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The bond market term premium: what is it, and how can we measure it?[1]

We review the concept of the term premium, examine alternative methods used to estimate it and discuss some of the challenges encountered in such efforts. We also explain how survey forecasts could be useful for providing an informal, model-free cross-check on simple regression-based forecasting models of term premia and for formal estimation of flexibly specified no-arbitrage models.

JEL classification: E43, E47, G12.

The term structure of interest rates can be an invaluable source of information for central banks. It offers continuous readings of market expectations and their evolution in response to changes in economic conditions. It serves to provide instant feedback to central bank policy decisions and communications. And it can serve as an early warning indicator of improvement or deterioration in macroeconomic conditions. Proper reading of this information, however, requires separating expectations of future interest rates from the term premium in the bond market. In recent years, understanding the term premium has attracted considerable attention. Indeed, explicit mention of the term premium – once a rather obscure part of academic jargon – has become commonplace in policy discussions and central bank communications.[2]

Unsurprisingly, the term premium has also become a focus of attention in market commentary and the financial press. To a considerable extent, this heightened attention in recent years has been instigated by the puzzling behaviour of long-term interest rates in the United States and numerous other

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2 See, for example, Kohn (2005) and Bernanke (2006) for discussions regarding the United States, and Papademos (2006) for a related discussion about the euro area. We focus our analysis on issues pertaining to the estimation of term premia in the United States, but essentially similar issues arise elsewhere (see eg Hördahl et al (2006) and Kremer and Werner (2006)).

countries following the start of a series of policy tightenings by the Federal Reserve in the summer of 2004 (see eg Kim and Wright (2005)). Rising short-term interest rates have typically been associated with a rise in longer-term yields, but in this episode yields at longer maturities have stayed surprisingly low – arguably too low to be explained purely in terms of revisions to expectations.

The heightened interest in term premia also coincides with developments in the academic literature. Over the past several years, progress has been made in modelling time-varying risk premia in asset markets in general, and the links between the macroeconomy and the yield curve in particular. Still, there is relatively little consensus about the empirical properties of term premia. The discussion is further complicated by the existence of multiple definitions of the term premium.

In this article, we review the term premium concept, take stock of recent progress in its modelling and discuss some of the challenges that remain with respect to the critical task of its real-time measurement. We also explain how the incorporation of information from survey forecasts might be useful in arriving at more robust estimates of the term premium.

Term premium: definitions and heuristics

The basic theory of the term structure of interest rates is the expectations hypothesis. According to this hypothesis, the expected return from holding a long bond until maturity is the same as the expected return from rolling over a series of short bonds with a total maturity equal to that of the long bond. That is, the long bond yield is the average of the expected short-term rates. Equivalently, the forward rate (the short-term rate at which investors agree now to borrow or lend in the future) is the expected future short-term rate.

Though the expectations hypothesis provides a simple and intuitively appealing interpretation of the yield curve, it ignores interest rate risk. Except if calculated until maturity, the nominal return on a long bond is uncertain, and investors may require compensation for this risk. The “term premium” refers to such compensation and any other sources of deviation from the expectations hypothesis.

Term premia represent deviations from the expectations hypothesis

The compensation demanded for holding long bonds can depend on both the amount of risk and the price of that risk, either of which can change over time due to variable fundamentals. For instance, the degree of systematic risk could change with varying perceptions of uncertainty about inflation, real activity and monetary policy. In addition, the compensation could vary with the business cycle, as investors might be more risk-averse in recessions than in booms.

Besides these fundamentals-based mechanisms, there may be other factors influencing term premia, such as liquidity considerations and preferred investor habitats. One example is the “flight to quality” effect in some major government securities markets at times of extreme volatility. News on geopolitical risk events, for instance, might induce a particularly strong demand for relatively safe assets, temporarily pushing down bond yields. Special

