MONETARY AND CAPITAL MARKETS

Global Financial Stability Notes

What Is Driving the Rise in Advanced Economy Bond Yields?

No. 2021/03

Prepared by: Rohit Goel and Sheheryar Malik

[June 2021]

The nominal bond yields for advanced economies rose sharply during the first quarter of the year. This note analyzes the drivers of this increase across the jurisdictions and tenors of the yield curve. A key investor focus, in particular, has been the rise in the nominal bond yields in the United States, which has had notable global financial stability spillovers. The analysis indicates that the rise in inflation expectations is the primary driver of the rise in US nominal bond yields over the near term, whereas, the rise in real yields has been the major contributor to the rise in longer-term yields. The change in term premiums has also played a key role in driving both the longer-term inflation breakeven and real yields. Considering other major advanced economies, while inflation expectations have risen across the board in the near term, change in real yields appear more pertinent a driver for shifts in longer-term yields.

INTRODUCTION[1]

Advanced economy bond yields rose sharply since the beginning of 2021, with a particular investor focus on the United States. The nominal 10-year US Treasury yield increased almost 80 basis points at its peak[2] in 2021, reflecting, in part, marked improvements in the economic outlook as recovery from the coronavirus disease (COVID-19) pandemic accelerates. The rise in US yields has implications for a wide range of securities around the world that are priced off the US yield curve. Indeed, the increase in yields has already passed through to the pricing of other advanced economy and emerging market bond yields and further increases could have significant spillovers to the global financial system, as discussed in the April 2021 *Global Financial Stability Report* (IMF 2021).

This note analyzes the drivers of the rise in nominal yields both in the United States and in other major advanced economies to allow policymakers and market participants to assess the interest rate outlook at a

[1] *The authors thank Xingmi Zhang for excellent research assistance. The note has also benefitted significantly from the comments from Nassira Abbas, Tobias Adrian, Fabio M Natalucci, and Mahvash Qureshi along with comments from internal reviewers and participants at an internal seminar.*

[2] *The charts are refreshed as of the end of May 2021*

time when the global economic recovery is gaining momentum. Moves in nominal yields reflect changes in market expectations of growth, inflation, the path of interest rates, and the pricing of interest rate risk. These factors are impacted by changes in macroeconomic policies in potentially in different ways.

DECOMPOSITION OF ADVANCED ECONOMY NOMINAL YIELDS

By standard economic theory, nominal yields may be decomposed into two general components: (i) the real yield and (ii) breakeven inflation. Breakeven inflation—expressed as the difference between nominal and real yields—is commonly viewed as a market-implied measure of inflation expectations, while the real yield reflects growth expectations. An increase in real yields could signal an improvement in the economic outlook via two potential channels. First, it reflects an increase in return on investment, leading to an increase in investment demand. Second, higher expected growth boosts future earnings, which, in turn, leads forward-looking households to increase current consumption and save less. The combination of lower savings and higher investment would translate into higher real yields.

$$nominal\ yield = real\ yield + inlfation\ breakeven \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Utilizing information contained within the yield curve is especially useful, given it embeds market expectations about yields at different horizons/tenors. For example, developments corresponding to real yield and inflation breakeven over the next 5 years (relatively near-term) may be gauged by examining the 5-year nominal yield. At the same time, the 5-year–5-year forward yield conveys information about a relatively longer-term horizon; specifically, a period spanning years 6 to 10. This forward yield (labeled 5yr5yr, henceforth) can be inferred from readily available 5-year and 10-year nominal yields as,

$$5yr5yr\ forward\ yield\ = \{(1 + 10yr\ yield)^{10}\ \times\ (1 + 5yr\ yield)^{-5}\}^{1/5} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

In the following analysis, attention will be focused on extracting market-implied expectations pertaining to the near- and longer-term horizons, delivered via decomposing the 5yr and 5yr5yr nominal yields, respectively.

Key results for the United States

Having risen significantly in 2021, the 10-year inflation breakeven at 2.7 percent touched its highest level since early 2013. This increase appears to be a major driver of the rise in the US nominal yield since March 2020. The 10-year real yield, however, displayed a relatively sharp increase only since March 2021 (Figure 1, Chart 1). Importantly, there is a notable difference between the underlying drivers of the 5yr and 5yr5yr tenors, summarized below:

- The 5-year nominal yield has been driven primarily by an increase in inflation breakeven, while the corresponding real yield has remained relatively unchanged (Figure 1, Chart 2). The 5-year inflation breakeven at 2.6 percent, also reached, its highest level since 2008.

- In sharp contrast, the increase in the real yield appears to have been the primary driver of the 5y5yr tenor, with corresponding inflation breakeven displaying relatively little variability (Figure 1, Chart 3).

- The disconnect is evident across a range of tenors, as real yields have an upward sloping term structure, while inflation breakevens display a downward sloping term structure (Figure 1, Chart 4).

