



## Real Estate Bubbles and Weak Recoveries

Private sector investment is the main culprit in the weak U.S. recovery following the Great Recession of 2007-09. The left chart below displays the trends in private investment and consumption since 1995 after adjusting for the effects of inflation. Consumption expenditures have actually surpassed their previous peak levels of 2007 and are therefore higher than ever. Government expenditure and net exports (not shown) display similar trends. Investment is the only component of gross domestic product (GDP) that has not yet recovered. Currently, it stands 20 percent below its peak level of 2006. This means investment is contributing negatively to GDP growth by 3.2 percentage points (the investment component represents about 16 percent of total GDP).

The right chart focuses on the individual components of private investment. According to the data, the low levels of investment are accounted for by a continuous decline in investment in structures (residential and nonresidential). The only other component of investment—equipment and software—is already above its previous peak level.

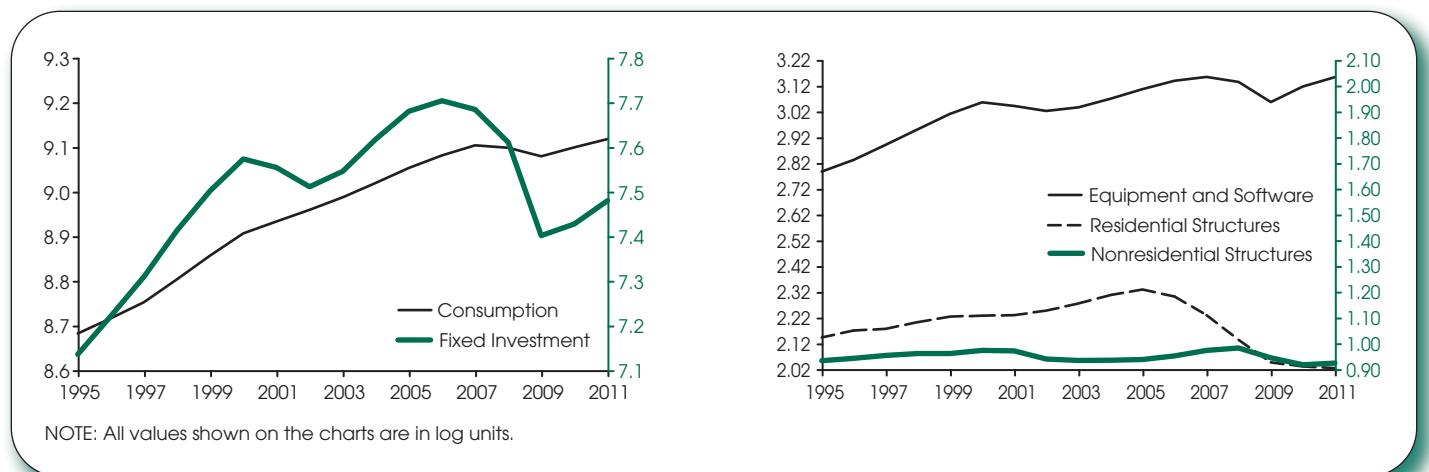
What economic factors explain the depressed behavior of residential structure investment? Many commentators have suggested that real estate prices during 2000-06 were driven by unreasonably low risk premia or too-optimistic expectations. Asset prices during this period, including the market valuations of existing and newly constructed

houses, plus many nonresidential structures, might have been too high. Namely, there was a bubble in real estate prices. Events such as the failure of Lehman Brothers, caused by a bet on further increases in the already “high” prices of commercial real estate that did not materialize, led to revised expectations. House prices started to fall and some existing homeowners were forced (perhaps because of illness or job loss) to sell or move into foreclosure. A self-fulfilling burst in home values materialized.

As the real estate bubble burst, the U.S. economy found itself with a stock of residential and nonresidential structures higher than desired. Under these conditions, economic theory predicts investment in structures should collapse (just as observed in the data) and stay low until the desired level is attained (either by natural depreciation or by actively restructuring the housing stock to more desirable uses). Moreover, this adjustment process is expected to be slow, given the relatively low rate of depreciation of residential and nonresidential structures.

The current slow economic recovery may therefore be, at least in part, the natural result of the burst of the real estate bubble. Further research is required to determine what role monetary policy can play under these circumstances.

—Adrian Peralta-Alva



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

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## Conventions used in this publication:

1. Unless otherwise indicated, data are monthly.
2. Shaded areas indicate recessions, as 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:

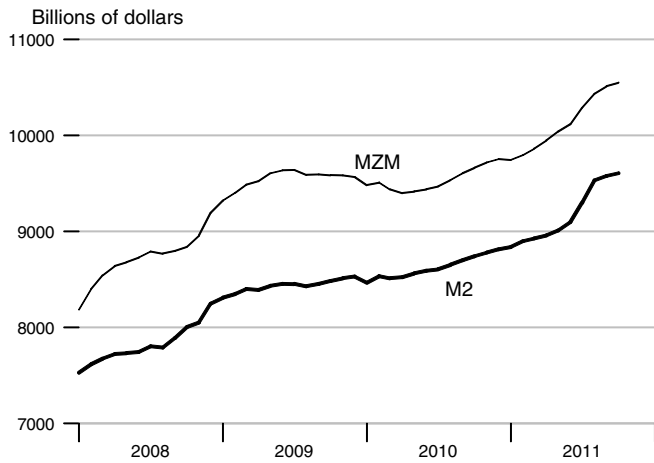
Editor, *Monetary Trends*  
Research Division  
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P.O. Box 442  
St. Louis, MO 63166-0442

or to:

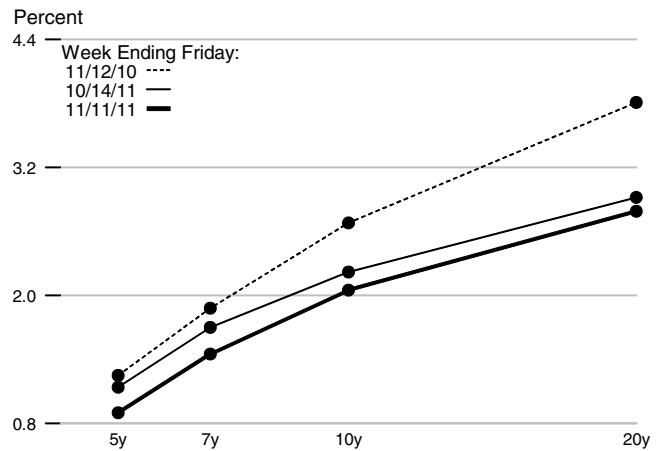
stlsFRED@stls.frb.org

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

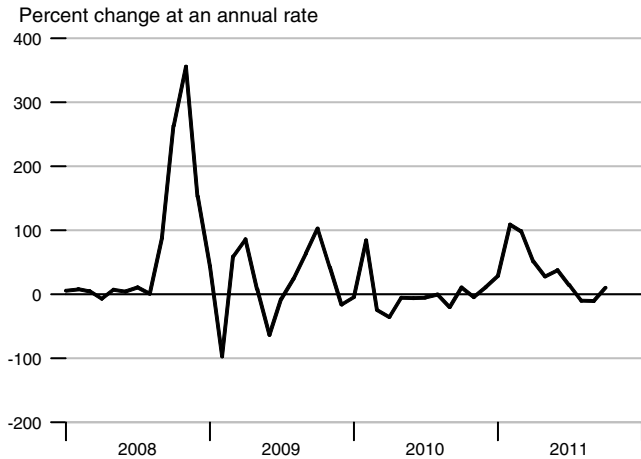
### M2 and MZM



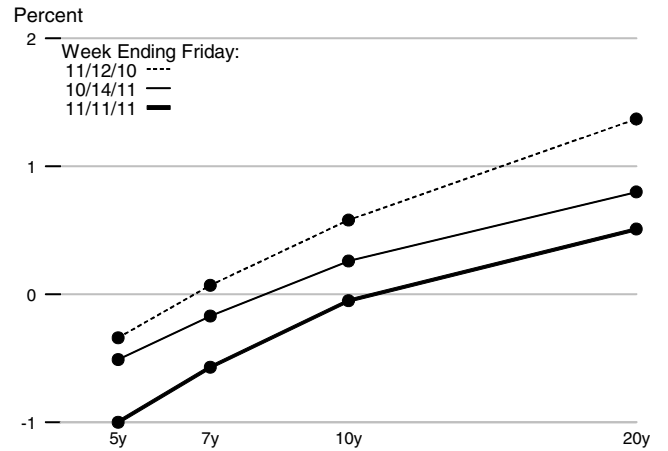
### Treasury Yield Curve



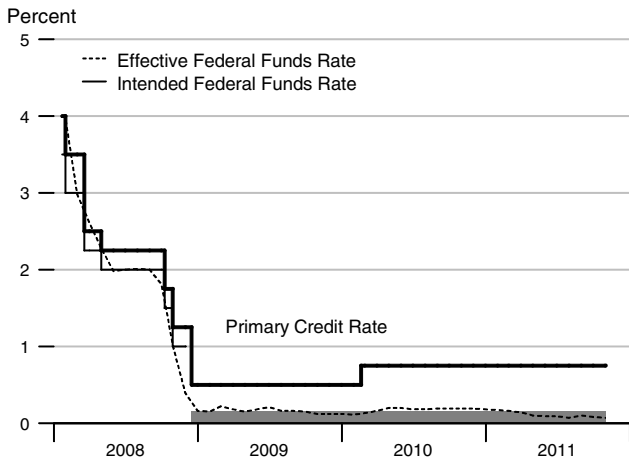
### Adjusted Monetary Base



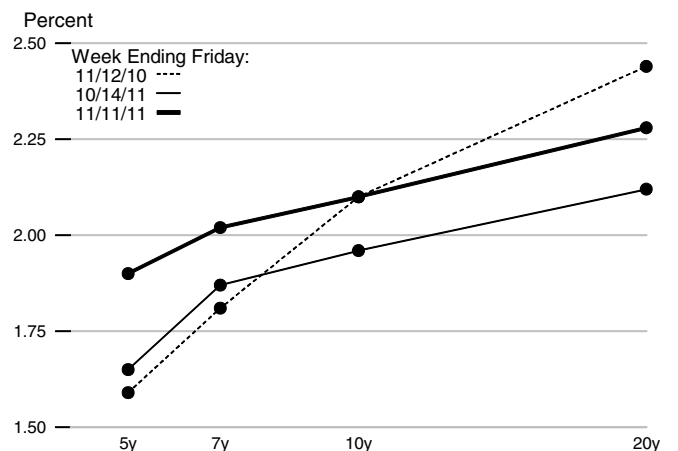
### Real Treasury Yield Curve



### Reserve Market Rates



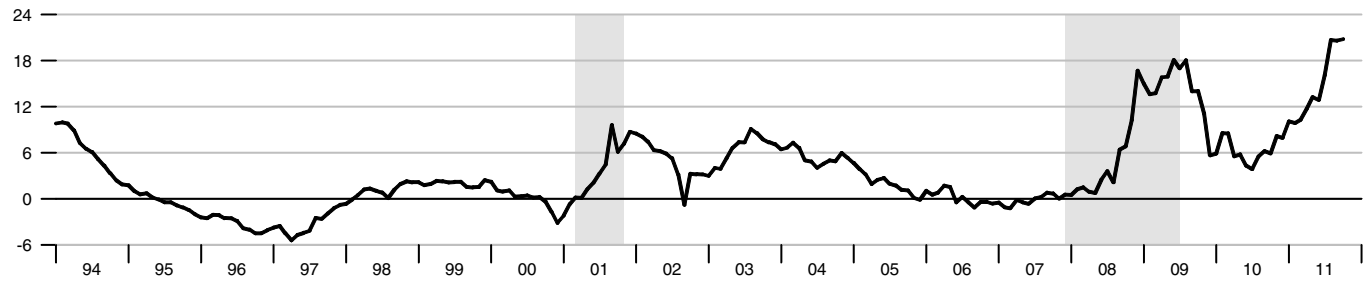
### Inflation-Indexed Treasury Yield Spreads



Note: Effective December 16, 2008, FOMC reports the intended Federal Funds Rate as a range.

