Expected Inflation Near and Far

Fluctuations in the price of oil and other apparently non-monetary phenomena often seem to drive the near-term outlook for inflation. Nonetheless, economists widely accept the view that, over the long run, inflation is determined by monetary policy. Thus, at longer horizons, expected inflation primarily reflects the public’s view of the monetary policymaker’s inflation objective. Put another way, fluctuations in oil prices and other non-monetary phenomena will have less impact on the public’s long-run inflation forecasts the more strongly the public sees policymakers as being committed to a particular inflation objective.

To gauge inflation expectations, analysts typically look to either surveys or market measures, such as the difference in yields on ordinary Treasury securities and inflation-protected Treasury securities (TIPS) of similar maturity. An increase in the yields on ordinary securities relative to those on TIPS would suggest that market participants have raised their forecast for inflation over the life of the securities.1

The chart plots monthly observations on the 5-year TIPS spread from January 2004 through November 2006. The spread fluctuated widely in 2004 and 2005, reflecting both volatility in oil prices and uncertainty about the economic outlook following hurricanes Katrina and Rita. More recent changes in the spread have also closely coincided with fluctuations in energy prices. A sharp decline in the spread in the second half of 2006, for example, coincided with a large decline in the price of oil from over $74 per barrel in July to less than $60 per barrel in October.

Although measures of near-term expected inflation, such as the 5-year TIPS spread, have moved closely with energy prices, measures of expected inflation over longer horizons have been less sensitive to fluctuations in energy prices. For example, the 5-year forward TIPS spread, which reflects expected inflation over the 5-year period beginning 5 years in the future, has been less closely correlated with fluctuations in oil prices than the TIPS spread covering the current 5-year period.2 The 5-year forward TIPS spread, which is also shown in the chart, has ranged between 2.25 and 2.75 percent since 2004 and declined only modestly with the fall in oil prices in the second half of 2006. Survey measures of expected inflation over long horizons, such as the Survey of Professional Forecasters by the Federal Reserve Bank of Philadelphia, have been even more stable. The median 10-year average CPI inflation forecast from the Survey of Professional Forecasters has been within 0.10 percentage points of 2.5 percent since 1999.3

The relative stability of measures of expected inflation over longer horizons indicates that market participants view the impact of fluctuations in oil prices on inflation as largely transitory. Apparently, the public has remained convinced that the Federal Reserve is committed to keeping inflation low. If measures of long-term expected inflation were to rise significantly, it would reflect less about the price of oil than it would about the credibility of the Federal Reserve’s commitment to holding inflation in check.

—David C. Wheelock


2 The 5-year forward TIPS spread is obtained by dividing the total inflation expected over the entire 10 years \([(1 + 10-Yr TIPS Spread)^{10}]\) by the total inflation expected over the first 5 years \([(1 + 5-Yr TIPS Spread)^5]\) and then taking this ratio’s 5th root (equivalent to raising it to the 0.2 power) to get the average annual rate.

3 See www.philadelphiafed.org/econ/spf/index.html.
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. Shaded areas indicate recessions, as determined by the National Bureau of Economic Research.
3. Percent change at an annual rate is the simple, not compounded, monthly percent change multiplied by 12. For example, using consecutive months, the percent change at an annual rate in x between month t−1 and the current month t is: 
   \[ \left( \frac{x_t}{x_{t-1}} - 1 \right) \times 1200 \]. 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: 
   \[ \left( \frac{x_t}{x_{t-12}} - 1 \right) \times 100 \].

We welcome your comments addressed to:

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

or to:

stlsFRED@stls.frb.org

On March 23, 2006, the Board of Governors of the Federal Reserve System ceased the publication of the M3 monetary aggregate. It also ceased publishing the following components: large-denomination time deposits, RPs, and eurodollars.
**MZM and M1**

Percent change from year ago

**M2**

Percent change from year ago

**M3**

Percent change from year ago

*See table of contents for changes to the series.

**Monetary Services Index - M2**

Percent change from year ago

**We will not update the MSI series until we revise the code to accommodate the discontinuation of M3.**
M1
Percent change at an annual rate

*Actual values for September and October 2001 are 55.87 and -38.35 percent rate, respectively.

MZM
Percent change at an annual rate

*Actual value for September 2001 is 39.41 percent rate.

M2
Percent change at an annual rate

*Actual value for September 2001 is 24.90 percent rate.

M3*
Percent change at an annual rate

*See table of contents for changes to the series.
Adjusted and Required Reserves

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

*Actual value for September 2001 is $26.43 billion.

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.
Inflation and 1-Year-Ahead 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. See notes on page 19.

