PROFESSOR ZDZISŁAW HENRYK HELLWIG (26.05.1925–8.11.2013)

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1. Short biography

Professor Doctor habilitatus h.c.h.c. Z.H. Hellwig was born on 26 May 1925 in the small town of Dokszyce, not far from Wilno. Both of his parents were teachers. His father, Henry Hellwig, taught German and his mother taught Mathematics. Prof. Z. Hellwig was educated at King Zygmunt August Gimnazjum in Wilno. However his secondary school graduation certificate (’matura’ in Polish) he only obtained after the Second World War in Wrocław, in 1947. In the same year he enrolledin the Wyższa Szkoła Ekonomiczna (University of Economics) in Wrocław, from which he graduated in 1950 with a Bachelor’s Degree.

In 1952 he received his Master’s Degree (‘magister’ in Polish) in Theory of Statistics at The Principal School of Planning and Statistics (SGPiS) in Warsaw.

Bachelor and Master degreecertificates

Whilsta student of the second year in the Higher Commercial School (Wyższa Szkoła Handlowa in Polish), he started to work at this school as a junior assistant.

ŚLĄSKI PRZEGLĄD STATYSTYCZNY

Nr 13(19)

On the basis of the paper "Linear regression and its applications in economics", he defended in 1958 his Ph.D. degree in Economic Sciences (officially the name of this degree was *Kandydat Nauk Ekonomicznych,* that is Candidate of Economic Sciences).

In 1967 he became Professor of Economics, and in 1972 he was nominated as (full) Professor in Economics.

In 1962 Prof. Z. Hellwig was nominated as Head of Department of Statistics and held this post until 1995, the year when he retired. Although Professor Hellwig retired from his chair, he continued to work quite regularly in his office. In 2005 the first conference on actuarial statistics was organized in Poland, dedicated to Professor Hellwig on the occasion of his 80th birthday. This conference was attended by practically all the prominent Polish statisticians.

Many ideas, concepts and methods bear the name of Hellwig. The most famous of them are listed below.

1. Information capacity or the information measure conveyed by a set of economic variables (in Polish: *pojemność informacyjna*), published in 1968.

The information measure conveyed by the m-element subsets $\{X_{k_1}, X_{k_2}, ..., X_{k_m}\}$ of the set of potential variables $\{X_1, X_2, ..., X_n\}$ has been defined by the following formula (instantly recognizable by any Polish statistician):

$$H(m,k,) = \sum_{i=1}^{m} \frac{r_{k_i}^2}{\sum_{j=1}^{m} | r_{k_i k_j} |},$$

where $k = (k_1, k_2, ..., k_m)$, and $r_{k_i k_j}$ is the correlation coefficient be-tween X_{k_i} and X_{k_j}, r_{k_i} is the correlation coefficient between Y and X_{k_i}.

2. Index of stochastic dependence (published in 1969)

The other significant Hellwig's achievement is the measure of stochastic dependence. For the case of two dimensional random vector (X,Y) this measure has been defined as follows:

$$d = (1 - \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \min[f(x,y), f_1(x) \cdot f_2(y)] dxdy)^{1/2} .$$

ŚLĄSKI PRZEGLĄD STATYSTYCZNY

Nr 13(19)

For the discrete case this measure has been defined by the following formula:

$$d = \left(\frac{1 - \sum_{i=1}^{r} \sum_{j=1}^{s} \min(p_{ij}, p_i q_j)}{1 - (\min(r,s))^{-1}} \right)^{1/2}.$$

Both of them were further investigated in a number of papers by many scholars.

3. Distance random variable

In 1967 Z. Hellwig introduced a new statistical concept, namely the concept of distance variable. It has been defined as follows.

Let $X^0 = (X_1^0, X_2^0, ..., X_n^0)$, $X^1 = (X_1^1, X_2^1, ..., X_n^1), ...,$ $X^m =$ $(X_1^m, X_2^m, ..., X_m^m\}$
be a simple random sample from the distribution given by cdf $\mathrm{F}(x_1, ..., x_n)$ or by the density function $f(x_1, ..., x_n)$. The distance random variable, demoted by symbol $C_{m,n}$, is defined as follows:

$$C_{m,n} = \min(Y_1, Y_2, ..., Y_m),$$

where

$$Y_j = \left(\sum_{i=1}^{n} (X_i^0 - X_i^j)^2 \right)^{1/2} \quad j = 1, 2, \dots, m.$$

Intuitively, variable $C_{m,n}$ means the shortest distance between a random vector X^0 and a set of random vectors $X^1, X^2, ..., X^m$.

