Monetary Trends

September 2011

Searching for the Financial Accelerator: How Credit Affects the Business Cycle

A prominent view in economics is that malfunctioning credit markets "are not simply passive reflections of a declining real economy, but are in themselves a major factor depressing economic activity."[1] This view has greatly influenced monetary policy. A clear example is the recent "Great Recession," when financial markets became volatile and illiquid and the viability of some of the world's leading financial institutions was seriously in doubt. Federal Reserve policymakers responded aggressively by lowering interest rates to near zero, implementing lending facilities, and instituting multiple rounds of quantitative easing, parts of which were aimed directly at supporting the functioning of the financial system.

Analyses linking the performance of financial markets to aggregate economic activity typically have a financial accelerator mechanism at their core. Fed Chairman Ben Bernanke eloquently summarizes the workings of this mechanism in a recent speech.[2] Here, I interpret movements in business credit demand and liquid asset holdings in terms of this theory.

The key links between the workings of the financial system and real economic activity are easily understood. Entrepreneurs may develop profitable projects and firms may find it profitable to expand or invest more. Both actions typically require tapping credit markets to obtain required resources. Access to credit, however, is limited by the presence of asymmetric information and principal-agent problems, which are natural in credit relations. Financial institutions appropriately monitor borrowers to help overcome these frictions.

Because of the costs incurred by lenders to monitor borrowers, external financing is generally costlier than internal financing. This external finance premium is negatively related to the borrower's net worth and overall financial position. This relationship creates a mechanism of financial acceleration. Any shock that affects the financial position of the firm affects its borrowing capacity, which in turn affects its profitability and, ultimately, its financial position. Shocks that otherwise would be short-lived may be easily amplified through this channel.

Two natural implications of the accelerator mechanism are that (i) crises with high financial distress should be associated with relatively larger declines in credit and (ii) a decline in credit should be associated with a decline in holdings of liquid assets. The chart shows the ratio of net changes in credit market instruments (including bank loans, commercial paper, and corporate bonds) to income before taxes for the U.S. nonfinancial business sector. Credit declined quite substantially during the Great Recession, as the theory predicts, given the distressed financial markets. However, the net change in credit does not seem particularly different from the two previous recessions, which were milder and not obviously driven by financial distress. Of note, not only did credit decline from 2008 to 2009, but firms also started repaying their debts (the change is negative). Furthermore, they did so while simultaneously accumulating highly liquid assets (currency, savings, and checkable deposits). The combination of these two observations is puzzling if firms are purportedly starving for credit but cannot obtain it.

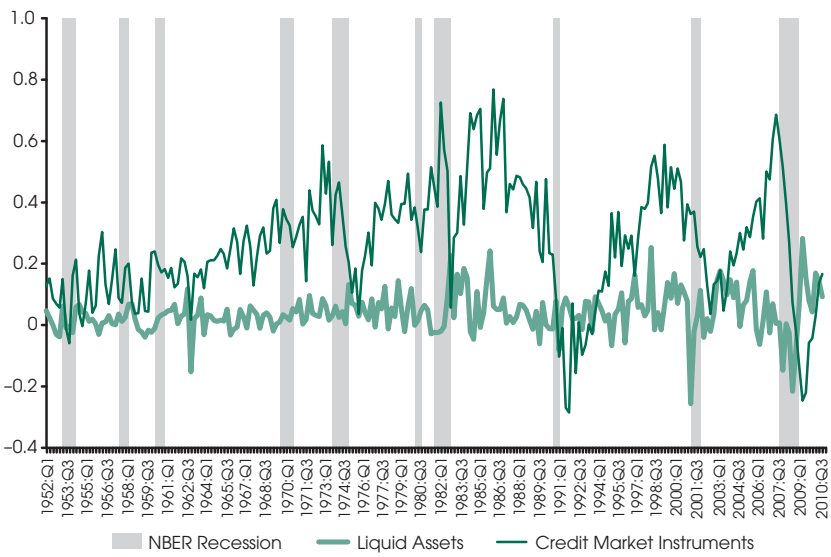
The implementation of aggressive policies supporting credit markets is one possible explanation why credit did not drop more than in previous crises. It is also possible that shocks affect small and large firms asymmetrically and that aggregate data, as used here, mask such effects. Finally, the recent crisis may have affected very short-term credit instruments that are not necessarily captured in the quarterly frequency data available from the Fed's Flow of Funds Accounts statistical release.

—Adrian Peralta-Alva

[1] Bernanke, Ben S.; Gertler, Mark and Gilchrist, Simon. "The Financial Accelerator in a Quantitative Business Cycle Framework," in John B. Taylor and Michael Woodford, eds., *Handbook of Macroeconomics*. Chap. 21. Amsterdam: Elsevier, pp. 1341-393.

[2] Bernanke, Ben S. "The Financial Accelerator and the Credit Channel." Presented at the Federal Reserve Bank of Atlanta Conference, *Credit Channel of Monetary Policy in the Twenty-First Century*, June 15, 2007; www.federalreserve.gov/newsevents/speech/Bernanke20070615a.htm.

Net Changes in Credit Market Instruments and Liquid Assets (nonfinancial business sector)



NOTE: NBER, National Bureau of Economic Research.
SOURCE: Federal Reserve Statistical Release Z.1: Flow of Funds Accounts of the United States (www.federalreserve.gov/releases/z1/).

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: $[(x_\tau/x_{\tau-1})-1]\times 1200$. 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: $[(x_\tau/x_{\tau-12})-1]\times 100$.

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 ceased the publication of the M3 monetary aggregate. It also ceased publishing the following components: large-denomination time deposits, RPs, and eurodollars.

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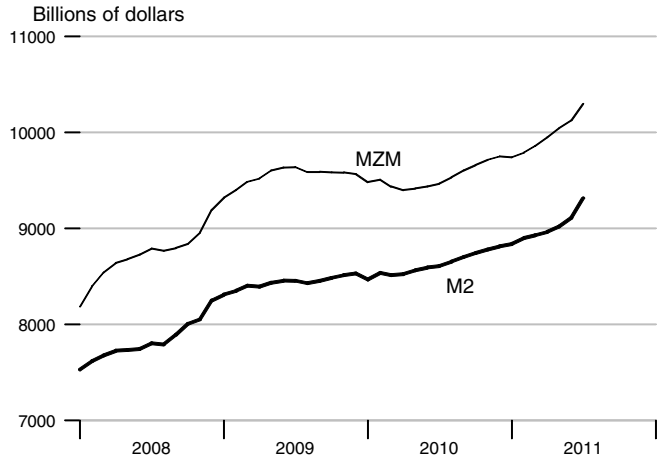
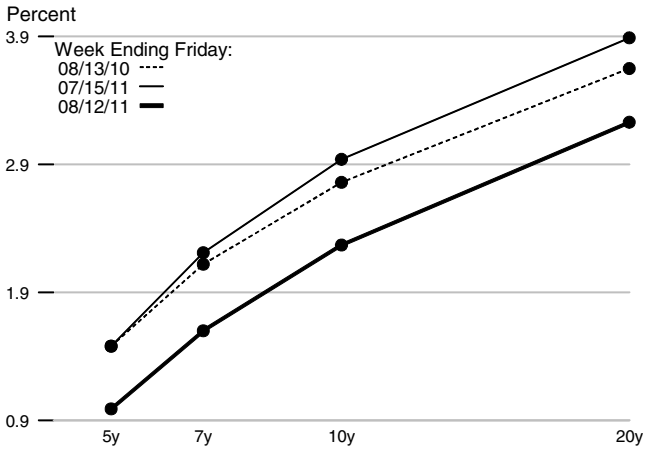
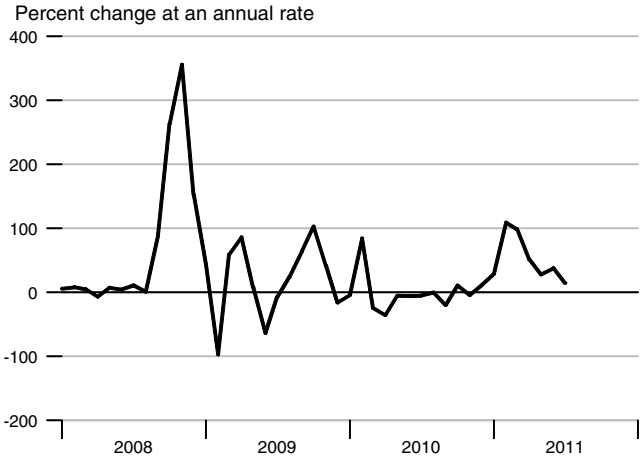
M2 and MZM



