



## Alternative Policy Weapons?

With short-term interest rates at historic lows and increased concern about deflation (not disinflation, but *deflation*), many analysts have expressed concern that the Fed will not be able to conduct monetary policy if the federal funds rate—which the Fed currently targets in the conduct of policy—falls to zero. Others claim that the Fed has other weapons in its arsenal that it could turn to in the event that the federal funds rate drops to zero. One claim is that the Fed could conduct monetary policy by buying government securities or other assets instead of targeting the funds rate. There is a sense in which this argument is correct and a sense in which it is not. The point of this discussion is to make this distinction clear.

The Fed has used a variety of short-run operating objectives over the years—free reserves, excess reserves, nonborrowed reserves, and (since the mid-to-late 1980s) the federal funds rate. While the operating objective has changed, the primary tool for achieving the objective essentially has been open market operations, i.e., buying and selling government securities.

The federal funds market rate is the rate paid for balances held at the Fed by banks (and other institutions) when those balances are traded. These balances are part of the banking system's reserves and are used to effect payments and meet statutory reserve requirements. The federal funds rate is determined by the supply of and demand for these balances. The Fed influences the funds rate by using open market operations to alter the supply of reserve balances relative to demand. For example, if the Fed wishes to reduce the funds rate, all other things the same, it must increase the supply of reserves.<sup>1</sup> Hence, open market operations are not another weapon in the Fed's arsenal, but the *only* weapon in its arsenal.

There is a sense in which open market operations and targeting the funds rate might be viewed as alternative

weapons, however. Consider the following example. Assume that the Fed is targeting the funds rate and that the market funds rate is currently at the target level. Now assume that there is a decline in interest rates due, say, to a drop in the demand for credit. This puts downward pressure on the funds rate. If the Fed does not wish to change its funds rate target, it must reduce the supply of reserves by selling government securities. With the funds rate target unchanged, some would say that monetary policy has not changed. From the perspective of open market operations, however, the Fed has tightened monetary policy.

Open market operations and the funds rate target need not be viewed as alternative weapons even in this case, however. Economists would generally argue that monetary policy became *tighter* in the above example not only because the Fed sold government securities, but because it kept the funds rate above the level that it would have moved to in the absence of these actions. According to this view, monetary policy is tight (easy) when the Fed attempts to keep the funds rate above (below) the level that would exist in the absence of policy actions, which might be called the *equilibrium* federal funds rate. From this perspective, monetary policy can be viewed either in terms of open market operations or the funds rate target relative to the equilibrium level. In one case, the degree to which monetary policy is tight or easy is measured by the difference between the target and equilibrium funds rates; in the other, it is measured by the magnitude of open market operations. If the federal funds rate were to reach zero, open market purchases of government securities would not cause the funds rate to fall further. Hence, it would make no sense to characterize policy in terms of the funds rate. Open market operations could continue to serve as the policy tool, however, and the Fed could continue to ease policy by buying government securities.

—Daniel L. Thornton

<sup>1</sup>The Fed must change the supply of reserves even in cases where the funds rate responds immediately to the announcement of a target change. (See Taylor, John B. "Expectations, Open Market Operations, and Changes in the Federal Funds Rate." *Federal Reserve Bank of St. Louis Review*, July/August 2001, 83(4), pp. 33-47.)

As of July 14, 2003, the St. Louis Adjusted Monetary Base and Reserve Series have been revised. For more information, visit [research.stlouisfed.org](http://research.stlouisfed.org), click the "Monetary Aggregates" link in the "Economic Research" section of the left-hand column, and scroll down to the "Federal Reserve Bank of St. Louis Monetary Base and Reserves" section.

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## Conventions used in this publication:

1. Unless otherwise indicated, data are monthly.
2. Except where otherwise noted, solid shading indicates recessions, as determined by the National Bureau of Economic Research. The NBER has not yet determined the end of the recession that began in March 2001; however, the hatched shading indicates this recession ended in November 2001, as determined by a statistical model for dating business cycle turning points developed by Marcelle Chauvet (“An Econometric Characterization of Business Cycle Dynamics with Factor Structure and Regime Switching,” *International Economic Review*, November 1998, pp. 969-96) and discussed by Marcelle Chauvet and Jeremy Piger (“Identifying Business Cycle Turning Points in Real Time,” *Federal Reserve Bank of St. Louis Review*, March/April 2003, pp. 47-62).
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:  $[(x_t/x_{t-12})-1] \times 100$ .

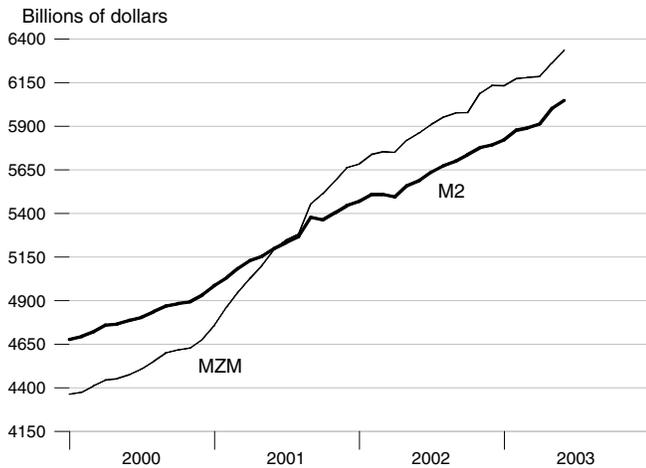
We welcome your comments addressed to:

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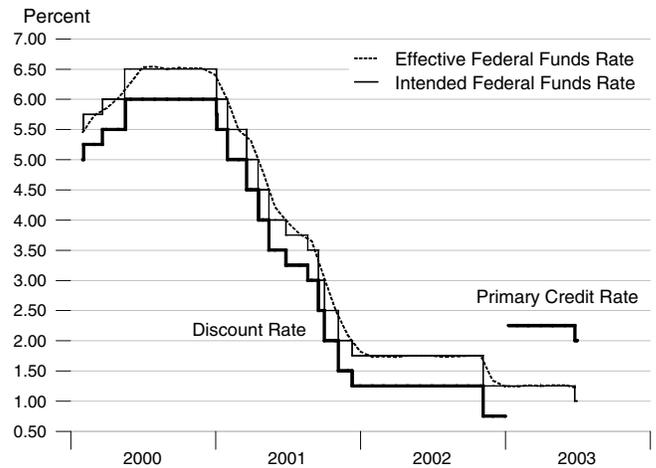
or to:

stlsFRED@stls.frb.org

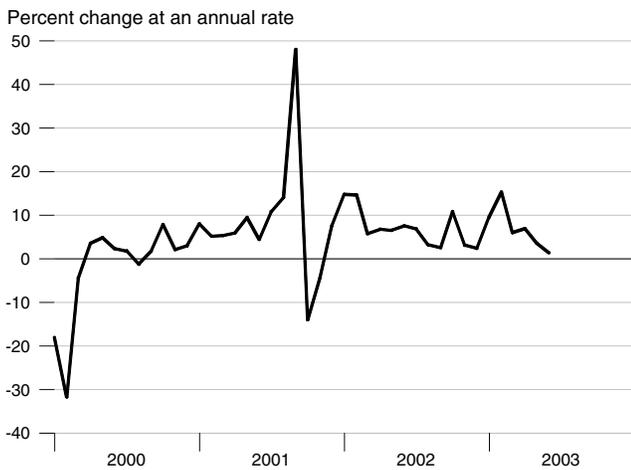
### M2 and MZM



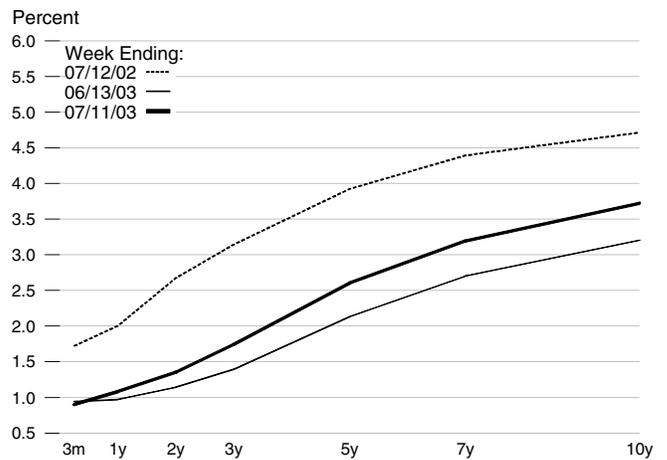
### Reserve Market Rates



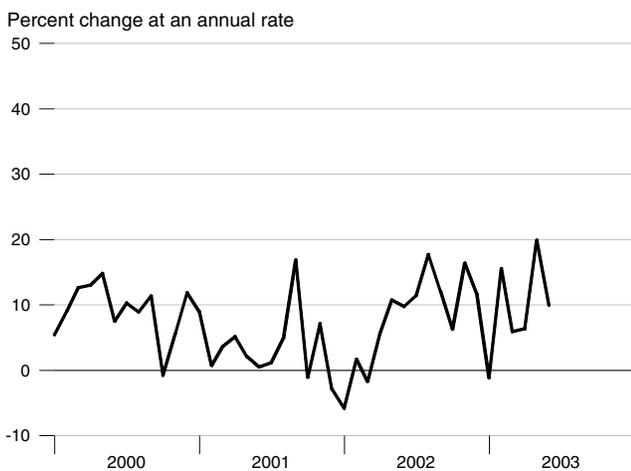
### Adjusted Monetary Base



### Treasury Yield Curve



### Total Bank Credit

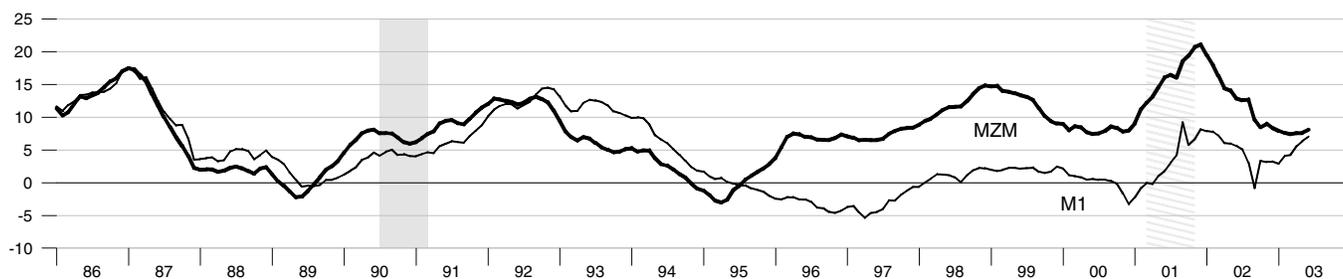


### Interest Rates

	Apr 03	May 03	Jun 03
Federal Funds Rate	1.26	1.26	1.22
Prime Rate	4.25	4.25	4.22
Primary Credit Rate	2.25	2.25	2.20
Conventional Mortgage Rate	5.81	5.48	5.23
<b>Treasury Yields:</b>			
3-Month Constant Maturity	1.15	1.09	0.94
6-Month Constant Maturity	1.17	1.11	0.94
1-Year Constant Maturity	1.27	1.18	1.01
3-Year Constant Maturity	2.06	1.75	1.51
5-Year Constant Maturity	2.93	2.52	2.27
10-Year Constant Maturity	3.96	3.57	3.33

