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The Term Premium Conundrum

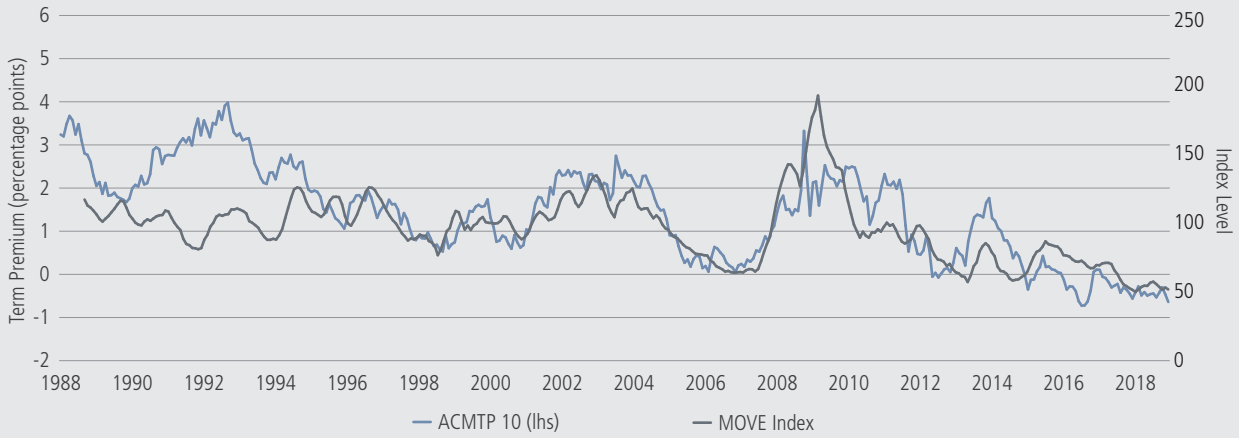
The U.S. Treasury yield curve is as flat as it has been since the financial crisis of 2008–09. When asked for the likely cause, most students of the yield curve would ascribe it to a low "term premium"—the compensation that fixed income investors receive to compensate for the uncertainty around future central bank policy, inflation shocks or growth shocks.

In this paper we look past the academic controversies between different econometric models of the term premium to observe that they all agree on one important thing: the premium has been falling steadily since 2009 and is currently at or below zero. In our view, investors are therefore not only undercompensated for long-horizon risks, but also exposed should the term premium revert to its historical mean. Given our view that such mean reversion is likely in the long term, we believe those investors who are not holding government bonds to hedge long-dated liabilities should consider tactically rotating into shorter-dated bonds.

Executive Summary

- As government bond yield curves have flattened over recent months, attention has turned once again to the concept of the "term premium": the excess return that market participants require for holding longer-dated bonds as opposed to rolling shorter-dated bonds.
- Determining the level of the term premium is challenging and controversial, and many different models have been developed by academic and finance-sector economists and econometricians over the years; however, most models show that the term premium has been falling steadily since 2009 and is currently at or below zero regardless of which market we look at.
- We argue that this is due to four reasons:
  - A lack of recent growth or inflation shocks
  - Lower macro volatility accompanying a downward shift in the level of U.S. nominal GDP trend growth
  - Technological advancements resulting in lower and less volatile inflation
  - The adoption of forward guidance, quantitative easing and zero interest rate policy by major central banks
- We set out three reasons why we believe the term premium will increase over the longer term, and we believe that means investors who are not holding government bonds to hedge long-dated liabilities should consider tactically rotating into shorter-dated bonds.

THE TERM PREMIUM IS CORRELATED WITH MACRO UNCERTAINTY



Source: Bloomberg, Federal Reserve. ACMTP10 = U.S. 10-year Treasury term premia estimates by New York Fed economists Tobias Adrian, Richard Crump and Emanuel Moench (see Adrian, Crump and Moench, 2013).

