

Monetary Policy's Effects on Unemployment

Incoming economic data this year have been encouraging, including a drop of 0.5 percentage points in the unemployment rate. Is this a sign that the Federal Reserve's quantitative easing (officially referred to as the "Large Scale Asset Purchase" [LSAP]) program is working? Perhaps. But some economists and analysts are cautious for several reasons. First, LSAP programs directly increase the deposits held by financial institutions at the Federal Reserve—that is, the monetary base. Historical data do not suggest that increases in the monetary base have reliable and significant positive effects on aggregate output and employment. Second, even though changes in the monetary base may affect real interest rates in the short run, it is not clear how much of this can translate into higher output and employment through the effect of interest rates on aggregate demand.

The impact of LSAP programs on economic activity depends on the programs' effects on *longer-term* interest rates and the responsiveness of aggregate demand to such changes. The St. Louis-based consulting and forecasting firm Macroeconomic Advisers recently estimated that the Federal Open Market Committee's current \$600 billion LSAP program likely will reduce the 10-year Treasury yield by 20 basis points, increase the eight-quarter-ahead level of real gross domestic product by 0.4 percentage points, reduce the unemployment rate by 0.2 percentage points, and increase employment by 350,000 jobs. Although analyses conducted by other institutions (such as the Boston and San Francisco Feds) have suggested slightly higher figures, the overall effect of the LSAP programs on unemployment is modest.

A less-recognized risk in LSAP programs is that permanent increases in the monetary base foreshadow eventual increases in inflation that can increase, rather than reduce, unemployment over the long term. David Ranson of Wainwright Economics has analyzed the U.S. data over the period of 1950 through 2007. Ranson divided the 57-year period into two categories: years when the monetary base grew at an above-average rate (8.1 percent) and years when it grew at a below-average rate (3.5 percent). Ironically, economic growth was higher in the years of slow money growth (3.7 percent) than it was in the years of rapid growth (3.2 percent). The same was true for industrial production. Meanwhile, the consumer price index rose 5.1 percent in years of above-average monetary growth and just 2.6 percent

in below-average years. The gold price showed an even bigger differential, rising 12.5 percent in above-average years and just 0.6 percent in below-average years.

Other recent analyses, using different tools, have reached similar conclusions. In my current research, I have estimated models for the period 1948:Q1 to 2008:Q2 that suggest that a sustained increase of 1 percentage point in the growth rate of the monetary base has almost no impact on unemployment during the initial 20 quarters but can significantly increase the unemployment rate in the longer run (say, during the subsequent 20 quarters). Extrapolated to the very long run, my analysis suggests that a sustained 1-percent-per-year faster growth of the monetary base might increase the unemployment rate by between 1.0 and 2.2 percentage points. The reason is that expected long-term inflation is bad for growth and employment.

A recent article in the *American Economic Review* documented a similar positive relationship between longer-term inflation and the unemployment rate (Berentsen, Menzio, and Wright, 2011). These authors use a search-and-matching model to explain why longer-term inflation can increase, rather than decrease, the unemployment rate. That is, inflation reduces the demand for money and, hence, hinders trade and the probability of matches in both the goods and labor markets.

In summary, the near-term effects of LSAP programs on unemployment remain uncertain. Further, caution must be exercised such that long-term inflation does not increase. More and more economic research suggests that the long-run costs of inflation, measured in welfare terms, are likely higher than previously estimated (see Wen, 2010). Fortunately, at least one recent cross-country study (Anderson, Gascon, and Liu, 2010) suggests that this long-run lesson is well understood by policymakers.

—Yi Wen

Anderson, Richard; Gascon, Charles and Liu, Yang. "Doubling Your Monetary Base and Surviving: Some International Evidence." *Federal Reserve Bank of St Louis Review*, November/December 2010, 92(6), pp. 481-506; <http://research.stlouisfed.org/publications/review/10/11/Anderson.pdf>.

Berentsen, Aleksander; Menzio, Guido and Wright, Randall. "Inflation and Unemployment in the Long Run." *American Economic Review*, February 2011, 101(1), pp. 371-98.

Wen, Yi. "Liquidity Demand and Welfare in a Heterogeneous-Agent Economy." Working Paper No. 2010-009A, Federal Reserve Bank of St. Louis, March 2010; <http://research.stlouisfed.org/wp/2010/2010-009.pdf>.

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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:

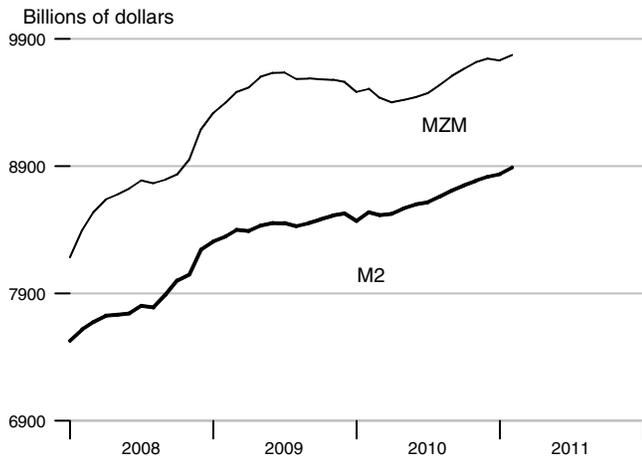
Editor, *Monetary Trends*
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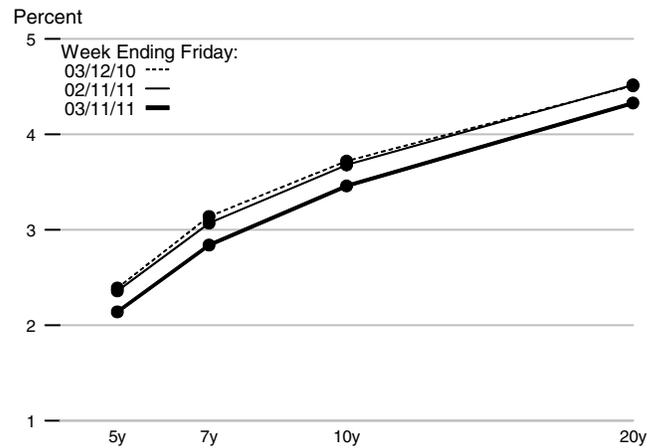
stlsFRED@stls.frb.org

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.

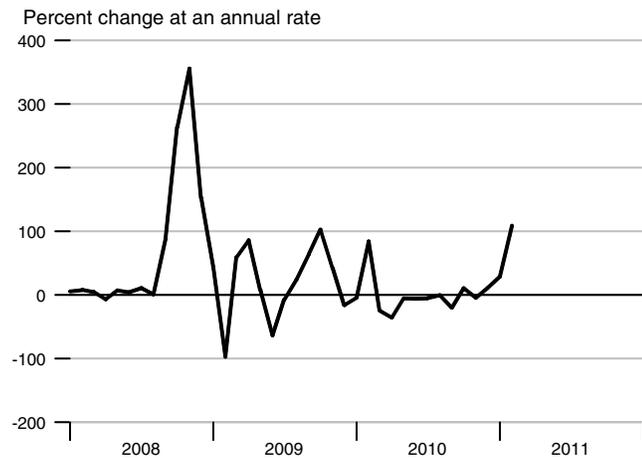
M2 and MZM



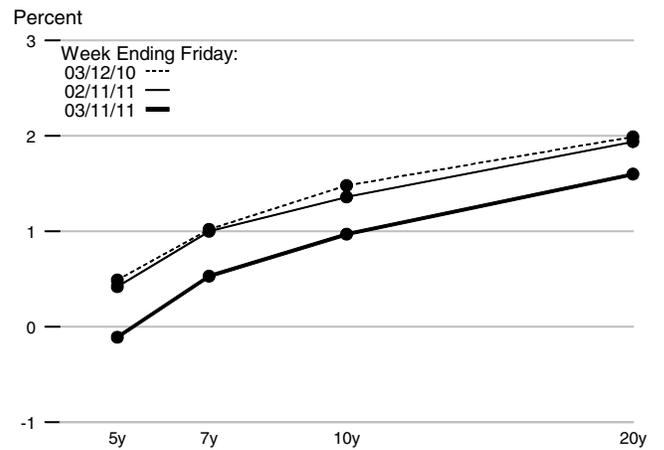
Treasury Yield Curve



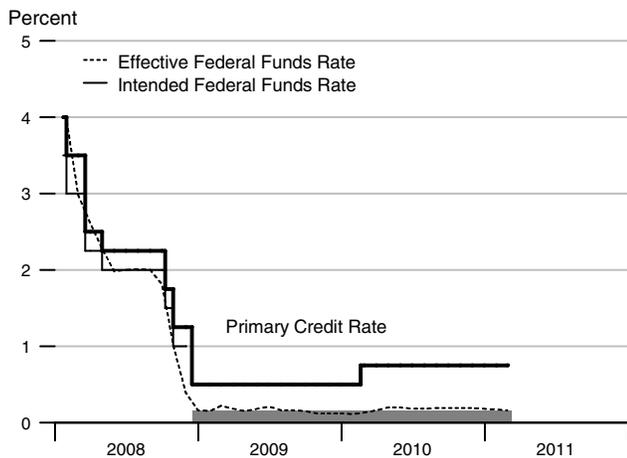
Adjusted Monetary Base



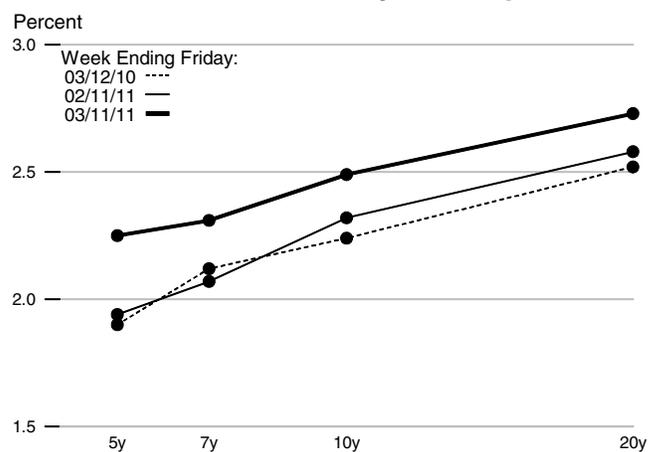
Real Treasury Yield Curve



Reserve Market Rates



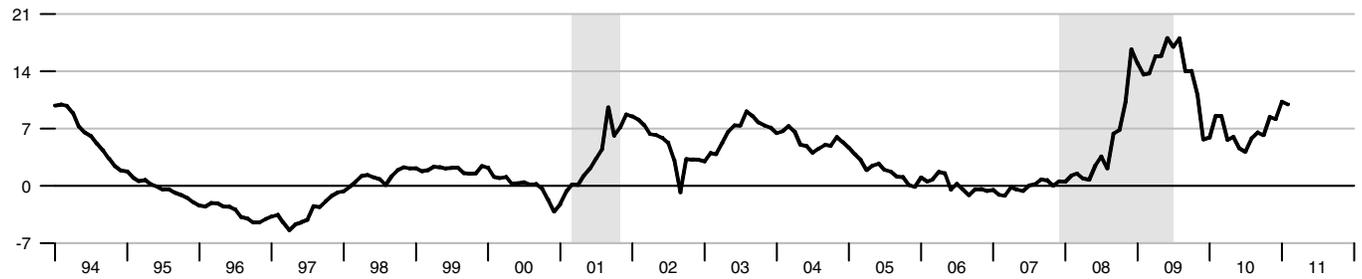
Inflation-Indexed Treasury Yield Spreads



