Monetary Trends

October 2009

A Yield Spread Perspective of the Financial Crisis

Increasing—yet still much-debated—evidence indicates the worst of the recent financial crisis is behind us. This marks the first payoff of a series of aggressive and coordinated steps by the Federal Reserve, Treasury, FDIC, and Congress to (i) stem the financial panic following the Lehman Brothers' bankruptcy and (ii) restore the flow of credit. Additional payoffs in the medium term are expected from the Fed's decision to cut its key policy rate to near zero and greatly expand the monetary base.

One of the most popular indicators of financial stress are yield spreads—both default risk spreads (e.g., between Baa- and AAA-grade corporate debt) and liquidity spreads (e.g., between interbank deposits and Treasury bills). Low bond yields are instrumental to the goals of an expansionary policy: They stimulate growth by reducing costs of capital to firms and households.[1] Yields on T-bills and notes have decreased notably in response to a number of the Fed's credit-easing policies. However, transmission of monetary impulses from Treasury yields to private sector yields—such as short-term interbank deposits and long-term corporate bonds—may be difficult. Default spreads in corporate bonds remain elevated: It has proven difficult to reduce the yields of corporate bonds with a rating below investment-grade. Meanwhile, rates on deposits used to trade short-term funds have followed abnormal paths, reflecting persistent concern over borrowers' solvency.

Do yield spreads now suggest an end to the crisis? The table lists some statistical facts for two key yield spreads. The first, the 3-month London Interbank Offering Rate–Overnight Index Swap (LIBOR-OIS) spread, indicates the magnitude of the liquidity premium for immediate convertibility of an asset into cash. The second spread, the Moody's spread between corporate bonds with Baa and Aaa ratings, indicates the premium required to compensate for the higher default probability of bonds without an investment-grade rating (such as Baa).

The mean yield spreads in the table (the coefficient γ) suggest the means underwent substantial increases during the crisis versus the pre-crisis period with a gradual return since November 2008 toward pre-crisis levels.[2] But a more careful analysis reveals a less-tranquilizing picture. We have estimated simple dynamic regressions (coefficient β in the table) that capture the speed at which a shock (i.e., an unpredictable change in the current level of a spread) to any of the spreads dissipates. A negative β suggests that a yield spread, once shocked, will return to its long-run mean; the larger the coefficient (in absolute value), the faster the effect of the shock vanishes.

The table shows that so far the good news is limited to the liquidity (LIBOR-OIS) spread; β returns significantly negative and to levels close to the pre-crisis standards (–0.15 vs. –0.17), starting in late 2008. However, recent developments for the default (Moody's Baa-Aaa) spread remain indecisive. While in the pre-crisis period, the β estimate was small in absolute value (–0.012) but highly statistically significant, during the crisis β becomes positive. Even though β has returned to negative since December 2008, there is little evidence that it may actually be different from zero. This is consistent with some recent, substantial volatility in the U.S. corporate bond market and leaves open the possibility that additional, future shocks to default premia may have long-lived effects.

—Massimo Guidolin and Yu Man Tam

[1] See Guidolin, Massimo and Tam, Yu Man. "Taming the Long-Term Spreads." Federal Reserve Bank of St. Louis *Economic Synopses*, No. 26, May 22, 2009; http://research.stlouisfed.org/publications/es/09/ES0926.pdf.

[2] Our estimates in the table concern three distinct subsamples: December 2001–August 2007 is the pre-crisis period; August 2007–October 2008 captures the heights of the crisis, culminating with Lehman Brothers' demise in September 2008. The November 2008–July 2009 period marks a return to normality.

Default Spreads Dynamics

	Regression coefficients			
Subsample	α	β	γ **(unconditional mean)**	R^2
3-Month LIBOR-OIS liquidity spread				
12/21/2001–8/10/2007	–0.082	–0.174**	0.109**	0.083
8/17/2001–10/17/2001	0.668**	–0.061	1.068*	0.318
10/24/2008–8/31/2009	–0.026	–0.146**	0.530**	0.415
Moody's Baa-Aaa default spread				
12/21/2001–8/10/2007	0.156**	–0.012**	0.898**	0.030
8/17/2001–10/17/2001	1.132**	0.034	1.048**	0.638
10/24/2008–8/31/2009	0.577**	–0.007	0.104	0.462

NOTE: * and ** indicate significance at the 10 and 1 percent levels. The model estimated is $\Delta s_t = \alpha \Delta s_{t-1} + \beta(s_{t-1} - \gamma) + \varepsilon_t$, where s_t is the spread at time t. The dating was obtained by applying the standard Andrews-Quandt break test and selecting dates as averages of break dates for the two series.

Contents

Conventions used in this publication:

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

We welcome your comments addressed to:

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

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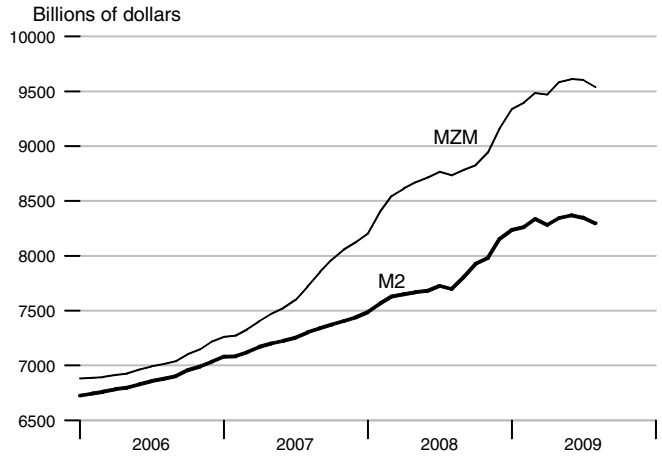
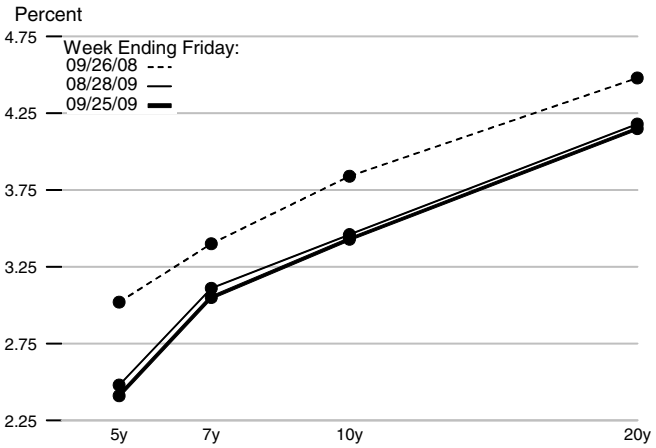
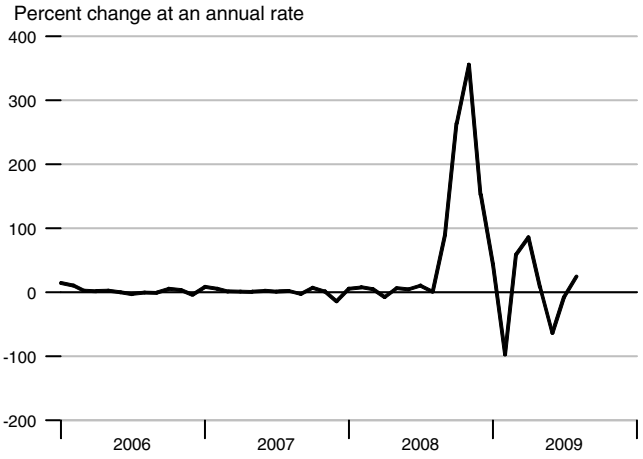
M2 and MZM



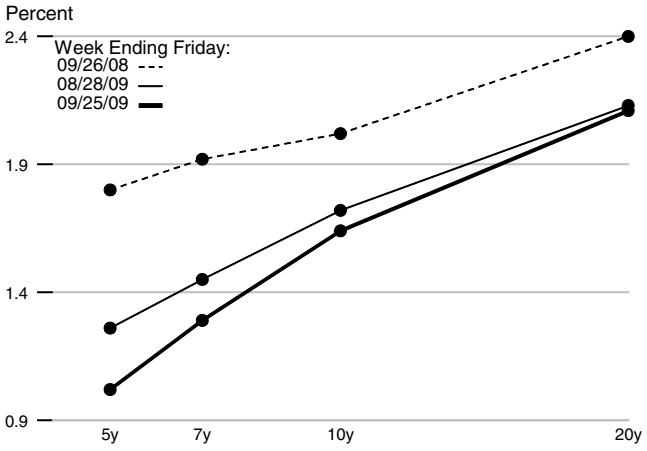
Treasury Yield Curve



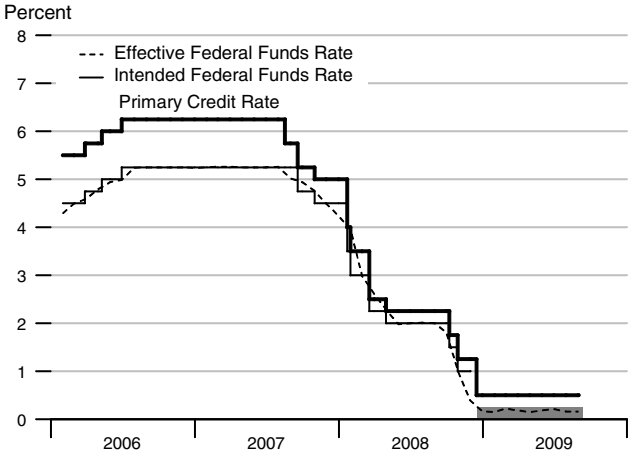
Adjusted Monetary Base



Real Treasury Yield Curve

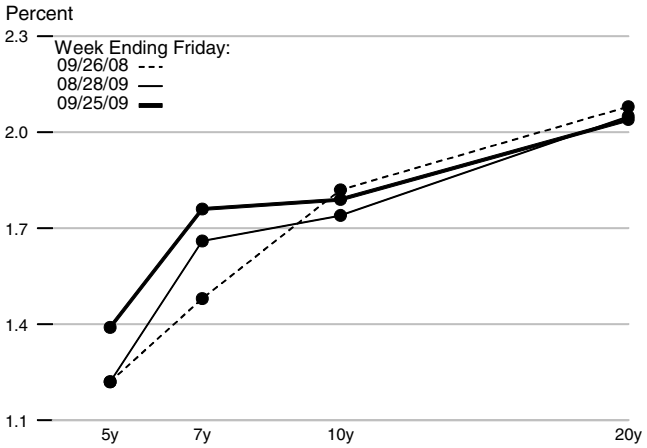


Reserve Market Rates



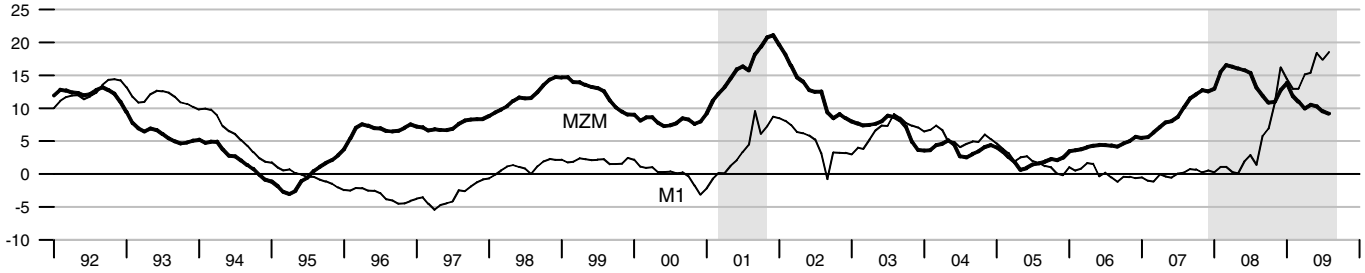
Note: Effective December 16, 2008, FOMC reports the intended Federal Funds Rate as a range.

