International Yield Co-movements

Geert Bekaert and Andrey Ermolov[*]

June 27, 2021

Abstract

We decompose long-term nominal bond yields into real and inflation components in an international context using inflation-linked and nominal bonds. In contrast to extant results, real rate variation dominates the variation in inflation-linked and nominal yields. Cross-country nominal and inflation-linked yield correlations have declined since the Great Recession. Real rates are the main source of the correlation between nominal yields. Our results are robust to various alternative measurements of inflation expectations and the liquidity premium. They continue to hold when a no-arbitrage term structure model with real, nominal, and inflation factors is used to effect the yield decomposition.

Keywords: Treasuries, sovereign bonds, cross-country co-movement, real yield, expected inflation, inflation risk premium, liquidity premium

JEL codes: E31, E43, G12, G15

I. Introduction

The nominal yield on a government bond can be decomposed into a real yield, expected inflation and an inflation risk premium. The decomposition is of critical economic interest because policymakers react very differently to expected inflation changes than to shifts in real yields or the inflation risk premium. However, if the market only trades nominal bonds, all three components are unobserved. The typical approach to identify these components involves estimating a term structure model, which imposes restrictions on the dynamics of state variables and risk compensation to achieve identification (see, e.g., Ang, Bekaert, and Wei (2008)). Instead, we follow recent literature which alleviates the identification problem by using survey data to (help) identify expected inflation, and inflation-linked bonds to help tie down real rates (see, e.g., D'Amico, Kim, and Wei (2018)). The older literature, which does not use inflation-linked debt, typically finds that inflation compensation (expected inflation and the inflation risk premium) accounts for most of the variation of nominal yields and nominal term spreads (see Bekaert and Wang (2010) for a survey). For example, Ang et al. (2008) find that variation in expected inflation and the inflation risk premium explains about 80% of the variation in nominal rates.

We re-examine this important decomposition with more recent data, ensuring that we can rely on inflation-linked debt yields. Yet, the use of inflation-linked bonds also creates various challenges. First, the time series sample is relatively short, starting only in 2004. Our main focus therefore is on co-movements and variances, rather than level averages, which may be too sensitive to the time period at hand. Second, the secondary market for inflation-linked debt tends to be less liquid than that for nominal

1

bonds, preventing the use of inflation-linked yields as direct proxies for real rates. Estimates by Gürkaynak, Sack, and Wright (2010) and D'Amico et al. (2018) show liquidity premiums on US TIPS in the first 3 to 5 years after inception to vary substantially over time, dropping from over 1% annually to considerably smaller levels around 2004.[1] We estimate liquidity premiums using state-of-the art methods. We examine the standard yield decomposition not only for the US but also internationally and study the co-movements of yields and their components across countries. We focus on France and the UK, because they have long time series on inflation-linked yields.

Our main findings are as follows. First, over the last 15 years, nominal and inflation-linked yields have decreased over time, and their standard deviations have mostly decreased. Internationally, these observed yields correlate highly but their correlation has decreased over time, in some cases turning negative. Second, expected inflation plays no role in these developments. Instead, real yields are the dominant component contributing to the variation in inflation-linked and nominal yields.[2] Liquidity premiums have only decreased in the US, but inflation risk premiums have decreased everywhere, and this decrease is statistically significant. Real yields are also the dominant component in explaining co-movements across countries. These results are remarkably robust to various alternative measurements of expected inflation and the liquidity premium.

To preserve space, we focus all of our results on the 5 year yield, but the results

---

[1]See also Sack and Elsasser (2004), Shen (2006), Abrahams, Adrian, Crump, Moench, and Yu (2016), and Pflueger and Viceira (2016) for similar results.

[2]This result is reminiscent but different from the result in Duffee (2018) who avoids the use of inflation-linked yields. He finds that expected inflation *news* contributes little to the variation in *shocks* to nominal bond yields. His computations (see Table III) do suggest that these inflation variance ratios also decreased in 2008-2013 relative to earlier periods. Early signs of the increased importance of real yields can be observed from plots, for example, in Campbell, Shiller, and Viceira (2009), Abrahams et al. (2016), and D'Amico et al. (2018), but we establish it formally via variance decompositions. Compared to the earlier literature, we also have a substantially longer sample, control for the liquidity risk premium, and study an international cross-section.

Electronic copy available at: https://ssrn.com/abstract=3402785

hold for the 2 and 10 year maturities as well. In an effort to impose no arbitrage conditions across different yields, and to provide further robustness checks, we also set out a no-arbitrage term structure model. We largely follow the approach in Abrahams et al. (2016), who formulate a Gaussian affine term structure model with prices of risk that are linear in various pricing factors. Our factors include nominal and real factors extracted from nominal and inflation-linked yields, respectively; a liquidity factor and an inflation factor (the level of inflation). We purposely do not use survey expectations in the model, so that inflation expectations and the inflation risk premium are solely implied by the model. All our key results regarding the dominant role of the real rate in yield variance and comovement decompositions continue to hold.

Our contribution is twofold. First, while the literature on international asset return co-movements is vast, surprisingly little research exists on yield correlations across countries. Jotikasthira, Le, and Lundblad (2015) examine correlations across nominal yields in the US, UK, and Germany through the lens of a reduced-form term structure model with inflation and real activity as main factors. They mostly distinguish a "policy" channel (the short rate and its effect of long term yields through the expectations hypothesis) and "risk compensation" channel (term premiums). They find that nominal yields are highly correlated across countries, with both channels explaining roughly equal parts of the total variation for 5 year yields. In a contemporaneous paper, Berardi and Plazzi (2021) estimate a reduced-form term structure model to compute yield correlations across 4 major economies, focusing, similarly to Jotikasthira et al. (2015), on short rate expectations and term premiums. We extend these papers by decomposing the cross-country yield correlations into real yield, expected inflation and inflation risk premium components for nominal bonds and

3

into real yield and liquidity premium components for inflation-linked bonds.

Our second contribution is to establish and economically interpret a set of stylized facts regarding yield decompositions. The extant literature performing such decompositions using inflation-linked yields either ignores the liquidity premium[3] or focuses on an individual time series, such as real yields in Campbell et al. (2009), arbitrage profits in Fleckenstein (2013) and Fleckenstein, Longstaff, and Lustig (2014), the inflation risk premium in Grishchenko and Huang (2013), expectation hypothesis violations in Pflueger and Viceira (2016), expected inflation in Kaminska, Zhuoshi, Relleen, and Vangelista (2018), the liquidity premium in D'Amico et al. (2018), or the issuance costs of inflation-linked versus nominal bonds in Ermolov (2021). Instead, we provide a comprehensive analysis on the relative importance of different yield components in multiple countries.

II. Decomposing Yields: on Liquidity and Inflation Risk Premiums

Throughout this article, we work with continuously compounded yields on zero-coupon government bonds. The main decomposition of interest is:

$$(1) \qquad \underbrace{y_t^n}_{\text{nominal rate}} = \underbrace{r_t^n}_{\text{real rate}} + \underbrace{E_t[\pi_{t,t+n}^n]}_{\text{expected inflation}} + \underbrace{\varphi_t^n}_{\text{inflation risk premium}},$$

where y_t^n is the yield on a nominal zero-coupon bond of maturity n, r_t^n is the yield on a perfectly indexed zero coupon bond of maturity n, and $\pi_{t,t+n}^n$ is (average) inflation from t to $t+n$. The difference between y_t^n and r_t^n is often called "inflation compensation" or

---

[3]Among others, Christensen, Lopez, and Rudebusch (2010) and Chen, Engstrom, and Grishchenko (2016) for the US, Evans (1998 and 2003), Risa (2001), Joyce, Lildhodlt and Sorensen (2008), for the UK, Garcia and Werner (2010), Hördahl and Tristani (2014), and Pericoli (2014), for the euro area. Haubrich, Pennacchi, and Richken (2012) use inflation swap rates instead of TIPS to estimate the various components assuming perfect liquidity in inflation swap markets.

sometimes "breakeven inflation rate". It consists of expected inflation and the inflation risk premium, the compensation investors demand to protect themselves against inflation risk.

The Fisher hypothesis holds that the inflation risk premium is zero, but is inconsistent with both modern asset pricing theory and recent empirical estimates of the inflation risk premium. In typical asset pricing models, the inflation risk premium depends on the covariance between the real pricing kernel and inflation. That is, the inflation risk premium is positive if inflation is high in "bad times", as the pricing kernel takes on high values in bad states of the world. Of course, this covariance between the wealth or consumption of agents and inflation may well vary through time inducing substantial variation in the conditional inflation risk premium. The premium may even be negative when inflation and stock returns (as an indicator of "wealth") are positively correlated (Campbell, Sunderam and Viceira, 2017) or in an aggregate demand environment, where real activity is negatively correlated with inflation (Bekaert, Engstrom, and Ermolov, 2021).

Liquidity premiums in inflation-linked debt considerably complicate the identification problem embedded in equation (1), because inflation-linked yields do not deliver r_t^n. Let $r_t^{n,IL}$ denote the zero-coupon yield derived from inflation linked debt. It consist of two components:

$$(2) \quad r_t^{n,IL} = r_t^n + LiqPr_t^n,$$

where LiqPr represents a liquidity premium that may vary through time.

We partially resolve the identification problem by measuring inflation expectations from survey forecasts. Such forecasts, by either professionals or consumers, are now available for multiple countries. In fact, Ang, Bekaert, and Wei (2007) find that

5

survey forecasts (in particular, the Survey of Professional Forecasters, SPF) consistently beat other models in forecasting U.S. inflation out-of-sample. Assuming inflation expectations are observed, data on inflation-linked and nominal yields generate direct information on an interesting concept, which we dub the nominal debt premium. That is, $NDPR_t^n = y_t^n - r_t^{n,IL} - E_t[\pi_{t+n,n}^n]$. From (1) and (2), it follows that $NDPR_t^n = \varphi_t^n - LiqPr_t^n$. The nominal debt premium is the difference between the inflation risk premium, priced in nominal bonds, and the liquidity premium, priced in inflation-linked debt. It represents the real cost advantage or disadvantage of the government issuing inflation-linked versus nominal debt. Full identification is then achieved by empirically estimating the liquidity premium.

III.   Data and Initial Stylized Facts

Our yield data comprise end-of-month zero-coupon yields extracted from nominal and inflation-linked bonds from France, the UK, and the US. The sample starts in 2004 because before this date an insufficient number of bonds are available to create yield curves, especially in France. Zero-coupon yields for the US, both for nominal Treasuries and Treasury inflation-protected securities (TIPS), are from Gürkaynak, Sack, and Wright (2007) and (2010), respectively). The UK zero-coupon nominal and inflation-linked yields are from the Bank of England web site.

For France, the nominal zero-coupon yields are from the Banque de France website. We use the Nelson and Siegel (1987) methodology to construct French zero-coupon yields from inflation-linked bond prices taken from Bloomberg. Under the

Nelson and Siegel (1987) parameterization, the time t n-period zero-coupon yield is:

$$r_t^{n,IL} = \beta_0 + \beta_1 \frac{1 - e^{-\frac{n}{\tau_1}}}{\frac{n}{\tau_1}} + \beta_2 \left(\frac{1 - e^{-\frac{n}{\tau_1}}}{\frac{n}{\tau_1}} - e^{-\frac{n}{\tau_1}} \right),$$

where β_0, β_1, β_2, and τ_1 are model parameters. We estimate end of month Nelson-Siegel parameters by minimizing the sum of squared deviations between observed and predicted bond prices weighted by the inverse of bond duration.[4] This procedure results in essentially the same yield curve as minimizing the sum of squared yield deviations, but is computationally much faster (Gürkaynak et al. (2007)). No bonds with residual maturity below 12 months are used, because their prices are strongly affected by indexation lags and seasonality effects. Our results are robust to excluding bonds with maturities less than 18 and 24 months. We only use the bonds linked to the euro zone harmonized index of consumer prices excluding tobacco as they are more common than bonds linked to domestic French inflation.

Because inflation-linked debt tends to be issued at relatively long maturities, the main security we focus on is the 5 year zero-coupon bond. Our results for longer maturities, discussed in Section IV.F.3 (and also in Section V), are similar. As our analysis is based mainly on off-the-run long maturity bonds, we assume that the deflation protection and indexation lag premia embedded in inflation-linked bond prices are zero (see Risa (2001) and D'Amico et al. (2018)). We provide some institutional background regarding the three markets primarily analyzed in this article in Online Appendix I.

In Table 1, we show the properties of the 5 year yields, with nominal yields on

---

[4]While the French nominal yield curves are constructed using the Svensson (1994) extension of the Nelson and Siegel (1987) methodology, we construct French inflation-linked yield curves using the original Nelson and Siegel (1987) methodology. The Svensson-methodology requires the availability of a sufficient number of long-term bonds to be reliably applied, which the French inflation-linked market lacks until the second half of our sample. For the last part of the sample, we confirmed that the differences between the Nelson-Siegel and Nelson-Siegel-Svensson methodologies are economically small at long maturities and essentially non-existent at medium maturities, such as the 5 year maturity we study.

the left and inflation-linked yields on the right and three panels for the full sample, the first half of the sample (2004 till 2012) and second half of the sample (2012-2019).[5] We show standard errors from a GMM procedure, outlined in Online Appendix II, incorporating 12 Newey-West (1987) lags. Asterisks in the second subsample indicate values statistically different from the first subsample. It should not be any surprise that yields have significantly decreased with inflation-linked yields becoming negative in the second sub-sample. The standard deviations of yields have decreased as well.

[Table 1 around here.]

For the full sample, we confirm the result in Jotikasthira et al. (2015) that nominal yields are highly correlated across countries, with the correlation varying between 0.67 for the US and France and 0.93 for France and the UK. The inflation-linked yield correlations are of the same order of magnitude. When looking at the subsamples however, we see that these correlations have decreased substantially in a statistically significant fashion, except for the correlation of French with UK yields. This is not due to a volatility effect, which we can infer from the statistics for US betas. These betas represent the exposure of French and UK yields to US yields (as implied by a linear regression with a constant). The US beta for French nominal (inflation-linked) yields has also decreased from 0.51 (0.46) to -0.35 (-0.33). For the UK, betas of around 1 turn negative (inflation-linked yields) or become virtually zero (nominal yields) from the first to the second subsample.

---

[5]We conduct the Bai, Lumsdaine, and Stock (1998) formal break tests on the 6 yields: three nominal and three inflation-linked yields. The test assumes a VAR with the lag order chosen by the BIC criterion (which is one in our case), formulates a test for one unknown break point, and provides a confidence interval on the break date. We find a significant break, with the null hypothesis of no break rejected at the 1% level. The break date is February 2011, but the 95% confidence interval is +/- 29 months, which includes the mid-point of the sample. To preserve balanced samples, we chose the midpoint as the breakpoint.

Inflation-linked bonds may result in debt cost savings for the government, when the inflation risk premium is larger than the liquidity premium priced in inflation index-linked bonds. We now provide direct estimates of the relative interest rate cost of issuing nominal versus inflation-linked debt, by measuring inflation expectations. We take 5 year expected inflation from the SPF for the US, from the European Central Bank (ECB) Survey of Professional Forecasters for France and from Consensus Economics for the UK. For the US, SPF data is only available from 2005Q3 onwards, so we use Aruoba (2020) estimates, who aggregates data from multiple surveys, for 2004Q4-2005Q2 . While the forecasts in Aruoba (2020) are "spot" forecasts and available every month, SPF and ECB SPF forecasts are available quarterly, and the Consensus Economics forecasts are only available twice a year. We assume that the forecasts do not change in between data releases. A robustness check, where we linearly interpolate between the forecasts, does not change any of our key findings. The ECB SPF provides one year forward inflation forecasts, between year 0 and 1; between year 1 and 2 and between year 4 and 5. To distill an estimate for expected inflation over the next 5 years, we set expected inflation two and three years from now, equal to expected inflation four years from now. An alternative assumption where we linearly interpolate between the values for expected inflation one and four year(s) ahead, produces very similar empirical results. Figure 1 graphs these expectations, clearly showing inflation expectations to be higher in the UK, followed by the US and then France, where inflation expectations seem to vary the least. Section IV.F.2 considers further robustness checks to alternative data sources on inflation expectations.

[Figure 1 around here.]

In Table 2, we report the statistical results on expected 5 year inflation, as

9

measured by the surveys (left-hand side). Average inflation expectations range from 1.80% in France, over 2.26% in the US to 2.97% in the UK. Therefore, the expectations are very near the inflation targets set by the European and US central banks (which are at 2%) but quite a bit above the target set by the Bank of England. There is a statistically significant decrease in the average expected inflation of about 20 basis points over the two sample periods for France and the US. In the UK, inflation expectations have actually increased to 3.2% in the second sample half from 2.7% in the first, and the change is statistically significant. Inflation expectations are now very stable, as witnessed by the low standard deviations, especially in France and the US, where the standard deviation is less than 20 basis points. D'Amico et al. (2018) report standard deviations for expected inflation over various horizons invariably exceeding 1%. The low volatility of the inflation expectations may partially reflect the long horizons over which expectations are formed but may also derive from monetary policy's ability to anchor inflation expectations. In Online Appendix III.A, we repeat the information in Table 2 but for one year ahead inflation expectations. These expectations are more variable, exhibiting standard deviations in the 35 to 40 basis points range. While inflation is far from dead, as was sometimes claimed in media reports preceding the recent pandemic, its stochastic process has definitely changed.

[Table 2 around here.]

Perhaps surprisingly, inflation expectations are not highly correlated across countries. The correlation between expected inflation in the UK and the US is negative, which is also reflected in a very large but negative UK beta with respect to US inflation. Expected inflation in the US and France are more highly correlated at 0.7. The table does reveal that the low correlations are all due to the first part of the sample. More

10

recently, expected inflation in France and the UK show a 0.78 correlation whereas US expected inflation correlates 0.78 (0.61) with expected inflation in the UK (France). Generally, these correlation coefficients are of little economic importance, because, as can be seen from Figure 1 and Table 2, the standard deviations of long-term inflation forecasts are very low, a pattern we confirm for statistical long-term inflation expectations in Section IV.F.2. Online Appendix III.A documents that one year ahead inflation expectations are more highly but still modestly correlated. These results are consistent with alternative estimates in the literature. Monacelli and Sala (2009), for example, find that for inflation rates in the US, UK, France, and Germany an international common factor explains less than 30% of the inflation variance. Förster and Tillman (2014) and Parker (2018) show that inflation correlations have decreased substantially in the 21st century. Kearns (2016), in contrast, suggests that inflation expectations are highly correlated but his results regard one year ahead inflation expectations and a sample starting in 1992.

The right panel of Table 2 shows properties of the nominal debt premium. The nominal debt premium has been on average negative in all three countries, ranging from -30 basis points in France to -42 basis points in the US. In the two European countries nominal debt premiums decrease substantially in a statistically significant manner in the second subsample. It appears that governments have enjoyed a substantive yield advantage issuing nominal debt. While it is tempting to associate this finding with the unusual monetary policies in Europe and elsewhere, note that monetary policy should primarily affect real yields. However, low inflation risk premiums relative to liquidity premiums, may also arise from the ability of nominal bonds to hedge real risk in aggregate demand environments, and correlate negatively with equity returns in periods

11

of market stress. From that perspective, it is surprising that the nominal debt

premiums are lower in the second part of the sample, as the first half of the sample was

dominated by the Great Recession, in which bond and stock returns were mostly

negatively correlated and which is mostly characterized as an aggregate demand

recession (see Mian and Sufi, 2010). Nominal debt premiums have become less

correlated across countries, with the decrease significant for the pairs involving the UK.

IV.   Empirical Decomposition Results

To implement the decomposition in equation (1), we now estimate the liquidity

premium and then show properties of the resulting liquidity and inflation risk

premiums. With all the components in hand, we provide variance decompositions of the

three yield components in the three countries and a decomposition of the correlation

dynamics across countries of nominal and inflation-linked yields.

A.   The Liquidity Premium

To estimate the liquidity premium, we follow Gürkaynak et al. (2010) and run

the following regression:

$$(3) \quad NDPR_{t,i}^n = c_{1,i} + c_2'l_{t,i} + \epsilon_{t,i},$$

where $NDPR_{t,i}^n$ is the nominal debt premium in country i, $l_{t,i}$ is a vector of

country-specific liquidity proxies and $\epsilon_{t,i}$ is the error term. Recall that the debt

premium equals the inflation risk premium minus the liquidity premium. Therefore, if

the liquidity proxies indicate illiquidity we expect the coefficients to be negative. In

addition, for the procedure to correctly identify the liquidity premium, the liquidity

proxies should be uncorrelated with the inflation risk premium. Given the slope

coefficients from equation (3), $\hat{c}_2$, the liquidity premium in country i at time t can be computed as $-\hat{c}_2' l_{t,i}$. Obviously, the mean of the liquidity premium is not identified through this procedure.

We use three types of liquidity proxies: the nominal off-the-run spread, the relative outstanding amount of inflation-linked bonds, and the inflation swap spread. The nominal off-the-run spread is the difference between yields of the most recent and older nominal bonds of the same maturity offering almost identical cash flows (see Krishnamurthy (2002) for the US and Geyer, Kossmeier, and Pichler (2004) internationally). Following Pflueger and Viceira (2016), we construct the off-the-run spread by estimating a nominal yield for a particular maturity using the cross-section of all bonds (most of which are off-the-run) and subtracting the on-the-run yield from Bloomberg. Pflueger and Viceira (2016), among others, propose this spread as an indicator of the overall demand for liquidity (higher spreads indicating stronger demand and higher liquidity premiums). Although the off-the-run spread is not directly linked to the liquidity of inflation-linked bonds, a voluminous literature, starting with Chordia, Sarkar, and Subrahmanyam (2005), suggests that there is strong commonality in liquidity between different markets.

The relative outstanding amount of inflation-linked bonds is the nominal value of outstanding inflation-linked bonds divided by the nominal value of outstanding inflation-linked and nominal bonds. This variable reflects the general market development of the inflation-linked market, as more debt outstanding likely implies a more comprehensive term structure of inflation-linked debt, more regular issue calendars etc. The outstanding amount may also be correlated with trading volumes, a variable we were unable to track down for the French market. We obtain the data on

13

nominal outstanding amounts of nominal and inflation-linked debt from the Agence France Trésor, for France, from the United Kingdom Debt Management Office for the UK, and from the Bank of International Settlements for the US.

The inflation-swap spread is defined as the rate on a zero-coupon inflation swap position paying fixed and receiving floating minus the difference between the zero-coupon nominal and inflation-linked yields. The inflation swap quote is the risk neutral expectation of future inflation and thus essentially represents inflation compensation (including expected inflation and the inflation risk premium). The nominal yield which is subtracted, also incorporates inflation compensation. In the absence of market frictions and liquidity differences, this spread should therefore be 0, as the inflation-linked yield would simply correct for the real yield. The inflation swap spread should therefore reflect the liquidity premium embedded in inflation-linked yields. Fleckenstein et al. (2014) show that the spread varies substantially over time. Because the spread is in principle arbitrageable, they also link it to the strength of arbitrage activity in debt markets.[6] Following Pflueger and Viceira (2016), we use the end of month 5 year inflation swap spread, with the inflation swap rate taken from Bloomberg.

Finally, we include a coarse measure of market development, the log of the number of months since inception. It is typically the case that early inflation-linked programs are associated with poor liquidity, uncertainty about the viability of the market, incomplete availability of bonds along the maturity spectrum and irregular issuance calendars (e.g., Campbell et al., 2009). From that perspective the UK has a much longer experience with inflation-linked debt than the other countries. However,

---

[6]To and Tran (2019) argue that inflation swaps may exhibit overpricing, which would bias our liquidity premium estimates upwards; Fleckenstein (2013), describing the G7 inflation swap markets, argues that the 5-10 year tenors are the most liquid.

because the variable only depends on time, it may also reflect trending behavior in the inflation risk premium. For example, Bekaert and Wang (2010) survey a large number of empirical studies on the inflation risk premium and show that studies with shorter, more recent samples tend to find smaller average inflation risk premiums.

We run a panel regression with monthly data including all three countries, imposing c_2 to be the same across countries. The results are very similar using quarterly observations. Table 3 first shows univariate results for each independent variable, with and without country fixed effects, before showing the full specification with all 4 independent variables and country fixed effects.

[Table 3 around here.]

In line with economic intuition, the off-the-run spread and inflation swap spreads have statistically significant negative coefficients, while the log share of total government debt accounted for by inflation-linked debt has a significantly positive coefficient. Months since inception has a negative coefficient which is only significant when country fixed effects are introduced. Thus, the nominal debt premium results suggest an upward trend in the liquidity premium that is stronger for the countries with more recent inflation-linked debt programs, but perhaps an economically more plausible explanation is that the negative coefficient captures the decrease in the inflation risk premium documented by several recent articles (among others, Chen et al. (2016), Song (2017), and D'Amico et al. (2018)). In specification 9, we use all 4 variables and country fixed effects. First, note that the adjusted R^2 is 56% suggesting the fit is good. The off-the-run spread is the only variable that is not significant. We therefore use specification 10 in our estimates of the liquidity premium, which only features the inflation swap spread, the log(share of inflation-linked debt) and log (months since

15

exception) and actually has a higher adjusted R^2 than Specification 9. Given that the log(months since inception of the inflation-linked bond program) variable is statistically significant, we include it as a regressor in the nominal debt premium regression in order to avoid an omitted variable bias on our estimated coefficients. However, we do not include it to compute the liquidity premium given that it likely captures inflation risk premium dynamics. That is, the liquidity premium is only computed using the inflation swap spread and log(share of inflation-linked debt)-variables from that regression. While we think this approach represents the most sensible choice economically, given that the interpretation of the log(months since inception of the inflation-linked bond program)-variable is somewhat ambiguous, we conduct two robustness checks. First, we do not include the log(months since inception of the inflation-linked bond program)-variable into the nominal debt premium regression and do not include it into the liquidity premium estimation. Second, we include the log(months since inception of the inflation-linked bond program)-variable into the nominal debt premium regression and also use it to compute the liquidity premium along the inflation swap spread and log(share of inflation-linked debt)-variables. Our main results hold in both cases and are presented in Online Appendix IV.A. Panel A of Figure 2 graphs the three estimated liquidity premiums over time. Further robustness checks are described in Section IV.F.1.

[Figure 2 around here.]

B.   Liquidity and Inflation Risk Premiums

Given the presence of fixed effects and the use of the nominal debt premium on the left hand side, it is impossible to tie down the level of the liquidity premium. This is immaterial for most of our results, which focus on volatility, variance decompositions,

16

and comovements. However, to graph the liquidity and inflation risk premiums, and report averages, we follow Gürkaynak et al. (2010), normalizing the level of the liquidity premium to zero at the point in time at which it was the lowest. Once the liquidity premium is identified, we identify real rates from inflation-linked yields using equation (2), and the inflation risk premium is simply:

(4) $\varphi_t^n = y_t^n - E_t[\pi_{t+n,n}^n] - r_t^n.$

In Table 4, we produce characteristics of liquidity (left panel) and inflation risk premiums (right panel). Liquidity premiums are around 50 basis points on average in France and the US, but around 1% in the UK. In the US, the liquidity premium decreases significantly from 74 to 31 basis points, which is not surprising given that liquidity premiums were high during the Great Recession. However, in the UK the liquidity premium is stable and in France it increases slightly. This may be related to the continuing poor economic conditions in Europe.[7] Liquidity premiums vary substantially through time, especially in the US and the UK where the standard deviation is 40-45 basis points. In France, it is only 29 basis points. In the UK and the US, the standard deviation of the liquidity premiums has decreased to French levels (UK) or even lower (the US) in the second part of the sample. Liquidity premiums comove positively across countries, with correlations in the 0.25 to 0.50 range. Such correlation is not surprising: Panyanukul (2010) shows strong commonality of liquidity risk in international government bond markets, finding the US market to be an important source of global liquidity risk. These correlations have decreased over time,

---

[7]Pflueger and Viceira (2016) use a different normalization for the liquidity premium, but their estimates are 82% correlated with ours over the overlapping sample. Our UK liquidity premium estimates are not comparable to Pflueger and Viceira (2016). First, they only study bond liquidity for 20 year maturity bonds, while we focus on maturities of 10 years and below. Second, they do not use the inflation swap spread as a liquidity proxy for the UK, while we find it to be the most statistically and economically significant liquidity proxy.

particularly between France and the other countries. This decrease is statistically significant for the US-France pair.

[Table 4 around here.]

Inflation risk premiums are on average quite small in France (27 basis points) and the US (10 basis points), but larger in the UK (67 basis points). They have decreased substantially over time, in a statistically significant manner, in all three countries and are now negative in the US and France. This confirms the claim in Chen et al. (2016) that the recent decrease in inflation compensation in the US can be attributed to lower inflation risk premiums. Their volatility is about 35-45 basis points, which has decreased over time to 25-35 basis points. Inflation risk premiums are positively correlated across countries (e.g. the correlation between US and French inflation risk premiums is round 60%). However, UK inflation risk premiums of late have decoupled from the ones in the US and France, with correlations dropping to -0.04 for the UK and France, and -0.33 for the UK and the US.

We graph the inflation risk premiums in Panel B of Figure 2. At the height of the Great Recession (roughly at the end of 2008 to the first quarter of 2009), there is a downward spike in the inflation risk premium, which coincides with an upward spike in the liquidity premium (see Panel A of Figure 2). While highly positive liquidity and low inflation risk premiums are not surprising during such crisis times, the particular sharp decrease of the inflation risk premium may have been partially affected by dislocations in the TIPS market (e.g. Huebscher, 2009). The unwinding of Lehman's portfolio after its bankruptcy caused a sharp increase in TIPS yields, which, in turn, contributed to the sharp decrease in the inflation risk premium.

18

C. Real Rates

Given liquidity premium estimates, we can now identify real rates. In Table 5, we report the statistical properties of real yields. Real rates have been unusually low during this sample period, being negative on average for the full sample (note again that unconditional levels are not exactly identified, given that the level of the liquidity premium is not pinned down). Real rates dropped steeply over the sample period, being on average in the -6 to 59 basis points range for the first sample period, while being robustly negative in the second (varying between -42 basis points for the US to -2.76% for the UK). The decreases are statistically significant for France and the UK.

[Table 5 around here.]

The volatility of real rates decreases sharply from the first to the second sample for all three countries with the decrease steepest for the UK (by almost 1%). Overall, real rates are highly correlated across countries (correlations between 0.54 for the US and France and 0.91 for the UK and France). When viewed over the two sample periods, correlations decrease everywhere, mildly so for France and the UK, but more steeply for the other correlations. These correlations are now quite low at -0.51 for the France-US and -0.20 for the UK-US correlation, and the betas with respect to US rates are significantly negative in the second subsample for both France and the UK. Figure 3 graphs the real yields illustrating these patterns. Overall, cleansing inflation-linked yields from the effects of liquidity premiums does not change the properties of real yields all that much (compare Table 5, with Table 1, right panel).