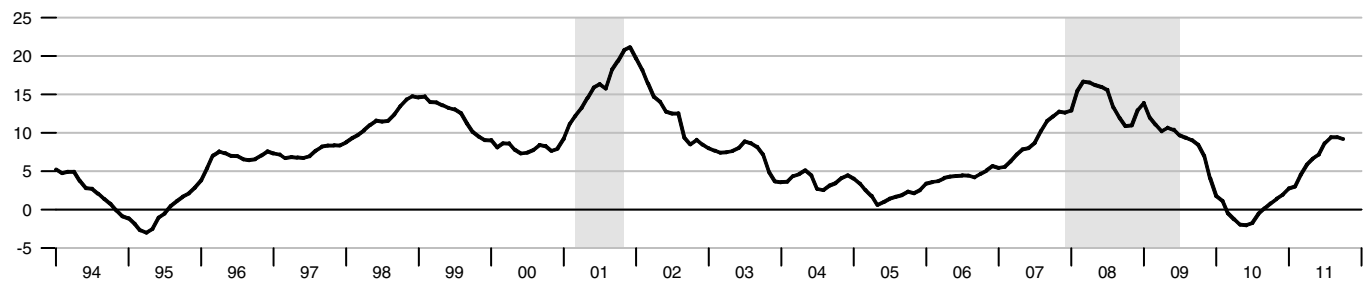
**M1**

Percent change from year ago



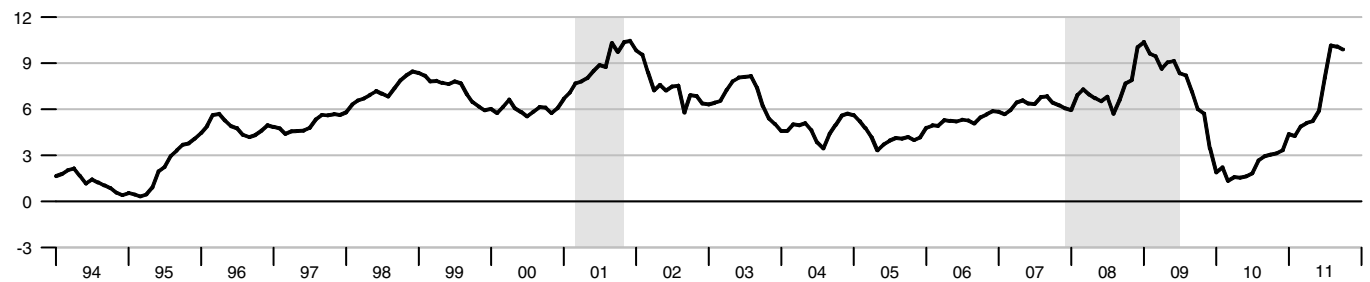
**M2M**

Percent change from year ago



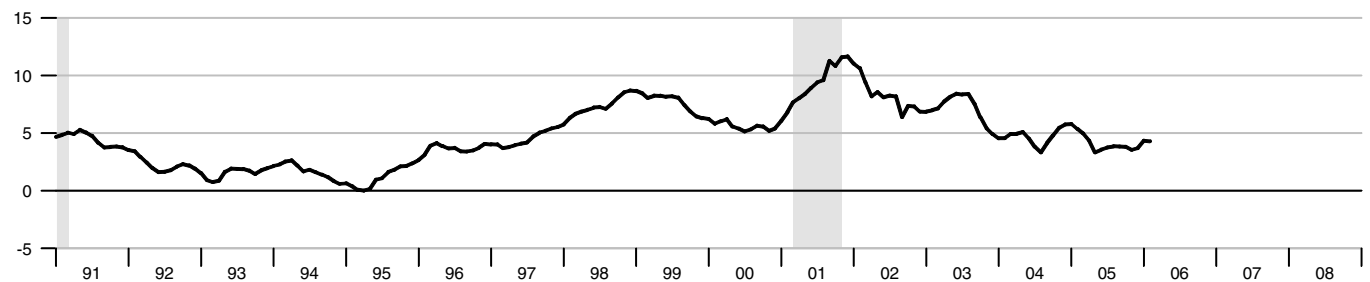
**M2**

Percent change from year ago



**Monetary Services Index - M2\*\***

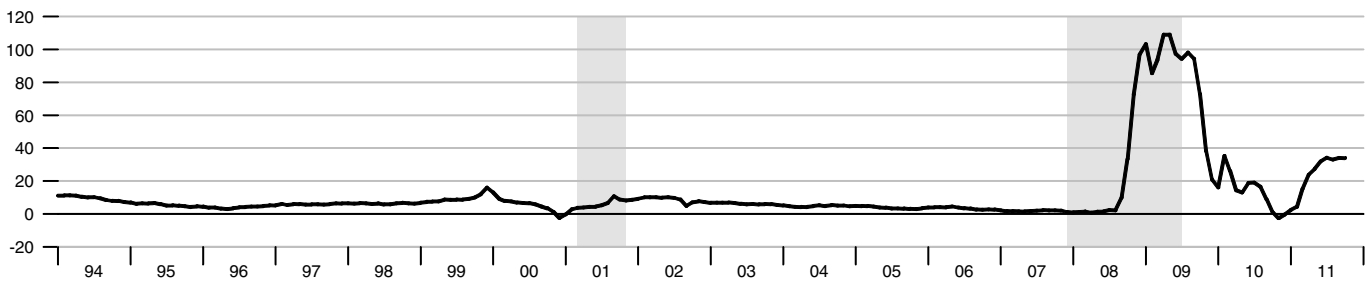
Percent change from year ago



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

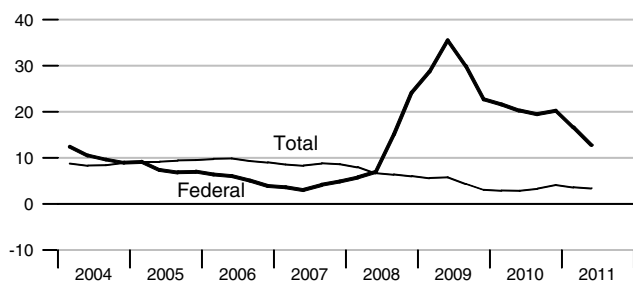
### Adjusted Monetary Base

Percent change from year ago



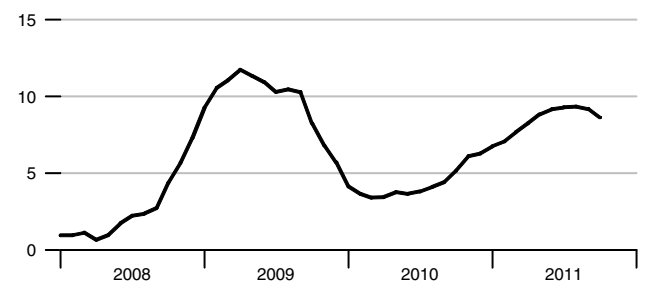
### Domestic Nonfinancial Debt

Percent change from year ago



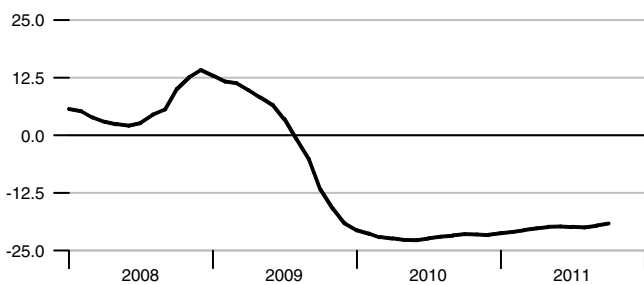
### Currency Held by the Nonbank Public

Percent change from year ago



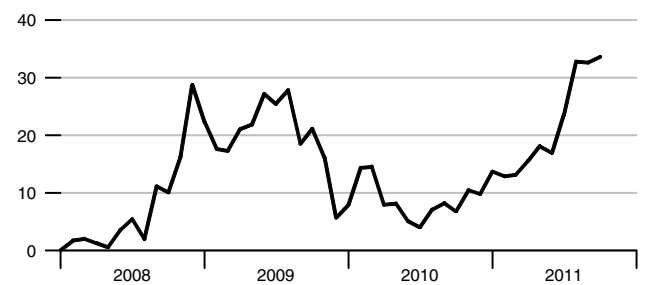
### Small Denomination Time Deposits

Percent change from year ago



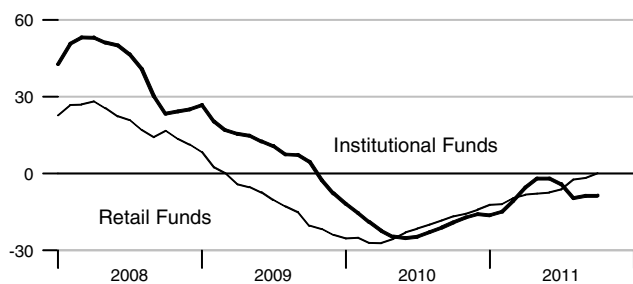
### Checkable Deposits

Percent change from year ago



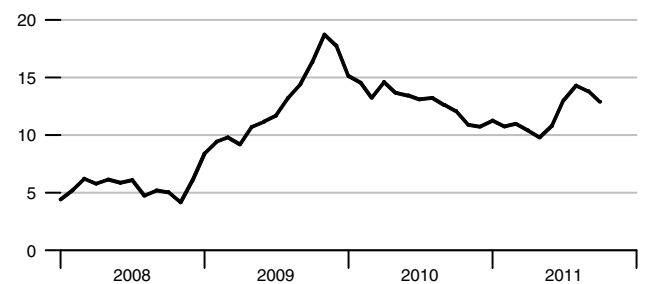
### Money Market Mutual Fund Shares

Percent change from year ago