Inflation-Indexed Treasury Yield Spreads



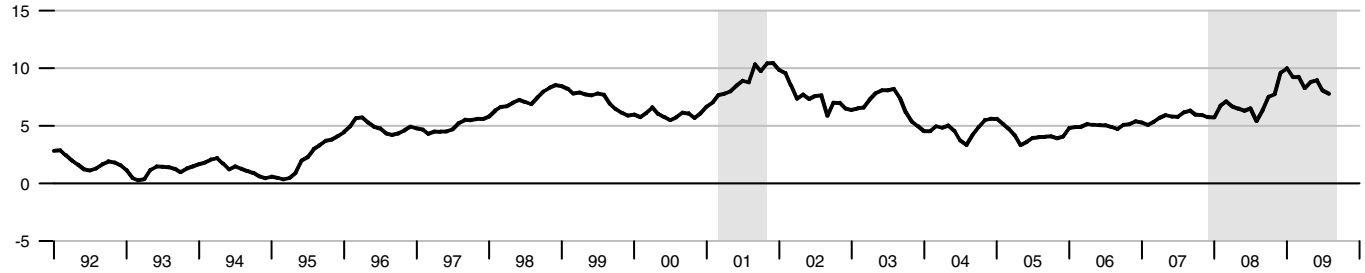
MZM and M1

Percent change from year ago



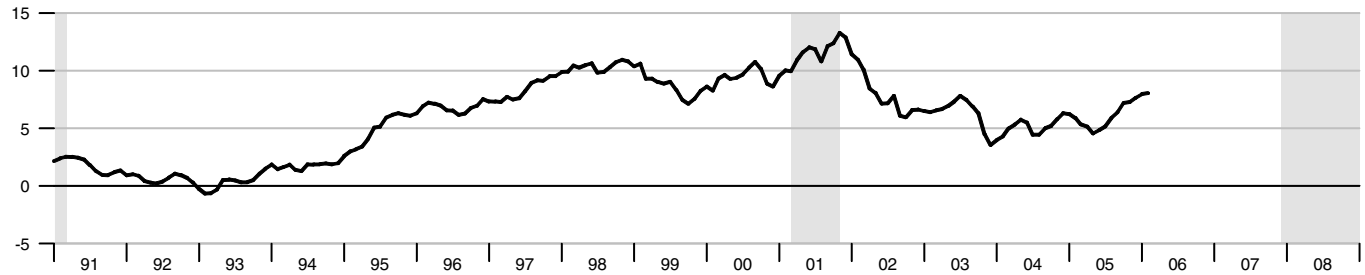
M2

Percent change from year ago



M3*

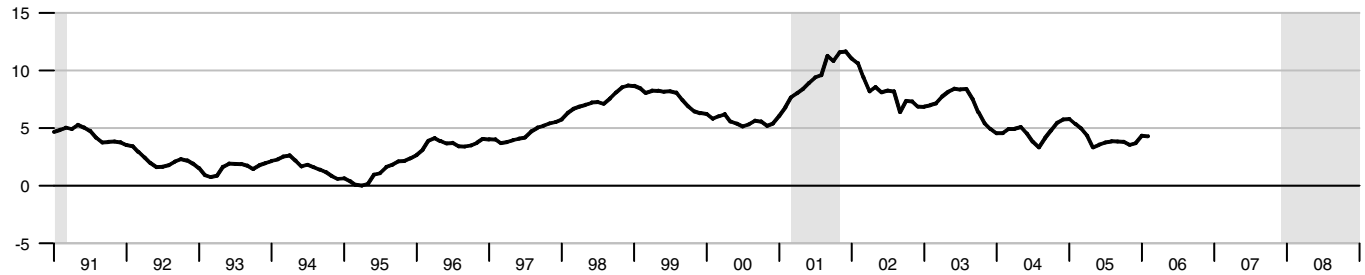
Percent change from year ago



*See table of contents for changes to the series.

Monetary Services Index - M2**

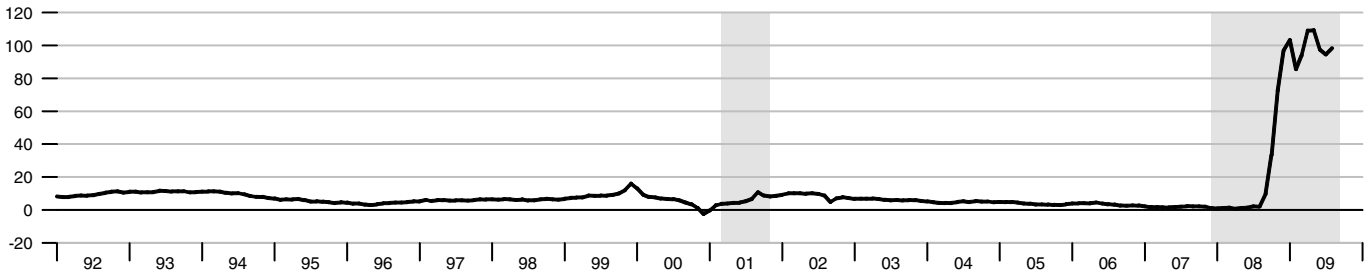
Percent change from year ago



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

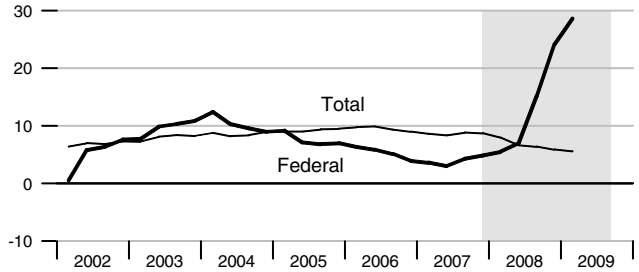
Adjusted Monetary Base

Percent change from year ago



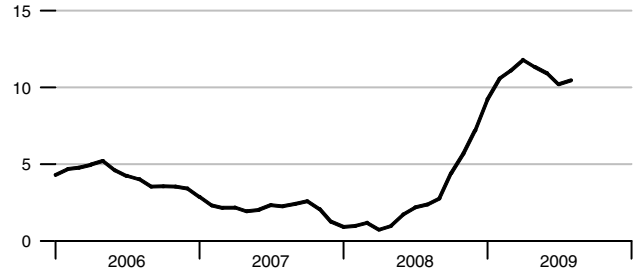
Domestic Nonfinancial Debt

Percent change from year ago



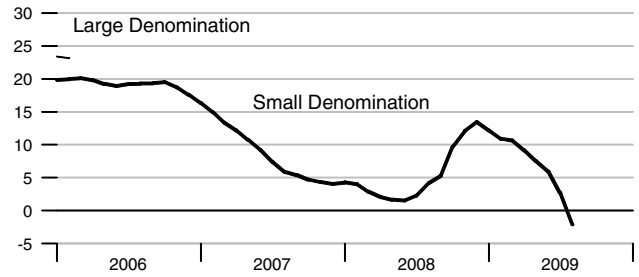
Currency Held by the Nonbank Public

Percent change from year ago



Time Deposits*

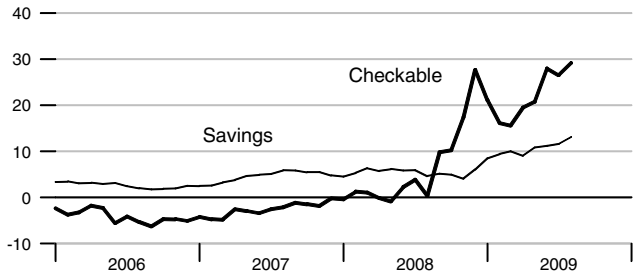
Percent change from year ago



*See table of contents for changes to the series.

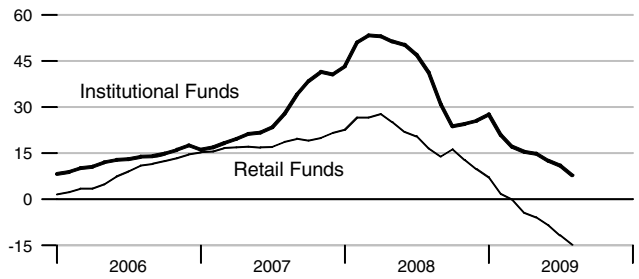
Checkable and Savings Deposits

Percent change from year ago



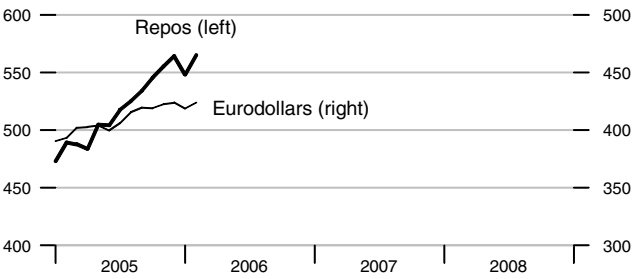
Money Market Mutual Fund Shares

Percent change from year ago



Repurchase Agreements and Eurodollars*

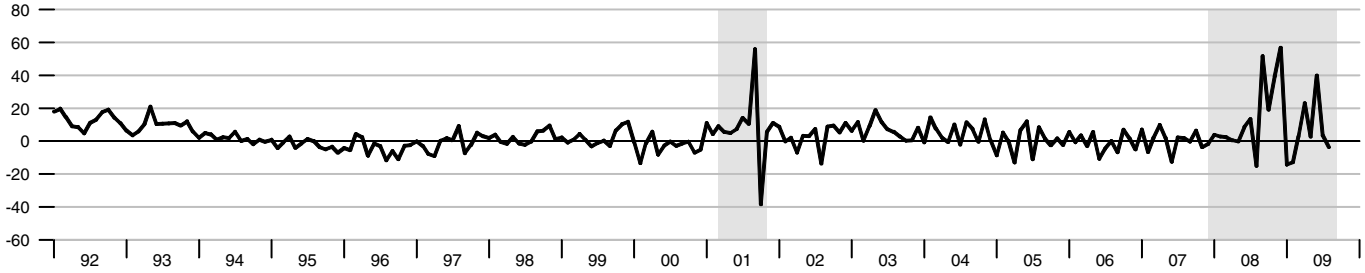
Billions of dollars



*See table of contents for changes to these series.

