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The sum of observables on a σ -distributive lattice effect algebra. (English) Zbl 1418.03181
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Summary: Observables on quantum structures can be seen as generalizations of random variables on a measurable space (Ω, \mathcal{A}) for the case when \mathcal{A} is not necessarily a Boolean algebra. The present paper investigates an extending of the usual pointwise sum of random variables onto the set of bounded observables on a σ -distributive lattice effect algebra E . We describe conditions under which this operation, so-called sum $x + y$ of observables x, y , preserves continuity of spectral resolutions of x, y . We show how the spectrum $\sigma(x + y)$ depends on spectra $\sigma(x), \sigma(y)$, and we provide a relation between the meager part x_m and the dense part x_d of an observable x .

MSC:

03G12 Quantum logic

06C15 Complemented lattices, orthocomplemented lattices and posets

81P10 Logical foundations of quantum mechanics; quantum logic (quantum-theoretic aspects)

Keywords:

effect algebra; monotone σ -complete effect algebra; observable; sum of observables; spectral resolution; Olson order

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References:

- [1] Cignoli R, D'Ottaviano IML, Mundici D (2000) Algebraic foundations of many-valued reasoning. Kluwer Academic Publishers, Dordrecht · Zbl 0937.06009 · doi:10.1007/978-94-015-9480-6
- [2] Davey BA, Priestley HA (2002) Introduction to lattices and order, 2nd edn. Cambridge University Press, Cambridge · doi:10.1017/CBO9780511809083
- [3] Dvurečenskij, A., Representable effect algebras and observables, Int J Theor Phys, 53, 2855-2866, (2014) · Zbl 1308.81011 · doi:10.1007/s10773-014-2083-z
- [4] Dvurečenskij, A., Olson order of quantum observables, Int J Theor Phys, 55, 4896-4912, (2016) · Zbl 1358.81011 · doi:10.1007/s10773-016-3113-9
- [5] Dvurečenskij, A., On orders of observables on effect algebras, Int J Theor Phys, 56, 4112-4125, (2017) · Zbl 1387.81015 · doi:10.1007/s10773-017-3472-x
- [6] Dvurečenskij, A., Quantum observables and effect algebras, Int J Theor Phys, 57, 637-651, (2018) · Zbl 1394.81020 · doi:10.1007/s10773-017-3594-1
- [7] Dvurečenskij, A., Sum of observables on MV-effect algebras, Soft Comput, 22, 2485-2493, (2018) · Zbl 1398.06012 · doi:10.1007/s00500-017-2741-1
- [8] Dvurečenskij, A.; Kuková, M., Observables on quantum structures, Inf Sci, 262, 215-222, (2014) · Zbl 1329.81140 · doi:10.1016/j.ins.2013.09.014
- [9] Dvurečenskij A, Pulmannová S (2000) New trends in quantum structures. Kluwer Academic Publisher, Dordrecht · Zbl 0987.81005 · doi:10.1007/978-94-017-2422-7
- [10] Foulis, DJ; Bennett, MK, Effect algebras and unsharp quantum logics, Found Phys, 24, 1331-1352, (1994) · Zbl 1213.06004 · doi:10.1007/BF02283036
- [11] Gudder, SP, Uniqueness and existence properties of bounded observables, Pac J Math, 19, 81-93, (1966) · Zbl 0149.23603 · doi:10.2140/pjm.1966.19.81
- [12] Halmos PR (1974) Measure theory. Springer, Berlin · Zbl 0283.28001
- [13] Janda J, Xie Y (2018) The spectrum of the sum of observables on (σ) -complete MV-effect algebras. Soft Comput. <https://doi.org/10.1007/s00500-018-3078-0> · Zbl 1415.06004
- [14] Jenča, G., Sharp and meager elements in orthocomplete homogeneous effect algebras, Order, 27, 41-61, (2010) · Zbl 1193.03084 · doi:10.1007/s11083-009-9137-5
- [15] Jenča, G.; Riečanová, Z., On sharp elements in lattice ordered effect algebras, BUSEFAL, 80, 24-29, (1999)
- [16] Varadarajan, VS, Probability in physics and a theorem on simultaneous observability, Commun Pure Appl Math, 15, 189-217, (1962) · Zbl 0109.44705 · doi:10.1002/cpa.3160150207

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