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Binary relations in mathematical economics: on continuity, additivity and monotonicity postulates in Eilenberg, Villegas and DeGroot. (English) [Zbl 1471.91375]

Summary: This chapter examines how positivity and order play out in two important questions in mathematical economics, and in so doing, subjects the postulates of continuity, additivity and monotonicity to closer scrutiny. Two sets of results are offered: the first departs from Eilenberg’s necessary and sufficient conditions on the topology under which an anti-symmetric, complete, transitive and continuous binary relation exists on a topologically connected space; and the second, from DeGroot’s result concerning an additivity postulate that ensures a complete binary relation on a \(\sigma\)-algebra to be transitive. These results are framed in the registers of order, topology, algebra and measure-theory; and also beyond mathematics in economics: the exploitation of Villegas’ notion of monotonic continuity by Arrow-Chichilnisky in the context of Savage’s theorem in decision theory, and the extension of Diamond’s impossibility result in social choice theory by Basu-Mitra. As such, this chapter has also a synthetic and expository motivation, and can be read as a plea for inter-disciplinary conversations, connections and collaboration.

For the entire collection see [Zbl 1470.46004].

MSC:
91B86 Mathematical economics and fuzziness
06F20 Ordered abelian groups, Riesz groups, ordered linear spaces
46A40 Ordered topological linear spaces, vector lattices

Keywords:
continuity; additivity; monotonicity; ordered space; weakly ordered space

Full Text: DOI

References:
G. Debreu, Topological methods in cardinal utility theory, in Mathematical Methods in the Social Sciences, ed. by K.J. Arrow, S. Karlin, P. Suppes (Stanford University, California, 1960) pp. 16-26 - Zbl 0249.90005
G. Debreu, Continuity properties of paretian utility. Int. Econ. Rev. 5(3), 285-293 (1964) - Zbl 0138.16301
J. Derbyshire, Unknown Quantity: A Real and Imaginary History of Algebra(Plume Books, New York, 2006) - Zbl 1140.01001
P.C. Fishburn, Mathematics of Decision Theory(The Hauge, Mouton, 1972) - Zbl 0276.62012
A. Ghosh, M. Ali Khan, M. Uyanik, Solvability and Continuity: On Bridging Two Communities(Johns Hopkins University, Baltimore, mimeo, 2020)
C. Hara, K. Suzumura, Y. Xu, On the possibility of continuous, paretian and egalitarian evaluation of infinite utility streams, in Andrew Young School of Policy Studies Research Paper Series(2006), pp. 07-12
G. Herden, Topological spaces for which every continuous total preorder can be represented by a continuous utility function. Math. Social Sci. 22(2), 123-136 (1991) - Zbl 0742.90017
S. Iliadis, V. Tzannes, Spaces on which every continuous map into a given space is constant. Can. J. Math. 38, 1281-1298 (1986) - Zbl 0599.54043


[57] M.A. Khan, On the finding of an equilibrium: Düppe-weintraub and the problem of scientific credit. J. Econ. Lit. online(1), 1-50 (2020)


[98] W.R. Zame, Can intergenerational equity be operationalized? Theor. Econ. 2(2)

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