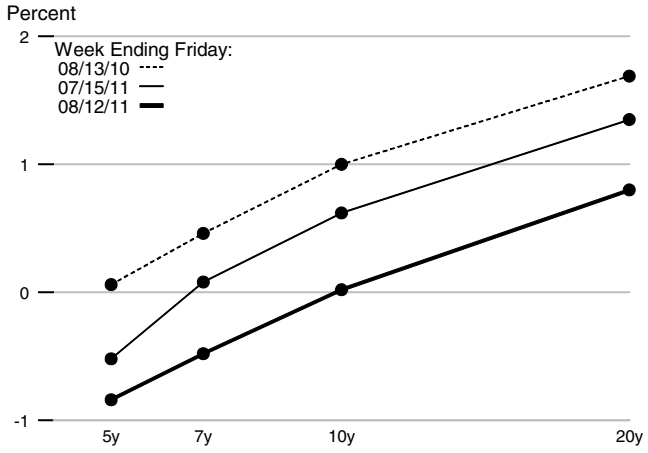
Treasury Yield Curve



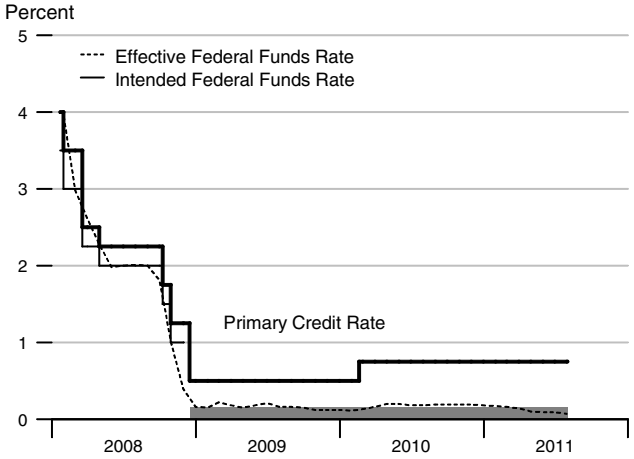
Adjusted Monetary Base



Real Treasury Yield Curve

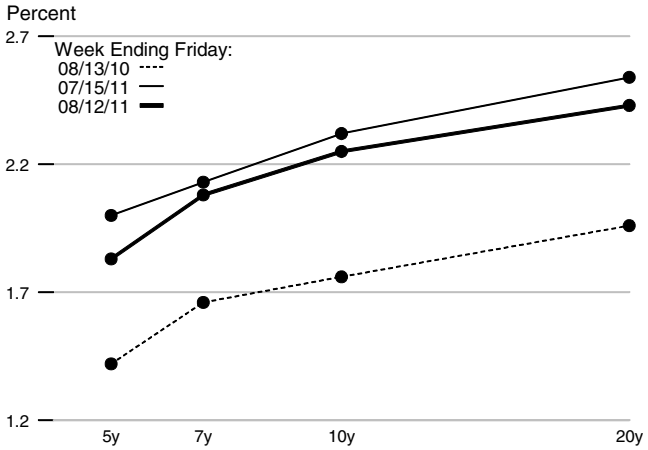


Reserve Market Rates



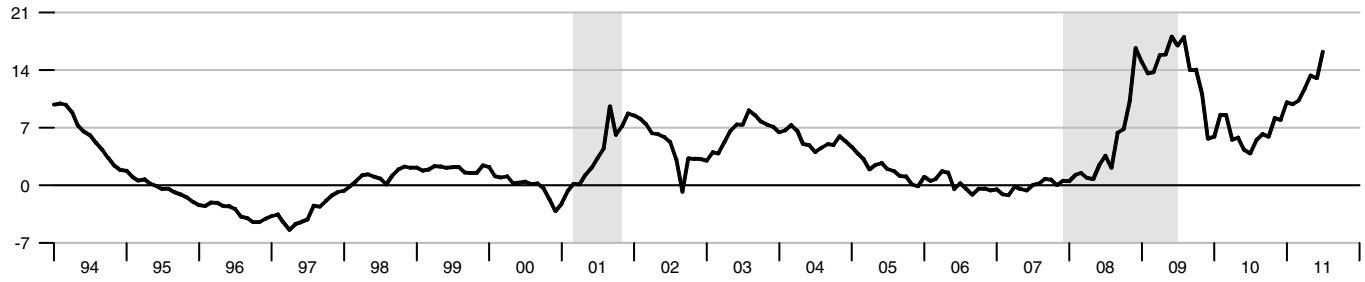
Note: Effective December 16, 2008, FOMC reports the intended Federal Funds Rate as a range.

