

Bayesian Analysis of Business Cycles in Japan Using Markov Switching Model with Stochastic Volatility and Fat-tail Distribution

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Abstract

The impact of the financial crisis starting with the Lehman shock on the Japanese economy is so large that it is impossible to detect business cycle if the simple Markov switching (MS) model with the normal error is applied to the composite index (CI) in Japan during the sample period including the financial crisis. This article extends the MS model by incorporating with stochastic volatility (SV) and fat-tail distribution. The SV model used in this article allows for the autocorrelation in volatility. The Student's t -distribution, which is symmetric, and the generalized hyperbolic (GH) skew Student's t -distribution, which allows for asymmetry, are used as fat-tail distributions. The extended models are fitted to the monthly data on the CI in Japan for the period of 1985–2012 using a Bayesian method via Markov chain Monte Carlo. The main results are: (1) the Student's t -error is favored over the GH skew Student's t -error, indicating that skewness is not important, and (2) the marginal likelihoods provide evidence that the best fitted model is the MS model with both SV and the Student's t -error, which can detect business cycle properly.

JEL classification: C11, C22, C51, C52, E32.

Keywords: Bayesian inference, Composite index, Generalized hyperbolic skew Student's t -distribution, Marginal likelihood, Markov chain Monte Carlo, Markov switching model, Stochastic volatility, Student's t -distribution.

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