

FUNCTIONAL LIMIT THEOREMS FOR THE QUADRATIC VARIATION OF A CONTINUOUS TIME RANDOM WALK AND FOR CERTAIN STOCHASTIC INTEGRALS

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A continuous time random walk (CTRW) can be formally defined as a random walk subordinated to a counting renewal process. CTRWs became a widely used tool for describing random processes that appear in a large variety of physical models and also in finance.

The main motivation of our work comes from the physical model given by a damped harmonic oscillator subject to a random force (Lévy process) studied in the paper of Sokolov et al.

We study the convergence of a class of stochastic integrals with respect to the compound fractional Poisson process.

Under proper scaling and distributional hypotheses, we establish a functional limit theorem for the integral of a deterministic function driven by a time-changed symmetric α -stable Lévy process with respect to a properly rescaled continuous time random walk in the Skorokhod space equipped with the Skorokhod M_1 -topology. The limiting process is the corresponding integral but with respect to a time-changed α -stable Lévy process where the time-change is given by the functional inverse of a β -stable subordinator.

REFERENCES

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