Estimation for Affine Term Structure with Smooth Transition

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Abstract

Affine dynamic term structure (ADTS) models suffer difficulty of estimations due to highly non-linear and badly behaved objective function. Although ADTS provides closed-form solutions for yields and bond prices for any maturity, it is too simple to capture the risk sensitivities of market participants. To gauge the risk sensitivity, we consider the ADTS model with time-varying market price of risk. In our model specification, risk factors follow VAR with time-varying coefficients and the market price of risk is represented as the affine form whose coefficients vary over time. Estimation method for our model is based on the asymptotic least squares (ALS) which incorporates the no-arbitrage conditions we have to impose to conquer the computational difficulties. We apply the ADTS model with time-varying market price of risk to Japanese government bonds. We find that there are two factors interpreted as level and curveture to explain the term structure of interest rates and their market price of risk are sensitive to the monetary policy. We confirm that the proposed model captures the market risk sensitivity.

Keywords: Affine term structure models, Smooth transition, Market price of risk, Asymptotic least square.