

## Is More QE in Sight?

The recent U.S. financial crisis—characterized by financial institution failures, heightened fear of counterparty risk, and worldwide coordinated central bank intervention to reduce financial market stress—is widely regarded to have ended by March 2009. Since its end, the Federal Open Market Committee (FOMC) has focused on policy to accelerate the recovery of economic activity. Prominent among the FOMC’s policies has been the “Large Scale Asset Purchase” program (LSAP), a quantitative easing (QE) policy designed to reduce long-term market interest rates. The program called for the Federal Reserve to purchase \$300 billion of long-term Treasury securities, approximately \$175 billion of federal agency debt, and up to \$1.25 trillion of agency-guaranteed mortgage-backed securities, concluding in March 2010.<sup>1</sup> The recent slowing in the pace of economic recovery has raised discussion of the need for a second LSAP-style program.

Most analysts have concluded that the LSAP successfully reduced long-term market interest rates. Two recent studies, for example, suggest that the LSAP reduced yields on 10-year Treasury securities by as much as 100 basis points below levels that otherwise would have prevailed. In addition, the program appears to have reduced interest rates abroad.<sup>2,3</sup>

How, exactly, do LSAP-style programs succeed? Two elements are necessary: Long-term market rates must decrease and aggregate spending must respond. Consider the first: Asset purchases are asserted to affect market rates by a “portfolio balance” effect. A typical analysis begins with the public holding two assets that differ only in time to maturity. Holders of the long-maturity asset risk a decrease in the asset’s price if/when market interest rates increase. When the Fed purchases such assets from the public, the extent of this interest rate risk is reduced and, perhaps, market interest rates will decrease by the size of the now-smaller risk premium. Formal models of this effect, however, usually require an ad hoc market friction. In a recent analysis, Hamilton and Wu consider an experiment in which a central bank sells its holdings of short-term Treasury securities and purchases an equal amount of long-term Treasuries.<sup>4</sup> In their model, short-term yields rise and long-term yields fall. This result, however, requires at least two distinct groups of investors, each of which strongly prefers either short- or long-term assets

even after allowing for differences in yields. Further, in the real world, the Fed’s actions differ somewhat from those in the model: Since March 2009, the Fed has paid for purchased assets by creating new deposits at the Federal Reserve Banks, not by the sale of existing short-term assets. Only banks and a few other financial institutions are permitted to hold deposits at the Fed, while Treasury securities are widely held.

Second, aggregate demand must respond to lower long-term interest rates—a sustained economic rebound requires recovery in household spending and business investment.<sup>5</sup> This aspect is more uncertain. Recent surveys suggest that business investment spending is tepid due to uncertainty regarding future demand, not high long-term interest rates—indeed, large businesses are borrowing readily in credit markets at highly favorable terms. Lending to households and small businesses remains constrained by increased lender caution about risk tied to uncertainty regarding future demand, sales, and income. Neither sector is hampered by excessively high long-term interest rates.

—Richard G. Anderson

<sup>1</sup> Here, “agency” refers to three organizations: FNMA (Federal National Mortgage Association, also referred to as Fannie Mae), FHLMC (Federal Home Loan Mortgage Corporation, also known as Freddie Mac), and GNMA (Government National Mortgage Association, also referred to as Ginnie Mae). GNMA is part of the U.S. Department of Housing and Urban Development. FNMA and FHLMC, government-chartered but privately owned corporations, were placed into federal receivership on September 6, 2008.

<sup>2</sup> Gagnon, Joseph; Raskin, Matthew; Remache, Julie and Sack, Brian. “Large-Scale Asset Purchases by the Federal Reserve: Did They Work?” Staff Report No. 441, Federal Reserve Bank of New York, March 2010; [www.newyorkfed.org/research/staff\\_reports/sr441.pdf](http://www.newyorkfed.org/research/staff_reports/sr441.pdf).

<sup>3</sup> Neely, Christopher J. “The Large Scale Asset Purchases Had Large International Effects.” Working Paper No. 2010-018A, Federal Reserve Bank of St. Louis, July 2010; <http://research.stlouisfed.org/wp/2010/2010-018.pdf>.

<sup>4</sup> Hamilton, James D. and Wu, Jing (Cynthia). “The Effectiveness of Alternative Monetary Policy Tools in a Zero Lower Bound Environment.” Unpublished manuscript, University of California, San Diego, September 1, 2010; <http://dss.ucsd.edu/~jhamilto/zlb.pdf>.

<sup>5</sup> Bernanke, Ben. “The Economic Outlook and Monetary Policy.” Presented at a symposium sponsored by the Federal Reserve Bank of Kansas City, “Macroeconomic Challenges: The Decade Ahead,” Jackson Hole, Wyoming, August 27, 2010; [www.federalreserve.gov/newsevents/speech/bernanke20100827a.htm](http://www.federalreserve.gov/newsevents/speech/bernanke20100827a.htm).

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## Conventions used in this publication:

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

We welcome your comments addressed to:

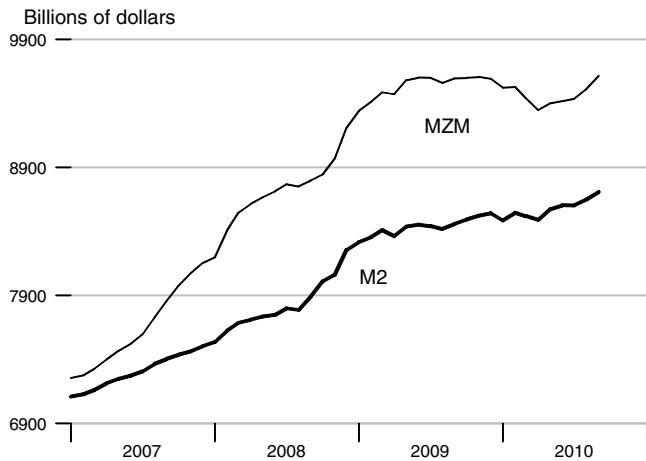
Editor, *Monetary Trends*  
Research Division  
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St. Louis, MO 63166-0442

or to:

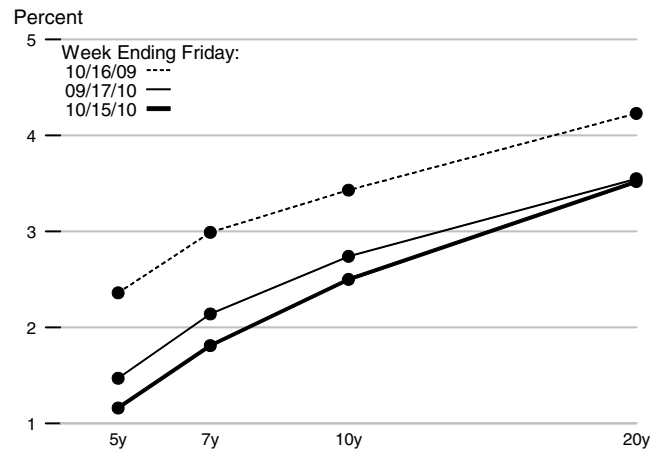
stlsFRED@stls.frb.org

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

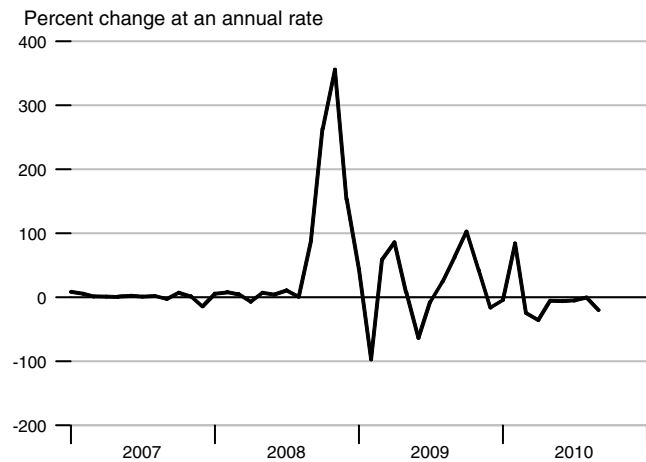
### M2 and MZM



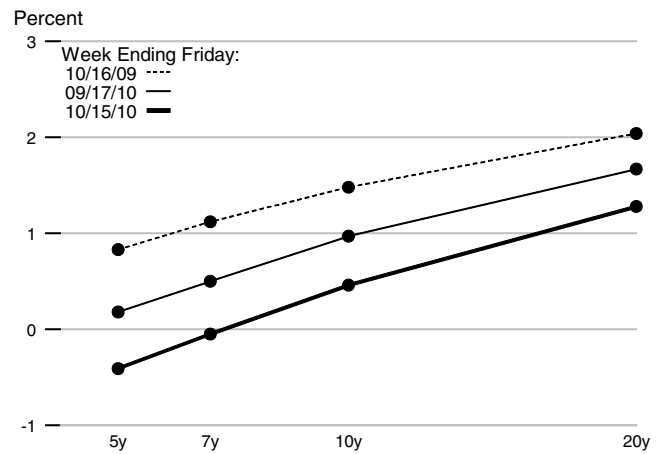
### Treasury Yield Curve



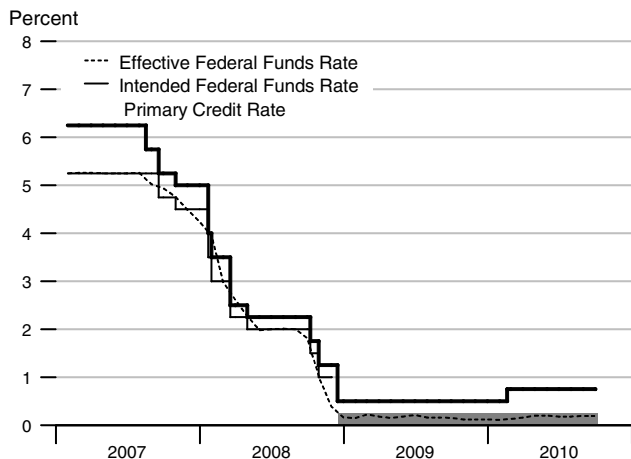
### Adjusted Monetary Base



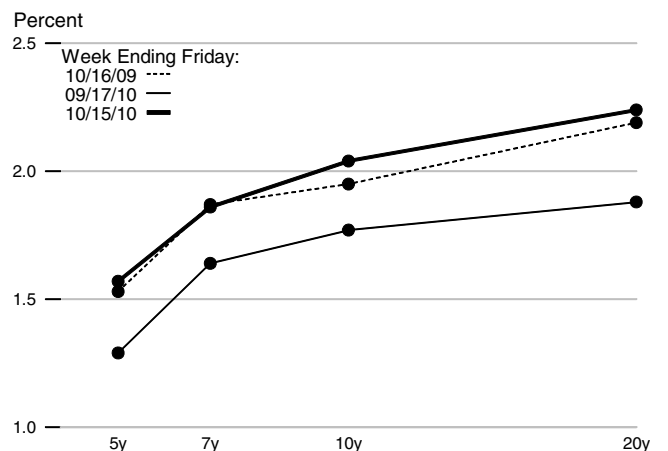
### Real Treasury Yield Curve



### Reserve Market Rates



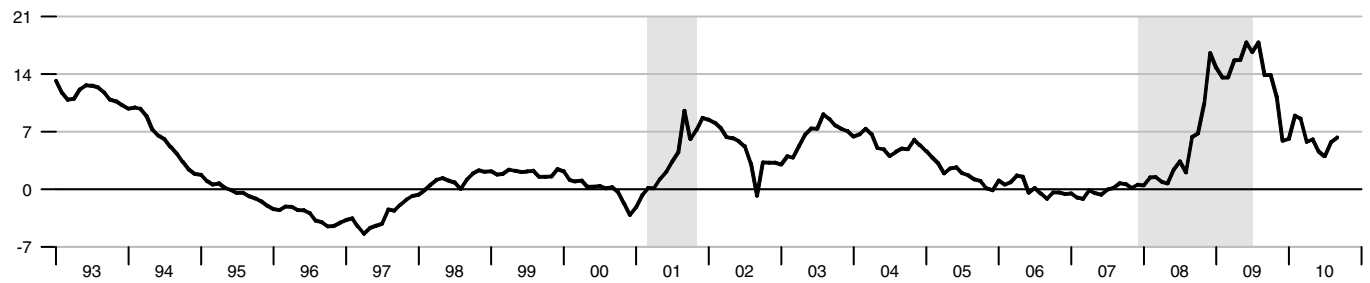
### Inflation-Indexed Treasury Yield Spreads