Figure 1: Decomposition of US Nominal Yield

Chart 1. Breakdown of US 10-year nominal yield
(Percent)

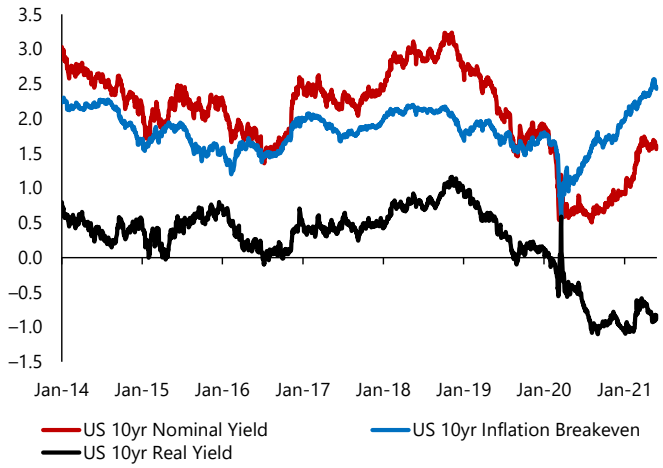


Chart 2. Breakdown of US 5-year nominal yield
(Percent)

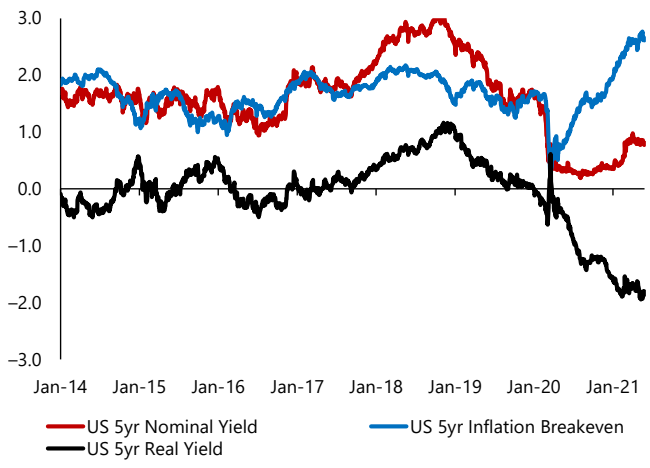


Chart 3. Breakdown of US 5y5y nominal yield
(Percent)

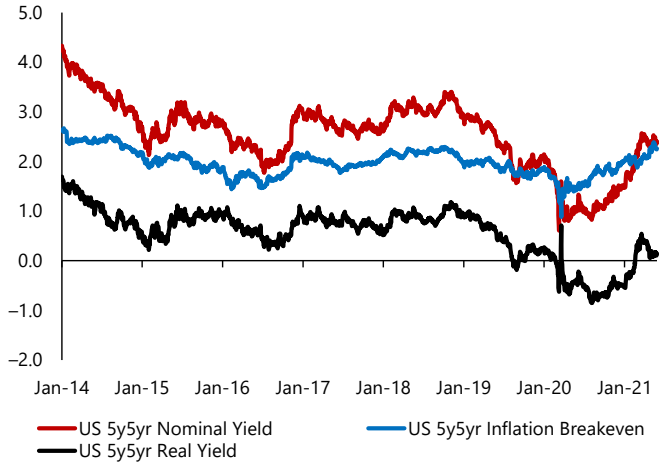
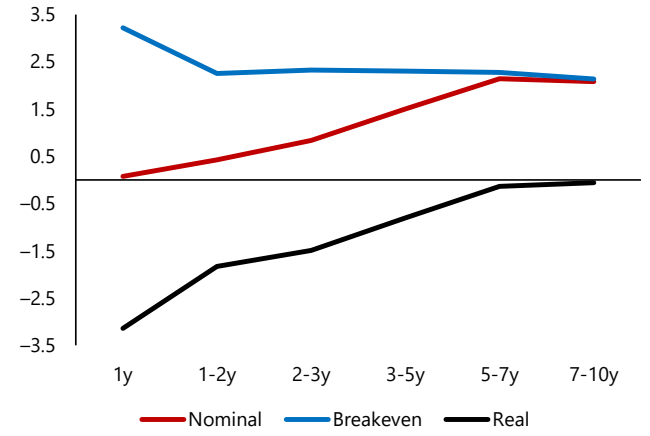


Chart 4. Forward rates in the respective tenors
(Percent, annualized)



Sources: Bloomberg, authors calculations.
Note: The real yields at the short tenors (up to 2-3 years) are rough approximations given the lack of appropriate instruments. US = United States; y= year; yr= year;

Results for other major advanced economies

Like the US, nominal yields rose across all major advanced economies. The 10-year nominal yield in the Euro Area, United Kingdom, and Japan rose by 40 basis points, 60 basis points, and about 10 basis points, taking cues from the 70 basis point rise in the US nominal yield (Figure 2, chart 1). Analyzing the nominal yield decomposition (described earlier) across these economies reveals the following trends:

- There is significant heterogeneity across the different tenors, as well as across jurisdictions with regard to the drivers of nominal yields. Like the United States, the United Kingdom has seen an increase in the 10-year real yield, while in the Euro Area and Japan, the change in real yields has been relatively subdued (Figure 2, chart 2).

- Real yields have risen across the board for the 5yr5yr tenor, especially in the United States and the United Kingdom. Moreover, this increase is meaningfully larger than movements for the 5-year tenor.

- Inflation breakevens have increased across the board. This increase is particularly pertinent for the 5-year tenor, as compared to the 5yr5yr tenor.

