

Guide to understand (and trade) US Treasuries

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Summary

This guide recalls what determines the interest rates observed on bonds issued by a government deemed solvent.

Investors' expectations regarding the central bank's monetary policy and the evolution of risk premia obviously play a key role. Using an original statistical approach, Risk Premium Invest extracts in real time from available information (recent surveys and observed interest rates) an estimate of what investors expect in the United States. Key indicators for understanding the US interest rates curve are published daily on our website (www.riskpremium.com), along with an analysis note.

This guide also explains how these indicators can help investors manage their positions in this volatile market with sometimes surprising developments.

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Interest rates on bonds issued by the US Treasury often have movements that are difficult to understand. On the one hand, the levels observed sometimes seem disconnected from economic realities. Over the last few years, long-term interest rates seemed abnormally low most of the time, which was generally explained by the massive purchases of bonds by the American central bank ("Quantitative Easing"). Furthermore, day-to-day developments are not always easy to interpret given the information published. Very often, observers need to refer to so-called "technical" factors (profit taking or capitulation of certain investors, in the absence of significant news).

In this note, we explain how the indicators provided daily by Risk Premium Invest provide a better understanding of the surprising developments observed in this important market.

A/A guide to understand...

Economic theory is very clear on what determines the interest rates on bonds issued by a State deemed solvent.

First, expectations regarding the country's monetary policy in the short, medium and long term play a fundamental role. An investor has the choice between buying a long-term bond or remaining invested in money market products. There is therefore a close relationship between the return offered by the long-term bond (R_t^i for the rate at date t on a bond of maturity i) and the expected return on a monetary investment renewed over time (ff_t^i , the expected average Fed funds rate between date t and date t+i). The two variables are separated by the "buy-and-hold" risk premium (PR_t^i), i.e. the yield spread required on the long bond held to maturity relatively to a monetary investment¹ :

$$R_t^i = ff_t^i + PR_t^i$$

So, the first essential step in "understanding" interest rates on bonds issued by the US Treasury is to analyze investors' expectations regarding US monetary policy in the future.

In this area, we have developed a very original statistical approach² to estimate ff_t^i for the different maturities i. The most important results are available daily on our website.

In the RiskPremia-UST-V excel file, we publish our estimate for:

- The Fed funds rate expected by investors at 3 horizons: one year, 3 years and at the long-term equilibrium (which is often referred to as the neutral rate).
- The average of these rates over a 10-year horizon (ff_t^{10}), and therefore the « buy-and-hold » risk premium over this horizon ($PR_t^{10} = R_t^{10} - ff_t^{10}$). "Buy-and-hold" risk premia on 2-year and 5-year bonds are also available in our daily commentary.

