Monetary Trends

February 2009

Bagehot on the Financial Crises of 1825…and 2008

Recently, several federal agencies, including the Federal Reserve, FDIC, and Treasury, have created numerous programs to support credit flows.[1] Some analysts have criticized these programs as "scattershot," as lacking focus, or as desperate attempts to be perceived as "doing something."[2] Others have argued that care must be taken so that these programs do not violate Walter Bagehot's maxim that central banks must lend only against good collateral and at penalty rates (Thornton, 2008). Here, I argue that these programs are appropriate and consistent with lessons learned from two centuries of monetary history.

Macroeconomists continue to find use in Bagehot's *Lombard Street* (1873), a book that prescribed behavioral rules for the Bank of England when Great Britain had no statutory central bank but the Bank held the nation's gold reserve and special statutory authority to issue banknotes. Bagehot's principal message was that the first task of a central bank during a financial panic is to end the panic—a message that remains true today. He defined a panic, in his day, as a period when the public wished to hold only gold coin, bullion, or Bank of England banknotes. Quelling a panic required satisfying the public's demand for these risk-free liquid assets. It was the practice of the Bank to lend aggressively during panics, and several times before his writing the Bank had nearly exhausted its reserves. Further, lending could not always be against "good" collateral since the panic itself harmed the market value of assets. Bagehot advised a lending rate sufficiently high to avoid exhausting the Bank's reserves and adequate collateral to ensure that the Bank, a private institution, would not itself become insolvent.[3]

The applicability of Bagehot's advice is limited today. Modern central banks in fiat money economies do not face the constraints that concerned Bagehot—their right to issue high-powered money cannot be exhausted, nor can they become insolvent. Modern research suggests, instead, two pieces of advice. The first is that panics tend to follow periods of increasing *asymmetric information* between borrowers and lenders, leading to an underpricing of risk associated with new financial securities and instruments. During the panic, information becomes more uniform, asset prices change, and some lenders/investors become insolvent. The central bank's role is to assist markets in this price discovery process by keeping them as orderly as possible. This mechanism has been explored by Kindleberger (1978), Mishkin (1991), Neal (1998), and others. The second piece of advice is that preserving the banking system through the panic is essential because banking firms, more so than other institutions, process private information and monitor borrowers. Sustaining the banking firms does *not* preclude imposing losses on the firms' owners and debtors, but maintaining the firms may require lending on questionable collateral. Friedman and Schwartz (1963) argue that such efforts during the Great Depression were inadequate, and they quote approvingly Bagehot's summary of how the Bank of England halted history's first modern financial panic (*Lombard Street*, pp. 51-52):

> The way in which the panic of 1825 was stopped by advancing money has been described in so broad and graphic a way that the passage has become classical. "We lent it," said Mr. Harman [a senior director] on behalf of the Bank of England, "by every possible means and in modes we have never adopted before; we took in stock on security, we purchased Exchequer bills, we made advances on Exchequer bills, we not only discounted outright, but we made advances on the deposit of bills of exchange to an immense amount, in short, by every possible means consistent with the safety of the Bank, and we were not on some occasions over-nice [to borrowers]."

It is clear in the historical record that the Federal Reserve's founders expected all Fed lending to be repaid; doing otherwise would be to conduct fiscal rather than monetary policy. Further, Bagehot's first advice to central banks remains: In a financial panic, quell the panic by every possible means, mindful that an effective monetary policy during a panic cannot be risk free.

—Richard G. Anderson

References

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[1] A summary and timeline are available at http://www.stlouisfed.org/timeline/.

[2] Examples include Leonhardt (2008) and the testimony of Mark Zandi, chief economist of Moody's Economy.com, before the U.S. Senate Budget Committee, November 19, 2008.

[3] The Bank of England at this time was a private bank with shareholders and dividend payments.

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:

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

or to:

stlsFRED@stls.frb.org

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

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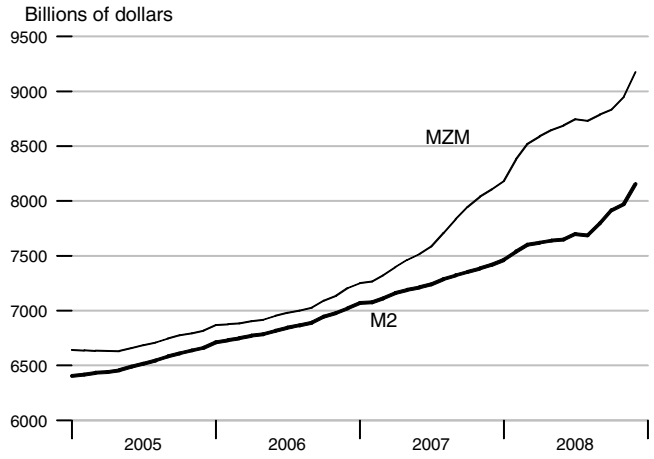
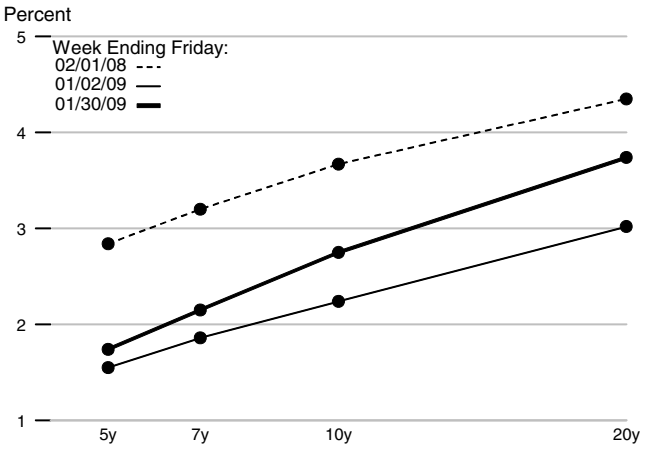
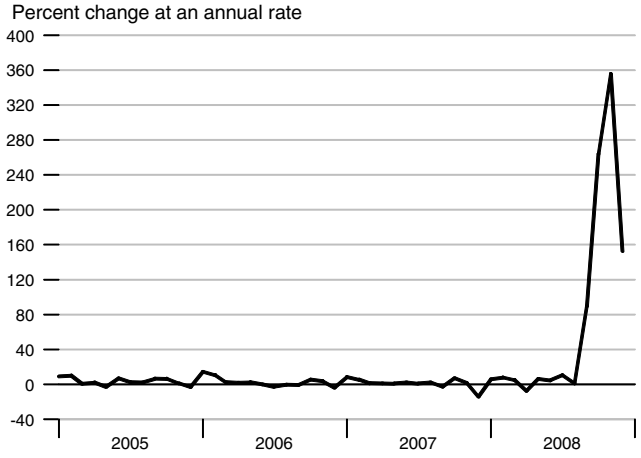
M2 and MZM



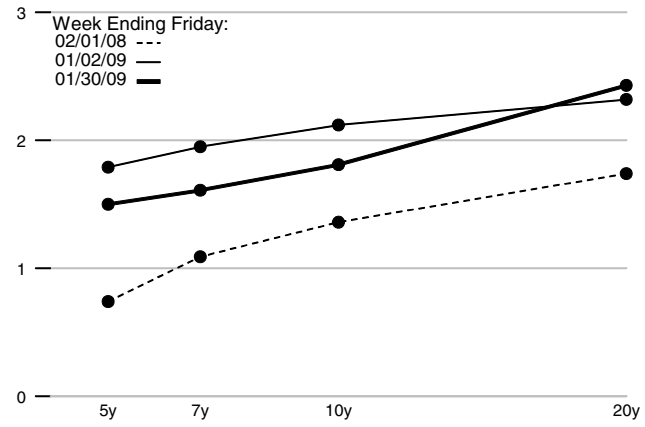
Treasury Yield Curve



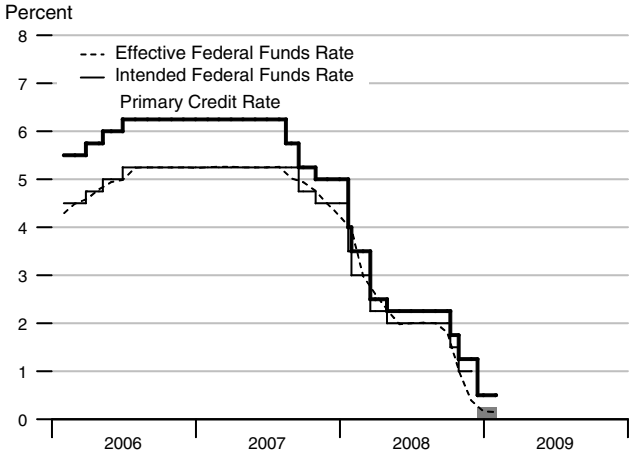
Adjusted Monetary Base



Real Treasury Yield Curve

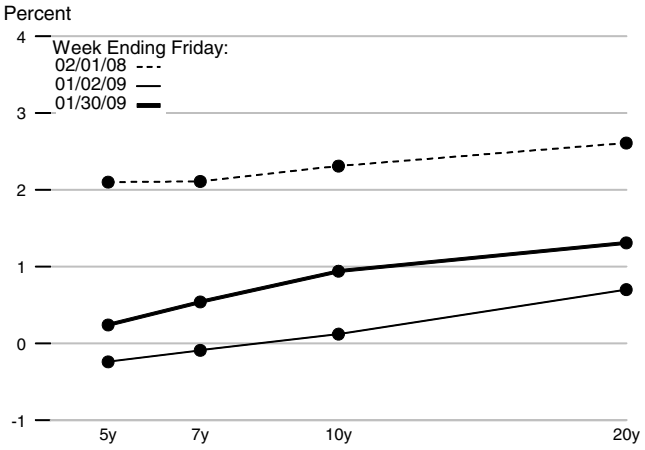


Reserve Market Rates



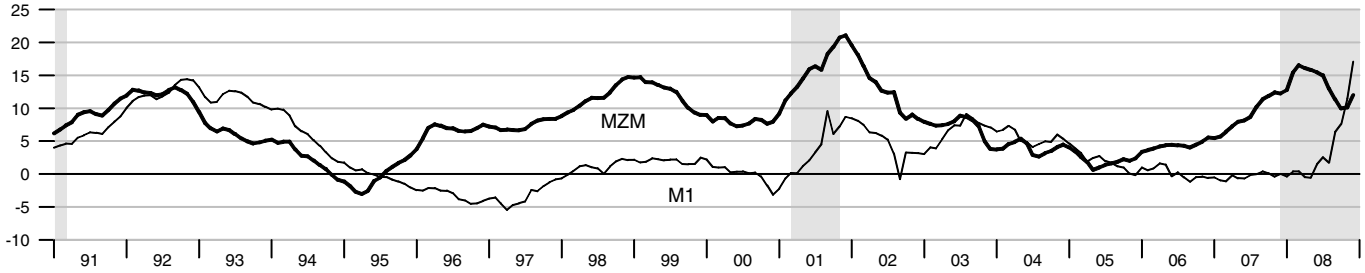
Data available as of January 2009.
Note: Effective December 16, 2008, FOMC reports the intended Federal Funds Rate as a range.

