November 2009

## Home Prices: A Case for Cautious Optimism

The July 2009 release of the Case-Shiller Composite-10 Index (CSXR) showed that home prices were up 1.36 percent from the previous month and 2.2 percent from their low in May 2009. According to the index, average U.S. home prices are comparable to their levels in the autumn of 2003-a decline of 33.5 percent from their peak in the second quarter of 2006. The recent gain was widespread- 9 of the 10 cities in the CSXR reported increases, with Las Vegas the only exception. Nationwide, housing starts and building permits increased 1.5 percent to 598,000 and 2.8 percent to 580,000, respectively, to their highest level since November 2008.

The chart plots three monthly data series related to house prices and median household income between January 1990 and July 2009. Two of them are monthly home price indices: the CSXR and the house price index released by the Federal Housing Finance Agency (FHFA). ${ }^{1}$ The third series is the House Affordability Index of Median Household Income published by the National Association of Realtors. ${ }^{2}$ The base of all three indices is January 1991. During the early 1990s, home prices rose somewhat slower than mean household income. However, after 1997 home prices rose sharply to their peak in mid-2006 before dropping precipitously. Meanwhile, the affordability index grew at a much slower but more persistent rate. While the recent data suggest that home prices have stabilized, both home price indices remain well above the affordability index of median household income.

Many analysts are cautiously optimistic that the house price decline has ended, citing that house prices increased in June and July. There are several reasons for being cautious. First, the government is currently providing significant support to the mortgage market. On the demand side, the American Recovery and Reinvestment Act of 2009 authorizes a tax credit of up to $\$ 8,000$ for qualified first-time home buyers purchasing a principal residence between January 1, 2009, and November 30, 2009. With the tax credit due to expire by the end of November, it will be important to see if the demand for housing can be sustained after it expires. On the supply side, the Federal Reserve is purchasing up to $\$ 1.25$ trillion of agency mortgage-backed securities through a program that began in January 2009 and continues through the first quarter of 2010. The aim is to "reduce the cost and increase the availability of credit for the purchase of houses, which in turn should support housing markets and foster improved conditions in financial markets more generally." ${ }^{3}$ In light of this, it remains unclear how the housing market will perform in the absence of these government measures.

Meanwhile, the number of mortgage delinquencies and foreclosures in process rose during the second quarter of
2009. In a study that includes 64 percent of all outstanding U.S. mortgages, the Office of the Comptroller of the Currency and the Office of Thrift Supervision report that serious delinquencies (at least 60 days delinquent) increased by 11.5 percent from the previous quarter. ${ }^{4}$ On the other hand, home retention actions (including loan modifications and payment plans) initiated under the "Making Home Affordable" program rose 21.7 percent over the first quarter. This in turn kept the number of newly initiated foreclosures stable despite rising delinquencies. However, another cause for concern is the number of rising delinquencies on particular mortgage products such as Alt-A loans (particularly those with 5 -year teaser rates) and payment-option adjustable-rate mortgages. The concern here is that these products might bring about a second wave of foreclosures, thereby leading to a further decline in home prices.

## -Rajdeep Sengupta and Yu Man Tam

${ }^{1}$ For a discussion of how the two indices compare with each other, see Aubuchon, Craig P. and Wheelock, David C. "How Much Have U.S. House Prices Fallen?" Federal Reserve Bank of St. Louis National Economic Trends, August 2008; http://research.stlouisfed.org/publications/net/20080801/cover.pdf.
${ }^{2}$ See http://www.realtor.org/research/research/hameth for details.
${ }^{3}$ Board of Governors of the Federal Reserve System. Press release, November 28, 2008; www.federalreserve.gov/newsevents/press/monetary/20081125b.htm.
${ }^{4}$ The OCC and OTS Mortgage Metrics Report covers all types of first-lien mortgages serviced by most large mortgage providers (see www.occ.treas.gov/ftp/release/2009-118a.pdf).


Views expressed do not necessarily reflect official positions of the Federal Reserve System.