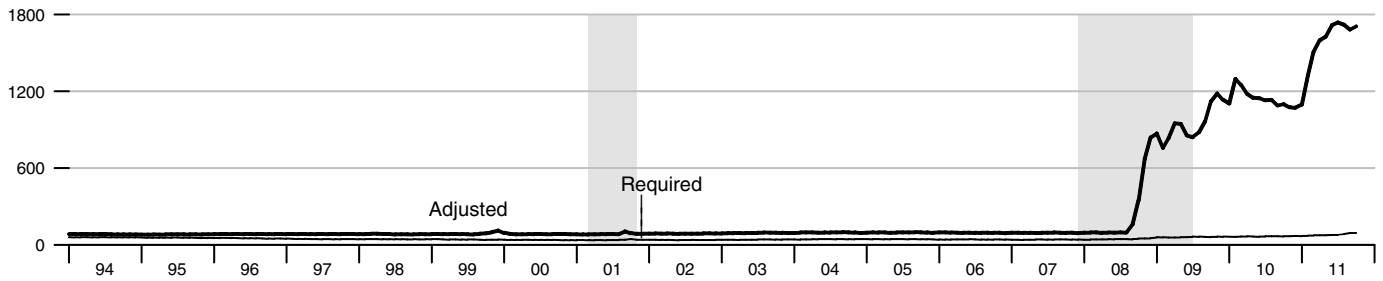
### Savings Deposits

Percent change from year ago



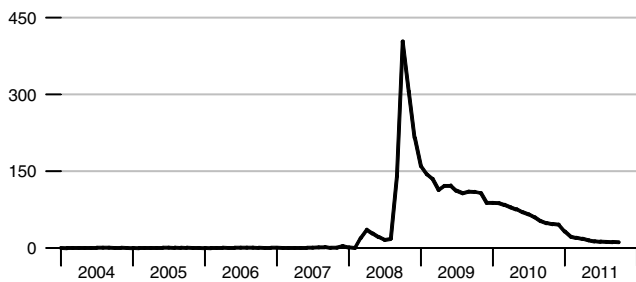
### Adjusted and Required Reserves

Billions of dollars



### Total Borrowings, nsa

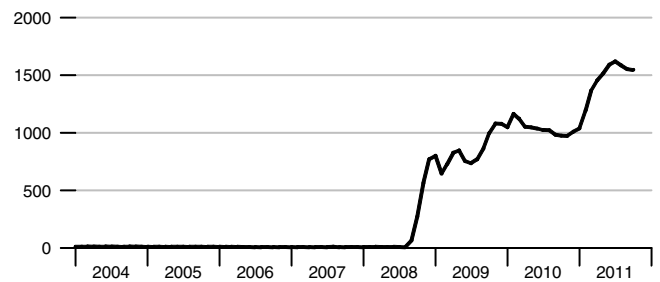
Billions of dollars



\* Data exclude term auction credit

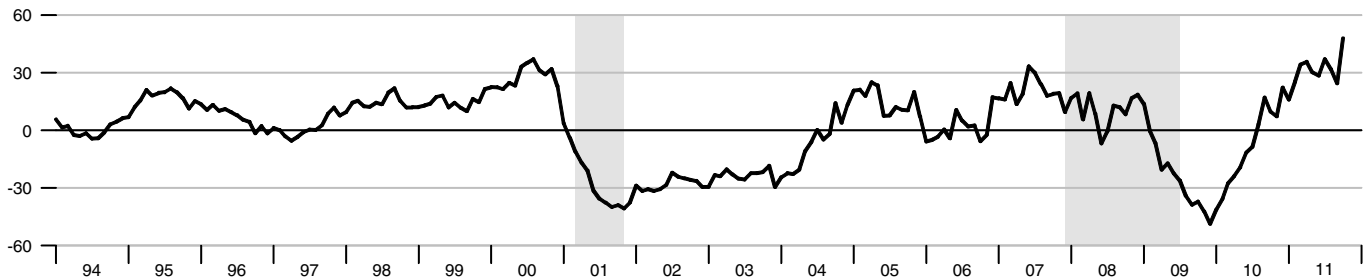
### Excess Reserves plus RCB Contracts

Billions of dollars



### 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>.

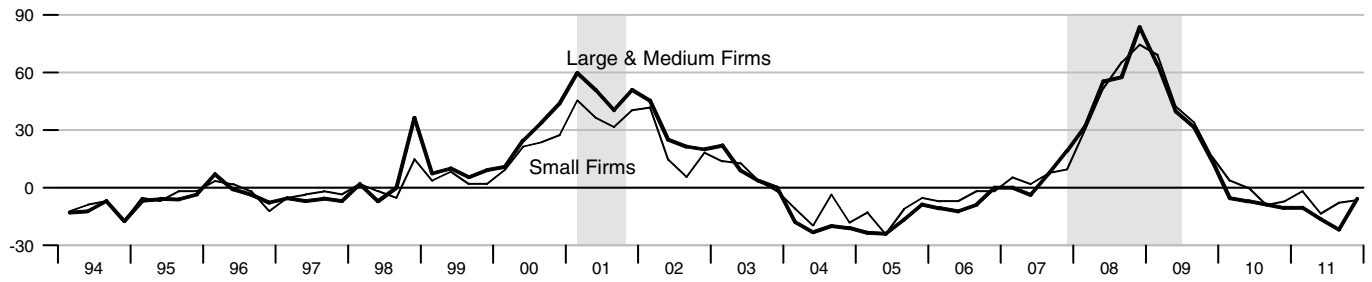
### Consumer Credit

Percent change from year ago



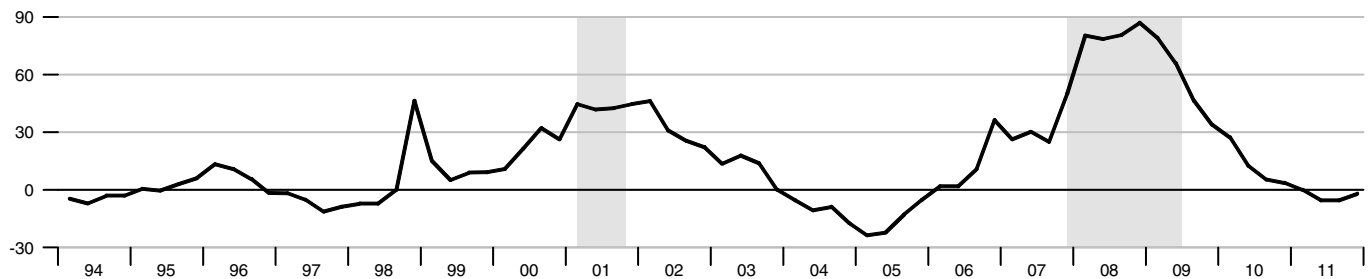
### Net Percentage of Domestic Banks Tightening Standards for Commercial and Industrial Loans

Percentage



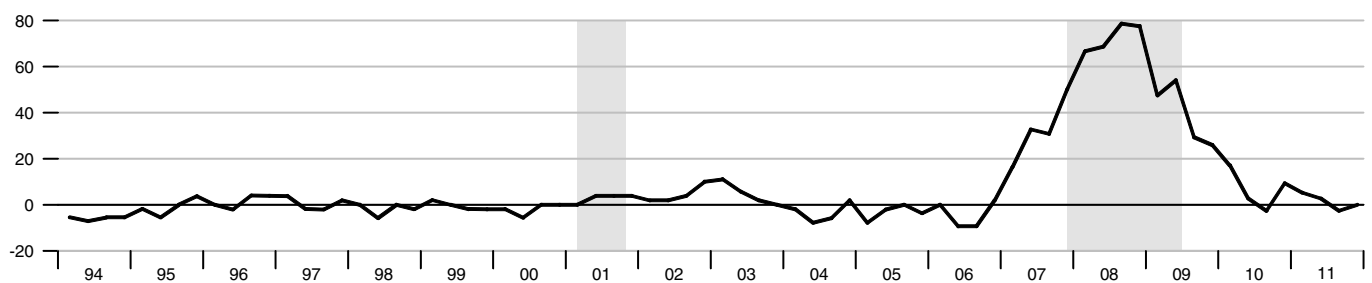
### Net Percentage of Domestic Banks Tightening Standards for Commercial Real Estate Loans

Percentage



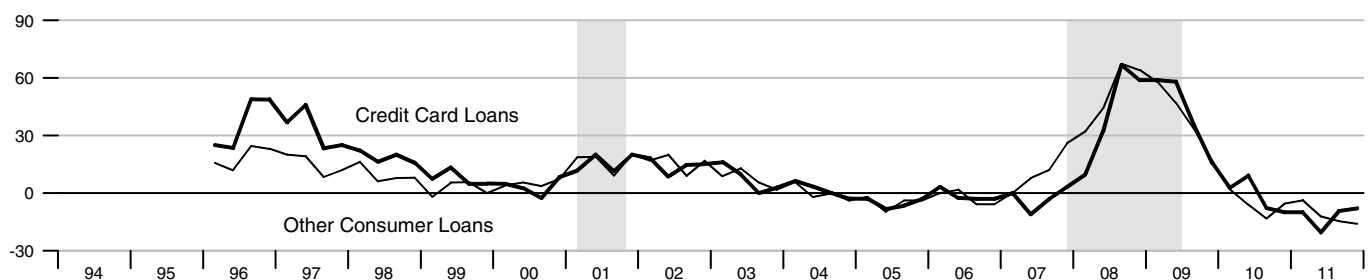
### Net Percentage of Domestic Banks Tightening Standards for Residential Mortgage Loans