Figure 2: Trends in Bond Yields for Major Advanced Economies

Chart 1. 10-year nominal yields across the major advanced economies
(Percent)

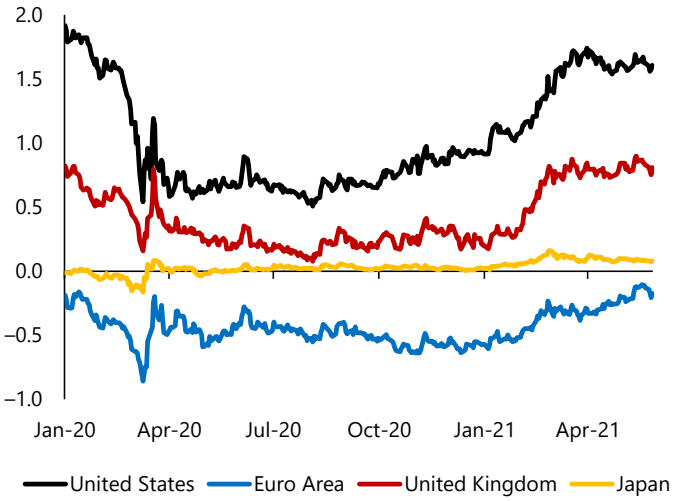
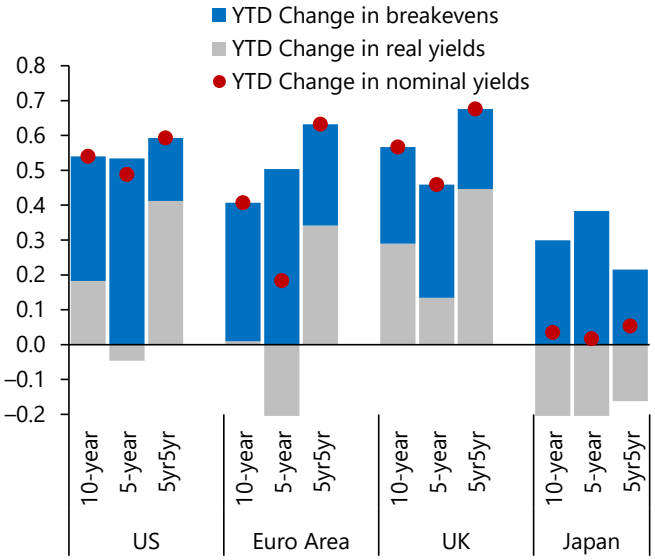


Chart 2. Breakdown of the change in advanced economy nominal yields into inflation and real yield components
(Percentage points)



Source: Bloomberg, authors calculations.
Note: Yr = year; YTD = year to date.

While the nominal yield decomposition described here is informative, it is important to note that signals pertaining to expected inflation and expected growth derived from breakeven and real yield components, respectively, are potentially conflated by other factors related to market pricing. In what follows, a deeper dive is taken into the United States and provide further decompositions of the inflation breakeven and real yield components.

DECOMPOSITION OF US INFLATION BREAKEVENS[1]

Breakeven inflation, while providing a reliable gauge of market-implied inflation expectations, may be subject to distortions. In the United States, Treasury inflation-protected securities (or TIPS, from which the real yield is derived), are generally less liquid than their nominal counterparts, especially in the short run and during periods of market stress. Breakevens also incorporate an inflation risk premium (IRP)—that is, the compensation that investors require for bearing inflation risk—for instance, related to inflation uncertainty. It is therefore useful to decompose breakevens into expected inflation and IRP components as,

$$inlfation\ breakeven = expected\ inflation + infaltion\ risk\ premium \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

The decomposition described in equation (3) can be delivered by the estimation of a joint affine term structure model of nominal and real bond yields, largely based on the framework of Abrahams et al. (2016).

In terms of underlying data, zero coupon bond yields from Gurkaynak et al. (2007, 2010) form the basis of the empirical estimation. The real and nominal curves are based on fitting Nelson-Seigel-Svensson curves, parameters of which are available from the Board of Governors of the Federal Reserve. These parameters are used to back out the cross-section of real and nominal zero-coupon bond yields for tenor/maturities up to 10 years for both TIPS and Treasuries. The end-of-month values from 1999:01 to date are used. As part of the estimation procedure, TIPS payouts need to be computed, for which the seasonally unadjusted Consumer Price Index for All Urban Consumers (CPI-U) is used; this index is available from the Bureau of Labor Statistics.

The joint term structure dynamics are described by a set of nominal and real pricing factors. An adjustment for potential TIPS illiquidity within the framework is made using a range of volume and price-based metrics. More specifically, using information contained within the ratio of primary dealer's nominal Treasury transaction volumes, relative to TIPS transaction volumes; bid-ask spreads of TIPS relative to nominals; and TIPS yield fitting error from the Nelson–Siegel–Svensson model (see Gurkaynak et al. 2010). While the first two may be considered natural choices as market liquidity metrics, information delivered by the fitting error is especially useful, since large errors reflect market stress and investors' inability to take advantage of mispricing. It therefore provides a reasonable proxy for time-variation in liquidity conditions in the TIPS market (Hu et al. 2013).

Key Results

The analysis suggests that expected inflation over the next five years has recovered significantly from the March 2020 trough, even after adjusting for the IRP and liquidity components. It is currently slightly above pre-pandemic levels–specifically, the average level prevailing over 2018–2019—and hovering within the 2.0–2.5 percent range (Figure 3, Chart 1). Expected inflation over the 5yr5yr segment has also recovered somewhat, albeit at a more sluggish pace compared with the 5-year horizon. It is currently just below pre-pandemic levels (Figure 3, Chart 2). That said, it is expected to remain broadly in line with the target range, both over the near and medium terms.