Box 1: Term premium formulae

In this box, we gather together several formulae for the term premia in "discrete time" notation. For simplicity, we only describe the term premia associated with expectations of one-period rate and holding period returns; the multi-period case is similar. The return premia ϕ_{nt}^{r}, forward premia ϕ_{nt}^{f} and yield premia ϕ_{nt}^{y} (for time t and time to maturity n) can be written as departures from the respective expectations hypothesis as follows:

$$E_t(\Re_{n,t+1}) = r_t + \phi_{nt}^{r}$$

$$f_{nt} = E_t(r_{t+n-1}) + \phi_{nt}^{f}$$

$$y_{nt} = (1/n)\Sigma_{i=0}^{n-1} E_t(r_{t+i}) + \phi_{nt}^{y} .$$

Here, $\Re_{n,t+1}$ is the log return on an n-period bond one period later (= $\log(P_{n-1,t+1}) - \log(P_{nt})$), f_{nt} is the (n – 1)-to-n-period (ie (n – 1)-period-ahead) forward rate (= $\log(P_{n-1,t}) - \log(P_{nt})$), y_{nt} is the n-period yield (= $-\log(P_{nt}) / n$) and r_t is the short rate, ie the one-period yield $y_{1,t}$. The notation $E_t(X_{t+u})$ denotes the expectation at time t of the quantity X u periods later.

From the definitions, it follows that the yield premium equals the average of the forward premia, ie:

$$\phi_{nt}^{y} = (1/n)\Sigma_{i=1}^{n} \phi_{it}^{f} .$$

The relationship between the forward premium and the return premium, derived in Cochrane and Piazzesi (2006), is given by:

$$\phi_{nt}^{f} = \phi_{nt}^{r} + E_t(\phi_{n-1,t+1}^{r} - \phi_{n-1,t}^{r}) + \ldots + E_t(\phi_{2,t+n-2}^{r} - \phi_{2,t+n-3}^{r}) .$$

demand for government securities from large institutions such as pension funds and foreign central banks might also influence the level of yields.[3] Behavioural mechanisms, such as over- or underreaction in the bond market to certain news events, have also been proposed as a source of term premium variation.

Although the underlying intuition is the same, there are in fact several distinct definitions of the term premium. Three commonly used definitions are:

(1) The expected return on holding a multi-period zero coupon bond for one period minus the one-period yield (short rate).

(2) The forward rate minus the expected future spot rate.

(3) The yield on a zero coupon bond minus the average of expected short rates from the present to the maturity of the bond.

The term premia defined in (1), (2) and (3) can be called the "return premium", the "forward premium" and the "yield premium" respectively. Box 1 expresses these term premia in mathematical form, with ϕ_{n}^{r}, ϕ_{n}^{f} and ϕ_{n}^{y} denoting the return premium, the forward premium and the yield premium for maturity n, respectively. These term premia tend to move in the same direction, though quantitatively they can differ from one another substantially. (Box 1 explains the mathematical relation between the three definitions.)

[3] See *BIS Annual Report*, 2006, Chapter VI for a recent discussion on these issues. Other "exogenous" circumstances affecting the supply of and demand for bonds (eg the concern in the late 1990s about the reduced supply of Treasuries due to budget surplus) can also influence term premia. See, for example, Reinhart and Sack (2002).

Estimating term premia is a challenging task regardless of the definition, for in each case both the premia and their expectation counterparts are unobservable. In the following sections, we first examine simple regression-based approaches to term premia estimation, and then turn to more complex no-arbitrage model-based approaches.

Measuring term premia: regression models

Simple regression models can produce measures of term premia. Under the joint assumption of the expectations hypothesis and rational expectations, ie expectations that are unbiased and incorporate all available information,[4] the difference between the forward rate and the ex post realised short rate should not be forecastable with ex ante variables. If, in fact, ex ante variables help to predict this difference, it would imply the presence of a term premium or a failure of rational expectations. Adopting the former interpretation, one may use the predictable component of the rate difference resulting from the regression as a measure of the term premium.

The estimation of near-term forward premia

The regression of the forward rate minus the ex post realised short-term rate on explanatory variables nests several well known models (see Box 2). The case with a constant and the forward spread (forward rate less the current spot rate) as regressors reflects the work of Fama and Bliss (1987). When we estimate this regression for the four-month horizon using the federal funds futures[5] data from 1989 through 2006, we obtain an average term premium of 0.18% (Graph 1, top panel).[6] A recent paper by Piazzesi and Swanson (2004) takes a constant, the futures rate, and year-on-year employment growth (non-farm payroll) as explanatory variables. The estimated forward premium from the Piazzesi-Swanson regression is not only large but also highly countercyclical, peaking shortly after the recessions of 1991–92 and 2001–02 (Graph 1, bottom panel).

Estimated forward premia are often large and highly variable

These results are striking, in terms of both the absolute size of the estimated term premia and their time-varying nature; even so, to our knowledge, central banks are not widely utilising "corrected" near-term expectations from such regression-based term premia estimates in their analysis. For example, when looking at futures-based policy expectations,

[4] The use of the term "rational expectations" can at times be misleading. In a realistic description of the economy (in which its structure and people's beliefs evolve over time), a seemingly biased expectation measured over a short sample period may be fully consistent with rationality.

