Zhāng, Xīlíng
A multi-dimensional central limit bound and its application to the Euler approximation for Lévy-sdes.


Summary: In the one-dimensional case, E. Rio gave a concise bound for the central limit theorem in the Vaserstein distances [Ann. Inst. Henri Poincaré, Probab. Stat. 45, No. 3, 802–817 (2009; Zbl 1175.60020)], which is a ratio between some higher moments and some powers of the variance. As a corollary, it gives an estimate for the normal approximation of the small jumps of Lévy processes, and N. Fournier applied that to the Euler approximation of stochastic differential equations driven by the Lévy noise [ESAIM, Probab. Stat. 15, 233–248 (2011; Zbl 1273.60080)]. It will be shown in this article that following A. M. Davie’s idea [“Polynomial perturbations of normal distributions”, Preprint, http://www.maths.ed.ac.uk/~sandy/polg.pdf], one can generalise Rio’s result to the multidimensional case, and have higher-order approximation via the perturbed normal distributions, if Cramér’s condition and a slightly stronger moment condition are assumed. Fournier’s result can then be partially recovered.

MSC:
60H10 Stochastic ordinary differential equations (aspects of stochastic analysis)
60H35 Computational methods for stochastic equations (aspects of stochastic analysis)
60J75 Jump processes (MSC2010)

Keywords: central limit theorem; Lévy processes; stochastic differential equations; approximations

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References:

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