Ragnar FRISCH
b. 3 March 1895 - d. 31 January 1973

Summary. Nobel Laureate in Economic Science in 1969, Ragnar Frisch promoted the use of statistical methods in economics and developed early methodological contributions to the new discipline of econometrics.

Ragnar Anton Frisch was born in Kristiania (Oslo) (Norway) in 1895. He became an economist of great international fame who did outstanding work in several branches of economics and was awarded the first Alfred Nobel Memorial Prize in Economic Science in 1969 (jointly with Jan Tinbergen) "for having developed and applied dynamic models for the analysis of economic processes" [**3**, p.300]. His main contribution to statistics was in developing - and promoting the use of - statistical methods in economics. Ragnar Frisch conceived at an early stage in his career the idea of *econometrics* as a discipline which should "have as its aim to subject abstract laws of theoretical political economy of 'pure' economics to experimental and numerical verification and thus to turn pure economics, as far as possible, into a science in the strict sense of the word" [**A**, Vol.1, Ch.1, p.3], an idea which he pursued with great perseverence.

Ragnar Frisch was born into a family of jewellers and as a lonely child he was groomed to take over the family business. At his mother's encouragement he interrupted his apprenticeship to prepare for an examination in economics at the University of Oslo and passed after two years study in 1919 with excellent marks. After completing his apprenticeship as a jeweller in 1920 he studied economics, mathematics and statistics in France and England in 1921-23 and obtained his doctoral degree from the University of Oslo in 1926. Frisch became Associate Professor of Economics and Statistics at the University of Oslo in 1928. A full professorate was offered to him in 1931, after his return from a Visiting Professorship at Yale University in 1930-31. Frisch established the Institute of Economics at the University of Oslo in 1932 and remained its Director until his retirement in 1965.

Frisch showed an early interest in mathematical statistics, especially in its relation to economics. In an outline of his research programme from 1926 he spoke - taking a lead from physics - of contributing towards the "quantification of economics", implying *both* the formulation of economic theory in a stringent mathematized way allowing in principle empirical verification *and* the development of statistical methods suitable for making empirical

verification practically feasible, given the nature of economic data [**A**, Vol.I, Introduction, pp. xxi-xxii]. This perspective on the relation between economics and statistics with a tough of logical positivism was later reflected in the Constitution stating the object of the Economic Society as "...to promote studies that aim at the unification of the theoretical-quantitative and the empirical-quantitative approach to economic problems and that are penetrated by constructive and rigorous thinking similar to that which has come to dominate in the natural sciences", as drafted by Frisch and rendered in every issue of the journal *Econometrica*.

Frisch's doctoral dissertation [**B**] from 1926 is primarily an apprenticeship in mathematical statistics with a deduction of general formulae for the semi-invariants (cumulants) for simple probability distributions, reflecting the state of the discipline at the time. By way of introduction Frisch distinguished two parts of mathematical statistics: *la partie rationnele* dealing with the deduction of mathematical properties of distributions for given data generating processes and *la partie empirique* searching for the probable data generating process and parameter values behind a given set of observations. The final note of the dissertation is that statisticians and mathematicians too long have shied away from the philosophical questions related to the foundation and methods of statistics and left these issues far behind the fast development in techniques and areas of application. Although Frisch did not contribute much to the foundations of statistics himself, this view foreshadowed his critical attitude towards contemporary applications and his approach in developing methods. In his later years he emphasized the role of prior reasoning and intuition in the cognitive process and accumulation of human knowledge, see [**F**].

In the early 1920's the analysis of time series, including decomposition into trend and cyclical components, using classical harmonic analysis or periodograms was an early source of inspiration to Frisch who engaged deeply in time series analysis. Frisch was searching for methods which went beyond purely mechanical techniques and allowed cycles that were not strictly regular, and thus suitable for the study of economic indicators. Frisch observed that linear operations applied to a series of randomly generated numbers might generate cycles similar to those found in actual observations. Although Frisch pursued the topic with passionate zeal, he did not publish much. A manuscript which circulated widely and outlined his ideas was [**D**]. Later he published [**E**] and [**A**, Vol.I, Ch.7], while a more comprehensive presentation on which he worked on and off throughout the interwar period never reached

publication. Frisch's time series studies led him to his seminal introduction of stochastic shocks to maintain cycles in a dynamic macroeconomic model in *Propagation Problems and Impulse Problems in the Dynamic Economics* [**A**, Vol.I, Ch.15], drawing upon ideas from K. Wicksell, E. Slutsky (q.v.) and G.U. Yule (q.v.).

Frisch was early aware that empirical studies of economic relations suffered from limitations in theoretical scope and a lack of appropriate methods. His *Correlation and Scatter* of 1929 [*A*, Vol.I, Ch.6] provided a more comprehensive framework for data analysis and multiple regression methods, introducing matrix methods. Frisch introduced new concepts, in particular 'multiple collinearity', and sobered the contemporary discussion of the ideal regression by focusing on *how* the random influence actually influenced the data at hand. In general he argued for more efforts in data analysis. He touched upon the fictitious determinateness that may be created by random errors, a theme he would later elaborate upon, and he assailed the "exaggerated importance" attributed to partial correlation coefficients.