Inflation-Indexed Treasury Yield Spreads



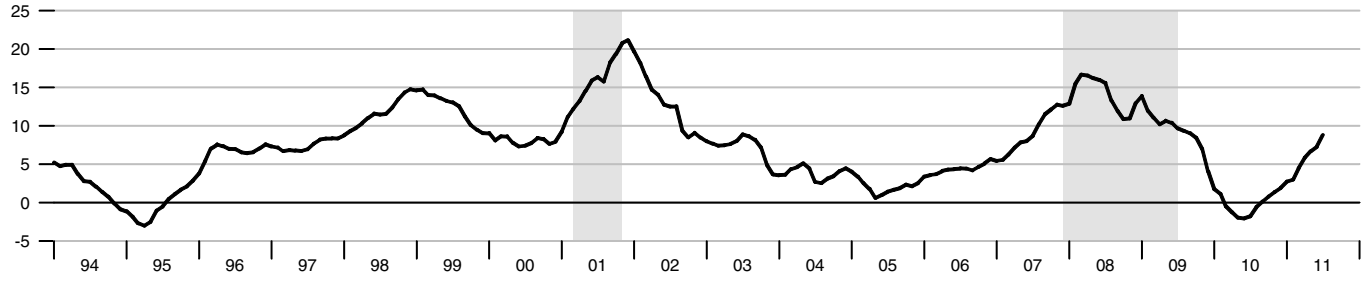
M1

Percent change from year ago



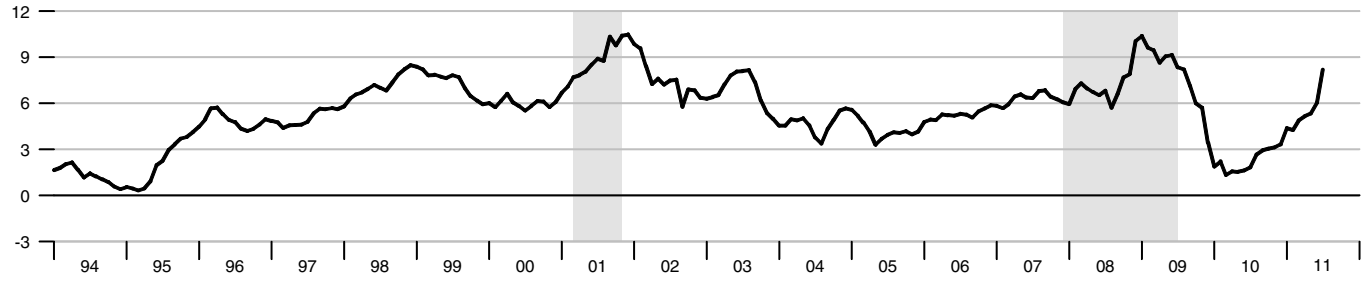
MZM

Percent change from year ago



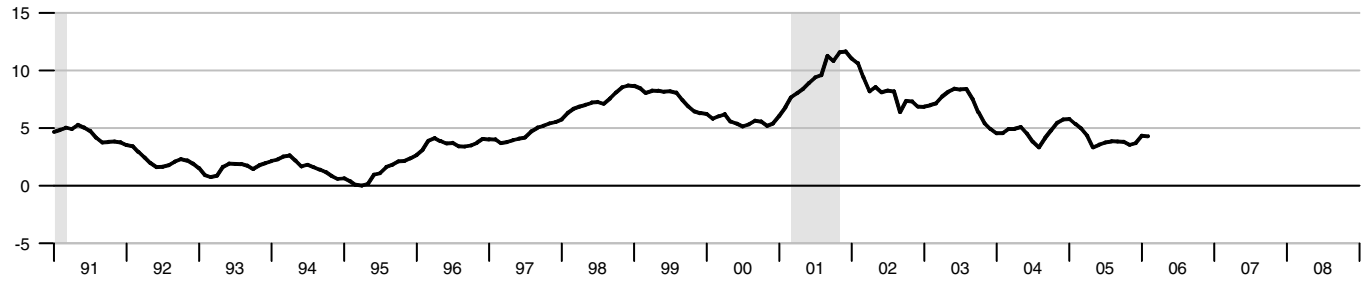
M2

Percent change from year ago



Monetary Services Index - M2**

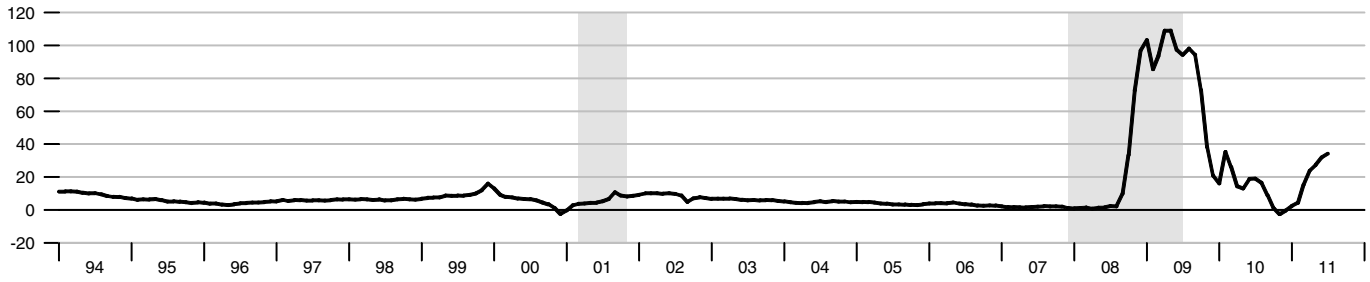
Percent change from year ago



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

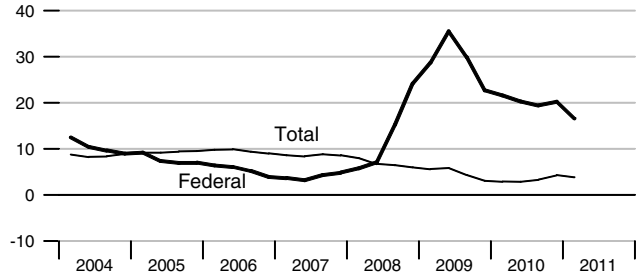
Adjusted Monetary Base

Percent change from year ago



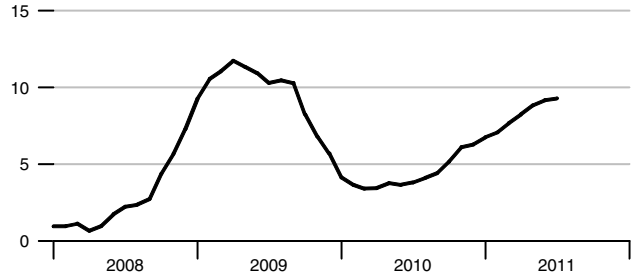
Domestic Nonfinancial Debt

Percent change from year ago



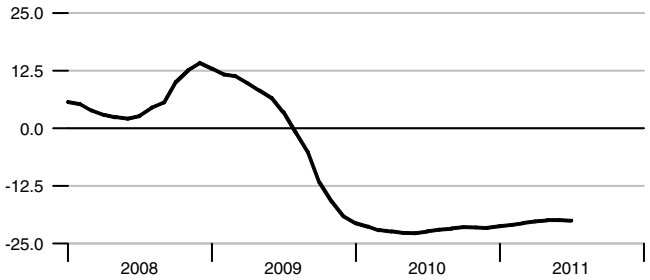
Currency Held by the Nonbank Public

Percent change from year ago



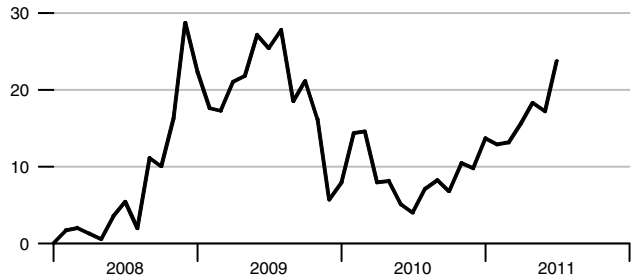
Small Denomination Time Deposits

Percent change from year ago



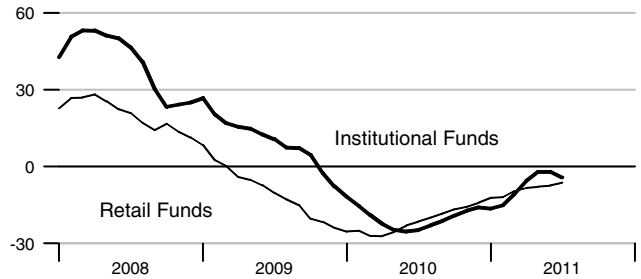
Checkable Deposits

Percent change from year ago



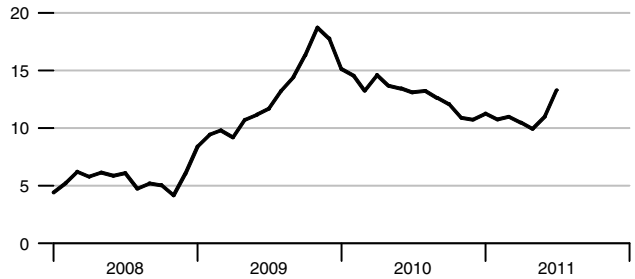
Money Market Mutual Fund Shares

Percent change from year ago



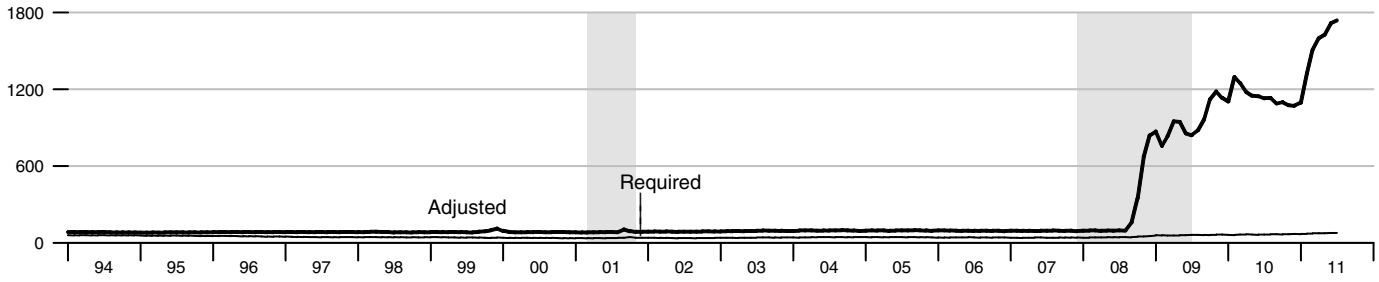
Savings Deposits

Percent change from year ago



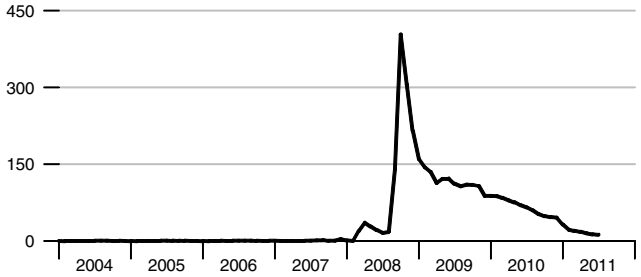
Adjusted and Required Reserves

Billions of dollars



Total Borrowings, nsa

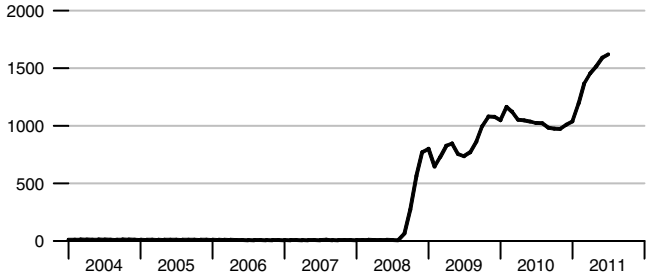
Billions of dollars



* Data exclude term auction credit

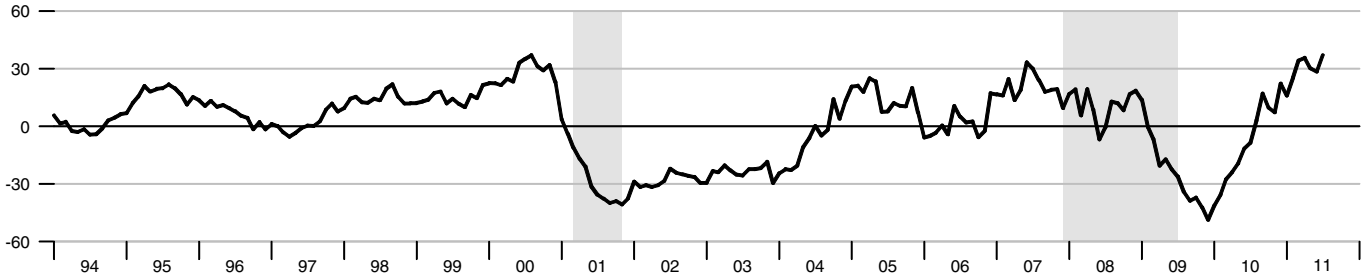
Excess Reserves plus RCB Contracts

Billions of dollars



Nonfinancial Commercial Paper

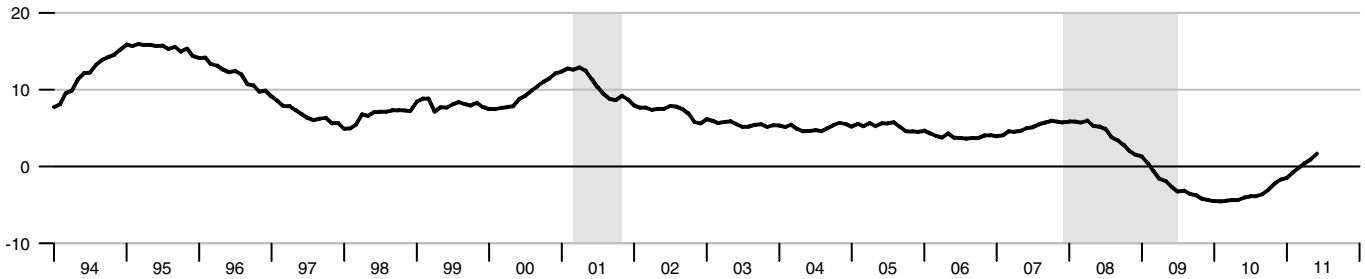
Percent change from year ago



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.

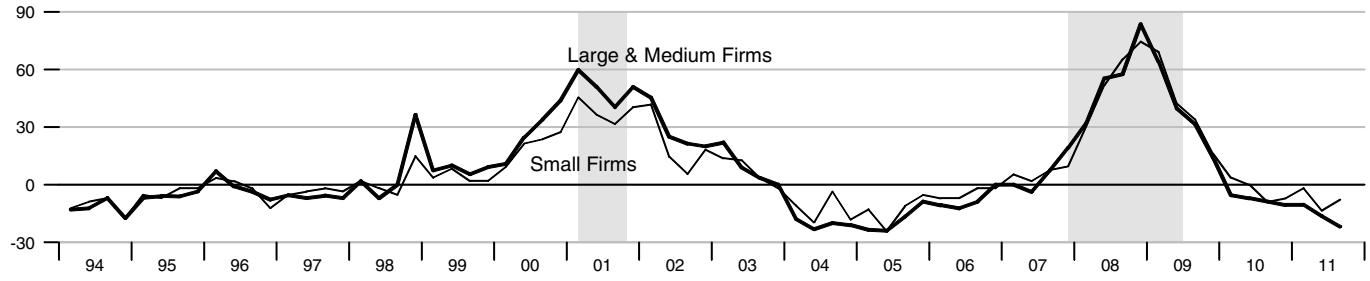
Consumer Credit

Percent change from year ago



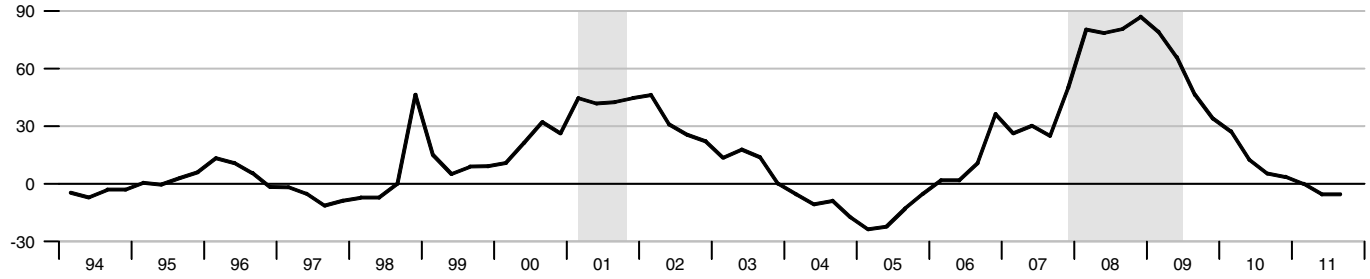
Net Percentage of Domestic Banks Tightening Standards for Commercial and Industrial Loans

Percentage



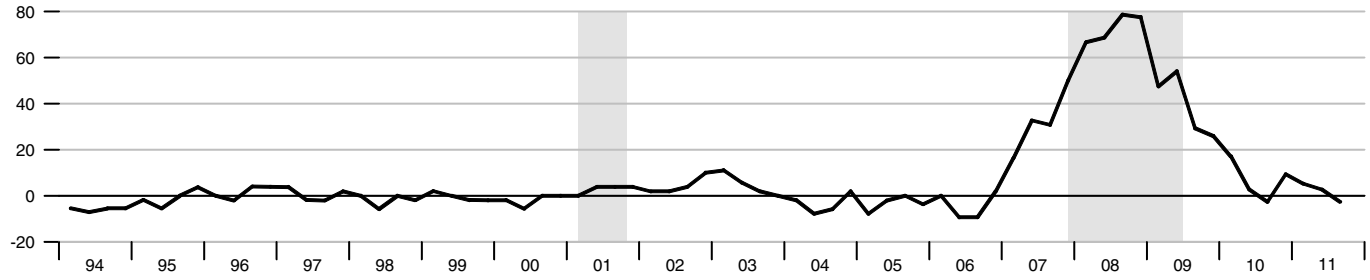
Net Percentage of Domestic Banks Tightening Standards for Commercial Real Estate Loans

