MOODY'S

A General Theory of Interest Rates

ANALYSIS
SEPTEMBER 2025

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This analysis provides an empirical framework for determining interest rates. It posits that interest rates have an equilibrium rate to which they ultimately converge. The normalization to equilibrium depends on various factors, including the business cycle, fiscal policy, economic and financial shocks, and market-specific characteristics. And the equilibrium itself is not fixed but evolves with slow-moving fundamentals such as demographic trends, productivity growth and debt trajectories.

A General Theory of Interest Rates

BY CRISTIAN DERITIS, DAMIEN MOORE, MARTIN WURM AND MARK ZANDI

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Moody's Analytics applies this framework to generate forecasts of key interest rates, including the federal funds rate, Treasury bond yields, residential mortgage rates, and corporate bond yields. Although interest rates are seldom at equilibrium, it is notable that, despite significant disruptions such as the pandemic, the Russian war in Ukraine, and global trade tensions, current interest rates remain relatively close to their equilibrium levels.

The federal funds rate is higher than its equilibrium rate. The Federal Reserve has been stymied in normalizing rates by the uncertainty created by economic policy, most notably higher U.S. tariffs and the resulting global trade war. Fixed residential mortgage rates are also elevated, partly because of the extraordinary volatility in the bond market and the consequent increase in prepayment risk to investors in mortgage-backed securities. In contrast, corporate bond yields are low compared with their equilibrium, as investors are seemingly sanguine about the credit risk in these investments.

Long-term Treasury yields are more or less consistent with their equilibrium rates. However, the Treasury market appears especially fragile given the rapid growth and large amount of federal government debt outstanding, mounting worries among global investors over the U.S.'s safe-haven status, and heightened political dysfunction emanating from Washington DC. Consequently, it is prudent to consider alternative scenarios in which equilibrium long-term interest rates significantly increase.

FEDERAL FUNDS RATE

A cornerstone of our framework is the equilibrium federal funds rate, so-called R-star, which serves as the gravitational center for all interest rates. By equilibrium, we mean a state where the economy is operating at full employment with inflation stably anchored at the Fed's target. R-star is not directly observable, but in the long run, abstracting from the vagaries of the business cycle, it is tied to the rate at which the economywide cost of capital equals the return on that capital.[1] The return on capital ultimately moves with the economy's potential growth rate, which is determined by the growth in the labor force and productivity.

1 The link between equilibrium interest rates, the marginal product of capital, and potential growth is a cornerstone of modern macroeconomic theory and is well-established by the early seminal works of Ramsey, F. (1928). A Mathematical Theory of Saving, Economic Journal, 38(152), 543-559; Swan, T. (1956). Economic Growth and Capital Accumulation, Economic Record, 32(2), 334-361; Solow, R. (1956). A Contribution to the Theory of Economic Growth, Quarterly Journal of Economics, 70(1), 65-94; Cass, D. (1965). Optimum Growth in an Aggregative Model of Economic Growth, Review of Economic Studies 32(3), 233-240; Koopmans, T. (1965). On the Concept of Optimal Economic Growth, The Economic Approach to Development Planning, Chicago: Rand McNally, 225-287. For an overview of how this early research lives on in current generation macroeconomic models, see Gali, J. (2015). Monetary Policy, Inflation and the Business Cycle – An Introduction to the New Keynesian Framework and Its Applications, Princeton: Princeton University Press, 2nd edition, especially Chapter 3, 52-97. This theoretical framework forms the basis for a large empirical literature on R-star and its determinants, see for example, Laubach, T. & Williams, J. (2003). Measuring the Natural Rate of Interest, Review of Economics and Statistics, 85(4), 1063-1070; Holston, K. & Laubach, T. & Williams, J. (2017). Measuring the Natural Rate of Interest: International Trends and Determinants, Journal of International Economics, 108, Supplemental 1, 39-57. For recent discussions

This helps explain why R-star was historically low in the decade after the Global Financial Crisis, when the recapitalization of the banking system and restrictive fiscal policy impaired the economy's potential growth. It also helps explain why R-star was so high coming into this year, as the economy's potential growth was fueled by substantial foreign immigration, which resulted in robust labor force growth and sturdy productivity gains.

R-star can also be influenced, at least in the short term, by other factors that affect the strength of the transmission mechanism between monetary policy and the economy. For example, because of the economy's heightened interest rate insensitivity following the pandemic, R-star has been somewhat elevated.[2] During the middle of the pandemic, when interest rates were exceptionally low, many households and businesses refinanced their debt and locked in the low rates. The average coupon on outstanding residential mortgages is near 4% and locked in, as nearly all of these are 30-year fixed-rate loans. Many businesses did the same, locking in when long-term rates were low. Their interest payments remain low relative to their cash flow.

The Federal Reserve sets the federal funds rate based on its so-called reaction function,[3] which includes R-star, how close the Fed is to achieving its dual mandate of low and stable inflation and full employment, and financial conditions that affect the strength of the transmission mechanism from the funds rate to the broader economy.

The existence of a reaction function suggests the Fed sets the funds rate in response to deviations of inflation and employment from their long-run values, producing a deviation from R-star that helps steer the economy back toward its long-run anchor. Thus, conceptually, the following relationship determines the federal funds rate:

$$\begin{aligned} FedFundsRate_t &= r_t^* + \beta_1(Inflation_t - Inflation^*) \\ &+ \beta_2(Unemployment_t - Unemployment^*) + \beta_3(FinancialCond_t) \\ &+ \beta_4(GlobalEconomicCond_t) \end{aligned}$$

where:

- $FedFundsRate_t$ is the federal funds rate target at time *t*
- r_t^* is R-star, or the equilibrium federal funds rate, at time *t*
- $Inflation_t$ is inflation at time *t* and $Inflation^*$ is the Fed's target inflation rate
- $Unemployment_t$ is the unemployment rate at time *t* and $Unemployment^*$ is the natural rate of unemployment

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of trends, see Martínez-García, E. (2023). Gazing at r-star: Gauging U.S. Monetary Policy via the Natural Rate of Interest. Dallas Fed Economics, July 3, 2023. Carvalho, C. & Ferrero, A. & Mazin, F. (2025). Underlying Trends in the U.S. Neutral Interest Rate. FRBSF Economic Letter 2025-10, April 21, 2025.

2 De Stefani, A. & Mano, R. (2025). Long-Term Debt and Short-Term Rates: Fixed-Rate Mortgages and Monetary Transmission, IMF Working Paper WP/25/24.

3 John Taylor is credited with the original idea of a prescriptive interest rate rule, which has since become known as the "Taylor rule", see Taylor, J. (1993). Discretion Versus Policy Rules in Practice, Carnegie-Rochester Conference Series on Public Policy, 39, 195-214. In practice, central banks do not follow strict mechanical policy rules because of the unreliability of available real-time data at the time policy rate decisions are made and the varying lags with which monetary policy affects economic conditions. Policy rules are, hence, more guiding principles than strict prescriptions, and central banks rely on additional judgment. See Clarida, R. & Gali, J. & Gertler, M. (2000). Monetary Policy Rules and Macroeconomic Stability: Theory and Some Evidence, Quarterly Journal of Economics, 115(1), 147-180 and Svensson, L. (2003). What Is Wrong With Taylor Rules? Using Judgment in Monetary Policy Through Targeting Rules, Journal of Economic Literature, 41(2), 426-477.

» $FinancialCond_t$ represents financial conditions, including stock prices and credit spreads at time *t*

» $GlobalEconomicCond_t$ represents global economic conditions such as the value of the U.S. dollar at time *t*

Empirically, we implement this relationship as follows:

$$FedFundsRate_t =$$

$$\begin{cases} \alpha + \beta_1 FedFundsRate_{t-1} + \beta_2 PotentialGrowth_t + \\ + \beta_3 E_t^{5y}(Inflation) + \\ + \beta_4(Unemployment_t - Unemployment^*) + \\ \beta_5(Inflation_t - Inflation^*) + \beta_6 EquityVol_t^* & if\ FedFundsRate_t > FedFundsRate_{floor} \\ FedFundsRate_{floor} & if\ FedFundsRate_t \leq FedFundsRate_{floor} \end{cases}$$

where:

» $PotentialGrowth_t$ is an eight-quarter moving average of the Congressional Budget Office's real potential GDP growth rate estimate at time *t*

» $E_t^{5y}(Inflation)$ is an eight-quarter moving average of the instantaneous five-year break-even inflation rate implied by Treasury inflation-protected securities at time *t*

» $EquityVol_t^*$ is the difference between Standard & Poor's 500 volatility and its historical average at time *t*

» $FedFundsRate_{floor}$ represents the lower zero bound for the policy rate, since the Fed has historically not let the policy rate fall below zero

Our empirical modeling results for these equations are shown in Table 1. The estimated parameters can be interpreted as follows:

» **Fed responsiveness to the unemployment gap (β_4=-0.08):** A positive unemployment gap in recession or recovery is associated with lower interest rates.

» **Fed responsiveness to the inflation gap (β_5=0.12):** A positive inflation gap when the economy is overheating is associated with higher interest rates.

