Monetary Trends

September 2007

Measure for Measure: Headline versus Core Inflation

When discussing long-run inflation trends, members of the Federal Open Market Committee (FOMC) have tended to emphasize the "core" measure—which excludes food and energy prices—over the corresponding headline measure, which does not. It is not that policymakers believe that food and energy prices do not affect economic decisions; they know very well it is headline inflation that matters for household welfare. Rather, as Chairman Bernanke noted in his July 18 monetary policy report to Congress, the emphasis on core measures is motivated by a desire to track and predict *persistent* inflation: "Food and energy prices tend to be quite volatile, so that, looking forward, core inflation (which excludes food and energy prices) may be a better gauge than overall [headline] inflation of underlying inflation trends."

Despite close, long-run similarities between core and headline inflation, not all measures are created equal. As noted recently in this publication, there has been considerable persistence in the difference between the headline and core inflation measures for the PCE and the CPI.[1] For example, from November 2002 to August 2006, average year-over-year headline CPI inflation was 1.04 percentage points higher than for core CPI. Over this same period, average year-over-year headline PCE inflation was 0.70 percentage points higher than for core PCE. This means that, based on the CPI measure, consumers experienced a 4 percent larger decline in purchasing power than the core measure would have indicated. Over the same period, the cumulative decline in purchasing power based on the PCE measure was smaller, 2.7 percent, but still significant. Consequently, even over fairly long periods of time, core inflation measures distort the inflation picture.

If the core measure is misleading as an indicator of changes in purchasing power, can it still be useful? The core measure may indeed be useful to both consumers and policymakers if it does a better job of predicting *future* headline inflation than the corresponding headline measure does. In recent research comparing core and headline CPI inflation, evidence suggests that core CPI inflation better predicts future headline CPI inflation. For example, if headline CPI inflation is below the corresponding core measure, and the core measure is a better predictor of future headline inflation, one might conclude that headline CPI inflation is likely to increase in the future.

Unfortunately, the same is not true for the PCE measure. Current research indicates that headline PCE inflation is a better predictor of future headline PCE inflation than is core PCE inflation.[2] Consequently, core PCE inflation appears to provide no useful information about future PCE inflation. It is the case, however, that over sufficiently long periods of time, CPI inflation averages about a half of a percentage point higher than PCE inflation—apparently reflecting a larger bias in the former measure relative to the latter. For this reason, one might think that one could forecast future headline PCE inflation by using the core CPI forecast of headline CPI and simply subtracting a half of a percentage point from the headline CPI forecast. Unfortunately, as is the case with the difference between the headline and core measures of these indices, there is considerable persistence in the difference between the CPI and PCE inflation measures. Hence, the differences between these measures averaged over a period of several years can be considerably larger or smaller than 50 basis points. Because of this, core CPI inflation is unlikely to be useful for forecasting future headline PCE inflation.

The alternative is to consider different measures of "core" inflation and not rely on the measures that exclude simply food and energy prices. There is some evidence, in fact, that alternative measures of core PCE inflation may have superior predictive power for headline PCE inflation.[3]

In any event, although preliminary, current research suggests that policymakers and the public may want to pay more attention to headline PCE inflation and less attention to core PCE inflation.

—Daniel L. Thornton

[1] DiCecio, Riccardo "Inflation Disconnect?" Federal Reserve Bank of St. Louis *Monetary Trends*, July 2007.

[2] See Khettry, N. Neil K. and Mester, Loretta J. "Core Inflation as a Predictor of Total Inflation." Federal Reserve Bank of Philadelphia *Research Rap—Special Report*. April 26, 2006; and Smith, Julie K. "PCE Inflation and Core Inflation." Unpublished manuscript, Department of Economics and Business, Lafayette College, July 6, 2006.

[3] For example, see Smith (2006).

Contents

Conventions used in this publication:

1. Unless otherwise indicated, data are monthly.
2. Shaded areas indicate recessions, as determined by the National Bureau of Economic Research.
3. *Percent change at an annual rate* is the simple, not compounded, monthly percent change multiplied by 12. For example, using consecutive months, the percent change at an annual rate in x between month $t-1$ and the current month t is: $[(x_t/x_{t-1})-1]\times 1200$. Note that this differs from *National Economic Trends.* In that publication, monthly percent changes are compounded and expressed as annual growth rates.
4. The *percent change from year ago* refers to the percent change from the same period in the previous year. For example, the percent change from year ago in x between month $t-12$ and the current month t is: $[(x_t/x_{t-12})-1]\times 100$.

We welcome your comments addressed to:

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On March 23, 2006, the Board of Governors of the Federal Reserve System ceased the publication of the M3 monetary aggregate. It also ceased publishing the following components: large-denomination time deposits, RPs, and eurodollars.

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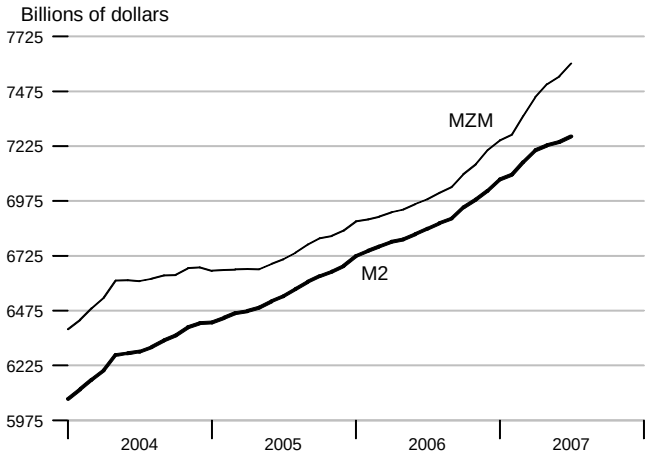
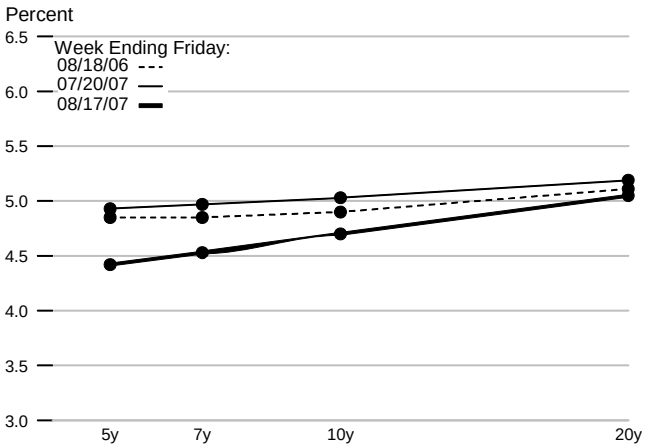
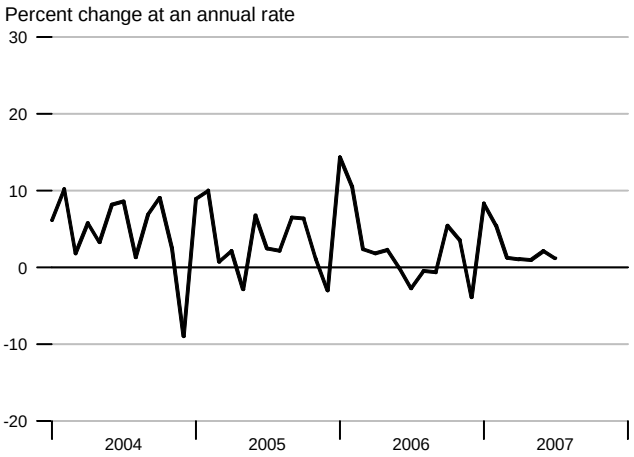
M2 and MZM



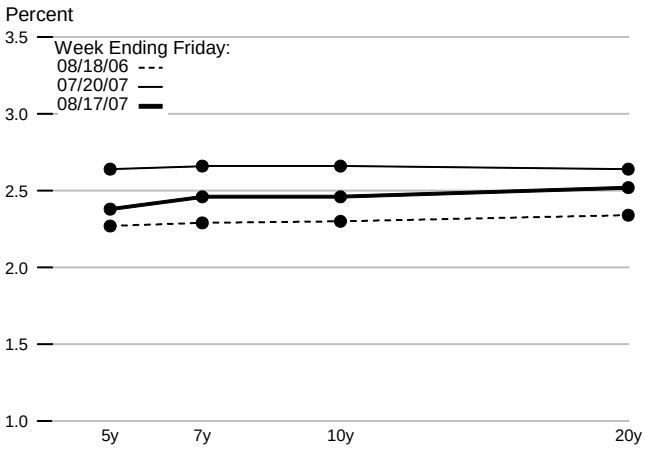
Treasury Yield Curve



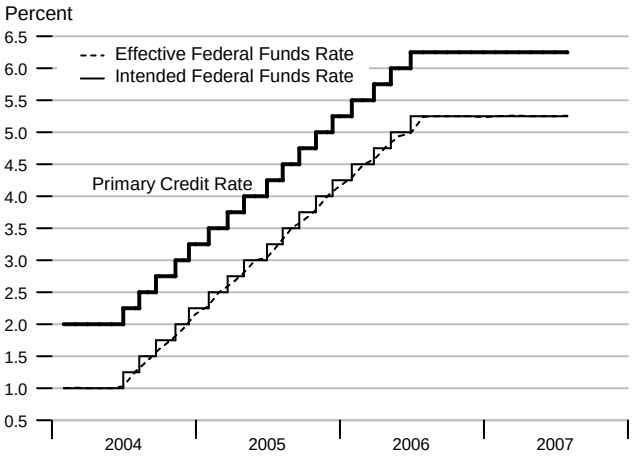
Adjusted Monetary Base



Real Treasury Yield Curve

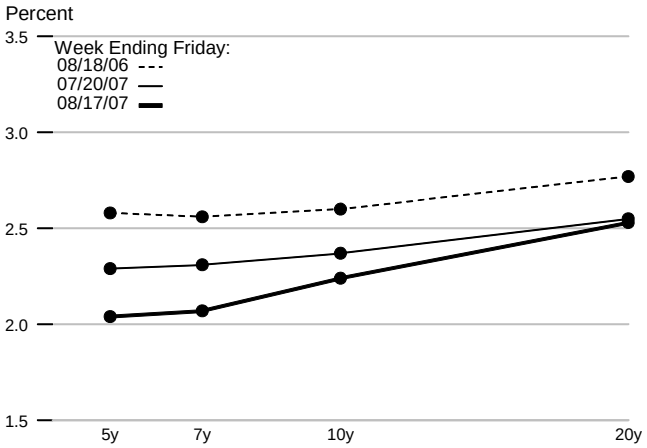


Reserve Market Rates



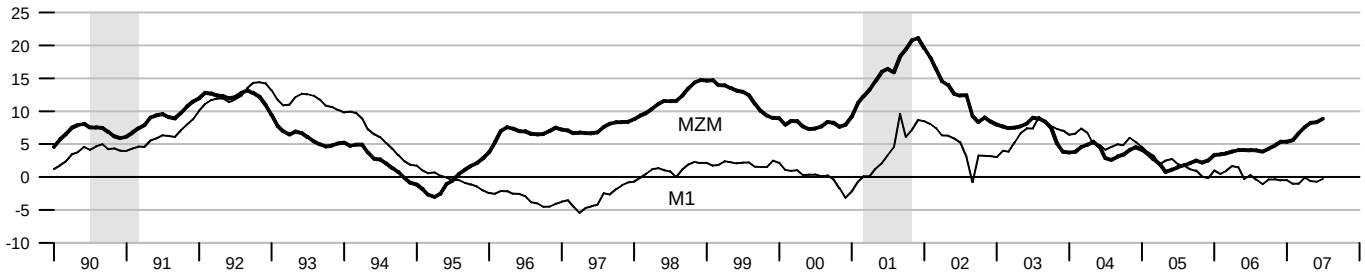
Data available as of July 2007.