Inflation-Indexed Treasury Yield Spreads



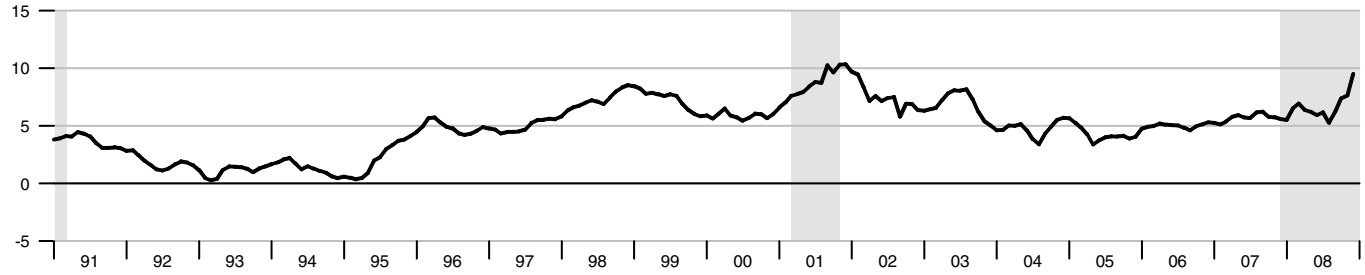
MZM and M1

Percent change from year ago



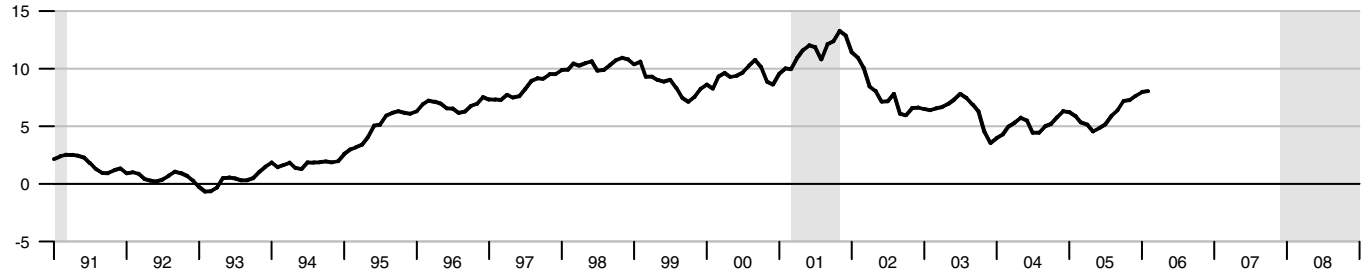
M2

Percent change from year ago



M3*

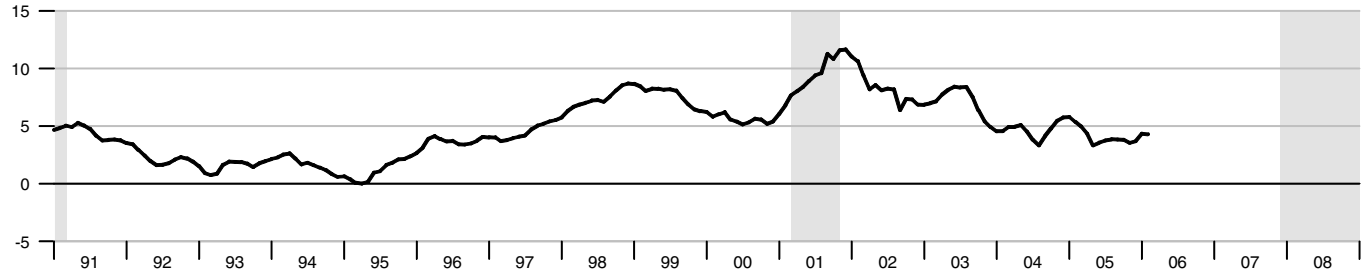
Percent change from year ago



*See table of contents for changes to the series.

Monetary Services Index - M2**

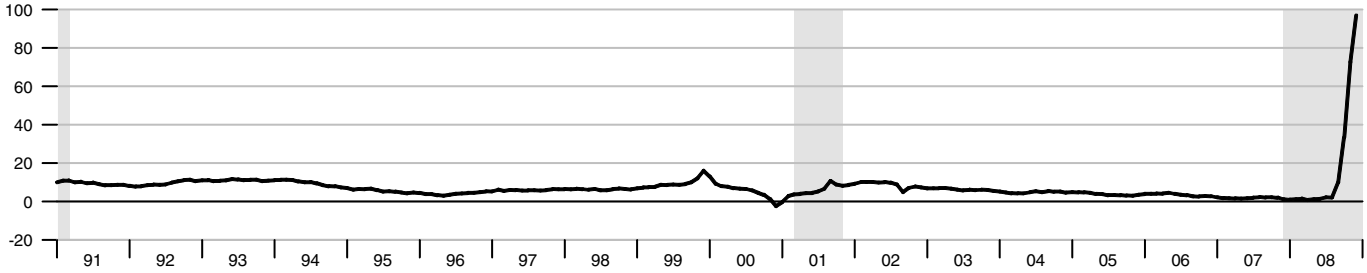
Percent change from year ago



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

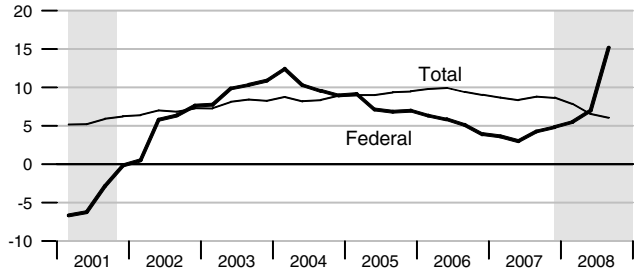
Adjusted Monetary Base

Percent change from year ago



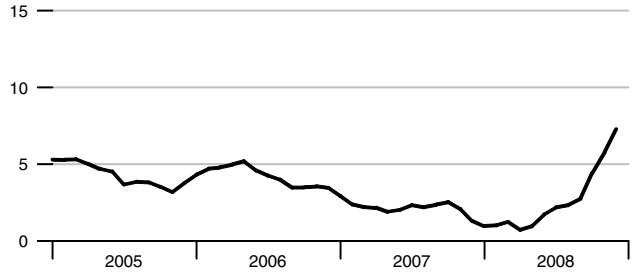
Domestic Nonfinancial Debt

Percent change from year ago



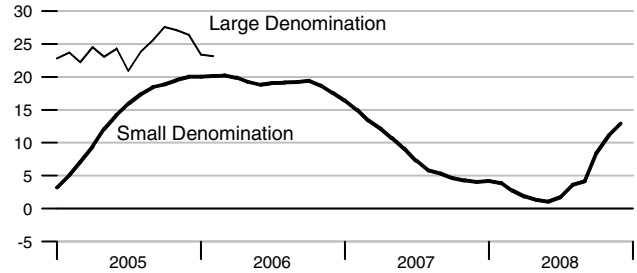
Currency Held by the Nonbank Public

Percent change from year ago



Time Deposits*

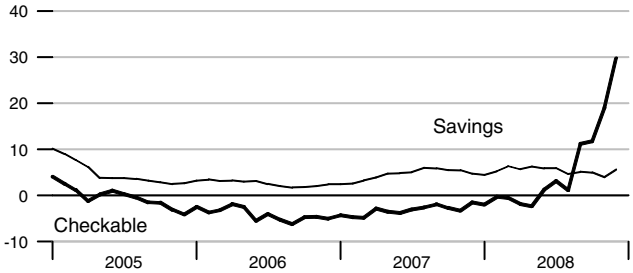
Percent change from year ago



*See table of contents for changes to the series.