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

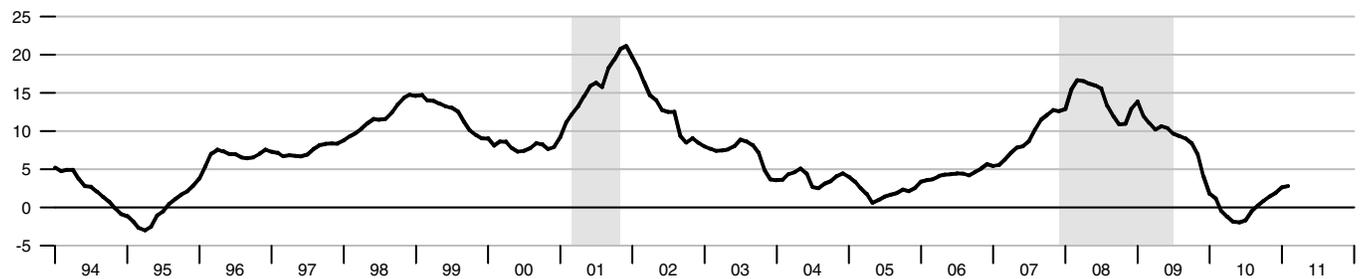
M1

Percent change from year ago



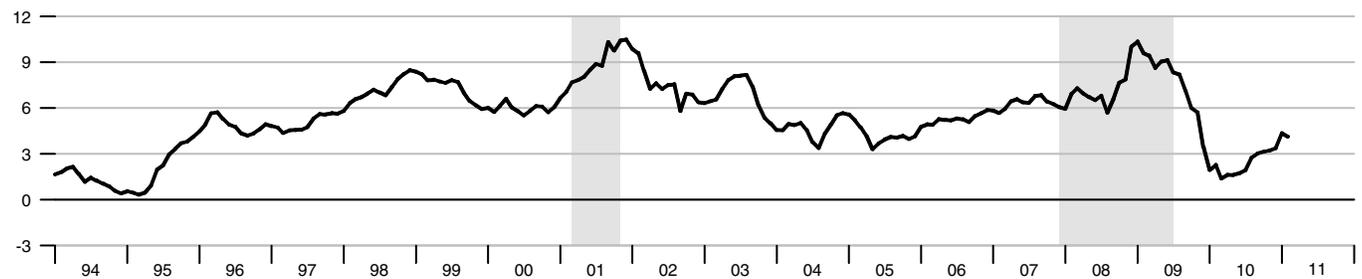
MZM

Percent change from year ago



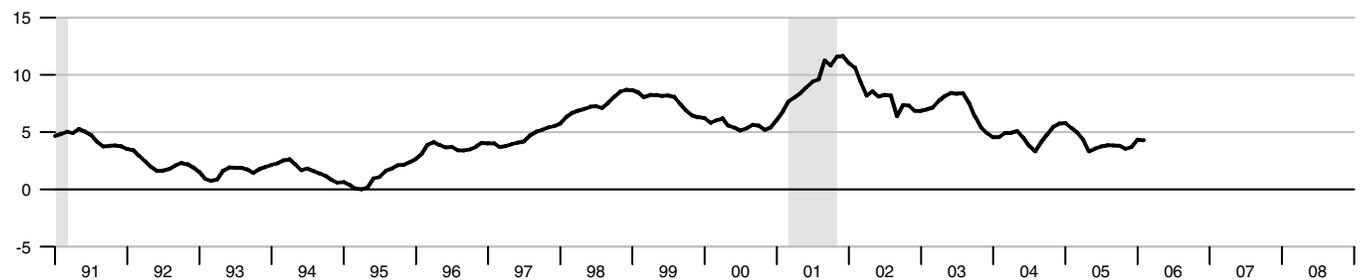
M2

Percent change from year ago



Monetary Services Index - M2**

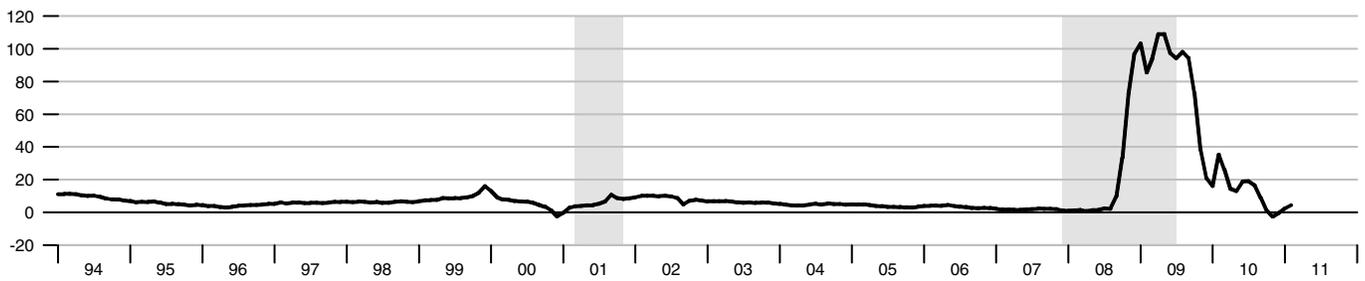
Percent change from year ago



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

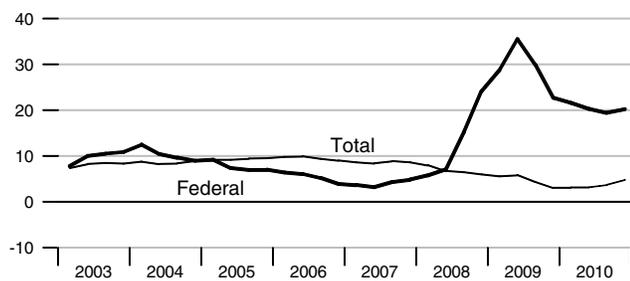
Adjusted Monetary Base

Percent change from year ago



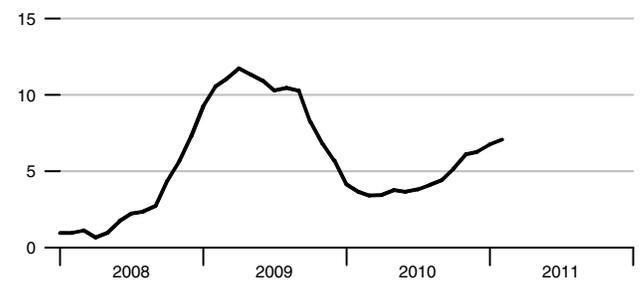
Domestic Nonfinancial Debt

Percent change from year ago



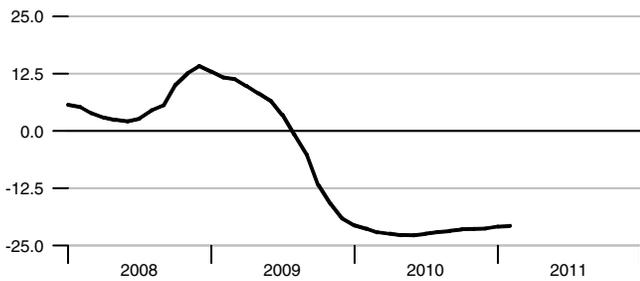
Currency Held by the Nonbank Public

Percent change from year ago



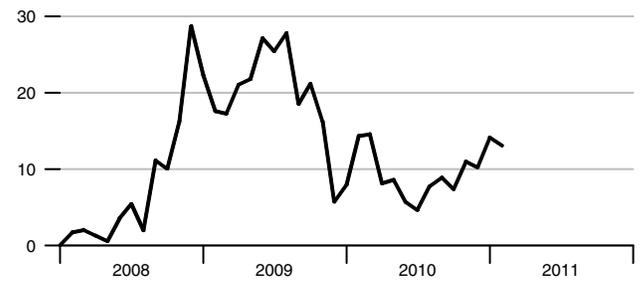
Small Denomination Time Deposits

Percent change from year ago



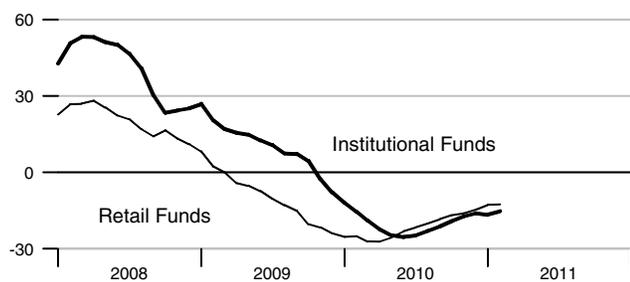
Checkable Deposits

Percent change from year ago



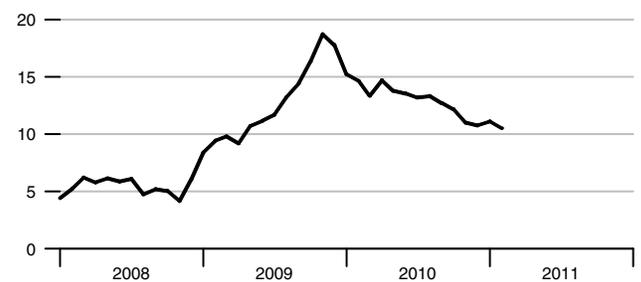
Money Market Mutual Fund Shares

Percent change from year ago