The recent flattening of the U.S. Treasury yield curve has been reminiscent of the flattening episode of 2004–2006, the last time the Federal Reserve was in a hiking cycle. During both periods the long end of the curve remained anchored while the central bank pushed up the short end.

Then-Fed Chairman Alan Greenspan famously considered this a "conundrum" in his February 2005 testimony to the U.S. Congress, and since then many researchers from central banks, financial and academic institutions, and international organizations have been studying the issue. Indeed, in the year before he took over as Fed Chair, Ben Bernanke had been researching this very subject, and with his co-authors he came up with an econometric model of the "term premium"—the somewhat nebulous concept that has been singled out time and again as the key to this conundrum.[1] Bernanke's successor, Janet Yellen, also repeatedly pointed to the low or negative term premium as the culprit when asked if an inverted yield curve could still be taken as a forecast of impending recession.

[1] Bernanke, Ben S., Reinhart, Vincent R. and Sack, Brian P. 2004, "Monetary Policy Alternatives at the Zero Bound: An Empirical Assessment", Brookings Papers on Economic Activity, 2004, No. 2.

Despite the obvious weight that central bankers put on the term premium in their decision making, some capital market practitioners still consider it an academic concept with little real-world consequence. That is not entirely surprising: even after 10–15 years of research by the world's best econometricians, no consensus has emerged on a uniform methodology to calculate the term premium, let alone a standard measure; and term-premium time series generated by the academic models often appear counterintuitive to practitioners, especially when considered over shorter time intervals.

As investors, we think there is merit in considering the level of the term premium, however. In this paper, we circumvent the discussion around the relative merits of the numerous proposed models and instead focus on the conclusions that are generally accepted by the research community, and the results that all models appear to share. Those results are clear, and we believe they suggest equally clear intuitions for most investors in fixed income markets.

What is the Term Premium?

Let's take a step back and define what the "term premium" means for the purposes of this paper.

One source of confusion has been inconsistent use of "term premium" in different contexts. We have found it used to mean at least three different things:

1. The "term spread" – Often referred to as the "slope" of the yield curve by practitioners, this is the difference between long-end and short-end yields.
2. The "term return premium" – This refers to the *ex-post* return difference between holding a longer-dated bond to maturity versus rolling a series of shorter-dated bonds at regular intervals over the same period.
3. The "term premium" – This is the *ex-ante* version of the term "return premium"—the excess return that market participants require for holding longer-dated bonds as opposed to rolling shorter-dated bonds.

For the purposes of this paper, we will only discuss the last definition since our ultimate interest lies in predicting yield curve movements. We are therefore concerned only with a measure that tells us something about investor expectations of uncertainty around those movements.

A practitioner would attempt to calculate the term premium by decomposing the current yield curve into its component types of compensation, and to link each component back to macro or technical drivers. Doing so requires the separation of current yield from the yield implied by the expected future path of short-term interest rates. However, it is challenging to find a good proxy for short rate projections far into the future; sources such as the Survey of Professional Forecasters administered every quarter by the Federal Reserve, or implied rates derived from the Fed Funds or Eurodollar futures markets, and inflation markets simply do not go out far enough. Moreover, the infrequency of survey updates render them useless to investment practitioners attempting to build a more thorough term-premium model. As a result, yield spreads at the longer end of the curve, such as the 5–10 year or 10–30 year spread, are often taken as weak proxies for the term premium.

These challenges have led to a proliferation of econometric models, the background to which we examine in a non-technical literature review on the following page.[2]

Where is the Term Premium Today?

While the different approaches and methodologies behind these models and term-premium proxies are of academic interest, as practitioners we think it is more important to focus on the results they generate and the broad conclusions we can draw from them.

Figure 1 shows the U.S. Treasury term premium estimates from five of the proposed models mentioned on page 4. We can see that while the differences among the models at any one point in time could be significant, it is overwhelmingly clear that they have all been trending lower in recent years.