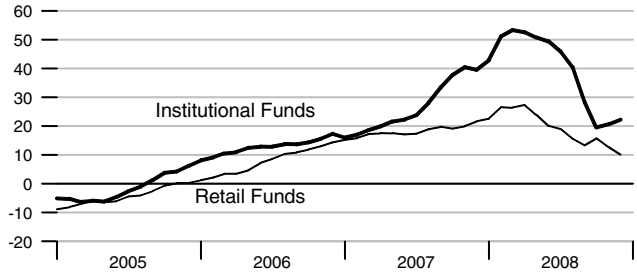
Checkable and Savings Deposits

Percent change from year ago



Money Market Mutual Fund Shares

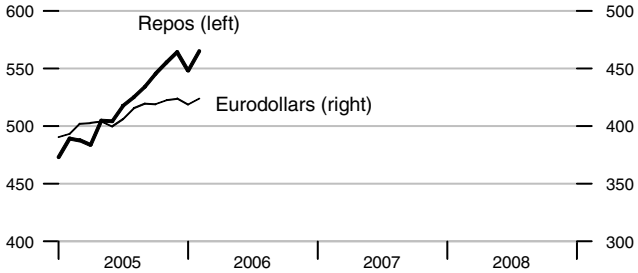
Percent change from year ago



Repurchase Agreements and Eurodollars*

Billions of dollars

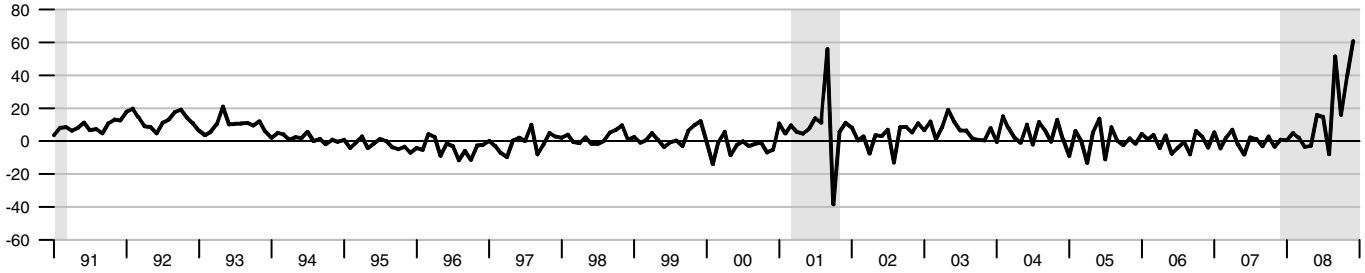
Billions of dollars



*See table of contents for changes to these series.

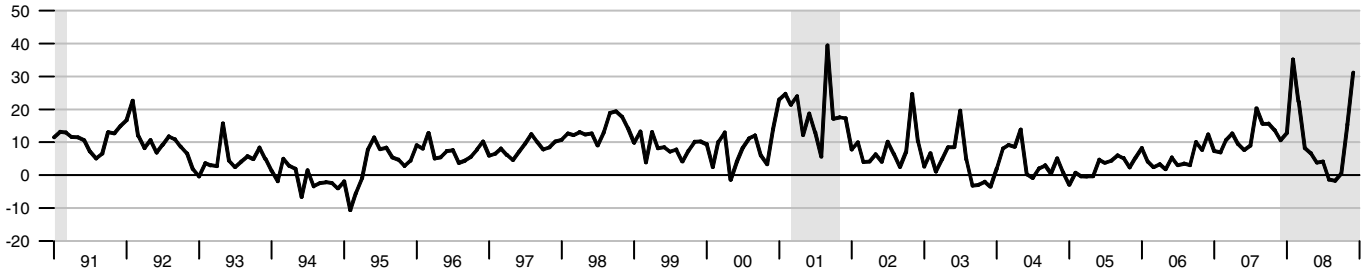
M1

Percent change at an annual rate



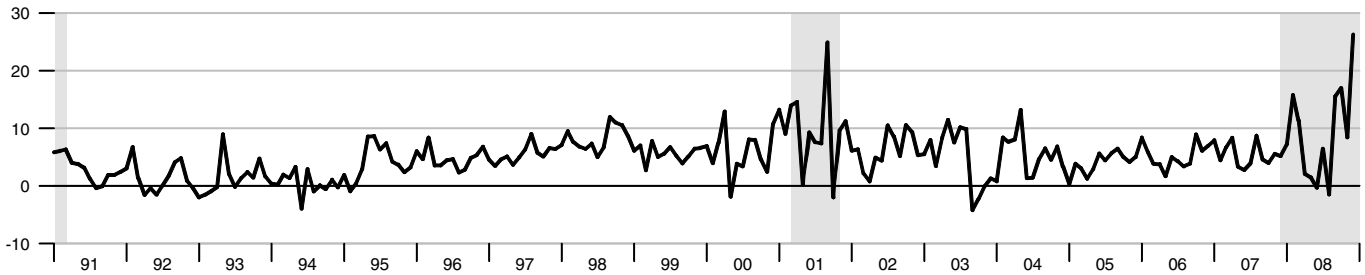
MZM

Percent change at an annual rate



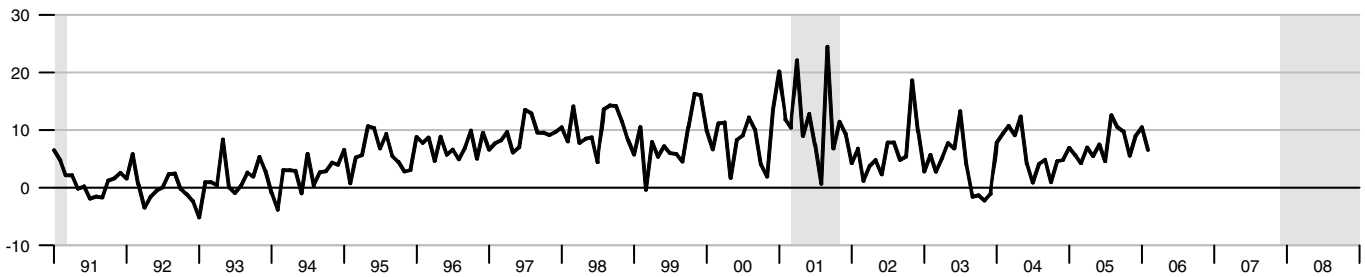
M2

Percent change at an annual rate



M3*

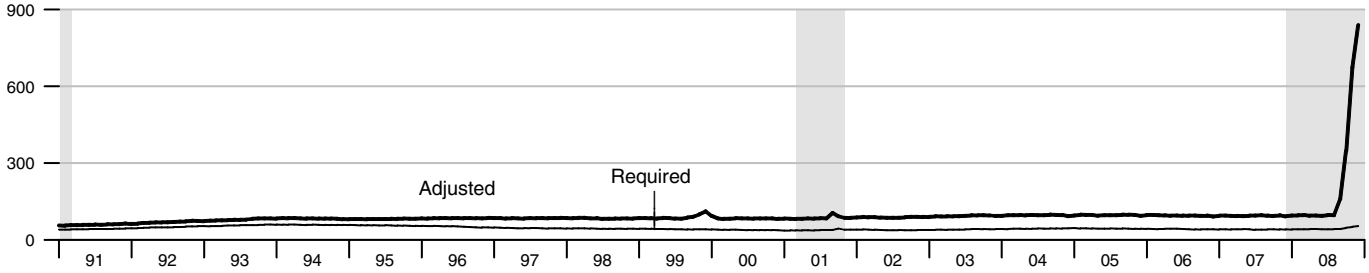
Percent change at an annual rate



*See table of contents for changes to the series.

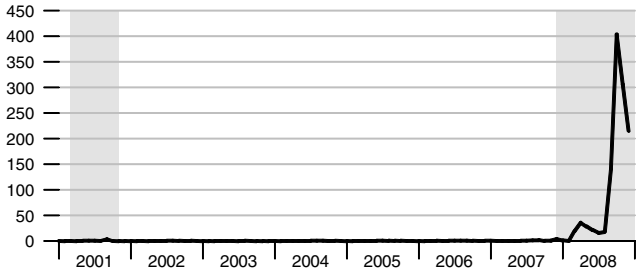
Adjusted and Required Reserves

Billions of dollars



Total Borrowings, nsa

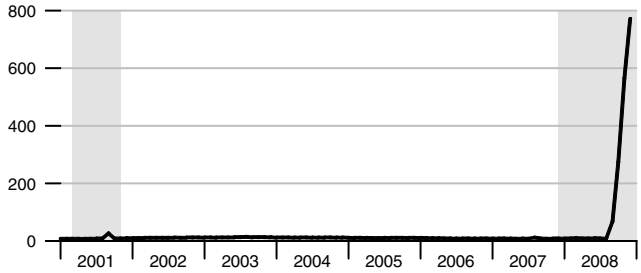
Billions of dollars



* Data exclude term auction credit

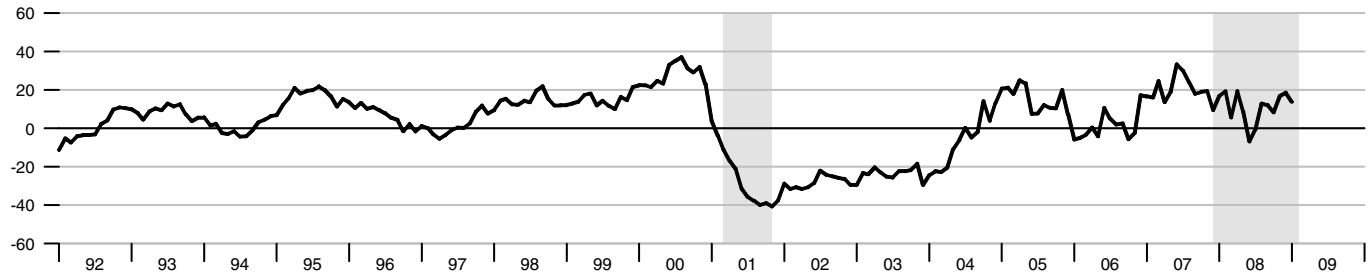
Excess Reserves plus RCB Contracts

Billions of dollars



Nonfinancial Commercial Paper

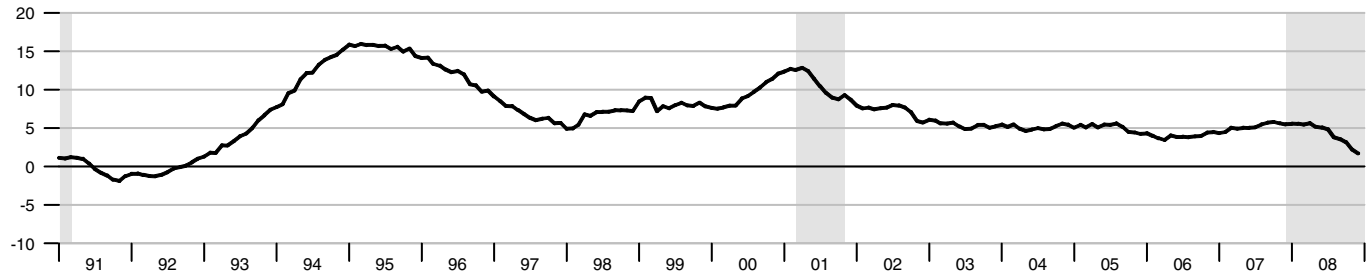
Percent change from year ago



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.

