Understanding the Inflation Targeting Debate

The nomination of Ben Bernanke to be Chairman of the Federal Reserve Board has rekindled a smoldering debate in U.S. monetary policy circles—namely, whether the Federal Reserve should join the ranks of the world's inflation targeting central banks. "Inflation targeting" is a sometimes nebulous phrase used to describe a monetary policy style which, at its heart, has the central bank setting an explicit, long-run, numeric target for inflation. Beginning in the 1990s, several countries in the world, perhaps most prominently the United Kingdom, formally began inflation targeting. Bernanke is on the record favoring inflation targeting, while outgoing Chairman Alan Greenspan has been opposed.

One particularly relevant summary of this debate occurred at the conference "Inflation Targeting: Prospects and Problems," held at the Federal Reserve Bank of St. Louis in October 2003.[1] At that conference, Bernanke, then a Fed Governor, participated in a panel discussion with Fed Governor Donald Kohn and European Central Bank (ECB) Executive Board member Otmar Issing. Governor Kohn, like Chairman Greenspan, has generally been opposed to inflation targeting. The ECB, the central bank most like the Fed in size and influence, has wrestled with inflation targeting issues since its inception in 1998. Thus, the panel provided an opportunity to debate the pros and cons of inflation targeting. What were the main arguments?

In his discussion, Bernanke stated that he felt there was an optimal, long-run inflation rate (OLIR) "that achieves the best average economic performance over time with respect to both the inflation and output objectives" [p. 166]. There would be no drawback, in Bernanke's view, to announcing an explicit target in the neighborhood of 2 percent, provided the FOMC makes no particular commitment to a timetable for reaching the OLIR. This last proviso would make sure that there were "no unwanted constraints on short-run monetary policy" [p. 167]. In suggesting a numerical target near 2 percent, Bernanke emphasized that very low levels of inflation are generally preferred, but not so low that the FOMC would face an unacceptably high risk of encountering the zero lower bound on nominal interest rates, as has occurred in Japan over the past decade.

The ECB experience is perhaps only cold comfort for the United States. Issing stressed that euro-zone monetary policy has been implemented only since 1999 and that many of the issues surrounding the introduction of the euro are special. Still, the ECB Governing Council did successfully introduce the new currency after adopting price stability as a main objective. The Council stated that it would strive to maintain a euro-zone inflation rate "below but close to 2 percent over the medium term" [p. 175]. Issing, like Bernanke, felt that 2 percent was reasonable in part because "a sufficient safety margin against the risk of deflation" [p. 175] was needed. Issing also emphasized that inflation targeting approaches often call for the central bank to adjust its nominal interest rate target in response to an inflation forecast. He warned that actual forecasts may not summarize all factors important for price stability; in addition, the forecasting model may be misspecified, reflecting economists' uncertainty about the true nature of the macroeconomy. Issing labeled these concerns "practical pitfalls" of inflation targeting [p. 172].

Kohn argued that adoption of inflation targeting might actually lead to worse economic performance relative to what has been achieved in the past two decades, stating that "the U.S. economy has benefited from the flexibility that the Federal Reserve has derived by eschewing a formal inflation target" [p. 180]. He questioned whether there was evidence that inflation targeting countries have actually witnessed benefits relative to non-inflation targeting countries. Like Issing, Kohn emphasized that there are many factors in actual policymaking that inflation targeting approaches may be ill-suited to handle. He concluded by stating that "those who propose changes from a good system have a high burden of proof. The marginal benefits [of changes] are not likely to be high [and may have] unintended consequences" [p. 183].

The panel discussion makes it clear that Bernanke was thinking mostly in terms of the merits of setting an explicit, numerical inflation target. He allowed the proviso that the Fed should make no commitment about a timetable to return inflation to this target, providing flexibility to policymakers to respond to special factors that may be influencing the economy. Issing and Kohn expressed little or only moderate concern with an explicit inflation target, but had more serious reservations about unwittingly placing constraints on policymakers, limiting their ability to manage the risks that naturally arise day to day. Thus, the core of the debate concerns whether adoption of inflation targeting would place important short-run constraints on policymakers and, if so, whether that is a good idea or not.

—James B. Bullard

[1] The conference proceedings, including the panel discussion, are published in the Federal Reserve Bank of St. Louis *Review*, July/August 2004, *86*(4).

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

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

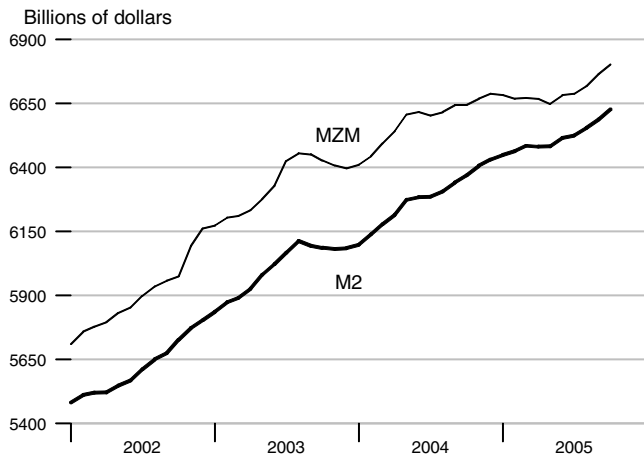We welcome your comments addressed to:

Editor, *Monetary Trends*
Research Division
Federal Reserve Bank of St. Louis
P.O. Box 442
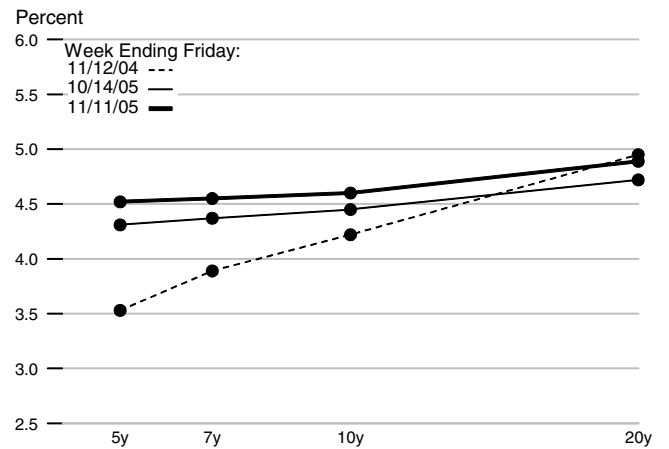St. Louis, MO 63166-0442

or to:

stlsFRED@stls.frb.org

On March 23, 2006, the Board of Governors of the Federal Reserve System will cease the publication of the M3 monetary aggregate. It will also cease publishing the following components: large-denomination time deposits, RPs, and eurodollars.
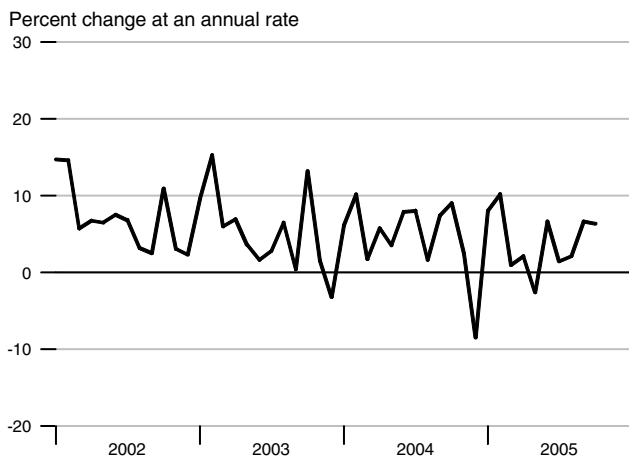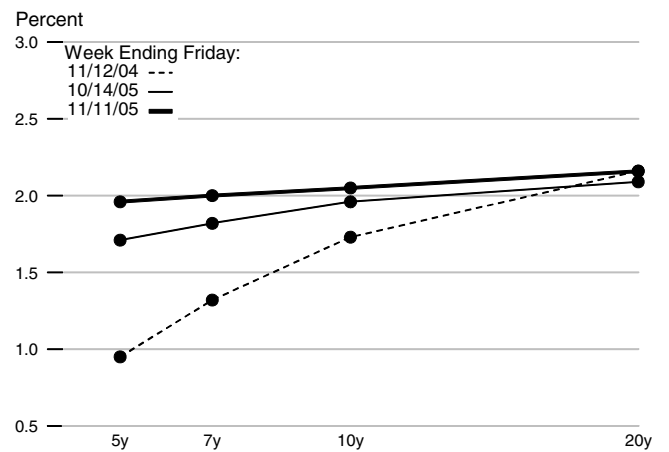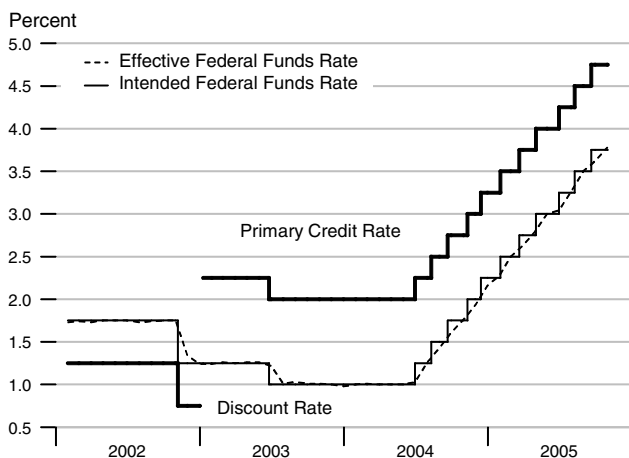
M2 and MZM