Inflation-Indexed Treasury Yield Spreads



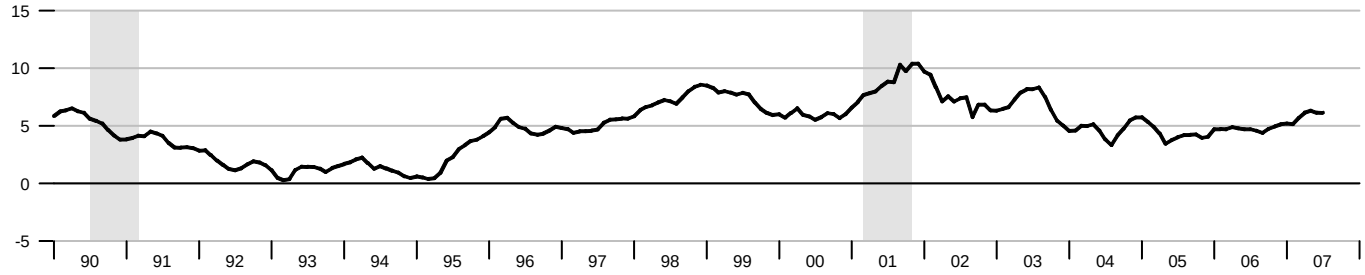
MZM and M1

Percent change from year ago



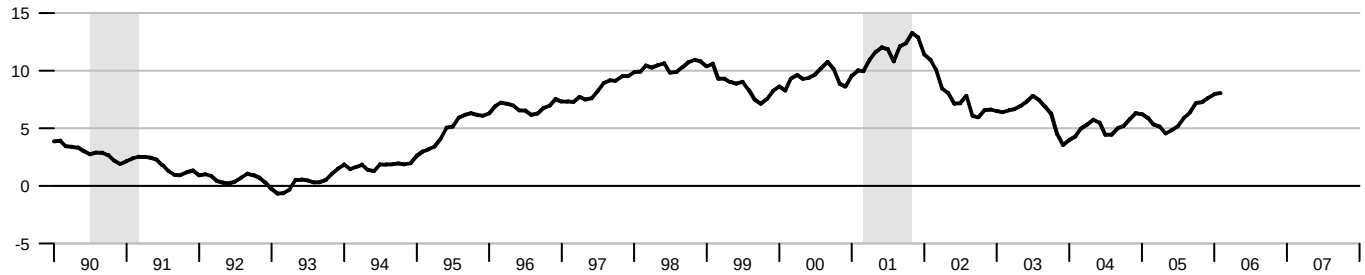
M2

Percent change from year ago



M3*

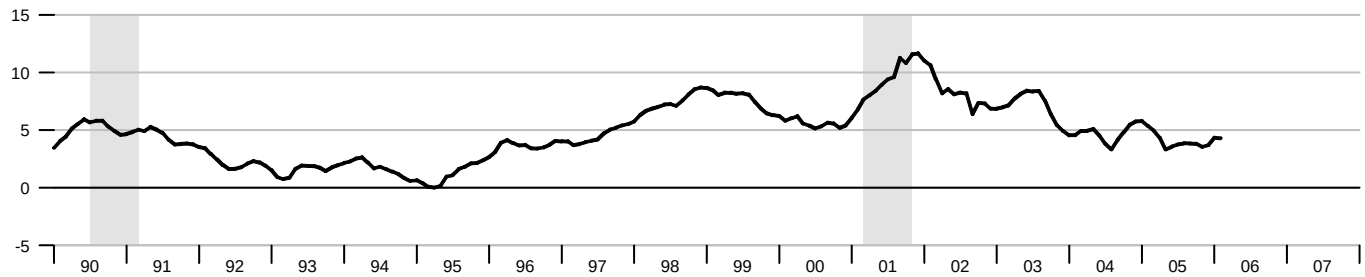
Percent change from year ago



*See table of contents for changes to the series.

Monetary Services Index - M2**

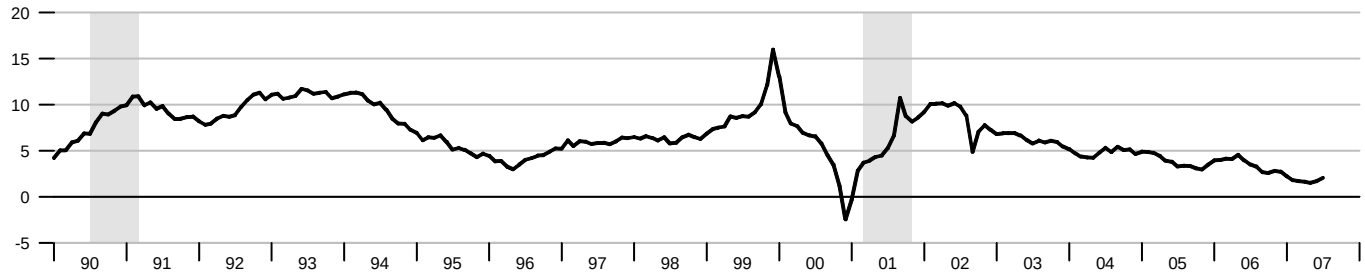
Percent change from year ago



**We will not update the MSI series until we revise the code to accomodate the discontinuation of M3.

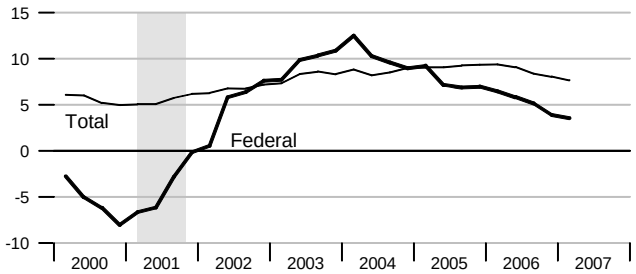
Adjusted Monetary Base

Percent change from year ago



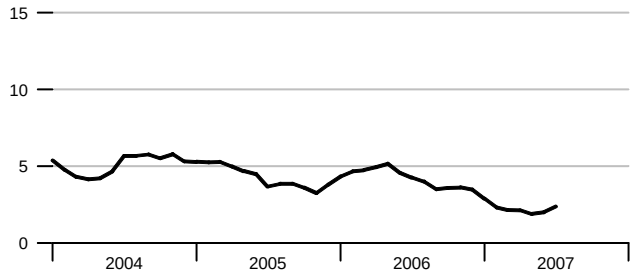
Domestic Nonfinancial Debt

Percent change from year ago



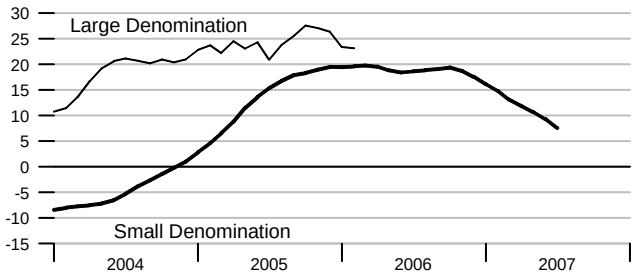
Currency Held by the Nonbank Public

Percent change from year ago



Time Deposits*

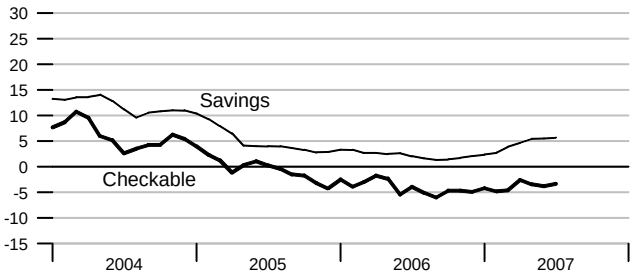
Percent change from year ago



*See table of contents for changes to the series.

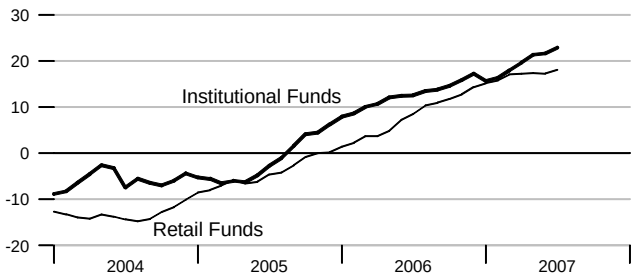
Checkable and Savings Deposits

Percent change from year ago



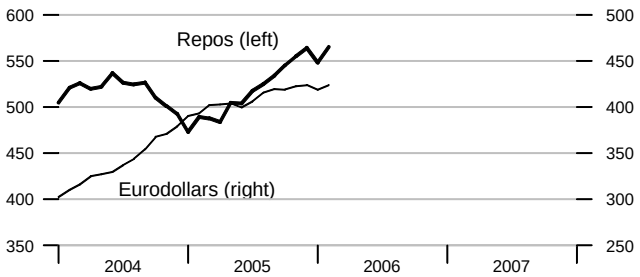
Money Market Mutual Fund Shares

Percent change from year ago



Repurchase Agreements and Eurodollars*

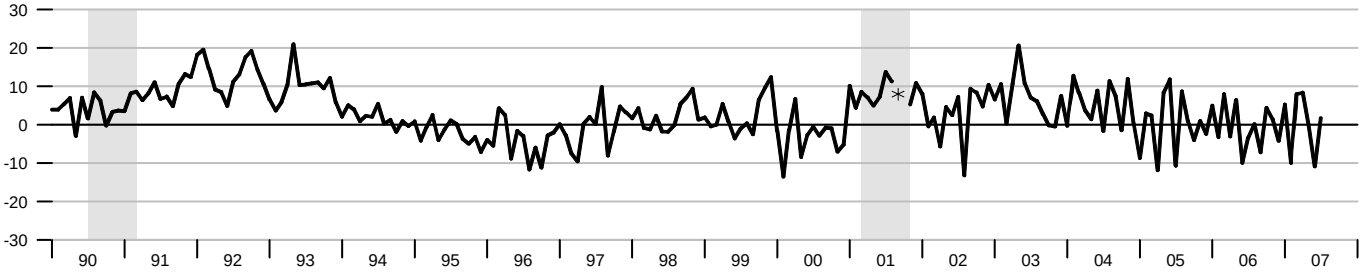
Billions of dollars Billions of dollars



*See table of contents for changes to these series.

M1

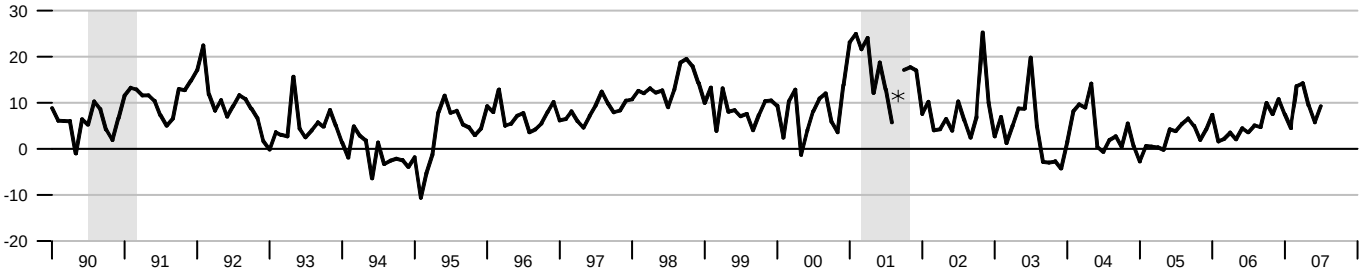
Percent change at an annual rate



*Actual values for September and October 2001 are 55.87 and -38.35 percent rate, respectively.