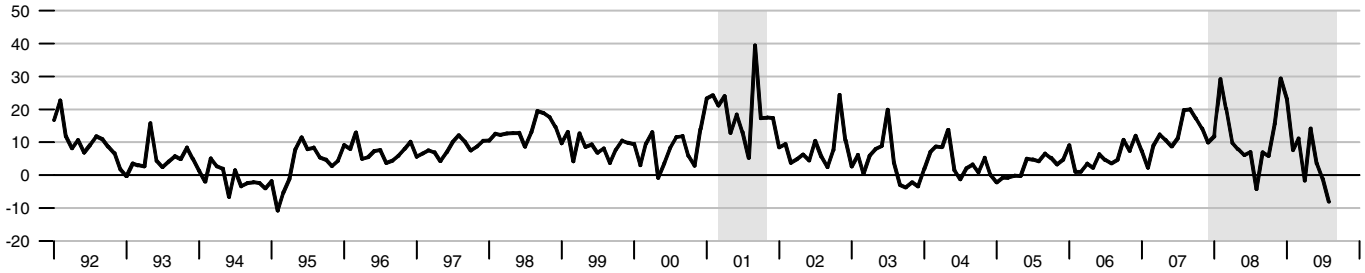
M1

Percent change at an annual rate



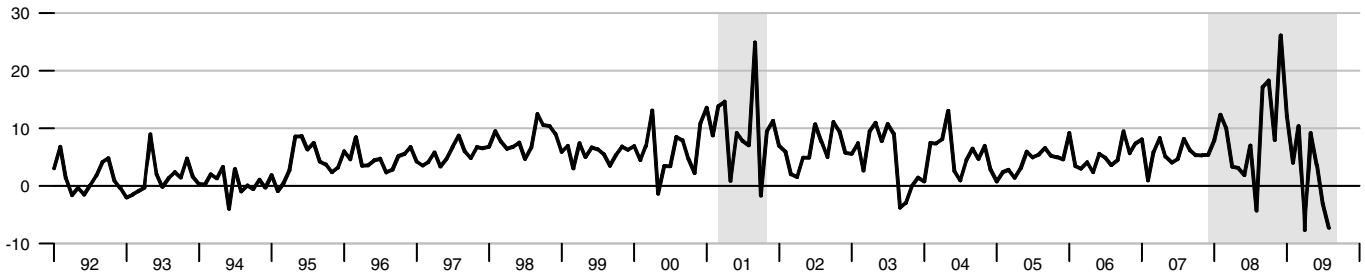
MZM

Percent change at an annual rate



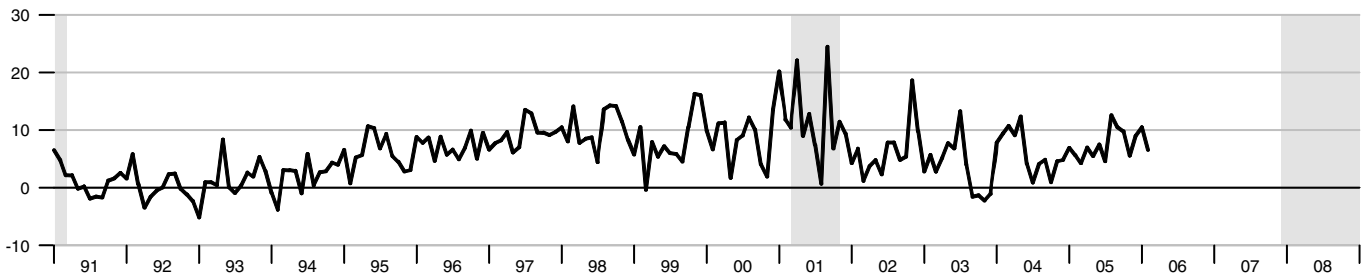
M2

Percent change at an annual rate



M3*

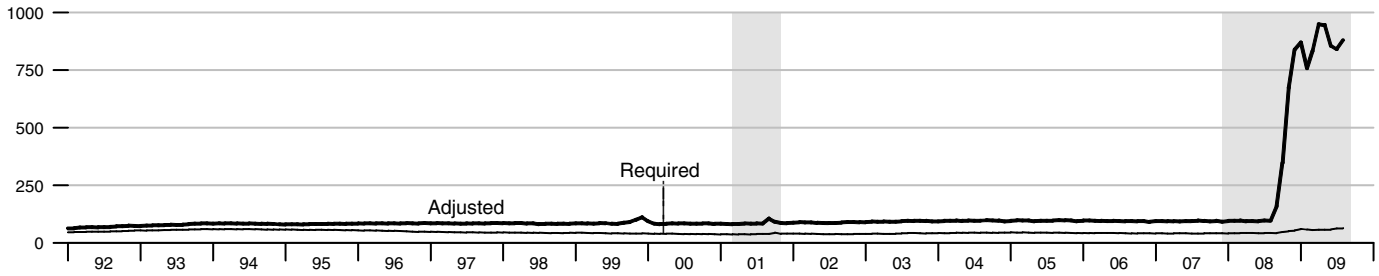
Percent change at an annual rate



*See table of contents for changes to the series.

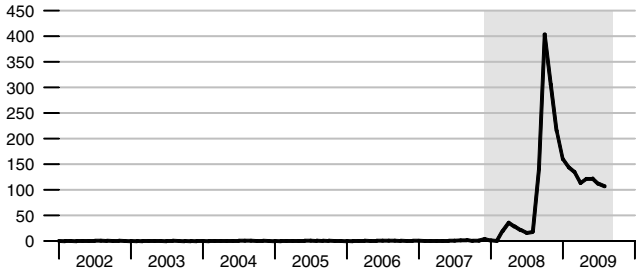
Adjusted and Required Reserves

Billions of dollars



Total Borrowings, nsa

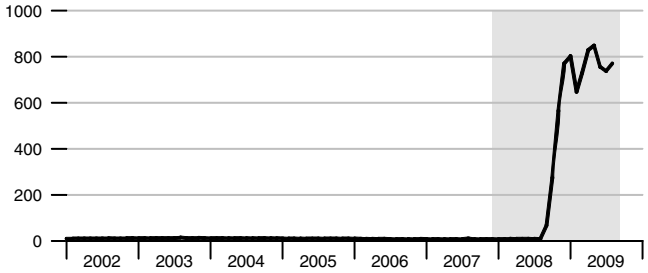
Billions of dollars



* Data exclude term auction credit

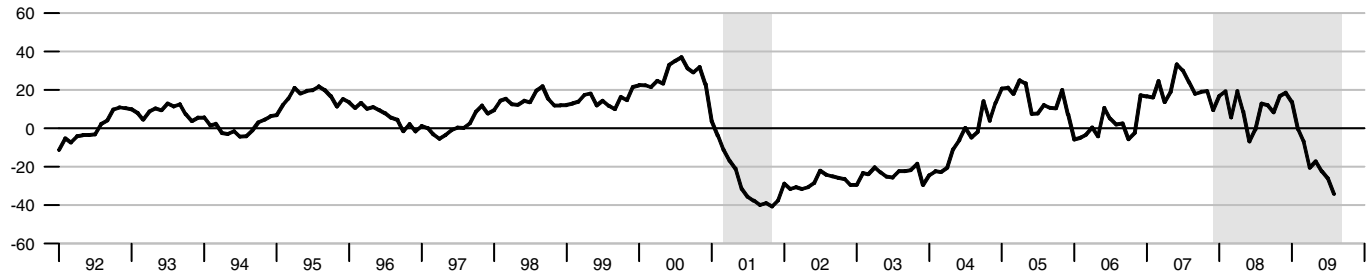
Excess Reserves plus RCB Contracts

Billions of dollars



Nonfinancial Commercial Paper

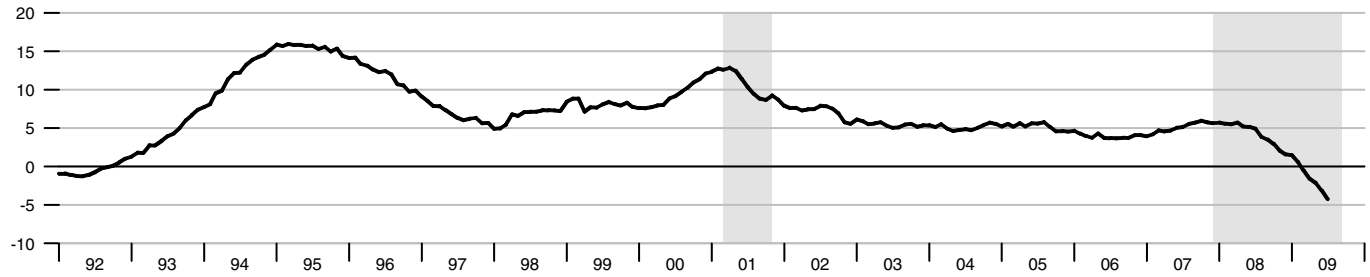
Percent change from year ago



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.