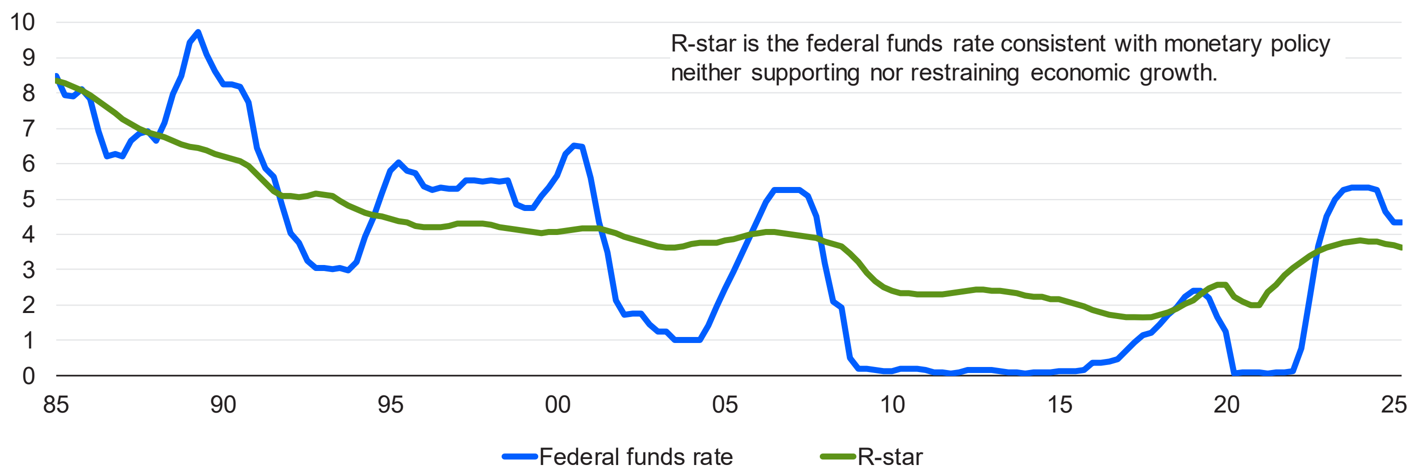
» **Fed responsiveness to financial conditions (β_6=-0.27):** Above-average financial market volatility is associated with lower interest rates.

» **Implicit r* =** $\left(\boldsymbol{\alpha + \beta_2 PotentialGrowth_t + \beta_3 E_t^{5y}(Inflation)}\right)/(\boldsymbol{1 - \beta_1})$:

In the economy's long-run equilibrium, the unemployment and inflation gaps close, and market volatility returns to its average. Because inflation expectations are stable in the long run, long-term R-star is solely determined by real potential growth and its determinants.

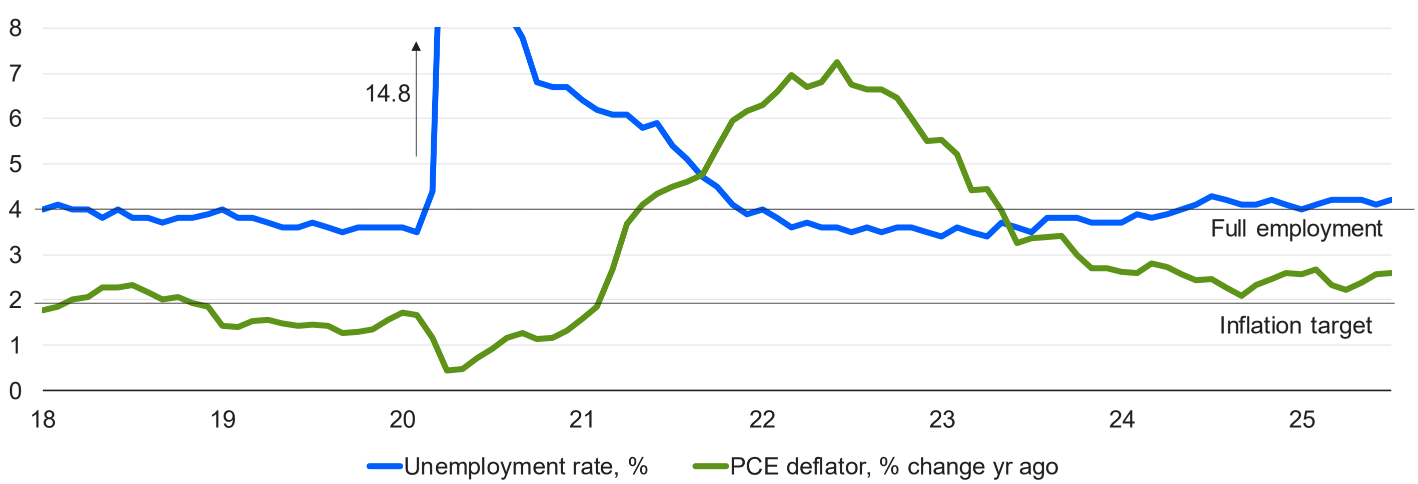
Our current estimate of R-star is 3.6%, some 70 basis points less than the current federal funds rate of 4.3% (see Chart 1). This suggests that monetary policy is somewhat restrictive, meaning it is working to restrain economic growth. This makes sense in the context of the Fed's reaction function, as inflation is above the Fed's target and set to accelerate given the higher U.S. tariffs. As measured by the core consumer expenditure deflator—the Fed's preferred inflation measure—inflation is almost 3%, nearly a percentage point higher than the Fed's 2% target (see Chart 2).

Chart 1: Monetary Policy Is Closing In on R-Star…



Sources: Federal Reserve, Moody's Analytics

Chart 2: …As the Federal Reserve Almost Achieved Its Dual Mandate



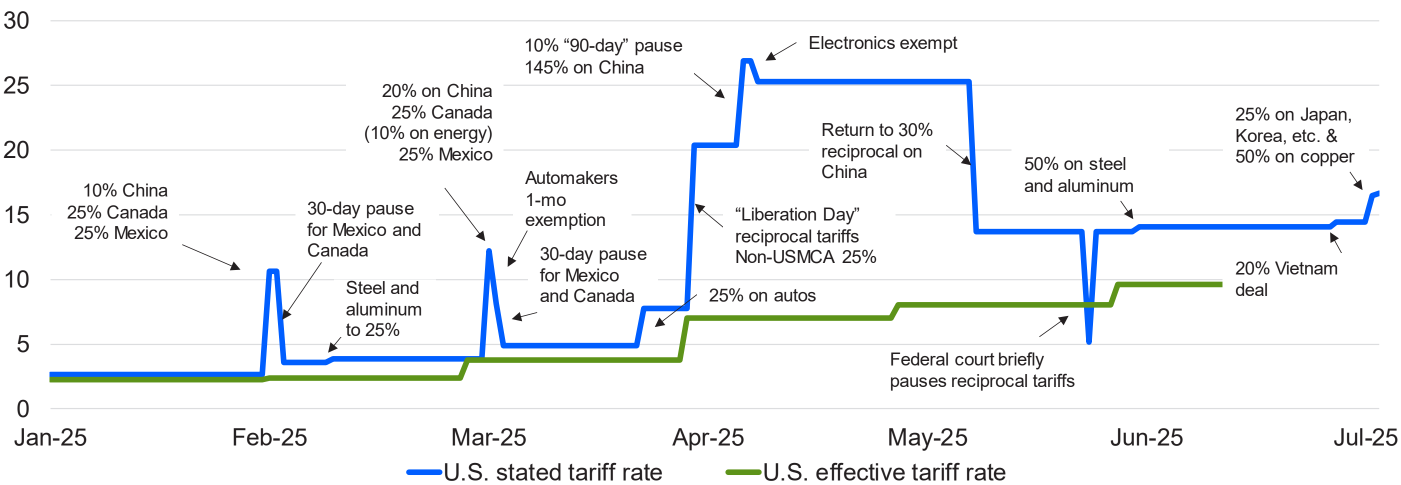
Sources: BLS, BEA, Moody's Analytics

The other variables in the reaction function do not strongly signal a need for a higher or lower funds rate. Since the current 4.3% unemployment rate is consistent with full employment, it has no bearing on the current funds rate. As measured by the strength of the stock market or bank lending standards, financial conditions appear neither easy nor restrictive. And the value of the U.S. dollar has fallen somewhat since the trade war began, although it is still on the high side of historical norms.

Highly uncertain economic policy, especially U.S. tariffs and the global trade war, complicates the Fed's monetary policy decision-making.[4] It is unclear whether the Fed should focus on the inflation being fueled by the higher tariffs or the resulting weaker economic growth. Since the tariffs change, at times dramatically, it is all but impossible for the Fed to calibrate monetary policy in response (see Chart 3). The Fed has dealt with these crosscurrents and uncertainty by holding rates unchanged this year.

Chart 3: Normalization Is Complicated by the Fog of the Trade War

U.S. tariff rate, %



Sources: News sources, BEA, Moody's Analytics

Timing based on tariff announcements, not implementation

Nonetheless, the Moody's Analytics baseline (or most likely) forecast expects that the Fed will soon resume cutting the funds rate and steadily normalize the rate by the end of next year. More explicitly, the Fed is expected to begin cutting rates again by a quarter percentage point in September, and to cut rates each quarter by a quarter point until the funds rate returns to R-star by the end of 2026. R-star is expected to steadily move lower, settling at 3% as the economy's potential growth slows, given the fallout from the trade war and restrictive immigration policy, and the easing of the interest rate lock.

4 Ozdagli, A. (2019). Financial Market Implications of the Trade War Between the United States and China, Boston Fed Current Policy Perspectives No. 19-3.

10-YEAR TREASURY BOND YIELD

The Moody's Analytics framework extends to the 10-year Treasury bond yield, arguably the most critical asset price in the global financial system. It acts as the benchmark for all other long-term interest rates and is thus a crucial determinant of the value of all assets, from equities and real estate to commodities and crypto prices.

If markets were frictionless and the future were perfectly known, the 10-year yield would be an average of future expected short-term rates. This results from financial arbitrage, the simultaneous purchase and sale of the same or similar instruments to profit from small price discrepancies. For instance, if today's 10-year Treasury yield were larger than the average expected short-term rate over the next 10 years, investors could realize extra-economic profits by short-selling short-term bonds and longing the 10-year bond. This strategy weighs on long-term rates and raises short-term rates, eliminating such differences over time. Because the U.S. Treasury bond market is a highly liquid market with many active global participants, such arbitrage opportunities do not systematically exist in practice.

Naturally, markets are not frictionless, and the future is unknown. For this reason, long-term yields are generally not equal to market expectations about shorter maturities as implied by the Treasury forward curve. This difference, the term premium, is best understood as a risk premium that compensates investors for holding long-term bonds rather than rolling over shorter-term securities.

The term premium is not directly observable but can be estimated from term structure models.[5] High inflation uncertainty,[6] high economic and financial volatility,[7] and rising fiscal debt[8] have all been linked to steeper term premiums. Technical factors such as quantitative easing,[9] that is, the purchase of long-term bonds by central banks, also affect the term premium.