MZM

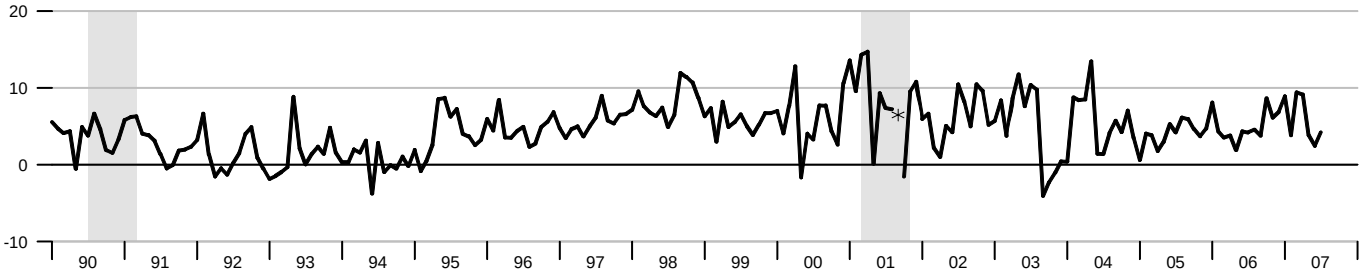
Percent change at an annual rate



*Actual value for September 2001 is 39.41 percent rate.

M2

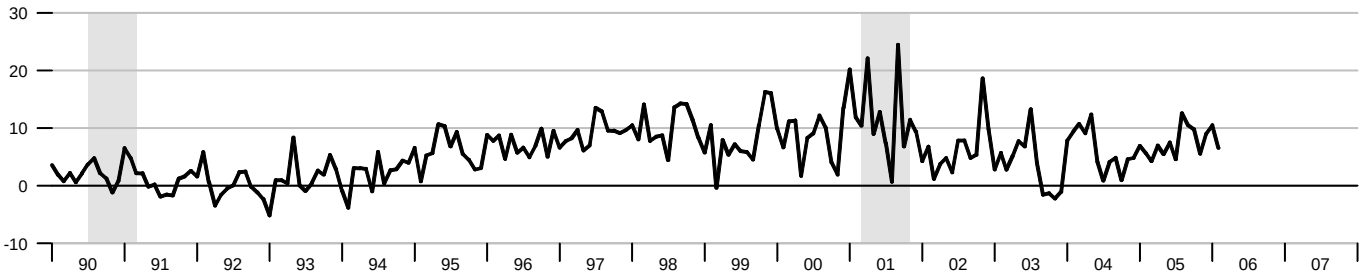
Percent change at an annual rate



*Actual value for September 2001 is 24.90 percent rate.

M3*

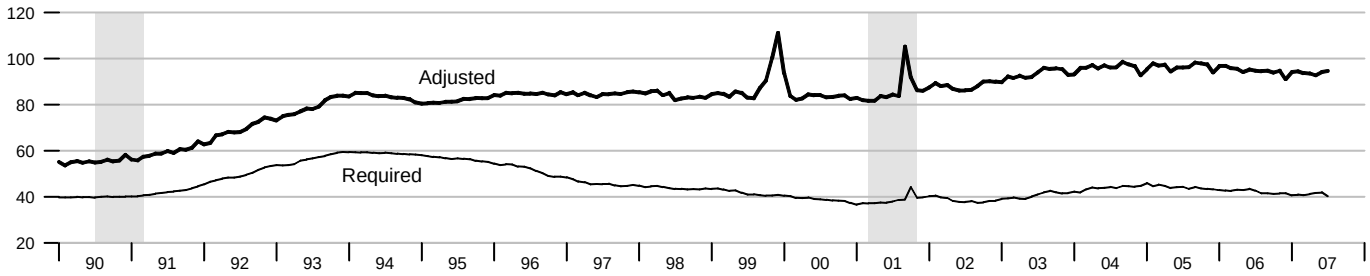
Percent change at an annual rate



*See table of contents for changes to the series.

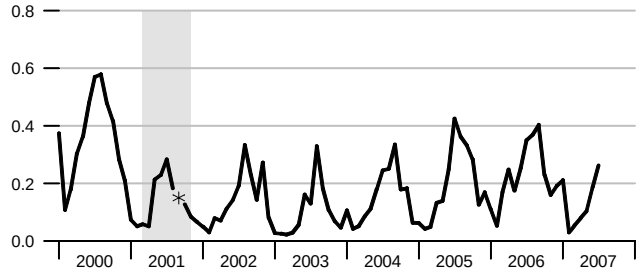
Adjusted and Required Reserves

Billions of dollars



Total Borrowings, nsa

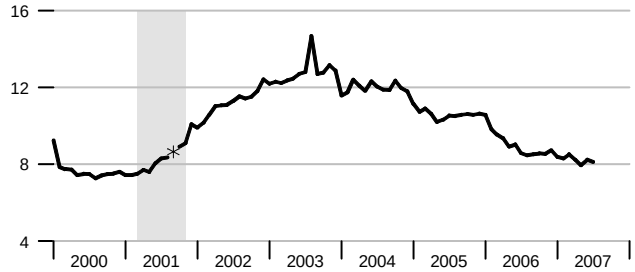
Billions of dollars



*Actual value for September 2001 is $3.4 billion.

Excess Reserves plus RCB Contracts

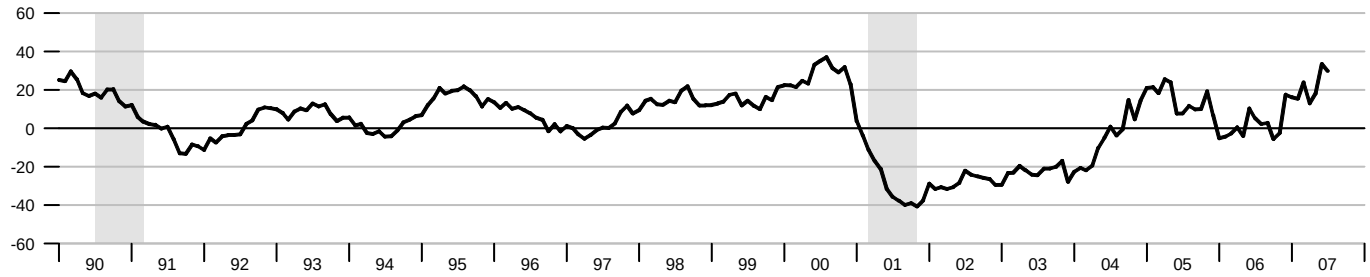
Billions of dollars



*Actual value for September 2001 is $26.43 billion.

Nonfinancial Commercial Paper

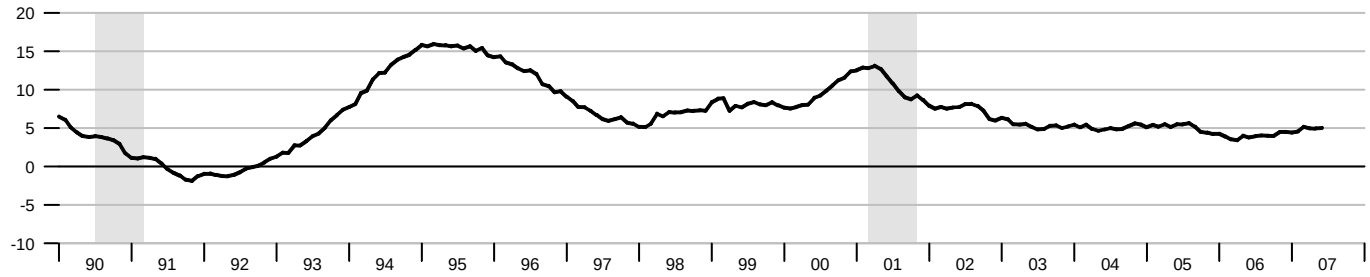
Percent change from year ago



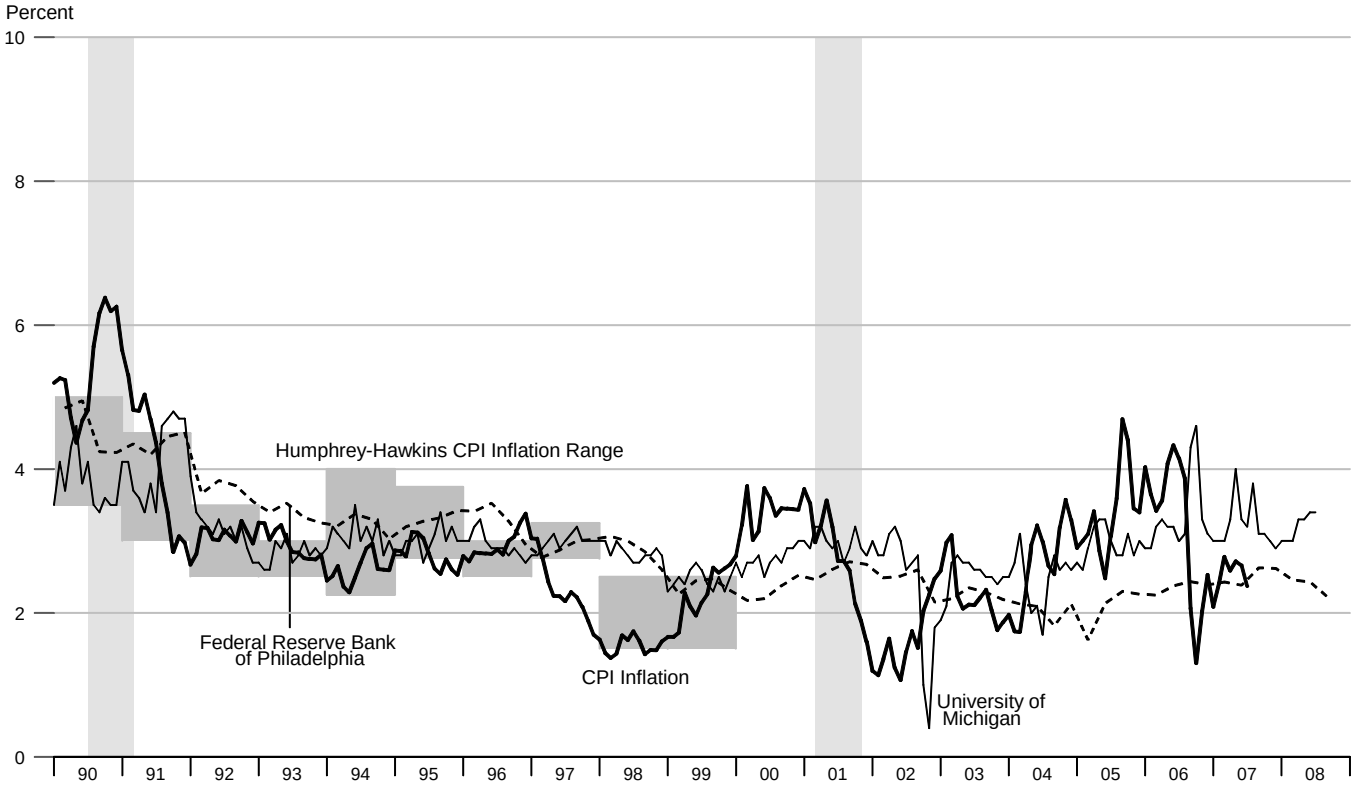
As of April 10, 2006, the Federal Reserve Board made major changes to its commercial paper calculations.
For more information, please refer to http://www.federalreserve.gov/releases/cp/about.htm.