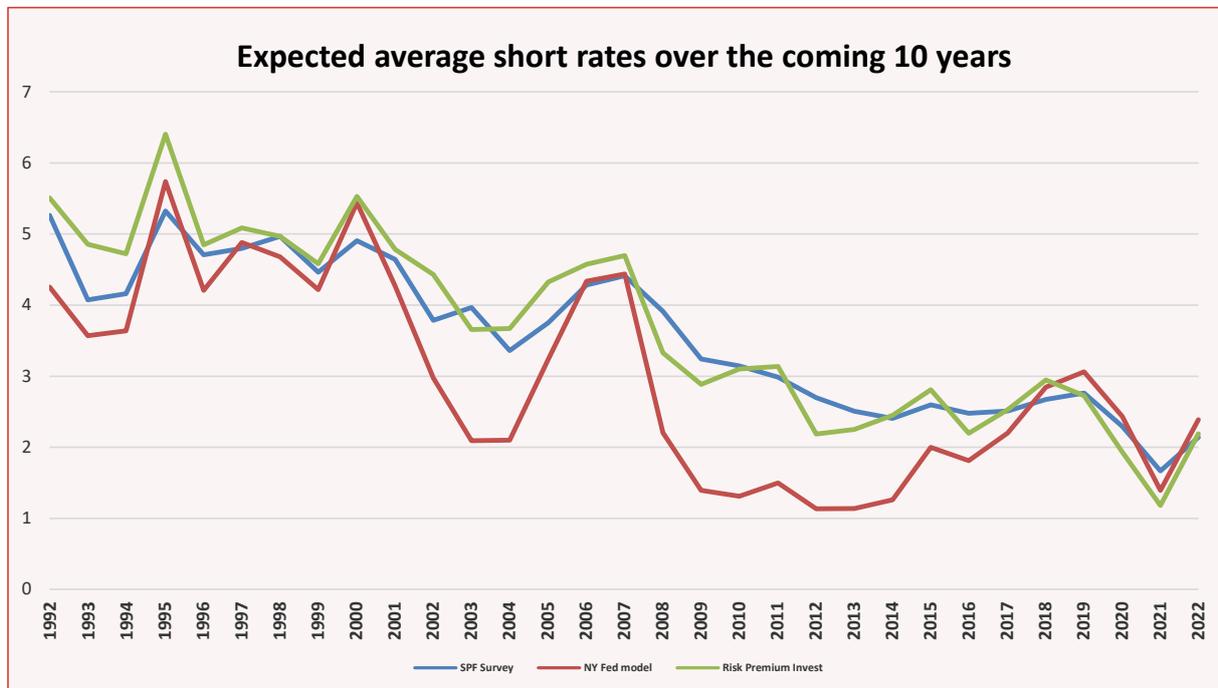
This daily publication clearly fills a gap. There are many academic studies using different statistical techniques to perform this decomposition. But works published in academic journals generally remains very theoretical and does not give rise to the regular publication of indicators that can be used by investors. In fact, to our knowledge, surprisingly, we only have one "competitor" in this area to inform investors in real time: the New York Fed, which publishes its estimate of expected short rates daily (ff_t^i for maturities i from one to ten years) and buy-and-hold risk premia (PR_t^i)³.

¹ In this relation, R_t^i is a zero-coupon rate.

² See <https://www.riskpremium.com/wp-content/uploads/2022/06/USTreasuries-Model-Guide.pdf> for a non-academic presentation.

³ See www.newyorkfed.org/research/data_indicators/term-premia-tabs#/overview).

But unfortunately, the New York Fed's estimates are quite often unrealistic, which may explain their low use by investors. To illustrate this observation, we can compare the average short rates expected by investors over the next 10 years according to this model with what professional forecasters expect (responses, once a year in February, to the high-quality survey conducted by the Federal Reserve Bank of Philadelphia⁴).



There are many reasons why average investor expectations may differ somewhat from the answer given by professional forecasters, but the difference shown in this chart is often far too large to be realistic.

The truth is that the estimates published on the NY Fed website are structurally imprecise. They are only based on observed interest rates and there is a large academic literature pointing out that the yield curve alone does not contain enough information to extract the underlying opinions of investors.

By using both surveys and observed rates, it is possible to reliably estimate short-term rates expected in the future. This therefore makes it possible to extract the “buy-and-hold” risk premia required by investors on bonds of different maturities.

This is a first step. But this very important information is still insufficient if we want to fully understand the behavior of investors, interpret the interest rate curve for a given country and analyze how rates could evolve in the future.

Indeed, in the real world as in the modern theory of optimal portfolio choices, investors are not (and should not be) “buy-and-hold” investors who freeze the structure of their portfolios. In a changing environment, they generally introduce (rightly) an important tactical component in their investment choices. Let us assume here for simplicity and in a conventional way that investors have a tactical horizon of 3 months. It is clear that the optimal weight of 10-year bonds in the portfolio will then not only depend on the buy-and-hold risk premium PR_t^{10} , but also on the 3-month return outlook. If they

⁴ See www.philadelphiafed.org/surveys-and-data/real-time-data-research/survey-of-professional-forecasters).

have a less favorable short-term return outlook than the long-term, they will hold fewer bonds than the buy-and-hold risk premium suggests (and they will explicitly or more often implicitly plan a gradual ramping up of their investments as the outlook for returns improves).