[2] See also Dick, Christian, Schmeling, Maik and Schrimpf, Andreas 2013, "Macro-expectations, aggregate uncertainty, and expected term premia", European Economic Review, 2013, vol. 58, issue C, 58-80; and Hördahl, Peter and Tristani, Oreste, 2017, "Inflation Risk Premia in the Euro Area and the United States", *International Journal of Central Banking*, Vol. 10, pp. 1-47.

The Term Premium: A Literature Review

To extract the term premium from the information in the current yield curve, one must first model the current term structure of yields. The earliest such research examined the Expectation Hypothesis, which implies that the forward yields embedded in the current term structure give the unbiased estimation of the future path of short-term interest rates. This hypothesis was rejected by strong statistical evidence to the contrary (Fama and Bliss [1987], Campbell and Shiller [1991]). However, the hypothesis could still hold if a time-varying term premium is introduced to the curve. As a byproduct, a risk-neutral expected path for short rates is also obtained during this modeling process.

Researchers generally find Vector Auto Regression models (VAR) to be the most appropriate statistical model for estimating the term premium since the direction of causality between term premium and other macro variables is not immediately obvious, theoretically. For instance, real GDP growth shocks should move the term premium. At the same time, the change in term premium should affect future GDP growth as well. VAR-based models bypass this issue by putting variables on both sides of the equation.

The main drawback of a VAR model is the large number of variables in the system. This requires a lot of data points to avoid running out of degrees of freedom in the estimation process (Bauer, Rudebusch and Wu, 2012). Therefore it is now common practice to condense the yield curve information to a few key components such as level, slope and curvature (Kim and Wright, 2005; Adrian, Crump and Moench, 2013; and others), or to a few key parameters in the Nelson-Siegel-Svensson model (Nelson and Siegel, 1987; Svensson, 1994; Diebold, Li and Yue, 2008; Kopp and Williams, 2018; and others).

The majority of researchers impose the no-arbitrage constraints to the term structure model. That limits the way the yield curve can evolve over time to prevent riskless profit-taking by simply taking long and short positions in certain Treasury bond combinations. However, some recent research has found that this constraint does not materially impact the estimation results, and can therefore be removed (Abbritti, Dell'Erba and Moreno, 2013; Pericoli and Toboga, 2012).

While most VAR-based models do not predefine the relationship among the macro variables and the yields, Rudebusch and Wu (2004) imposed a New Keynesian macroeconomic framework. Follow-up research includes Rudebusch, Swanson and Wu (2006), Rudebusch, Sack and Swanson (2007), among others.

Virtually all the models assume a linear (affine) relationship between the yield and the state variables, which are either latent or a combination of observable macro factors. Ang and Piazzesi (2003) first proposed this model, and it was adopted by many later researchers, including Bernanke, Reinhart and Sack (2004), Kim and Wright (2005), Cochran and Piazzesi (2008) and others.

While most studies focused on the term premium dynamics in the U.S., researchers from international organizations such as the Bank of International Settlements and the International Monetary Fund have also examined the cross-correlations of term premia from various developed market rate curves (Kopp and Williams, 2018; Abbritti, Dell'Erba and Moreno, 2013). Sell-side researchers have also implemented models for macro forecasting purposes (for example, Garzarelli and Demyanets, 2017).