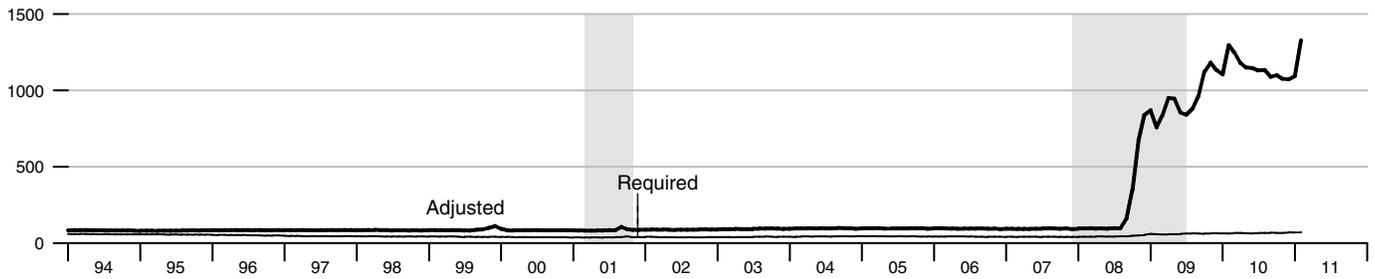
Savings Deposits

Percent change from year ago



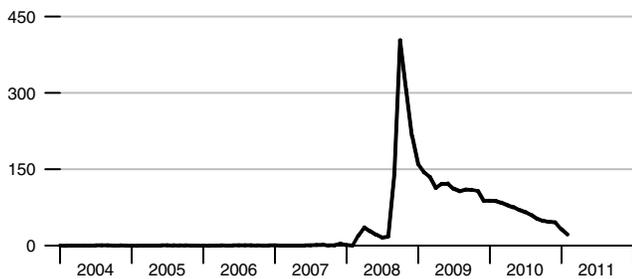
Adjusted and Required Reserves

Billions of dollars



Total Borrowings, nsa

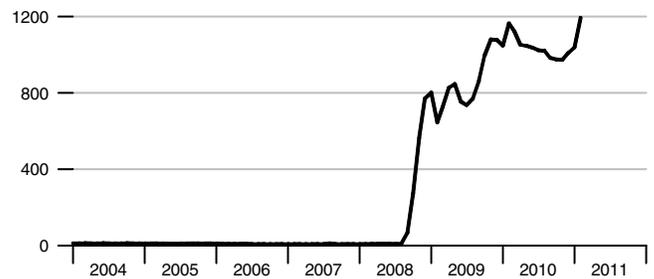
Billions of dollars



* Data exclude term auction credit

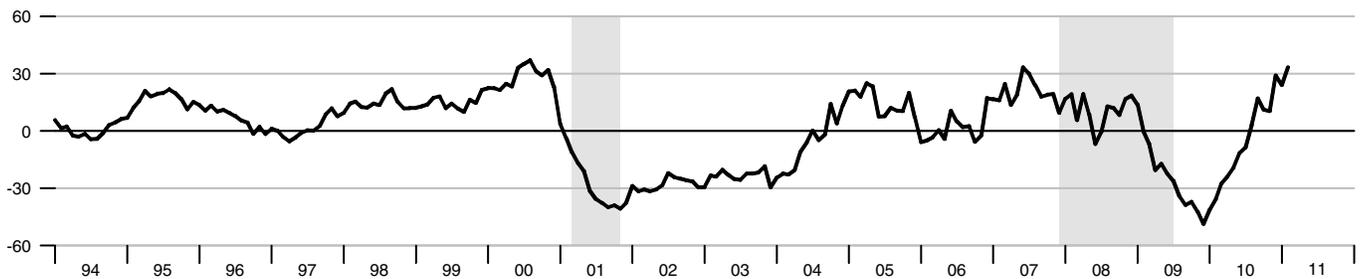
Excess Reserves plus RCB Contracts

Billions of dollars



Nonfinancial Commercial Paper

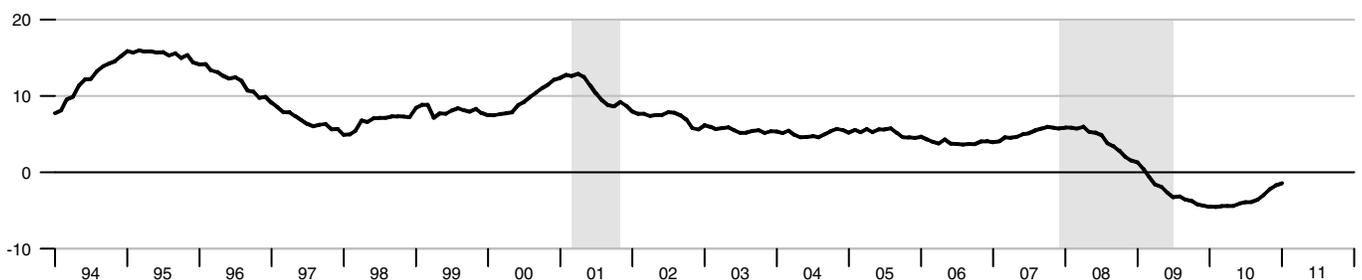
Percent change from year ago



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>.

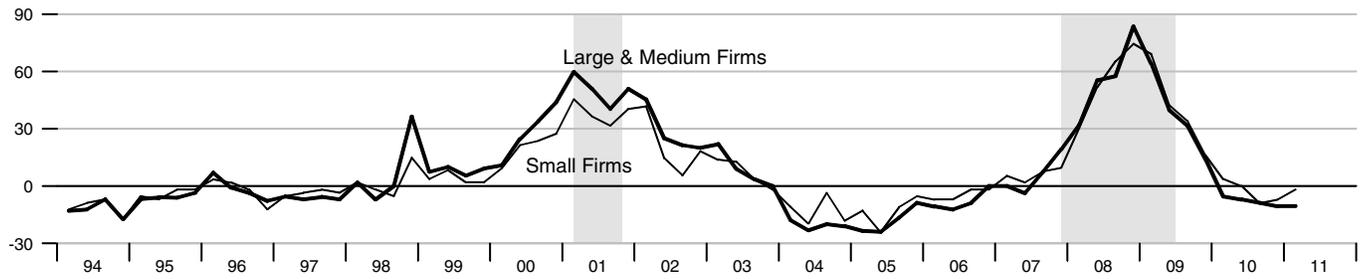
Consumer Credit

Percent change from year ago



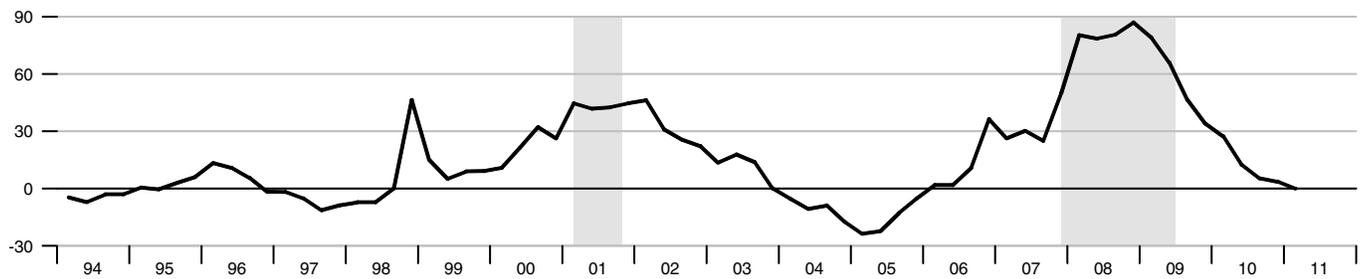
Net Percentage of Domestic Banks Tightening Standards for Commercial and Industrial Loans

Percentage



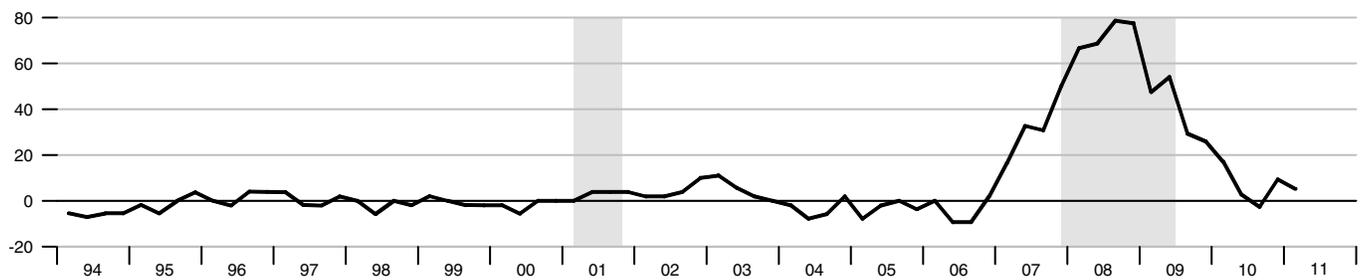
Net Percentage of Domestic Banks Tightening Standards for Commercial Real Estate Loans

Percentage



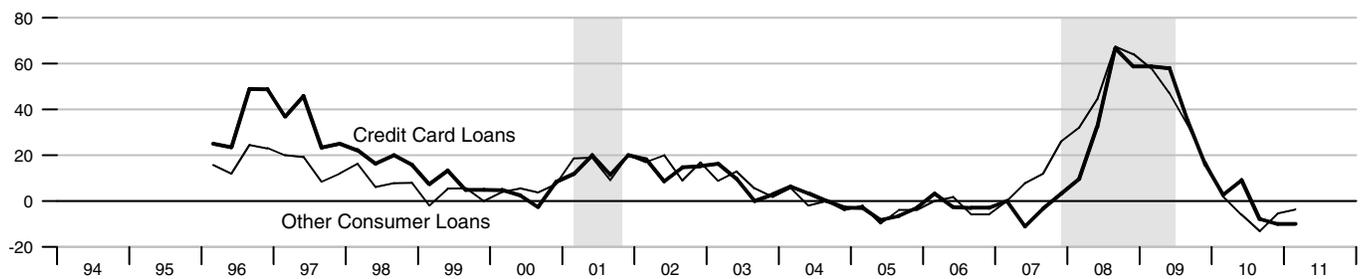
Net Percentage of Domestic Banks Tightening Standards for Residential Mortgage Loans

