

Monetary Trends



Gambler's Fallacy?

Judged by historical data, the stock market is the growth-optimal investment vehicle among standard types of U.S. securities. The capital of a buy-and-hold portfolio invested in a value-weighted index of large-company U.S. stocks (with capital gains and dividends reinvested) grew at an annualized inflation-adjusted rate of 7.43 percent between the end of 1925 and the end of 2001. By comparison, the corresponding growth rate of a buy-and-hold portfolio of long-term corporate bonds averaged only 2.63 percent. If annual inflation-adjusted rates of growth are independent, random realizations (and thus unpredictable), then an investor who wants to maximize the long-run rate of capital growth should be invested in the stock market at all times.

If annual rates of growth of the aforementioned buy-and-hold stock index portfolio are indeed independent, random realizations, then they may be compared to the outcomes of coin flips. The probability of a coin coming up "heads" is independent of the outcomes of past coin flips. A run of several consecutive tails does not change the odds that heads will come up on the next flip. If we keep flipping the coin infinitely, the fraction of heads in the total number of outcomes converges to 50 percent—the long-run average. The convergence to 50 percent happens not because nature corrects deviations from the long-run average; rather, the unfolding random process dilutes deviations from the baseline frequency. To many people, the concept of dilution is not intuitive; they believe that deviations from the long-run average in games of chance will be corrected somehow as the game is played. This correction process is called mean reversion. This erroneous belief in mean reversion when outcomes are in fact independent is known as the gambler's fallacy.

Sometimes it is difficult to determine whether the data-generating processes of an economic variable dilutes or corrects deviations from the long-run average. The stock market is widely believed to follow a random walk, which implies that annual rates of capital growth are independent of past realizations. There are finance scholars, however, who believe that the stock market is mean-reverting. Robert

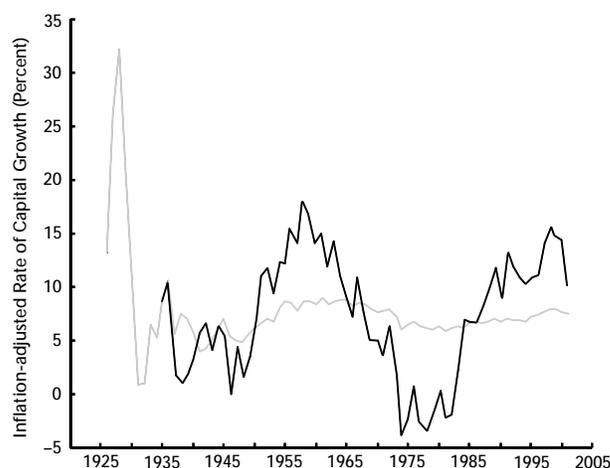
Shiller (1981), for instance, argues that stock market valuation exhibits pronounced swings around its fundamental value.¹ Obviously, if capital growth rates are indeed independent realizations, those who believe in mean reversion in the stock market fall prey to the gambler's fallacy.

The graph below exhibits annualized capital growth rates of the aforementioned buy-and-hold portfolio of large-company stocks. The thin line shows the inflation-adjusted annualized capital growth rate of the portfolio since the end of 1925, while the thick line shows the corresponding growth rate for rolling ten-year periods. The ten-year growth rate swings markedly around the long-run mean rate of growth of 7.43 percent. The stock market outlook depends on whether such swings in shorter-term growth rates reflect mean reversion or whether dilution drives the annual rate of capital growth.

—Frank A. Schmid

¹Shiller, Robert J. "Do Stock Prices Move Too Much to be Justified by Subsequent Changes in Dividends?" *American Economic Review* 1981, 71, pp. 421-36.

Average Rates of Growth of a Buy-and-Hold Portfolio in Large-Company Stocks



NOTE: Annual observations: The first observations are 1926 (average growth rate since year-end 1925; thin line) and 1935 (average growth rate prior 10 years; thick line). The last observation is 2001.

SOURCE: Ibbotson Associates. *Stocks, Bonds, Bills, and Inflation. 2002 Yearbook*. Chicago: Ibbotson Associates, 2002.



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Conventions used in this publication:

1. Unless otherwise indicated, data are monthly.
2. Shaded areas indicate recessions, as dated by the National Bureau of Economic Research.
3. The *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: $[(x_t / x_{t-12}) - 1] \times 100$.

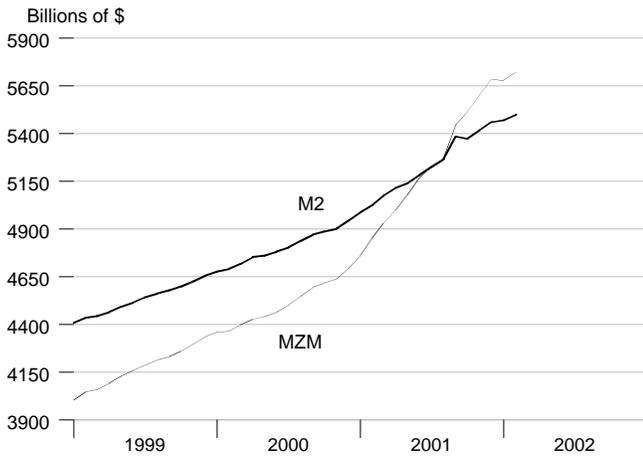
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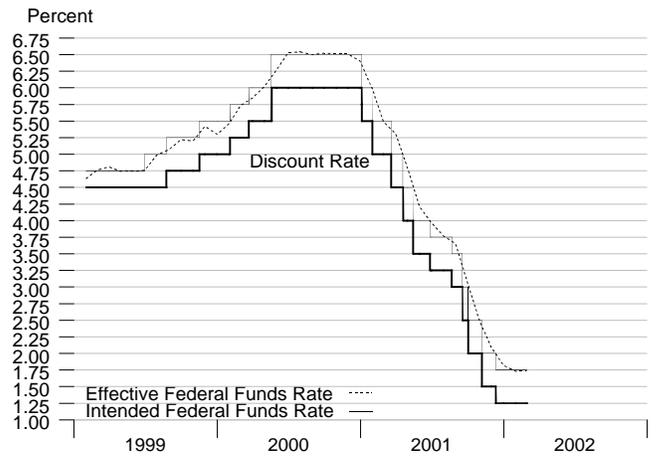
or to:

webmaster@stls.frb.org

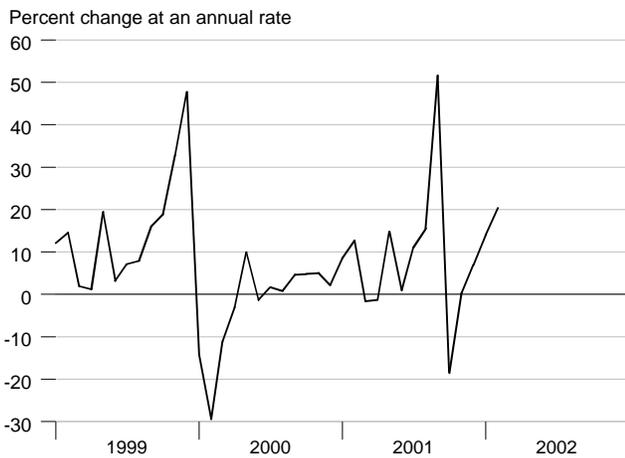
M2 and MZM



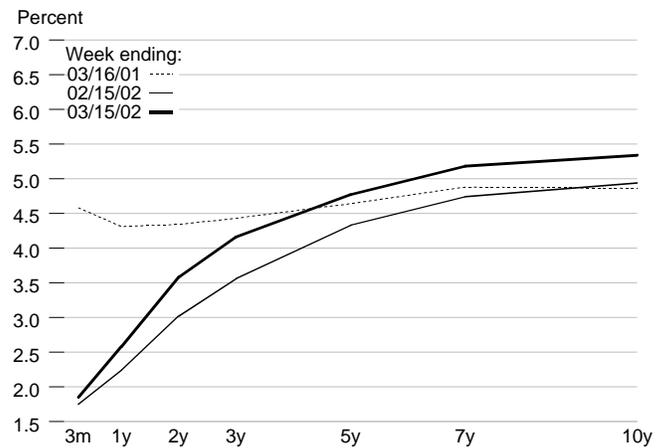
Reserve Market Rates



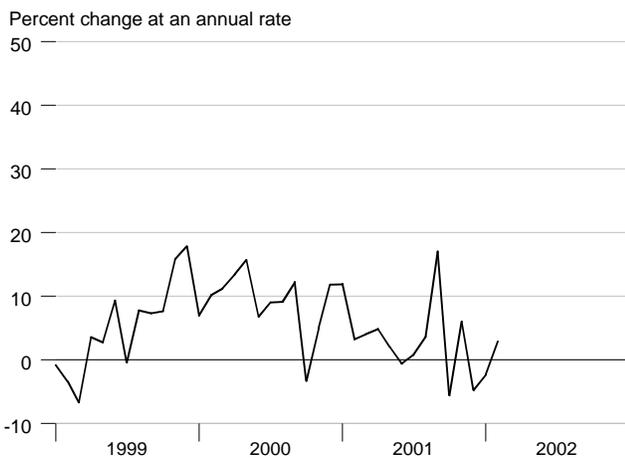
Adjusted Monetary Base



Treasury Yield Curve



Total Bank Credit



Interest Rates

	Dec 01	Jan 02	Feb 02
Federal Funds Rate	1.82	1.73	1.74
Discount Rate	1.33	1.25	1.25
Prime Rate	4.84	4.75	4.75
Conventional Mortgage Rate	7.07	7.00	6.89
Treasury Yields:			
3-month constant maturity	1.72	1.68	1.76
6-month constant maturity	1.82	1.77	1.86
1-year constant maturity	2.22	2.16	2.23
3-year constant maturity	3.62	3.56	3.55
5-year constant maturity	4.39	4.34	4.30
10-year constant maturity	5.09	5.04	4.91

