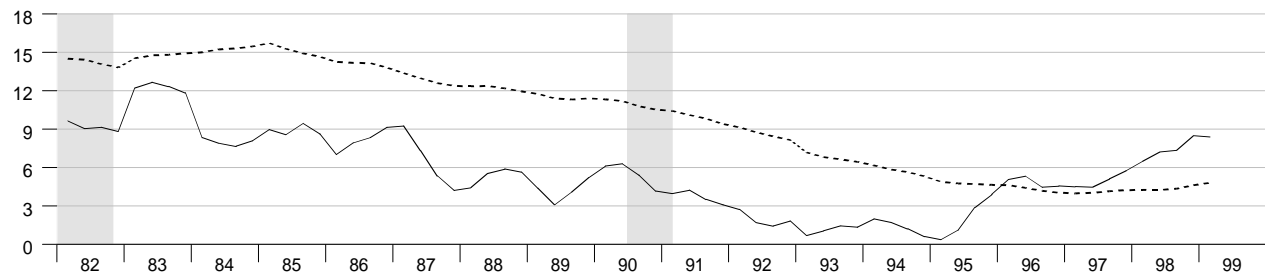
Dashed lines indicate 10-year moving averages

Federal Reserve Bank of St. Louis

Bank Credit

Percent change from year ago
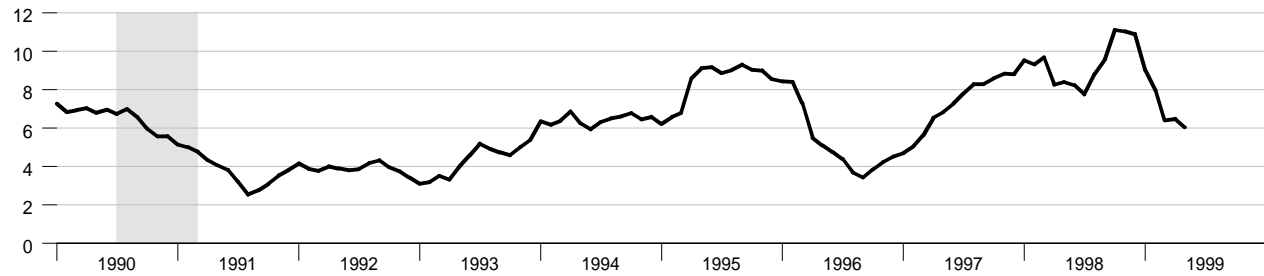
Investment Securities in Bank Credit at Commercial Banks

Percent change from year ago
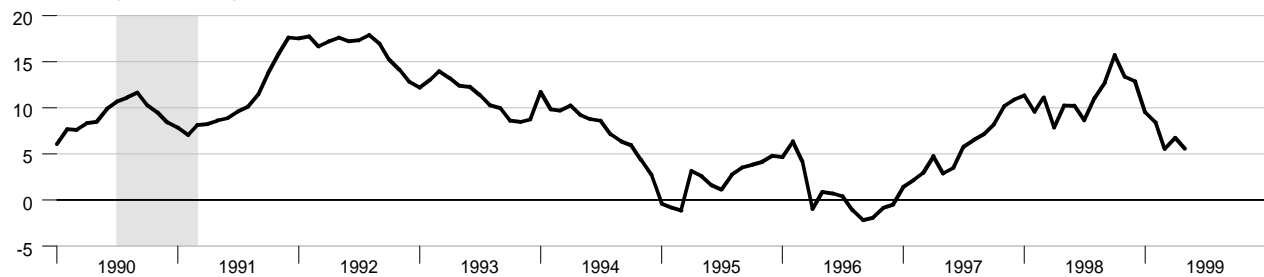
Total Loans and Leases in Bank Credit at Commercial Banks

