

What about equilibrium and complexity when economic agents do not think? A finitistic-arithmetic description.

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## Abstract

The various economic theories propose different interpretations of the systems they study and offer different solutions to the fundamental questions. The debate on the fundamentals of the theory has been underway for some time but has not yet reached a level comparable to the debate that mathematicians and physicists reached.

By means of a finitistic computational method, that requires a simple algebraic structure capable of dealing only with finite sets of natural numbers, we found that computable aggregate “curves” are but mathematical constructs. The computational method adopted is under development but is well suited to interpreting the empirical evidence found by Kirman with reference to reserve prices.

In the model, the agents are heterogeneous. Agents are described by quantities and reserve prices, both of which are defined as natural numbers. Agents are 0-intelligent, they act on the basis of a single "if ... then" rule. Buyers and sellers randomly interact and effective prices are determined. Each buyer is associated with a random sample of sellers, whose size is governed by a parameter that mimics the ability to explore the market: all buyers have the same ability. Buyers sort their sellers in descending order with respect to the prices they have revealed: the transaction takes place if and only if the supply reserve price is lower than the demand reserve price, therefore it is possible that missed sales and rationing may occur. As a further simplification, we assume that sellers can satisfy any level of demand. With this approach we find three preliminary results. The first two relate to a model in which there is only one commodity with direct interaction, the third result refers to a model similar to the previous one but a second commodity is introduced, without interdependence with the first, and without yet providing for the direct interaction between buyers and sellers. In the context of the Walrasian exchange economy, the first result is that the equilibrium understood as a point in the price-space at which aggregate supply and demand balance exists only in mathematical terms. The equilibrium emerges as a set of points in the price-space at which different species of heterogeneous and interacting agents find states of compatibility between their demand and supply: the equilibrium is characterized as a distribution even if the agents are not intelligent and are not rational. The second result is that the balance as a single matching point between individuals' demand and supply is consistent with the intersection of aggregate supply and demand curves if and only if the information is almost complete for all agents. Finally, considering two non-interdependent commodities, when we move on to describe the aggregate system, the supply and demand curves at reserve prices emerge with that non-linearity that is typical of complex systems, i.e. the arrangement of the supply and demand points do not locate about straight-lines but non-linear structures emerge.

In conclusion, although linear structures obedient to the rule of supply and demand can be identified at the micro level, the macro level tends to deviate from this form due to aggregation: the whole and the sum of its parts do not coincide. Furthermore, although individuals are 0-intelligent, once composed in the system a sort of self-organization emerges, even without the need to assume their rationality.