Percentage

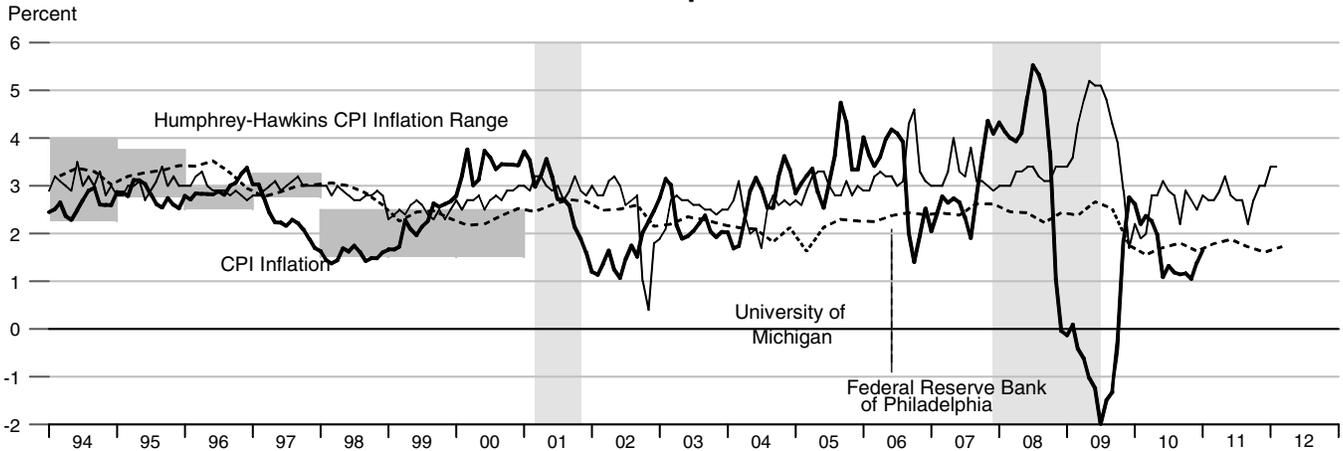


Net Percentage of Domestic Banks Tightening Standards for Consumer Loans

Percentage

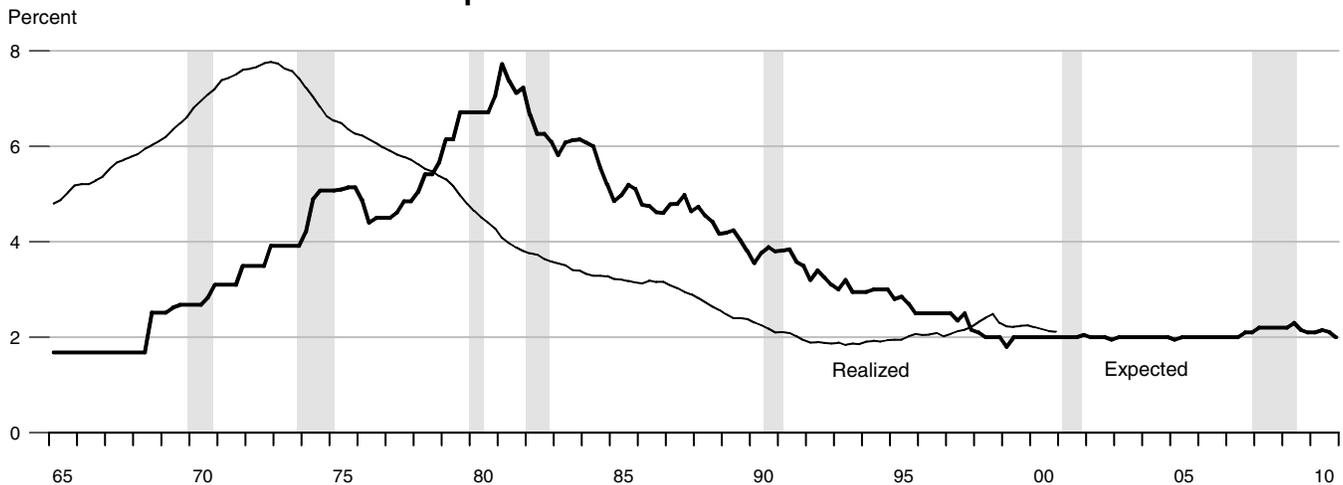


CPI Inflation and 1-Year-Ahead CPI Inflation Expectations



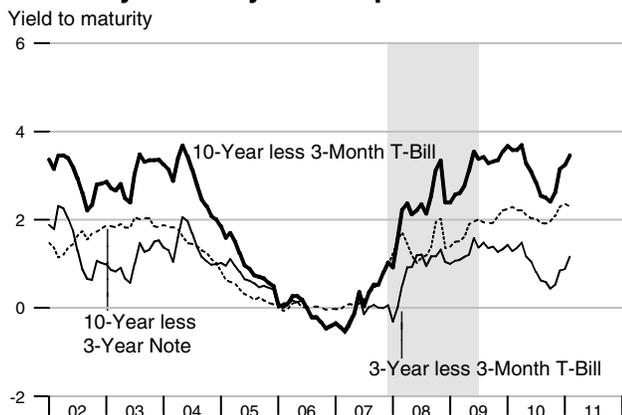
The shaded region shows the Humphrey-Hawkins inflation range. Beginning in January 2000, the Humphrey-Hawkins inflation range was reported using the PCE price index and therefore is not shown on this graph.

10-Year Ahead PCE Inflation Expectations and Realized Inflation

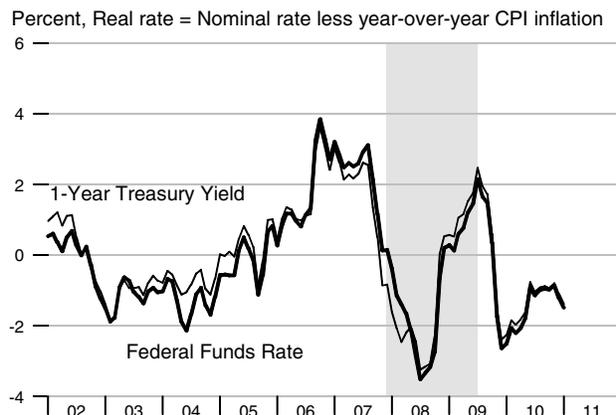


See the notes section for an explanation of the chart.