Consumer Credit

Percent change from year ago

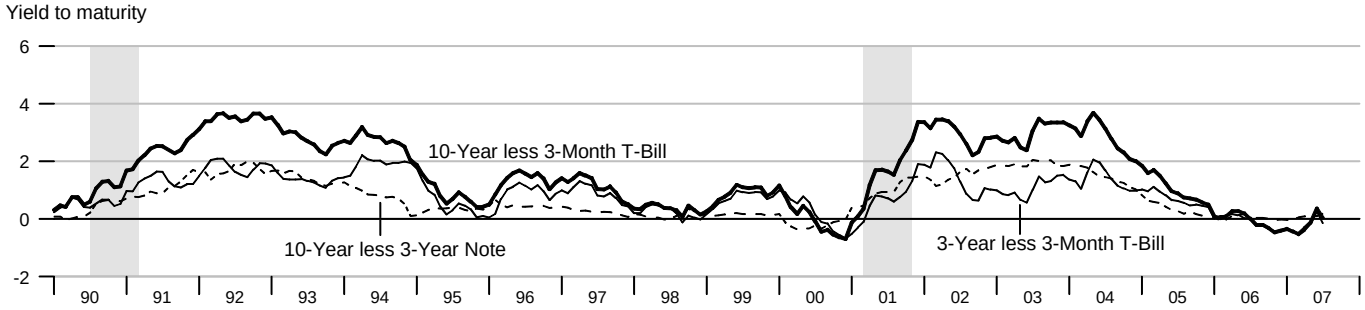


Inflation and 1-Year-Ahead Inflation Expectations

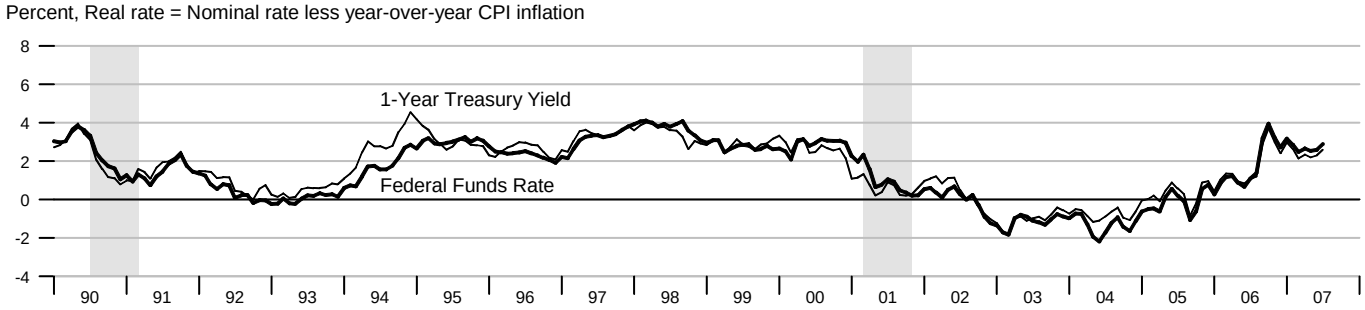


The shaded region shows the Humphrey-Hawkins CPI inflation range. Beginning in January 2000, the Humphrey-Hawkins inflation range was reported using the PCE price index and therefore is not shown on this graph. See notes on page 19.

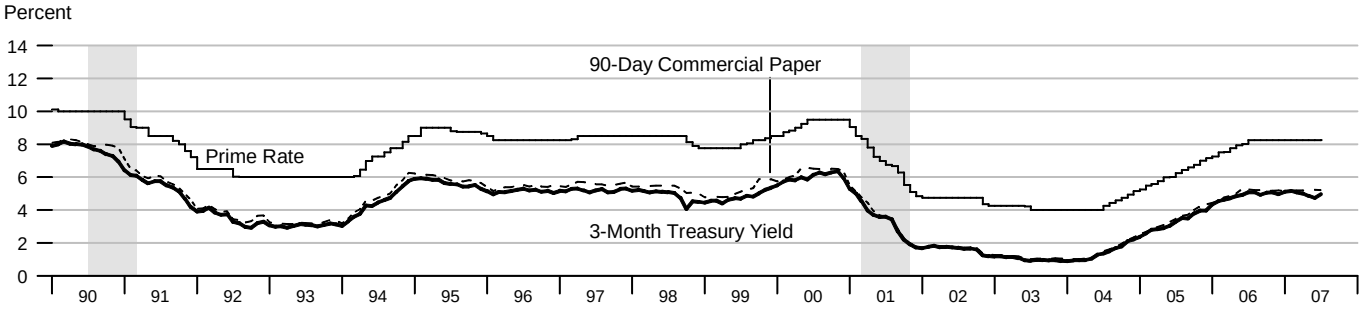
Treasury Security Yield Spreads



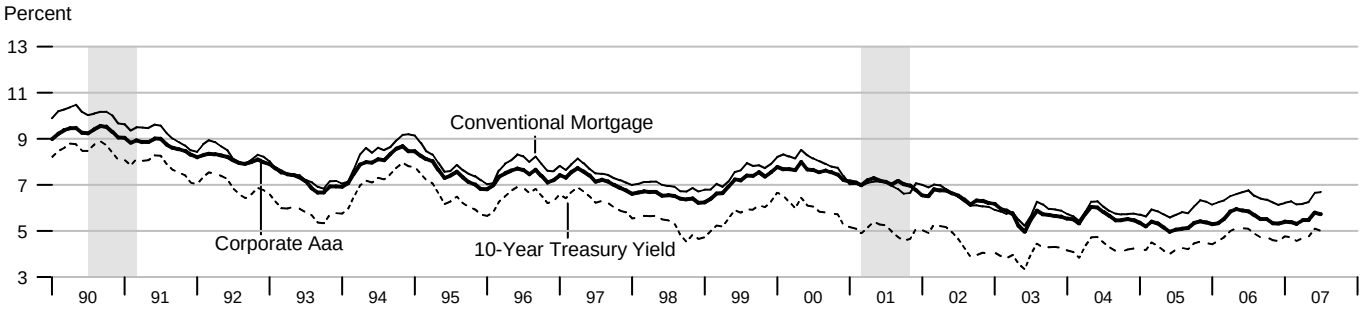
Real Interest Rates



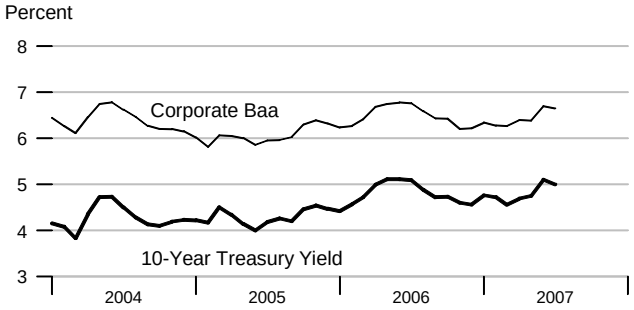
Short-Term Interest Rates



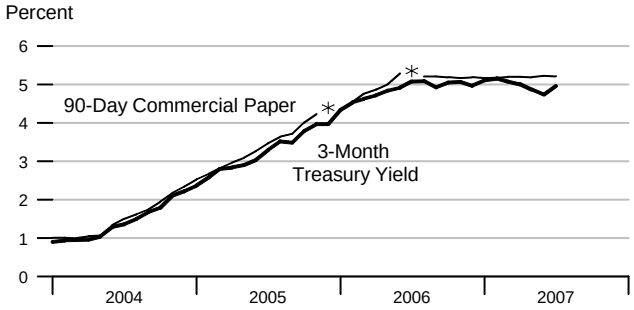
Long-Term Interest Rates



Long-Term Interest Rates

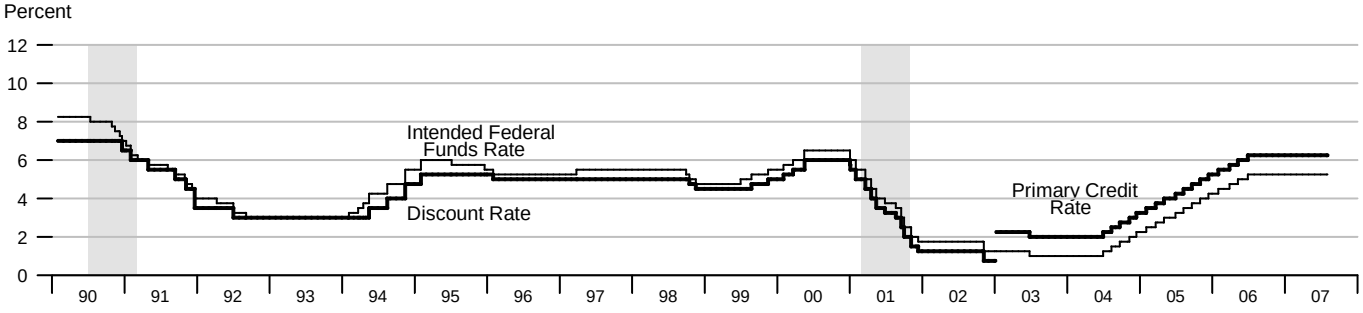


Short-Term Interest Rates



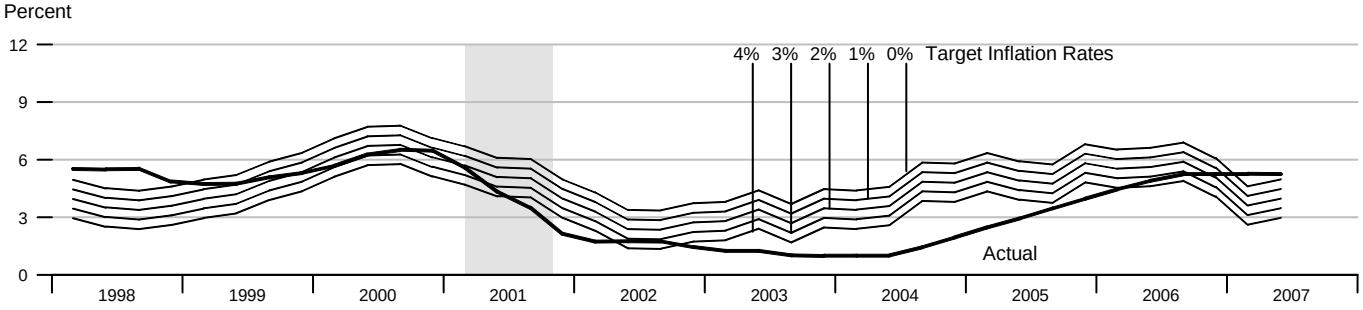
*90-Day Commercial Paper data are not available for December 2005, January 2006, and July 2006.

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



Data available as of July 2007.

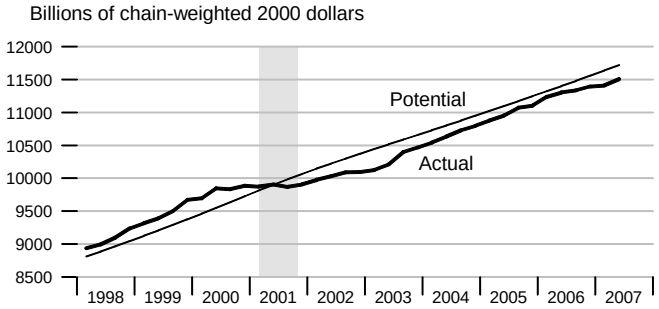
Federal Funds Rate and Inflation Targets



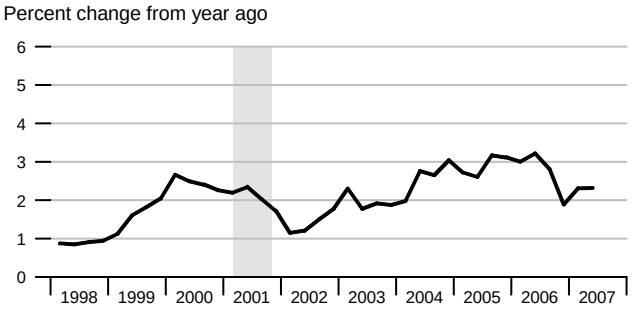
Calculated federal funds rate is based on Taylor's rule. See notes on page 19.

Components of Taylor's Rule

Actual and Potential Real GDP



PCE Inflation

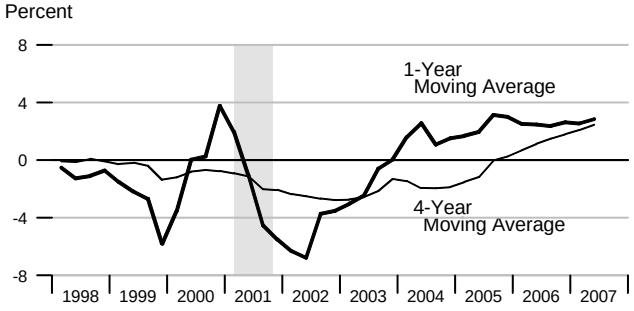


Monetary Base Growth* and Inflation Targets

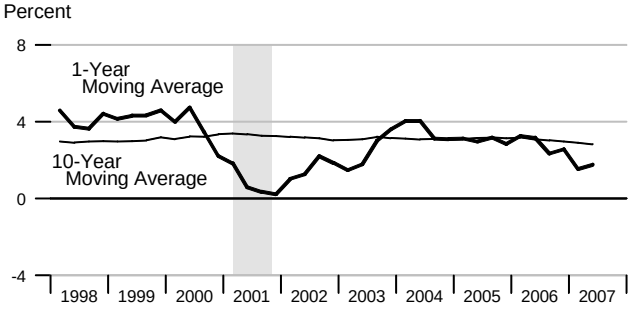
*Modified for the effects of sweeps programs on reserve demand.
Calculated base growth is based on McCallum's rule. Actual base growth is percent change from year ago. See notes on page 19.