Conceptually, the following relationship, then, determines the 10-year Treasury bond yield:

$$TreasuryYield_t^{10y} = E_t^{10y}(FedFundsRate) + E_t^{10y}(Inflation) + TermPremium_t^{10y}$$

where:

- » $E_t^{10y}(FedFundsRate)$ represents the average expected real federal funds rate over the next 10 years at time *t*
- » $E_t^{10y}(Inflation)$ is the average expected inflation rate over the next 10 years at time *t*
- » $TermPremium_t^{10y}$ is the 10-year term premium at time *t*

5 Adrian, T. & Crump, R. & Moench, E. (2013). Pricing the Term Structure With Linear Regressions, Journal of Financial Economics, 110(1), 110-138

6 Cochrane, J. & Piazzesi, M. (2005). Bond Risk Premia. American Economic Review, 95(1), 138-160; Wright, J. (2011). Term Premiums and Inflation Uncertainty: Empirical Evidence From an International Panel Dataset. American Economic Review, 101(4), 1514-1534; Breach, T. & D'Amico, Stefania & Orphanides, A. (2020). The Term Structure and Inflation Uncertainty, Journal of Financial Economics, 138(2), 388-414

7 Kumar, A. & Mallick, S. & Mohanty, M. & Zampolli, F. (2022). Market Volatility, Monetary Policy and the Term Premium, Bank for International Settlements Working Paper WP606.

8 Laubach, T. (2009). New Evidence on the Interest Rate Effects of Budget Deficits and Debt, Journal of the European Economic Association, 7(4), 858-885. Liu. Y (2023). Government Debt and Risk Premia, Journal of Monetary Economics, 136, 18-34.

9 Bonis, B. & Ihrig, J. & Wei, M. (2017). The Effect of the Federal Reserve's Securities Holdings on Longer-Term Interest Rates, FEDS Notes. Washington: Board of Governors of the Federal Reserve System.

While this identity defines the yield in equilibrium, in practice, market frictions, policy actions, and shifts in sentiment cause observed yields to deviate, which motivates modeling an equilibrium equation that links the 10-year rate to fundamentals and an adjustment equation that captures how the observed yield converges back toward equilibrium. In parallel, we model the term premium separately, since it is a direct component of the equilibrium yield and an important driver of its fluctuations over time.

10-YEAR EQUILIBRIUM YIELD:

$$\left(TreasuryYield_t^{10y}\right)^* = \alpha_1 + \beta_1 FedFundsRate_t + \beta_2 TermPremium_t^{10y} + \beta_3 Debt_{t-1} + \varepsilon_{1,t}$$

where:

» $Debt_t$ is the ratio of publicly traded Treasury debt to GDP at time *t-1*

10-YEAR-ADJUSTMENT EQUATION:

$$\begin{aligned}\Delta TreasuryYield_t^{10y} &= \alpha_2 + \gamma_1\left(TreasuryYield_{t-1}^{10y} - \left(TreasuryYield_{t-1}^{10y}\right)^*\right) + \gamma_2 \Delta FedFundsRate_t \\ &+ \gamma_3 \Delta FedBalanceSheet_t + \varepsilon_{2,t}\end{aligned}$$

where:

» $\Delta TreasuryYield_t^{10y}$ is the change in the 10-year Treasury yield from time *t-1* to *t*

» $FedBalanceSheet_t$ is the ratio of assets held by the Federal Reserve to GDP at time *t*

TERM PREMIUM:[10]

$$\begin{aligned}TermPremium_t^{10y} &= \alpha_3 + \delta_1 TermPremium_{t-1}^{10y} + \delta_2 BondVol_t^{10y} \\ &+ \delta_3\left(Unemployment_t - Unemployment^*\right) + \delta_4 FedBalanceSheet_t + \delta_5 E_t^{5y5y}(Inflation) \\ &+ \varepsilon_{3,t}\end{aligned}$$

where:

» $BondVol_t^{10y}$ is the annualized realized volatility of the 10-year Treasury yield at time *t*

» $E_t^{5y5y}(Inflation)$ represents long-term inflation expectations at time *t*, as measured by the five-year, five-year forward break-even inflation implied by Treasury inflation-protected securities

Our empirical modeling results for these equations are shown in Table 2. The estimated parameters can be interpreted as follows:

10-YEAR EQUILIBRIUM YIELD:

» **Rate-level effect (β_1≈0.6):** Interest rates co-move—a higher short-term interest rate also implies a higher long-term rate at a correlation of less than 1.

10 The choice of drivers loosely follows Adrian, K. & Crump, R. & Moench, E. (2013). Do Treasury Term Premia Rise Around Monetary Tightening?, Liberty Street Economics.

» **Term premium effect (β_2≈1):** A higher term premium increases the 10-year yield one-to-one relative to the fed funds rate.

» **Public debt effect (β_3≈1):** An increase in the debt-to-GDP ratio by 1 percentage point increases the long-term equilibrium yield by approximately 1 basis point.

10-YEAR-ADJUSTMENT EQUATION:

» **Speed of adjustment (γ_1≈-0.25):** If the current yield deviates from its long-term equilibrium, it will converge to its equilibrium value by reducing the current distance by about 25% each quarter.

» **Near-term policy rate response (γ_2≈0.35):** An increase in the policy rate by 10 basis points causes an increase in the 10-year yield by about 3.5 basis points near term.

» **QE absorption effect (γ_3≈ -1.3):** An increase in the Fed's balance sheet-to-GDP ratio by 1 percentage point lowers the 10-year yield by about 1.3 basis points near term.

TERM PREMIUM:

» **Long-term rate volatility (δ_2≈0.25):** An increase in the annualized volatility of the 10-year yield raises the term premium.

» **Economic uncertainty (δ_3≈0.03 > 0):** A positive unemployment gap increases the term premium, while a negative one lowers it.

» **QE's long-term rate effect (δ_4≈-1.1):** An increase in the Fed's balance sheet-to-GDP ratio by 1 percentage point lowers the 10-year yield by about 1 basis point long term.

» **Expected inflation (δ_5≈0.17):** An increase in expected long-term inflation increases the term premium.

» **Mean reversion (δ_1≈0.87):** The term premium is persistent but reverts gradually toward a stable equilibrium level.

The federal funds rate is still above its estimated equilibrium, but investors expect it to steadily decline to its neutral rate by this time next year. Thus, short-term rate movements have a limited effect on the 10-year Treasury yield.

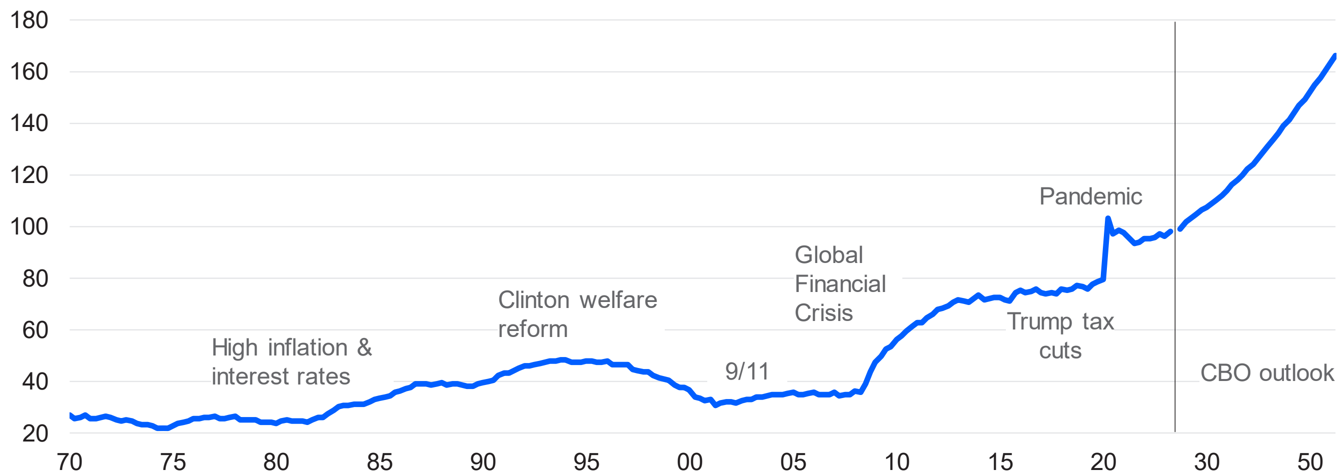
Meanwhile, with budget deficits at an uncomfortably large 6% of GDP and little prospect of narrowing, the federal debt-to-GDP ratio will continue its upward trajectory (see Chart 4). Moody's Analytics modeling suggests that for every 1-percentage point increase in the debt-to-GDP ratio, the 10-year Treasury yield increases by approximately 1 basis point.[11] While a relatively modest effect in isolation, over the next decade, the projected 20-percentage point increase in the debt ratio will add a consequential 20 basis points to the 10-year Treasury yield.

Moreover, this abstracts from the fallout from the political tensions and dysfunction on global investors' view of the safe-haven status of the U.S. With prospects for more government shutdowns and showdowns over increasing the nation's debt ceiling, along with worries about the U.S.'s role in the global economy, this is sure to become a more significant issue. This will only add to the term premium and raise long-term rates.

11 The Congressional Budget Office estimates that a 1-percentage point increase in the nation's debt-to-GDP ratio adds 2 basis points to the 10-year Treasury yield. See Neveu, A. & Schaffer, J. (2024). Revisiting the Relationship Between Debt and Long-Term Interest Rates, CBO Working Paper 2024-05.