[1] The decomposition is updated as of mid April 2021, reflecting the peak levels

Figure 3: Decompositon of US Inflation Breakeven

Chart 1. Drivers of US 5-year inflation breakeven
(Percent)

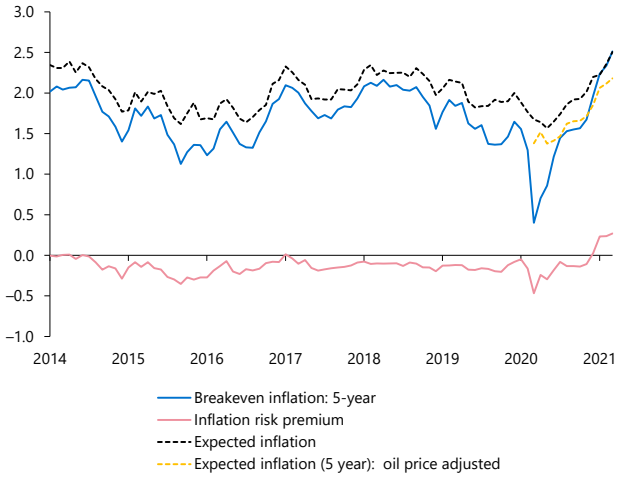
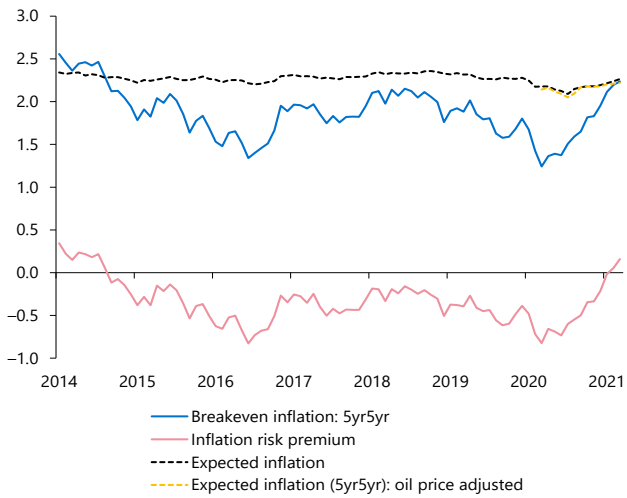


Chart 2. Drivers of US 5yr5yr inflation breakeven
(Percent)



Source: Bloomberg, Haver Analytics, authors calculations:
Note: All results presented are adjusted for liquidity factors. The charts are updated as of mid April 2021, reflecting the peak levels. Yr = year.

Comparing across horizons, expected inflation over the next 5 years is also now slightly above the corresponding longer-term (5yr5yr) horizon. This near-term over-shoot in inflation expectations may be viewed as broadly consistent with the Federal Reserve's new average inflation targeting framework (link), and is evident in standard breakevens as well, with the level of the 5-year now exceeding the 10-year breakeven for the first time in the past decade (Figure 4, chart 1). Notwithstanding the rise in 5-year expectations, given that TIPS are indexed to CPI inflation, of which oil is a major driving factor, near-term moves in expected inflation (and breakevens overall) will reflect, in part, the recent sharp spike in oil prices. Considering the period since March 2020, estimates suggest that attempting to adjust for oil price impact does not meaningfully alter the trajectory followed by the 5-year or 5yr5yr expectations (Figure 4, chart 2).

The IRP derived from both 5-year and 5yr5yr breakeven decompositions has turned positive and is currently at a multi-year high. This switch in sign may be reflecting an increasing perception that inflation risk is becoming more counter-cyclical—that is,, future states of higher inflation would potentially coincide with lower output growth. This stands in contrast to the 2013–2014 period, for instance, which saw comparable levels of the 5-year expectations; however, IRP was (weakly) negative, indicating that the balance of risks was then skewed marginally toward more deflationary/low inflation outcomes.

Considering the period from the end of March 2020 to the end of March 2021, results suggest that about 45 percent of the increase in (liquidity-adjusted) 5-year breakeven is due to an increase in the IRP corresponding to this tenor, and the remaining 55 percent is due to an increase in the inflation expectations component. For the 5yr5yr year, close to 10 percent is an increase in expected inflation with the 90 percent attributable to an increase in risk premiums (Figure 4, chart 3). Comparing with another trough-to-peak period of June 2016–June 2017, the relative contributions of IRP and expected inflation to the increase in breakeven were similar at the 5yr5yr horizon. However, for the 5-year, the bulk of the variation was due to a change in expectations, with just about 15 percent attributable to increased IRP. Interestingly, for the period October 2008–October 2009, the rise in expected inflation was a significant contributor to increased breakeven at both near- and longer-term horizons.

In conjunction with the upward drift in IRP—reflecting an increasing risk of higher inflation outcomes—TIPS'

exchange traded funds (ETFs) have also witnessed robust inflows as market participants are actively seeking to hedge inflation risk (Figure 4, chart 4). Flows in these ETFs have amounted to an average 5 percent of assets under management over the last three months, which compares with just 1.5 percent over the last five years. Evidence from inflation options also reveals an increasing probability being attached to higher inflation outcomes (as discussed below).