Billions of dollars

Treasury Yield Curve

Percent

Week Ending Friday:
11/12/04 ---
10/14/05 —
11/11/05 —

Adjusted Monetary Base

Percent change at an annual rate

Real Treasury Yield Curve

Percent

Week Ending Friday:
11/12/04 ---
10/14/05 —
11/11/05 —

Reserve Market Rates

Percent

--- Effective Federal Funds Rate
— Intended Federal Funds Rate

Primary Credit Rate

Discount Rate

Inflation-Indexed Treasury Yield Spreads

Percent

Week Ending Friday:
11/12/04 ---
10/14/05 —
11/11/05 —
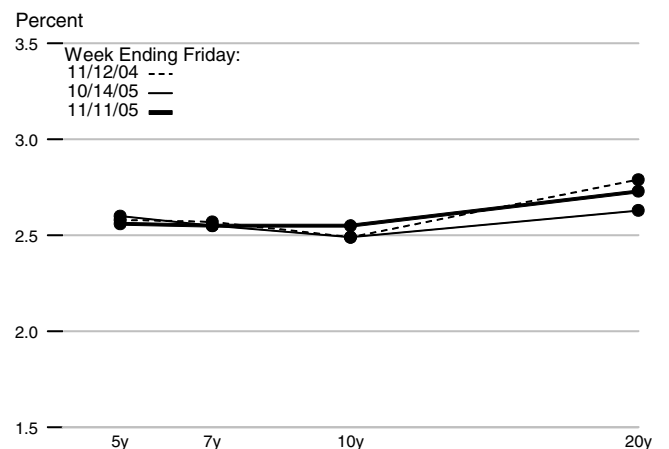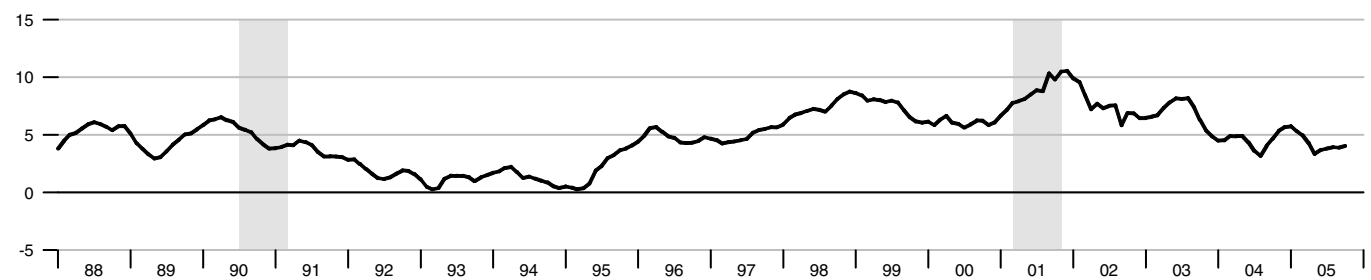
MZM and M1

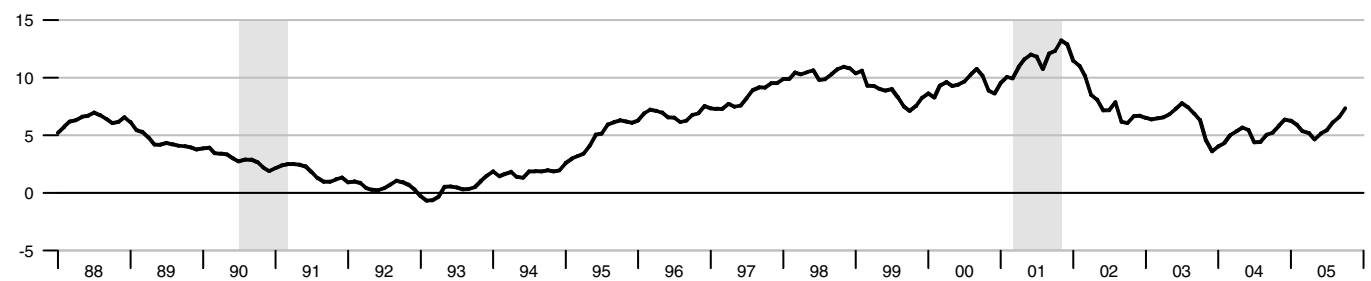Percent change from year ago

M2
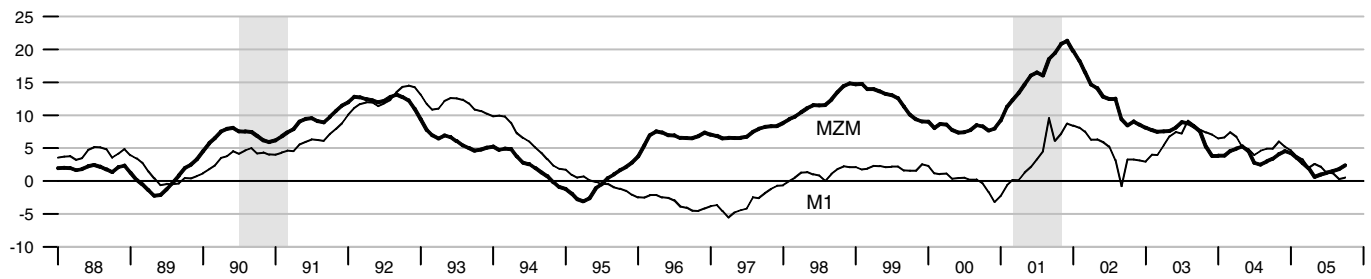
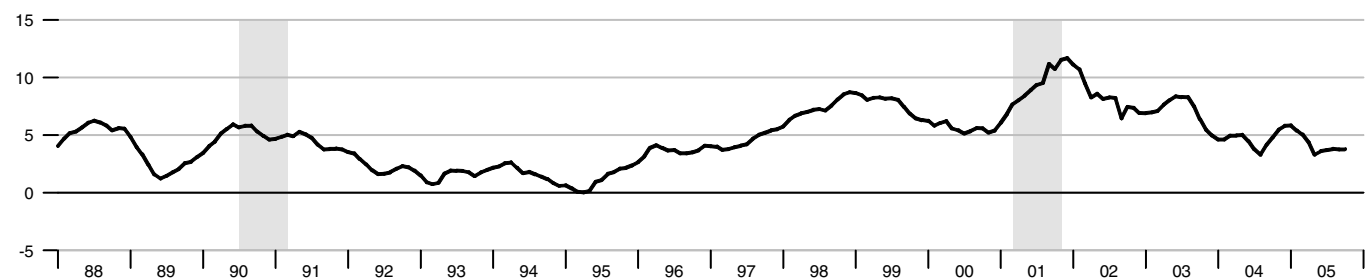Percent change from year ago

M3

Percent change from year ago

Monetary Services Index - M2

Percent change from year ago

Adjusted Monetary Base

Percent change from year ago
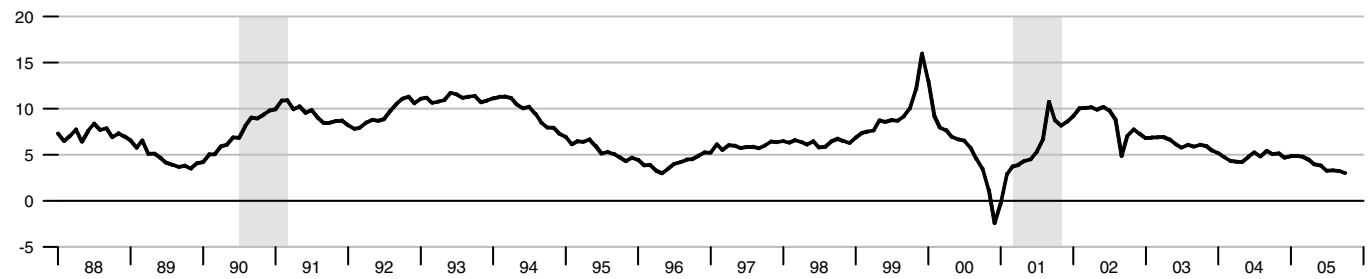
Domestic Nonfinancial Debt

Percent change from year ago
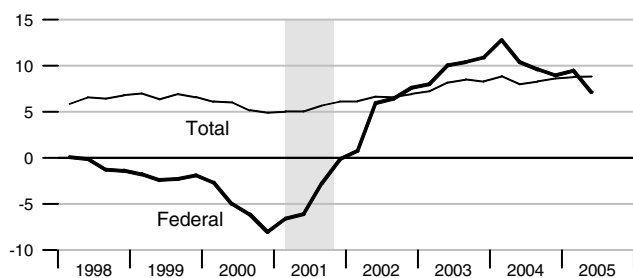
Currency Held by the Nonbank Public

Percent change from year ago
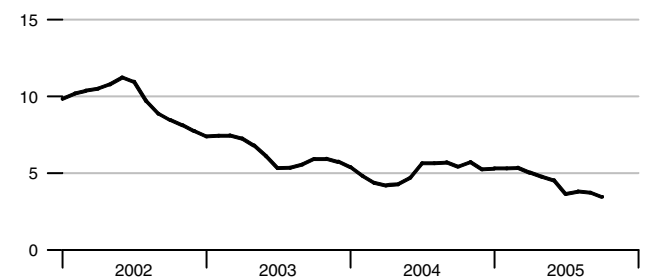
Time Deposits

Percent change from year ago
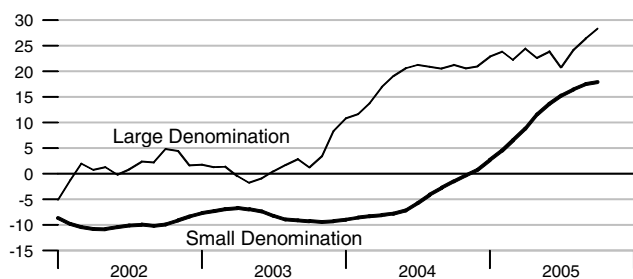
Checkable and Savings Deposits

Percent change from year ago
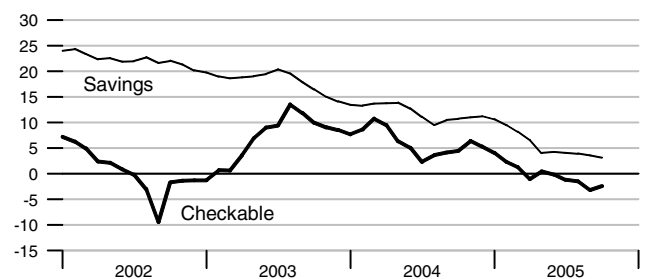
Money Market Mutual Fund Shares

Percent change from year ago
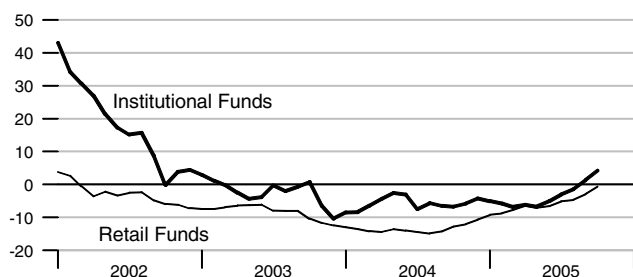
Repurchase Agreements and Eurodollars

Billions of dollars   Billions of dollars
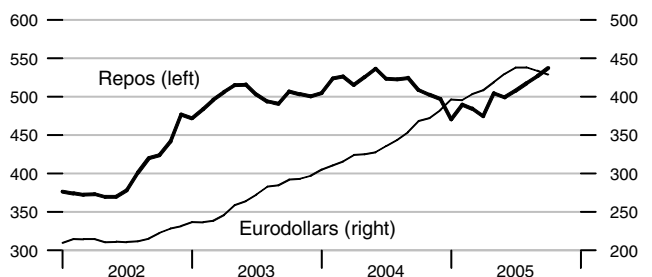
M1

Percent change at an annual rate
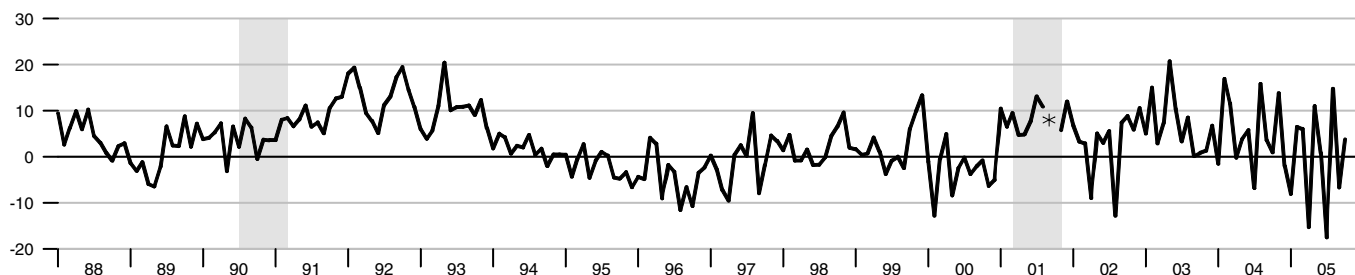
*Actual values for September and October 2001 are 55.87 and -38.35 percent rate, respectively.