[Figure 3 around here.]

19

D.   Variance Decompositions

With all the components identified, we now determine their contribution to the observed yield variation. We begin with nominal yields. In Table 6 (Panel A), we show variance decompositions of nominal yield variation into the variation of its three components. To keep the decompositions simple, we report $\frac{Cov(\text{component}_i, \text{nominal yield})}{Var(\text{nominal yield})}$, for $i =$ real yield, expected inflation, and inflation risk premium, respectively. This assigns the covariance terms equally to the three components and the three components add to 100%. The main message is that real yield variation is the dominant component of the yield variation for all three countries and both sample periods. The exact magnitude, the variation over time and what other components are important vary across countries.

[Table 6 around here.]

For France, real yield variation accounts for about 77% of nominal yield variation in the first sample period, 85% in the second, and 75% overall. The remainder is mostly accounted for by the inflation risk premium, except in the second subsample where expected inflation accounts for almost 15% of the total variation. For the UK, real yield variation accounts for about 115% of nominal yield variation in the first sample period, 135% in the second, and 110% overall. Ratios above 100% occur when there are other, negative covariance contributions, and for the UK real yields and expected inflation are negatively correlated. A negative correlation between real yields and expected inflation is inconsistent with activist monetary policy, but during our sample may be partially driven by longer term offsetting trends in expected inflation (up) and real yields (down). The contribution of the inflation risk premium is positive overall and in the first subsample, but it is strongly negative (<-30%) in the second subsample), because

20

the correlation between the inflation risk premium and real yields was negative then.

For the US, real yield variation accounts for about 75% of nominal yield variation in the first sample period, almost 100% in the second, and 75% overall. The contribution of expected inflation is mostly larger overall than in the other countries, but still smallish at about 10%, and it drops to close to zero in the second subsample. The inflation risk premium accounts for about 15% of the total nominal yield variation over the full sample, but the share becomes slightly negative in the second period. Even though real yields and inflation risk premiums decreased over time, they show a positive covariation in the first sample period but a negative covariation in the second subsample resulting in the negative contribution of the inflation risk premium to nominal yield variation.

We can do a similar decomposition for inflation-linked yields, splitting them in real yields and liquidity premiums. The results are in Table 6, Panel B. Again, real yields dominate, accounting for between 82% and 122% of the total variation of inflation-linked yields. The numbers are often above 1, because the covariance between liquidity premiums and real yields is mostly negative.

The real yield dominance is such that if we simply split up nominal interest rates in inflation-linked yields and the remainder (inflation compensation), it is still the case that inflation-linked yields dominate the variation of nominal interest rates. This decomposition does not require measurement of the liquidity premium, but, unlike our main decompositions, is difficult to interpret economically. These results are in Online Appendix IV.B.

21

E. Comovement Decompositions

In Table 7, we report a decomposition of the international correlation between nominal yields. Recall that these correlations were generally high, but decreased in the second part of the sample, with the decrease particularly dramatic for the French - US correlation. Because the nominal yield has three components, there would be nine components in a full correlation decomposition. We therefore report a simpler decomposition, analogous to the one reported for the variance. We compute the covariance with the three components of the nominal yield in one country with the nominal yield in the other country, but scale all of them by the product of the nominal yield standard deviations so that the 3 numbers sum to the total correlation. We can do this decomposition from the perspective of the two countries, but they provide a clear picture of what component dominates the correlation. Overwhelmingly, it is the covariance between real yields across countries that constitutes the most important component of the total correlation.

[Table 7 around here.]

This is always true over the full sample with the real yield covariance accounting for 0.74 (French perspective) or 1.03 (UK perspective) of a 0.93 correlation for French-UK nominal yields, for 0.53/0.40 of a 0.67 French-US correlation and for 0.94/0.58 of a 0.85 UK-US correlation. The second most important component is invariably the inflation risk premium with expected inflation even providing a negative contribution to the France-UK correlation.

For the first subsample, the overall correlation remains positive and the overall result in terms of relative contribution, with real rates dominating followed by inflation

22

risk premiums, mostly holds. For the second subsample, the results are slightly different. For France and the UK, the nominal yield correlation is still robustly positive and dominated by real yield comovements: 0.63 of 0.61 from the French perspective and 0.89 of 0.61 from the UK perspective. Expected inflation is now more important than inflation risk premiums, with the latter's contribution now negative. For France and the US, the nominal yield correlation drops to -0.38. Clearly, the negative correlation is driven by the highly negative covariance between the French and US real yields, which show up in the real yield component from both perspectives. Again, expected inflation is not important, but from the US perspective there is a strong positive contribution of the inflation risk premium component. The UK-US nominal yield correlation is close to zero: relatively large and positive contributions of inflation risk premiums are partially offset by negative contributions of real yields and expected inflation.

Table 7 Panel B investigates the cross-country correlation decompositions of inflation-linked yields. It shows that, as for nominal yields, real yield correlations are the main driver of correlation levels and their time variation. This is also true for the negative correlations observed between French and US and between UK and US real yields in the second sample.

F.   Robustness Checks

In this section, we summarize the results of a number of robustness exercises regarding the measurement of various inputs to the computations.

1. Measurement of the Liquidity Premium

We conduct four robustness checks. First, we consider a model where we only use the inflation swap spread as an independent variable. The temporal evolution of the other variables we use may correlate with that of inflation risk premiums, which would bias our estimates. For example, the inflation-linked debt issuance volumes may depend on the magnitude of the inflation risk premium. Our results, reported in Online Appendix IV.C, are robust, which is not surprising given that the inflation swap spread has by far the highest explanatory power for variation in the nominal debt premium.[8] Our results also remain robust when we explicitly impose the coefficient of -1 on the inflation swap spread in the liquidity premium regression (3). This would correspond to the assumption that inflation swap spreads are perfectly liquid, as in Haubrich et al. (2012), an assumption nonetheless criticized by Christensen and Gillan (2012) and To and Tran (2019).

Second, we verify the usefulness of an alternative general liquidity measure, namely, Hu, Pan, and Wang's (2013) "noise measure," which measures the pricing errors of fitted yields. We describe the calculations in Online Appendix IV.D and then repeat the liquidity premium estimation exercise of Table 3. Because the Hu et al. (2013) measure is insignificant when we add our other liquidity proxies, we do not include it in the specification we report. However, including it does not affect any of our conclusions.

Third, in Online Appendix IV.E we re-estimate the models country by country rather than in a panel. All our results remain robust.

Finally, the liquidity premium is estimated with error as it relies on the fitted

---

[8]Note that the inflation swap *spread* is the rate on a zero-coupon inflation swap position paying fixed and receiving floating minus the difference between the zero-coupon nominal and inflation-linked yields. Thus, unlike the inflation swap *rate*, it does not have a strong relationship with the spread between nominal and index-linked debt by (near) arbitrage.

value of a panel regression. To assess the effect of this sampling error, we draw 10,000 possible coefficient vectors from their asymptotic distribution, recompute the liquidity premiums, and then recompute our variance and correlation decompositions. Online Appendix IV.F shows 95% confidence intervals for our estimates. The confidence intervals are rather tight, and our conclusions regarding the primary importance of real rate variation remain intact. For the variance decomposition, both for nominal yields and inflation-linked yields, the confidence intervals for the other components do not overlap at all with that for the real yield contribution. As a concrete example, the US real yield accounts for 75% of the variation of the US nominal yield, with a confidence interval of [67%, 83%], whereas the upper bound of the confidence interval for the inflation risk premium contribution is 23%. Similarly, with one exception, we get non-overlapping confidence intervals for the different contributions to the yield correlations across countries. For example, for the France-UK nominal yield correlation (from the French perspective), the real yield contribution is 0.74 with a confidence interval of [0.66, 0.82], whereas the upper bound to the inflation risk premium contribution is 0.22. In many cases the confidence intervals are quite a bit tighter than the ones reported here.

2. Measurement of Inflation Expectations

As a first robustness check, we use alternative inflation surveys to the ones used in our main specification. There also exist Consensus Economics survey forecasts for France and the US, and we recompute our variance and correlation decompositions using survey long-term expected inflation from the semi-annual Consensus Economics survey for all three countries. The results are in Online Appendix III.B for the case

where we do not change the forecasts in between data releases (but they are almost identical under linear interpolation in between dates). For the US, the Blue Chip survey also produces long-term inflation forecasts, but they are also only available semi-annually. In Online Appendix III.B we also generate our results using that survey, coupled with the Consensus Economics surveys for the UK and France. Again, our results prove robust. This is not surprising, as the forecasts produced by the surveys are very similar. To illustrate this fact, Figure 4 shows the forecast from the three different surveys for the US. This similarity is likely driven by the fact that many survey respondents in the various surveys overlap.

[Figure 4 around here.]

As an alternative to survey expectations, we compute a statistical estimate of 5 year expected inflation, based on a country-specific vector autoregression (VAR) with quarterly data. The VAR variables include the 3 month nominal short rate, realized quarterly inflation, and either one quarter (for the US) or one year inflation survey forecasts (for France and the UK). We use a lag length of 2 (the BIC optimal length for the realized quarterly inflation is 1 or 2 depending on the country). We also correct the parameter estimates for small sample bias. This is done by re-sampling 10,000 time series of historical length under the estimated parameters (that is, the VAR residuals are bootstrapped and the actual series recreated using the VAR parameters), re-estimating the VAR parameters for each time series and computing the bias as the difference between the average of the parameters estimated from the 10,000 sampled series and the parameters used to simulate. From the VAR, we can compute the forecast for 5 year (20 quarter) future (annualized) inflation. Because our yield data are monthly, we simply keep the forecast the same within a quarter. However, linearly

26

interpolating the forecasts to monthly data has no material impact on our results. Statistical expected inflation is slightly more (less) variable in the US and France (the UK), compared to the survey forecasts, but its overall variability remains very low. It is therefore not surprising that our key result, that real rates dominate the variation in nominal yields and are the main driver of nominal yield comovements across countries, remains robust with the statistical measure of inflation. These results are reported in Online Appendix III.C.

G.   Results for Other Maturities

We repeat our reduced-form analysis for 2 and 10 year bonds. The 2 year maturity is the shortest for which we can reliably use inflation-linked bonds (Gürkaynak et al., 2010). This is because at shorter maturities indexation lag effects and specific trading associated with them become a significant concern. This is especially true in the UK, where the indexation lag for bonds issued pre-2005 is 8 months (it is 3 months for post-2005 bonds; in France and the US the indexation lag is 2.5 months). D'Amico et al. (2018) argue that the indexation lag effects can still be significant at maturities between 2 and 4 years. Thus, we provide 2 year results only as suggestive additional evidence. The second new maturity we introduce is 10 years. This choice is driven by the lack of longer-term survey inflation expectations.

The results in Online Appendix V confirm the dominant role of real yields in variance and correlation decompositions of 2 and 10 year yields. The 2 and 10 year yields decompositions are very similar to 5 year yields decompositions. For example, for French 10 year nominal yields, $\frac{Cov(\text{real yield, nominal yield})}{Var(\text{nominal yield})}$=74.14%,

$\frac{Cov(\text{expected inflation, nominal yield})}{Var(\text{nominal yield})}$=3.80%, and $\frac{Cov(\text{inflation risk premium, nominal yield})}{Var(\text{nominal yield})}$=22.07%,

while these numbers for 5 year bonds in Table 6 are 77.22%, 6.29%, and 16.49%, respectively.

V.   A No-arbitrage Term Structure Model

Our previous results rely on empirical proxies to inflation expectations and liquidity premiums to estimate the components of nominal yields in a model-free fashion. In this section, we use a no-arbitrage model with real and nominal factors to provide alternative estimates of our key decompositions. While the results so far appear very robust to different choices made, the use of a term structure model has the benefit of more efficiently using information in actual yields and imposing no-arbitrage restrictions across yields of different maturities. Section V.A outlines the model and discusses its estimation; the decomposition results are discussed in Section V.B. Finally, in Section V.C we explore implications for exchange rate dynamics.

A.   A No-arbitrage Term Structure Model with Real and Nominal Factors

Our model follows closely the Gaussian affine term structure literature (see e.g. Joslin, Singleton, and Zhu, 2011) where principal components of yields are used as factors, and prices of risk are linear in the factors. Our particular application closely follows the set up in Abrahams et al. (2016).

1. Model

We assume that a $K \times 1$ vector of pricing factors, X_t, evolves under the physical measure as:

$$(5) \quad X_{t+1} = \mu_X + \Phi(X_t - \mu_X) + \nu_{t+1},$$

where μ_X is the $K \times 1$ unconditional mean vector, Φ is a $K \times K$ matrix, and $\nu_{t+1} \sim \mathcal{N}(\mathbf{0}, \Sigma)$ with $\mathbf{0}$ a $K \times 1$ zero vector and Σ a $K \times K$ covariance matrix. We assume that the log-nominal stochastic discount factor is:

$$(6) \quad m_{t+1} = -r_t - \frac{1}{2}\lambda_t'\lambda_t - \lambda_t'\Sigma^{-\frac{1}{2}}\nu_{t+1},$$

where r_t is the nominal short rate and $\lambda_t = \Sigma^{-\frac{1}{2}}(\lambda_0 + \lambda_1 X_t)$ with λ_0 a $K \times 1$ vector and λ_1 a $K \times K$ matrix. Thus, the price of risk, λ_t, is linear in the state variables but shocks are homoscedastic (Duffee, 2002). This implies that the state variable dynamics under the risk-neutral measure are governed by the following parameters:

$$(7) \quad \tilde{\mu} = (I_{K\times K} - \Phi)\mu_X - \lambda_0,$$

$$\tilde{\Phi} = \Phi - \lambda_1,$$

where $I_{K \times K}$ is a $K \times K$ identity matrix.

It follows that the time t price of an n-period risk-free nominal zero-coupon bond, P_t^n, satisfies a set of recursive equations (with $A_0 = 0, B_0 = \mathbf{0}$):

$$(8) \quad \log P_t^n = A_n + B_n'X_t,$$

$$A_n = A_{n-1} + B_{n-1}'\tilde{\mu} + \frac{1}{2}B_{n-1}'\Sigma B_{n-1} - \delta_0,$$

$$B_n' = B_{n-1}'\tilde{\Phi} - \delta_1',$$

where δ_0 is a constant and δ_1 is a $K \times 1$ vector.

So far, the model is a standard nominal term structure model, pricing nominal yields. To price zero coupon inflation-linked bonds, we use the fact that such bonds pay

29

out gross inflation at maturity. This requires a model for inflation. Following Abrahams et al. (2016), we assume that inflation is an affine function of the K pricing factors, X_t: $\pi_0 + \pi_1' X_t$. It follows that the time t price of an n-period risk-free inflation-linked zero-coupon bond, $P_{t,il}^n$, satisfies a set of recursive equations, with $A_{0,il} = 0$, $B_{0,il} = \mathbf{0}$:

$$(9) \quad \log P_{t,il}^n = A_{n,il} + B_{n,il}' X_t,$$

$$A_{n,il} = A_{n-1,il} + (B_{n-1,il} + \pi_1)' \tilde{\mu} + \frac{1}{2}(B_{n-1,il} + \pi_1)' \Sigma (B_{n-1,il} + \pi_1) - \delta_0 + \pi_0,$$

$$B_{n,il}' = (B_{n-1,il} + \pi_1)' \tilde{\Phi} - \delta_1'.$$

2. Factors

We estimate the model country-by-country. To bring the model to the data, the factors X_t must be determined. All factors are assumed to be observed. First, we specify nominal factors as the smallest number of principal components of nominal yields, which together explain over 99.5% of the yield variation. We use 1 month, and 1-10 year nominal zero-coupon yields for each country (11 yields in total) to extract principal components.[9] This procedure results in 3 factors for each country. We scale the factors to have zero mean and unit variance.

Second, because we cannot assume that TIPS produce the real interest rate factors, we must specify a liquidity factor. The different sensitivity of nominal and real yields to this factor then implicitly determines the liquidity premium; so that, liquidity-adjusted yields can be constructed. We assume that the liquidity factor is an affine function of the inflation swap spread. Compared to alternative specifications such as using a weighted average of several standardized liquidity proxies (the inflation swap

---

[9]For France only bonds of maturity 1 month, 3, 6, 9 months, 1 year, 2, 5, 10, and 30 years are available. We construct the missing maturities (3, 4, 6, 7, 8, and 9 years) by fitting the Svensson (1994) zero-coupon model to French nominal bonds. This estimation procedure, excluding bonds with maturities below (above) 6 months (15 years) and all strips, achieves a near perfect fit for maturities reported on the Banque de France website.

spread, the log of the share of inflation-linked debt, and the nominal off-the run premium) or the first principal component of these proxies, this results in a slightly better model fit, but our conclusions are robust across these alternative specifications. We use the 5-year inflation swap spread, but the maturity has only a minor effect on the results. We also do not find that adding other liquidity proxies as separate pricing factors improves the model fit or affects the decomposition outcomes.

Third, given these two sets of factors, we determine a set of real factors, by regressing zero-coupon inflation-linked yields on our nominal and liquidity factors and pick the smallest number of principal components which explain over 99.5% of the residual variation as our real factors. We use 2-10 year inflation-linked zero-coupon yields (9 in total) for the US and France and 4-10 year inflation-linked zero-coupon yields (7 in total) for the UK. We do not use shorter-maturity inflation-linked yields due to the indexation lag factors discussed above. For the UK we also do not use 2 and 3 year zero-coupon yields.[10] The procedure results in 2 real factors for the US and 3 real factors for France and the UK. We again scale the factors to have zero mean and unit variance.

These three sets of factors suffice to estimate the model. In this model, inflation, expected inflation and the inflation risk premium are completely driven by financial market information and no inflation data is used. Alternatively, we can incorporate survey inflation forecasts by adding expected and realized inflation as pricing factors and impose the corresponding restrictions on π_0 and π_1 (see, e.g., Kim and Orphanides, 2012). However, we prefer to obtain purely financial markets-implied inflation forecasts and contrast them with our reduced-form results which are obtained using only survey

---

[10]The Bank of England data have several missing values on yields and returns for those maturities, preventing their use.

inflation expectations. While we estimate the inflation-less model with similar results to our reported model, our main model also includes 1 month realized inflation as a factor, because it improves the fit of the model. Measures of real growth, such as industrial production or consumption growth, do not improve the fit, after controlling for the inflation factor. Importantly and on purpose, we do not impose any restrictions that inflation in the model should be related to our inflation factor: the model-implied inflation is just a linear combination of factors, which best fits the inflation-linked yields.

3. Estimation Results

We discuss the estimation procedure and report the parameter estimates in Online Appendix VI. Figure 5 shows the actual zero-coupon yields together with the model-implied yields for the 5 year maturity, showing them to be nearly indistinguishable. Table 8 shows the mean absolute and root-mean-square errors for 2-,[11] 5- and 10-year yields. The errors are always lower than 0.12%, and mostly 0.05% or lower; they tend to be slightly higher for the lowest maturity.

[Figure 5 around here.]

[Table 8 around here.]

Given the estimated parameters, expected inflation can be obtained as the difference between nominal and inflation-linked zero-coupon yields computed under the physical measure. This can be done by replacing $\tilde{\mu}$ and $\tilde{\Phi}$ with $(I_K - \Phi)\mu_X$ and Φ, respectively, in the nominal and inflation-linked bond pricing equations (8) and (9). The inflation risk premium can then be computed as the difference between the nominal and inflation-linked zero-coupon yields under the risk-neutral measure, computed

---

[11]4-year yields for the UK inflation-linked bonds due to the data issues discussed above.

32

exactly as in equations (8) and (9), minus expected inflation. To adjust for liquidity effects, we remove the component due to the liquidity factor from the nominal-inflation-linked yield spread under both the risk-neutral and physical measures while computing expected inflation and the inflation risk premium. Formally, in our model both nominal and inflation-linked bond prices load on the liquidity factor. Therefore, we refer to the difference between liquidity components of inflation-linked and nominal yields as the liquidity premium. Empirically, we find the contribution of the liquidity factor to nominal yields negligible.

B. Variance and Correlation Decompositions

The model generates results for any maturity. To enhance comparability with our previous results, we focus on 5-year yields, and also report results for 10-year yields. Table 9 reports our variance decompositions for the 5- and 10-year nominal and inflation linked yields. Panels A and B focus on 5 -year nominal and inflation-linked yields, which can be compared with the results in Table 6. The dominance of the real yield contributions is again very apparent. In panel A, its smallest contribution to the nominal yield variance is 60.58% for France in the second subsample. This is also the entry with the largest difference relative to Table 6, as the real yield contribution is 74.92% in our main specification in Section IV. The other numbers are remarkably close to the numbers in Table 6. In Panel B, the contribution of the real yield to inflation-linked yields is never lower than 73.80% (full sample for the US); the largest difference is the real yield contribution for the UK in the first subsample being 111.90% whereas it is 121.94% in the main specification. Overall, given the sampling error in these estimates, it is obvious that our main conclusions continue to hold. These results

33

also hold for 10-year yields in Panels C and D, with the relative real contributions being quite similar to those for 5-year yields.

[Table 9 around here.]

In terms of the relative contributions of the other components to nominal yield variation, we do obtain sometimes somewhat different results. For the full sample, it remains the case that the inflation risk premium has a higher variance contribution than expected inflation for all three countries, with the absolute magnitude even rather close (except for the US). The results differ the most for the second subsample. For example, for France, we now find a very large contribution of the inflation risk premium, but a negative one for expected inflation, whereas we obtain relatively similar positive 10-15% contributions for both components in the main specification. For the UK, the contribution of expected inflation is essentially zero in the main specification with the inflation risk premium contributing a negative 32%. The estimates of the term structure model make the inflation risk premium contribution even more negative and the expected inflation contribution solidly positive (at 29%). Similar results hold for 10-year yields. We conclude that the variance contributions generated by the term structure model are consistent with our main results, except for the relative contributions of expected inflation and the inflation risk premium in the second subsample.

Table 10 reports the correlation decomposition for 5-year yields, and should be compared with Table 7 for our main specification. Focusing first on Panel A, for nominal yields, the contribution of the real yield to the total correlation is remarkably similar to our numbers in Table 7. For the full sample, the real rate scaled covariance with the nominal yield (first country perspective) is respectively 0.69 for the France-UK pair; 0.50 for the France-US pair and 0.90 for the UK-US pair. The corresponding numbers

34

in Table 7 are 0.74, 0.53 and 0.94. Overall, the real rate contributions are insignificantly different from what we observe in Table 7. Again, there are somewhat large differences for the contributions of expected inflation and the inflation risk premium, especially in the second subsample. This is particularly the case for the pairs involving France, where the relative importance rank among expected inflation and the inflation risk premium changes between Table 7 and Table 10. Yet, these differences are economically and statistically not that large, given the dominance of the real yield contributions.

[Table 10 around here.]

In Panel B, the scaled covariances of real yields with inflation-linked yields are again very close between Tables 7 and 10. For the full sample, the real rate scaled covariance with the inflation-linked yield (first country perspective) is respectively 0.98 for the France-UK pair; 0.68 for the France-US pair and 0.81 for the UK-US pair. The corresponding numbers in Table 7 are 1.03, 0.72 and 0.83. Again, these differences are trivial, especially given the sampling error involved in the estimates. The largest difference we observe is that for the France-US pair; the real rate covariance contributes only 0.49 in the first subsample (second country perspective), whereas that number is 0.62 in Table 7.

We report the correlation decompositions for the 10-year yields in Online Appendix V. We again confirm that the real yield contributions dominate, and that the results are not that different from our results reported earlier.

C. Exchange Rate Dynamics

Let M_t^i be a time t nominal stochastic discount factor in country i and S_t the time t spot exchange rate between countries A and B. If the markets are complete, the

35

well-known no-arbitrage condition (e.g., Lucas, 1982) implies:

$$(10) \quad \frac{M_{t+1}^A}{M_{t+1}^B} = \frac{S_{t+1}}{S_t},$$

or $m_{t+1}^A - m_{t+1}^B = s_{t+1} - s_t$ in logs.

Equation (10) implies that state variables and shocks which span stochastic discount factors should also span exchange rate changes. However, Jotikasthira et al. (2015) find that stochastic discount factor state variables and shocks which price the term structure of international interest rates in Germany, the UK, and the US only explain 6.7%-10.5% of the variation in the corresponding exchange rate changes.

We repeat the exercise for our model by regressing monthly log nominal exchange rate changes on stochastic discount factor realizations computed following equation (6). We estimate the R^2's at 16.52%, 18.06%, and 13.74% for the USD-GBP, EUR-GBP, and EUR-USD pairs, respectively. These are somewhat higher values than in Jotikasthira et al. (2015). Of course, our values are far away from 100%, indicating that additional work is needed to understand the joint dynamics of interest and exchange rates.

This raises the question whether a model which fits exchange rates perfectly can fit yield dynamics. This question was addressed in Chernov and Creal (2019), in a model similar to ours. We therefore apply their "WFX model" to our specification in Section V.A, adding monthly USD-EUR and USD-GBP exchange rate changes as factors. Furthermore, we impose international no-arbitrage restrictions as in Chernov and Creal (2019). The model fits exchange rates by construction. In unreported results, we find that our variance and correlation decomposition results are almost indistinguishable from the results in Section V.B. This is very much in line with the conclusions of Chernov and Creal (2019) that the models with and without exchange rates imply almost identical bond yield dynamics. We choose not to include the WFX

36

model into this article instead of/in addition to the model we estimate above, as it is less parsimonious, but has the same implications for the issues we are studying.

VI. Extensions

In this section, we consider three extensions of our analysis. First, because the real yield in this article is a long-term yield, we decompose the results in a component due to expected future short rates (the expectations hypothesis or EH component, henceforth), and a component due to the real term premium. Second, we redo all the analysis using slopes rather than levels. Third, we expand our sample of countries to include Germany, Australia, and Sweden (over a shorter sample period).

A. The Expectations Hypothesis Decomposition

Real interest rates vary because of variation in expected future rates or variation in the real term premium. Unfortunately, neither component is observed. We identify expected future short rates using two approaches: a pure statistical model, and survey expectations. The first approach uses a VAR(2) model with short-term nominal interest rates, inflation and inflation expectations. The second approach uses Blue Chip survey forecasts for nominal rates in the US and then extrapolates a linear model on observables (expected real GDP growth and expected inflation) to France and the UK as in Wright (2011). Both methodologies forecast nominal short rates and use survey expected inflation to correct for expected inflation, but we check robustness with a statistical estimate of expected inflation. Full details on the methodology and results are provided in Online Appendix VII; here we provide a summary.

For the full sample, the EH component roughly contributes between 54 and 75%

of the total variance of the real yield depending on the country and the methodology. Its dominance is very prominent in the first subsample (where its contribution is at least 70%), but in the second subsample its contribution in the UK and France decreases in a statistically significant fashion to 6-12% in the UK and about 36% in France. In the US, its contribution decreases from 67-75% to 46-52%. We also compute the contribution of the two components to the correlations of real yields across countries. For the overall sample and the first subsample, the EH component is again the dominant component in driving the high and positive correlation between real yields across countries. The term premium is again relatively more important in the second subsample, with the results generally more mixed and somewhat dependent on the country perspective.

B. Evidence for Slopes

Slopes over a very short time period may be more informative about the economic forces driving interest rates, especially when interest rates show (near) non-stationary behavior. For example, if the short-term interest rate follows a driftless random walk, the term spread equals the term premium. More generally, the large changes observed in the means of nominal and inflation-linked interest rates across subsamples may not affect spreads as strongly.

We replicate all our earlier work on levels for slopes. Our measure of the nominal term spread is simply the 5-year yield minus the one quarter Treasury bill rate. Furthermore, we assume that the one quarter nominal yield equals the real yield plus one quarter expected inflation, where the latter is measured from survey data. That is, we assume the Fisher hypothesis holds at the one quarter horizon, rendering the inflation and liquidity risk premiums zero at the one quarter horizon.

38

Table 11 provides a summary of the results for nominal slopes, computed from the data, and real slopes, which follow from correcting the inflation-linked slopes for the liquidity premium. First, we show the usual statistical properties in terms of averages, standard deviations and correlations. It is indeed the case that neither nominal nor real slopes show statistically significant changes in means over the two subsamples, although real slopes increase by about 40 basis points in the US, and nominal and real slopes decrease substantially in France in the second subsample. We do observe that the standard deviations of both nominal and real slopes decreased over time, and in a statistically significant fashion. As with interest rate levels, nominal slopes are highly correlated across countries, but real interest rate slopes are somewhat less correlated (with the correlations varying between 26% and 70%). Almost invariably, slope correlations decrease over time, mostly in a statistically significant fashion. The real slope correlation between France and the US is negative in the second subsample.

[Table 11 around here.]

We also show how much our derived real slopes contribute to the variance of the nominal and inflation-linked slopes. We confirm our main result for levels: the real slope dominates. In the UK, the real rate slope contribution is 93% over the full sample but increases from 85 to slightly over 130% from the first subsample to the second. In the US and France, the real rate slope contribution varies between 73% and 86% over the three samples. The real rate slope also dominates inflation-linked yield slopes, with its contribution being never lower than 68%, which occurs for the UK in the first subsample. It exceeds 100% for the US in the second subsample.

In Online Appendix VIII we further verify the international correlation decomposition, analogous to what we did for levels, finding that the real part of the

39

nominal slope dominates overall correlations over the full sample. For the France-US pair, the contribution of the expected inflation slope is close to that of the real slope, however. The dominance of the real yield slope continues to hold for the cross-country inflation-linked slopes correlations.

C.   Additional International Evidence

Many inflation-linked debt markets have relative short histories and/or an insufficient number of bonds to reliably compute zero coupon bonds in the early stages of their development (see Ermolov, 2021 for more details). To expand our sample internationally to Germany, Sweden and Australia, we are forced to start the sample later, in 2011. Thus, this sample roughly coincides with our second subsample during which, for example, correlations between yields decrease. Nonetheless, we can still verify whether our main result, namely, the dominance of real rate variation, holds up for these other countries.