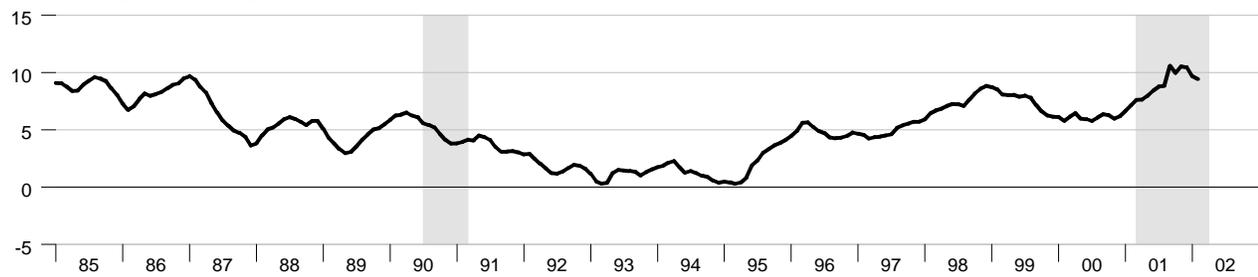
MZM and M1

Percent change from year ago



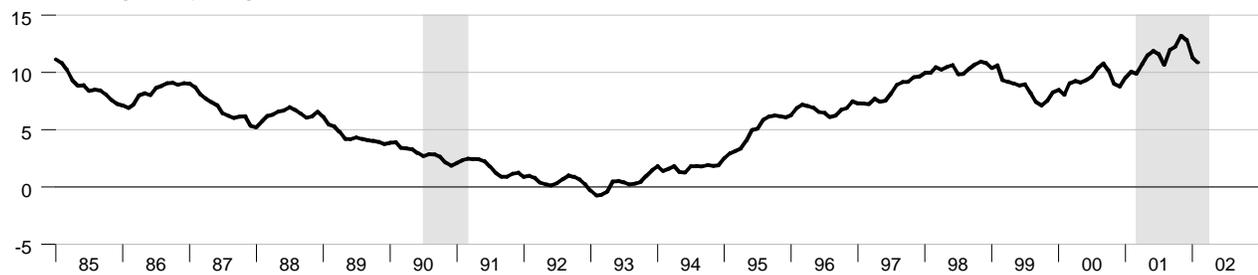
M2

Percent change from year ago



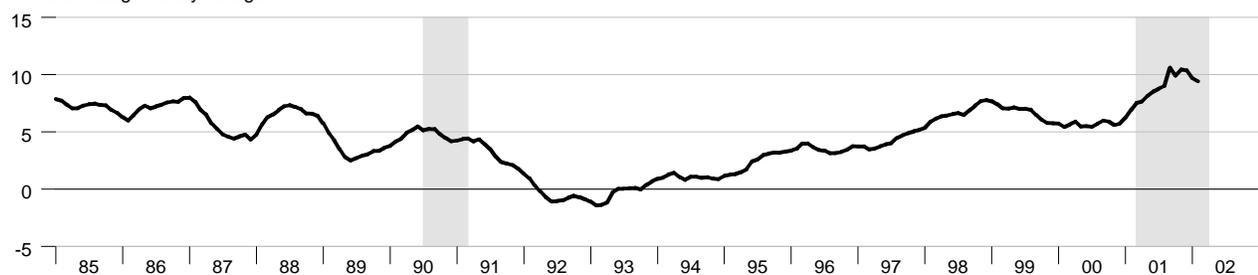
M3

Percent change from year ago



Monetary Services Index - M2

Percent change from year ago



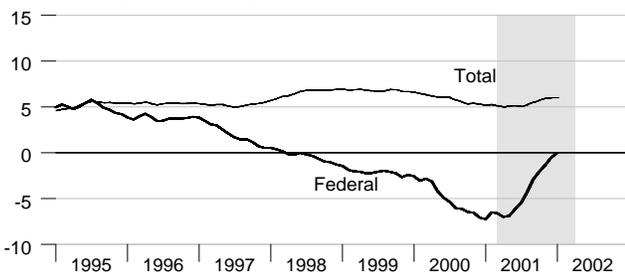
Adjusted Monetary Base

Percent change from year ago



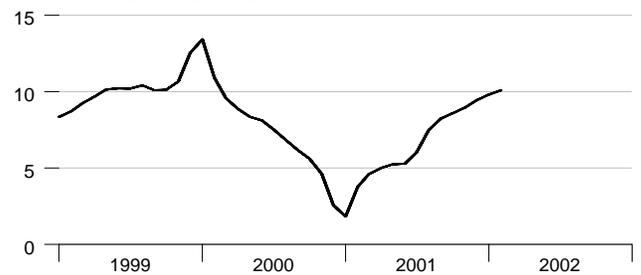
Domestic Nonfinancial Debt

Percent change from year ago



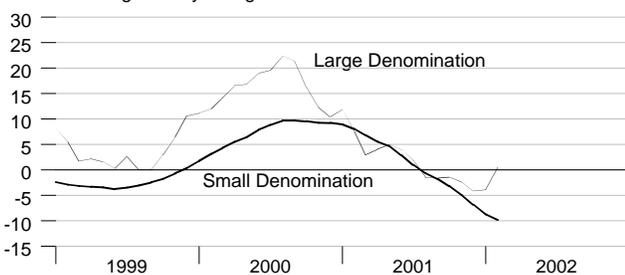
Currency Held by the Nonbank Public

Percent change from year ago



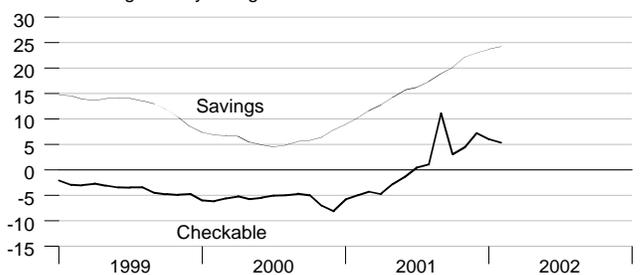
Time Deposits

Percent change from year ago



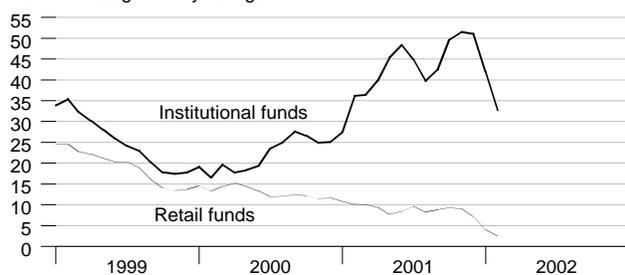
Checkable and Savings Deposits

Percent change from year ago



Money Market Mutual Fund Shares

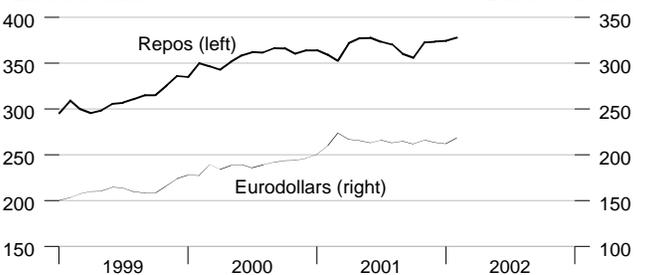
Percent change from year ago



Repurchase Agreements and Eurodollars

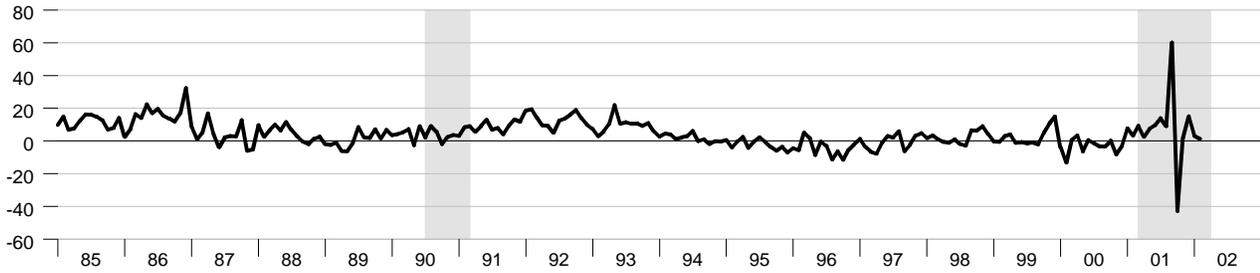
