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Exponential Functional of the Matrix Brownian Motion, Dufresne Identity and Quantum Scattering

Exponential functionals of the Brownian motion appear in many different contexts (classical diffusion in random media, quantum scattering, finance,...).
I will discuss a recent generalization to the case of matrix Brownian motion. This problem has a natural motivation within the study of quantum scattering on a disordered wire with several conducting channels. I will show that the Wigner-Smith time delay matrix, a fundamental matrix in quantum scattering encoding several characteristic time scales, can be represented as an exponential functional of the matrix BM. I will discuss the relation between this problem of quantum physics and the Dufresne identity, which gives the stationary distribution of such exponential functionals of the BM.

Ref:
Aurélien Grabsch and Christophe Texier, Wigner-Smith Matrix, Exponential Functional of the Matrix Brownian Motion and Matrix Dufresne Identity
J. Phys. A: Math. Theor. 53, 425003 (2020)

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