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Laudatio

Laudatio for Paul Embrechts

Op 21 mei 2002 heeft Paul Embrechts in de Aula van het Academieggebouw van de Universiteit Groningen de 2001/2002 Johann Bernoulli-lezing gehouden. Herold Dehling, hoogleraar stochastiek aan de universiteit in Bochum, sprak voorafgaand aan de lezing de onderstaande laudatio uit.

Mijnheer de Rector, ladies and gentlemen, it is a great and undeserved honor for me to have the opportunity to introduce the Johann-Bernoulli-lecturer for the academic year 2001/2002, *Professor Paul Embrechts* from the Eidgenössische Technische Hochschule in Zürich. Professor Embrechts is a well-known person in mathematics, known for his fundamental work on applied probability theory, insurance mathematics and the mathematics of finance, and hardly needs an introduction. Nevertheless, the Johann Bernoulli stichting voor de wiskunde has asked me to give a laudatio, maybe on behalf of the non-mathematicians in the audience, and thus I will try my best to tell you a little about the person Paul Embrechts and his work.

Paul Embrechts was born in Schoten in Belgium in 1953, he is married and has three children. He obtained his academic education in Belgium, first at the University of Antwerp and then at the Catholic University of Leuven, from where he graduated with a Ph.D. in Mathematics in 1979. His Ph.D. advisor in Leuven was Jef Teugels. Paul then spent two years as lecturer at Imperial College in London, was a *docent* at the University of Limburg in Diepenbeek

and in 1989 he obtained his present position as Full Professor of Mathematics at the ETH Zürich. There he holds a very prestigious chair in Insurance Mathematics that had previously been occupied by Hans Bühlmann, founder of the modern stochastic theory of insurance mathematics.

Insurance against extreme risks

The research of Paul Embrechts is at the interface of probability theory, more specifically applied probability theory, and its applications to insurance mathematics and mathematical finance. Paul Embrechts is one of the very few people in the world who combine profound mathematical research with the ability to talk to practitioners in banks and insurance companies. Paul finds inspirations for his mathematical research in the problems of modern day insurance and banking industry and is able to translate the results of his research into concrete advice for solutions.

Looking over the mathematical research of Paul Embrechts that by now spans a period of almost 25 years, one sees as a clear unifying theme the modelling of risks in insurance and finance and the rigorous mathematical analysis of such models. Topics that frequently appear in Paul Embrechts research are distributions with heavy tails, subexponential distributions, extreme value theory, regularly varying functions, ruin probabilities, themes arising from classical risk theory of non-life insurance mathematics. It is remarkable that Paul Embrechts is both an inspiring visionary and pathbreaker for new directions of research as

well as a master of the analytical techniques that are involved in the details of the studies — a great leader and a dedicated craftsman at the same time.

In the area of insurance mathematics, Paul is most notably interested in the difficult area of extreme risks, not the insurance against theft of our bicycles or against possible storm damage to the roofs of our houses but insurance against the risks of earthquakes, hurricanes, hail storms and other natural catastrophes. In such questions the classical approach of insurance mathematics, charging the expected claim plus a safety loading as premium, fails badly. The total claim size is not the average of a large number of small or moderate claims where classical laws of probability theory apply, but it is governed by a very small number or often just a single extreme claim. The analysis of such situations involves extreme value theory, an area of probability theory whose difficulty arises from the fact that extrapolation is required into a range where no data have ever been collected. In The Netherlands, this topic has a strong tradition in connection with flood data and the question of the heights of dikes required to guarantee a small probability of flooding. Lately Paul Embrechts research interests have also included the analysis of dynamical models that exhibit such extreme behaviour.

Concerning applications, during the last decade Paul Embrechts has focussed on the integration of insurance and finance. Roughly speaking the idea is to reinsure an extreme

risk for an insurance company by issuing a bond whose value on the day of expiry is contingent upon the occurrence of a certain catastrophic event, thereby spreading the risk that would ruin a single company among over many shoulders of small bond-holders. The valuation of such bonds is a topic on the border of insurance mathematics and mathematical finance.

In addition to his capacities already mentioned, Paul is an inspiring lecturer and a superb writer. His book *Modelling of Extremal Events for Insurance and Finance*, coauthored by Claudia Klüppelberg and Thomas Mikosch is an award-winning best seller. His recent book *Self-similar Processes*, written jointly with Makoto Maejima, will certainly become a classic, too.

Daniel Bernoulli

For the local audience it will be interesting to know that Paul Embrechts' research had at various moments ties with Groningen scientists from the past and present. The oldest tie I found in a reference to the Peter-and-Paul distribution as a counterexample to a theorem on dominated-varying distribution functions. The Peter-and-Paul distribution arises in the context of the St. Petersburg paradox which was for the first time seriously studied by the Groningen-born Daniel Bernoulli, son of Johann Bernoulli whose name is attached to today's lecture. Later reference is to the work of Aart Stam and Niels Kalma from the 1970s on subexponential distributions and on generalized renewal theory. Most recently Paul Embrechts had an extensive collaboration in the 1990's with then Groningen probabilist Thomas Mikosch.

It would go too far to cite all the honors that have been awarded to Paul Embrechts. He is a fellow of the Institute of Mathematical Statistics, an Elected Member of the International Statistical Institute and Honorary Fellow of the British Institute of Actuaries. He is Editor of *ASTIN Bulletin*, a leading journal on insurance mathematics, and an associate editor of several top journals.

As a result of his strong affiliation with the mathematics of insurance, finance and risk, Paul Embrechts holds in addition to his academic tasks top functions in private industry. Most notably he is member of the Board of Directors of Bank Julius Bär, Mathematischer Revisor for the Swiss Re Life insurance company and a founding member and the current director of RiskLab Zürich. ←

