

Book Reviews

HOW TO HANDLE UNCERTAINTY

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Xiaoxia Huang. Portfolio Analysis. From Probabilistic to Credibilistic and Uncertain Approaches. Heidelberg: Springer-Verlag, 2010. ix + 182 pp. ISBN 978-3-642-11213-3.

The referred monograph deals with mathematical models of rational investment policy and some of its principles, among which the concept of uncertainty connected with the expected returns or risks of portfolios are in the very focus of the author's interest.

The uncertainty belongs to most salient features of the realistic models of portfolio. The aim of this volume is to offer a fundamental overview of particular approaches to the quantitative analysis of returns and risks of a portfolio with respect to the type of uncertainty connected with the portfolio structure. Recent mathematical theory deals with various general classes of the uncertainty models, and three of them are analyzed and compared in the referred volume. The historically first and in many cases most effective one is formed by the probabilistic models of randomness as one of the possible uncertainties. The second class includes the credibilistic models, mathematically represented by means of fuzzy sets and related credibility concepts. Finally, the third class, as formulated in the referred volume, includes various particular approaches to the uncertainty, generally covered by the relatively new theory of uncertainty suggested in one of the referred sources.

The book is divided into five main chapters structured in short, well organized units.

The first brief chapter, *What is Portfolio Analysis*, includes heuristic introduction of the basic concepts and of their sense in the portfolio models. Next three chapters represent the main parts of the book. Chapter 2, *Probabilistic Portfolio Selection*, summarizes the classical probabilistic approach to the uncertainty of expected returns and costs. After the recollection of fundamental concepts of the probability theory, the following five sections deal with the methods of optimal treatment of random risk and returns based on different probabilistic criteria. They are focused, namely, on the mean-risk model, β -return-risk model, probability minimization model, mean-variance model and their synthesis called hybrid intelligent algorithms. All these sections are further structured into well organized parts and each of them is closed by examples of applications. The last section of this chapter includes very brief remarks on historical and methodological background of the probabilistic portfolio models.

The following Chapter 3, headed *Credibilistic Portfolio Selection*, deals with the alternative type of uncertainty, known as the vagueness and mathematically represented by the fuzzy set theory. The term "credibility" in the heading and further text of the

chapter has its justification. The fundamentals of the formal apparatus used in this chapter are fuzzy set theoretical, but its general background is not supported by the theory of possibility and possibilistic uncertainty measure, but by its modification known as the concept of credibility, and related concept of the credibilistic measure of uncertainty and knowledge. After an introductory section presenting the necessary fundamentals of credibility theory, the text of the third chapter continues in six sections, each of which dealing with specific criteria of optimality of the portfolio forming. The models presented and discussed by them are focused, quite similarly to the structure of Chapter 2. They regard the mean-risk model, β -return-risk model, credibility minimization model, mean-variance model, entropy optimization model, and hybrid intelligent algorithm. All these classical approaches to the portfolio optimization under risk are treated by means of the vagueness and credibility instead of the randomness used in the previous chapter. Also the internal structure of the sections forming this chapter is very similar to their counterparts in the previous chapter, including the conclusive illustrative examples of the presented theoretical models.

The last one of the three main chapters, Chapter 4, is called *Uncertain Portfolio Selection*, and it keeps the structural framework of the previous two chapters, in this case focused on the general uncertainty theory offering cover methods suitable for the processing of various marginal representations of the phenomenon of uncertainty. Even this chapter keeps the formal structure respected in the previous ones, and its text is divided in the introductory section on the fundamentals of uncertainty theory, and four following sections dealing with particular specific models of the portfolio. In this case, the mean-risk model, β -return-risk model, chance minimization model, and mean-variance model are presented and analyzed. Also in this case, the inner structure of particular sections is preserved, and their

general models are illustrated by examples.

The volume is concluded by the last Chapter 5, headed *Model Varieties*, and devoted to the analysis and discussion of several possibilities of extension of the previous models to other qualitatively new portfolio optimization problems. The unifying concept of this chapter, determining the point of view presented in it, is characterized by the term “diversification”. Particular sections of this chapter partly preserve the structure of topics of the previous chapters, and they are focused on the topics like entropy and diversification, mean-risk diversification models, β -return-risk diversification models, chance minimization diversification models, and mean-variance diversification models.

The book is completed by a list of references including 97 items sufficiently representing the topics dealt in its chapters, and a brief index of most frequently used terms.

Even if the number of pages of the volume does not seem to be impressive, its volume can be considered for very valuable and inspirational. It offers a possibility to percept the typical concepts and methods derived for the analysis of portfolio under the presence of uncertainty from different points of view of specific approaches to the phenomenon of uncertainty. The consequent respect to the stabile structure of the main chapters simplifies the comparison of the referred approaches to uncertainty, and the analysis of their adequacy of different types of particular problems or methods. It is also worth mentioning that the models of uncertainty presented in this book include even modern and relatively new theories and their characterization itself means one of the positive features of the referred book.

All the previous paragraphs can be summarized in the conclusion that the referred volume represents a useful and well written modern survey of the main approaches to the topic mentioned in its title, and it can be recommended to every reader being interested in the portfolio analysis methods and having sufficient knowledge of not very difficult but relatively wide-range mathematics.