



Inflation risk premia and the expectations hypothesis[☆]

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Received 21 August 2003; received in revised form 7 October 2003; accepted 4 November 2003

Available online 11 September 2004

Abstract

We study the properties of the nominal and real risk premia of the term structure of interest rates. We develop and solve the bond pricing implications of a structural monetary version of a real business cycle model, with taxes and endogenous monetary policy. We show the relation of this model with the class of essentially affine models that incorporate an endogenous state-dependent market price of risk. We characterize and estimate the inflation risk premium and find that over the last 40 years the ten-year inflation risk premium has been averaged 70 basis points. It is time-varying, ranging from 20 to 140 basis points over the business cycle and its term structure is sharply upward sloping. The inflation risk premium explains 23% (42%) of the time variation in the five (ten)-year forward risk

[☆]The authors want to thank Lars P. Hansen for several useful comments and suggestions on an earlier version of the paper, and Geert Bekaert, David Chapman, John Cochrane, George Constantinides, Ian Cooper, Silverio Foresi, Stefano Risa, Nizar Touzi, Raman Uppal, and seminar participants at Carnegie Mellon, The University of Chicago, Duke University, Insead, London Business School, University of Michigan, MIT Sloan School, Northwestern University, UCLA, University of Rochester, Wharton, and the WFA Conference. Special thanks to the WFA Committee which awarded this paper the Best Paper Award in Investment.

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premium and it plays an important role in help explain deviations from the expectations hypothesis of interest rates.

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JEL classification: D9; E3; E4; G12

Keywords: Term structure; Bond prices; Inflation; Expectations hypothesis; Risk premium

1. Introduction

An enormous literature discusses the estimation and properties of dynamic models of the term structure of interest rates. A significant part of this literature focuses on reduced-form affine models.¹ In this paper, first we study the link between these models and the real business cycle literature. We then quantify the properties of the inflation risk premium and study the ability of a general equilibrium model to explain deviations from the expectations hypothesis of interest rates.

The first generation of (completely) affine models makes three assumptions to derive implications about the nominal yield curve. First, the spot interest rate is an affine function of a set of mean-reverting state variables with constant or square-root local volatility. Second, the price of risk is a constant multiple of the local interest rate volatility. Third, inflation is neutral so that the Fisher relation between nominal and real interest rates holds.

Empirical studies of this class of models have exposed several limitations. With regards to the second assumption, Duffee (2002) shows that the restriction on the market price of risk implies bond returns and Sharpe ratios that are too high with respect to the empirical evidence. Dai and Singleton (2000) show that this same assumption makes affine models unable to explain the extent of the deviation from the expectations hypothesis of interest rates. They state that “a three factor CIR-style [Cox, Ingersoll, and Ross] model is wholly incapable of matching linear projection yield (*LPY*) coefficients. We attribute this model failure to the constraint in CIR-style models that risk premiums are proportional to factor volatilities”. With regards to the third assumption, there is mounting evidence against the Fisher neutrality assumption. Benninga and Protopapadakis (1983), Fama (1990), and Boudoukh (1993) find that the inflation rate is negatively related to the real interest rate in terms of both realized changes and expected values. Moreover, real returns on nominal bonds decline when inflation increases (Fama, 1976b, 1990; Fama and Gibbons, 1982).²

¹Important studies of nonlinear models include Naik and Lee (1997), who introduce Markov regime switching into an affine model, and Bansal and Zhou (2002) who study Markov switching in the context of richer discrete-time affine models.

²Fama (1979) also finds evidence of inflation nonneutrality in the stock market and shows that stock real returns are negatively correlated with inflation. In the medium and long term, the real gross domestic product is negatively affected by an increase in inflation (Fama and Gibbons, 1982; Boudoukh, 1993; Harvey, 1988).

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