MZM

Percent change at an annual rate
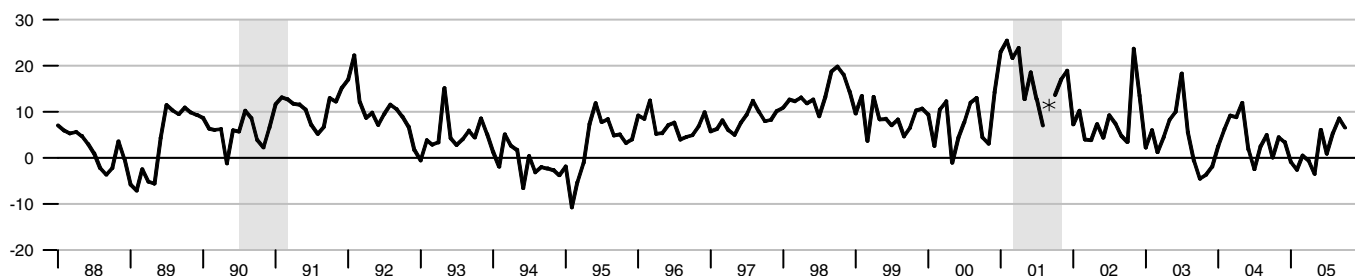
*Actual value for September 2001 is 39.41 percent rate.

M2

Percent change at an annual rate
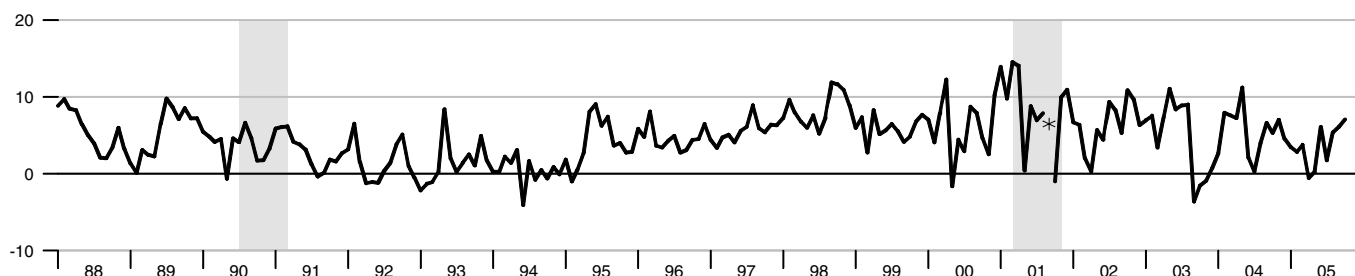
*Actual value for September 2001 is 24.90 percent rate.

M3

Percent change at an annual rate
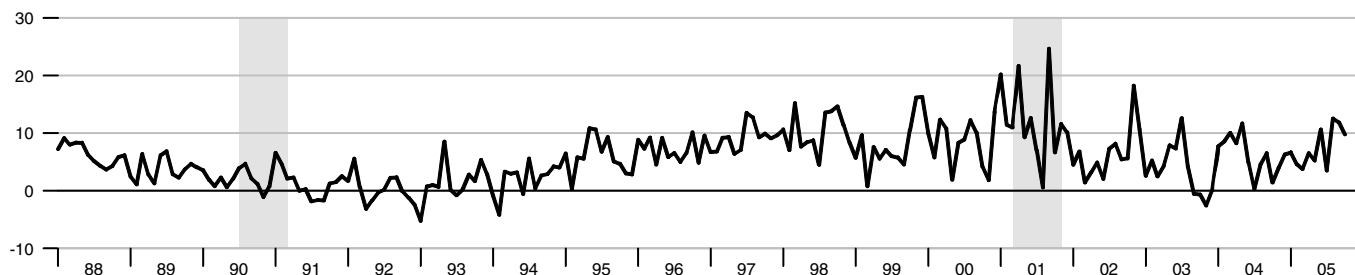
Adjusted and Required Reserves

Billions of dollars
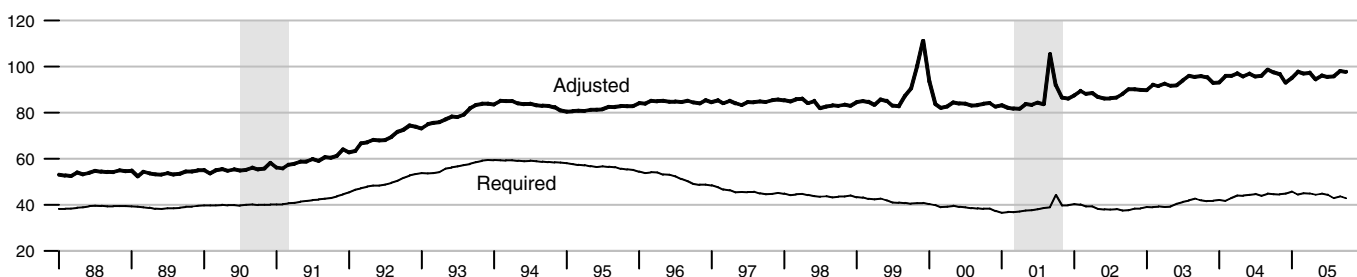
Total Borrowings, nsa

Billions of dollars
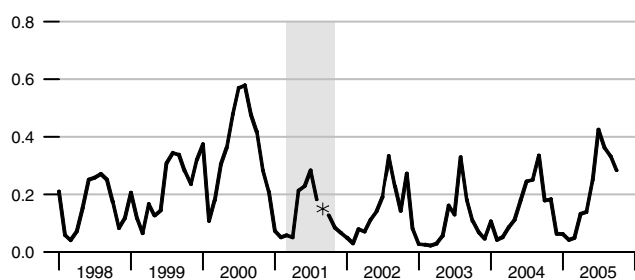
*Actual value for September 2001 is $3.4 billion.

Excess Reserves plus RCB Contracts

Billions of dollars
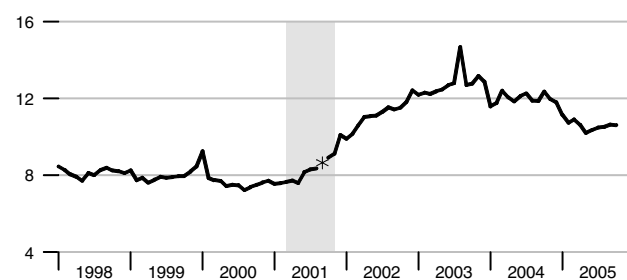
*Actual value for September 2001 is $26.43 billion.

Nonfinancial Commercial Paper

Percent change from year ago

Consumer Credit

Percent change from year ago
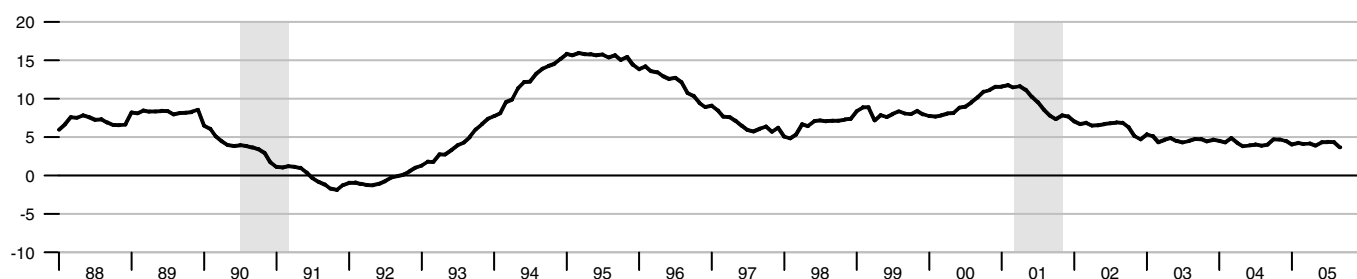
Inflation and Inflation Expectations

Percent

Humphrey-Hawkins CPI Inflation Range

Federal Reserve Bank
of Philadelphia

CPI Inflation

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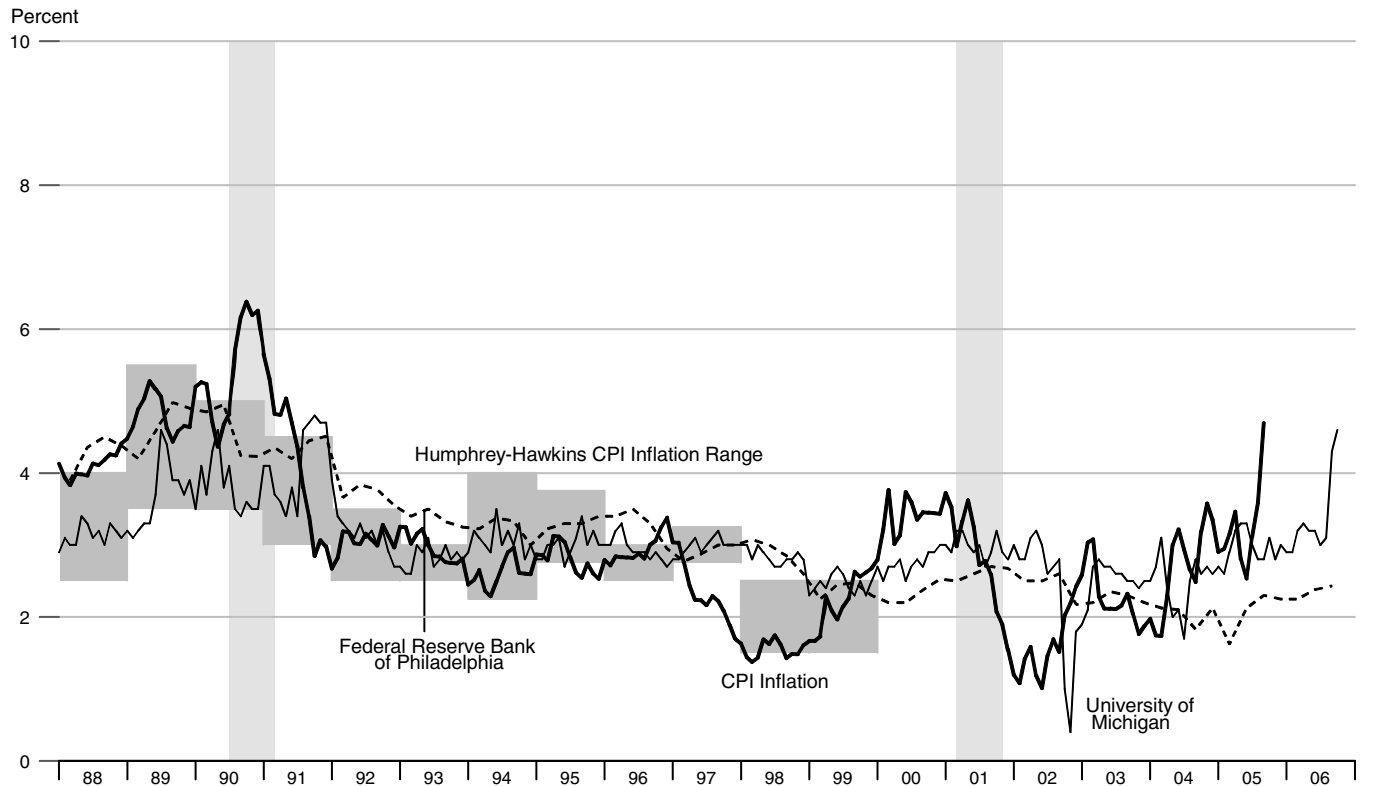
The shaded region shows the Humphrey-Hawkins CPI inflation range. Beginning in January 2000, the Humphrey-Hawkins inflation range was reported using the PCE price index and therefore is not shown on this graph. See notes on page 19.

