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# APPLY THE RESULT TO ECONOMIC PROCESSES.

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**Abstract:**This article discusses the importance of the concept of derivative in economic processes, its role in optimization and marginal analysis. It explains how the concepts of marginal revenue, profit and cost are determined through derivatives, as well as methods for calculating price elasticity. The practical application of the derivative in economic processes is examined through examples, and the importance of the derivative in the strategies for maximizing the profit of companies is emphasized.
**Keywords:** Derivative, economic processes, optimization, limit analysis, elasticity.

**Аннотация:** В данной статье рассматривается значение понятия производной в экономических процессах, её роль в оптимизации и предельном анализе. Объясняется, как с помощью производных определяются предельный доход, прибыль и издержки, а также методы расчёта ценовой эластичности. Практическое применение производной в экономике проиллюстрировано на примерах, подчёркивается важность производной в стратегиях максимизации прибыли компаний.
**Ключевые слова:** производная, экономические процессы, оптимизация, предельный анализ, эластичность.

## Introduction

Mathematics and economics are closely related, and one of the main tools of mathematical analysis - the concept of the derivative - is widely used in modeling and analyzing economic processes. The use of the derivative is of great importance in improving the efficiency of economic processes, making optimal decisions, and forecasting processes. The derivative is used to determine the speed and direction of economic changes and plays an important role in business and macroeconomic policy.

Concepts developed on the basis of the derivative in economic models and theories, such as marginal revenue, marginal cost, and marginal profit, are key indicators in making business decisions. Marginal analysis is widely used by enterprises to optimize production volumes, effectively use resources, and set prices. In addition, the derivative is also used to define the concept of elasticity, which allows us to determine the sensitivity of consumers to demand.

Therefore, this article examines the role of derivatives in economics, their practical applications, and methods of analysis. Based on scientific sources, theoretical concepts, and practical examples, it examines how derivatives help in understanding and managing economic processes. The results of the study provide a deeper understanding of the effectiveness of derivatives in economic modeling and strategic decision-making.

## Methodology

The article presents theoretical and practical analyses of the application of derivatives in economic processes based on mathematical analysis and economic modeling methods. The

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research shows how basic economic concepts such as marginal analysis, optimization, and elasticity can be expressed using derivatives through examples.

The theoretical foundations of economic modeling were developed using the principles of economic analysis put forward by Samuelson and Nordhaus (2009). Also, the mathematical expressions of the concepts of marginal profit and cost were studied based on the methods of microeconomic analysis proposed by Varian (1992). At the first stage, the use of derivatives in economic models was analyzed. How indicators such as marginal revenue and marginal cost are calculated based on derivatives and their role in the development of economic strategies was studied based on examples. For example, a company can optimize profits by increasing or decreasing the volume of product production.

In the second stage, elasticity analysis was conducted using the derivative. Demand elasticity is used to determine the relationship between the price of a product and the volume of consumer demand. In this stage, demand elasticity was calculated using the derivative at different price levels and how consumers responded to price changes was studied. Silberberg and Suen (2001) emphasized the use of the derivative in economic elasticity analysis and emphasized its importance in strategic decision-making. In the third stage, optimization problems were solved. In the process of economic modeling, optimal points were identified using the second-order derivative analysis. In particular, methods for maximizing profit and minimizing costs were studied. Differential equations and boundary conditions were used in these processes. Production and pricing problems were analyzed based on research by Chiang (1984) on the importance of the derivative in economic modeling.

The results were compared with economic models and real-life data, and the role of the derivative in optimizing economic processes was determined. The research methods used were mathematical differentiation, limit analysis, and statistical analysis based on empirical observations.

**Results**

The results of this study clearly confirm the role and importance of the derivative in the application of mathematical analysis to economic processes. Based on the formulas of marginal profit, marginal revenue and marginal cost studied during the study, the possibilities of companies to maximize their profits were identified. Static and experimental analyses have shown that the determination of the growth rate of economic variables through the derivative and the determination of the point of infinity in the optimization process are important. At the same time, the application of the concept of the derivative in economic models and theories serves to achieve reliable results in the calculation of marginal analysis and price elasticity.

The application of the MR = MC condition based on boundary analysis helped companies determine the optimal production volume. This approach made it possible to reduce production costs, increase profit levels, and use resources efficiently. Using the product of price elasticity, consumer demand sensitivity was determined and strategies were developed to increase market competitiveness.

The results of the study were noteworthy, as scientists Abdurakhmonov (2010), Shermatov (2012), and Millatov (2015). As they noted, the use of mathematical analysis tools accurately reflects the complexity of economic processes and allows for high efficiency in making business decisions. The integration of Yunusov's (2020) approaches and traditional theories opened up new horizons in the formation of economic strategies.

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In addition, the study found that the use of derivatives is important in the formation of not only theoretical foundations, but also practical strategies in the process of making economic decisions. In this regard, it was observed that the ideas put forward by economists, in particular, the views of Karimov (2018) and Yunusov (2020), are consistent with practical results. As they noted, using the derivative methodology, it is possible to increase production efficiency, quickly respond to market changes, and optimally allocate resources. In addition, this approach has its place in ensuring the stability of the economic system. This approach helps not only to strengthen theoretical foundations, but also to optimize the process of making practical decisions. All this serves to significantly accelerate economic development.

The use of derivatives in economic processes helps to solve important problems such as maximizing or minimizing profit. The following is a discussion of the issue of maximizing and minimizing profit to illustrate how derivatives are used in real economic situations.

*Problem:*

The total profit of a company is represented by the following function:

$P(x)=-2x^2+40x-100$

where x is the number of units produced (thousands of units). We use derivative analysis to determine the optimal points for the company to maximize or minimize its profit.

*Solution:*

1. Find the derivative to maximize and minimize the profit.

To determine the maximum and minimum points, the first derivative of the function is taken:

$P'(x)=\frac{d}{dx}(-2x^2+40x-100)=-4x+40$

To determine the extremum points, the derivative is set to zero:

$-4x+40=0$

$x=10$

This value can be the point at which the company's profit is maximized or minimized.

2. Determining the type of extremum using the second derivative

The second derivative of a function is:

$P''(x)=\frac{d}{dx}(-4x+40)=-4$

Since the second derivative is negative:

$P''(10)=-4<0$

This result shows that the function reaches a maximum at x=10.

Result:

• The company achieves maximum profit by producing 10,000 units of the product.

• Minimum profit is achieved by increasing or decreasing production indefinitely.

• Derivative analysis helps companies determine the optimal production volume and develop economic strategies.

**Conclusion:**

The study proved that the derivative is of great importance in the analysis and optimization of economic processes. Marginal profit, income and cost indicators, as well as price elasticity are important elements in the economic model. These approaches have been widely used in the formulation of business decisions, improving production efficiency, and determining the sensitivity of consumer demand. The results create a solid foundation for further comprehensive research and the development of economic theories. According to scientists, this methodological

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approach plays an important role in solving modern problems of the economy and making strategic decisions, as well as in achieving practical results.

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