Percentage

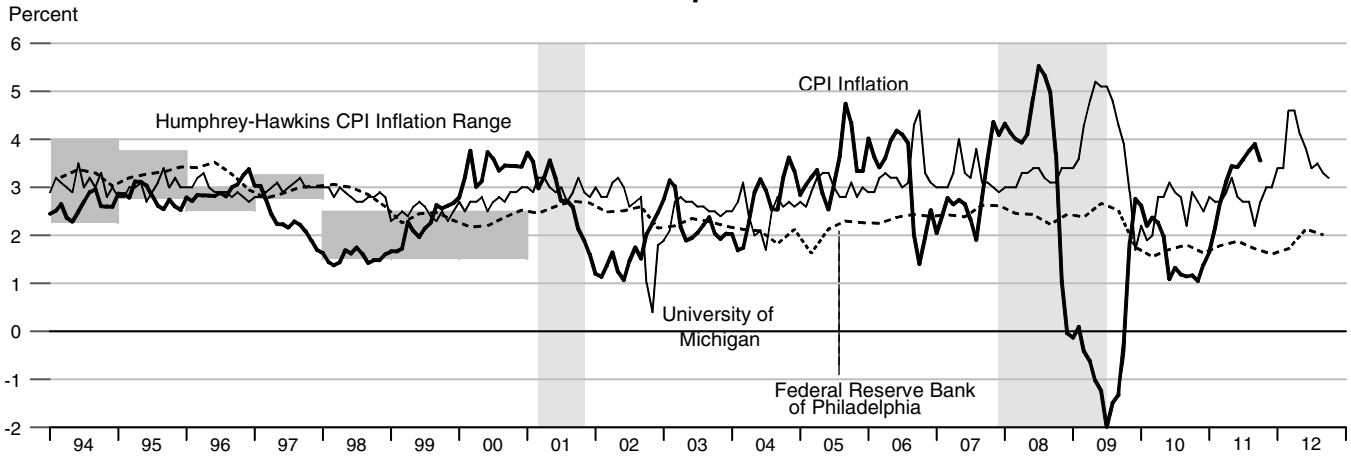


### Net Percentage of Domestic Banks Tightening Standards for Consumer Loans

Percentage

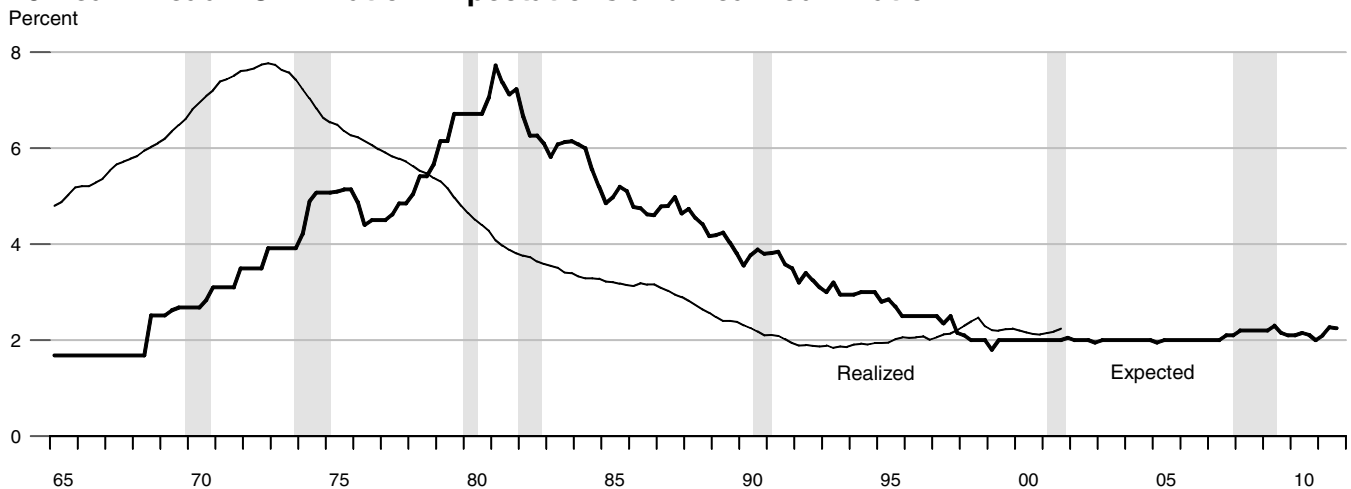


### CPI Inflation and 1-Year-Ahead CPI Inflation Expectations



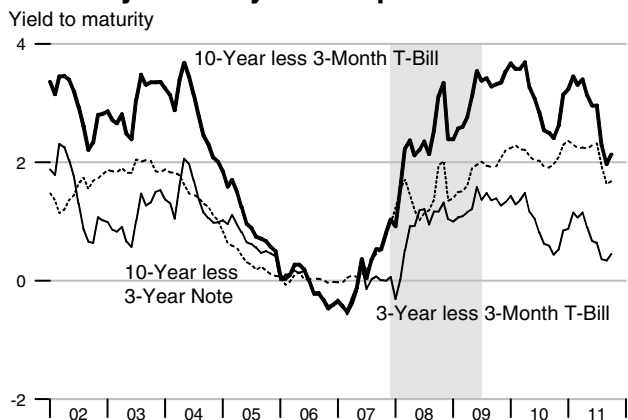
The shaded region shows the Humphrey-Hawkins CPI inflation range. Beginning in January 2000, the Humphrey-Hawkins inflation range was reported using the PCE price index and therefore is not shown on this graph.

### 10-Year Ahead PCE Inflation Expectations and Realized Inflation

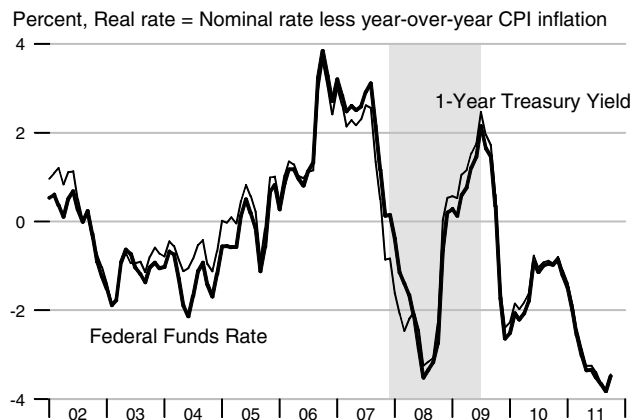


See the notes section for an explanation of the chart.

### Treasury Security Yield Spreads

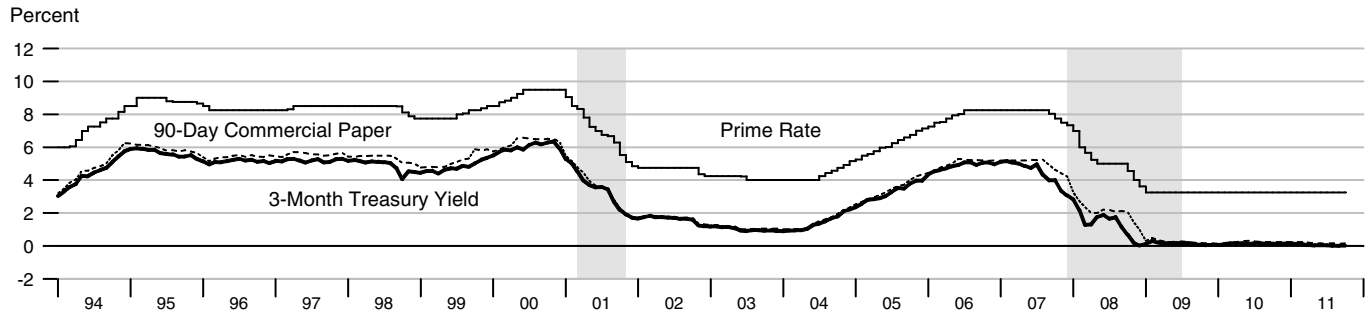


### Real Interest Rates

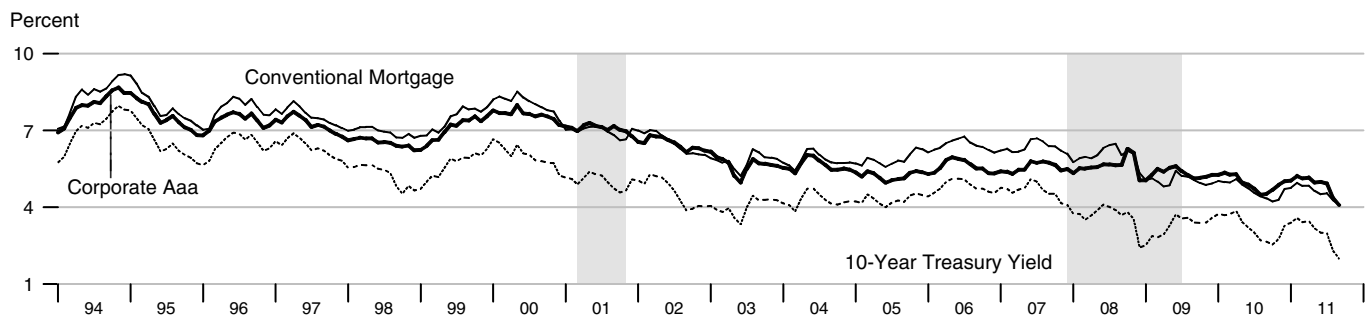




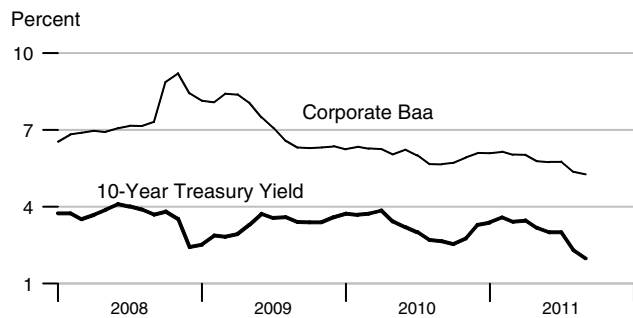
### Short-Term Interest Rates



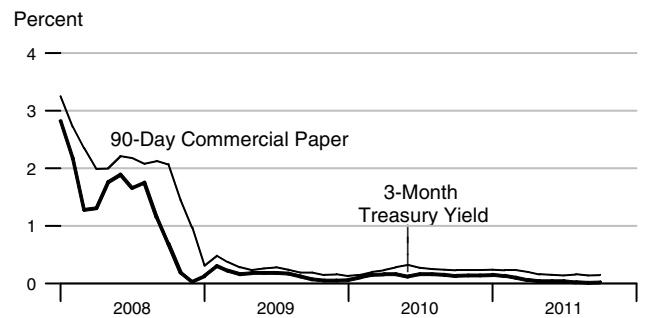
### Long-Term Interest Rates



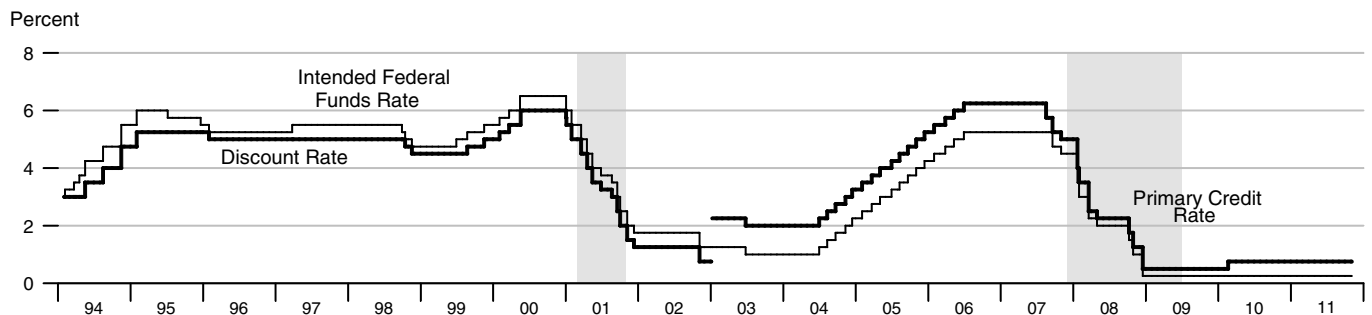
### Long-Term Interest Rates



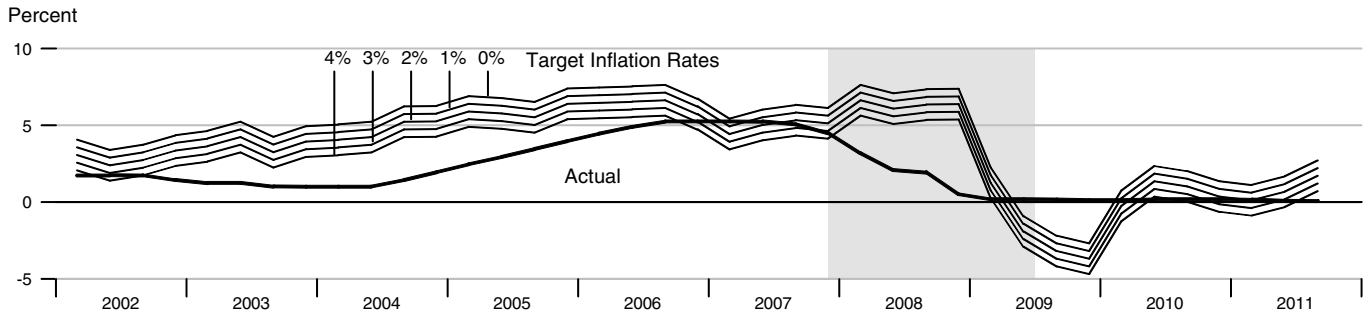
### Short-Term Interest Rates



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



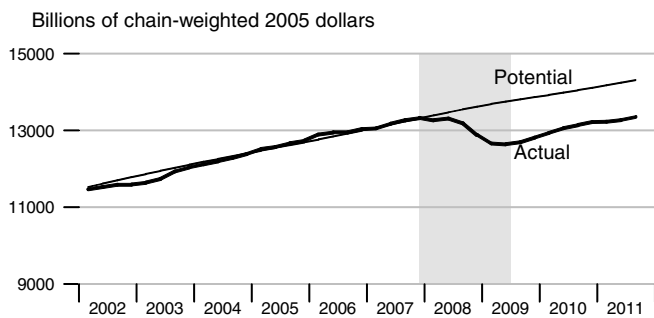
### Federal Funds Rate and Inflation Targets



Calculated federal funds rate is based on Taylor's rule.