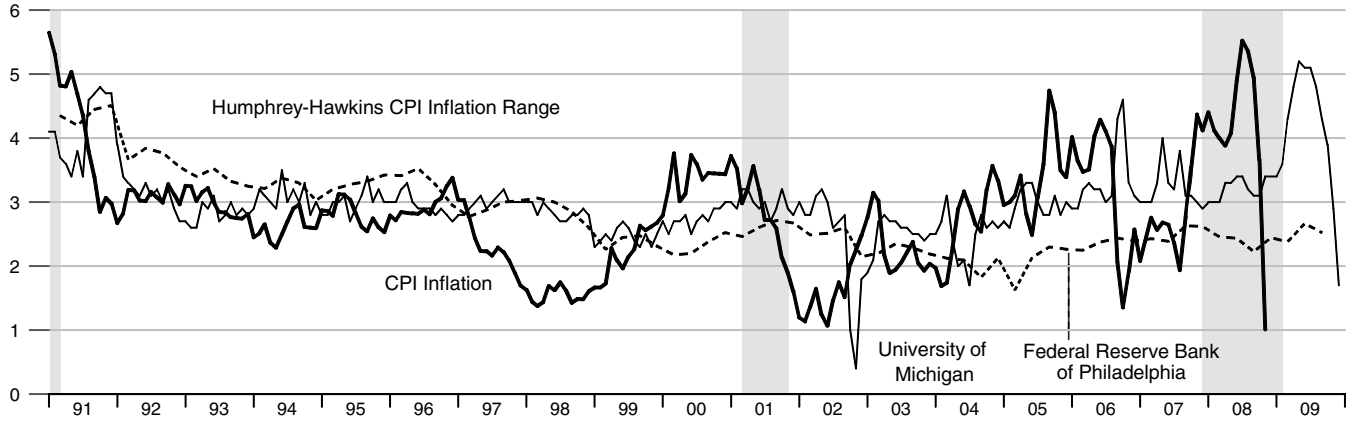
Consumer Credit

Percent change from year ago



CPI Inflation and 1-Year-Ahead CPI Inflation Expectations

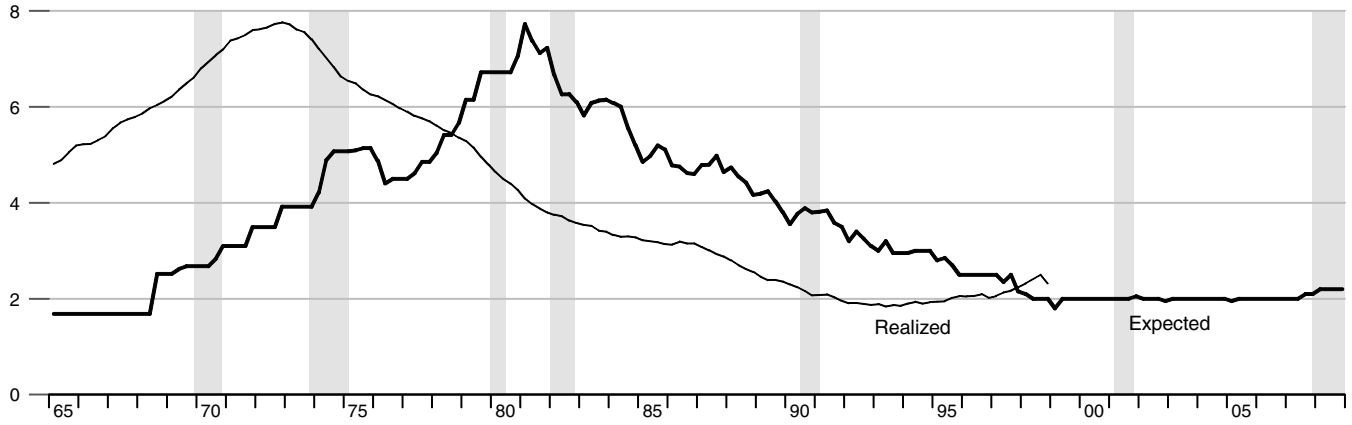
Percent



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

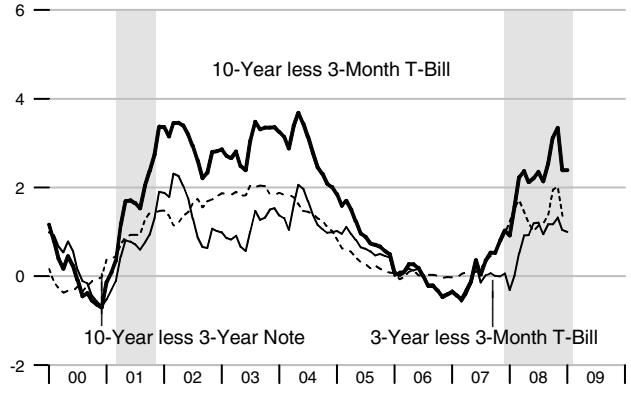
Percent



See the notes section for an explanation of the chart.

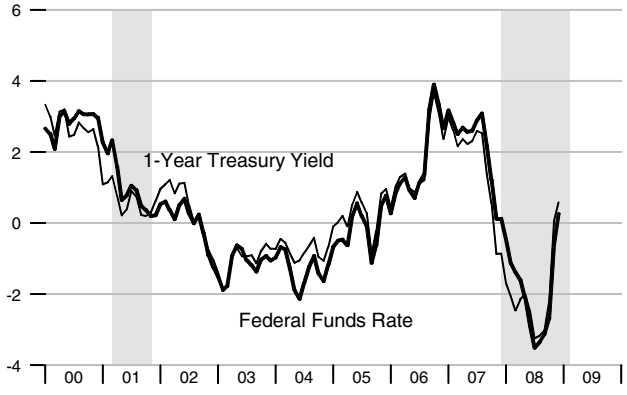
Treasury Security Yield Spreads

Yield to maturity

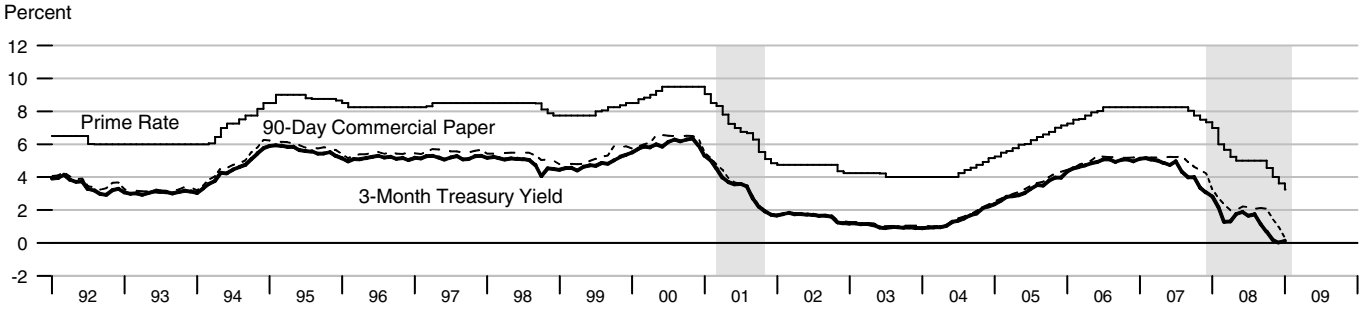


Real Interest Rates

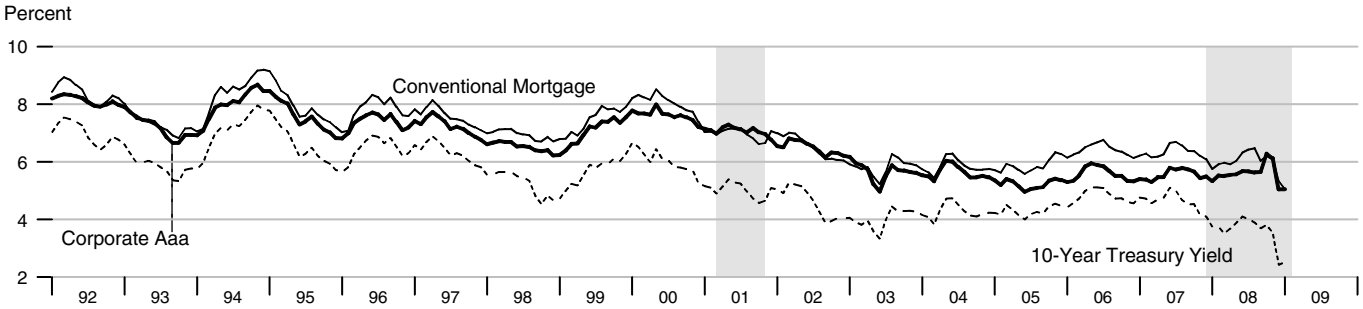
Percent, Real rate = Nominal rate less year-over-year CPI inflation