Figure 4: Diference between drivers across the Term Structure of Inflation Breakevens

Chart 1. Term structure of inflation breakeven
(Percentage points)

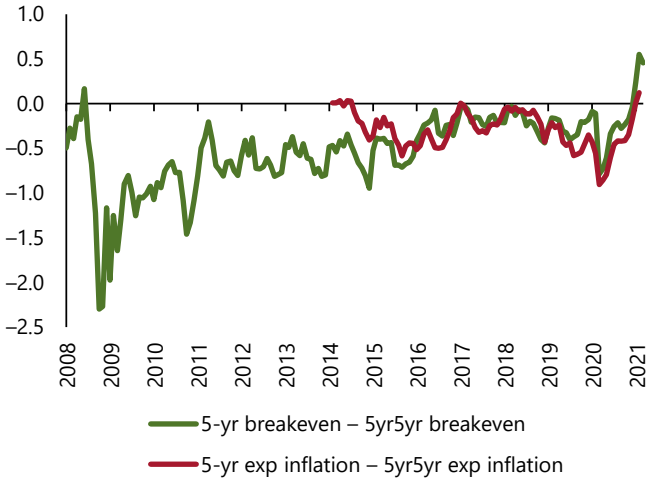


Chart 2. Impact of oil on inflation breakeven
(Percentage points)

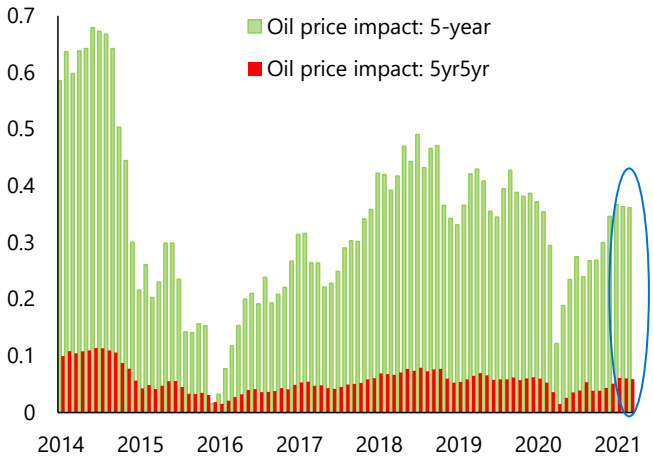


Chart 3. Inflation risk premiums and expected inflation: relative contributions to changes over different time periods
(Percent)

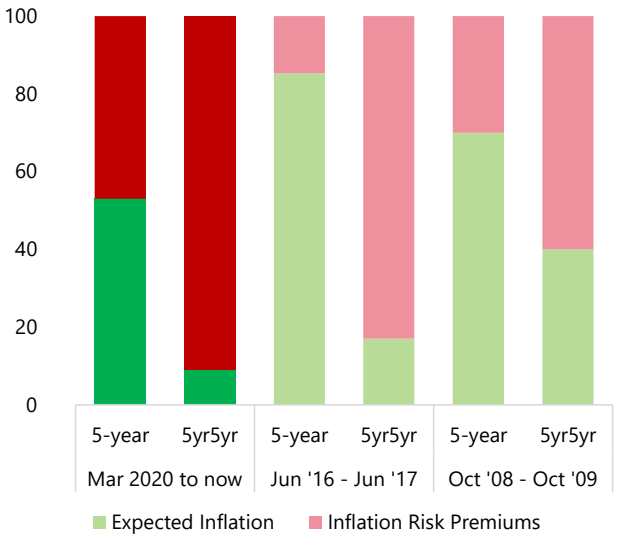
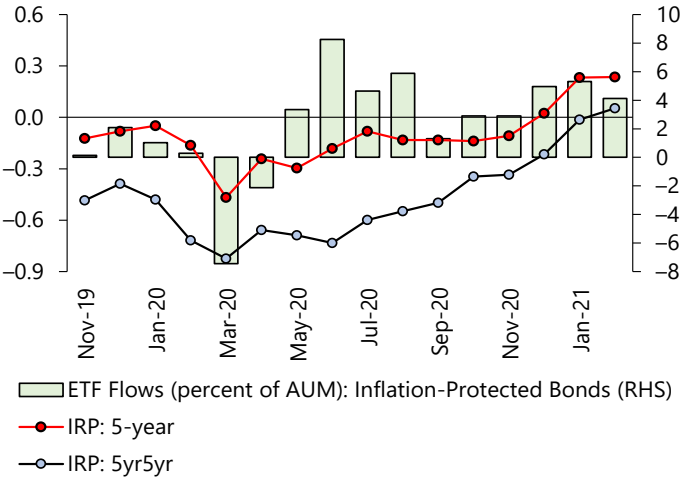


Chart 4. Inflation risk premiums and ETF flows
(Percent; percent of AUM on RHS)



Sources Bloomberg, Haver Analytics, EPFR, authors salculations.
Note: All results presented are adjusted for liquidity factors. The charts are updated as of April 2021 levels, reflecting the peak levels. AUM = assets under management; ETF = exchange traded fund; exp = expected; IRP = inflation risk premium; RHS = right-hand scale; yr = year.

DECOMPOSITION OF US REAL YIELDS[2]

While expected inflation has displayed a more significant increase over the near-term, real yield appears to have been the primary driver of the increase in longer-term nominal yields. The real yield, however, can also be decomposed into two components: the risk-adjusted real yield, which reflects the average expected short-term real rate (over the particular horizon), and a real-term premium, which is the compensation investors require for bearing risks related to uncertainty around the economic outlook and/or path of policy rates.

$$real\ yield = risk - adjusted\ real\ yield + real\ term\ premium \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

In equation (4), the average expected short-term real rate is labeled as the "risk-adjusted" real yield as it does not incorporate the term premium. Decomposition of the real yield is delivered via estimation of the joint nominal and real term structure model described above.[3]

Key Results

The analysis reveals that the 5-year real yield has remained low, even on a risk-adjusted basis, with a slight up-tick in the real-term premium in recent months (Figure 5, Chart 1). With higher near-term inflation expectations and policy rates remaining close to the zero-lower bound, such compression in real yield is reflective of the intended near-term effects of ultra-accommodative monetary policy.