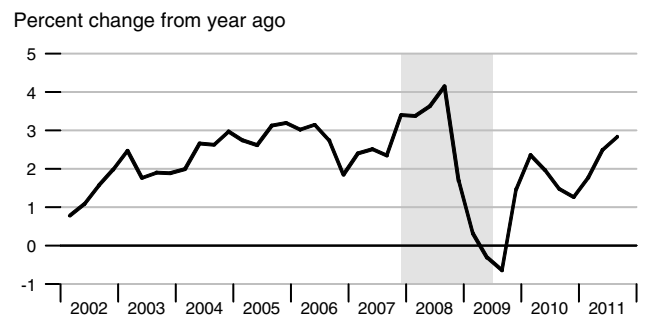
### Components of Taylor's Rule

#### Actual and Potential Real GDP

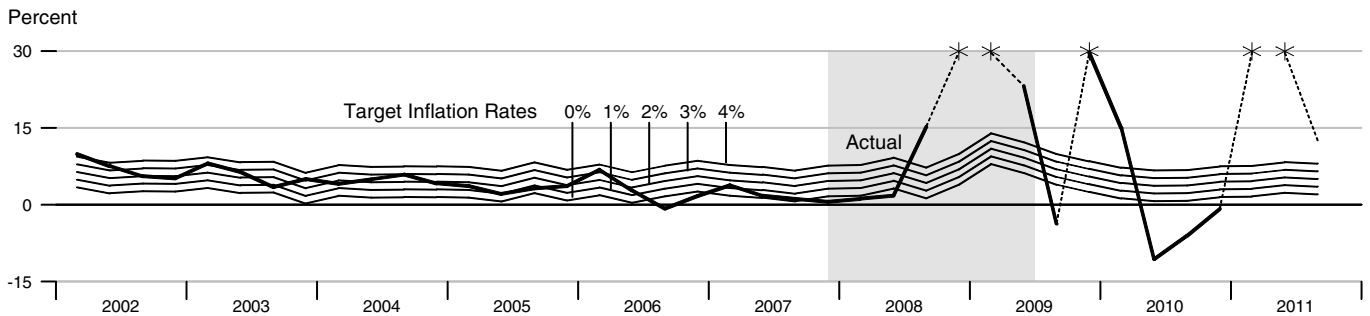


See notes section for further explanation.

#### PCE Inflation



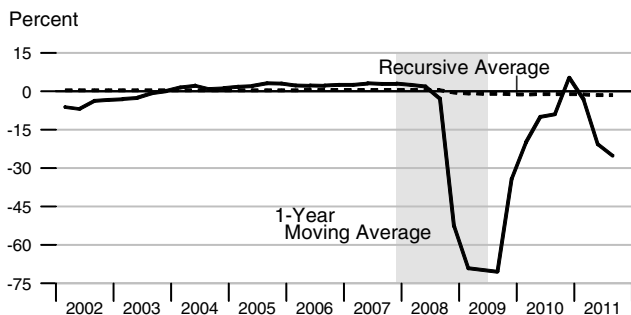
### Monetary Base Growth and Inflation Targets



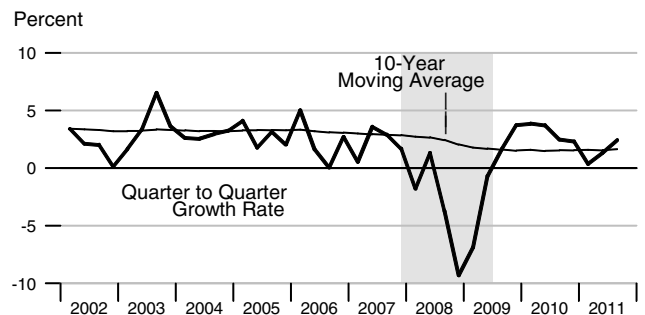
Calculated base growth is based on McCallum's rule. Actual base growth is percent change from the previous quarter. Stars represent actual values for 2008:Q4, 2009:Q1, 2009:Q4, 2011:Q1, 2011:Q2 and are 188.02 percent, 60.74 percent, 56.52 percent, 45.94 percent, and 58.74 percent, respectively.

### Components of McCallum's Rule

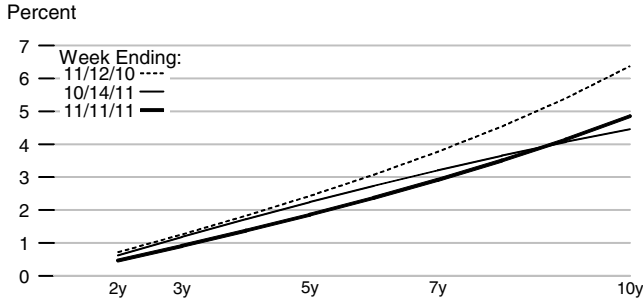
#### Monetary Base Velocity Growth



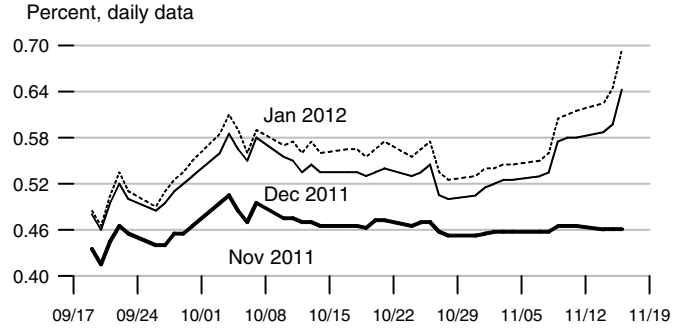
#### Real Output Growth



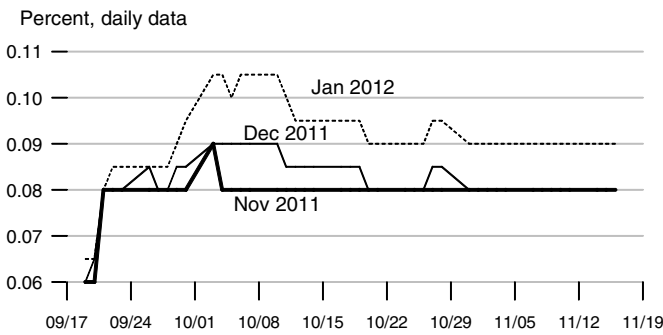
### Implied One-Year Forward Rates



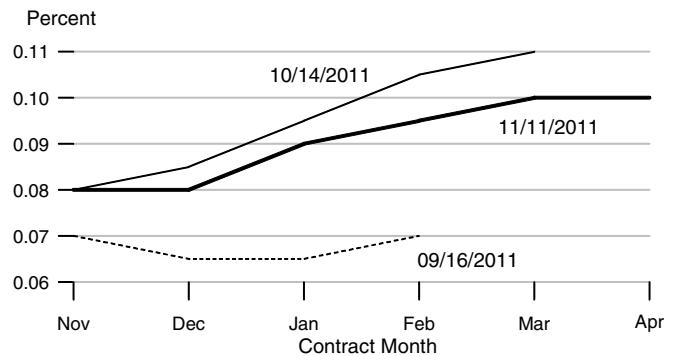
### Rates on 3-Month Eurodollar Futures



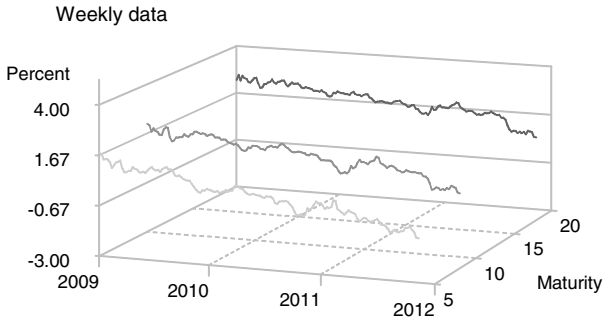
### Rates on Selected Federal Funds Futures Contracts



### Rates on Federal Funds Futures on Selected Dates

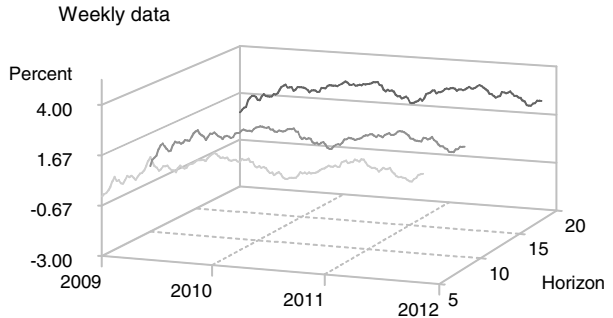


### Inflation-Indexed Treasury Securities



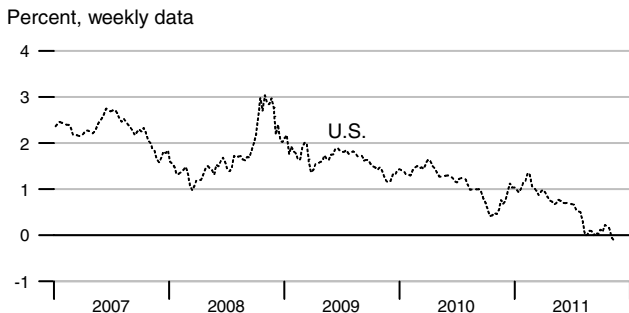
Note: Yields are inflation-indexed constant maturity U.S. Treasury securities

### Inflation-Indexed Treasury Yield Spreads



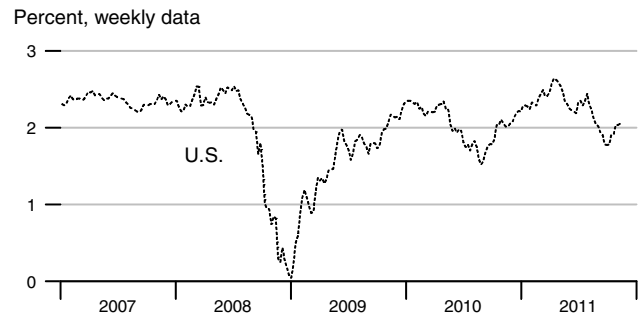
Note: Yield spread is between nominal and inflation-indexed constant maturity U.S. Treasury securities.

