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An Invers probleme of Lyapunov type inequality for Sugeno integral

Amir SHafiloo*
Ph. D Student of the Department of Mathematics, University of Maragheh, Maragheh, Iran.

Abstract

Integral inequalities play important roles in classical probability and measure theory. Sugenos integral is a useful tool in several theoretical and applied statistics which has been built on non-additive measure. Lyapunov type inequalities for the Sugeno integral on abstract spaces are studied in a rather general form, thus closing the series of papers on the topic dealing with special cases restricted to the(pseudo-)additive operation. Moreover, a strengthened version of Lyapunov type inequality for Sugeno integrals on a real interval based on a binary operation $\star$ is presented.

Keywords: Lyapunov inequality, Semiring, Fuzzy integral inequality; Nonadditive.
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1 Introduction

Some integral inequalities, such as Lyapunov inequality, Jensen type inequality, Holders inequality and Minkowski inequality, play important roles in classic measure space. A natural thought is whether these integral inequalities still hold in fuzzy measure space under the condition of non-additive measure. The study of inequalities for Sugeno integral was developed by Mesiar, Pap [7, 6] and so on. All of them enrich the fuzzy measure theory. We focus on the inequalities for Sugeno integral on abstract space. There are hardly any papers concern about inequalities for Sugenio ntegral. Hun Hong [5] has done this work, but the Lyapunov type inequality for Sugeno integral on abstract space are obviously uncorrect. Its easy to nd errors in the procedure of the proof and to give counterexamples. Thus the conditions under what the Lyapunov integral are discussed. In [4], a fuzzy Chebyshev inequality for a special case was obtained which has been generalized by Ouyang et al. [8]. Furthermore, Chebyshev type inequalities for fuzzy integral were proved in a rather general form by Mesiar and Ouyang [7]. They obtained the following result:

Theorem 1.1. *Let $f, g \in \mathcal{F}_+(X)$ and μ be an arbitrary fuzzy measure such tath both $(S)\int_A f d\mu$ and $(S)\int_A g d\mu$ are finite. and Let $\star : [o, \infty)^2 \to [0, \infty)$ be continuous and non-decreasing in both arguments and bounded from above by minimum. if f, g are comonotone, then the inequality*

$$(S)\int_A f \star g d\mu \geqslant \left((S)\int_A f d\mu\right) \star \left((S)\int_A g d\mu\right)$$

*Speaker