[5] Futures rates and forward rates differ by the so-called convexity premium arising from the fact that the payoff to a forward contract is non-linear in interest rates. This wedge, however, is extremely small for short horizons. We shall therefore refer to the term premium in the (near-term) futures curve also as the "forward premium".

[6] We show the four-month-ahead term premium here for illustration, but the procedure can be used for interest rate changes for arbitrary horizons to map out the "term structure" of term premia.

Box 2: Estimating forward premia at short horizons

The original Fama-Bliss regression is

$$(1)\qquad r_{t+T} - r_t = \alpha^* + \beta^*(f_{t,T} - r_t) + e_{t+T}.$$

The pure expectations hypothesis implies $\alpha^* = 0$ and $\beta^* = 1$. Most studies of this regression have focused on whether the forward rate moves one-for-one with the expected future short rate, ie $\beta^* = 1$, with the rejection of this condition being interpreted as evidence for a time-varying term premium. Early studies using Treasury yields tended to find a significant time-varying term premium, but more recent studies using federal funds rate (and federal funds futures) data often find that β^* is insignificantly different from 1. Indeed, in the regression with the four-month-ahead federal funds futures rate from 1989 through 2006, we obtain a β^* of 1.22, which is within two standard deviations (2 x 0.12) from 1.

The forward rate expectations hypothesis regressions can be also written as

$$(2)\qquad f_{t,T} - r_{t+T} = \alpha + \beta_1 X_{1t} + \ldots + \beta_n X_{nt} + e_{t+T},$$

as in Piazzesi and Swanson (2004). Having a single regressor $X_t = f_{t,T} - r_t$ besides the constant term makes this equivalent to the Fama-Bliss regression (1) above, whose α^* and β^* are related to α and β as $\alpha = -\alpha^*$, $\beta = (1 - \beta^*)$. The term premium estimate in the regression (2) is simply $\alpha + \beta_1 X_{1t} + \ldots + \beta_n X_{nt}$. Note that when this term is zero, the futures-based forecast errors $(r_{t+T} - f_{t,T})$ are unpredictable.

The results from regression (2) imply a fairly sizeable near-term forward premium. If we assume that the premium is constant (setting β to zero as suggested by the Fama-Bliss regression with federal funds futures data from 1989 through 2006), the model generates a term premium of 0.18% for the four-month futures rate. Alternatively, if we assume that the term premium is time-varying, we can use the unrestricted estimate of the coefficients from the regression to obtain a time-varying term premium as a linear function of the futures spread (Fama-Bliss) or as a linear function of the futures rate and non-farm payroll growth (Piazzesi-Swanson).

Federal Reserve staff have been known to use a simple rule of thumb and apply a 1 basis point per month term premium correction (eg 4 basis points for a four-month-ahead futures contract).[7] This is obviously much smaller than the constant premium estimated above.

Lack of robustness of regression-based term premia

One reason for official reluctance to use regression-based term premium estimates is their apparent lack of robustness to the choice of the sample and regressors. For example, the time-varying forward premia estimated from the Fama-Bliss regression vary considerably depending on whether the sample is taken from 1998 or a decade earlier (Graph 1, top panel). In turn, the estimates using the Piazzesi-Swanson regressions are markedly different from either of the Fama-Bliss regression estimates (Graph 1, bottom panel).[8]

