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Fractional-order derivatives models in computational finance

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Abstract

The financial derivatives models such as Black-Scholes (BS) model, can be expressed as a partial differential equation (PDE), applicable to the valuation of call options in terms of different parameters [1]. These models use standard integer-order derivatives, which can only capture localised information of a function at a particular point and time.

Due to the appearance of long-range dependence in stock returns, these equations may underestimate the large price changes in the market turbulence. A remedy is to employ a fractional operator [2].

Fractional models are nonlocal models [3]. The models describe memory effects and help to include past events which may be needed in the governing equations.

Development of efficient and accurate computational methods for effective evaluation of these fractional-order PDE models is crucial [4].

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