

Applied study of mathematical economic modeling in economy and trade

Li Jun

Shizhen College of Guizhou University of Traditional Chinese Medicine, GuizhouGuiyang 550025

Abstract: With the development of economic globalization, a large number of economic information has been produced in the society. How to deal with these information scientifically is a problem that relevant scholars should consider. In the development of international market competition, China's foreign trade is becoming more and more frequent, and the economic information involved in enterprises is also gradually increasing. To process this information effectively, an economic mathematical model should be established. This paper analyzes the characteristics and classification of the economic mathematical model, and discusses the steps of the model establishment and the practical application of the model, in order to provide reference for related research.

Key words: economy and trade; mathematical economic model; application example

1 Introduction

The economic mathematical model can effectively deal with the complex economic information, which is conducive to the relevant workers to fully grasp the economic and trade situation, conduct scientific evaluation of trade, and provide effective reference for enterprises to make decisions. According to the perspective of application, the construction of economic mathematical model is mainly based on the economic development goal, and the application of mathematical formulas and ideas in the research and summary, so as to play the role of mathematical concepts and formulas in solving economic problems.

2 Concept, characteristics and classification of economic mathematical models

Mathematical model is mainly to abstract expression of concrete problems, and carry out abstract description with the help of mathematical theory and methods. For specific objects, the necessary assumptions can be carried out in combination with the preset goal and the actual development scale, and the mathematical structure of analysis can be constructed through data tools in combination with the hypothesis conjecture. Under the influence of the mathematical model, the abstract problems in daily life can be explained, so as to effectively deal with the practical problems. With the help of economic mathematical models, economic laws and economic and trade exchanges can be analyzed, and the relations between relevant factors after economic phenomena can be summarized and transformed into quantitative relations, based on which mathematical formulas and algorithms can be constructed, and then the laws of economic development can be analyzed. With the help of economic mathematical model is mainly the study of objective economic phenomena, which is the key bridge between theory and reality. Based on the application of this model, it can lay a foundation for relevant workers to deal with specific economic problems with the help of economic research theory.

The economic mathematical model has the following characteristics. First, the characteristics of authenticity. Building

a mathematical model can fully reflect the relationship between the research object and mathematics. Second, the characteristics of the application. For mathematical models, it is mainly to carry out the general situation of abstract mathematical relations. On the basis of clear parameters, the conventional economic law is summarized by adjusting the parameter variables scientifically. Third, the characteristics of simplicity. The establishment of mathematical model can present relevant content more simply and vividly, and redundant factors can be discarded in computational analysis. Fourth, the characteristics of accuracy. The construction of mathematical model has certain requirements for accuracy, and scientific adjustment can be carried out according to specific needs, so as to find accurate calculation results. Fifth, the characteristics of the effectiveness. On the basis of scientific modeling, the internal parameters of the model can analyze the original problems, which plays a key role in solving the practical problems better.

The classification of the economic mathematical models is given as follows. Combined with the differences in mathematical forms, economic mathematical models can be divided into two types, one is linear mathematical model, the other is nonlinear mathematical model. From the perspective of economic research, linear and nonlinear models often behave as primary equations and above quadratic equations. Combined with the differences in research time, there are two types of mathematical models. One is static mathematical model, the other is dynamic mathematical model. And the former can effectively reflect the economic quantitative relationship at a certain time point in the process of application. Or it can reflect a certain stage of economic development process. Combined with the application purpose of the model, there are mainly two models, one is the theoretical model, the other is the application model. Combined with the use of the model, the division includes four models, namely, structure, prediction, policy and calculation model.

3 Steps to building economic mathematical models

The construction of mathematical model can be completed in three stages. First, in the abstract development stage, abstract

mathematical problems can be extracted through a series of economic and trade problems, and the analysis of the relationship between dependent variables and independent variables can establish a model in line with actual needs and help solve practical problems. Secondly, it is the logical development stage. With the help of model logical processing, variables can be effectively treated, and a causal relationship model can be constructed by integrating key variables. Finally, for the development stage of concrete development, it is mainly to apply the constructed model to the specific environment, and carry out scientific analysis, and apply effective improvement measures combined with the analysis results. Specifically, the construction of the economic mathematical model can be completed through the following steps.

