New estimates of the UK real and nominal yield curves

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This paper presents a new method for calculating estimates of the UK real and nominal yield curves. This is helpful in assessing implied market interest rate expectations at various horizons and for deriving inflation expectations. The estimates differ in a number of ways from those previously published. First, we adapt for the UK market a spline-based technique originally developed by Waggoner for the United States. Second, data from the generalised collateral (GC) repo market are used, in addition to coupon bond prices, to improve the quality of the estimates at shorter maturities. Third, estimates of the real curve are extracted from the prices of index-linked gilts. Each of these issues is described in detail in the paper, and discussed briefly below.

To arrive at the new estimates we have made a detailed comparison of four competing yield curve estimation methods, assessing each against the following three criteria:

1) Smoothness—the technique should give relatively smooth forward curves rather than trying to fit every data point, since the aim is to supply a market expectation for monetary policy purposes, rather than a precise pricing of all bonds in the market. Nonetheless, subject to the former, a better fit to the data would be preferred.

2) Flexibility—the technique should be sufficiently flexible to capture movements in the underlying term structure. More flexibility is likely to be needed at shorter maturities (where expectations are better informed and more subject to revision as news reaches the market) than at the longer end.

3) Stability—estimates of the yield curve at any particular maturity should be stable in the sense

that small changes in the data at one maturity (such as at the long end) do not have a disproportionate effect on forward rates at other maturities.

The aim is to find the yield curve model that provides us with the most reliable and useful estimates, not only on any particular day, but also over time. The models tested are: the new method (called the 'variable roughness penalty', or VRP, method); the parametric technique of Nelson and Siegel; the extended parametric approach due to Svensson; and the spline-based method of Fisher, Nychka and Zervos. We find that the VRP method significantly outperforms the others on all our criteria.

Having chosen this as our basic model, we then turn our focus to the short end of the yield curve, where there is a lack of data in both the conventional and index-linked gilt markets. The challenge is to investigate whether there are alternative sources of data that can feasibly be included to help fill the gaps. In the case of the real yield curve, there is very little we can do—index-linked gilts are the only direct source of real interest rate data, at least in the United Kingdom. For nominal yields, however, we find that data from the GC repo market can successfully be used to supplement bond data at the short end of the conventional gilt market.

In the final section of the paper we re-examine estimates of the real yield curve derived from index-linked gilt prices. We demonstrate that a model that combines the VRP technology with a modified version of the framework proposed by Evans is able to improve significantly on the iterative technique used previously. This naturally also leads to improved measures of the inflation term structure, being the difference between the real and nominal yield curves.