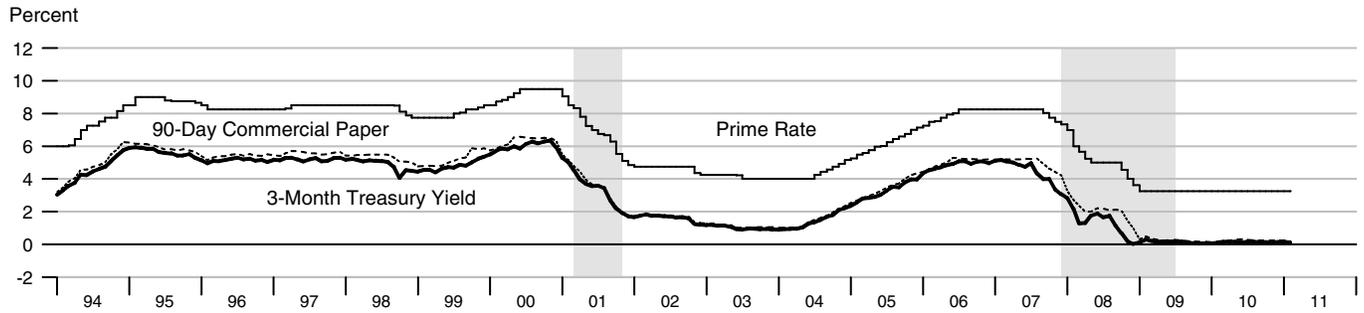
Treasury Security Yield Spreads



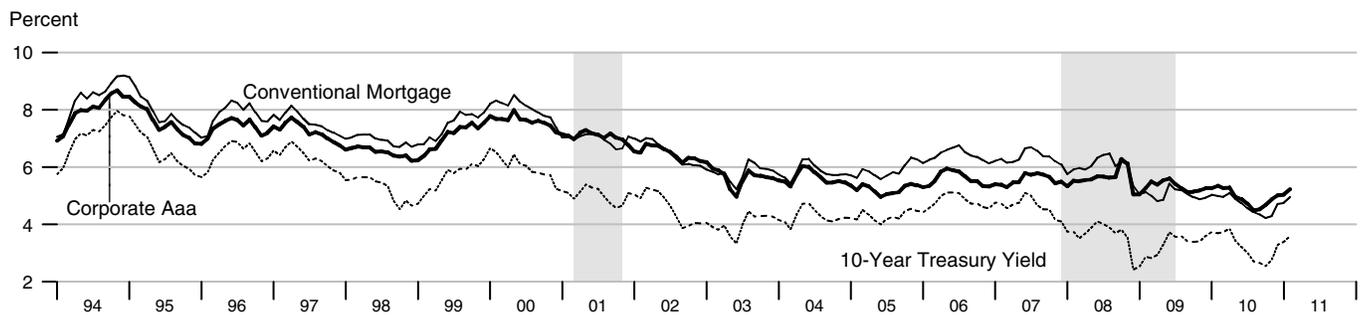
Real Interest Rates



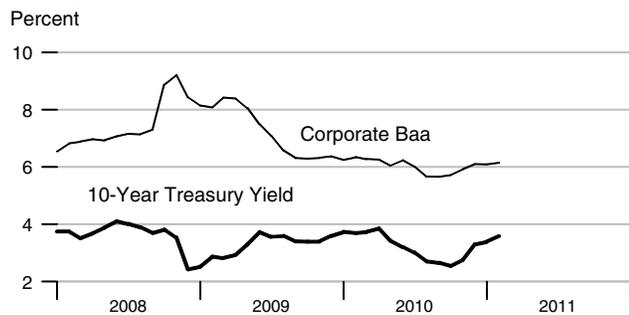
Short-Term Interest Rates



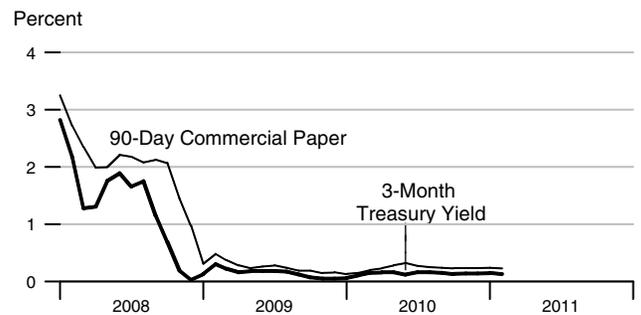
Long-Term Interest Rates



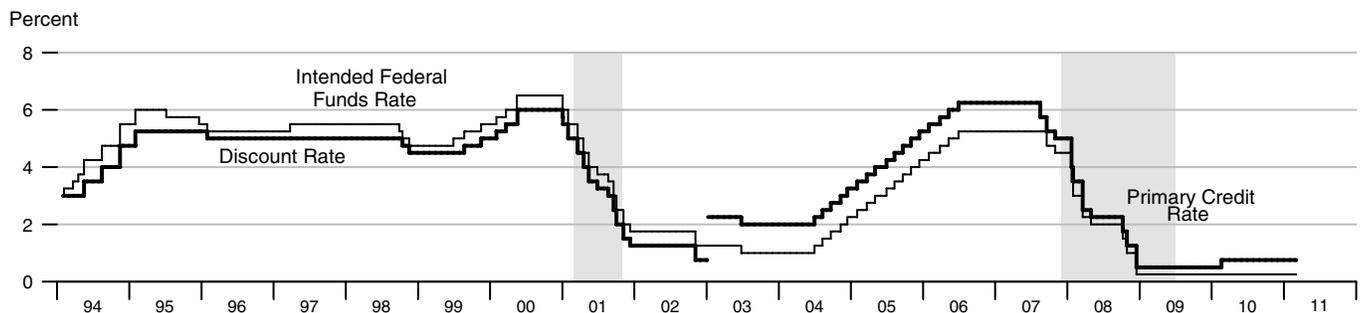
Long-Term Interest Rates



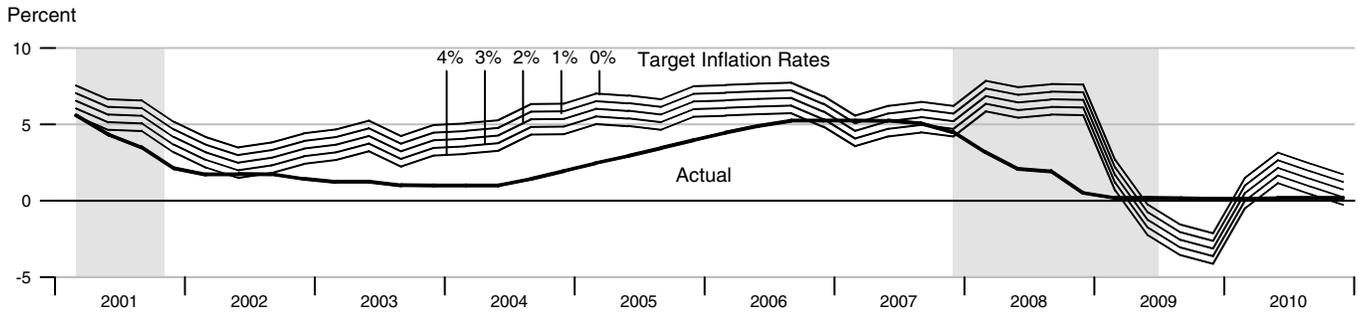
Short-Term Interest Rates



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



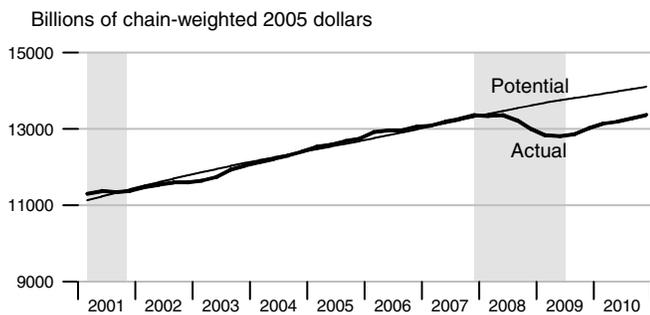
Federal Funds Rate and Inflation Targets



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

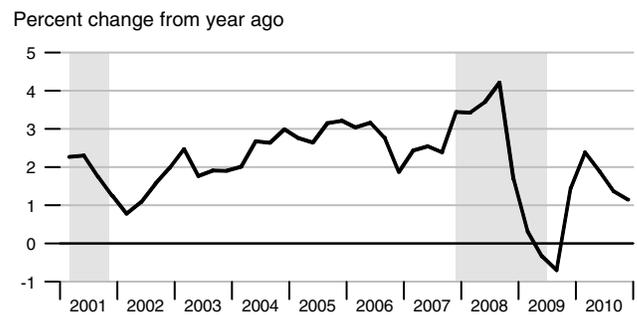
Components of Taylor's Rule

Actual and Potential Real GDP

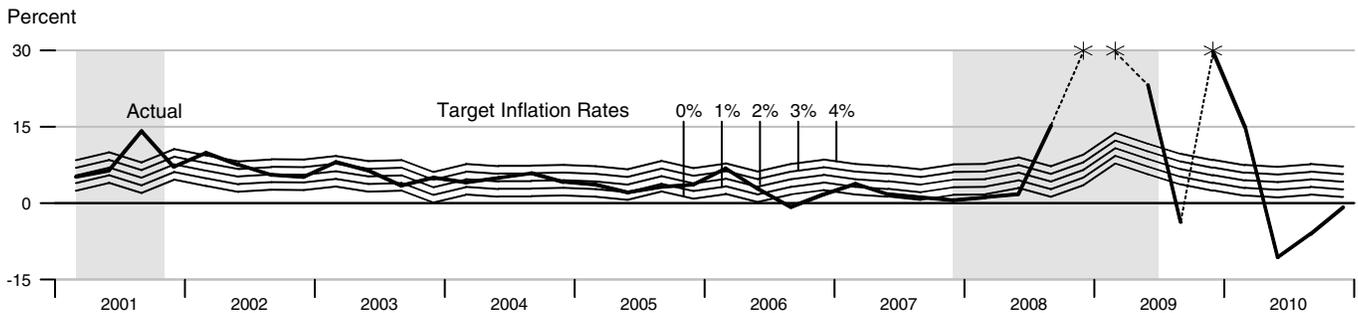


See notes section for further explanation.

PCE Inflation



Monetary Base Growth and Inflation Targets

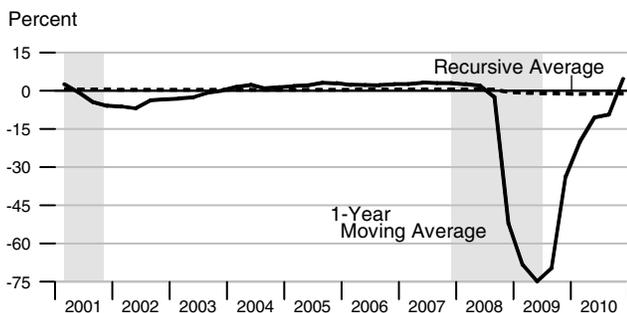


Calculated base growth is based on McCallum's rule. Actual base growth is percent change from the previous quarter.

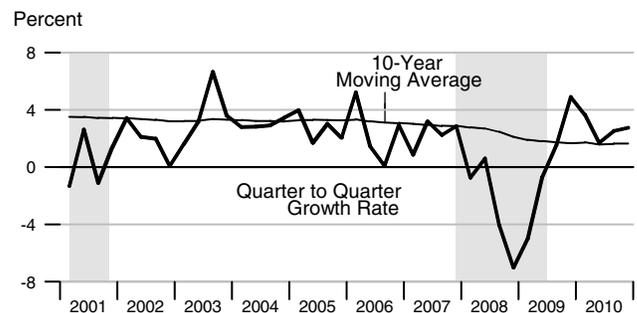
*Actual values for 2008:Q4, 2009:Q1, and 2009:Q4 are 188.02 percent, 60.74 percent, and 56.52, respectively.

Components of McCallum's Rule

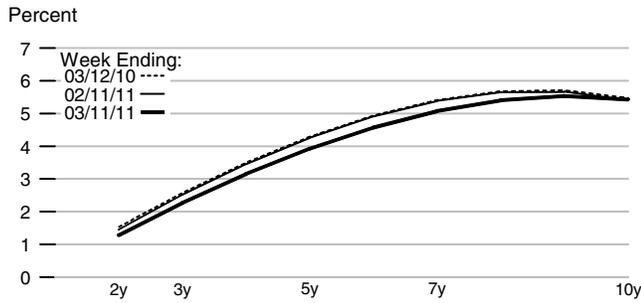
Monetary Base Velocity Growth



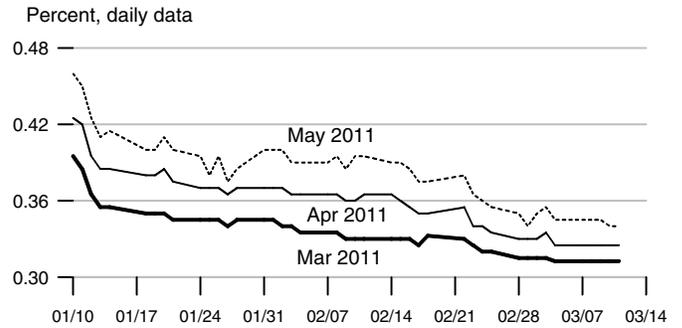
Real Output Growth



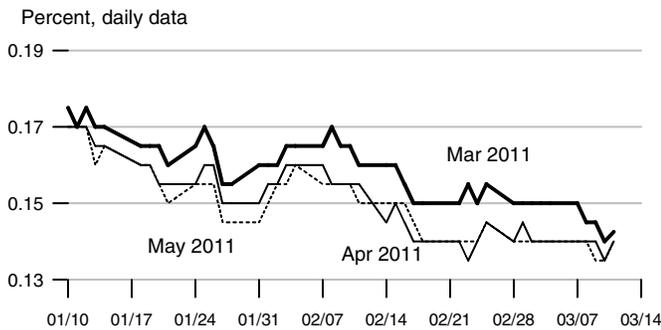
Implied One-Year Forward Rates



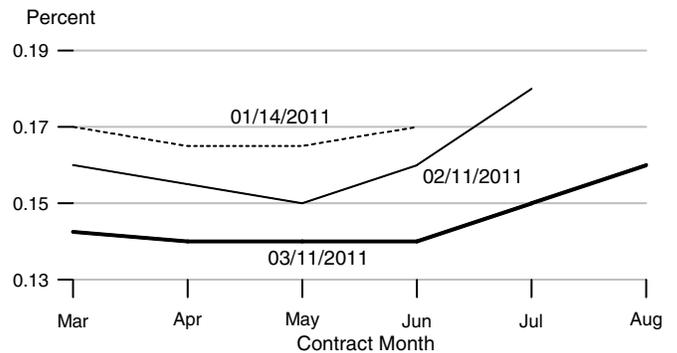
Rates on 3-Month Eurodollar Futures



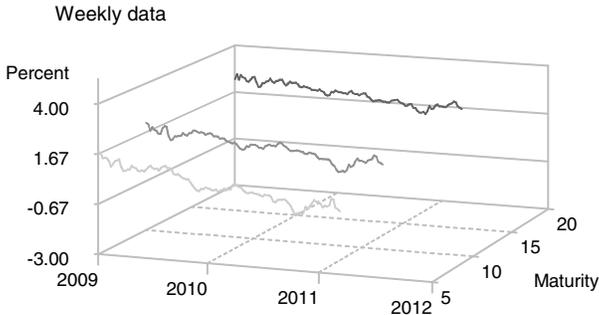
Rates on Selected Federal Funds Futures Contracts