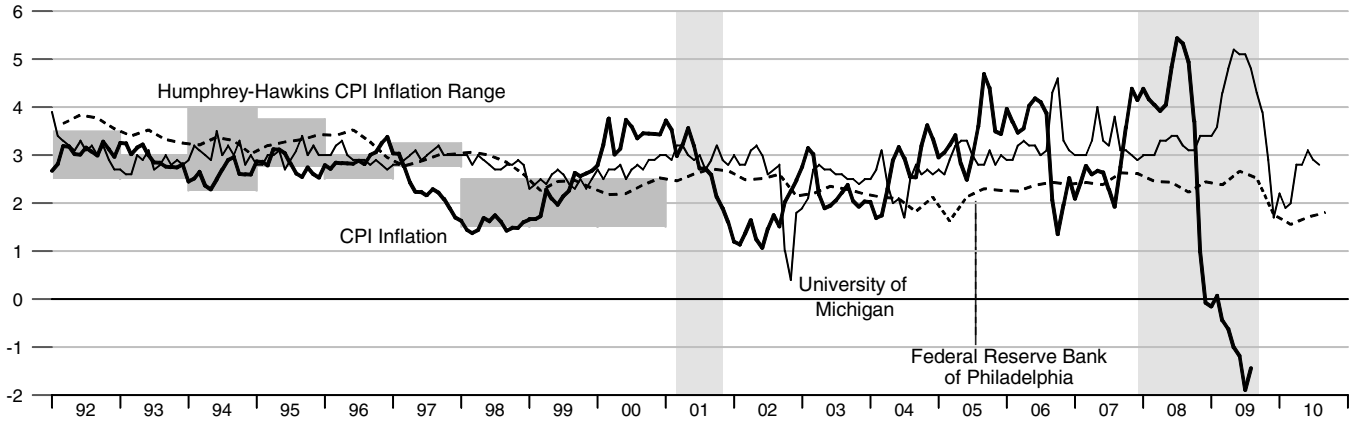
Consumer Credit

Percent change from year ago



CPI Inflation and 1-Year-Ahead CPI Inflation Expectations

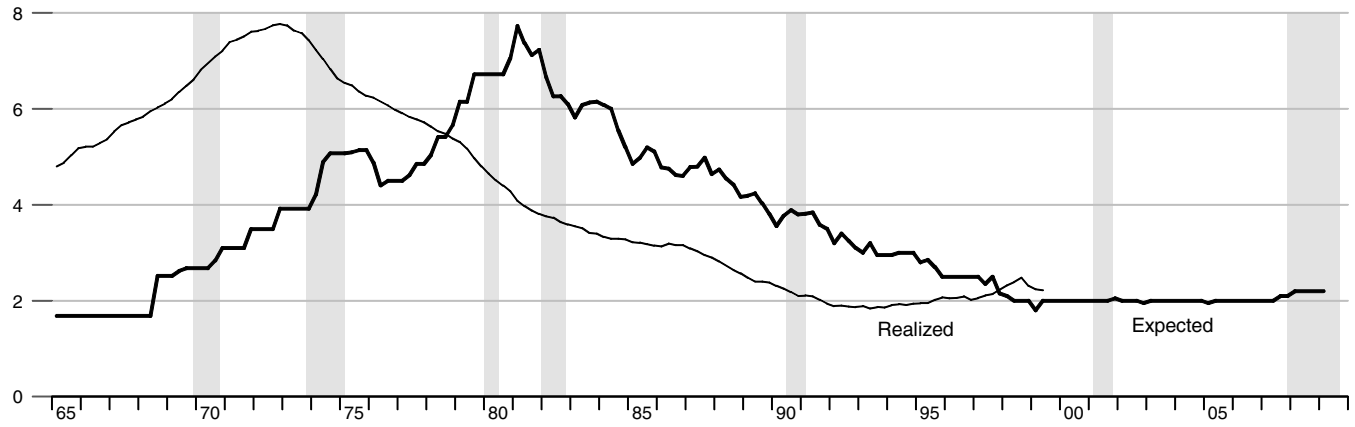
Percent



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

10-Year Ahead PCE Inflation Expectations and Realized Inflation

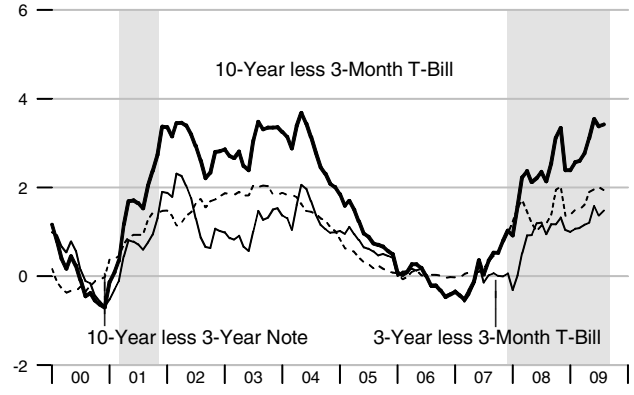
Percent



See the notes section for an explanation of the chart.

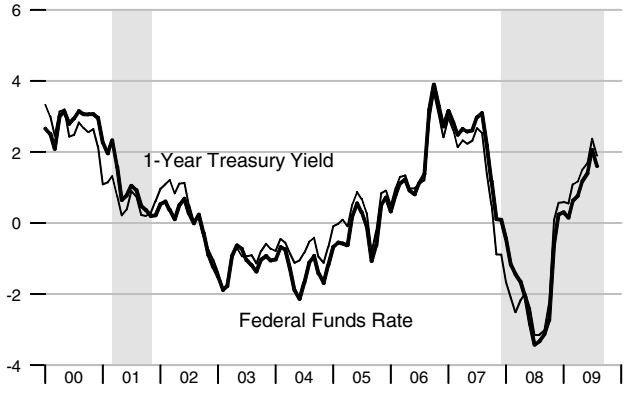
Treasury Security Yield Spreads

Yield to maturity

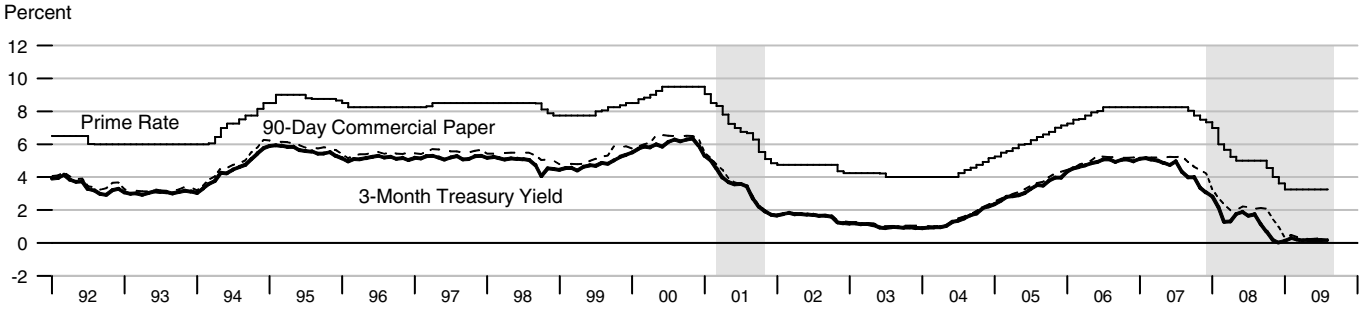


Real Interest Rates

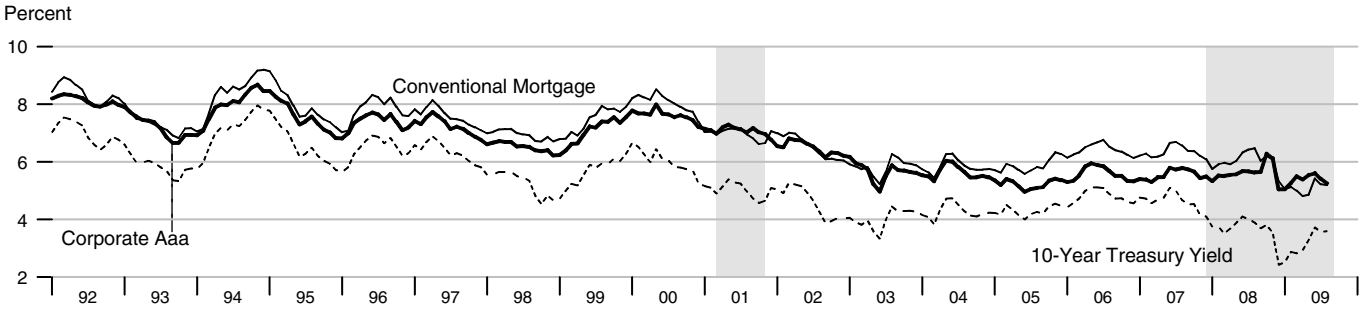
Percent, Real rate = Nominal rate less year-over-year CPI inflation



