Agreeing to disagree under a Quantum-like decision framework: Implications for costly signalling in economic science

Sudip Patra

Abstract

The current paper provides a short discussion on the quantum-like model of probability updates in case of costly signalling phenomenon relevant for financial markets, or economic decision making in general. Recently (**as summarised by Haven, Khrennikov, and Robinson, 2017**) Quantum-like modelling of common knowledge based on quantum probability updating rules, rather than standard Bayesian updating rules, has demonstrated that rational agents can continue disagreeing on the posterior probabilities of any event even if they have a common prior and common knowledge about posterior probabilities, or beliefs. Hence the Aumann's(1976) famous and central theorem in standard decision-making theory is challenged. The current paper provides an extension of such a model to costly signalling literature which is a central theory in modern financial economics. The results from the simple model developed here can contribute to the theory of the formation of 'separating equilibrium' under information asymmetry, or more deep uncertainty. Standard neoclassical finance theory is based on information asymmetry, where one party to any transaction has a greater degree of private information about the quality of the asset than the other party has, which generates screening (adverse selection) or monitoring (Moral Hazard) problems. However deep uncertainty is a scenario when all parties to a transaction may have a common prior belief state which is non-trivial to describe in the standard adverse selection/ moral hazard set up. Quantum-like modelling can prove to be a useful alternative in describing and predicting agents' behaviour in such an uncertainty scenario, hence extending the signalling theory. Another feature of such quantum like modelling or quantum decision theory modelling is that there is no need to introduce 'irrational' or 'inductive reasoning' for demonstrating violations of neoclassical theory predictions. Even rational and deductive logic-based reasoning can also generate violations.

Keywords: quantum probability updating, Bayesian probability updating, common knowledge criterion, costly signalling, deep uncertainty, information asymmetry, cognitive modelling