### Inflation-Indexed 10-Year Government Notes



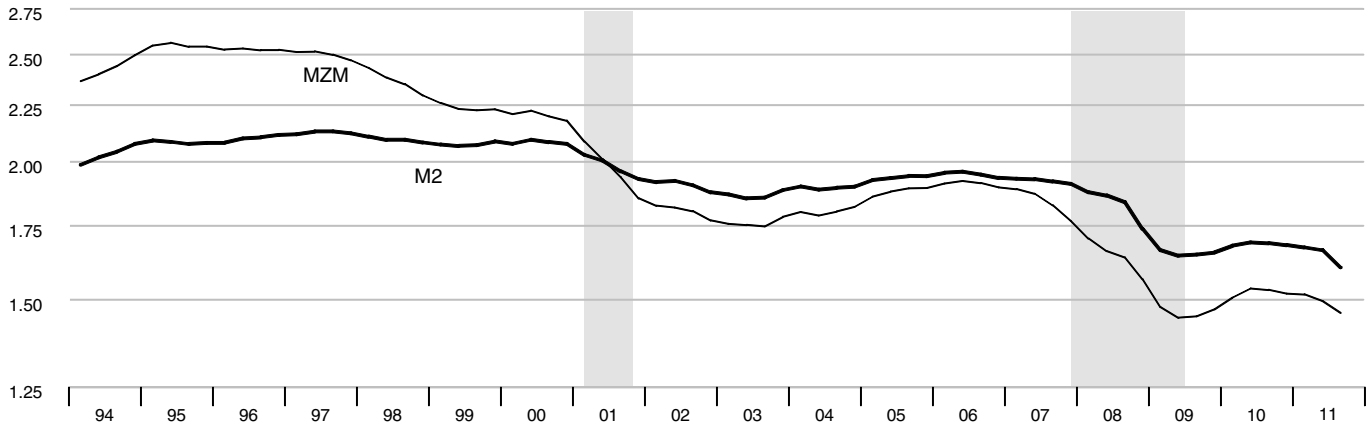
Note: Data is temporarily unavailable for the French and U.K. 10-Year Notes and Government Yield Spreads.

### Inflation-Indexed 10-Year Government Yield Spreads



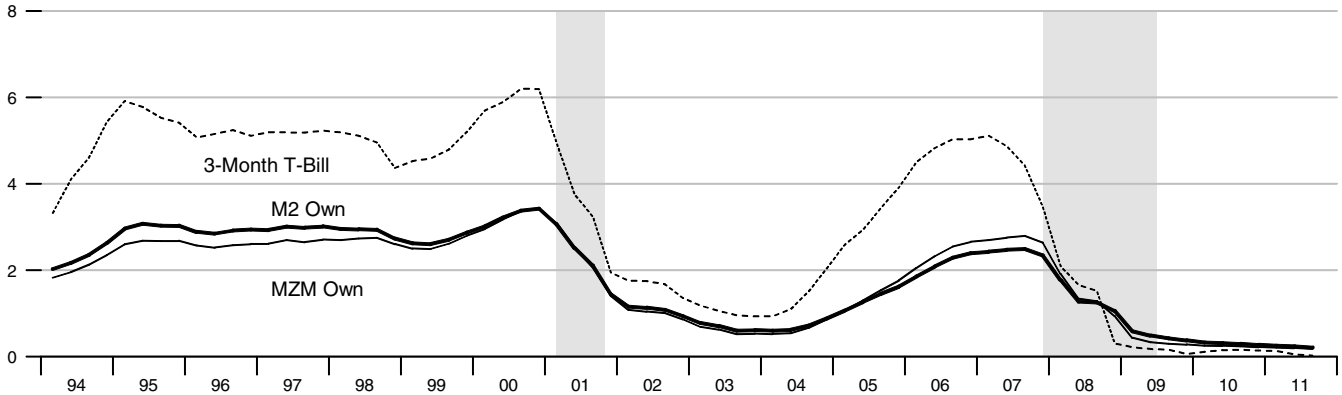
Velocity

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



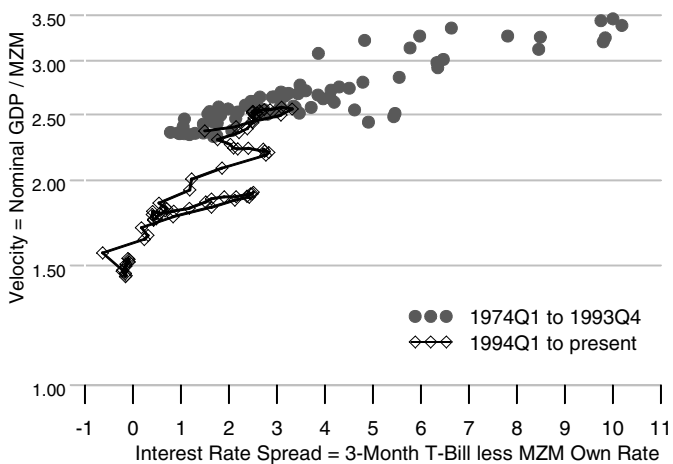
Interest Rates

Percent



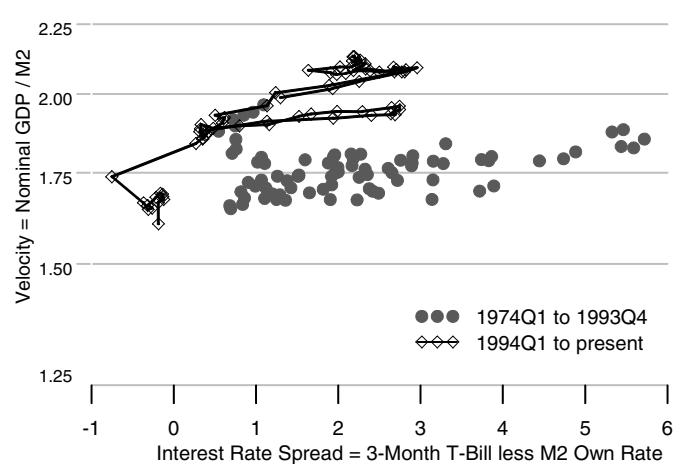
MZM Velocity and Interest Rate Spread

Ratio Scale



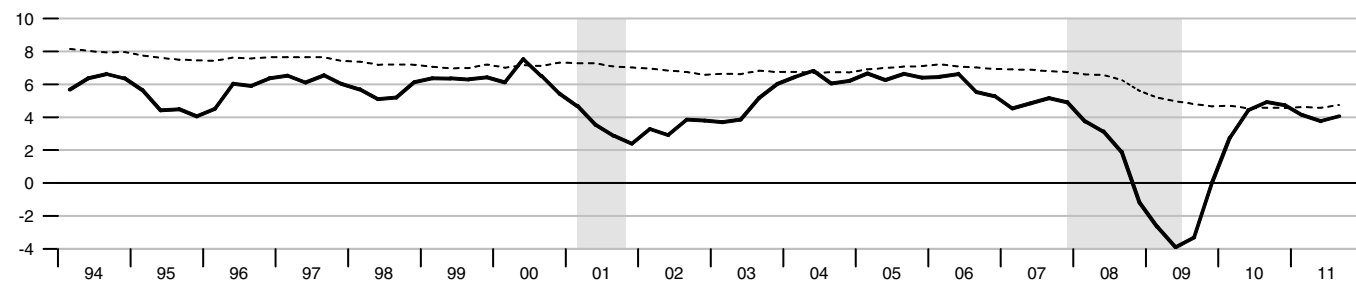
M2 Velocity and Interest Rate Spread

Ratio Scale



### Gross Domestic Product

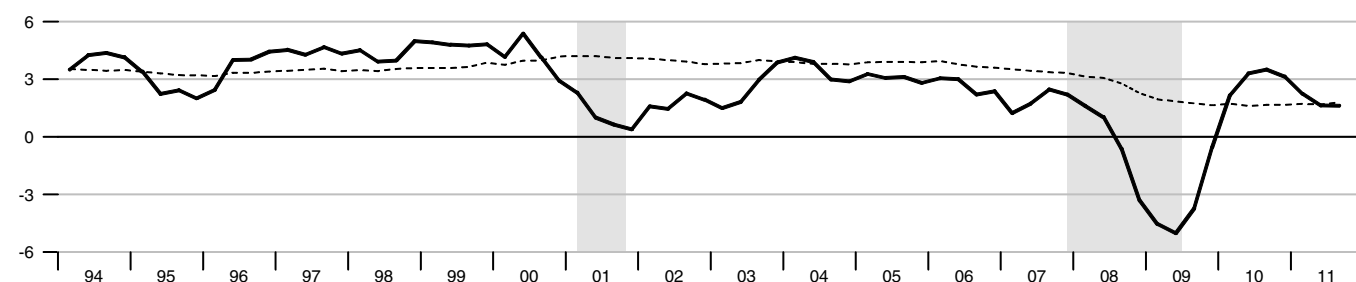
Percent change from year ago



Dashed lines indicate 10-year moving averages.

### Real Gross Domestic Product

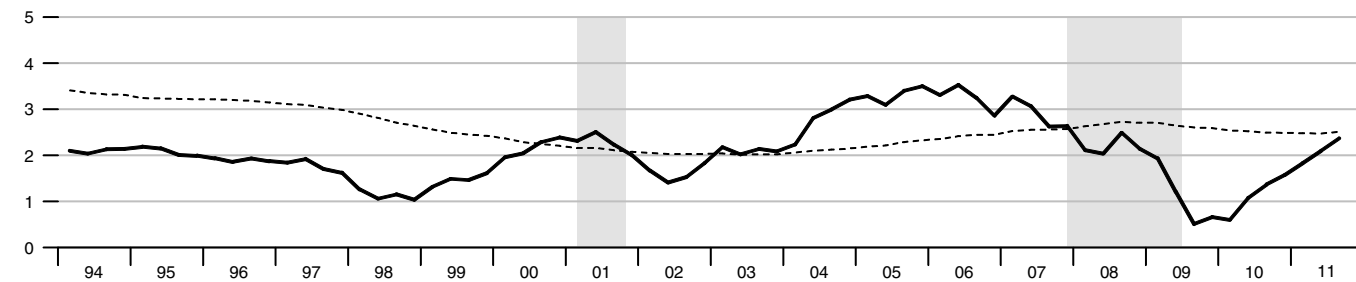
Percent change from year ago



Dashed lines indicate 10-year moving averages.

