Quality Spreads in the Bond Market

Modern option-pricing theory shows that corporate bonds are equivalent to default-risk free government bonds with the same promised payment streams (and thus the same maturities) except that a corporate bond conveys an implicit put option to the firm’s shareholders. This put option is the right to default with limited liability, that is to walk away from the firm and leave it to the bondholders. The option can be exercised any day up to and including the bond’s maturity date. The value of the corporate bond to its holder thus equals the value of the default-risk free bond minus the value of the shareholders’ put option.

The value of the put option increases with the probability that the option will be “in the money” on the maturity date or any prior day. The option is in the money if (and only if) the value of the firm’s assets is lower than the present value of the promised payments to the bondholders (discounted at the default-risk free rate of return). All else being equal, the value of the put increases with the volatility of the firm’s earnings and a decrease in the expected level of its earnings. The market value of the put option implicit in corporate debt is reflected in the quality spread: the difference between the market yields of a corporate bond and of a comparable default-risk free government bond.

The Russian default on domestic debt in late August 1998 sharply increased volatility in financial markets (see Monetary Trends, May 1999). As the chart indicates, the quality spread between corporate bonds and U.S. treasury bonds increased from 1.09 percent (Aaa-rated bonds) and 1.69 (Baa-rated bonds) in July 1998 to 1.84 percent (Aaa) and 2.65 percent (Baa) in October 1998. More than half a year later, Aaa and Baa spreads of 1.39 percent and 2.18 percent, respectively, are still well above the January 1996 - July 1998 average values of 0.95 percent and 1.59 percent.

Many observers have suggested that illiquidity in corporate bond markets explains the increased quality spreads, at least initially. This explanation no longer seems compelling, however, as spreads remain high in mid-1999. It is possible that the sharp increase of the quality spread in the wake of the Russian default was due in part also to a downward revision of expected corporate earnings. As U.S. economic growth accelerated in the last quarter of 1998 and remained high in the first quarter of 1999, however, a near-term decline in expected earnings appears to be an unlikely explanation for the persistence of large quality spreads. More plausibly, bond investors have recognized a heightened and persisting degree of fundamental business risk that makes the right of corporate owners to default on debt payments—the put option—more valuable. This, in turn, depresses corporate bond prices and generates the higher quality spreads that prevail today.

—Frank A. Schmid
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3 Monetary and Financial Indicators at a Glance
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8 Measures of Expected Inflation
9 Interest Rates
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Conventions used in this publication:

1. Unless otherwise indicated, data are monthly.

2. Shaded areas indicate recessions, as dated by the National Bureau of Economic Research.

3. The percent change at an annual rate is the simple, not compounded, monthly percent change multiplied by 12. For example, using consecutive months, the percent change at an annual rate in x between month \( t-1 \) and the current month \( t \) is: \( [(x_t / x_{t-1}) - 1] \times 1200 \). Note that this differs from National Economic Trends. In that publication monthly percent changes are compounded and expressed as annual growth rates.

4. The percent change from year ago refers to the percent change from the same period in the previous year. For example, the percent change from year ago in x between month \( t-12 \) and the current month \( t \) is: \( [(x_t / x_{t-12}) - 1] \times 100 \).

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

or to:

webmaster@stls.frb.org
MZM and M1

Dotted lines indicate the FOMC target ranges.

M2

Dotted lines indicate the FOMC target ranges.

M3

Dotted lines indicate the FOMC target ranges.

Monetary Services Indexes - M2 and L

Federal Reserve Bank of St. Louis
Adjusted Monetary Base

Domestic Nonfinancial Debt

Currency Held by the Nonbank Public

Time Deposits

Checkable and Savings Deposits

Money Market Mutual Fund Shares

Repurchase Agreements and Eurodollars

Federal Reserve Bank of St. Louis
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 dollars

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. See notes on page 19.

Monetary Base Velocity Growth

Real Output Growth

Federal Reserve Bank of St. Louis
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

Federal Reserve Bank of St. Louis
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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.

M2: M1 plus: savings 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).

L: M3 plus: U.S. savings bonds, short-term Treasury securities, commercial paper, and bankers acceptances held by households and by firms other than depository institutions and money market mutual funds.

Bank Credit: all loans, leases and securities held by commercial banks.

Domestic Nonfinancial Debt: total credit market liabilities of the U.S. Treasury, federally sponsored agencies, state and local governments, households, and firms except depository institutions and money market mutual funds.

Note: The above 6 series are constructed and published by the Board of Governors of the Federal Reserve System, Washington, D.C. For details, see Federal Reserve Bulletin, tables 1.21 and 1.26.

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). On pages 4 and 6, MZM prior to January 1984 is not shown due to distortions caused by regulatory changes, including the introduction of liquid deposits accounts not subject to binding interest rate ceilings.

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 depository institutions. This series is a spliced chain index; see Anderson and Rasche (1996a, b).

Adjusted Reserves: the sum of vault cash and Federal Reserve Bank deposits held by depository institutions, and an adjustment for the effects of changes in statutory reserve requirements on the quantity of base money held by depositories. This series, a spliced chain index, is numerically larger than the Board of Governors’ measure which excludes vault cash not used to satisfy statutory reserve requirements and Federal Reserve Bank deposits used to satisfy required clearing balance contracts; see Anderson and Rasche (1996a) and http://www.stls.frb.org/research/newbase.html.

Monetary Services Index: an index which 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 and L; additional data are available at http://www.stls.frb.org/research/msi/index.html.