Full estimation details and the results are provided in Online Appendix IX. Note that we identify liquidity premiums in the three new countries separately as we could not assemble a consistent set of liquidity proxies for all three countries. First, we confirm for these countries that the bulk of nominal yield variation derives from the real rate, which accounts for 64% of nominal yield variation in Germany and Australia and over 100% in Sweden. In Germany and Australia the inflation risk premium is the second most important component. Second, nominal yields are generally highly correlated, with one exception. US yields, during this more recent period, show negative correlation with the yields of these other countries. All other correlations vary between 0.70 (Sweden and the UK) and 0.97 (France and Germany). While the latter high

correlation is not surprising, note that Australian and German/French yields are also more than 90% correlated. The correlation decomposition shows the real rate consistently to be the main variable behind these high correlations.

VII.   Conclusion

We reconsider an important decomposition of nominal bond yields into its real and inflation components in an international context, focusing on the US, UK, and France. We start the sample in 2004, because we want to alleviate the identification problem in the decomposition by using inflation-linked debt. With this period dominated by unusual monetary policies, we primarily focus on the 5 year yield, rather than short term rates. The key finding relative to earlier work is that the roles of expected inflation and real rates have changed. Inflation expectations show little variation and thus variance and cross-country co-movement decompositions show that expected inflation accounts for little of the variation in nominal yields. With stable inflation expectations, and moderately variable inflation risk premiums, real rate variation dominates the variation in nominal yields. Real rates correlate highly across countries for most of the sample period, but more recently the correlations have decreased substantially.

We establish these results in a model-free way, using survey inflation expectations and empirical estimates of the liquidity premium. We then confirm that they continue to hold from the perspective of a no-arbitrage Gaussian term structure model, where principal components of nominal and liquidity-adjusted real yields serve as factors (together with the level of inflation).

41

References

Abrahams, M.; T. Adrian; R. Crump; E. Moench; and R. Yu. "Decomposing Real and Nominal Yield Curves." *Journal of Monetary Economics*, 84 (2016), 182-200.

Adrian, T.; R. Crump, R.; and E. Moench. "Pricing the Term Structure with Linear Regressions." *Journal of Financial Economics*, 110 (2013), 110-138.

Ang, A.; G. Bekaert; and M. Wei. "Do Macro Variables, Asset Markets, or Surveys Forecast Inflation Better?" *Journal of Monetary Economics*, 54 (2007), 1163-1212.

Ang, A.; G. Bekaert; and M. Wei. "The Term Structure of Real Rates and Expected Inflation." *Journal of Finance*, 63 (2008), 797-849.

Aruoba, B. "Term Structures of Inflation Expectations and Real Interest Rates." *Journal of Business and Economic Statistics*, 38 (2020), 542-553.

Bai, J.; R. Lumsdaine; and J. Stock. "Testing for and Dating Common Breaks in Multivariate Time Series." *Review of Economic Studies*, 65 (1998), 395-432.

Bekaert G.; E. Engstrom; and A. Ermolov. "Macro Risks and the Term Structure of Interest Rates." *Journal of Financial Economics*, 141 (2021), 479-504.

Bekaert, G., and X. Wang. "Inflation Risk and the Inflation Risk Premium." *Economic Policy*, 64 (2010), 755-806.

Berardi, A., and A. Plazzi. "Dissecting the Yield Curve: The International Evidence." *Journal of Banking and Finance*, forthcoming (2021).

Campbell, J.; R. Shiller; and L. Viceira. "Understanding Inflation-Indexed Bond Markets." In *Brookings Papers on Economic Activity*, Spring (2009), 79-138.

Campbell, J.; A. Sunderam; and L. Viceira. "Inflation Bets or Deflation Hedges? The Changing Risks of Nominal Bonds." *Critical Finance Review*, 6 (2017), 263-301.

Chen, A.; E. Engstrom; and O. Grishchenko. "Has the Inflation Risk Premium Fallen? Is It Now Negative?" *FEDS Notes*, April 4, 2016.

Chernov, M., and D. Creal. "International Yield Curves and Currency Puzzles." Working paper, University of California Los Angeles and University of Notre Dame (2019).

Chordia, T.; A. Sarkar; and A. Subrahmanyam. "An Empirical Analysis of Stock and Bond Market Liquidity." *Review of Financial Studies*, 18 (2005), 85-129.

Christensen, J., and J. Gillan. "Could the U.S. Treasury Benefit from Issuing More TIPS?" Working paper, Federal Reserve Bank of San Francisco (2012).

Christensen, J.; J. Lopez, J.; and G. Rudebusch. "Inflation Expectations and Risk Premiums in an Arbitrage-Free Model of Nominal and Real Bond Yields." *Journal of Money, Credit, and Banking*, 42 (2010), 143-178.

D'Amico, S.; D. Kim; and M. Wei. "Tips from TIPS: the Informational Content of Treasury Inflation-Protected Security Prices." *Journal of Financial and Quantitative Analysis*, 53 (2018), 395-436.

Driscoll, J., and A. Kraay. "Consistent Covariance Matrix Estimation with Spatially Dependent Panel Data." *Review of Economics and Statistics*, 80 (1998), 549-560.

Duffee, G. "Term Premia and Interest Rate Forecasts in Affine Models." *Journal of Finance*, 57 (2002), 405-443.

Duffee, G. "Expected Inflation and Other Determinants of Treasury Yields." *Journal of Finance*, 73 (2018), 2139-2180.

Ermolov, A. "When and Where Is It Cheaper to Issue Inflation-linked Debt?" *Review of Asset Pricing Studies*, forthcoming (2021).

Evans, M. "Real Rates, Expected Inflation and Inflation Risk Premia." *Journal of*

Finance, 53 (1998), 187-218.

Evans, M.,"Real Risk, Inflation Risk, and the Term Structure." *Economic Journal*, 113 (2003), 345-389.

Fleckenstein, M. "The Inflation-Indexed Bond Puzzle." Working paper, University of Delaware (2013).

Fleckenstein, M.; F. Longstaff; and H. Lustig. "The TIPS-Treasury Bond Puzzle." *Journal of Finance*, 69 (2014), 2151-2197.

Förster, M., and P. Tillmann. "Reconsidering the International Comovement of Inflation." *Open Economies Review*, 25 (2014), 841-863.

Garcia, J., and A. van Rixtel. "Inflation-linked Bonds from a Central Bank Perspective." Working paper, European Central Bank (2007).

Garcia, J., and T. Werner. "Inflation Risks and Inflation Risk Premia." Working paper, European Central Bank (2010).

Geyer, A.; S. Kossmeier; and S. Pichler, "Measuring Systematic Risk in EMU Government Yield Spreads." *Review of Finance*, 8 (2004), 171-197.

Grishchenko, O., and J. Huang. "The Inflation Risk Premium: Evidence from the TIPS Market." *Journal of Fixed Income*, 22 (2013), 5-30.

Gürkaynak, R.; B. Sack; and J. Wright. "The U.S. Treasury Yield Curve: 1961 to the Present." *Journal of Monetary Economics*, 54 (2007), 2291-2304.

Gürkaynak, R.; B. Sack; and J. Wright, "The TIPS Yield Curve and Inflation Compensation." *American Economic Journal: Macroeconomics*, 2 (2010), 70-92.

Haubrich, J.; G. Pennachi; and P. Ritchken. "Inflation Expectations, Real Rates, and Risk Premia: Evidence from Inflation Swaps." *Review of Financial Studies*, 25 (2012), 1588-1629.

44

Hördahl, P., and O. Tristani. "Inflation Risk Premia in the Euro Area and the United States." *International Journal of Central Banking*, 10 (2014), 1-47.

Hu, G.; J. Pan; and J. Wang. "Noise as Information for Illiquidity." *Journal of Finance*, 6 (2013), 2341-2382.

Huebscher, R. "Uncovering the Mayhem in 2008 in the TIPS Market." *Advisor Perspectives Report*, August 4 (2009).

Joslin, S.; K. Singleton; and H. Zhu, "A New Perspective on Gaussian Dynamic Term Structure Models." *Review of Financial Studies*, 25 (2011), 926-970.

Jotikasthira, C.; A. Le; and C. Lundblad. "Why Do Term Structures in Different Currencies Comove?" *Journal of Financial Economics*, 115 (2015), 58-83.

Joyce, M.; P. Lildholdt; and S. Sorensen. "Extracting Inflation Expectations and Inflation Risk Premia from the Term Structure: A Joint Model of the UK Nominal and Real Yield Curves." *Journal of Banking and Finance*, 34 (2010), 281-294.

Kaminska, I.; L. Zhuoshi; J. Relleen; and E. Vangelista. "What Do the Prices of UK Inflation-linked Securities Say on Inflation Expectations, Risk Premia and Liquidity Risks?" *Journal of Banking and Finance*, 88 (2018), 76-96.

Kearns, J. "Global Inflation Forecasts." Working paper, Bank of International Settlements (2016).

Kim, D., and A. Orphanides. "Term Structure Estimation with Survey Data on Interest Rate Forecasts." *Journal of Financial and Quantitative Analysis*, 47 (2012), 241-272.

Krishnamurthy, A. "The Bond/Old-bond Spread." *Journal of Financial Economics*, 66 (2002), 463-506.

Lucas, R. "Interest Rates and Currency Prices in a Two-country World." *Journal of Monetary Economics*, 10 (1982), 335-359.

Mian, A., and A. Sufi. "The Great Recession: Lessons from Microeconomic Data." *American Economic Review*, 100 (2010), 51-56.

Monacelli, T., and L. Sala. "The International Dimension of Inflation: Evidence from Disaggregated Consumer Price Data." *Journal of Money, Credit, and Banking*, 41 (2009), 101-120.

Nelson, C., and A. Siegel. "Parsimonious Modeling of Yield Curves." *Journal of Business*, 60 (1987), 473-489.

Newey, W., and K. West. "A Simple, Positive Semi-definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix." *Econometrica*, 55 (1987), 703-708.

Panyanukul, S. "Liquidity and International Bond Pricing." Working paper, The University of Warwick (2010).

Parker, M. "How Global is "Global Inflation"?" *Journal of Macroeconomics*, 58 (2018), 174-197.

Pericoli, M. "Real Term Structure and Inflation Compensation in the Euro Area." *International Journal of Central Banking*, 34 (2014), 1-42.

Pflueger, C., and L. Viceira. "Return Predictability in the Treasury Market: Real Rates, Inflation, and Liquidity." In Pietro Veronesi (ed.) Handbook of Fixed-Income Securities, Wiley, NJ (2016), Chapter 10.

Risa, S. "Nominal and Inflation Indexed Yields: Separating Expected Inflation and Inflation Risk Premia." Working paper, Columbia University (2001).

Sack, B., and R. Elsasser. "Treasury Inflation-indexed Debt: A Review of the US Experience." *Economic Policy Review*, 10 (2004), 47-63.

Shen, P. "Liquidity Risk Premia and Breakeven Inflation Rates." *Economic Review*, 83 (2006), 29-54.

Song, D. "Bond Market Exposures to Macroeconomic and Monetary Policy Risks." *Review of Financial Studies*, 30 (2017), 2761-2817.

Svensson, L. "Estimating and Interpreting Forweard Interest Rates: Sweden 1992-1994." Working paper, Stockholm University (1994).

To, T., and N. Tran. "Cheap TIPS or Expensive Inflation Swaps? Mispricing in Real Asset Markets." Working paper, University of New South Wales and Virginia Polytechnic Institute and State University (2019).

Wright, J. "Term Premia and Inflation Uncertainty: Empirical Evidence from an International Panel Dataset." *American Economic Review*, 101 (2011), 1514-1534.
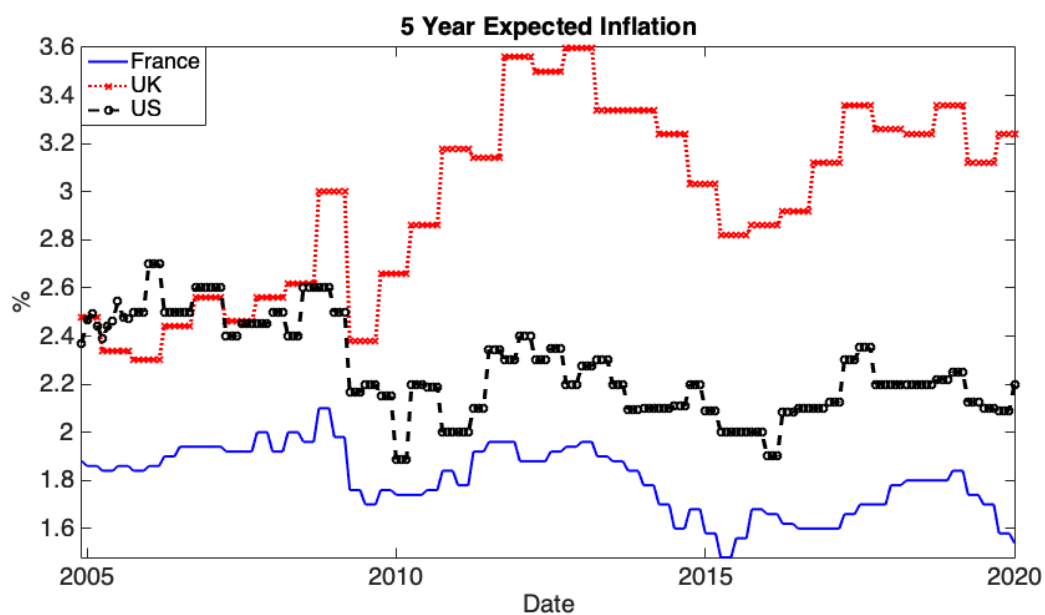
Figure 1 – Annualized 5 Year Survey Expected Inflation.
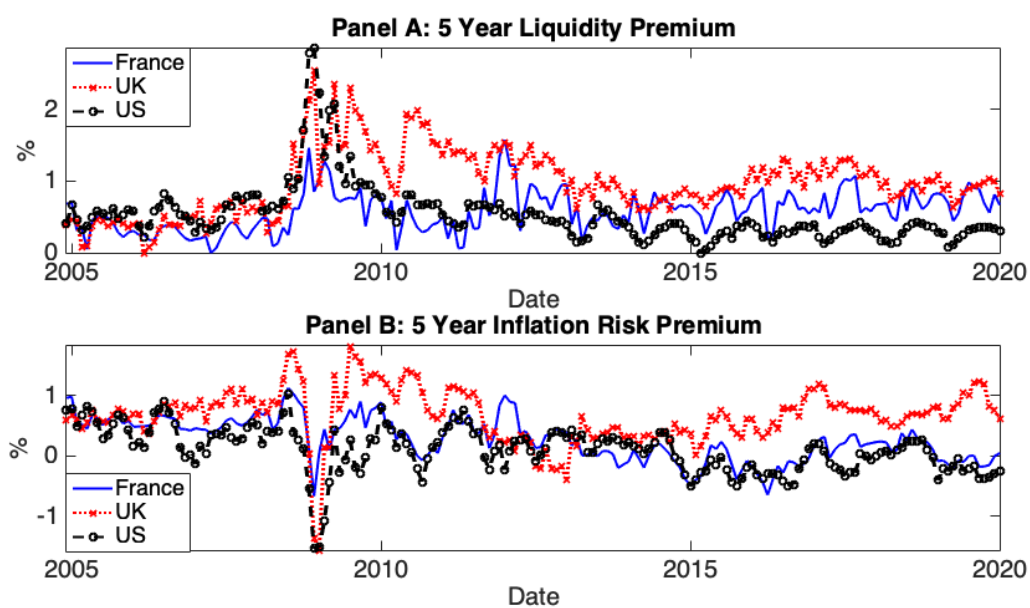
Figure 2 – Annualized 5 Year Zero-Coupon Liquidity and Inflation Risk Premia.

48
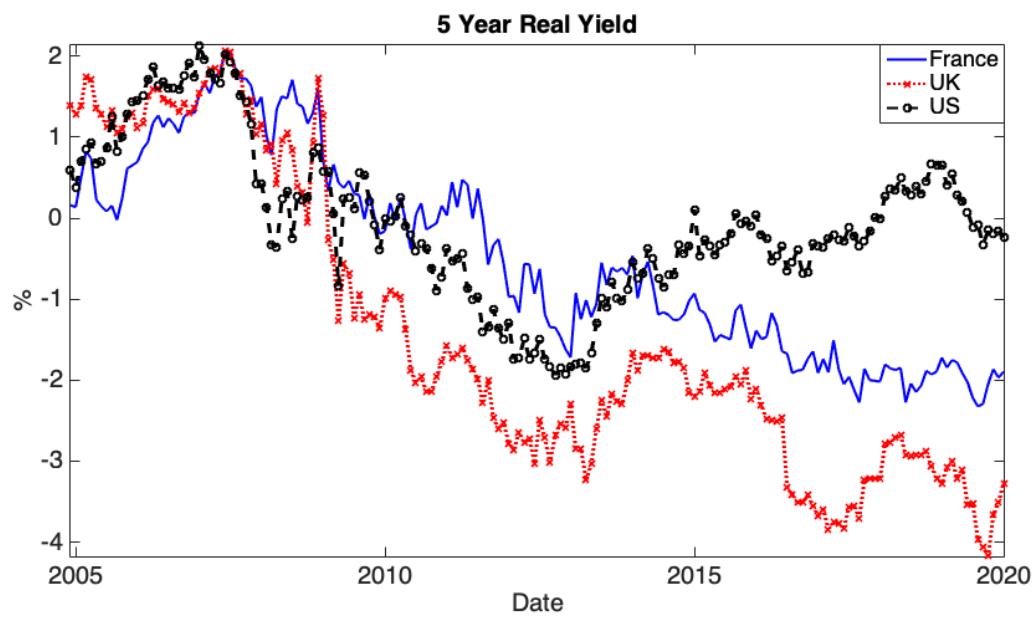
Figure 3 – Annualized 5 Year Real Yields.

Electronic copy available at: https://ssrn.com/abstract=3402785
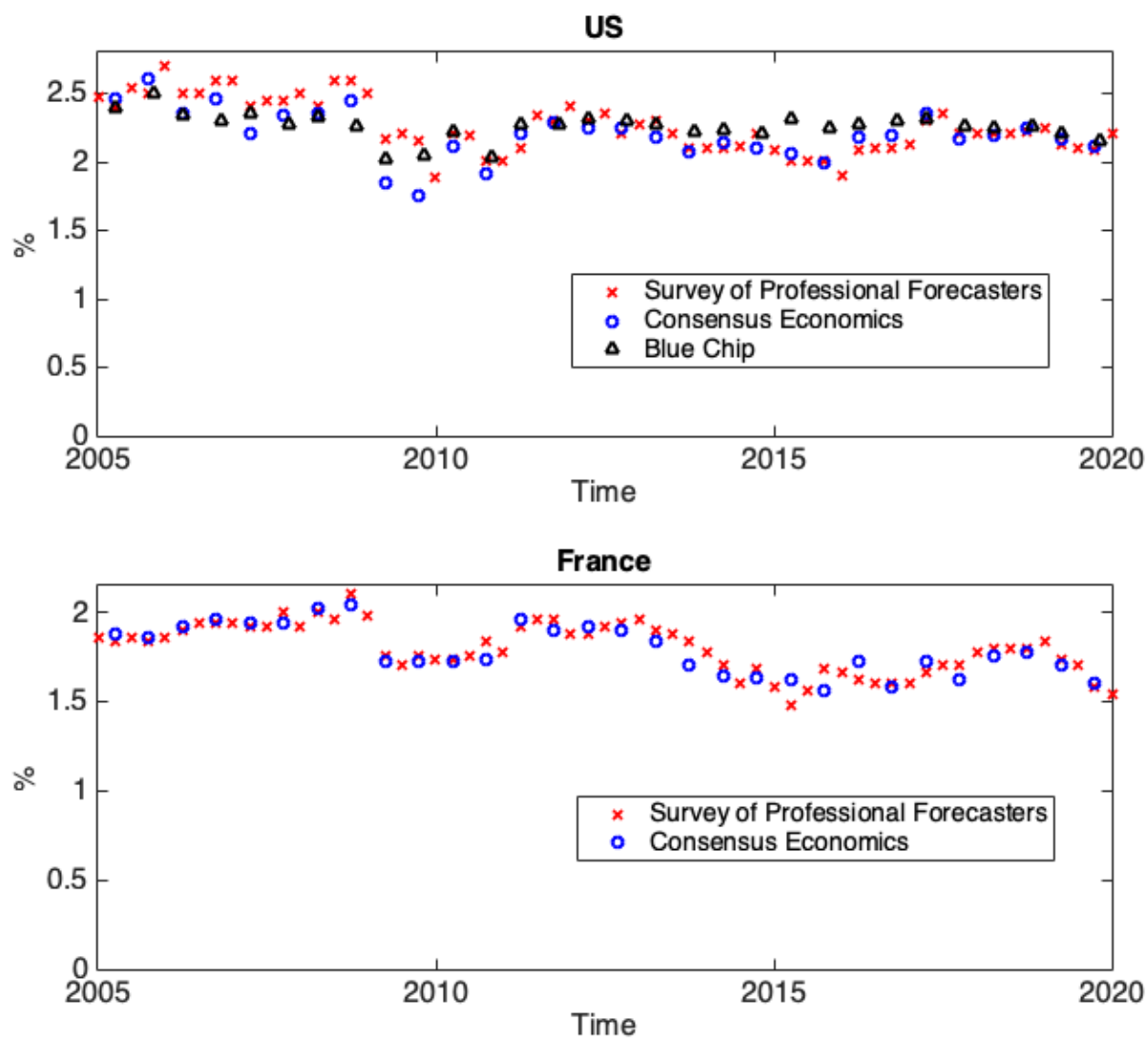
Figure 4 – 5 Year Expected Inflation From Different Surveys. The data are annualized.
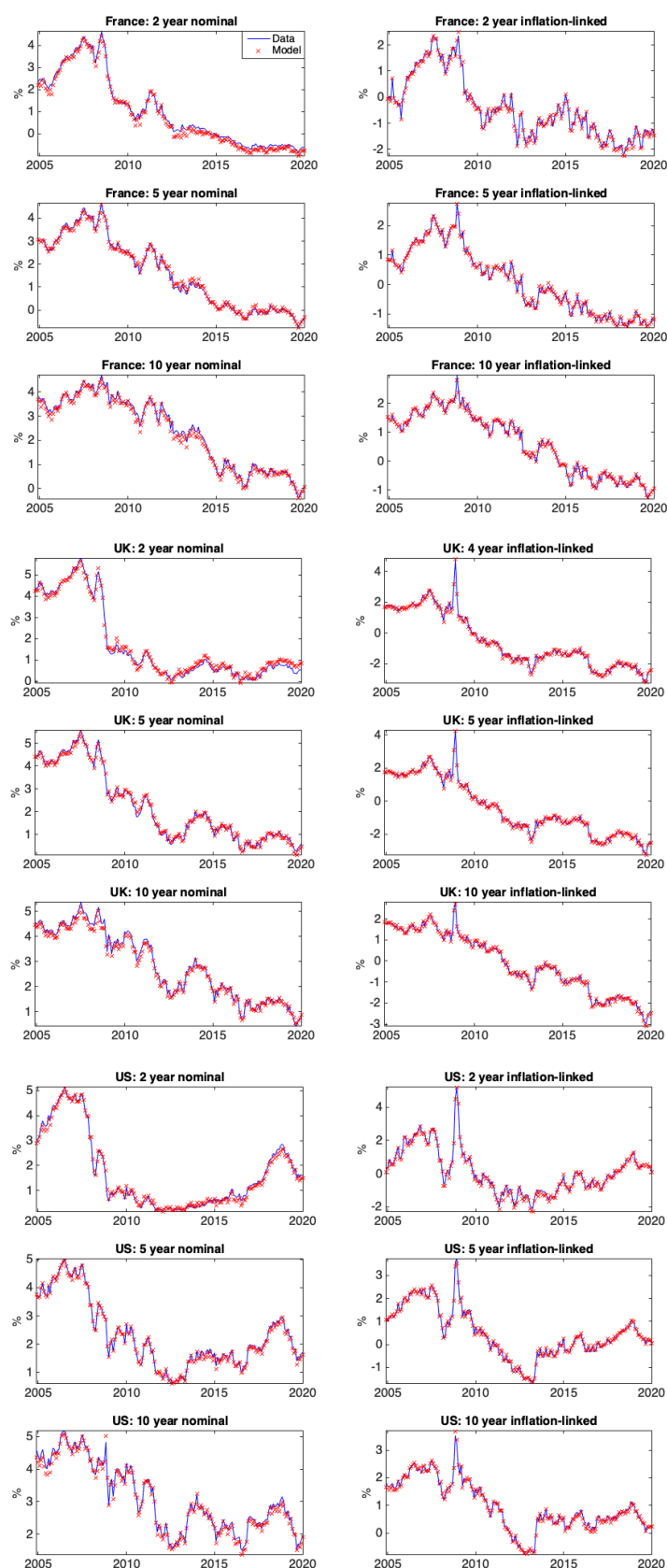
Figure 5 – Model Yield Fit. The sample is monthly 2004M11-2019M12. Yields are annualized zero-coupon yields.

Table 1 – Annualized 5 Year Observed Zero-Coupon Bond Yields. Data is monthly. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

	Nominal yields			Inflation-linked yields		
Full sample: 2004M11-2019M12						
	France	UK	US	France	UK	US
Average	1.61%	2.23%	2.32%	0.11%	-0.43%	0.48%
	(0.59%)	(0.56%)	(0.38%)	(0.43%)	(0.60%)	(0.38%)
Standard deviation	1.56%	1.58%	1.19%	1.12%	1.68%	1.10%
	(0.12%)	(0.16%)	(0.14%)	(0.12%)	(0.14%)	(0.12%)
β wrt US	0.89	1.13	1.00	0.68	1.19	1.00
	(0.18)	(0.10)		(0.17)	(0.19)	
Correlation with US	0.67	0.85	1.00	0.66	0.78	1.00
	(0.14)	(0.07)		(0.17)	(0.12)	
Correlation with UK	0.93	1.00	0.85	0.94	1.00	0.78
	(0.08)		(0.07)	(0.08)		(0.12)
Subsample 1: 2004M11-2012M5						
	France	UK	US	France	UK	US
Average	2.99%	3.47%	2.95%	1.08%	0.93%	1.08%
	(0.47%)	(0.72%)	(0.66%)	(0.36%)	(0.67%)	(0.57%)
Standard deviation	0.86%	1.32%	1.30%	0.67%	1.24%	1.15%
	(0.11%)	(0.18%)	(0.20%)	(0.09%)	(0.15%)	(0.15%)
β wrt US	0.51	0.95	1.00	0.46	1.01	1.00
	(0.09)	(0.09)		(0.05)	(0.05)	
Correlation with US	0.76	0.93	1.00	0.79	0.93	1.00
	(0.14)	(0.09)		(0.09)	(0.05)	
Correlation with UK	0.89	1.00	0.93	0.83	1.00	0.93
	(0.12)		(0.09)	(0.14)		(0.05)
Subsample 2: 2012M6-2019M12						
	France	UK	US	France	UK	US
Average	0.23%***	0.99%***	1.69%**	-0.86%***	-1.80%***	-0.12%***
	(0.18%)	(0.19%)	(0.24%)	(0.19%)	(0.29%)	(0.22%)
Standard deviation	0.53%	0.46%**	0.58%**	0.42%	0.60%**	0.63%**
	(0.11%)	(0.12%)	(0.17%)	(0.08%)	(0.10%)	(0.12%)
β wrt US	-0.35***	0.06***	1.00	-0.33***	-0.24***	1.00
	(0.19)	(0.07)		(0.08)	(0.13)	
Correlation with US	-0.38***	0.08***	1.00	-0.50***	-0.25***	1.00
	(0.21)	(0.08)		(0.13)	(0.13)	
Correlation with UK	0.61*	1.00	0.08***	0.76	1.00	-0.25***
	(0.11)		(0.08)	(0.11)		(0.13)

52

Table 2 – Annualized 5 Year Survey Expected Inflation and Nominal Debt Premium. Data is monthly. The nominal debt premium is defined as the difference between nominal yields and the sum of expected inflation and inflation-linked yields. GMM standard errors computed using 12 Newey-West (1987) lags are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

| | Full sample: 2004M11-2019M12 | | | | | |
| | Expected inflation | | | Nominal debt premium | | |
	France	UK	US	France	UK	US
Average	1.80%	2.97%	2.26%	-0.30%	-0.30%	-0.42%
	(0.05%)	(0.12%)	(0.06%)	(0.13%)	(0.14%)	(0.13%)
Standard deviation	0.14%	0.39%	0.19%	0.47%	0.60%	0.61%
	(0.10%)	(0.12%)	(0.10%)	(0.09%)	(0.07%)	(0.08%)
β wrt US	0.50	-0.81	1.00	0.36	0.63	1.00
	(0.10)	(0.43)		(0.10)	(0.09)	
Correlation with US	0.70	-0.41	1.00	0.47	0.64	1.00
	(0.14)	(0.21)		(0.13)	(0.09)	
Correlation with UK	-0.11	1.00	-0.41	0.60	1.00	0.64
	(0.22)		(0.21)	(0.15)		(0.09)
	Subsample 1: 2004M11-2012M5					
	Expected inflation			Nominal debt premium		
	France	UK	US	France	UK	US
Average	1.88%	2.73%	2.36%	0.03%	-0.20%	-0.49%
	(0.04%)	(0.18%)	(0.10%)	(0.12%)	(0.26%)	(0.26%)
Standard deviation	0.09%	0.38%	0.20%	0.41%	0.76%	0.82%
	(0.19%)	(0.22%)	(0.14%)	(0.11%)	(0.09%)	(0.12%)
β wrt US	0.29	-0.70	1.00	0.41	0.74	1.00
	(0.10)	(0.43)		(0.02)	(0.06)	
Correlation with US	0.63	-0.37	1.00	0.82	0.79	1.00
	(0.22)	(0.23)		(0.04)	(0.06)	
Correlation with UK	0.16	1.00	-0.37	0.91	1.00	0.79
	(0.15)		(0.23)	(0.04)		(0.06)
	Subsample 2: 2012M6-2019M12					
	Expected inflation			Nominal debt premium		
	France	UK	US	France	UK	US
Average	1.72%***	3.20%***	2.15%**	-0.64%***	-0.41%	-0.35%
	(0.04%)	(0.09%)	(0.04%)	(0.06%)	(0.09%)	(0.06%)
Standard deviation	0.13%	0.21%*	0.11%*	0.24%	0.36%**	0.26%
	(0.12%)	(0.17%)	(0.12%)	(0.06%)	(0.09%)	(0.06%)
β wrt US	0.72*	1.58***	1.00	0.70***	-0.09***	1.00
	(0.22)	(0.19)		(0.07)	(0.24)	
Correlation with US	0.61	0.78***	1.00	0.75	-0.06***	1.00
	(0.18)	(0.09)		(0.07)	(0.17)	
Correlation with UK	0.78***	1.00	0.78***	-0.08***	1.00	-0.06***
	(0.14)		(0.09)	(0.21)		(0.17)

