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Recent Movements in R*: The Most Important Interest Rate That You Have Never Heard Of

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- R*, or the natural rate of interest, measures the inflation-adjusted interest rate that would prevail in the U.S. if economic growth and inflation were balanced.
- However, R* is unobservable and highly uncertain, especially in real-time.
- Most, but not all, direct and indirect estimates of R* have risen in recent years to be above 2019 levels. This suggests interest rates could converge to higher levels than pre-pandemic, even after inflation is at target.
- There are positive and negative reasons for a higher R*. On one hand, it indicates that U.S. productivity and growth expectations may have risen. On the other hand, U.S. fiscal and political risks may also be higher.

Introduction

One of the key uncertainties in the market today is the appropriate level of interest rates, both in the short- and the long-run. These uncertainties are largely questions about "R*", which is perhaps the most important unobservable economic concept at the moment. R* is also called the "natural rate of interest." It is defined as the inflation-adjusted short-term interest rate that prevails when the economy is growing at its sustainable trend rate and inflation is at target. One cannot directly observe R*, so instead, economists and financial analysts infer it from models, surveys, and existing financial spreads. Generally speaking, if R* rises over time, it is a signal that interest rates will likely be higher for any given growth rate.

The overnight nominal federal funds rate has been at 5.3% since July 2023; in contrast, on the eve of the pandemic back in February 2020, it was 1.6%. Inflation has meaningfully declined since last July—year-on-year core personal consumption expenditures (PCE) inflation has fallen to 4.2% from 2.8%—but is still above the Federal Reserve's 2% target. Stronger-than-expected monthly inflation reads in 2024 Q1 have made the timing of future progress on inflation more uncertain. Meanwhile, the unemployment rate has stayed below 4%, three-month average payroll growth is exactly the same as last July at a strong +242,000 per month, and real GDP has grown at a robust 3% pace over the last four quarters. Stubborn inflation coupled with surprisingly vigorous labor market and output growth has raised the possibility that not only will the

Federal Reserve keep interest rates higher for longer than previously expected, but even after inflation returns to target, the prevailing interest rate will be higher than pre-pandemic. Put another way, there is a real possibility that R* has risen over the past couple of years and is higher than pre-pandemic.

Most estimates of R* are long-run; they measure the short-term interest rate that would prevail in the economy in equilibrium, after many years and after any current cyclical imbalances close. Some think about "short-run R*" as well, which might deviate from long-run R* due to temporary frictions in the economy. Long-run R* is the better concept for thinking about structural changes in the economy, while short-run R* is more appropriate for measuring the current stance of monetary policy. Most of the R* measures in this brief will be long-run but we will touch on short-run estimates as well.

Data on Long-Run R*

Figure 1 shows various measures of and proxies for long-run R* divided into four different categories:

- **Market forwards.** These are forward real Treasury bond yields calculated from various Treasury Inflation Protected Securities (TIPS) maturities. One is the average 5-year rate 5 years ahead, while the other is the 1-year rate 29 years ahead. The advantage of market forwards is that they are rooted solely in the market pricing of Treasury securities with no modeling assumptions. The disadvantage is that bond prices reflect factors other than expected policy rates such as term premia, which are unobservable themselves and which likely vary over time.[1]
- **Term structure models.** These models decompose Treasury bond yields into various components including expected short-term rates (the concept needed to calculate R*) and term premia. The graph below shows the inflation-adjusted 5-year short-term rate expected 5 years ahead from three prominent models:

[1] A related observation is that forward long-run inflation breakevens calculated from TIPS, such as 5Y5Y inflation compensation, appear to be strongly correlated with fluctuations in spot oil prices, even though in principle spot prices should have minimal effects on long-run inflation.

Adrian-Crump-Moench, D'Amico-Kim-Wei, and Christensen-Rudebusch. Their advantage is that they explicitly try to control for term premia and other confounding factors that may skew market forwards. However, these models require strong assumptions to do so and may struggle to assign a change in yields to rate expectations or term premia when in the middle of a regime shift in real time.

- **R* macro models.** These models move beyond solely relying on market pricing. They embed relationships between interest rates and macroeconomic metrics, like real GDP growth, and interest rates. R* is estimated based on these models' assessments of macroeconomic trends. Three widely-followed versions of this approach are Laubach-Williams, Holston-Laubach-Williams, and Lubik-Matthes. Macroeconomic models attempt to ensure that R* estimates adhere to a well-defined economic definition. However, in calculating trends in other variables, such as GDP growth, they introduce additional uncertainty.
- **Surveys of market participants.** Surveys among market participants are not directly dependent on either market price or modeling (though individual participant responses may be informed by both). Figure 1 shows the median long-run policy rate in the Federal Open Market Committee's (FOMC) Summary of Economic Projections, the Survey of Primary Dealers, the Survey of Market Participants (also conducted by the Federal Reserve), and MacroPolicy Perspectives' Shadow Survey of Market Participants. By talking with economic observers directly, surveys incorporate factors that models may miss and not control for. However, surveys may also be skewed by herding effects, and the economists and policymakers represented in many of these surveys may have different views from the bond investors participating in the market.

