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Economics as a Science: The resolution of the microeconomic problem of market demand

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Abstract: The purpose of this report is to acquaint applied mathematicians solving real problems of economic analysis, as well as economists, both theoretical and applied, with our solution, published mainly in Russian-language books and economic journals, of a valuable problem in economic theory and practice. The problem is that modern neoclassical economics, which is studied in most universities around the world and forms the majority of economic investigations contains an unrealistic mathematical axiomatic individual demand theory (IDTh) in multi-product consumer markets, but does not contain a realistic market demand theory (MDTh), which is of real interest to economic practitioners and governments. The consequences of this failure are the lack of founded mathematical methods for analysing market demand, in particular, the calculation of economic (analytical) consumer demand indexes that reflect the consumers preferences of the population, and a theory of economic equilibrium that determines prices that are effective for real economies. The realistic MDTh has created by the author as a revision of the IDTh within scientific methodology. Also, we have developed a verification method of this MDTh on the basis of Afriat-Varian's nonparametric (individual) demand analysis. The problem of verifying an applied mathematical theory is the inverse problem of that theory, and the latter is usually ill-posed and generally has many solutions. The solution of such problems consists in their regularization with involvement of additional information about the desired solution, and to regularize the MDTh inverse problem we use economic indexes, which makes it possible to obtain solutions with various meaningful properties.

Keywords: market demand problem, methodological analysis, statistical ensemble of consumers, verification, Konüs indexes

1. Introduction

The founders of the mathematized neoclassical approach to economics, William Stanley Jevons [1] and Leon Walras [2], have intended (independently) to reconsider Economics, which at that time was a collection of loosely linked verbal doctrines on welfare and the value of goods, on general scientific principles used in the natural sciences, firstly, mechanics and physics. Educated in natural (Jevons) and technical (Walras) sciences, they both saw economics as a teaching dealing with quantities and believed it should be a mathematized science. Jevons realised that the demand theory that is of interest to any economic activity is the theory of aggregate (collective) market demand [3], but he and Walras started by constructing a mathematical theory of individual demand (IDTh). Perhaps because of the ideas of the classics Adam Smith and John Stuart Mill about Man as an independent egoist (Homo Economicus), which became established in Europe in the 19th century.

The programs to revise economic theories along natural sciences line met with stiff resistance from most academic economists already at the late 19th century, and this resistance continues to this day. Modern neoclassical economic theory (orthodox/main-

stream Economics) has been established within a framework of methodological individualism [4]. This methodology denies the existence of socio-economic phenomena as special ones and prescribes that researchers of such phenomena, collective in nature, should represent them through the actions of elementary agents – individual consumers and production firms acting independently and selfishly. In accordance with this prescribe, Economics has accepted a mathematical axiomatic method for constructing partial theories [5] but the natural sciences are based not on axioms, but on hypotheses tested by facts. So, methodological individualism differs radically from scientific methodology, and the contributions of Jevons and Walras have proved potentially contradictory.

This report presents a methodological analysis of the market demand problem within a general scientific methodology and a resolution to the problem on this basis in our works [6–12].

2. The program «Economics as a science»

Opponents of the scientization of economic theory explain their position by the significant differences in natural and social phenomena. In doing so, they deny the legitimacy of a (natural) scientific approach to economic problems.

The opponents' arguments about the significant differences between natural and social phenomena are not in doubt. The feature of the natural sciences is the identity of elementary objects in their classes, complete in physics, chemistry, and molecular biology. Here main processes are usually reproduced experimentally, and this simplifies the formalization of their research and the application of mathematical and statistical methods to create and verify many descriptive laws and predictive theories.

The feature of the social sciences is that the «atoms» of the objects – persons – have a psyche and an active mind, an ability to work and transform the environment and society. People behave, especially when making decisions under uncertainty, in a poorly predictable manner and often spontaneously. Accordingly, economic processes at the personal (when buying), meso and macro levels are unique, which limits the possibilities of experiments, error assessment, and this feature complicates the verification of the proposed theories.

However, the Natural Sciences and Social Sciences (Humanities) are Sciences, so there should be commonality in their definitions and methodology, consistent with the root concept of Science. We understand Science as a system of non-trivial knowledge, justified logically and empirically, about some system of real objects.

The coined essence of the principles of scientific research (scientific methodology) are objectivity, provability of proposing theories and verifiability of their findings by facts. Many economic phenomena can be investigated within this methodology.

3. Holistic theory of market demand

The market demand theory [7, 10, 11] is a revision of the individual demand theory [5, Ch. 3] with the replacement of the object of the theory – an individual/household – with a set of buyers of a given market. This set is not precisely defined, since buyers usually spend only a fraction of their consumer spending in a given market. The set of such buyers is understood as a «fuzzy set» in the sense of Lotfi Zadeh [13] and is called the «Statistical Ensemble of Consumers» (SAC) of a given market. SAC is a subset of consumers of the population of a region/country who have made purchases in this market. The ratio of the value of an individual's purchases to his total consumption expenditures is the «degree» of the individual's belonging to a given SAC. This concept is conceptual and not observed

for real markets, as well as individual utility functions. For more details, see [7, pp. 35-36].

The second basic difference in our theory is the replacement of the postulate of individual rationality with the hypothesis of collective rationality. It is assumed that most individuals only want to be rational, and this can be considered their limited rationality, which forms, on average, under relatively stable market conditions, the dominant of collective market behavior, which can be considered hypothetically as collective rationality, or SAC's rationality. The SAC's preferences are manifested on average, represented by a collective utility function, and the corresponding holistic model is taken as a hypothetical model of market demand to be tested by trade statistics of market prices and bought goods' quantities. Due to space limitation of this presentation, we refer interested readers to our published and archived books and articles listed in the Introduction for a detailed and formal presentation of the issues and results outlined here.

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