53

Table 3 – Inflation-linked Bonds Liquidity Premia Estimation. The data is monthly 2004M11-2019M12. The panel regression is $y_{t,i} - y_{t,i}^{\text{IL}} - \pi_{t,i}^e = c_{1,i} + c_2' l_{t,i} + \epsilon_{t,i}$, where $y_{t,i}$ is zero-coupon yield in country i at time t, π_t^e is expected inflation, and l_t is the vector of liquidity proxies, which are assumed to be uncorrelated with the inflation risk premium, and $\epsilon_{t,i}$ is the error term. Regressions are for 5 year zero-coupon yields. Driscoll and Kraay (1998) standard errors computed with 12 lags are in parentheses. Asterisks *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

	Spec 1	Spec 2	Spec 3	Spec 4	Spec 5	Spec 6	Spec 7	Spec 8	Spec 9	Spec 10
Off-the-run premium	-2.91***	-2.90***							-0.33	
	(0.97)	(0.93)							(0.47)	
Inflation swap spread			-1.50***	-1.74***					-1.77***	-1.80***
			(0.34)	(0.27)					(0.31)	(0.33)
Log(share of inflation-linked debt)					0.24*	1.01**			0.51**	0.55**
					(0.14)	(0.44)			(0.23)	(0.23)
Log(months since inception)							-0.19	-0.66***	-0.63***	-0.63***
							(0.13)	(0.20)	(0.10)	(0.10)
Country-fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes
Adjusted R^2	9.40%	9.88%	37.73%	43.85%	2.00%	5.65%	2.01%	10.52%	58.08%	58.14%

54

Table 4 – Annualized 5 Year Zero-Coupon Liquidity and Inflation Risk Premia. Data is monthly. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

	Liquidity premium			Inflation risk premium		
Full sample: 2004M11-2019M12						
	France	UK	US	France	UK	US
Average	0.58%	0.97%	0.52%	0.27%	0.67%	0.10%
	(0.05%)	(0.12%)	(0.12%)	(0.10%)	(0.10%)	(0.07%)
Standard deviation	0.29%	0.45%	0.41%	0.36%	0.45%	0.39%
	(0.06%)	(0.11%)	(0.09%)	(0.07%)	(0.09%)	(0.07%)
β wrt US	0.17	0.53	1.00	0.60	0.42	1.00
	(0.07)	(0.10)		(0.11)	(0.25)	
Correlation with US	0.24	0.48	1.00	0.66	0.36	1.00
	(0.10)	(0.09)		(0.12)	(0.22)	
Correlation with UK	0.47	1.00	0.48	0.38	1.00	0.36
	(0.16)		(0.09)	(0.16)		(0.22)
Subsample 1: 2004M11-2012M5						
	Liquidity premium			Inflation risk premium		
	France	UK	US	France	UK	US
Average	0.50%	0.99%	0.74%	0.52%	0.79%	0.25%
	(0.10%)	(0.27%)	(0.18%)	(0.04%)	(0.10%)	(0.09%)
Standard deviation	0.34%	0.61%	0.47%	0.28%	0.52%	0.44%
	(0.09%)	(0.10%)	(0.12%)	(0.09%)	(0.11%)	(0.11%)
β wrt US	0.39	0.71	1.00	0.37	0.62	1.00
	(0.05)	(0.16)		(0.04)	(0.25)	
Correlation with US	0.54	0.55	1.00	0.59	0.53	1.00
	(0.07)	(0.13)		(0.07)	(0.21)	
Correlation with UK	0.54	1.00	0.55	0.46	1.00	0.53
	(0.13)		(0.13)	(0.21)		(0.21)
Subsample 2: 2012M6-2019M12						
	Liquidity premium			Inflation risk premium		
	France	UK	US	France	UK	US
Average	0.65%	0.95%	0.31%***	0.02%***	0.55%*	-0.04%**
	(0.03%)	(0.07%)	(0.02%)	(0.08%)	(0.12%)	(0.07%)
Standard deviation	0.20%***	0.19%***	0.13%	0.23%	0.34%	0.26%*
	(0.03%)	(0.08%)	(0.08%)	(0.08%)	(0.08%)	(0.09%)
β wrt US	0.34	0.55	1.00	0.56	-0.44***	1.00
	(0.16)	(0.14)		(0.10)	(0.30)	
Correlation with US	0.22**	0.36	1.00	0.62	-0.33***	1.00
	(0.11)	(0.09)		(0.11)	(0.23)	
Correlation with UK	0.36	1.00	0.36	-0.04*	1.00	-0.33***
	(0.06)		(0.09)	(0.27)		(0.23)

55

Table 5 – Annualized 5 Year Zero-Coupon Real Yields. Data is monthly. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

	France	UK	US
Full sample: 2004M11-2019M12			
Average	-0.46%	-1.41%	-0.04%
	(0.59%)	(0.56%)	(0.38%)
Standard deviation	1.23%	1.83%	0.97%
	(0.12%)	(0.16%)	(0.14%)
β wrt US	0.69	1.34	1.00
	(0.18)	(0.10)	
Correlation with US	0.54	0.71	1.00
	(0.14)	(0.07)	
Correlation with UK	0.91	1.00	0.71
	(0.08)		(0.07)
Subsample 1: 2004M11-2012M5			
Average	0.59%	-0.06%	0.34%
	(0.47%)	(0.72%)	(0.66%)
Standard deviation	0.77%	1.61%	1.07%
	(0.11%)	(0.18%)	(0.19%)
β wrt US	0.55	1.36	1.00
	(0.09)	(0.09)	
Correlation with US	0.77	0.90	1.00
	(0.14)	(0.09)	
Correlation with UK	0.81	1.00	0.90
	(0.12)		(0.09)
Subsample 2: 2012M6-2019M12			
Average	-1.51%***	-2.76%***	-0.42%
	(0.18%)	(0.19%)	(0.24%)
Standard deviation	0.48%	0.68%**	0.66%*
	(0.11%)	(0.12%)	(0.17%)
β wrt US	-0.38***	-0.21***	1.00
	(0.19)	(0.07)	
Correlation with US	-0.51***	-0.20***	1.00
	(0.21)	(0.08)	
Correlation with UK	0.75	1.00	-0.20***
	(0.11)		(0.08)

56

Table 6 – 5 Year Zero-Coupon Yield Variance Decompositions. Data is monthly 2004M11-2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

Panel A: Nominal yield variance decomposition

	France			UK			US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
$\frac{Cov(\text{real yield,nominal yield})}{Var(\text{nominal yield})}$	77.22%	84.80%	74.92%	112.67%	116.73%	134.58%	75.27%	77.68%	99.36%
	(3.62%)	(7.91%)	(8.12%)	(4.06%)	(8.41%)	(11.34%)	(7.57%)	(7.93%)	(14.10%)
$\frac{Cov(\text{expected inflation,nominal yield})}{Var(\text{nominal yield})}$	6.29%	5.64%	14.44%	-19.65%	-23.21%	-2.92%*	10.34%	9.19%	0.80%
	(1.18%)	(2.87%)	(3.29%)	(3.00%)	(6.75%)	(2.44%)	(2.75%)	(2.99%)	(4.20%)
$\frac{Cov(\text{inflation risk premium,nominal yield})}{Var(\text{nominal yield})}$	16.49%	9.56%	10.64%	6.98%	6.48%	-31.66%***	14.39%	13.13%	-0.17%
	(2.74%)	(5.69%)	(5.94%)	(4.61%)	(7.93%)	(12.85%)	(5.22%)	(6.91%)	(10.07%)

Panel B: Inflation-linked yield variance decomposition

	France			UK			US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
$\frac{Cov(\text{real yield,inflation-linked yield})}{Var(\text{inflation-linked yield})}$	107.30%	104.08%	105.77%	105.59%	121.94%	109.63%	81.74%	85.45%	102.31%
	(5.00%)	(14.53%)	(2.95%)	(6.43%)	(11.75%)	(8.19%)	(12.07%)	(16.46%)	(1.51%)
$\frac{Cov(\text{liquidity premium,inflation-linked yield})}{Var(\text{inflation-linked yield})}$	-7.30%	-4.08%	-5.77%	-5.59%	-21.94%	-9.63%	18.26%	14.55%	-2.31%
	(5.00%)	(14.53%)	(2.95%)	(6.43%)	(11.75%)	(8.19%)	(12.07%)	(16.46%)	(1.51%)

57

Table 7 − 5 Year Zero-Coupon Yield Correlation Decompositions. Data is monthly 2004M11–2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel A: Nominal yield correlation decomposition									
Panel A1: Country 1 perspective									
$\frac{Cov(\text{real yield}_1, \text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.74	0.78	0.63	0.53	0.67	-0.43***	0.94	1.12	-0.27***
	(0.04)	(0.10)	(0.05)	(0.11)	(0.14)	(0.15)	(0.09)	(0.12)	(0.11)
$\frac{Cov(\text{expected inflation}_1, \text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.05	0.03	0.01	0.03	0.02	-0.03	-0.19	-0.24	-0.03
	(0.01)	(0.03)	(0.05)	(0.02)	(0.02)	(0.07)	(0.04)	(0.06)	(0.12)
$\frac{Cov(\text{inflation risk premium}_1, \text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.14	0.08	-0.03**	0.11	0.07	0.07	0.09	0.06	0.38*
	(0.02)	(0.06)	(0.05)	(0.03)	(0.06)	(0.12)	(0.05)	(0.07)	(0.10)
Panel A2: Country 2 perspective									
$\frac{Cov(\text{real yield}_2, \text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	1.03	0.98	0.89	0.40	0.58	-0.73***	0.58	0.73	-0.05***
	(0.07)	(0.11)	(0.25)	(0.14)	(0.15)	(0.17)	(0.11)	(0.11)	(0.10)
$\frac{Cov(\text{expected inflation}_2, \text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	-0.16	-0.17	0.23**	0.11	0.09	0.05	0.11	0.09	-0.05***
	(0.02)	(0.07)	(0.08)	(0.02)	(0.04)	(0.03)	(0.02)	(0.03)	(0.03)
$\frac{Cov(\text{inflation risk premium}_2, \text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.06	0.07	-0.52**	0.16	0.09	0.30*	0.16	0.11	0.18
	(0.04)	(0.09)	(0.16)	(0.05)	(0.03)	(0.11)	(0.04)	(0.05)	(0.06)
Panel A3: Total correlation									
	0.93	0.89	0.61*	0.67	0.76	-0.38***	0.85	0.93	0.08***
	(0.08)	(0.12)	(0.11)	(0.14)	(0.14)	(0.21)	(0.07)	(0.09)	(0.08)
Panel B: Inflation-linked yield correlation decomposition									
Panel B1: Country 1 perspective									
$\frac{Cov(\text{real yield}_1, \text{inflation-linked yield}_2)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	1.03	0.97	0.86	0.72	0.88	-0.59***	0.83	1.10	-0.24***
	(0.05)	(0.16)	(0.06)	(0.15)	(0.23)	(0.15)	(0.12)	(0.17)	(0.14)
$C\frac{Cov(\text{liquidity premium}_1, \text{inflation-linked yield}_2)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	-0.10	-0.14	-0.10	-0.06	-0.10	0.09	-0.06	-0.17	-0.01
	(0.05)	(0.15)	(0.04)	(0.06)	(0.19)	(0.02)	(0.07)	(0.15)	(0.03)
Panel B2: Country 2 perspective									
$\frac{Cov(\text{real yield}_2, \text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	0.96	0.94	0.83	0.44	0.62	-0.55***	0.57	0.82	-0.27***
	(0.08)	(0.15)	(0.06)	(0.17)	(0.19)	(0.15)	(0.15)	(0.16)	(0.16)
$\frac{Cov(\text{liquidity premium}_2, \text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	-0.02	-0.12	-0.07	0.23	0.17	0.05	0.21	0.11	0.02
	(0.06)	(0.12)	(0.07)	(0.10)	(0.15)	(0.02)	(0.10)	(0.14)	(0.02)
Panel B3: Total correlation									
	0.94	0.83	0.76	0.66	0.79	-0.50***	0.78	0.93	-0.25***
	(0.08)	(0.14)	(0.11)	(0.17)	(0.09)	(0.13)	(0.12)	(0.05)	(0.13)

58

Table 8 – Model Yield Fitting Errors. The sample is monthly 2004M11-2019M12. Yields are annualized zero-coupon yields.

Panel A: France			
	2 year nominal	5 year nominal	10 year nominal
Mean absolute error	0.10%	0.06%	0.07%
Root-mean-square error	0.12%	0.07%	0.09%
	2 year inflation-linked	5 year inflation-linked	10 year inflation-linked
Mean absolute error	0.04%	0.02%	0.02%
Root-mean-square error	0.06%	0.03%	0.03%
Panel B: UK			
	2 year nominal	5 year nominal	10 year nominal
Mean absolute error	0.06%	0.05%	0.06%
Root-mean-square error	0.09%	0.07%	0.09%
	4 year inflation-linked	5 year inflation-linked	10 year inflation-linked
Mean absolute error	0.05%	0.03%	0.03%
Root-mean-square error	0.06%	0.04%	0.04%
Panel C: US			
	2 year nominal	5 year nominal	10 year nominal
Mean absolute error	0.08%	0.03%	0.05%
Root-mean-square error	0.10%	0.05%	0.07%
	2 year inflation-linked	5 year inflation-linked	10 year inflation-linked
Mean absolute error	0.05%	0.03%	0.03%
Root-mean-square error	0.07%	0.04%	0.04%

Table 9 – Model-implied Variance Decompositions. Data is monthly 2004M11-2012M12. Subsample 1 is 2004M11-2019M12. Subsample 2 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

Panel A: 5 year nominal yield

	France			UK			US		
	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2
$\frac{Cov(\text{real yield,nominal yield})}{Var(\text{nominal yield})}$	71.67%	85.60%	60.58%	110.55%	109.80%	128.39%	69.48%	75.30%	96.39%
	(3.18%)	(6.68%)	(7.21%)	(3.23%)	(5.86%)	(11.27%)	(6.59%)	(5.17%)	(12.52%)
$\frac{Cov(\text{expected inflation,nominal yield})}{Var(\text{nominal yield})}$	6.45%	15.40%	-15.53%***	-13.83%	-37.12%	28.78%***	1.59%	9.35%	16.58%
	(1.95%)	(2.68%)	(2.32%)	(4.93%)	(8.23%)	(7.29%)	(3.01%)	(2.61%)	(5.99%)
$\frac{Cov(\text{inflation risk premium,nominal yield})}{Var(\text{nominal yield})}$	21.88%	-1.00%	54.95%***	3.28%	27.32%	-57.17%***	28.93%	15.36%	-12.98%
	(3.74%)	(6.78%)	(5.15%)	(7.43%)	(10.51%)	(14.03%)	(9.31%)	(5.31%)	(18.05%)

Panel B: 5 year inflation-linked yield

	France			UK			US		
	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2
$\frac{Cov(\text{real yield,inflation-linked yield})}{Var(\text{inflation-linked yield})}$	100.25%	100.38%	99.02%	103.29%	111.90%	106.71%	73.80%	76.62%	97.44%
	(3.03%)	(8.61%)	(3.52%)	(3.46%)	(6.81%)	(4.12%)	(12.63%)	(16.42%)	(3.55%)
$\frac{Cov(\text{liquidity premium,inflation-linked yield})}{Var(\text{inflation-linked yield})}$	-0.25%	-0.38%	0.98%	-3.29%	-11.90%	-6.71%	26.20%	23.38%	2.56%
	(3.03%)	(8.61%)	(3.52%)	(3.46%)	(6.81%)	(4.12%)	(12.63%)	(16.42%)	(3.55%)

Panel C: 10 year nominal yield

	France			UK			US		
	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2
$\frac{Cov(\text{real yield,nominal yield})}{Var(\text{nominal yield})}$	72.75%	77.06%	64.40%	108.64%	98.27%	117.71%	67.50%	82.98%	69.62%
	(1.85%)	(5.69%)	(3.42%)	(4.90%)	(7.74%)	(11.53%)	(7.10%)	(4.61%)	(11.81%)
$\frac{Cov(\text{expected inflation,nominal yield})}{Var(\text{nominal yield})}$	2.72%	10.10%	-6.45%***	-4.14%	-24.12%	13.88%***	-4.28%	2.62%	-6.60%
	(1.21%)	(2.58%)	(0.81%)	(3.77%)	(7.37%)	(2.48%)	(2.53%)	(2.35%)	(5.22%)
$\frac{Cov(\text{inflation risk premium,nominal yield})}{Var(\text{nominal yield})}$	24.53%	12.84%	42.05%**	-4.49%	25.85%	-31.60%***	36.78%	14.41%	36.98%
	(2.34%)	(5.31%)	(2.71%)	(7.38%)	(11.93%)	(13.53%)	(9.43%)	(6.06%)	(16.73%)

Panel D: 10 year inflation-linked yield

	France			UK			US		
	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2
$\frac{Cov(\text{real yield,inflation-linked yield})}{Var(\text{inflation-linked yield})}$	99.95%	97.93%	99.96%	101.63%	111.68%	102.50%	79.51%	80.10%	98.03%
	(1.16%)	(5.72%)	(1.26%)	(2.05%)	(5.46%)	(1.84%)	(8.88%)	(13.34%)	(1.75%)
$\frac{Cov(\text{liquidity premium,inflation-linked yield})}{Var(\text{inflation-linked yield})}$	0.05%	2.07%	0.04%	-1.63%	-11.68%	-2.50%	20.49%	19.90%	1.97%
	(1.16%)	(5.72%)	(1.26%)	(2.05%)	(5.46%)	(1.84%)	(8.88%)	(13.34%)	(1.75%)

60

Table 10 – Model-implied 5 Year Zero-Coupon Yield Correlation Decompositions. Data is monthly 2004M11-2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel A: Nominal yield correlation decomposition									
Panel A1: Country 1 perspective									
$\frac{Cov(\text{real yield}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.69	0.79	0.56	0.50	0.66	-0.36***	0.90	1.02	-0.26***
	(0.03)	(0.08)	(0.07)	(0.08)	(0.14)	(0.12)	(0.07)	(0.10)	(0.11)
$\frac{Cov(\text{expected inflation}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.07	0.15	-0.14***	0.09	0.17	0.11	-0.18	-0.32	-0.19
	(0.02)	(0.03)	(0.03)	(0.02)	(0.04)	(0.04)	(0.03)	(0.06)	(0.06)
$\frac{Cov(\text{inflation risk premium}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.16	-0.05	0.18*	0.08	-0.07	-0.16	0.11	0.23	0.47
	(0.04)	(0.06)	(0.09)	(0.05)	(0.06)	(0.10)	(0.04)	(0.08)	(0.13)
Panel A2: Country 2 perspective									
$\frac{Cov(\text{real yield}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	1.02	0.94	0.80	0.31	0.50	-0.76***	0.50	0.68	-0.07***
	(0.05)	(0.08)	(0.18)	(0.12)	(0.15)	(0.14)	(0.10)	(0.09)	(0.10)
$\frac{Cov(\text{expected inflation}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	-0.09	-0.37	0.33***	-0.11	0.04	-0.35**	-0.07	0.07	-0.21**
	(0.06)	(0.08)	(0.08)	(0.05)	(0.03)	(0.11)	(0.05)	(0.03)	(0.08)
$\frac{Cov(\text{inflation risk premium}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.00	0.32	-0.53***	0.47	0.22	0.69	0.41	0.18	0.30
	(0.08)	(0.12)	(0.19)	(0.11)	(0.09)	(0.23)	(0.11)	(0.07)	(0.16)
Panel A3: Total correlation									
	0.93	0.89	0.60*	0.67	0.76	-0.42***	0.84	0.93	0.02***
	(0.09)	(0.09)	(0.09)	(0.13)	(0.15)	(0.22)	(0.07)	(0.09)	(0.12)
Panel B: Inflation-linked yield correlation decomposition									
Panel B1: Country 1 perspective									
$\frac{Cov(\text{real yield}_1,\text{inflation-linked yield}_2)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	0.96	0.92	0.79	0.68	0.84	-0.49***	0.81	1.03	-0.21***
	(0.03)	(0.10)	(0.07)	(0.11)	(0.14)	(0.11)	(0.09)	(0.09)	(0.12)
$\frac{Cov(\text{liquidity premium}_1,\text{inflation-linked yield}_2)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	-0.02	-0.08	-0.04	-0.02	-0.06	-0.01	-0.03	-0.10	0.00
	(0.03)	(0.09)	(0.02)	(0.04)	(0.10)	(0.02)	(0.04)	(0.08)	(0.02)
Panel B2: Country 2 perspective									
$\frac{Cov(\text{real yield}_2,\text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	0.95	0.90	0.80	0.36	0.49	-0.50***	0.49	0.71	-0.19***
	(0.04)	(0.09)	(0.09)	(0.15)	(0.20)	(0.10)	(0.14)	(0.16)	(0.11)
$\frac{Cov(\text{liquidity premium}_2,\text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	-0.01	-0.06	-0.05	0.30	0.29	0.00	0.28	0.22	-0.02
	(0.03)	(0.07)	(0.04)	(0.11)	(0.17)	(0.03)	(0.11)	(0.15)	(0.03)
Panel B3: Total correlation									
	0.94	0.83	0.75	0.66	0.78	-0.49***	0.77	0.93	-0.21***
	(0.08)	(0.13)	(0.12)	(0.17)	(0.09)	(0.12)	(0.12)	(0.06)	(0.14)

61

Table 11 – Annualized 5 Year - 1 Quarter Zero-Coupon Yield Curve Slopes. Data is monthly. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

	Nominal slope			Real slope		
Full sample: 2004M11-2019M12						
	France	UK	US	France	UK	US
Average	0.83%	0.61%	1.00%	0.35%	-0.29%	0.52%
	(0.20%)	(0.27%)	(0.24%)	(0.15%)	(0.25%)	(0.22%)
Standard deviation	0.60%	0.85%	0.76%	0.52%	0.93%	0.77%
	(0.11%)	(0.16%)	(0.13%)	(0.10%)	(0.10%)	(0.11%)
$\frac{Cov(\text{real slope,nominal slope})}{Var(\text{nominal slope})}$	73.24%	92.99%	80.16%			
	(6.80%)	(12.59%)	(13.96%)			
$\frac{Cov(\text{real slope,inflation-linked slope})}{Var(\text{inflation-linked slope})}$				75.41%	72.82%	72.62%
				(5.11%)	(4.01%)	(12.40%)
Correlation with US	0.55	0.76	1.00	0.26	0.58	1.00
	(0.20)	(0.12)		(0.19)	(0.12)	
Correlation with UK	0.76	1.00	0.76	0.70	1.00	0.58
	(0.14)		(0.12)	(0.12)		(0.12)
Subsample 1: 2004M11-2012M5						
	France	UK	US	France	UK	US
Average	1.10%	0.64%	1.04%	0.47%	-0.29%	0.31%
	(0.36%)	(0.57%)	(0.47%)	(0.29%)	(0.47%)	(0.42%)
Standard deviation	0.70%	1.09%	0.91%	0.63%	1.11%	0.92%
	(0.12%)	(0.18%)	(0.15%)	(0.14%)	(0.13%)	(0.13%)
$\frac{Cov(\text{real slope,nominal slope})}{Var(\text{nominal slope})}$	78.87%	84.75%	85.34%			
	(7.79%)	(12.49%)	(11.81%)			
$\frac{Cov(\text{real slope,inflation-linked slope})}{Var(\text{inflation-linked slope})}$				72.14%	67.55%	68.93%
				(14.93%)	(14.55%)	(16.86%)
Correlation with US	0.69	0.76	1.00	0.52	0.65	1.00
	(0.10)	(0.15)		(0.07)	(0.08)	
Correlation with UK	0.91	1.00	0.76	0.86	1.00	0.65
	(0.07)		(0.15)	(0.07)		(0.08)
Subsample 2: 2012M6-2019M12						
	France	UK	US	France	UK	US
Average	0.56%	0.58%	0.97%	0.22%	-0.28%	0.73%
	(0.18%)	(0.21%)	(0.29%)	(0.06%)	(0.29%)	(0.23%)
Standard deviation	0.32%*	0.50%***	0.57%**	0.34%**	0.70%*	0.51%**
	(0.11%)	(0.14%)	(0.19%)	(0.09%)	(0.15%)	(0.14%)
$\frac{Cov(\text{real slope,nominal slope})}{Var(\text{nominal slope})}$	86.32%	134.12%	72.57%			
	(9.67%)	(12.48%)	(12.80%)			
$\frac{Cov(\text{real slope,inflation-linked slope})}{Var(\text{inflation-linked slope})}$				88.08%	103.27%	97.97%
				(14.56%)	(17.90%)	(12.35%)
Correlation with US	0.27*	0.83	1.00	-0.21***	0.47	1.00
	(0.22)	(0.13)		(0.19)	(0.23)	
Correlation with UK	0.47***	1.00	0.83	0.35***	1.00	0.47
	(0.17)		(0.13)	(0.12)		(0.23)

62

Online Appendix I: Historical Background on Inflation-Linked Debt in the US, UK and France

Here we offer some background on the experiences of three developed markets with inflation-protected bonds, the UK, France and the euro area, and finally, the US (which has become the largest index-linked market with over $1300 billon outstanding at the end of 2017).

The UK. The UK program is the oldest program, with the UK government issuing inflation-indexed Gilts since March 1981. Importantly, the index-linked market is an important part of the total gilt market, representing over 30% of the total market at the end of 2017, making it the largest index-linked program in relative terms. Changes in UK financial regulation did prove critical in further boosting demand for indexed gilts. The Pension Act of 2004 requires pension funds to prove that they can meet their future liabilities, which has led to a strong demand for long-dated indexed gilts.

The euro area and France. France first introduced indexed Treasury bonds (the so-called OATis) in 1998. An issue of special interest in the euro area is to what inflation index these bonds should be indexed. France first used its local CPI, excluding tobacco. Later on, it started to issue bonds indexed to the HPIC (the Harmonized Index of Consumer Prices), again excluding tobacco, which is an euro-wide price index, regularly published by Eurostat. This index has now become the market benchmark in the euro area, with other countries issuing inflation-linked bonds indexed to that index (Italy, Greece and Germany) and financial products (swaps, futures) linked to it as well. The euro area government linked bond market has now overtaken the UK market to become the second largest linker market in the world behind the US, both in terms of

63

outstanding amounts and turnover (see Garcia and van Rixtel, 2007, for some relevant data).

The US. The US started issuing TIPS in January 1997. While the TIPS program in the US initially met with some enthusiasm (see Sack and Elsasser, 2004), the program grew rather slowly. The outstanding amount of TIPS, which grew from around \$150 billion at the end of the nineties to close to \$1300 billion at the end of 2017, representing only around 10% of the total medium- and long-term government debt outstanding. The Treasury affirmed its commitment to the program in 2002. It is often argued that during its infancy, up to around 2004, the TIPS market was very illiquid and even somewhat "unknown, inefficiently priced" (e.g., Sack and Elsasser, 2004, and Gürkaynak, Sack, and Wright, 2010).

Online Appendix II: GMM Standard Errors

Suppose that $\{y_{t,1}^n\}_{t=1:T}$ is the time series of yields in country 1 and $\{y_{t,2}^n\}_{t=1:T}$ is the time series of yields in country 2. The GMM orthogonality conditions we use to obtain standard errors are:

$$[\frac{1}{T}\sum_{t=1}^{T} y_{t,1}^n] - \mu_1 = 0,$$

$$[\frac{1}{T}\sum_{t=1}^{T} y_{t,2}^n] - \mu_2 = 0,$$

$$[\frac{1}{T}\sum_{t=1}^{T} (y_{t,1}^n - \mu_1)^2] - \sigma_1^2 = 0,$$

$$[\frac{1}{T}\sum_{t=1}^{T} (y_{t,2}^n - \mu_2)^2] - \sigma_2^2 = 0,$$

$$[\frac{1}{T}\sum_{t=1}^{T} (y_{t,1}^n - \mu_1)(y_{t,2}^n - \mu_2)] - \sigma_{12} = 0,$$

where μ_1 and μ_2 are averages, σ_1 and σ_2 standard deviations, and σ_{12} the covariance of the two series. The weighting matrix is, as usual, the inverse of an estimate of the spectral density at frequency zero of the orthogonality conditions, computed as in Newey and West (1987) with 12 lags. The variance covariance matrix is then the usual optimal GMM estimator. We obtain standard errors for correlations and betas from standard errors for standard deviations and covariances using the delta method. Standard errors for variance and correlation decompositions are also obtained by applying the delta method to variance and covariance standard errors obtained via GMM.

In order to compute the statistical significance of the changes in parameters across the two subsamples, we use a system similar to the system above, but estimate the difference between the parameters across the subsamples as a separate parameter. For instance, the conditions for averages become:

$$[\frac{1}{T_1} \sum_{t=1}^{T_1} y_{t,1}^n] - \mu_{11} = 0,$$

$$[\frac{1}{T - T_1} \sum_{t=T_1+1}^{T} y_{t,1}^n] - (\mu_{11} + \mu_{1 \to 2}) = 0,$$

where T_1 is the number of data points in the first subsample. The statistical significance of $\mu_{1 \to 2}$ then determines the statistical significance of the parameter change across two subsamples. The conditions for other parameters follow the same approach.