Chart 4: High and Rising Federal Debt Load

Ratio of U.S. federal debt held by the public and GDP, %

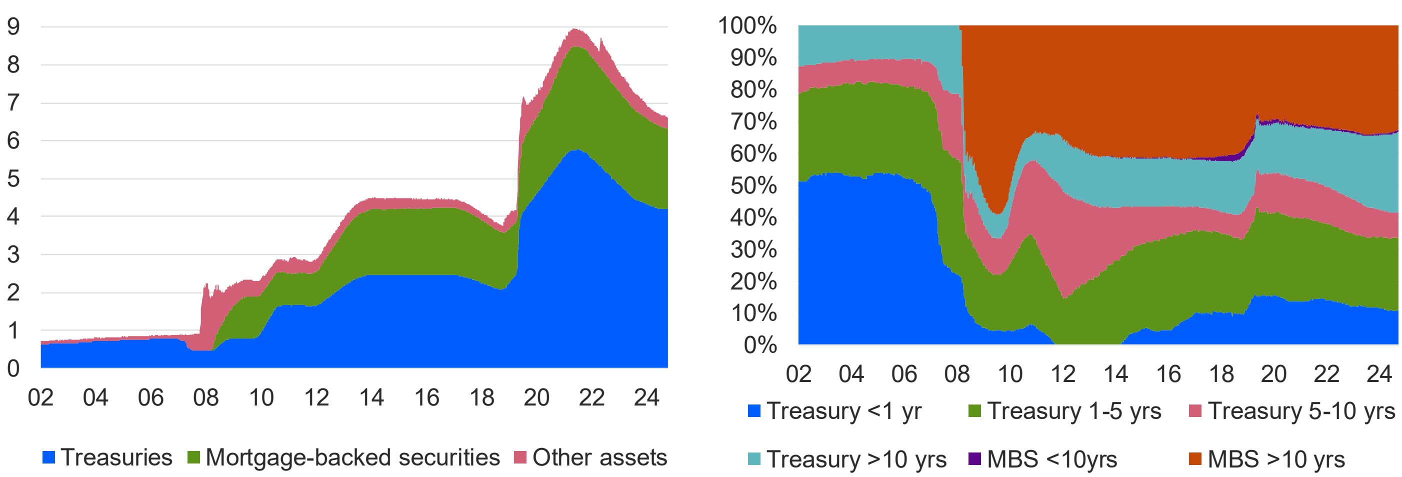


Sources: U.S. Treasury, BEA, Moody's Analytics

Chart 5: Rise and Fall of the Fed's Balance Sheet

Federal Reserve assets, $ tril

Fed securities composition



Sources: Federal Reserve, Moody's Analytics

The size of the Federal Reserve's balance sheet policies also influences Treasury yields. The balance sheet peaked at approximately $9 trillion in 2022, when the Fed ended its aggressive quantitative easing efforts following the pandemic, purchasing significant amounts of Treasury and mortgage-backed securities (see Chart 5). Since then, quantitative tightening has reduced the balance sheet by approximately $2 trillion.

Moody's Analytics modeling indicates that for every 1-percentage point increase in the ratio of the Fed's assets to GDP—quantitative easing—the 10-year Treasury yield is lowered by 2 to 3 basis points. Quantitative tightening pushes up long-term rates less than quantitative easing lowers them, because the Fed primarily tightens by allowing its shorter-term securities to mature rather than by selling long-term assets outright. Moody's Analytics expects the Fed to end quantitative tightening within the next 12 months, and the stabilizing role of unconventional monetary policy will diminish in the coming years.

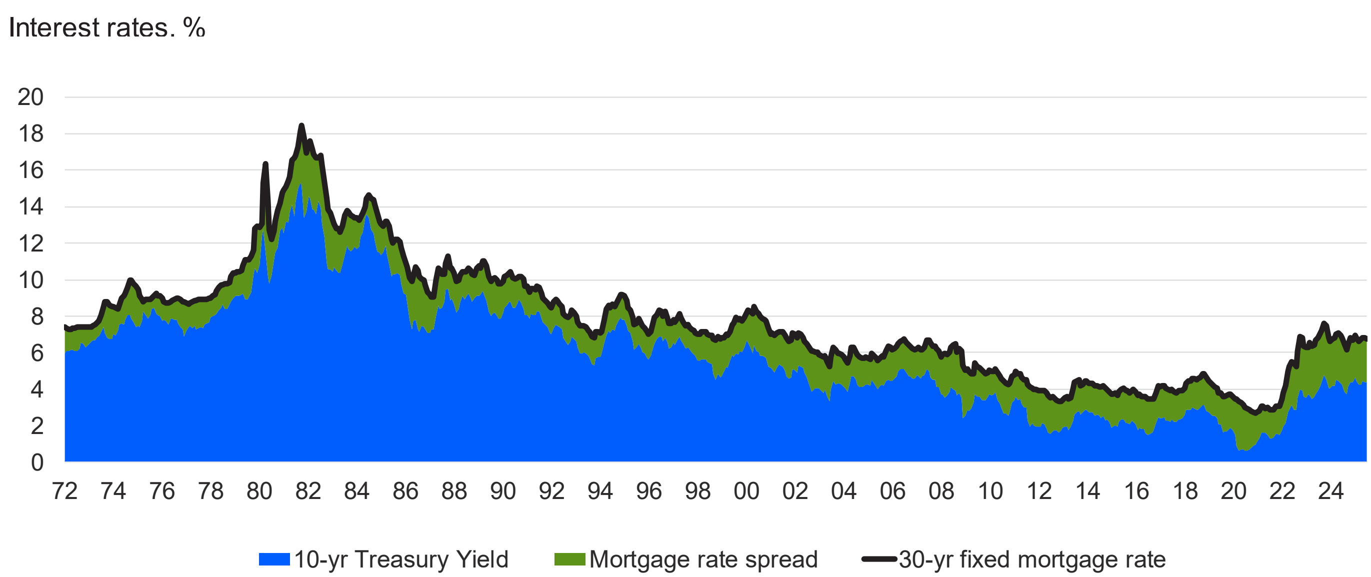
Using our policy rate and 10-year forecasts as anchors, we expand the rest of the Treasury term structure—the relationship between interest rates of different maturities. When modeling the complete Treasury yield curve, we focus on two key tenors: the three-month T-bill rate, which closely tracks the federal funds rate, and the benchmark 10-year yield. The remainder of the curve is derived from historical spreads relative to these anchor points, with appropriate adjustments for current market conditions.

The Moody's Analytics baseline forecast anticipates a widening of the Treasury yield curve, driven by the expected decline in the federal funds rate. The 10-year Treasury yield will remain between 4% and 4.5%, consistent with its equilibrium. However, this equilibrium is fragile as the preconditions for higher yields develop. But more about this later.

FIXED MORTGAGE RATES

Our interest rate framework extends to other parts of the credit markets, including the interest rates on prepayable residential mortgage loans. We model the 30-year fixed mortgage rate as the sum of the 10-year Treasury yield, as the typical mortgage duration is approximately 10 years, and a rate spread (see Chart 6).[12] The spread can, in turn, be decomposed into the primary spread, which represents the difference between the mortgage rate and the yield on mortgage-backed securities, and the secondary spread, which measures the difference between MBS and Treasury yields (see Chart 7).

Chart 6: Mortgage Rates Track 10-Year Treasuries With a Spread

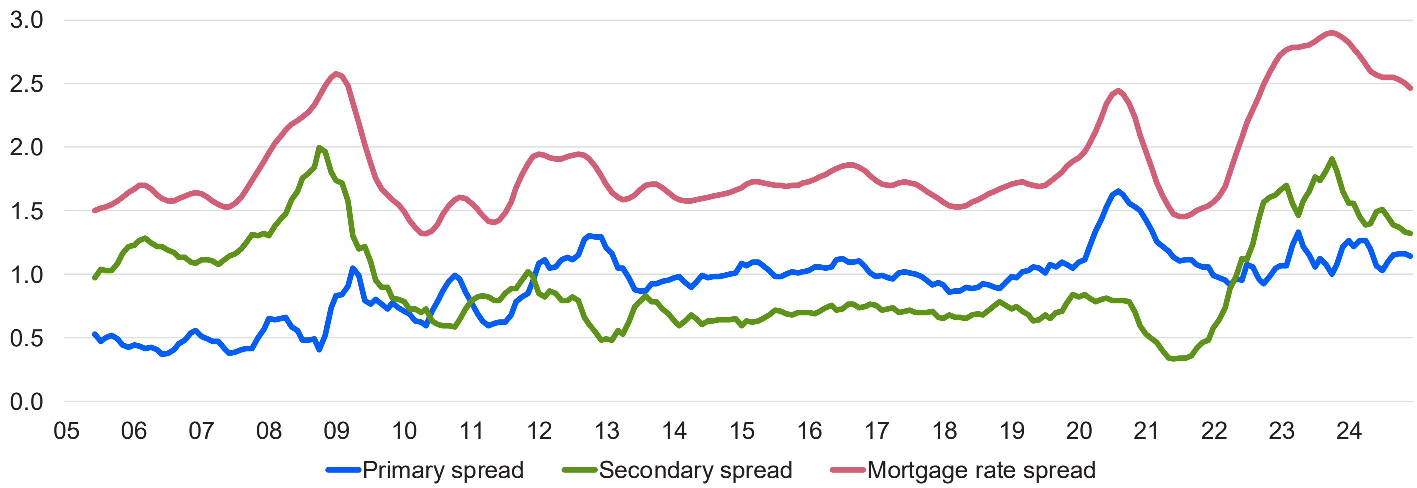


Sources: Federal Reserve, Freddie Mac, Moody's Analytics

12 Drake, N. (2024). What Determines the Rate on a 30-Year Mortgage? Fannie Mae Housing Insights, December 11, 2024.

Chart 7: Secondary Spreads Widened Post-Pandemic

Interest rate spread, ppt, 6-mo MA



Sources: Federal Reserve, Freddie Mac, Moody's Analytics

The primary spread reflects costs and margins at the mortgage's origination, including lender operating costs, servicing costs, and compensation for pipeline hedging risk. A key component of the spread for conforming mortgages is the guaranty fee, which compensates Fannie Mae and Freddie Mac for the expected credit losses and cost of capital of the mortgages they insure.[13] Some origination costs are paid upfront but rolled into rates when financed. Thus, their cost depends on the duration of the mortgage. When durations shorten, the costs are amortized over fewer months, increasing the effective primary spread.