Rates on Federal Funds Futures on Selected Dates

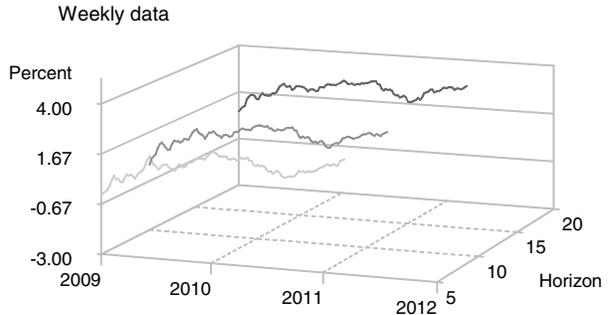


Inflation-Indexed Treasury Securities



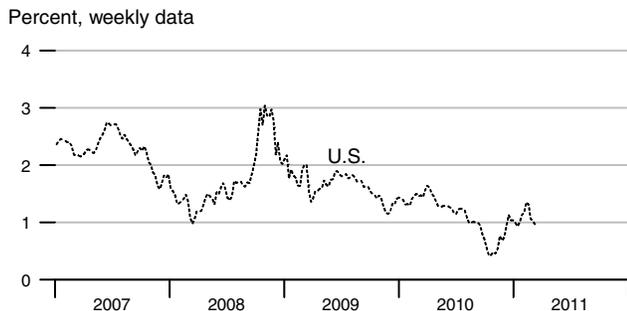
Note: Yields are inflation-indexed constant maturity U.S. Treasury securities

Inflation-Indexed Treasury Yield Spreads



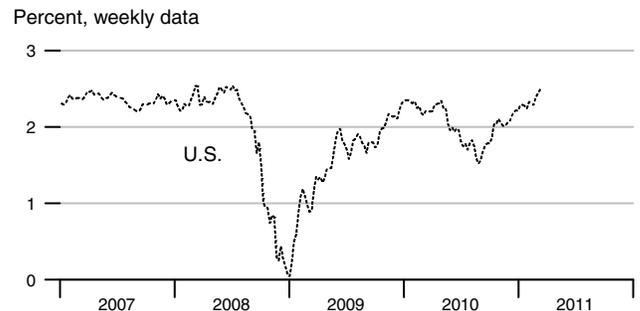
Note: Yield spread is between nominal and inflation-indexed constant maturity U.S. Treasury securities.

Inflation-Indexed 10-Year Government Notes



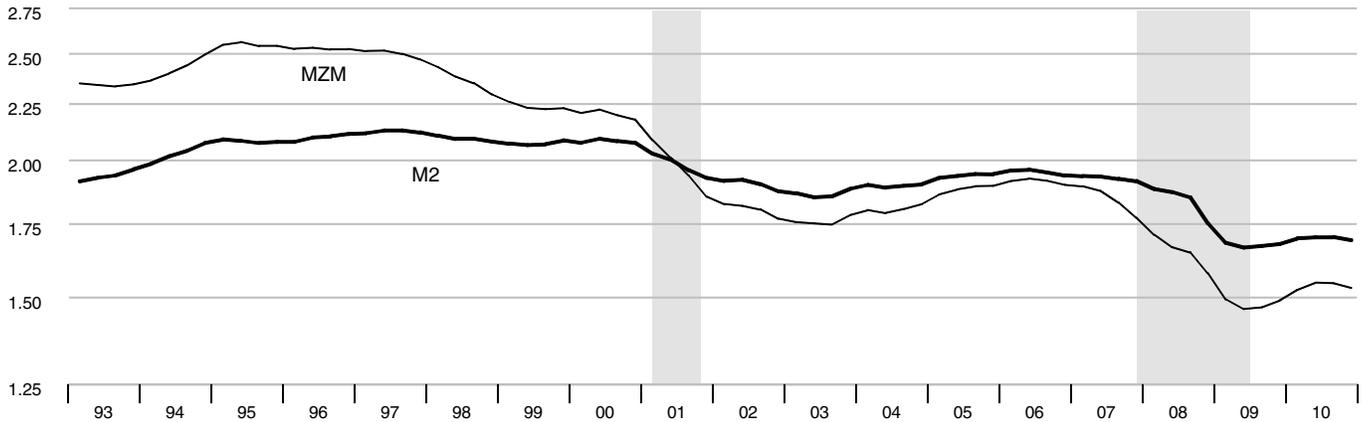
Note: Data is temporarily unavailable for the French and U.K. 10-Year Notes and Government Yield Spreads.

Inflation-Indexed 10-Year Government Yield Spreads



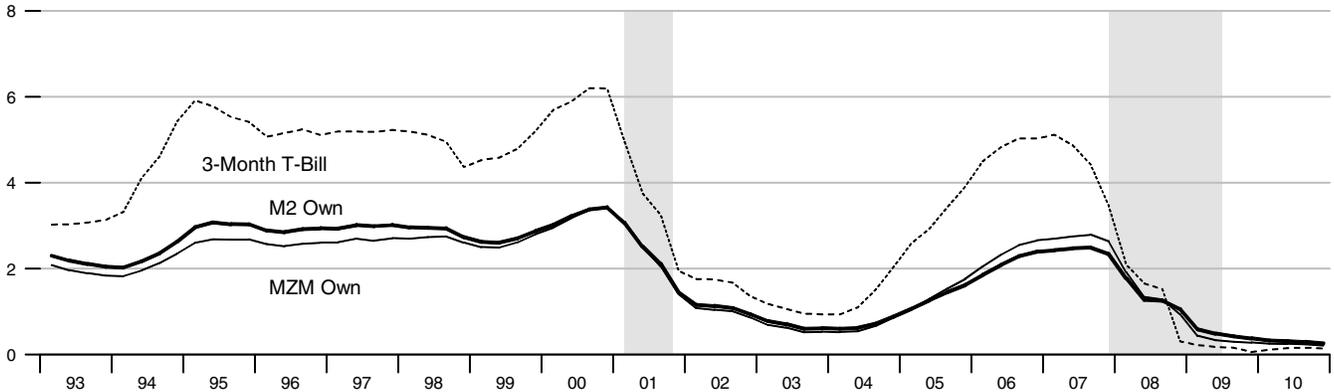
Velocity

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



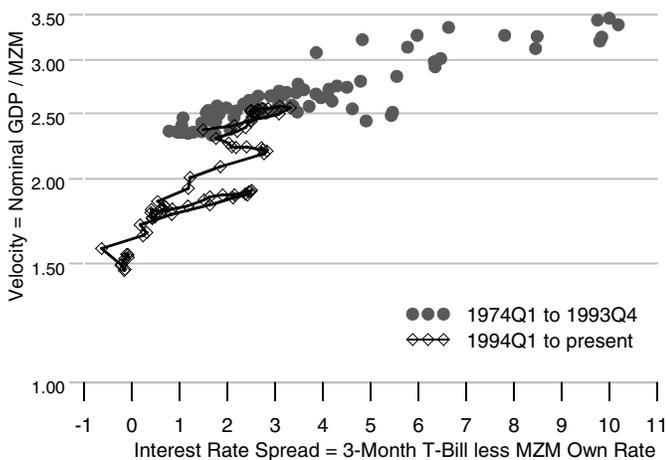
Interest Rates

Percent



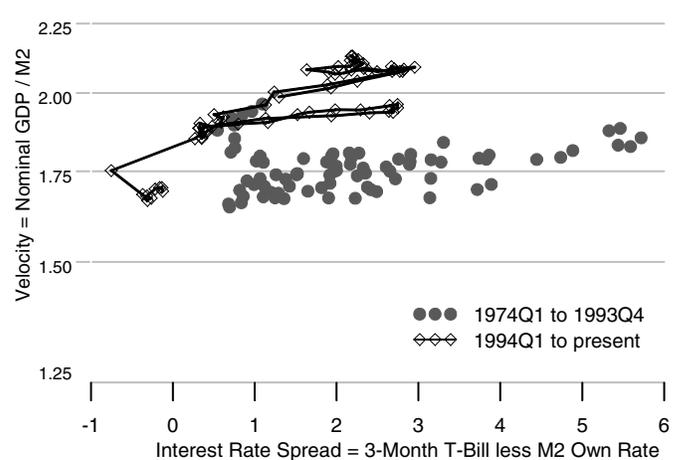
MZM Velocity and Interest Rate Spread

Ratio Scale



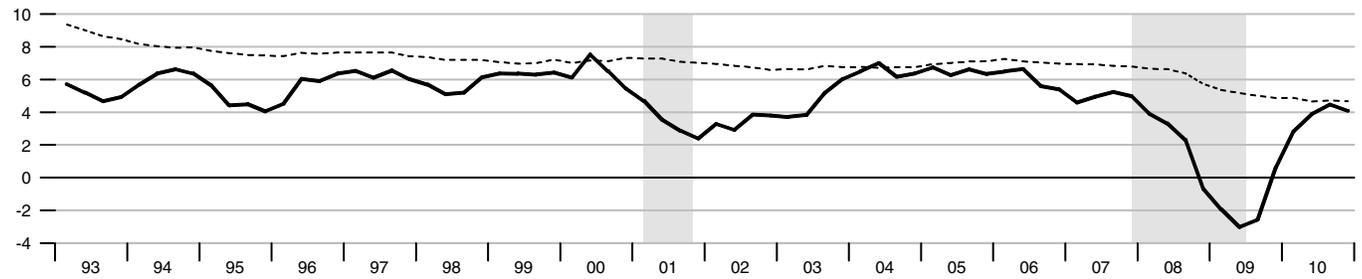
M2 Velocity and Interest Rate Spread

Ratio Scale



Gross Domestic Product

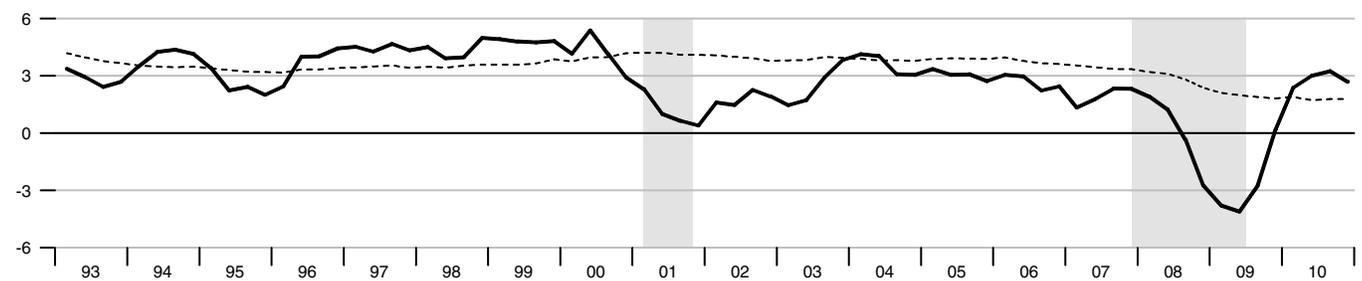
Percent change from year ago



Dashed lines indicate 10-year moving averages.

