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# The Econometricians' Statisticians 1895-1945

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# 1895 and 1945 ?

- 1895 London

Yule: On the Correlation of Total Pauperism with Proportion of Out-Relief

- 1945 Chicago

Koopmans: Measuring the Equation Systems of Dynamic Economics. (maximum likelihood applied to simultaneous equations model)

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# The statisticians

Karl Pearson (1857-1936)

R. A. Fisher (1890-1962)

Jerzy Neyman (1895-1973)

Abraham Wald (1902-1950)

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# The econometricians

H. L. Moore (1869-1958)

R. Frisch (1895-1973)

T. C. Koopmans (1910-1985)

T. Haavelmo (1911-1999)

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# The relations

- Karl Pearson: above us—Mark I
  - Ronald Fisher: above us—Mark II
  - Jerzy Neyman: one of us—Mark I
  - Abraham Wald : one of us—Mark II
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# What the econometricians took

- Correlation & regression from Pearson
  - $t$  tests and maximum likelihood from Fisher
  - The Neyman-Pearson theory of hypothesis testing from Neyman
  - Reassurance and rigour from Wald
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# Pearson: correlation & regression



Karl Pearson in 1896. Baby Egon is in pram

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# From biometry to economics / statistics

Karl Pearson Professor of Applied Mathematics at University College publishes

- 1896 Mathematical Contributions to the Theory of Evolution. III. Regression, Heredity and Panmixia
- One of a series in the physics/maths section of *Philosophical Transactions of the Royal Society*

Udny Yule, Pearson's assistant publishes

- 1895 On the Correlation of Total Pauperism with Proportion of Out-Relief
  - one of a series in the *Economic Journal* and *JRSS*
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# Beginning & end of British econometrics

- Yule (and friend Hooker) wrote on economic topics
  - British economists were not interested
  - Yule found other things to do
  - From now on the econometricians are American or Continental European
  - They connect with Pearson not with Yule
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Pearson could go to his public or it could come to him

- **1905.** Irving Fisher invites him to Yale to give some lectures, hinting at something more permanent.
  - Pearson declines.
  - **1909 and 1913.** H. L. Moore of Columbia goes to London to hear Pearson
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# Henry L Moore (1869-1958)



“one can say that Moore was as much a founder of this movement as any one man is likely to be a founder of a great movement toward which a science has been steadily moving”

George Stigler

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## Econometrician to statistician at a bad time

- But I candidly confess that I have long had a desire to know how you regard the use I have made of what you taught me.
  - If I have done good work, the knowledge that you regard the work as good will increase my strength and fortify my purpose.
  - If I have not been wise in devoting so much time to this particular phase of science, the sooner I realise my mistake the better.
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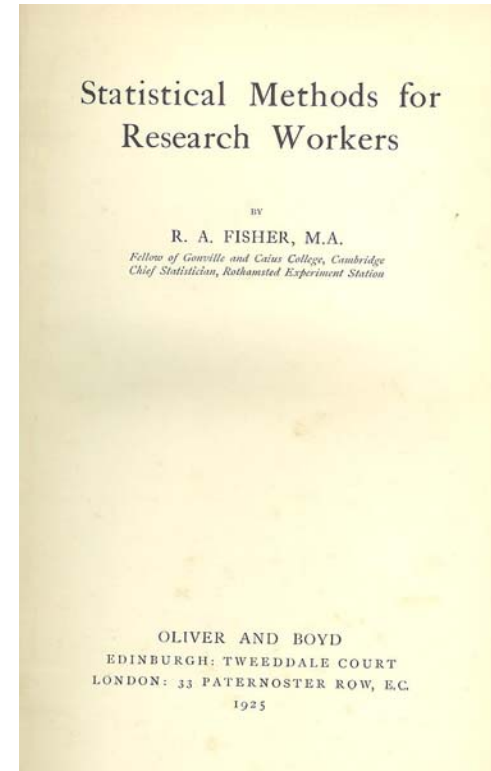
Meanwhile in British statistics/biometry ...

Pearson's work comprehensively  
challenged by Ronald Fisher

- New approach to estimation theory
  - Method of moments out—maximum likelihood in
  - Pearson's  $\chi^2$  reconstructed
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# Ronald Fisher in 1925 with calling card



“of revolutionary importance” Harold Hotelling

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# Fisher's public & what he offered

- Fisher's *research worker* was a biologist or agricultural scientist
  - the regression theory—including  $t$  tests—was easy for economists to lift
  - maximum likelihood not so easy: illustrated in the book with a genetic example; the original papers 1922, -25 were very difficult.
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# Economists should listen and learn

- Statistical methods are essential to social studies, and it is principally by the aid of such methods that these studies may be raised to the rank of sciences.
  - This particular dependence of social studies upon statistical methods has led to the **painful misapprehension** that statistics is to be regarded as a branch of economics,
  - whereas in truth economists have much to learn from their scientific contemporaries, not only in general scientific method, but in particular in statistical practice.
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# The economists ...