## Contents

## Page

| 3 | Monetary and Financial Indicators at a Glance |
| :--- | :--- |
| 4 | Monetary Aggregates and Their Components |
| 6 | Monetary Aggregates: Monthly Growth |
| 7 | Reserves Markets and Short-Term Credit Flows |
| 8 | Measures of Expected Inflation |
| 9 | Interest Rates |
| 10 | Policy-Based Inflation Indicators |
| 11 | Implied Forward Rates, Futures Contracts, and Inflation-Indexed Securities |
| 12 | Velocity, Gross Domestic Product, and M2 |
| 14 | Bank Credit |
| 15 | Stock Market Index and Foreign Inflation and Interest Rates |
| 16 | Reference Tables |
| 18 | Definitions, Notes, and Sources |

## 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 December 2007; however, the hatched shading shows that the recession ended in July 2009. We made this determination based on a statistical model for dating business cycle turning points developed by Marcelle Chauvet and Jeremy Piger ("A Comparison of the Real-Time Performance of Business Cycle Dating Methods," Journal of Business and Economic Statistics, 2008, 26, 42-49). For more information, see http://www.uoregon.edu/~jpiger/us_recession_probs.htm.
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: $\left[\left(x_{\tau} / x_{\tau-1}\right)-1\right] \times 1200$. 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: $\left[\left(x_{\tau} / x_{\tau-12}\right)-1\right] \times 100$.

We welcome your comments addressed to:
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On March 23, 2006, the Board of Governors of the Federal Reserve System will cease the publication of the M3 monetary aggregate. It will also cease publishing the following components: large-denomination time deposits, RPs, and eurodollars.
or to:
stlsFRED@stls.frb.org

M2 and MZM
Billions of dollars
10000 -


## Adjusted Monetary Base

Percent change at an annual rate 400


## Reserve Market Rates



Treasury Yield Curve
Percent


## Real Treasury Yield Curve

Percent


Inflation-Indexed Treasury Yield Spreads
Percent


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

## 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


## Small Denomination Time Deposits*

Percent change from year ago


## Money Market Mutual Fund Shares

Percent change from year ago


## Currency Held by the Nonbank Public

Percent change from year ago


## Checkable and Savings Deposits

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


M3*

*See table of contents for changes to the series.

## Adjusted and Required Reserves

Billions of dollars


## Total Borrowings, nsa



## 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

Percent


## Long-Term Interest Rates

Percent


## Long-Term Interest Rates

Percent


## Short-Term Interest Rates

Percent


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


Federal Funds Rate and Inflation Targets
Percent


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

## Components of Taylor's Rule

Actual and Potential Real GDP
Billions of chain-weighted 2005 dollars


See notes section for further explanation.

PCE Inflation
Percent change from year ago


Monetary Base Growth and Inflation Targets
Percent


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

## Components of McCallum's Rule

Monetary Base Velocity Growth
Percent


## Real Output Growth

Percent


## Implied One-Year Forward Rates

Percent


Rates on Selected
Federal Funds Futures Contracts
Percent, daily data


## Inflation-Indexed Treasury Securities <br> Weekly data



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

## Inflation-Indexed <br> 10-Year Government Notes

Percent, weekly data


## Rates on 3-Month Eurodollar Futures

Percent, daily data


## Rates on Federal Funds Futures on Selected Dates



Inflation-Indexed Treasury Yield Spreads Weekly data


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

## Inflation-Indexed <br> 10-Year Government Yield Spreads

Percent, weekly data



## Interest Rates



## MZM Velocity and Interest Rate Spread

Ratio Scale


## M2 Velocity and Interest Rate Spread



## 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


[^0]
## 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 <br> Percent |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Percent change from year ago |  |  |  |  |  |  |  |
|  | 2008Q4 | 2009Q1 | 2009Q2 | 2009Q3 | Jun09 | Jul09 | Aug09 | Sep09 |
| United States | 1.53 | -0.18 | -0.94 | -1.55 | 3.72 | 3.56 | 3.59 | 3.40 |
| Canada | 1.91 | 1.25 | 0.06 | . | 3.47 | 3.42 | 3.47 | 3.37 |
| France | 1.76 | 0.63 | -0.21 | . | 3.90 | 3.73 | 3.58 |  |
| Germany | 1.65 | 0.82 | 0.25 | . | 3.47 | 3.34 | 3.31 | 3.26 |
| Italy | 2.80 | 1.48 | 0.85 | 0.12 | 4.61 | 4.37 | 4.12 |  |
| Japan | 1.03 | -0.10 | -0.98 | . | 1.36 | 1.39 | 1.31 |  |
| United Kingdom | 3.88 | 3.01 | 2.12 | . | 3.72 | 3.82 | 3.71 | 3.66 |

* Copyright ©, 2009, Organisation for Economic Cooperation and Development, OECD Main Economic Indicators (www.oecd.org).