Percentage



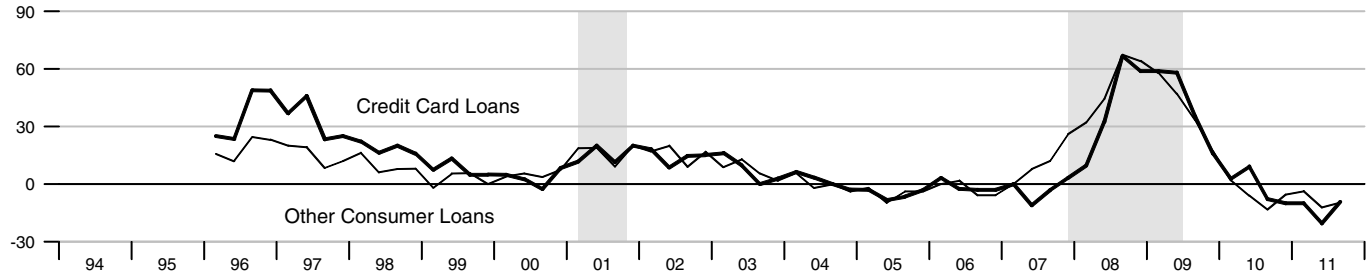
Net Percentage of Domestic Banks Tightening Standards for Residential Mortgage Loans

Percentage



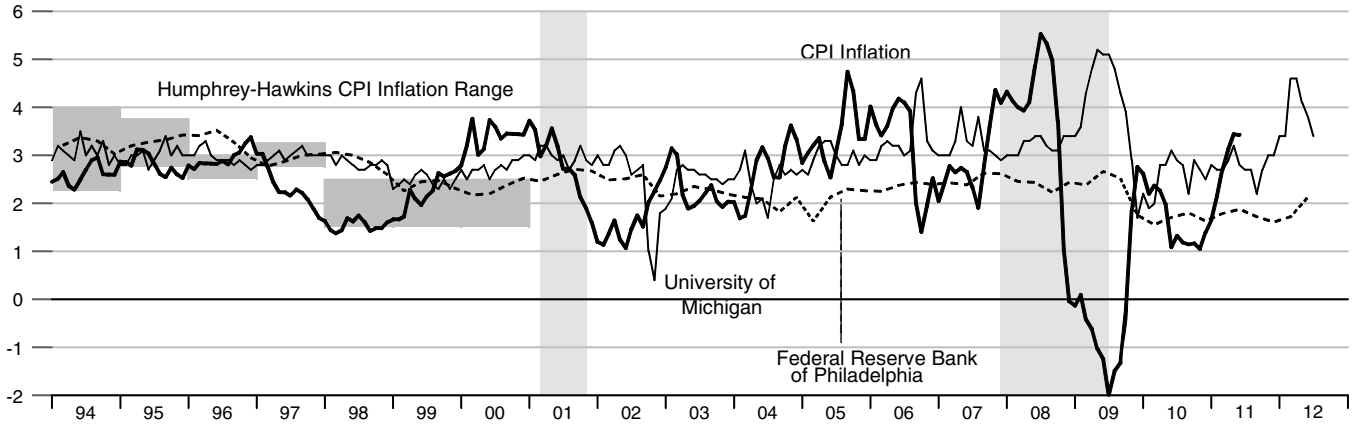
Net Percentage of Domestic Banks Tightening Standards for Consumer Loans

Percentage



CPI Inflation and 1-Year-Ahead CPI Inflation Expectations

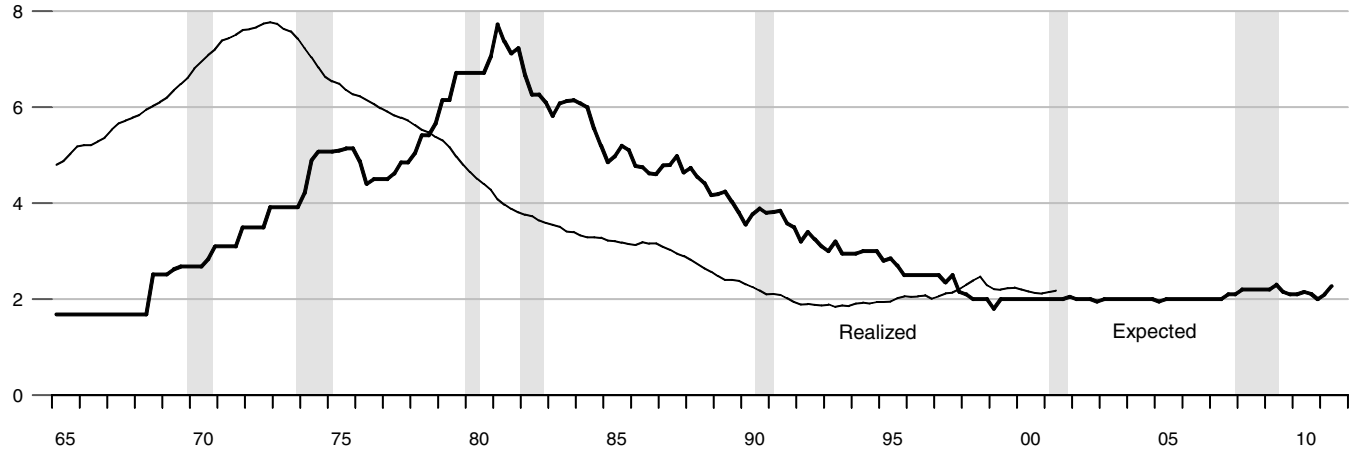
Percent



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

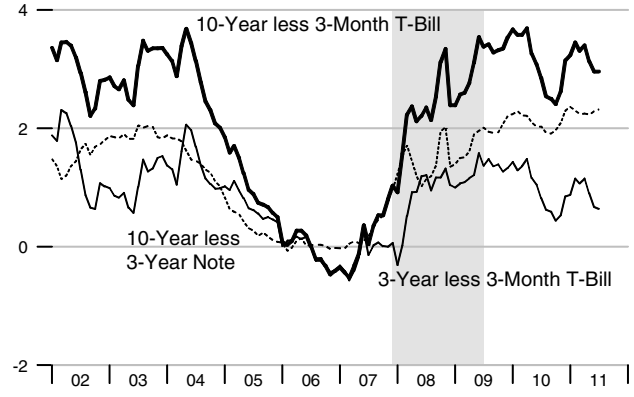
Percent



See the notes section for an explanation of the chart.

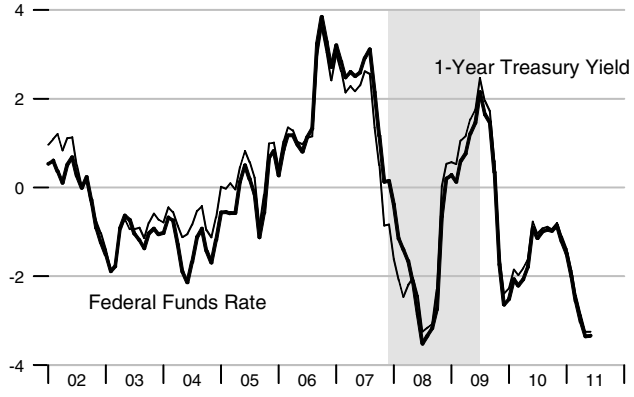
Treasury Security Yield Spreads

Yield to maturity

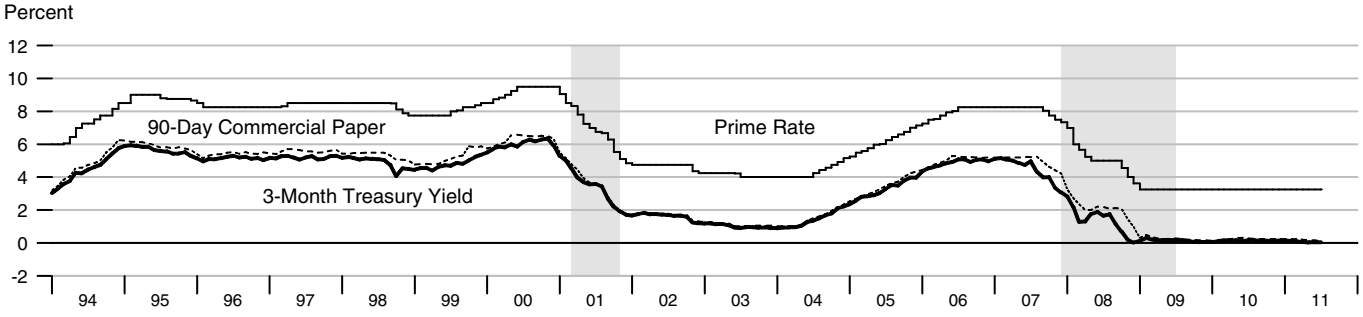


Real Interest Rates

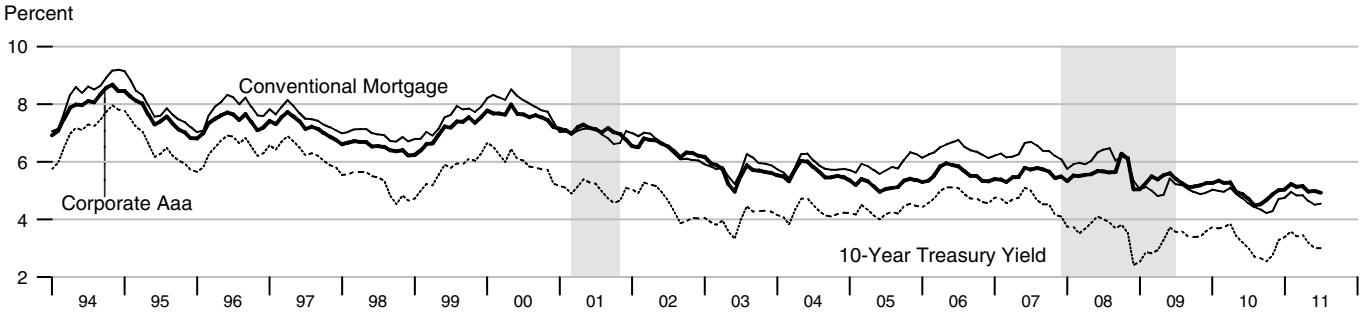
Percent, Real rate = Nominal rate less year-over-year CPI inflation