Percent change from year ago
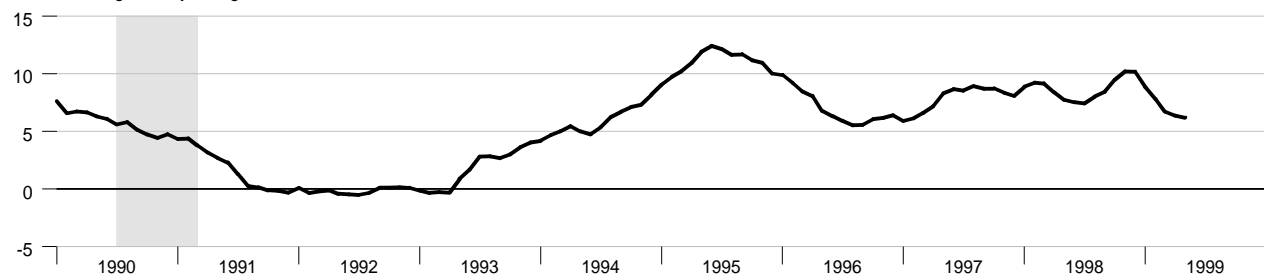
Commercial and Industrial Loans at Commercial Banks

Percent change from year ago

Federal Reserve Bank of St. Louis
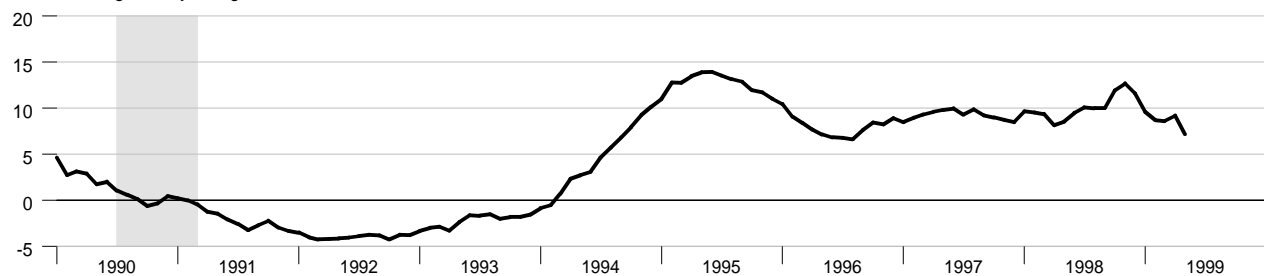
Standard and Poor's 500
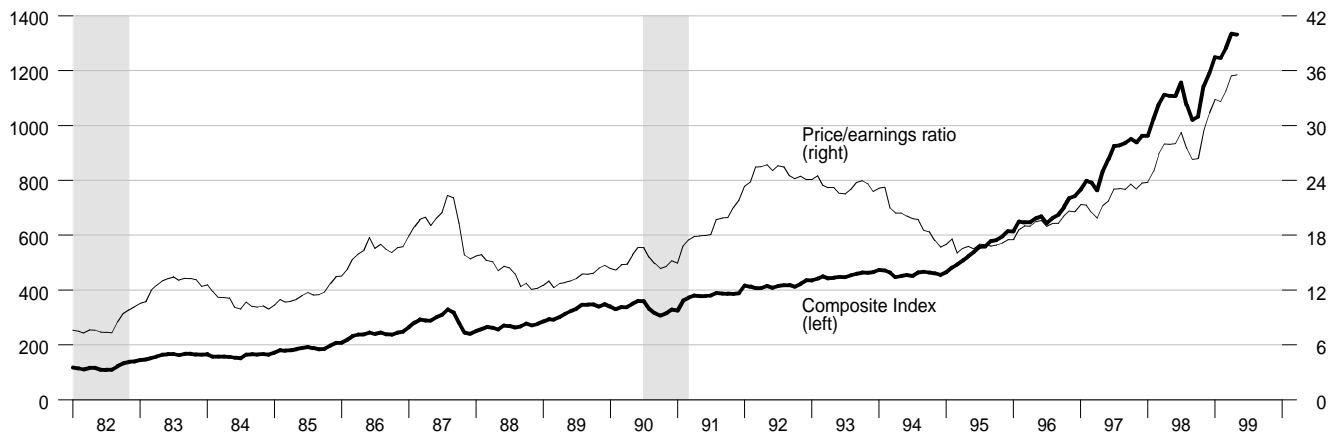
Inflation and Long-Term Interest Rates