Online Appendix III: Alternative Expected Inflation Measures

Online Appendix III.A: One Year Inflation Survey Forecasts

One Year Ahead Survey Expected Inflation. Data is quarterly. GMM standard errors computed using 4 Newey-West (1987) lags are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

	Full sample: 2004Q4-2019Q4			Subsample 1: 2004Q4-2012Q2			Subsample 2: 2012Q3-2019Q4		
	France	UK	US	France	UK	US	France	UK	US
Average	1.58%	2.74%	2.12%	1.77%	2.59%	2.14%	1.40%***	2.89%*	2.11%
	(0.15%)	(0.09%)	(0.08%)	(0.12%)	(0.37%)	(0.35%)	(0.15%)	(0.06%)	(0.10%)
Standard deviation	0.34%	0.41%	0.26%	0.30%	0.45%	0.35%	0.27%	0.32%*	0.14%*
	(0.13%)	(0.05%)	(0.18%)	(0.24%)	(0.24%)	(0.18%)	(0.21%)	(0.18%)	(0.12%)
β wrt US	0.78	-0.06	1.00	0.70	-0.18	1.00	0.95	0.96**	1.00
	(0.13)	(0.24)		(0.06)	(0.20)		(0.15)	(0.44)	
Correlation with US	0.60	-0.04	1.00	0.81	-0.14	1.00	0.49**	0.41**	1.00
	(0.10)	(0.15)		(0.07)	(0.16)		(0.08)	(0.19)	
Correlation with UK	0.03	1.00	-0.04	0.24	1.00	-0.14	0.40	1.00	0.41**
	(0.15)		(0.15)	(015)		(0.16)	(0.11)		(0.19)

Online Appendix III.B: Yield Variance and Correlation Decompositions Using Alternative Long-term Expected Inflation Surveys

5 Year Zero-Coupon Yield Variance Decompositions Using Consensus Economics Survey Expected Inflation for All Countries. Data is monthly 2004M11-2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

	France			UK			US		
	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2
Panel A: Nominal yield variance decomposition									
$\frac{Cov(\text{real yield,nominal yield})}{Var(\text{nominal yield})}$	77.29%	84.08%	75.06%	112.10%	115.29%	132.95%	75.87%	77.67%	99.58%
	(2.97%)	(7.84%)	(8.79%)	(3.91%)	(7.05%)	(12.97%)	(6.17%)	(7.06%)	(11.40%)
$\frac{Cov(\text{expected inflation,nominal yield})}{Var(\text{nominal yield})}$	6.77%	6.88%	9.86%	-19.65%	-23.21%	-2.92%*	7.49%	9.12%	1.57%*
	(0.77%)	(2.90%)	(2.94%)	(2.64%)	(5.12%)	(9.13%)	(2.11%)	(3.81%)	(1.76%)
$\frac{Cov(\text{inflation risk premium,nominal yield})}{Var(\text{nominal yield})}$	15.94%	9.04%	15.08%	7.56%	7.92%	-30.02%**	16.64%	13.21%	-1.15%
	(2.59%)	(5.68%)	(7.43%)	(3.83%)	(7.18%)	(10.30%)	(4.74%)	(5.29%)	(10.37%)
Panel B: Inflation-linked yield variance decomposition									
$\frac{Cov(\text{real yield,inflation-linked yield})}{Var(\text{inflation-linked yield})}$	107.58%	104.18%	106.18%	105.28%	121.02%	108.86%	83.20%	86.86%	102.64%
	(4.45%)	(12.76%)	(5.98%)	(5.85%)	(10.89%)	(7.36%)	(10.32%)	(13.61%)	(0.35%)
$\frac{Cov(\text{liquidity premium,inflation-linked yield})}{Var(\text{inflation-linked yield})}$	-7.58%	-4.18%	-6.18%	-5.28%	-21.02%	-8.86%	16.80%	13.14%	-2.64%
	(4.45%)	(12.76%)	(5.98%)	(5.85%)	(10.89%)	(7.36%)	(10.32%)	(13.61%)	(0.35%)

68

5 Year Zero-Coupon Yield Correlation Decompositions Using Consensus Economics Survey Expected Inflation for All Countries. Data is monthly 2004M11-2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

Panel A: Nominal yield correlation decomposition

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel A1: Country 1 perspective									
$\frac{Cov(\text{real yield}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.74 (0.03)	0.77 (0.10)	0.62 (0.09)	0.52 (0.09)	0.66 (0.14)	-0.44*** (0.14)	0.94 (0.08)	1.10 (0.09)	-0.27*** (0.11)
$\frac{Cov(\text{expected inflation}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.06 (0.01)	0.05 (0.03)	-0.02** (0.03)	0.04 (0.01)	0.03 (0.03)	-0.05 (0.04)	-0.19 (0.03)	-0.24 (0.05)	-0.03 (0.09)
$\frac{Cov(\text{inflation risk premium}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.14 (0.02)	0.08 (0.05)	0.01 (0.06)	0.11 (0.03)	0.07 (0.05)	0.10 (0.11)	0.10 (0.04)	0.07 (0.07)	0.38 (0.10)
Panel A2: Country 2 perspective									
$\frac{Cov(\text{real yield}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	1.02 (0.06)	0.97 (0.09)	0.88 (0.20)	0.41 (0.12)	0.59 (0.13)	-0.73*** (0.14)	0.59 (0.09)	0.73 (0.09)	-0.05*** (0.11)
$\frac{Cov(\text{expected inflation}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	-0.16 (0.02)	-0.17 (0.05)	0.23*** (0.08)	0.05 (0.02)	0.07 (0.04)	0.00 (0.02)	0.06 (0.02)	0.09 (0.04)	-0.07*** (0.03)
$\frac{Cov(\text{inflation risk premium}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.06 (0.04)	0.09 (0.08)	-0.51** (0.14)	0.21 (0.05)	0.10 (0.03)	0.35* (0.11)	0.20 (0.05)	0.12 (0.04)	0.21 (0.09)
Panel A3: Total correlation									
	0.93 (0.08)	0.89 (0.12)	0.61* (0.11)	0.67 (0.14)	0.76 (0.14)	-0.38*** (0.21)	0.85 (0.07)	0.93 (0.09)	0.08*** (0.08)

Panel B: Inflation-linked yield correlation decomposition

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel B1: Country 1 perspective									
$\frac{Cov(\text{real yield}_1,\text{inflation-linked yield}_2)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	1.04 (0.05)	0.96 (0.15)	0.86 (0.07)	0.72 (0.13)	0.88 (0.19)	-0.59*** (0.11)	0.83 (0.11)	1.09 (0.14)	-0.23*** (0.12)
$\frac{Cov(\text{liquidity premium}_1,\text{inflation-linked yield}_2)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	-0.10 (0.04)	-0.13 (0.13)	-0.10 (0.03)	-0.06 (0.06)	-0.09 (0.16)	0.09 (0.02)	-0.06 (0.07)	-0.16 (0.13)	-0.02 (0.03)
Panel B2: Country 2 perspective									
$\frac{Cov(\text{real yield}_2,\text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	0.96 (0.06)	0.94 (0.14)	0.82 (0.10)	0.45 (0.14)	0.64 (0.17)	-0.55*** (0.10)	0.58 (0.12)	0.83 (0.13)	-0.27*** (0.11)
$\frac{Cov(\text{liquidity premium}_2,\text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	-0.02 (0.06)	-0.11 (0.11)	-0.06 (0.07)	0.21 (0.09)	0.15 (0.13)	0.05 (0.02)	0.19 (0.09)	0.10 (0.11)	0.02 (0.03)
Panel B3: Total correlation									
	0.94 (0.08)	0.83 (0.14)	0.76 (0.11)	0.66 (0.17)	0.79 (0.09)	-0.50*** (0.13)	0.78 (0.12)	0.93 (0.05)	-0.25** (0.13)

5 Year Zero-Coupon Yield Variance Decompositions Using Consensus Economics Survey Expected Inflation for France and the UK and Blue Chip Survey Expected Inflation for the US. Data is monthly 2004M11-2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

Panel A: Nominal yield variance decomposition

	France			UK			US		
	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2
$\frac{Cov(\text{real yield,nominal yield})}{Var(\text{nominal yield})}$	77.75%	83.79%	75.78%	111.79%	114.73%	131.81%	76.55%	78.06%	100.09%
	(2.93%)	(7.67%)	(8.69%)	(3.85%)	(6.95%)	(12.99%)	(6.20%)	(7.34%)	(11.44%)
$\frac{Cov(\text{expected inflation,nominal yield})}{Var(\text{nominal yield})}$	6.77%	6.88%	9.86%	-19.65%	-23.21%	-2.92%*	3.19%	5.43%	-1.92%***
	(0.77%)	(2.90%)	(2.94%)	(2.64%)	(5.12%)	(9.13%)	(1.22%)	(2.27%)	(0.56%)
$\frac{Cov(\text{inflation risk premium,nominal yield})}{Var(\text{nominal yield})}$	15.48%	9.33%	14.36%	7.87%	8.48%	-28.89%**	20.26%	16.51%	1.84%
	(2.56%)	(5.49%)	(7.37%)	(3.79%)	(7.08%)	(10.29%)	(5.50%)	(5.78%)	(11.16%)

Panel B: Inflation-linked yield variance decomposition

	France			UK			US		
	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2
$\frac{Cov(\text{real yield,inflation-linked yield})}{Var(\text{inflation-linked yield})}$	108.33%	104.53%	107.04%	105.09%	120.72%	108.21%	84.45%	88.20%	103.23%
	(4.26%)	(12.27%)	(5.88%)	(5.73%)	(10.64%)	(7.19%)	(9.99%)	(13.19%)	(0.40%)
$\frac{Cov(\text{liquidity premium,inflation-linked yield})}{Var(\text{inflation-linked yield})}$	-8.33%	-4.53%	-7.04%	-5.09%	-20.72%	-8.21%	15.55%	11.80%	-3.23%
	(4.26%)	(12.27%)	(5.88%)	(5.73%)	(10.64%)	(7.19%)	(9.99%)	(13.19%)	(0.40%)

69

5 Year Zero-Coupon Yield Variance Decompositions Using Consensus Economics Survey Expected Inflation for France and the UK and Blue Chip Survey Expected Inflation for the US. Data is monthly 2004M11-2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

Panel A: Nominal yield correlation decomposition

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel A1: Country 1 perspective									
$\dfrac{Cov(\text{real yield}_1,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.74	0.76	0.62	0.52	0.65	-0.44***	0.93	1.09	-0.26***
	(0.03)	(0.09)	(0.09)	(0.09)	(0.14)	(0.14)	(0.08)	(0.09)	(0.11)
$\dfrac{Cov(\text{expected inflation}_1,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.06	0.05	-0.02*	0.04	0.03	-0.05	-0.19	-0.24	-0.03
	(0.01)	(0.03)	(0.03)	(0.01)	(0.03)	(0.04)	(0.03)	(0.05)	(0.09)
$\dfrac{Cov(\text{inflation risk premium}_1,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.14	0.08	0.01	0.11	0.08	0.11	0.10	0.08	0.37
	(0.02)	(0.05)	(0.06)	(0.03)	(0.05)	(0.11)	(0.04)	(0.07)	(0.10)
Panel A2: Country 2 perspective									
$\dfrac{Cov(\text{real yield}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	1.02	0.97	0.87	0.42	0.60	-0.74***	0.60	0.74	-0.06***
	(0.06)	(0.09)	(0.19)	(0.12)	(0.13)	(0.14)	(0.09)	(0.09)	(0.11)
$\dfrac{Cov(\text{expected inflation}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	-0.16	-0.17	0.23***	0.02	0.04	0.02	0.02	0.05	-0.01*
	(0.02)	(0.05)	(0.08)	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)
$\dfrac{Cov(\text{inflation risk premium}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.07	0.09	-0.50***	0.23	0.12	0.33*	0.23	0.15	0.15
	(0.04)	(0.08)	(0.14)	(0.05)	(0.03)	(0.11)	(0.05)	(0.05)	(0.09)
Panel A3: Total correlation									
	0.93	0.89	0.61*	0.67	0.76	-0.38***	0.85	0.93	0.08***
	(0.08)	(0.12)	(0.11)	(0.14)	(0.14)	(0.21)	(0.07)	(0.09)	(0.08)

Panel B: Inflation-linked yield correlation decomposition

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel B1: Country 1 perspective									
$\dfrac{Cov(\text{real yield}_1,\text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	1.04	0.95	0.86	0.73	0.88	-0.60***	0.83	1.09	-0.23***
	(0.05)	(0.14)	(0.07)	(0.13)	(0.19)	(0.11)	(0.07)	(0.12)	(0.03)
$\dfrac{Cov(\text{liquidity premium}_1,\text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	-0.10	-0.13	-0.10	-0.06	-0.09	0.10	-0.06	-0.16	-0.02
	(0.04)	(0.13)	(0.03)	(0.05)	(0.15)	(0.02)	(0.12)	(0.13)	(0.11)
Panel B2: Country 2 perspective									
$\dfrac{Cov(\text{real yield}_2,\text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	0.96	0.94	0.82	0.46	0.65	-0.56***	0.60	0.85	-0.28***
	(0.06)	(0.14)	(0.10)	(0.14)	(0.16)	(0.10)	(0.12)	(0.13)	(0.11)
$\dfrac{Cov(\text{liquidity premium}_2,\text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	-0.02	-0.11	-0.06	0.20	0.13	0.05	0.18	0.09	0.03
	(0.06)	(0.11)	(0.06)	(0.09)	(0.13)	(0.02)	(0.09)	(0.11)	(0.02)
Panel B3: Total correlation									
	0.94	0.83	0.76	0.66	0.79	-0.50***	0.78	0.93	-0.25***
	(0.08)	(0.14)	(0.11)	(0.17)	(0.09)	(0.13)	(0.12)	(0.05)	(0.13)

70

Online Appendix III.C: Yield Variance and Correlation Decompositions Using Statistical Expected Inflation

5 Year Zero-Coupon Nominal Yield Variance and Correlation Decompositions Using Statistical Expected Inflation. Data is monthly 2004M11-2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

Panel A: Nominal yield variance decomposition

	France			UK			US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
$\frac{Cov(\text{real yield},\text{nominal yield})}{Var(\text{nominal yield})}$	74.84%	80.99%	71.45%	110.11%	109.02%	128.96%	75.70%	75.08%	97.88%
	(3.39%)	(6.53%)	(7.68%)	(4.14%)	(8.22%)	(11.87%)	(7.36%)	(9.85%)	(13.69%)
$\frac{Cov(\text{expected inflation},\text{nominal yield})}{Var(\text{nominal yield})}$	13.44%	25.05%	12.44%	-6.27%	-7.50%	1.55%****	26.02%	28.49%	23.21%
	(2.47%)	(3.53%)	(4.94%)	(0.54%)	(0.01%)	(0.73%)	(3.37%)	(4.87%)	(3.08%)
$\frac{Cov(\text{inflation risk premium},\text{nominal yield})}{Var(\text{nominal yield})}$	11.72%	-6.04%	16.11%**	-3.84%	-1.53%	-30.51%**	-1.72%	-3.56%	-21.10%
	(4.06%)	(6.05%)	(5.45%)	(4.51%)	(7.92%)	(12.35%)	(7.98%)	(11.00%)	(13.68%)

Panel B: Nominal yield correlation decomposition

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel B1: Country 1 perspective									
$\frac{Cov(\text{real yield}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.71	0.73	0.60	0.51	0.62	-0.42***	0.94	1.12	-0.27***
	(0.04)	(0.09)	(0.05)	(0.10)	(0.14)	(0.14)	(0.08)	(0.12)	(0.11)
$\frac{Cov(\text{expected inflation}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.14	0.24	0.03***	0.12	0.22	-0.03***	-0.19	-0.24	-0.03***
	(0.02)	(0.04)	(0.03)	(0.03)	(0.03)	(0.05)	(0.01)	(0.01)	(0.01)
$\frac{Cov(\text{inflation risk premium}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.08	-0.08	-0.02	0.05	-0.08	0.06	0.09	0.06	0.38***
	(0.04)	(0.05)	(0.07)	(0.04)	(0.06)	(0.13)	(0.03)	(0.07)	(0.08)
Panel B2: Country 2 perspective									
$\frac{Cov(\text{real yield}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	1.02	0.92	0.88	0.44	0.58	-0.71***	0.58	0.73	-0.05***
	(0.07)	(0.10)	(0.26)	(0.13)	(0.15)	(0.17)	(0.10)	(0.12)	(0.10)
$\frac{Cov(\text{expected inflation}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	-0.06	-0.07	0.01***	0.14	0.18	-0.19***	0.11	0.09	-0.05***
	(0.01)	(0.01)	(0.01)	(0.07)	(0.08)	(0.07)	(0.06)	(0.06)	(0.08)
$\frac{Cov(\text{inflation risk premium}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	-0.03	0.04	-0.28*	0.09	0.01	0.51**	0.16	0.11	0.18
	(0.05)	(0.09)	(0.21)	(0.08)	(0.13)	(0.16)	(0.08)	(0.12)	(0.13)
Panel B3: Total correlation									
	0.93	0.89	0.61*	0.67	0.76	-0.38***	0.85	0.93	0.08***
	(0.08)	(0.12)	(0.11)	(0.14)	(0.14)	(0.21)	(0.07)	(0.09)	(0.08)

71

Online Appendix IV: Alternative Liquidity Premia Estimates

Online Appendix IV.A: Robustness with Respect to the *log(months since inception)* Variable

Online Appendix IV.A.1: Main Results Not Including the *log(months since inception)* Variable into the Nominal Debt Premium Regression

Annualized 5 Year Zero-Coupon Liquidity and Inflation Risk Premia. Data is monthly. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

	Liquidity premium			Inflation risk premium		
Whole sample: 2004M11-2019M12						
	France	UK	US	France	UK	US
Average	0.67%	1.00%	0.50%	0.37%	0.70%	0.08%
	(0.08%)	(0.14%)	(0.12%)	(0.07%)	(0.10%)	(0.08%)
Standard deviation	0.32%	0.48%	0.39%	0.32%	0.46%	0.40%
	(0.06%)	(0.12%)	(0.09%)	(0.06%)	(0.09%)	(0.07%)
β wrt US	0.07	0.70	1.00	0.49	0.38	1.00
	(0.11)	(0.12)		(0.08)	(0.25)	
Correlation with US	0.08	0.57	1.00	0.62	0.34	1.00
	(0.14)	(0.10)		(0.11)	(0.22)	
Correlation with UK	0.34	1.00	0.57	0.41	1.00	0.34
	(0.20)		(0.10)	(0.15)		(0.22)
Subsample 1: 2004M11-2012M5						
	France	UK	US	France	UK	US
Average	0.52%	1.03%	0.70%	0.55%	0.83%	0.21%
	(0.10%)	(0.30%)	(0.17%)	(0.05%)	(0.12%)	(0.11%)
Standard deviation	0.33%	0.65%	0.45%	0.30%	0.53%	0.46%
	(0.09%)	(0.10%)	(0.12%)	(0.08%)	(0.11%)	(0.10%)
β wrt US	0.41	0.94	1.00	0.39	0.57	1.00
	(0.06)	(0.20)		(0.04)	(0.24)	
Correlation with US	0.55	0.65	1.00	0.60	0.50	1.00
	(0.08)	(0.14)		(0.06)	(0.21)	
Correlation with UK	0.48	1.00	0.65	0.40	1.00	0.50
	(0.15)		(0.14)	(0.22)		(0.21)
Subsample 2: 2012M6-2019M12						
	France	UK	US	France	UK	US
Average	0.82%***	0.97%	0.30%***	0.19%***	0.56%**	-0.05%**
	(0.04%)	(0.07%)	(0.03%)	(0.08%)	(0.11%)	(0.08%)
Standard deviation	0.20%***	0.19%***	0.14%	0.22%	0.32%	0.28%*
	(0.01%)	(0.06%)	(0.08%)	(0.09%)	(0.08%)	(0.10%)
β wrt US	-0.02**	0.50	1.00	0.39	-0.44***	1.00
	(0.18)	(0.18)		(0.12)	(0.26)	
Correlation with US	-0.01***	0.37	1.00	0.48	-0.38***	1.00
	(0.12)	(0.13)		(0.15)	(0.22)	
Correlation with UK	0.27	1.00	0.37	0.11	1.00	-0.38***
	(0.11)		(0.13)	(0.25)		(0.22)

5 Year Zero-Coupon Yield Variance Decompositions. Data is monthly 2004M11-2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

Panel A: Nominal yield variance decomposition

	France			UK			US		
	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2
$\frac{Cov(\text{real yield, nominal yield})}{Var(\text{nominal yield})}$	81.99%	86.09%	82.15%	112.82%	119.45%	132.09%	79.12%	82.22%	103.67%
	(3.48%)	(8.26%)	(8.32%)	(3.82%)	(8.24%)	(10.91%)	(7.98%)	(8.54%)	(14.88%)
$\frac{Cov(\text{expected inflation, nominal yield})}{Var(\text{nominal yield})}$	6.29%	5.64%	14.44%	-19.65%	-23.21%	-2.92%*	10.34%	9.19%	0.80%
	(1.18%)	(2.87%)	(3.29%)	(3.00%)	(6.75%)	(2.44%)	(2.75%)	(2.99%)	(4.20%)
$\frac{Cov(\text{inflation risk premium, nominal yield})}{Var(\text{nominal yield})}$	11.72%	8.28%	3.41%	6.83%	3.76%	-29.17%***	10.54%	8.60%	-4.47%
	(2.62%)	(6.22%)	(6.42%)	(4.34%)	(8.56%)	(12.42%)	(5.64%)	(7.66%)	(10.85%)

Panel B: Inflation-linked yield variance decomposition

	France			UK			US		
	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2
$\frac{Cov(\text{real yield, inflation-linked yield})}{Var(\text{inflation-linked yield})}$	114.02%	107.33%	112.92%	105.43%	124.42%	107.08%	86.62%	91.79%	106.89%
	(4.63%)	(14.22%)	(3.82%)	(7.05%)	(12.32%)	(9.17%)	(12.00%)	(16.46%)	(1.78%)
$\frac{Cov(\text{liquidity premium, inflation-linked yield})}{Var(\text{inflation-linked yield})}$	-14.02%	-7.33%	-12.92%	-5.43%	-24.42%	-7.08%	13.38%	8.21%	-6.89%
	(4.63%)	(14.22%)	(3.82%)	(7.05%)	(12.32%)	(9.17%)	(12.00%)	(16.46%)	(1.78%)

73

5 Year Zero-Coupon Yield Correlation Decompositions. Data is monthly 2004M11-2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

Panel A: Nominal yield correlation decomposition	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel A1: Country 1 perspective									
$\frac{Cov(\text{real yield}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.77	0.77	0.65	0.54	0.65	-0.49***	0.95	1.14	-0.23***
	(0.04)	(0.10)	(0.06)	(0.12)	(0.15)	(0.15)	(0.09)	(0.11)	(0.11)
$\frac{Cov(\text{expected inflation}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.05	0.03	0.01	0.03	0.02	-0.03	-0.19	-0.24	-0.03
	(0.01)	(0.03)	(0.05)	(0.02)	(0.02)	(0.07)	(0.04)	(0.06)	(0.12)
$\frac{Cov(\text{inflation risk premium}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.11	0.08	-0.05**	0.10	0.09	0.13	0.08	0.03	0.34*
	(0.02)	(0.06)	(0.05)	(0.03)	(0.06)	(0.11)	(0.05)	(0.08)	(0.09)
Panel A2: Country 2 perspective									
$\frac{Cov(\text{real yield}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	1.02	1.01	0.84	0.43	0.65	-0.78***	0.61	0.78	-0.08***
	(0.07)	(0.11)	(0.24)	(0.15)	(0.14)	(0.18)	(0.12)	(0.10)	(0.10)
$\frac{Cov(\text{expected inflation}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	-0.16	-0.17	0.23**	0.11	0.09	0.05	0.11	0.09	-0.05***
	(0.02)	(0.07)	(0.08)	(0.02)	(0.04)	(0.03)	(0.02)	(0.03)	(0.03)
$\frac{Cov(\text{inflation risk premium}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.07	0.05	-0.46**	0.13	0.02	0.35**	0.13	0.06	0.21*
	(0.04)	(0.09)	(0.15)	(0.06)	(0.02)	(0.11)	(0.05)	(0.05)	(0.06)
Panel A3: Total correlation									
	0.93	0.89	0.61*	0.67	0.76	-0.38***	0.85	0.93	0.08***
	(0.08)	(0.12)	(0.11)	(0.14)	(0.14)	(0.21)	(0.07)	(0.09)	(0.08)

Panel B: Inflation-linked yield correlation decomposition	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel B1: Country 1 perspective									
$\frac{Cov(\text{real yield}_1,\text{inflation-linked yield}_2)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	1.09	0.97	0.90	0.75	0.89	-0.68***	0.84	1.12	-0.20***
	(0.05)	(0.16)	(0.08)	(0.16)	(0.22)	(0.15)	(0.12)	(0.18)	(0.14)
$\frac{Cov(\text{liquidity premium}_1,\text{inflation-linked yield}_2)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	-0.15	-0.14	-0.14	-0.09	-0.10	0.18	-0.07	-0.19	-0.05
	(0.04)	(0.14)	(0.06)	(0.06)	(0.18)	(0.01)	(0.08)	(0.15)	(0.04)
Panel B2: Country 2 perspective									
$\frac{Cov(\text{real yield}_2,\text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	0.95	0.97	0.80	0.47	0.70	-0.59***	0.60	0.89	-0.31***
	(0.04)	(0.14)	(0.06)	(0.18)	(0.18)	(0.15)	(0.16)	(0.15)	(0.17)
$\frac{Cov(\text{liquidity premium}_2,\text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	-0.02	-0.14	-0.04	0.20	0.09	0.09	0.17	0.04	0.05
	(0.07)	(0.13)	(0.07)	(0.10)	(0.15)	(0.02)	(0.10)	(0.13)	(0.02)
Panel B3: Total correlation									
	0.94	0.83	0.76	0.66	0.79	-0.50***	0.78	0.93	-0.25***
	(0.08)	(0.14)	(0.11)	(0.17)	(0.09)	(0.13)	(0.12)	(0.05)	(0.13)

74

Online Appendix IV.A.2: Main Results Treating the *log(months since inception)*-variable as a Liquidity Variable

Annualized 5 Year Zero-Coupon Liquidity and Inflation Risk Premia. Data is monthly. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

	Liquidity premium			Inflation risk premium		
Whole sample: 2004M11-2019M12						
	France	UK	US	France	UK	US
Average	0.95%	1.11%	0.60%	0.65%	0.80%	0.18%
	(0.12%)	(0.13%)	(0.09%)	(0.06%)	(0.10%)	(0.05%)
Standard deviation	0.42%	0.48%	0.37%	0.27%	0.45%	0.34%
	(0.09%)	(0.11%)	(0.09%)	(0.06%)	(0.08%)	(0.07%)
β wrt US	0.40	0.82	1.00	0.41	0.48	1.00
	(0.22)	(0.22)		(0.07)	(0.27)	
Correlation with US	0.36	0.63	1.00	0.51	0.36	1.00
	(0.19)	(0.17)		(0.09)	(0.20)	
Correlation with UK	0.58	1.00	0.63	0.41	1.00	0.36
	(0.21)		(0.17)	(0.18)		(0.20)
Subsample 1: 2004M11-2012M5						
	France	UK	US	France	UK	US
Average	0.69%	1.05%	0.66%	0.72%	0.85%	0.17%
	(0.16%)	(0.29%)	(0.19%)	(0.05%)	(0.11%)	(0.09%)
Standard deviation	0.41%	0.65%	0.51%	0.29%	0.52%	0.42%
	(0.10%)	(0.09%)	(0.12%)	(0.08%)	(0.11%)	(0.10%)
β wrt US	0.51	0.88	1.00	0.36	0.71	1.00
	(0.11)	(0.21)		(0.05)	(0.22)	
Correlation with US	0.63	0.68	1.00	0.53	0.57	1.00
	(0.13)	(0.16)		(0.07)	(0.17)	
Correlation with UK	0.71	1.00	0.68	0.50	1.00	0.57
	(0.11)		(0.16)	(0.19)		(0.17)
Subsample 2: 2012M6-2019M12						
	France	UK	US	France	UK	US
Average	1.22%***	1.16%	0.55%	0.58%	0.76%	0.20%
	(0.07%)	(0.08%)	(0.03%)	(0.10%)	(0.14%)	(0.07%)
Standard deviation	0.23%*	0.20%***	0.13%	0.24%	0.37%	0.24%
	(0.01%)	(0.09%)	(0.08%)	(0.08%)	(0.09%)	(0.08%)
β wrt US	0.72	0.70	1.00	0.59*	-0.22**	1.00
	(0.18)	(0.11)		(0.13)	(0.32)	
Correlation with US	0.41	0.45	1.00	0.58	-0.14***	1.00
	(0.10)	(0.07)		(0.13)	(0.21)	
Correlation with UK	0.44**	1.00	0.45	0.22	1.00	-0.14***
	(0.06)		(0.07)	(0.24)		(0.21)

5 Year Zero-Coupon Yield Variance Decompositions. Data is monthly 2004M11-2019M12. Subsample 2 is 2012M6-2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

Panel A: Nominal yield variance decomposition

	France			UK			US		
	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2
$\frac{Cov(\text{real yield,nominal yield})}{Var(\text{nominal yield})}$	89.68%	93.61%	87.69%	117.75%	119.97%	138.67%	86.25%	85.79%	90.31%
	(4.10%)	(9.97%)	(9.85%)	(4.60%)	(8.95%)	(12.25%)	(5.88%)	(8.12%)	(12.90%)
$\frac{Cov(\text{expected inflation,nominal yield})}{Var(\text{nominal yield})}$	6.29%	5.64%	14.44%	-19.65%	-23.21%	-2.92%*	10.34%	9.19%	0.80%
	(1.18%)	(2.87%)	(3.29%)	(3.00%)	(6.75%)	(2.44%)	(2.75%)	(2.99%)	(4.20%)
$\frac{Cov(\text{inflation risk premium,nominal yield})}{Var(\text{nominal yield})}$	4.03%	0.75%	-2.12%	1.90%	3.24%	-35.75%***	3.40%	5.02%	8.88%
	(3.19%)	(7.49%)	(7.48%)	(5.10%)	(8.17%)	(13.68%)	(3.84%)	(7.19%)	(8.87%)

Panel B: Inflation-linked yield variance decomposition

	France			UK			US		
	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2
$\frac{Cov(\text{real yield,inflation-linked yield})}{Var(\text{inflation-linked yield})}$	123.96%	112.41%	121.34%	110.47%	125.19%	114.12%	92.11%	92.73%	92.82%
	(6.52%)	(18.19%)	(5.71%)	(6.59%)	(12.39%)	(7.36%)	(12.33%)	(18.32%)	(1.25%)
$\frac{Cov(\text{liquidity premium,inflation-linked yield})}{Var(\text{inflation-linked yield})}$	-23.96%	-12.41%	-21.34%	-10.47%	-25.19%	-14.12%	7.89%	7.27%	7.18%
	(6.52%)	(18.19%)	(5.71%)	(6.59%)	(12.39%)	(7.36%)	(12.33%)	(18.32%)	(1.25%)

76

5 Year Zero-Coupon Yield Correlation Decompositions. Data is monthly 2004M11-2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