Note: The above 4 series are constructed and published by the Research Division of the Federal Reserve Bank of St. Louis, St. Louis MO.

Notes

Page 3: M3, or “Money, Zero Maturity” includes the zero maturity, or immediately available, components of M3. M3M 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 http://www.stls.frb.org/research/swdadu.html. For analytical purposes, M3M largely replaces M1. The Discount Rate and Expected 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 Release. 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, 10, 20 and 30 years to maturity. Daily data and a description are available at http://www.stls.frb.org/fred/data/wkly.html. See also Federal Reserve Bulletin, table 1.35.

Page 5: Total Checkable Deposits is the sum of demand and other checkable deposits. Total Savings Deposits is the sum of money market deposit accounts (MMDA), 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 range as reported to the Congress in the February Humphrey-Hawkins Act testimony each year. CPI Inflation is the percentage change from a year ago in the CPI for all urban consumers. Real Interest Rates are ex post measures, equal to nominal rates minus CPI inflation.

Page 9: FOMC Expected Federal Funds Rate is the level (or midpoint of the range, if applicable) of the federal funds rate that the staff of the Federal Open Market Committee expected to be consistent with the desired degree of pressure on bank reserve positions.

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

\[ f_t = \alpha_t + \beta_t \pi_t + \gamma_t y_t \]

to five alternative target inflation rates \( \pi_t \) = 0, 1, 2, 3, 4 percent, where \( f_t \) is the implied federal funds rate, \( \pi_t \) is the previous period’s inflation rate (CPI), \( y_t \) is the log of the previous period’s level of real GDP, and \( y_{t-1}^{*} \) is the log of an estimate of the previous period’s level of potential output. Potential real output 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

\[ \Delta MB_t = \pi_t + (10\text{-year moving average growth of real GDP}) - (4\text{-year moving average of base velocity growth}) \]

to five alternative target inflation rates \( \pi_t \) = 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 \( (y_{t-40} - y_{t-1}) / 40 \times 4 \times 100 \), 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 http://www.stls.frb.org/research/swdata.html.

Page 11: **Implied One-Year Forward Rates** are calculated by this Bank from Treasury constant maturity yields. Yields to maturity, \( R(m) \), for securities with \( m = 1, \ldots, 30 \) 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)

\[
R(m) = \alpha_0 + (\alpha_1 + \alpha_2)(1 - e^{-m/50}) + \alpha_2 e^{-m/50},
\]

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

\[
f(m) = \left[ D(m)R(m) - D(m-1) \right] / \left[ D(m) - D(m-1) \right],
\]

where duration is approximated as \( D(m) = (1 - e^{-m/50}) / R(m) \). These rates are linear approximations to the true instantaneous forward rates; see Shiller. For a discussion of the use of forward rates as indicators of inflation expectations, see Sharpe (1997). **Rates on 3-Month Eurodollar Futures and Rates on Selected Fed Funds Futures Contracts** each trace through time the yield on three specific contracts. **Implied Yields on Fed Funds Futures** displays a single day’s snapshot of yields for contracts expiring in the months shown on the horizontal axis. **Inflation-Protected Treasury Yield Spreads** equal, for 5, 10, and 30 year maturities, the difference between the Treasury constant maturity yield and the yield on the most recently issued inflation-protected security. **Inflation-Indexed Bonds** for Canada are the 31-year bond with a maturity date of 12/01/2026; for the U.K., the 37.5-year bond with a maturity date of 07/17/2024 and the 12.1-year bond with a maturity date of 10/21/2004; and, for the U.S., the 30-year bond with a maturity date of 04/15/2028 and the 10-year bond with a maturity date of 01/15/2007.

Page 12: **Velocity** (for MZM and M2) equals the ratio of GDP, measured in current dollars, to the level of the monetary aggregate. **MZM and M2 Own Rates** are weighted averages of the rates received by households and firms on the assets included in the aggregates. Two alternative opportunity costs are shown, one relative to the 3-month Treasury constant-maturity yield, the other to the 5-year constant-maturity yield.

Page 13: **Real Gross Domestic Product** is GDP as measured in chained 1992 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 1992 dollars.

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

**Sources**

- Bank of Canada
  - Canadian inflation-linked bond yields.
- Bank of England
  - U.K. inflation-linked bond yields.
- Board of Governors of the Federal Reserve System
  - Monetary aggregates and components, nonfinancial debt: H.6 release; bank credit and components: H.8 release; consumer credit: G.19 release; required reserves, excess reserves, clearing balance contracts and discount window borrowing: H.4.1 and H.3 releases; interest rates: H.15 and G.13 releases; nonfinancial commercial paper: Board of Governors web site; M2 and MZM own rates.
- Bureau of Economic Analysis
  - Gross domestic product.
- Bureau of Labor Statistics
  - Consumer price index.
- Federal Reserve Bank of Philadelphia
  - Survey of Professional Forecasters inflation expectations.

**Federal Reserve Bank of St. Louis**

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

**Organization for Economic Cooperation and Development**

- International interest and inflation rates.

**University of Michigan Survey Research Center**

- Median expected price change.

**Congressional Budget Office**

- Potential real GDP.

**Dow Jones and Co. (Wall Street Journal)**

- Federal funds futures contracts, Eurodollar futures.

**Standard and Poors Inc.**

- Stock price-earnings ratio, stock price composite index.

**U.S. Department of the Treasury**

- U.S. inflation-protected security yields.

**References**


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