

5. Uses of Derivatives in Economics

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Introduction. To the question "What is a derivative?" economist answers: "Marginalism.". Limit values in the economy are marginal revenue, marginal cost, marginal utility, marginal productivity of labor. They do not characterize the state, but a process - changing economic object. Therefore, the derivative shows the rate of change of some of the entity or process over time or in relation to other factors studied.

Materials and Methods. Differential calculus - widely used for economic analysis of the mathematical apparatus. The basic task of economic analysis is the study of the relationships of economic variables recorded as function. For such tasks should be constructed communication function variables occurring in them, which are then studied by the methods of differential calculus.

Results. Economic theory is based on the idea that people do the best that they can given the opportunities that they face. Accordingly, mathematical optimization models lend themselves well to economic theory. For example, we model a firm by supposing that its object is to produce the quantity of output q^* that maximized its profit. If the firm's total revenue from sales as a function of the quantity it produces q is $TR(q)$ and its total cost of producing a given quantity q is $TC(q)$, then the firm's profit equals $TR(q)-TC(q)$. The necessary first order condition for maximizing profit, then is that $TR'(q^*)=TC'(q^*)$. That is,

at the quantity of output that maximizes profit, the firm's marginal revenue equals its marginal cost.

Partial derivatives arise when the value of the dependent variable is a function of more than one independent variables. For example, if a consumer's utility is function of the quantities of good x and good y that he purchases, then we might $U=U(x,y)$. The partial derivative of this function with respect to x is found by differentiating the function with respect to x while treating the variable y as a constant. For example, if $U=xy$, then the partial derivative of with respect to x is $U'_x=y$.

Conclusions. In my opinion, a derivative is an essential tool for economic analysis that allows to deepen the mathematical sense of economic concepts and express economic laws with mathematical formulas. Economic meaning of the derivative is that it acts as a rate of change of the economic process over time or in relation to other factors studied. Many of the laws of the theory of production and consumption, supply and demand is a direct consequence of mathematical theorems.

References.

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