

On the Use of the Kernel Method for Specification Tests of Diffusion Models

by Song Xi Chen
Iowa State University
and
Jiti Gao
University of Western Australia

September 2004

ABSTRACT

This paper evaluates the use of the nonparametric kernel method for testing specification of diffusion models as originally considered in Aït-Sahalia (1996). A serious doubt on the ability of the kernel method for diffusion model testing has been cast in Pritsker (1998), who observes severe size distortion of the test proposed by Aït-Sahalia and finds that 2755 years of data are required in order for the test to have a reasonable size approximation. The kernel method has been taken to be responsible for the problem, which also leads to a belief that the kernel method is incapable of capturing the dependence induced by a continuous-time diffusion model. We demonstrate in this paper that the kernel method is still a valid method for testing specification of diffusion models. The severe size distortion observed by Pritsker (1998) can be overcome by implementing a set of measures to the kernel method. Such measures include (i) employing the empirical likelihood to formulate the test statistic; (ii) targeting on the transitional density; (iii) using a bootstrap procedure to profile the null distribution of the test statistic; and (iv) smoothing the model-implied transitional density properly. Our simulation for both the Vasicek and Cox-Ingersoll-Ross models indicates that the proposed test has reasonable size and power under various degrees of data persistence for as little as 10 years of data. We then apply the proposed test to a monthly Federal Fund rate data and find there are empirical supports for some of the one-factor diffusion models proposed in the literature.