Quantum approach to incompleteness of financial market

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We use methods of classical and quantum mechanics for mathematical modeling of price dynamics at the financial market. The Hamiltonian formalism on the price/price-change phase space is used to describe the classical-like evolution of prices. This classical dynamics of prices is determined by "hard" conditions (natural resources, industrial production, services and so on). These conditions as well as "hard" relations between traders at the financial market are mathematically described by the classical financial potential. At the real financial market "hard" conditions are not the only source of price changes. The information exchange and market psychology play important (and sometimes determining) role in price dynamics. We propose to describe this "soft" financial factors by using the pilot wave (Bohmian) model of quantum mechanics. The theory of financial mental (or psychological) waves is used to take into account market psychology. The real trajectories of prices are determined (by the financial analogue of the second Newton law) by two financial potentials: classical-like ("hard" market conditions) and quantum-like ("soft" market conditions), some preliminary results on this quantum-like financial model were published in [1], [2]. The ψ-function plays the role of an additional parameter in the stochastic differential equation describing the price evolution. Dynamics of this parameter is described by the additional equation – Schrödinger's equation. In such an approach the conventional description of the financial market based on classical stochastic differential equations is not complete.

1. O. Choustova, Bohmian mechanics for financial processes. *J. Modern Optics*, **51**, n. 6/7, 1111 (2004)

2. O. Choustova, A. Khrennikov, Quantum model for the theory of reflexivity of J. Soros. Proc. Workshop "Mathematics in Economics", ed. Ja. Ekberg and A. Khrennikov. Ser. Math. Modeling, vol. 3, Växjö Univ. Press, 2001.