By contrast, the recent increase in the 5yr5yr real yield has been more pronounced (Figure 5, Chart 2). While the risk-adjusted component corresponding to this tenor has increased somewhat, the bulk of the increase is due to a rise in the real-term premium over the longer term (Figure 5, Chart 3). Therefore, as opposed to signaling a meaningful improvement in market expectations for growth outlook (and/or shift in the expected policy path), the rise in 5yr5yr real yield essentially reflects increased uncertainties around growth and the path of policy over the longer term. And relatedly, it may reflect concerns around large fiscal deficits and issuance needs. It should be noted that the longer-term outlook may also be affected by structural factors, such as productivity and demographics (aging populations) in advanced economies.

[2] The decomposition is updated as of mid April 2021, reflecting the peak levels

[3] The nominal yield decomposition (1) can also be rearranged to be expressed as the sum of average expected short-term nominal yield and the nominal-term premium. The IRP discussed in Section 2 is a function of the wedge between nominal and real-term premiums (see Abrahams et al. for more details).

Figure 5: Decomposing US Real Yields

Chart 1. Decomposition of 5-year real yields
(Percent)

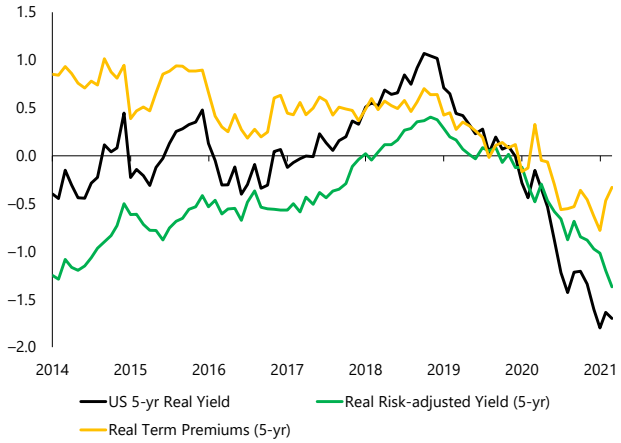


Chart 2. Decomposition of 5y5y real yields
(Percent)

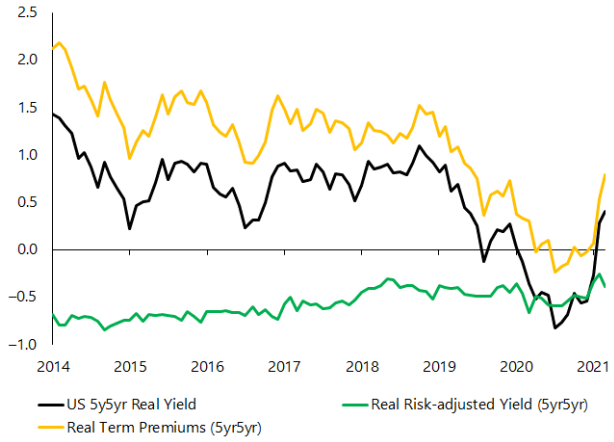
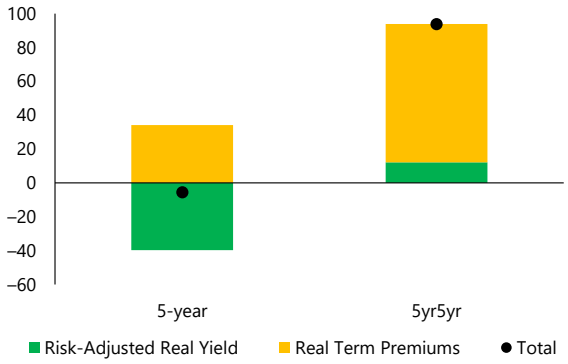


Chart 3. Decomposition of the YTD change in real yields
(Basis points)



Sources: Bloomberg, Haver Analytics, authors calculations.
Note: All results presented are adjusted for liquidity factors. The charts are updated as of mid April 2021, reflecting the peak levels. US = United States; yr = year; YTD = year to date.

INFLATION EXPECTATIONS FROM CONSENSUS SURVEY

In addition to the analysis above, we also consider the consensus forecasts from Consensus Economics to analyze the inflation expectations over the very near term (1 year) and the medium term (5 years). Inflation expectations over the very near term have increased quite sharply since June 2020, ranging between 30–45 basis points across the major advanced economies (Figure 6, Chart 1). In contrast, the change over the medium term has been relatively benign. These trends are broadly consistent with the inflation breakeven trends documented previously. The latest consensus expectations (Figure 6, chart 2) show that inflation is indeed expected to remain broadly within the target range over the medium term. The United Kingdom has the highest inflation forecast, especially in the near term, followed by the United States, Euro Area, and Japan.