	Trend in Consumer Price Inflation Rates Percent change from year ago				Recent Long-Term Government Bond Rates Percent			
	1998Q2	1998Q3	1998Q4	1999Q1	Feb99	Mar99	Apr99	May99
United States	1.62	1.62	1.48	1.73	5.60	5.81	5.77	6.04
Canada	0.95	0.87	1.13	0.86	5.26	5.34	5.26	.
France	1.13	0.69	0.43	0.35	4.42	4.39	.	.
Germany	1.38	0.65	0.48	0.24	3.85	4.04	3.85	.
Italy	2.06	2.06	1.75	1.38	4.06	4.28	4.13	4.31
Japan	0.37	-0.27	0.46	-0.09	1.85	1.84	.	.
United Kingdom	4.02	3.34	3.00	2.20	4.45	4.66	4.59	.

Inflation and Long-Term Interest Rates Differentials

Federal Reserve Bank of St. Louis
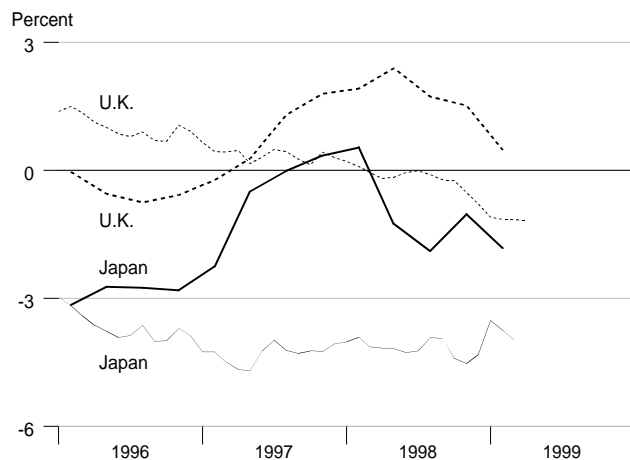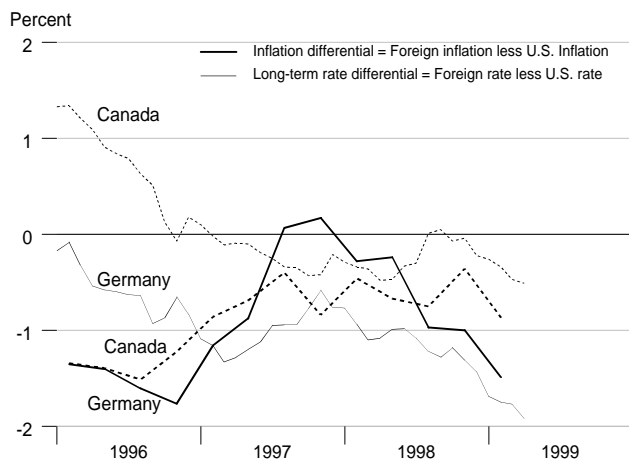
		Money Stock			Bank			
	M1	**M2**	**M3**	**L**	**Credit**	**Monetary Base**	**Reserves**	**MSI M2**
1994	1145.340	3500.100	4303.777	5256.565	3230.435	421.574	80.684	205.514
1995	1142.820	3572.376	4499.721	5554.661	3500.570	443.511	76.849	210.302
1996	1106.126	3745.602	4796.153	5928.831	3684.414	455.586	73.415	217.734
1997	1069.573	3931.523	5176.818	6372.562	3950.780	478.753	68.918	226.998
1998	1079.456	4222.045	5703.293		4321.883	508.978	66.952	242.118
1997 1	1076.381	3849.912	5012.702	6175.405	3823.085	470.027	70.409	222.783
2	1065.603	3895.604	5110.126	6305.462	3916.909	473.896	68.177	225.083
3	1068.155	3957.266	5229.446	6433.221	3990.535	480.945	68.565	228.293
4	1068.155	4023.310	5354.997	6576.161	4072.592	490.144	68.519	231.833
1998 1	1076.826	4099.473	5492.880	6777.780	4186.511	498.387	67.711	235.870
2	1079.349	4176.201	5631.574	6911.261	4241.808	502.060	66.084	239.810
3	1074.077	4247.762	5752.079	7029.558	4338.190	511.592	66.951	243.503
4	1087.571	4364.742	5936.638		4521.021	523.871	67.063	249.290
1999 1	1095.063	4443.509	6041.378		4512.354	536.301	67.557	253.047
1997 May	1063.367	3892.846	5108.331	6306.876	3912.468	474.355	68.255	224.940
Jun	1065.992	3911.589	5135.525	6338.072	3941.100	475.927	67.939	225.950
Jul	1067.570	3929.064	5185.878	6381.473	3975.550	478.813	68.897	226.850
Aug	1072.076	3961.052	5232.781	6440.270	3990.316	481.011	68.465	228.460
Sep	1064.818	3981.681	5269.679	6477.919	4005.739	483.012	68.333	229.570
Oct	1062.064	4000.166	5306.691	6513.130	4039.262	485.892	67.709	230.580
