

## Oskar Morgenstern and the Game Theory



Oskar Morgenstern (1902-1977)

On January 24, 1902, German-American economist and mathematician **Carl Friedrich Alfred Oskar Morgenstern** was born. Morgenstern popularized “game theory” which mathematically analyzes behaviour of man or animals in terms of strategies to maximize gains and minimize losses. He coauthored *Theory of Games and Economic Behavior* (1944), with John von Neumann, which extended Neumann’s 1928 theory of games of strategy to competitive business situations.[\[4\]](#)

*“As far as the use of mathematics in economics is concerned, there is an abundance of formulas where such are not needed. They are frequently introduced, one fears, in order to show off. The more difficult the mathematical theorem, the more esoteric the name of the mathematician quoted, the better.”*

— Oskar Morgenstern, from *Limits of the Use of Mathematics in Economics*

## Oskar Morgenstern – Early Years

Oskar Morgenstern was born in Görlitz, Silesia, Germany, the son of the merchant Wilhelm Morgenstern and Margarete Teichler. His mother was said to be an illegitimate daughter of Emperor Frederick III of Germany. In 1914, Morgenstern’s parents moved to Vienna, Austria, where he received the Austrian citizenship in 1925. The same year he graduated from the University of Vienna, where he was a student of the economist Ludwig von Mises and received his PhD in political science. From 1925 until 1928 he went on a three year fellowship financed by the Rockefeller Foundation, at the end of which he published *Economic Forecasting* (1928). After his return in 1928 he became a professor in economics at his alma mater the University of Vienna until his visit to Princeton University in 1938. At Vienna, he published his *Frontiers of Economic Policy* in 1934. He succeeded Friedrich August von Hayek as Director of the Austrian Institute for Business Cycle Research and was Professor in Vienna from 1935 to 1938.

## Economic Equilibrium and Game Theory

In 1935 Oskar Morgenstern published the article *Perfect Foresight and Economic Equilibrium*, after which his colleague, Eduard Čech, pointed him to an article of John von Neumann, *Zur Theorie der Gesellschaftsspiele* (1928). During Morgenstern’s visit to Princeton University in 1938, Austria was incorporated into Nazi Germany and Morgenstern decided to remain in the United States. He would even remain in the country for the rest of his life, becoming a naturalized citizen in 1944. Morgenstern soon received a promotion to full professor at Princeton but gravitated toward the Institute for Advanced Study. There, he met the John von Neumann again and they collaborated to write their famous *Theory of Games and Economic Behavior*, published in 1944, which is recognized as the first book on game theory.<sup>[4]</sup> Game Theory is a mathematical framework for the study of strategic structures which govern rational decision-making in certain economic, political and military situations. This book applied John von Neumann’s theory of games of strategy to competitive business situations. It is controversial what part von Neumann actually played in the work. It is now assumed that John von Neumann is responsible for most of the scientific representation.

## The Theory of Games and Economic Behaviour

*“All economic decisions, whether private or business, as well as those involving economic policy, have the characteristic that quantitative and non-quantitative information must be combined into one act of decision. It would be desirable to understand how these two classes of information can best be combined.”*

— attributed to Oscar Morgenstern in [14]

Von Neumann and Morgenstern used objective probabilities, supposing that all the agents had the same probability distribution, as a convenience. However, Neumann and Morgenstern mentioned that a theory of subjective probability could be provided, and this task was completed by Jimmie Savage in 1954 and Johann Pfanzagl in 1967. Savage extended von

Neumann and Morgenstern's axioms of rational preferences to endogenize probability and make it subjective. He then used Bayes' theorem to update these subject probabilities in light of new information, thus linking rational choice and inference.

## **Later Years**

The collaboration between economist Morgenstern and mathematician von Neumann led to the birth of entirely new areas investigation in both mathematics and economics. These have attracted widespread academic and practical interest since that time. Morgenstern wrote many other articles and books, including *On the Accuracy of Economic Observations* (1950), and *Predictability of Stock Market Prices* (1970) with subsequent Nobel laureate Clive Granger. In 1963 Morgenstern, together with Paul F. Lazarsfeld, founded the Institute for Advanced Studies (IHS) in Vienna, which he headed for a year starting in September 1965. Later he returned to the USA. In 1976 he was accepted into the American Academy of Arts and Sciences. After retiring from Princeton in 1970, Morgenstern accepted a professorship in economics at New York University, where he would remain until his death in 1977.

### **Publications of Oskar Morgenstern:**

- 1928 Wirtschaftsprognose: Eine Untersuchung ihrer Voraussetzungen und Möglichkeiten
- 1934 Die Grenzen der Wirtschaftspolitik (1937 [The Limits of Economics](#))
- 1935 The Time Moment in Value Theory
- 1935 Perfect Foresight and Economic Equilibrium
- 1936 Logistics and the Social Science
- 1944 Theory of Games and Economic Behavior, mit John von Neumann
- 1948 Demand Theory Reconsidered
- 1949 Economics and the Theory of Games (Kyklos)
- 1950 [On the Accuracy of Economic Observations](#)
- 1951 [Prolegomena to a Theory of Organization](#)
- 1954 Experiment and Large-Scale Computation in Economics, Economic Activity Analysis
- 1956 Generalization of the von Neumann Model of an Expanding Economy, mit J.G. Kemeny und G.L. Thompson, (Econometrica)
- 1959 The Question of National Defense
- 1970 Predictability of Stock Market Prices, with C.W.J. Granger
- 1972 Thirteen Critical Points in Contemporary Economic Theory
- 1972 Descriptive, Predictive and Normative Theory (Kyklos)
- 1976 Collaborating with von Neumann
- 1976 Mathematical Theories of Expanding and Contracting Economies, with G.L. Thompson
- 1979 Some Reflections on Utility. In: The Expected Utility Hypothesis and the Allais Paradox, (Hrsg. M. Allais e O. Hagen), D. Reidel, Dordrecht.