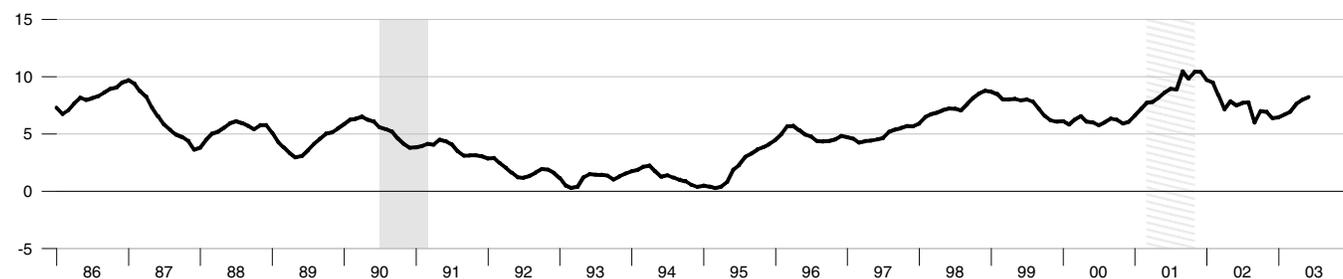
**MZM and M1**

Percent change from year ago



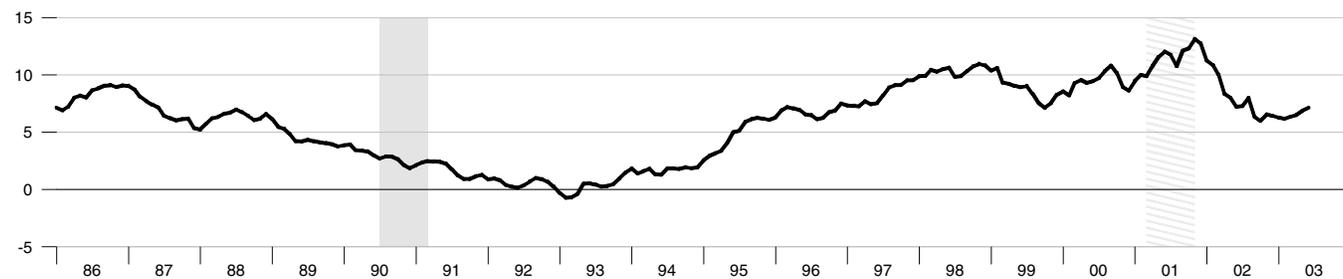
**M2**

Percent change from year ago



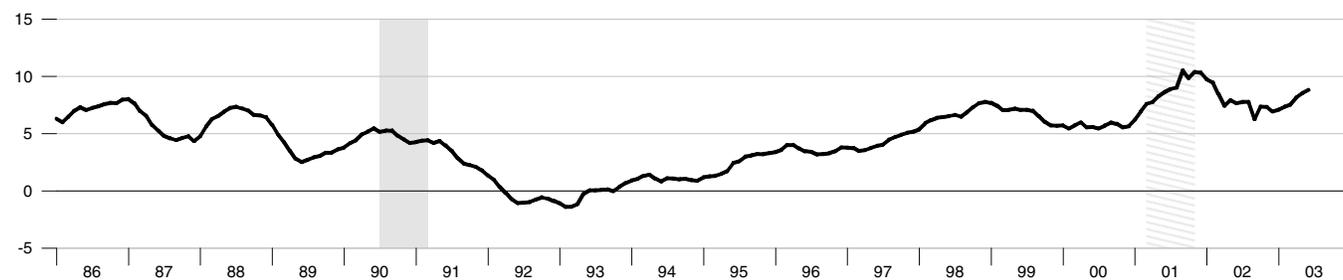
**M3**

Percent change from year ago



**Monetary Services Index - M2**

Percent change from year ago



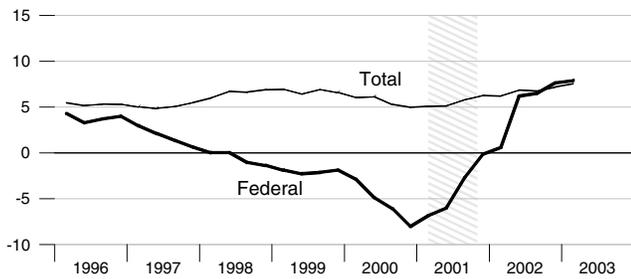
### Adjusted Monetary Base

Percent change from year ago



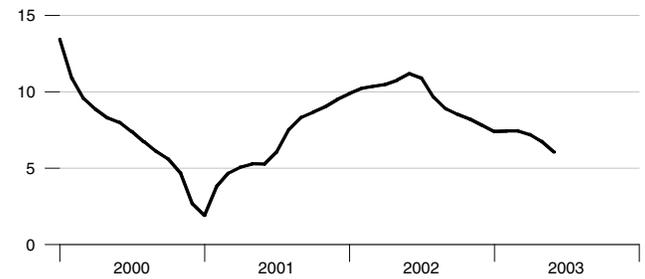
### Domestic Nonfinancial Debt

Percent change from year ago



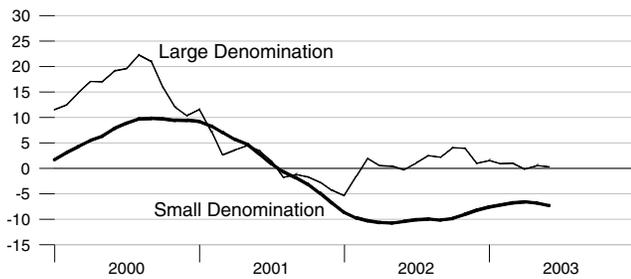
### Currency Held by the Nonbank Public

Percent change from year ago



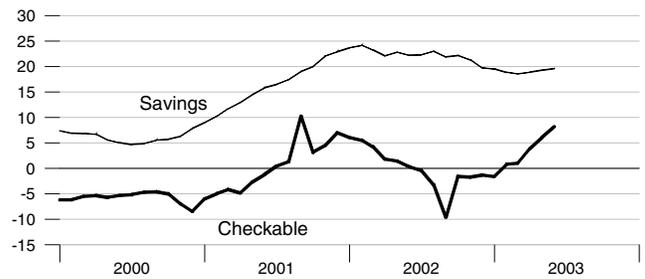
### Time Deposits

Percent change from year ago



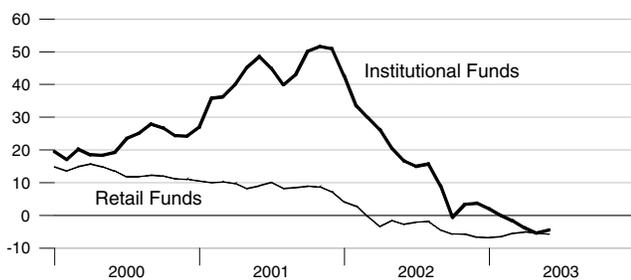
### Checkable and Savings Deposits

Percent change from year ago



### Money Market Mutual Fund Shares

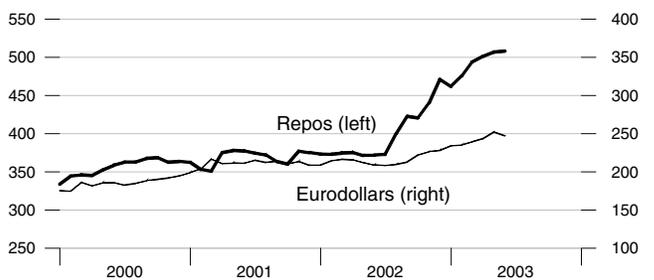
