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Research Article

Construction of Tourism Market Forecasting Model Based on Embedded Data Analysis System

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With the harmonious development of China's social environment and the substantial improvement of people's living standards, tourism has shown its vigorous vitality. Tourism is a comprehensive industry in the tertiary sector and also a new industry that is valued by countries all over the world. Embedded systems are application-centric, based on modern computer technology, and can flexibly tailor software and hardware modules according to user needs. The purpose of this paper is to investigate whether the construction of a prediction model for the tourism market can be carried out using an embedded data analysis system to provide a basis for advance planning of the tourism market. The tourism market is the sum of the tourism demand market and the tourism supply market, reflecting the complex economic relations between countries, between countries and tourism operators, between tourism operators, and between tourism operators and tourists. This paper takes the tourism market as the research object focusing on a systematic analysis of the current state of market development and proposes the use of a variety of quantitative analysis methods to build a prediction model for the tourism market and to test and compare them. The experimental results of this paper show that the number of tourists will exceed 8.3 billion by 2025, and the tourism revenue will be close to 10 trillion yuan.

1. Introduction

1.1. Background. Tourism, as an emerging industry, has become one of the industries with the best prospects and larger scale of global economic development. The tourism industry is mainly engaged in the comprehensive industry of attracting, receiving tourists, providing them with transportation, sightseeing, accommodation, catering, shopping, and entertainment. Among them, tourism, transportation, and accommodation represented by hotels are the three pillars of tourism. Its industrial status and economic drive in economic development has been gradually strengthened, mainly in the ability to derive new jobs to drive the employment rate; promote the development of regional economy; promote the spread of regional culture, etc. Tourism resources: tourism market is an important part of the tourism system, the size of the attractiveness of tourism resources, in addition to the type, grade, and quantity of resources, also depends on the spatial combination of resources, that is, the spatial structure of tourism resources. According to the survey, since 1960, the average annual growth rate of the number of tourists in the world has been stable at 10%, and tourism consumption is about 6 times of the previous every year. China is the most touristic country and also one of the fastest growing countries in the tourism market, which is of practical significance for forecasting the tourism market.

1.2. Significance. Through the forecast of tourism market, we can grasp the trend and direction of tourism market, and we can optimize the allocation of tourism resources, reduce the waste of resources, and improve the economic efficiency, reasonably arrange the flow of people, and improve the experience of tourists; through the forecast of the market, we can estimate the daily reception in advance and make industry adjustment to the scenic service industry such as hotels and guesthouses and optimize the management level. Tourism market demand forecast is the basis of tourism market price forecast and tourism benefit forecast. Due to

the multifactor characteristics of market changes, a reasonable market forecast can be reasonably priced.