### Gross Domestic Product Price Index

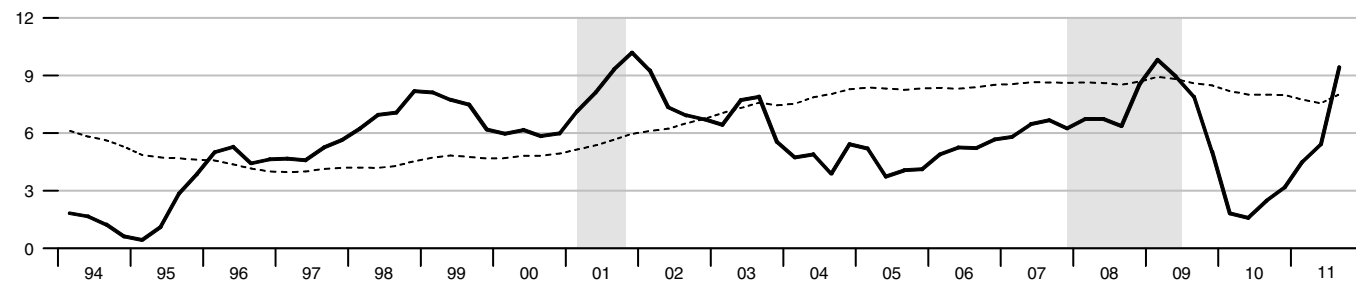
Percent change from year ago



Dashed lines indicate 10-year moving averages.

### M2

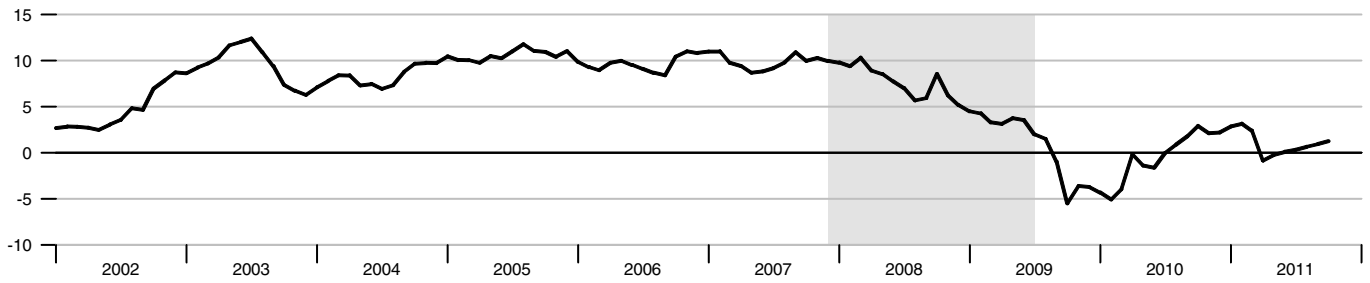
Percent change from year ago



Dashed lines indicate 10-year moving averages.

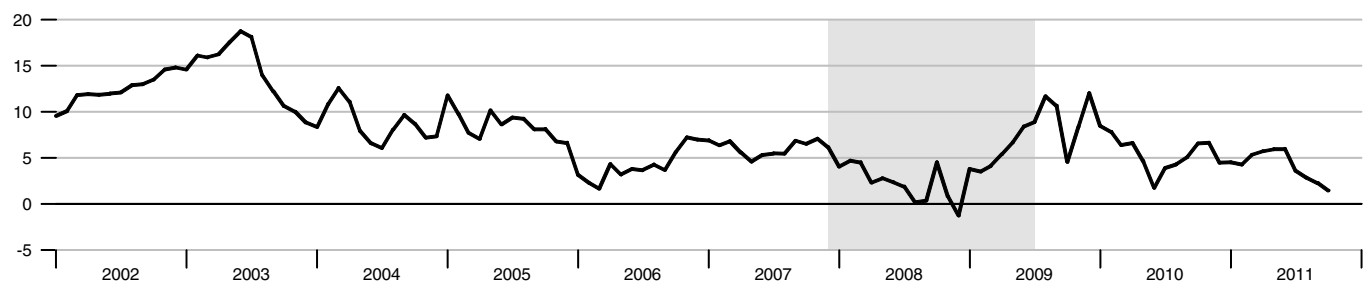
**Bank Credit**

Percent change from year ago



**Investment Securities in Bank Credit at Commercial Banks**

Percent change from year ago



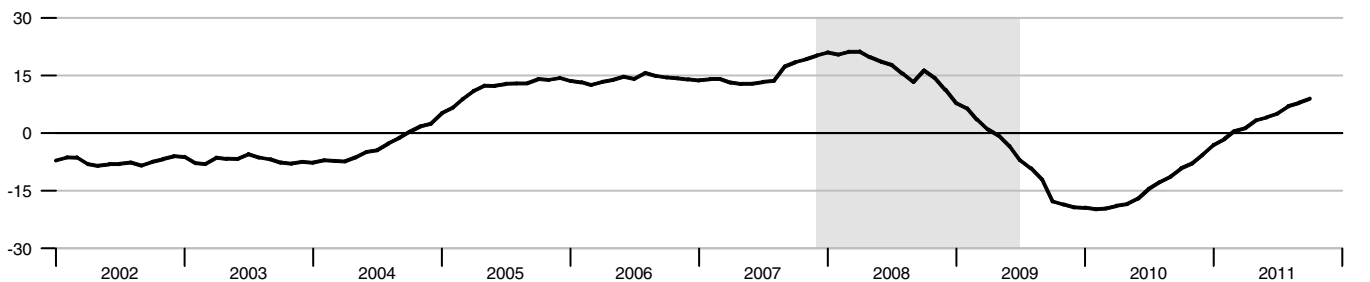
**Total Loans and Leases in Bank Credit at Commercial Banks**

Percent change from year ago

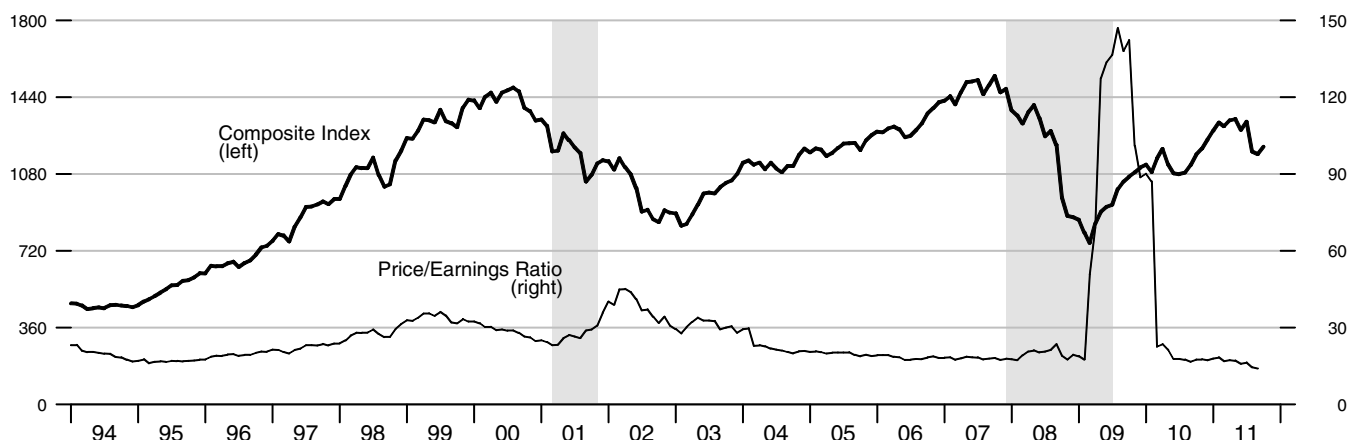


**Commercial and Industrial Loans at Commercial Banks**

Percent change from year ago



### Standard & Poor's 500

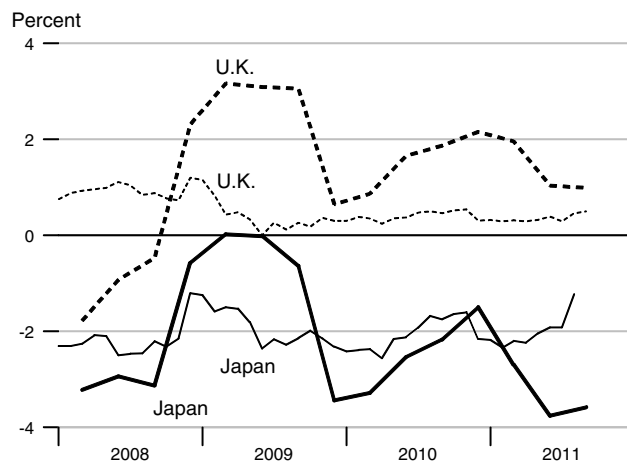
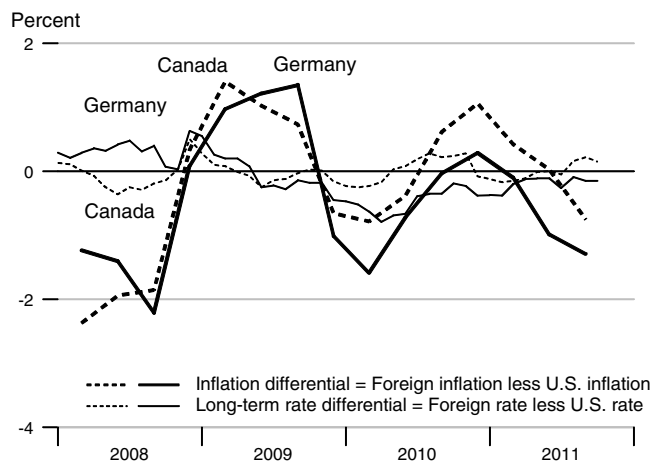


### Recent Inflation and Long-Term Interest Rates

	Consumer Price Inflation Rates				Long-Term Government Bond Rates			
	Percent change from year ago				Percent			
	2010Q4	2011Q1	2011Q2	2011Q3	Jul11	Aug11	Sep11	Oct11
United States	1.20	2.17	3.33	3.75	3.00	2.30	1.98	2.15
Canada	2.27	2.60	3.36	3.00	2.95	2.46	2.20	2.30
France	1.65	1.81	2.07	2.15	3.40	2.98	2.64	.
Germany	1.49	2.08	2.35	2.46	2.74	2.21	1.83	2.00
Italy	1.79	2.34	2.67	2.80	5.46	5.27	5.75	5.97
Japan	-0.29	-0.52	-0.43	0.17	1.08	1.07	.	.
United Kingdom	3.36	4.13	4.37	4.74	3.29	2.76	2.48	.

