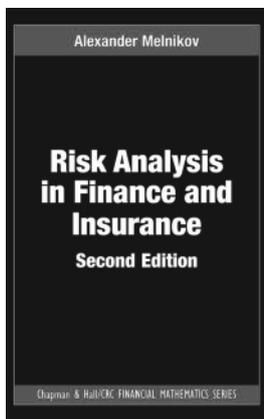


Review of the book of Alexander Melnikov “Risk Analysis in Finance and Insurance”

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Обзор книги Александра Мельникова «Риск-анализ в финансах и страховании»

Роман Макаров



Review of the book of Alexander Melnikov “Risk Analysis in Finance and Insurance” (Second edition: Chapman&Hall/CRC Press, Boca Raton, 2011, 328 p., Extended translation into Russian: ANKIL, Moscow, 2015, 416 p.)

Writing a solid textbook can be a challenge due to many factors that

have to be taken into account. What audience has the book written for? What topics should be chosen and how can they be presented? At first glance, the book “Risk Analysis in Finance and Insurance” written by Prof. Alexander Melnikov looks as one of many other similar texts that have been published in the last two decades. However, this book has many unique features. Many of which make it stand out above all others.

First, as follows from its title, the quantitative analysis of risks inherent in financial securities and insurance contracts is the focus of the book. Identification, estimation and control of financial risks are keys to financial stability that plays an important role not only for financial institutions but also for all people making various business and investment decisions on a regular basis. In his book, Prof. Melnikov has demonstrated the power of stochastic analysis in dealing with uncertainty of finance and insurance. The unified approach to problems of financial

and actuarial mathematics helps the reader to see different links within risk analysis and valuation of equity options, fixed-income derivatives and insurance products.

Second, the author has managed to maintain a balance between the clarity and rigorousness of presentation and the length of the book. It is a condensed yet comprehensive and accurate survey of the theory and applications of financial and actuarial mathematics. Every important concept is explained as it arises so that no prior knowledge of the theory of probability and stochastic processes is necessary. However, it may not be an easy reading for everyone since a solid background in general mathematics is required. Besides the fact that the book is self-contained, no result is taken for granted. The reader can find a compact proof of every theorem and proposition used in the book. On the other hand, it contains multiple worked-out problems, which illustrate important aspects of the theory, and quantitative examples demonstrating the practical usefulness of results.

The book begins with the introduction of basic concepts of financial markets and risk management in Chapter 1. There, essential facts of the modern probability theory are presented, from the axioms of probability to martingales. On discrete-time financial models are focused the next two chapters. The binomial tree, introduced in Chapter 2, is a perfect model to study pricing and hedging of options. It allows for writing the fair value of every European-style derivative as a sum of weighted payoffs with

respect to all possible market scenarios. Every important concept such as arbitrage, completeness, replication, hedging, fundamental theorems of asset pricing, etc. can be defined with the full rigour in the discrete-time setting. In limiting case, the binomial tree model converges to a continuous-time model and from the Cox-Ross-Rubinstein pricing formula is obtained the famous Black-Scholes formula. Additionally, in Chapter 3, the reader can study pricing and hedging options in incomplete market models and in models having restrictions on the capital and in models with transaction costs.

Chapter 4 deals with the Black-Scholes model where the stock price process is constructed from Brownian motion. Fundamental problems related to pricing, hedging, optimal investment and risk assessment are thoroughly studied. As the original Black-Scholes model as its generalizations that, for example, take into account transaction costs and non-uniform distribution of information about the market among traders, have been considered. Chapter 5 is devoted to pricing fixed-income derivatives such as bonds and options on bonds using stochastic models of short rates and forward rates. Chapter 6 is fully concentrated on the risk analysis. Different players of financial markets can find something appealing to them in that chapter. An investor can optimize her long-term strategy using the Bellman principle. A trad-

er can learn methods of technical analysis used to identify different trends in stock prices. Finally, a risk-manager can make use of risk measure discussed at the end of Chapter 6. The last two chapters are concentrated on insurance models and ruin theory. Those chapters successfully link together insurance and finance. As it is well known, many large insurance companies are active players on financial markets and use derivatives for hedging their investment portfolios. Therefore, the risk analysis of diversified portfolios that in addition to traditional insurance contracts include investments in stocks and bonds is of great importance.

In the appendix is hidden the true treasure, where 140 exercises sorted by topics and accompanied by answers and hints are presented to the reader. A unique combination of well-chosen topics from financial and actuarial mathematics blended with a rich selection of exercises makes this book a must-have text for every individual interested in quantitative finance. Book, needless to say, written by Prof. Melnikov is an excellent choice of textbook for a university-level course on quantitative risk analysis in finance and insurance.

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The List of References:

A complete book:

Jones, P.J. (1980), *Introduction to Algorithms*, London: Methuen.

A chapter in an edited book:

Hamza, K.A. (1988), «Vision Systems», in Jones, P.J., Smith, R. & Watson, E.P. (eds), *Artificial Intelligence Reconsidered* (2nd edition), New York: Wiley, pp. 12-34.

An article in a journal:

Carson, P.R. (1970), «An Approach to Intelligent Planning», *Journal of Applied Artificial Intelligence* **38**(3), 4–11.

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