1.3. Related Work. With the boom in tourism, tourism markets have become a hot topic of research. Kaynak and Marandu suggest that efforts aimed at increasing tourism may be more productive if the focus is on changing structures and hosting events rather than changing people's values, while arguing that as values, structures, and events evolve, the changes become greater, and the impact becomes greater. The study also improves the understanding of understanding of Delphi's predictive behavior [1]. Jackson examined residents' perceptions of the social, economic, and environmental impacts of special event tourism on destinations and collected data through a telephone survey that solicited residents' perceptions of the social, economic, and environmental impacts of special event tourism and used a descriptive design. The results indicate that residents generally favor tourism activities that contribute to the destination's society and economy but are willing to deal with negative impacts as long as the perceived benefits outweigh them [2]. Frauman and Banks used a variant of performance analysis (IPA) to map resident types and their ratings of environmental, cultural, and economic attributes to better understand the perceptions of tourism development perceptions. The IPA analysis method refers to the comparison between the customer's perceived importance of the service provided by the company or the customer's expectation of the project and the customer's actual perceived satisfaction. Performance analysis was chosen because it can be used as a simple assessment tool for communities in gateway areas interested in adopting a more comprehensive Limits of Acceptable Change (LAC) planning framework. Environmental attributes are considered special to the area and are considered important and of real concern from the perspective of each resident type. With the exception of a few items, all cultural or economic attributes are of the same importance and concern as environmental items, with few meaningful differences found between resident types [3]. Kasagranda et al. explained that urban tourism is characterized by a high proportion of international visitors, while presenting an analysis of bed capacity in collective accommodation facilities and urban tourism performance, which represents a subsequent typology of urban tourism centers. This represents the basis for the subsequent typology of urban tourism centers. In the typology process, the basis for the formation of the potential of urban tourism centers, that is, localization conditions and their attractiveness, was assessed. The results of the study show that urban tourism is one of the most important types of tourism. Urban tourism refers to a unique way of tourism developed based on modern urban facilities, with the city's rich natural and cultural landscapes and thoughtful services as attractive elements. The most valuable towns in terms of tourism are those with high cultural and historical value (historical towns) and those defined as spa resorts [4]. Latkova and Vogt studied and examined the attitude of the population of several rural areas at different stages of tourism and economic development to the existing and future tourism development. Social exchange theory and the destination life cycle model when used together with the total economic activity of the community were used to examine the impact of tourism development on residents' attitudes, and new social predictors and endogenous factors were tested in the model. Overall, residents of three different rural counties supported tourism development, and there was little evidence that attitudes toward tourism became negative as tourism levels increased [5]. Schonland et al. proposed some preliminary surveys of Internet travelers, a seminal ongoing study of the travel and tourism characteristics of Internet users. The focus is on the advantages and challenges associated with using the Internet as the primary medium for research studies. Primarily, it provides useful guidelines for tourism market researchers and managers on survey design and operational issues such as addressing sample bias, weighting samples, and improving survey effectiveness and efficiency for respondents, clients, and research institutions [6]. Tosun and Timothy suggest that many developing countries have developed plans to guide tourism development, particularly at the central level, because they have recognized the tourism sector as an important source of earning foreign exchange and employment. Tourism planning requires starting from the system, focusing on the overall optimization, being able to correctly handle the complex structure of the tourism system, considering and dealing with problems from a development and three-dimensional perspective, and providing a guiding policy for tourism. In order to analyze the shortcomings of planning methods for tourism development in developing countries, a study was conducted using a region as an example, and it was found that stable tourism development requires political stability, the establishment of supportive institutions, and decentralization to develop and implement appropriate contemporary tourism planning methods that take into account the specificities of the destination, as well as collaboration and cooperation of Western governments and international agencies [7]. The above theoretical studies are based on a single domain study in a particular market and do not combine the tourism market with local resources for good prediction.

1.4. Innovation Points. Philosophy believes that quantitative changes develop to a certain extent to produce qualitative changes. Therefore, when investigating the tourism market, in addition to focusing on the quality, the quantitative research should not be ignored. In this paper, quantitative analysis is the main focus, and qualitative analysis exists as a supplement to explore the operational characteristics and dynamic changes of the tourism market and establish a reasonable prediction model.

2. Embedded Data Analysis System for Tourism Market Approach

2.1. Status of Tourism Market Research. With the development of society, tourism has become one of the strongest and largest industries in the global economy. The industrial status and economic role of tourism in urban economic development has gradually increased, and the pulling power of tourism to the regional economy, the driving force of social employment, and the promotion of culture and the

environment are increasingly apparent [8, 9]. In a narrow sense, tourism in China mainly refers to travel agencies, tourist hotels, and tourism businesses specializing in the trading of tourism commodities. Tourism in a broad sense, in addition to the sector specialized in tourism business, also includes all walks of life related to tourism. According to the World Tourism Organization, since the 1960s, the number of tourists in the world has grown by an average of more than 10% per year, and tourism consumption has doubled almost every six years. In this context, in recent years, the majority of provinces and municipalities across the country have established tourism as a pillar industry, with the tourism economy as a "handful of economy" to grasp. The tourism industry uses tourism resources and tourism facilities to provide the products and services needed by tourists as the object of study. Tourism as a comprehensive industry has a wide range of topics; for example, theoretical studies on tourism include both humanities and natural sciences. Since tourism has a significant impact on the gross national product of each country, a series of studies have been conducted on tourism both at home and abroad [10]. Figure 1 shows a virtual representation of tourism market development.