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

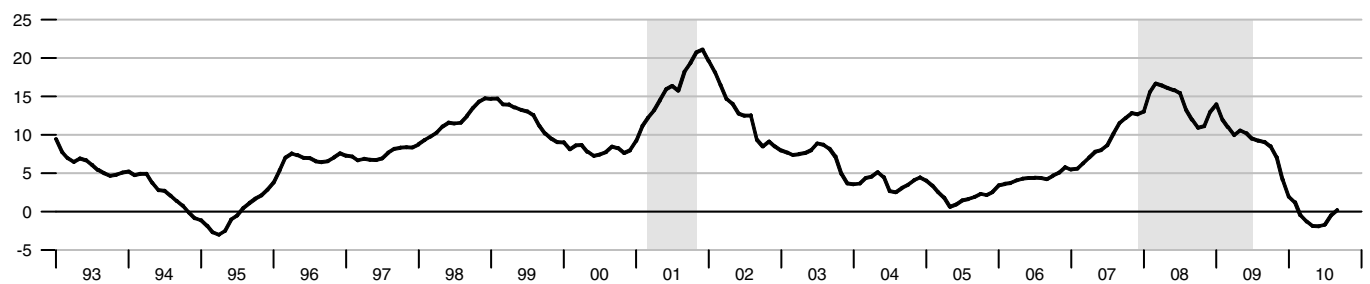
**M1**

Percent change from year ago



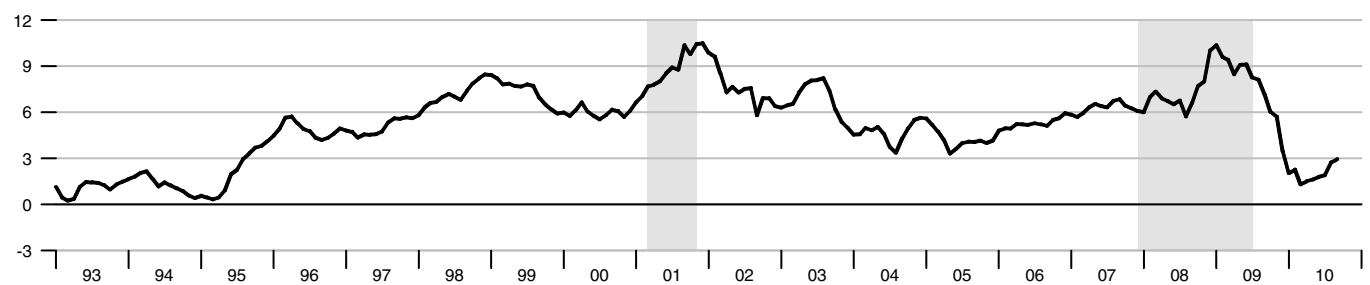
**M2M**

Percent change from year ago



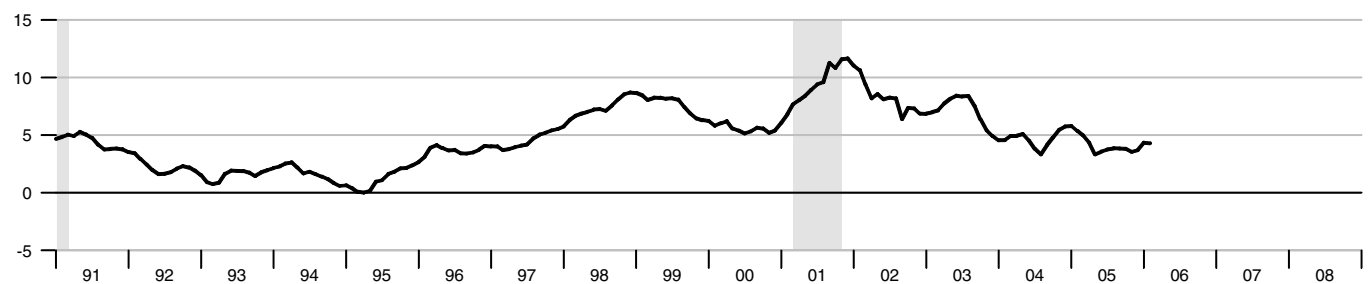
**M2**

Percent change from year ago



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

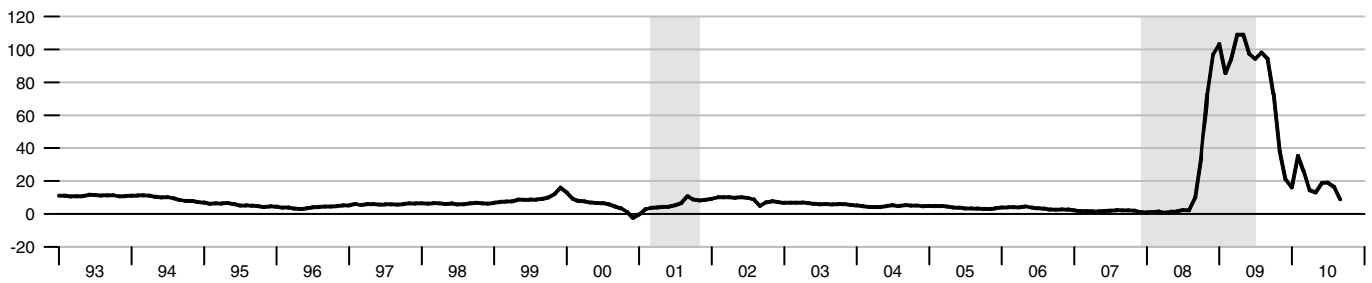
Percent change from year ago



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

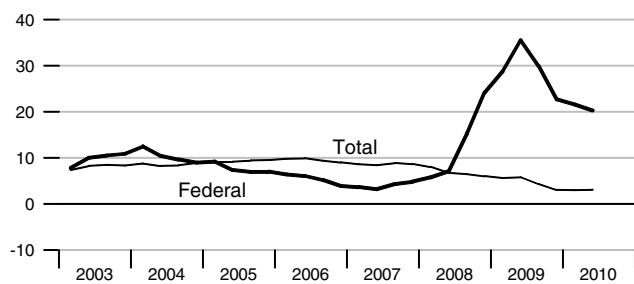
### Adjusted Monetary Base

Percent change from year ago



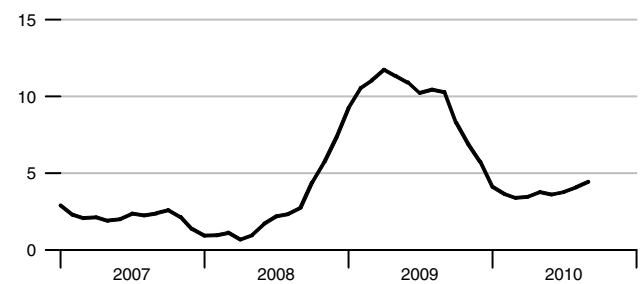
### Domestic Nonfinancial Debt

Percent change from year ago



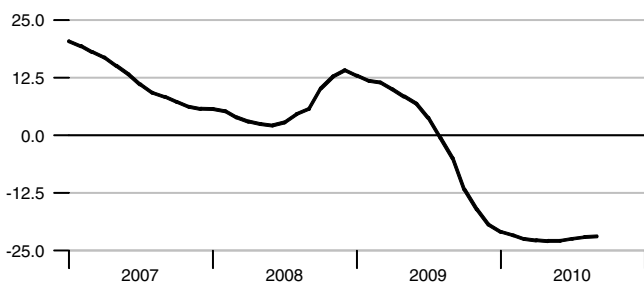
### Currency Held by the Nonbank Public

Percent change from year ago



### Small Denomination Time Deposits\*

Percent change from year ago



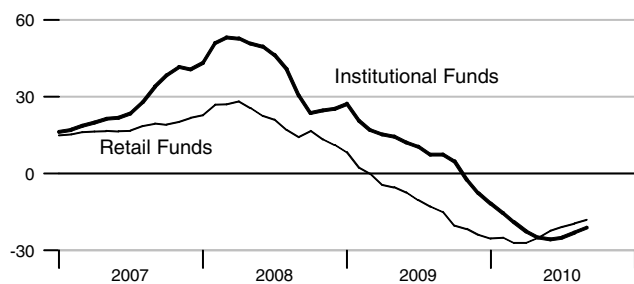
### Checkable Deposits

Percent change from year ago



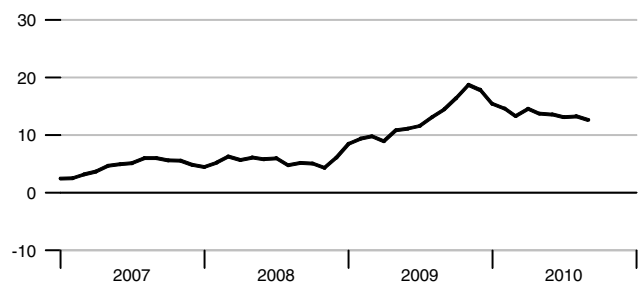
### Money Market Mutual Fund Shares

Percent change from year ago