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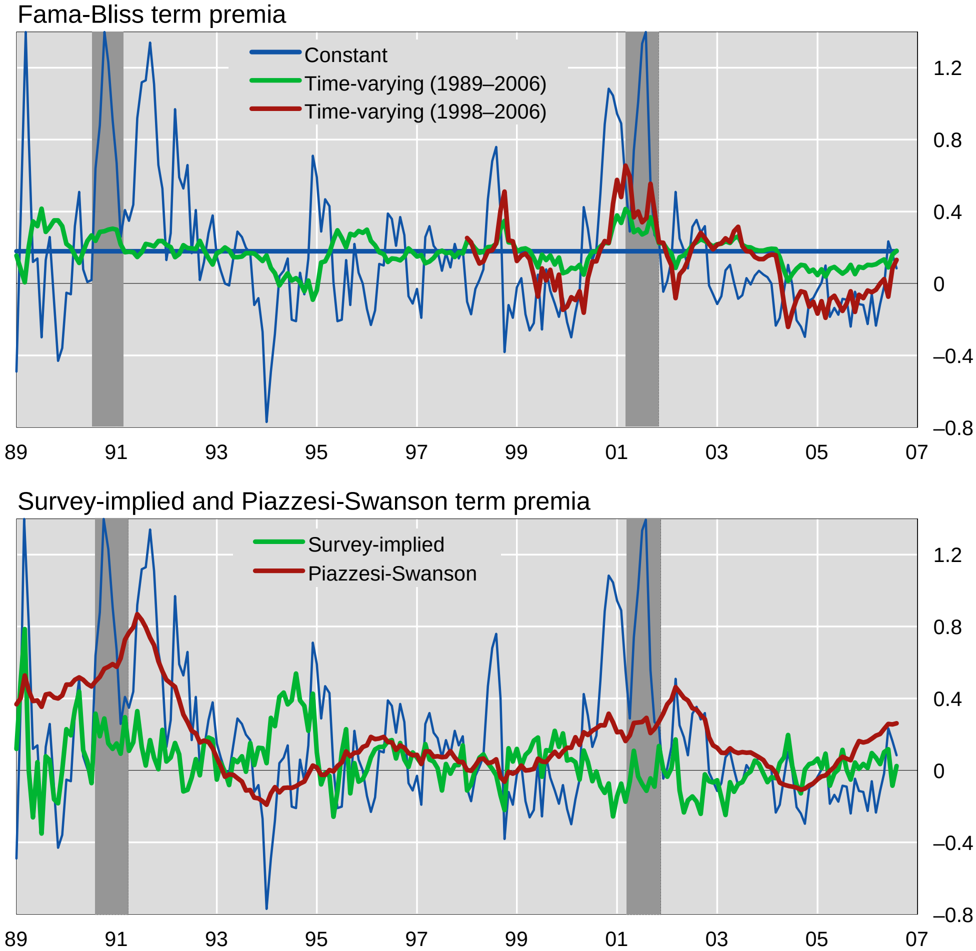
[7] These adjustments have been subject to periodic changes, but have always been small. The historical adjustments made by Federal Reserve Board staff to the federal funds and eurodollar futures curves on various dates are described in the Blue Book, a document that discusses monetary policy alternatives prepared by the staff prior to every regularly scheduled FOMC meeting. Blue Books are made available to the public by the Secretariat of the FOMC with a five-year lag.

[8] Incidentally, the Piazzesi-Swanson regression estimated over the 1989–2006 sample and the Fama-Bliss regression estimated over the 1999–2006 sample generate very similar in-sample forecast RMSEs in the 1999–2006 period, despite considerable differences between the term premia implied by the two regressions.

Four-month-ahead forward premia

In percentage points



The thin blue line in both panels denotes the futures rate less the ex post realised short rate. The shaded areas represent US business cycle contractions (recessions) as defined by the National Bureau of Economic Research.

Sources: Federal Reserve Board; authors' calculations. Graph 1

Regression models often generate "good" in-sample forecasts, but it is not clear whether in-sample forecast performance is an appropriate criterion for model selection. Because future information (ie the ex post realised short rate) is used to fit the models generating these forecasts, the forecast errors are likely to be understated relative to what would have emerged from a real-time application of the model. In addition, even out-of-sample forecast root mean squared error (RMSE) comparisons may be misleading, particularly in relatively small samples, as the RMSE measure has its own uncertainty (sampling variability).[9]

An even more basic concern is whether a fixed-coefficient linear function of a few financial and macro variables (as specified in the above-mentioned regression models) could possibly capture the complexity of term premium

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9 The presence of a substantial amount of unforecastable variation in interest rates means that out-of-sample forecast RMSEs have low power. Clark and McCracken (2006) emphasise this point in the analogous case of inflation forecasting.

variation over time. Practitioners might reasonably harbour doubts in this regard, and thus strive to take into account the evolving beliefs of market participants and the changing economic environment more flexibly in a judgmental fashion.

Surveys provide a real-time measure of expectations

An alternative approach to regression-based estimates of term premia is to take survey forecasts of financial market participants as a "model-free" proxy for market expectations. Unlike the in-sample regression-based premia discussed above, this measure is calculated in real time. The forward premium in this case is the futures rate minus the expectation of the federal funds rate implied by the survey.