## Inflation and Long-Term Interest Rate Differentials

Percent
2 -


|  |  | Money Stock |  |  |  | Bank <br> Credit | Adjusted Monetary Base | Reserves |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | M1 | MZM | M2 | M3* |  |  |  | MSI M2** |
|  | 2004 | 1344.401 | 6569.679 | 6262.679 | 9234.718 | 6339.387 | 776.768 | 96.130 | 329.873 |
|  | 2005 | 1371.751 | 6707.775 | 6527.248 | 9786.477 | 6986.233 | 806.628 | 96.560 | 343.539 |
|  | 2006 | 1374.358 | 6998.369 | 6856.042 | 10270.74 | 7659.746 | 835.039 | 94.913 |  |
|  | 2007 | 1373.207 | 7632.049 | 7251.158 |  | 8403.538 | 850.565 | 94.182 |  |
|  | 2008 | 1429.042 | 8698.672 | 7748.994 |  | 9104.870 | 1009.814 | 232.217 |  |
| 2007 | 1 | 1369.341 | 7289.108 | 7097.940 |  | 8129.742 | 846.309 | 94.123 |  |
|  | 2 | 1376.333 | 7467.984 | 7200.443 |  | 8246.613 | 849.917 | 93.536 |  |
|  | 3 | 1371.420 | 7722.863 | 7300.125 |  | 8475.331 | 852.247 | 95.410 |  |
|  | 4 | 1375.734 | 8048.240 | 7406.125 |  | 8762.465 | 853.787 | 93.658 |  |
| 2008 | 1 | 1380.439 | 8384.159 | 7560.830 |  | 8974.244 | 856.300 | 96.153 |  |
|  | 2 | 1387.174 | 8667.178 | 7667.286 |  | 8991.919 | 859.394 | 94.440 |  |
|  | 3 | 1417.516 | 8763.332 | 7745.460 |  | 9062.935 | 892.824 | 117.901 |  |
|  | 4 | 1531.037 | 8980.018 | 8022.401 |  | 9390.382 | 1430.738 | 620.374 |  |
| 2009 | 1 | 1566.478 | 9403.718 | 8273.334 |  | 9303.134 | 1663.074 | 820.756 |  |
|  | 2 | 1611.979 | 9555.768 | 8329.859 |  | 9310.169 | 1763.765 | 917.192 |  |
|  | 3 | 1655.195 | 9583.543 | 8332.265 |  | 9188.509 | 1747.166 | 895.359 |  |
| 2007 | Sep | 1371.973 | 7850.509 | 7341.583 |  | 8585.166 | 851.463 | 94.991 |  |
|  | Oct | 1379.222 | 7963.122 | 7374.220 |  | 8692.417 | 856.426 | 93.493 |  |
|  | Nov | 1374.972 | 8057.383 | 7405.317 |  | 8764.139 | 857.480 | 95.722 |  |
|  | Dec | 1373.009 | 8124.214 | 7438.839 |  | 8830.840 | 847.454 | 91.758 |  |
| 2008 | Jan | 1377.414 | 8204.131 | 7488.190 |  | 8922.886 | 851.405 | 95.043 |  |
|  | Feb | 1380.574 | 8403.584 | 7565.327 |  | 8970.963 | 856.964 | 96.211 |  |
|  | Mar | 1383.330 | 8544.761 | 7628.973 |  | 9028.882 | 860.532 | 97.205 |  |
|  | Apr | 1383.980 | 8614.811 | 7650.054 |  | 8971.126 | 855.222 | 94.350 |  |
|  | May | 1383.770 | 8671.288 | 7669.845 |  | 9002.545 | 859.920 | 95.142 |  |
|  | Jun | 1393.771 | 8715.434 | 7681.958 |  | 9002.086 | 863.041 | 93.827 |  |
|  | Jul | 1409.317 | 8766.530 | 7726.867 |  | 9016.310 | 870.771 | 97.074 |  |
|  | Aug | 1391.659 | 8736.351 | 7699.561 |  | 9014.391 | 871.530 | 96.736 |  |
|  | Sep | 1451.572 | 8787.114 | 7809.953 |  | 9158.103 | 936.171 | 159.892 |  |
|  | Oct | 1474.699 | 8830.304 | 7929.177 |  | 9491.948 | 1142.202 | 347.655 |  |
|  | Nov | 1523.164 | 8945.365 | 7982.133 |  | 9360.613 | 1480.759 | 674.088 |  |
|  | Dec | 1595.249 | 9164.385 | 8155.894 |  | 9318.586 | 1669.254 | 839.379 |  |
| 2009 | Jan | 1576.451 | 9339.366 | 8235.858 |  | 9297.650 | 1730.463 | 870.226 |  |
|  | Feb | 1559.675 | 9394.505 | 8258.690 |  | 9316.522 | 1590.250 | 758.672 |  |
|  | Mar | 1563.307 | 9477.283 | 8325.455 |  | 9295.230 | 1668.510 | 833.371 |  |
|  | Apr | 1592.762 | 9464.545 | 8272.304 |  | 9257.000 | 1787.802 | 949.439 |  |
|  | May | 1595.428 | 9583.633 | 8342.769 |  | 9340.318 | 1799.371 | 946.283 |  |
|  | Jun | 1647.748 | 9619.127 | 8374.503 |  | 9333.189 | 1704.123 | 855.854 |  |
|  | Jul | 1653.550 | 9615.867 | 8356.813 |  | 9256.749 | 1693.703 | 841.446 |  |
|  | Aug | 1649.848 | 9552.001 | 8305.456 |  | 9199.013 | 1728.114 | 879.512 |  |
|  | Sep | 1662.187 | 9582.762 | 8334.527 |  | 9109.766 | 1819.681 | 965.119 |  |