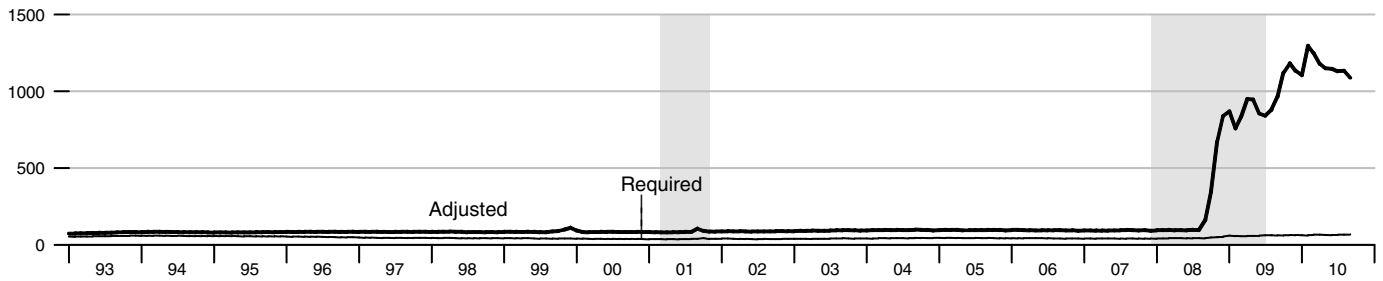
### Savings Deposits

Percent change from year ago



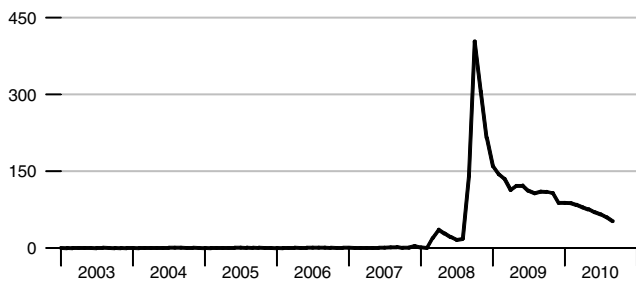
### Adjusted and Required Reserves

Billions of dollars



### Total Borrowings, nsa

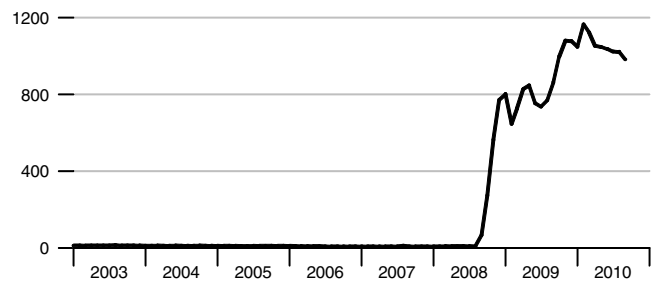
Billions of dollars



\* Data exclude term auction credit

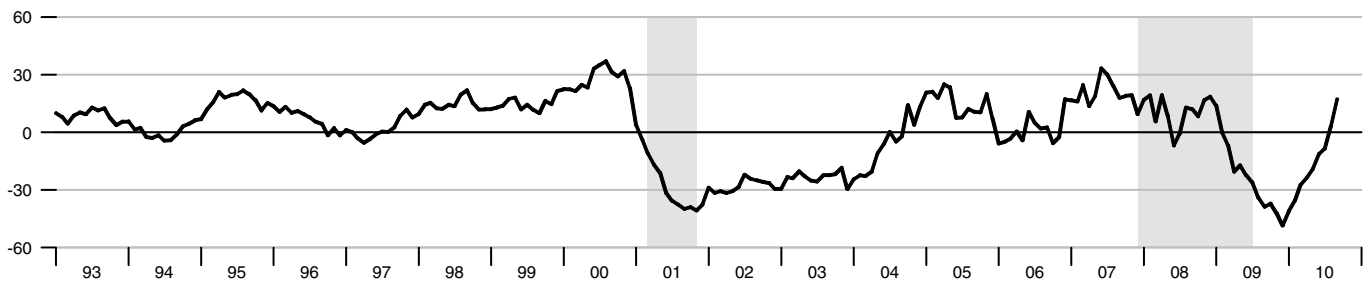
### Excess Reserves plus RCB Contracts

Billions of dollars



### Nonfinancial Commercial Paper

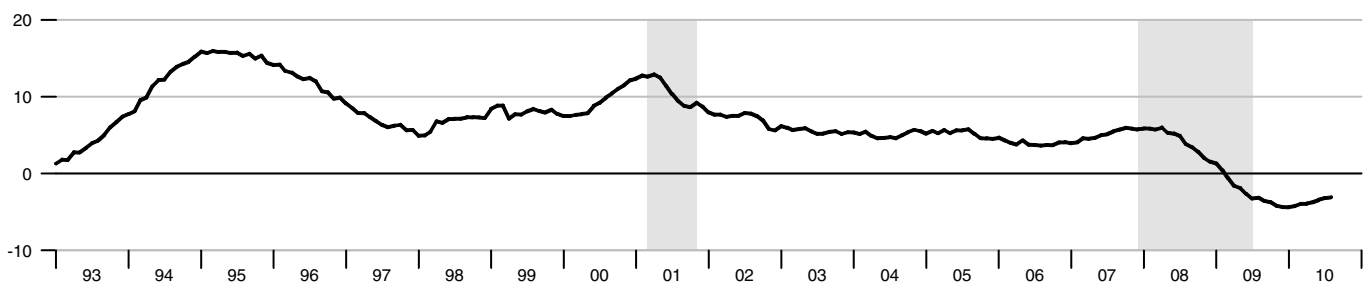
Percent change from year ago



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

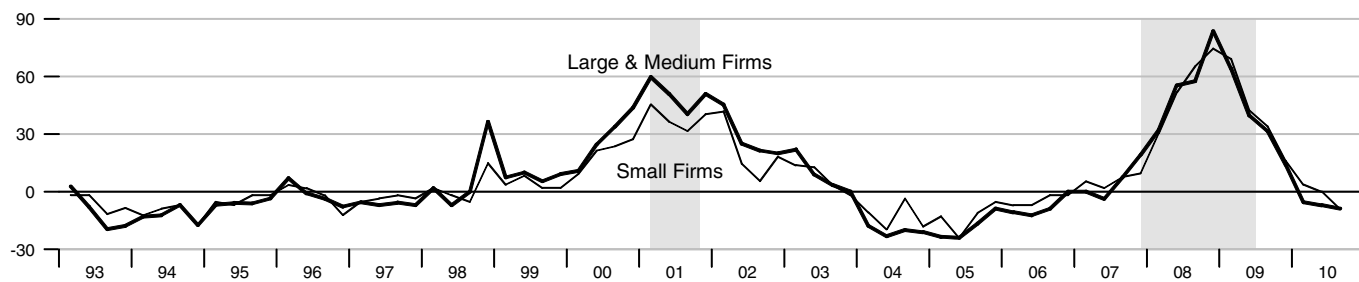
### Consumer Credit

Percent change from year ago



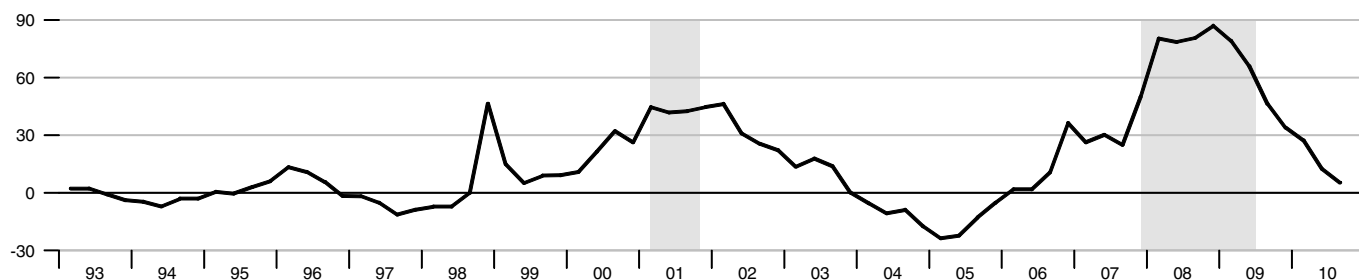
### Net Percentage of Domestic Banks Tightening Standards for Commercial and Industrial Loans

Percentage



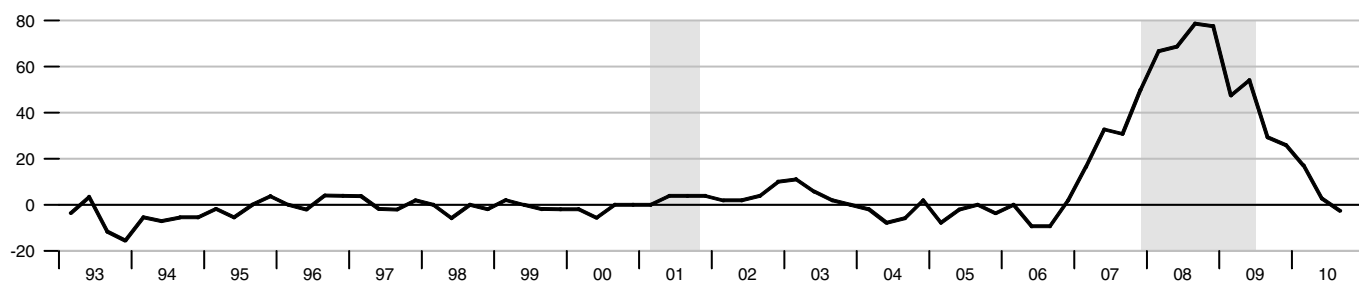
### Net Percentage of Domestic Banks Tightening Standards for Commercial Real Estate Loans

Percentage



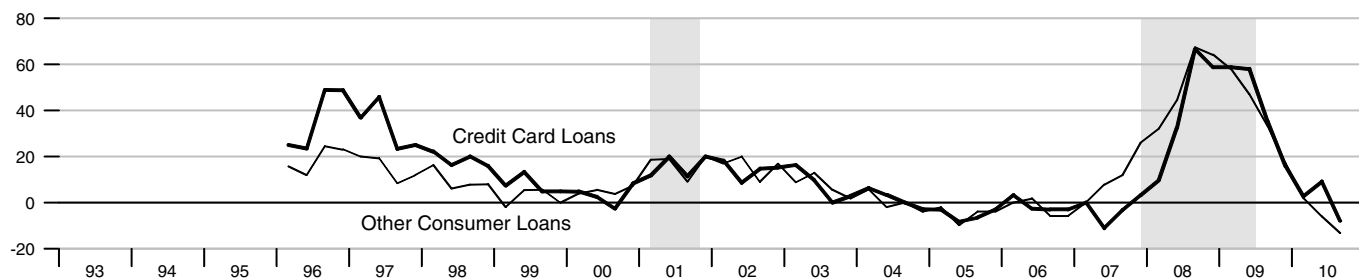
### Net Percentage of Domestic Banks Tightening Standards for Residential Mortgage Loans