Pre-pandemic most R* measures were undergoing a structural decline. For example, the widely-followed Laubach-Williams measure fell from 5.4% in 1961 Q2 to 0.6% in 2014 Q1, before recovering somewhat to 1.6% by 2019 Q4 on the eve of the pandemic. Economists generally agree that this post-1960s decline in R* was driven by a slowdown

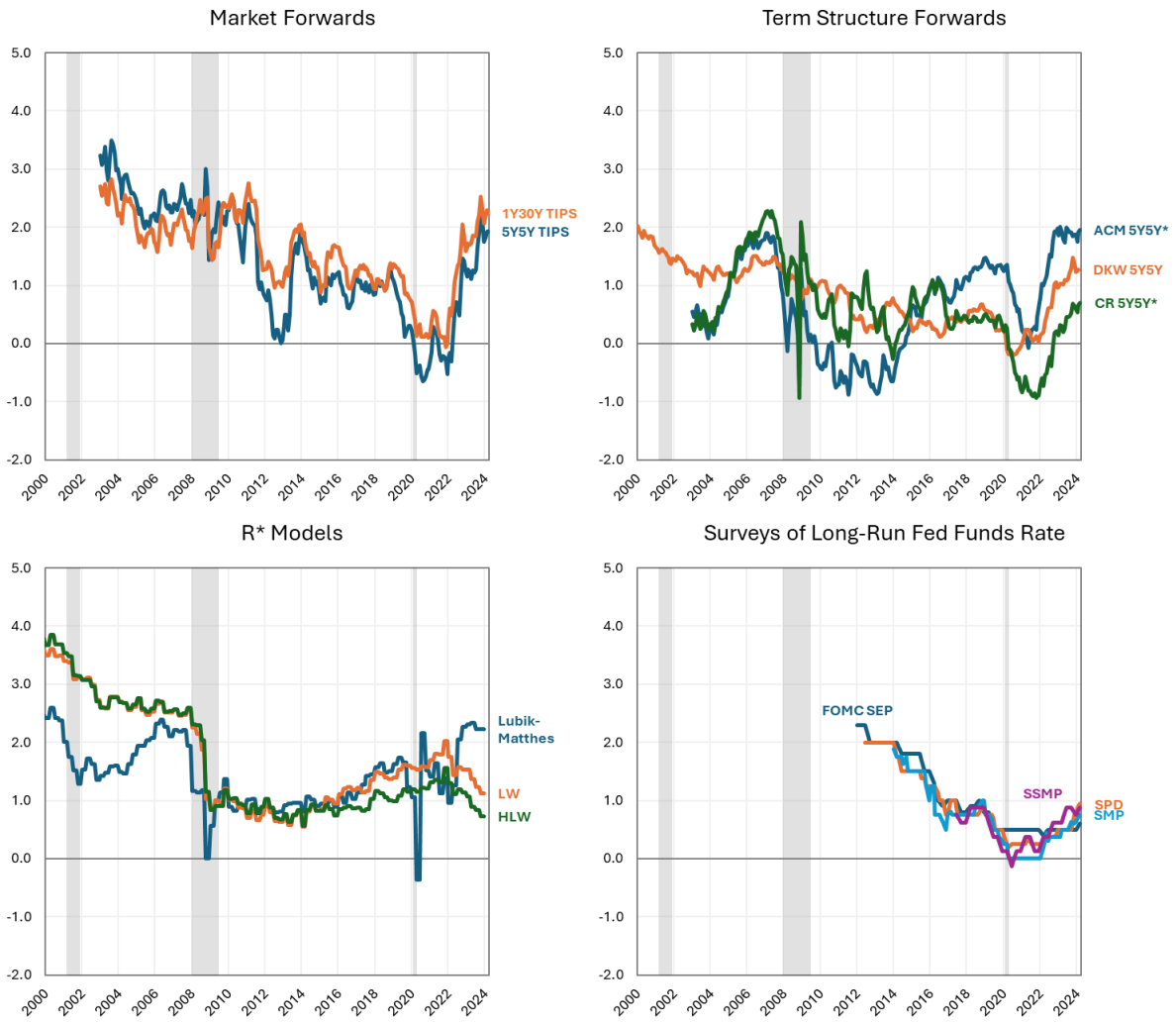
in productivity growth–temporarily reversed for several years by the dot com boom–and the aging of the population.[2]