Components of McCallum's Rule

Monetary Base Velocity Growth

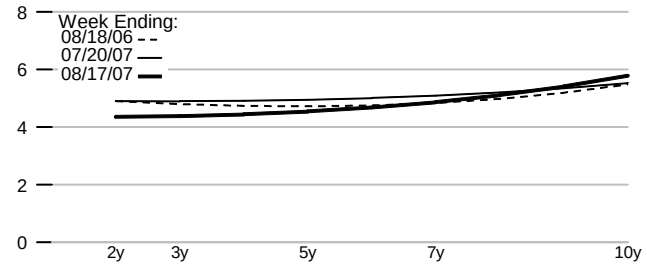


Real Output Growth



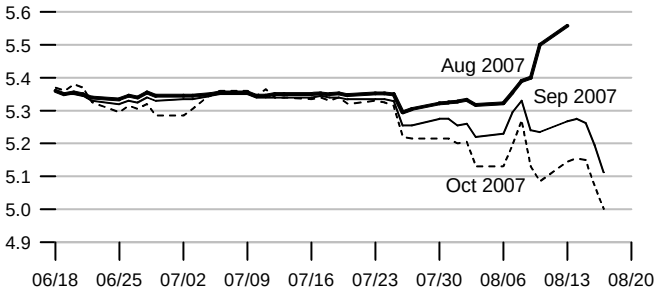
Implied One-Year Forward Rates

Percent



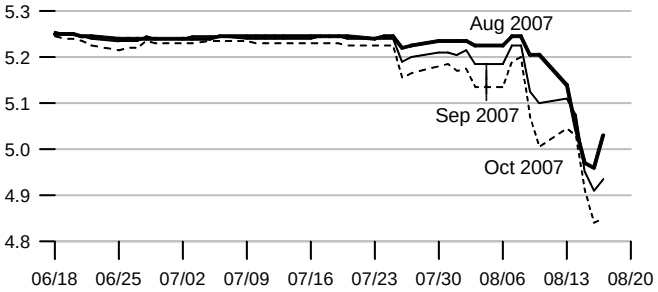
Rates on 3-Month Eurodollar Futures

Percent, daily data



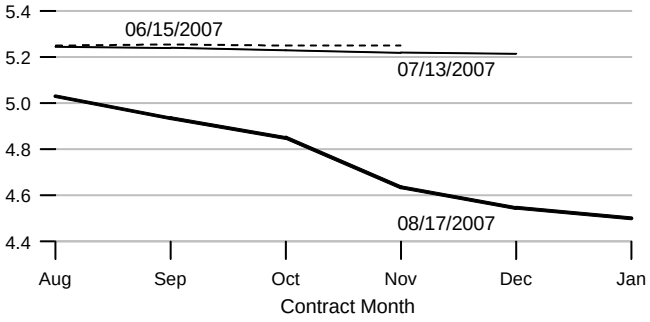
Rates on Selected Federal Funds Futures Contracts

Percent, daily data



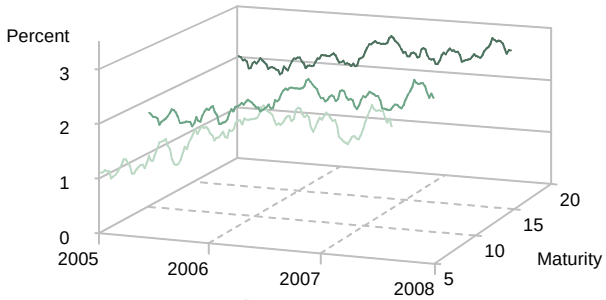
Rates on Federal Funds Futures on Selected Dates

Percent



Inflation-Indexed Treasury Securities

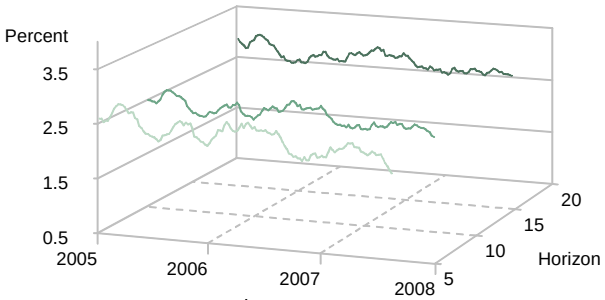
Weekly data



Note: Yields are inflation-indexed constant maturity U.S. Treasury securities

Inflation-Indexed Treasury Yield Spreads

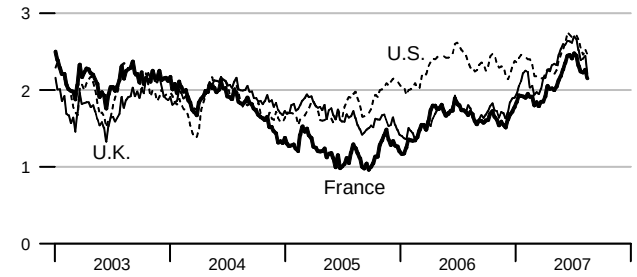
Weekly data



Note: Yield spread is between nominal and inflation-indexed constant maturity U.S. Treasury securities.

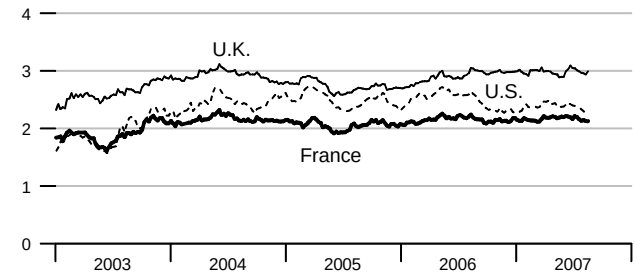
Inflation-Indexed 10-Year Government Notes

Percent, weekly data



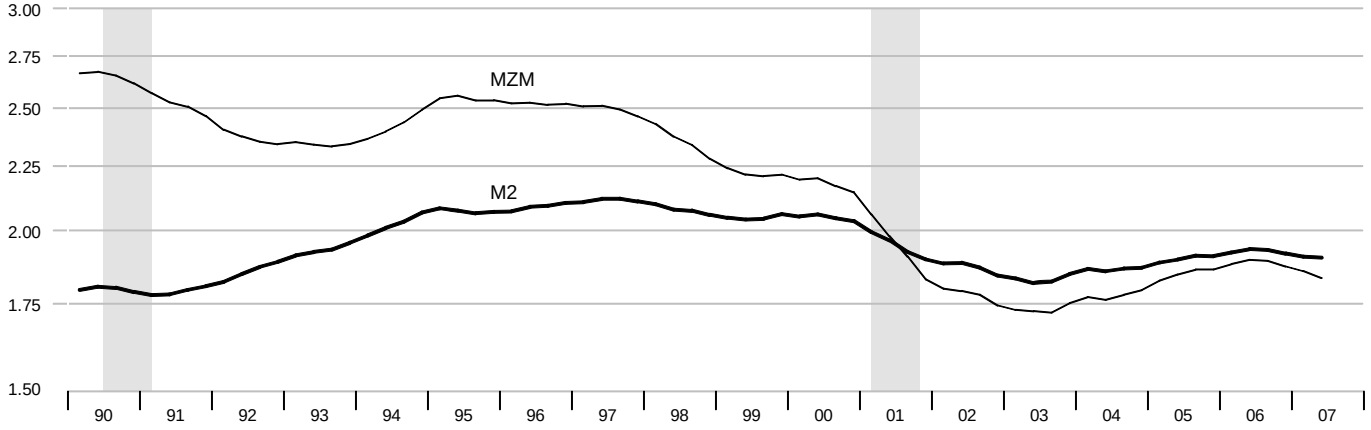
Inflation-Indexed 10-Year Government Yield Spreads