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.

|  |  | Federa Funds | Primary <br> Credit Rate | Prime <br> Rate | 3-mo CDs | Treasury Yields |  |  | Corporate Aaa Bonds | Municipal Aaa Bonds | Conventional <br> Mortgage |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 3-mo |  |  |  | 3-yr | 10-yr |  |  |  |
|  | 2004 |  | 1.35 | 2.34 | 4.34 | 1.56 | 1.40 | 2.78 | 4.27 | 5.63 | 4.50 | 5.84 |
|  | 2005 | 3.21 | 4.19 | 6.19 | 3.51 | 3.21 | 3.93 | 4.29 | 5.23 | 4.28 | 5.86 |
|  | 2006 | 4.96 | 5.96 | 7.96 | 5.15 | 4.85 | 4.77 | 4.79 | 5.59 | 4.15 | 6.41 |
|  | 2007 | 5.02 | 5.86 | 8.05 | 5.27 | 4.47 | 4.34 | 4.63 | 5.56 | 4.13 | 6.34 |
|  | 2008 | 1.93 | 2.39 | 5.09 | 2.97 | 1.39 | 2.24 | 3.67 | 5.63 | 4.58 | 6.04 |
| 2007 | 1 | 5.26 | 6.25 | 8.25 | 5.31 | 5.12 | 4.68 | 4.68 | 5.36 | 3.91 | 6.22 |
|  | 2 | 5.25 | 6.25 | 8.25 | 5.32 | 4.87 | 4.76 | 4.85 | 5.58 | 4.13 | 6.37 |
|  | 3 | 5.07 | 5.93 | 8.18 | 5.42 | 4.42 | 4.41 | 4.73 | 5.75 | 4.27 | 6.55 |
|  | 4 | 4.50 | 5.02 | 7.52 | 5.02 | 3.47 | 3.50 | 4.26 | 5.53 | 4.24 | 6.23 |
| 2008 | 1 | 3.18 | 3.67 | 6.21 | 3.23 | 2.09 | 2.17 | 3.66 | 5.46 | 4.39 | 5.88 |
|  | 2 | 2.09 | 2.33 | 5.08 | 2.76 | 1.65 | 2.67 | 3.89 | 5.60 | 4.43 | 6.09 |
|  | 3 | 1.94 | 2.25 | 5.00 | 3.06 | 1.52 | 2.63 | 3.86 | 5.65 | 4.50 | 6.31 |
|  | 4 | 0.51 | 1.31 | 4.06 | 2.82 | 0.30 | 1.48 | 3.25 | 5.82 | 5.02 | 5.87 |
| 2009 | 1 | 0.18 | 0.50 | 3.25 | 1.08 | 0.22 | 1.27 | 2.74 | 5.27 | 4.64 | 5.06 |
|  | 2 | 0.18 | 0.50 | 3.25 | 0.62 | 0.17 | 1.49 | 3.31 | 5.51 | 4.43 | 5.03 |
|  | 3 | 0.16 | 0.50 | 3.25 | 0.30 | 0.16 | 1.56 | 3.52 | 5.27 | 4.11 | 5.16 |
| 2007 | Sep | 4.94 | 5.53 | 8.03 | 5.46 | 3.99 | 4.06 | 4.52 | 5.74 | 4.26 | 6.38 |
|  | Oct | 4.76 | 5.24 | 7.74 | 5.08 | 4.00 | 4.01 | 4.53 | 5.66 | 4.20 | 6.38 |
|  | Nov | 4.49 | 5.00 | 7.50 | 4.97 | 3.35 | 3.35 | 4.15 | 5.44 | 4.26 | 6.21 |