Percentage

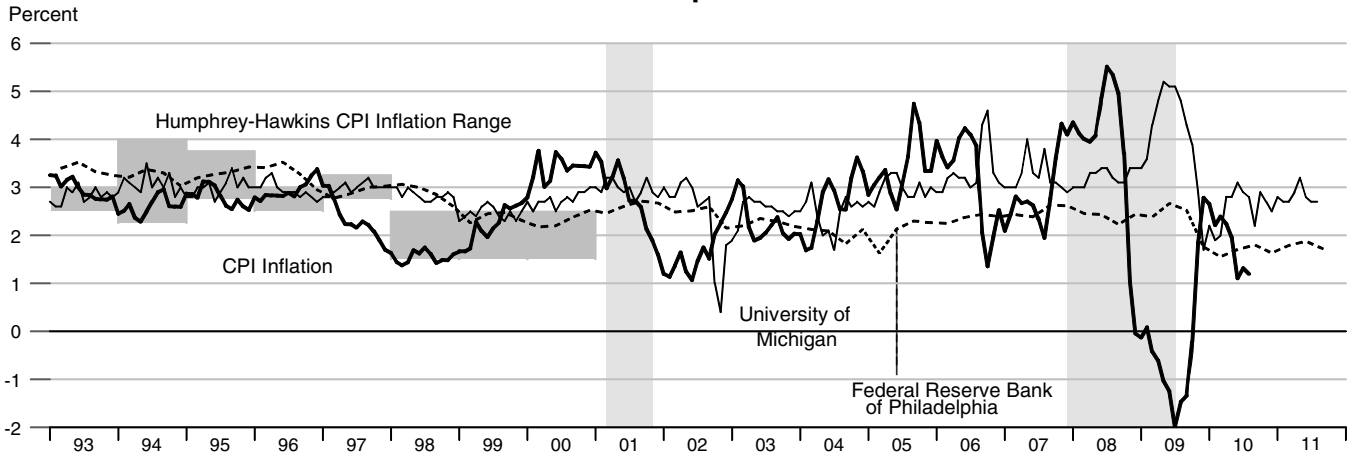


### Net Percentage of Domestic Banks Tightening Standards for Consumer Loans

Percentage

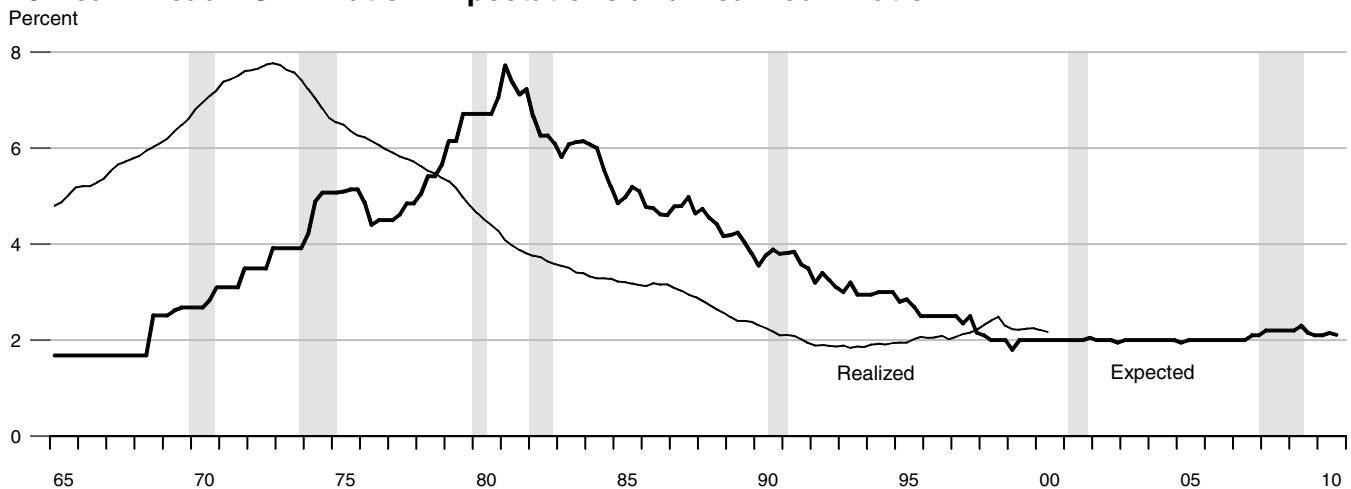


### CPI Inflation and 1-Year-Ahead CPI Inflation Expectations



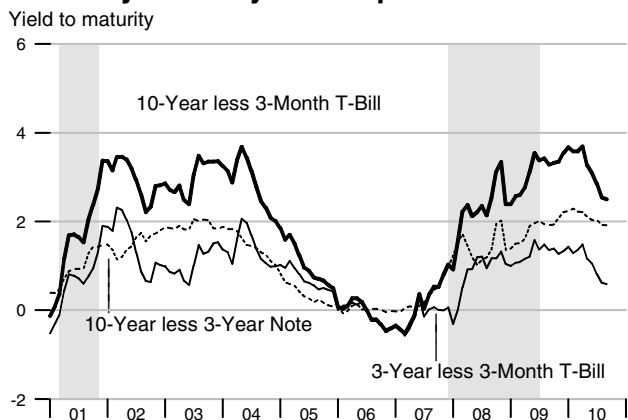
The shaded region shows the Humphrey-Hawkins CPI inflation range. Beginning in January 2000, the Humphrey-Hawkins inflation range was reported using the PCE price index and therefore is not shown on this graph.

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

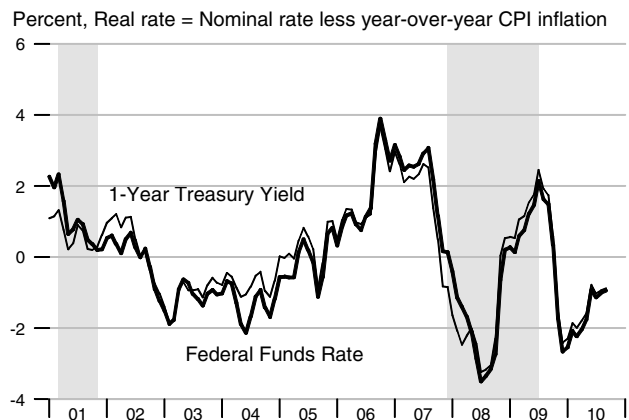


See the notes section for an explanation of the chart.