Percent change from year ago



### Repurchase Agreements and Eurodollars

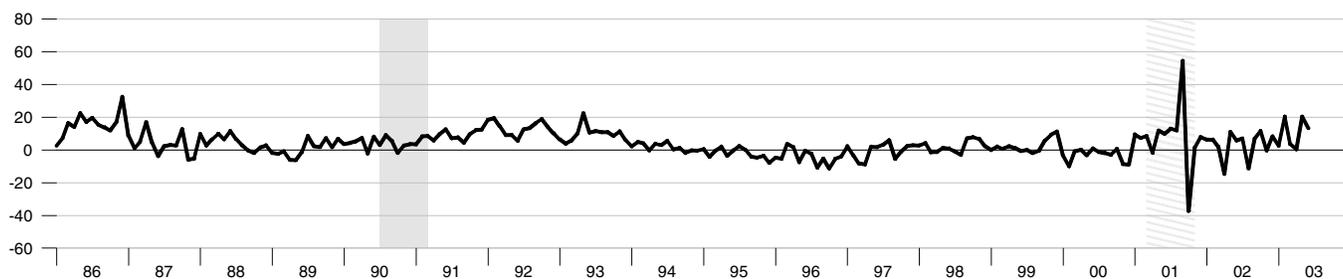
Billions of dollars

Billions of dollars



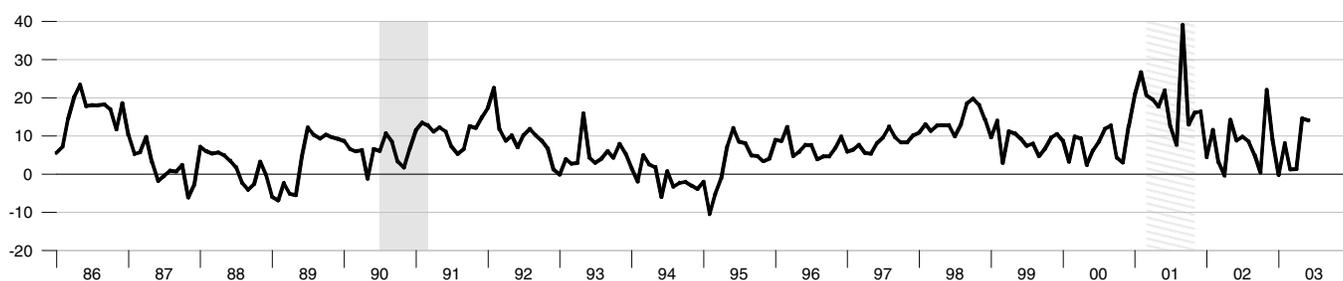
## M1

Percent change at an annual rate



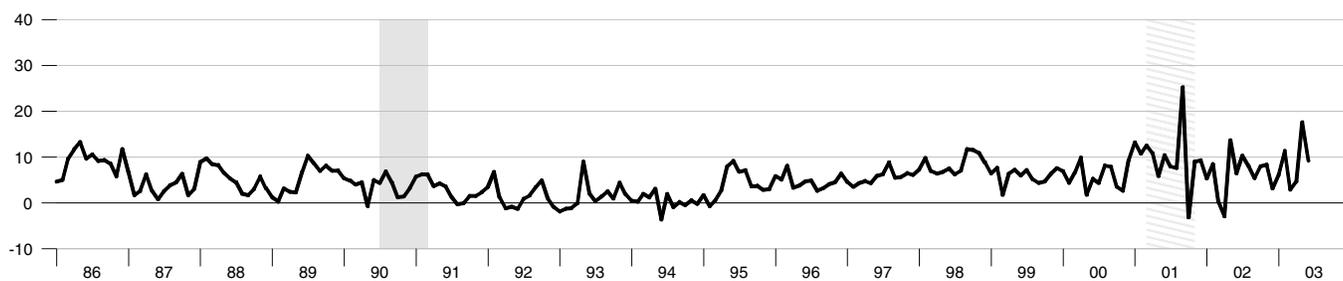
## MZM

Percent change at an annual rate



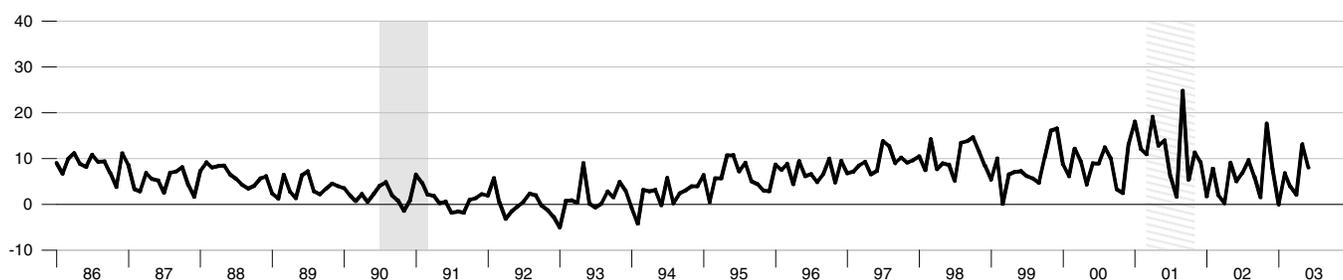
## M2

Percent change at an annual rate



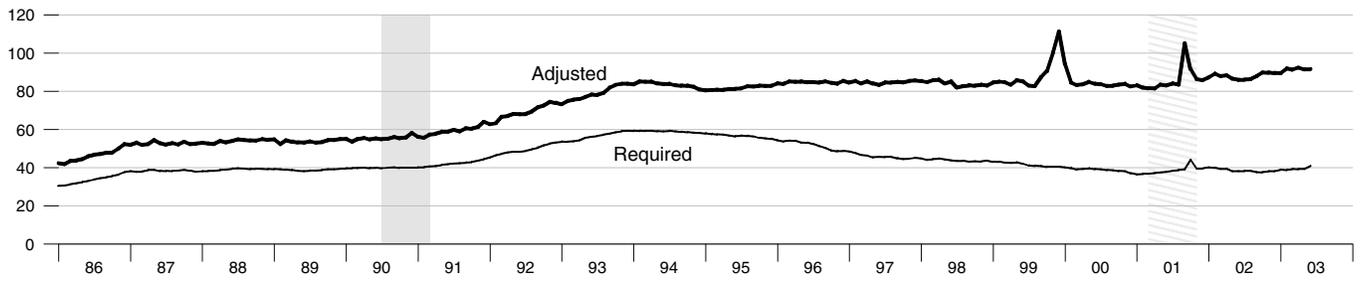
## M3

Percent change at an annual rate



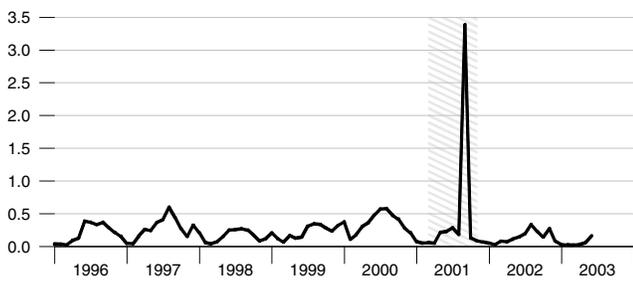
### Adjusted and Required Reserves

Billions of dollars



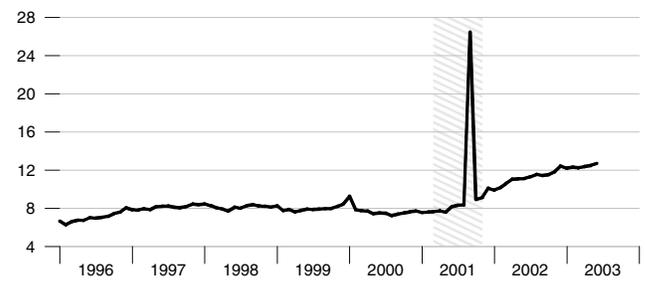
### Total Borrowings, nsa

Billions of dollars



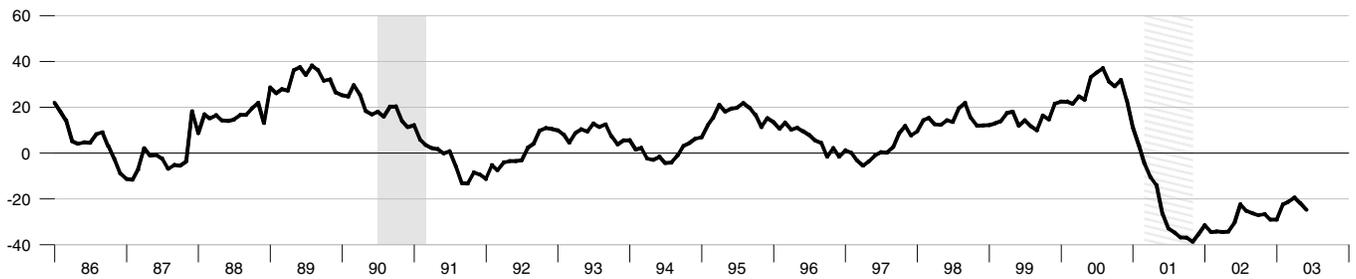
### Excess Reserves plus RCB Contracts

Billions of dollars



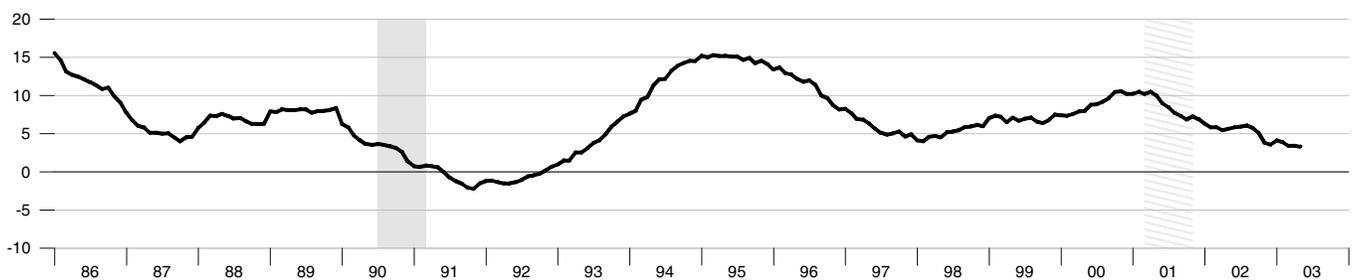
### Nonfinancial Commercial Paper

Percent change from year ago