The secondary spread reflects prepayment risk and valuation in the secondary market. Mortgages embed a prepayment option, and investors require compensation for the associated convexity risk and negative duration.[14] This is typically measured through an option-adjusted spread to Treasuries, which captures how investors price the embedded call option. The secondary spread increases with greater interest rate volatility and market uncertainty, since both increase the value of the prepayment option and the risk of hedging it.

Our empirical model of the mortgage rate spread is driven by shifts in the Treasury yield curve, interest rate volatility, market uncertainty, and adjustments back toward equilibrium levels, with a notable structural break during the 2022 monetary tightening period (see Table 3). More formally, our model can be represented by:

$$\Delta Spread_t^{FRM\,30y} = \\ = \beta_0 + \beta_1 Spread_{t-1}^{FRM\,30y} + \beta_2 \Delta YieldCurve_t + \beta_3 \Delta EquityVol_t + \beta_4 \Delta BondVol_t^{10y} \\ + \beta_5 CrisisDummy_t + \varepsilon_t$$

where:

13 Zandi, M., & deRitis, C. (2014). A General Theory of G-Fees, Moody's Analytics White Paper, October.

14 Deng, Y., Quigley, J., & Van Order, R. (2000). Mortgage Terminations, Heterogeneity and the Exercise of Mortgage Options, Econometrica, 68(2), 275–307; Stanton, R. (1995). Rational Prepayment and the Valuation of Mortgage-Backed Securities, Review of Financial Studies, 8(3), 677–708; Passmore, W., Sherlund, S., & Burgess, G. (2005). The Effect of Housing Government-Sponsored Enterprises on Mortgage Rates, Real Estate Economics, 33(3), 427–463.

- $\Delta Spread_t^{FRM\,30y}$ is the change in the spread between the 30-year fixed mortgage rate minus the 10-year Treasury rate minus the change in the average annual guarantee from time *t-1* to *t*

- $\Delta YieldCurve_t$ is the change in the spread between the 10-year Treasury yield minus the three-month Treasury yield from time *t-1* to *t*

- $\Delta EquityVol_t$ is the change in S&P 500 volatility from time *t-1* to *t*

- $\Delta BondVol_t^{10y}$ is the change in the annualized realized volatility of the 10-year Treasury yield from time *t-1* to *t*

- $CrisisDummy_t$ is an indicator = 1 from 2022Q2 to 2022Q4

Our estimation results for these equations are shown in Table 3. The estimated parameters can be interpreted as follows:

Yield curve effect (β_2=–0.11): When the yield curve steepens, mortgage spreads narrow. This reflects both reduced refinancing incentives and longer expected durations, which reduce the impact of upfront origination and guarantee costs.

Equity volatility effect (β_3=0.1): Higher stock market volatility widens mortgage spreads. The effect largely operates through the secondary market, where option-adjusted spreads increase as investors demand more compensation for prepayment and convexity risk.

Bond market volatility effect (β_4=0.26): Treasury market volatility also widens spreads, amplifying prepayment risk and raising hedging costs for mortgage-backed securities. This secondary spread channel is especially sensitive to swings in the MOVE Index.[15]

Crisis dummy (β_5=0.25): During the 2022 monetary tightening episode, mortgage spreads were about 25 basis points wider than normal. Both origination margins and secondary-market premiums were elevated, underscoring how unusual market conditions can distort both components of the spread.

Mean reversion (β_1=–0.08): Mortgage spreads tend to revert toward equilibrium over time. When spreads are unusually wide, competitive and market forces narrow them; when tight, they gradually widen back.

The current mortgage rate spread is as high as 250 basis points, which is meaningfully wider than the 175-basis point spread that has prevailed on average historically. This reflects various factors, including reduced competition among mortgage originators, which has resulted in a wider primary spread, and heightened prepayment risk, which has increased the secondary spread. The heightened prepayment risk is mainly due to the extraordinary volatility of Treasury yields. It was not long ago that it was noteworthy if the 10-year Treasury yield moved more than a few basis points in a day. Yields now seem to move tens of basis points within minutes. This volatility is confirmed in the MOVE Index, which measures the implied volatility in the option prices for Treasury bonds, analogous to the VIX (CBOE Volatility Index) for stocks. The MOVE Index has been higher than recent levels, but not often.

Behind the heightened bond market volatility, at least in part, is the reticence of broker-dealers—units of large banks that facilitate trading in the Treasury market—to increase their

15 The MOVE Index, or Merrill Lynch Option Volatility Estimate Index, is a gauge of interest rate volatility in the U.S. Treasury market.

balance sheets consistent with the surging amount of Treasury debt outstanding. This may be due to the stiffer capital and liquidity requirements for large banks with these operations. Banks may also question the business model since trading will increasingly be done through clearinghouses. Whatever the reasons, Treasury bond auctions and trading are getting sloppier, amplifying the volatility in interest rates.

The Fed's quantitative tightening, which allows it to wind down its mortgage security holdings acquired during the pandemic, may also factor in the wider secondary spread.

In the Moody's Analytics baseline outlook for fixed mortgage rates, the rate spread and, thus, mortgage rates slowly normalize over the next several years. Behind this normalization will be a moderation in prepayment risk, as the extraordinary rate volatility subsides with the move of Treasury bond trading to clearinghouses. It will also help that the Fed will end its efforts to reduce its MBS holdings. However, the normalized rate spread is expected to settle closer to 200 basis points, which, combined with a 10-year yield at just over 4%, will result in a 30-year fixed mortgage rate closer to 6%.

CORPORATE BOND YIELDS

The yield on corporate bonds can be understood as the sum of the yield on comparable-maturity Treasuries and a credit spread. The credit spread compensates corporate bond investors for expected losses, which is the product of the probability of a default on the corporate bond and the loss given default. The credit spread also provides investors with a risk premium, which compensates them for bearing uncertainty over those losses, and a liquidity premium, which compensates them for the thinner trading volumes and greater transaction costs in the corporate bond market.

Moody's Analytics models and forecasts spreads on ratings-based corporate bond indexes for medium- and long-term tenors using an option-theoretic framework in which a corporate default occurs when firm asset values decline relative to debt obligations, so expected losses can be derived from asset volatility and leverage.[16] The framework also motivates why there is a risk premium beyond expected losses, as credit risk is systematically related to the business cycle, and investors demand compensation for that covariance. It also shows how equity volatility is directly tied to corporate spreads, a link that is borne out in the empirical literature.[17]

Each index reflects the prevailing yield for corporate bond issuers in that ratings bucket. Segmenting bonds by tenor allows us to capture systematic variation in liquidity premiums and term risk across the curve. We also include equity returns and volatility as empirical proxies for the market price of systematic risk exposures and value of optionality.

Most important in our modeling is the BBB-rated, 7-10 year corporate bond index, which is employed by the Federal Reserve in its annual stress-testing of large commercial banks, making it a natural benchmark for gauging credit conditions in the investment-grade corporate bond market:

$$\Delta Spread_t^{BBB} = \alpha + \beta_1 \Delta \log(EquityIndex_t) + \beta_2 EquityVol_t + \beta_3 Spread_{t-1}^{BBB} + \varepsilon_t$$

16 Merton, R. (1974). On the Pricing of Corporate Debt: The Risk Structure of Interest Rates. Journal of Finance, 29(2), 449–470.

17 Collin-Dufresne, P., Goldstein, R., & Martin, J. (2001). The Determinants of Credit Spread Changes, Journal of Finance, 56(6), 2177–2207; Gilchrist, S., & Zakrajšek, E. (2012). Credit Spreads and Business Cycle Fluctuations, American Economic Review, 102(4), 1692–1720; Bao, J., Pan, J., & Wang, J. (2011). The Illiquidity of Corporate Bonds, Journal of Finance, 66(3), 911–946.

where:

- $\Delta Spread_t^{BBB}$ is the quarter change in spread between the BBB 7-10 year corporate bond index and the 10-year Treasury yield
- $EquityIndex_t$ is the S&P 500 equity market price index
- $EquityVol_t$ is the S&P 500 volatility index
- $Spread_{t-1}^{BBB}$ is the BBB yield index level in the prior quarter

Our empirical modeling results for these equations are shown in Table 4. The estimated parameters can be interpreted as follows:

- **Equity effect ($\beta_1 < 0$):** Rising equity valuations are associated with narrower spreads, consistent with stronger firm balance sheets and, at times, reduced required returns on corporate risk.
- **Volatility effect ($\beta_2 > 0$):** Greater equity volatility widens spreads, reflecting the option-like nature of default risk in structural models and the higher compensation investors demand under uncertainty.
- **Mean reversion ($\beta_3 \approx 0.6\text{–}0.7 < 1$):** Spreads are persistent but converge toward a long-run equilibrium, as deviations from fundamentals are gradually corrected.

Taken together, the specification links market-based measures of equity values and volatility to credit spreads, which we extend to other tenors and ratings buckets using specifications that capture liquidity and term-structure differences.