Percent, weekly data



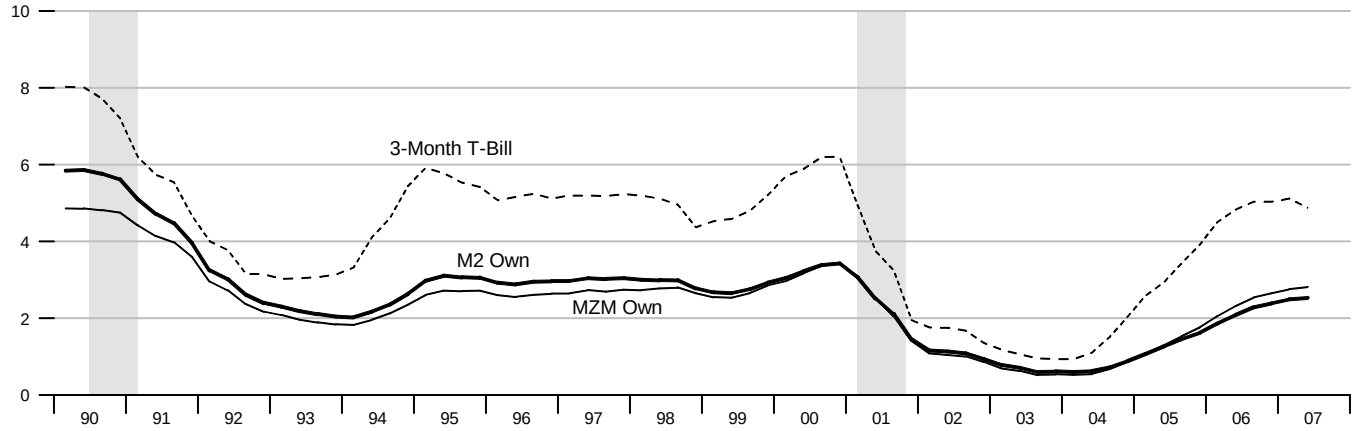
Velocity

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



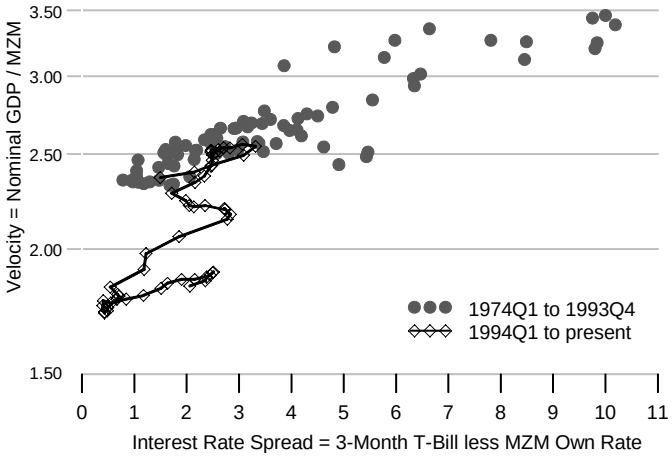
Interest Rates

Percent



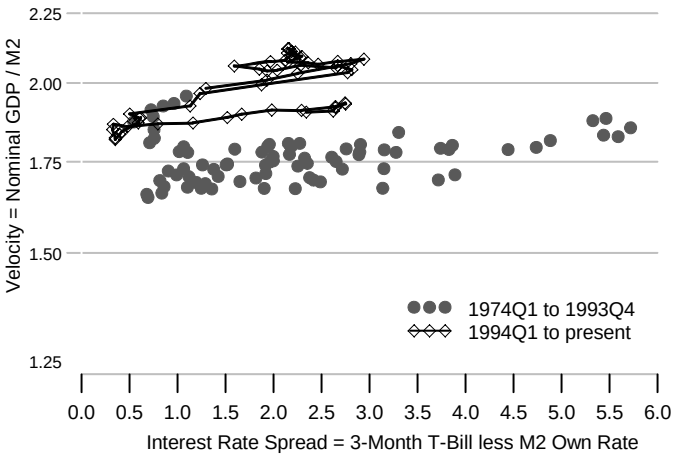
MZM Velocity and Interest Rate Spread

Ratio Scale



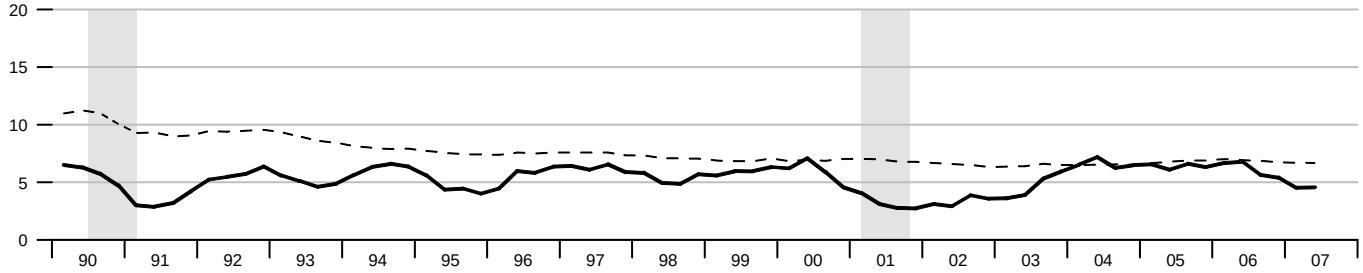
M2 Velocity and Interest Rate Spread

Ratio Scale



Gross Domestic Product

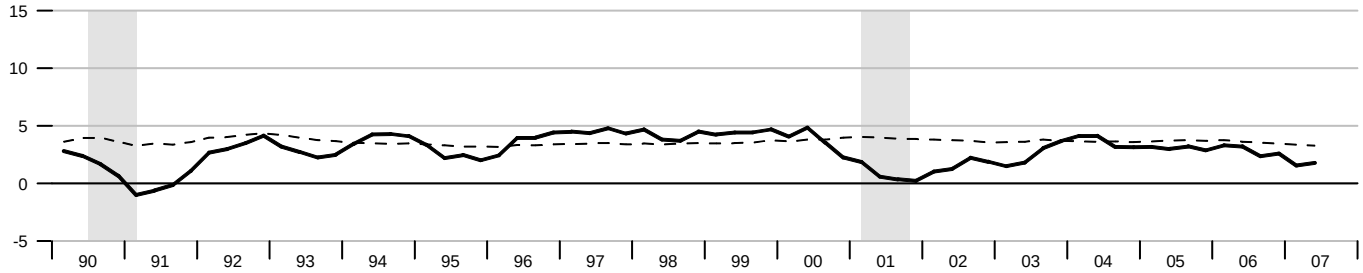
Percent change from year ago



Dashed lines indicate 10-year moving averages.

Real Gross Domestic Product

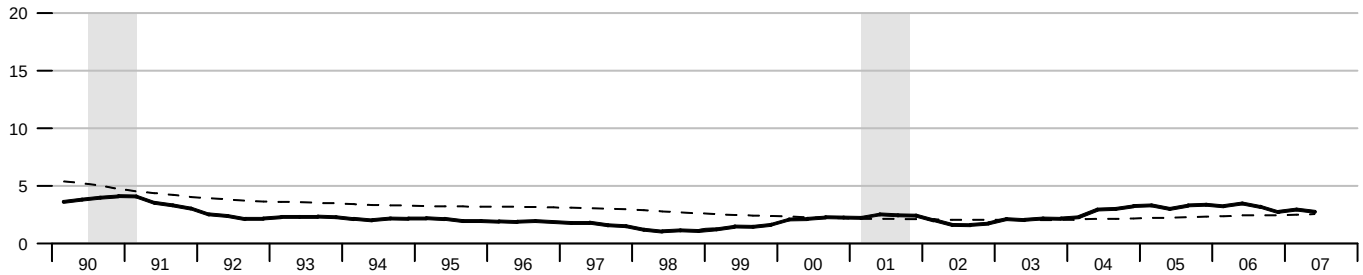
Percent change from year ago



Dashed lines indicate 10-year moving averages.

Gross Domestic Product Price Index

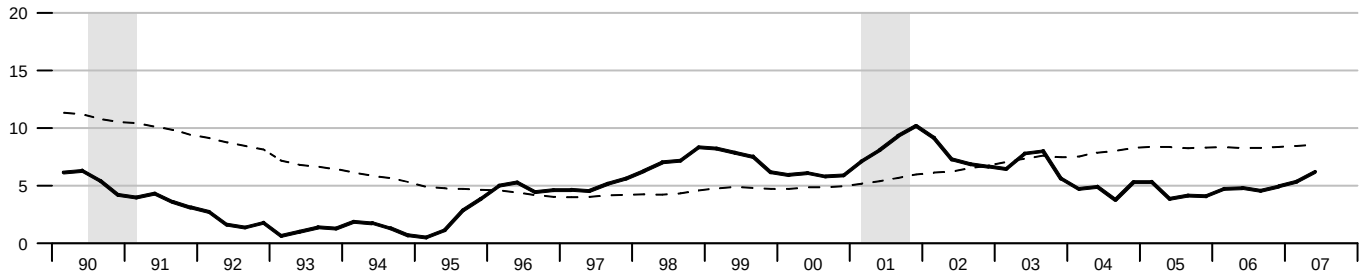
Percent change from year ago



Dashed lines indicate 10-year moving averages.

M2

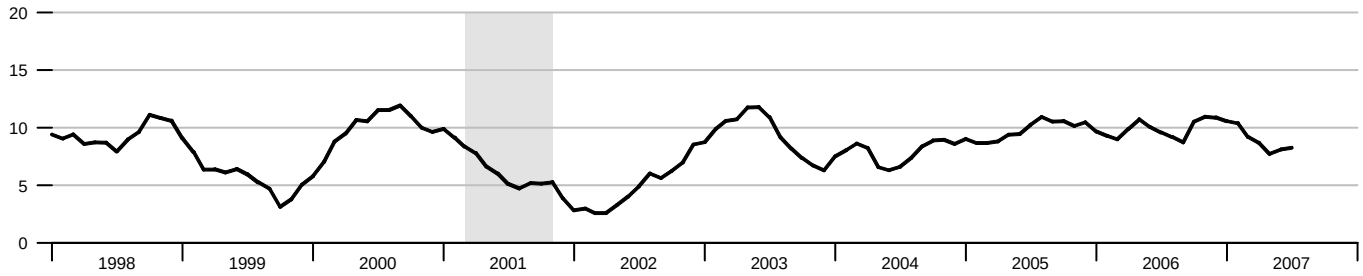
Percent change from year ago



Dashed lines indicate 10-year moving averages.

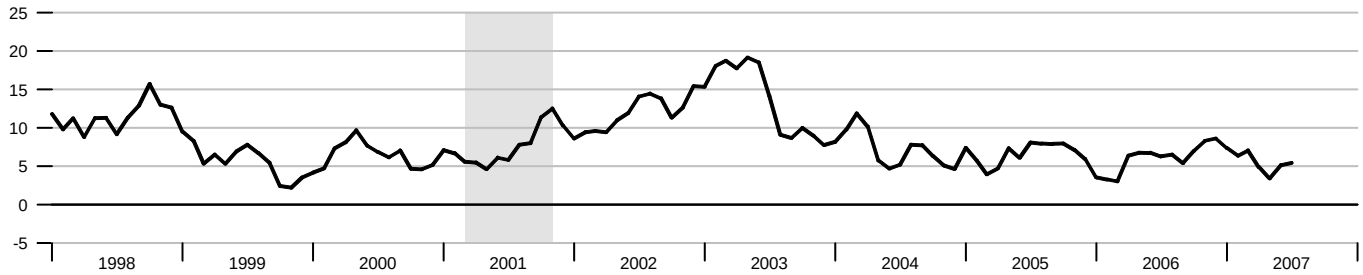
Bank Credit

Percent change from year ago



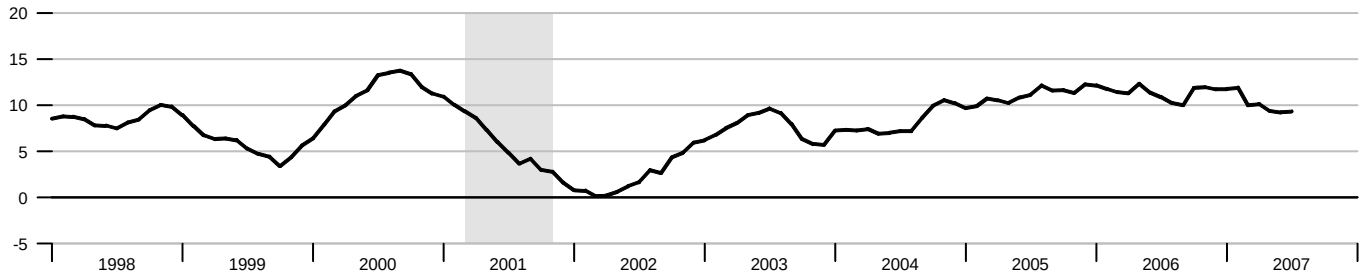
Investment Securities in Bank Credit at Commercial Banks

Percent change from year ago



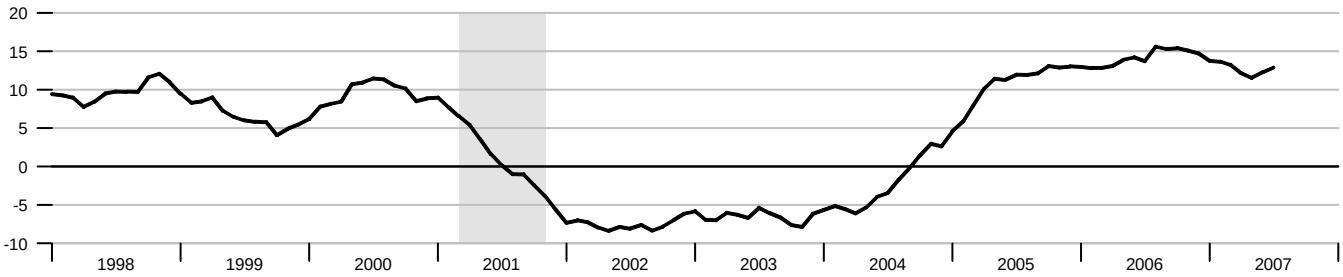
Total Loans and Leases in Bank Credit at Commercial Banks