Tourist traffic is defined as the displacement activity of some tourists in a certain area for a fixed period of time due to tourist demand. Recorded on a time scale, passenger flows can be categorized by length of time into daily, monthly, quarterly ,and annual passenger flows. A large body of literature exists for forecasting monthly, quarterly, and yearly traffic forecasts; however, little research exists for forecasting daily traffic. Tourism passenger flow has obvious nonlinear and seasonal characteristics, so the seasonal adjustment method is used to preprocess the sample data to eliminate the influence of seasonality, which can improve the accuracy of passenger flow forecasting. Daily traffic forecasting studies can improve the application management and deployment of resources and have a significant role in the improvement and management of the tourism environment, but there are many influencing factors and difficulties in organizing daily traffic.

There is a wide range of influencing factors for tourism demand, and when constructing a daily passenger flow model, it is necessary to eliminate some of the influencing factors that cannot be applied. The influencing factors that do not need to be considered in the construction of daily passenger flow forecasting models are social environment, socioeconomic influencing factors with a long time and wide range of influence, which are only suitable for the construction of forecasting models with a large period span, personal demand, and personal economy influencing factors that are difficult to quantify, which are only suitable for the construction of forecasting models in areas with obvious tourist characteristics. After eliminating the obviously inapplicable influencing factors, it is necessary to make the selected daily passenger flow influencing factors conform to the following two major principles: (1) when selecting the influencing factors on passenger flow.

(1) When selecting the impact factors on passenger traffic, each impact factor must be considered to belong to a category and layer, so that each layer can constitute an independent impact layer. (2) When influencing factors of different layers on passenger flow, they must be parallel to each other and avoid compatibility, inclusiveness, or even substitutability among factors.

Daily passenger flow influence factors have their complexity, which is mainly manifested in the multiplicity, dynamism, and diversity of the constituent elements. At the same time, the passenger flow forecasting system is also an open system, which needs to constantly judge the destructiveness of new possible contingencies on the forecasting effect. To get a good prediction effect, it is necessary to clarify the characteristics of the influencing factors and be able to better add the influencing factors into the prediction system.

2.1.1. Foreign Research Status. Tourism was first started from the Western countries, so for the study of tourism market foreign research history is longer, and the theory is relatively complete [11]. Taking developed Western tourism countries such as Spain as an example, they all have special institutions for planning and management of domestic and foreign tourism and have also generated corresponding staff to conduct dynamic research on different tourism modes and form research reports on tourism markets. The development of tourism is linked to the development of the economy, the progress of society, and the improvement of people's living standards. There are three main factors that determine the development of tourism: first, the availability of more spare time; second, more convenient transportation conditions; and third, the availability of economic income for consumption. The boom in international tourism since the mid-20th century has benefited from these three factors. First, the development of social productivity and the increase in social productivity have led to a gradual improvement in people's living conditions and an increase in paid holidays. In developed countries, the average working week is 40 hours, with 30 hours of discretionary time per week, and in many industrialized countries, people have 30 hours of discretionary time equal to or even more than working hours, and in many industrialized countries, people have only 31 hours of discretionary time equal to or even more than working hours, 31.4 hours in Germany and 35.8 hours in the United States. The increase in leisure time provides time for the development of international tourism. Second, with the development of science and technology, the level of modernization of transportation has greatly increased, making tourism more convenient. Western scholars mostly use quantitative analysis when studying tourism markets and are good at using statistical tools [12]. Figure 2 shows well-known tourist attractions.

2.1.2. Status of Domestic Research. China's tourism industry started late, but it is developing extremely fast. The development of tourism in China can be roughly divided into three stages.