Moody's investment-grade bond indexes with ratings spanning Aaa through Baa for medium- and long-term tenors are modeled as a function of the BBB benchmark. For example, for the Baa-rated, seven-year bonds, the spread is modeled as:

$$Spread_t^{Baa,7y} = \alpha + \beta_1 Spread_t^{BBB,10y} + \beta_2 EquityVol_t + \beta_3 Spread_{t-1}^{Baa,7y} + \varepsilon_t$$

where:

- $Spread_t^{Baa,7y}$ is the spread between the Baa seven-year corporate bond index and the seven-year Treasury yield
- $Spread_t^{BBB,10y}$ is the level of the spread between the BBB 10-year corporate bond index and the 10-year Treasury yield
- $Spread_{t-1}^{Baa,7y}$ is the Baa seven-year spread in the prior quarter

For Baa-rated, 20-year bonds, we make tenor-slope effects explicit, given the at times significant gap in yields between seven-year and 20-year maturities:

$$Spread_t^{Baa,20y} = \alpha + \beta_1\left(TreasuryYield_t^{20y} - TreasuryYield_t^{7y}\right) + \beta_2 EquityVol_t + \beta_3 Spread_{t-1}^{Baa,20y} + \varepsilon_t$$

where:

- $Spread_t^{Baa,20y}$ is the spread between the Baa 20-year corporate bond index and the 20-year Treasury yield

- $TreasuryYield_t^{20y} - TreasuryYield_t^{7y}$ is the 20-year Treasury yield less the seven-year Treasury yield
- $Spread_{t-1}^{Baa,20y}$ is the Baa 20-year spread in the prior quarter

For A-rated, seven-year corporates, spreads are tied to the Baa benchmark but less sensitive to volatility ($0<\beta_1 < 1$; $\beta_2 < 0$):

$$Spread_t^{A,7y} = \alpha + \beta_1 Spread_t^{Baa,7y} + \beta_2 EquityVol_t + \beta_3 Spread_{t-1}^{A,7y} + \varepsilon_t$$

where:

- $Spread_t^{A,7y}$ is the spread between the A seven-year corporate bond index and the seven-year Treasury yield
- $Spread_{t-1}^{A,7y}$ is the A seven-year spread in the prior quarter

For high-yield corporates, we use the ICE BofA High Yield Option-Adjusted Spread, which is also referenced by the Federal Reserve in its stress-testing, to capture broad speculative-grade borrowing conditions:

$$Spread_t^{HY} = \alpha + \beta_1 \left(Yield_t^{Baa,20y} - TreasuryYield_t^{10y}\right) + \beta_2 EquityVol_t + \beta_3 Spread_{t-1}^{HY} + \varepsilon_t$$

where:

- $Spread_t^{HY}$ is the ICE BofA High Yield Option-Adjusted Spread relative to Treasuries
- $Yield_t^{Baa,20y} - TreasuryYield_t^{10y}$ is the spread between the 20-year Baa yield and 10-year Treasury yield
- $Spread_{t-1}^{HY}$ is the high-yield spread in the prior quarter

Current corporate bond spreads are thin compared with historical norms (see Chart 8).

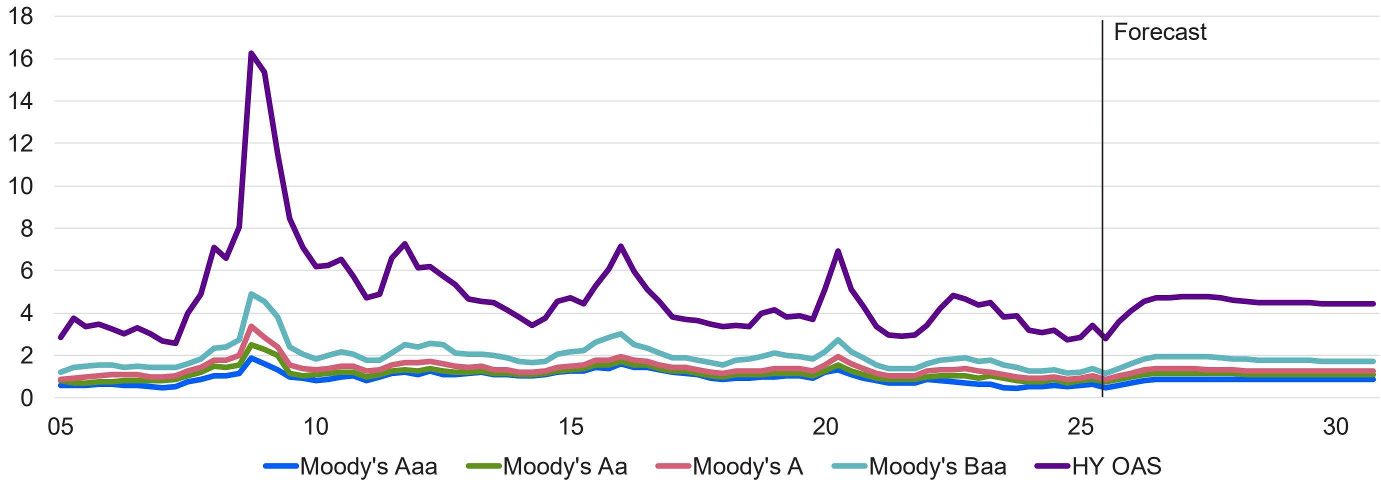
Below-investment-grade bonds trade at narrow spreads over 10-year Treasury yields of nearly 300 basis points. Historically, even abstracting from economic and financial stress periods, high-yield corporate spreads have averaged closer to 500 basis points.

The narrow spread appears somewhat incongruous with credit fundamentals (see Chart 9). Take the debt-to-corporate gross value added ratio for nonfinancial corporations, which has increased substantially, and interest coverage ratios, which remain low, particularly for speculative-grade issuers. Our forecast thus anticipates a normalization process whereby spreads will widen, especially for lower-rated bonds, as market pricing gradually realigns with fundamental credit risk.

However, we do not expect spreads to return to 500 basis points, but closer to 450 basis points. This reflects competition for corporate lending from private credit funds, which generally lend to lower-quality middle-market nonfinancial corporates. Given their weakening safe-haven status, it also reflects a small but developing risk premium in Treasury bonds. In the Moody's Analytics baseline outlook, high-yield corporate bond yields will settle near 9%.

Chart 8: Corporate Spreads Are Near Historic Nadirs

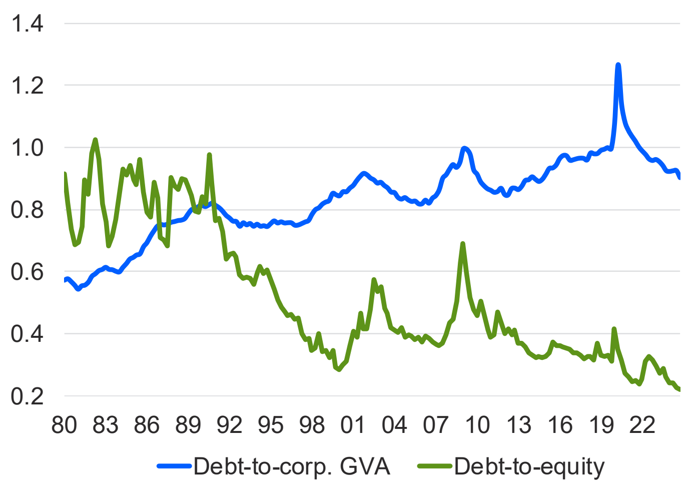
Moody's seasoned corporate rates minus 20-yr Treasury (Aug 2025 baseline), BB HY OAS, %



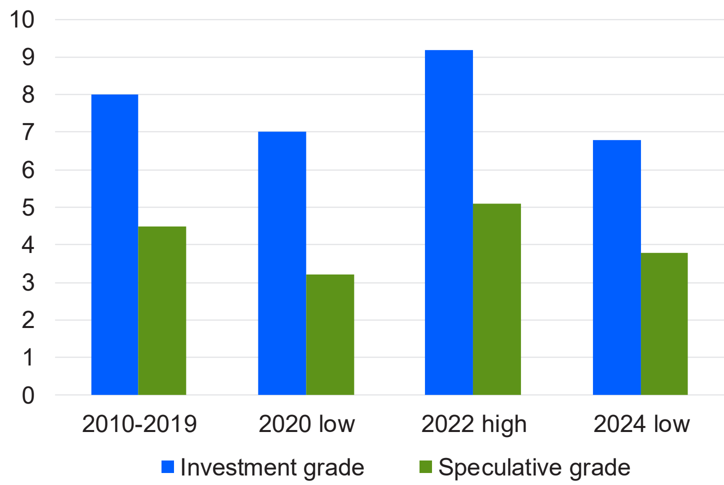
Sources: U.S. Treasury, Bloomberg, Moody's Analytics

Chart 9: Corporate Debt Fundamentals Paint a Mixed View

Nonfinancial corporate debt ratios (securities and loans)



Coverage ratios, EBITA/interest expense multiple



Sources: Federal Reserve, BEA, Bloomberg, Apollo, Moody's Analytics

INTEREST RATE RISKS

The baseline forecast expects a gradual normalization of interest rates across the credit markets. Assuming no additional shocks to the economy, the federal funds rate will decline to 3% by the end of 2026, the 10-year Treasury yield will continue to trade near 4.25%, fixed mortgage rates will moderate toward 6%, and corporate spreads will widen back to their historical norms, putting the yield on high-yield corporate bonds closer to 9%.

While this is our most likely outlook for interest rates, it faces substantial risks, particularly regarding long-term Treasury yields. The 10-year is at its equilibrium, but it is a fragile equilibrium. This is partly because of the shift in who owns Treasury bonds. The Federal Reserve, the most interest-rate-insensitive holder of Treasuries, continues to reduce its Treasury and mortgage-backed security holdings as part of its quantitative tightening policy. The Fed will remain a large owner of Treasuries even after its quantitative tightening ends, but it will no longer be a source of new demand for Treasuries.

Japanese investors, the largest foreign owners of Treasuries, have become more circumspect holders as interest rates on their bonds have risen significantly, making them more attractive. This is especially true when considering that they have no currency risk when investing in their Japanese government bonds. Chinese investors, also large holders of Treasuries, are steadily reducing their exposure, likely because of the rapid decoupling of the U.S. and Chinese economies. With the U.S. trade deficit with China narrowing, China's need to reinvest the dollars earned from trade in Treasury bonds is fading.

U.S. banks also remain cautious investors in Treasury bonds. They have yet to fully recover from the significant losses they suffered on their bond portfolios when the Fed aggressively tightened policy and long-term interest rates jumped a few years ago, precipitating deposit runs and several prominent bank failures. A recent easing in banks' capital standards may prompt more Treasury demand, but this is likely to be modest and will take some time to have an effect.

This leaves hedge funds to fill the void in Treasury demand. These investors are highly price-sensitive and are big buyers of Treasuries when conditions are opportune. However, they run for the proverbial door when they are not, which adds to interest rate volatility.

More fundamentally, there are ample reasons to worry that the 10-year Treasury yield's fragile equilibrium will be broken by a selloff in the bond market and a significant increase in yields. The most disconcerting aspect is the U.S. federal fiscal situation. By nearly every measure, it has rarely been so dire. The nation's massive budget deficits are persistently near 6% of GDP. Even the primary deficit, which excludes interest payments on the debt, is an extraordinary 3%. And this is in a full-employment economy with low unemployment. There is little doubt about what will happen to the deficit when the economy stumbles, and at some point, it will.