To understand the behavior of investors and their purchases of US Treasury bonds, it is therefore not enough to estimate the "buy-and-hold" risk premia. It is necessary to assess more finely the return profile that investors expect. In other words, limiting ourselves here to 10-year bonds, it is necessary to estimate what is the expected excess return in the next 3 months relative to monetary investments ("tactical" risk premium PRT_t^{10}), what is the expected excess return between 3 months and 6 months⁵ (and so on). Obviously, most investors do not build such an explicit and complete scenario about these future returns. But they have a general intuition about this future pattern of returns and this general intuition rightly plays a key role in their investment decisions. We can use the analogy of billiards in this respect: the good billiard player does not solve in real time the complex mathematical equation which governs the movement of the ball, but the billions of neurons in his brain are able to provide a simulation of great quality. The same goes for investors: most of them have not mathematically formalized a dynamic optimization process, but the expected profile of future returns, even imprecise, plays a key role in their investment decisions.

So, to understand the behavior of investors and the interest rates that result from their investment choices, it is essential to go beyond the "buy-and-hold" premia and to estimate more finely the time profile of the excess returns expected by investors.

To our knowledge, Risk Premium Invest is the only player to carry out this extraction of expected returns from available information (investor surveys and interest rates curve). In addition to the "buy-and-hold" risk premia, we thus provide four indicators on a daily basis allowing us to better understand the expectations of investors: the current tactical risk premium on 10-year bonds (i.e., over the next 3 months, the expected outperformance relative to a monetary investment), the tactical risk premia expected on this same bond at the one-year and three-year horizons, finally the tactical risk premium considered normal in the long term. There is of course in principle a close link between these "tactical" risk premia expected at different horizons and the "buy-and-hold" risk premia⁶.

By way of example, the following table shows the result of our estimates for June 7, 2022. On this date, the "buy-and-hold" risk premium is positive and equal to 0.22%. But investors are far from expecting a steady outperformance of long-term US Treasury bonds. They think that in a context of inflationary tensions, long rates will rise in the short term, and they think that they will lose money (relative to a monetary investment) in the next 3 months (annualized tactical risk premium of -1.95%). They also think that investing in 10-year bonds will still not be very attractive in a year's time (still negative outperformance over 3 months at this horizon). On the other hand, they think that in the long term it is normal for bonds to yield more than monetary investments (long-term expected annualized

⁵ In a formal way $E_t(PRT_{t+0,25}^{10})$.

⁶ The long-term expected excess return is ultimately the addition of all the excess returns expected in the meantime over shorter periods of time. In a formal way,

$$PR_t^i = \frac{PRT_t^i}{4i} + \sum_{q=1}^{4i-1} E_t(PRT_{t+0,25}^{i-0,25q})/4i$$

It is this fundamental equation, accompanied by the non-arbitrability constraints, which allows us to extract the profile of expected returns in the future from the "buy-and-hold" risk premia on which the existing academic literature is focused.

outperformance of 1.83%) and they think that this normal hierarchy will already be restored in 3 years (annualized outperformance of 1.11% at this horizon).

Table 1: Expected outperformance of the 10-year bond relative to a monetary investment (% , annualized).

Date:	"Buy-and-hold" risk premium(1)	Tactical risk premium (2)	Expected outperformance in one year (3).	Expected outperformance in three years(4).	Expected outperformance at long-term equilibrium (5).
07/06/2022	0,22	-1,95	-0,49	1,04	1,83

(1) 10-year rates minus expected average short rates.

(2) Expected outperformance of the 10-year bond over the next 3 months (annualized).

(3) Expected outperformance of the 10-year bond over the 3-month period starting in one year (annualized).

(4) Expected outperformance of the 10-year bond over the 3-month period starting in three years (annualized).

(5) Long-term expected outperformance of the 10-year bond over a 3-month period (annualized).

B/ and better trade bonds issued by the US Treasury.

To trade US Treasuries, it is obviously essential to know what lies behind the current rates: what are investors' expectations regarding the policy of the Fed, what are their expectations regarding the future outperformance of bonds of different maturities?