|  | Dec | 4.24 | 4.83 | 7.33 | 5.02 | 3.07 | 3.13 | 4.10 | 5.49 | 4.25 | 6.10 |
| 2008 | Jan | 3.94 | 4.48 | 6.98 | 3.84 | 2.82 | 2.51 | 3.74 | 5.33 | 4.13 | 5.76 |
|  | Feb | 2.98 | 3.50 | 6.00 | 3.06 | 2.17 | 2.19 | 3.74 | 5.53 | 4.42 | 5.92 |
|  | Mar | 2.61 | 3.04 | 5.66 | 2.79 | 1.28 | 1.80 | 3.51 | 5.51 | 4.63 | 5.97 |
|  | Apr | 2.28 | 2.49 | 5.24 | 2.85 | 1.31 | 2.23 | 3.68 | 5.55 | 4.45 | 5.92 |
|  | May | 1.98 | 2.25 | 5.00 | 2.66 | 1.76 | 2.69 | 3.88 | 5.57 | 4.34 | 6.04 |
|  | Jun | 2.00 | 2.25 | 5.00 | 2.76 | 1.89 | 3.08 | 4.10 | 5.68 | 4.50 | 6.32 |
|  | Jul | 2.01 | 2.25 | 5.00 | 2.79 | 1.66 | 2.87 | 4.01 | 5.67 | 4.44 | 6.43 |
|  | Aug | 2.00 | 2.25 | 5.00 | 2.79 | 1.75 | 2.70 | 3.89 | 5.64 | 4.44 | 6.48 |
|  | Sep | 1.81 | 2.25 | 5.00 | 3.59 | 1.15 | 2.32 | 3.69 | 5.65 | 4.61 | 6.04 |
|  | Oct | 0.97 | 1.81 | 4.56 | 4.32 | 0.69 | 1.86 | 3.81 | 6.28 | 5.05 | 6.20 |
|  | Nov | 0.39 | 1.25 | 4.00 | 2.36 | 0.19 | 1.51 | 3.53 | 6.12 | 4.83 | 6.09 |
|  | Dec | 0.16 | 0.86 | 3.61 | 1.77 | 0.03 | 1.07 | 2.42 | 5.05 | 5.17 | 5.33 |
| 2009 | Jan | 0.15 | 0.50 | 3.25 | 1.02 | 0.13 | 1.13 | 2.52 | 5.05 | 4.64 | 5.06 |
|  | Feb | 0.22 | 0.50 | 3.25 | 1.16 | 0.30 | 1.37 | 2.87 | 5.27 | 4.56 | 5.13 |
|  | Mar | 0.18 | 0.50 | 3.25 | 1.07 | 0.22 | 1.31 | 2.82 | 5.50 | 4.74 | 5.00 |
|  | Apr | 0.15 | 0.50 | 3.25 | 0.89 | 0.16 | 1.32 | 2.93 | 5.39 | 4.48 | 4.81 |
|  | May | 0.18 | 0.50 | 3.25 | 0.57 | 0.18 | 1.39 | 3.29 | 5.54 | 4.26 | 4.86 |
|  | Jun | 0.21 | 0.50 | 3.25 | 0.39 | 0.18 | 1.76 | 3.72 | 5.61 | 4.56 | 5.42 |
|  | Jul | 0.16 | 0.50 | 3.25 | 0.35 | 0.18 | 1.55 | 3.56 | 5.41 | 4.36 | 5.22 |
|  | Aug | 0.16 | 0.50 | 3.25 | 0.30 | 0.17 | 1.65 | 3.59 | 5.26 | 4.17 | 5.19 |
|  | Sep | 0.15 | 0.50 | 3.25 | 0.25 | 0.12 | 1.48 | 3.40 | 5.13 | 3.81 | 5.06 |

