



A law of large numbers for the 2-dimensional Brownian semistationary process with stochastic correlation

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In this work we prove new limit theorems for a class of Gaussian stochastic processes which does not belong to the semimartingale class: the *Brownian Semistationary process* (\mathcal{BSS}). The \mathcal{BSS} process is used as a model for velocity fields in turbulence flows, and as a price model in markets with transaction costs. As a non-semimartingale, the existence of its quadratic variation and covariation processes does not follow from general theorems, and need to be proven explicitly in each case. In our work we prove convergence of an appropriately scaled realised covariation process and identify a limiting process, giving sufficient conditions on the covariance function of the \mathcal{BSS} process to ensure convergence. The result can be viewed as an high-frequency law of large numbers, ensuring consistency of estimators for the stochastic correlation between two non-semimartingales.

Keywords: Brownian semistationary process; scaling limit theorems; high-frequency asymptotics; non-semimartingales.