Treasury Security Yield Spreads
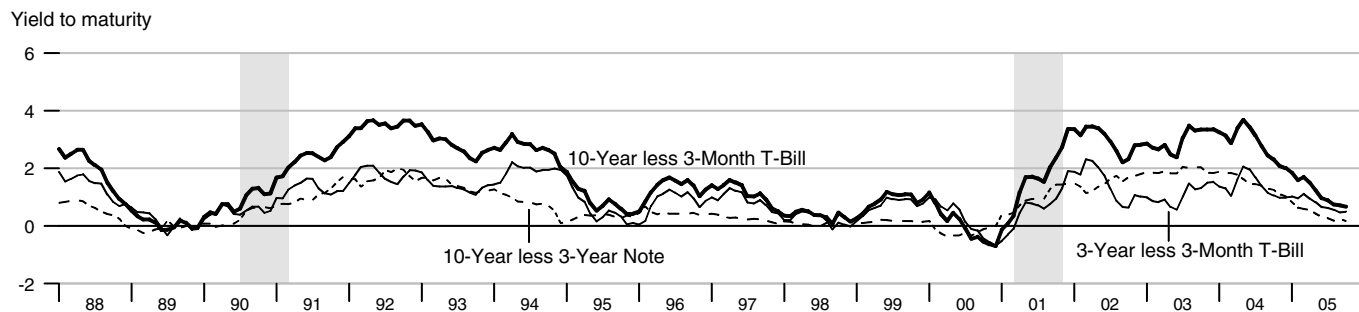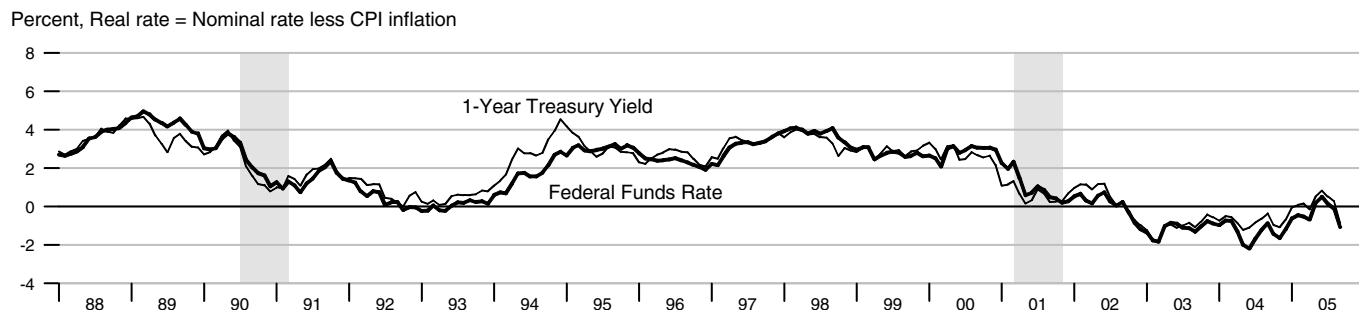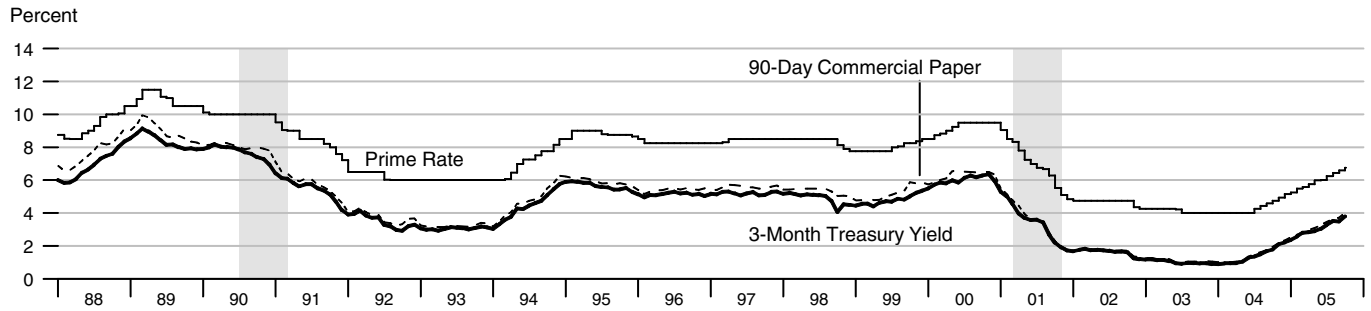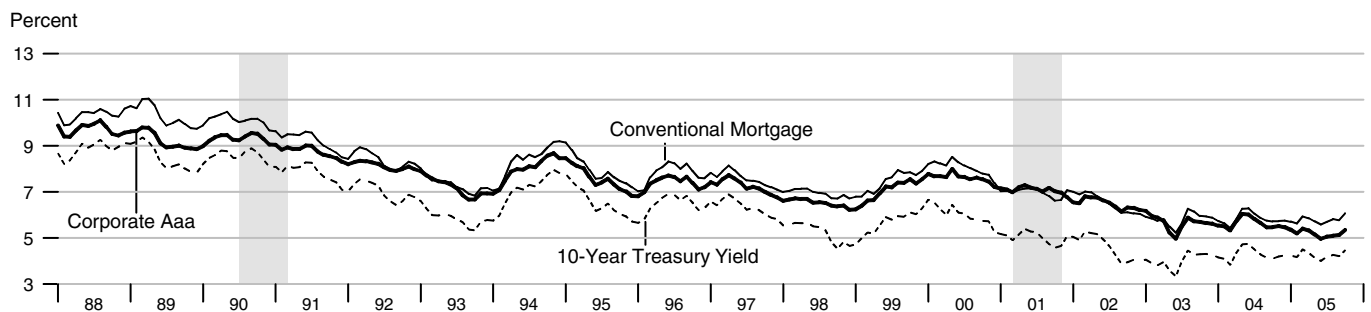
Yield to maturity

10-Year less 3-Month T-Bill

10-Year less 3-Year Note

3-Year less 3-Month T-Bill

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

10-Year Treasury Yield

Long-Term Interest Rates

Percent

Corporate Baa

10-Year Treasury Yield

Short-Term Interest Rates

Percent

90-Day Commercial Paper

3-Month
Treasury Yield
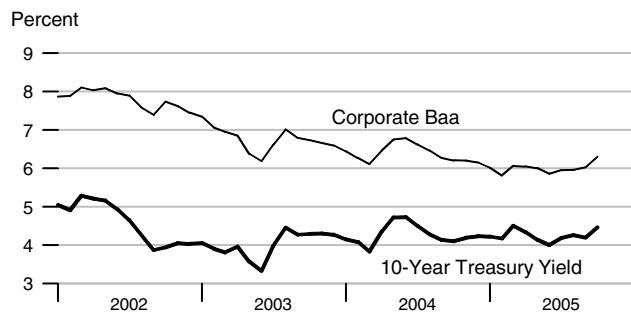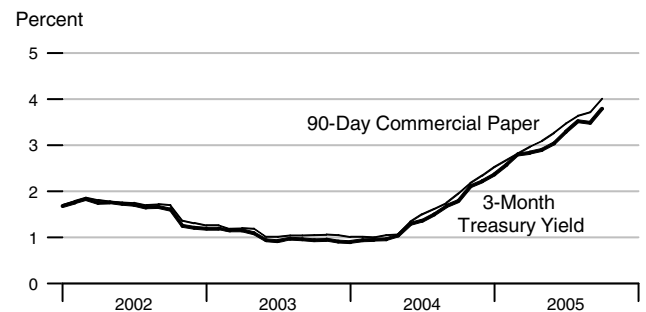
FOMC Intended Federal Funds Rate, Discount Rate, and Primary Credit Rate