Figure 6: Inflation Expectations from Consensus Surveys

Chart 1. Change in the consensus forecasts for forward inflation
(Percentage point; since June 2020)

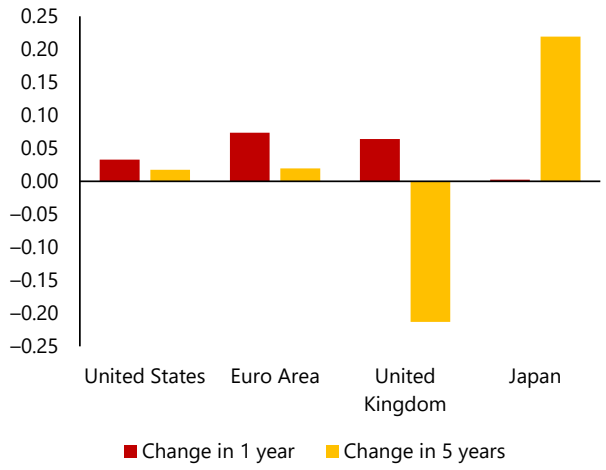
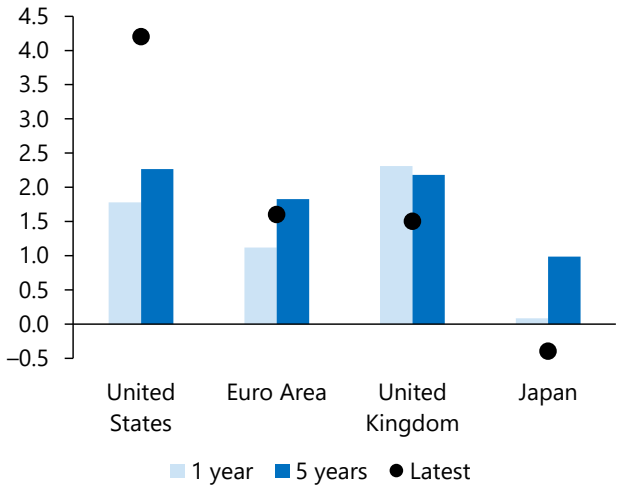


Chart 2. Market implied probabilities of inflation in various regimes—experience during the COVID-19 sell-off
(Percent)



Sources: Bloomberg, Consensus Forecast, Haver Analytics, authors calculations.

SIGNALS FROM INFLATION OPTIONS

Inflation options (both caps and floors) are also traded quite frequently in the United States and in the Euro Area, and this can be used to infer the probability distribution around future inflation expectations. The analysis—using the methodology based on the Black's model of pricing interest rates as in Feldman et al. (2015)—confirms the earlier trends and shows that inflation expectations have increased steadily in the United States, with the probability distribution moving significantly to the right (Figure 7, chart 1).

The trends in inflation expectations are analyzed by looking at the probability of inflation being in various ranges. Figure 7, chart 2, shows that the probability of high inflation (>2 percent) has increased sharply both in the United States and Euro Area, while the probability of low inflation (<1 percent) has declined materially. However, it is interesting to note that both the United States and Euro Area are in two structurally different positions. The probability of high inflation in the United States is at almost 70 percent compared to 10 percent in the Euro Area. Similarly, the probability of low inflation in the Euro Area is still relatively high at 30 percent (despite the sharp decline since the COVID-19 sell-off), while in the United States it is almost negligible. Looking at trends over the longer horizon, the analysis finds that the probability of low inflation (<1 percent) in the United States is at historical lows now and has corrected sharply from the peak of the COVID-19 sell-off (Figure 7, Chart 3). The

probability of low inflation has declined in the Euro Area as well but remains higher than the 2018 troughs (Figure 7, Chart 4) reflecting that the downside risks are still notable.

Figure 7: Extracting Signals from Inflation Options

Chart 1. Probability density function for inflation expectations

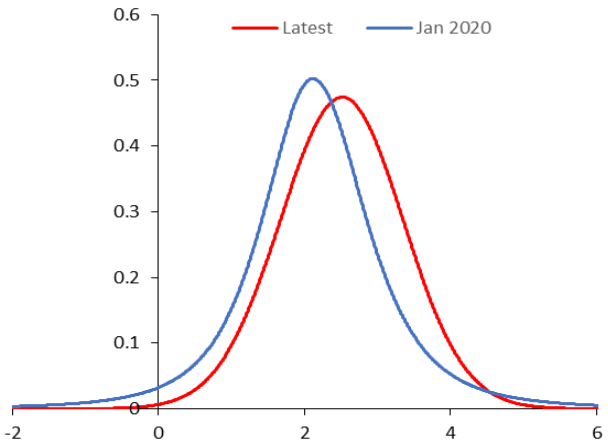


Chart 2. Market-implied probabilities of inflation in various regimes—experience during the COVID-19 sell-off
(Percent)

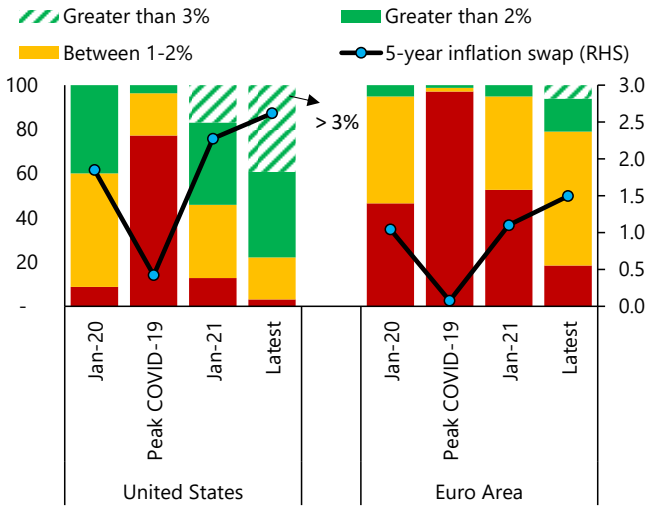


Chart 3. US—Marketimplied probability of inflation distribution
(Percent)