The nation's heavy debt load is thus rapidly mounting. The publicly traded debt-to-GDP ratio is nearly 100%, more than double what it was before the Global Financial Crisis. With the recent passage of the significant tax and spending legislation dubbed the One Big Beautiful Bill, it is set to increase by approximately 20 percentage points over the next decade. And the forecast gets no better after that.

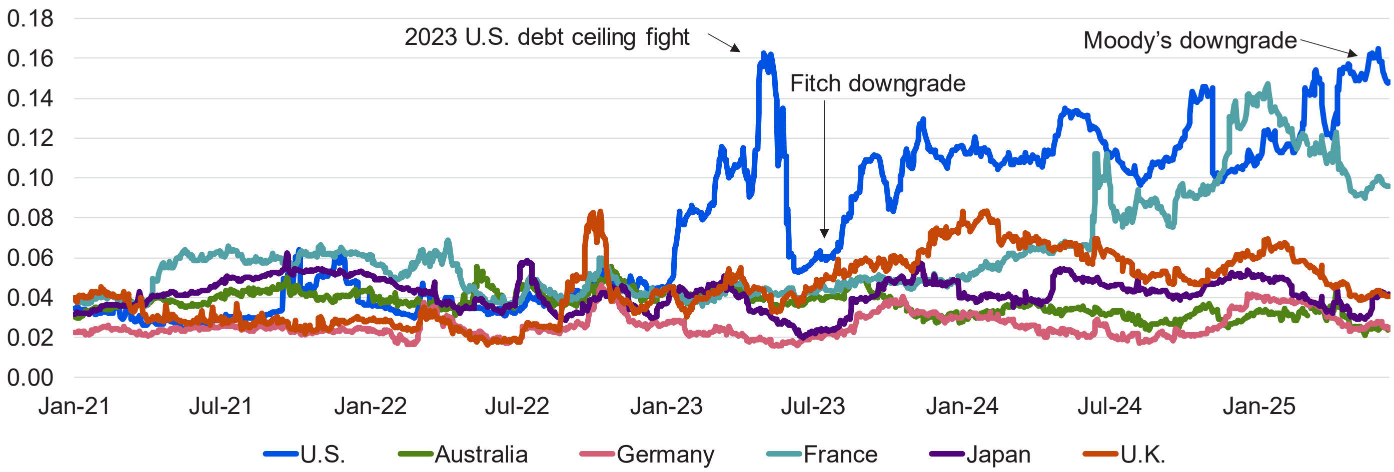
A handy rule of thumb based on various econometric analyses is that for every 1-percentage point increase in the nation's debt-to-GDP ratio, the equilibrium 10-year Treasury yield will increase by at least 1 basis point. Doing the arithmetic, unless there is a significant turnaround in U.S. fiscal policy soon, the equilibrium 10-year Treasury yield will be 20 basis points higher a decade from now, and there will be no looking back.

Global investors are hand-wringing over the diminished safe-haven status of U.S. Treasury securities. Historically, in times of global uncertainty and crisis, investors have flocked to the safety of U.S. Treasury bonds, keeping interest rates down. No other financial market globally has been as large and liquid or perceived as money-sound; investors could be sure that if they purchased a Treasury bond, they would promptly receive their principal and interest. Investing in a Treasury bond has been perceived as risk-free.

However, investors appear to wonder whether this is still the case. This is evident in credit default swap spreads on Treasury bonds. CDS spreads represent the cost of insurance to protect against a U.S. Treasury default. These spreads have widened considerably lately and remain persistently higher than the spreads on the debts of many other sovereigns (see Chart 10).

Chart 10: U.S. Haven Status Is in Question

5-yr CDS-implied expected default frequency, annualized %



Source: Moody's Analytics

Investors are concerned with the U.S. fiscal situation but are also grappling with the implications of the country's decoupling from the global economy. Broad-based and rapidly changing U.S. tariffs are impairing trade with the rest of the world and, in the eyes of global investors, making the U.S. a less reliable business partner. This helps explain the recent decline in the value of the U.S. dollar, particularly vis-à-vis the euro, and the surges in crypto, gold and silver prices.

U.S. political dysfunction and concerns about competent governance also affect global investors' thinking. This dysfunction is apparent in the seemingly never-ending threat of government shutdowns, down-to-the-wire battles over increasing the Treasury debt limit, and the inability of the two main political parties to come to terms on almost any issue.

The equilibrium 10-year Treasury yield thus appears set to rise. It is difficult to predict how this will play out, but given the heightened volatility in yields, there is a meaningful threat of a rapid selloff, with yields spiking. There are many potential catalysts. Given recent events, President Trump's appointment of a new Federal Reserve chair by May is a good candidate. Federal Reserve independence is in question, and nothing is more likely to spook bond investors than if the Fed is captured and keeps short-term rates too low for too long, fomenting higher inflation.

Indeed, without a spike in interest rates, it may be impossible to generate the political will sufficient to make the tough tax and government spending choices required to put the U.S. on a sustainable fiscal path. Lawmakers may need the resulting tumult to prompt voters to connect the dots and realize that there are no other options.

Forecasting interest rates is an intrepid affair, and forecasting a spike in rates borders on foolhardy, but failing to prepare for this possibility would prove even more reckless.

Equation Glossary

FEDERAL FUNDS RATE

$FedFundsRate_t$: federal funds rate target at time t

r_t^* : R-star, or the equilibrium federal funds rate

$Inflation_t$: inflation

$Inflation^*$: the Fed's target inflation rate

$Unemployment_t$: the unemployment rate

$Unemployment^*$: the natural rate of unemployment

$FinancialCond_t$: represents financial conditions, including stock prices and credit spreads

$GlobalEconomicCond_t$: global economic conditions such as the value of the U.S. dollar

$PotentialGrowth_t$: eight-quarter moving average of the CBO's real potential GDP growth rate estimate

$E_t^{5y}(Inflation)$: eight-quarter moving average of the instantaneous five-year break-even inflation rate implied by Treasury inflation-protected securities

$EquityVol_t^*$: the difference between S&P 500 volatility and its historical average

$FedFundsRate_{floor}$: the lower zero bound for the policy rate

TREASURY BOND YIELDS

$TreasuryYield_t^{10y}$: 10-year Treasury yield

$E_t^{10y}(FedFundsRate)$: the average expected real federal funds rate over the next 10 years

$E_t^{10y}(Inflation)$: the average expected inflation rate over the next 10 years

$TermPremium_t^{10y}$: the 10-year term premium (for example, ACM-term premium) equilibrium 10-year Treasury yield

$Debt_t$: ratio of publicly traded Treasury debt to GDP

$FedBalanceSheet_t$: ratio of assets held by the Federal Reserve to GDP

$BondVol_t^{10y}$: the annualized realized volatility of the 10-year Treasury yield

$E_t^{5y5y}(Inflation)$: long-term inflation expectations, as measured by the five-year, five-year forward break-even inflation implied by Treasury inflation-protected securities

MORTGAGE RATES

$Spread_t^{30yFRM}$: 30-year fixed-rate mortgage rate minus 10-year Treasury yield minus the average guaranty fee

$PrimarySpread_t$: 30-year fixed-rate mortgage rate minus 30-year current coupon MBS yield

$SecondarySpread_t$: MBS yield minus 10-year Treasury yield

$YieldCurve_t$: 10-year Treasury yield minus three-month Treasury yield

$StockVol_t$: equity market volatility (for example, S&P 500 or VIX)

$BondVol_t$: 10-year Treasury yield volatility (for example, MOVE Index)

$GuarantyFee_t$: average annual GSE guaranty fee

$CrisisDummy_t$: indicator = 1 for 2022Q2-Q4, 0 otherwise

CORPORATE BOND YIELDS

$Spread_t^{BBB}$: yield on BBB 7-10 year corporate index minus 10-year Treasury yield

$Spread_t^{Baa,7y}$: yield on Baa seven-year corporate index minus seven-year Treasury yield

$Spread_t^{Baa,20y}$: yield on Baa 20-year corporate index minus 20-year Treasury yield

$Spread_t^{A,7y}$: yield on A seven-year corporate index minus seven-year Treasury yield

$Spread_t^{HY}$: ICE BofA High Yield Option-Adjusted Spread (relative to matched Treasuries)

$TreasuryYield_t^m$: Treasury yield of maturity $m \in 7y, 10y, 20y$

$EquityIndex_t$: broad equity market index (for example, S&P 500)

$EquityVol_t$: equity market volatility (for example, CBOE VIX or equivalent)

COEFFICIENTS AND OPERATORS

Δ: first difference operator ($\Delta x_t = x_t - x_{t-1}$)

$\alpha, \beta_i, \gamma_i, \delta_i$: estimated coefficients

ε_t : disturbance term

$E_t^{ny}(\cdot)$: expectation operator for a variable *n* years into the future

Table 1: Explaining the Federal Funds Rate
Dependent variable: Federal funds rate

	Coefficient
Constant term	-1.10
	(-1.66)
Fed funds rate (t-1)	0.89
	(28.02)
Potential growth	0.18
	(1.17)
Expected inflation	0.49
	(1.77)
Unemployment gap	-0.08
	(-1.94)
Inflation gap	0.12
	(3.63)
Stock volatility	-0.27
	(-2.54)
Summary statistics	
Sample	1979Q1 to 2023Q4
R-squared	0.96
Adjusted R-squared	0.96
S.E. of regression	0.81
Durbin-Watson stat	1.78
Mean dependent var	4.57
S.D. dependent var	4.07
Sum squared resid	112.47
Log Likelihood	-213.08
Akaike	2.45
Schwarz	2.57
F Stat	731.22
F Stat Probability	0.00

Notes: Numbers in parentheses are t-statistics. We use Newey-West robust standard errors.
TIPS inflation is backfitted to expand the sample.

