Stochastic Interpolation: An Application to Economic Models

Şule Şahin[1] and A. David Wilkie[2]

[1] *Hacettepe University, Department of Actuarial Sciences, Ankara, TURKEY; email: sule@hacettepe.edu.tr*

[2] *InQA Limited, Dennington, Ridgeway, Horsell, Woking, GU21 4QR, U. K.; email: david.wilkie@inqa.com*

Abstract

This paper discusses ways of doing stochastic interpolation by applying Brownian bridges and Ornstein-Uhlenbeck (OU) bridges to the Wilkie model, as an example of a stochastic economic model. Stochastic bridges are a method of stochastic interpolation, enabling one to simulate values at more frequent intervals than the model provides. We focus on the practical aspects of Brownian bridges and OU bridges. We develop their algebra fully, and show their properties. We find that applying them in the obvious way produces unsuitable results, especially with integrated series, like price indices based on annual inflation. We analyse the monthly source data, generally from 1923 to 2014. We find that in almost no case does the monthly data conform to the annual model; there is seasonal variation, year to year correlation, cross-correlations between series, and the monthly variance may depend on the size of the annual jumps. The results have considerable significance. The conflict between the mean-reverting and the random walk views of financial economists can be reconciled by the different properties of annual and monthly data.

Keywords Wilkie model; stochastic interpolation; Brownian bridge; Ornstein-Uhlenbeck (OU) bridge.