Weighted Conditional Least Squares Estimation in Controlled Branching Processes

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Abstract

The controlled branching process with random control function provides a useful way to model generation sizes in population dynamics studies, where control on the growth of the population size is necessary at each generation. From a probabilistic viewpoint and in the framework of asymptotic linear growth of the expectation of the control variables, this model has been well studied. One of the main parameters describing the evolution of these models is known as the offspring mean. As in classical Galton-Watson process, this plays a crucial role as a threshold parameter, which drastically changes the behavior of the process in the three cases known as subcritical, critical and supercritical. However, few papers deal with the study of inference problems arising in this model. In this talk, we present the weighted conditional least squares (WCLS) estimator of the offspring mean proposed in Sriram et al. (2007) and derive the asymptotic limit distribution of the estimator in the tree cases. It turns out that the limit distribution depends on each case. In order to provide a unified solution, we present the bootstrap approximation to the sampling distribution of the WCLS estimator of the offspring mean.

References

[1] Sriram, T.N., Bhattacharya, A., González, M., Martínez, R., del Puerto, I. (2007). Estimation of the offspring mean in a controlled branching process with a random control function. *Stochastic Process. Appl.*, **118**, 928–946.