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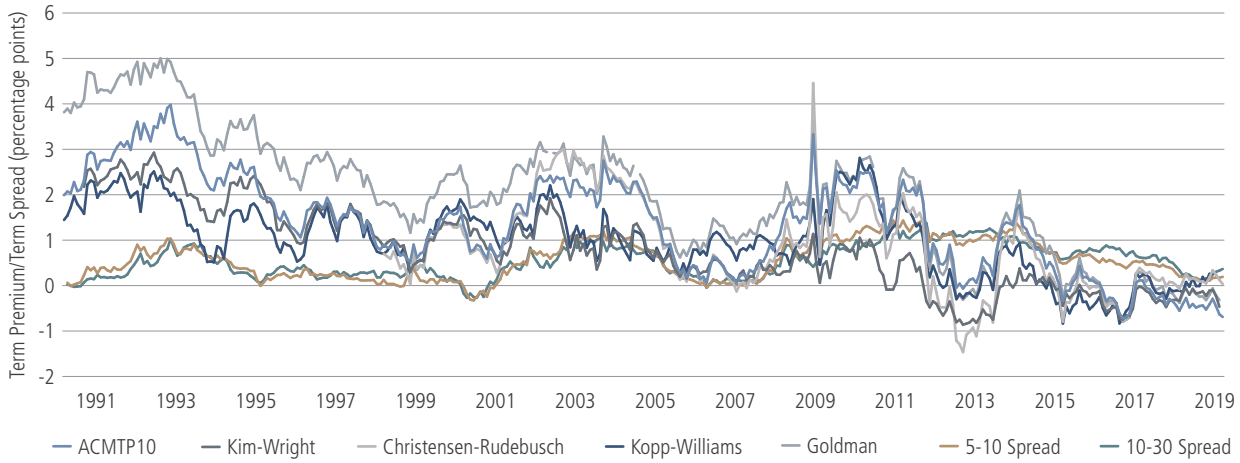
FIGURE 1. NUMEROUS TERM PREMIUM MODELS SHOW A STEADY DOWNWARD TREND



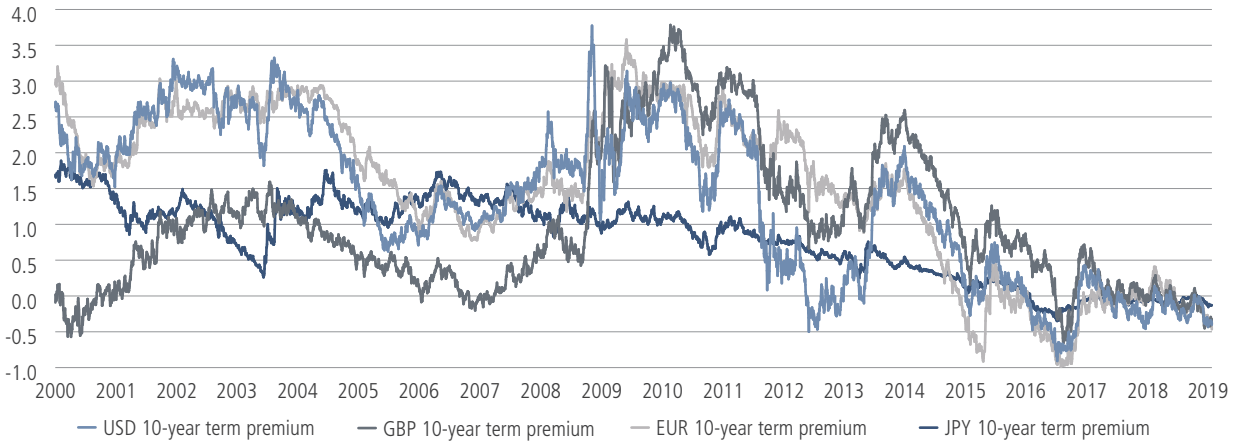
Source: Bloomberg, Federal Reserve, Goldman Sachs, IMF. The chart shows two term spreads and the outputs from five different models of the term premium. ACMTP10 = U.S. 10-year Treasury term premia estimates by New York Fed economists Tobias Adrian, Richard Crump and Emanuel Moench (see Adrian, Crump and Moench, 2013). Kim-Wright = a simple three-factor, arbitrage-free term structure model estimated by Federal Reserve Board staff Don H. Kim and Jonathan H. Wright (see see Kim and Wright, 2005). Christensen-Rudebusch = the U.S. Treasury yield premium model by Jens H.E. Christensen and Glenn D. Rudebusch from Federal Reserve Bank of San Franciso (see Christensen, Diebold and Rudebusch, 2010). Kopp-Williams = the macroeconomic approach by Emanuel Kopp and Peter D. Williams from the International Monetary Fund (see Kopp and Williams, 2018). Goldman = the model developed by Francesco Garzarelli and Alexander Demyanets of Goldman Sachs (see Garzarelli and Demyanets, 2017).