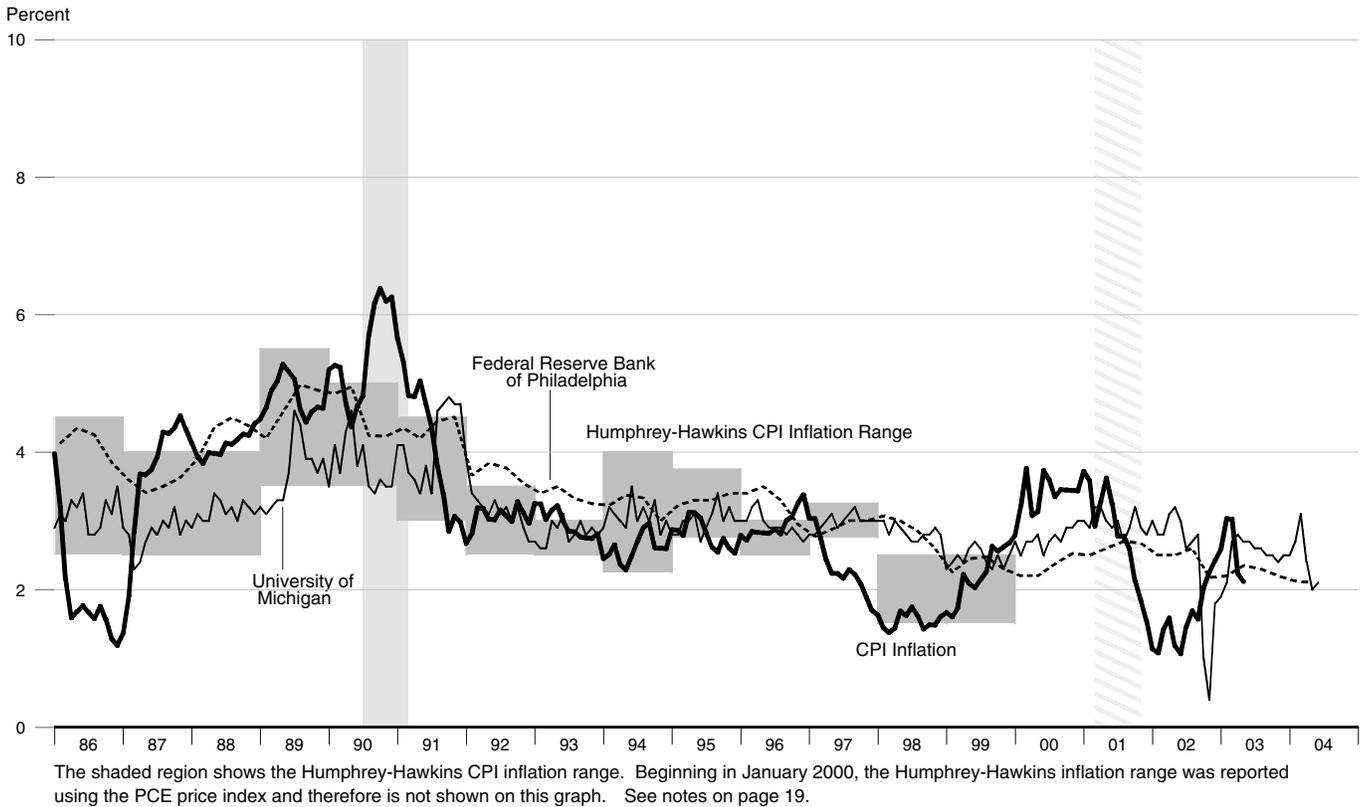


### Consumer Credit

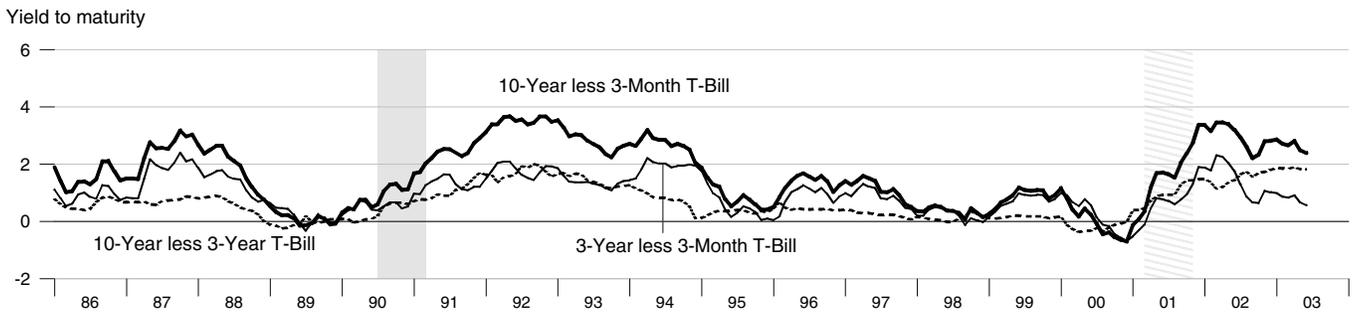
Percent change from year ago



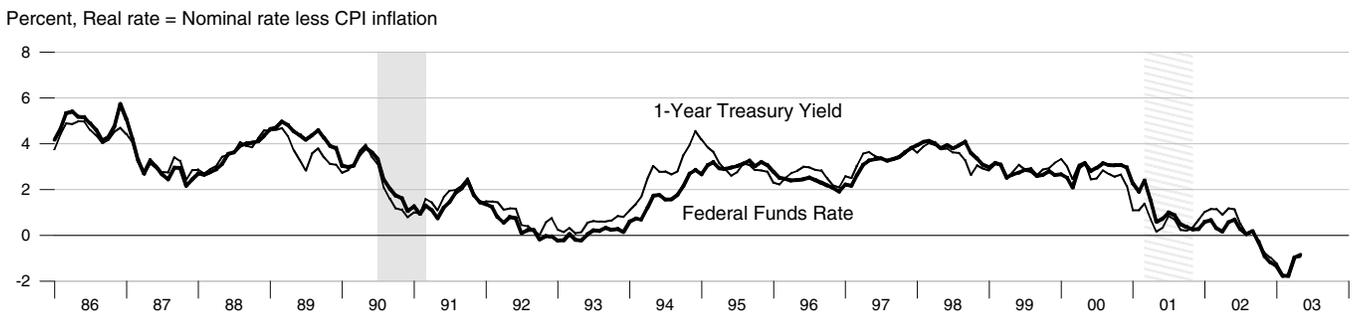
**Inflation and Inflation Expectations**



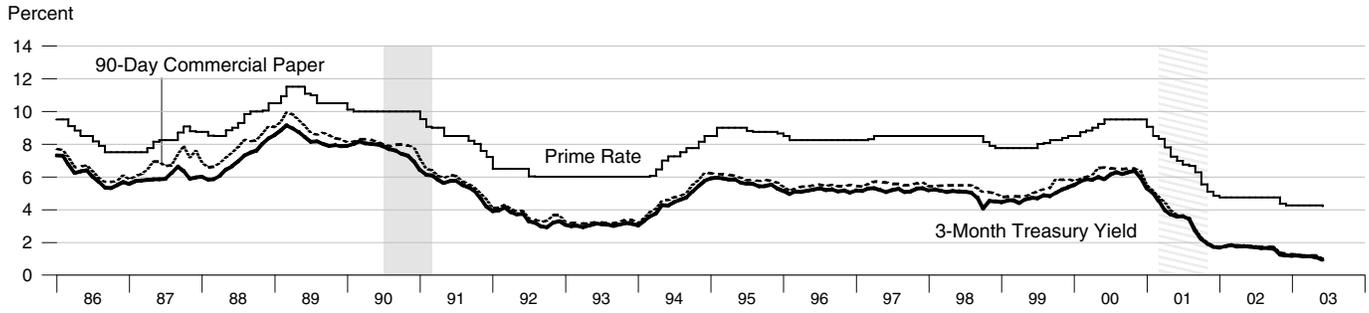
**Treasury Security Yield Spreads**



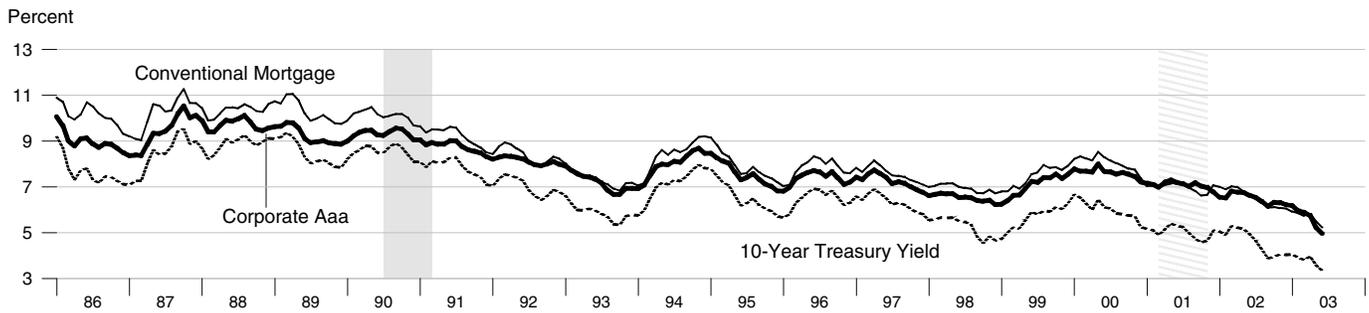
**Real Interest Rates**



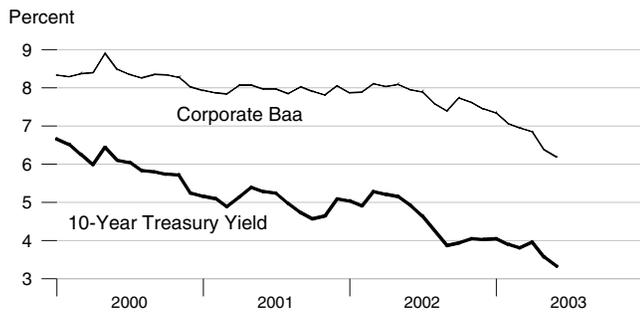
### Short-Term Interest Rates



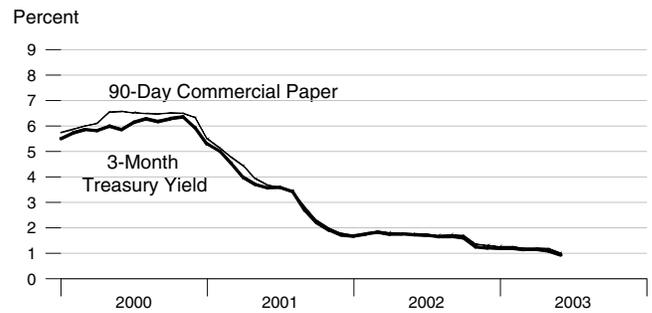
### Long-Term Interest Rates



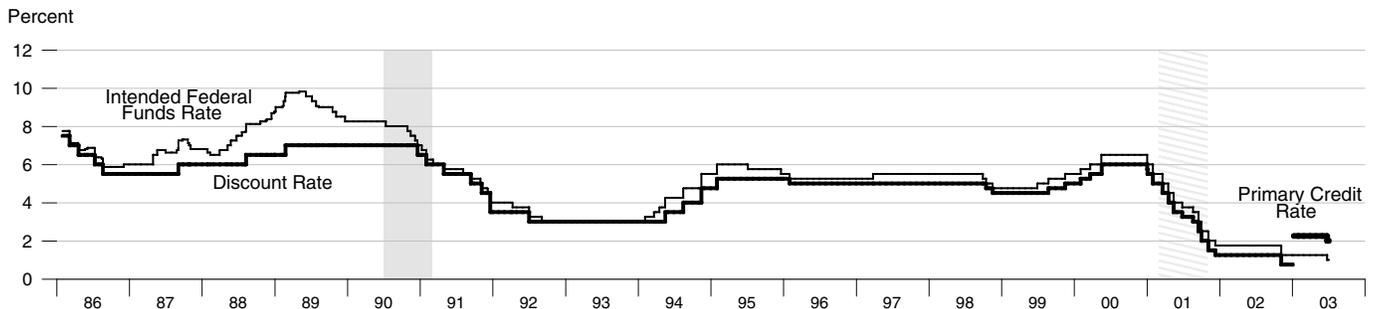
### Long-Term Interest Rates



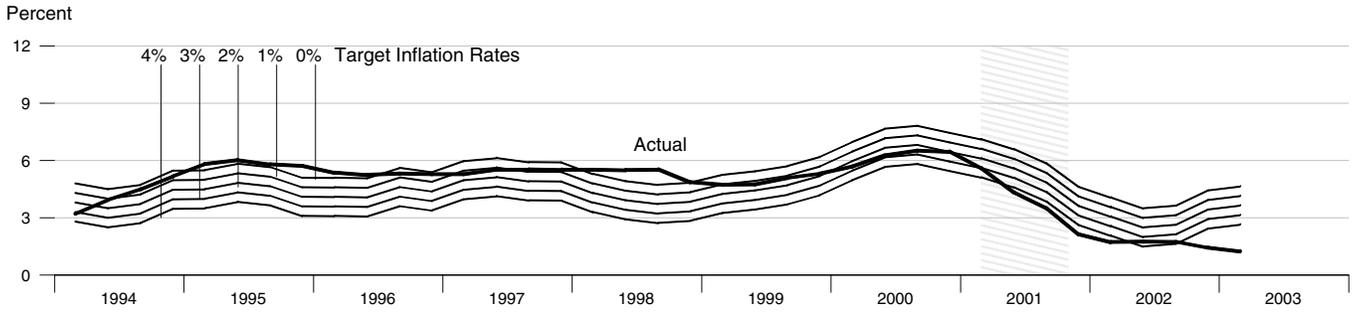
### Short-Term Interest Rates



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



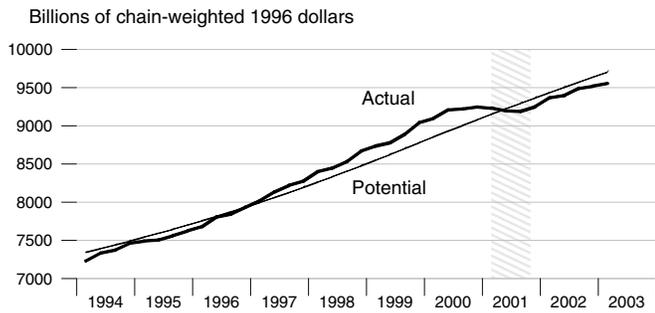
**Federal Funds Rate and Inflation Targets**



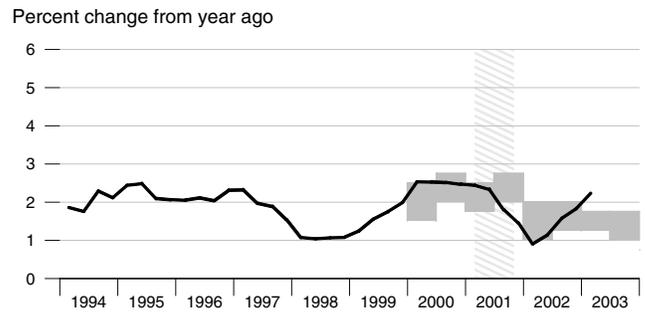
Calculated federal funds rate is based on Taylor's rule. See notes on page 19.

