The term structure and the macroeconomy : An application of the Nelson-Siegel model[*][†]

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Abstract

In this paper, the dynamic interactions between the macroeconomy and the yield curve are modeled and estimated based on the Nelson-Siegel term structure framework. Three time-varying parameters that characterize the Nelson-Siegel model were empirically related to the macroeconomic variables. Based on the Japanese Government Bond (JGB) data for the past 15 years, we found that (i) the variables of the inflation rate and the Bank of Japan policy were positively related to level factor, (ii) upturns in stock prices and increases in the U.S. bond yield spread were associated with the steepening of the yield curve, and (iii) a rise in real activity and in the U.S. federal funds rate appeared to have led to a relative rise in the interest rates in the medium-term zone of the yield curve.

Further, we formulated the model in the state-space representation and estimated the three Nelson-Siegel parameters and macroeconomic variables simultaneously by using the Kalman filter. The estimation results were improved in the vector auto-regressive (VAR) model with macroeconomic variables as compared to the case in the simple VAR model. Similar effects were found with regard to the changes in stock prices and real activities on the yield curve movements.

Key words: Term structure, Nelson-Siegel model, State-Space model