One is the preparation stage. This link mainly analyzes the problems related to the model construction, uses the understanding of the basic situation of the model to analyze the relevant problems, discusses the solutions of the problems, and puts forward scientific solutions. Second, the assumptions of the model. Combined with the information obtained from the preparation work, the factors affecting the model construction are analyzed, the research objects are abstracted into actual mathematical symbols, and the model is analyzed with the help of special tools to clarify the relationship between the existence of relevant variables, conduct a comprehensive analysis of the high variable model information, and conduct the description with the help of professional language. Third, the establishment of the model. The main variables are obtained combined with conditional assumptions, and mathematical relations are established with the help of scientific mathematical analysis tools^[1]. To accurately determine the data relationships, the workers concerned should use professional language when building the models. Fourth, the solution of the model. When constructing the model, differential equations and linear algebra are used, and the model is constructed with the help of graphical analysis and logical derivation. Fifth, the analysis of the model. Corresponding the results to the specific problems, analyze how to use the established model to deal with the economic problems, and effectively play the role of the mathematical model. Six is the test of the model. Test of the model. The data information and the specific value are analyzed. If there is some difference in the value, it means that the model establishment has problems; if the difference in the model data is within the standard range, it means that the model establishment meets the actual needs.

4 Study on the application and effect of economic mathematical models

4.1 Application in economy and trade

(1) The application of the limit theory

From the perspective of the mathematical economic model, it is often used in the operation cost calculation. In the actual operation and management of enterprises, the transaction cost analysis is generally carried out through the mathematical economic model. Limit analysis and function theory are widely used in the calculation of production quantity and purchase quantity. For example, in the manufacturing industry, the basic mathematical theory is often used to calculate the amount of production hoarding, in which the amount of hoarding should be consistent with the supply of enterprises, so as to avoid the problem of supply shortage caused by the small amount of hoarding, or the price decline and

product backlog caused by the large amount of hoarding. With the help of mathematical theory, enterprises can combine their own production conditions and scientifically deal with product supply problems. In product order management, through the mathematical function relationship can scientifically determine the quantity, the enterprise development cost to carry out the scientific control, based on the effective analysis of related factors at the same time, find the quantity, scientific processing enterprise goods backlog, control the enterprise cost, promote the further development of enterprises, to maximize the economic benefit.

(2) The use of mathematical tables

It is an important way to deal with the results of economic and trade as an important way to deal with problems. Using mathematical table can accurately find the economic foothold of order, which can know what the order quantity is, and the enterprise benefit can be maximized. In the process of calculation and analysis, enterprises should first determine the order method, on this basis, clear the cost formed in the application of various methods, through comprehensive comparison, choose reasonable economic methods, so as to realize the needs of enterprise development.

(3) The use of calculus

In the process of economic and trade, calculus plays a key role, the actual analysis, take an enterprise, for example, assuming the annual demand for A, in the process of goods procurement, done, with B and C, respectively, and the actual procurement management, should ensure the actual inventory to half of the batch, if meet the requirement, the inventory cost is D yuan, related cost formula for $E=AD / 2B + BC$, combined with the formula to find the minimum cost value, is conducive to the relationship between inventory and define cost^[2].

4.2 Model application examples

(1) Monte Carlo simulation

The simulation method is generally on the understanding of the geometric characteristics and quantitative relations of things, with the help of mathematical simulation, based on the simulation experiment. According to the development of the field of economics, if you want to require the probability of a certain situation and reach the mathematical expectation of a certain variable, this analysis method can be used to find the probability of random events. Based on Monte Carlo mathematical analysis, usually based on a mathematical probability model, the simulation analysis and calculation method to find the approximvalue of the problem. The construction process of the model is as follows: First, describe the problem and build the model. With the help of Monte Carlo model, the experimental development process is accurately described, the odds of different events are found, and the complex problems are presented in an abstract way. The establishment of the model is able to turn the problem into random events in the mathematical probability. Second, to carry out the sampling management of the determined probability information. Scientific estimation and prediction based on the action of numerous data. Third, to construct the different estimators. All kinds of parameters are applied to the specific conditions to carry out verification analysis, and to verify the accuracy of the model establishment and whether the relevant data and information can meet the specified requirements.

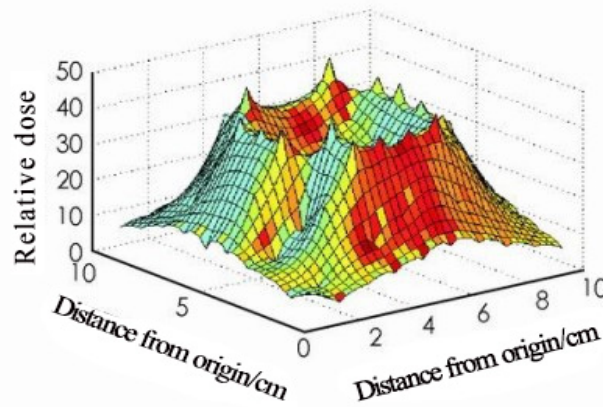


Figure 1 Monte Carlo simulation

(2) Typical economic mathematical model

First, the marginal analysis model. For the marginal function $y=f(x)$, the derivative of the x position is usually a marginal function, such as the derivative on x_0 , and the marginal function is $f'(x_0)$. Specifically, in the case of $x=x_0$, if x changes, the function y will change accordingly. Second, the elastic analysis model. The yield and price are expressed by q and p respectively. Through the analysis of the relationship between the two, the demand function is as follows, namely $Q=Q(P)$. The image shows a monotonous decreasing trend, indicating that the demand change is elastic. If the price elasticity is greater than 1, it means that it has good elasticity; if the price elasticity is equal to 1, it means that it has unit elasticity. If the price elasticity is within the range of 0 to 1, it means that the demand is not flexible to the price. If the price changes, there will only be relatively small demand changes^[3].