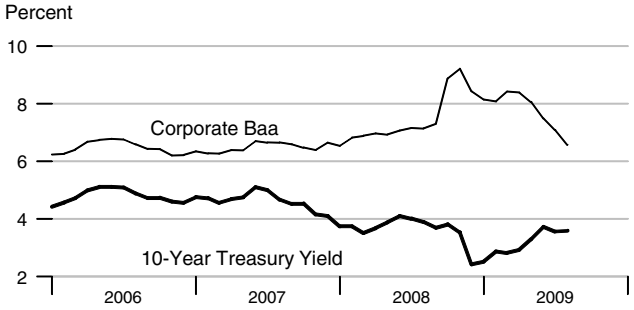
Short-Term Interest Rates



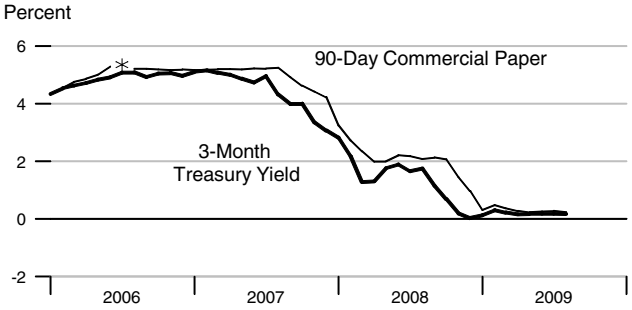
Long-Term Interest Rates



Long-Term Interest Rates

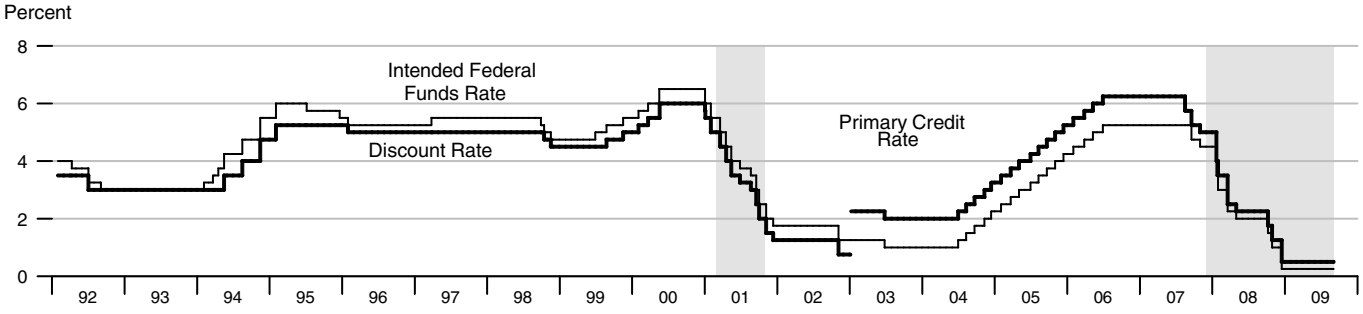


Short-Term Interest Rates

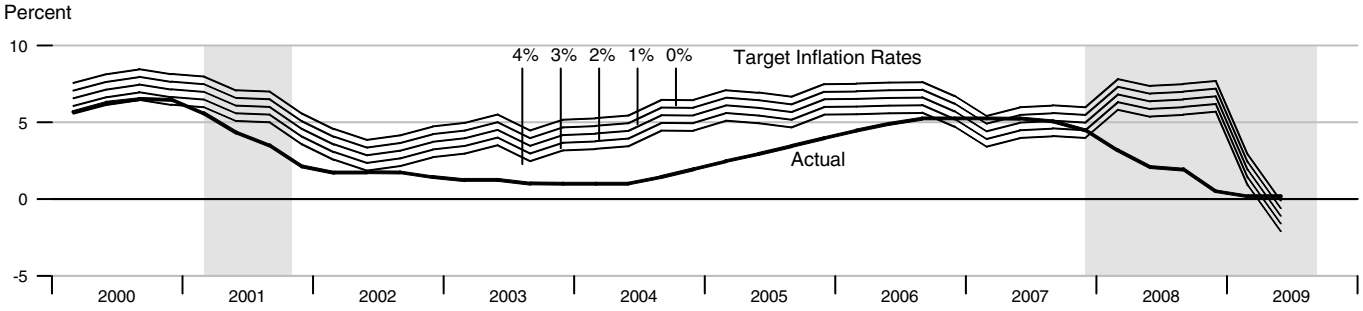


*90-Day Commercial Paper data are not available for December 2005, January 2006, and July 2006.

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



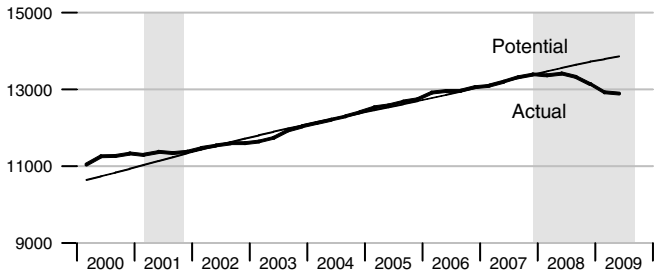
Federal Funds Rate and Inflation Targets



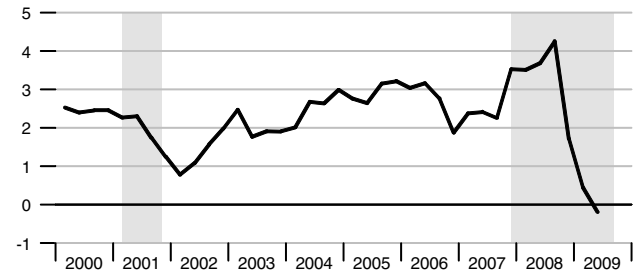
Calculated federal funds rate is based on Taylor's rule.

Components of Taylor's Rule

Actual and Potential Real GDP

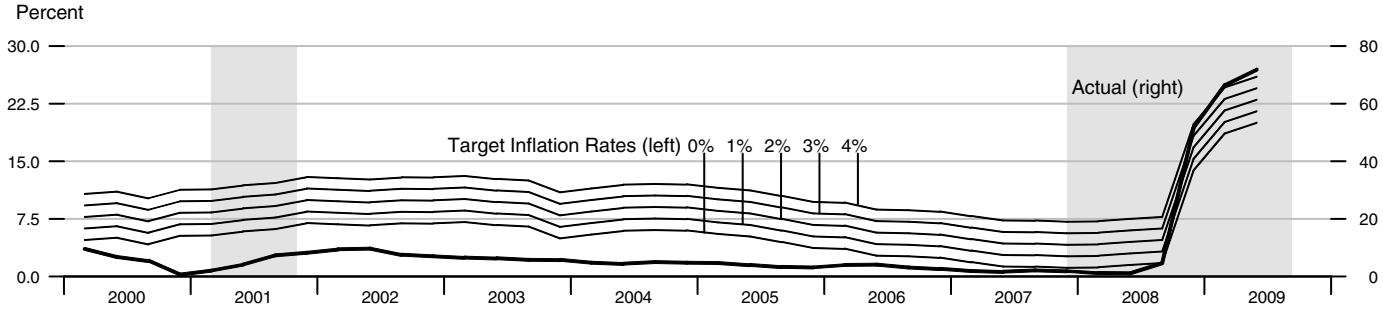


PCE Inflation



See notes section for further explanation.

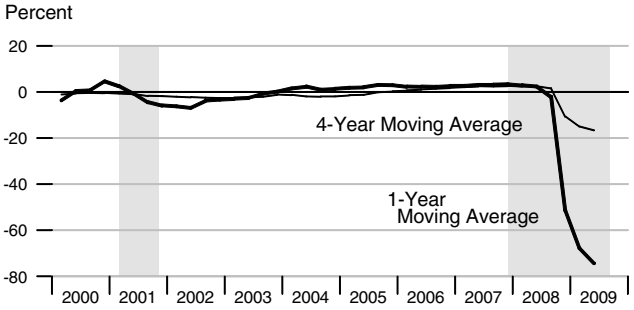
Monetary Base Growth and Inflation Targets



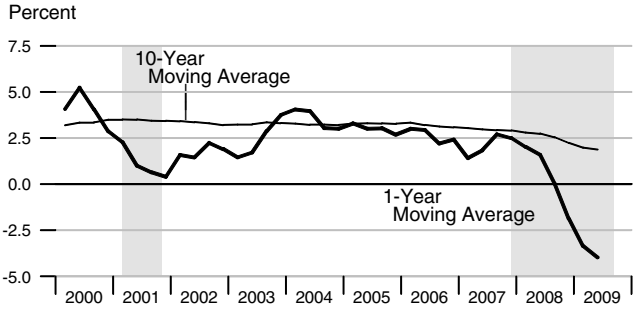
Calculated base growth is based on McCallum's rule. Actual base growth is percent change from year ago.

Components of McCallum's Rule

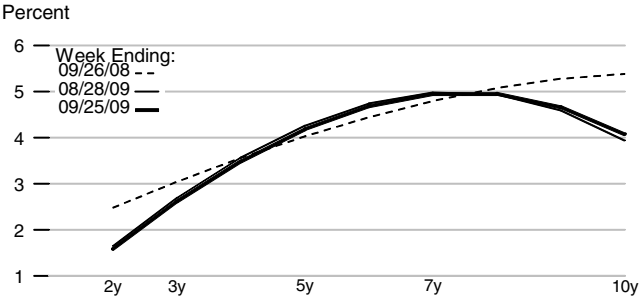
Monetary Base Velocity Growth



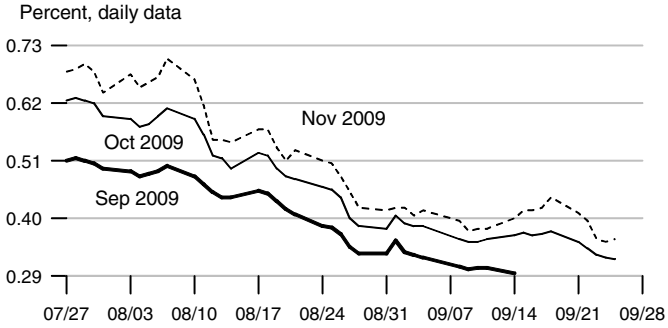
Real Output Growth



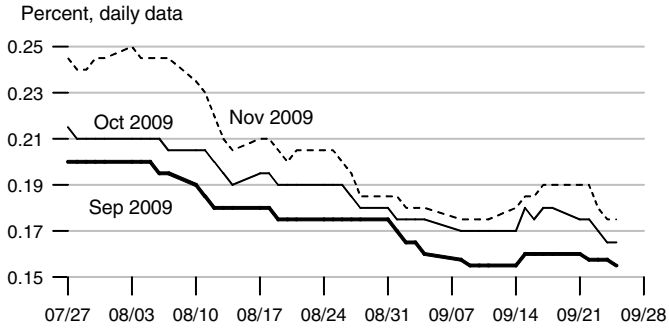
Implied One-Year Forward Rates



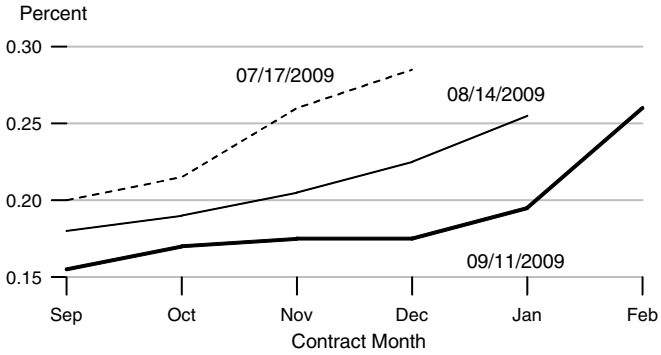
Rates on 3-Month Eurodollar Futures



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

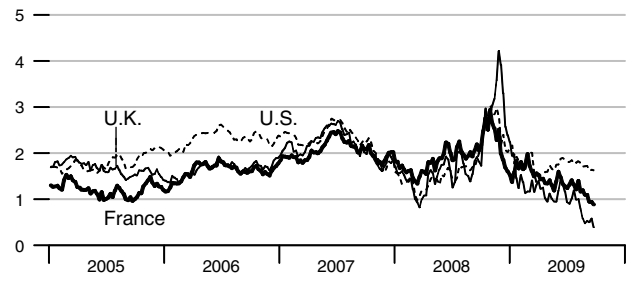
Inflation-Indexed Treasury Yield Spreads

