

FUZZY RANDOM VECTORS AS MODELS FOR VAGUE BUT SYNTHETIC DESCRIPTIONS OF COMPLEX RANDOM PHENOMENA

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ABSTRACT. *In this paper, the author investigates a class of fuzzy random vectors, where they are considered as vague but smart perceptions of some complex random phenomena. First, based on the result previously proposed by the author [1], and inspired by the recent researches, especially Krätschmer [2], the definition of fuzzy random vectors are reconsidered from the viewpoint of vague but concise description of the state of very complex random phenomena. Then, the expectation of the proposed fuzzy random vectors are derived from the viewpoint of the multi-valued logic approach.*

Keywords: Fuzzy random vectors, Vague but synthetic perception, Multi-valued logic

1. Introduction. Recent years, motivated by the importance for treating the data exhibiting both vagueness and randomness, fuzzy random variables or more generally fuzzy random vectors have been intensively investigated by many researchers with various definitions. For instance, the concept of fuzzy random variables obtained as vague linguistic observations of crisp random data was firstly presented by Kwakernaak [3, 4], and investigated by e.g., Boswell [5], and Kruse [6, 7, 8, 9, 10, 11]. On the other hand, Puri and Ralescu [12] defined firstly fuzzy random variables as the generalized random sets and discussed their statistical properties [13, 14]. From this viewpoint of fuzzy random variables as the generalized random sets, many researchers have been investigated intensively. Such phases are observed in Negoita and Ralescu [15], Inoue [16], Li and Ogura [17, 18]. Recently, Krätschmer [2, 19, 20] presented the precise discussion of the measurability of fuzzy random variables.

Consider, for instance, the situation of evaluating the economic condition for forecasting the business activities as it will be discussed precisely in Example 4.3 in Section 4. It is needless to say that the economic condition is evaluated based on various indices. However, each economic index shows only one aspect of the highly complex economic system and it is often observed that some of the indices seem to show the contradictory values each other. Therefore, deliberating the whole aspect of the economic system indicated by various indices, we have to evaluate the economic state and have to express it by using vague words like “good”, “bad” and so on. Furthermore, it should be also taken into consideration that the economic condition fluctuates randomly due to the unpredictable