Likewise, most measures fell further during the pandemic but then began recovering around 2022. Nine of the twelve measures we tracked are now above their 2019 levels (see Table 1). The simple average of our measures rose from 85 basis points in 2019 to 118 basis points in December 2023, a rise of 34 basis points. Interestingly, the movement in market forwards has been well above this average–the 5Y5Y TIPS increased 120 basis points–while survey measures saw weaker growth than the average. R* macro models meanwhile are split: Lubik-Matthes R* was 66 basis points higher in 2023 Q4 than it was in 2019, while both Laubach-Williams and Holston-Laubach-Williams are actually *lower* than 2019.

Taken together, the data are not unanimous but lean towards the conclusion that the long-run natural rate of interest at the moment is most likely higher than its pre-pandemic level. They also raise the real possibility that it is higher in level terms than the 60 basis points the median Federal Open Market Committee (FOMC) participant currently projects.

[2] See Council of Economic Advisers (2015).

Measures of R* and Long-Run Real Interest Rates



ACM = Adrian-Crump-Moench. DKW = D'Amico-Kim-Wei. CR = Christensen-Rudebusch. LW = Laubach-Williams. HLW = Holston-Laubach-Williams. FOMC SEP = Federal Open Market Committee Summary of Economic Projections. SPD = Survey of Primary Dealers. SMP = Survey of Market Participants. SSMP = Shadow Survey of Market Participants.

* Adjusted for inflation using the 5Y5Y TIPS breakeven.
Source: Haver, FRB, FRBNY, Treasury, MacroPolicy Perspectives, author's analysis.

Change in Measures of R*/Long-Run Real Interest Rates Since 2019

Percentage points

	2019 Average	Dec 2023	Difference
5Y5Y TIPS	0.55	1.75	1.20
1Y30Y TIPS	1.08	2.07	0.99
ACM 5Y5Y*	1.33	1.87	0.54
DKW 5Y5Y	0.39	1.23	0.84
CR 5Y5Y*	0.40	0.59	0.19
Lubik-Matthes	1.56	2.23	0.66
LW	1.53	1.12	-0.41
HLW	1.11	0.73	-0.37
FOMC SEP**	0.60	0.50	-0.10
SPD**	0.62	0.75	0.13
SMP**	0.56	0.63	0.07
SSMP**	0.44	0.75	0.31
Simple Average	**0.85**	**1.18**	**0.34**
Median	**0.61**	**0.93**	**0.32**

* Adjusted for inflation using the 5Y5Y TIPS breakeven.