The approach yields estimates of term premia that appear to have reasonable properties. The bottom panel of Graph 1 shows the four-month-ahead forward premium based on the monthly surveys of the federal funds rate published in *Blue Chip Financial Forecasts* (BCFF). Admittedly, there is jaggedness in the survey-implied premium, part of which is probably due to measurement errors, including errors associated with interpolation and the dating of the survey.[10] Still, it is notable that over the past several years the survey-based forward premium appears to be centred around zero and is consistent with an assumption of a small or even no forward premium at near-term maturities, in line with current thinking at the Federal Reserve Board and in contrast with the regression-based estimates.

Using survey forecasts may shed some light on some of the more extreme values resulting from regression-based term premia estimates. While the survey-implied forward premium is positive on average in the 1990s, in line with other estimates, it differs markedly from the Piazzesi-Swanson premium, particularly when the latter is very large, as in 1991 and 2002. These large discrepancies suggest the strength of the results documented by Piazzesi and Swanson may be somewhat exaggerated.[11]

The estimation of long-term premia

As the horizon becomes longer, a more substantial role for the term premium is likely. Unfortunately, direct estimation of the forward premium at long horizons in forward rate regressions is hampered by the fact that overlapping observations greatly shrink the effective size of the sample. But the estimation of the *return premium* on long bonds is less affected by this problem, since short holding periods (over which the excess return is typically calculated) diminish the problem of overlapping observations. In a manner analogous to the forward rate regressions discussed above, the excess returns on bonds

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[10] BCFF is a monthly survey of about 50 private sector economists (mostly affiliated with financial institutions). Because it provides forecasts of quarter-averaged federal funds rates, we rely on a linear interpolation to obtain the four-month-ahead forecast. This procedure thus introduces some error.

[11] The regressors in the Piazzesi-Swanson regression include the futures rate, which is very persistent (ie takes a long time to revert to the mean). Mankiw and Shapiro (1986) have noted that in small samples, this type of regression can overstate the predictive power of explanatory variables. The persistent regressor also raises concerns about spurious regression; see, for example, Ferson et al (2003).

should be unpredictable under the expectations hypothesis and rational expectations. Therefore, the predictable variation found in the regression of realised excess return on ex ante variables can be viewed as a return premium (a version of ϕ^r in Box 1).

An interesting measure of the return premium …

Of particular interest in this regard is a measure of the return premium presented in the well known paper by Cochrane and Piazzesi (2005). They report impressive predictability in the excess returns for holding two-, three-, four- or five-year bonds for one year (with R-squared statistics as high as 40%) when using a single "return forecasting factor" that is a linear combination of forward rates. The factor is highly variable and has a strong countercyclical component, tending to fall in expansions and rise in recessions. Return premia for bonds of different maturities are simple multiples of this factor, and thus exhibit similarly strong countercyclical behaviour.

One can approximate the forward premium implied by Cochrane and Piazzesi's return premia by applying a simplifying assumption that makes the forward premia linear functions of the return forecasting factor.[12] Arguably, though, the *variability* of the resulting forward premia seems too large: for the Cochrane-Piazzesi sample period (1964–2002), the standard deviation of the monthly change of the four-to-five-year forward premium is 0.47%, which is larger than the monthly variability of the four-to-five-year forward rate itself (0.34%), a rather implausible result.[13] This echoes the concern voiced by Sack (2006) that Cochrane and Piazzesi's return premia may be excessively volatile.

… but it may be too volatile

Measuring term premia: no-arbitrage models

Reduced-form no-arbitrage models have shown promise …

In recent years, a class of dynamic term structure models, called "no-arbitrage models", has been increasingly used to extract expectations and term premia from the yield curve, especially at longer maturities. The no-arbitrage concept implies, among other things, that securities with the same risk characteristics (same payoff in all states of the world) should have the same price. This condition constrains the way bond yields of various maturities can move relative to one another, simplifying the formulation of the dynamics of the entire yield curve. Reduced-form no-arbitrage models do not explicitly specify the structure of the economy and the risk preferences of investors; instead, they assume that market equilibrium conditions support a given functional form for the dynamics of risk factors (variables that move the yield curve) and the market price of risk.

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[12] More specifically, we use the relationship between ϕ^f and ϕ^r given in Box 1, assuming that the annually sampled return forecasting factor follows an AR(1) process. The annual AR(1) model is more general than the monthly AR(1) model, since the latter implies the former, but not vice versa. In particular, with the monthly AR(1) model there is a concern that high-frequency movements that do not affect expectations at annual horizons push down the estimate of the AR(1) coefficient. We use the median of the AR(1) coefficient estimates from 12 possible samplings (January to December).