Percent change from year ago

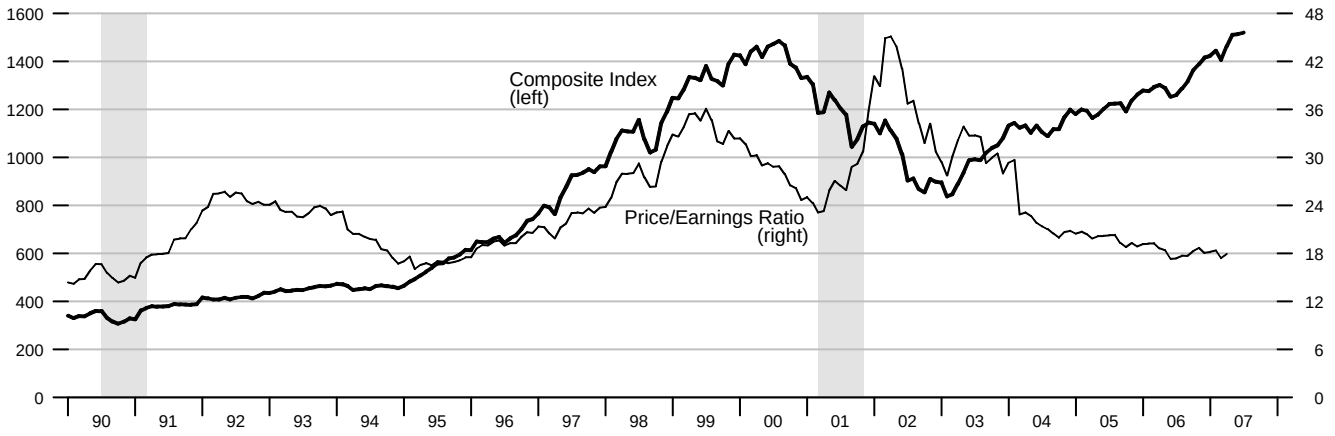


Commercial and Industrial Loans at Commercial Banks

Percent change from year ago



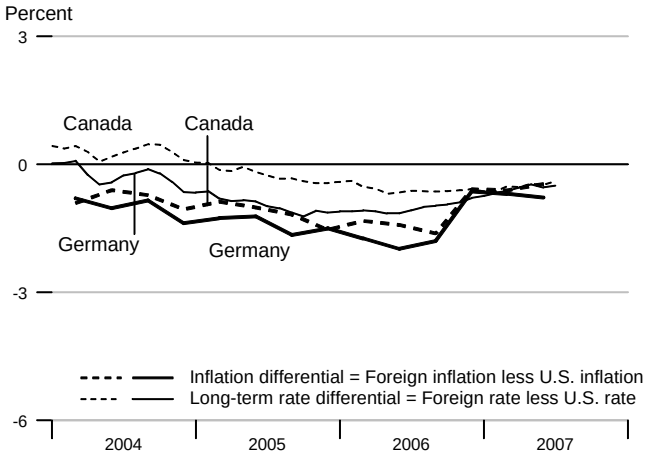
Standard & Poor's 500

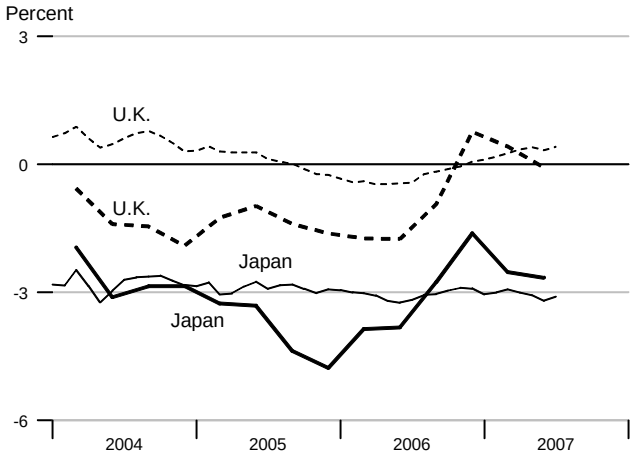


Recent Inflation and Long-Term Interest Rates

	Consumer Price Inflation Rates				Long-Term Government Bond Rates			
	Percent change from year ago				Percent			
	2006Q3	2006Q4	2007Q1	2007Q2	Apr07	May07	Jun07	Jul07
United States	3.36	1.95	2.43	2.66	4.69	4.75	5.10	5.00
Canada	1.73	1.37	1.81	2.19	4.16	4.29	4.62	4.60
France	1.68	1.34	1.16	1.18	4.21	4.34	4.62	.
Germany	1.56	1.31	1.74	1.88	4.15	4.28	4.56	4.50
Italy	2.17	1.82	1.73	1.59	4.37	4.49	4.77	4.76
Japan	0.60	0.33	-0.10	0.00	1.68	1.68	1.90	1.90
United Kingdom	2.43	2.71	2.84	2.58	5.04	5.15	5.43	5.41

Inflation and Long-Term Interest Rate Differentials





		Money Stock				Bank	Adjusted		
		M1	MZM	M2	M3*	Credit	Monetary Base	Reserves	MSI M2**
	2002	1196.216	5888.211	5598.784	8259.055	5597.733	697.075	88.132	294.080
	2003	1273.497	6324.948	5988.524	8787.321	6118.567	740.938	93.321	315.192
	2004	1344.404	6576.260	6268.459	9234.718	6598.334	776.768	96.125	329.873
	2005	1371.683	6723.495	6540.902	9786.477	7242.139	806.626	96.546	343.539
	2006	1374.928	6998.183	6851.516	10270.74	7957.823	835.011	94.873	
2005	1	1368.350	6660.098	6442.484	9528.052	6992.397	798.378	96.763	339.356
	2	1368.566	6672.127	6493.200	9670.405	7158.555	802.565	95.987	341.280
	3	1375.343	6741.629	6573.580	9859.294	7354.836	809.023	96.923	344.766
	4	1374.471	6820.125	6654.344	10088.16	7462.769	816.537	96.510	348.753
2006	1	1379.238	6892.080	6746.178		7643.640	830.532	96.478	
	2	1381.649	6940.252	6804.285		7890.432	836.330	95.014	
	3	1369.915	7011.311	6872.906		8029.446	834.531	94.737	
	4	1368.908	7149.088	6982.694		8267.775	838.651	93.264	
2007	1	1367.619	7297.339	7106.924		8411.686	846.332	94.132	
	2	1375.150	7499.933	7226.355		8535.153	849.921	93.526	
2005	Jul	1368.443	6709.066	6540.426	9762.435	7284.620	806.594	96.160	343.275
	Aug	1378.316	6739.454	6573.873	9864.629	7365.033	808.055	96.319	344.739
	Sep	1379.269	6776.367	6606.440	9950.818	7414.855	812.419	98.291	346.285
	Oct	1374.668	6804.816	6631.984	10031.96	7431.841	816.722	97.974	347.590
	Nov	1375.740	6815.893	6652.527	10078.49	7448.387	817.462	97.544	348.603
	Dec	1373.006	6839.665	6678.522	10154.03	7508.080	815.426	94.012	350.067
2006	Jan	1378.666	6881.812	6723.493	10242.79	7563.566	825.161	96.774	353.032
	Feb	1374.976	6891.047	6747.561	10298.68	7647.809	832.400	96.850	353.943
	Mar	1384.073	6903.382	6767.479		7719.544	834.035	95.810	
	Apr	1380.561	6923.655	6788.869		7811.091	835.306	95.563	
	May	1387.927	6935.664	6799.662		7925.221	836.887	94.190	
	Jun	1376.459	6961.437	6824.323		7934.984	836.796	95.290	
	Jul	1372.561	6982.346	6848.346		7983.366	834.899	94.801	
	Aug	1372.693	7012.024	6874.358		8042.683	834.567	94.631	
	Sep	1364.490	7039.563	6896.014		8062.288	834.128	94.779	
	Oct	1369.457	7097.902	6945.713		8213.433	837.899	93.958	
	Nov	1371.026	7142.598	6981.201		8264.430	840.381	94.758	
	Dec	1366.241	7206.764	7021.167		8325.461	837.672	91.077	
2007	Jan	1372.185	7251.688	7073.260		8363.107	843.477	94.164	
	Feb	1360.822	7278.874	7095.924		8442.057	847.313	94.464	
	Mar	1369.849	7361.454	7151.589		8429.895	848.205	93.769	
	Apr	1379.341	7448.817	7206.095		8489.528	848.961	93.577	
	May	1379.278	7507.422	7229.080		8537.915	849.648	92.767	
	Jun	1366.832	7543.560	7243.889		8578.016	851.153	94.234	
	Jul	1368.778	7601.673	7269.228		8642.773	852.009	94.662	

Note: All values are given in billions of dollars. *See table of contents for changes to the series.

**We will not update the MSI series until we revise the code to accommodate the discontinuation of M3.

		Federal Funds	Primary Credit Rate	Prime Rate	3-mo CDs	Treasury Yields 3-mo	3-yr	10-yr	Corporate Aaa Bonds	Municipal Aaa Bonds	Conventional Mortgage
2002		1.67		4.68	1.73	1.63	3.10	4.61	6.49	4.87	6.54
2003		1.13	2.11	4.12	1.15	1.03	2.11	4.02	5.67	4.52	5.82
2004		1.35	2.34	4.34	1.56	1.40	2.78	4.27	5.63	4.50	5.84
2005		3.21	4.19	6.19	3.51	3.21	3.93	4.29	5.23	4.28	5.86
2006		4.96	5.96	7.96	5.15	4.85	4.77	4.79	5.59	4.15	6.41
2005	1	2.47	3.44	5.44	2.78	2.58	3.61	4.30	5.32	4.23	5.76
	2	2.94	3.91	5.91	3.23	2.93	3.73	4.16	5.15	4.15	5.72
	3	3.46	4.43	6.43	3.74	3.43	3.98	4.21	5.09	4.28	5.76
	4	3.98	4.97	6.97	4.30	3.91	4.37	4.49	5.38	4.45	6.22
2006	1	4.46	5.43	7.43	4.72	4.50	4.58	4.57	5.39	4.29	6.24
	2	4.91	5.90	7.90	5.18	4.83	4.98	5.07	5.89	4.36	6.60
	3	5.25	6.25	8.25	5.39	5.03	4.87	4.90	5.68	4.13	6.56
	4	5.25	6.25	8.25	5.32	5.03	4.65	4.63	5.39	3.82	6.24
2007	1	5.26	6.25	8.25	5.31	5.12	4.68	4.68	5.36	3.91	6.22
	2	5.25	6.25	8.25	5.32	4.87	4.76	4.85	5.58	4.13	6.37
2005	Jul	3.26	4.25	6.25	3.57	3.29	3.91	4.18	5.06	4.18	5.70
	Aug	3.50	4.44	6.44	3.77	3.52	4.08	4.26	5.09	4.33	5.82
	Sep	3.62	4.59	6.59	3.87	3.49	3.96	4.20	5.13	4.34	5.77
	Oct	3.78	4.75	6.75	4.13	3.79	4.29	4.46	5.35	4.49	6.07
	Nov	4.00	5.00	7.00	4.31	3.97	4.43	4.54	5.42	4.42	6.33
	Dec	4.16	5.15	7.15	4.45	3.97	4.39	4.47	5.37	4.46	6.27
2006	Jan	4.29	5.26	7.26	4.56	4.34	4.35	4.42	5.29	4.27	6.15
	Feb	4.49	5.50	7.50	4.72	4.54	4.64	4.57	5.35	4.33	6.25
	Mar	4.59	5.53	7.53	4.88	4.63	4.74	4.72	5.53	4.29	6.32
	Apr	4.79	5.75	7.75	5.03	4.72	4.89	4.99	5.84	4.36	6.51
	May	4.94	5.93	7.93	5.15	4.84	4.97	5.11	5.95	4.38	6.60
	Jun	4.99	6.02	8.02	5.35	4.92	5.09	5.11	5.89	4.35	6.68
	Jul	5.24	6.25	8.25	5.46	5.08	5.07	5.09	5.85	4.41	6.76
	Aug	5.25	6.25	8.25	5.38	5.09	4.85	4.88	5.68	4.10	6.52
	Sep	5.25	6.25	8.25	5.34	4.93	4.69	4.72	5.51	3.87	6.40
	Oct	5.25	6.25	8.25	5.33	5.05	4.72	4.73	5.51	3.91	6.36
	Nov	5.25	6.25	8.25	5.32	5.07	4.64	4.60	5.33	3.81	6.24
	Dec	5.24	6.25	8.25	5.32	4.97	4.58	4.56	5.32	3.76	6.14
2007	Jan	5.25	6.25	8.25	5.32	5.11	4.79	4.76	5.40	3.89	6.22
	Feb	5.26	6.25	8.25	5.31	5.16	4.75	4.72	5.39	3.95	6.29
	Mar	5.26	6.25	8.25	5.30	5.08	4.51	4.56	5.30	3.88	6.16
	Apr	5.25	6.25	8.25	5.31	5.01	4.60	4.69	5.47	3.99	6.18
	May	5.25	6.25	8.25	5.31	4.87	4.69	4.75	5.47	4.04	6.26
	Jun	5.25	6.25	8.25	5.33	4.74	5.00	5.10	5.79	4.36	6.66
	Jul	5.26	6.25	8.25	5.32	4.96	4.82	5.00	5.73	4.24	6.70