Panel A: Nominal yield correlation decomposition

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel A1: Country 1 perspective									
$\frac{Cov(\text{real yield}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.86	0.91	0.70	0.62	0.81	-0.54***	0.98	1.15	-0.33***
	(0.04)	(0.12)	(0.07)	(0.12)	(0.17)	(0.16)	(0.09)	(0.12)	(0.13)
$\frac{Cov(\text{expected inflation}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.05	0.03	0.01	0.03	0.02	-0.03	-0.19	-0.24	-0.03
	(0.01)	(0.03)	(0.05)	(0.02)	(0.02)	(0.07)	(0.04)	(0.06)	(0.12)
$\frac{Cov(\text{inflation risk premium}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.02	-0.06	-0.10	0.02	-0.07	0.18**	0.06	0.02	0.44*
	(0.03)	(0.08)	(0.05)	(0.03)	(0.04)	(0.09)	(0.05)	(0.08)	(0.11)
Panel A2: Country 2 perspective									
$\frac{Cov(\text{real yield}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	1.08	1.01	0.97	0.55	0.64	-0.62***	0.72	0.80	0.01***
	(0.08)	(0.11)	(0.27)	(0.12)	(0.16)	(0.16)	(0.08)	(0.12)	(0.09)
$\frac{Cov(\text{expected inflation}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	-0.16	-0.17	0.23**	0.11	0.09	0.05	0.11	0.09	-0.05***
	(0.02)	(0.07)	(0.08)	(0.02)	(0.04)	(0.03)	(0.02)	(0.03)	(0.03)
$\frac{Cov(\text{inflation risk premium}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.01	0.05	-0.59**	0.02	0.04	0.19*	0.02	0.04	0.13*
	(0.05)	(0.09)	(0.19)	(0.03)	(0.04)	(0.09)	(0.03)	(0.06)	(0.04)
Panel A3: Total correlation									
	0.93	0.89	0.61*	0.67	0.76	-0.38***	0.85	0.93	0.08***
	(0.08)	(0.12)	(0.11)	(0.14)	(0.14)	(0.21)	(0.07)	(0.09)	(0.08)

Panel B: Inflation-linked yield correlation decomposition

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel B1: Country 1 perspective									
$\frac{Cov(\text{real yield}_1,\text{inflation-linked yield}_2)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	1.21	1.13	0.99	0.84	1.03	-0.74***	0.87	1.13	-0.29***
	(0.07)	(0.21)	(0.10)	(0.17)	(0.29)	(0.17)	(0.12)	(0.18)	(0.15)
$\frac{Cov(\text{liquidity premium}_1,\text{inflation-linked yield}_2)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	-0.27	-0.30	-0.23	-0.18	-0.24	0.24**	-0.09	-0.19	0.04
	(0.07)	(0.20)	(0.07)	(0.08)	(0.24)	(0.03)	(0.07)	(0.15)	(0.02)
Panel B2: Country 2 perspective									
$\frac{Cov(\text{liquidity premium}_1,\text{inflation-linked yield}_2)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	1.01	0.96	0.88	0.59	0.66	-0.45***	0.73	0.90	-0.19***
	(0.08)	(0.16)	(0.06)	(0.16)	(0.21)	(0.14)	(0.14)	(0.18)	(0.15)
$\frac{Cov(\text{liquidity premium}_2,\text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	-0.07	-0.14	-0.12	0.08	0.12	-0.05	0.05	0.03	-0.06
	(0.07)	(0.13)	(0.06)	(0.11)	(0.17)	(0.02)	(0.11)	(0.15)	(0.03)
Panel B3: Total correlation									
	0.94	0.83	0.76	0.66	0.79	-0.50***	0.78	0.93	-0.25***
	(0.08)	(0.14)	(0.11)	(0.17)	(0.09)	(0.13)	(0.12)	(0.05)	(0.13)

77

Online Appendix IV.B: Nominal Yield Correlation Decompositions into Inflation-linked Yield and Breakeven Inflation Components

5 Year Zero-Coupon Nominal Yield Correlation Decompositions into Inflation-linked Yield and Breakeven Inflation Components. Data is monthly 2004M11-2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel 1: Country 1 perspective									
$\frac{Cov(\text{inflation-linked yield}_1, \text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.65	0.58	0.52	0.44	0.46	-0.40***	0.79	0.77	-0.33***
	(0.04)	(0.07)	(0.06)	(0.10)	(0.14)	(0.14)	(0.08)	(0.15)	(0.12)
$\frac{Cov(\text{breakeven inflation}_1, \text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.28	0.31	0.09**	0.23	0.30	0.01	0.06	0.17	0.41
	(0.03)	(0.04)	(0.10)	(0.04)	(0.05)	(0.17)	(0.03)	(0.11)	(0.10)
Panel 2: Country 2 perspective									
$\frac{Cov(\text{inflation-linked yield}_2, \text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.98	0.74	0.81	0.57	0.60	-0.67***	0.71	0.69	-0.05***
	(0.07)	(0.09)	(0.30)	(0.12)	(0.16)	(0.15)	(0.08)	(0.17)	(0.09)
$\frac{Cov(\text{breakeven inflation}_2, \text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	-0.05	0.15	-0.20	0.10	0.17	0.28	0.14	0.24	0.13
	(0.06)	(0.08)	(0.24)	(0.09)	(0.07)	(0.12)	(0.07)	(0.13)	(0.06)
Panel 3: Total correlation									
	0.93	0.89	0.61*	0.67	0.76	-0.38***	0.85	0.93	0.08***
	(0.08)	(0.12)	(0.11)	(0.14)	(0.14)	(0.21)	(0.07)	(0.09)	(0.08)

78

IV.C: Liquidity Premium Estimated Using Only an Inflation Swap Spread as a Liquidity Proxy

Annualized 5 Year Zero-Coupon Liquidity Premia, Inflation Risk Premia, and Real Yields. Data is monthly. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

	Liquidity premium			Inflation risk premium			Real yield		
Full sample: 2004M11-2019M12									
	France	UK	US	France	UK	US	France	UK	US
Average	0.53%	0.93%	0.53%	0.23%	0.62%	0.11%	-0.42%	-1.36%	-0.05%
	(0.05%)	(0.11%)	(0.13%)	(0.14%)	(0.11%)	(0.08%)	(0.43%)	(0.63%)	(0.30%)
Standard deviation	0.28%	0.43%	0.43%	0.42%	0.46%	0.39%	1.16%	1.83%	0.92%
	(0.07%)	(0.10%)	(0.09%)	(0.08%)	(0.08%)	(0.08%)	(0.12%)	(0.16%)	(0.15%)
β wrt US	0.26	0.38	1.00	0.69	0.46	1.00	0.70	1.38	1.00
	(0.05)	(0.11)		(0.14)	(0.24)		(0.20)	(0.28)	
Correlation with US	0.40	0.38	1.00	0.65	0.40	1.00	0.56	0.69	1.00
	(0.08)	(0.11)		(0.13)	(0.21)		(0.16)	(0.14)	
Correlation with UK	0.54	1.00	0.38	0.33	1.00	0.40	0.92	1.00	0.69
	(0.10)		(0.11)	(0.17)		(0.21)	(0.09)		(0.14)
Subsample 1: 2004M11-2012M5									
	France	UK	US	France	UK	US	France	UK	US
Average	0.52%	0.94%%	0.76%	0.55%	0.73%	0.27%	0.56%	-0.00%	0.32%
	(0.11%)	(0.24%)	(0.20%)	(0.05%)	(0.10%)	(0.11%)	(0.41%)	(0.86%)	(0.50%)
Standard deviation	0.34%	0.57%	0.50%	0.27%	0.51%	0.45%	0.76%	1.57%	1.01%
	(0.08%)	(0.09%)	(0.12%)	(0.10%)	(0.11%)	(0.11%)	(0.13%)	(0.22%)	(0.21%)
β wrt US	0.36	0.51	1.00	0.35	0.65	1.00	0.56	1.37	1.00
	(0.06)	(0.16)		(0.06)	(0.25)		(0.07)	(0.13)	
Correlation with US	0.53	0.45	1.00	0.58	0.57	1.00	0.76	0.88	1.00
	(0.09)	(0.14)		(0.11)	(0.21)		(0.10)	(0.08)	
Correlation with UK	0.58	1.00	0.45	0.51	1.00	0.57	0.84	1.00	0.88
	(0.12)		(0.14)	(0.18)		(0.21)	(0.14)		(0.08)
Subsample 2: 2012M6-2019M12									
	France	UK	US	France	UK	US	France	UK	US
Average	0.54%	0.92%	0.31%***	-0.10%***	0.52%	-0.04%**	-1.40%***	-2.73%***	-0.42%*
	(0.02%)	(0.07%)	(0.02%)	(0.08%)	(0.13%)	(0.07%)	(0.21%)	(0.34%)	(0.21%)
Standard deviation	0.19%***	0.19%***	0.12%	0.25%	0.36%	0.25%**	0.45%	0.70%**	0.63%
	(0.05%)	(0.09%)	(0.08%)	(0.08%)	(0.09%)	(0.08%)	(0.07%)	(0.09%)	(0.13%)
β wrt US	0.56	0.64	1.00	0.71**	-0.39**	1.00	-0.32***	-0.23***	1.00
	(0.13)	(0.10)		(0.08)	(0.33)		(0.10)	(0.12)	
Correlation with US	0.34	0.40	1.00	0.70	-0.26**	1.00	-0.43***	-0.21***	1.00
	(0.08)	(0.06)		(0.08)	(0.23)		(0.14)	(0.11)	
Correlation with UK	0.37	1.00	0.40	-0.20**	1.00	-0.26**	0.77	1.00	-0.21
	(0.07)		(0.06)	(0.28)		(0.23)	(0.10)		(0.11)

IV.D: Liquidity Premium Estimation with Hu, Pan, and Wang (2013) Yield Curve Fitting Error Measure

We start by constructing the measure separately for each country following the methodology of Hu, Pan, and Wang (2013) as closely as possible. We first fit Svensson (1994) curves to all nominal bonds with 1 month-10 years to maturity excluding strips. We minimize the sum of pricing errors weighted by inverse duration using the end-of-month mid-quotes. For each bond i at time t we compute the observed and model-implied yields-to-maturity, $y^i_{t,data}$ and $y^i_{t,model}$, respectively. We then compute the

yield curve fitting error measure as $\sqrt{\frac{1}{N_t}\sum_{i=1}^{N_t}(y_{t,data}^i - y_{t,model}^i)^2}$, where N_t is the number of bonds available at time t. Following Hu, Pan, and Wang (2013), we only use bonds with between 1 year and 10 years to maturity to compute the yield curve fitting error measure, although we use bonds with 1 month to 10 years to maturity to fit the yield curves. In the univariate regression with country-fixed effects (Spec 1), the Hu, Pan, and Wang (2013) measure has the economically expected negative sign and is statistically significant at the 10% level. However, the sign becomes positive and statistically insignificant when we augment the regression with the on-the-run spread Pflueger and Viceira (2016) use (Spec 2).

Inflation-linked Bonds Liquidity Premia Estimation with Hu, Pan, and Wang (2013) Yield Curve Fitting Error Measure. The data is monthly 2004M11-2019M12. The panel regression is $y_{t,i} - y_{t,i}^{\mathrm{IL}} - \pi_{t,i}^e = c_{1,i} + c_2' l_{t,i} + \epsilon_{t,i}$, where $y_{t,i}$ is zero-coupon yield in country i at time t, π_t^e is expected inflation, and l_t is the vector of liquidity proxies, which are assumed to be uncorrelated with the inflation risk premium, and $\epsilon_{t,i}$ is the error term. Regressions are for 5 year zero-coupon yields. Driscoll and Kraay (1998) standard errors computed with 12 lags are in parentheses. Asterisks *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

	Spec 1	Spec 2	Spec 3
Hu, Pan, and Wang (2013) yield curve fitting measure	-0.73*	0.19	0.24
	(0.44)	(1.00)	(0.67)
Off-the-run premium		-2.96***	-0.42
		(0.57)	(0.37)
Inflation swap spread			-1.78***
			(0.30)
Log(share of inflation-linked debt)			0.48**
			(0.22)
Log(months since inception)			-0.61***
			(0.09)
Country-fixed effects	Yes	Yes	Yes
Adjusted R^2	2.62%	10.57%	58.47%

IV.E: Liquidity Premiums Estimated for Each Country Separately Using Only an Inflation Swap Spread as a Liquidity Proxy

Annualized 5 Year Zero-Coupon Liquidity Premia, Inflation Risk Premia and Real Yields. The liquidity premium is estimated country-by-country using the inflation swap spread as the only explanatory variable. Data is monthly. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

	Liquidity premium			Inflation risk premium			Real yield		
Full sample: 2004M11-2019M12									
	France	UK	US	France	UK	US	France	UK	US
Average	0.43%	0.86%	0.57%	0.13%	0.56%	0.15%	-0.32%	-1.30%	-0.09%
	(0.04%)	(0.10%)	(0.14%)	(0.13%)	(0.10%)	(0.08%)	(0.43%)	(0.62%)	(0.30%)
Standard deviation	0.22%	0.40%	0.46%	0.41%	0.45%	0.39%	1.15%	1.81%	0.91%
	(0.07%)	(0.10%)	(0.09%)	(0.08%)	(0.08%)	(0.09%)	(0.13%)	(0.16%)	(0.15%)
β wrt US	0.19	0.33	1.00	0.78	0.49	1.00	0.67	1.35	1.00
	(0.04)	(0.09)		(0.11)	(0.24)		(0.20)	(0.28)	
Correlation with US	0.40	0.38	1.00	0.74	0.42	1.00	0.53	0.68	1.00
	(0.08)	(0.11)		(0.11)	(0.20)		(0.16)	(0.14)	
Correlation with UK	0.54	1.00	0.38	0.37	1.00	0.42	0.92	1.00	0.68
	(0.10)		(0.11)	(0.16)		(0.20)	(0.09)		(0.14)
Subsample 1: 2004M11-2012M5									
	France	UK	US	France	UK	US	France	UK	US
Average	0.43%	0.87%	0.82%	0.45%	0.67%	0.33%	0.66%	0.06%	0.26%
	(0.09%)	(0.22%)	(0.21%)	(0.05%)	(0.10%)	(0.10%)	(0.40%)	(0.84%)	(0.50%)
Standard deviation	0.28%	0.53%	0.54%	0.27%	0.51%	0.43%	0.73%	1.54%	1.01%
	(0.08%)	(0.09%)	(0.12%)	(0.10%)	(0.11%)	(0.11%)	(0.13%)	(0.22%)	(0.20%)
β wrt US	0.27	0.44	1.00	0.44	0.72	1.00	0.53	1.34	1.00
	(0.05)	(0.14)		(0.07)	(0.25)		(0.08)	(0.14)	
Correlation with US	0.53	0.45	1.00	0.71	0.61	1.00	0.73	0.88	1.00
	(0.09)	(0.14)		(0.11)	(0.21)		(0.11)	(0.09)	
Correlation with UK	0.58	1.00	0.45	0.63	1.00	0.61	0.84	1.00	0.88
	(0.12)		(0.14)	(0.15)		(0.21)	(0.15)		(0.09)
Subsample 2: 2012M6-2019M12									
	France	UK	US	France	UK	US	France	UK	US
Average	0.43%	0.86%	0.33%***	-0.20%***	0.45%*	-0.02%**	-1.29%***	-2.66%***	-0.44%
	(0.02%)	(0.06%)	(0.02%)	(0.07%)	(0.12%)	(0.07%)	(0.20%)	(0.34%)	(0.21%)
Standard deviation	0.16%***	0.18%***	0.13%	0.23%	0.36%	0.25%**	0.44%	0.69%	0.63%
	(0.05%)	(0.09%)	(0.08%)	(0.08%)	(0.09%)	(0.08%)	(0.08%)	(0.09%)	(0.13%)
β wrt US	0.42	0.55	1.00	0.72***	-0.37**	1.00	-0.32***	-0.23***	1.00
	(0.10)	(0.09)		(0.07)	(0.34)		(0.10)	(0.12)	
Correlation with US	0.34	0.40	1.00	0.76	-0.25**	1.00	-0.45***	-0.21***	1.00
	(0.08)	(0.06)		(0.08)	(0.23)		(0.14)	(0.11)	
Correlation with UK	0.37	1.00	0.40	-0.20***	1.00	-0.25**	0.78	1.00	-0.21***
	(0.07)		(0.06)	(0.27)		(0.23)	(0.10)		(0.11)

5 Year Zero-Coupon Yield Variance Decompositions. The liquidity premium is estimated country-by-country using the inflation swap spread as the only explanatory variable. Data is monthly 2004M11-2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

	Panel A: Nominal yield variance decomposition								
	France			UK			US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
$\frac{Cov(\text{real yield,nominal yield})}{Var(\text{nominal yield})}$	71.80%	80.50%	66.83%	111.55%	111.36%	134.57%	70.90%	73.29%	94.95%
	(3.52%)	(6.68%)	(7.64%)	(4.44%)	(8.62%)	(12.03%)	(7.27%)	(6.97%)	(13.34%)
$\frac{Cov(\text{expected inflation,nominal yield})}{Var(\text{nominal yield})}$	6.29%	5.64%	14.44%	-19.65%	-23.21%	-2.92%*	10.34%	9.19%	0.80%
	(1.18%)	(2.87%)	(3.29%)	(3.00%)	(6.75%)	(2.44%)	(2.75%)	(2.99%)	(4.20%)
$\frac{Cov(\text{inflation risk premium,nominal yield})}{Var(\text{nominal yield})}$	21.90%	13.87%	18.74%	8.11%	11.85%	-31.65%***	18.76%	17.52%	4.24%
	(2.64%)	(4.47%)	(5.32%)	(5.03%)	(6.88%)	(13.56%)	(4.93%)	(5.80%)	(9.33%)
	Panel B: Inflation-linked yield variance decomposition								
	France			UK			US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
$\frac{Cov(\text{real yield,inflation-linked yield})}{Var(\text{inflation-linked yield})}$	100.37%	100.61%	98.81%	105.24%	117.69%	111.13%	75.49%	77.82%	97.51%
	(4.33%)	(12.01%)	(2.18%)	(5.34%)	(10.27%)	(6.66%)	(12.87%)	(17.42%)	(1.32%)
$\frac{Cov(\text{liquidity premium,inflation-linked yield})}{Var(\text{inflation-linked yield})}$	-0.37%	-0.61%	1.19%	-5.24%	-17.69%	-11.13%	24.51%	22.18%	2.49%
	(4.33%)	(12.01%)	(2.18%)	(5.34%)	(10.27%)	(6.66%)	(12.87%)	(17.42%)	(1.32%)

82

5 Year Zero-Coupon Nominal Yield Correlation Decomposition. The liquidity premium is estimated country-by-country using the inflation swap spread as the only explanatory variable. Data is monthly 2004M11-2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

Panel A: Nominal yield correlation decomposition

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel A1: Country 1 perspective									
$\frac{Cov(\text{real yield}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.69 (0.04)	0.74 (0.09)	0.59 (0.05)	0.50 (0.10)	0.64 (0.13)	-0.38*** (0.14)	0.92 (0.08)	1.06 (0.12)	-0.31*** (0.12)
$\frac{Cov(\text{expected inflation}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.05 (0.01)	0.03 (0.03)	0.01 (0.05)	0.03 (0.02)	0.02 (0.02)	-0.03 (0.07)	-0.19 (0.04)	-0.24 (0.06)	-0.03 (0.12)
$\frac{Cov(\text{inflation risk premium}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.19 (0.02)	0.11 (0.04)	0.01* (0.05)	0.15 (0.04)	0.10 (0.04)	0.02 (0.12)	0.12 (0.05)	0.11 (0.07)	0.42 (0.11)
Panel A2: Country 2 perspective									
$\frac{Cov(\text{real yield}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	1.03 (0.07)	0.94 (0.11)	0.93 (0.26)	0.37 (0.13)	0.51 (0.16)	-0.68*** (0.16)	0.54 (0.10)	0.67 (0.11)	-0.02*** (0.09)
$\frac{Cov(\text{expected inflation}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	-0.16 (0.02)	-0.17 (0.07)	0.23** (0.08)	0.11 (0.02)	0.09 (0.04)	0.05 (0.03)	0.11 (0.02)	0.09 (0.03)	-0.05*** (0.03)
$\frac{Cov(\text{inflation risk premium}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.06 (0.05)	0.12 (0.08)	-0.56** (0.18)	0.20 (0.04)	0.16 (0.04)	0.25 (0.10)	0.20 (0.04)	0.17 (0.05)	0.16 (0.05)
Panel A3: Total correlation									
	0.93 (0.08)	0.89 (0.12)	0.61* (0.11)	0.67 (0.14)	0.76 (0.14)	-0.38*** (0.21)	0.85 (0.07)	0.93 (0.09)	0.08*** (0.08)

Panel B: Inflation-linked yield correlation decomposition

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel B1: Country 1 perspective									
$\frac{Cov(\text{real yield}_1,\text{inflation-linked yield}_2)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	0.97 (0.05)	0.94 (0.14)	0.80 (0.05)	0.69 (0.14)	0.86 (0.20)	-0.50*** (0.15)	0.82 (0.11)	1.06 (0.16)	-0.27*** (0.15)
$\frac{Cov(\text{liquidity premium}_1,\text{inflation-linked yield}_2)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	-0.03 (0.04)	-0.11 (0.12)	-0.04 (0.03)	-0.03 (0.06)	-0.07 (0.15)	0.00 (0.03)	-0.05 (0.06)	-0.13 (0.13)	0.02 (0.02)
Panel B2: Country 2 perspective									
$\frac{Cov(\text{real yield}_2,\text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	0.96 (0.06)	0.91 (0.14)	0.86 (0.05)	0.39 (0.16)	0.53 (0.20)	-0.50*** (0.14)	0.52 (0.14)	0.74 (0.17)	-0.24** (0.16)
$\frac{Cov(\text{liquidity premium}_2,\text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	-0.02 (0.05)	-0.09 (0.10)	-0.10 (0.05)	0.27 (0.11)	0.26 (0.17)	0.00 (0.02)	0.25 (0.11)	0.19 (0.15)	-0.01 (0.03)
Panel B3: Total correlation									
	0.94 (0.08)	0.83 (0.14)	0.76 (0.11)	0.66 (0.17)	0.79 (0.09)	-0.50*** (0.13)	0.78 (0.12)	0.93 (0.05)	-0.25*** (0.13)

83

IV.F: Controlling for Noise in Liquidity Premium Estimates

5 Year Zero-Coupon Nominal and Inflation-linked Yield Variance Decompositions Controlling for the Liquidity Premium Estimates Uncertainty. Liquidity proxies coefficients are sampled from the distribution given by the OLS estimation procedure and used recompute the liquidity premium. The new liquidity premium estimates are used to recompute the variance decompositions. 95% bootstrap confidence intervals in square brackets. Data is monthly 2004M11-2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12. irp stands for the inflation risk premium and lp for the liquidity premium. There are no confidence intervals for the expected inflation component, because it does not depend on the liquidity premium estimates.

Panel A: Nominal yield variance decomposition

	France			UK			US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
$\frac{Cov(\text{real yield},\text{nominal yield})}{Var(\text{nominal yield})}$	77.22%	84.80%	74.92%	112.67%	116.73%	134.58%	75.27%	77.68%	99.36%
	[68.19%, 86.51%]	[75.79%, 93.67%]	[61.31%, 88.88%]	[106.41%, 118.99%]	[98.55%, 134.65%]	[117.88%, 151.24%]	[66.87%, 83.49%]	[68.85%, 86.76%]	[91.38%, 107.44%]
$\frac{Cov(\text{expected inflation},\text{nominal yield})}{Var(\text{nominal yield})}$	6.29%	5.64%	14.44%	-19.65%	-23.21%	-2.92%	10.34%	9.19%	0.80%
	-	-	-	-	-	-	-	-	-
$\frac{Cov(irp,\text{nominal yield})}{Var(\text{nominal yield})}$	16.49%	9.56%	10.64%	6.98%	6.48%	-31.66%	14.39%	13.13%	-0.17%
	[7.20%, 25.51%]	[0.69%, 18.57%]	[-3.32%, 24.25%]	[0.67%, 13.24%]	[-11.44%, 24.66%]	[-48.31%, -14.96%]	[6.17%, 22.79%]	[4.05%, 21.96%]	[-8.25%, 7.82%]

Panel B: Inflation-linked yield variance decomposition

	France			UK			US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
$\frac{Cov(\text{real yield},\text{inflation-linked yield})}{Var(\text{inflation-linked yield})}$	107.30%	104.08%	105.77%	105.59%	121.94%	109.63%	81.74%	85.45%	102.31%
	[94.85%, 120.02%]	[98.00%, 110.29%]	[92.49%, 119.20%]	[102.34%, 108.84%]	[109.47%, 134.21%]	[101.54%, 117.89%]	[66.02%, 97.19%]	[68.83%, 101.48%]	[93.78%, 110.94%]
$\frac{Cov(lp,\text{inflation-linked yield})}{Var(\text{inflation-linked yield})}$	-7.30%	-4.08%	-5.77%	-5.59%	-21.94%	-9.63%	18.26%	14.55%	-2.31%
	[-20.02%, 5.15%]	[-10.29%, 2.00%]	[-19.20%, 7.51%]	[-8.84%, -2.34%]	[-34.21%, -9.47%]	[-17.89%, -1.54%]	[2.81%, 33.98%]	[-1.48%, 31.17%]	[-10.94%, 6.22%]

5 Year Zero-Coupon Nominal and Inflation-linked Yield Correlation Decompositions Controlling for the Liquidity Premium Estimates Uncertainty. Liquidity proxies coefficients are sampled from the distribution given by the OLS regression of the nominal debt premium on liquidity proxies and then used recompute the liquidity premium. The new liquidity premium estimates are used to recompute the correlation decompositions. 95% bootstrap confidence intervals in square brackets are computed by repeating the procedure 10,000 times. Data is monthly 2004M11-2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12.

Panel A: Nominal yield correlation decomposition

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel A1: Country 1 perspective									
$\frac{Cov(\text{real yield}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.74	0.78	0.63	0.53	0.67	-0.43	0.94	1.12	-0.27
	[0.66, 0.82]	[0.66, 0.89]	[0.56, 0.69]	[0.48, 0.58]	[0.54, 0.80]	[-0.54, -0.33]	[0.86, 1.03]	[0.92, 1.31]	[-0.34, -0.19]
$\frac{Cov(\text{expected inflation}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.05	0.03	0.01	0.03	0.02	-0.03	-0.19	-0.24	-0.03
	-	-	-	-	-	-	-	-	-
$\frac{Cov(\text{inflation risk premium}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.14	0.08	-0.03	0.11	0.07	0.07	0.09	0.06	0.38
	[0.07, 0.22]	[-0.04, 0.19]	[-0.10, 0.03]	[0.06, 0.17]	[-0.06, 0.21]	[-0.03, 0.18]	[0.01, 0.18]	[-0.14, 0.25]	[0.30, 0.46]
Panel A2: Country 2 perspective									
$\frac{Cov(\text{real yield}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	1.03	0.98	0.89	0.40	0.58	-0.73	0.58	0.73	-0.05
	[1.00, 1.06]	[0.85, 1.12]	[0.77, 1.02]	[0.28, 0.52]	[0.46, 0.71]	[-0.83, -0.63]	[0.47, 0.68]	[0.62, 0.83]	[-0.10, 0.00]
$\frac{Cov(\text{expected inflation}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	-0.16	-0.17	0.23	0.11	0.09	0.05	0.11	0.09	-0.05
	-	-	-	-	-	-	-	-	-
$\frac{Cov(\text{inflation risk premium}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.06	0.07	-0.52	0.16	0.09	0.30	0.16	0.11	0.18
	[0.03, 0.09]	[-0.06, 0.21]	[-0.64, -0.40]	[0.04, 0.28]	[-0.04, 0.22]	[0.20, 0.40]	[0.05, 0.27]	[0.01, 0.22]	[0.13, 0.23]

Panel B: Inflation-linked yield correlation decomposition

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel B1: Country 1 perspective									
$\frac{Cov(\text{real yield}_1,\text{inflation-linked yield}_2)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	1.03	0.97	0.86	0.72	0.88	-0.59	0.83	1.10	-0.24
	[0.93, 1.14]	[0.89, 1.05]	[0.77, 0.95]	[0.67, 0.78]	[0.83, 0.94]	[-0.76, -0.42]	[0.80, 0.86]	[1.00, 1.19]	[-0.31, -0.17]
$\frac{Cov(\text{liquidity premium}_1,\text{inflation-linked yield}_2)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	-0.10	-0.14	-0.10	-0.06	-0.10	0.09	-0.06	-0.17	-0.01
	[-0.20, 0.01]	[-0.22, -0.06]	[-0.19, -0.01]	[-0.12, 0.00]	[-0.15, -0.04]	[-0.08, 0.25]	[-0.09, -0.02]	[-0.26, -0.07]	[-0.09, 0.06]
Panel B2: Country 2 perspective									
$\frac{Cov(\text{real yield}_2,\text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	0.96	0.94	0.83	0.44	0.62	-0.55	0.57	0.82	-0.27
	[0.94, 0.98]	[0.87, 1.01]	[0.74, 0.92]	[0.28, 0.59]	[0.42, 0.81]	[-0.63, -0.47]	[0.42, 0.72]	[0.66, 0.98]	[-0.33, -0.21]
$\frac{Cov(\text{liquidity premium}_2,\text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	-0.02	-0.12	-0.07	0.23	0.17	0.05	0.21	0.11	0.02
	[-0.04, 0.00]	[-0.19, -0.04]	[-0.16, 0.01]	[0.07, 0.38]	[-0.03, 0.37]	[-0.03, 0.13]	[0.06, 0.36]	[-0.05, 0.27]	[-0.04, 0.08]

Online Appendix V: Results for Other Maturities

2 and 10 Year Zero-Coupon Yield Variance Decompositions. Data is monthly 2004M11-2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For the US, SPF only provides 1, 2, 3, and 4 quarters and then 5 and 10 year-ahead inflation expectations. Thus, we use the Aruoba (2020) 2 year expectations, which are interpolated from multiple surveys. Our results are robust to using alternative methodologies, such as interpolating 2 year inflation expectations from available SPF maturities or assuming that expected inflation for the second year is the same as 4 quarters or 5 years ahead expected inflation. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