- Harold Hotelling stays with Fisher for 6 months 1929
  - Mordecai Ezekiel consults Fisher on *Methods of Correlation Analysis* 1930—first textbook to adopt Fisher's exact distributions)
  - Fisher visits US in 1931 and 36: sees Henry Schultz
  - Fisher does not visit the Continent but maximum likelihood is first applied there
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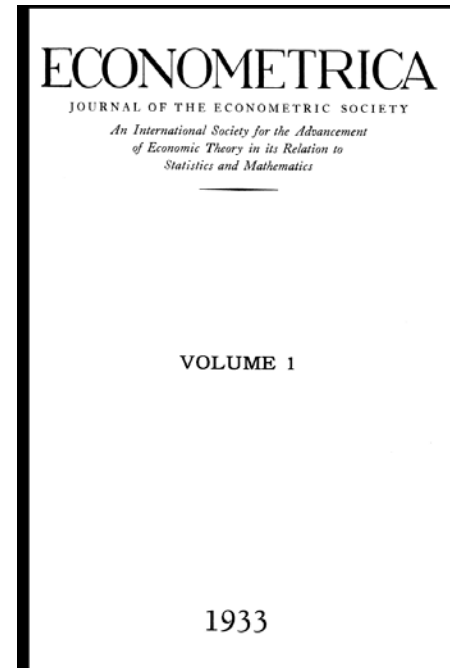
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# Institutional developments

Two new societies in the 1930s

- The Econometric Society—*Econometrica*
  - The Institute of Mathematical Statistics—the *Annals of Mathematical Statistics*
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# Ragnar Frisch (1895-1973) & *Econometrica*



“the advancement of economic theory in its relation to statistics and mathematics”

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# Frisch and statistics

- Frisch was an accomplished mathematical statistician—but not in the new Fisherian style
  - In the 20s and 30s he developed *confluence analysis*—theory and methods for economic variables measured with error and hold together by multiple relations—not in the new style
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# Statisticians & the Frisch network

- *Econometrica* publishes surveys of statistical theory—including one by Fisher
  - Frisch encourages statisticians to work on econometric problems
  - The outstanding problem is to combine his confluence analysis with “sampling theory”
  - Frisch creates a huge network—the list of his correspondents is 80 pages long
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One of the network :Tjalling Koopmans  
(1910-1985) visitor to Oslo 1935



- *Linear Regression Analysis of Economic Time Series*  
PhD thesis supervised by Tinbergen & Hans Kramers
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## Koopmans applies Fisher's maximum likelihood to Frisch's errors in variables model

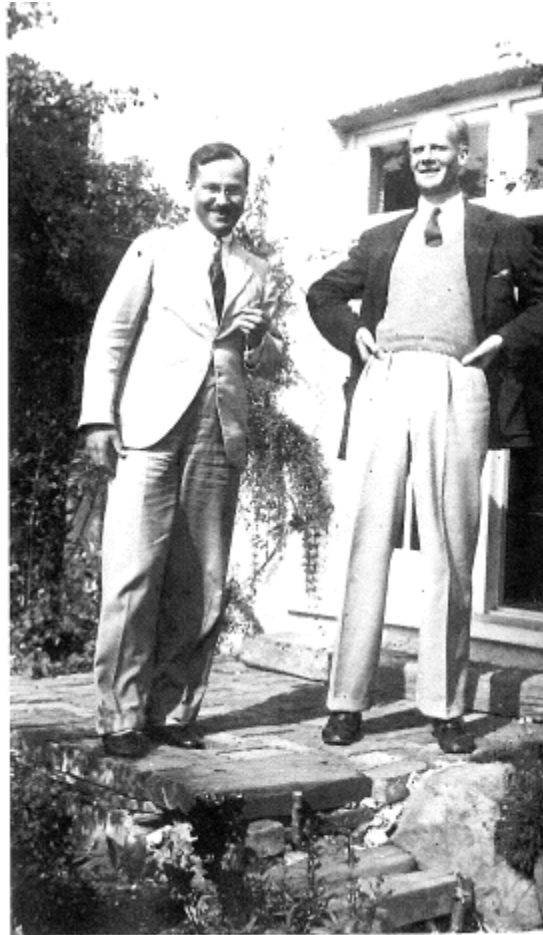
- “an application of the theoretical concepts of the English school of mathematical statistics to the special situation prevailing in economics.”
  - Fisher congratulated Koopmans  
“you have done a magnificent piece of work, which should be the basis of a large part of future applications of a theoretical statistics to economic problems.”
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# Haavelmo in the network