### Treasury Security Yield Spreads

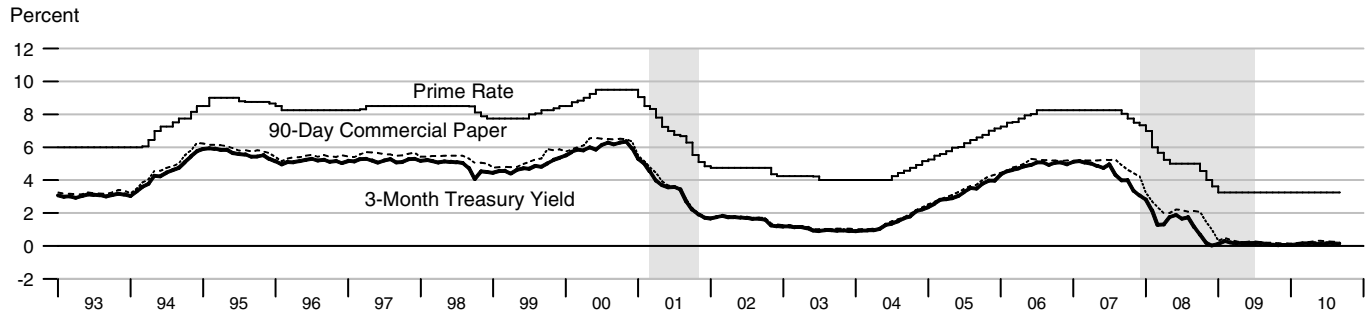


### Real Interest Rates

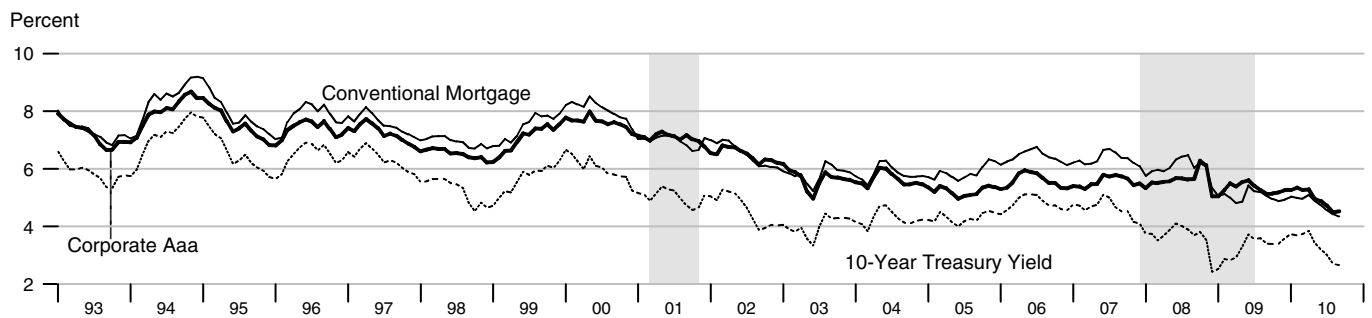




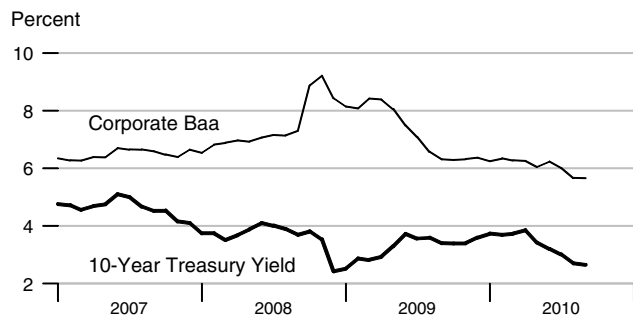
### Short-Term Interest Rates



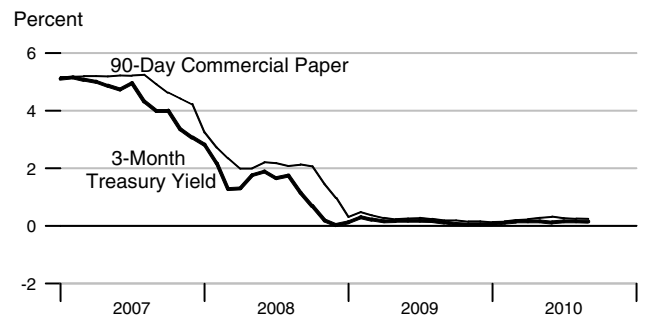
### Long-Term Interest Rates



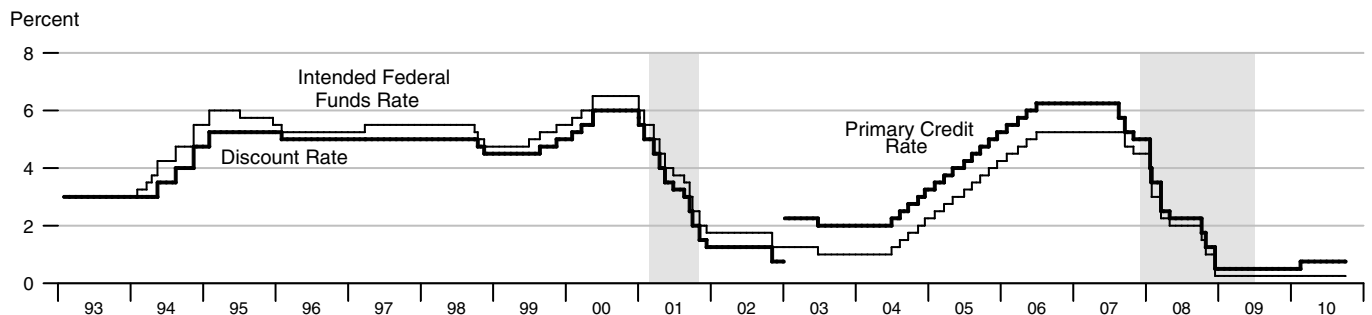
### Long-Term Interest Rates



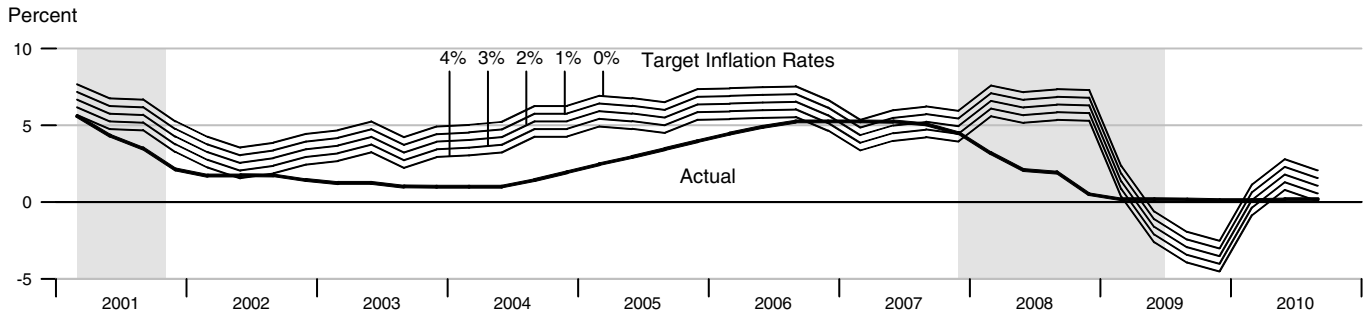
### Short-Term Interest Rates



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



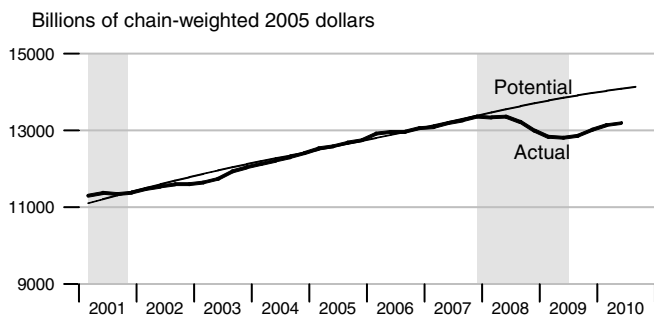
### Federal Funds Rate and Inflation Targets



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

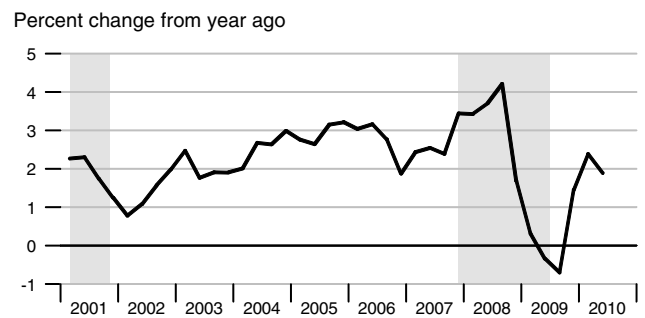
### Components of Taylor's Rule

#### Actual and Potential Real GDP

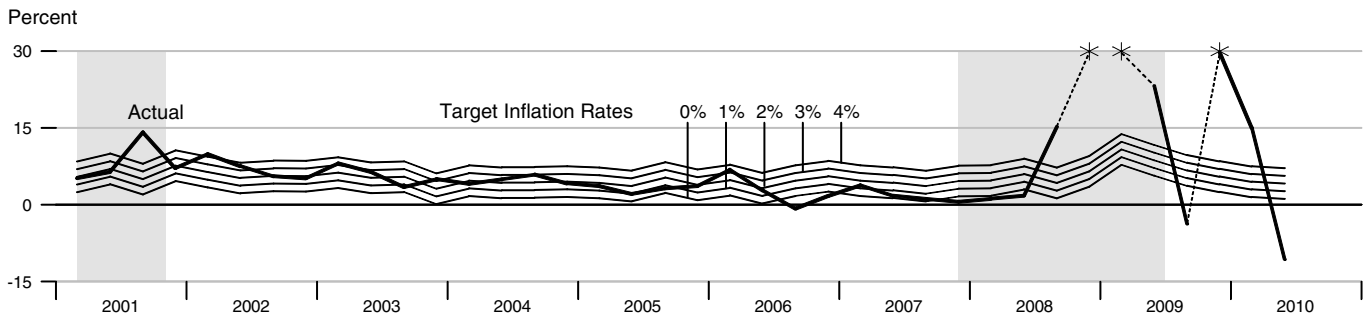


See notes section for further explanation.

#### PCE Inflation



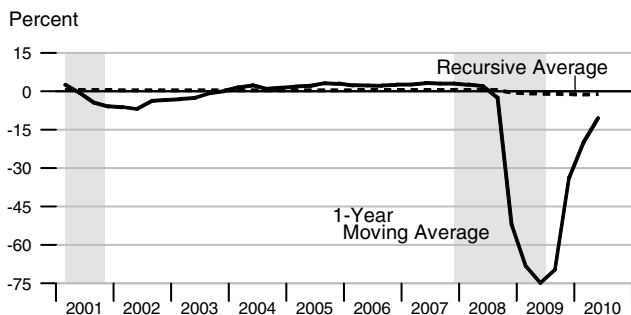
### Monetary Base Growth and Inflation Targets



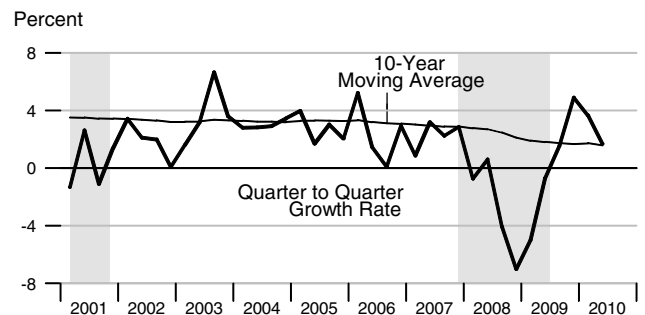
Calculated base growth is based on McCallum's rule. Actual base growth is percent change from the previous quarter.  
\*Actual values for 2008:Q4, 2009:Q1, and 2009:Q4 are 188.38 percent, 60.77 percent, and 56.51, respectively.

### Components of McCallum's Rule

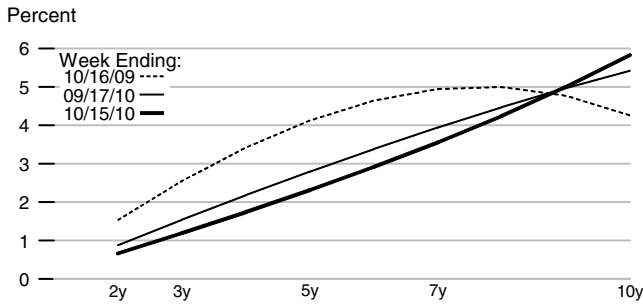
#### Monetary Base Velocity Growth



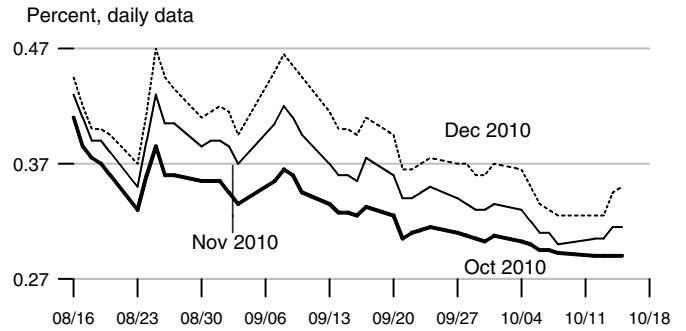
#### Real Output Growth



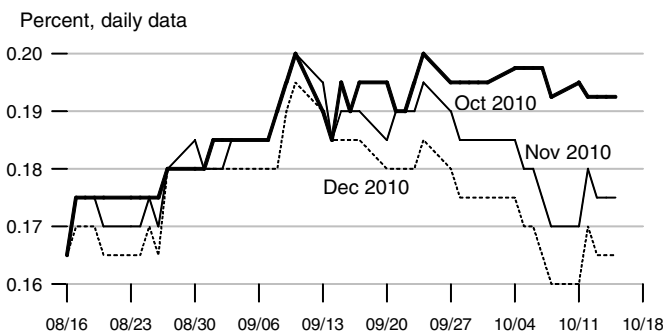
### Implied One-Year Forward Rates



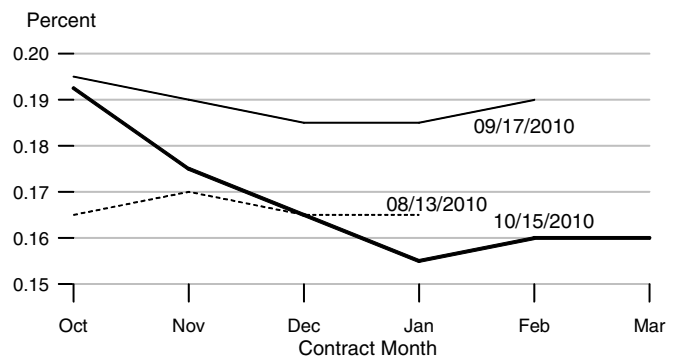
### Rates on 3-Month Eurodollar Futures



### Rates on Selected Federal Funds Futures Contracts

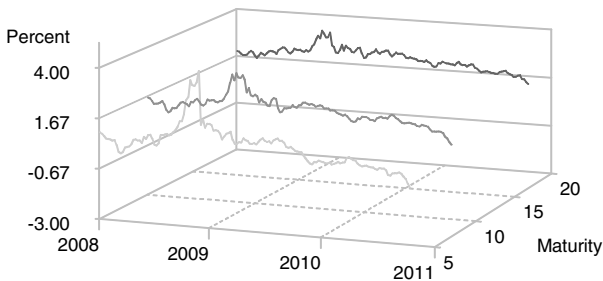


### Rates on Federal Funds Futures on Selected Dates



### Inflation-Indexed Treasury Securities

Weekly data



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

### Inflation-Indexed Treasury Yield Spreads

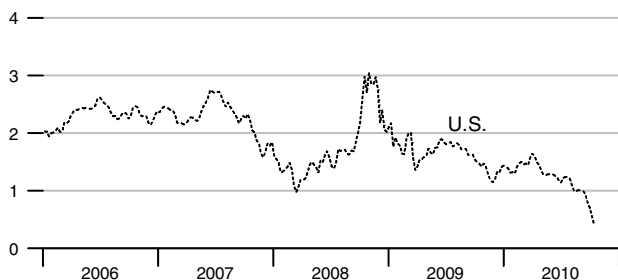
Weekly data



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

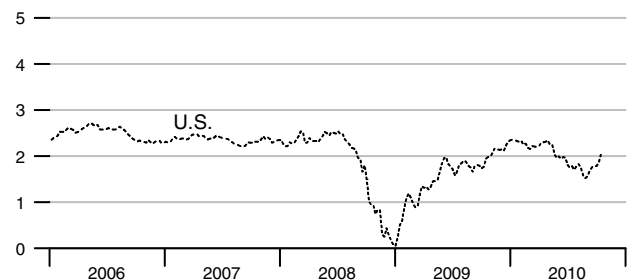
### Inflation-Indexed 10-Year Government Notes