Billions of dollars

Billions of dollars



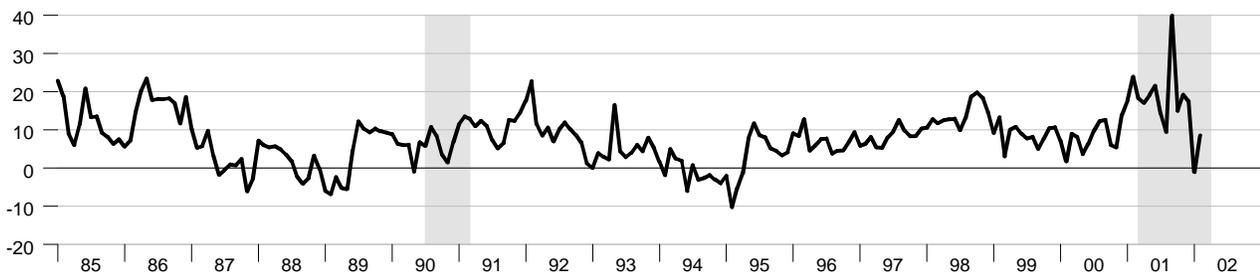
M1

Percent change at an annual rate



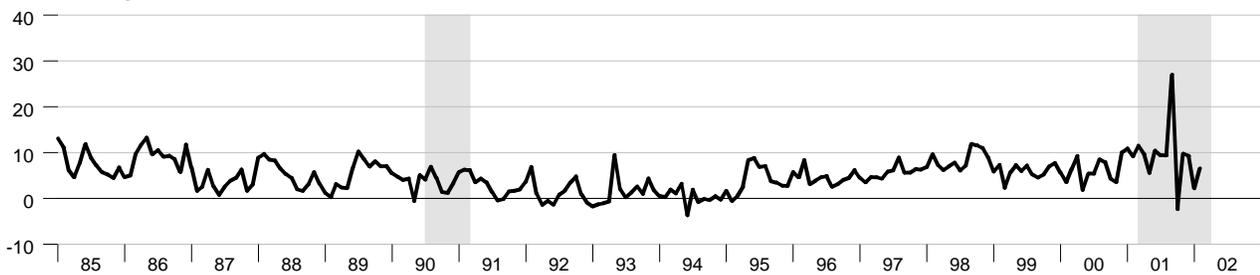
MZM

Percent change at an annual rate



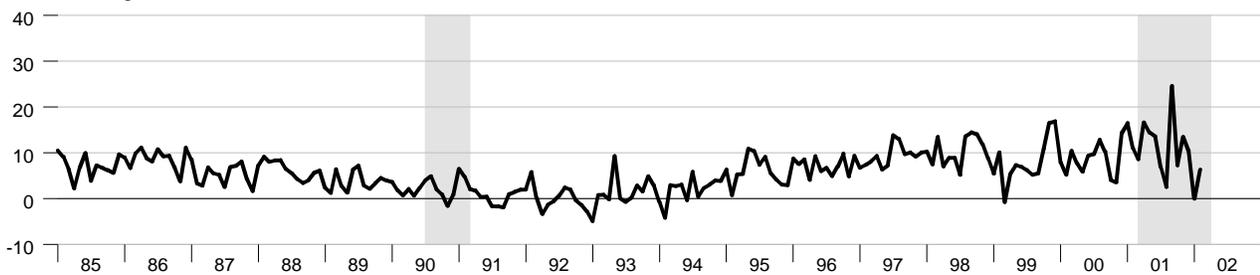
M2

Percent change at an annual rate

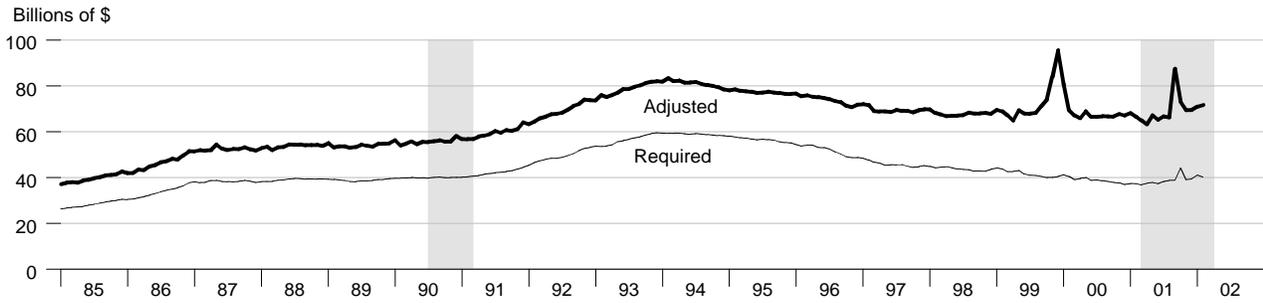


M3

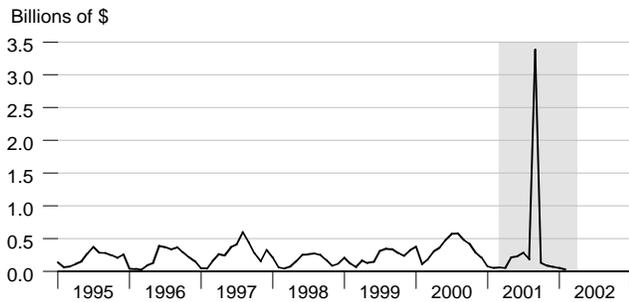
Percent change at an annual rate



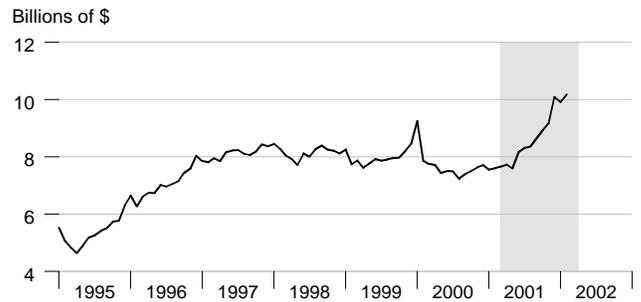
Adjusted and Required Reserves



Total Borrowings, nsa



Excess Reserves plus RCB Contracts



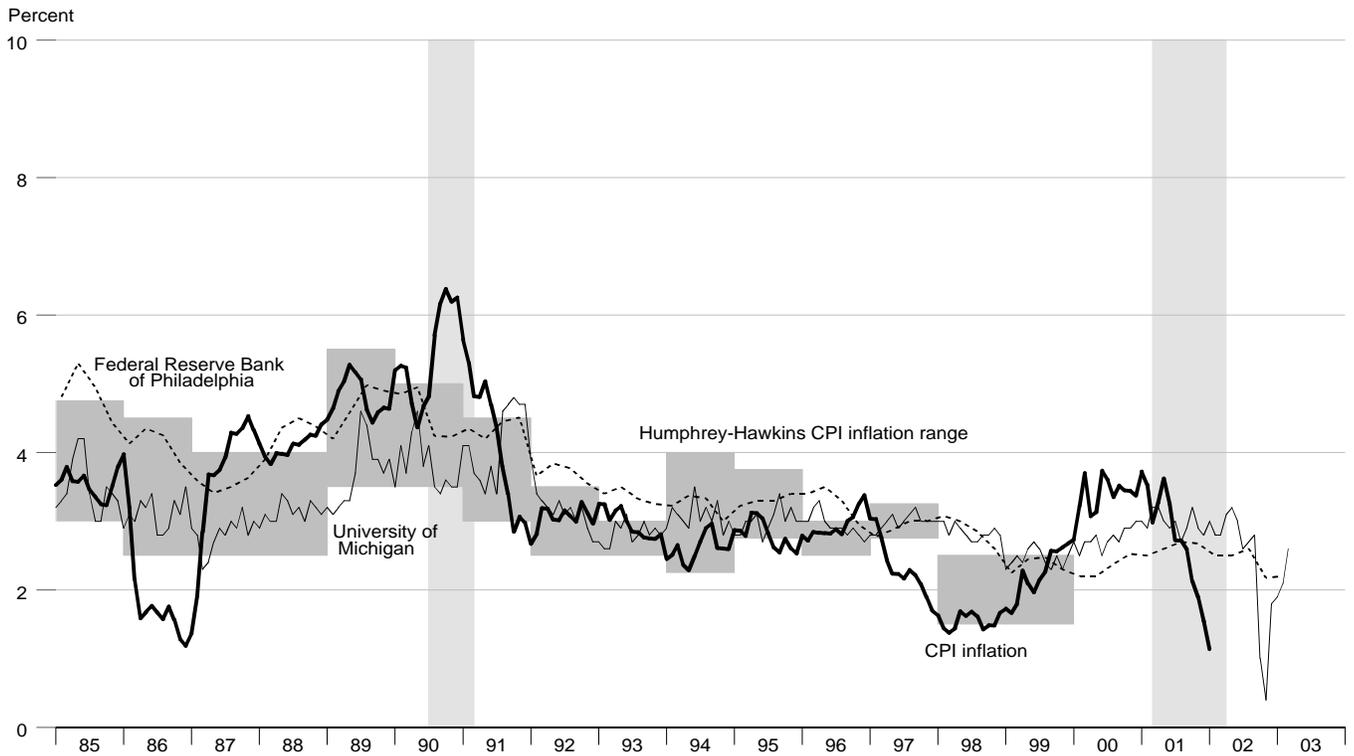
Nonfinancial Commercial Paper



Consumer Credit

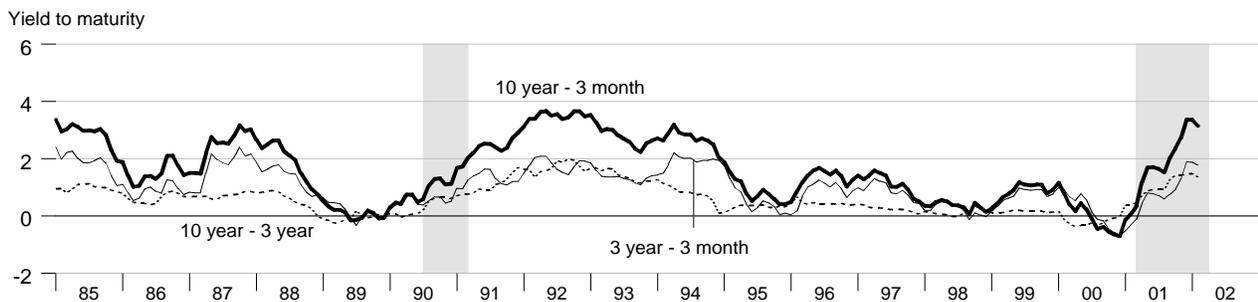


Inflation and Inflation Expectations

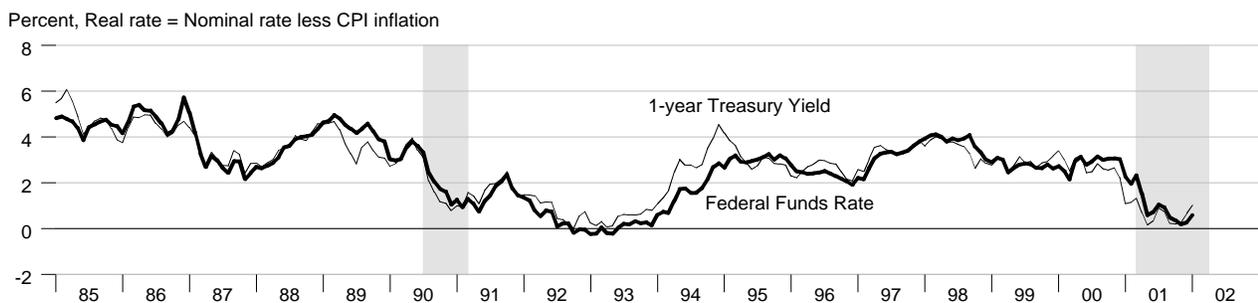


The shaded region shows the Humphrey-Hawkins CPI inflation range. Beginning in January 2000, the Humphrey-Hawkins inflation range was reported using the PCE price index and therefore is not shown on this graph. See page 19 for information.