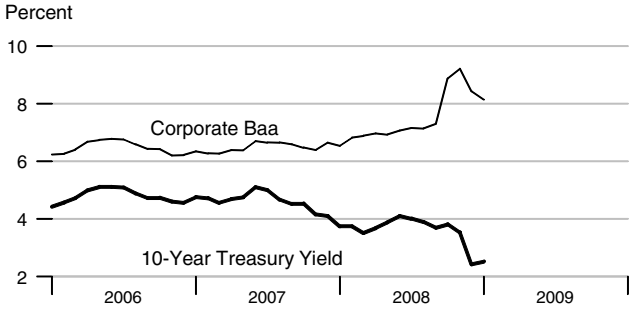
Short-Term Interest Rates



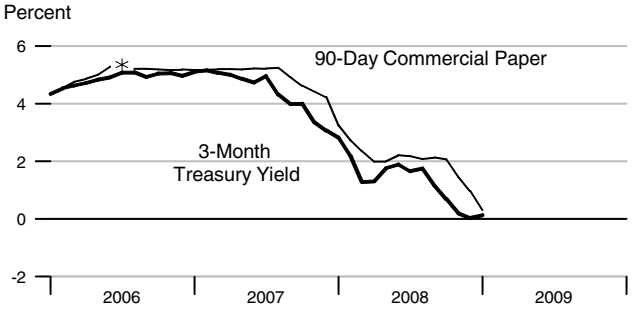
Long-Term Interest Rates



Long-Term Interest Rates

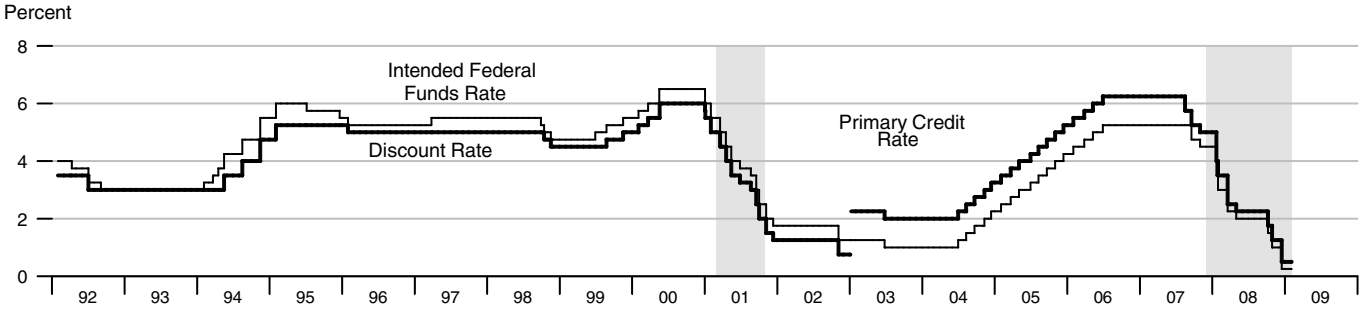


Short-Term Interest Rates



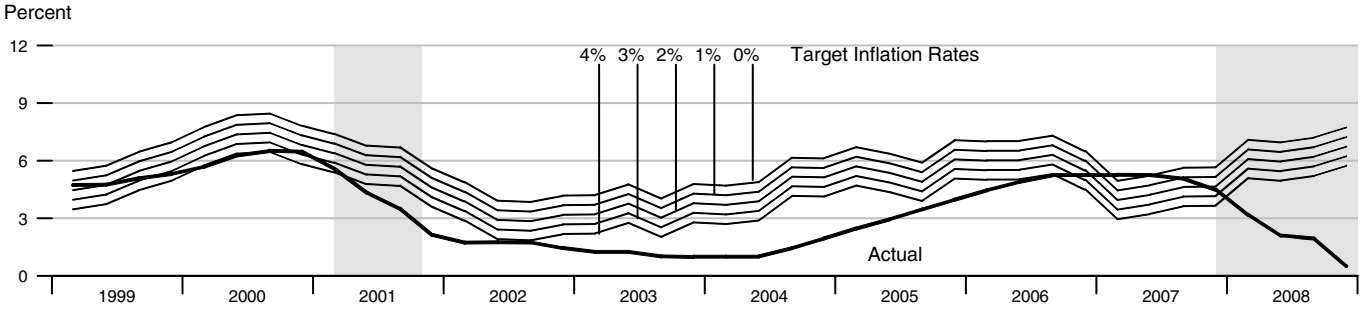
*90-Day Commercial Paper data are not available for December 2005, January 2006, and July 2006.

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



Data available as of January 2009.

Federal Funds Rate and Inflation Targets

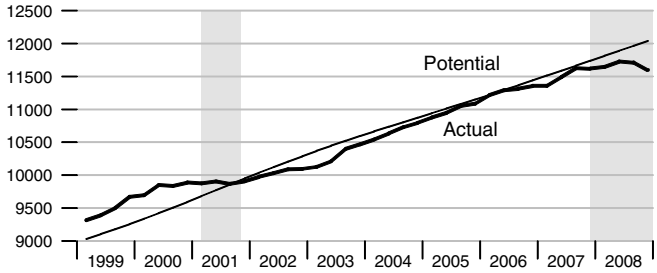


Calculated federal funds rate is based on Taylor's rule.

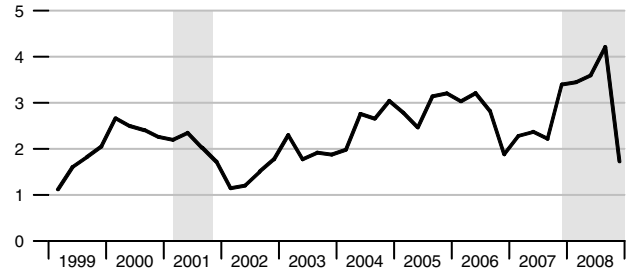
See notes on page 19.

Components of Taylor's Rule

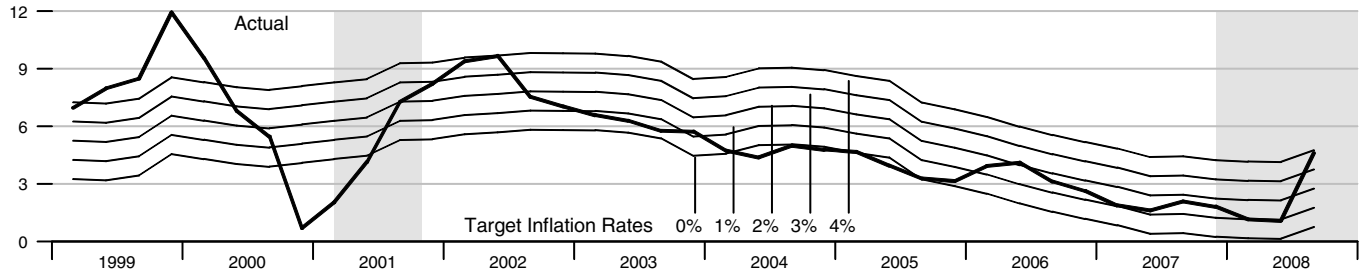
Actual and Potential Real GDP



PCE Inflation



Monetary Base Growth* and Inflation Targets

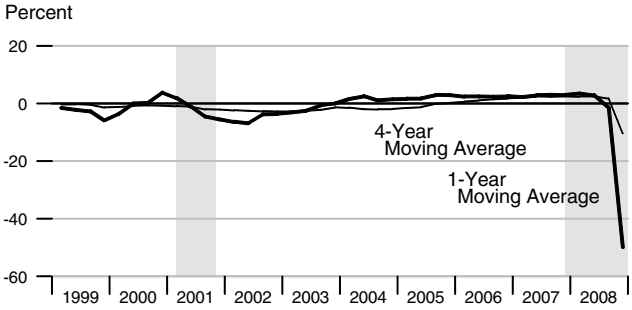


*Modified for the effects of sweeps programs on reserve demand.
Calculated base growth is based on McCallum's rule. Actual base growth is percent change from year ago.

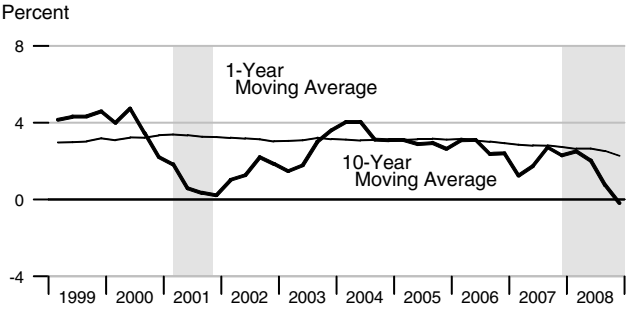
See notes on page 19.

Components of McCallum's Rule

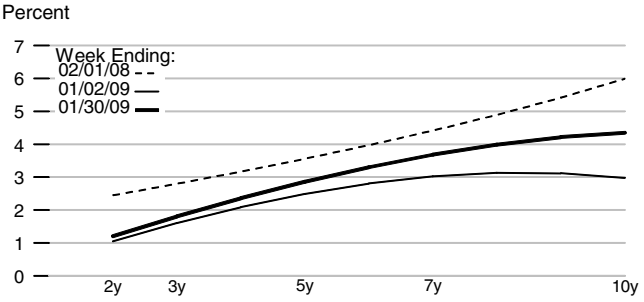
Monetary Base Velocity Growth



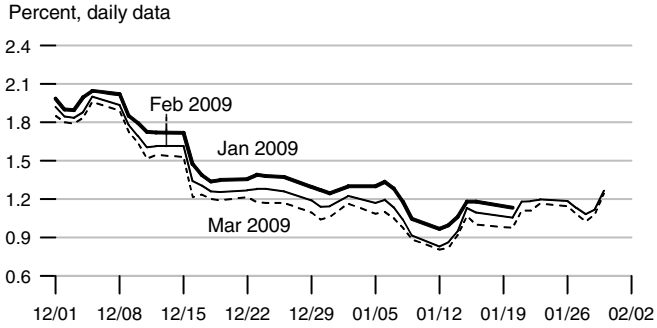
Real Output Growth



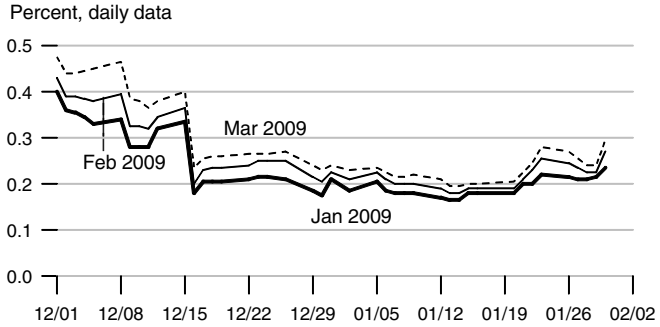
Implied One-Year Forward Rates



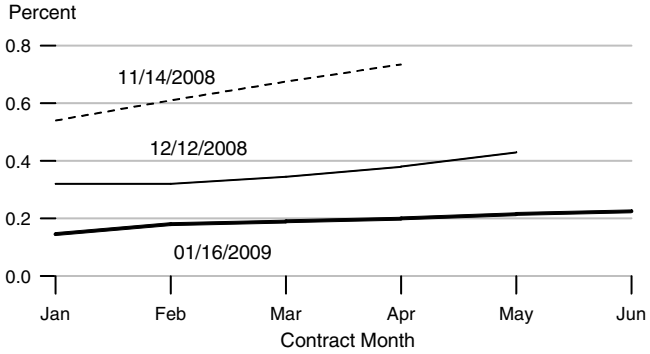
Rates on 3-Month Eurodollar Futures



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

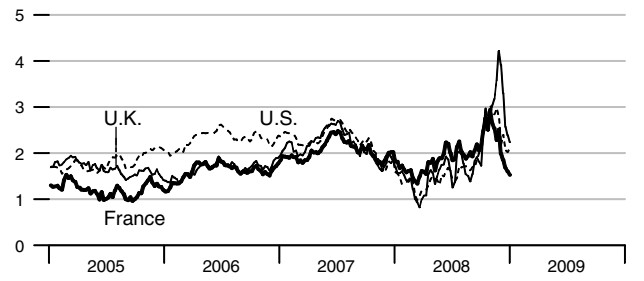
Inflation-Indexed Treasury Yield Spreads