[13] To have a forward premium variability that is larger than the forward rate variability, the expected short rate and the forward premium would have to be negatively correlated.

Early generations of no-arbitrage models did not perform well empirically, as the assumed functional forms were too simple. For example, the well known Vasicek model assumed the presence of a single risk factor that followed an autoregressive process and a constant market price of risk. In effect, this implied a version of the expectations hypothesis (with constant term premia) by construction. Later research introduced multiple risk factors and specified the market price of risk more flexibly as a function of the risk factors (eg Dai and Singleton (2000) and Duffee (2002)).

A workhorse among the no-arbitrage models is the so-called Gaussian affine model. "Affine" means that the bond yields depend linearly on the risk factors. Though the linearity here may appear simplistic (as in the case of the "linear term premia" in regression models), when the risk factors are defined as unobserved (statistical) variables, such a specification can accommodate a rich array of possible term premium variation. "Gaussian" refers to the distributional assumption for the risk factors, which simplifies the yield dynamics considerably. In most applications, this tractable class of models provides a reasonable approximation to more complicated term structure models.

Problems with empirical estimation

… though they often exhibit implausible properties

Despite its promise, the implementation of this class of models for the estimation of forward premia has also run into practical problems. Many of these mirror the difficulties mentioned earlier regarding computation of regression-based term premia. Term premia based on conventional estimation procedures (such as the maximum likelihood estimation) often lack robustness to various choices involved in estimation,[14] and often exhibit implausible properties.

One manifestation of such difficulties is that the estimated no-arbitrage models frequently imply that long-horizon (eg 10-year-ahead) expectations of the short rate do not vary much from the estimated long-run average of the short rate. As a result, the variability of long-horizon forward rates is attributed almost entirely to variation in forward premia. By contrast, most practitioners in the United States recognise that long-horizon expectations of the short-term interest rate have generally trended down over the past 25 years since the Volcker disinflation, in line with the gradual decline of long-horizon inflation expectations (see eg Kozicki and Tinsley (2001)).

Conventional estimation faces small-sample problems

The main problems can be summarised as follows. First, the highly persistent nature of interest rates reduces the effective size of the samples typically used in the analysis, causing term premia to be estimated very imprecisely. Second, conventional estimation techniques have the tendency to make a stationary time series appear to revert to its long-run average faster than it does in reality,[15] leading to artificially stable long-horizon expectations. Third, owing to their lack of tight structure and large number of free

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[14] These include the sample choice (length of the sample, yield maturities to be used), choice of the method for optimising the likelihood function and differences in specification.

[15] Marriott and Pope (1954) discuss this bias in the case of the AR(1) model.

parameters, flexibly specified term structure models may overfit the available data to produce “too good” in-sample forecasts.[16]

Diagnostic criteria often used in the finance literature have difficulties in detecting these problems. Long-horizon forward premium estimates are hard to evaluate on purely econometric grounds because the long time interval between the forecast and the realisation limits the effective sample size. And the in-sample and out-of-sample RMSEs of near-term interest rate forecasts are often insufficiently reliable guides to model selection, like the RMSEs for regression-based forecasts discussed above.

The use of survey forecast information

Information from survey forecasts could help

One way to help overcome some of these empirical problems is to incorporate additional information into the estimation procedure. Surveys of financial market participants’ forecasts are one such potentially useful source of information. To the extent that these forecasts can serve as an, admittedly, noisy proxy for market expectations, incorporating them in the estimation can alleviate the severity of the aforementioned problems. At the same time, this can also help overcome a major shortcoming of the survey forecasts – their less frequent availability compared to financial data.

An example of term premia estimation incorporating information from surveys is provided in Kim and Orphanides (2005). In this paper, estimations of a three-factor Gaussian affine term structure model are augmented with the BCFF forecasts of the three-month T-bill rate, under the assumption that these forecasts correspond to the market expectation plus a measurement error.[17] Introducing information from survey forecasts results in significant increases in the precision of the term premium estimates. The estimates so obtained also accord better with widely held priors than those from the conventional estimation procedures.[18]

Plausible long-horizon expectations …

Graph 2 presents some of the time series estimates of forward premia and long-horizon expectations obtained from this estimation. The long-horizon (10-year-ahead) expectation of the short rate shown in the top panel displays substantial variation as well as a downward trend over the last 15 years, lining up reasonably well with survey forecasts.[19] At the same time, the use of

[16] Although the importance of these problems would wane with the length of the sample period, Monte Carlo experiments performed in Kim and Orphanides (2005) suggest that the problems are quite serious for the sample sizes that are commonly used in practice.

