SKILL DEVELOPMENT IN MATH, A SOURCE OF ECONOMIC DEVELOPMENT

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Abstract :What is Economics?

Economics is the study of how people choose to use resources.

Resources include the time and talent people have available, the land, buildings, equipment, and other tools on hand, and the knowledge of how to combine them to create useful products and services.

Keywords: Skill Development , economic development , buildings, equipment.

INTRODUCTION

Important choices involve how much time to devote to work, to school, and to leisure, how many dollars to spend and how many to save, how to combine resources to produce goods and services, and how to vote and shape the level of taxes and the role of government.

https://www.aeaweb.org/students/WhatIsEconomics.php

Some important definitions of economics:
"Economics is the study of people in the ordinary business of life."
-- Alfred Marshall, Principles of economics; an introductory volume (London: Macmillan, 1890)
Economics is the "study of how societies use scarce resources to produce valuable commodities and distribute them among different people."
-- Paul A. Samuelson, Economics (New York: McGraw-Hill, 1948)

Mathematical economics

Mathematical economics is the application of mathematical methods to represent theories and analyze problems in economics. By convention, the applied methods refer to those beyond simple geometry, such as differential and integral calculus, difference and differential equations, matrix algebra, mathematical programming, and othercomputational methods.[1][2] An advantage claimed for the approach is its allowing formulation of theoretical relationships with rigor, generality, and simplicity.[3] The language of mathematics allows economists to make specific, positive claims about controversial or contentious subjects that would be impossible without mathematics.[4] Much of economic theory is currently presented in terms of mathematical economic models, a set of stylized and simplified mathematical relationships asserted to clarify assumptions and implications.[5]

Economics became more mathematical as a discipline throughout the first half of the 20th century, but introduction of new and generalized techniques in the period around the Second World War, as in game theory, would greatly broaden the use of mathematical formulations in economics.[6][7]

One needs mathematics to do economics; parts of calculus and parts of linear algebra are our workhorses.

Mathematical applications in economics:

Differential calculus

Vilfredo Pareto analyzed microeconomics by treating decisions by economic actors as attempts to change a given allotment of goods to another, more preferred allotment. Sets of allocations could then be treated as Pareto efficient (Pareto optimal is an equivalent term) when no exchanges could occur between actors that could make at least one individual better off without making any other individual worse off.[8] Pareto's proof is commonly conflated with Walrassian equilibrium or informally ascribed to Adam Smith's Invisible hand hypothesis.[9] Rather, Pareto's statement was the first formal assertion of what would be known as the first fundamental theorem of welfare economics.[10] These models lacked the inequalities of the next generation of mathematical economics.

Linear models

Linear Economic Modeling is a mathematical tool used to analyze economic behavior in either a closed or open system. Closed model is a very simple use of linear algebra where the system is simplistic with the least amount of variables. On the other hand the open model in linear economic theory can analyze multiple variables and the relationships between the inputs and outputs.

Input-output economics

Input-output analysis is an economics term that refers to the study of the effects that different sectors have on the economy as a whole, for a particular nation or region. This type of economic analysis was originally developed by Wassily Leontief (1905 – 1999), who later won the Nobel Memorial Prize in Economic Sciences for his work on this model. Input-output analysis allows the various relationships within an economic system to be analyzed as a whole, rather than individual components.

Mathematical optimization

In mathematics, mathematical optimization (or optimization or mathematical programming) refers to the selection of a best element from some set of available alternatives.[11] The solution process includes satisfying general necessary and sufficient conditions for optimality. For optimization problems, specialized notation may be used as to the function and its input(s). More generally, optimization includes finding the best available element of some function given a defined domain and may use a variety of different computational optimization techniques.[12]

Economics is closely enough linked to optimization by agents in an economy that an influential definition relatedly describes economics qua science as the "study of human behavior as a relationship between ends and scarce means" with alternative uses.[13] In microeconomics, the utility maximization problem and its dual problem, the expenditure minimization problem for a given level of utility, are economic optimization problems.[14] Theory posits that consumersmaximize their utility, subject to their budget constraints and that firms maximize their profits, subject to their production functions, input costs, and marketdemand.[15]

Economic equilibrium is studied in optimization theory as a key ingredient of economic theorems that in principle could be tested against empirical data.[[16] Newer developments have occurred in dynamic programming and modeling optimization with risk and uncertainty, including applications to portfolio theory, the economics of information, and search theory.[15]