In *Pitfalls in the Statistical Construction of Demand and Supply Curves* of 1933 [**A**, Vol.I, Ch.9] Frisch considered systems of simultaneous equations and elaborated on how careless use of regression methods might lead to indeterminate 0/0 expressions, only camouflaged by random noise. Frisch criticized a tendency to make theoretical assumptions about the data set instead of investigating by appropriate data analysis. This work drew very explicitly attention to the identification problem in the estimation of economic relationships. In *Statistical versus theoretical relations in economic macrodynamics* of 1938 [**A**, Vol.I, Ch.12] Frisch again considered identifiability, now in systems of linear difference equations and introduced the concept of autonomy. An equation in a system representation in an economic structure is said to be "autonomous" if it remains unchanged while other feature of the structure are changed. The original system of equations may not be identifiable, but linear combinations of the original equations may still be identifiable. Linear combinations of autonomous relations will, however, generally have a low degree of autonomy. The importance of autonomy was related to Frisch's interest in policy analysis and reform of economic mechanisms.

Frisch was a skeptic with regard to the applicability of probability reasoning to the non-experimental data of economic observations. This influenced his views of appropriate inference methods in economics. His main contribution to statistical methods for economic problems was his *Statistical Confluence Analysis by means of Complete Regression Systems*, recognized

as the first general statistical method designed for econometric research [**2**, p. 35]. It may be characterized as a method for exploratory data analysis. In the essay Frisch considers a more specific model of n variates, each of which has a systematic part and a disturbance, with exact linear relationships, "structural equations", holding between the systematic parts. The essay also included an elaborate numerical technique, devised by Frisch and adapted to the technical means of calculation at the time, called "bunch map analysis", through which Frisch hoped to determine bounds on the structural equation coefficients, derived from the coefficients of regressions of the variates in all directions. The general framework of confluence analysis was used by Frisch to discuss a numer of problems, known in later terminology as errors-in-variables, simultaneity, multiple collinearity and model selection. Through Frisch's high recognition as an econometrician in the 1930's the confluence analysis became well known, although it may have been a too demanding method to become widely used. Amonth those who applied and further developed confluence analysis were i.a. J. Tinbergen, J.R.N. Stone, O. Reiersøl and T. Haavelmo, who was Frisch's former student, later redirected econometric research through his path-breaking and influential *The Probability Approach in Economics* [**1**].

Much of Frisch's work in economics was also imbued with stochastic and statistical considereations. Frisch's interest in planning and reform of economic systems led him to a pioneering effort in national accounting in the late 1930's. His contribution on the conceptual and theoretical level became quite influential in the Scandinavian countries, while his empirical work was interrupted when the University of Oslo was closed by the German occupying authorities in 1943 and Frisch imprisoned. Another topic with ties to statistical theory is Frisch's work on the theory of index numbers, his survey article from 1936 [**A**, Vol.I, Ch.4] remained influential for decades.

Ragnar Frisch was very internationally oriented from an early stage and established through travel and correspondence a wide circle of contacts with economists, statisticians and mathematicians in various countries. Together with Irving Fisher (q.v.) and Charles F. Roos he initiated the founding of the Econometric Society in 1930 and played a leading role in the Society for several years. He played a major role in establishing the European Meetings of the Econometric Society from 1931; at the time this was the only institutionalized international academic conference forum for European economists. In his broad conception of econometrics Frisch tried to co-opt mathematicians and also engineers, in addition to statisticians, as members and participants

in the econometric movement. Frisch became the first Editor of the Society's journal *Econometrica* from 1933 and remained as editor until 1952, exerting strong editorial influence.

In the postwar period Frisch shifted much of this attention to the construction of models appropriate for national planning, and he also delved into various statistical aspects related to planning issues. His general planning methodology became influential in many countries, in particular in India and the united Arab Republic where he spent considerable time conducting planning exercises and advising the government.

Ragnar Frisch was an Honorary Fellow of the Royal Statistical Society, a Fellow of the Institute of Mathematical Statistics, and an elected member of the International Statistical Institute.

References

[1] [**A**] Frisch, Ragnar (1995). *Foundations of Modern Econometrics. The Selected Essays of Ragnar Frisch*, Two Vol., Aldershot, UK: Edward Elgar, (selected, edited and with an introduction by Olav Bjerkholt).

[2] [**B**] Frisch, Ragnar (1926). Sur les semi-invariants et moments employés dans l'etude des distributions statistiques. *Skrifter utgitt av Det Norske Videnskapsakademi i Oslo*, II. Hist.-Filos. Klasse No.3, pp. 1-87.

[3] [**C**] Frisch, Ragnar (1934). *Statistical Confluence Analysis by means of Complete Regression Systems*, Publication No.5 from the University Institute of Economics, Oslo, 192 pp.

[4] [**D**] Frisch, Ragnar (1927). The Analysis of Economic Time Series, Mimeographed, 123 pp.

[5] [**E**] Frisch, Ragnar (1928). Changing Harmonics and Other General types of Components in Empirical Series, *Skandinavisk Aktuarietidskrift* **11**, 220-236.

[6] [**F**] Frisch, Ragnar (1951). Estimeringsteori, Memorandum from the Institute of Economics, 10 September 1951, Oslo, 91 pp.

[7] [**1**] Haavelmo, Trygve M. (1944). The Probability Approach in Econometrics, *Econometrica* **12** (Supplement), 1-118.

[8] [**2**] Hendry, David F. and Morgan, Mary (1989). A Re-Analysis of Confluence Analysis, *Oxford Economic Papers* **5**, 35-52.

[9] [**3**] The first Nobel Prize in Economics (1969). The Official Announcement of the Swedish Academy of Sciences, *Swedish Journal of Economics* **71**, 300-301.

O. Bjerkholt