Ernest Filip Oskar LUNDBERG
b. 2 June 1876 - d. 31 December 1965

Summary. Lundberg was a founder of mathematical Risk Theory. In 1903 he treated a stochastic model for an insurance business and later formulated what we now call the compound Poisson model of a risk process.

Filip Lundberg was not only a remarkably successful corporate leader and a trusted representative for Swedish life insurance as a whole, but also a mathematician-statistician who with great endurance paved the way to the strikingly original collective risk theory.

Lundberg's complex attitude towards himself probably had an early beginning. He showed no outward sign of insecurity, and his career was to turn out a complete success. Yet he was plagued throughout his life by a sense of inadequacy. Possibly this began because three months after birth he lost his father, a good-humoured grammar school senior teacher in mathematics, and when his mother remarried he felt he had also lost her.

Lundberg worked with a meticulously planned eagerness that knew no limits, save for regular sleeping hours and some summer vacation. However, he did not lack a sense of humour, albeit of a predominantly sarcastic kind.

Initially Lundberg made the same career goals as his father. In 1896 he graduated in mathematics and associated subjects at the University of Uppsala, and in 1898 he successfully presented his Licentiate thesis. He was thereby half-way to a PhD, which at the time meant the right to hold a position as a grammar school teacher.

Now fate would play first one, and then another trick with Lundberg's plans. The young Phil. Lic. - only 21 years of age - happened to see an advertisement in which a newly started life insurance company sought a clerk of some competence. Lundberg got the position, but the company was in difficulty and he soon moved to another, the industrial insurance company De Förenade (The United). He was soon promoted to actuary, and three years later, after a crisis within management, and at the age of only 28, was asked to take over the position of Managing Director.

But now he was Dr Lundberg. Insurance had been seen as a means to economic security for some time, nothing more. Lundberg never gave up the idea of producing a doctoral thesis. His strategy was shrewd; he chose a subject for this thesis which required a minimum of time-consuming reading

Thus Lundberg, late in 1903, defended a double-titled doctoral thesis,

primarily meant to be a bridge to the security of a senior grammar school teacher's position; and in 1904 he received his doctor's hat and golden ring. His thesis bears the titles: I *Approximerad framställning af sannolikhetsfunktionen.* II *Återförsäkring af kollektivrisker.* (Approximations of the Probability Function/ Reinsurance of Collective Risks.)

From then until the 1930s, Lundberg's activities were divided between the demands of everyday life and trying to understand the relationship between two concepts, collective and risk.

Lundberg's corporate duties were eventually threefold. He was managing director of De Förenade 1905-1942; of the health insurance company Eir 1911-1946; and of the life insurance company Lif-Victoria 1936-1948. Eir was mostly Lundberg's own creation. It started its activities in 1911 and was essentially a sister company to De Förenade. But Lif-Victoria was a different story. It demanded crisis management in general and restructuring in particular.

From around 1910 Lundberg became preeminent in Swedish life and sickness insurance. No-one wrote more articles, no-one debated more on topics related to the industry. His message could be summarized: know what you are doing and then rationalize. He always put consolidation before expansion, and his companies were richly rewarded.

From the middle of the 1930s to the late 1940s Lundberg's influence on Swedish life and health insurance was at its peak. As chairman of the Association of Swedish Life Insurance Companies 1938-1948, and as a member of two government committees on insurance, 1937-1939 and 1942-1946 respectively, Lundberg used his immense knowledge and considerable influence to promote a major review, which ended around 1950. By then the Swedish life insurance crisis of the 1930s was no more than a memory, and the future of the industry was bright.

Lundberg's 1903 thesis became the starting point of numerous attempts to get a firm grip on a theory both interesting and elusive. Lundberg wrestled for years with his collective-and-risk combination and his results are described in his publications of 1909, 1919, 1926, 1928, 1930. There were three obstacles on his way to a full understanding and acceptance of the definitive collective risk theory: time, space and notation.

Lundberg was a master of efficiency as a corporate leader and industry spokesman. His decision making was swift and precise, and he surrounded himself with co-workers of the greatest ability. When he chaired meetings or joined committees, Lundberg was frequently impatient. He was a very busy

man, working at least six days a week; and he had a family. His research activities had to be carried out in the time that remained which became increasingly scarcer.

The 1909 and 1930 papers mentioned above are written in German and addressed to international life insurance congresses (in Vienna and Stockholm respectively), and thus were part of the international interchange of facts and findings. But Lundberg's doctoral thesis and his contributions of 1926 and 1928 were all written in Swedish. This limited their circle of readers to a select group of Scandinavian and Finnish specialists.

Lundberg's mathematical notation was highly individual. Many scholars tried to examine what he had written about risk theory. Nearly as many simply gave up. But fortunately there was one person who could decipher Lundberg's work and develop it into a coherent theory, namely Harald Cramér (q.v.). In 1926 and later in 1969 he published penetrating reviews of Lundberg's work, and in two monographs, of 1930 and 1955, he gave a lucid account of the development of the theory through his own and his students' works. This is described in Martin-Löf (1995) and his monographs are republished in Martin-Löf (1994).

An original starting point for Lundberg in his 1903 thesis was the description of the total claim amount by what is now called a compound Poisson process, a concept not previously defined. He derived a central limit theorem for this by highly original methods. In his later work of 1926 he studied the ruin probability for a risk process, which describes the net flow of a company, consisting of a continuous inflow of premia and a discontinuous compound Poisson outflow of payments. He made extensive use of what we now know as the forward equations of this Markov process with ingeniously chosen initial distributions. He also pointed out that one need to consider a variable premium rate in order to prevent an overflow in the system, a feature that has only recently been considered in risk theory. Overall he made an important and useful contribution to the general theory of stochastic processes.

Filip Lundberg left his last position within Swedish insurance, as chairman of the board of Eir, in the same year that his collective risk theory was definitively clarified. He was then seventy eight and a long journey towards enlightenment had passed its rendez-vous with destiny and finally reached its goal.

References

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