Panel A: 2 year bonds – nominal yield variance decomposition

	France			UK			US		
	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2
$\frac{Cov(\text{real yield,nominal yield})}{Var(\text{nominal yield})}$	73.04%	86.83%	90.70%	115.87%	121.15%	170.80%	66.88%	63.08%	88.09%
	(4.30%)	(7.83%)	(14.49%)	(5.92%)	(16.17%)	(42.05%)	(6.56%)	(12.10%)	(9.46%)
$\frac{Cov(\text{expected inflation,nominal yield})}{Var(\text{nominal yield})}$	11.86%	12.24%	17.01%	-12.98%	-9.08%	-13.07%	7.11%	9.22%	2.47%**
	(2.37%)	(3.57%)	(11.65%)	(2.95%)	(7.99%)	(17.96%)	(1.50%)	(2.26%)	(0.88%)
$\frac{Cov(\text{inflation risk premium,nominal yield})}{Var(\text{nominal yield})}$	15.09%	0.93%	-7.70%	-2.89%	-12.07%	-57.74%*	26.01%	27.70%	9.44%*
	(2.45%)	(4.57%)	(10.44%)	(4.02%)	(11.27%)	(25.38%)	(5.91%)	(10.40%)	(9.74%)
Yield standard deviation	1.61%	1.26%	0.35%	1.81%	1.86%	0.25%*	1.50%	1.78%	0.80%*
	(0.13%)	(0.10%)	(0.14%)	(0.14%)	(0.13%)	(0.08%)	(0.08%)	(0.05%)	(0.25%)

Panel B: 2 year bonds – inflation-linked yield variance decomposition

	France			UK			US		
	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2
$\frac{Cov(\text{real yield,inflation-linked yield})}{Var(\text{inflation-linked yield})}$	105.92%	107.57%	109.05%	108.25%	115.89%	114.13%	84.37%	86.13%	98.27%
	(2.81%)	(6.38%)	(2.60%)	(3.07%)	(3.79%)	(5.09%)	(6.84%)	(8.39%)	(1.29%)
$\frac{Cov(\text{liquidity premium,inflation-linked yield})}{Var(\text{inflation-linked yield})}$	-5.92%	-7.57%	-9.05%	-8.25%	-15.89%	-14.13%	15.63%	13.87%	1.73%
	(2.81%)	(6.38%)	(2.60%)	(3.07%)	(3.79%)	(5.09%)	(6.84%)	(8.39%)	(1.29%)
Yield standard deviation	1.15%	1.03%	0.47%	2.01%	2.04%	0.55%***	1.35%	1.53%	0.78%**
	(0.12%)	(0.08%)	(0.12%)	(0.14%)	(0.25%)	(0.19%)	(0.09%)	(0.07%)	(0.20%)

Panel C: 10 year bonds – nominal yield variance decomposition

	France			UK			US		
	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2
$\frac{Cov(\text{real yield,nominal yield})}{Var(\text{nominal yield})}$	74.14%	76.40%	70.90%	105.95%	110.95%	110.29%	80.66%	90.65%	79.29%
	(1.52%)	(7.40%)	(2.37%)	(5.02%)	(6.19%)	(9.89%)	(8.75%)	(6.09%)	(18.02%)
$\frac{Cov(\text{expected inflation,nominal yield})}{Var(\text{nominal yield})}$	3.80%	3.81%	6.07%	-17.23%	-42.67%	4.89%*	8.22%	3.47%	-0.10%
	(0.76%)	(2.77%)	(1.58%)	(5.16%)	(9.76%)	(3.57%)	(2.60%)	(1.11%)	(4.48%)
$\frac{Cov(\text{inflation risk premium,nominal yield})}{Var(\text{nominal yield})}$	22.07%	19.79%	23.03%	11.28%	31.71%	-15.18%***	11.11%	5.88%	20.80%
	(1.03%)	(8.19%)	(1.64%)	(7.46%)	(8.82%)	(8.06%)	(6.60%)	(5.63%)	(13.74%)
Yield standard deviation	1.45%	0.52%	0.76%	1.37%	0.79%	0.64%	1.05%	0.86%	0.44%
	(0.12%)	(0.08%)	(0.19%)	(0.17%)	(0.19%)	(0.10%)	(0.08%)	(0.22%)	(0.11%)

Panel D: 10 year bonds – inflation-linked yield variance decomposition

	France			UK			US		
	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2	Whole sample	Subsample 1	Subsample 2
$\frac{Cov(\text{real yield,inflation-linked yield})}{Var(\text{inflation-linked yield})}$	98.78%	89.33%	101.73%	102.85%	118.21%	99.75%*	98.57%	98.66%	102.11%
	(2.60%)	(13.71%)	(3.75%)	(3.86%)	(7.24%)	(1.84%)	(3.69%)	(7.91%)	(3.00%)
$\frac{Cov(\text{liquidity premium,inflation-linked yield})}{Var(\text{inflation-linked yield})}$	1.22%	10.67%	-1.73%	-2.85%	-18.21%	0.25%*	1.43%	1.34%	-2.11%
	(2.60%)	(13.71%)	(3.75%)	(3.86%)	(7.24%)	(1.84%)	(3.69%)	(7.91%)	(3.00%)
Yield standard deviation	1.08%	0.43%	0.54%	1.42%	0.75%	0.73%	0.89%	0.81%	0.45%
	(0.11%)	(0.08%)	(0.15%)	(0.18%)	(0.20%)	(0.17%)	(0.11%)	(0.19%)	(0.14%)

86

2 Year Zero-Coupon Yield Correlation Decompositions. Data is monthly 2004M11-2019M12. Subsample 1 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For the US, SPF only provides 1, 2, 3, and 4 quarters and then 5 and 10 year-ahead inflation expectations. Thus, we use the Aruoba (2020) 2 year expectations, which are interpolated from available multiple surveys. Our results are robust to using alternative methodologies, such as interpolating 2 year inflation expectations from available SPF maturities or assuming that expected inflation for the second year is the same as 4 quarters or 5 years ahead expected inflation. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

Panel A: Nominal yield correlation decomposition

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel A1: Country 1 perspective									
$\frac{Cov(\text{real yield}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.70	0.80	0.36	0.48	0.70	-0.97***	0.97	1.15	-0.59***
	(0.03)	(0.08)	(0.35)	(0.12)	(0.12)	(0.25)	(0.11)	(0.14)	(0.39)
$\frac{Cov(\text{expected inflation}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.10	0.10	-0.03	0.08	0.08	0.10	-0.09	-0.10	0.34**
	(0.02)	(0.04)	(0.15)	(0.02)	(0.03)	(0.16)	(0.03)	(0.08)	(0.16)
$\frac{Cov(\text{inflation risk premium}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.13	0.02	-0.19	0.09	0.01	0.16	-0.03	-0.12	0.56**
	(0.03)	(0.05)	(0.11)	(0.04)	(0.05)	(0.15)	(0.06)	(0.11)	(0.20)
Panel A2: Country 2 perspective									
$\frac{Cov(\text{real yield}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	1.06	1.08	0.98	0.41	0.51	-0.72***	0.54	0.58	0.33
	(0.05)	(0.11)	(0.41)	(0.12)	(0.14)	(0.14)	(0.08)	(0.12)	(0.23)
$\frac{Cov(\text{expected inflation}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	-0.12	-0.06	-0.07	0.04	0.09	-0.04*	0.06	0.09	-0.04*
	(0.03)	(0.05)	(0.19)	(0.01)	(0.02)	(0.03)	(0.01)	(0.02)	(0.03)
$\frac{Cov(\text{inflation risk premium}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.00	-0.10	-0.77***	0.20	0.19	0.05	0.24	0.25	0.02**
	(0.03)	(0.10)	(0.17)	(0.05)	(0.04)	(0.08)	(0.04)	(0.07)	(0.07)
Panel A3: Total correlation									
	0.93	0.93	0.13**	0.65	0.79	-0.71***	0.85	0.93	0.32**
	(0.09)	(0.10)	(0.23)	(0.14)	(0.12)	(0.22)	(0.07)	(0.09)	(0.18)

Panel B: Inflation-linked yield correlation decomposition

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel B1: Country 1 perspective									
$\frac{Cov(\text{real yield}_1,\text{inflation-linked yield}_2)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	0.97	0.94	0.71	0.67	0.80	-0.53***	0.80	0.90	-0.09***
	(0.05)	(0.08)	(0.13)	(0.15)	(0.18)	(0.16)	(0.11)	(0.14)	(0.17)
$\frac{Cov(\text{liquidity premium}_1,\text{inflation-linked yield}_2)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	-0.06	-0.08	-0.05	-0.01	-0.02	0.09	-0.03	-0.07	0.05
	(0.04)	(0.06)	(0.03)	(0.05)	(0.10)	(0.03)	(0.05)	(0.07)	(0.06)
Panel B2: Country 2 perspective									
$\frac{Cov(\text{real yield}_2,\text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	0.96	0.97	0.79	0.51	0.69	-0.42***	0.63	0.77	-0.01***
	(0.05)	(0.06)	(0.15)	(0.15)	(0.15)	(0.17)	(0.12)	(0.11)	(0.13)
$\frac{Cov(\text{liquidity premium}_2,\text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	-0.05	-0.11	-0.13	0.15	0.09	-0.02	0.13	0.06	-0.02
	(0.04)	(0.04)	(0.06)	(0.06)	(0.08)	(0.04)	(0.06)	(0.06)	(0.02)
Panel B3: Total correlation									
	0.91	0.86	0.65	0.66	0.78	-0.43***	0.77	0.83	-0.04***
	(0.11)	(0.13)	(0.10)	(0.14)	(0.07)	(0.13)	(0.10)	(0.12)	(0.11)

87

10 Year Zero-Coupon Yield Correlation Decompositions. Data is monthly 2004M11-2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

Panel A: Nominal yield correlation decomposition

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel A1: Country 1 perspective									
$\frac{Cov(\text{real yield}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.71 (0.03)	0.63 (0.05)	0.62 (0.05)	0.60 (0.07)	0.54 (0.06)	0.13* (0.14)	0.96 (0.05)	1.09 (0.07)	0.34** (0.18)
$\frac{Cov(\text{expected inflation}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.03 (0.02)	0.02 (0.03)	0.03 (0.02)	0.03 (0.01)	0.01 (0.02)	0.02 (0.03)	-0.21 (0.07)	-0.46 (0.08)	-0.03** (0.13)
$\frac{Cov(\text{inflation risk premium}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.21 (0.02)	0.17 (0.05)	0.17 (0.04)	0.19 (0.03)	0.17 (0.09)	0.10 (0.08)	0.15 (0.09)	0.30 (0.11)	0.15 (0.13)
Panel A2: Country 2 perspective									
$\frac{Cov(\text{real yield}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.99 (0.08)	0.80 (0.08)	0.91 (0.20)	0.57 (0.12)	0.70 (0.11)	-0.38** (0.20)	0.69 (0.08)	0.87 (0.10)	0.01** (0.16)
$\frac{Cov(\text{expected inflation}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	-0.12 (0.05)	-0.30 (0.10)	0.22** (0.10)	0.10 (0.01)	0.03 (0.03)	0.11 (0.04)	0.09 (0.02)	0.03 (0.01)	0.04 (0.02)
$\frac{Cov(\text{inflation risk premium}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.08 (0.07)	0.33 (0.09)	-0.31** (0.07)	0.14 (0.06)	0.00 (0.02)	0.51** (0.09)	0.13 (0.06)	0.04 (0.04)	0.42*** (0.06)
Panel A3: Total correlation									
	0.95 (0.06)	0.82 (0.14)	0.81 (0.08)	0.81 (0.16)	0.72 (0.10)	0.24* (0.18)	0.91 (0.09)	0.93 (0.08)	0.46** (0.16)

Panel B: Inflation-linked yield correlation decomposition

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel B1: Country 1 perspective									
$\frac{Cov(\text{real yield}_1,\text{inflation-linked yield}_2)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	0.94 (0.03)	0.68 (0.09)	0.88 (0.11)	0.69 (0.14)	0.67 (0.12)	-0.32** (0.13)	0.82 (0.07)	1.03 (0.18)	-0.07** (0.16)
$\frac{Cov(\text{liquidity premium}_1,\text{inflation-linked yield}_2)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	0.00 (0.02)	-0.01 (0.08)	-0.03 (0.04)	0.02 (0.03)	0.06 (0.14)	0.04 (0.01)	-0.04 (0.05)	-0.10 (0.14)	-0.09 (0.03)
Panel B2: Country 2 perspective									
$\frac{Cov(\text{real yield}_2,\text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	0.94 (0.05)	0.66 (0.17)	0.83 (0.05)	0.68 (0.15)	0.71 (0.10)	-0.32** (0.15)	0.77 (0.09)	0.96 (0.08)	-0.20** (0.19)
$\frac{Cov(\text{liquidity premium}_2,\text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	0.00 (0.04)	0.00 (0.13)	0.02 (0.03)	0.02 (0.03)	0.02 (0.06)	0.04 (0.04)	0.01 (0.03)	-0.03 (0.04)	0.05 (0.04)
Panel B3: Total correlation									
	0.94 (0.07)	0.67 (0.18)	0.84 (0.12)	0.71 (0.21)	0.73 (0.15)	-0.28** (0.13)	0.78 (0.18)	0.93 (0.04)	-0.16*** (0.13)

88

Model-implied 10 Year Zero-Coupon Yield Correlation Decompositions. Data is monthly 2004M11-2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

Panel A: Nominal yield correlation decomposition

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel A1: Country 1 perspective									
$\frac{Cov(\text{real yield}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.69 (0.03)	0.63 (0.09)	0.57 (0.06)	0.61 (0.05)	0.61 (0.10)	0.19* (0.17)	0.97 (0.05)	0.97 (0.06)	0.32* (0.29)
$\frac{Cov(\text{expected inflation}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.03 (0.01)	0.12 (0.02)	-0.07*** (0.01)	0.04 (0.01)	0.12 (0.03)	-0.02*** (0.03)	-0.06 (0.03)	-0.21 (0.06)	0.03** (0.04)
$\frac{Cov(\text{inflation risk premium}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.21 (0.03)	0.00 (0.07)	0.31*** (0.03)	0.16 (0.04)	-0.04 (0.07)	0.12 (0.08)	0.01 (0.06)	0.18 (0.06)	0.17 (0.16)
Panel A2: Country 2 perspective									
$\frac{Cov(\text{real yield}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	1.02 (0.06)	0.64 (0.12)	1.02 (0.14)	0.42 (0.08)	0.47 (0.14)	-0.37** (0.18)	0.56 (0.07)	0.76 (0.09)	0.02*** (0.14)
$\frac{Cov(\text{expected inflation}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	-0.02 (0.04)	-0.22 (0.07)	0.14*** (0.03)	-0.08 (0.02)	-0.01 (0.02)	-0.22*** (0.03)	-0.06 (0.02)	0.02 (0.02)	-0.18*** (0.03)
$\frac{Cov(\text{inflation risk premium}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	-0.07 (0.07)	0.33 (0.14)	-0.34** (0.15)	0.47 (0.07)	0.22 (0.09)	0.87*** (0.11)	0.42 (0.08)	0.16 (0.07)	0.68** (0.12)
Panel A3: Total correlation									
	0.93 (0.07)	0.75 (0.14)	0.82 (0.08)	0.81 (0.15)	0.69 (0.09)	0.29* (0.13)	0.92 (0.08)	0.94 (0.06)	0.52** (0.11)

Panel B: Inflation-linked yield correlation decomposition

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel B1: Country 1 perspective									
$\frac{Cov(\text{real yield}_1,\text{inflation-linked yield}_2)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	0.95 (0.02)	0.73 (0.12)	0.86 (0.07)	0.72 (0.10)	0.78 (0.10)	-0.27*** (0.16)	0.79 (0.08)	0.99 (0.09)	-0.18*** (0.16)
$\frac{Cov(\text{liquidity premium}_1,\text{inflation-linked yield}_2)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	-0.01 (0.01)	-0.07 (0.05)	-0.01 (0.01)	-0.01 (0.02)	-0.04 (0.07)	-0.01 (0.01)	-0.02 (0.03)	-0.08 (0.07)	-0.01 (0.01)
Panel B2: Country 2 perspective									
$\frac{Cov(\text{real yield}_2,\text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	0.94 (0.03)	0.68 (0.14)	0.86 (0.07)	0.50 (0.10)	0.48 (0.17)	-0.29** (0.17)	0.59 (0.09)	0.78 (0.12)	-0.18*** (0.17)
$\frac{Cov(\text{liquidity premium}_2,\text{inflation-linked yield}_1)}{SD(\text{inflation-linked yield}_1)SD(\text{inflation-linked yield}_2)}$	0.00 (0.02)	-0.02 (0.07)	-0.02 (0.02)	0.21 (0.07)	0.27 (0.15)	0.01* (0.03)	0.18 (0.07)	0.14 (0.10)	-0.01 (0.03)
Panel B3: Total correlation									
	0.94 (0.07)	0.66 (0.17)	0.85 (0.11)	0.71 (0.21)	0.74 (0.14)	-0.28*** (0.12)	0.77 (0.18)	0.91 (0.05)	-0.19*** (0.11)

89

Online Appendix VI: No-arbitrage Term Structure Model Estimation

We start by regressing the 1 month nominal short rate on our pricing factors to estimate δ_0 and δ_1 in (8). We then estimate $\tilde{\mu}$ and $\tilde{\Phi}$ in (8) using the seemingly unrelated regression approach of Adrian, Crump, and Moench (2013). This fast methodology not prone to local optima is based on the observation that one period excess nominal and inflation-linked bond returns are linear in $\tilde{\Phi}$. We use monthly excess returns on 1-10 year nominal bonds (10 return time series in total) and 2-10 year inflation-linked bonds (9 return time series in total) for the estimation of these parameters. For the UK we use 4-10 year inflation-linked bonds (7 return time series in total) in the estimation. Unfortunately, inflation-linked bond prices in (9) are quadratic in π_1 preventing the estimation via the seemingly unrelated regression approach. We thus estimate π_0 and π_1 via minimizing the sum of squared deviations between annualized observed and model-implied inflation-linked zero-coupon yields given the values of δ_0, δ_1, $\tilde{\mu}$, and $\tilde{\Phi}$ as estimated above. We use 2-10 year zero-coupon inflation-linked yields (9 time series in total) for France and the US and 4-10 year zero-coupon inflation-linked yields (7 time series in total) for the UK.

We report $\tilde{\mu}$ and $\tilde{\Phi}$ instead of λ_0 and λ_1, because these are the primary output of our estimation procedure and used directly in pricing equations (8) and (9). λ_0 and λ_1 can be obtained from (7).

It is not possible to estimate the "WFX model" of Chernov and Creal (2019) through the seemingly unrelated regression approach of Adrian, Crump, and Moench (2013) due to international no-arbitrage restrictions. We estimate the model by

minimizing the squared errors between observed and model-implied annualized yields

using the same maturities as before.

Parameter Estimates: France. Standard errors are in parentheses. μ_X- and Φ-standard errors are Newey and West (1987) ordinary least squares standard errors computed with 12 lags. π-standards are maximum likelihood standard errors computed by inverting the information matrix. $\tilde{\mu}$- and $\tilde{\Phi}$-standard errors are generalized least squares standard errors.

$\mu_{X,\text{ nominal PC 1}}$	0.0298 (0.0195)	$\tilde{\mu}_{\text{nominal PC 1}}$	0.0126 (0.0102)	δ_0	0.00062 (0.00001)	π_0	-0.0019 (0.0010)
$\mu_{X,\text{ nominal PC 2}}$	0.1078 (0.0286)	$\tilde{\mu}_{\text{nominal PC 2}}$	-0.0530 (0.0389)	$\delta_{1,\text{ nominal PC 1}}$	0.00119 (0.00002)	$\pi_{1,\text{ nominal PC 1}}$	-0.0004 (0.0002)
$\mu_{X,\text{ nominal PC 3}}$	0.0948 (0.0919)	$\tilde{\mu}_{\text{nominal PC 3}}$	-0.2319 (0.1130)	$\delta_{1,\text{ nominal PC 2}}$	0.00037 (0.00001)	$\pi_{1,\text{ nominal PC 2}}$	0.0003 (0.0002)
$\mu_{X,\text{ real PC 1}}$	-0.1668 (0.1512)	$\tilde{\mu}_{\text{real PC 1}}$	0.0349 (0.0205)	$\delta_{1,\text{ nominal PC 3}}$	0.00011 (0.00001)	$\pi_{1,\text{ nominal PC 3}}$	-0.0002 (0.0001)
$\mu_{X,\text{ real PC 2}}$	0.2323 (0.1593)	$\tilde{\mu}_{\text{real PC 2}}$	0.0113 (0.0108)	$\delta_{1,\text{ real PC 1}}$	0.00001 (0.00001)	$\pi_{1,\text{ real PC 1}}$	0.0005 (0.0003)
$\mu_{X,\text{ real PC 3}}$	0.1814 (0.1784)	$\tilde{\mu}_{\text{real PC 3}}$	0.0391 (0.0312)	$\delta_{1,\text{ real PC 2}}$	-0.00001 (0.00001)	$\pi_{1,\text{ real PC 2}}$	0.0004 (0.0002)
$\mu_{X,\text{ inflation}}$	0.1895 (0.0388)	$\tilde{\mu}_{\text{inflation}}$	0.1838 (0.0901)	$\delta_{1,\text{ real PC 3}}$	-0.00001 (0.00001)	$\pi_{1,\text{ real PC 3}}$	0.0003 (0.0001)
$\mu_{X,\text{ liquidity}}$	0.1412 (0.0239)	$\tilde{\mu}_{\text{liquidity}}$	0.0081 (0.0195)	$\delta_{1,\text{ inflation}}$	0.00001 (0.0001)	$\pi_{1,\text{ inflation}}$	0.0200 (0.0053)
				$\delta_{1,\text{ liquidity}}$	0.00006 (0.00003)	$\pi_{1,\text{ liquidity}}$	0.0019 (0.0010)

Φ

	nominal PC 1	nominal PC 2	nominal PC 3	real PC 1	real PC 2	real PC 3	inflation	liquidity
nominal PC 1	0.9905 (0.0075)	0.0059 (0.0088)	-0.0063 (0.0077)	-0.0132 (0.0056)	0.0031 (0.0100)	0.0117 (0.0079)	0.0419 (0.0369)	-0.1576 (0.0631)
nominal PC 2	-0.0148 (0.0244)	0.9558 (0.0138)	-0.0076 (0.0154)	-0.0130 (0.0193)	-0.0145 (0.0150)	0.0041 (0.0251)	-0.0703 (0.1625)	-0.3129 (0.1472)
nominal PC 3	0.0275 (0.0416)	-0.0248 (0.0451)	0.8702 (0.0399)	-0.0619 (0.0546)	0.0539 (0.0288)	-0.0437 (0.0284)	-0.1288 (0.2296)	-0.2989 (0.2454)
real PC 1	0.0558 (0.0403)	0.0662 (0.0386)	0.0675 (0.0470)	0.7766 (0.0553)	-0.0369 (0.0482)	0.0035 (0.0584)	-0.3783 (0.2369)	0.7380 (0.4737)
real PC 2	-0.0089 (0.0468)	-0.0467 (0.0664)	-0.0102 (0.0614)	0.0138 (0.0765)	0.6096 (0.0615)	0.0281 (0.0864)	-0.3495 (0.3746)	-0.6432 (0.4633)
real PC 3	0.0160 (0.0529)	-0.0459 (0.0751)	0.0666 (0.0572)	-0.0872 (0.0641)	0.0141 (0.0639)	0.4767 (0.1109)	-0.5633 (0.4464)	-0.3931 (0.4366)
inflation	0.0349 (0.0146)	-0.0110 (0.0125)	-0.0116 (0.0098)	-0.0625 (0.0157)	-0.0045 (0.0131)	-0.0038 (0.0119)	0.0119 (0.0859)	-0.2346 (0.1108)
liquidity	0.0010 (0.0143)	-0.0155 (0.0110)	0.0025 (0.0070)	-0.0083 (0.0091)	0.0010 (0.0072)	0.0004 (0.0094)	-0.1076 (0.0734)	0.5662 (0.0792)

$\tilde{\Phi}$

	nominal PC 1	nominal PC 2	nominal PC 3	real PC 1	real PC 2	real PC 3	inflation	liquidity
nominal PC 1	1.0049 (0.0158)	-0.0114 (0.0198)	-0.0037 (0.0102)	0.0001 (0.0139)	0.0019 (0.0067)	0.0015 (0.0107)	-0.0144 (0.0135)	0.0053 (0.0116)
nominal PC 2	0.0426 (0.0265)	0.9994 (0.0131)	-0.0276 (0.0264)	0.0042 (0.0153)	0.0164 (0.0168)	0.0098 (0.0252)	-0.1118 (0.1610)	0.0536 (0.1030)
nominal PC 3	0.1271 (0.0419)	0.0695 (0.0340)	0.9681 (0.0249)	0.0146 (0.0140)	0.0804 (0.0381)	0.0513 (0.0191)	-0.6043 (0.1593)	0.2786 (0.1017)
real PC 1	0.0584 (0.0444)	-0.0809 (0.0337)	0.1737 (0.0775)	0.7034 (0.0271)	-0.1291 (0.0276)	-0.2142 (0.0893)	-0.7825 (0.2161)	0.2166 (0.2162)
real PC 2	0.0167 (0.0188)	-0.0315 (0.0328)	0.0511 (0.0379)	-0.0620 (0.0334)	0.9594 (0.0207)	-0.0674 (0.0418)	-0.2340 (0.2151)	0.1035 (0.1070)
real PC 3	-0.0604 (0.0416)	0.0172 (0.0178)	-0.1084 (0.0596)	0.1001 (0.0716)	0.0006 (0.0177)	1.0274 (0.1138)	0.7275 (0.1160)	-0.2486 (0.1511)
inflation	0.0379 (0.0174)	-0.0257 (0.0165)	0.0142 (0.0149)	-0.0481 (0.0179)	-0.0361 (0.0218)	-0.0241 (0.0129)	0.0036 (0.0115)	-0.1821 (0.1088)
liquidity	-0.0128 (0.0141)	0.0122 (0.0171)	-0.0349 (0.0166)	0.0592 (0.0139)	0.0190 (0.0126)	0.0428 (0.0205)	0.1780 (0.1200)	0.9192 (0.0417)

Parameter Estimates: UK. Standard errors are in parentheses. μ_X- and Φ-standard errors are Newey and West (1987) ordinary least squares standard errors computed with 12 lags. π-standards are maximum likelihood standard errors computed by inverting the information matrix. $\tilde{\mu}$- and $\tilde{\Phi}$-standard errors are generalized least squares standard errors.

$\mu_{X,\text{ nominal PC 1}}$	0.0695 (0.0387)	$\tilde{\mu}_{\text{nominal PC 1}}$	0.0072 (0.0183)	δ_0	0.00137 (0.00005)	π_0	0.0010 (0.0012)
$\mu_{X,\text{ nominal PC 2}}$	0.0747 (0.0392)	$\tilde{\mu}_{\text{nominal PC 2}}$	-0.0428 (0.0265)	$\delta_{1,\text{ nominal PC 1}}$	0.00153 (0.00001)	$\pi_{1,\text{ nominal PC 1}}$	-0.0001 (0.0001)
$\mu_{X,\text{ nominal PC 3}}$	-0.0155 (0.0975)	$\tilde{\mu}_{\text{nominal PC 3}}$	-0.1431 (0.0573)	$\delta_{1,\text{ nominal PC 2}}$	0.00049 (0.00001)	$\pi_{1,\text{ nominal PC 2}}$	0.0003 (0.0001)
$\mu_{X,\text{ real PC 1}}$	-0.4205 (0.3496)	$\tilde{\mu}_{\text{real PC 1}}$	-0.0332 (0.1536)	$\delta_{1,\text{ nominal PC 3}}$	0.00015 (0.00001)	$\pi_{1,\text{ nominal PC 3}}$	-0.0001 (0.0002)
$\mu_{X,\text{ real PC 2}}$	-0.1718 (0.1753)	$\tilde{\mu}_{\text{real PC 2}}$	-0.0644 (0.0388)	$\delta_{1,\text{ real PC 1}}$	0.00002 (0.00002)	$\pi_{1,\text{ real PC 1}}$	-0.0006 (0.0004)
$\mu_{X,\text{ real PC 3}}$	0.0945 (0.1388)	$\tilde{\mu}_{\text{real PC 3}}$	0.1035 (0.0888)	$\delta_{1,\text{ real PC 2}}$	0.00003 (0.00002)	$\pi_{1,\text{ real PC 2}}$	-0.0007 (0.0005)
$\mu_{X,\text{ inflation}}$	0.5716 (0.1065)	$\tilde{\mu}_{\text{inflation}}$	0.4072 (0.1665)	$\delta_{1,\text{ real PC 3}}$	-0.00001 (0.00001)	$\pi_{1,\text{ real PC 3}}$	-0.0003 (0.0002)
$\mu_{X,\text{ liquidity}}$	0.1037 (0.0467)	$\tilde{\mu}_{\text{liquidity}}$	0.0377 (0.0259)	$\delta_{1,\text{ inflation}}$	-0.00001 (0.00001)	$\pi_{1,\text{ inflation}}$	0.0063 (0.0030)
				$\delta_{1,\text{ liquidity}}$	0.00001 (0.00003)	$\pi_{1,\text{ liquidity}}$	-0.0007 (0.0012)

Φ

	nominal PC 1	nominal PC 2	nominal PC 3	real PC 1	real PC 2	real PC 3	inflation	liquidity
nominal PC 1	0.9720 (0.0112)	-0.0024 (0.0098)	-0.0068 (0.0099)	0.0010 (0.0052)	-0.0137 (0.0082)	0.0173 (0.0115)	0.0225 (0.0208)	-0.1701 (0.0748)
nominal PC 2	-0.0225 (0.0139)	0.9632 (0.0168)	-0.0308 (0.0194)	-0.0389 (0.0149)	-0.0475 (0.0127)	-0.0283 (0.0187)	-0.0121 (0.0449)	-0.1275 (0.0692)
nominal PC 3	0.0429 (0.0491)	0.0125 (0.0406)	0.8785 (0.0457)	-0.0782 (0.0387)	-0.0856 (0.0345)	0.0254 (0.0530)	-0.1840 (0.1010)	0.1034 (0.1633)
real PC 1	0.1272 (0.0957)	0.0954 (0.0779)	0.0903 (0.0649)	0.7972 (0.0538)	-0.0559 (0.0452)	-0.0636 (0.0727)	-0.1612 (0.1057)	0.8750 (0.6281)
real PC 2	0.0821 (0.0561)	0.1318 (0.0507)	0.0166 (0.0362)	-0.0488 (0.0347)	0.8587 (0.0339)	-0.0638 (0.0526)	-0.2877 (0.0806)	0.4897 (0.3250)
real PC 3	-0.0275 (0.0552)	-0.0202 (0.0649)	0.0404 (0.0469)	0.1473 (0.0740)	0.0498 (0.0510)	0.7532 (0.0721)	-0.0168 (0.1663)	-0.1647 (0.2283)
inflation	-0.0199 (0.0264)	-0.0686 (0.0390)	0.0127 (0.0319)	-0.1766 (0.0268)	-0.1061 (0.0233)	-0.0150 (0.0301)	-0.2710 (0.0533)	-0.5138 (0.1761)
liquidity	-0.0183 (0.0098)	-0.0230 (0.0134)	0.0123 (0.0141)	-0.0135 (0.0139)	0.0265 (0.0155)	0.0081 (0.0124)	0.0888 (0.0377)	0.7617 (0.0702)

$\tilde{\Phi}$

	nominal PC 1	nominal PC 2	nominal PC 3	real PC 1	real PC 2	real PC 3	inflation	liquidity
nominal PC 1	0.9933 (0.0150)	-0.0110 (0.0161)	-0.0059 (0.0079)	-0.0024 (0.0063)	-0.0032 (0.0103)	0.0005 (0.0098)	0.0027 (0.0160)	-0.0006 (0.0183)
nominal PC 2	0.0021 (0.0088)	1.0107 (0.0281)	-0.0274 (0.0152)	-0.0129 (0.0179)	-0.0163 (0.0162)	0.0011 (0.0147)	0.0124 (0.0314)	-0.0016 (0.0188)
nominal PC 3	-0.0110 (0.0151)	0.1158 (0.0444)	0.9631 (0.0238)	-0.0741 (0.0309)	-0.0928 (0.0319)	0.0088 (0.0119)	0.0786 (0.1000)	-0.0190 (0.1620)
real PC 1	0.0813 (0.0468)	0.0274 (0.0354)	0.0750 (0.0506)	0.9026 (0.0695)	-0.2149 (0.0532)	-0.1234 (0.0645)	-0.5805 (0.1502)	0.2753 (0.2162)
real PC 2	0.0635 (0.0412)	0.0630 (0.0327)	0.0668 (0.0419)	-0.1178 (0.0443)	0.7835 (0.0278)	-0.1135 (0.0673)	-0.4223 (0.1111)	0.2763 (0.2106)
real PC 3	-0.0009 (0.0160)	-0.0583 (0.0586)	-0.0815 (0.0447)	0.0128 (0.0157)	0.0443 (0.0226)	1.0089 (0.0344)	0.2310 (0.1850)	-0.2070 (0.1131)
inflation	-0.0085 (0.0111)	0.0094 (0.0223)	-0.0478 (0.0353)	-0.1305 (0.0111)	-0.1546 (0.0218)	-0.0630 (0.0339)	-0.0415 (0.0446)	-0.3742 (0.1111)
liquidity	-0.0317 (0.0120)	-0.0069 (0.0137)	-0.0357 (0.0262)	0.0189 (0.0165)	0.0545 (0.0339)	0.0359 (0.0226)	0.2186 (0.0516)	0.8316 (0.0213)

Parameter Estimates: US. Standard errors are in parentheses. μ_X- and Φ-standard errors are Newey and West (1987) ordinary least squares standard errors computed with 12 lags. π-standards are maximum likelihood standard errors computed by inverting the information matrix. $\tilde{\mu}$- and $\tilde{\Phi}$-standard errors are generalized least squares standard errors.