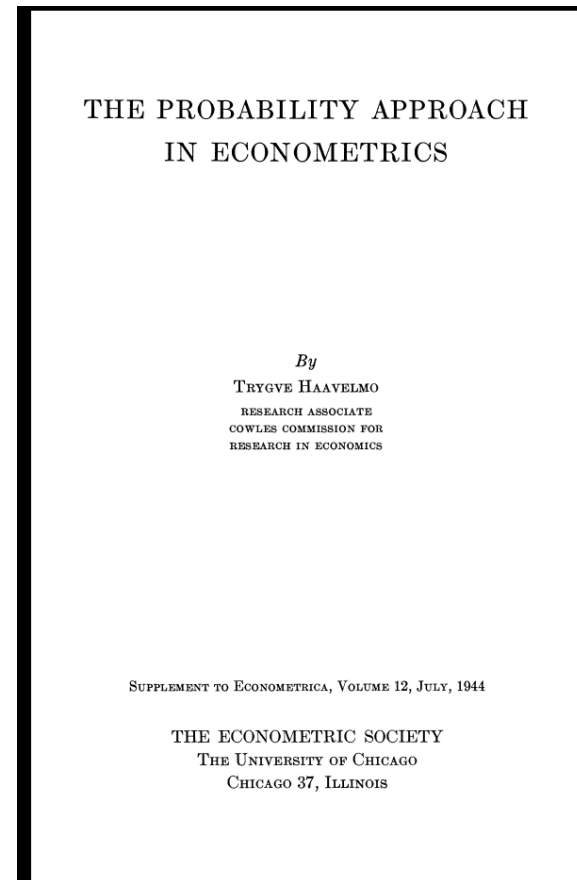
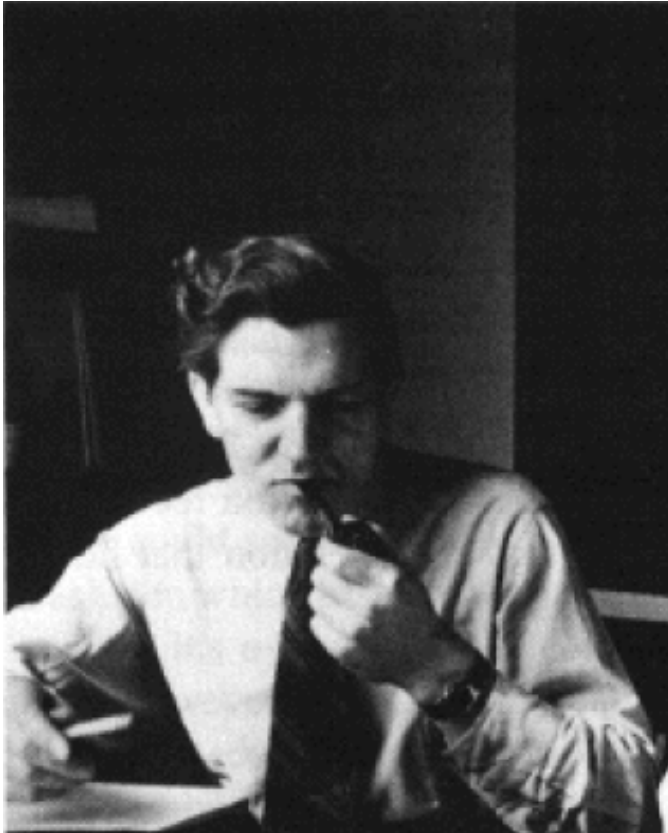
- Frisch encouraged visitors to Oslo
  - Frisch travelled himself
  - Frisch sent his assistant **Trygve Haavelmo (1911-1999)** to learn what was going on elsewhere
  - Haavelmo went to London to study the **Neyman-Pearson** test theory
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# Neyman-Pearson theory of testing 1933 +



- Haavelmo visited Neyman in 1936 for the latest word on testing and again 1940.

# Mission accomplished: *Probability Approach*



## ■ Chapter V The Theory of Testing

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BUT BUT BUT...