Studies have shown that the term premia estimated for most developed market countries are highly correlated.[3] It is therefore not surprising to find that the estimated term premia for markets other than the U.S. are also at or near their record lows. While Japan's term premium has behaved differently because it was the country where the term "quantitative easing" was coined and the first to enact a Zero Interested Rate Policy (ZIRP), it, too, has arrived in the same place.

Figure 2 shows how, before the 2008 crisis, term premia in USD, EUR and GBP Treasuries were merely strongly correlated; since the crisis, they have moved in lockstep, mostly due to the coordinated response to the crisis by the major central banks. The Fed, ECB and BOE all cut the policy rates to near zero around 2009, followed by various quantitative easing programs. The resulting shortage of default-free assets forced the private sector players to rebalance their global allocations, thereby leading to synchronized term premium movements. We expect this trend to continue and to put further downward pressure on the U.S. term premium since we fail to find near-term catalysts for an economic turnaround in Europe.

[3] See Abbritti, Mirko, Dell'Erba, Salvatore, Moreno, Antonio and Sola, Sergio, 2013 "Global Factors in the Term Structure of Interest Rates", IMF Working Papers, November, 2013.

FIGURE 2. A CORRELATED TREND TOWARD ZERO IN GLOBAL TERM PREMIA



Source: Goldman Sachs. The model used in this chart is that developed by Francesco Garzarelli and Alexander Demyanets of Goldman Sachs (see Garzarelli and Demyanets, 2017), applied to four currencies.

What Drives the Term Premium?

At its core, while econometric models of it vary in their approach, the term premium is compensation for taking incrementally more duration or interest rate risk. If we assume that an econometric model estimates the expected future path of short rates properly, it primarily compensates for the potential deviations of future short rates from this expected path. Such deviations can originate from four sources: 1) an unexpected central bank policy shift; 2) an unexpected inflation shock; 3) an unexpected growth shock; and 4) changing supply-and-demand dynamics in government bond markets.

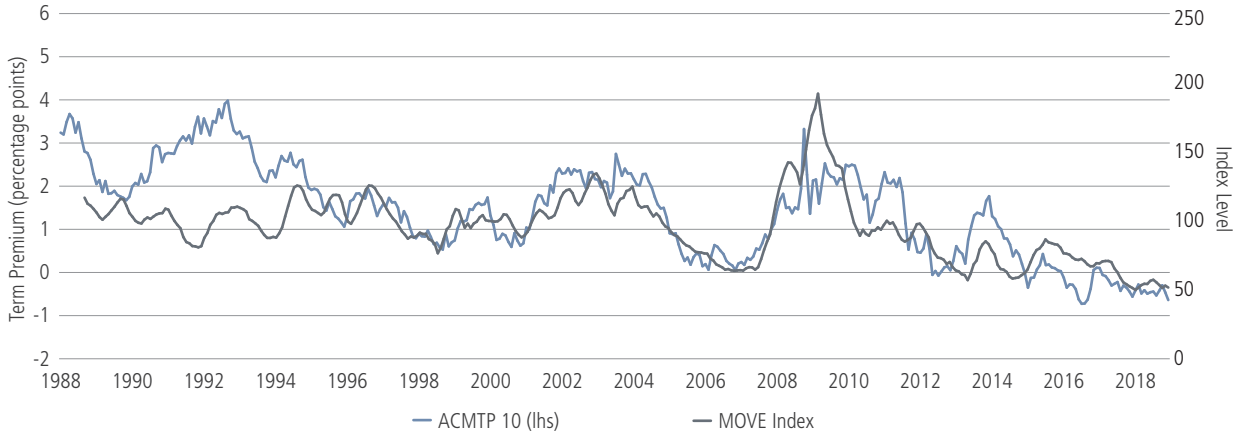
It is important to recognize why we are explicit about the term premium being driven by uncertainty about unexpected shocks. A declining working age population is likely to affect the expected path of short rates, but not the term premium because demographic trends such as that are predictable well in advance and exhibit very little volatility. By contrast, a surprise in the unemployment rate would be likely to affect the term premium. Similarly, there have been studies of the impact of quantitative easing on the term premium. One such study quantified two effects: the removal of duration from the overall market and a local supply shock on certain key term points in the curve.[4] But the impact came, not in 2017 when the Federal Reserve actually began its quantitative tightening program, but during the "taper tantrum" of 2013, when the Fed caught market participants by surprise with its early intimations of an exit from its QE program. It is the surprise, not the predictable progression of macro factors that affects the term premium.