$\mu_{X,\text{ nominal PC 1}}$	-0.0014 (0.0261)	$\tilde{\mu}_{\text{nominal PC 1}}$	0.0113 (0.0385)	δ_0	0.00127 (0.00003)	π_0	-0.0009 (0.0014)
$\mu_{X,\text{ nominal PC 2}}$	-0.0578 (0.0516)	$\tilde{\mu}_{\text{nominal PC 2}}$	0.0477 (0.0404)	$\delta_{1,\text{ nominal PC 1}}$	0.00127 (0.00002)	$\pi_{1,\text{ nominal PC 1}}$	0.0001 (0.0001)
$\mu_{X,\text{ nominal PC 3}}$	0.0174 (0.0706)	$\tilde{\mu}_{\text{nominal PC 3}}$	-0.1265 (0.1502)	$\delta_{1,\text{ nominal PC 2}}$	-0.00035 (0.00001)	$\pi_{1,\text{ nominal PC 2}}$	-0.0005 (0.0005)
$\mu_{X,\text{ real PC 1}}$	-0.0065 (0.0984)	$\tilde{\mu}_{\text{real PC 1}}$	-0.0669 (0.0700)	$\delta_{1,\text{ nominal PC 3}}$	0.00017 (0.00001)	$\pi_{1,\text{ nominal PC 3}}$	-0.0008 (0.0006)
$\mu_{X,\text{ real PC 2}}$	0.0111 (0.0884)	$\tilde{\mu}_{\text{real PC 2}}$	0.0642 (0.0949)	$\delta_{1,\text{ real PC 1}}$	0.00002 (0.00002)	$\pi_{1,\text{ real PC 1}}$	-0.0004 (0.0001)
$\mu_{X,\text{ inflation}}$	0.2118 (0.0597)	$\tilde{\mu}_{\text{inflation}}$	0.2788 (0.0754)	$\delta_{1,\text{ real PC 2}}$	-0.00002 (0.00002)	$\pi_{1,\text{ real PC 2}}$	-0.0002 (0.0002)
$\mu_{X,\text{ liquidity}}$	0.0281 (0.0159)	$\tilde{\mu}_{\text{liquidity}}$	0.0180 (0.0263)	$\delta_{1,\text{ inflation}}$	-0.00003 (0.00003)	$\pi_{1,\text{ inflation}}$	0.0111 (0.0043)
				$\delta_{1,\text{ liquidity}}$	-0.00008 (0.00005)	$\pi_{1,\text{ liquidity}}$	0.0022 (0.0027)

Φ

	nominal PC 1	nominal PC 2	nominal PC 3	real PC 1	real PC 2	inflation	liquidity
nominal PC 1	0.9864 (0.0166)	-0.0139 (0.0114)	-0.0309 (0.0139)	-0.0028 (0.0133)	0.0053 (0.0104)	0.0542 (0.0449)	-0.0481 (0.0586)
nominal PC 2	-0.0235 (0.0203)	0.9379 (0.0218)	0.0226 (0.0309)	-0.0214 (0.0276)	-0.0198 (0.0241)	0.0331 (0.0612)	0.1247 (0.1254)
nominal PC 3	0.0665 (0.0286)	0.0363 (0.0328)	0.8788 (0.0343)	-0.0212 (0.0379)	0.0557 (0.0270)	0.0609 (0.0869)	-0.0714 (0.1809)
real PC 1	0.0287 (0.0495)	-0.0146 (0.0547)	-0.0506 (0.0457)	0.7181 (0.0824)	-0.0916 (0.0380)	-0.5064 (0.1454)	0.3150 (0.2281)
real PC 2	0.0053 (0.0479)	-0.0423 (0.0622)	-0.0019 (0.0582)	-0.2874 (0.0670)	0.6420 (0.0744)	-0.4442 (0.2212)	0.2020 (0.2146)
inflation	0.0383 (0.0252)	0.0242 (0.0226)	0.0253 (0.0218)	0.0133 (0.0337)	-0.0285 (0.0208)	0.4225 (0.0752)	-0.3935 (0.1739)
liquidity	0.0141 (0.0074)	0.0149 (0.0112)	0.0047 (0.0079)	-0.0007 (0.0109)	0.0036 (0.0066)	0.0404 (0.0196)	0.8832 (0.0605)

$\tilde{\Phi}$

	nominal PC 1	nominal PC 2	nominal PC 3	real PC 1	real PC 2	inflation	liquidity
nominal PC 1	0.9934 (0.0308)	0.0120 (0.0195)	-0.0124 (0.0078)	-0.0025 (0.0174)	0.0021 (0.0132)	0.0025 (0.0383)	0.0153 (0.0639)
nominal PC 2	-0.0150 (0.0295)	1.0094 (0.0235)	0.0394 (0.0395)	0.0067 (0.0068)	-0.0051 (0.0170)	-0.0052 (0.0191)	-0.0353 (0.0386)
nominal PC 3	0.0495 (0.0253)	-0.0452 (0.0274)	0.9297 (0.0352)	-0.0328 (0.0317)	0.0260 (0.0306)	0.0324 (0.0406)	0.1677 (0.1235)
real PC 1	0.0882 (0.0345)	-0.0945 (0.0425)	-0.2086 (0.0792)	0.8334 (0.0526)	-0.1594 (0.0283)	-0.4815 (0.1521)	0.3137 (0.02467)
real PC 2	0.0032 (0.0292)	0.0529 (0.0211)	0.0043 (0.0414)	-0.0246 (0.0365)	0.9009 (0.0441)	-0.1452 (0.1507)	-0.0388 (0.0547)
inflation	0.0329 (0.0287)	0.0767 (0.0256)	0.1102 (0.0460)	-0.0076 (0.0097)	-0.0344 (0.0349)	0.0573 (0.0440)	-0.5165 (0.1548)
liquidity	-0.0110 (0.0082)	0.0208 (0.0146)	0.0387 (0.0244)	0.0239 (0.0572)	0.0194 (0.0170)	0.0777 (0.0297)	0.9184 (0.0471)

Online Appendix VII: Expected Real Future Short Rates versus the Real Term Premium

We consider two approaches to decompose the real yield into the expected short rate and the term premium parts. The first approach is statistical. For each country separately, we estimate a quarterly small-sample adjusted VAR(2) process, which includes 3 month nominal short rate, realized quarterly inflation, and either one quarter (the US) or one year (France and the UK) ahead expected inflation. This allows us to construct expected 5 year ahead average 3 month nominal short rate. We then subtract 5 year ahead survey expected inflation from this estimate to construct expected 5 year ahead average 3 month real short rate. Using statistical (output of VAR(2)) expected inflation estimates doesn't substantially affect our results.

The second approach is the survey approach. For the US, we have expected 5 year ahead average 3 month nominal short rate survey forecast by Blue Chips Economic Indicators. For France and the UK such forecasts are not available. Thus, we follow Wright (2011) and regress the US survey forecasts on the US 5 year survey expected GDP growth (from Consensus Forecasts) and inflation and the statistical expected 5 year ahead average 3 month nominal short rate. This regression has R^2 of 77.97%. As in Wright (2011), we assume that the regression coefficients are the same for France and the UK and construct expected 5 year ahead average 3 month nominal short rate "survey" forecasts for these countries using their 5 year survey expected GDP growth (from Consensus Forecasts) and inflation and the statistical expected 5 year ahead average 3 month nominal short rate.

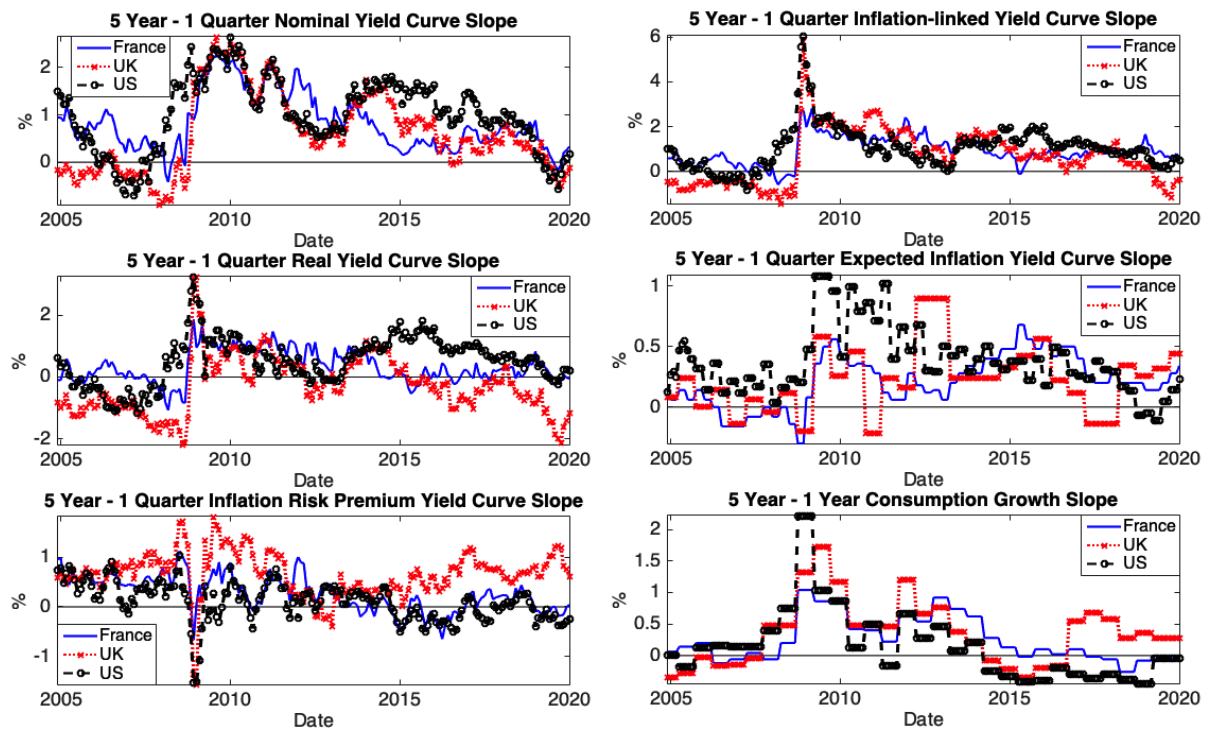The real yield variance and correlation decompositions are below.

94

5 Year Zero-Coupon Real Yield Variance Decompositions. Data is monthly 2004M11-2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2, *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

Panel A: Statistical term premium estimates

	France			UK			US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
$\frac{Cov(\text{expected short rate},\text{real yield})}{Var(\text{real yield})}$	59.06%	98.52%	36.63%***	71.65%	91.54%	11.66%***	67.12%	77.61%	52.22%
	(8.81%)	(6.55%)	(6.22%)	(7.15%)	(3.72%)	(13.09%)	(12.08%)	(15.25%)	(15.33%)
$\frac{Cov(\text{term premium},\text{real yield})}{Var(\text{real yield})}$	40.94%	1.48%	63.37%***	28.35%	8.46%	88.34%***	32.88%	22.39%	47.78%
	(8.81%)	(6.55%)	(6.22%)	(7.15%)	(3.72%)	(13.09%)	(12.08%)	(15.25%)	(15.33%)

Panel B: Survey term premium estimates

	France			UK			US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
$\frac{Cov(\text{expected short rate},\text{real yield})}{Var(\text{real yield})}$	53.83%	90.68%	35.52%***	65.42%	84.61%	6.06%***	75.11%	69.57%	46.62%
	(8.10%)	(6.40%)	(5.67%)	(6.84%)	(3.41%)	(12.05%)	(8.77%)	(4.84%)	(10.83%)
$\frac{Cov(\text{term premium},\text{real yield})}{Var(\text{real yield})}$	46.17%	9.32%	64.48%***	34.58%	15.39%	93.94%***	24.89%	30.43%	53.38%
	(8.10%)	(6.40%)	(5.67%)	(6.84%)	(3.41%)	(12.05%)	(8.77%)	(4.84%)	(10.83%)

95

5 Year Zero-Coupon Real Yield Correlation Decompositions. Data is monthly 2004M11-2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

Panel A: Statistical term premium estimates

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel A1: Country 1 perspective									
$\frac{Cov(\text{expected short rate}_1,\text{real yield}_2)}{SD(\text{real yield}_1)SD(\text{real yield}_2)}$	0.62	0.97	0.40**	0.45	0.85	-0.14***	0.61	0.80	0.22**
	(0.07)	(0.07)	(0.10)	(0.13)	(0.14)	(0.15)	(0.10)	(0.07)	(0.10)
$\frac{Cov(\text{term premium}_1,\text{real yield}_2)}{SD(\text{real yield}_1)SD(\text{real yield}_2)}$	0.29	-0.16	0.35**	0.09	-0.09	-0.37	0.10	0.10	-0.42***
	(0.07)	(0.09)	(0.11)	(0.08)	(0.07)	(0.06)	(0.06)	(0.03)	(0.13)
Panel A2: Country 2 perspective									
$\frac{Cov(\text{expected short rate}_2,\text{real yield}_1)}{SD(\text{real yield}_1)SD(\text{real yield}_2)}$	0.62	0.75	-0.02***	0.30	0.59	-0.50***	0.45	0.74	-0.37***
	(0.09)	(0.07)	(0.10)	(0.23)	(0.14)	(0.14)	(0.18)	(0.13)	(0.17)
$\frac{Cov(\text{term premium}_2,\text{real yield}_1)}{SD(\text{real yield}_1)SD(\text{real yield}_2)}$	0.29	0.06	0.77***	0.24	0.17	-0.01	0.26	0.16	0.18
	(0.08)	(0.05)	(0.11)	(0.09)	(0.16)	(0.12)	(0.09)	(0.16)	(0.17)
Panel A3: Total correlation									
	0.91	0.81	0.75	0.54	0.77	-0.51***	0.71	0.90	-0.20***
	(0.08)	(0.12)	(0.11)	(0.14)	(0.14)	(0.21)	(0.07)	(0.09)	(0.08)

Panel B: Survey term premium estimates

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel B1: Country 1 perspective									
$\frac{Cov(\text{expected short rate}_1,\text{real yield}_2)}{SD(\text{real yield}_1)SD(\text{real yield}_2)}$	0.56	0.88	0.37**	0.40	0.78	-0.16***	0.56	0.74	0.22**
	(0.07)	(0.06)	(0.08)	(0.12)	(0.12)	(0.13)	(0.09)	(0.07)	(0.08)
$\frac{Cov(\text{term premium}_1,\text{real yield}_2)}{SD(\text{real yield}_1)SD(\text{real yield}_2)}$	0.35	-0.07	0.38**	0.13	-0.01	-0.35*	0.14	0.16	-0.41**
	(0.07)	(0.08)	(0.10)	(0.08)	(0.07)	(0.05)	(0.06)	(0.03)	(0.14)
Panel B2: Country 2 perspective									
$\frac{Cov(\text{expected short rate}_2,\text{real yield}_1)}{SD(\text{real yield}_1)SD(\text{real yield}_2)}$	0.56	0.70	-0.06***	0.65	0.62	-0.24***	0.75	0.70	0.01***
	(0.09)	(0.07)	(0.09)	(0.13)	(0.08)	(0.04)	(0.10)	(0.05)	(0.12)
$\frac{Cov(\text{term premium}_2,\text{real yield}_1)}{SD(\text{real yield}_1)SD(\text{real yield}_2)}$	0.35	0.11	0.80***	-0.11	0.15	-0.27**	-0.04	0.20	-0.21***
	(0.07)	(0.05)	(0.11)	(0.13)	(0.09)	(0.11)	(0.12)	(0.08)	(0.08)
Panel B3: Total correlation									
	0.91	0.81	0.75	0.54	0.77	-0.51***	0.71	0.90	-0.20***
	(0.08)	(0.12)	(0.11)	(0.14)	(0.14)	(0.21)	(0.07)	(0.09)	(0.08)

Online Appendix VIII: Yield Curve Slopes

Annualized Zero-coupon Yield Curve Slopes. Graphs are monthly. Consumption growth slopes are based on survey forecasts.

5 Year - 1 Quarter Zero-Coupon Yield Curve Slope Correlation Decompositions. Data is monthly 2004M11-2019M12. Subsample 1 is 2004M11-2012M5. Subsample 2 is 2012M6-2019M12. GMM standard errors, computed using 12 Newey-West (1987) lags, are in parentheses. For subsample 2 *, **, and *** indicate if statistics are different from subsample 1 at the 10%, 5%, and 1% significance level, respectively.

Panel A: Nominal slope correlation decomposition

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel A1: Country 1 perspective									
$\frac{Cov(\text{real slope}_1,\text{nominal slope}_2)}{SD(\text{nominal slope}_1)SD(\text{nominal slope}_2)}$	0.63	0.77	0.32*	0.37	0.51	0.04*	0.69	0.58	1.11
	(0.10)	(0.09)	(0.22)	(0.10)	(0.09)	(0.25)	(0.09)	(0.07)	(0.20)
$\frac{Cov(\text{expected inflation slope}_1,\text{nominal slope}_2)}{SD(\text{nominal slope}_1)SD(\text{nominal slope}_2)}$	0.18	0.23	0.14	0.18	0.19	0.31	0.04	0.07	-0.07*
	(0.05)	(0.05)	(0.09)	(0.08)	(0.08)	(0.10)	(0.05)	(0.04)	(0.05)
$\frac{Cov(\text{inflation risk premium slope}_1,\text{nominal slope}_2)}{SD(\text{nominal slope}_1)SD(\text{nominal slope}_2)}$	-0.05	-0.10	0.02	0.00	0.00	-0.07	0.04	0.10	-0.21
	(0.13)	(0.07)	(0.09)	(0.11)	(0.04)	(0.13)	(0.10)	(0.08)	(0.14)
Panel A2: Country 2 perspective									
$\frac{Cov(\text{real slope}_2,\text{nominal slope}_1)}{SD(\text{nominal slope}_1)SD(\text{nominal slope}_2)}$	0.66	0.76	0.70	0.18	0.48	-0.12*	0.57	0.62	0.46
	(0.11)	(0.10)	(0.31)	(0.16)	(0.14)	(0.28)	(0.09)	(0.10)	(0.09)
$\frac{Cov(\text{expected inflation slope}_2,\text{nominal slope}_1)}{SD(\text{nominal slope}_1)SD(\text{nominal slope}_2)}$	0.04	0.10	0.06	0.26	0.28	0.07**	0.26	0.28	0.15
	(0.04)	(0.03)	(0.05)	(0.05)	(0.04)	(0.06)	(0.05)	(0.04)	(0.04)
$\frac{Cov(\text{inflation risk premium slope}_2,\text{nominal slope}_1)}{SD(\text{nominal slope}_1)SD(\text{nominal slope}_2)}$	0.06	0.05	-0.29*	0.10	-0.07	0.32***	-0.06	-0.15	0.22***
	(0.11)	(0.10)	(0.12)	(0.09)	(0.06)	(0.09)	(0.09)	(0.09)	(0.07)
Panel A3: Total correlation									
	0.76	0.91	0.47***	0.55	0.69	0.27*	0.76	0.76	0.83
	(0.14)	(0.07)	(0.17)	(0.20)	(0.10)	(0.22)	(0.12)	(0.15)	(0.13)

Panel B: Inflation-linked slope correlation decomposition

	France-UK			France-US			UK-US		
	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2	Full sample	Subsample 1	Subsample 2
Panel B1: Country 1 perspective									
$\frac{Cov(\text{real slope}_1,\text{inflation-linked slope}_2)}{SD(\text{inflation-linked slope}_1)SD(\text{inflation-linked slope}_2)}$	0.65	0.69	0.40	0.31	0.39	-0.15**	0.46	0.44	0.53
	(0.07)	(0.06)	(0.20)	(0.12)	(0.10)	(0.17)	(0.07)	(0.09)	(0.16)
$\frac{Cov(\text{liquidity premium slope}_1,\text{inflation-linked slope}_2)}{SD(\text{inflation-linked slope}_1)SD(\text{inflation-linked slope}_2)}$	0.17	0.22	-0.12***	0.20	0.25	-0.07**	0.23	0.27	-0.01***
	(0.07)	(0.06)	(0.07)	(0.06)	(0.06)	(0.04)	(0.04)	(0.05)	(0.05)
Panel B2: Country 2 perspective									
$\frac{Cov(\text{real slope}_2,\text{inflation-linked slope}_1)}{SD(\text{inflation-linked slope}_1)SD(\text{inflation-linked slope}_2)}$	0.55	0.61	0.22*	0.33	0.45	-0.33***	0.51	0.52	0.47
	(0.06)	(0.05)	(0.19)	(0.12)	(0.11)	(0.16)	(0.09)	(0.09)	(0.18)
$\frac{Cov(\text{liquidity premium slope}_2,\text{inflation-linked slope}_1)}{SD(\text{inflation-linked slope}_1)SD(\text{inflation-linked slope}_2)}$	0.27	0.30	0.06***	0.19	0.18	0.11	0.17	0.19	0.04
	(0.03)	(0.03)	(0.05)	(0.09)	(0.08)	(0.04)	(0.10)	(0.08)	(0.04)
Panel B3: Total correlation									
	0.82	0.91	0.28***	0.52	0.63	-0.22***	0.68	0.71	0.51
	(0.09)	(0.08)	(0.13)	(0.10)	(0.09)	(0.15)	(0.08)	(0.09)	(0.25)

Online Appendix IX: Additional International Evidence

The liquidity premium is identified as in (3) except that the regression is run country-by-country, because a consistent set of liquidity proxies for all three countries is not available.

IX.A: Liquidity Proxies

The liquidity proxies for Australia are the nominal off-the-run spread, the relative transaction volume of inflation-linked bonds, and the inflation swap spread. Annual bond transaction volumes were provided by Stephen Kirchner from Australian Financial Markets Association.

The liquidity proxies for Germany are the nominal off-the-run spread, the relative transaction volume of inflation-linked bonds, and the inflation swap spread. Semi-annual bond transaction volumes were provided by Christian Hirschfeld from Bundesrepublik Deutschland - Finanzagentur.

The liquidity proxies for Sweden are the nominal off-the-run spread, the relative transaction volume of inflation-linked bonds, and the 7 day STIBOR (Stockholm interbank Offered Rate) - Riksbank (Swedish Central Bank) repo rate spread. The monthly bond transaction volumes, STIBOR, and Riskbank repo rate are from Riskbank website.

Electronic copy available at: https://ssrn.com/abstract=3402785

IX.B: Expected Inflation

For Australia, the available inflation expectations are 3 months ahead business inflation expectations, 1 and 2 year ahead union officials' inflation expectations, and 1 and 2 year ahead market economists' inflation expectations from Reserve Bank of Australia website. To extrapolate the inflation expectations, we use 1 and 2 year ahead market economists' inflation expectations. Using one and two year ahead union officials' inflation expectations doesn't affect the results. We estimate an AR(1) model of 1 year ahead inflation expectations. To compute inflation expectations for years 3-, we input the inflation expectations for the second year into the estimated AR(1) model and iterate forward.

German inflation expectations are Survey of Professional Forecasters mean estimates of 5 year ahead year on year percentage change of the Eurostat Harmonised Index of Consumer Prices from European Central Bank website. Swedish inflation expectations are All Interviewees' Median Expectations of 5 year inflation from TNS Sifo Prospera, an agency which conducts the inflation surveys for Riksbank, the Swedish Central Bank. Using mean instead of the median forecasts does not affect the results.

5 Year Zero-Coupon Yield Correlation Decompositions: Further International Evidence. Data is monthly 2011:M4-2019:M12. For Australia, Germany, and Sweden inflation-linked yields are decomposed into real yields and the liquidity premia in the same way as for France, the UK, and the US, except that breakeven inflation regressions are run separately for each country. Liquidity proxies are inflation swap spreads and log-share of inflation-linked debt. GMM standard errors, computed using 24 Newey-West (1987) lags, are in parentheses.

Panel A: Nominal variance decomposition						
	Australia (AU)	Germany (GER)	Sweden (SWE)			
$\frac{Cov(\text{real yield},\text{nominal yield})}{Var(\text{nominal yield})}$	63.68%	64.49%	101.34%			
	(5.07%)	(4.91%)	(9.26%)			
$\frac{Cov(\text{expected inflation},\text{nominal yield})}{Var(\text{nominal yield})}$	13.16%	13.34%	4.74%			
	(2.12%)	(2.38%)	(7.13%)			
$\frac{Cov(\text{inflation risk premium},\text{nominal yield})}{Var(\text{nominal yield})}$	23.16%	22.18%	-6.08%			
	(3.86%)	(4.55%)	(2.84%)			
Nominal yield standard deviation	0.88%	0.68%	0.84%			
	(0.08%)	(0.07%)	(0.08%)			
Panel B: Nominal correlation decomposition						
	AU-FR	AU-GER	AU-SWE	AU-UK	AU-US	FR-GER
Country 1 perspective						
$\frac{Cov(\text{real yield}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.55	0.57	0.53	0.46	-0.03	0.67
	(0.04)	(0.05)	(0.05)	(0.07)	(0.03)	(0.05)
$\frac{Cov(\text{expected inflation}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.15	0.14	0.13	0.09	-0.11	0.11
	(0.02)	(0.02)	(0.02)	(0.03)	(0.01)	(0.02)
$\frac{Cov(\text{inflation risk premium}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.21	0.22	0.23	0.20	-0.09	0.19
	(0.04)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)
Country 2 perspective						
$\frac{Cov(\text{real yield}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.63	0.59	0.88	0.80	-0.60	0.60
	(0.04)	(0.04)	(0.06)	(0.22)	(0.08)	(0.05)
$\frac{Cov(\text{expected inflation}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.10	0.12	0.08	0.15	0.07	0.14
	(0.02)	(0.02)	(0.06)	(0.06)	(0.04)	(0.03)
$\frac{Cov(\text{inflation risk premium}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.18	0.22	-0.07	-0.20	0.31	0.23
	(0.04)	(0.04)	(0.02)	(0.13)	(0.09)	(0.04)
Total correlation	0.91	0.93	0.90	0.75	-0.23	0.97
	(0.09)	(0.07)	(0.12)	(0.18)	(0.09)	(0.04)
	FR-SWE	GER-SWE	GER-UK	GER-US	UK-SWE	US-SWE
Country 1 perspective						
$\frac{Cov(\text{real yield}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.67	0.61	0.57	-0.28	0.79	-0.79
	(0.07)	(0.06)	(0.04)	(0.13)	(0.23)	(0.09)
$\frac{Cov(\text{expected inflation}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.12	0.14	0.04	-0.05	0.20	0.07
	(0.02)	(0.03)	(0.04)	(0.05)	(0.07)	(0.04)
$\frac{Cov(\text{inflation risk premium}_1,\text{nominal yield}_2)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.16	0.21	0.12	-0.01	-0.28	0.33
	(0.06)	(0.06)	(0.07)	(0.06)	(0.11)	(0.12)
Country 2 perspective						
$\frac{Cov(\text{real yield}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.93	0.94	0.81	-0.71	0.78	-0.58
	(0.09)	(0.08)	(0.21)	(0.08)	(0.07)	(0.18)
$\frac{Cov(\text{expected inflation}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	0.09	0.08	0.16	0.06	-0.03	0.07
	(0.06)	(0.06)	(0.06)	(0.04)	(0.07)	(0.06)
$\frac{Cov(\text{inflation risk premium}_2,\text{nominal yield}_1)}{SD(\text{nominal yield}_1)SD(\text{nominal yield}_2)}$	-0.07	-0.07	-0.24	0.30	-0.05	0.12
	(0.03)	(0.02)	(0.12)	(0.10)	(0.02)	(0.03)
Total correlation	0.95	0.95	0.73	-0.35	0.70	-0.40
	(0.11)	(0.12)	(0.20)	(0.09)	(0.13)	(0.09)

101