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### Inflation and Long-Term Interest Rate Differentials



		Money Stock				Bank	Adjusted		MSI M2**
		M1	MZM	M2	M3*	Credit	Monetary Base	Reserves	
2006		1374.188	7001.801	6864.998	10270.74	7691.512	835.035	94.908	
2007		1372.136	7636.515	7297.654		8453.004	850.529	94.146	
2008		1433.140	8710.223	7816.427		9106.875	1010.131	232.536	
2009		1636.837	9544.509	8432.307		9193.553	1796.544	944.774	
2010		1740.672	9536.483	8623.201		9138.617	2031.704	1144.134	
2009	1	1577.914	9403.304	8352.344		9335.930	1662.910	820.582	
	2	1624.149	9588.049	8424.850		9307.671	1763.620	917.025	
	3	1660.871	9607.369	8444.302		9131.444	1747.189	895.450	
	4	1684.413	9579.315	8507.731		8999.166	2012.459	1146.039	
2010	1	1698.790	9477.109	8503.684		8920.329	2089.193	1217.051	
	2	1708.538	9419.642	8558.483		9207.812	2034.300	1158.476	
	3	1747.113	9537.833	8653.345		9210.683	2003.663	1117.955	
	4	1808.245	9711.348	8777.292		9215.644	1999.660	1083.054	
2011	1	1869.991	9801.157	8887.108		9169.862	2243.008	1310.597	
	2	1924.073	10035.48	9022.088		9177.283	2597.870	1647.732	
	3	2081.750	10412.67	9469.614		9268.570	2680.205	1714.241	
2009	Oct	1679.823	9586.007	8482.442		8973.048	1975.378	1122.203	
	Nov	1679.878	9584.233	8511.972		9030.054	2044.688	1182.381	
	Dec	1693.538	9567.705	8528.780		8994.396	2017.311	1133.534	
2010	Jan	1681.032	9484.153	8465.809		8939.579	2010.111	1105.468	
	Feb	1703.324	9508.962	8533.570		8879.978	2150.926	1296.208	
	Mar	1712.015	9438.213	8511.674		8941.430	2106.541	1249.476	
	Apr	1698.852	9401.200	8522.443		9261.585	2044.317	1179.158	
	May	1703.972	9417.657	8561.890		9206.831	2034.566	1149.889	
	Jun	1722.790	9440.069	8591.117		9155.020	2024.018	1146.380	
	Jul	1725.883	9470.010	8607.079		9193.851	2015.197	1131.111	
	Aug	1746.277	9535.741	8652.648		9226.294	2014.643	1133.742	
	Sep	1769.180	9607.747	8700.308		9211.904	1981.149	1089.012	
	Oct	1779.259	9662.857	8740.802		9233.733	1998.502	1099.716	
	Nov	1817.171	9718.765	8778.857		9221.328	1991.154	1076.443	
	Dec	1828.304	9752.421	8812.217		9191.869	2009.323	1073.003	
2011	Jan	1850.333	9745.485	8836.813		9193.643	2057.166	1095.898	
	Feb	1871.451	9795.715	8898.174		9159.440	2243.621	1327.499	
	Mar	1888.189	9862.270	8926.336		9156.502	2428.238	1508.394	
	Apr	1897.800	9948.966	8958.362		9182.632	2531.680	1599.149	
	May	1929.535	10040.34	9010.177		9185.122	2590.373	1627.375	
	Jun	1944.883	10117.13	9097.726		9164.094	2671.557	1716.671	
	Jul	2003.831	10288.87	9299.203		9222.693	2703.579	1738.035	
	Aug	2107.583	10434.71	9531.334		9285.780	2680.476	1721.549	
	Sep	2133.837	10514.44	9578.304		9297.237	2656.559	1683.140	
	Oct	2149.245	10551.01	9606.470		9349.216	2678.469	1707.432	

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			Corporate Aaa Bonds	Municipal Aaa Bonds	Conventional Mortgage
						3-mo	3-yr	10-yr			
2006		4.96	5.96	7.96	5.15	4.85	4.77	4.79	5.59	4.15	6.41
2007		5.02	5.86	8.05	5.27	4.47	4.34	4.63	5.56	4.13	6.34
2008		1.93	2.39	5.09	2.97	1.39	2.24	3.67	5.63	4.58	6.04
2009		0.16	0.50	3.25	0.56	0.15	1.43	3.26	5.31	4.27	5.04
2010		0.17	0.72	3.25	0.31	0.14	1.11	3.21	4.94	3.90	4.69
2009	1	0.18	0.50	3.25	1.08	0.22	1.27	2.74	5.27	4.64	5.06
	2	0.18	0.50	3.25	0.62	0.17	1.49	3.31	5.51	4.43	5.03
	3	0.16	0.50	3.25	0.30	0.16	1.56	3.52	5.27	4.11	5.16
	4	0.12	0.50	3.25	0.22	0.06	1.39	3.46	5.20	3.91	4.92
2010	1	0.13	0.61	3.25	0.21	0.11	1.47	3.72	5.29	3.93	5.00
	2	0.19	0.75	3.25	0.42	0.15	1.38	3.49	5.04	3.83	4.91
	3	0.19	0.75	3.25	0.34	0.16	0.83	2.79	4.58	3.58	4.45
	4	0.19	0.75	3.25	0.28	0.14	0.74	2.86	4.86	4.24	4.41
2011	1	0.16	0.75	3.25	0.28	0.13	1.16	3.46	5.13	4.71	4.85
	2	0.09	0.75	3.25	0.22	0.05	0.95	3.21	5.04	4.50	4.66
	3	0.08	0.75	3.25	0.29	0.02	0.47	2.43	4.46	4.02	4.31
2009	Oct	0.12	0.50	3.25	0.24	0.07	1.46	3.39	5.15	3.85	4.95
	Nov	0.12	0.50	3.25	0.21	0.05	1.32	3.40	5.19	3.99	4.88
	Dec	0.12	0.50	3.25	0.22	0.05	1.38	3.59	5.26	3.89	4.93
2010	Jan	0.11	0.50	3.25	0.20	0.06	1.49	3.73	5.26	3.96	5.03
	Feb	0.13	0.59	3.25	0.19	0.11	1.40	3.69	5.35	3.91	4.99
	Mar	0.16	0.75	3.25	0.23	0.15	1.51	3.73	5.27	3.91	4.97
	Apr	0.20	0.75	3.25	0.30	0.16	1.64	3.85	5.29	3.95	5.10
	May	0.20	0.75	3.25	0.45	0.16	1.32	3.42	4.96	3.75	4.89
	Jun	0.18	0.75	3.25	0.52	0.12	1.17	3.20	4.88	3.81	4.74
	Jul	0.18	0.75	3.25	0.41	0.16	0.98	3.01	4.72	3.69	4.56
	Aug	0.19	0.75	3.25	0.32	0.16	0.78	2.70	4.49	3.44	4.43
	Sep	0.19	0.75	3.25	0.28	0.15	0.74	2.65	4.53	3.63	4.35
	Oct	0.19	0.75	3.25	0.27	0.13	0.57	2.54	4.68	3.62	4.23
	Nov	0.19	0.75	3.25	0.27	0.14	0.67	2.76	4.87	4.44	4.30
	Dec	0.18	0.75	3.25	0.30	0.14	0.99	3.29	5.02	4.67	4.71
2011	Jan	0.17	0.75	3.25	0.29	0.15	1.03	3.39	5.04	4.86	4.76
	Feb	0.16	0.75	3.25	0.28	0.13	1.28	3.58	5.22	4.79	4.95
	Mar	0.14	0.75	3.25	0.28	0.10	1.17	3.41	5.13	4.47	4.84
	Apr	0.10	0.75	3.25	0.23	0.06	1.21	3.46	5.16	4.93	4.84
	May	0.09	0.75	3.25	0.21	0.04	0.94	3.17	4.96	4.33	4.64
	Jun	0.09	0.75	3.25	0.22	0.04	0.71	3.00	4.99	4.23	4.51
	Jul	0.07	0.75	3.25	0.24	0.04	0.68	3.00	4.93	4.31	4.55
	Aug	0.10	0.75	3.25	0.29	0.02	0.38	2.30	4.37	3.90	4.27
	Sep	0.08	0.75	3.25	0.33	0.01	0.35	1.98	4.09	3.84	4.11
	Oct	0.07	0.75	3.25	0.37	0.02	0.47	2.15	3.98	3.93	4.07

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

		M1	MZM	M2	M3*
<b>Percent change at an annual rate</b>					
2006		0.19	4.34	5.26	4.95
2007		-0.15	9.07	6.30	
2008		4.45	14.06	7.11	
2009		14.21	9.58	7.88	
2010		6.34	-0.08	2.26	
<hr/>					
2009	1	12.72	18.08	12.45	
	2	11.72	7.86	3.47	
	3	9.04	0.81	0.92	
	4	5.67	-1.17	3.00	
2010	1	3.41	-4.27	-0.19	
	2	2.30	-2.43	2.58	
	3	9.03	5.02	4.43	
	4	14.00	7.28	5.73	
2011	1	13.66	3.70	5.00	
	2	11.57	9.56	6.08	
	3	32.78	15.03	19.84	
<hr/>					
2009	Oct	10.13	-0.85	4.32	
	Nov	0.04	-0.22	4.18	
	Dec	9.76	-2.07	2.37	
2010	Jan	-8.86	-10.48	-8.86	
	Feb	15.91	3.14	9.60	
	Mar	6.12	-8.93	-3.08	
	Apr	-9.23	-4.71	1.52	
	May	3.62	2.10	5.55	
	Jun	13.25	2.86	4.10	
	Jul	2.15	3.81	2.23	
	Aug	14.18	8.33	6.35	
	Sep	15.74	9.06	6.61	
	Oct	6.84	6.88	5.59	
	Nov	25.57	6.94	5.22	
	Dec	7.35	4.16	4.56	
2011	Jan	14.46	-0.85	3.35	
	Feb	13.70	6.19	8.33	
	Mar	10.73	8.15	3.80	
	Apr	6.11	10.55	4.31	
	May	20.07	11.02	6.94	
	Jun	9.55	9.18	11.66	
	Jul	36.37	20.37	26.58	
	Aug	62.13	17.01	29.95	
	Sep	14.95	9.17	5.91	
	Oct	8.66	4.17	3.53	

\*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](http://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](http://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/](http://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. **Retail Money Market Mutual Funds** are included in M2. **Institutional** money market funds are not included in M2.

**Page 6:** **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 7:** Data are reported in the Senior Loan Officer Opinion Survey on Bank Lending Practices.

**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.

From 1991 to the present the source of the long-term PCE inflation expectations data is the Federal Reserve Bank of Philadelphia's *Survey of Professional Forecasters*. Prior to 1991, the data were obtained from the Board of Governors of the Federal Reserve System. Realized (actual) inflation is the annualized rate of change for the 40-quarter period that corresponds to the forecast horizon (the expectations measure). For example, in 1965:Q1, annualized PCE inflation over the next 40 quarters was expected to average 1.7 percent. In actuality, the average annualized rate of change measured 4.8 percent from 1965:Q1 to 1975:Q1. Thus, the vertical distance between the two lines in the chart at any point is the forecast error.

**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,  $\pi_{t-1}$  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 estimated by the Congressional Budget Office (CBO).

**Monetary Base Growth and Inflation Targets** shows the quarterly growth of the adjusted monetary base implied by applying McCallum's (2000, p. 52) equation

$$\Delta b_t = \Delta x_t^* - \Delta v_t^a + \lambda (\Delta x_t^* - \Delta x_{t-1}),$$

$$\Delta x_t^* = \pi^* + \Delta y_t^*$$

to five alternative target inflation rates,  $\pi^* = 0, 1, 2, 3, 4$  percent, where  $\Delta b_t$  is the implied growth rate of the adjusted monetary base,  $\Delta y_t^*$  is the 10-year

moving average growth in real GDP,  $\Delta v_t^\alpha$  is the average base velocity growth (calculated recursively),  $\Delta x_{t-1}$  is the lag growth rate of nominal GDP, and  $\lambda = 0.5$ .

**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  $m = 1, \dots, 10$  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 4/16/2020, and the current U.S. note has a maturity date of 11/15/2020. **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 2005 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. Senior Loan Officer Opinion Survey on Bank Lending Practices.

*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/](http://research.stlouisfed.org/publications/review/).