Nearly all central banks, other than those that peg an exchange rate, now explicitly communicate policy changes through an announced target level for a short-term interest rate. Notably, in 1999, the Swiss National Bank replaced its monetary base target with an operating target for the 3-month Swiss franc interbank lending (LIBOR) rate that the central bank adjusts as part of its strategy to maintain price stability. One question that has arisen with interest rate targets is whether a central bank can cause the interest rate to move simply by expressing its intention to establish a new target level—so-called open mouth operations—or whether transactions of securities in the central bank’s portfolio—open market operations—are necessary to initiate a shift in interest rates. (See Thornton, 2004, for such a study of U.S. monetary policy in the 1970s.1)

A narrow definition of open mouth operations concerns the ability of the central bank to achieve changes in its target interest rate without corresponding open market operations. A broader definition of open mouth operations, however, would include the proposition that the central bank can alter the slope of the yield curve at the very short end (at maturities between the overnight rate and 3 months, for example) through an announcement regarding a target rate change. Here we consider such a case study from the Swiss money market.

The Swiss National Bank targets the 3-month Swiss LIBOR rate, but it seeks to affect that rate by entering into securities repurchase (repo) agreements with commercial banks. The typical maturity of a repo agreement is a week and the typical spread between the 3-month LIBOR rate and the 1-week repo rate is approximately 15 basis points. Twice in 2004, the Swiss National Bank raised its target range for the Swiss LIBOR rate by 25 basis points. The midpoint of the target range is shown on the accompanying chart.

The market anticipated the first target change, which accounts for the preceding spike in the LIBOR-repo rate spread in June 2004. Nevertheless, money market participants did not appear to realize that the Swiss National Bank sought to implement the smallest initial rise in the repo rate that would achieve their new target for the LIBOR. The fact that the 3-month Swiss LIBOR rate immediately rose by the full 25 basis points, while the repo rate rose by only about 15 basis points, suggests that the Swiss National Bank used open market operations to increase the rate spread above its usual level of 15 basis points. By the time of the second target change in September 2004, however, the Swiss National Bank did not achieve its objective of raising the Swiss LIBOR rate by 25 basis points (to a level of 75 basis points) until it had raised the repo rate to a level of approximately 60 basis points—that is, not until the typical rate spread of about 15 basis points was restored. Together, these two episodes suggest that policy announcements—open mouth operations—can cause rate spreads to deviate temporarily from their expected levels, although not necessarily on a regular basis or for an extended period of time.

—Michael J. Dueker and Andreas M. Fischer

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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: \( \left( \frac{x_t}{x_{t-1}} \right) - 1 \) \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: \( \left( \frac{x_t}{x_{t-12}} \right) - 1 \) \times 100.

We welcome your comments addressed to:

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   St. Louis, MO 63166-0442

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Monetary Trends is published monthly by the Research Division of the Federal Reserve Bank of St. Louis. Visit the Research Division’s website at research.stlouisfed.org/publications/mt to download the current version of this publication or register for e-mail notification updates. For more information on data in the publication, please visit research.stlouisfed.org/fred2 or call (314) 444-8590.
Monetary Trends

Updated through 12/21/04

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
Inflation and 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

- **10-Year less 3-Month T-Bill**
- **3-Year less 3-Month T-Bill**
- **10-Year less 3-Year Note**

---

Real Interest Rates

**Percent, Real rate = Nominal rate less CPI inflation**

- **1-Year Treasury Yield**
- **Federal Funds 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

Billions of chain-weighted 2000 dollars

Potential

Actual

PCE Inflation

Percent change from year ago

Components of McCallum's Rule

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.