Percent, weekly data



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

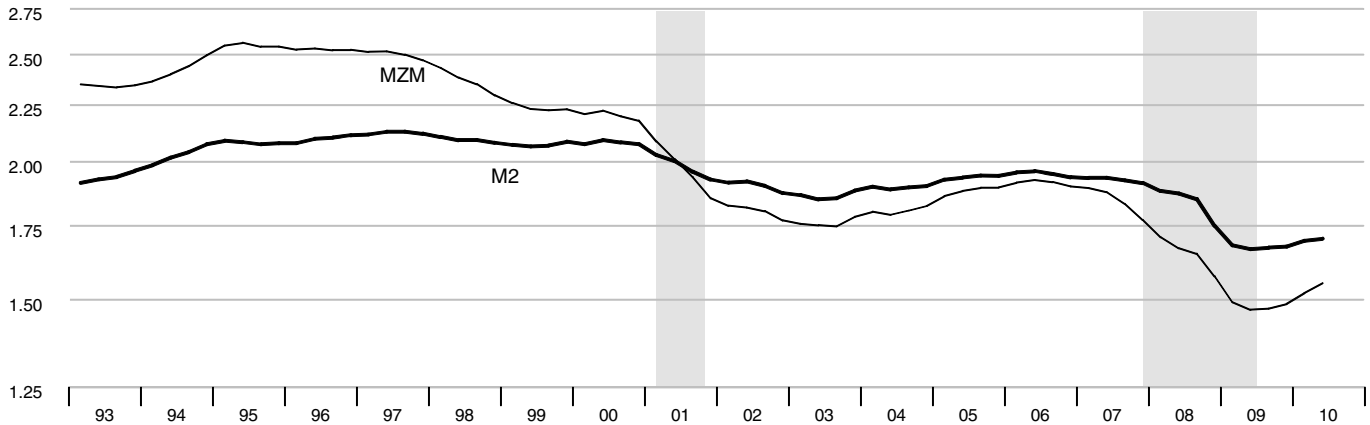
Percent, weekly data



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

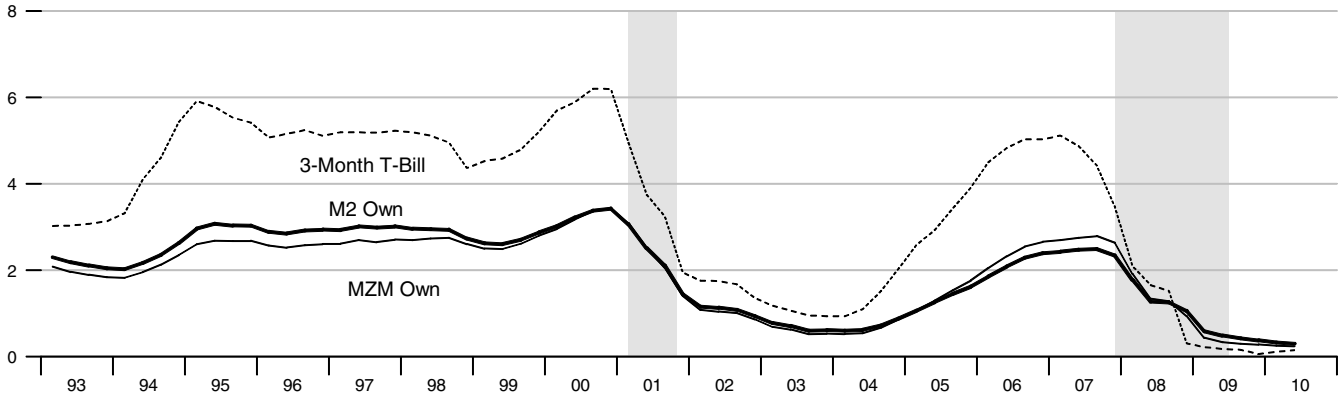
Velocity

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



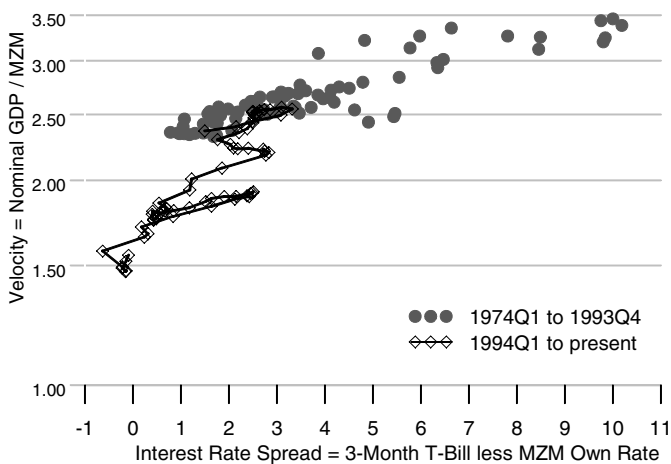
Interest Rates

Percent



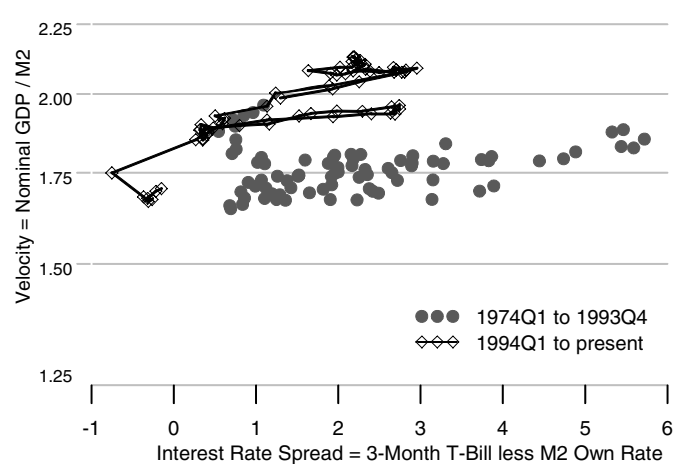
MZM Velocity and Interest Rate Spread

Ratio Scale



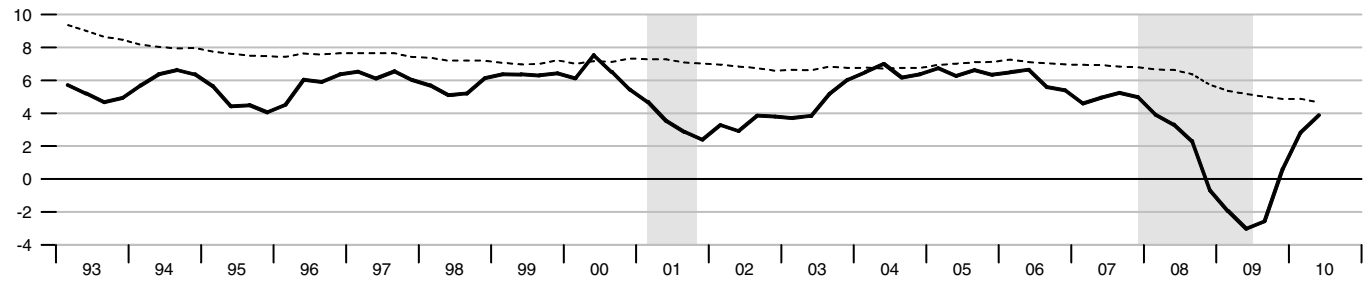
M2 Velocity and Interest Rate Spread

Ratio Scale



### Gross Domestic Product

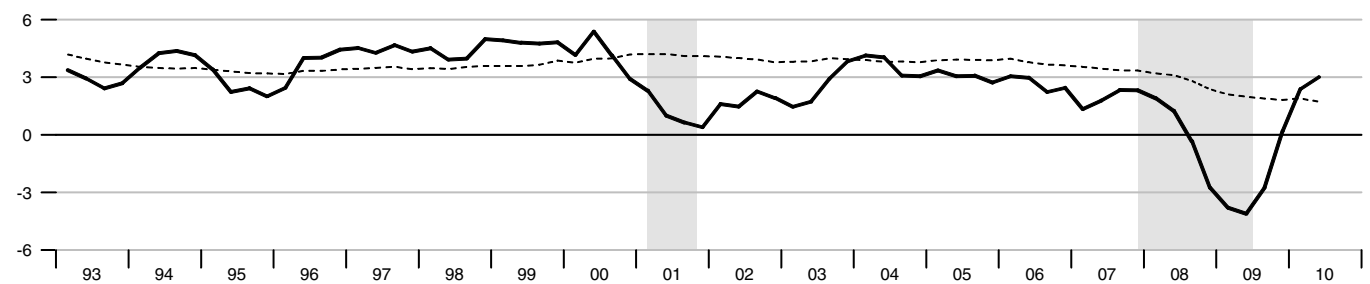
Percent change from year ago



Dashed lines indicate 10-year moving averages.

### Real Gross Domestic Product

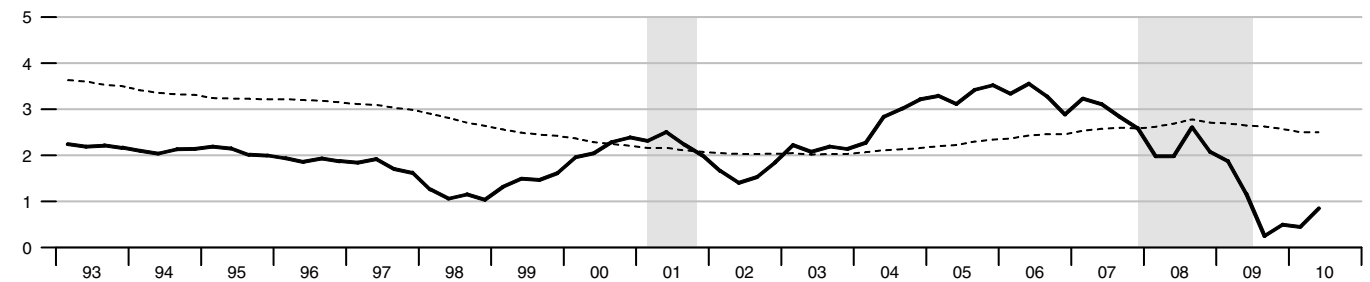
Percent change from year ago



Dashed lines indicate 10-year moving averages.

### Gross Domestic Product Price Index

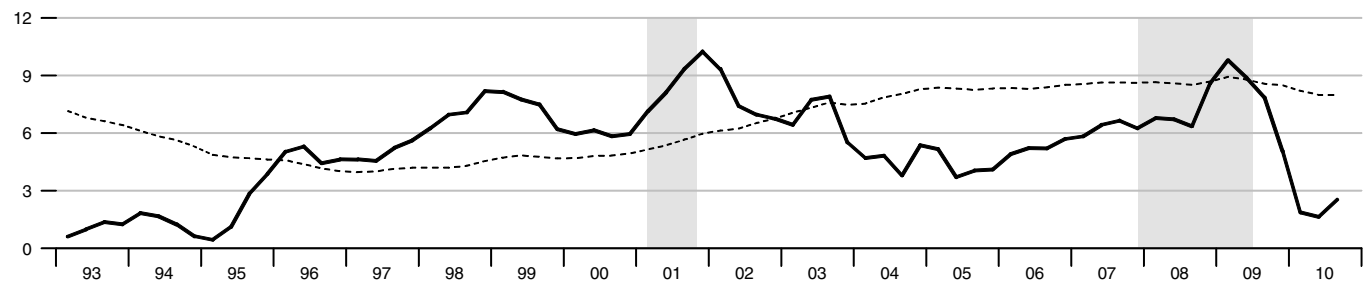
Percent change from year ago



Dashed lines indicate 10-year moving averages.