**Components of Taylor's Rule**

**Actual and Potential Real GDP**

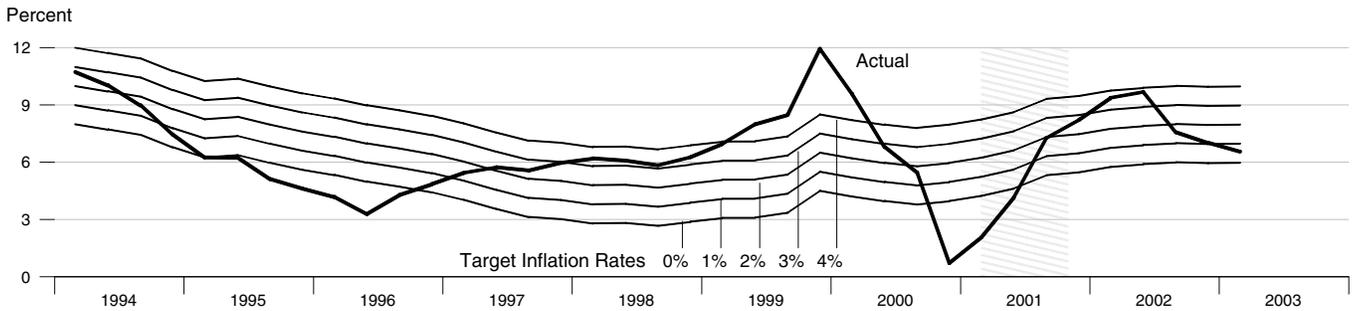


**PCE Inflation and Projections**



The shaded region shows the range of projections published in the Monetary Policy Report to the Congress.

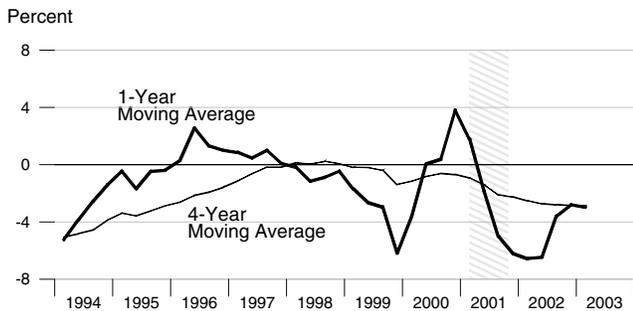
**Monetary Base Growth\* and Inflation Targets**



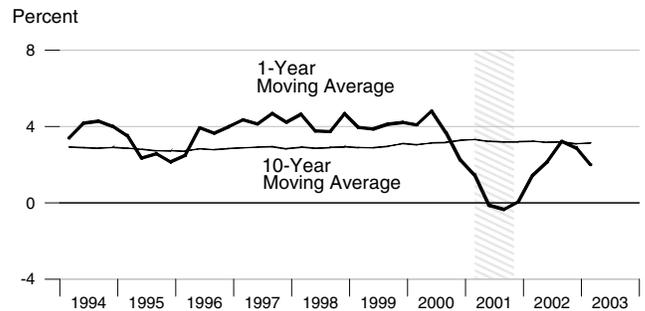
\*Modified for the effects of sweeps programs on reserve demand. Calculated base growth is based on McCallum's rule. Actual base growth is percent change from year ago. See notes on page 19.

**Components of McCallum's Rule**

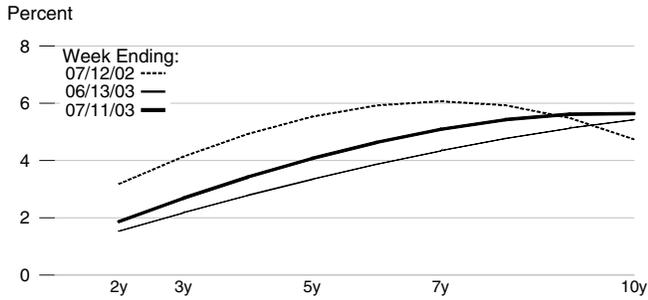
**Monetary Base Velocity Growth**



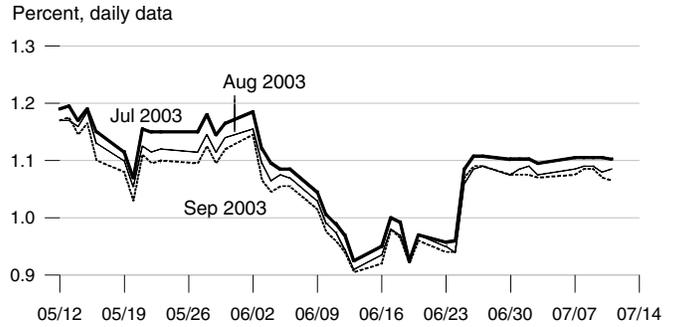
**Real Output Growth**



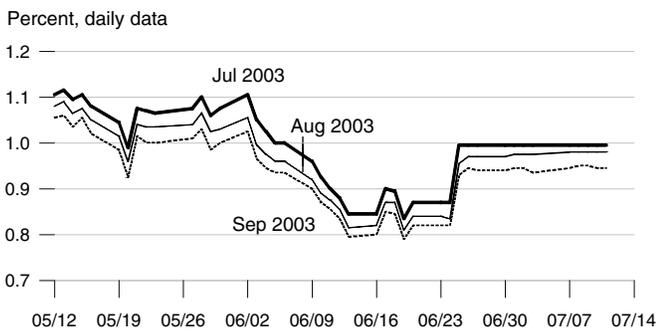
### Implied One-Year Forward Rates



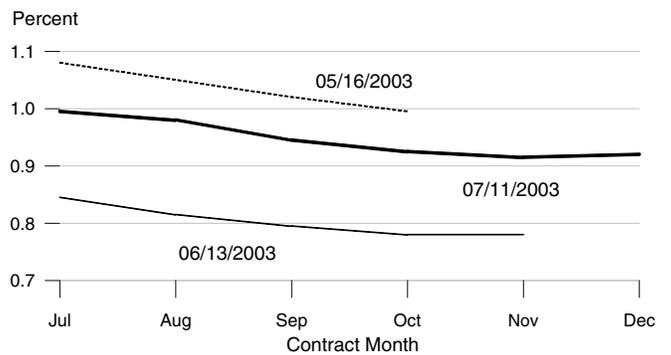
### Rates on 3-Month Eurodollar Futures



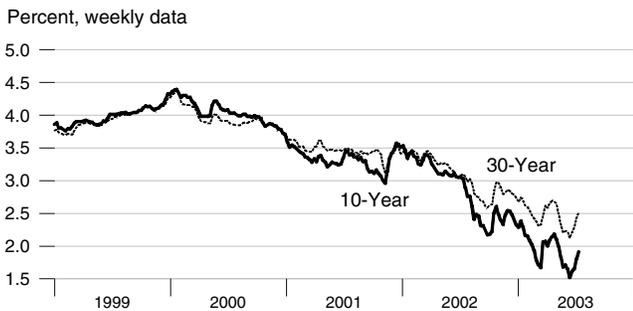
### Rates on Selected Federal Funds Futures Contracts



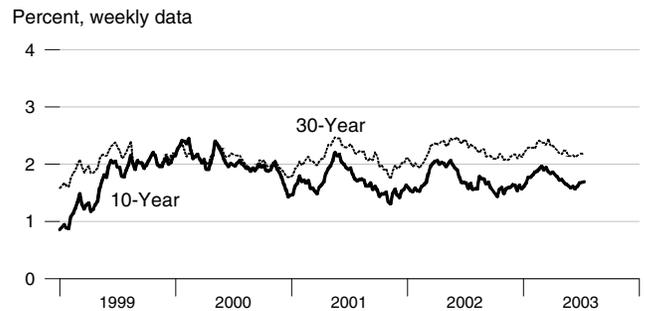
### Rates on Federal Funds Futures on Selected Dates



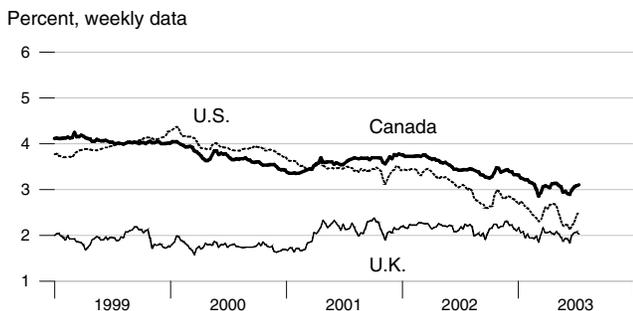
### Inflation-Indexed Treasury Bonds



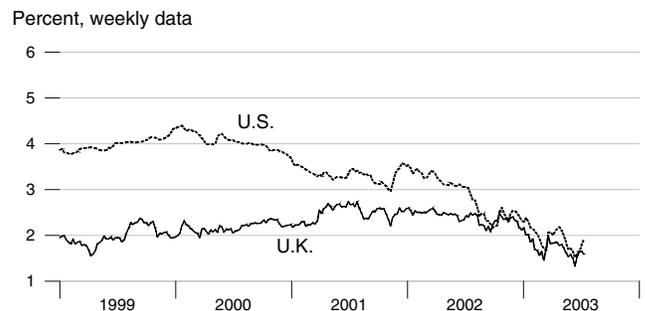
### Inflation-Indexed Treasury Yield Spreads