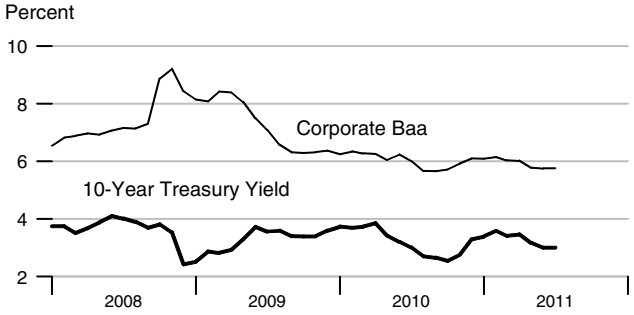
Short-Term Interest Rates



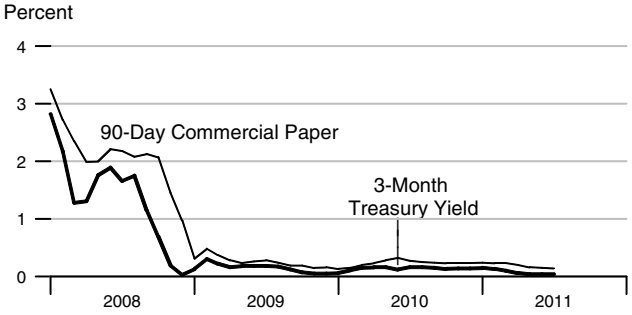
Long-Term Interest Rates



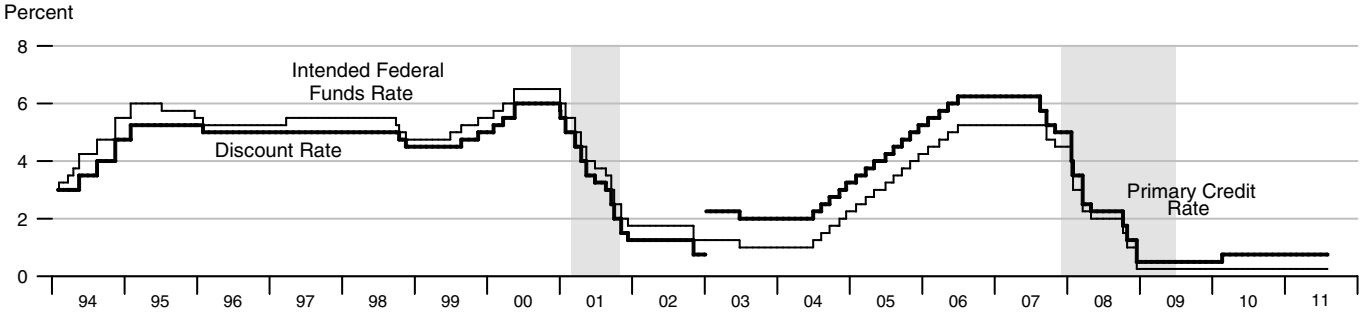
Long-Term Interest Rates



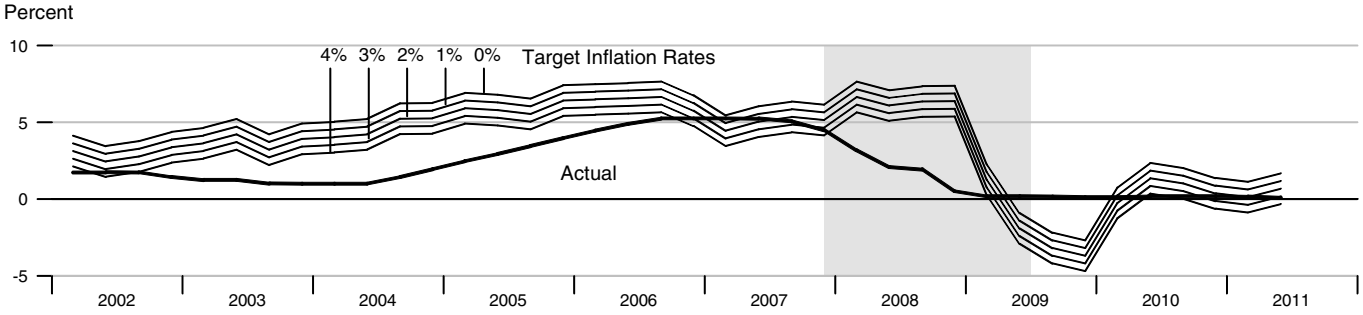
Short-Term Interest Rates



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



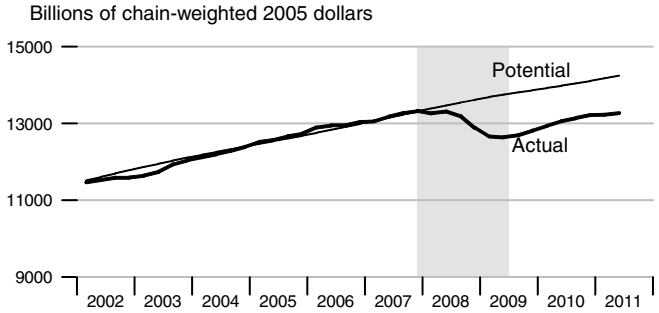
Federal Funds Rate and Inflation Targets



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

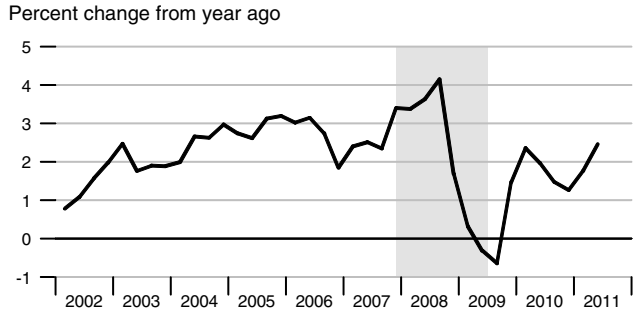
Components of Taylor's Rule

Actual and Potential Real GDP

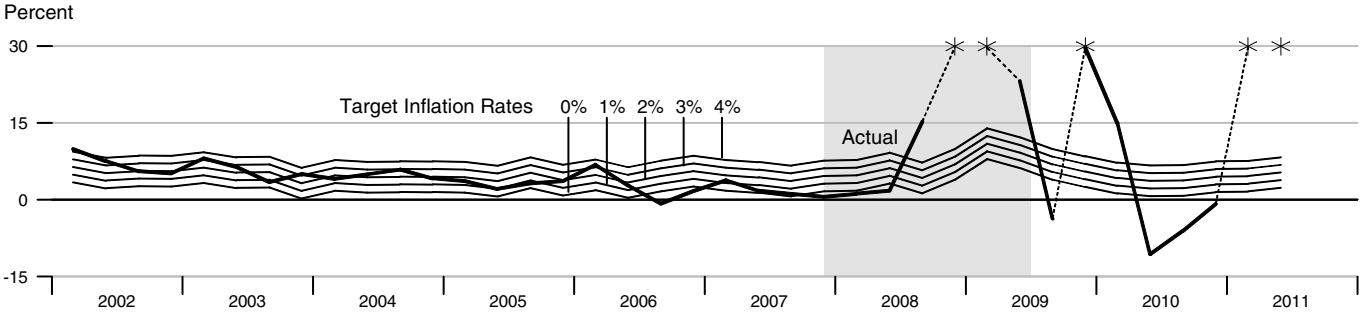


See notes section for further explanation.

PCE Inflation



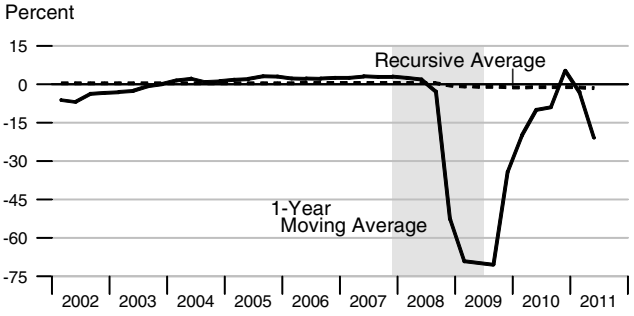
Monetary Base Growth and Inflation Targets



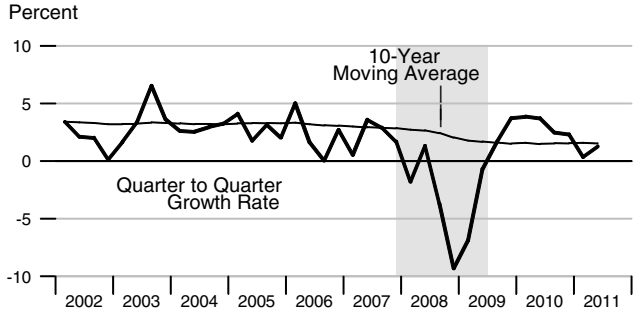
Calculated base growth is based on McCallum's rule. Actual base growth is percent change from the previous quarter. Stars represent actual values for 2008:Q4, 2009:Q1, 2009:Q4, 2011:Q1, 2011:Q2 and are 188.02 percent, 60.74 percent, 56.52 percent, 45.94 percent, and 58.74 percent, respectively.

Components of McCallum's Rule

Monetary Base Velocity Growth

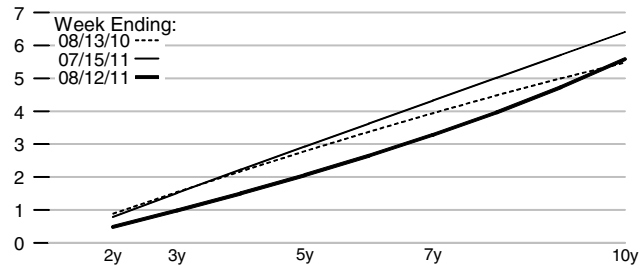


Real Output Growth



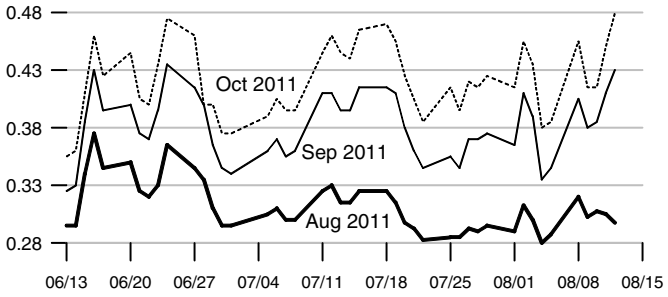
Implied One-Year Forward Rates

Percent



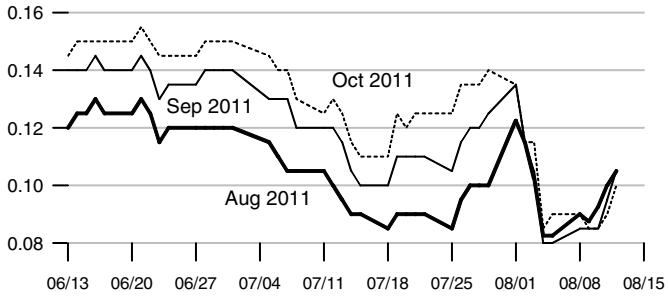
Rates on 3-Month Eurodollar Futures

Percent, daily data



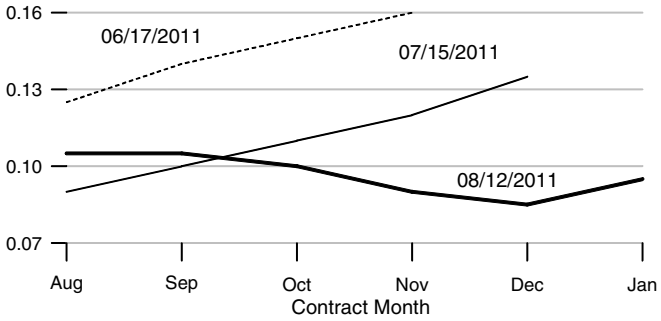
Rates on Selected Federal Funds Futures Contracts