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

|  |  | M1 | MZM | M2 | M3* |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Percent change at an annual rate |  |  |  |  |  |
| 2004 |  | 5.57 | 3.83 | 4.64 | 5.09 |
| 2005 |  | 2.03 | 2.10 | 4.22 | 5.97 |
| 2006 |  | 0.19 | 4.33 | 5.04 | 4.95 |
| 2007 |  | -0.08 | 9.05 | 5.76 |  |
| 2008 |  | 4.07 | 13.98 | 6.87 |  |
| 2007 | 1 | 0.16 | 7.49 | 5.85 |  |
|  | 2 | 2.04 | 9.82 | 5.78 |  |
|  | 3 | -1.43 | 13.65 | 5.54 |  |
|  | 4 | 1.26 | 16.85 | 5.81 |  |
| 2008 | 1 | 1.37 | 16.70 | 8.36 |  |
|  | 2 | 1.95 | 13.50 | 5.63 |  |
|  | 3 | 8.75 | 4.44 | 4.08 |  |
|  | 4 | 32.03 | 9.89 | 14.30 |  |
| 2009 | 1 | 9.26 | 18.87 | 12.51 |  |
|  | 2 | 11.62 | 6.47 | 2.73 |  |
|  | 3 | 10.72 | 1.16 | 0.12 |  |


| 2007 Sep | -0.24 | 20.02 | 6.17 |
| ---: | ---: | ---: | ---: |
| Oct | 6.34 | 17.21 | 5.33 |
| Nov | -3.70 | 14.20 | 5.06 |
| Dec | -1.71 | 9.95 | 5.43 |
| 2008 Jan | 3.85 | 11.80 | 7.96 |
| Feb | 2.75 | 29.17 | 12.36 |
| Mar | 2.40 | 20.16 | 10.10 |
| Apr | 0.56 | 9.84 | 3.32 |
| May | -0.18 | 7.87 | 3.10 |
| Jun | 8.67 | 6.11 | 1.90 |
| Jul | 13.38 | 7.04 | 7.02 |
| Aug | -15.04 | -4.13 | -4.24 |
| Sep | 51.66 | 6.97 | 17.20 |
| Oct | 19.12 | 5.90 | 18.32 |
| Nov | 39.44 | 15.64 | 8.01 |
| Dec | 56.79 | 29.38 | 26.12 |
| 2009 Jan | -14.14 | 22.91 | 11.77 |
| Feb | -12.77 | 7.08 | 3.33 |
| Mar | 2.79 | 10.57 | 9.70 |
| Apr | 22.61 | -1.61 | -7.66 |
| May | 2.01 | 15.10 | 10.22 |
| Jun | 39.35 | 4.44 | 4.56 |
| Jul | 4.23 | -0.41 | -2.53 |
| Aug | -2.69 | -7.97 | -7.37 |
| Sep | 8.97 | 3.86 | 4.20 |
|  |  |  |  |
| Jeb |  |  |  |

*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 $/ \mathrm{msi} / \mathrm{index} . \mathrm{html}$.