Nov	1067.528	4023.132	5353.640	6576.023	4078.030	490.783	68.772	231.760
Dec	1074.873	4046.631	5404.660	6639.329	4100.483	493.756	69.076	233.160
1998 Jan	1073.810	4071.363	5449.626	6709.736	4157.577	496.198	68.918	234.440
Feb	1076.021	4100.889	5485.171	6777.996	4186.140	499.555	67.414	235.910
Mar	1080.646	4126.168	5543.843	6845.609	4215.817	499.408	66.801	237.260
Apr	1082.094	4155.243	5589.265	6873.322	4218.943	499.601	66.000	238.890
May	1078.171	4174.757	5631.330	6904.054	4240.814	502.385	66.134	239.670
Jun	1077.782	4198.602	5674.127	6956.407	4265.667	504.193	66.117	240.870
Jul	1075.365	4216.112	5694.154	6967.492	4283.761	507.677	66.366	241.990
Aug	1072.214	4241.707	5749.666	7022.501	4341.927	511.093	67.434	243.200
Sep	1074.653	4285.467	5812.418	7098.681	4388.882	516.006	67.052	245.320
Oct	1080.404	4326.876	5874.069		4487.879	520.803	67.055	247.370
Nov	1088.956	4365.256	5938.646		4527.988	524.379	67.183	249.340
Dec	1093.354	4402.094	5997.198		4547.196	526.432	66.952	251.160
1999 Jan	1090.953	4426.173	6016.177		4532.335	531.713	68.375	252.270
Feb	1092.499	4447.084	6059.122		4519.041	538.145	67.918	253.110
Mar	1101.738	4457.271	6048.834		4485.685	539.045	66.379	253.760
Apr	1108.001	4489.916	6089.798		4492.102	539.597	63.801	255.620
May	1104.561	4507.123	6113.533		4496.877	548.275	68.266	256.500

*All values are given in billions of dollars

Federal Reserve Bank of St. Louis

		Federal Funds	Discount Rate	Prime Rate	3-mo CDs	Treasury Yields			Corporate Aaa Bonds	S & L Aaa Bonds	Conventional Mortgage
						3 mo	3 yr	30 yr			
	1994	4.20	3.60	7.14	4.63	4.37	6.26	7.37	7.96	5.77	8.35
	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
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
1997	May	5.50	5.00	8.50	5.70	5.20	6.42	6.94	7.58	5.48	7.94
	Jun	5.56	5.00	8.50	5.66	5.07	6.24	6.77	7.41	5.33	7.69
	Jul	5.52	5.00	8.50	5.60	5.19	6.00	6.51	7.14	5.24	7.50
	Aug	5.54	5.00	8.50	5.60	5.28	6.06	6.58	7.22	5.25	7.48
	Sep	5.54	5.00	8.50	5.60	5.08	5.98	6.50	7.15	5.19	7.43
	Oct	5.50	5.00	8.50	5.65	5.11	5.84	6.33	7.00	5.19	7.29
	Nov	5.52	5.00	8.50	5.74	5.28	5.76	6.11	6.87	5.19	7.21
	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		7.15