### Inflation-Indexed 30-Year Government Bonds

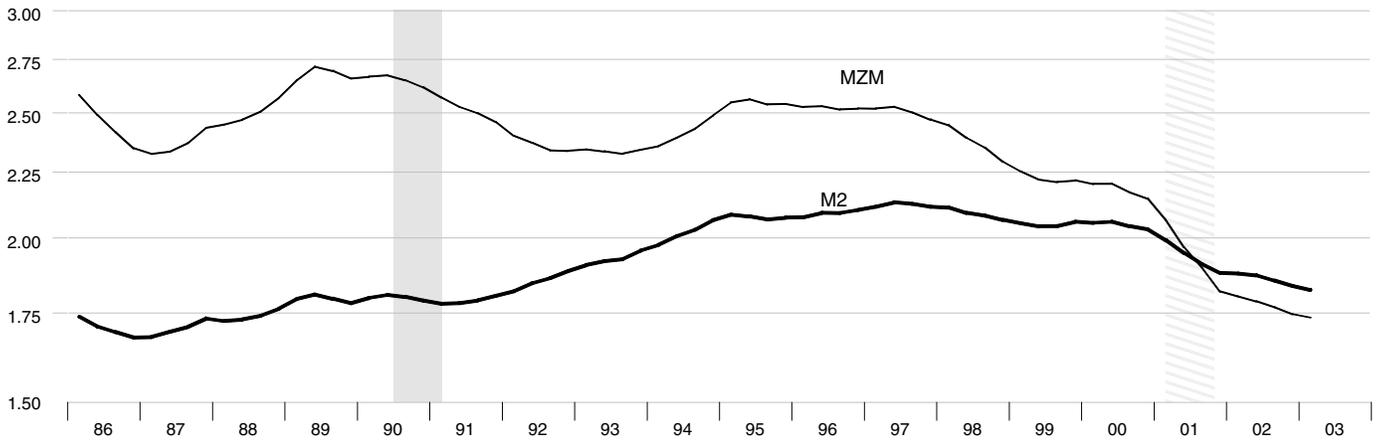


### Inflation-Indexed 10-Year Government Bonds



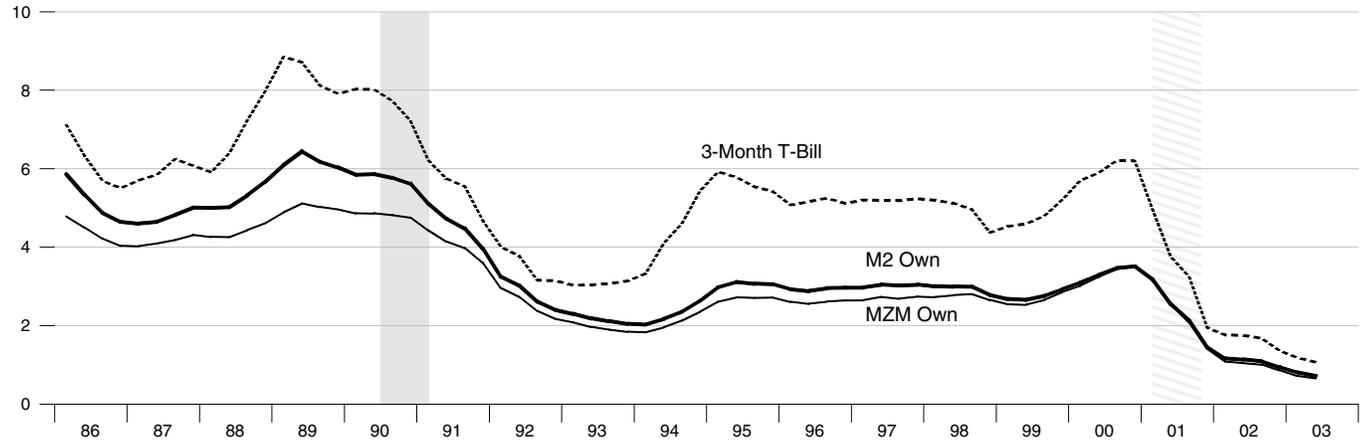
Velocity

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



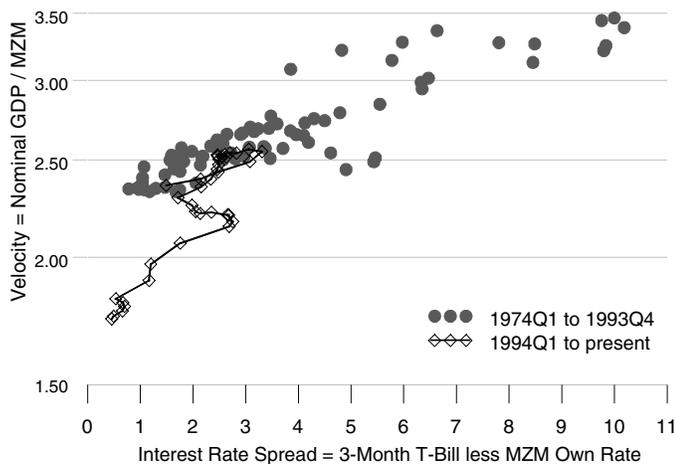
Interest Rates

Percent



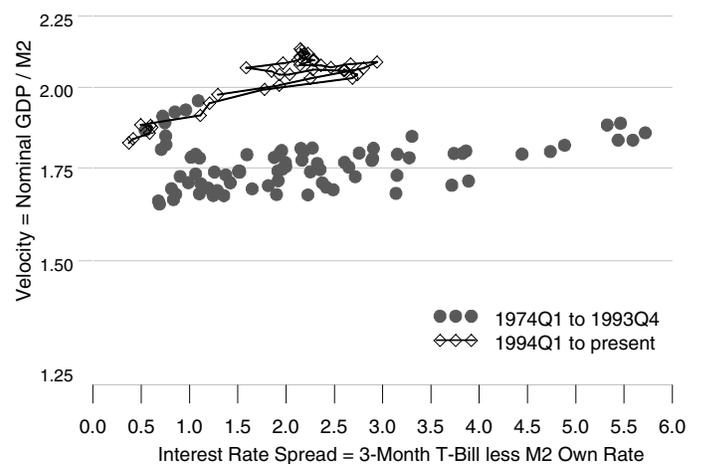
MZM Velocity and Interest Rate Spread

Ratio Scale



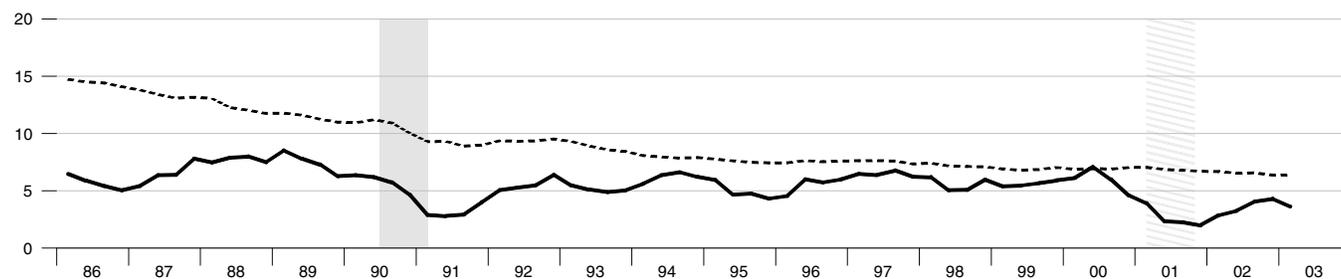
M2 Velocity and Interest Rate Spread

Ratio Scale



### Gross Domestic Product

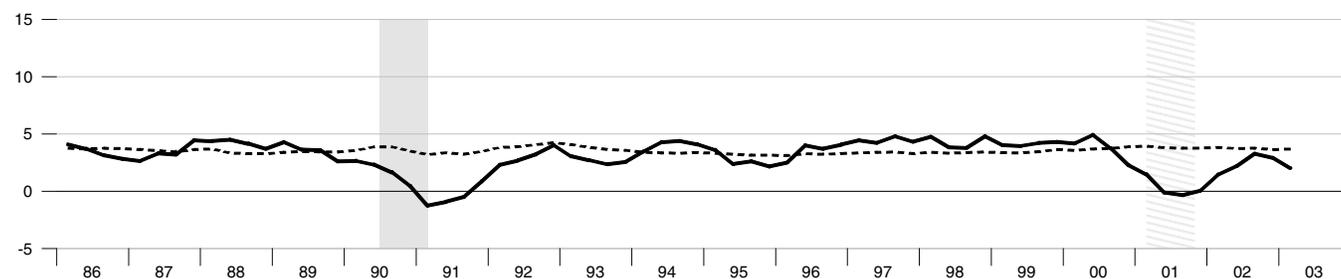
Percent change from year ago



Dashed lines indicate 10-year moving averages.

### Real Gross Domestic Product

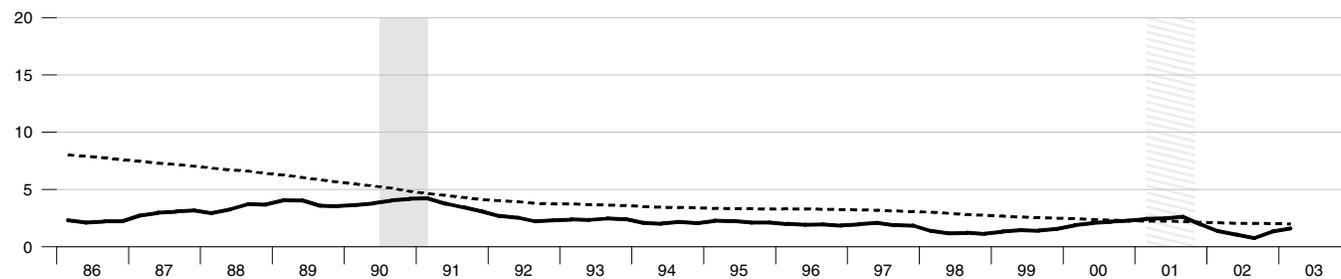
Percent change from year ago



Dashed lines indicate 10-year moving averages.

### Gross Domestic Product Price Index

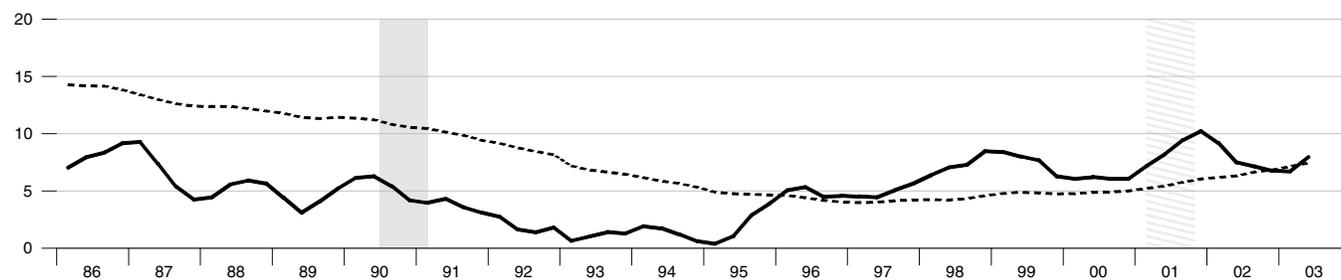
Percent change from year ago



Dashed lines indicate 10-year moving averages.