Percent

Intended Federal
Funds Rate

Discount Rate

Primary Credit
Rate

Federal Funds Rate and Inflation Targets

Percent

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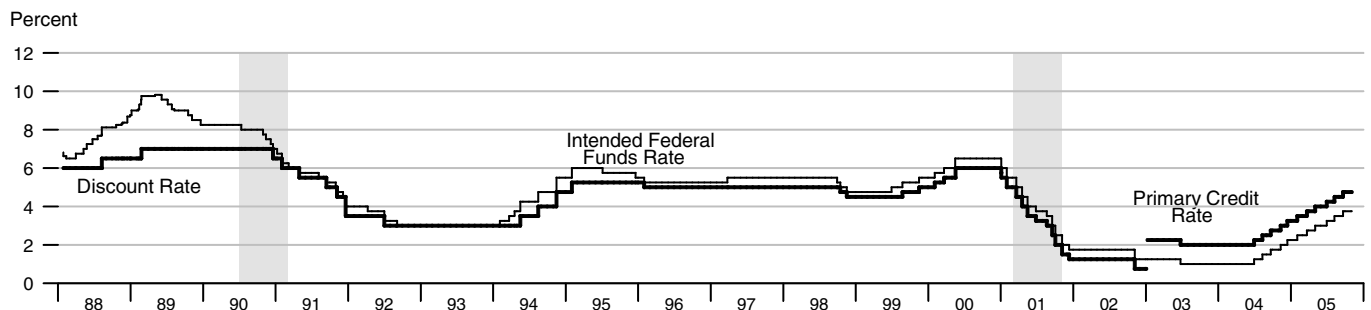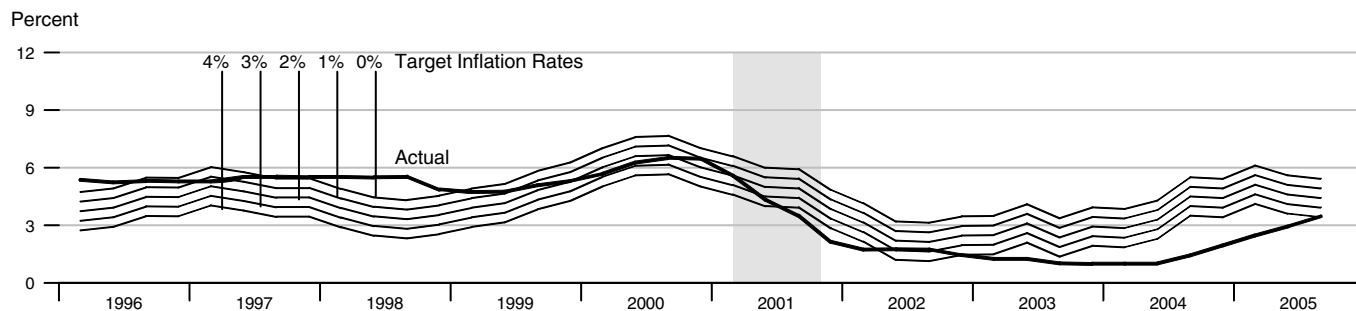
Actual

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

Components of Taylor's Rule

Actual and Potential Real GDP

Billions of chain-weighted 2000 dollars

Potential

Actual

PCE Inflation

Percent change from year ago

Monetary Base Growth* and Inflation Targets

Percent

Actual

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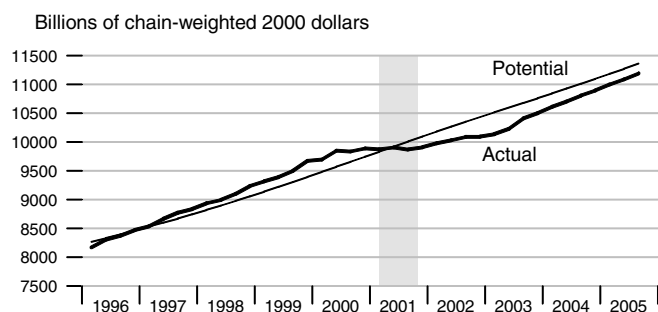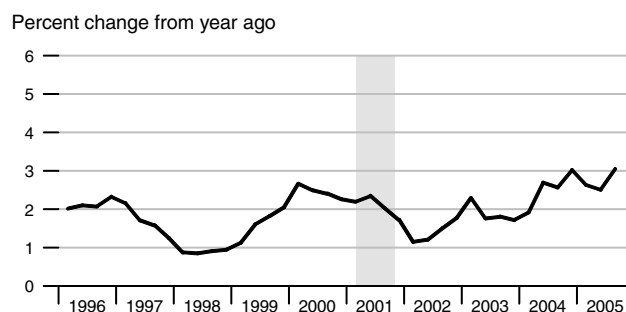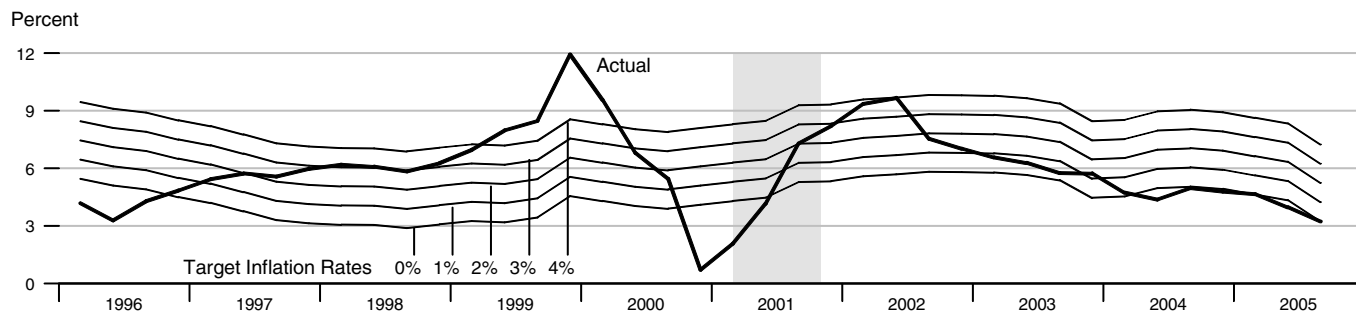
*Modified for the effects of sweeps programs on reserve demand.
Calculated base growth is based on McCallum's rule. Actual base growth is percent change from year ago. See notes on page 19.

Components of McCallum's Rule

Monetary Base Velocity Growth
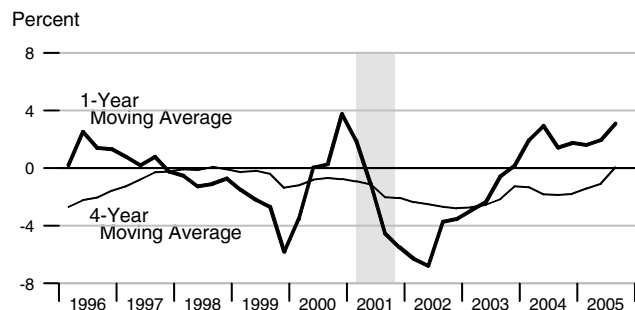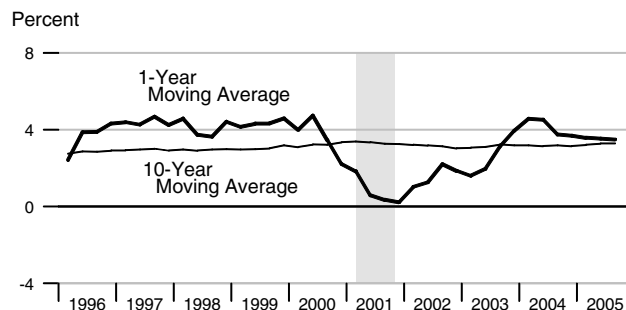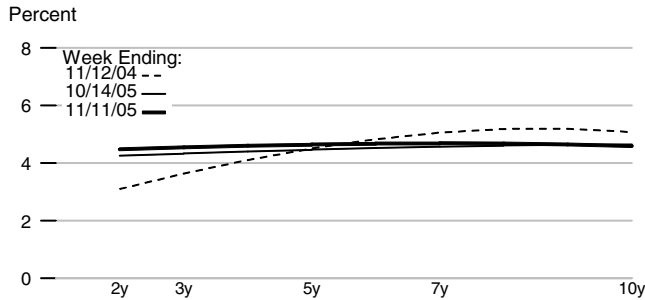
Percent

1-Year
Moving Average

4-Year
Moving Average

Real Output Growth

Percent

1-Year
Moving Average

10-Year
Moving Average

Implied One-Year Forward Rates

Percent

Week Ending:
11/12/04
10/14/05
11/11/05

Rates on 3-Month Eurodollar Futures

Percent, daily data

Jan 2006

Dec 2005

Nov 2005

Rates on Selected Federal Funds Futures Contracts

Percent, daily data

Jan 2006

Dec 2005

Nov 2005

Rates on Federal Funds Futures on Selected Dates

Percent

11/10/2005

10/14/2005

09/16/2005

Contract Month

Inflation-Indexed Treasury Securities

Weekly data

Percent

Maturity

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

Inflation-Indexed Treasury Yield Spreads

Weekly data

Percent

Horizon

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

Inflation-Indexed 10-Year Government Notes

Percent, weekly data

France

U.K.

U.S.

Inflation-Indexed 10-Year Government Yield Spreads

Percent, weekly data

U.K.

U.S.

France
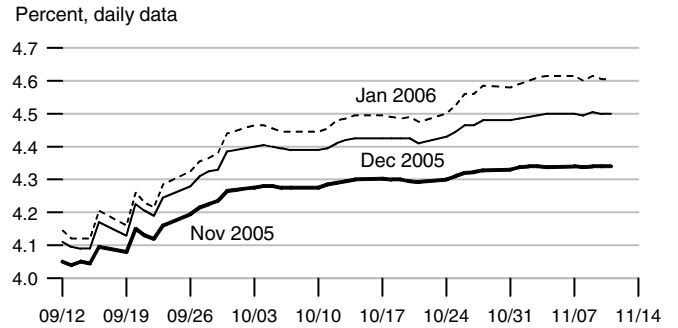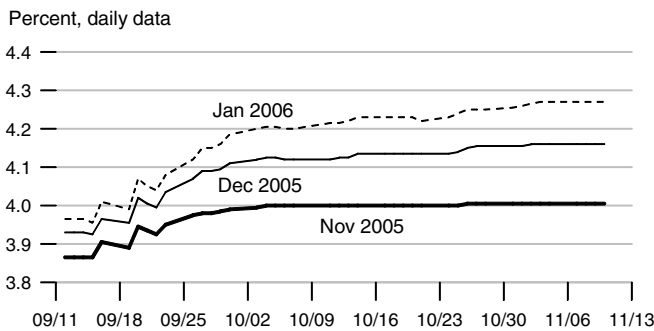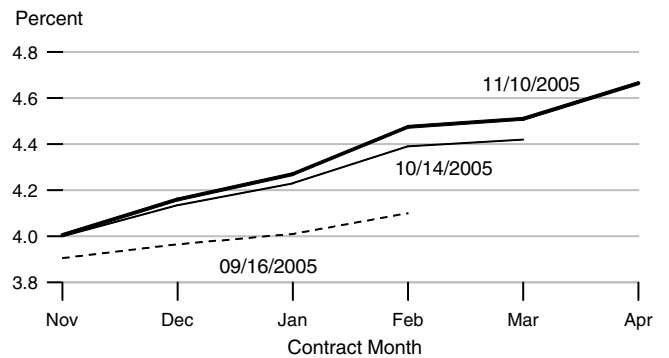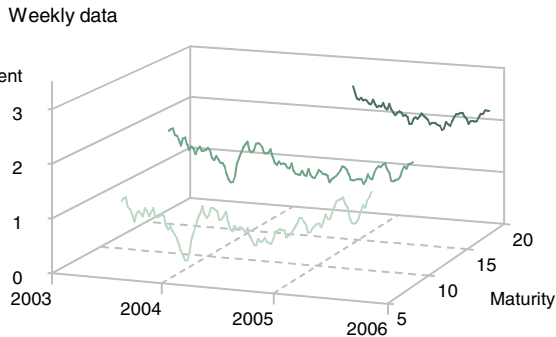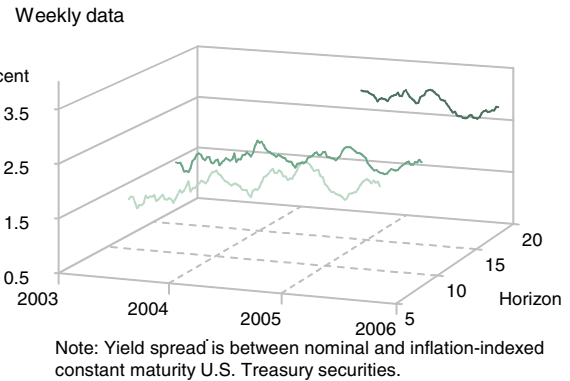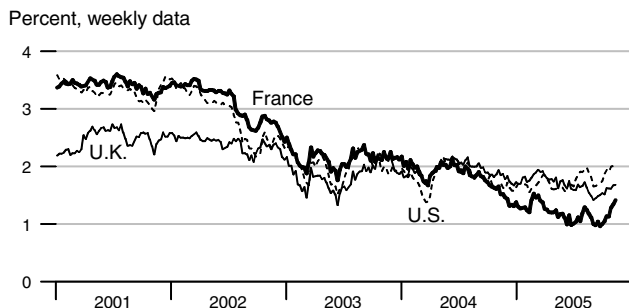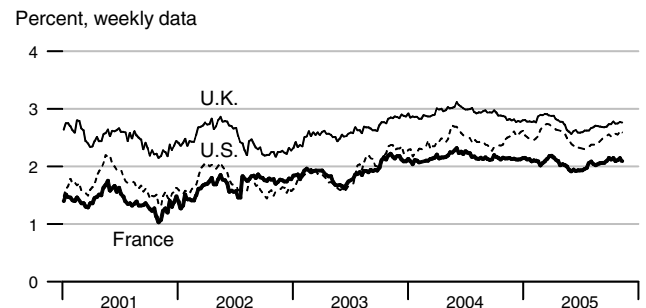
Velocity