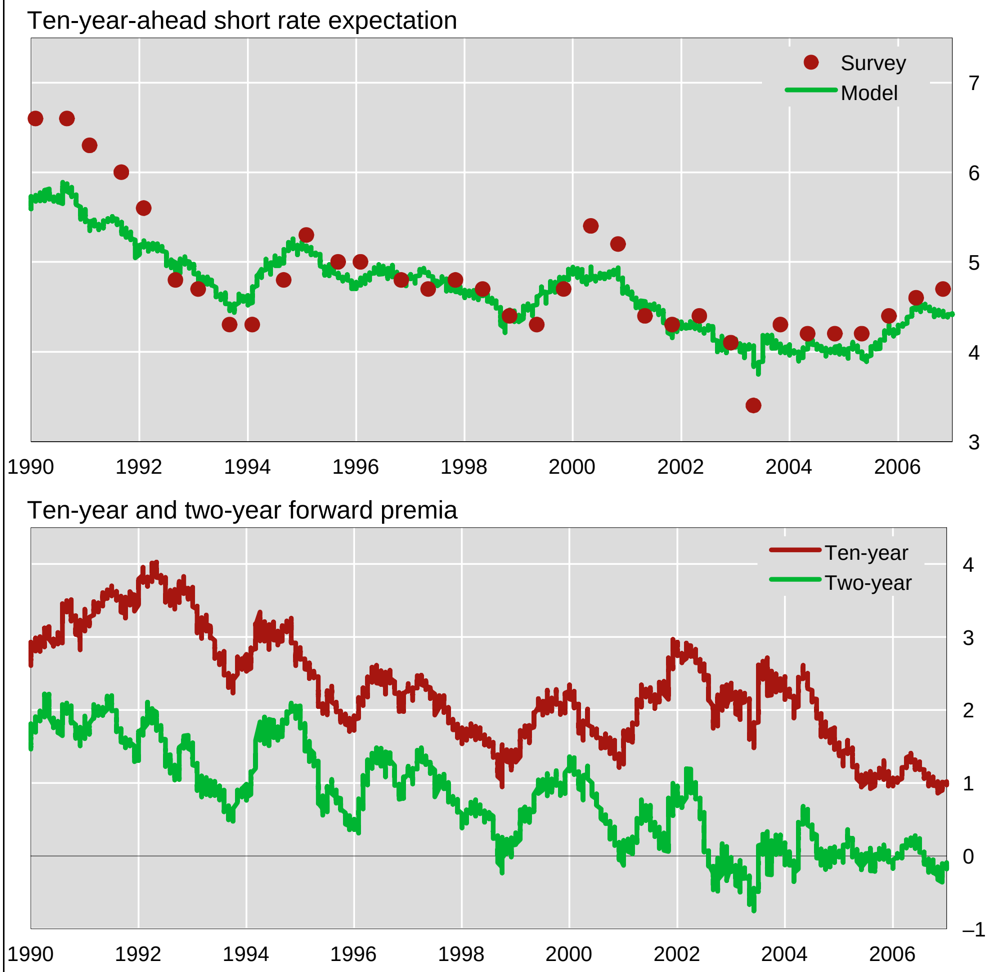
[17] To be specific, we use six- and 12-month-ahead forecasts interpolated from the forecasts of quarter averages available every month, and also the long-horizon forecast (the average expected rate over an approximately six- to 10-year horizon) available twice a year.

[18] Because the survey forecasts are an imperfect proxy for market expectations, alternative assumptions about the nature of measurement errors in the survey forecasts were examined. The results were fairly robust across various alternative specifications. Although our (limited) real-time experience with the use of survey data has been encouraging, we emphasise that all term premium estimates, including our own, should be taken with a grain of salt.

[19] One might dispute the significance of this latter result, since the long-horizon forecast was also used in the estimation. However, the result is not trivial, because the long-horizon survey forecast information is introduced only weakly (imposing a large measurement error).