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 nomi-
nal 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

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

to five alternative target inflation rates, $\pi^{*}=0,1,2,3,4$ percent, where $f_{t}^{*}$ is the implied federal funds rate, $\pi_{t-1}$ is the previous period's inflation rate (PCE) measured on a year-over-year basis, $y_{t-1}$ is the $\log$ of the previous period's level of real gross domestic product (GDP), and $y_{t-1}{ }^{P}$ is the log of an estimate of the previous period's level of potential output. Potential Real GDP is estimated by the Congressional Budget Office (CBO). Since the July 2009 NIPA revision, there is a discrepancy between real GDP (in billions of chained 2005 dollars) and CBO real potential GDP (in billions of chained 2000 dollars). We have multiplied each quarterly observation of CBO real potential GDP by a factor of 1.14. This scaling factor is the average of the ratio of real GDP in billions of chained 2005 dollars to real GDP in billions of chained 2000 dollars for the four quarters of 2005.
Monetary Base Growth and Inflation Targets shows the quarterly growth of the adjusted monetary base implied by applying McCallum's (2000, p. 52) equation

$$
\begin{aligned}
& \Delta b_{t}=\Delta x_{t}^{*}-\Delta v_{t}^{a}+\lambda\left(\Delta x_{t}^{*}-\Delta x_{t-1}\right), \\
& \Delta x_{t}^{*}=\pi^{*}+\Delta y_{t}^{*}
\end{aligned}
$$

to five alternative target inflation rates, $\pi^{*}=0,1,2,3,4$ percent, where $\Delta b_{t}$ is the implied growth rate of the adjusted monetary base, $\Delta y_{t}^{*}$ is the 10-year moving average growth in real GDP, $\Delta v_{t}^{\alpha}$ is the average base velocity growth (calculated recursively), $\Delta x_{t-1}$ is the lag growth rate of nominal GDP, and $\lambda=0.5$.
Page 11: Implied One-Year Forward Rates are calculated by this Bank from Treasury constant maturity yields. Yields to maturity, $R(m)$, for securities with $m=1, \ldots, 10$ years to maturity are obtained by linear interpolation between reported yields. These yields are smoothed by fitting the regression suggested by Nelson and Siegel (1987),

$$
R(m)=\mathrm{a}_{0}+\left(\mathrm{a}_{1}+\mathrm{a}_{2}\right)\left(1-\mathrm{e}^{-m / 50}\right) /(m / 50)-\mathrm{a}_{2} \times \mathrm{e}^{-m / 50}
$$

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 $D(m)=\left(1-e^{-R(m) \times m}\right) / R(m)$. 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 InflationIndexed 10-Year Government Yield Spreads equal the difference between the yields on the most recently issued inflation-indexed securities and the unadjusted security yields of similar maturity.

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

Page 13: Real Gross Domestic Product is GDP as measured in chained 2000 dollars. The Gross Domestic Product Price Index is the implicit price deflator for GDP, which is defined by the Bureau of Economic Analysis, U.S. Department of Commerce, as the ratio of GDP measured in current dollars to GDP measured in chained 2005 dollars.
Page 14: Investment Securities are all securities held by commercial banks in both investment and trading accounts.
Page 15: Inflation Rate Differentials are the differences between the foreign consumer price inflation rates and year-over-year changes in the U.S. all-items Consumer Price Index.

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

## Sources

Agence France Trésor: French note yields.
Bank of Canada: Canadian note yields.
Bank of England: U.K. note yields.
Board of Governors of the Federal Reserve System:
Monetary aggregates and components: H. 6 release. Bank credit and components: H. 8 release. Consumer credit: G. 19 release. Required reserves, excess reserves, clearing balance contracts, and discount window borrowing: H.4.1 and H. 3 releases. Interest rates: H. 15 release. Nonfinancial commercial paper: Board of Governors website. Nonfinancial debt: Z. 1 release. M2
own rate.
Bureau of Economic Analysis: GDP.
Bureau of Labor Statistics: CPI.
Chicago Board of Trade: Federal funds futures contract.
Chicago Mercantile Exchange: Eurodollar futures.
Congressional Budget Office: Potential real GDP.
Federal Reserve Bank of Philadelphia: Survey of Professional Forecasters inflation expectations.

Federal Reserve Bank of St. Louis: Adjusted monetary base and adjusted reserves, monetary services index, MZM own rate, one-year forward rates.
Organization for Economic Cooperation and Development: International interest and inflation rates.
Standard \& Poor's: Stock price-earnings ratio, stock price composite index.
University of Michigan Survey Research Center: Median expected price change.
U.S. Department of the Treasury: U.S. security yields.

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Note: *Available on the Internet at research.stlouisfed.org/publications/review/.


[^0]:    Dashed lines indicate 10-year moving averages.