Percent, daily data



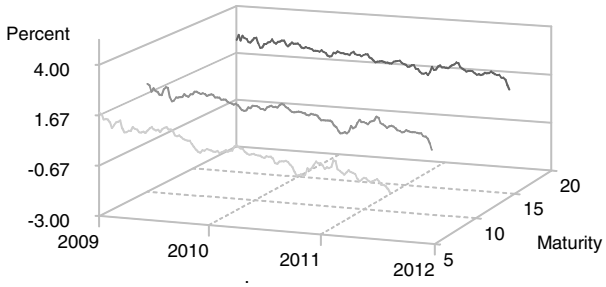
Rates on Federal Funds Futures on Selected Dates

Percent



Inflation-Indexed Treasury Securities

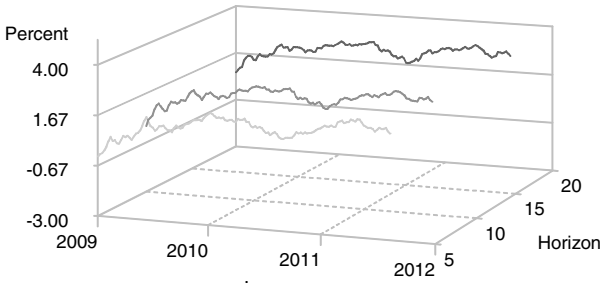
Weekly data



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

Inflation-Indexed Treasury Yield Spreads

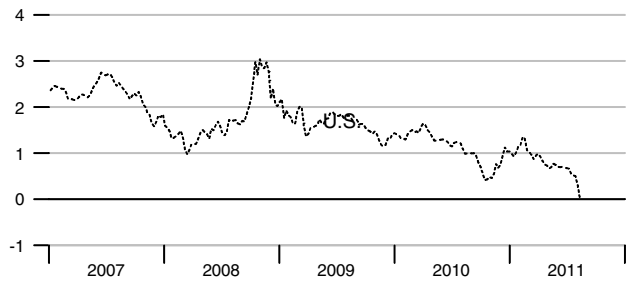
Weekly data



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

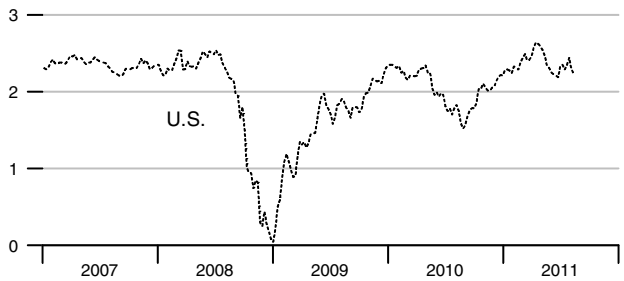
Inflation-Indexed 10-Year Government Notes