Weekly data

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

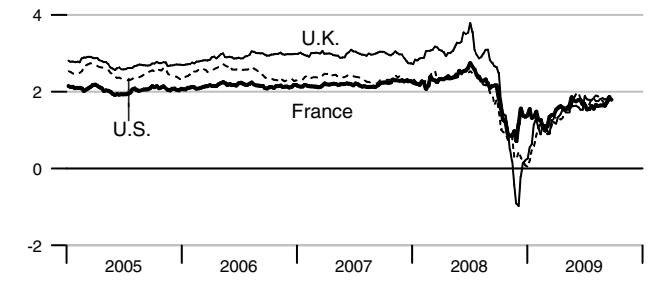
Inflation-Indexed 10-Year Government Notes

Percent, weekly data



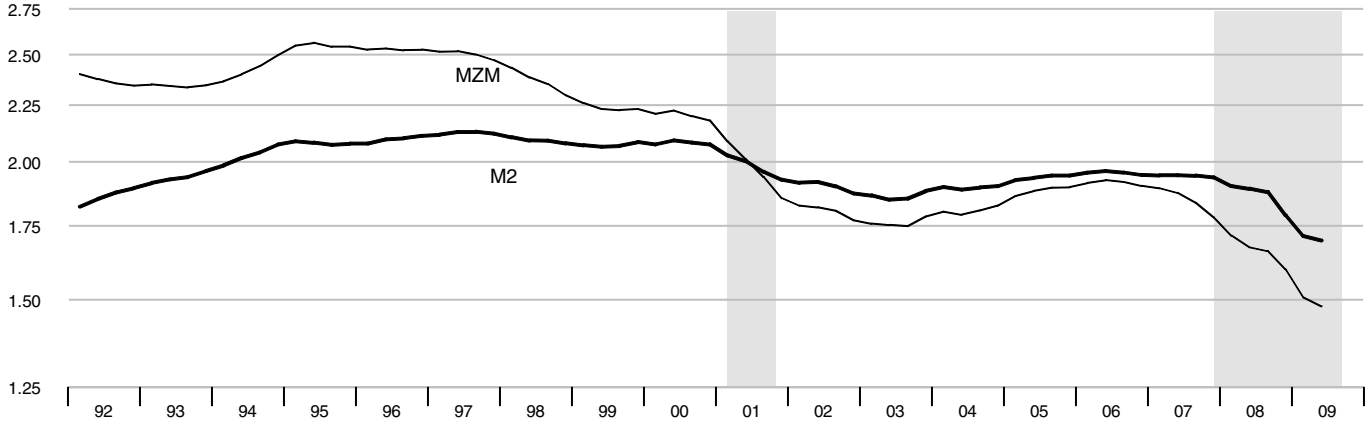
Inflation-Indexed 10-Year Government Yield Spreads

Percent, weekly data



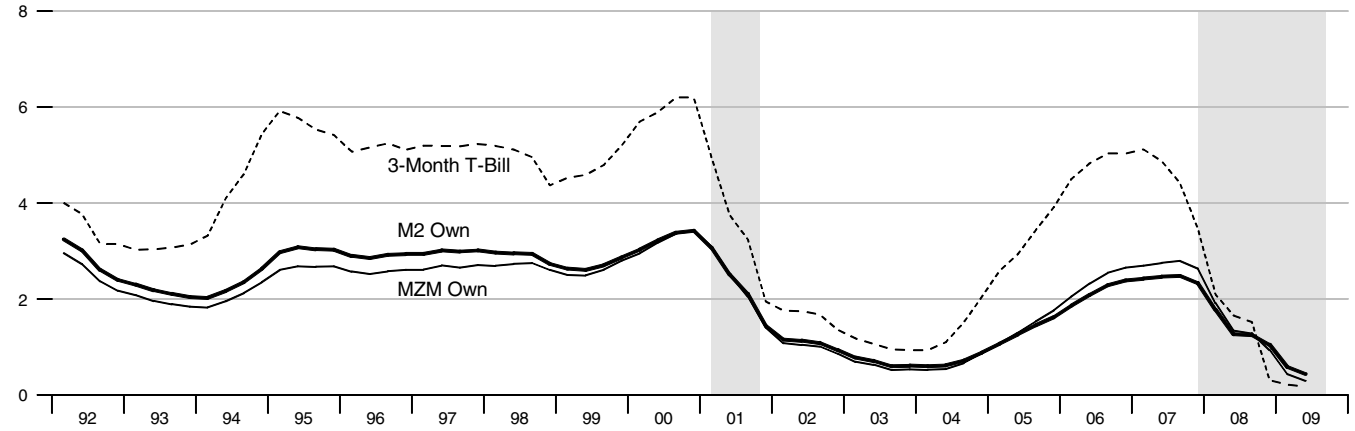
Velocity

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



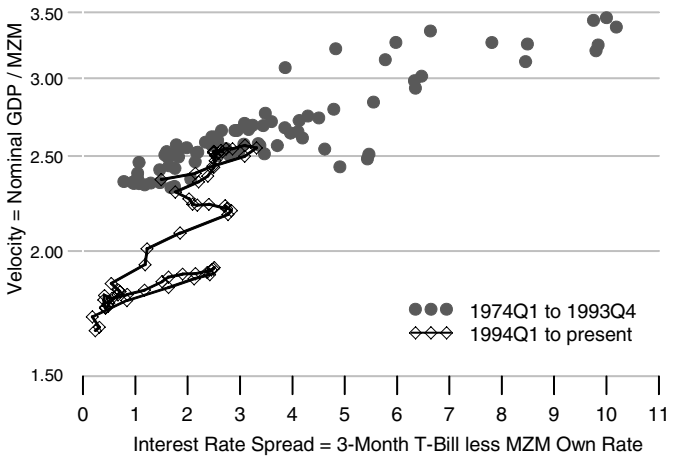
Interest Rates

Percent



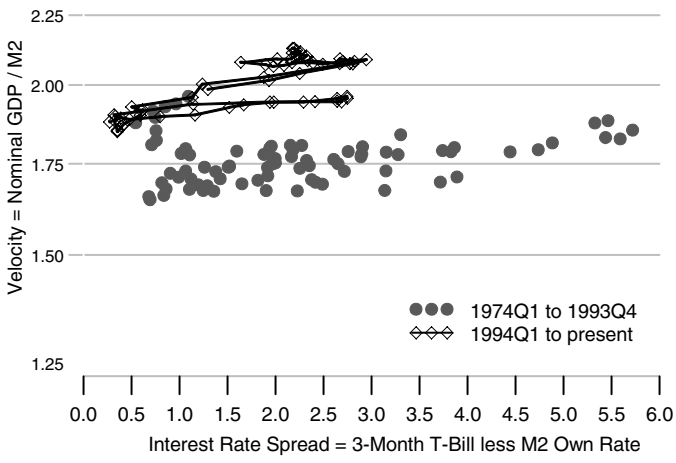
MZM Velocity and Interest Rate Spread

Ratio Scale



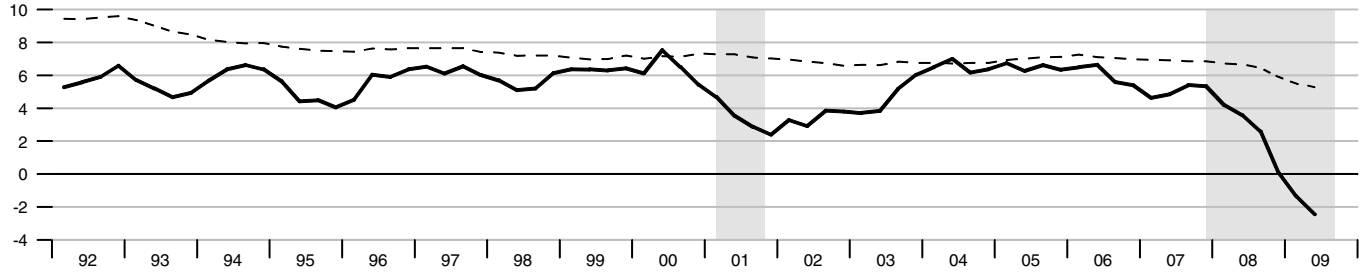
M2 Velocity and Interest Rate Spread

Ratio Scale



Gross Domestic Product

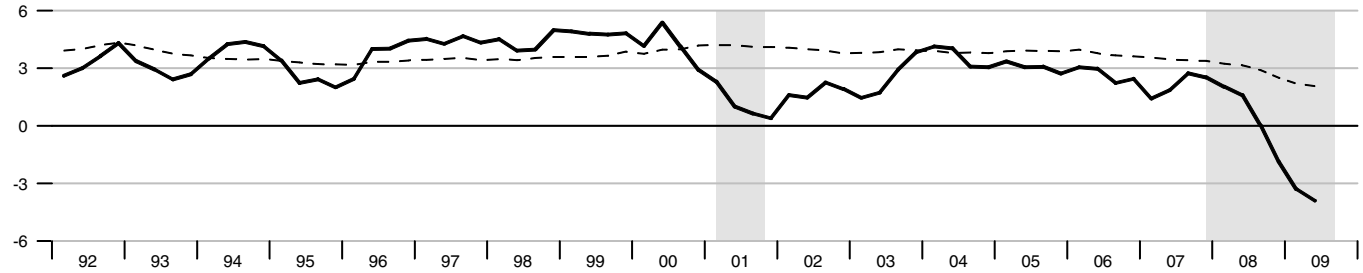
Percent change from year ago



Dashed lines indicate 10-year moving averages.

Real Gross Domestic Product

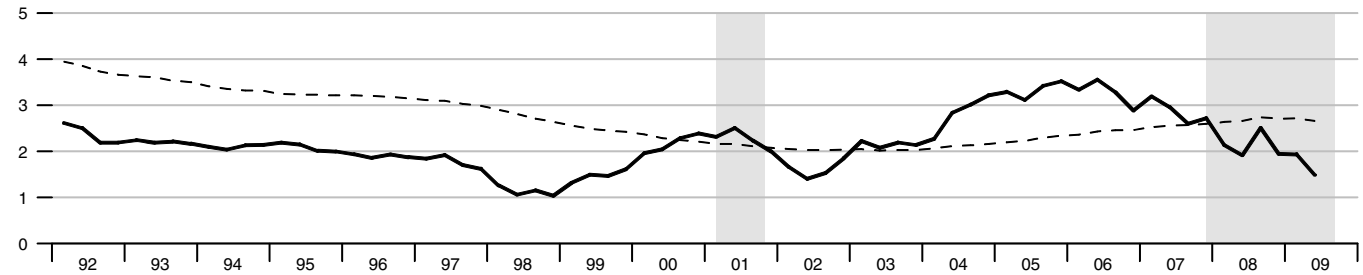
Percent change from year ago



Dashed lines indicate 10-year moving averages.

