

the Norwegian Odd Dahl—aviator, explorer, pioneer in radio wave propagation, oceanographer, designer and builder of particle accelerators, and father of the book's author, to mention only a few highlights.

Per Dahl is now retired from the Lawrence Berkeley National Laboratory, where he made important contributions to the development of superconducting accelerator magnets. On the history of physics, he published four previous books, which covered conservation of energy, superconductivity, the discovery of the electron, and the story of Norwegian heavy water and its role in World War II.

It is not easy to weave as much as Dahl has into a coherent whole, especially when many of the side stories are as interesting as the main scientific thread. Dahl has effectively organized his work so that the main and tangential stories come through clearly. The history is well worth revisiting and Dahl's summary of it is fresh and engaging.

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Tools for Computational Finance

Rüdiger Seydel
Springer-Verlag, New York, 2002.
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The past quarter century has witnessed accelerating growth in use of financial derivatives—transactions betting on the future prices of one or more assets. Many derivatives take the form of options—in which one party acquires the right to buy or sell, at a later date, a certain asset at a given price.

The options traded on stock exchanges are relatively easy to understand and implement. However, more sophisticated and tailor-made options exist that are not traded on stock exchanges. Those financially engineered products have gradually increased in complexity to the point where they can appear quite obscure to casual investors. That is one reason such investors and even auditors suspect that sophisticated options are being used for murky speculation—and sometimes they are. However, when options are correctly implemented as hedges, they become powerful instruments of risk management. Today, they are an integral part of financial engineering.

An important prerequisite to trading options is calculating their price. In general, the task amounts to solving linear partial differential equations of the second order in both time and future prices of the underlying assets. The complexity of the problem resides in the stochastic nature of those prices and the idiosyncratic boundary conditions. The problem is reminiscent of Brownian motion and much has been written about numerical solutions of such equations. In finance, with its peculiar boundary conditions, the literature is expanding fast, but few textbooks exist. Rüdiger Seydel's *Tools for Computational Finance* helps fill the textbook void.

First published in German, the text arose from the author's lectures on computational finance at the University of Cologne, where he is a professor of applied mathematics. The English edition contains a few more comments on risk-neutral valuation, stochastic processes, and Monte Carlo integration. It also contains a new chapter on the pricing of exotic options. The English title is a bit misleading, because the book examines only one aspect of finance—calculating the price of financial options. Although that aspect is undoubtedly a glorious part of mathematical finance, it is not the only one that requires serious numerical analysis.

Seydel has sought a compromise between justifying his results and avoiding formal proofs. I think he has struck a healthy balance, and I enjoyed reading the book. Wherever I thought the author could have said more, he referred to the extensive bibliography. However, the bibliography may have limited value to readers unfamiliar with the literature, because it does not classify its contents according to readability or breadth.

In his preface, the author advocates "learning by calculating." That principle is easily fulfilled in the first few chapters, but is less practical for the later, more abstract ones. It is symptomatic that the first chapter contains 13 exercises, but the last one has only three, and those three are purely analytical. I would have liked more exercises in the form of numerical experiments. I would also have appreciated an accompanying CD or a reference to a Web site with standard solutions in the form of code. The preface does refer to a Web site, but that site provides hardly any additional information except for a few hints on some of the exercises.

Owing to the inherent technicalities in the valuation of financial instruments and to their increasing complexity, it is no surprise that a

growing number of scientists—physicists in particular—have been attracted to finance. After a short period of acclimatization, many physicists turned bankers (including all the ones I know) have come to thoroughly enjoy their new profession.

Tools for Computational Finance is targeted at financial engineers and mathematically inclined financial economists, but physicists who are attracted to finance and know the basics of options will probably find it useful. Other physicists will easily grasp the mathematical concepts and recognize many familiar techniques, but may find some important issues are skipped or not treated at an accustomed depth. Furthermore, physicists unfamiliar with financial derivatives may wonder about the broader context and may misunderstand concepts that the book takes for granted.

Seydel's text is not an adequate introduction to finance, because it is too narrow and assumes too much prior knowledge of options. I strongly recommend that interested physicists first read John Hull's classic text *Options, Futures, and Other Derivatives* (4th ed., Prentice Hall, 2000), which I consider to be the best and most readable introduction to the field. Its intuitive style will appeal to physicists. In a sense, the two books are complementary: Hull's book teaches how to write the equations and Seydel's teaches how to solve them.

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New Books

Acoustics

Fundamentals of Ocean Acoustics. 3rd edition. L. M. Brekhovskikh, Yu. P. Lysanov. *AIP Series in Modern Acoustics and Signal Processing*. AIP Press/Springer-Verlag, New York, 2003 [1991]. \$99.00 (278 pp.). ISBN 0-387-95467-8

Astronomy and Astrophysics

AGN Surveys: IAU Colloquium 184. R. F. Green, E. Ye. Khachikian, D. B. Sanders, eds. *Astronomical Society of the Pacific Conference Series 284*. Proc. colloq., Byurakan, Republic of Armenia, June 2001. Astronomical Society of the Pacific, San Francisco, 2002. \$57.00 (425 pp.). ISBN 1-58381-127-3

Astronomical Data Analysis Software and Systems XI. D. A. Bohlender, D. Durand, T. H. Handley, eds. *Astronomical Society of the Pacific Conference Series 281*. Proc. mtg., Victoria, British Columbia, Canada, Sept.-Oct. 2001. Astronomical Society of the Pacific, San Francisco, 2002. \$57.00 (522 pp.). ISBN 1-58381-124-9