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Risk Management in Finance and Logistics

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Preface

Risk has been recognized as an important factor that has to be considered in managerial decision-making in many disciplines, such as investments in financial markets and reforming business plans. Despite its generality, there is no consensus on the understanding of this notion; different people may have different perceptions of the meanings and implications of risk, even within the same discipline. Hence risk is a notion that spans multiple disciplines, and people's diverse subjective perceptions should be considered in addressing issues regarding risk management. These features make this book an appropriate part of the Translational Systems Sciences series, which aims to cultivate a new frontier of systems sciences that contribute to the need for beneficial and practical applications.

This book is intended to provide an introduction to the central concepts and quantitative tools for risk management, and simultaneously present some up-to-date research results on risk management in the fields of financial investments and logistics planning. To the best of our knowledge, this is the first book covering diverse definitions of risk and quantitative methods for risk management in the fields of finance and logistics.

It is designed for self-study by professionals or classroom work at the undergraduate or graduate level for students who have a technical background in engineering, mathematics, or science. This book aims to be informative for researchers whose interests are related to risk management, especially for those in the fields of finance and logistics. The prerequisites for reading this book are relatively modest; the prime requirement is some familiarity with introductory elements of probability theory and optimization techniques. Certain sections do assume some knowledge of more advanced concepts of probability theory and optimization, such as stochastic processes and the branch and bound algorithm, but the text is structured so that the mainstream can be faithfully pursued without reliance on these advanced background concepts.

This book is composed of two separate parts, each part is relatively independent and self-contained, readers interested in risk management in logistics can skip Part I, and those interested only in financial investments may only read Part I.

Part I is on risk management in finance, which is the most developed branch in risk management. The first three chapters in Part I introduce the key concepts and quantitative tools for risk management in financial investments. Chapter 1 is an introduction to investments in financial markets, the associated risks, and risk management in investments. Chapter 2 presents the popular indices for market risk, which form the basis of risk management. We introduce the concepts of variance, value at risk, and conditional value at risk in measuring market risk, and the methods for estimating these risk measures. Chapter 3 presents optimization models for risk control in investment decisions and the methods for solving these models, which are the main tools for risk management in investments. While the last two chapters of Part I include some up-to-date research results on financial investments. Chapter 4 addresses a more general situation of investment known as the flexible investment, wherein the start and/or exit time of investments are not fixed but flexible within certain time intervals. We introduce the return and risk measures for flexible investments, some new indices for market risk are included, such as the period value at risk, and the methods for estimating these risk measures. Chapter 5 includes optimization models for risk control in flexible investments and methods for solving these models.

Part II is on risk management in logistics. Chapter 6 presents the basic theory of stochastic programming which originates from the linear programming problem developed by Dantzig. In particular, the solution method is described in detail regarding the stochastic programming problem with recourse. This model is extended to models that include multi-stage planning and integer constraints. In addition, we show the basic concepts regarding a model having probabilistic constraints and also including a variance term in the objective function. In Chap. 7, stochastic programming problem for inventory distribution is formulated with demand as a stochastic variable and the effectiveness of the policy of using both preventive and emergency lateral transshipment is examined. In Chap. 8, the stochastic programming model for the logistics network reorganization problem and the efficient solution method are shown.

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