Real Gross Domestic Product

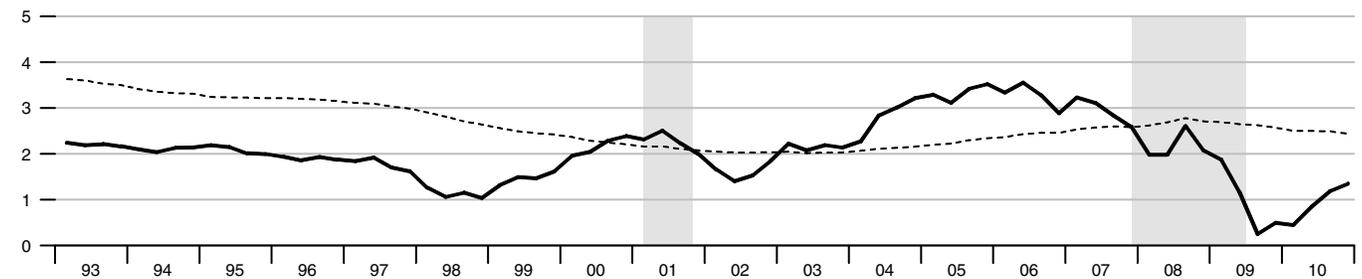
Percent change from year ago



Dashed lines indicate 10-year moving averages.

Gross Domestic Product Price Index

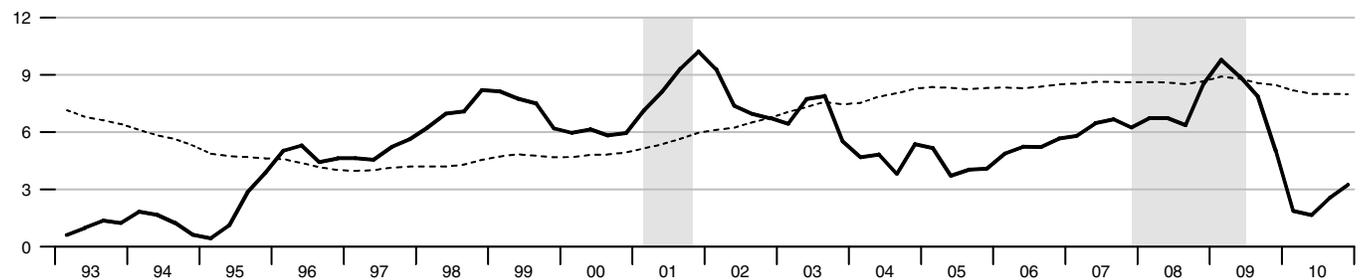
Percent change from year ago



Dashed lines indicate 10-year moving averages.

M2

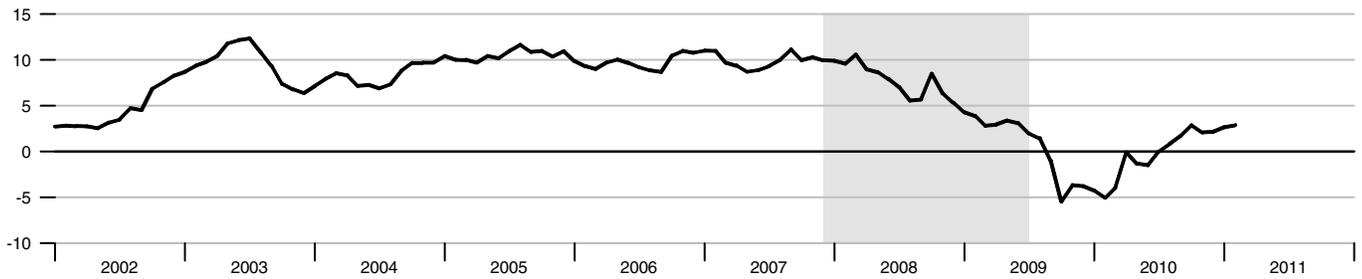
Percent change from year ago



Dashed lines indicate 10-year moving averages.

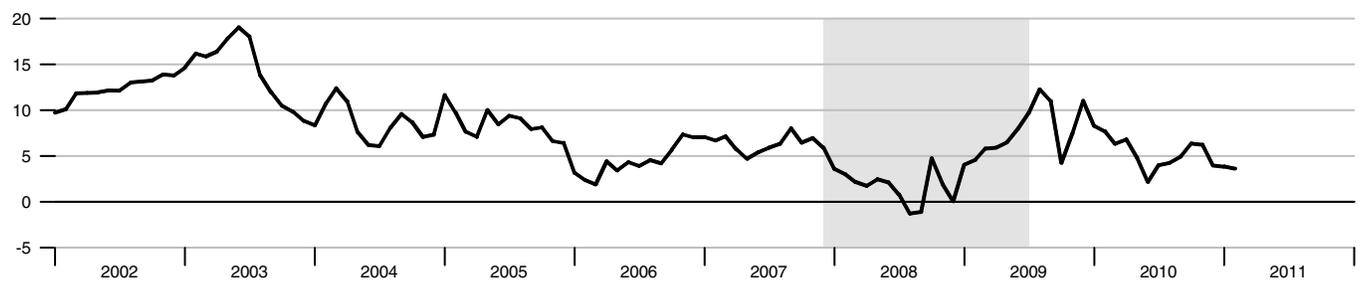
Bank Credit

Percent change from year ago



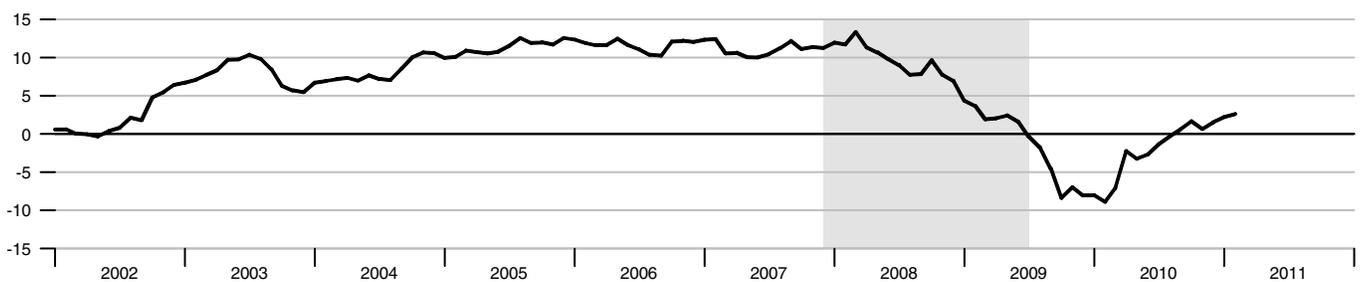
Investment Securities in Bank Credit at Commercial Banks

Percent change from year ago



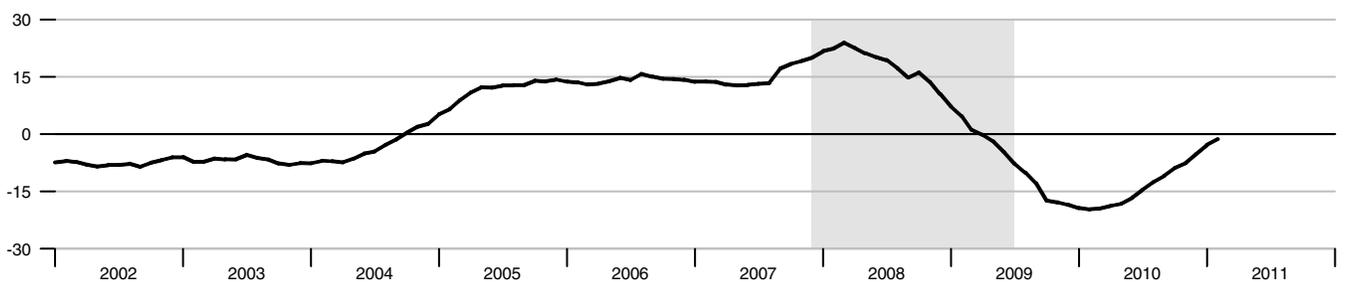
Total Loans and Leases in Bank Credit at Commercial Banks