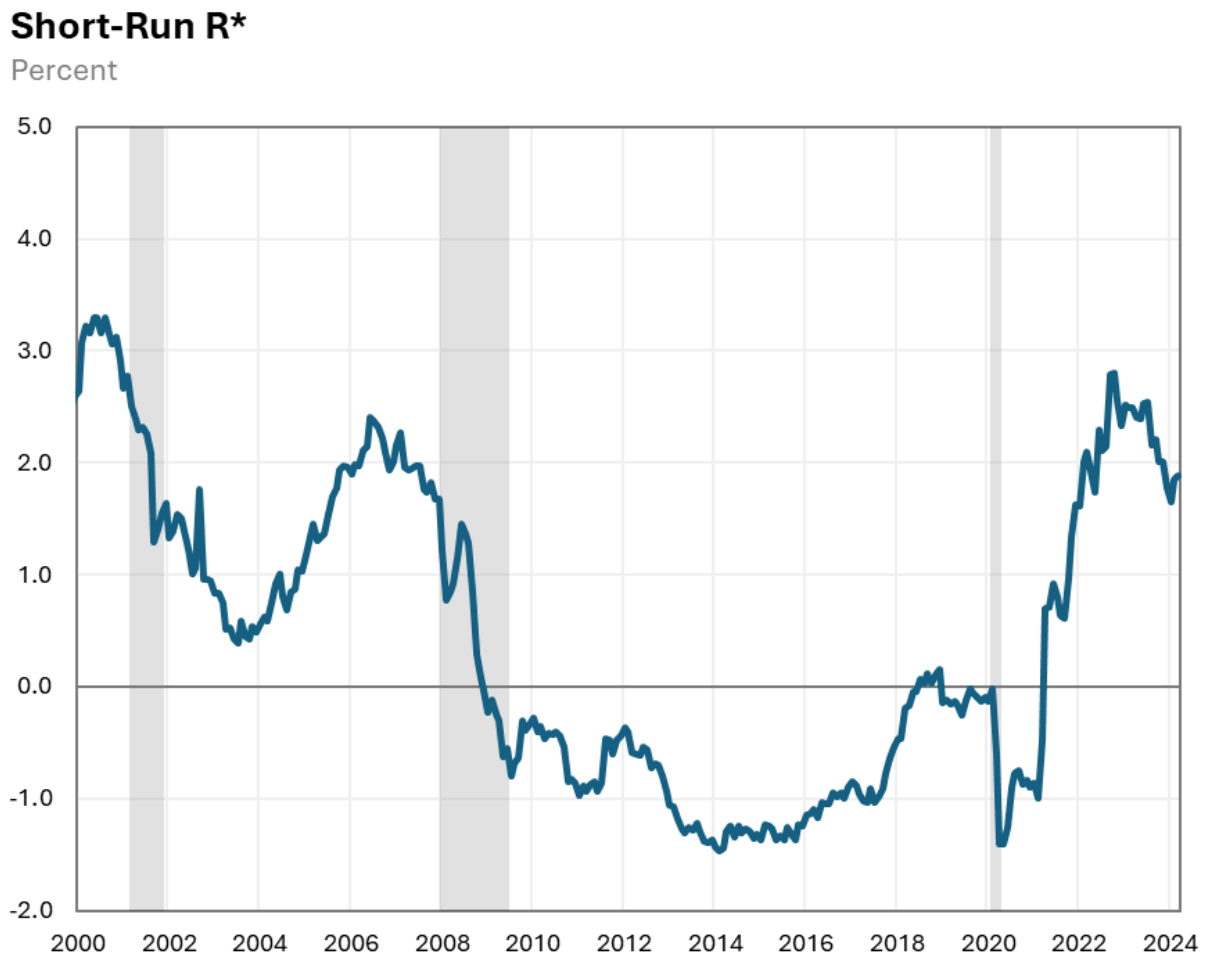
** Assumes 2% long-run inflation.

Source: Haver, author's analysis.

Short-run R*

Short-run R* is less widely discussed and studied in economics than long-run R*. Short-run R* may pick up factors more quickly in real-time than long-run R* that will persistently affect interest rates, but short-run R* is also noisier and will reflect transitory factors that will not hold in the long-run. Figure 2 below presents an estimate

of short-run R* from a state-space model described in the appendix. Think of this short-run R* estimate as a real-time measure of the inflation-adjusted interest rate consistent with stable (neither increasing nor decreasing) real GDP growth and inflation. This metric has grown substantially since 2019–by 190 percentage points–but has fallen somewhat from its peak in late 2022. Nevertheless, short-run R* is well above the negative rates seen for most of the Great Recession recovery and has risen to levels closer to the pre-2007 and pre-2001 averages.



Source: FRBSF, FRBPHL, S&P Global, BEA, Haver, author's calculations.

Why might R* be rising now?

It is important to bear in mind that even the largest estimates for rises in R* since 2019 only counteract a small portion of the declines seen over the last several decades. Nevertheless, the recent rise in most R* estimates is notable for bucking this prior structural downward trend.[3] This raises the question of what economic factors have changed since 2019 that might be driving this rise. R* can rise for both positive and negative reasons. Here are several possibilities:

1. **Stronger expected productivity.** The canonical Ramsey (1928) model implies that interest rates are a function of expected growth in real consumption per capita and the intertemporal rate of substitution (the rate at which a household is willing to sacrifice current consumption for future consumption). One reason that investors might bid up market yields on Treasury securities, and thus boost R*, is if expected productivity growth rose, which in turn implies stronger consumption growth.

   This raises the question of *why* expected productivity growth might have risen. A possibility is recency bias: actual nonfarm business productivity growth was a robust 2.9% over the four-quarters ending 2024 Q1, so some R* measures may be extrapolating from this experience. It is far from clear how the performance over the last four quarters reflects any factors persistently raising trend productivity. Productivity growth was -1.9% over 2022 so the recent strength may merely represent mean reversion. Another possibility is that market participants are embedding expectations of productivity effects from emerging technologies, such as artificial intelligence (AI). The effect of AI on measured productivity is potentially important but still highly speculative.
2. **A more favorable demographic and labor supply outlook.** The aging of the population seen in the United States in recent decades has tended to lower interest rates and R* by lowering the intertemporal rate of substitution, as the U.S. population has aged to levels where savings is more prevalent. This aging

[3] See Council of Economic Advisers (2015).