Weekly data

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

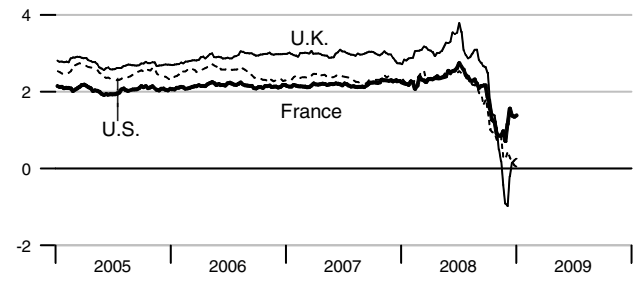
Inflation-Indexed 10-Year Government Notes

Percent, weekly data



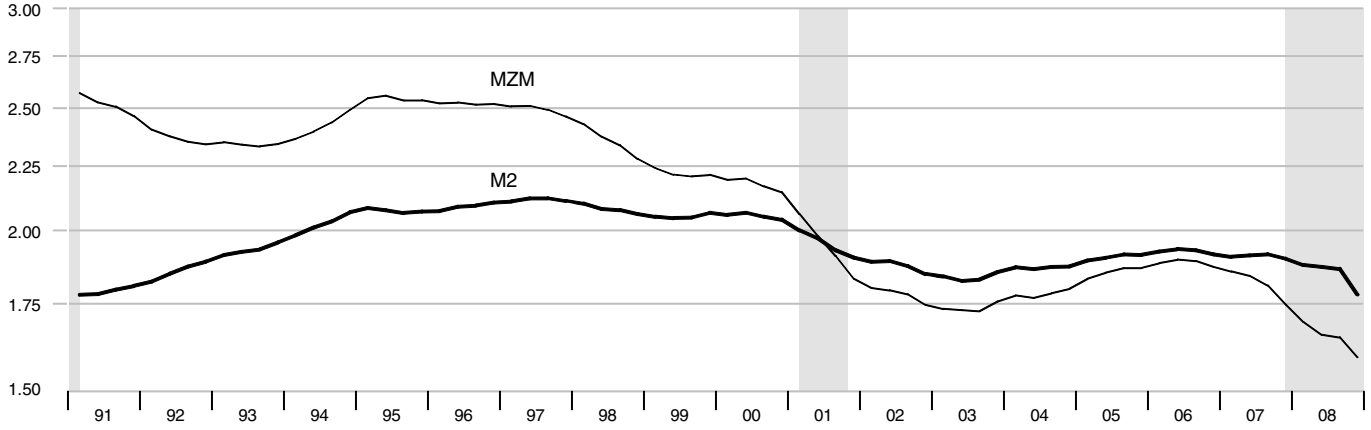
Inflation-Indexed 10-Year Government Yield Spreads

Percent, weekly data



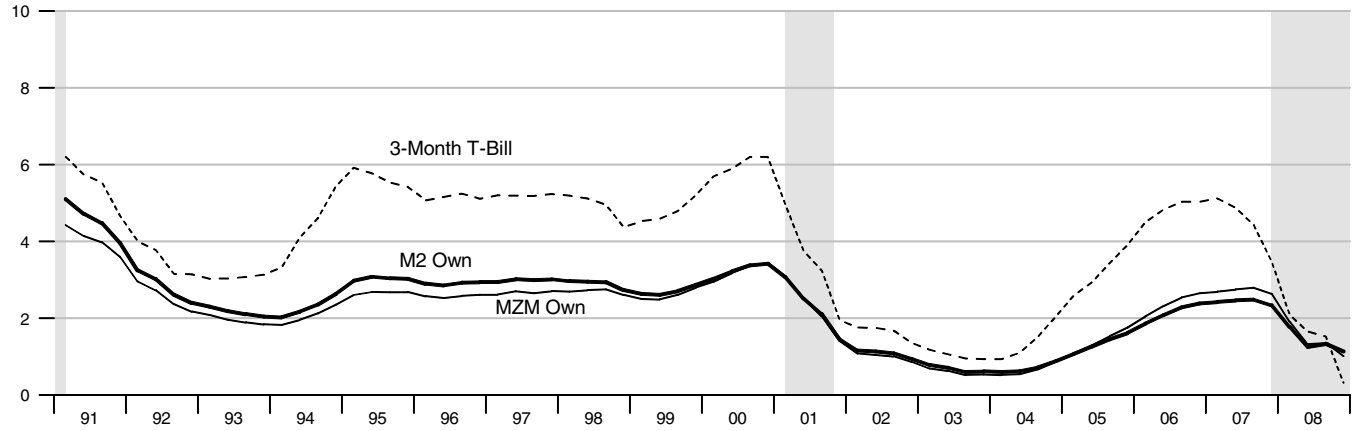
Velocity

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



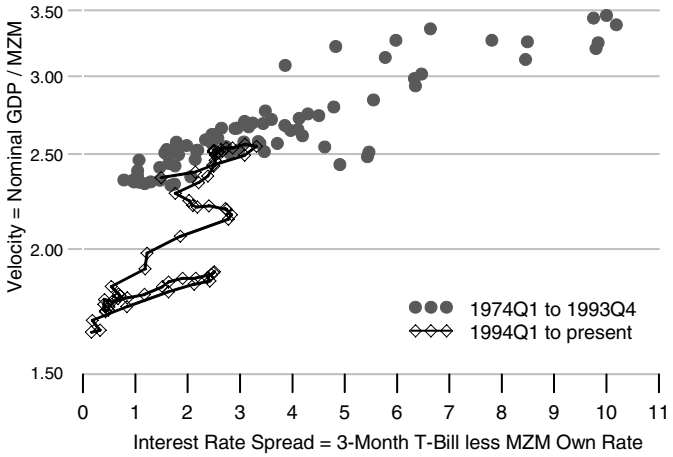
Interest Rates

Percent



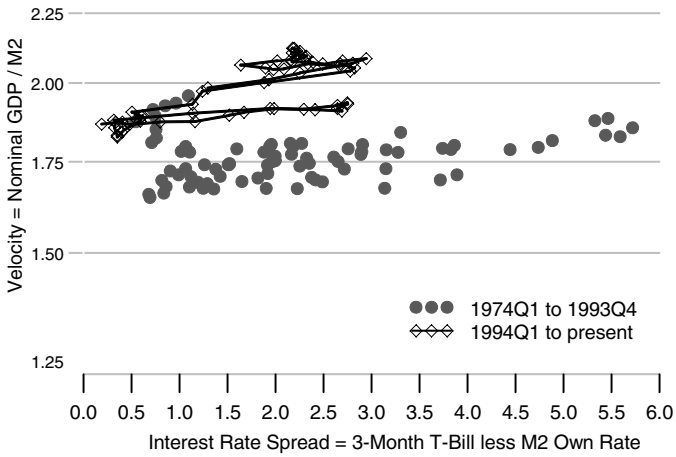
MZM Velocity and Interest Rate Spread

Ratio Scale



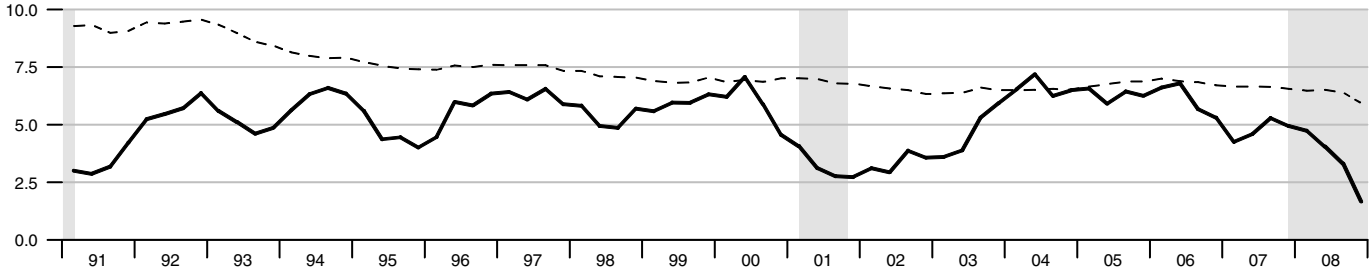
M2 Velocity and Interest Rate Spread

Ratio Scale



Gross Domestic Product

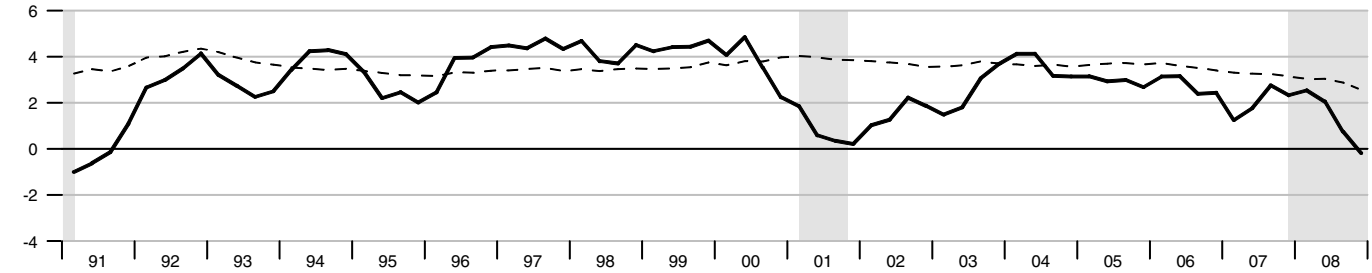
Percent change from year ago



Dashed lines indicate 10-year moving averages.