Percent, weekly data



Inflation-Indexed 10-Year Government Yield Spreads

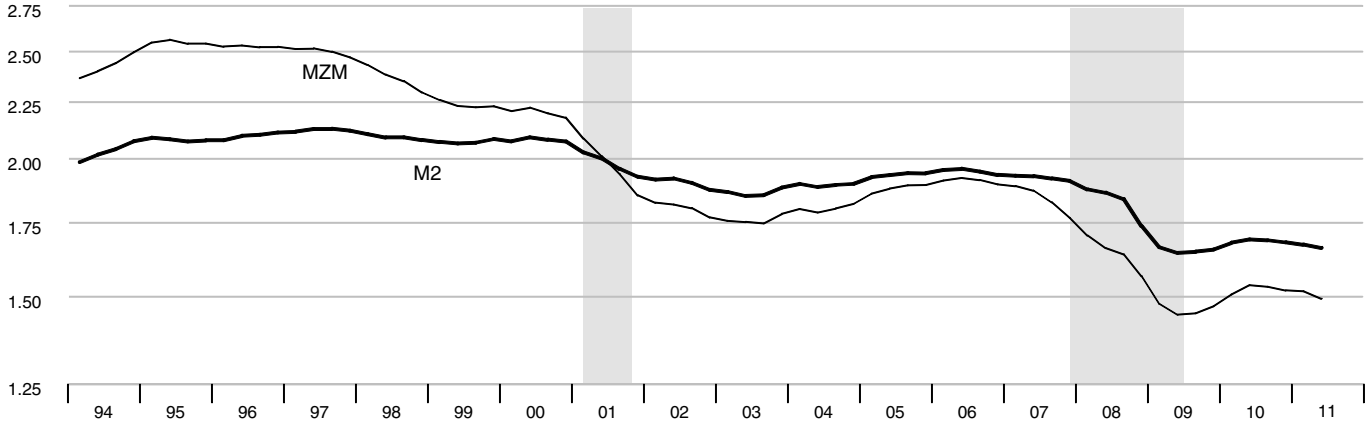
Percent, weekly data



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

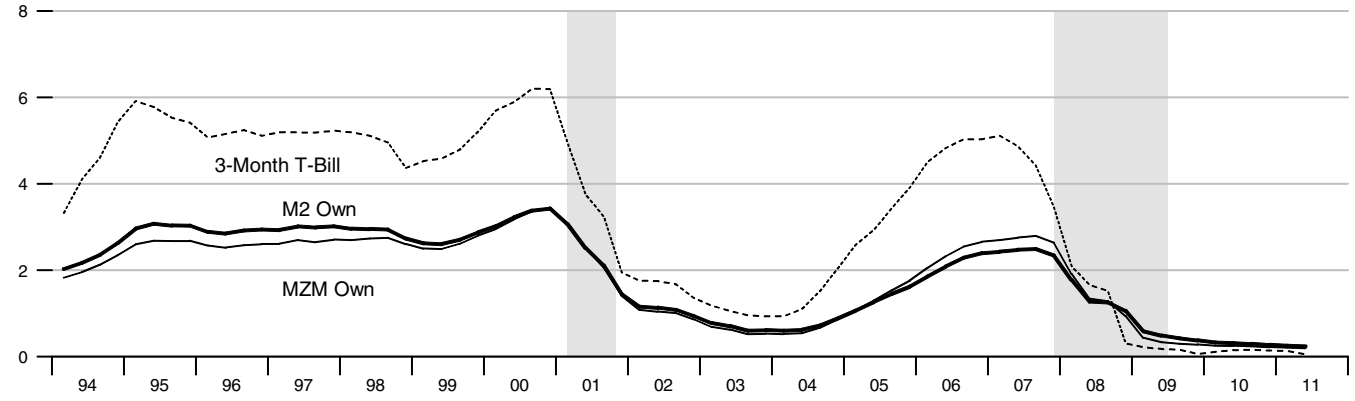
Velocity

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



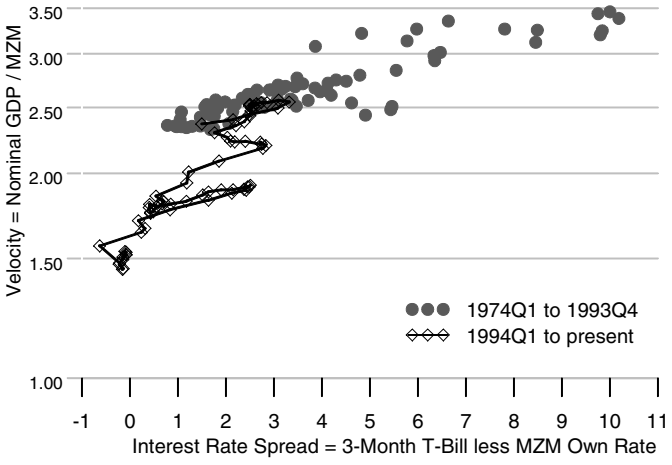
Interest Rates

Percent



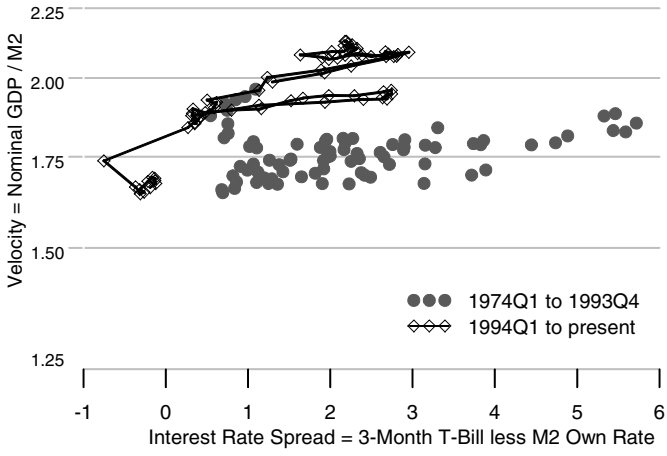
MZM Velocity and Interest Rate Spread

Ratio Scale



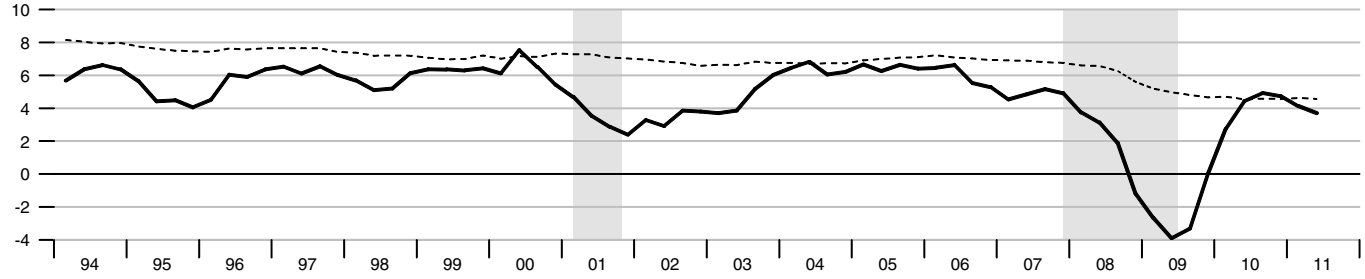
M2 Velocity and Interest Rate Spread

Ratio Scale



Gross Domestic Product

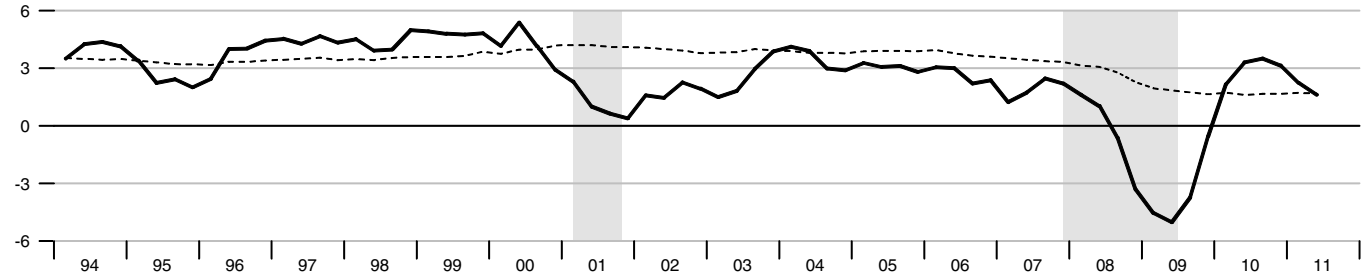
Percent change from year ago



Dashed lines indicate 10-year moving averages.

Real Gross Domestic Product

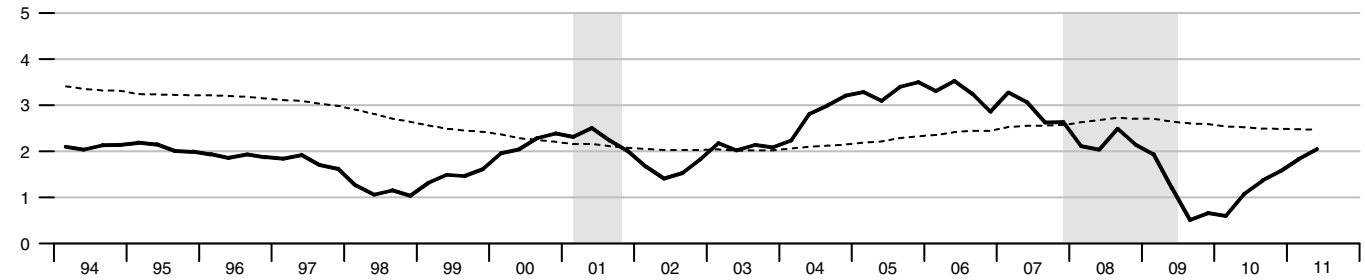
Percent change from year ago



Dashed lines indicate 10-year moving averages.

Gross Domestic Product Price Index

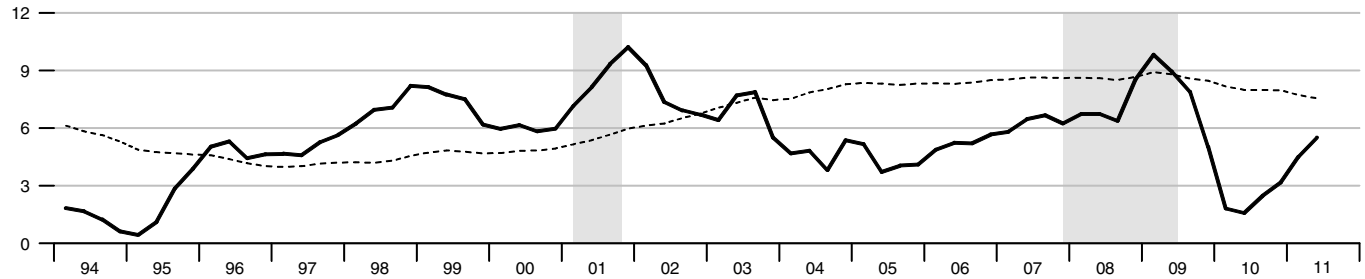
Percent change from year ago



Dashed lines indicate 10-year moving averages.

M2

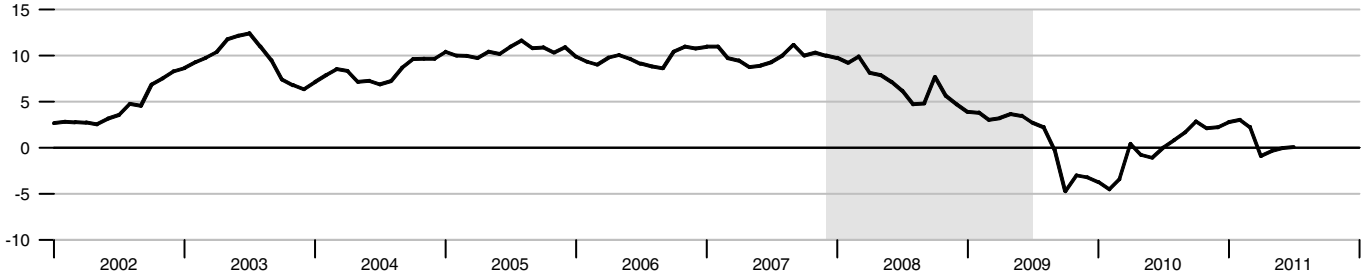
Percent change from year ago



Dashed lines indicate 10-year moving averages.

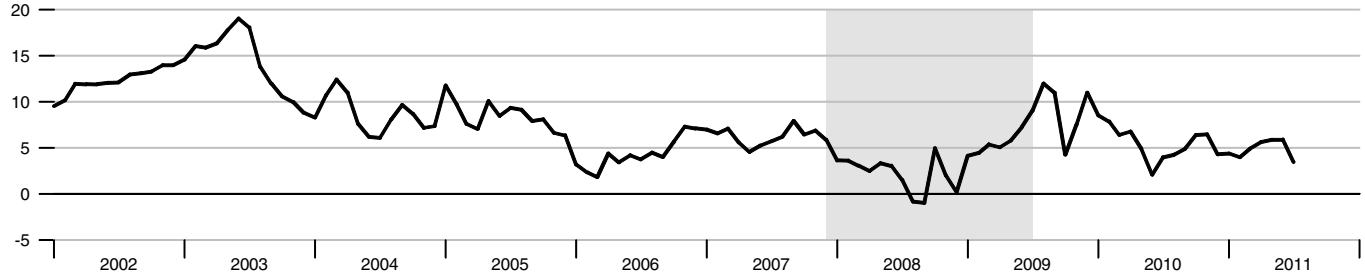
Bank Credit

Percent change from year ago



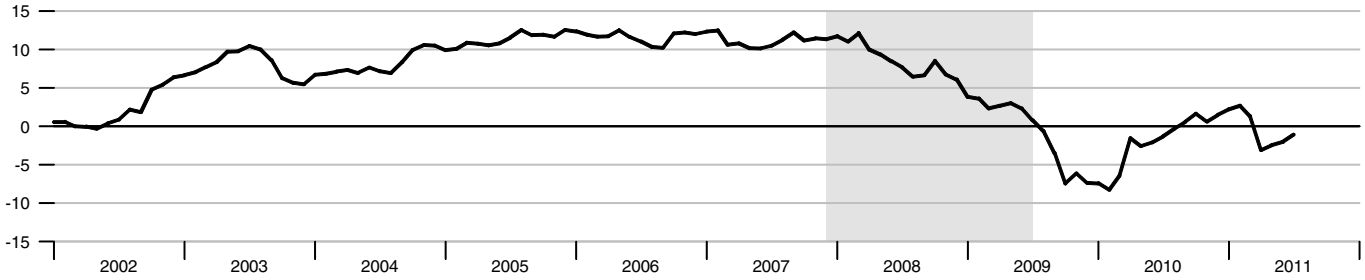
Investment Securities in Bank Credit at Commercial Banks

Percent change from year ago



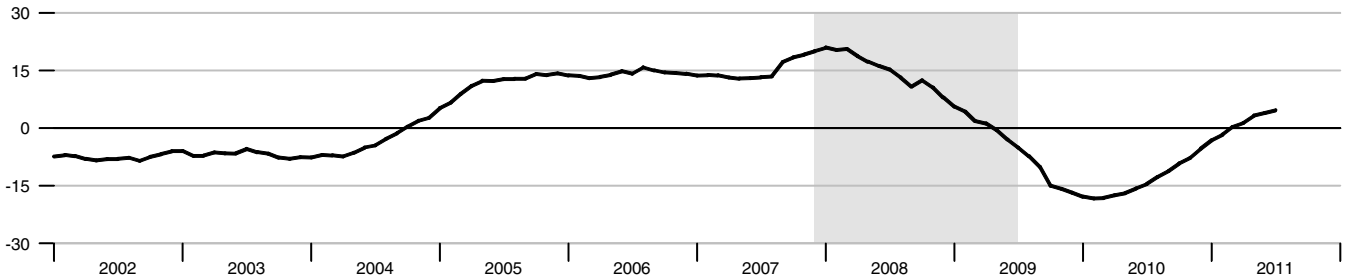
Total Loans and Leases in Bank Credit at Commercial Banks