Percent change from year ago

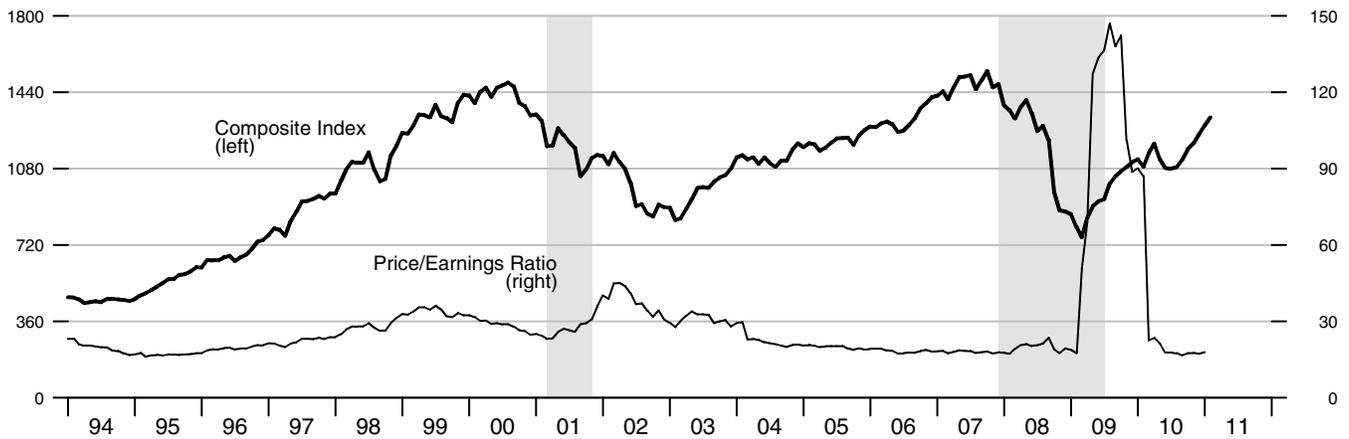


Commercial and Industrial Loans at Commercial Banks

Percent change from year ago



Standard & Poor's 500

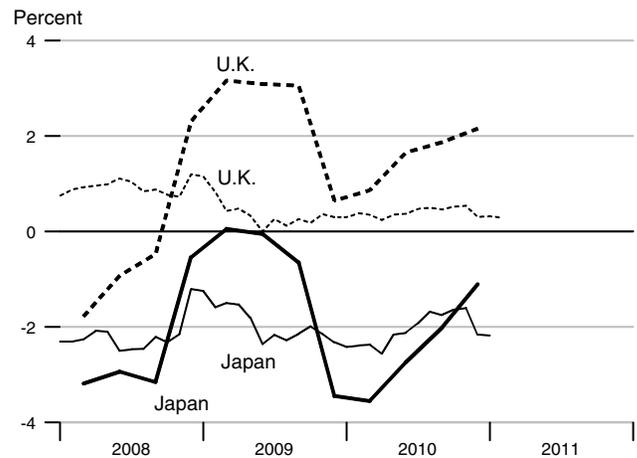
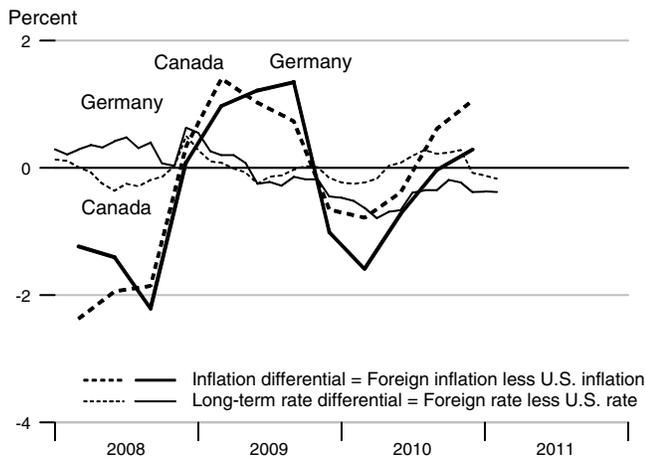


Recent Inflation and Long-Term Interest Rates

	Consumer Price Inflation Rates				Long-Term Government Bond Rates			
	Percent change from year ago				Percent			
	2010Q1	2010Q2	2010Q3	2010Q4	Nov10	Dec10	Jan11	Feb11
United States	2.40	1.78	1.22	1.20	2.76	3.29	3.39	3.58
Canada	1.61	1.40	1.83	2.27	3.04	3.21	3.27	3.41
France	1.32	1.61	1.53	1.65	3.00	3.34	3.44	.
Germany	0.81	1.06	1.18	1.49	2.53	2.91	3.02	3.20
Italy	1.29	1.41	1.62	1.79	4.18	4.60	4.73	4.73
Japan	-1.15	-0.96	-0.80	0.10	1.16	1.13	1.21	.
United Kingdom	3.26	3.44	3.09	3.36	3.30	3.59	3.71	3.87

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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	1374.189	7000.711	6865.809	10270.74	7697.334	835.035	94.908	
	2007	1372.137	7634.968	7298.505		8462.691	850.529	94.145	
	2008	1433.111	8708.028	7816.754		9122.596	1010.131	232.536	
	2009	1636.777	9541.218	8432.114		9192.134	1796.541	944.769	
	2010	1743.806	9537.290	8629.304		9138.281	2031.696	1144.100	
2008	1	1382.619	8373.905	7606.477		9002.639	856.341	96.195	
	2	1392.860	8680.873	7733.560		9009.297	860.035	95.083	
	3	1427.790	8783.200	7827.611		9066.351	893.440	118.519	
	4	1529.174	8994.132	8099.369		9412.096	1430.710	620.347	
2009	1	1577.790	9400.631	8351.336		9331.459	1662.910	820.583	
	2	1624.005	9585.008	8425.019		9292.137	1763.619	917.024	
	3	1660.868	9604.231	8444.607		9138.793	1747.180	895.438	
	4	1684.447	9575.000	8507.494		9006.146	2012.456	1146.033	
2010	1	1698.705	9477.049	8507.285		8918.323	2089.184	1217.037	
	2	1711.573	9421.606	8564.859		9201.345	2034.289	1158.456	
	3	1752.368	9540.965	8661.543		9214.869	2003.654	1117.918	
	4	1812.578	9709.540	8783.528		9218.589	1999.655	1082.990	
2009	Feb	1568.852	9399.596	8347.217		9346.740	1590.134	758.561	
	Mar	1577.386	9483.380	8398.985		9308.754	1668.461	833.270	
	Apr	1609.798	9520.070	8390.464		9263.396	1787.681	949.273	
	May	1610.536	9601.986	8431.788		9317.862	1799.197	946.072	
	Jun	1651.681	9632.969	8452.805		9295.153	1703.979	855.726	
	Jul	1661.494	9636.921	8452.751		9208.368	1693.704	841.468	
	Aug	1655.331	9586.329	8428.713		9150.741	1728.107	879.583	
	Sep	1665.778	9589.442	8452.357		9057.269	1819.730	965.263	
	Oct	1679.831	9582.238	8482.316		8971.552	1975.374	1122.197	
	Nov	1679.913	9579.475	8511.456		9040.281	2044.685	1182.376	
	Dec	1693.596	9563.287	8528.709		9006.606	2017.309	1133.526	
2010	Jan	1680.951	9484.310	8469.482		8940.084	2010.106	1105.458	
	Feb	1703.188	9508.957	8537.132		8874.872	2150.916	1296.192	
	Mar	1711.975	9437.879	8515.242		8940.012	2106.530	1249.461	
	Apr	1700.234	9402.087	8527.198		9253.424	2044.306	1179.141	
	May	1707.057	9419.757	8568.322		9194.393	2034.554	1149.868	
	Jun	1727.428	9442.973	8599.057		9156.219	2024.007	1146.360	
	Jul	1731.029	9473.172	8615.307		9205.239	2015.190	1131.087	
	Aug	1751.543	9538.683	8660.775		9226.905	2014.632	1133.712	
	Sep	1774.533	9611.040	8708.548		9212.463	1981.141	1088.956	
	Oct	1784.124	9664.754	8748.388		9227.581	1998.498	1099.654	
	Nov	1821.458	9717.939	8785.805		9227.803	1991.149	1076.373	
	Dec	1832.151	9745.926	8816.392		9200.383	2009.319	1072.943	
2011	Jan	1853.757	9732.692	8837.681		9176.874	2057.086	1095.844	
	Feb	1872.871	9775.206	8890.126		9131.062	2243.524	1327.483	

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
2008	1	3.18	3.67	6.21	3.23	2.09	2.17	3.66	5.46	4.39	5.88
	2	2.09	2.33	5.08	2.76	1.65	2.67	3.89	5.60	4.43	6.09
	3	1.94	2.25	5.00	3.06	1.52	2.63	3.86	5.65	4.50	6.31
	4	0.51	1.31	4.06	2.82	0.30	1.48	3.25	5.82	5.02	5.87
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
2009	Feb	0.22	0.50	3.25	1.16	0.30	1.37	2.87	5.27	4.56	5.13
	Mar	0.18	0.50	3.25	1.07	0.22	1.31	2.82	5.50	4.74	5.00
	Apr	0.15	0.50	3.25	0.89	0.16	1.32	2.93	5.39	4.48	4.81
	May	0.18	0.50	3.25	0.57	0.18	1.39	3.29	5.54	4.26	4.86
	Jun	0.21	0.50	3.25	0.39	0.18	1.76	3.72	5.61	4.56	5.42
	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
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

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		4.44	14.05	7.10	
2009		14.21	9.57	7.87	
2010		6.54	-0.04	2.34	
<hr/>					
2008	1	2.36	15.61	7.69	
	2	2.96	14.66	6.68	
	3	10.03	4.72	4.86	
	4	28.40	9.61	13.89	
2009	1	12.72	18.08	12.44	
	2	11.72	7.85	3.53	
	3	9.08	0.80	0.93	
	4	5.68	-1.22	2.98	
2010	1	3.39	-4.09	-0.01	
	2	3.03	-2.34	2.71	
	3	9.53	5.07	4.52	
	4	13.74	7.07	5.63	
<hr/>					
2009	Feb	-13.82	10.39	5.69	
	Mar	6.53	10.70	7.44	
	Apr	24.66	4.64	-1.22	
	May	0.55	10.33	5.91	
	Jun	30.66	3.87	2.99	
	Jul	7.13	0.49	-0.01	
	Aug	-4.45	-6.30	-3.41	
	Sep	7.57	0.39	3.37	
	Oct	10.12	-0.90	4.25	
	Nov	0.06	-0.35	4.12	
	Dec	9.77	-2.03	2.43	
	<hr/>				
2010	Jan	-8.96	-9.91	-8.33	
	Feb	15.87	3.12	9.59	
	Mar	6.19	-8.97	-3.08	
	Apr	-8.23	-4.55	1.68	
	May	4.82	2.26	5.79	
	Jun	14.32	2.96	4.30	
	Jul	2.50	3.84	2.27	
	Aug	14.22	8.30	6.33	
	Sep	15.75	9.10	6.62	
	Oct	6.49	6.71	5.49	
	Nov	25.11	6.60	5.13	
	Dec	7.04	3.46	4.18	
<hr/>					
2011	Jan	14.15	-1.63	2.90	
	Feb	12.37	5.24	7.12	

*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 $m = 1, \dots, 10$ 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/.