Real Gross Domestic Product

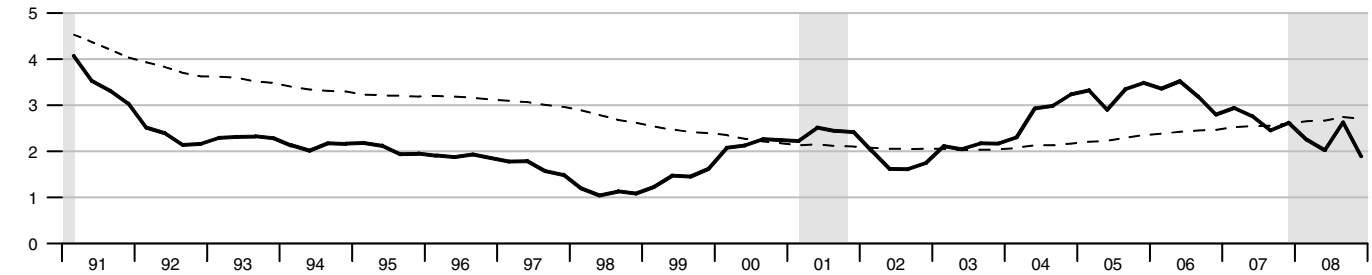
Percent change from year ago



Dashed lines indicate 10-year moving averages.

Gross Domestic Product Price Index

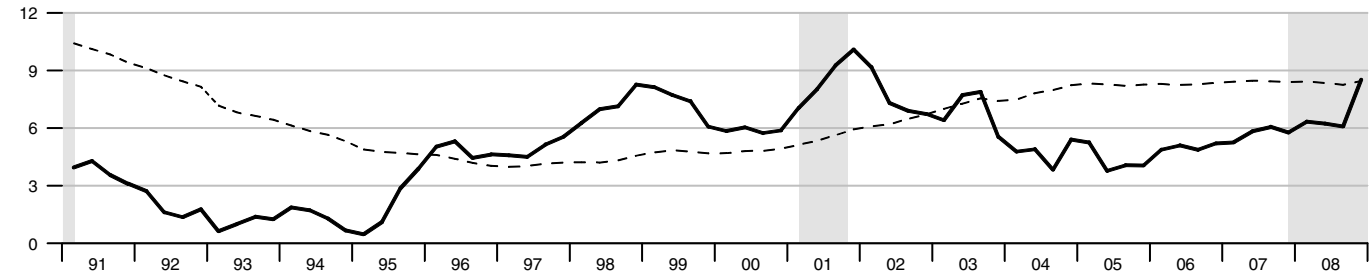
Percent change from year ago



Dashed lines indicate 10-year moving averages.

M2

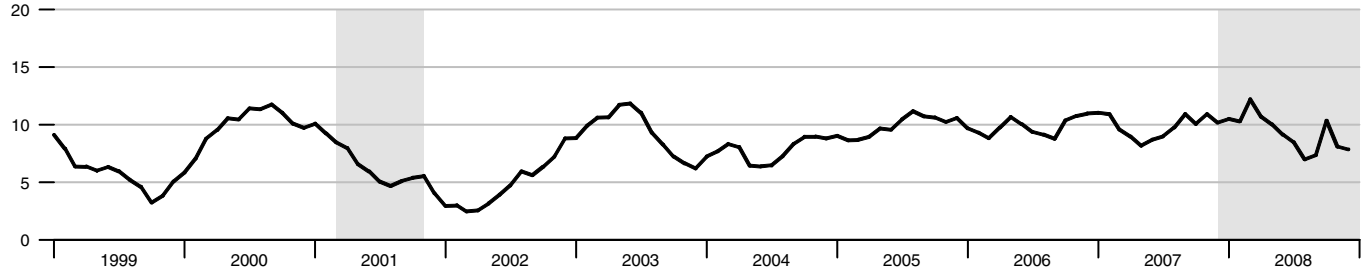
Percent change from year ago



Dashed lines indicate 10-year moving averages.

Bank Credit

Percent change from year ago

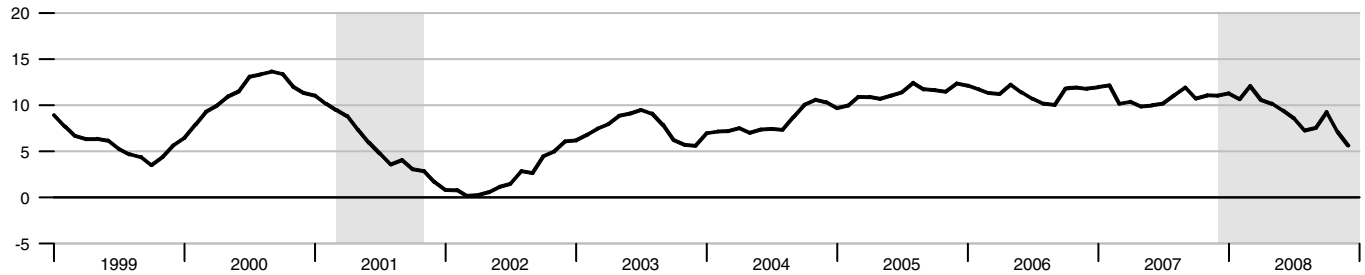


Investment Securities in Bank Credit at Commercial Banks

Percent change from year ago

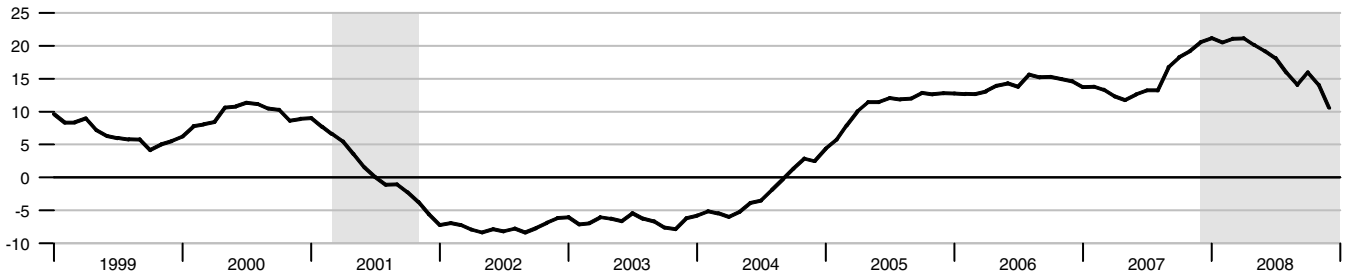
Total Loans and Leases in Bank Credit at Commercial Banks