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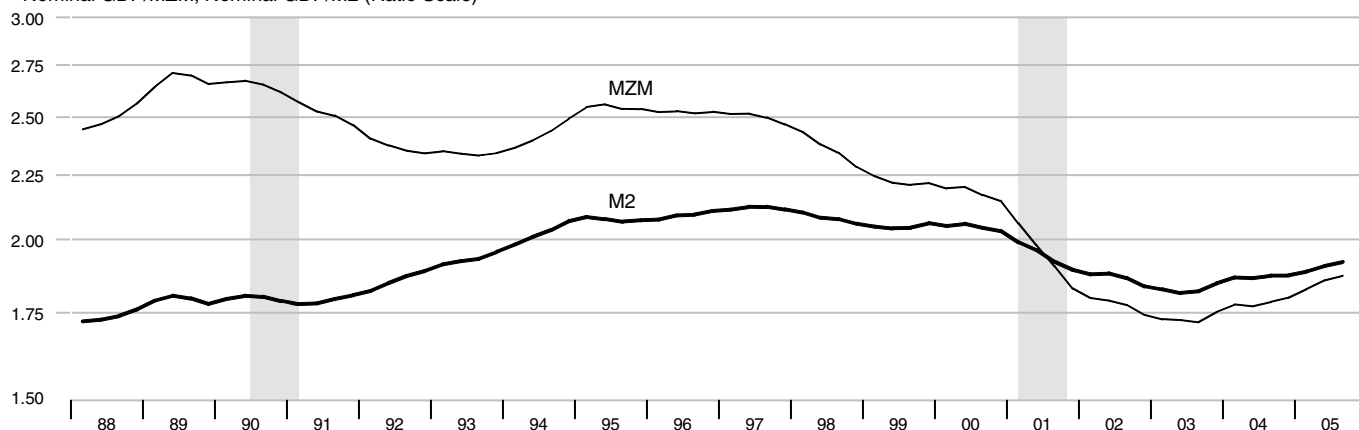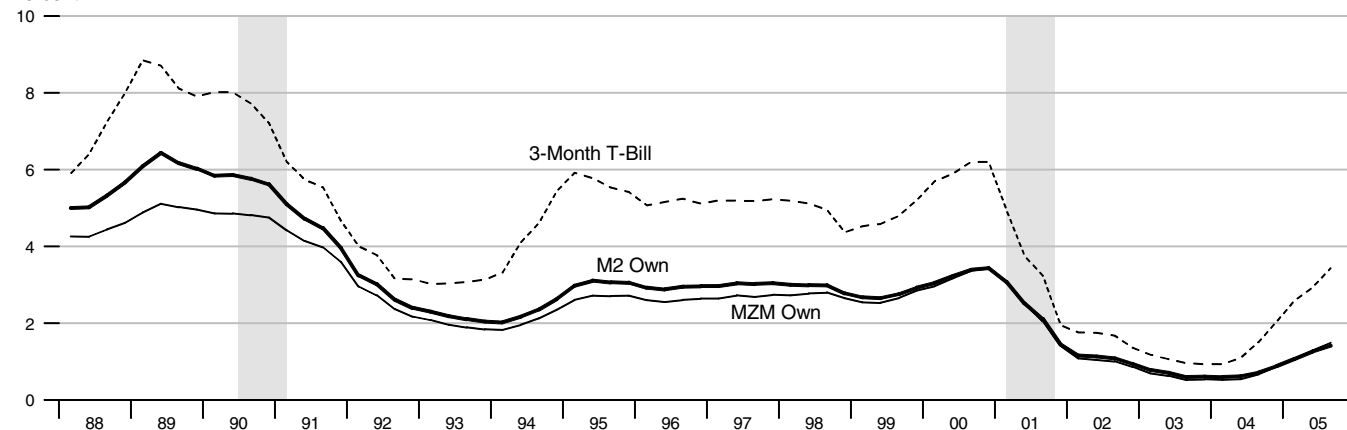
MZM

M2

Interest Rates

Percent

3-Month T-Bill

M2 Own

MZM Own

MZM Velocity and Interest Rate Spread

Ratio Scale

Velocity = Nominal GDP / MZM

●●● 1974Q1 to 1993Q4
◇◇◇ 1994Q1 to present

Interest Rate Spread = 3-Month T-Bill less MZM Own Rate

M2 Velocity and Interest Rate Spread

Ratio Scale

Velocity = Nominal GDP / M2

●●● 1974Q1 to 1993Q4
◇◇◇ 1994Q1 to present

Interest Rate Spread = 3-Month T-Bill less M2 Own Rate
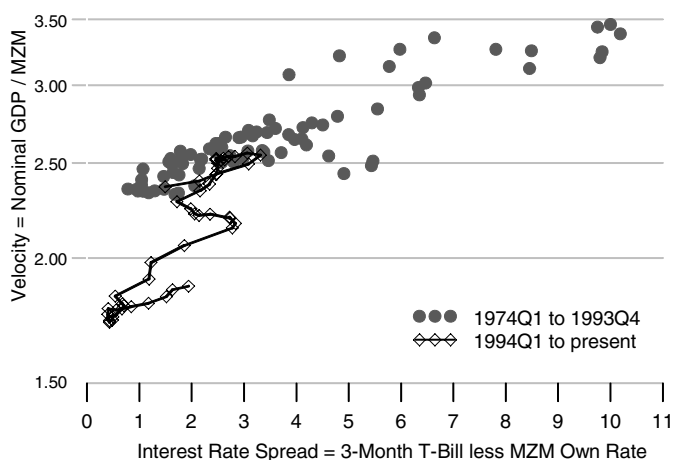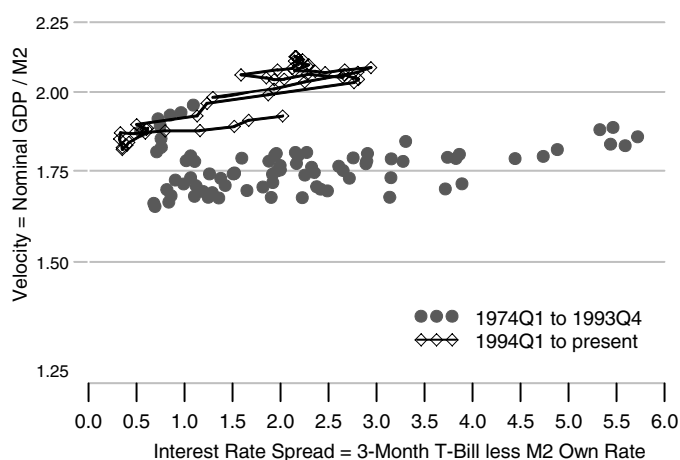
Gross Domestic Product

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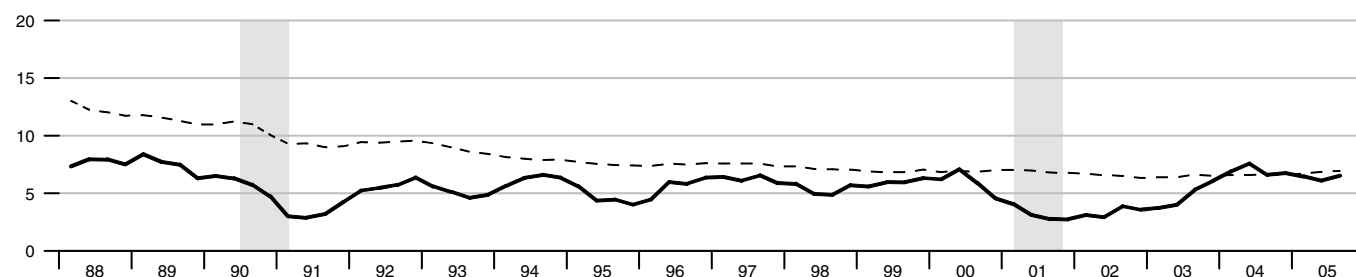
Dashed lines indicate 10-year moving averages.

Real Gross Domestic Product

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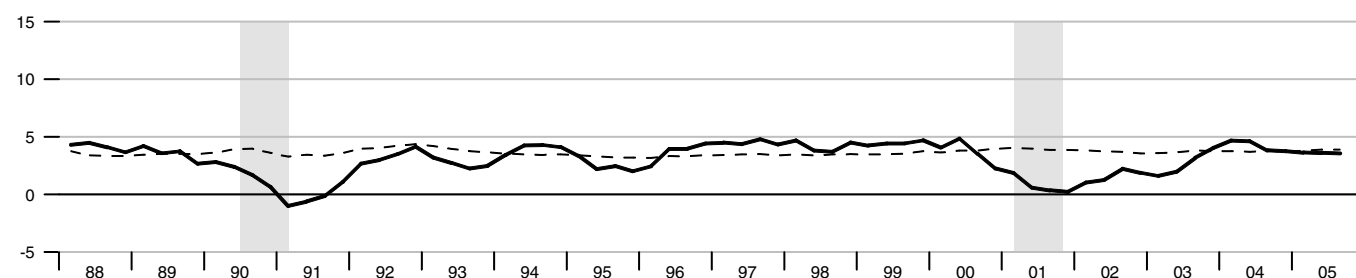
Dashed lines indicate 10-year moving averages.