Our model gives a first answer to these essential questions, based on the analysis of the interest rate curve and the results of investor surveys (monthly survey by "Consensus Economics" and quarterly "Survey of Professional Forecasters" of the Philadelphia Fed).

In principle, this understanding of the current curve gives a powerful tool to anticipate future movements. Indeed, the latter will reflect changes in the opinions of investors concerning these key values. But how can we hope to anticipate these changes in opinion?

The question arises very differently depending on whether it is a question of expectations on the Fed's monetary policy or expectations on risk premia.

For future short-term rates, this is essentially a question for economists who must analyze the economic outlook at different horizons and, based on their knowledge of the decision-making process at the Fed, deduce a probable scenario for the evolution of the Fed funds rate. If this scenario differs from that of other investors identified through our indicators, there is probably an arbitrage opportunity, and it remains to define the optimal way to put it in place to maximize the risk/return pair (choice of maturities). These positions will be profitable when the expectations of other investors evolve in the expected direction.

For risk premia, the subject is infinitely more complicated and most trading losses on US Treasuries come from violent movements in risk premia that had not been anticipated (and are generally referred to as "technical" by the observers).

A key reason for this difficulty in predicting the evolution of risk premia is that this is an area where unstable expectations play a key role. If investors believe that bonds should yield significantly more in the medium term than money market investments, they will demand higher long-term rates as soon as today. A good example is the hard-to-predict impact of "Quantitative Tightening": when investors anticipate an influx of bonds in the future, they factor in the fact that this will raise the yield demands of future investors and the level of long-term rates today. The indicators that we publish on the returns

expected by investors in the future illustrate the volatility of these medium-term expectations and the key role they play in explaining the volatility of long-term rates. Our indicators thus help to better understand a posteriori the origin of certain market movements, but forecasting remains difficult⁷.

Given the difficulty of anticipating changes in risk premia, it may be tempting to favor trading positions linked to macroeconomic expectations and analysis of the Fed's monetary policy. There are two ways to do this:

These trading positions can be taken on short bonds, not very sensitive to risk premia and highly dependent on expectations regarding Fed policy. 2-year rates are for example often considered to be closely linked to monetary policy expectations. That's right, but the pairing is far from perfect. Even on two-year bonds, there can be significant and difficult to predict movements related to the risk premia demanded by investors.

Another approach is to play longer bonds with quite different sensitivities to changes in risk premia. For example, 5-year bonds are more sensitive to monetary policy expectations than 10-year bonds, and less sensitive to variations in risk premia. In our estimates, investing 180% in 5-year bonds with a short position of 40% in 10-year bonds makes it possible to build a trading portfolio with a duration equivalent to that of a 5-year bond⁸, but with particularly interesting properties. This trading portfolio behaves very differently depending on the nature of the rate movement. When rates move due to short- and medium-term monetary policy expectations, it is very impacted (despite its 5-year duration, it behaves similarly to a 10-year bond in this case). On the other hand, when rates move due to risk premia, it is very little affected. In other words, its average duration of 5 years hides a duration close to 10 when the movements come from monetary policy expectations and close to 0 when they come from changes in risk premia!

More generally, Risk Premium Invest's modeling work can make US Treasury bond trading more robust in two ways:

- By informing investors on what is really "priced" in terms of monetary policy expectations and risk premia (see the RiskPremia-UST-V file and its daily accompanying note).
- By helping to construct "surgical" curve positions that allow precise play on certain changes in expectations (on future Fed funds or risk premia at certain specific horizons) while being largely immune to other changes.

⁷ We show in various studies available on our site that investors have systematically underestimated for 20 years the structural strength of demand for bonds issued by the US Treasury. They have difficulty in estimating in a stable manner the risk premia needed in the medium term, and regularly revise their estimates on this key issue for no apparent reason.

⁸ The short position of 40% in 10 years offsetting in terms of duration the purchase with leverage of 80% of 5 years. However, this calculation is only accurate for zero-coupon bonds.