### M2

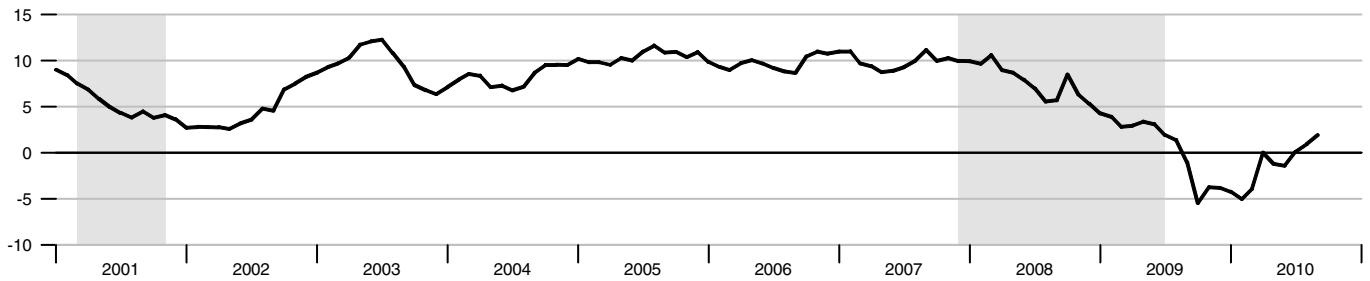
Percent change from year ago



Dashed lines indicate 10-year moving averages.

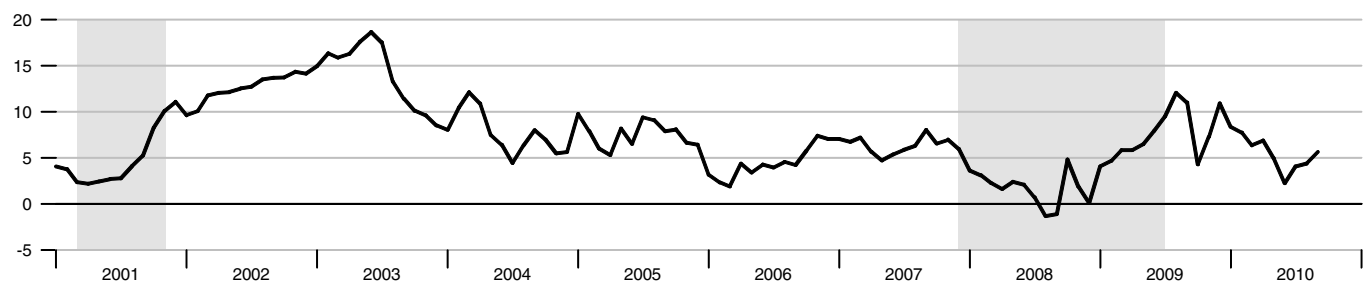
**Bank Credit**

Percent change from year ago



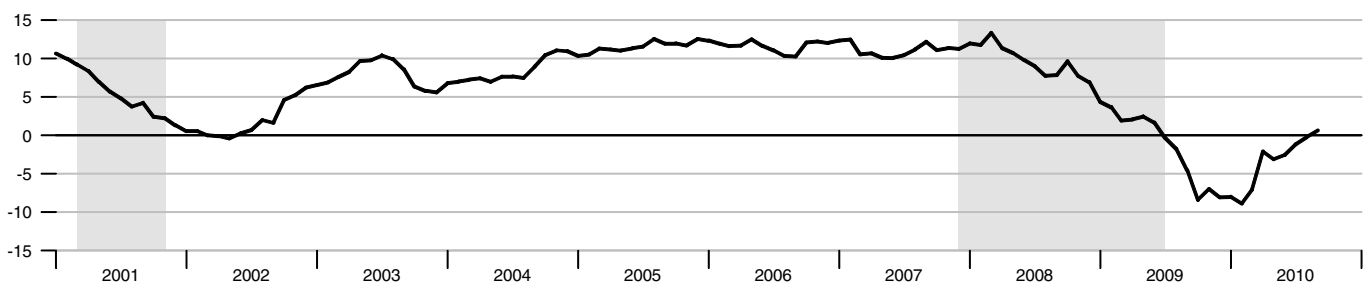
**Investment Securities in Bank Credit at Commercial Banks**

Percent change from year ago



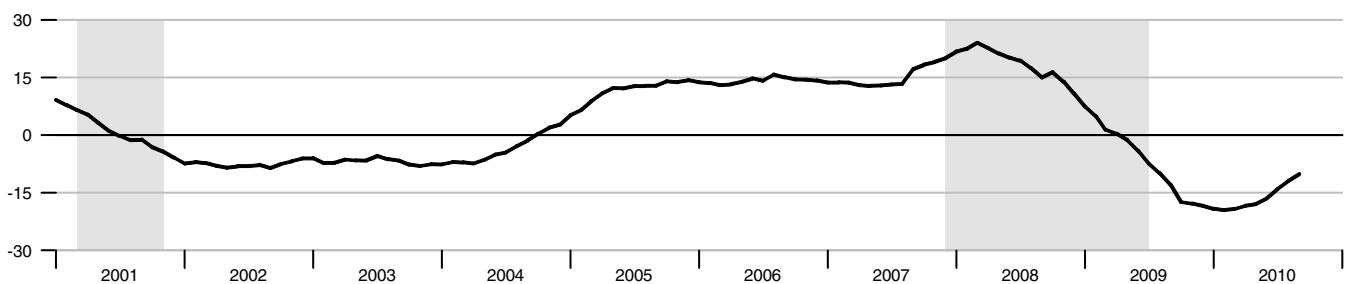
**Total Loans and Leases in Bank Credit at Commercial Banks**

Percent change from year ago

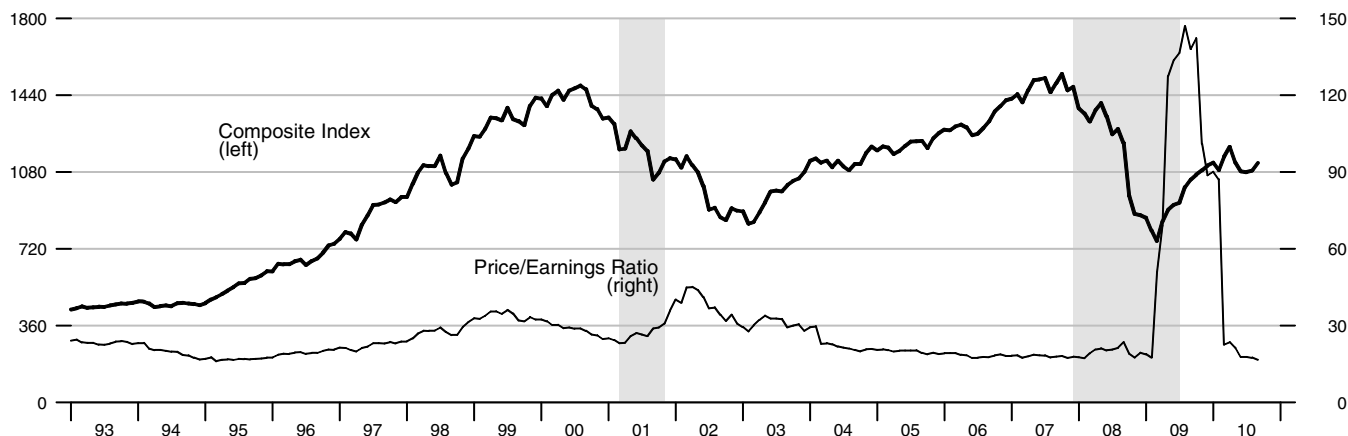


**Commercial and Industrial Loans at Commercial Banks**

Percent change from year ago



### Standard & Poor's 500

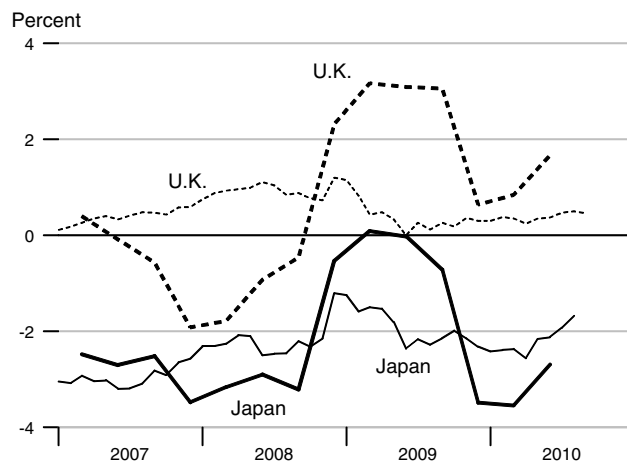
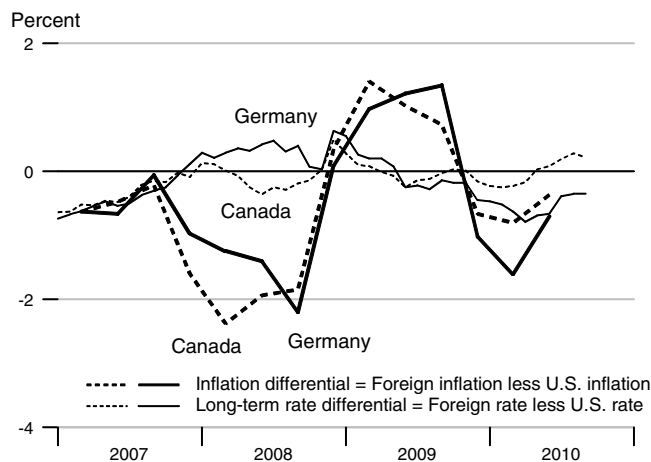


### Recent Inflation and Long-Term Interest Rates

	Consumer Price Inflation Rates				Long-Term Government Bond Rates			
	Percent change from year ago				Percent			
	2009Q4	2010Q1	2010Q2	2010Q3	Jun10	Jul10	Aug10	Sep10
United States	1.46	2.42	1.77	1.22	3.20	3.01	2.70	2.65
Canada	0.79	1.61	1.40	.	3.28	3.20	2.98	2.87
France	0.36	1.32	1.61	.	3.07	2.99	2.68	.
Germany	0.44	0.81	1.06	.	2.54	2.62	2.35	2.30
Italy	0.65	1.29	1.41	1.62	4.10	4.03	3.80	3.86
Japan	-2.03	-1.12	-0.93	.	1.08	1.08	1.02	.
United Kingdom	2.09	3.26	3.44	.	3.57	3.48	3.20	3.11

\* Copyright©, 2010, Organisation for Economic Cooperation and Development, OECD Main Economic Indicators (www.oecd.org).