### M2

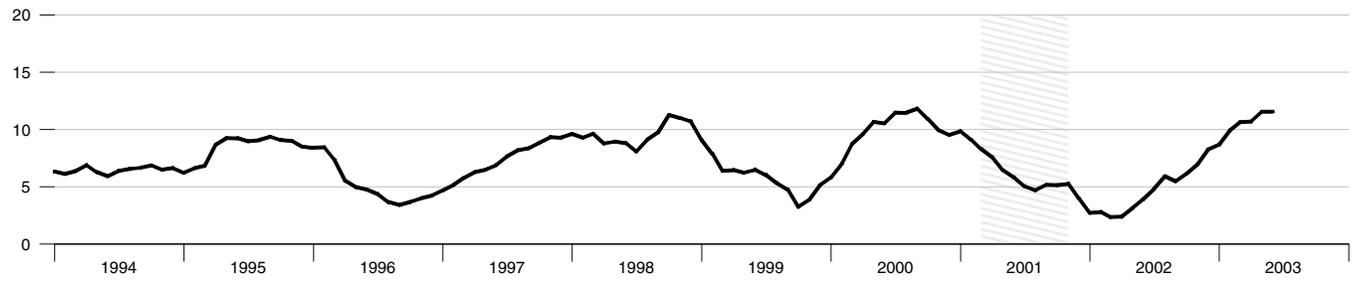
Percent change from year ago



Dashed lines indicate 10-year moving averages.

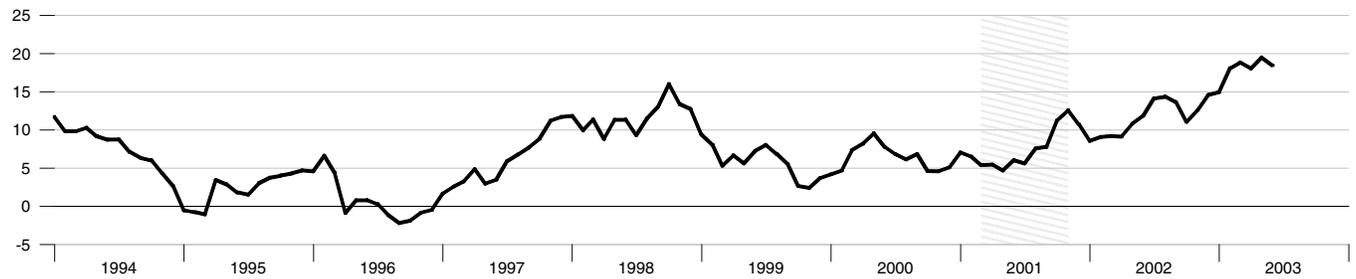
**Bank Credit**

Percent change from year ago



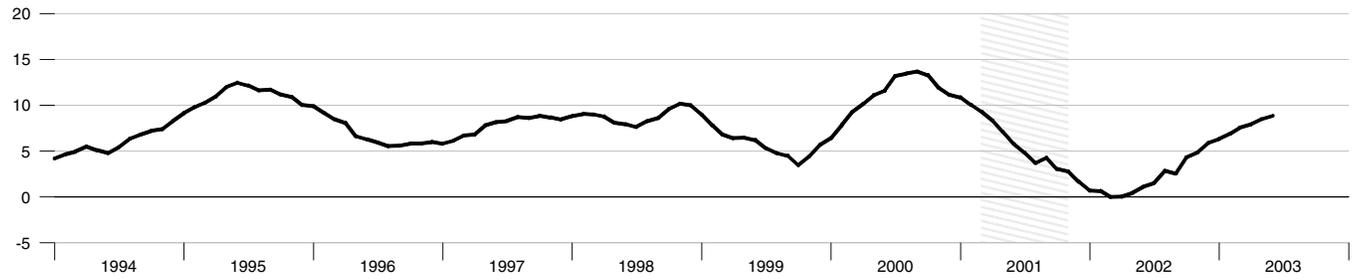
**Investment Securities in Bank Credit at Commercial Banks**

Percent change from year ago



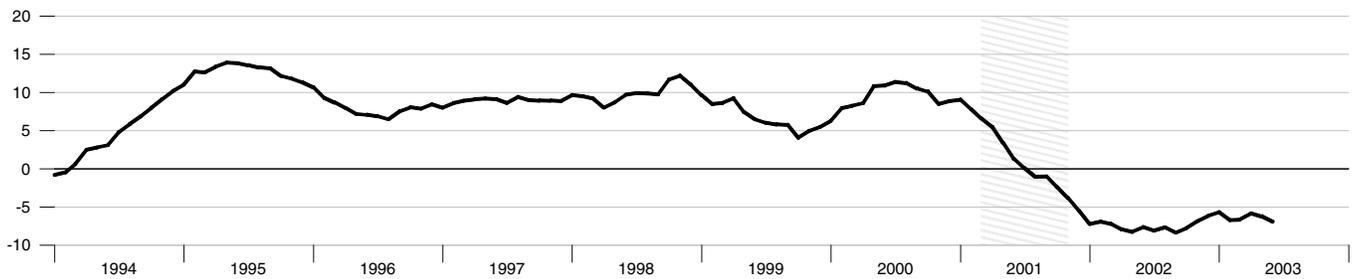
**Total Loans and Leases in Bank Credit at Commercial Banks**

Percent change from year ago

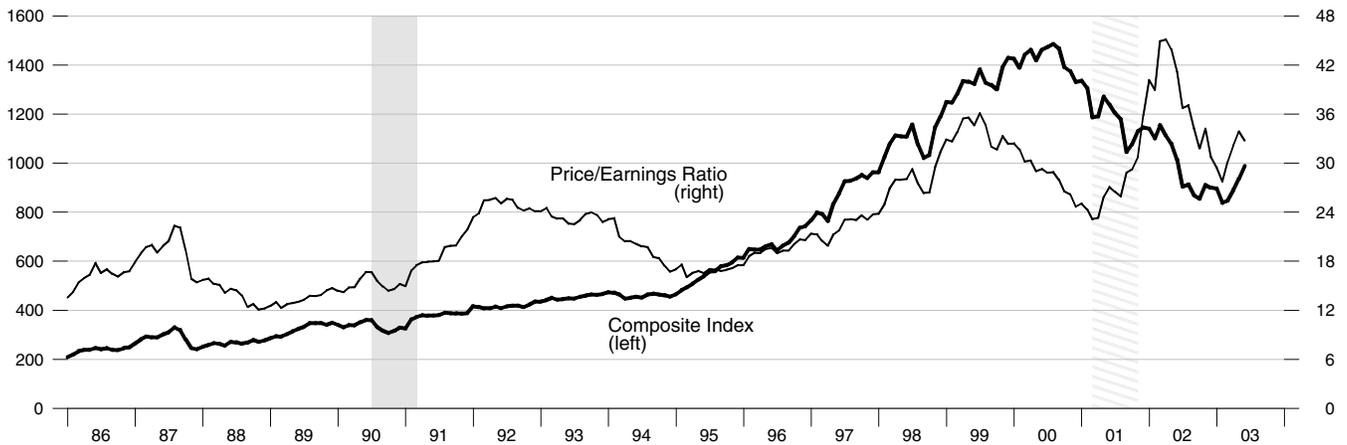


**Commercial and Industrial Loans at Commercial Banks**

Percent change from year ago



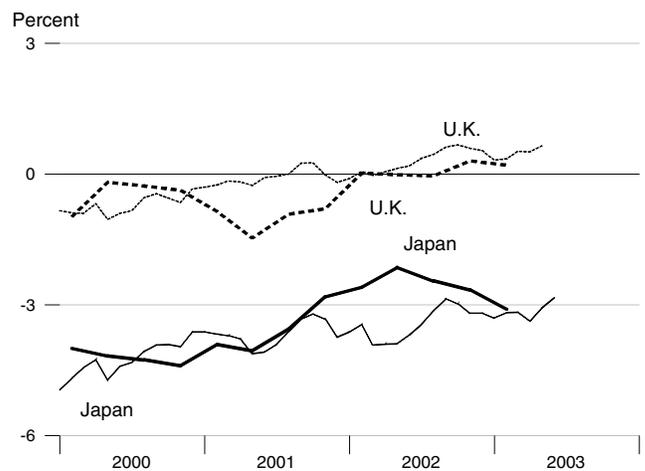
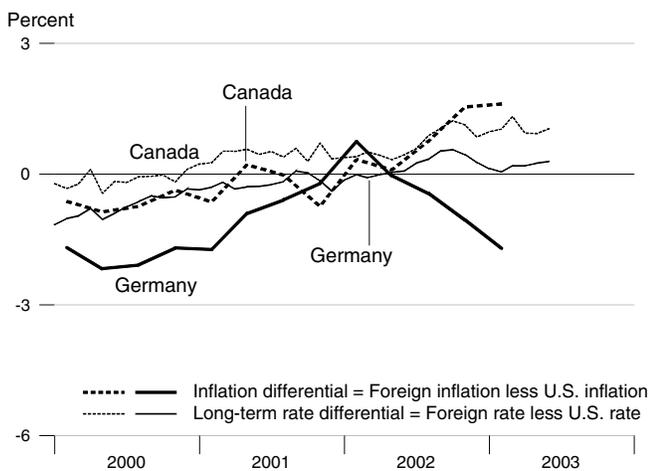
### Standard & Poor's 500



### Recent Inflation and Long-Term Interest Rates

	Consumer Price Inflation Rates				Long-Term Government Bond Rates			
	Percent change from year ago				Percent			
	2002Q2	2002Q3	2002Q4	2003Q1	Mar03	Apr03	May03	Jun03
United States	1.24	1.58	2.25	2.87	3.81	3.96	3.57	3.33
Canada	1.33	2.33	3.79	4.47	5.13	4.90	4.50	4.37
France	1.63	1.75	2.14	2.38	4.55	4.49	3.88	.
Germany	1.20	1.14	1.20	1.17	4.00	4.15	3.82	3.62
Italy	2.27	2.41	2.77	2.72	4.18	4.31	4.04	.
Japan	-0.90	-0.87	-0.40	-0.23	0.64	0.59	0.50	0.49
United Kingdom	1.23	1.53	2.56	3.07	4.33	4.47	4.22	.