Expectations and term premia

In per cent



Sources: *Blue Chip Financial Forecasts*; authors' calculations. Graph 2

survey data produces forward premia that exhibit a declining trend while still retaining a significant amount of variation (Graph 2, bottom panel). Interestingly, the two-year forward premium has been close to zero since about 2003, implying that the forward rate curve (futures curve) is currently a good description of policy expectations at horizons out to two years.

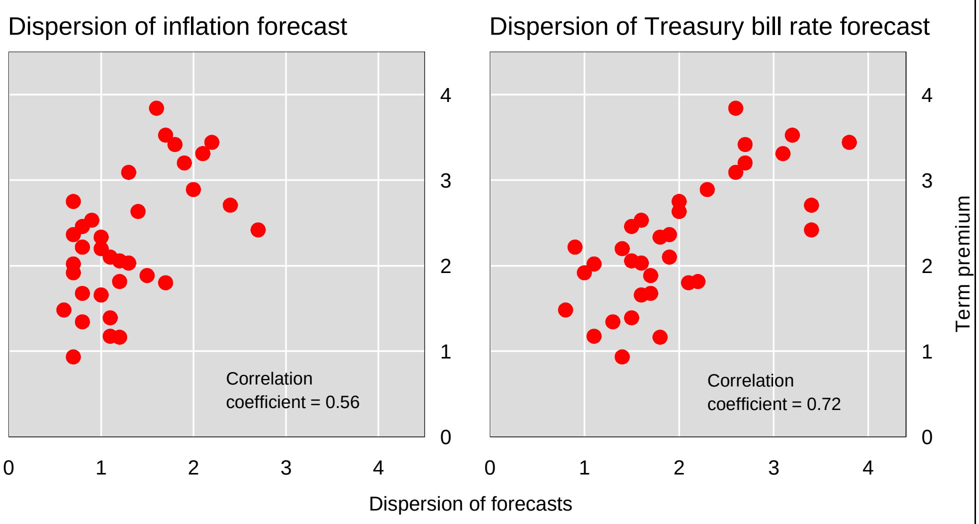
Although the model does not have sufficient structure to explain the underlying sources of the forward premia variation in terms of macroeconomic fundamentals, information from the BCFF survey can be used to shed some light on this issue. In addition to the mean forecast, BCFF provides measures of dispersion of the individual responses to the survey questions, which can serve as rough proxies for the uncertainty associated with the implicit market forecasts of the underlying macroeconomic variables.[20] To the extent that term

Estimates of the model without the long-horizon survey data (ie with only six- and 12-month data) produce a similar variation in the long-horizon short rate expectation.

[20] Although direct empirical evidence on the relation between long-horizon forecast dispersion and uncertainty is not available, evidence from short-horizon probabilistic forecasts suggests that the dispersion of individual forecasts is strongly positively correlated with average individual uncertainty (eg D'Amico and Orphanides (2006)). Furthermore, Gadanecz et al

Ten-year term premia and economic uncertainty

In percentage points



Sources: *Blue Chip Financial Forecasts*; authors' calculations. Graph 3

premia are related to the amount of risk in the economy, one might expect to see a correlation between term premia and these survey-based proxies. Indeed, as can be seen in the scatter plots in Graph 3, the estimated long-horizon (10-year-ahead) forward premium is strongly positively correlated with the dispersion of both long-horizon inflation forecasts and long-horizon Treasury bill rate forecasts. That said, much of the variation in term premia remains poorly understood, and other explanatory factors (including time-varying risk appetite and liquidity considerations) are likely to be important as well.

… and a positive relation between term premia and measures of uncertainty

Conclusion

Recent advances in no-arbitrage term structure modelling and new regression-based studies have resulted in a plethora of term premium estimates over the past few years. Numerous studies have reported interesting variations in term premia based on both futures rates and bond returns. Estimated premia vary substantially over time, and some estimates suggest a prominent business cycle component. These results make a strong case that proper correction for time-varying term premia is crucial for assessing changes in expectations regarding interest rates and their implications for the economy.

Practical estimation of term premia, however, remains a challenging task. Many estimates appear sensitive to small-sample problems, while questions regarding their reliability and seemingly excessive variability often limit their appeal to practitioners. We find that incorporating survey forecast information in estimating flexibly specified term structure models leads to term premium estimates that are more precise and align better with reasonable priors. That

(2007) report a substantial correlation (of about 70%) between a survey forecast dispersion and an economic derivative-based uncertainty measure for non-farm payroll announcements.

said, more research is needed in modelling and estimating term premia in order to refine our interpretations of the information content of the yield curve.

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