Percent change from year ago

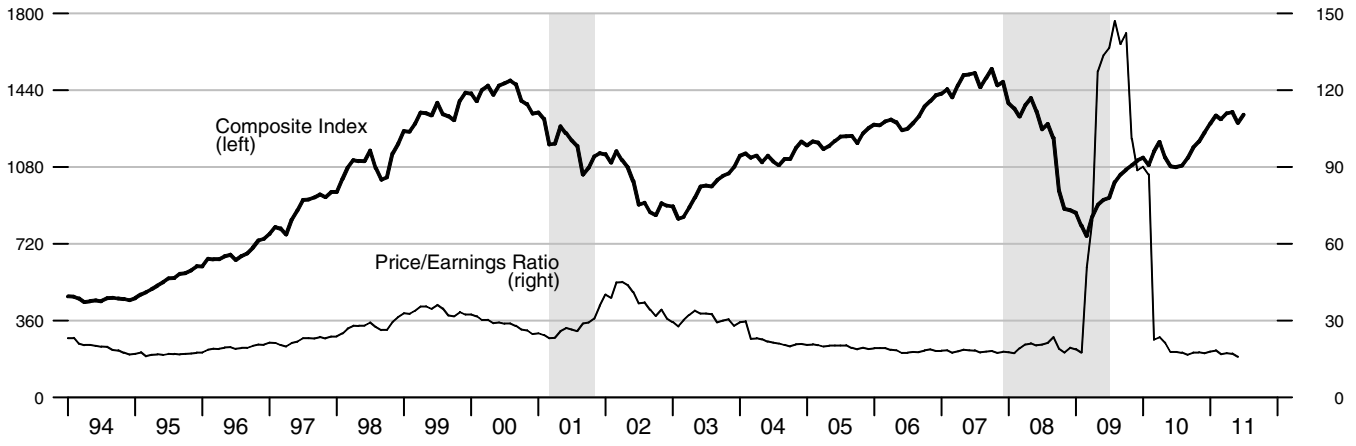


Commercial and Industrial Loans at Commercial Banks

Percent change from year ago



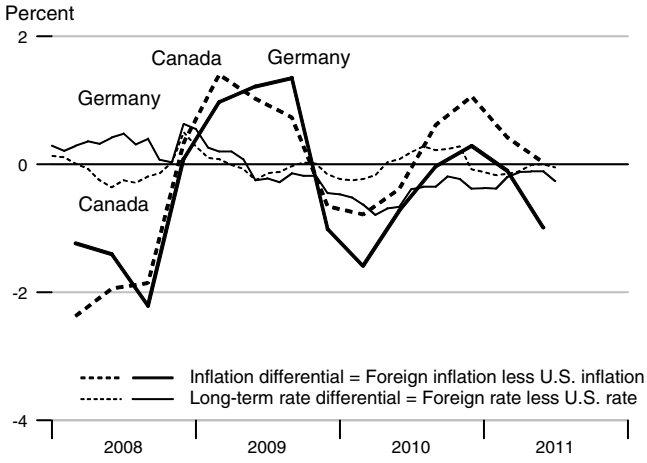
Standard & Poor's 500

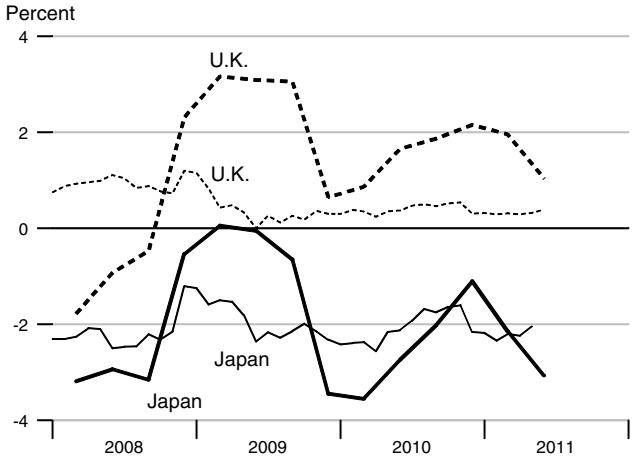


Recent Inflation and Long-Term Interest Rates

	Consumer Price Inflation Rates				Long-Term Government Bond Rates			
	Percent change from year ago				Percent			
	2010Q3	2010Q4	2011Q1	2011Q2	Apr11	May11	Jun11	Jul11
United States	1.22	1.20	2.17	3.33	3.46	3.17	3.00	3.00
Canada	1.83	2.27	2.60	3.36	3.35	3.16	3.00	2.95
France	1.53	1.65	1.81	2.07	3.69	3.49	3.43	.
Germany	1.18	1.49	2.08	2.35	3.34	3.06	2.89	2.74
Italy	1.62	1.79	2.34	2.67	4.84	4.76	4.82	.
Japan	-0.80	0.10	0.03	0.27	1.22	1.12	.	.
United Kingdom	3.09	3.36	4.13	4.37	3.75	3.49	3.39	.

Inflation and Long-Term Interest Rate Differentials





		Money Stock				Bank	Adjusted		
		M1	MZM	M2	M3*	Credit	Monetary Base	Reserves	MSI M2**
	2006	1374.189	7001.848	6866.561	10270.74	7694.074	835.035	94.908	
	2007	1372.136	7636.260	7299.210		8461.299	850.529	94.146	
	2008	1433.140	8709.498	7818.267		9062.465	1010.131	232.536	
	2009	1636.852	9543.295	8434.306		9170.372	1796.544	944.774	
	2010	1740.808	9533.956	8624.882		9141.833	2031.704	1144.131	
2009	1	1577.914	9402.331	8354.439		9282.676	1662.910	820.582	
	2	1624.149	9586.836	8426.964		9255.248	1763.620	917.025	
	3	1660.872	9605.995	8446.243		9136.652	1747.189	895.450	
	4	1684.474	9578.020	8509.576		9006.912	2012.459	1146.039	
2010	1	1698.897	9475.708	8505.431		8922.244	2089.193	1217.050	
	2	1708.658	9417.419	8560.186		9210.437	2034.300	1158.475	
	3	1747.268	9534.782	8655.011		9212.451	2003.663	1117.953	
	4	1808.411	9707.913	8778.900		9222.199	1999.660	1083.047	
2011	1	1870.223	9797.337	8888.794		9162.361	2243.008	1310.581	
	2	1925.759	10039.92	9031.673		9170.455	2597.878	1647.759	
2009	Jul	1661.505	9638.678	8454.482		9200.259	1693.714	841.482	
	Aug	1655.340	9588.082	8430.323		9151.857	1728.117	879.597	
	Sep	1665.770	9591.224	8453.924		9057.841	1819.736	965.271	
	Oct	1679.853	9584.743	8484.315		8975.719	1975.378	1122.203	
	Nov	1679.941	9582.970	8513.822		9038.296	2044.688	1182.381	
	Dec	1693.627	9566.347	8530.591		9006.722	2017.311	1133.534	
2010	Jan	1681.135	9482.865	8467.609		8940.781	2010.111	1105.468	
	Feb	1703.433	9507.608	8535.307		8881.908	2150.926	1296.207	
	Mar	1712.122	9436.651	8513.376		8944.043	2106.541	1249.475	
	Apr	1698.965	9399.374	8524.135		9262.173	2044.317	1179.157	
	May	1704.092	9415.482	8563.592		9208.606	2034.566	1149.889	
	Jun	1722.917	9437.400	8592.831		9160.532	2024.018	1146.379	
	Jul	1726.024	9467.029	8608.783		9199.941	2015.197	1131.110	
	Aug	1746.429	9532.627	8654.303		9227.316	2014.643	1133.740	
	Sep	1769.350	9604.690	8701.947		9210.095	1981.149	1089.008	
	Oct	1779.432	9659.486	8742.448		9231.310	1998.502	1099.711	
	Nov	1817.343	9715.258	8780.476		9228.827	1991.154	1076.436	
	Dec	1828.458	9748.996	8813.777		9206.459	2009.323	1072.995	
2011	Jan	1850.504	9741.745	8838.362		9189.682	2057.166	1095.886	
	Feb	1871.679	9791.719	8899.747		9151.164	2243.621	1327.482	
	Mar	1888.487	9858.548	8928.272		9146.238	2428.238	1508.374	
	Apr	1898.622	9948.833	8963.725		9178.868	2531.680	1599.150	
	May	1931.239	10044.69	9019.840		9175.699	2590.384	1627.402	
	Jun	1947.416	10126.23	9111.454		9156.798	2671.569	1716.724	
	Jul	2006.204	10298.71	9313.437		9206.707	2703.615	1738.123	

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

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

	Federal Funds	Primary Credit Rate	Prime Rate	3-mo CDs	Treasury Yields 3-mo	3-yr	10-yr	Corporate Aaa Bonds	Municipal Aaa Bonds	Conventional Mortgage
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
2009 Jul	0.16	0.50	3.25	0.35	0.18	1.55	3.56	5.41	4.36	5.22
Aug	0.16	0.50	3.25	0.30	0.17	1.65	3.59	5.26	4.17	5.19
Sep	0.15	0.50	3.25	0.25	0.12	1.48	3.40	5.13	3.81	5.06
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

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

		M1	MZM	M2	M3*
Percent change at an annual rate					
	2006	0.19	4.34	5.25	4.95
	2007	-0.15	9.06	6.30	
	2008	4.45	14.05	7.11	
	2009	14.21	9.57	7.88	
	2010	6.35	-0.10	2.26	
2009	1	12.72	18.08	12.45	
	2	11.72	7.85	3.47	
	3	9.04	0.80	0.92	
	4	5.68	-1.16	3.00	
2010	1	3.42	-4.27	-0.19	
	2	2.30	-2.46	2.58	
	3	9.04	4.98	4.43	
	4	14.00	7.26	5.73	
2011	1	13.67	3.68	5.01	
	2	11.88	9.90	6.43	
2009	Jul	7.05	0.48	-0.03	
	Aug	-4.45	-6.30	-3.43	
	Sep	7.56	0.39	3.36	
	Oct	10.15	-0.81	4.31	
	Nov	0.06	-0.22	4.17	
	Dec	9.78	-2.08	2.36	
2010	Jan	-8.85	-10.47	-8.86	
	Feb	15.92	3.13	9.59	
	Mar	6.12	-8.96	-3.08	
	Apr	-9.22	-4.74	1.52	
	May	3.62	2.06	5.55	
	Jun	13.26	2.79	4.10	
	Jul	2.16	3.77	2.23	
	Aug	14.19	8.31	6.35	
	Sep	15.75	9.07	6.61	
	Oct	6.84	6.85	5.59	
	Nov	25.57	6.93	5.22	
	Dec	7.34	4.17	4.55	
2011	Jan	14.47	-0.89	3.35	
	Feb	13.73	6.16	8.33	
	Mar	10.78	8.19	3.85	
	Apr	6.44	10.99	4.77	
	May	20.62	11.56	7.51	
	Jun	10.05	9.74	12.19	
	Jul	36.23	20.44	26.60	

*See table of contents for changes to the series.

Definitions

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

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

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

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

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

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

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

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

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

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

Notes

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

Page 5: **Checkable Deposits** is the sum of demand and other checkable deposits. **Savings Deposits** is the sum of money market deposit accounts and passbook and statement savings. **Time Deposits** have a minimum initial maturity of 7 days. **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, 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 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 Δb_t is the implied growth rate of the adjusted monetary base, Δy_t^* is the 10-year

moving average growth in real GDP, Δv_t^{α} is the average base velocity growth (calculated recursively), Δx_{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 $m = 1,...,$ 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/.