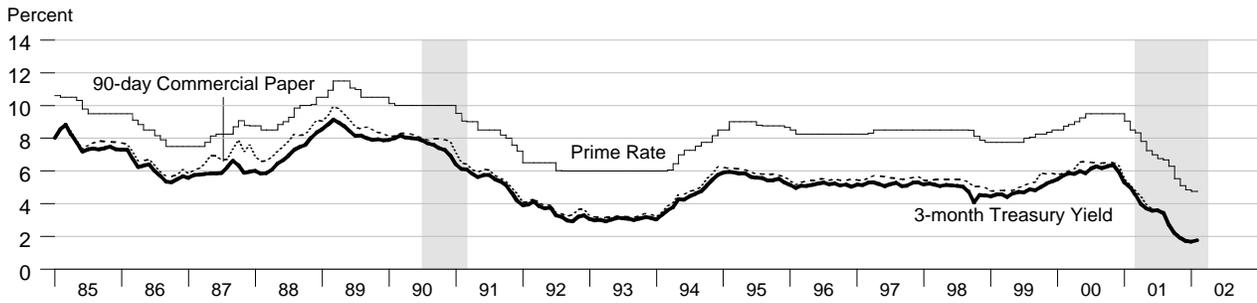
Treasury Security Yield Spreads



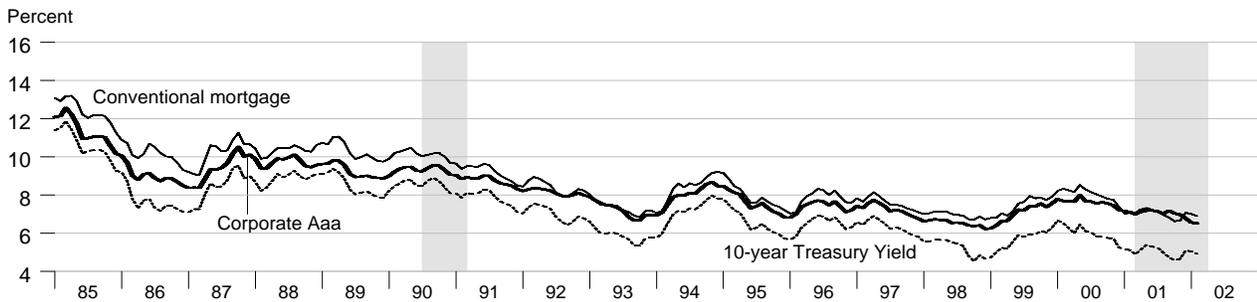
Real Interest Rates



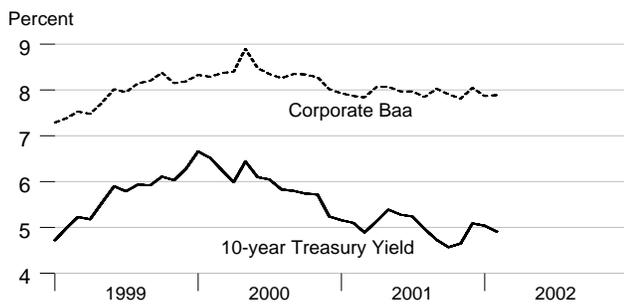
Short Term Interest Rates



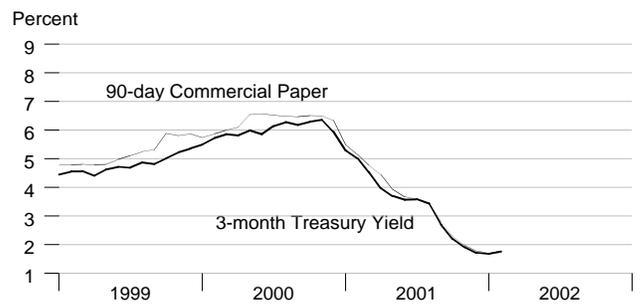
Long Term Interest Rates



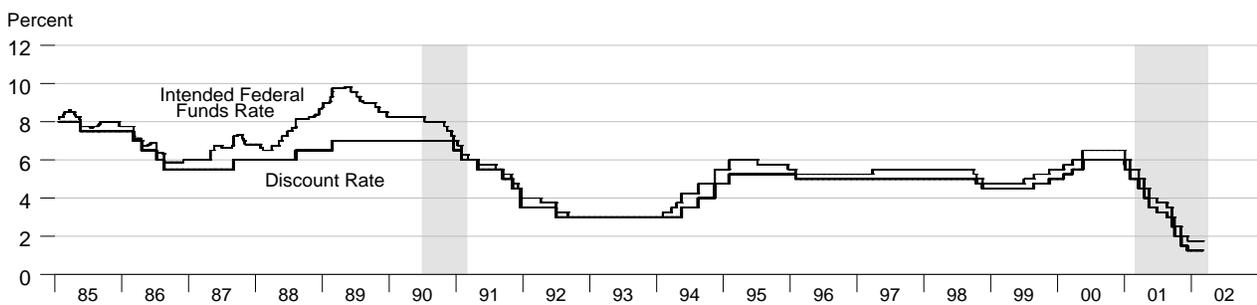
Long Term Interest Rates



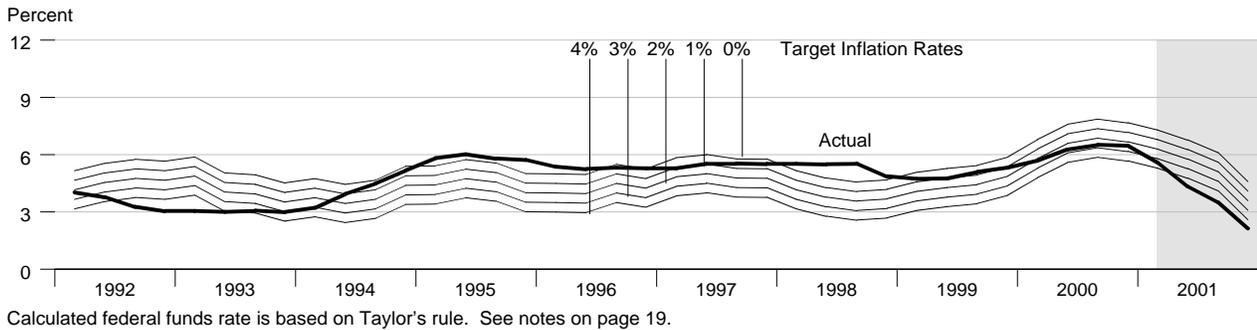
Short Term Interest Rates



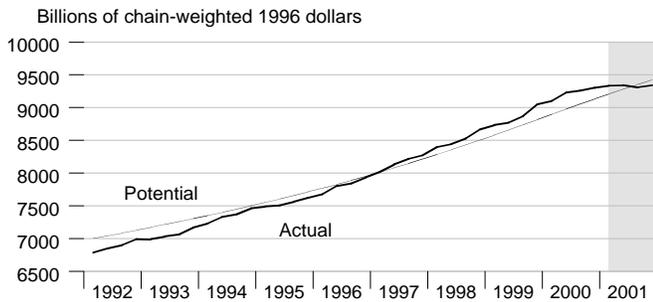
FOMC Intended Federal Funds Rate and Discount Rate



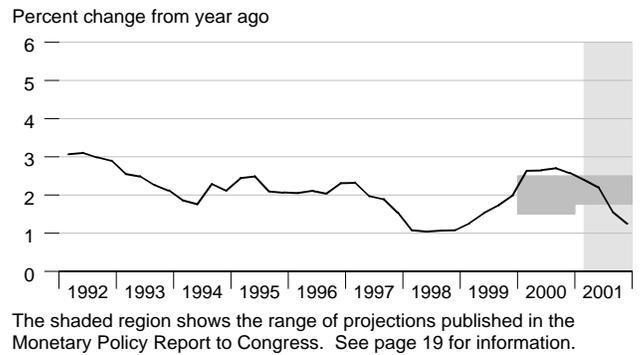
Federal Funds Rate and Inflation Targets



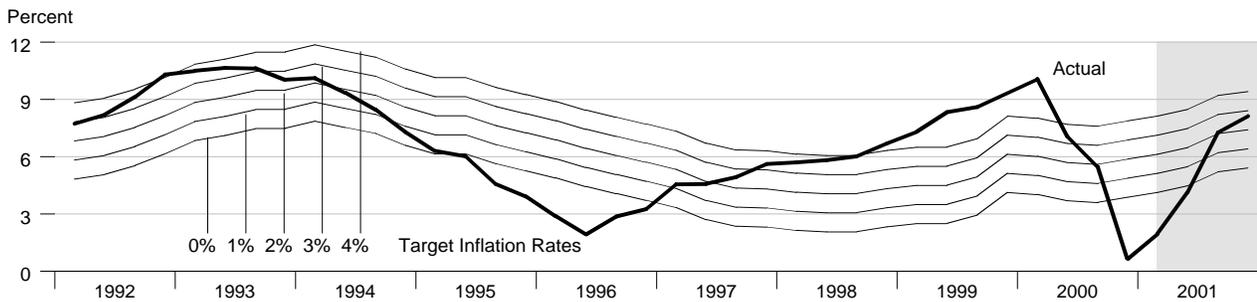
Actual and Potential Real GDP



PCE Inflation and Projections

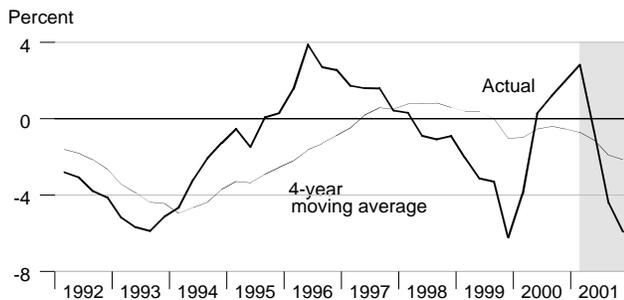


Monetary Base Growth* and Inflation Targets

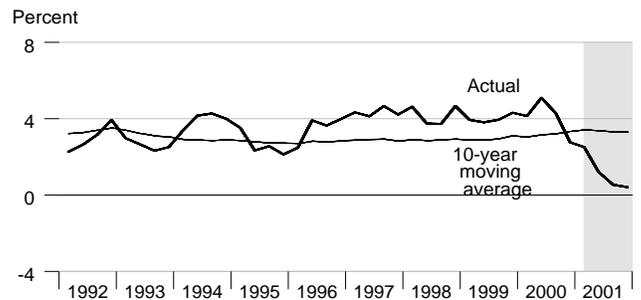


*Modified for the effects of sweeps programs on reserve demand. Calculated base growth is based on McCallum's rule. Actual base growth is percent change from year ago. See notes on page 19.