has been widely understood and anticipated for many years. However, since 2022, evidence has emerged that the labor supply might be larger than commonly measured. The primary driver of this expansion is higher-than-expected immigration.[4] For example, the Congressional Budget Office (CBO) estimates that higher immigration rates will add a cumulative $7 trillion to their GDP projections over the next decade. Immigrants also tend to lower the average age of the U.S. Recent rises in R* may in part reflect a shift in assumptions towards a slightly younger U.S. than previously thought with stronger labor supply growth. However, even under optimistic assumptions, the effect of higher immigration on the aging is likely to only be modest. After CBO updated its demographic projections in 2024 to incorporate higher immigration assumptions, the average age of the U.S. population fell just a tenth of a year for both the 2024 and 2034 projections, offsetting only a small fraction of the aging that has taken place since the 1980s.

3. **Higher fiscal and political risks.** The debt trajectory of the U.S. has increased since the pandemic. In January 2020, CBO projected that U.S. publicly-held federal debt would total 87% of GDP in 2024. The latest CBO outlook now projects 2024 debt to reach 99% of GDP. Most of this rise in debt reflects temporary COVID-19 relief passed in 2020 and 2021. Higher debt is a claim on the future real resources of the U.S. economy and incrementally raises long-run interest rates, and therefore R*, by roughly 2-3 basis points per percentage point of GDP increase in debt.[5] Therefore the increase in debt incurred since pre-pandemic might be expected to raise real interest rates by 24-36 basis points, enough to explain much or all of the Table 1 average measures but not enough to explain some of the measures with larger movements, such as the 5Y5Y TIPS. The timing of the rise in R* estimates is also not consistent with an *immediate* pricing in of higher debt levels. Metrics like the 5Y5Y TIPS began recovering in 2022, well after the last piece of emergency COVID-19 relief had been enacted. Investors were aware of the higher U.S. debt trajectory months before R*

[4] See, for example, CBO (2024) and Edelberg & Watson (2024).
[5] See Gamber & Seliski (2019).

measures began increasing. A possibility is that the anticipation of the Fed hiking cycle in early 2022 induced markets to reprice fiscal risk quickly, but this hypothesis is difficult to test.

The rise in R* may also partially reflect higher political risk in the U.S. over the last decade, independent of fiscal risk. One recent estimate found that in equity risk premium terms, political risk in the U.S. has risen by 20-25 basis points over the last eight years. [6]

Conclusion

R* is one of the most important concepts in markets today, but it is both unobservable and highly uncertain. Most direct or indirect estimates of R* appear to have risen since 2022 and are above 2019 levels, though a few prominent ones like Laubach-Williams are lower. The data lean toward the conclusion that the pandemic and its aftermath have, for the moment, arrested the structural decline in R* the U.S. was undergoing in the decades prior to 2020. Some of this may be due to positive developments, such as stronger productivity and growth expectations, but the rise may also be driven by higher fiscal and political risks.

[6] See e.g. Tedeschi (2024).

Appendix: Short-Run R*

The short-run R* model shown is a simple stable-growth/inflation specification in the vein of Bok & Petrosky-Nadeau (2022)'s stable-price unemployment rate model. In other words, the model estimates a short-run R* consistent with both the *change* in real GDP growth and the *change* in core PCE inflation converging to 0. In a state-space framework:

$$\Delta y_t = A \times L_{t-4}^{t-1} \Delta y_j + b_y \times (rgap_{t-1}) + \epsilon_t^y$$
$$\Delta \pi_t = B \times L_{t-4}^{t-1} \Delta \pi_j + b_\pi \times (rgap_{t-1}) + b_x \times \Delta x_t + \epsilon_t^\pi$$
$$r_t = r^*_t + rgap_t$$
$$r^*_t = c \times r^*_{t-1} + d \times r^*_{t-1} + \epsilon_t^{r^*} \ni c + d = 1$$
$$rgap_t = f \times rgap_{t-1} + \epsilon_t^{rgap}$$

Where

Δ is the month-to-month difference

L is the lag operator

y is the year-on-year percent growth in monthly US real GDP from S&P Global

π is year-on-year core PCE inflation

x is the year-on-year percent growth in the trade-weighted value of the US dollar

r is a measure of the real policy rate calculated from

1. the FRBSF proxy funds rate, a mapping of the stance of nominal monetary policy into fed funds rate space that is unconstrained by the zero lower bound; and,
2. Survey measures of year-ahead CPI inflation from the Survey of Professional Forecasters (through December 1997) and from the FRB Philadelphia ATSIX composite of inflation expectations thereafter. We put these expectations into PCE terms by adding the Kalman-filtered trend spread between monthly annualized PCE and CPI inflation.