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

Federal Reserve Bank of St. Louis

		M1	**M2**	**MZM**	**M3**	**L**
Percent change from previous period						
	1994	6.17	1.38	2.61	1.60	2.37
	1995	-0.22	2.06	-0.47	4.55	5.67
	1996	-3.21	4.85	6.54	6.59	6.74
	1997	-3.30	4.96	7.18	7.94	7.48
	1998	0.92	7.39	11.61	10.17	
1997	1	-0.47	1.19	1.77	1.88	1.66
	2	-1.00	1.19	1.63	1.94	2.11
	3	0.24	1.58	2.23	2.33	2.03
	4	0.00	1.67	2.39	2.40	2.22
1998	1	0.81	1.89	2.76	2.57	3.07
	2	0.23	1.87	3.25	2.52	1.97
	3	-0.49	1.71	2.91	2.14	1.71
	4	1.26	2.75	4.53	3.21	
1999	1	0.69	1.80	2.93	1.76	
1997	May	-0.38	0.27	0.29	0.43	0.57
	Jun	0.25	0.48	0.65	0.53	0.49
	Jul	0.15	0.45	0.68	0.98	0.68
	Aug	0.42	0.81	1.11	0.90	0.92
	Sep	-0.68	0.52	0.80	0.71	0.58
	Oct	-0.26	0.46	0.66	0.70	0.54
	Nov	0.51	0.57	0.74	0.88	0.97
	Dec	0.69	0.58	0.94	0.95	0.96
1998	Jan	-0.10	0.61	0.84	0.83	1.06
	Feb	0.21	0.73	1.02	0.65	1.02
	Mar	0.43	0.62	0.99	1.07	1.00
	Apr	0.13	0.70	1.26	0.82	0.40
	May	-0.36	0.47	0.93	0.75	0.45
	Jun	-0.04	0.57	0.97	0.76	0.76
	Jul	-0.22	0.42	0.67	0.35	0.16
	Aug	-0.29	0.61	1.11	0.97	0.79
	Sep	0.23	1.03	1.56	1.09	1.08
	Oct	0.54	0.97	1.61	1.06	
	Nov	0.79	0.89	1.50	1.10	
	Dec	0.40	0.84	1.35	0.99	
1999	Jan	-0.22	0.55	0.71	0.32	
	Feb	0.14	0.47	1.03	0.71	
	Mar	0.85	0.23	0.33	-0.17	
	Apr	0.57	0.73	1.11	0.68	
	May	-0.31	0.38	0.65	0.39	

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.

M2: M1 plus: savings 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).

L: M3 plus: U.S. savings bonds, short-term Treasury securities, commercial paper, and bankers acceptances held by households and by firms other than depository institutions and money market mutual funds.

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.

Note: The above 6 series are constructed and published by the Board of Governors of the Federal Reserve System, Washington, D.C. For details, see *Federal Reserve Bulletin,* tables 1.21 and 1.26.

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). On pages 4 and 6, MZM prior to January 1984 is not shown due to distortions caused by regulatory changes, including the introduction of liquid deposit accounts not subject to binding interest rate ceilings.

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 and L; additional data are available at http://www.stls.frb.org/research/msi/index.html.

Note: The above 4 series are constructed and published by the Research Division of the Federal Reserve Bank of St. Louis, St. Louis MO.

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 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 01/15/2007.

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 1992 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 1992 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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