

## First passage time for jump-diffusion processes and flexible boundaries

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**摘要:** First passage time (FPT) of stochastic processes plays an important role in many scientific fields, such as biology and genetics, epidemiology, finance and insurance, engineering reliability, neuroscience, physics, and statistics. We study the boundary crossing problem for jump-diffusion processes over a general boundary. In particular, we provide a complete characterization on the distribution of the first passage time (FPT) and show that the FPT density exists only at the points where the upper boundary does not jump down. The master equation for the FPT density is extended to the discontinuous boundaries. Moreover, we derive new formulas for piecewise linear boundary crossing probabilities and density of Brownian motion with general random jumps. These formulas can be used to approximate the boundary crossing distributions for general nonlinear boundaries. The method can be extended to more general diffusion processes such as geometric Brownian motion and Ornstein-Uhlenbeck processes with jumps. The numerical computation can be done by Monte Carlo integration which is straightforward and easy to implement. Some numerical examples are presented for illustration.

**个人简介:** Liqun Wang is Professor and former Head of the Department of Statistics at the University of Manitoba, Canada. He was a research fellow at Universities of Dortmund and Hannover, Germany, an assistant professor at University of Basel, Switzerland, and a guest professor at TU Dortmund University and Vienna University of Economics and Business. He has served on the editorial board of several statistical journals including Editor-in-Chief of Springer journal Statistical Papers and Associate Editor of Canadian Journal of Statistics. He is an Elected Member of the International Statistical Institute. Liqun Wang's research interests include boundary crossing probability (first passage time) for diffusion processes, estimation in nonlinear measurement error models, high-dimensional variable selection and data assimilation, and Monte Carlo simulation methods in statistical computation and optimization. He is also interested in biostatistics and econometrics.

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