The first stage was the early stage of reform and opening up, as the reform and opening up had just been achieved;

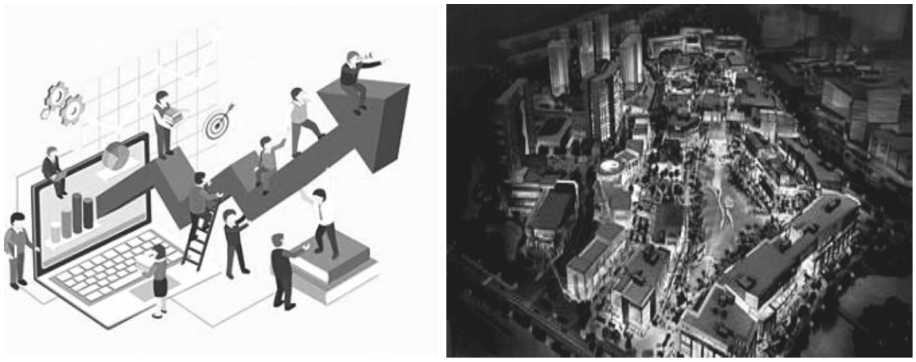

Figure 1: Tourism market development virtual.

Figure 2: Tourist attractions.

overseas Chinese from all over the world returned to visit their relatives in China, which promoted the development of domestic tourism and trade.

The second stage was the end of the 20th century, when the number of inbound tourists soared, and tourism foreign exchange earnings reached new heights. As it was due to the rapid development of China's economy and the continuous increase of reform and opening up, East Asian countries introduced policies to encourage travel.

The third stage is from the 21st century to the present. Although a series of economic crises and epidemics and other risks have hit China's tourism industry to some extent, the domestic tourism industry still maintains a steady state of development.

China has a unique advantage of resources, rich historical and human resources, and rich and colorful folklore resources, which bring endless charm to China's tourism industry; the Chinese economy, which continues to grow strongly, is the deep economic foundation for China's tourism development; and the stable political environment and superior government policies are the strong backing for the steady development of China's tourism industry. The 21st century is an important period for China to transform these advantages into strong competitiveness, and to transform itself from a "major Asian tourism country" to a "world tourism power." Tourism can be divided into general recreational travel; business and conference travel, often combined with a certain amount of recreational travel; religious travel; sports travel, travel associated with major sports events; and mutual aid travel. It is expected that, by 2020, the number of inbound tourists in China will reach 135–145 million, including 27.5–33.5 million foreigners, and the foreign exchange earnings from international tourism will be 52–75 billion USD.

The development of China's inbound tourism over the past 20 years can be roughly divided into the following three stages: the first stage was from 1980 to 1990, when China had just entered the reform and opening-up stage, with compatriots from Hong Kong, Macao, and Taiwan returning to visit relatives or trade, foreign investment slowly entering, and international trade developing to a certain extent. The growth of inbound tourism in the 1980s, both in terms of the number of inbound tourists and foreign exchange earnings from inbound tourism, doubled approximately every five years, with the growth mainly coming from family visits to Hong Kong, Macau, and Taiwan. The second phase, from 1991 to 1997, saw an acceleration in China's inbound tourism development. The number of inbound tourists increased from nearly 33.35 million in 1991 to nearly 5.759 million in 1997, an increase of 72.7 percent, 70/: foreign exchange earnings from inbound tourism increased from $2.8 billion to $12.5 billion, US$12.0 billion, up from US$2.845 billion. The growth in foreign exchange earnings from inbound tourism increased from US$2.845 billion to US$12.074 billion, more than threefold increase. This period was the fastest growing period for inbound tourism in China. On the one hand, it is due to the rapid development of China's economy and the increase of China's reform and opening up; on the other hand, it is due to the economic prosperity of East and Southeast Asia and the policies of East Asian countries to encourage their citizens to travel, etc. The third stage is from 1998 to the present, when China's