Gross Domestic Product Price Index

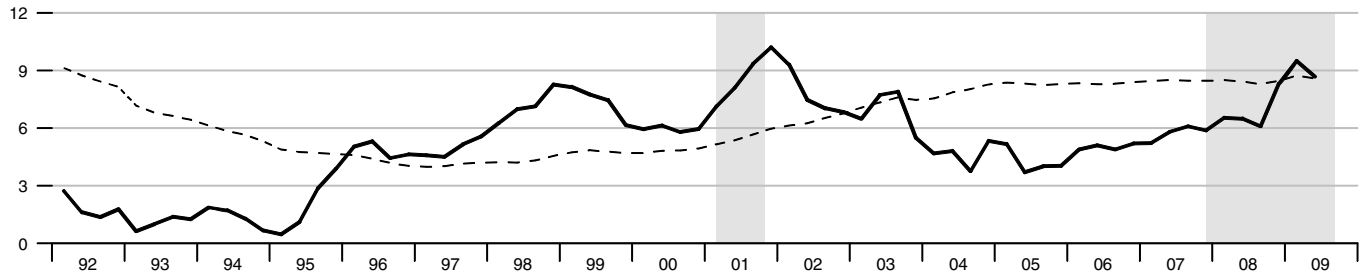
Percent change from year ago



Dashed lines indicate 10-year moving averages.

M2

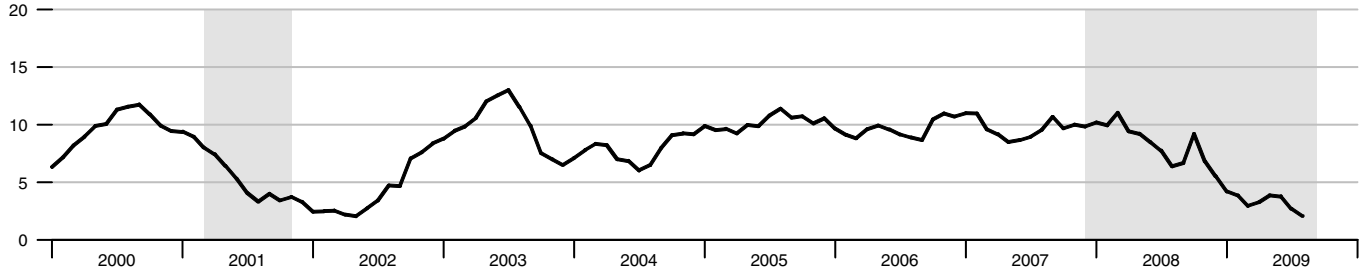
Percent change from year ago



Dashed lines indicate 10-year moving averages.

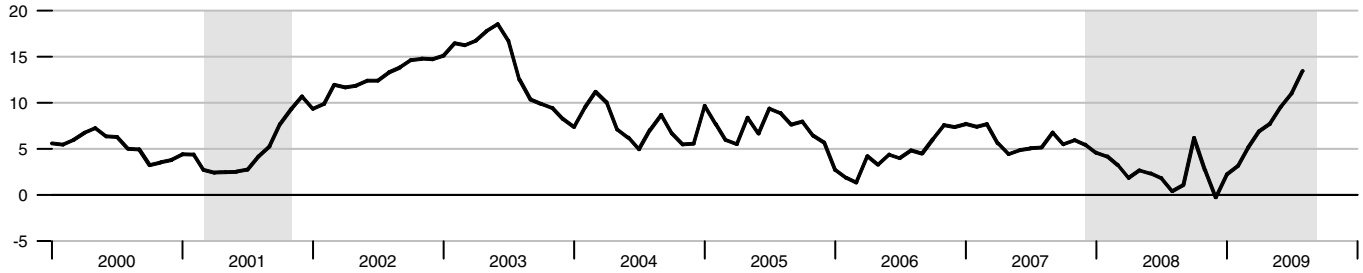
Bank Credit

Percent change from year ago



Investment Securities in Bank Credit at Commercial Banks

Percent change from year ago

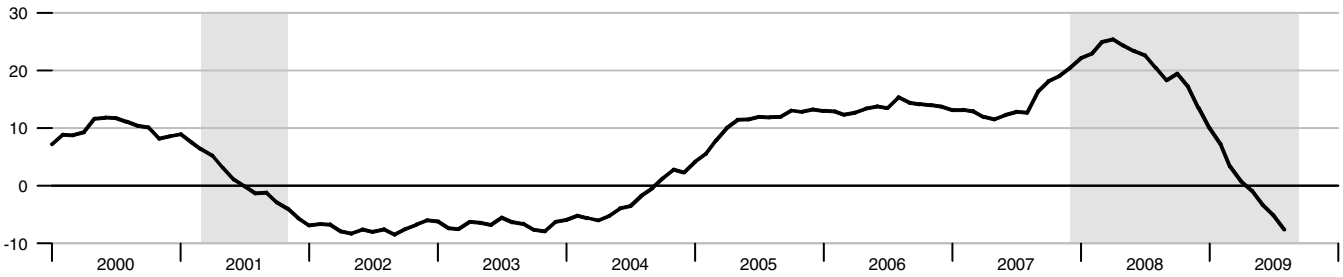


Total Loans and Leases in Bank Credit at Commercial Banks

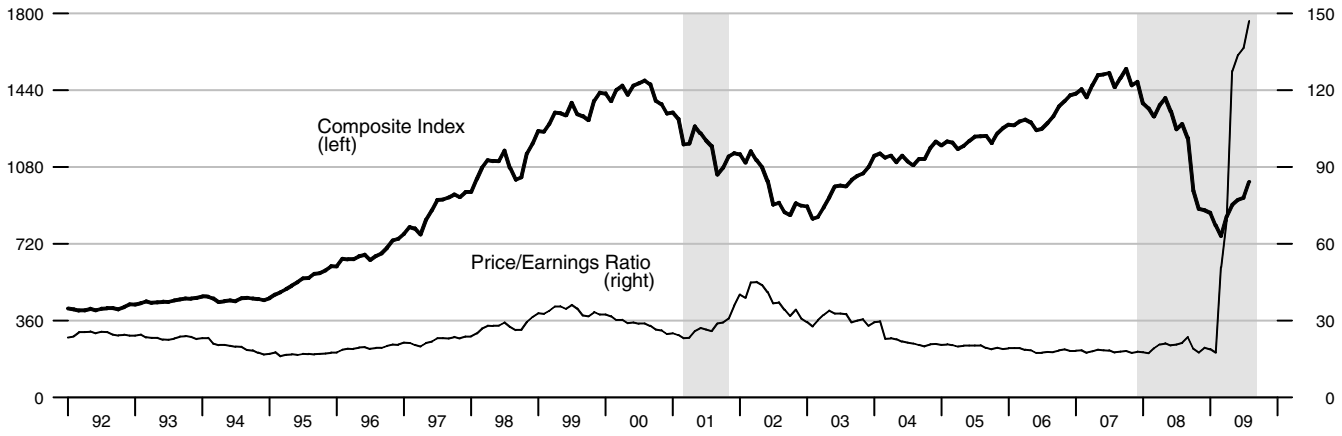
Percent change from year ago

Commercial and Industrial Loans at Commercial Banks

Percent change from year ago



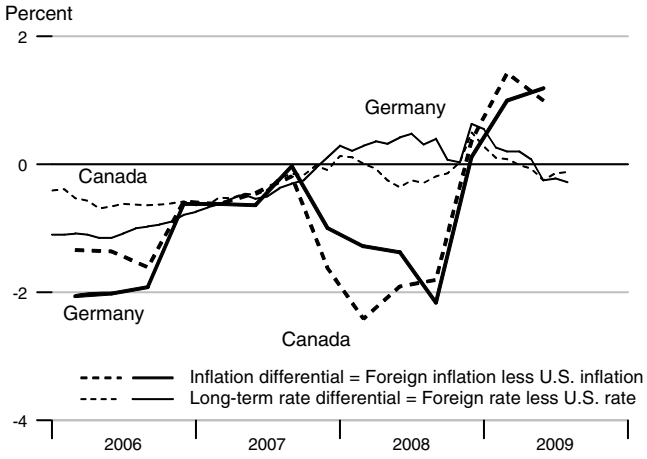
Standard & Poor's 500

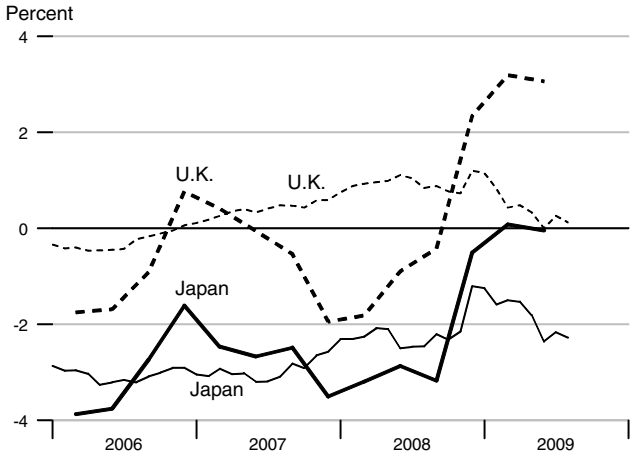


Recent Inflation and Long-Term Interest Rates

	Consumer Price Inflation Rates				Long-Term Government Bond Rates			
	Percent change from year ago				Percent			
	2008Q3	2008Q4	2009Q1	2009Q2	May09	Jun09	Jul09	Aug09
United States	5.23	1.53	-0.18	-0.94	3.29	3.72	3.56	3.59
Canada	3.43	1.91	1.25	0.06	3.22	3.47	3.42	3.47
France	3.25	1.76	0.63	-0.21	3.80	3.90	3.73	.
Germany	3.07	1.65	0.82	0.25	3.37	3.47	3.34	3.31
Italy	3.97	2.80	1.48	0.85	4.42	4.61	4.37	4.12
Japan	2.06	1.03	-0.10	-0.98	1.48	1.36	1.39	1.31
United Kingdom	4.81	3.88	3.01	2.12	3.62	3.72	3.82	3.71