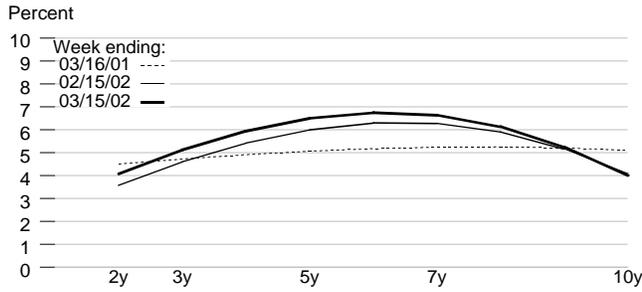
Monetary Base Velocity Growth



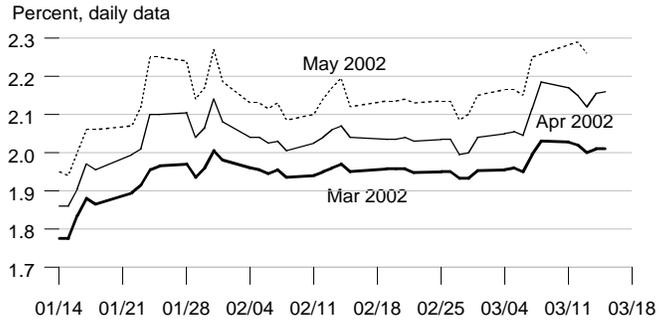
Real Output Growth



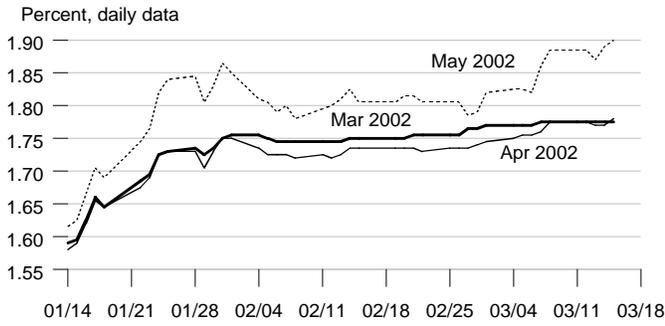
Implied One-Year Forward Rates



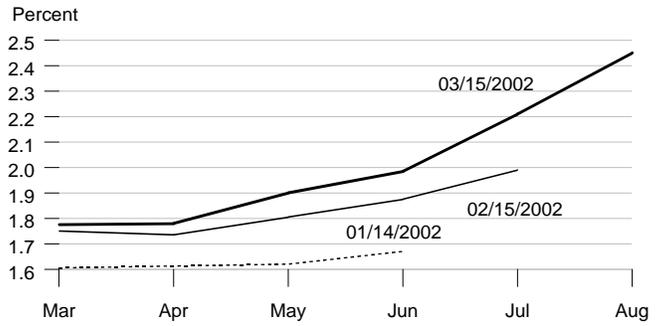
Rates on 3-Month Eurodollar Futures



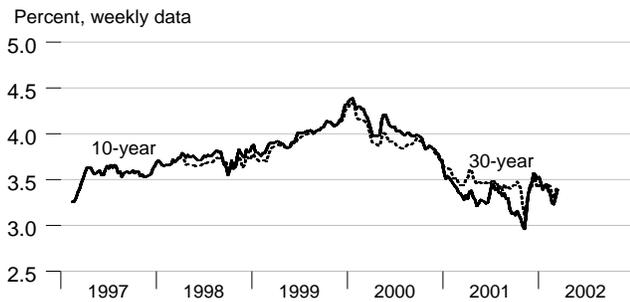
Rates on Selected Fed Funds Futures Contracts



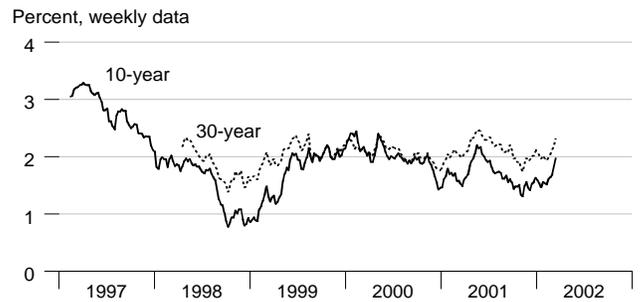
Implied Yields on Fed Funds Futures



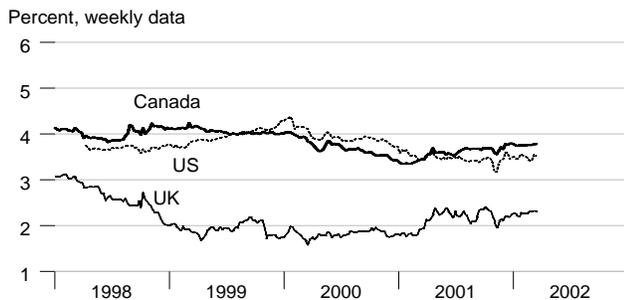
Inflation-Protected Treasury Yields



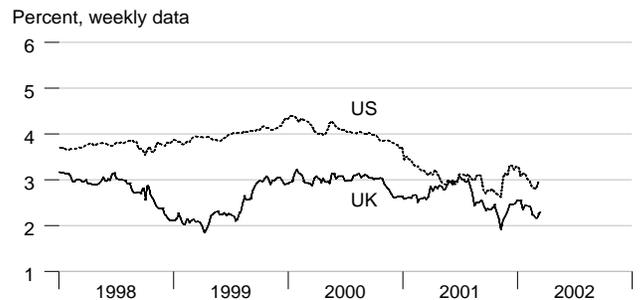
Inflation-Protected Treasury Yield Spreads



Inflation-Indexed 30-Year Bonds



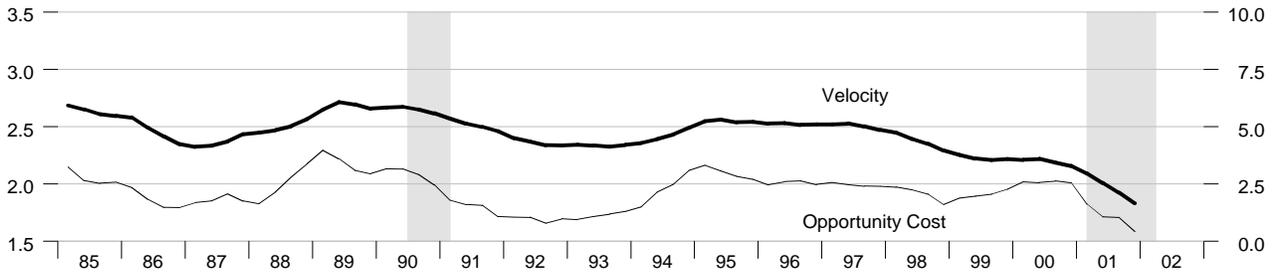
Inflation-Indexed 10-Year Bonds



MZM Velocity and Opportunity Cost

Velocity = Nominal GDP / MZM

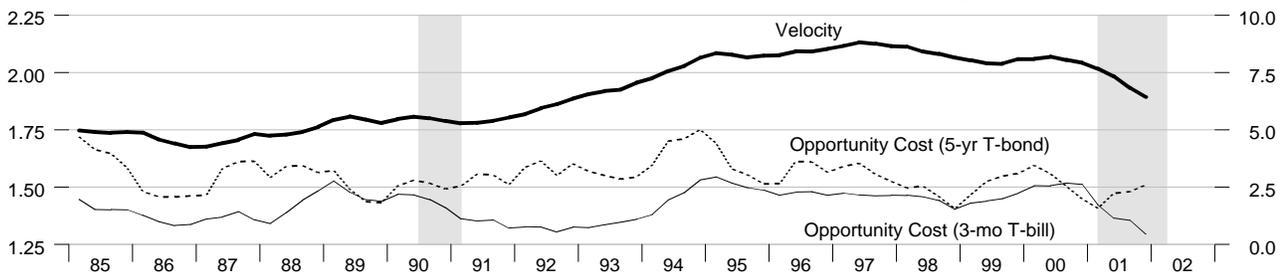
Opportunity Cost = 3 month T-bill rate less MZM own rate



