

Two-step memory within Continuous Time Random Walk

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By means of a novel version of the Continuous-Time Random Walk (CTRW) model with memory [1], we describe, for instance, the stochastic process of a single share price on a double-auction market within the high frequency time scale. The memory present in the model is understood as dependence between successive share price jumps, while waiting times between price changes are considered as i.i.d. random variables. The range of this memory is defined herein by dependence between three successive jumps of the process. This dependence is motivated both empirically, by analysis of empirical two-point histograms, and theoretically, by analysis of the bid-ask bounce mechanism containing some delay. Our model turns out to be analytically solvable, which enables us a direct comparison of its predictions with empirical counterparts, for instance, with so significant and commonly used quantity as velocity autocorrelation function. This work extends our previous one-step memory model [2] and the capabilities of the CTRW formalism.

References

- [1] T. Gubiec, R. Kutner: *Two-step memory within Continuous Time Random Walk. Description of double-action market dynamics*. arXiv:1305.6797 (2013)
- [2] T. Gubiec, R. Kutner: *Backward jump Continuous-Time Random Walk: An application to market trading*. Phys. Rev. E **82**, 046119 (2010)