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MODELLING THE YIELD CURVE*

Mark P. Taylor

This paper utilises a high-quality, weekly data base on UK interest rates on short- and long-term UK government instruments to test and estimate a variety of alternative models of the term structure of interest rates,[1] including the expectations model, a risk premium model and a market segmentation model.

Among the innovations in the present study, we develop the vector autoregressive methodology introduced by Campbell and Shiller (1987) for testing present value models to the case where the frequency of data observation is finer than the maturity of the short-term instrument. In addition, this study is the first to use the interest rate data generated by the 'new' Bank of England method of measuring the yield curve, which is thought to be superior to data on Treasury Bond yields previously published by the Bank (Bank of England 1990).[2]

I. MODELS OF THE TERM STRUCTURE

A. *The Expectations Model*

The expectations theory (ET) postulates that the slope of the yield curve may be explained by agents' expectations of future short-term interest rates.[3] The ET may be expressed formally, following Shiller (1979), as an expression of the form:

$$R_t^{(n)} = \frac{1-\gamma}{1-\gamma^n} \sum_{i=0}^{n-1} \gamma^i r_{t+i}^e + \Phi^{(n)} \qquad (1)$$

where $R_t^{(n)}$ denotes the yield to maturity on an n-period bond, r_{t+i}^e denotes the current expectation of the one-period rate i periods ahead, $\Phi^{(n)}$ is a function of the one-period holding term premia and $\gamma = (1+\bar{R})^{-1}$, where $\bar{R}$ is the par yield.[4] Although equation (1) is derived under the assumption that the period

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[1] For an introduction to the term structure literature, see Malkiel (1987). Boughton (1988) and Taylor (1987) suggest that term structure effects may be important in explaining exchange rates and money demand.

[2] Although it might be argued that only very limited conclusions can be drawn from data covering only a tiny fraction of the period of existence of the UK gilts market, our data are, nevertheless, the best currently available and cover a period of some interest with respect to the funding policy of the UK authorities.

[3] A number of writers are credited with originating the expectations theory (ET); the essentials of the view may be found in Lutz (1940), Hicks (1946), Fisher (1930) and Keynes (1930). Shiller and McCulloch (1987) trace the ET as far back as Fisher (1896).

[4] Equation (1) is derived by taking a Taylor series approximation of an expression for the holding period return in terms of the redemption yield around the par yield, and will thus be more precise the closer the redemption yield is to the par yield (see Shiller (1979) or the working paper version of this paper, Taylor

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