### Inflation and Long-Term Interest Rate Differentials



		Money Stock				Bank	Adjusted		MSI M2**
		M1	MZM	M2	M3*	Credit	Monetary Base	Reserves	
2005		1371.536	6709.741	6525.151	9786.477	7015.091	806.622	96.554	343.539
2006		1374.163	7000.945	6868.146	10270.74	7697.040	835.035	94.908	
2007		1372.079	7635.149	7300.241		8462.623	850.529	94.145	
2008		1432.773	8708.061	7820.320		9122.749	1010.130	232.534	
2009		1634.793	9538.280	8434.798		9190.798	1796.550	944.772	
2008	1	1384.588	8384.447	7615.259		8999.867	856.338	96.192	
	2	1392.554	8664.431	7730.396		9011.612	860.033	95.081	
	3	1423.716	8773.390	7826.426		9068.211	893.439	118.518	
	4	1530.235	9009.974	8109.200		9411.306	1430.709	620.346	
2009	1	1578.270	9414.578	8361.120		9329.186	1662.925	820.597	
	2	1621.077	9552.027	8417.984		9294.851	1763.628	917.017	
	3	1653.063	9586.193	8440.664		9136.651	1747.186	895.441	
	4	1686.761	9600.321	8519.425		9002.503	2012.460	1146.032	
2010	1	1702.864	9497.680	8517.187		8919.104	2089.180	1217.002	
	2	1709.600	9389.539	8556.076		9214.321	2034.276	1158.343	
	3	1741.536	9522.221	8653.879		9225.696	2003.638	1117.919	
2008	Sep	1458.460	8798.768	7894.083		9156.750	936.456	160.176	
	Oct	1471.731	8846.032	8009.842		9493.317	1142.152	347.604	
	Nov	1516.919	8972.642	8062.465		9385.134	1480.740	674.070	
	Dec	1602.055	9211.248	8255.292		9355.466	1669.236	839.363	
2009	Jan	1583.473	9343.138	8316.718		9332.244	1730.151	869.931	
	Feb	1573.980	9413.828	8356.720		9348.492	1590.149	758.576	
	Mar	1577.358	9486.769	8409.921		9306.821	1668.474	833.284	
	Apr	1608.533	9473.300	8364.291		9264.930	1787.690	949.281	
	May	1608.536	9580.607	8436.668		9322.693	1799.205	946.080	
	Jun	1646.162	9602.174	8452.994		9296.929	1703.989	855.691	
	Jul	1649.944	9600.506	8442.977		9202.656	1693.712	841.475	
	Aug	1648.424	9561.480	8419.718		9143.923	1728.112	879.587	
	Sep	1660.820	9596.594	8459.298		9063.375	1819.734	965.262	
	Oct	1676.190	9599.932	8492.133		8974.661	1975.378	1122.194	
	Nov	1687.506	9607.092	8523.343		9033.627	2044.689	1182.377	
	Dec	1696.588	9593.940	8542.798		8999.221	2017.312	1133.526	
2010	Jan	1680.736	9523.959	8486.026		8936.817	2010.109	1105.435	
	Feb	1714.782	9529.017	8545.671		8878.969	2150.910	1296.160	
	Mar	1713.074	9440.065	8519.863		8941.525	2106.522	1249.412	
	Apr	1701.363	9349.022	8490.572		9264.847	2044.296	1178.992	
	May	1706.010	9400.673	8573.035		9210.519	2034.541	1149.753	
	Jun	1721.427	9418.921	8604.621		9167.597	2023.991	1146.284	
	Jul	1716.390	9437.037	8603.314		9212.820	2015.187	1131.072	
	Aug	1742.735	9514.515	8649.327		9228.457	2014.614	1133.729	
	Sep	1765.484	9615.112	8708.995		9235.811	1981.112	1088.957	

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			
2005		3.21	4.19	6.19	3.51	3.21	3.93	4.29	5.23	4.28	5.86
2006		4.96	5.96	7.96	5.15	4.85	4.77	4.79	5.59	4.15	6.41
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
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
2008	Sep	1.81	2.25	5.00	3.59	1.15	2.32	3.69	5.65	4.61	6.04
	Oct	0.97	1.81	4.56	4.32	0.69	1.86	3.81	6.28	5.05	6.20
	Nov	0.39	1.25	4.00	2.36	0.19	1.51	3.53	6.12	4.83	6.09
	Dec	0.16	0.86	3.61	1.77	0.03	1.07	2.42	5.05	5.17	5.33
2009	Jan	0.15	0.50	3.25	1.02	0.13	1.13	2.52	5.05	4.64	5.06
	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	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

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

		M1	MZM	M2	M3*
<b>Percent change at an annual rate</b>					
2005		2.04	2.11	4.25	5.97
2006		0.19	4.34	5.26	4.95
2007		-0.15	9.06	6.29	
2008		4.42	14.05	7.12	
2009		14.10	9.53	7.86	
<hr/>					
2008	1	2.63	15.74	7.90	
	2	2.30	13.36	6.05	
	3	8.95	5.03	4.97	
	4	29.93	10.79	14.45	
2009	1	12.56	17.96	12.43	
	2	10.85	5.84	2.72	
	3	7.89	1.43	1.08	
	4	8.15	0.59	3.73	
2010	1	3.82	-4.28	-0.11	
	2	1.58	-4.55	1.83	
	3	7.47	5.65	4.57	
<hr/>					
2008	Sep	51.14	6.27	16.53	
	Oct	10.92	6.45	17.60	
	Nov	36.84	17.18	7.88	
	Dec	67.35	31.91	28.70	
<hr/>					
2009	Jan	-13.92	17.18	8.93	
	Feb	-7.19	9.08	5.77	
	Mar	2.58	9.30	7.64	
	Apr	23.72	-1.70	-6.51	
	May	0.00	13.59	10.38	
	Jun	28.07	2.70	2.32	
	Jul	2.76	-0.21	-1.42	
	Aug	-1.11	-4.88	-3.31	
	Sep	9.02	4.41	5.64	
	Oct	11.11	0.42	4.66	
	Nov	8.10	0.90	4.41	
	Dec	6.46	-1.64	2.74	
<hr/>					
2010	Jan	-11.21	-8.75	-7.97	
	Feb	24.31	0.64	8.43	
	Mar	-1.20	-11.20	-3.62	
	Apr	-8.20	-11.57	-4.13	
	May	3.28	6.63	11.65	
	Jun	10.84	2.33	4.42	
	Jul	-3.51	2.31	-0.18	
	Aug	18.42	9.85	6.42	
	Sep	15.66	12.69	8.28	

\*See table of contents for changes to the series.

## Definitions

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

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

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

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

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

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

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

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

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

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

## Notes

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

nominal constant maturity yield less the real constant maturity yield. Daily data and descriptions are available at [research.stlouisfed.org/fred2/](http://research.stlouisfed.org/fred2/). See also *Statistical Supplement to the Federal Reserve Bulletin*, table 1.35. The 30-year constant maturity series was discontinued by the Treasury as of February 18, 2002.

*Page 5:* **Checkable Deposits** is the sum of demand and other checkable deposits. **Savings Deposits** is the sum of money market deposit accounts and passbook and statement savings. **Time Deposits** have a minimum initial maturity of 7 days. **Retail Money Market Mutual Funds** are included in M2. **Institutional** money market funds are not included in M2.

*Page 6:* **Excess Reserves plus RCB (Required Clearing Balance) Contracts** equals the amount of deposits at Federal Reserve Banks held by depository institutions but not applied to satisfy statutory reserve requirements. (This measure excludes the vault cash held by depository institutions that is not applied to satisfy statutory reserve requirements.) **Consumer Credit** includes most short- and intermediate-term credit extended to individuals. See *Statistical Supplement to the Federal Reserve Bulletin*, table 1.55.

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

*Page 8:* **Inflation Expectations** measures include the quarterly Federal Reserve Bank of Philadelphia *Survey of Professional Forecasters*, the monthly University of Michigan Survey Research Center's *Surveys of Consumers*, and the annual Federal Open Market Committee (FOMC) range as reported to the Congress in the February testimony that accompanies the Monetary Policy Report to the Congress. Beginning February 2000, the FOMC began using the personal consumption expenditures (PCE) price index to report its inflation range; the FOMC then switched to the PCE chain-type price index excluding food and energy prices ("core") beginning July 2004. Accordingly, neither are shown on this graph. **CPI Inflation** is the percentage change from a year ago in the consumer price index for all urban consumers. **Real Interest Rates** are ex post measures, equal to nominal rates minus year-over-year CPI inflation.

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

*Page 9:* **FOMC Intended Federal Funds Rate** is the level (or midpoint of the range, if applicable) of the federal funds rate that the staff of the FOMC expected to be consistent with the desired degree of pressure on bank reserve positions. In recent years, the FOMC has set an explicit target for the federal funds rate.

*Page 10:* **Federal Funds Rate and Inflation Targets** shows the observed federal funds rate, quarterly, and the level of the funds rate implied by applying Taylor's (1993) equation

$$f_t^* = 2.5 + \pi_{t-1} + (\pi_{t-1} - \pi^*)/2 + 100 \times (y_{t-1} - y_{t-1}^P)/2$$

to five alternative target inflation rates,  $\pi^* = 0, 1, 2, 3, 4$  percent, where  $f_t^*$  is the implied federal funds rate,  $\pi_{t-1}$  is the previous period's inflation rate (PCE) measured on a year-over-year basis,  $y_{t-1}$  is the log of the previous period's level of real gross domestic product (GDP), and  $y_{t-1}^P$  is the log of an estimate of the previous period's level of potential output. **Potential Real GDP** is estimated by the Congressional Budget Office (CBO).

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

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

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

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

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

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

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

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

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

where duration is approximated as  $D(m) = (1 - e^{-R(m) \times m})/R(m)$ . These rates are linear approximations to the true instantaneous forward rates; see Shiller (1990). For a discussion of the use of forward rates as indicators of inflation expectations, see Sharpe (1997). **Rates on 3-Month Eurodollar Futures and Rates on Selected Federal Funds Futures Contracts** trace through time the yield on three specific contracts. **Rates on Federal Funds Futures on Selected Dates** displays a single day's snapshot of yields for contracts expiring in the months shown on the horizontal axis. **Inflation-Indexed Treasury Securities and Yield Spreads** are those plotted on page 3. **Inflation-Indexed 10-Year Government Notes** shows the yield of an inflation-indexed note that is scheduled to mature in approximately (but not greater than) 10 years. The current French note has a maturity date of 7/25/2015, the current U.K. note has a maturity date of 4/16/2020, and the current U.S. note has a maturity date of 5/15/2020. **Inflation-Indexed Treasury Yield Spreads and Inflation-Indexed 10-Year Government Yield Spreads** equal the difference between the yields on the most recently issued inflation-indexed securities and the unadjusted security yields of similar maturity.

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

**Page 13: Real Gross Domestic Product** is GDP as measured in chained 2000 dollars. The **Gross Domestic Product Price Index** is the implicit price deflator for GDP, which is defined by the Bureau of Economic Analysis, U.S. Department of Commerce, as the ratio of GDP measured in current dollars to GDP measured in chained 2005 dollars.

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

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

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

## Sources

*Agence France Trésor*: French note yields.

*Bank of Canada*: Canadian note yields.

*Bank of England*: U.K. note yields.

*Board of Governors of the Federal Reserve System*:

Monetary aggregates and components: H.6 release. Bank credit and components: H.8 release. Consumer credit: G.19 release. Required reserves, excess reserves, clearing balance contracts, and discount window borrowing: H.4.1 and H.3 releases. Interest rates: H.15 release. Nonfinancial commercial paper: Board of Governors website. Nonfinancial debt: Z.1 release. M2 own rate. Senior Loan Officer Opinion Survey on Bank Lending Practices.

*Bureau of Economic Analysis*: GDP.

*Bureau of Labor Statistics*: CPI.

*Chicago Board of Trade*: Federal funds futures contract.

*Chicago Mercantile Exchange*: Eurodollar futures.

*Congressional Budget Office*: Potential real GDP.

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

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

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

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

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

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

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**Note:** \*Available on the Internet at [research.stlouisfed.org/publications/review/](http://research.stlouisfed.org/publications/review/).