Percent change from year ago

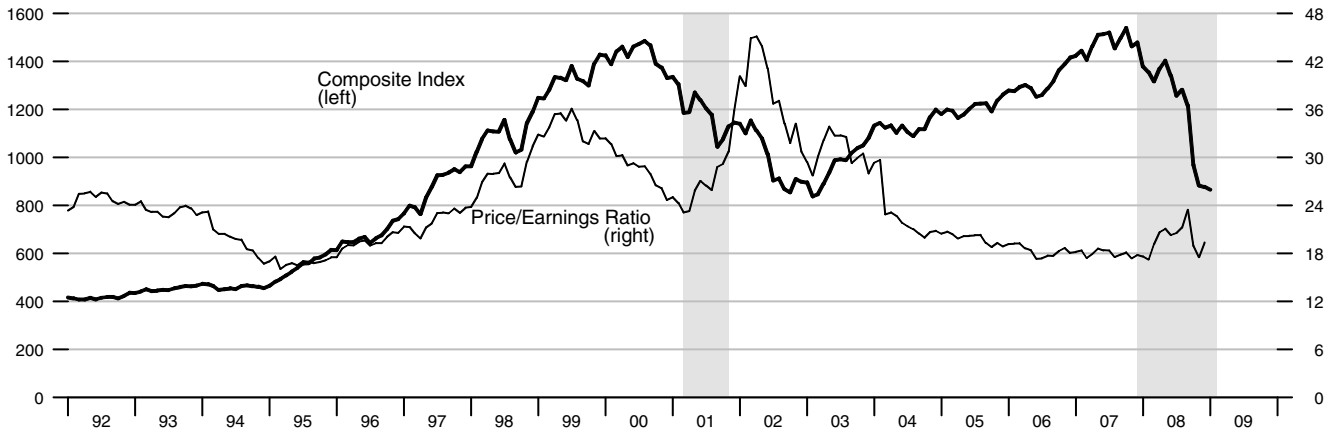


Commercial and Industrial Loans at Commercial Banks

Percent change from year ago



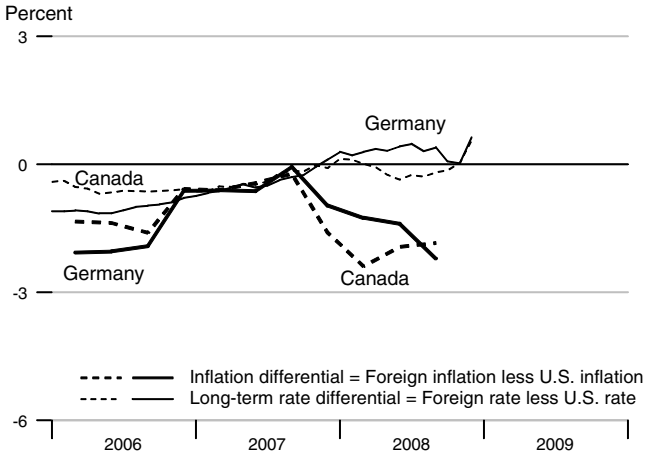
Standard & Poor's 500

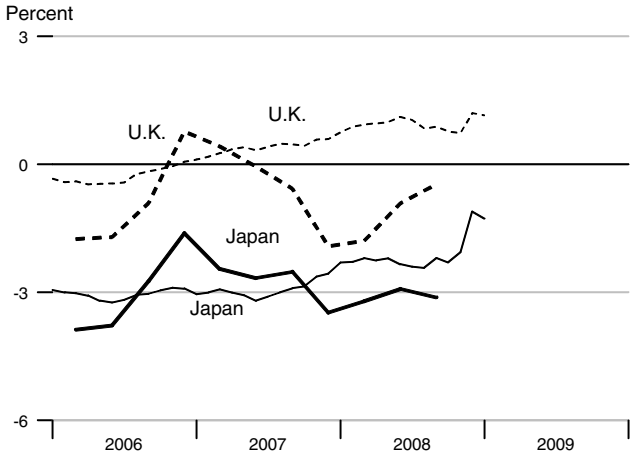


Recent Inflation and Long-Term Interest Rates

	Consumer Price Inflation Rates				Long-Term Government Bond Rates			
	Percent change from year ago				Percent			
	2008Q1	2008Q2	2008Q3	2008Q4	Oct08	Nov08	Dec08	Jan09
United States	4.17	4.29	5.27	1.52	3.81	3.53	2.42	2.52
Canada	1.78	2.35	3.43	.	3.67	3.56	2.98	.
France	2.95	3.30	3.25	.	4.18	3.98	.	.
Germany	2.92	2.90	3.07	.	3.88	3.56	3.05	.
Italy	3.06	3.57	3.97	2.80	4.78	4.74	.	.
Japan	0.96	1.37	2.16	.	1.51	1.47	1.31	1.25
United Kingdom	2.38	3.37	4.81	.	4.58	4.26	3.62	3.67

Inflation and Long-Term Interest Rate Differentials





		Money Stock				Bank	Adjusted		
		M1	MZM	M2	M3*	Credit	Monetary Base	Reserves	MSI M2**
	2004	1344.402	6556.928	6248.406	9234.718	6595.613	776.768	96.129	329.873
	2005	1371.752	6697.133	6515.975	9786.477	7247.386	806.628	96.560	343.539
	2006	1374.358	6986.483	6842.763	10270.74	7958.671	835.039	94.913	
	2007	1369.576	7619.362	7235.304		8742.766	850.579	94.200	
	2008	1423.578	8686.162	7727.792		9555.667	1009.763	232.102	
2006	1	1381.423	6876.284	6731.000		7626.312	830.534	96.495	
	2	1380.550	6924.310	6791.445		7885.208	836.387	95.082	
	3	1366.663	7002.055	6866.923		8037.701	834.610	94.829	
	4	1368.796	7143.282	6981.686		8285.464	838.627	93.246	
2007	1	1369.251	7279.610	7085.785		8427.275	846.309	94.123	
	2	1374.350	7458.604	7187.360		8564.629	849.919	93.558	
	3	1367.069	7709.610	7283.222		8832.784	852.267	95.428	
	4	1367.635	8029.626	7384.847		9146.373	853.820	93.691	
2008	1	1370.798	8361.485	7534.377		9354.433	856.319	96.170	
	2	1377.006	8642.041	7635.422		9416.468	859.325	94.366	
	3	1414.805	8754.996	7727.245		9504.306	892.679	117.729	
	4	1531.702	8986.124	8014.125		9947.461	1430.730	620.143	
2006	Dec	1365.627	7205.533	7021.454		8353.491	837.690	91.096	
2007	Jan	1373.592	7250.698	7069.503		8394.111	843.494	94.186	
	Feb	1366.017	7265.761	7076.141		8460.590	847.258	94.424	
	Mar	1368.143	7322.370	7111.712		8427.125	848.174	93.758	
	Apr	1378.801	7397.675	7160.675		8507.034	848.960	93.603	
	May	1379.739	7462.432	7189.135		8564.809	849.615	92.773	
	Jun	1364.511	7515.704	7212.270		8622.044	851.181	94.299	
	Jul	1366.558	7584.888	7239.370		8703.713	851.858	94.605	
	Aug	1368.421	7708.629	7287.654		8840.630	853.438	96.648	
	Sep	1366.227	7835.314	7322.642		8954.010	851.505	95.031	
	Oct	1371.683	7945.750	7352.836		9055.628	856.459	93.524	
	Nov	1366.682	8038.563	7384.407		9178.942	857.515	95.757	
	Dec	1364.540	8104.565	7417.297		9204.550	847.487	91.792	
2008	Jan	1368.387	8182.799	7463.613		9276.160	851.441	95.076	
	Feb	1371.076	8381.144	7539.039		9331.877	856.945	96.190	
	Mar	1372.931	8520.512	7600.479		9455.262	860.571	97.243	
	Apr	1373.665	8590.031	7619.971		9415.470	855.242	94.371	
	May	1373.707	8646.561	7637.837		9424.096	859.687	94.904	
	Jun	1383.647	8689.531	7648.459		9409.839	863.047	93.823	
	Jul	1400.135	8745.482	7698.757		9441.353	870.535	96.821	
	Aug	1392.187	8730.975	7687.056		9458.525	871.322	96.507	
	Sep	1452.092	8788.532	7795.921		9613.041	936.180	159.860	
	Oct	1475.230	8834.152	7915.833		9992.604	1142.213	347.507	
	Nov	1524.069	8950.817	7972.464		9921.831	1480.746	673.767	
	Dec	1595.808	9173.403	8154.078		9927.948	1669.231	839.154	

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
2006	1	4.46	5.43	7.43	4.72	4.50	4.58	4.57	5.39	4.29	6.24
	2	4.91	5.90	7.90	5.18	4.83	4.98	5.07	5.89	4.36	6.60
	3	5.25	6.25	8.25	5.39	5.03	4.87	4.90	5.68	4.13	6.56
	4	5.25	6.25	8.25	5.32	5.03	4.65	4.63	5.39	3.82	6.24
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
2007	Jan	5.25	6.25	8.25	5.32	5.11	4.79	4.76	5.40	3.89	6.22
	Feb	5.26	6.25	8.25	5.31	5.16	4.75	4.72	5.39	3.95	6.29
	Mar	5.26	6.25	8.25	5.30	5.08	4.51	4.56	5.30	3.88	6.16
	Apr	5.25	6.25	8.25	5.31	5.01	4.60	4.69	5.47	3.99	6.18
	May	5.25	6.25	8.25	5.31	4.87	4.69	4.75	5.47	4.04	6.26
	Jun	5.25	6.25	8.25	5.33	4.74	5.00	5.10	5.79	4.36	6.66
	Jul	5.26	6.25	8.25	5.32	4.96	4.82	5.00	5.73	4.24	6.70
	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

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	3.98	4.73	5.09
	2005	2.03	2.08	4.28	5.97
	2006	0.19	4.31	4.99	4.95
	2007	-0.35	9.01	5.70	
	2008	3.97	13.57	6.65	
2006	1	1.98	5.38	6.12	
	2	-0.55	3.10	3.70	
	3	-3.68	3.54	3.93	
	4	0.36	7.55	6.38	
2007	1	0.43	8.82	6.63	
	2	0.88	10.41	5.84	
	3	-1.37	12.12	4.74	
	4	-0.31	15.34	5.15	
2008	1	1.33	18.79	9.03	
	2	0.98	13.56	5.26	
	3	12.18	2.49	3.64	
	4	32.41	6.53	13.90	
2006	Dec	-3.91	12.38	6.97	
2007	Jan	5.27	7.30	7.92	
	Feb	-4.40	6.92	4.45	
	Mar	2.03	10.70	6.68	
	Apr	6.92	12.68	8.36	
	May	-2.11	9.46	3.33	
	Jun	-8.16	7.67	2.77	
	Jul	2.26	8.96	3.87	
	Aug	1.25	20.30	8.70	
	Sep	-3.10	15.63	4.59	
	Oct	2.73	15.65	3.99	
	Nov	-3.39	13.67	5.56	
	Dec	0.80	10.66	5.21	
2008	Jan	0.58	12.88	7.23	
	Feb	4.92	35.15	15.77	
	Mar	2.17	22.36	11.34	
	Apr	-3.50	8.22	2.08	
	May	-2.85	6.68	1.48	
	Jun	15.88	3.85	-0.31	
	Jul	14.86	4.15	6.43	
	Aug	-7.99	-1.38	-1.48	
	Sep	51.49	-1.70	15.53	
	Oct	16.00	0.43	16.98	
	Nov	40.23	15.38	8.42	
	Dec	60.89	31.18	26.27	

*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

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

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 as estimated by the Congressional Budget Office.

Monetary Base Growth and Inflation Targets shows the quarterly growth of the adjusted monetary base (modified to include an estimate of the effect of sweep programs) implied by applying McCallum's (1988, 1993) equation

$$\Delta MB_t^* = \pi^* + (\text{10-year moving average growth of real GDP}) - (\text{4-year moving average of base velocity growth})$$

to five alternative target inflation rates, $\pi^* = 0, 1, 2, 3, 4$ percent, where ΔMB_t^* is the implied growth rate of the adjusted monetary base. The 10-year moving average growth of real GDP for a quarter t is calculated as the average quarterly growth during the previous 40 quarters, at an annual rate, by the formula

$((y_t - y_{t-40})/40)$? 400, where y_t is the log of real GDP. The 4-year moving average of base velocity growth is calculated similarly. To adjust the monetary base for the effect of retail-deposit sweep programs, we add to the monetary base an amount equal to 10 percent of the total amount swept, as estimated by the Federal Reserve Board staff. These estimates are imprecise, at best. Sweep program data are found at research.stlouisfed.org/aggreg/swdata.html.

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

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

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 $D(m) = (1 - e^{-R(m) \text{ ? } m})/R(m)$. 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 2000 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/.