INTRINSIC PHYSICAL ASPECTS OF MARTINGALE –
MARTINGALE DRIFT AND CLASSICAL CANONICAL SPIN DISTRIBUTION

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ABSTRACT

Martingale property is a concept widespread in mathematics and statistical mechanics. Is there any intrinsic physical aspect hidden in the martingale beyond just a tool? We have shown analytically that, when the evolution of the drift function is a martingale associated with the histories generated by the very Langevin equation, the drift function of the d-dimensional Langevin equation is the Langevin function with a properly chosen scale factor. Moreover, we numerically demonstrated that those generated histories from a common initial data, which become asymptotically ballistic, show their orientations to obey the classical canonical spin statistics under the external field corresponding to the initial data. Finally we showed that the canonical density of a d-dimensional spin evolves as martingale associated with the process generate by the above mentioned Langevin equation. This finding, as a byproduct, leads to an analytical proof of the above numerical finding. These results elucidate a "physical link" between the martingale and canonical spin statistics.