Neyman had views on econometrics

He

- rejected Frisch's confluence analysis as too empirical
  - advocated the "a priori" method based on economic models
  - looked for a big advance in stochastic processes
  - expected his approach to statistical inference to be followed
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# Neyman's role in the development of econometrics a mystery

- Neyman tried to influence the econometricians in the late 30s and 40s
  - But to no *apparent* effect (he is not referred to in the literature of the time)
  - Yet the new econometrics of the 40s incorporated his principles
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# In his 1989 Nobel speech Haavelmo recalled meetings with Neyman

- Instead of entering into a discussion with me, he gave me two or three numerical exercises for me to work out. He said he would talk to me when I had done these exercises.
  - When I met him for that second talk, I had lost most of my illusions regarding the understanding of how to do econometrics.
  - But professor Neyman also gave me hopes that there might be other more fruitful ways to approach the problem of econometric methods than those which had so far caused difficulties and disappointments.
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What was the significance of these meetings?

- Mary Morgan
  - Olav Bjerkholt (recent papers in *ET*)
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# No mystery about Wald....

“Upon his unique knowledge of modern statistical theory and mathematics in general I have drawn very heavily.”

Haavelmo “Probability Approach”

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# Abraham Wald (1902-50)

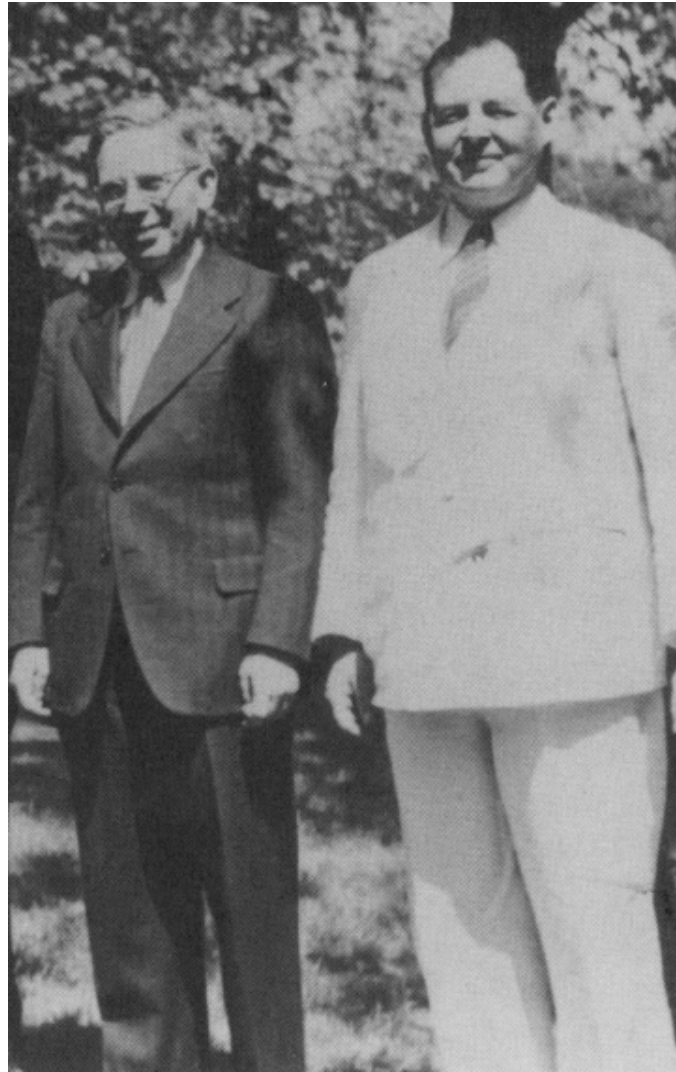
Wald was unique in being

- a statistical inference authority –maximum likelihood and decision theory
- a working econometric theorist

Wald's mentor in statistical theory was Hotelling

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# Wald and Hotelling in the late 40s



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# Wald as symbol of the Frisch network

- Wald left Europe before being inducted into the Frisch network
  - Many members of the network were in the USA during the Second World War
  - Wald was a major contributor to the *Annals of Mathematical Statistics*
  - He also contributed to *Econometrica*
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# The Frisch network triumphant

- In 1939 Sam Wilks became editor of the *Annals*
  - Large overlap in contributors to the *Annals* and to *Econometrica*
  - Once upon a time Pearson founded *Biometrika* for the "statistical study of biological problems" and Fisher warned against the economists
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# 1945 Koopmans & Rubin Measuring the Equation Systems of Dynamic Economics

- The simultaneous equations model from Haavelmo (ultimately back to Frisch & confluence analysis)
  - Maximum likelihood from Fisher & Koopmans
  - Asymptotic theory for dynamics from Wald
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## Maturity : Koopmans & Reiersøl 1950

- **Fisher 1922**: the specification of the mathematical form of the population from which the data are regarded as a sample.
- **Now**: a reformulation of the specification problem, appropriate to many applications of statistical methods

the emergence of a new group of problems, to be called **identification problems**.

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# Modern parallels ....

- Bayesian econometrics ?



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some of the people...