M2 Velocity and Opportunity Cost

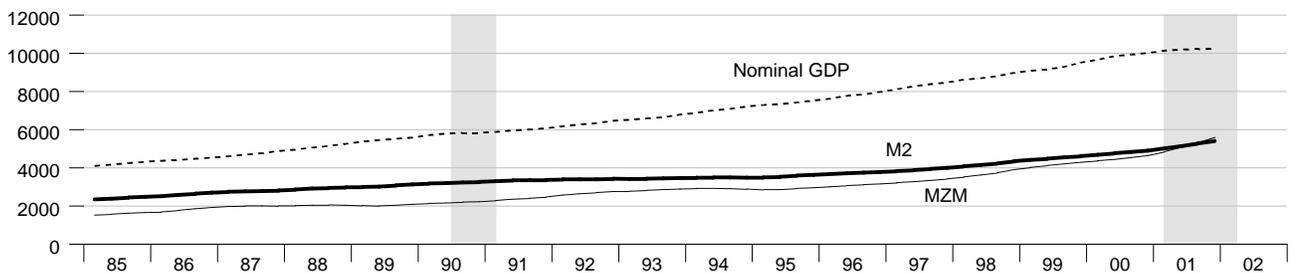
Velocity = Nominal GDP / M2

Opportunity Cost = Treasury rate less M2 own rate



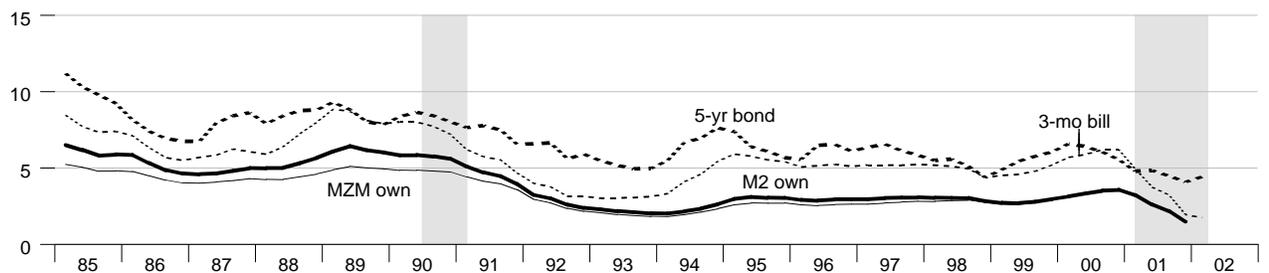
M2, MZM and Nominal GDP

Billions of \$



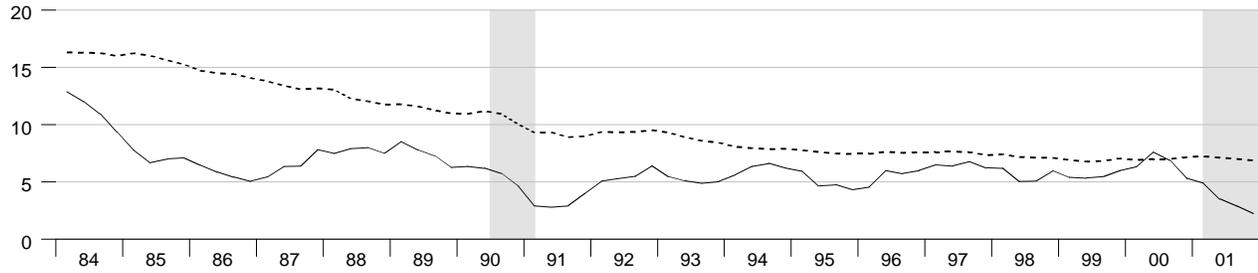
Interest Rates

Percent



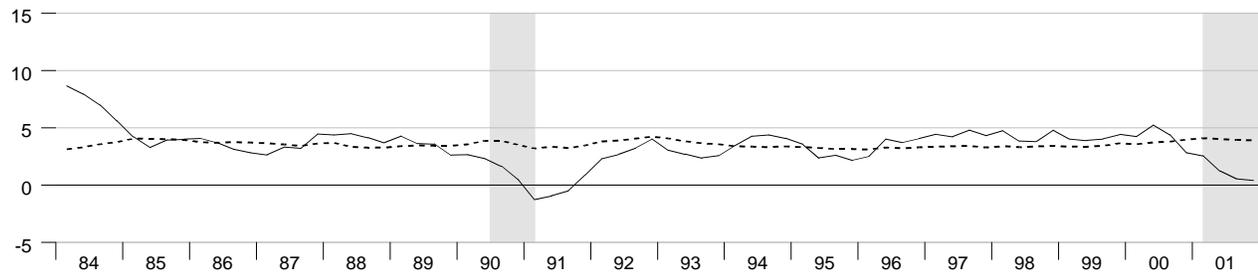
Gross Domestic Product

Percent change from year ago



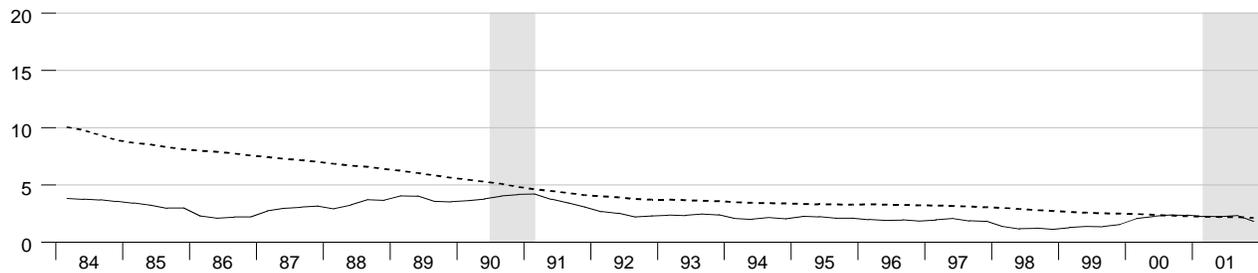
Real Gross Domestic Product

Percent change from year ago



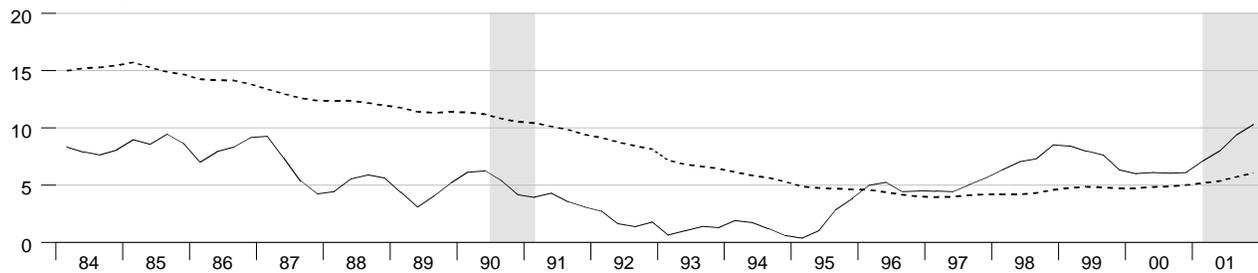
Gross Domestic Product Price Index

Percent change from year ago



M2

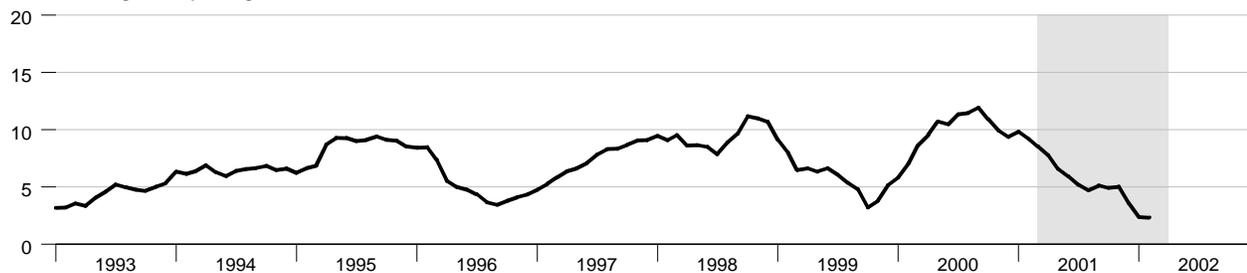
Percent change from year ago



Dashed lines indicate 10-year moving averages

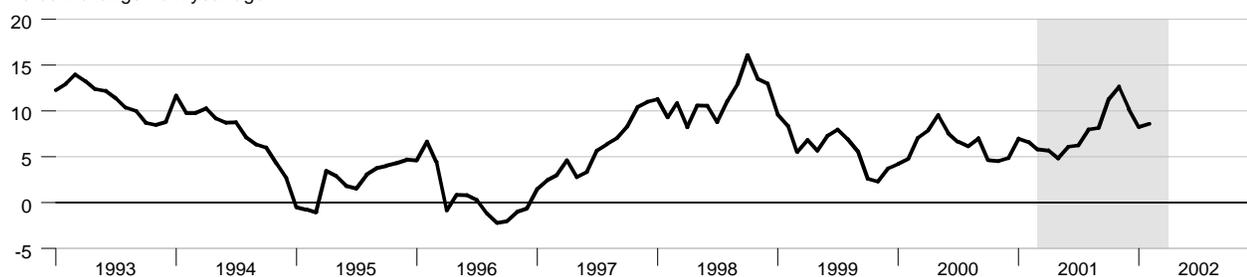
Bank Credit

Percent change from year ago



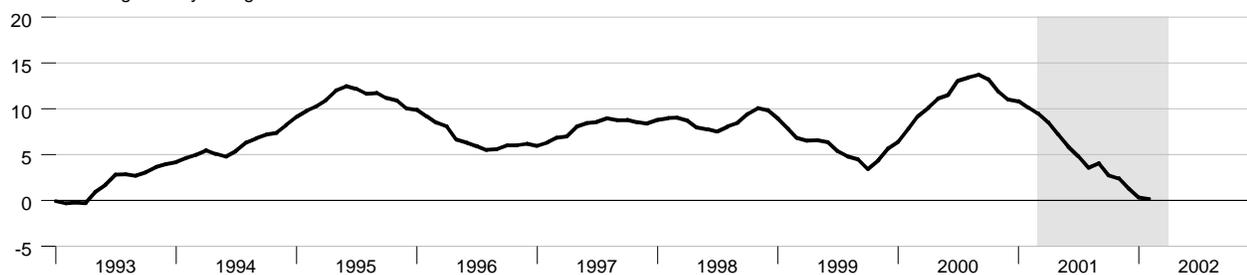
Investment Securities in Bank Credit at Commercial Banks

Percent change from year ago



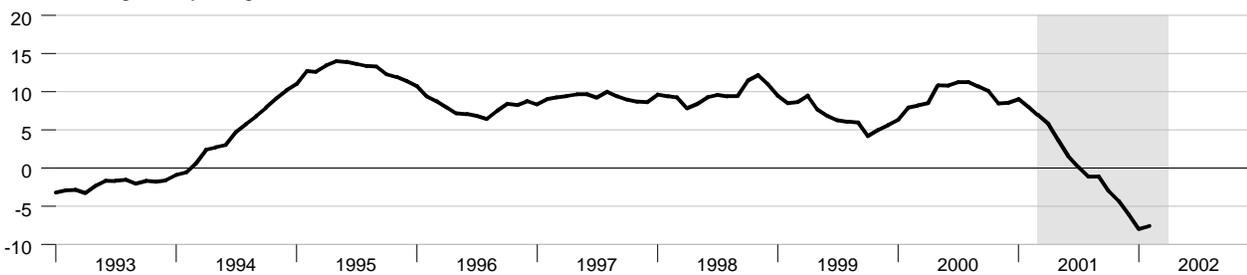
Total Loans and Leases in Bank Credit at Commercial Banks