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

		M1	MZM	M2	M3*
Percent change at an annual rate					
	2002	4.91	12.76	7.47	7.98
	2003	6.46	7.42	6.96	6.40
	2004	5.57	3.97	4.67	5.09
	2005	2.03	2.24	4.35	5.97
	2006	0.24	4.09	4.75	4.95
2005	1	-0.60	0.03	3.10	5.63
	2	0.06	0.72	3.15	5.98
	3	1.98	4.17	4.95	7.81
	4	-0.25	4.66	4.91	9.29
2006	1	1.39	4.22	5.52	
	2	0.70	2.80	3.45	
	3	-3.40	4.10	4.03	
	4	-0.29	7.86	6.39	
2007	1	-0.38	8.29	7.12	
	2	2.20	11.11	6.72	
2005	Jul	-10.65	3.87	4.21	4.58
	Aug	8.66	5.44	6.14	12.56
	Sep	0.83	6.57	5.94	10.48
	Oct	-4.00	5.04	4.64	9.79
	Nov	0.94	1.95	3.72	5.57
	Dec	-2.38	4.19	4.69	8.99
2006	Jan	4.95	7.39	8.08	10.49
	Feb	-3.21	1.61	4.30	6.55
	Mar	7.94	2.15	3.54	
	Apr	-3.04	3.52	3.79	
	May	6.40	2.08	1.91	
	Jun	-9.92	4.46	4.35	
	Jul	-3.40	3.60	4.22	
	Aug	0.12	5.10	4.56	
	Sep	-7.17	4.71	3.78	
	Oct	4.37	9.94	8.65	
	Nov	1.37	7.56	6.13	
	Dec	-4.19	10.78	6.87	
2007	Jan	5.22	7.48	8.90	
	Feb	-9.94	4.50	3.85	
	Mar	7.96	13.61	9.41	
	Apr	8.32	14.24	9.15	
	May	-0.05	9.44	3.83	
	Jun	-10.83	5.78	2.46	
	Jul	1.71	9.24	4.20	

*See table of contents for changes to the series.

Definitions

M1: The sum of currency held outside the vaults of depository institutions, Federal Reserve Banks, and the U.S. Treasury; travelers checks; and demand and other checkable deposits issued by financial institutions (except demand deposits due to the Treasury and depository institutions), minus cash items in process of collection and Federal Reserve float.

MZM (money, zero maturity): M2 minus small-denomination time deposits, plus institutional money market mutual funds (that is, those included in M3 but excluded from M2). The label MZM was coined by William Poole (1991); the aggregate itself was proposed earlier by Motley (1988).

M2: M1 plus savings deposits (including money market deposit accounts) and small-denomination (under $100,000) time deposits issued by financial institutions; and shares in retail money market mutual funds (funds with initial investments under $50,000), net of retirement accounts.

M3: M2 plus large-denomination ($100,000 or more) time deposits; repurchase agreements issued by depository institutions; Eurodollar deposits, specifically, dollar-denominated deposits due to nonbank U.S. addresses held at foreign offices of U.S. banks worldwide and all banking offices in Canada and the United Kingdom; and institutional money market mutual funds (funds with initial investments of $50,000 or more).

Bank Credit: All loans, leases, and securities held by commercial banks.

Domestic Nonfinancial Debt: Total credit market liabilities of the U.S. Treasury, federally sponsored agencies, state and local governments, households, and nonfinancial firms. End-of-period basis.

Adjusted Monetary Base: The sum of currency in circulation outside Federal Reserve Banks and the U.S. Treasury, deposits of depository financial institutions at Federal Reserve Banks, and an adjustment for the effects of changes in statutory reserve requirements on the quantity of base money held by depositories. This series is a spliced chain index; see Anderson and Rasche (1996a,b, 2001, 2003).

Adjusted Reserves: The sum of vault cash and Federal Reserve Bank deposits held by depository institutions and an adjustment for the effects of changes in statutory reserve requirements on the quantity of base money held by depositories. This spliced chain index is numerically larger than the Board of Governors' measure, which excludes vault cash not used to satisfy statutory reserve requirements and Federal Reserve Bank deposits used to satisfy required clearing balance contracts; see Anderson and Rasche (1996a, 2001, 2003).

Monetary Services Index: An index that measures the flow of monetary services received by households and firms from their holdings of liquid assets; see Anderson, Jones, and Nesmith (1997). Indexes are shown for the assets included in M2, with additional data at research.stlouisfed.org/msi/index.html.

Note: M1, M2, M3, Bank Credit, and Domestic Nonfinancial Debt are constructed and published by the Board of Governors of the Federal Reserve System. For details, see *Statistical Supplement to the Federal Reserve Bulletin*, tables 1.21 and 1.26. MZM, Adjusted Monetary Base, Adjusted Reserves, and Monetary Services Index are constructed and published by the Research Division of the Federal Reserve Bank of St. Louis.

Notes

Page 3: Readers are cautioned that, since early 1994, the level and growth of M1 have been depressed by retail sweep programs that reclassify transactions deposits (demand deposits and other checkable deposits) as savings deposits overnight, thereby reducing banks' required reserves; see Anderson and Rasche (2001) and research.stlouisfed.org/aggreg/swdata.html. **Primary Credit Rate**, **Discount Rate,** and **Intended Federal Funds Rate** shown in the chart **Reserve Market Rates** are plotted as of the date of the change, while the **Effective Federal Funds Rate** is plotted as of the end of the month. Interest rates in the table are monthly averages from the Board of Governors H.15 Statistical Release. The **Treasury Yield Curve** and **Real Treasury Yield Curve** show constant maturity yields calculated by the U.S. Treasury for securities 5, 7, 10, and 20 years to maturity. **Inflation-Indexed Treasury Yield Spreads** are a measure of inflation compensation at those horizons, and it is simply the nominal constant maturity yield less the real constant maturity yield. Daily data and descriptions are available at research.stlouisfed.org/fred2/. See also *Statistical Supplement to the Federal Reserve Bulletin*, table 1.35. The 30-year constant maturity series was discontinued by the Treasury as of February 18, 2002.

Page 5: **Checkable Deposits** is the sum of demand and other checkable deposits. **Savings Deposits** is the sum of money market deposit accounts and passbook and statement savings. **Time Deposits** have a minimum initial maturity of 7 days. **Large Time Deposits** are deposits of $100,000 or more. **Retail** and **Institutional Money Market Mutual Funds** are as included in M2 and the non-M2 component of M3, respectively.

Page 7: **Excess Reserves plus RCB (Required Clearing Balance) Contracts** equals the amount of deposits at Federal Reserve Banks held by depository institutions but not applied to satisfy statutory reserve requirements. (This measure excludes the vault cash held by depository institutions that is not applied to satisfy statutory reserve requirements.) **Consumer Credit** includes most short- and intermediate-term credit extended to individuals. See *Statistical Supplement to the Federal Reserve Bulletin*, table 1.55.

Page 8: **Inflation Expectations** measures include the quarterly Federal Reserve Bank of Philadelphia *Survey of Professional Forecasters*, the monthly University of Michigan Survey Research Center's *Surveys of Consumers*, and the annual Federal Open Market Committee (FOMC) range as reported to the Congress in the February testimony that accompanies the Monetary Policy Report to the Congress. Beginning February 2000, the FOMC began using the personal consumption expenditures (PCE) price index to report its inflation range; the FOMC then switched to the PCE chain-type price index excluding food and energy prices ("core") beginning July 2004. Accordingly, neither are shown on this graph. **CPI Inflation** is the percentage change from a year ago in the consumer price index for all urban consumers. **Real Interest Rates** are ex post measures, equal to nominal rates minus year-over-year 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 $((y_t - y_{t-40})/40) \times 400$, where y_t is the log of real GDP. The 4-year moving average of base velocity growth is calculated similarly. To adjust the monetary base for the effect of retail-deposit sweep programs, we add to the monetary base an amount equal to 10 percent of the total amount swept, as estimated by the Federal Reserve Board staff. These estimates are imprecise, at best. Sweep program data are found at research.stlouisfed.org/aggreg/swdata.html.

Page 11: **Implied One-Year Forward Rates** are calculated by this Bank from Treasury constant maturity yields. Yields to maturity, $R(m)$, for securities with $m = 1,...,$ 10 years to maturity are obtained by linear interpolation between reported yields. These yields are smoothed by fitting the regression suggested by Nelson and Siegel (1987),

$$R(m) = a_0 + (a_1 + a_2)(1 - e^{-m/50})/(m/50) - a_2 \times e^{-m/50},$$

and forward rates are calculated from these smoothed yields using equation (a) in table 13.1 of Shiller (1990),

$$f(m) = [D(m)R(m) - D(m-1)] / [D(m) - D(m-1)],$$

where duration is approximated as $D(m) = (1 - e^{-R(m) \times m})/R(m)$. These rates are linear approximations to the true instantaneous forward rates; see Shiller (1990). For a discussion of the use of forward rates as indicators of inflation expectations, see Sharpe (1997). **Rates on 3-Month Eurodollar Futures** and **Rates on Selected Federal Funds Futures Contracts** trace through time the yield on three specific contracts. **Rates on Federal Funds Futures on Selected Dates** displays a single day's snapshot of yields for contracts expiring in the months shown on the horizontal axis. **Inflation-Indexed Treasury Securities and Yield Spreads** are those plotted on page 3. **Inflation-Indexed 10-Year Government Notes** shows the yield of an inflation-indexed note that is scheduled to mature in approximately (but not greater than) 10 years. The current French note has a maturity date of 7/25/2015, the current U.K. note has a maturity date of 8/16/2013, and the current U.S. note has a maturity date of 7/15/2017. **Inflation-Indexed Treasury Yield Spreads** and **Inflation-Indexed 10-Year Government Yield Spreads** equal the difference between the yields on the most recently issued inflation-indexed securities and the unadjusted security yields of similar maturity.

Page 12: **Velocity** (for MZM and M2) equals the ratio of GDP, measured in current dollars, to the level of the monetary aggregate. **MZM** and **M2 Own Rates** are weighted averages of the rates received by households and firms on the assets included in the aggregates. Prior to 1982, the 3-month T-bill rates are secondary market yields. From 1982 forward, rates are 3-month constant maturity yields.

Page 13: **Real Gross Domestic Product** is GDP as measured in chained 2000 dollars. The **Gross Domestic Product Price Index** is the implicit price deflator for GDP, which is defined by the Bureau of Economic Analysis, U.S. Department of Commerce, as the ratio of GDP measured in current dollars to GDP measured in chained 2000 dollars.

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

Page 15: **Inflation Rate Differentials** are the differences between the foreign consumer price inflation rates and year-over-year changes in the U.S. all-items Consumer Price Index.

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

Sources

Agence France Trésor: French note yields.

Bank of Canada: Canadian note yields.

Bank of England: U.K. note yields.

Board of Governors of the Federal Reserve System: Monetary aggregates and components: H.6 release. Bank credit and components: H.8 release. Consumer credit: G.19 release. Required reserves, excess reserves, clearing balance contracts, and discount window borrowing: H.4.1 and H.3 releases. Interest rates: H.15 release. Nonfinancial commercial paper: Board of Governors website. Nonfinancial debt: Z.1 release. M2 own rate.

Bureau of Economic Analysis: GDP.

Bureau of Labor Statistics: CPI.

Chicago Board of Trade: Federal funds futures contract.

Chicago Mercantile Exchange: Eurodollar futures.

Congressional Budget Office: Potential real GDP.

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

Federal Reserve Bank of St. Louis: Adjusted monetary base and adjusted reserves, monetary services index, MZM own rate, one-year forward rates.

Organization for Economic Cooperation and Development: International interest and inflation rates.

Standard & Poor's: Stock price-earnings ratio, stock price composite index.

University of Michigan Survey Research Center: Median expected price change.

U.S. Department of the Treasury: U.S. security yields.

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