Optimality properties for an entire market system may be stated in mathematical terms, as in formulation of the two fundamental theorems of welfare economics[17]and in the Arrow–Debreu model of general equilibrium (also discussed below).[18] More concretely, many problems are amenable to analytical (formulaic) solution. Many others may be sufficiently complex to require numerical methods of solution, aided by software.[12]

Differential decline and rise

John von Neumann’s work on working examination and configuration in smashed spic-and-span terrain in arithmetics and financial hypothesis. Neumann, John von, and Oskar Morgenstern (1944) Theory of Games and Economic Behavior, Princeton. It as well left developed arithmetical economic science with less applications of differential arithmetic. In specific, common balance theoreticians applied common configuration, convex pure mathematics, and arithmetical optimization, optimization hypothesis further compared to differential arithmetic, since the tactic of differential arithmetic had disappointed to demonstrate the being of an balance.

Agent-based computational economics

The computational study of economic processes modeled asdynamic systems of interacting agents. Here agent refers broadly to a bundle of data and behavioral methods representing an entity constituting part of a computationally constructed world.

Examples of possible agents include individuals (e.g. consumers, producers), social groupings (e.g. families, firms, communities, government agencies), institutions (e.g. markets, regulatory systems), biological entities (e.g. crops, livestock, forests), and physical entities (e.g. infrastructure, weather, and geographical regions). Thus, agents can range from active data-gathering decision makers with sophisticated embodied cognitive capabilities to passive world features with no cognitive function.

Game theory

What economists call game theory psychologists call the theory of social situations, which is an accurate description of what game theory is about. Although game theory is relevant to parlor games such as poker or bridge, most research in game theory focuses on how groups of people interact. There are two main branches of game theory: cooperative and no cooperative game theory. No cooperative game theory deals largely with how intelligent individuals interact with one another in an effort to achieve their own goals.

In addition to game theory, economic theory has three other main branches: decision theory, general equilibrium theory and mechanism design theory.

Mathematicization of economics

Over the course of the 20th century, articles in "core journals"[19] in economics have been almost exclusively written by economists in academia. As a result, much of the material transmitted in those journals relates to economic theory, and "economic theory itself has been continuously more abstract and mathematical."[20] A subjective assessment of mathematical techniques[21] employed in these core journals showed a decrease in articles that use neither geometric representations nor mathematical notation from 95% in 1892 to 5.3% in 1990.[22] A 2007 survey of ten of the top economic journals finds that only 5.8% of the articles published in 2003 and 2004 both lacked statistical analysis of data and lacked displayed mathematical expressions that were indexed with numbers at the margin of the page.[23]

Econometrics

The term “econometrics” is believed to have been crafted by Ragnar Frisch (1895-1973) of Norway, one of the three principal founders of the Econometric Society, first editor of the journal Econometrica, and co-winner of the first Nobel Memorial Prize in Economic Sciences in 1969. It is therefore fitting that we turn to Frisch’s own words in the introduction to the first issue of Econometrica to describe the discipline.

“The Econometric Society is an international society for the advancement of economic theory in its relation to statistics and mathematics.... Its main object shall be to promote studies that aim at a unification of the theoretical quantitative and the empirical-quantitative approach to economic problems....”

Dependence of economics on Mathematics and statitistics.

Economics has become increasingly dependent upon mathematical methods and the mathematical tools it employs have become more sophisticated. As a result, mathematics has become considerably more important to professionals in economics and finance. Graduate programs in both economics and finance require strong undergraduate preparation in mathematics for admission and, for this reason, attract an increasingly high number of mathematicians. Applied mathematicians apply mathematical principles to practical problems, such as economic analysis and other economics-related issues, and many economic problems are often defined as integrated into the scope of applied mathematics.

In economics, the language of mathematics is sometimes necessary for representing substantive problems. Moreover, mathematical economics has led to conceptual advances in economics.[24]In particular, Samuelson gave the example of microeconomics, writing that "few people are ingenious enough to grasp [its] more complex parts... without resorting to the language of mathematics, while most ordinary individuals can do so fairly easily with the aid of mathematics."[25]

Some economists state that mathematical economics deserves support just like other forms of mathematics, particularly its neighbors in optimization and mathematical statistics and increasingly in theoretical computer science.

Notes:

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