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## Rezensionen

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**G. Szpiro: Pricing the Future.** Finance, Physics, and the 300-Year Journey to the Black-Scholes Equation. 336 pages, \$28. Basic Books, New York, 2011; ISBN 978-0465022489.

The following review is reprinted with permission from *The Economist*, January 14th 2012.

Options and futures are almost as old as trade itself. From the farmer who sold his crop before the harvest to the merchant who bought at a set price in the future, the forerunners of today's markets can be traced to ancient Greece and Rome. Yet for centuries these markets remained stunted because of a simple question of valuation. What is the right to buy next year's olive crop worth? Answering this question took centuries of study of physics, botany and mathematics. When solved, it changed finance for ever.

The tale includes a fascinating succession of people who tried doggedly to master probability and markets. It is engagingly told by George Szpiro, a mathematician-turned-journalist, who flits between biographies and formulae. He begins with the futures and options markets of the tulip bubble of the 1630s. He looks at Napoleon's attempt to regulate trading with a modern-sounding ban on futures contracts and short sales. And he explores those whom history has forgotten, such as Jules Regnault, a self-taught broker's assistant who started working on the Paris Bourse in 1862. After seeing how share prices changed over time, he wrote a book on the subject and made a fortune trading shares. Regnault's writings have been largely forgotten, but his work foreshadowed modern financial theory.

Another great mind whose work was lost was Wolfgang Döblin. The son of a prominent German novelist of Jewish descent, Döblin fled Berlin to Paris in the 1930s. He obtained his PhD in mathematics at the Sorbonne, where he soon established himself as a pioneering mathematician and innovator in the field of probability. With war approaching, Döblin joined the French army in a gesture of gratitude to the country that had sheltered him. In his billet on the front-lines, he scribbled on a cheap school notebook, sketching out a formula that he sealed in an envelope and posted to the Académie des Sciences in Paris. Soon after, with his regiment surrounded and the French army in retreat, he burned his personal papers and, fearing what would happen if he was captured by German soldiers, shot himself.

The envelope lay sealed in archives until May 2000, when it was found to contain the mathematical tools to describe the random movements of particles. Calculations such as these transformed people's understanding of physics and provided an important building block of the so-called Black-Scholes equation.

That equation, which Robert Merton, Myron Scholes and Fischer Black worked out in 1973, turned out to be a breakthrough that promised accurate assessments of the value of options, which are the right (but not the obligation) to buy or sell something at a particular price on some future date. Mr Merton and Mr Scholes were awarded the Nobel prize for their work on this in 1997. Black, who died in 1995, was also credited for his contribution.

The equation's publication led to a flowering of options markets and an explosion of trading on them. It also transformed investment banking and stockbroking. The affable trader who calculated prices and odds by the seat of his pants on the trading floor, much as a gambler did at the poker table, was supplanted by the "quant", a mathematician with a room full of computers and reams of data.

Yet the model has deep failings. Black-Scholes assumes that movements in share prices, like those of particles suspended in liquid, can be plotted using a Gaussian, or bell curve, distribution. Yet finance is filled with "fat

tailed" events that occur far more frequently than predicted by this model of the physical world. Black-Scholes reached its zenith in 1998, just before the collapse of Long-Term Capital Management (LTCM), an investment firm backed by the two Nobel prize-winning economists.

LTCM failed when the yields on bonds issued by countries such as Russia and America began to diverge, something the models said was virtually impossible. A decade later, the great financial crisis was ushered in by the simultaneous collapse of house prices across America, another event that the mathematical models said was virtually impossible. In both instances, financial firms quickly found themselves racking up daily losses that the computers said should occur only once in millions of years.

*Pricing the Future* is at its best when it skips through the parallel developments in physics, mathematics and economics that led to the equation, a development that Mr Szpiro compares to the discovery of the structure of DNA or Isaac Newton's laws of motion. Unfortunately, Mr Szpiro's narrative dodges some important questions that it ought to have delved into in detail. In just four pages the book describes, almost as an afterthought, the failings of the Black-Scholes model and the history of the past decade since the collapse of LTCM. Black-Scholes may well have been a great achievement, but histories of the financial crisis will treat it less than kindly. The quest to tame risk and price the future is far from over.

**Georg Glaeser: Wie aus der Zahl ein Zebra wird – Ein mathematisches Fotoshooting.** 288 Seiten, CHF 37.50. Spektrum Akademischer Verlag, Heidelberg, 2011; ISBN 978-3-8274-2502-7

Nicht nur die Frage "Wie wird aus der Zahl ein Zebra?", sondern auch Fragen wie "Wieso haben Elefanten solch grosse Ohren?" oder "Sehen Fische so wie durch ein Fischaugenobjektiv?" und viele weitere werden in diesem neuen Buch von Georg Glaeser beantwortet. Auf 144 Doppelseiten findet der Leser viele faszinierende und spektakuläre Photos mit manchmal überraschenden Erklärungen zu vielen verschiedenen Themen aus der Mathematik, Physik, Astronomie, Chemie und Biologie. Der Autor bekennt im Vorwort, nicht nur ein professioneller Mathematiker, sondern auch ein leidenschaftlicher Naturphotograph zu sein. Dieses Buch bietet eine photographisch-mathematische Reise in das Reich der Natur mit ihren Phänomenen und den faszinierenden Resultaten der Evolution. Neben dem Hobbymathematiker wohlbekannten Prinzipien über Minimalflächen, das Pflanzenwachstum (Fibonacci-Folge) und Fraktale lernt der Leser in diesem Buch auch bislang kaum popularisierte Konzepte wie Klothoiden als natürliche Wickelkurven, Zonoedernetze, Voronoi-Diagramme oder apollonische Kreise kennen.

Das Buch ist nicht gedacht zum linearen Durchlesen, lädt aber ein zum Blättern und Schmökern. Jede Doppelseite behandelt ein anderes Thema; es gibt darauf mehrere schöne Bilder und einen leider oft etwas zu kurz geratenen erklärenden Text; andererseits gibt es reichlich Verweisungen auf das Internet. Glaeser hat mit seinem "Zebra" ein mathematisches *coffee table book* vorgelegt, also ein wunderschönes Werk, das viel Stoff für anregende Diskussionen hergibt, empfehlenswert sowohl für Laien als auch für Mathematiker. Interessierte Schüler finden hier sicher auch spannende Themen für eine Maturarbeit - die Auswahl ist riesig!

M.E. Akveld, Zürich