Gross Domestic Product Price Index

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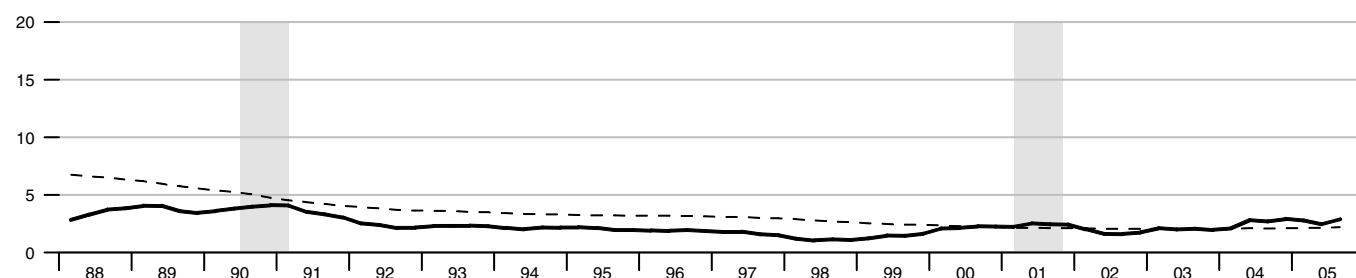
Dashed lines indicate 10-year moving averages.

M2

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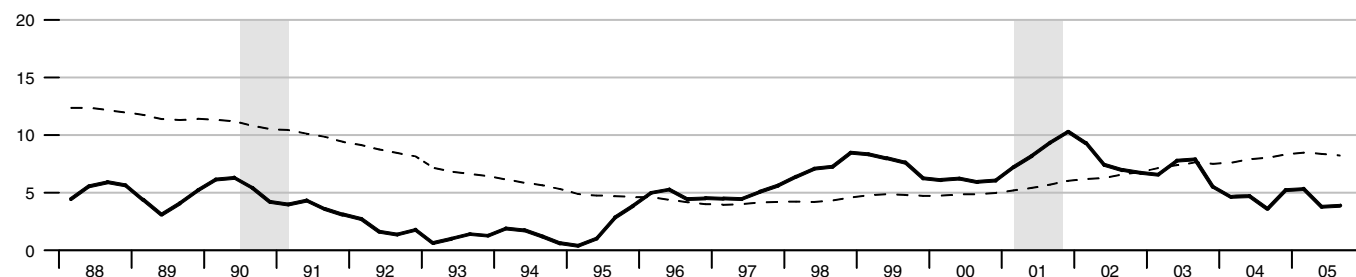
Dashed lines indicate 10-year moving averages.

Bank Credit

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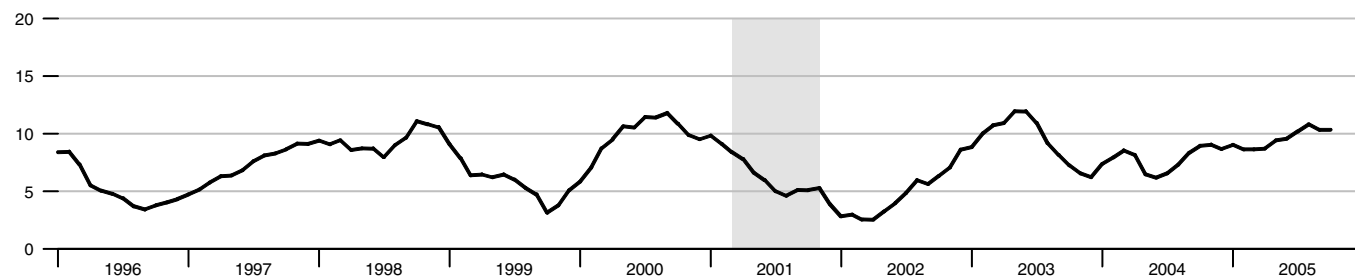
Investment Securities in Bank Credit at Commercial Banks

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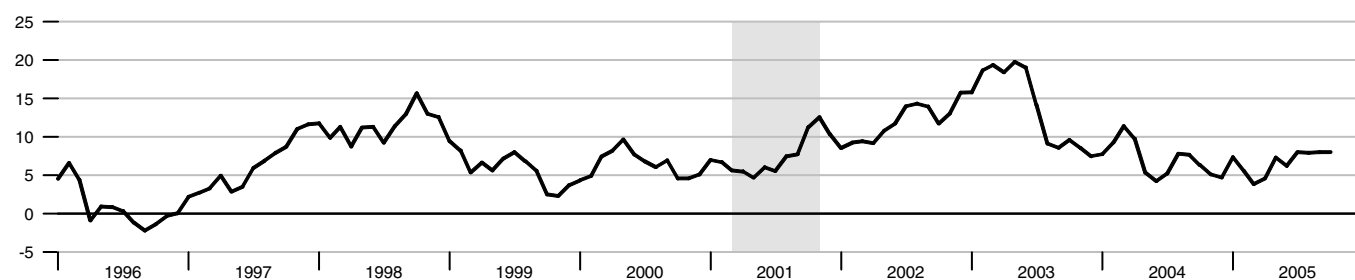
Total Loans and Leases in Bank Credit at Commercial Banks

Percent change from year ago

Commercial and Industrial Loans at Commercial Banks

Percent change from year ago
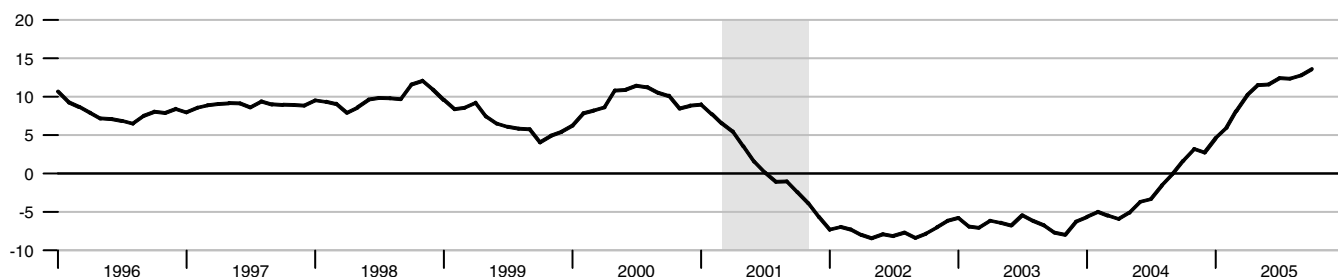
Standard & Poor's 500
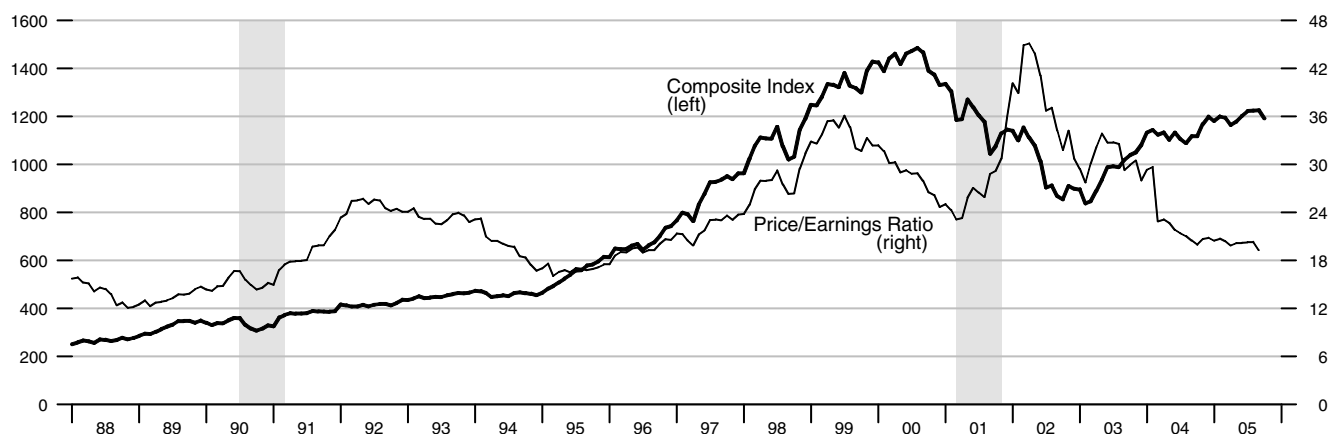
Recent Inflation and Long-Term Interest Rates

	Consumer Price Inflation Rates				Long-Term Government Bond Rates			
	Percent change from year ago				Percent			
	2004Q4	2005Q1	2005Q2	2005Q3	Jul05	Aug05	Sep05	Oct05
United States	3.37	3.00	2.93	3.80	4.18	4.26	4.20	4.46
Canada	2.29	2.13	1.90	.	3.92	3.92	3.87	.
France	2.08	1.70	1.69	.	3.27	3.30	.	.
Germany	1.98	1.74	1.70	.	3.20	3.23	3.07	.
Italy	1.98	1.92	1.84	2.03	3.44	3.45	3.29	.
Japan	0.48	-0.20	-0.14	.	1.26	1.43	1.38	1.54
United Kingdom	3.41	3.17	3.01	.	4.29	4.31	.	.