Treasury Security Yield Spreads

Yield to maturity

Real Interest Rates

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

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 notes on page 19.
**Monetary Trends**

**Short-Term Interest Rates**

**Percent**

- 90-Day Commercial Paper
- Prime Rate
- 3-Month Treasury Yield

**Long-Term Interest Rates**

**Percent**

- Conventional Mortgage
- Corporate Aaa
- 10-Year Treasury Yield

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

**Percent**

- Intended Federal Funds Rate
- Discount Rate
- Primary Credit Rate

---

*90-Day Commercial Paper data are not available for December 2005, January 2006, and July 2006.*
Federal Funds Rate and Inflation Targets

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

Actual and Potential Real GDP

Billions of chain-weighted 2000 dollars

Components of Taylor's Rule

PCE Inflation

Percent change from year ago

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 Trends

Updated through 01/16/07

Research Division
Federal Reserve Bank of St. Louis

Implied One-Year Forward Rates
Percent

Week Ending:
- 12/15/06
- 01/12/07

Rates on 3-Month Eurodollar Futures
Percent, daily data

Rates on Selected Federal Funds Futures Contracts
Percent, daily data

Rates on Federal Funds Futures on Selected Dates
Percent

Inflation-Indexed Treasury Securities
Weekly data

Inflation-Indexed 10-Year Government Notes
Percent, weekly data

Inflation-Indexed 10-Year Government Yield Spreads
Percent, weekly data
Velocity
Nominal GDP/MZM, Nominal GDP/M2 (Ratio Scale)

Interest Rates
Percent

MZM Velocity and Interest Rate Spread
Ratio Scale

M2 Velocity and Interest Rate Spread
Ratio Scale

Interest Rate Spread = 3-Month T-Bill less MZM Own Rate
Interest Rate Spread = 3-Month T-Bill less M2 Own Rate
### Recent Inflation and Long-Term Interest Rates

#### Consumer Price Inflation Rates

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<tr>
<th>Country</th>
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<th>2006Q2</th>
<th>2006Q3</th>
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#### Long-Term Government Bond Rates

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<th>Nov06</th>
<th>Dec06</th>
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<td>France</td>
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<tr>
<td>United Kingdom</td>
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<td>4.61</td>
<td>4.52</td>
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### Inflation and Long-Term Interest Rate Differentials

- **Inflation differential** = Foreign inflation less U.S. inflation
- **Long-term rate differential** = Foreign rate less U.S. rate

#### Inflation differential

- **Canada**
- **Germany**

#### Long-term rate differential

- **U.K.**
- **Japan**
### Money Stock

<table>
<thead>
<tr>
<th>Year</th>
<th>M1</th>
<th>MZM</th>
<th>M2</th>
<th>M3*</th>
<th>Bank Credit</th>
<th>Adjusted Monetary Base</th>
<th>Reserves</th>
<th>MSI M2**</th>
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<tbody>
<tr>
<td>2002</td>
<td>1196.168</td>
<td>5880.308</td>
<td>5590.239</td>
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<td>5596.389</td>
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<td>329.873</td>
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<td>6716.403</td>
<td>6531.713</td>
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<td>806.303</td>
<td>96.234</td>
<td>343.539</td>
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<td>2006</td>
<td>1373.851</td>
<td>6991.493</td>
<td>6845.160</td>
<td>10270.74</td>
<td>7948.455</td>
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<td>94.873</td>
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### Money Stock

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<th>Month</th>
<th>Money Stock</th>
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<td>2005</td>
<td>Jan</td>
<td>1365.795, 6661.230, 4222.413, 9487.218, 6892.750, 793.547, 95.107, 338.366</td>
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<td>Feb</td>
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<td>Mar</td>
<td>1372.574, 6664.272, 6463.748, 9565.364, 7080.652, 800.901, 97.038, 340.347</td>
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<td>Aug</td>
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<td>1374.270, 6790.709, 6618.997, 10031.96, 7429.458, 816.097, 97.346, 347.590</td>
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<td>Nov</td>
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<td>Dec</td>
<td>1368.511, 6833.570, 6664.801, 10154.03, 7501.389, 814.936, 93.541, 350.067</td>
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### Bank Credit

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<th>Year</th>
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<td>2002</td>
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<tr>
<td>2003</td>
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<td>2004</td>
<td>6598.491</td>
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<td>7240.097</td>
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<td>2006</td>
<td>7948.455</td>
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### Adjusted Monetary Base

<table>
<thead>
<tr>
<th>Year</th>
<th>Adjusted Monetary Base</th>
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<tbody>
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<td>2003</td>
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<td>2006</td>
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### Reserves

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<td>2005</td>
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<td>2006</td>
<td>94.873</td>
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### MSI M2**

<table>
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<tbody>
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<tr>
<td>2005</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td></td>
</tr>
</tbody>
</table>