The general expression for the cumulative distribution function was established by Bolesław Kopociński (the well-known Polish mathematician). His formula is the following:

$$F_{C_{m,n}}(c) = 1 - \int_{R^n} (1 - V(x_1, x_2, ..., x_n, c))^m \, dx, ... dx_n.$$

Where $V(x_1 ... x_n, c) = \int_A f(x_1 + u_1, x_2 + u_2, ..., x_n + u_n)\, du_1 ... du_n$

with

$$A = \{(u_1 ..., u_n) \mid \sqrt{u_1^2 + u_2^2 + ... + u_n^2} < c\}.$$

ŚLĄSKI PRZEGLĄD STATYSTYCZNY

Nr 13(19)

The limit distribution, when $m \to \infty$, is the following:

$$F_{C_n}(c) = 1 - \int_{R^n} e^{-K_n(c)} f(x_1, x_2, ..., x_n) dx_1 ... dx_n,$$
$$K_n(c) = \Pi^{n/2} c^n / \Gamma(n/2+1).$$

Ginter Trybuś (1941-2013), one of Hellwig's first disciples, thoroughly investigated the theoretical and practical problems related to the distance variable. He devoted a whole monograph tothe investigation of the explicit formulae of the distributions of distance variable calculated for sample droving from a number of populations.

4. Index of socio-economic development

Suppose there is given observation vector $x_i = (x_{i1}, x_{i2}, ..., x_{in})$ which contains the values of *n* features characterising the evaluated countries with respect to their level of socio-economic development. There is given the reference vector $x_0 = (x_{01}, x_{01}, ..., x_{0n})$ which has been called "the pattern of economic development", characterizing an ideal country. The level of development of each country is calculated according to the following formula:

$$d_i = 1 - \frac{c_i}{c_o}, \quad i = 1,2,\ldots, N,$$

where N is the number of countries evaluated with respect to their status of development, and the quantities c_i and c_o are defined as follows:

$$c_i = \left[\sum_{j=1}^{n} (x_{ij} - x_{oj})^2 \right]^{1/2}$$

$$c_o = \overline{c} + 2\left[\frac{1}{N} \sum_{i=1}^{N} (c_i - \overline{c})^2 \right]^{1/2}, \quad \text{with } \overline{c} = \frac{1}{N} \sum_{i=1}^{N} c_i.$$

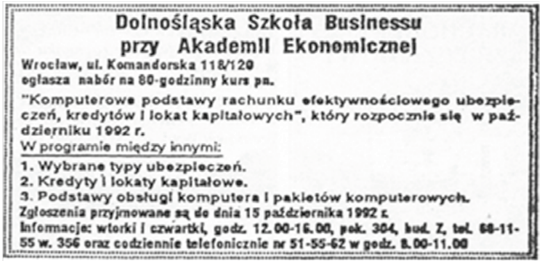
For illustration, here is an excerpt from Hellwig's work, A method for the selection of a "compact" set of varaiables published in Social indicators: problems of definition and of selection, Reports and papers in the social sciences, No. 30, UNESCO, 1974.

ŚLĄSKI
PRZEGLĄD
STATYSTYCZNY

Nr 13(19)

5. Visionary activities

Professor Hellwig had an unusual prophetic abilities. When only a few people in Poland were seriously thinking about the future of an electronic brain , Professor Hellwig organi-zed an educational and study centre for computer programming and data pro-cessing. Under his leadership there were published for the first time in Poland a series of textbooks on programming languages, scientific computations using a com-puter machine. When Poland was undergoing the change of political system, Z. Hellwig proposed to organize the Lower Silesian Business School for the study and teaching of financial mathematics and actuarial statistics. Remembering this initiative, there was organized in 2000,for the first time in Poland, Actuarial Conference commemora-ting Hellwig's 80th birthday. In spite of some stumbling blocks, practically all of the most prominent Polish statisticians and mathematicians took part in this conference.



Dolnośląska Szkoła Businessu
przy Akademii Ekonomicznej

Wrocław, ul. Komandorska 118/120
ogłasza nabór na 80-godzinny kurs pn.

"Komputerowe podstawy rachunku efektywnościowego ubezpieczeń, kredytów i lokat kapitałowych", który rozpocznie się w październiku 1992 r.

W programie między innymi:

1. Wybrane typy ubezpieczeń.
2. Kredyty i lokaty kapitałowe.
3. Podstawy obsługi komputera i pakietów komputerowych.

Zgłoszenia przyjmowane są do dnia 15 października 1992 r.
Informacje: wtorki i czwartki, godz. 12.00-16.00, pok. 304, bud. Z, tel. 68-11-55 w. 356 oraz codziennie telefonicznie nr 51-55-62 w godz. 8.00-11.00

advertisement of Lower Silesia Business School