Percent change from year ago

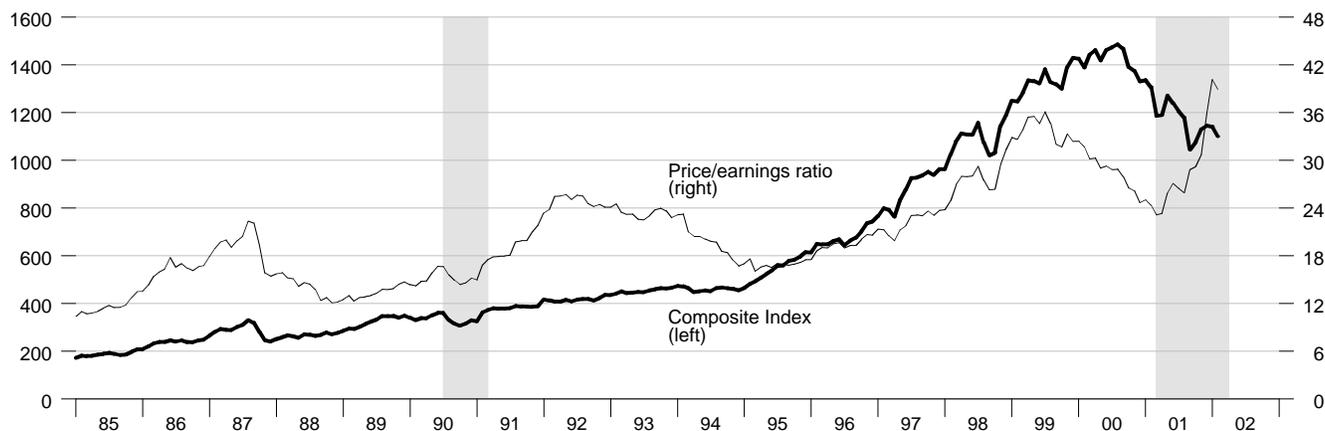


Commercial and Industrial Loans at Commercial Banks

Percent change from year ago



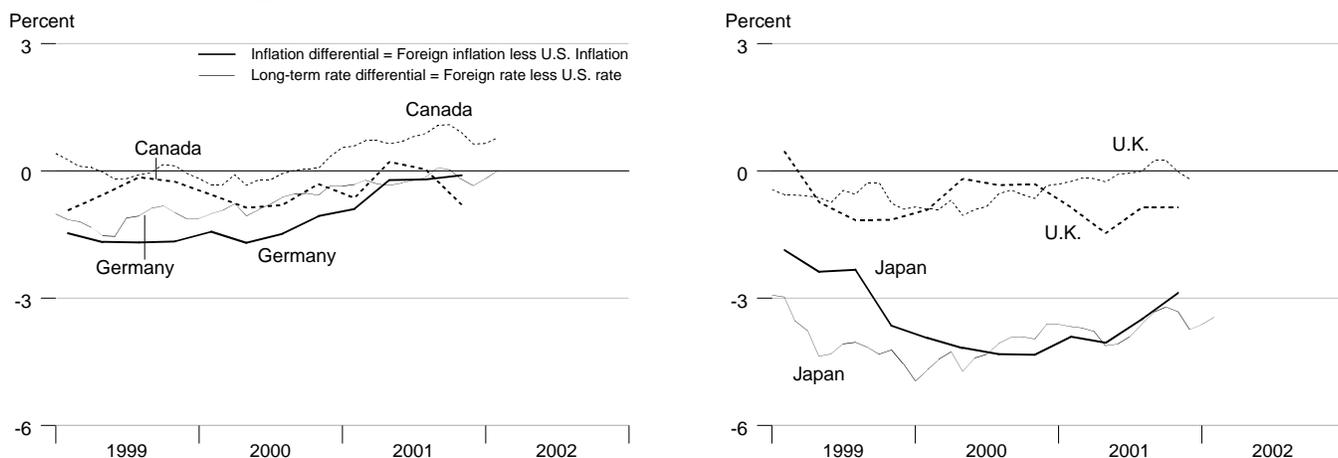
Standard and Poor's 500



Inflation and Long-Term Interest Rates

	Trend in Consumer Price Inflation Rates Percent change from year ago				Recent Long-Term Government Bond Rates Percent			
	2001Q1	2001Q2	2001Q3	2001Q4	Nov01	Dec01	Jan02	Feb02
United States	3.41	3.38	2.66	1.89	4.65	5.09	5.04	4.91
Canada	2.77	3.60	2.69	1.10	5.55	5.72	5.69	5.69
France	1.29	2.02	1.79	1.43	5.07	5.35	.	.
Germany	2.52	3.16	2.46	1.79	4.45	4.74	4.86	4.92
Italy	2.89	3.05	2.80	2.40	4.80	5.05	5.14	5.20
Japan	-0.50	-0.67	-0.84	-0.98	1.33	1.35	1.42	1.46
United Kingdom	2.55	1.91	1.80	1.04	4.63	4.90	.	.

Inflation and Long-Term Interest Rates Differentials



		Money Stock				Bank			
		M1	MZM	M2	M3	Credit	Monetary Base	Reserves	MSI M2
1997		1069.292	3320.460	3920.394	5211.258	3955.027	478.708	69.523	226.529
1998		1079.990	3708.387	4207.472	5751.770	4327.991	508.942	67.808	241.567
1999		1101.865	4166.903	4526.244	6253.479	4584.041	557.865	72.360	257.920
2000		1104.049	4503.205	4801.361	6837.994	5031.596	590.821	68.327	272.554
2001		1137.346	5211.494	5220.452	7616.224	5349.107	623.818	68.953	296.272
1999	1	1096.775	4035.853	4428.650	6102.379	4518.432	536.334	68.521	252.663
	2	1101.094	4125.906	4490.035	6181.516	4529.144	545.912	67.392	255.987
	3	1097.702	4210.246	4560.083	6277.979	4583.380	557.969	69.050	259.677
	4	1111.887	4295.605	4626.211	6452.042	4705.207	591.246	84.477	263.353
2000	1	1112.680	4373.882	4694.548	6623.095	4841.934	593.102	72.390	266.813
	2	1108.119	4443.925	4764.491	6753.141	4992.578	586.045	67.097	270.377
	3	1102.126	4546.633	4836.304	6923.027	5113.814	589.054	66.670	274.533
	4	1093.271	4648.382	4910.102	7052.715	5178.059	595.084	67.151	278.493
2001	1	1100.702	4847.897	5028.871	7274.932	5286.143	604.848	66.543	285.233
	2	1117.319	5082.052	5145.630	7521.263	5329.286	610.939	65.201	292.303
	3	1163.460	5316.006	5290.947	7714.624	5369.772	633.770	73.453	300.523
	4	1167.903	5600.019	5416.360	7954.077	5411.227	645.714	70.616	307.027
2000	Feb	1108.415	4365.168	4690.871	6613.556	4840.412	589.984	69.258	266.610
	Mar	1108.899	4397.604	4715.939	6670.919	4885.622	584.525	67.089	267.800
	Apr	1111.965	4427.242	4752.376	6713.639	4940.163	583.053	65.913	269.700
	May	1105.976	4440.582	4759.809	6746.521	5004.650	587.863	68.889	270.060
	Jun	1106.415	4463.950	4781.289	6799.262	5032.920	587.220	66.490	271.370
	Jul	1105.149	4500.162	4802.898	6854.459	5070.745	588.032	66.555	272.740
	Aug	1102.141	4546.055	4836.988	6927.742	5109.364	588.436	66.765	274.540
	Sep	1099.088	4593.683	4869.026	6986.880	5161.332	590.694	66.689	276.320
	Oct	1099.233	4616.667	4886.657	7010.620	5147.086	593.064	66.688	277.290
	Nov	1091.724	4637.370	4901.331	7031.568	5168.100	595.549	67.686	278.050
	Dec	1088.856	4691.108	4942.318	7115.956	5218.990	596.639	67.078	280.140
2001	Jan	1095.843	4760.179	4987.212	7213.594	5270.797	600.886	68.095	282.640
	Feb	1098.905	4854.806	5025.621	7279.509	5284.969	607.234	66.556	285.100
	Mar	1107.359	4928.707	5073.779	7331.692	5302.662	606.425	64.979	287.960
	Apr	1109.742	4998.739	5114.837	7433.292	5324.112	605.800	63.239	290.370
	May	1116.628	5078.226	5138.709	7522.626	5333.225	613.259	67.119	292.040
	Jun	1125.587	5169.191	5183.344	7607.870	5330.522	613.759	65.246	294.500
	Jul	1138.570	5230.318	5224.111	7651.451	5333.894	619.439	66.654	296.690
	Aug	1147.188	5271.389	5265.149	7667.734	5349.804	627.454	66.276	299.260
	Sep	1204.623	5446.312	5383.582	7824.687	5425.619	654.416	87.430	305.620
	Oct	1161.627	5514.243	5373.223	7872.170	5400.411	644.340	72.945	304.790
	Nov	1163.768	5602.226	5416.966	7960.444	5427.438	644.535	69.396	307.090
	Dec	1178.313	5683.587	5458.892	8029.616	5405.831	648.267	69.506	309.200
2002	Jan	1181.327	5678.468	5469.147	8029.723	5395.256	655.818	70.905	310.050
	Feb	1182.649	5718.636	5499.048	8072.061	5408.188	666.938	71.682	311.970