Real Output Growth

1-Year Moving Average

10-Year Moving Average

Monetary Base Velocity Growth

4-Year Moving Average

4-Year Moving Average

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Monetary Trends

Updated through 01/12/05

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Federal Reserve Bank of St. Louis

Implied One-Year Forward Rates
Percent

Week Ending:
12/10/04
12/10/05
01/07/05

Percent, daily data

Mar 2005
Feb 2005
Jan 2005

2y 3y 5y 7y 10y

Rates on 3-Month Eurodollar Futures
Percent

Week Ending:
01/07/05
12/10/04
01/09/04

Percent, daily data

Mar 2005
Feb 2005
Jan 2005

2.1 2.2 2.3 2.4 2.5 2.6 2.7

Rates on Selected Federal Funds Futures Contracts
Percent, daily data

2.1 2.2 2.3 2.4 2.5 2.6 2.7

Rates on Federal Funds Futures on Selected Dates
Percent

3.0
2.8
2.6
2.4
2.2
2.0

Jan
Feb
Mar
Apr
May
Jun

Jan 2005
Feb 2005
Mar 2005

% 2.1 2.2 2.3 2.4 2.5 2.6 2.7

Inflation-Indexed Treasury Securities
Percent, weekly data

Percent, weekly data

2001 2002 2003 2004 2005

Inflation-Indexed Treasury Yield Spreads
Percent, weekly data

2001 2002 2003 2004 2005

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

2001 2002 2003 2004 2005

U.K.
France
U.S.

Inflation-Indexed 10-Year Government Yield Spreads
Percent, weekly data

2001 2002 2003 2004 2005

U.K.
U.S.
France
Monetary Trends

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
Recent Inflation and Long-Term Interest Rates

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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
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*All values are given in billions of dollars.*
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<th>3-yr Treasury Yields</th>
<th>10-yr Treasury Yields</th>
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*All values are given as a percent at an annual rate.
## Monetary Trends

**Percent change at an annual rate**

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<td>6.24</td>
<td>2.98</td>
</tr>
</tbody>
</table>
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 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/ms/index.html.

Note: M1, M2, M3, Bank Credit, and Domestic Nonfinancial Debt are constructed and published by the Board of Governors of the Federal Reserve System. For details, see Statistical Supplement to the Federal Reserve Bulletin, tables 1.21 and 1.26. MZM, Adjusted Monetary Base, Adjusted Reserves, and Monetary Services Index are constructed and published by the Research Division of the Federal Reserve Bank of St. Louis.

Notes

Page 3: Readers are cautioned that, since early 1994, the level and growth of M1 have been depressed by retail sweep programs that reclassify transactions deposits (demand deposits and other checkable deposits) as savings deposits overnight, thereby reducing banks’ required reserves; see Anderson and Rasche (2001) and research.stlouisfed.org/aggreg/swdata.html. Primary Credit Rate, Discount Rate, and Intended Federal Funds Rate shown in the chart Reserve Market Rates are plotted as of the date of the change, while the Effective Federal Funds Rate is plotted as of the end of the month. Interest rates in the table are monthly averages from the Board of Governors H.15 Statistical Release. The Treasury Yield Curve shows constant maturity yields calculated by the U.S. Treasury 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/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 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

\[ f_t^* = 2.5 + \pi_{t-1} + (\pi_{t-1} - \pi_t)/2 + 100 \times (y_{t-1} - y_t)^2/2 \]

to five alternative target inflation rates, \( \pi_t^* = 0, 1, 2, 3, 4 \) 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 \( y_t, y_{t-1} \) are the logs 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 (modeled 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 rate 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

\[ (y_t - y_{t-40})/40 \times 400, \text{ where } y_t \text{ is the log of real GDP.} \]

The 4-year moving average of base velocity growth is calculated similarly. To adjust the monetary base for the effect of retail-deposit sweep programs, we add to the monetary base an amount equal to 10 percent of the total amount swept, as estimated by the Federal Reserve Board staff. These estimates are imprecise, at best. Sweep program data are found at research.stlouisfed.org/aggreg/swdata.html.

Page 11: Impelled 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),

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

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 Securities are yields on the most recently issued inflation-indexed securities of 10- and 30-year original maturities. 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 7/25/2013, the current U.K. note has a maturity date of 8/16/2013, and the current U.S. note has a maturity date of 7/15/2014. 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 **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.