Inflation and Long-Term Interest Rate Differentials

- - - - ▬▬▬ Inflation differential = Foreign inflation less U.S. inflation
- - - - ───── Long-term rate differential = Foreign rate less U.S. rate
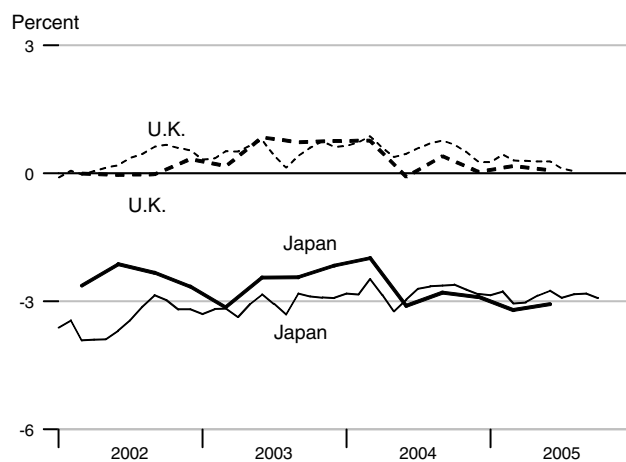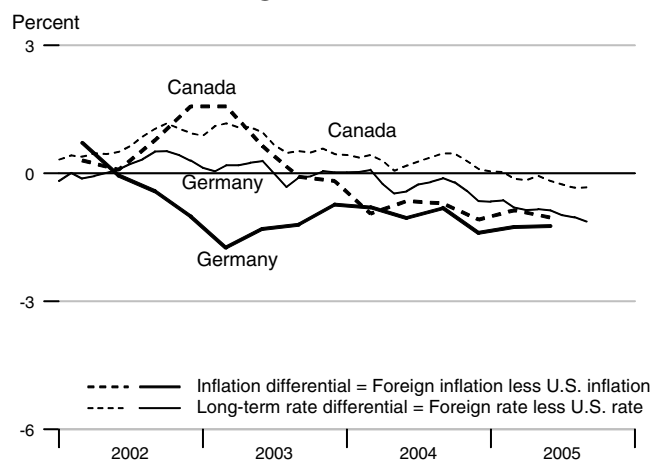
| | | Money Stock | | | | Bank | Adjusted | | |
		M1	MZM	M2	M3	Credit	Monetary Base	Reserves	MSI M2
	2000	1103.484	4507.601	4798.883	6860.005	5025.427	607.106	84.308	248.591
	2001	1140.215	5223.438	5219.902	7646.741	5344.288	641.167	86.172	271.439
	2002	1196.344	5895.446	5615.409	8261.403	5597.161	697.092	88.158	294.191
	2003	1273.946	6332.382	6004.606	8788.514	6120.619	740.926	93.308	315.219
	2004	1344.897	6581.409	6277.338	9236.793	6597.778	776.704	96.061	329.910
2003	1	1235.469	6195.709	5866.596	8624.845	5954.913	726.940	91.196	307.910
	2	1268.185	6279.599	5976.326	8735.938	6135.240	738.451	92.117	313.666
	3	1292.370	6443.859	6091.199	8901.791	6187.916	744.331	95.163	319.766
	4	1299.762	6410.361	6084.306	8891.481	6204.407	753.981	94.758	319.534
2004	1	1319.929	6449.505	6138.564	9010.315	6428.570	761.427	95.031	322.486
	2	1339.324	6587.990	6257.514	9216.103	6560.512	771.146	96.600	328.774
	3	1350.520	6621.038	6311.119	9313.488	6646.073	782.780	96.796	331.731
	4	1369.815	6667.102	6402.156	9407.267	6755.958	791.464	95.817	336.649
2005	1	1371.472	6674.399	6465.992	9536.917	6992.027	798.241	96.640	339.991
	2	1369.594	6666.294	6493.276	9677.205	7166.381	802.631	96.015	341.137
	3	1362.893	6723.350	6555.798	9877.223	7340.493	808.399	96.510	344.199
2003	Oct	1296.390	6426.878	6086.156	8904.143	6162.605	754.020	95.892	319.572
	Nov	1297.815	6407.337	6081.566	8884.999	6199.117	754.971	95.410	319.395
	Dec	1305.081	6396.868	6085.195	8885.301	6251.498	752.952	92.971	319.634
2004	Jan	1303.448	6410.822	6098.708	8942.455	6321.943	756.790	93.206	320.482
	Feb	1321.799	6444.242	6139.032	9006.604	6442.880	763.195	95.937	322.499
	Mar	1334.540	6493.452	6177.951	9081.885	6520.886	764.295	95.950	324.478
	Apr	1334.317	6541.332	6215.194	9144.307	6541.214	767.951	97.095	326.515
	May	1338.617	6606.287	6273.248	9233.171	6550.191	770.211	95.779	329.610
	Jun	1345.039	6616.350	6284.101	9270.830	6590.132	775.275	96.927	330.197
	Jul	1337.428	6602.798	6285.668	9273.163	6602.590	780.464	95.691	330.486
	Aug	1355.047	6616.533	6306.493	9308.479	6632.915	781.527	96.023	331.433
	Sep	1359.084	6643.783	6341.195	9358.822	6702.713	786.349	98.674	333.274
	Oct	1360.163	6644.202	6369.273	9369.946	6714.056	792.248	97.558	334.886
	Nov	1375.791	6669.000	6406.537	9401.368	6759.908	793.878	96.828	336.880
	Dec	1373.491	6688.104	6430.657	9450.486	6793.910	788.267	93.065	338.181
2005	Jan	1364.258	6683.116	6449.132	9502.881	6892.995	793.540	95.087	339.216
	Feb	1371.622	6668.727	6464.333	9538.993	6998.750	800.277	97.805	339.882
	Mar	1378.537	6671.355	6484.511	9568.877	7084.335	800.906	97.029	340.874
	Apr	1360.984	6667.905	6481.469	9620.699	7111.873	802.312	97.377	340.793
	May	1373.439	6648.645	6482.762	9662.754	7166.331	800.580	94.522	340.505
	Jun	1374.360	6682.331	6515.596	9748.161	7220.938	805.002	96.146	342.112
	Jul	1354.328	6687.377	6525.109	9776.738	7275.116	805.964	95.584	342.723
	Aug	1370.981	6717.448	6554.382	9878.739	7350.364	807.389	95.817	344.071
	Sep	1363.371	6765.225	6587.904	9976.191	7396.000	811.844	98.129	345.804
	Oct	1367.631	6802.290	6626.683	10057.54	7408.574	816.136	97.793	347.561

*All values are given in billions of dollars.

		Federal Funds	Primary Credit Rate	Prime Rate	3-mo CDs	Treasury Yields			Corporate Aaa Bonds	S & L Aaa Bonds	Conventional Mortgage
						3-mo	3-yr	10-yr			
2000		6.24		9.23	6.46	6.00	6.22	6.03	7.62	5.58	8.06
2001		3.89		6.92	3.69	3.47	4.08	5.02	7.08	5.01	6.97
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
2003	1	1.25	2.25	4.25	1.26	1.18	2.07	3.92	6.00	4.60	5.83
	2	1.25	2.23	4.24	1.17	1.06	1.77	3.62	5.31	4.28	5.51
	3	1.02	2.00	4.00	1.07	0.95	2.20	4.23	5.70	4.68	6.01
	4	1.00	2.00	4.00	1.10	0.93	2.38	4.29	5.66	4.52	5.92
2004	1	1.00	2.00	4.00	1.05	0.93	2.17	4.02	5.45	4.26	5.61
	2	1.01	2.00	4.00	1.25	1.10	2.98	4.60	5.93	4.82	6.13
	3	1.43	2.42	4.42	1.70	1.51	2.92	4.30	5.64	4.54	5.89
	4	1.95	2.94	4.94	2.25	2.04	3.05	4.17	5.48	4.39	5.73
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
2003	Oct	1.01	2.00	4.00	1.10	0.94	2.26	4.29	5.70	4.64	5.95
	Nov	1.00	2.00	4.00	1.11	0.95	2.45	4.30	5.65	4.50	5.93
	Dec	0.98	2.00	4.00	1.10	0.91	2.44	4.27	5.62	4.41	5.88
2004	Jan	1.00	2.00	4.00	1.06	0.90	2.27	4.15	5.54	4.42	5.74
	Feb	1.01	2.00	4.00	1.05	0.94	2.25	4.08	5.50	4.26	5.64
	Mar	1.00	2.00	4.00	1.05	0.95	2.00	3.83	5.33	4.11	5.45
	Apr	1.00	2.00	4.00	1.08	0.96	2.57	4.35	5.73	4.69	5.83
	May	1.00	2.00	4.00	1.20	1.04	3.10	4.72	6.04	4.93	6.27
	Jun	1.03	2.01	4.01	1.46	1.29	3.26	4.73	6.01	4.85	6.29
	Jul	1.26	2.25	4.25	1.57	1.36	3.05	4.50	5.82	4.71	6.06
	Aug	1.43	2.43	4.43	1.68	1.50	2.88	4.28	5.65	4.52	5.87
	Sep	1.61	2.58	4.58	1.86	1.68	2.83	4.13	5.46	4.40	5.75
	Oct	1.76	2.75	4.75	2.04	1.79	2.85	4.10	5.47	4.38	5.72
	Nov	1.93	2.93	4.93	2.26	2.11	3.09	4.19	5.52	4.45	5.73
	Dec	2.16	3.15	5.15	2.45	2.22	3.21	4.23	5.47	4.35	5.75
2005	Jan	2.28	3.25	5.25	2.61	2.37	3.39	4.22	5.36	4.24	5.71
	Feb	2.50	3.49	5.49	2.77	2.58	3.54	4.17	5.20	4.16	5.63
	Mar	2.63	3.58	5.58	2.97	2.80	3.91	4.50	5.40	4.29	5.93
	Apr	2.79	3.75	5.75	3.09	2.84	3.79	4.34	5.33	4.18	5.86
	May	3.00	3.98	5.98	3.22	2.90	3.72	4.14	5.15	4.20	5.72
	Jun	3.04	4.01	6.01	3.38	3.04	3.69	4.00	4.96	4.08	5.58
	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

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

		M1	MZM	M2	M3
Percent change at an annual rate					
	2000	0.18	8.09	6.07	9.41
	2001	3.33	15.88	8.77	11.47
	2002	4.92	12.87	7.58	8.04
	2003	6.49	7.41	6.93	6.38
	2004	5.57	3.93	4.54	5.10
2003	1	8.38	7.85	6.90	6.69
	2	10.59	5.42	7.48	5.15
	3	7.63	10.46	7.69	7.59
	4	2.29	-2.08	-0.45	-0.46
2004	1	6.21	2.44	3.57	5.35
	2	5.88	8.59	7.75	9.14
	3	3.34	2.01	3.43	4.23
	4	5.71	2.78	5.77	4.03
2005	1	0.48	0.44	3.99	5.51
	2	-0.55	-0.49	1.69	5.88
	3	-1.96	3.42	3.85	8.27
2003	Oct	0.82	-4.53	-1.56	-0.68
	Nov	1.32	-3.65	-0.91	-2.58
	Dec	6.72	-1.96	0.72	0.04
2004	Jan	-1.50	2.62	2.66	7.72
	Feb	16.89	6.26	7.93	8.61
	Mar	11.57	9.16	7.61	10.03
	Apr	-0.20	8.85	7.23	8.25
	May	3.87	11.92	11.21	11.66
	Jun	5.76	1.83	2.08	4.89
	Jul	-6.79	-2.46	0.30	0.30
	Aug	15.81	2.50	3.98	4.57
	Sep	3.58	4.94	6.60	6.49
	Oct	0.95	0.08	5.31	1.43
	Nov	13.79	4.48	7.02	4.02
	Dec	-2.01	3.44	4.52	6.27
2005	Jan	-8.07	-0.89	3.45	6.65
	Feb	6.48	-2.58	2.83	4.56
	Mar	6.05	0.47	3.75	3.76
	Apr	-15.28	-0.62	-0.56	6.50
	May	10.98	-3.47	0.24	5.25
	Jun	0.80	6.08	6.08	10.61
	Jul	-17.49	0.91	1.75	3.52
	Aug	14.76	5.40	5.38	12.52
	Sep	-6.66	8.53	6.14	11.84
	Oct	3.75	6.57	7.06	9.79

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 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 7/15/2015. **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.

References

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