*All values are given in billions of dollars

		Federal	Discount	Prime	3-mo	Treasury Yields			Corporate	S & L	Conventional
		Funds	Rate	Rate		CDs	3 mo	3 yr	10 yr	Aaa Bonds	
1997		5.46	5.00	8.44	5.62	5.20	6.10	6.35	7.26	5.32	7.60
1998		5.35	4.92	8.35	5.47	4.91	5.14	5.26	6.53	4.93	6.94
1999		4.97	4.62	7.99	5.33	4.78	5.49	5.64	7.04	5.28	7.43
2000		6.24	5.73	9.23	6.46	6.00	6.22	6.03	7.62	5.58	8.06
2001		3.89	3.41	6.92	3.69	3.47	4.08	5.02	7.08	4.99	6.97
1999	1	4.73	4.50	7.75	4.90	4.53	4.87	4.98	6.42	4.87	6.88
	2	4.75	4.50	7.75	4.98	4.59	5.35	5.54	6.93	5.05	7.20
	3	5.09	4.60	8.10	5.38	4.79	5.71	5.88	7.33	5.42	7.80
	4	5.31	4.87	8.37	6.06	5.20	6.00	6.14	7.49	5.79	7.83
2000	1	5.68	5.19	8.69	6.03	5.70	6.56	6.48	7.71	5.82	8.26
	2	6.27	5.74	9.25	6.57	5.89	6.52	6.18	7.77	5.72	8.32
	3	6.52	6.00	9.50	6.63	6.20	6.16	5.89	7.61	5.45	8.03
	4	6.47	6.00	9.50	6.59	6.20	5.63	5.57	7.40	5.32	7.64
2001	1	5.59	5.11	8.62	5.26	4.95	4.64	5.05	7.08	5.03	7.01
	2	4.33	3.83	7.34	4.10	3.75	4.43	5.27	7.22	5.11	7.13
	3	3.50	3.06	6.57	3.34	3.24	3.93	4.98	7.11	4.87	6.97
	4	2.13	1.64	5.16	2.06	1.94	3.33	4.77	6.92	4.97	6.78
2000	Feb	5.73	5.24	8.73	6.01	5.73	6.65	6.52	7.68	5.88	8.33
	Mar	5.85	5.34	8.83	6.14	5.86	6.53	6.26	7.68	5.68	8.24
	Apr	6.02	5.50	9.00	6.28	5.82	6.36	5.99	7.64	5.60	8.15
	May	6.27	5.71	9.24	6.71	5.99	6.77	6.44	7.99	5.87	8.52
	Jun	6.53	6.00	9.50	6.73	5.86	6.43	6.10	7.67	5.69	8.29
	Jul	6.54	6.00	9.50	6.67	6.14	6.28	6.05	7.65	5.53	8.15
	Aug	6.50	6.00	9.50	6.61	6.28	6.17	5.83	7.55	5.43	8.03
	Sep	6.52	6.00	9.50	6.60	6.18	6.02	5.80	7.62	5.40	7.91
	Oct	6.51	6.00	9.50	6.67	6.29	5.85	5.74	7.55	5.46	7.80
	Nov	6.51	6.00	9.50	6.65	6.36	5.79	5.72	7.45	5.38	7.75
	Dec	6.40	6.00	9.50	6.45	5.94	5.26	5.24	7.21	5.11	7.38
2001	Jan	5.98	5.52	9.05	5.62	5.29	4.77	5.16	7.15	4.99	7.03
	Feb	5.49	5.00	8.50	5.26	5.01	4.71	5.10	7.10	5.09	7.05
	Mar	5.31	4.81	8.32	4.89	4.54	4.43	4.89	6.98	5.00	6.95
	Apr	4.80	4.28	7.80	4.53	3.97	4.42	5.14	7.20	5.14	7.08
	May	4.21	3.73	7.24	4.02	3.70	4.51	5.39	7.29	5.15	7.15
	Jun	3.97	3.47	6.98	3.74	3.57	4.35	5.28	7.18	5.03	7.16
	Jul	3.77	3.25	6.75	3.66	3.59	4.31	5.24	7.13	4.79	7.13
	Aug	3.65	3.16	6.67	3.48	3.44	4.04	4.97	7.02	4.89	6.95
	Sep	3.07	2.77	6.28	2.87	2.69	3.45	4.73	7.17	4.93	6.82
	Oct	2.49	2.02	5.53	2.31	2.20	3.14	4.57	7.03	4.89	6.62
	Nov	2.09	1.58	5.10	2.03	1.91	3.22	4.65	6.97	4.85	6.66
	Dec	1.82	1.33	4.84	1.83	1.72	3.62	5.09	6.77	5.18	7.07
2002	Jan	1.73	1.25	4.75	1.74	1.68	3.56	5.04	6.55	5.05	7.00
	Feb	1.74	1.25	4.75	1.82	1.76	3.55	4.91	6.51		6.89

*All values are given as a percent at an annual rate

		M1	MZM	M2	M3
Percent change from previous period					
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1997		-3.31	7.23	4.90	8.29
1998		1.00	11.68	7.32	10.37
1999		2.03	12.36	7.58	8.72
2000		0.20	8.07	6.08	9.35
2001		3.02	15.73	8.73	11.38
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1999	1	0.51	2.92	1.78	1.82
	2	0.39	2.23	1.39	1.30
	3	-0.31	2.04	1.56	1.56
	4	1.29	2.03	1.45	2.77
2000	1	0.07	1.82	1.48	2.65
	2	-0.41	1.60	1.49	1.96
	3	-0.54	2.31	1.51	2.52
	4	-0.80	2.24	1.53	1.87
2001	1	0.68	4.29	2.42	3.15
	2	1.51	4.83	2.32	3.39
	3	4.13	4.60	2.82	2.57
	4	0.38	5.34	2.37	3.10
<hr/>					
2000	Feb	-1.10	0.14	0.30	0.44
	Mar	0.04	0.74	0.53	0.87
	Apr	0.28	0.67	0.77	0.64
	May	-0.54	0.30	0.16	0.49
	Jun	0.04	0.53	0.45	0.78
	Jul	-0.11	0.81	0.45	0.81
	Aug	-0.27	1.02	0.71	1.07
	Sep	-0.28	1.05	0.66	0.85
	Oct	0.01	0.50	0.36	0.34
	Nov	-0.68	0.45	0.30	0.30
	Dec	-0.26	1.16	0.84	1.20
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2001	Jan	0.64	1.47	0.91	1.37
	Feb	0.28	1.99	0.77	0.91
	Mar	0.77	1.52	0.96	0.72
	Apr	0.22	1.42	0.81	1.39
	May	0.62	1.59	0.47	1.20
	Jun	0.80	1.79	0.87	1.13
	Jul	1.15	1.18	0.79	0.57
	Aug	0.76	0.79	0.79	0.21
	Sep	5.01	3.32	2.25	2.05
	Oct	-3.57	1.25	-0.19	0.61
	Nov	0.18	1.60	0.81	1.12
	Dec	1.25	1.45	0.77	0.87
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2002	Jan	0.26	-0.09	0.19	0.00
	Feb	0.11	0.71	0.55	0.53

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: M2 minus small denomination time deposits, plus institutional money market mutual funds. The label MZM was coined by William Poole (1991) for this aggregate, proposed earlier by Motley (1988).

M2: M1 plus savings deposits (including money market deposit accounts) and small-denomination (less than \$100,000) time deposits issued by financial institutions; and shares in retail money market mutual funds (funds with initial investments of less than \$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 firms (except depository institutions and money market mutual funds).

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).

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 series, a 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) and www.stls.frb.org/research/newbase.html.

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; additional data are available at www.stls.frb.org/research/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 *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: **MZM**, or "Money, Zero Maturity," includes the zero maturity, or immediately available, components of M3. MZM equals M2 minus small-denomination time deposits, plus institutional money market mutual funds (that is, the money market mutual funds included in M3 but excluded from M2). 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 www.stls.frb.org/research/swdata.html. For analytical purposes, MZM largely replaces M1. The **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** shows constant maturity yields calculated by the U.S. Treasury Department for securities with 3 months and 1, 2, 3, 5, 7, and 10 years to maturity. Daily data and descriptions are available at www.stls.frb.org/fred/data/wkly.html. See also *Federal Reserve Bulletin*, table 1.35. The 30-year constant maturity series was discontinued by the Treasury Department as of February 18, 2002.

Page 5: **Total Checkable Deposits** is the sum of demand and other checkable deposits. **Total 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 *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 Humphrey-Hawkins Act testimony each year. Beginning February 2000, the FOMC began using the Personal Consumption Expenditures (PCE) price index to report its inflation range and therefore is not shown on this graph. **CPI Inflation** is the percentage change from a year ago in the CPI for all urban consumers. **Real Interest Rates** are ex post measures, equal to nominal rates minus CPI inflation.

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 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

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

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 "r" is calculated as the average quarterly growth during the previous 40 quarters, at an annual rate, by the formula $((y_t - y_{t-40})/40) \times 4 \times 100$, where y_t is the log of real GDP. The four-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 available at www.stls.frb.org/research/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 $m = 1, \dots, 10$ years to maturity are obtained by linear interpolation between reported yields. These yields are smoothed by fitting the regression suggested by Nelson and Siegel (1987),

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

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

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

where duration is approximated as $D(m) = (1 - e^{-R(m) \times m}) / R(m)$. These rates are linear approximations to the true instantaneous forward rates; see Shiller (1990). For a discussion of the use of forward rates as indicators of inflation expectations, see Sharpe (1997). **Rates on 3-Month Eurodollar Futures and Rates on Selected Fed Funds Futures Contracts** each trace through time the yield on three specific contracts. **Implied Yields on Fed Funds Futures** displays a single day's snapshot of yields for contracts expiring in the months shown on the horizontal axis. **Inflation-Protected Treasury Yields** are yields on the most recently issued inflation-protected securities of 10- and 30-year original maturity. **Inflation-Protected Treasury Yield Spreads** equal, for 10- and 30-year maturities, the difference between the yields on the most recently issued inflation-protected securities and the unadjusted bond yields of similar maturity. **Inflation-Indexed Bonds** are, for Canada, the 31-year bond with a maturity date of 12/01/2026; for the U.K., the 37.5-year bond with a maturity date of 07/17/2024 and the 12.1-year bond with a maturity date of 10/21/2004; and, for the U.S., the 30-year bond with a maturity date of 04/15/2028 and the 10-year bond with a maturity date of 01/15/2007.

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. Two alternative opportunity costs are shown, one relative to the 3-month Treasury constant-maturity yield, the other to the 5-year constant-maturity yield.

Page 13: Real Gross Domestic Product is GDP as measured in chained 1996 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 1996 dollars.

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

Sources

Bank of Canada

Canadian inflation-linked bond yields.

Bank of England

U.K. inflation-linked bond yields.

Board of Governors of the Federal Reserve System

Monetary aggregates and components, nonfinancial debt: 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 web site. M2 own rate.

Bureau of Economic Analysis

Gross domestic product.

Bureau of Labor Statistics

Consumer price index.

Federal Reserve Bank of Philadelphia

Survey of Professional Forecasters inflation expectations.

Federal Reserve Bank of St. Louis

Adjusted monetary base and adjusted total reserves, monetary services index, MZM own rate, one-year forward rates.

Organization for Economic Cooperation and Development

International interest and inflation rates.

University of Michigan Survey Research Center

Median expected price change.

Congressional Budget Office

Potential real GDP.

Dow Jones and Co. (Wall Street Journal)

Federal funds futures contracts, Eurodollar futures.

Standard and Poors Inc.

Stock price-earnings ratio, stock price composite index.

U.S. Department of the Treasury

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Note: Articles from this Bank's *Review* are available on the Internet at www.stls.frb.org/research/index.html.