Sure enough, our empirical research has found a strong correlation between the level of uncertainty regarding these factors and the level of term premium indicated by the various models that have been proposed. In figure 3 we show how the ouput of one of those models, the estimates of the U.S. 10-year Treasury term premia estimates made by New York Fed economists Tobias Adrian, Richard Crump and Emanuel Moench, has closely tracked the Bank of America Merrill Lynch MOVE Index, a measure of bond market implied volatility that we use as a proxy for macro uncertainty.

As we have seen, since the 2008–09 global financial crisis, a decline in the estimated term premium has led it to near-zero or even negative levels. We argue that this is due to the following four reasons: 1) There have been no growth or inflation shocks in the past 10 years, and instead of safeguarding the economy from out-of-control inflation, most developed market central banks are presently struggling with disinflation; 2) The shift in the level of U.S. nominal GDP trend growth to 4% from around 6% has led to lower macro volatility relative to the pre-crisis period; 3) Technological advancements such as e-commerce, big data and artificial intelligence have led to lower and less volatile inflation; and 4) The Fed and other developed market central banks have adopted more explicit forward guidance in their communications, alongside quantitative easing and ZIRP.

[4] Cahill, Michael E., D'Amico, Stefania, Li, Canlin and Sears, John S., 2013, "Duration risk versus local supply channel in Treasury yields: evidence from the Federal Reserve's asset purchase announcements" Finance and Economics Discussion Series from Board of Governors of the Federal Reserve System (US), No 2013 - 35.

FIGURE 3. THE TERM PREMIUM IS CORRELATED WITH MACRO UNCERTAINTY



Source: Bloomberg, Federal Reserve. ACMTP10 = U.S. 10-year Treasury term premia estimates by New York Fed economists Tobias Adrian, Richard Crump and Emanuel Moench (see Adrian, Crump and Moench, 2013).

Projections

We are projecting the term premium to stay at its current low levels in the near term before increasing over the longer term. We consider the following factors to be supportive of a rising term premium:

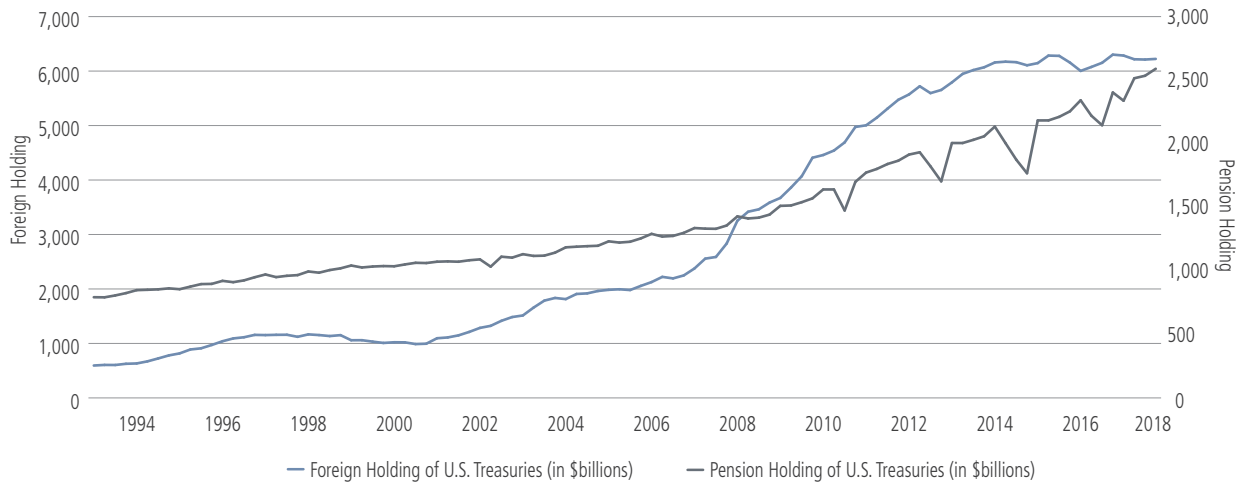
First, market participants have become less confident about the U.S. growth picture, with increasing chatter regarding the end of the current business cycle. There is also growing disagreement about what the Fed will do in 2019 and 2020, expressed by a widening gap between market expectations for the path of the Fed Funds rate and the median output from the Fed's "dot plot."

Second, the current negative term premium reflects the lack of growth or inflation shocks in market participants' long-term projections, as they have grown accustomed to the low-and-declining volatility in real growth and inflation since the financial crisis. However, the Fed is conducting a review of its approach to inflation targeting while the U.S. government is simultaneously trying to boost productivity through tax-policy changes, reduction of business regulation and infrastructure spending. New technologies that could radically change the inflation dynamic, such as 5G and virtual reality, are on the verge of large-scale implementation. For these reasons, we think it would be unwise to assume that the next decade will look the same as the last one in terms of productivity or inflation shocks.

Third, there are technical reasons for a higher term premium. While foreign demand for U.S. Treasury securities, especially from non-economic entities such as foreign central banks, have been a strong force depressing Treasury yields for years, the value of foreign holdings plateaued recently. Against the background of ongoing trade conflicts and a decelerating global economy, foreign institutions may no longer be willing or able to act as the marginal buyer of U.S. Treasuries in the future.

Finally, although the market has generally priced in an increasing Treasury supply in the near term, an expansionary fiscal policy at this stage of the business cycle could trigger unexpected Treasury issuance that the market is not ready to digest properly.

FIGURE 4. WHILE FOREIGN HOLDINGS OF U.S. TREASURIES PLATEAU, PENSION HOLDINGS CONTINUE TO GROW



Source: Federal Reserve.

What are the key risks to that expectation for a rising term premium? We see three.

Firstly, while demand from foreign buyers may be in decline, recent years have seen rising demand for longer-duration U.S. Treasuries from liability-driven investors such as pension plans and life insurance companies, and this can significantly shape the long end of the Treasury market. Secondly, term premia in other major economies are all near historical lows, and this could act as an anchor on the U.S. term premium. And finally, the slowing down of the Chinese economy could lead to unexpected disinflationary pressures in developed market economies.

Conclusion

With the U.S. Treasury term spread at its post-2008 low, most econometric models also measure the term premium as near or below zero. In our view, investors are therefore not only undercompensated for long-horizon risks, but also exposed should the term premium revert to its historical mean.

Given our view that such mean reversion is likely, we believe those investors who are not holding government bonds to hedge long-dated liabilities should consider tactically rotating into shorter-dated bonds, where carry remains attractive and the risk of a significant selloff is decreasing as the Fed ends, or nears the end of, its current round of rate hikes.

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