Sources: Federal Reserve, BEA, BLS, Standard and Poor's, Moody's Analytics

Table 2: Explaining the 10-Year Treasury Yield

Dependent variable					
10-yr equilibrium yield (1)		Change in the 10-yr yield (2)		10-yr term premium (3)	
Constant term	0.91	Constant term	-0.03	Constant term	-0.34
	(4.49)		(-1.1)		(-1.29)
Fed funds rate	0.58	10-yr yield (t-1)-10-yr equilibrium yield (t-1)	-0.24	10-yr term premium (t-1)	0.87
	(49.34)		(-2.55)		(26.54)
10-yr term premium	1.00	Change in the fed funds rate	0.37	10-yr bond volatility	0.27
	(27.15)		(3.83)		(4.44)
Publicly traded federal debt-to-GDP ratio	1.07	Federal Reserve assets-to-GDP ratio	-1.28	Unemployment gap	0.03
	(3.79)		(-1.06)		(1.6)
				Federal Reserve assets-to-GDP ratio	-1.09
					(-2.72)
				5-yr, 5-yr forward break-even inflation	0.17
					(1.52)
Summary statistics					
Sample	1979Q1 to 2023Q4		1997Q3 to 2025Q1		1979Q1 to 2023Q4
R-squared	0.98		0.17		0.95
Adjusted R-squared	0.98		0.15		0.95
S.E. of regression	0.48		0.33		0.32
Durbin-Watson stat	0.64		1.76		1.58
Mean dependent var	5.78		-0.02		1.67
S.D. dependent var	3.36		0.36		1.50
Sum squared resid	40.51		11.62		18.36
Log Likelihood	-121.18		-32.25		-49.97
Akaike	1.39		0.65		0.62
Schwarz	1.46		0.75		0.73
F Stat	2873.92		7.48		731.23
F Stat Probability	0.00		0.00		0.00

Notes: Numbers in parentheses are t-statistics. We use Newey-West robust standard errors. We use the 10-yr term premium from Adrian, Crump and Moench (2013) as the dependent variable in equation (3). TIPS inflation and the Fed balance sheet are backfitted to expand the sample. The remainder of our yield curve model empirically expands other tenors based on policy rate and 10-yr behavior. Details are available by request.

Sources: Federal Reserve, BEA, BLS, Standard and Poor's, Adrian, Crump & Moench (2013), Moody's Analytics

Table 3: Explaining Mortgage Rates

Dependent variable					
Change in the 30-yr fixed-rate mortgage (1)		Change in the 15-yr fixed-rate mortgage (2)		5/1-yr adjustable-rate mortgage - minus 5-yr Treasury yield (3)	
Constant term	0.11	Constant term	-0.10	Constant term	-0.00
	(2.36)		(-2.3)		(-0.01)
30-yr fixed mortgage rate spread (t-1)	-0.08	15-yr fixed commitment rate (t-1)	-0.10	5/1-yr ARM rate - minus 5-yr Treasury yield (t-1)	0.42
	(-2.3)		(-2.32)		-4.73
Change in the 10-yr/3-mo Treasury yield	-0.11	30-yr fixed-rate mortgage commitment rate (t-1)	-0.10	15-yr fixed commitment rate minus 10-yr Treasury yield	0.75
	(-2.9)		(-2.3)		-10.17
Change in equity volatility	0.10	Change in the 30-yr fixed-rate mortgage commitment rate	0.99	1-yr OIS SOFR - COFI spread	-0.29
	(3.73)		-74.49		(-6.65)
Change in bond volatility	0.26				
	(3.46)				
Crisis dummy	0.25				
	(7.3)				
Summary statistics					
Sample	1993Q2 to 2022Q4		1992Q1 to 2025Q1		2006Q1 to 2023Q2
R-squared	0.46		0.98		0.96
Adjusted R-squared	0.44		0.98		0.96
S.E. of regression	0.13		0.05		0.12
Durbin-Watson stat	1.71		1.74		1.12
Mean dependent var	0.01		-0.02		1.76
S.D. dependent var	0.17		0.36		0.55
Sum squared resid	1.92		0.39		0.89
Log Likelihood	76.57		199.15		53.33
Akaike	-1.19		-2.93		-1.41
Schwarz	-1.05		-2.85		-1.28
F Stat	19.27		1878.59		495.96
F Stat Probability	0.00		0.00		0.00

Notes: Numbers in parentheses are t-statistics. We use Newey-West robust standard errors.

Sources: Federal Housing Authority, Federal Reserve, BEA, BLS, Standard and Poor's, Moody's Analytics

Table 4: Explaining Corporate Bond Rates

Dependent variable					
ICE BofA 7-10 yr BBB U.S. Corporate Index minus 10-yr Treasury yield		Baa corporate rate with 7-yr avg maturity minus 7-yr Treasury yield		Baa corporate bond rate with 20-yr and above-avg maturity minus Baa corporate bond rate with 7-yr avg maturity	
(1)		(2)		(3)	
Constant term	0.22	Constant term	-0.08	Constant term	0.14
	(3.79)		(-1.53)		(2.37)
BBB bond spread (t-1)	0.69	Baa intermediate spread (t-1)	0.36	Baa seasoned spread (t-1)	0.74
	(18.23)		(2.9)		(12.02)
S&P 500 return	-3.37	BBB bond spread	0.50	20-yr minus 7-yr T-yield	0.25
	(-3.7)		(6.27)		(5.14)
S&P 500 volatility	0.42	S&P 500 volatility	0.18	S&P 500 volatility	-0.05
	(4.35)		(3.51)		(-1.27)
Sample	1989Q1 to 2025Q2		1994Q4 to 2025Q2		1994Q4 to 2025Q2
R-squared	0.92		0.95		0.89
Adjusted R-squared	0.92		0.95		0.89
S.E. of regression	0.22		0.16		0.14
Durbin-Watson stat	1.22		0.89		1.53
Mean dependent var	1.78		1.56		1.01
S.D. dependent var	0.81		0.75		0.41
Sum squared resid	7.10		3.16		2.23
Log Likelihood	13.54		50.66		72.13
Akaike	-0.13		-0.76		-1.11
Schwarz	-0.05		-0.67		-1.02
F Stat	579.30		823.96		325.74
F Stat Probability	0.00		0.00		0.00

Notes: Numbers in parentheses are t-statistics. We use Newey-West robust standard errors. The remainder of our corpoprate yield curve model empirically expands other tenors and categories based on these core models. Details are available by request.

Sources: Federal Reserve, BEA, BLS, Standard and Poor's, Moody's Analytics

ABOUT THE AUTHORS

Cristian deRitis is a managing director and deputy chief economist at Moody's Analytics, where he leads a team of economic analysts and develops econometric models for a wide variety of clients. His regular analysis and commentary on consumer credit, policy and the broader economy appear on the firm's Economic View website and in other publications. He is regularly quoted in publications such as The Wall Street Journal for his views on the economy and consumer credit markets. Currently he is spearheading efforts to develop alternative sources of data to measure economic activity more accurately than traditional sources of data.

Before joining Moody's Analytics, Cristian worked for Fannie Mae and taught at Johns Hopkins University. He received his PhD in economics from Johns Hopkins University and is named on two U.S. patents for credit modeling techniques.

Damien Moore is a director of economic research at Moody's Analytics. He covers U.S. financial markets, provides research on finance-related topics, develops market risk models for stress-testing and other applications, and works on various Moody's Analytics models and tools related to government and corporate finances. He has broad expertise in financial economics including asset pricing, valuation methodologies, portfolio analytics, macro finance, and financial econometrics.

Prior to joining Moody's Analytics, Damien spent 12 years at the Congressional Budget Office, most recently as the head of the agency's Financial Analysis Division, where he supervised projects analyzing the federal role in the financial system and the costs of federal financial programs. Under his supervision, the division produced numerous reports including analyses of polices to rescue the U.S. financial system during the 2008 financial crisis, the federal conservatorships of Fannie Mae and Freddie Mac, the federal role in housing and mortgage markets, the Pension Benefits Guarantee Corporation, and federal student loan programs. Before his time at the CBO, Damien was a lecturer in the School of Business at the University of Sydney. He taught classes in investments, fixed income securities, and corporate finance.

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He is a trusted adviser to policymakers and an influential source of economic analysis for businesses, journalists and the public. Dr. Zandi frequently testifies before Congress and conducts regular briefings on the economy for corporate boards, trade associations and policymakers at all levels.

Dr. Zandi is the author of Paying the Price: Ending the Great Recession and Beginning a New American Century, which assesses the monetary and fiscal policy response to the Great Recession. His other book, Financial Shock: A 360º Look at the Subprime Mortgage Implosion, and How to Avoid the Next Financial Crisis, is described by The New York Times as the "clearest guide" to the financial crisis. Dr. Zandi is host of the Inside Economics podcast.

Dr. Zandi earned his BS from the Wharton School at the University of Pennsylvania and his PhD at the University of Pennsylvania.

About Moody's Analytics

In an increasingly interconnected and complex operating environment, organizations face challenges decoding the intricacies of the global economy. Moody's Analytics Economics team delivers timely and in-depth data, forecasts and analysis of the global economy's latest developments and trends—empowering organizations and policymakers to identify and manage risks, seize new growth opportunities, respond to geopolitical threats, and thrive in an ever-evolving landscape.

The Economics team has more than 35 years of dedicated experience in economic forecasting and research. Leveraging our team's global coverage and local expertise, our economists provide unrivalled insight on pivotal economic topics, including labor markets, housing, commercial real estate, and consumer spending, among others, across the Americas, Europe, the Middle East, and APAC. We also provide real-time monitoring of economic indicators, scenario analysis, and thought leadership on critical themes such as monetary and fiscal policy and sovereign risk—all of which support decision makers and policymakers in strategic planning, product and sales forecasting, stress testing, credit risk management, and investment decisions.

By combining economic modeling, expansive data resources, and innovative technology solutions, we equip business leaders with critical insights to navigate the complexities of an ever-changing economic landscape. Recognized for our industry-leading solutions and commitment to quality, client service, and integrity, more than 1,000 organizations worldwide—including multinational corporations, governments, financial institutions, real estate firms, and professional investors—trust us to help them turn today's risks into tomorrow's opportunities.

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