Inflation and Long-Term Interest Rate Differentials





		Money Stock				Bank	Adjusted		
		M1	MZM	M2	M3*	Credit	Monetary Base	Reserves	MSI M2**
	2004	1344.402	6569.805	6262.734	9234.718	6339.387	776.768	96.130	329.873
	2005	1371.751	6707.812	6527.286	9786.477	6986.233	806.628	96.560	343.539
	2006	1374.358	6998.306	6855.111	10270.74	7659.746	835.039	94.913	
	2007	1373.204	7631.767	7249.709		8403.538	850.565	94.181	
	2008	1429.012	8696.990	7747.775		9104.870	1009.740	232.140	
2007	1	1369.341	7288.950	7096.279		8129.742	846.309	94.123	
	2	1376.332	7467.781	7198.776		8246.613	849.917	93.536	
	3	1371.422	7722.617	7298.459		8475.331	852.247	95.409	
	4	1375.722	8047.719	7405.322		8762.465	853.787	93.656	
2008	1	1380.407	8383.297	7560.200		8974.244	856.281	96.134	
	2	1387.124	8666.121	7666.478		8991.919	859.282	94.328	
	3	1417.472	8761.428	7744.084		9062.935	892.651	117.725	
	4	1531.044	8977.114	8020.337		9390.382	1430.746	620.374	
2009	1	1566.382	9406.712	8278.145		9303.264	1663.080	820.767	
	2	1613.409	9555.488	8332.244		9318.901	1763.776	917.223	
2007	Aug	1372.247	7721.432	7302.341		8473.087	853.413	96.623	
	Sep	1371.975	7850.252	7339.922		8585.166	851.463	94.990	
	Oct	1379.223	7962.766	7372.484		8692.417	856.426	93.491	
	Nov	1374.961	8056.860	7405.112		8764.139	857.480	95.721	
	Dec	1372.981	8123.530	7438.371		8830.840	847.454	91.757	
2008	Jan	1377.385	8203.343	7487.626		8922.886	851.406	95.044	
	Feb	1380.535	8402.715	7564.691		8970.963	856.904	96.151	
	Mar	1383.300	8543.832	7628.284		9028.882	860.532	97.207	
	Apr	1383.945	8613.813	7649.316		8971.126	855.198	94.327	
	May	1383.721	8670.218	7669.036		9002.545	859.644	94.868	
	Jun	1393.705	8714.333	7681.082		9002.086	863.005	93.788	
	Jul	1409.267	8765.149	7725.746		9016.310	870.491	96.794	
	Aug	1391.630	8734.432	7698.172		9014.391	871.284	96.486	
	Sep	1451.519	8784.703	7808.334		9158.103	936.177	159.896	
	Oct	1474.683	8827.585	7927.292		9491.948	1142.205	347.653	
	Nov	1523.176	8942.482	7980.016		9360.613	1480.768	674.089	
	Dec	1595.273	9161.276	8153.704		9318.586	1669.264	839.379	
2009	Jan	1576.298	9338.083	8235.939		9297.650	1730.469	870.231	
	Feb	1559.556	9397.445	8263.558		9316.522	1590.254	758.684	
	Mar	1563.291	9484.609	8334.937		9295.620	1668.517	833.386	
	Apr	1593.274	9471.748	8281.773		9263.877	1787.809	949.463	
	May	1596.957	9583.381	8344.932		9350.806	1799.387	946.319	
	Jun	1649.995	9611.334	8370.028		9342.020	1704.131	855.887	
	Jul	1654.684	9602.616	8348.357		9258.934	1693.703	841.476	
	Aug	1649.636	9538.148	8297.651		9201.053	1728.068	879.578	

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

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

		Federal Funds	Primary Credit Rate	Prime Rate	3-mo CDs	Treasury Yields 3-mo	3-yr	10-yr	Corporate Aaa Bonds	Municipal Aaa Bonds	Conventional Mortgage
2004		1.35	2.34	4.34	1.56	1.40	2.78	4.27	5.63	4.50	5.84
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
2007	1	5.26	6.25	8.25	5.31	5.12	4.68	4.68	5.36	3.91	6.22
	2	5.25	6.25	8.25	5.32	4.87	4.76	4.85	5.58	4.13	6.37
	3	5.07	5.93	8.18	5.42	4.42	4.41	4.73	5.75	4.27	6.55
	4	4.50	5.02	7.52	5.02	3.47	3.50	4.26	5.53	4.24	6.23
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
2007	Aug	5.02	6.01	8.25	5.49	4.32	4.34	4.67	5.79	4.30	6.57
	Sep	4.94	5.53	8.03	5.46	3.99	4.06	4.52	5.74	4.26	6.38
	Oct	4.76	5.24	7.74	5.08	4.00	4.01	4.53	5.66	4.20	6.38
	Nov	4.49	5.00	7.50	4.97	3.35	3.35	4.15	5.44	4.26	6.21
	Dec	4.24	4.83	7.33	5.02	3.07	3.13	4.10	5.49	4.25	6.10
2008	Jan	3.94	4.48	6.98	3.84	2.82	2.51	3.74	5.33	4.13	5.76
	Feb	2.98	3.50	6.00	3.06	2.17	2.19	3.74	5.53	4.42	5.92
	Mar	2.61	3.04	5.66	2.79	1.28	1.80	3.51	5.51	4.63	5.97
	Apr	2.28	2.49	5.24	2.85	1.31	2.23	3.68	5.55	4.45	5.92
	May	1.98	2.25	5.00	2.66	1.76	2.69	3.88	5.57	4.34	6.04
	Jun	2.00	2.25	5.00	2.76	1.89	3.08	4.10	5.68	4.50	6.32
	Jul	2.01	2.25	5.00	2.79	1.66	2.87	4.01	5.67	4.44	6.43
	Aug	2.00	2.25	5.00	2.79	1.75	2.70	3.89	5.64	4.44	6.48
	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		5.19

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

		M1	MZM	M2	M3*
Percent change at an annual rate					
	2004	5.57	3.83	4.64	5.09
	2005	2.03	2.10	4.22	5.97
	2006	0.19	4.33	5.02	4.95
	2007	-0.08	9.05	5.76	
	2008	4.06	13.96	6.87	
2007	1	0.16	7.48	5.85	
	2	2.04	9.81	5.78	
	3	-1.43	13.65	5.54	
	4	1.25	16.84	5.86	
2008	1	1.36	16.68	8.37	
	2	1.95	13.49	5.62	
	3	8.75	4.40	4.05	
	4	32.05	9.85	14.27	
2009	1	9.23	19.14	12.86	
	2	12.01	6.33	2.61	
2007	Aug	1.93	19.79	8.14	
	Sep	-0.24	20.02	6.18	
	Oct	6.34	17.20	5.32	
	Nov	-3.71	14.18	5.31	
	Dec	-1.73	9.93	5.39	
2008	Jan	3.85	11.79	7.95	
	Feb	2.74	29.16	12.35	
	Mar	2.40	20.15	10.09	
	Apr	0.56	9.83	3.31	
	May	-0.19	7.86	3.09	
	Jun	8.66	6.11	1.88	
	Jul	13.40	7.00	6.98	
	Aug	-15.02	-4.21	-4.28	
	Sep	51.64	6.91	17.17	
	Oct	19.15	5.86	18.28	
	Nov	39.46	15.62	7.98	
	Dec	56.80	29.36	26.12	
2009	Jan	-14.27	23.16	12.10	
	Feb	-12.75	7.63	4.02	
	Mar	2.87	11.13	10.37	
	Apr	23.02	-1.63	-7.65	
	May	2.77	14.14	9.15	
	Jun	39.85	3.50	3.61	
	Jul	3.41	-1.09	-3.11	
	Aug	-3.66	-8.06	-7.29	

*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. **Large Time Deposits** are deposits of $100,000 or more. **Retail** and **Institutional Money Market Mutual Funds** are as included in M2 and the non-M2 component of M3, respectively.

Page 7: **Excess Reserves plus RCB (Required Clearing Balance) Contracts** equals the amount of deposits at Federal Reserve Banks held by depository institutions but not applied to satisfy statutory reserve requirements. (This measure excludes the vault cash held by depository institutions that is not applied to satisfy statutory reserve requirements.) **Consumer Credit** includes most short- and intermediate-term credit extended to individuals. See *Statistical Supplement to the Federal Reserve Bulletin*, table 1.55.

Page 8: **Inflation Expectations** measures include the quarterly Federal Reserve Bank of Philadelphia *Survey of Professional Forecasters*, the monthly University of Michigan Survey Research Center's *Surveys of Consumers*, and the annual Federal Open Market Committee (FOMC) range as reported to the Congress in the February testimony that accompanies the Monetary Policy Report to the Congress. Beginning February 2000, the FOMC began using the personal consumption expenditures (PCE) price index to report its inflation range; the FOMC then switched to the PCE chain-type price index excluding food and energy prices ("core") beginning July 2004. Accordingly, neither are shown on this graph. **CPI Inflation** is the percentage change from a year ago in the consumer price index for all urban consumers. **Real Interest Rates** are ex post measures, equal to nominal rates minus 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). Since the July 2009 NIPA revision, there is a discrepancy between real GDP (in billions of chained 2005 dollars) and CBO real potential GDP (in billions of chained 2000 dollars). We have multiplied each quarterly observation of CBO real potential GDP by a factor of 1.14. This scaling factor is the average of the ratio of real GDP in billions of chained 2005 dollars to real GDP in billions of chained 2000 dollars for the four quarters of 2005.

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 4-year moving average of base velocity growth, 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 $m = 1,\ldots,$ 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),

$$f(m) = [D(m)R(m) - D(m\text{–}1)] \,/\, [D(m) - D(m\text{–}1)],$$

where duration is approximated as $D(m) = (1 - e^{-R(m) \times m})/R(m)$. These rates are linear approximations to the true instantaneous forward rates; see Shiller (1990). For a discussion of the use of forward rates as indicators of inflation expectations, see Sharpe (1997). **Rates on 3-Month Eurodollar Futures** and **Rates on Selected Federal Funds Futures Contracts** trace through time the yield on three specific contracts. **Rates on Federal Funds Futures on Selected Dates** displays a single day's snapshot of yields for contracts expiring in the months shown on the horizontal axis. **Inflation-Indexed Treasury Securities and Yield Spreads** are those plotted on page 3. **Inflation-Indexed 10-Year Government Notes** shows the yield of an inflation-indexed note that is scheduled to mature in approximately (but not greater than) 10 years. The current French note has a maturity date of 7/25/2015, the current U.K. note has a maturity date of 8/16/2013, and the current U.S. note has a maturity date of 1/15/2018. **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.

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/.