### Inflation and Long-Term Interest Rate Differentials



		Money Stock				Bank	Adjusted		
		M1	MZM	M2	M3	Credit	Monetary Base	Reserves	MSI M2
1998		1079.870	3709.460	4207.773	5749.669	4333.248	525.184	84.060	241.552
1999		1101.495	4170.041	4525.775	6252.402	4587.556	574.181	88.664	257.900
2000		1103.401	4507.616	4801.194	6841.028	5037.233	607.106	84.511	272.523
2001		1136.611	5218.970	5221.875	7620.986	5355.620	641.167	85.931	296.257
2002		1190.259	5886.105	5619.391	8228.171	5601.618	697.071	87.924	319.376
2001	1	1100.135	4855.412	5032.809	7275.901	5282.427	619.676	82.207	285.330
	2	1116.115	5107.226	5160.071	7542.994	5323.768	629.484	82.722	292.817
	3	1162.814	5327.136	5291.533	7725.814	5373.268	651.930	90.906	300.507
	4	1167.377	5586.105	5403.087	7939.235	5443.015	663.578	87.887	306.373
2002	1	1183.762	5724.013	5494.506	8055.002	5421.149	680.264	88.157	311.587
	2	1181.599	5809.887	5546.291	8134.736	5491.095	692.937	86.979	315.240
	3	1190.547	5944.733	5668.776	8281.752	5663.678	702.753	86.820	322.263
	4	1205.127	6065.787	5767.990	8441.193	5830.551	712.330	89.741	328.413
2003	1	1227.902	6160.945	5862.333	8559.387	5949.685	726.820	90.923	334.383
	2	1255.980	6259.910	5986.470	8690.594	6109.869	738.183	91.835	342.003
2001	Jun	1125.834	5193.835	5198.157	7627.837	5328.383	632.666	83.152	295.000
	Jul	1138.001	5247.612	5232.558	7666.166	5333.570	638.344	84.123	297.030
	Aug	1149.222	5281.126	5265.733	7676.583	5355.553	645.817	83.517	299.260
	Sep	1201.220	5452.671	5376.309	7834.693	5430.682	671.628	105.077	305.230
	Oct	1163.909	5511.502	5362.212	7869.722	5425.940	663.798	91.551	304.240
	Nov	1165.335	5585.291	5402.608	7943.632	5458.128	661.381	86.229	306.400
	Dec	1172.887	5661.523	5444.441	8004.351	5444.976	665.556	85.880	308.480
2002	Jan	1179.038	5682.552	5468.550	8016.074	5418.717	673.713	87.296	310.000
	Feb	1185.171	5737.146	5506.972	8067.869	5426.176	681.914	89.238	312.220
	Mar	1187.077	5752.342	5507.995	8081.063	5418.555	685.165	87.936	312.540
	Apr	1172.605	5750.446	5494.617	8082.742	5443.739	689.008	88.352	312.460
	May	1183.278	5818.325	5557.095	8143.703	5492.434	692.736	86.588	315.710
	Jun	1188.913	5860.890	5587.162	8177.764	5537.113	697.068	85.998	317.550
	Jul	1195.803	5908.516	5634.983	8224.290	5589.830	701.032	86.100	320.040
	Aug	1184.532	5950.535	5672.855	8290.107	5672.139	702.878	86.382	322.450
	Sep	1191.305	5975.149	5698.489	8330.860	5729.066	704.350	87.978	324.300
	Oct	1202.680	5977.528	5736.336	8341.483	5759.216	710.664	89.827	326.550
	Nov	1202.252	6087.124	5776.231	8463.682	5837.766	712.472	89.818	328.840
	Dec	1210.450	6132.710	5791.403	8518.415	5894.670	713.853	89.578	329.850
2003	Jan	1213.076	6131.413	5821.023	8518.320	5889.107	719.528	89.508	331.950
	Feb	1233.526	6172.608	5875.886	8566.094	5965.281	728.657	91.901	335.140
	Mar	1237.105	6178.814	5890.090	8593.748	5994.668	732.276	91.360	336.060
	Apr	1237.425	6185.465	5913.277	8608.810	6026.403	736.467	92.372	337.920
	May	1258.285	6260.411	5999.921	8702.434	6126.143	738.623	91.499	342.580
	Jun	1272.230	6333.855	6046.212	8760.539	6177.062	739.460	91.633	345.510

\*All values are given in billions of dollars.

		Federal	Discount	Primary	Prime	3-mo	Treasury Yields			Corporate	S & L	Conventional
		Funds	Rate	Credit Rate	Rate		CDs	3-mo	3-yr	10-yr	Aaa Bonds	
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	5.01	6.97
2002		1.67	1.17		4.68	1.73	1.63	3.10	4.61	6.49	4.87	6.54
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	4.95	6.97
	4	2.13	1.64		5.16	2.06	1.94	3.33	4.77	6.92	4.97	6.78
2002	1	1.73	1.25		4.75	1.82	1.76	3.75	5.08	6.62	5.02	6.97
	2	1.75	1.25		4.75	1.83	1.75	3.77	5.10	6.71	5.01	6.81
	3	1.74	1.25		4.75	1.76	1.67	2.62	4.26	6.35	4.72	6.29
	4	1.44	0.94		4.45	1.49	1.36	2.27	4.01	6.28	4.71	6.08
2003	1	1.25		2.25	4.25	1.26	1.18	2.07	3.92	6.00	4.60	5.83
	2	1.25		2.23	4.24	1.17	1.06	1.77	3.62	5.31	4.28	5.51
2001	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	5.04	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	4.93	6.89
	Mar	1.73	1.25		4.75	1.91	1.83	4.14	5.28	6.81	5.09	7.01
	Apr	1.75	1.25		4.75	1.87	1.75	4.01	5.21	6.76	5.09	6.99
	May	1.75	1.25		4.75	1.82	1.76	3.80	5.16	6.75	5.03	6.81
	Jun	1.75	1.25		4.75	1.81	1.73	3.49	4.93	6.63	4.92	6.65
	Jul	1.73	1.25		4.75	1.79	1.71	3.01	4.65	6.53	4.81	6.49
	Aug	1.74	1.25		4.75	1.73	1.65	2.52	4.26	6.37	4.78	6.29
	Sep	1.75	1.25		4.75	1.76	1.66	2.32	3.87	6.15	4.58	6.09
	Oct	1.75	1.25		4.75	1.73	1.61	2.25	3.94	6.32	4.66	6.11
	Nov	1.34	0.83		4.35	1.39	1.25	2.32	4.05	6.31	4.77	6.07
	Dec	1.24	0.75		4.25	1.34	1.21	2.23	4.03	6.21	4.70	6.05
2003	Jan	1.24			4.25	1.29	1.19	2.18	4.05	6.17	4.72	5.92
	Feb	1.26		2.25	4.25	1.27	1.19	2.05	3.90	5.95	4.57	5.84
	Mar	1.25		2.25	4.25	1.23	1.15	1.98	3.81	5.89	4.51	5.75
	Apr	1.26		2.25	4.25	1.24	1.15	2.06	3.96	5.74	4.60	5.81
	May	1.26		2.25	4.25	1.22	1.09	1.75	3.57	5.22	4.16	5.48
	Jun	1.22		2.20	4.22	1.04	0.94	1.51	3.33	4.97	4.07	5.23

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

		M1	MZM	M2	M3
<b>Percent change at an annual rate</b>					
<hr/>					
	1998	0.99	11.67	7.29	10.36
	1999	2.00	12.42	7.56	8.74
	2000	0.17	8.10	6.09	9.41
	2001	3.01	15.78	8.76	11.40
	2002	4.72	12.78	7.61	7.97
<hr/>					
2001	1	2.71	18.61	10.65	13.24
	2	5.81	20.75	10.11	14.68
	3	16.74	17.22	10.19	9.69
	4	1.57	19.45	8.43	11.05
2002	1	5.61	9.88	6.77	5.83
	2	-0.73	6.00	3.77	3.96
	3	3.03	9.28	8.83	7.23
	4	4.90	8.15	7.00	7.70
2003	1	7.56	6.28	6.54	5.60
	2	9.15	6.43	8.47	6.13
<hr/>					
2001	Jun	9.86	21.86	10.38	13.93
	Jul	12.97	12.42	7.94	6.03
	Aug	11.83	7.66	7.61	1.63
	Sep	54.30	38.98	25.20	24.72
	Oct	-37.27	12.95	-3.15	5.37
	Nov	1.47	16.07	9.04	11.27
	Dec	7.78	16.38	9.29	9.17
<hr/>					
2002	Jan	6.29	4.46	5.31	1.76
	Feb	6.24	11.53	8.43	7.75
	Mar	1.93	3.18	0.22	1.96
	Apr	-14.63	-0.40	-2.91	0.25
	May	10.92	14.16	13.64	9.05
	Jun	5.71	8.78	6.49	5.02
	Jul	6.95	9.75	10.27	6.83
	Aug	-11.31	8.53	8.07	9.60
	Sep	6.86	4.96	5.42	5.90
	Oct	11.46	0.48	7.97	1.53
	Nov	-0.43	22.00	8.35	17.58
	Dec	8.18	8.99	3.15	7.76
<hr/>					
2003	Jan	2.60	-0.25	6.14	-0.01
	Feb	20.23	8.06	11.31	6.73
	Mar	3.48	1.21	2.90	3.87
	Apr	0.31	1.29	4.72	2.10
	May	20.23	14.54	17.58	13.05
	Jun	13.30	14.08	9.26	8.01

## 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 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, 1996b, 2001).

**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, 2001).

**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 [research.stlouisfed.org/msi/index.html](http://research.stlouisfed.org/msi/index.html).

**Note:** M1, M2, M3, Bank Credit, and Domestic Nonfinancial Debt are constructed and published by the Board of Governors of the Federal Reserve System. For details, see *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 [research.stlouisfed.org/aggreg/swdata.html](http://research.stlouisfed.org/aggreg/swdata.html). **Primary Credit Rate**,

**Discount Rate**, and **Intended Federal Funds Rate** shown in the chart **Reserve Market Rates** are plotted as of the date of the change, while the **Effective Federal Funds Rate** is plotted as of the end of the month. Interest rates in the table are monthly averages from the Board of Governors H.15 Statistical Release. The **Treasury Yield Curve** 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 [research.stlouisfed.org/fred/data/wkly.html](http://research.stlouisfed.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:* **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 *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 consumer price index 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,  $\pi_{t-1}$  is the previous period's inflation rate (PCE) measured on a year-over-year basis,  $y_{t-1}$  is the log of the previous period's level of real gross domestic product (GDP), and  $y_{t-1}^P$  is the log of an estimate of the previous period's level of potential output. **Potential Real GDP** is 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  $\Delta MB_t^*$  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  $((y_t - y_{t-40})/40) \times 4 \times 100$ , 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 [research.stlouisfed.org/aggreg/swdata.html](http://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  $m = 1, \dots, 10$  years to maturity are obtained by linear interpolation between reported yields. These yields are smoothed by fitting the regression suggested by Nelson and Siegel (1987),

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

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

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

where duration is approximated as  $D(m) = (1 - e^{-R(m) \times m})/R(m)$ . These rates are linear approximations to the true instantaneous forward rates; see Shiller (1990). For a discussion of the use of forward rates as indicators of inflation expectations, see Sharpe (1997). **Rates on 3-Month Eurodollar Futures** and **Rates on Selected Federal Funds Futures Contracts** trace through time the yield on three specific contracts. **Rates on Federal Funds Futures on Selected Dates** displays a single day's snapshot of yields for contracts expiring in the months shown on the horizontal axis. **Inflation-Indexed Treasury Bonds** are yields on the most recently issued inflation-indexed securities of 10- and 30-year original maturities. **Inflation-Indexed Treasury Yield Spreads** equal, for 10- and 30-year maturities, the difference between the yields on the most recently issued inflation-indexed securities and the unadjusted bond yields of similar maturity. **Inflation-Indexed 30-Year Government Bonds** shows the yield of an inflation-indexed bond that is scheduled to mature in approximately (but not greater than) 30 years. The current bond for Canada has a maturity date of 12/01/2031, the current U.K. bond has a maturity date of 7/22/2030, and the current U.S. bond has a maturity date of 4/15/2032. **Inflation-Indexed 10-Year Government Bonds** shows the yield of an inflation-indexed bond that is scheduled to mature in approximately (but not greater than) 10 years. The current U.K. bond has a maturity date of 8/23/2011 and the current U.S. bond has a maturity date of 7/15/2012.

**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 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.

**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

### *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: 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. inflation-indexed security yields.

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