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.
## Monetary Trends

**Federal Funds Credit Rate** | **Primary Credit Rate** | **Prime Rate** | **3-mo CD Rates** | **Treasury Yields** | **Corporate Aaa Bonds** | **Municipal Aaa Bonds** | **Conventional Mortgage Rates**
---|---|---|---|---|---|---|---
| 2002 | 1.67 | 4.88 | 1.73 | 1.63 | 3.10 | 4.61 | 6.49 | 4.87 | 6.54
| 2003 | 1.13 | 4.12 | 1.15 | 1.03 | 2.11 | 4.02 | 5.67 | 4.52 | 5.82
| 2004 | 1.35 | 4.34 | 1.56 | 1.40 | 2.78 | 4.27 | 5.63 | 4.50 | 5.84
| 2005 | 3.21 | 6.19 | 3.51 | 3.21 | 3.93 | 4.29 | 5.23 | 4.28 | 5.86
| 2006 | 4.96 | 7.96 | 5.15 | 4.85 | 4.77 | 4.79 | 5.59 | 4.15 | 6.41

**2004**

1. 1.00 2.00 4.00 1.05 0.93 2.17 4.02 5.45 4.26 5.61
2. 1.01 2.00 4.00 1.25 1.10 2.98 4.60 5.93 4.15 5.72
3. 1.43 2.42 4.42 1.70 1.51 2.92 4.30 5.64 4.28 5.76
4. 1.95 2.94 4.94 2.25 2.04 3.05 4.17 5.48 4.39 6.22

**2005**

1. 2.47 3.44 5.44 2.78 2.58 3.61 4.30 5.32 4.23 5.76
2. 2.94 3.91 5.91 3.23 2.93 3.73 4.16 5.15 4.15 5.72
3. 3.46 4.43 6.43 3.74 3.43 3.98 4.21 5.09 4.28 5.76
4. 3.98 4.97 6.97 4.30 3.91 4.37 4.49 5.38 4.45 6.22

**2006**

1. 4.46 5.43 7.43 4.72 4.50 4.58 4.57 5.39 4.29 6.24
2. 4.91 5.90 7.90 5.18 4.83 4.98 5.07 5.89 4.36 6.60
3. 5.25 6.25 8.25 5.39 5.03 4.87 4.90 5.68 4.13 6.56
4. 5.25 6.25 8.25 5.32 5.03 4.65 4.63 5.39 3.82 6.24

**2004 Dec**

2.16 3.15 5.15 2.45 2.22 3.21 4.23 5.47 4.35 5.75

**2005 Jan**

2.28 3.25 5.25 2.61 2.37 3.39 4.22 5.36 4.24 5.71

**Aug**

3.50 4.44 6.44 3.77 3.52 4.08 4.26 5.09 4.33 5.82

**Sep**

3.62 4.59 6.59 3.87 3.49 3.96 4.20 5.13 4.34 5.77

**2006 Jan**

4.29 5.26 7.26 4.56 4.34 4.35 4.42 5.29 4.27 6.15

**Dec**

4.16 5.15 7.15 4.45 3.97 4.39 4.47 5.37 4.46 6.27

**Note:** All values are given as a percent at an annual rate.
### Monetary Trends

<table>
<thead>
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<tbody>
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<td>Percent change at an annual rate</td>
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*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. (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.

Inflation Expectations: The sum 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.

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Monetary Services Index: An index that measures the flow of monetary services received by households and firms from their holdings of liquid assets; Treasury, federally sponsored agencies, state and local governments, households, and institutional money market mutual funds; and nonfinancial firms. End-of-period basis.

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Monetary Trends

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 maturity \( m = 1, ..., 10 \) years to maturity are obtained by linear interpolation between reported yields. These yields are smoothed by fitting the regression suggested by Nelson and Siegel (1987),

\[
R(m) = a_0 + (a_1 + a_2)(1 - e^{-m(50)}/(m/50) - a_3 	imes e^{-m(50)},
\]

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 \( D(m) = (1 - e^{-R(m) 	imes m})R(m) \). 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 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 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 7/15/2016. **Inflation-Indexed Treasury Yield Spreads** and **Inflation-Indexed 10-Year Government Yield Spreads** equal the difference between the yields on the most recently issued inflation-indexed securities and the unadjusted security yields of similar maturity.

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

Page 13: **Real Gross Domestic Product** is GDP as measured in chained 2000 dollars. The **Gross Domestic Product Price Index** is the implicit price deflator for GDP, which is defined by the Bureau of Economic Analysis, U.S. Department of Commerce, as the ratio of GDP measured in current dollars to GDP measured in chained 2000 dollars.

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

Page 15: **Inflation Rate Differentials** are the differences between the foreign consumer price inflation rates and year-over-year changes in the U.S. all-items Consumer Price Index.

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

**Sources**

*Agence France Trésor*: French note yields.

*Bank of Canada*: Canadian note yields.


*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 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.

**References**


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