(3) Specific application analysis

When carrying out economic and trade management, economic model has been widely used, and has obtained good results. According to the production management situation of the enterprise, the need of the manufacturers for the economic inventory will affect the development efficiency of the enterprise to a large extent. How to clarify the economic inventory is the problem that the relevant workers should deal with. When producing products, manufacturers usually have to order goods to obtain the original products. During this period, the actual development needs of the enterprise should be comprehensively analyzed. If the manufacturer buys a large number of goods at one time, but the order is not much, it will cause the problem of oversupply of enterprises, which will cause the waste of resources, leading to greater losses of enterprises. If the manufacturer orders less goods, but the enterprise has received a lot of orders, although it will not produce the backlog of goods, but it is easy to send goods and order management problems, resulting in enterprise production supply, and may even lead to factory shutdown, hindering the development of businesses. Therefore, in order to promote the sustainable development of enterprises, the scientific order quantity should be set according to the specific situation of their development, and the minimum order value should be set while ensuring the maximum interests of merchants. According to the development of economic research field, the minimum amount of the total order cost of the inventory quantity is usually regarded as the best order volume. The determination of this value is usually achieved by using the table and calculus analysis methods.

Take a product as an example, its maximum demand is 1200, and the demand function and elasticity are $Q=Q(P)$ and $p/(120-P)$ respectively, so under what output can the maximum benefit be achieved. While carrying out the quantitative relationship analysis, the calculation can be carried out by using the differential equations. It can be seen that $Q(P)=1200-10p$, and the relevant benefit is $R(p)=1200-0.1Q^2$, Q is 600, so the benefit will be maximized at P is 60. In the analysis of decision variables, the quantitative relationship is obtained from the original hypothesis, which can be regarded as a constraint, and the solved function is regarded as the objective function based on this action. Combine the constraints to construct a linear equation, and find the answer with the theoretical knowledge of operations research^[4]. During this period, if the value can be calculated directly, the value obtained is the best. Take a company as an example, there are three warehouses in total, which are expressed by A, B and C respectively. Their warehouse reserves are different. After weighing all the goods, it is known that there are a total of 100 products. Want to transport in A, B, the transportation cost calculation is as follows: A and A, B transportation distance is 600 and 800 km, respectively, transportation cost is 11 / per kilometer, b and A, B transportation distance is 700 and 400 km respectively, transportation cost is 9 / per kilometer, c and A, B transport distance is 400 and 500 km, respectively, transportation cost is 4 / per kilometer. For both A and B, the minimum number of required goods are 56000 and 63000 units respectively. Therefore, the most economical scheme should be discussed according to the above information. Suppose the three warehouses are shipped out x , y and z respectively, and the objective function is $C=11x + 9y + 4z$, and the constraints are $600x + 700y + 400z \leq 56000$ and $800x + 400y + 500z \leq 63000$, where x and y are 100. After calculation, x , y and z are 50,30 and 20 respectively.

4 Conclusion

To sum up, for economic and trade, the economic model is widely used, which helps to promote the development of world economy and trade and plays a key role. The construction of mathematical economic model can not only lay the foundation for economic management decision-making, but also help enterprises to obtain more benefits, reduce the risk of international development, and reasonably control the loss of enterprise development. In this regard, the relevant workers should strengthen the research work of mathematical economic model, discuss more model establishment

and application methods, in order to make effective use of the development of enterprise trade.
mathematical economic model, and provide scientific guidance for

Reference

- [1] Wei Xuhui, Zhu Jiaming. Mathematical modeling analysis of the effect of China's export trade on economic growth [J]. Journal of Wuzhou University, 2022, (03): 10-18.
- [2] Zuo Mengting, Huo Ying. The effect of economic modeling in mathematics in economic trade [J]. Scientific Chinese, 2021, (03): 56.
- [3] Wu Zhiyang, Guo Huimeng. The effect of economic modeling in mathematics in economic trade [J]. Economic and trade practice, 2021, (07): 144.
- [4] Bao Jianhua, Li Rongfu. Dynamic modeling and analysis of the Relationship between foreign trade and economic growth —— Take Anhui Province as an example [J]. Chizhou Teachers' College, 2020, (04): 34-37.