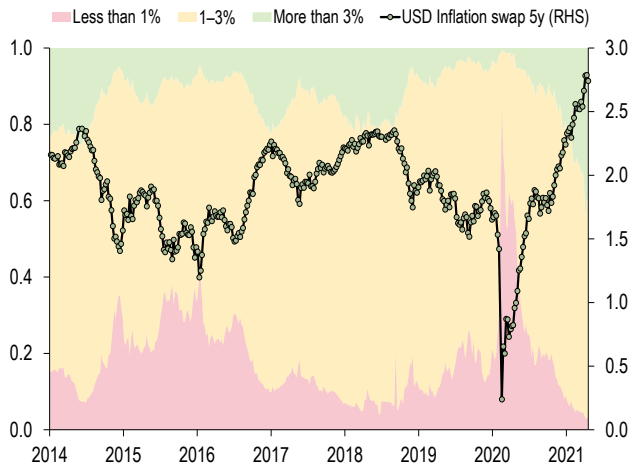
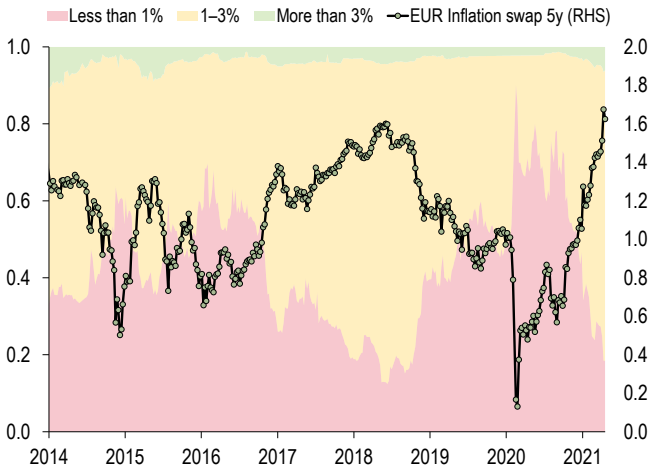


Chart 4. Euro Area—Market-implied probability of inflation distribution
(Percent)



Sources: Bloomberg, authors calculations.
Note: COVID-19 = coronavirus disease; RHS = right-hand scale.

CONCLUSION AND POLICY IMPLICATIONS

The analysis provided in this note attempts to decompose the sharp rise in the United States and other major advanced economy nominal bond yields into constituent drivers, specifically inflation expectations and real yields.

Results reveal that while US inflation expectations appear to be well-anchored over the longer term, there is some evidence of a *transitory* increase expected over the near-term horizon. Comparing the United States with other advanced economies, there appears to be some divergence in terms of the behavior of inflation expectations. Specifically, for the Euro Area, as well as the United Kingdom and Japan, inflation expectations appear to be displaying a meaningful increase over both the near- and longer-term horizons. Similar to the United States, near-term expectations have risen somewhat more prominently, potentially reflecting "base effects" in inflation measurement, as the recovery gains traction with re-opening of these economies.

The difference in near- versus longer-term dynamics of US inflation expectations can be considered in line with the Federal Reserve's new objective of allowing inflation to moderately overshoot its target for some time. Moreover, taken together with the significant monetary stimulus with the overnight policy rate essentially held at zero, the finding of negative expected real yields over the horizon of next few years suggests investors expect US monetary policy conditions to remain highly accommodative over the near term.

While the short end of the yield curve appears well-anchored due to the Federal Reserve's forward guidance on the path of rates and conditions that need to be met before considering a liftoff, it should be noted that the longer end of the curve is also meaningfully affected by the Federal Reserve's asset purchases program (see also Adrian et al. 2021). In fact, asset purchases—as the main unconventional monetary policy tool in the United State—to a large extent operate via the compression of risk premiums, supporting risky asset prices and easing broader financial conditions. Hence the evidence found of a rise in real risk premiums over the longer term— that is, at the 5yr5yr forward horizon—can be interpreted as a potential reassessment of the outlook for, and the risks surrounding, asset purchases, taking into account the expected increase in Treasury supply related to fiscal support in the United States.

Indeed, there is a wide range of views among market participants regarding the outlook for asset purchases, as well as uncertainty about the parameters of the Federal Reserve's new Average Inflation Targeting Framework. An important challenge for the Federal Reserve, once the beginning of the policy normalization process draws closer, will be to provide clear and well-telegraphed communication about the pace of future asset purchases—and the reaction function more generally—–to avoid unnecessary volatility in financial markets.

A gradual increase in longer-term US rates—a reflection of the expected strong US recovery—is heathy and should be welcomed. It would also help contain unintended consequences of the unprecedented policy support required by the pandemic, such as stretched asset prices and rising financial vulnerabilities. The IMF's baseline expectation is one of continued accommodative financial conditions, even if US rates were to rise further. However, an abrupt tightening of global financial conditions remains a risk. Given the asynchronous and multispeed nature of the global recovery, fast and sudden increases in US rates could lead to significant spillovers around the world, tightening financial conditions in emerging markets and disrupting their recovery process.

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