inbound tourism faced a more complex international environment. The East Asian financial crisis in 1997 hit the economies of many Asian countries and caused a significant decline in the number of tourists from East and Southeast Asia to China, and the number of foreigners in China's inbound tourism also experienced a rare negative growth in 1998. This is another example of the fragile sensitivity of tourism. Despite the complexity and volatility of the international environment, especially the impact of the SA SR in 2003, inbound tourism in China is still on a relatively stable upward trend. World Tourism Organization officials predict that China will become the world's leading tourist destination by 2030, replacing France and the United States, with an estimated 130 million tourists visiting China annually. The rapid development of inbound tourism in China has been achieved largely without external pressure. In the past, China's international tourism industry was essentially public, and although the Regulations on Travel Agencies and their Implementing Rules did not specify the form of ownership, in practice only public ownership was permitted or encouraged, and foreign-invested hotels were subject to significant restrictions, both geographically and in terms of numbers. On January 24, 1999, the National Tourism Administration and the Ministry of Foreign Trade and Economic Cooperation jointly promulgated the "Interim Measures for Piloting Chinese-Foreign Cooperative Travel Agencies," but this did not fundamentally change the state monopoly of international travel agencies for many years. After joining the WTO, this pressure-free situation will be completely changed. Within the framework of WTO, China's international tourism industry, which is at the forefront of reform and opening up, will face more opportunities on the one hand, ushering in a large number of foreign tourists, thus promoting the development of China's international tourism industry; on the other hand, China's international tourism industry will face greater challenges at the same time, the liberalization of foreign investment policy will make China's international tourism enterprises face fierce competition from foreign enterprises, and this competition will be at the three levels of travel agencies, hotels, and tourism products. This competition will take place at three levels: travel agencies, hotels, and tourism products.

Although the tourism industry has developed more steadily, research on the tourism market has been weak. Basically, it is a simple data analysis of the figures in the tourism statistical yearbook. This paper will start from the data analysis embedded in the system and use statistics to analyze the tourism market quantitatively, hoping to make progress in the establishment of the tourism market forecasting model [13, 14].

2.2. Forecasting Model. According to the literal interpretation, to predict means for anticipation and to measure means for measurements and estimate or to guess, forecasting in the field of tourism means to predict and judge the future trends and outcomes of things in advance using the knowledge and tools already available. Forecasting methods include a variety of methods, widely used in econometrics, systems engineering, marketing, etc. According to their nature, they can be divided into qualitative forecasting, time series forecasting, and causality forecasting [15]. The research on tourism forecasting in China focuses on the statistical description of the forecasting object, and less on the analysis of the process and mechanism using models, and more on the empirical analysis of specific tourism destinations, that is, more case studies, so that the quality and representativeness of the samples are problematic, and the research findings do not have general guiding significance; furthermore, the methods for tourism forecasting are developing from a single to a comprehensive direction, but compared with foreign studies, the research on tourism forecasting in China is fragmented and lacks systematization, and the research results have certain similarities. Figure 3 shows the optimization diagram of the forecasting model.

Qualitative forecasting method: researchers rely on their own professional knowledge and practical experience, interest logical analysis, and inductive evolution and other means to forecast the market. It can give full play to the staff's own ability, the historical information and data needed are not specifically required, there are no special provisions for completeness, and this method is relatively simple to adapt and operate, but its accuracy is not high because it is less restrictive [16]. This type of method is mainly applicable to some matters that do not have complete historical information and data both to forecast the future supply and demand of the market and to make a judgment forecast on the trend of the characteristics of future development changes.

Quantitative forecasting method: using mathematical tools to analyze the complete data and forecast the market. Due to the complete data, the forecasting results are more accurate, and it is possible to study the correlation between the elements and respond to the market development, but the method is costly and takes a long time [17]. The requirements for data collection are high, and the establishment of the model is carried out on the basis of certain assumptions, which will affect the accuracy of prediction, and the quantitative prediction method is costly and takes a lot of time.

Overall, qualitative analysis is relatively simple and does not require a lot of relevant information. In the case where other methods cannot be used due to many constraints, the Delphi method as the representative of qualitative analysis can help tourism decision makers have a general understanding of the future development trend.

Currently, time series models are more widely used in the field of forecasting with less error. The expression of the function of the autoregressive model is as follows:

$$\widetilde{F}_a = \delta_1 \widetilde{F_{a-1}} + \delta_2 \widetilde{F_{a-2}} + \cdots + \delta_q \widetilde{F_{a-q}} + k_a, \tag{1}$$

where q is the model order, δ is the autoregressive coefficient, and k_a is the white noise series.

The mathematical expression of the sliding average model is as follows. The moving average model is a way of estimating data. Its benefits are that it can make the data smoother, with less noise and no outliers.

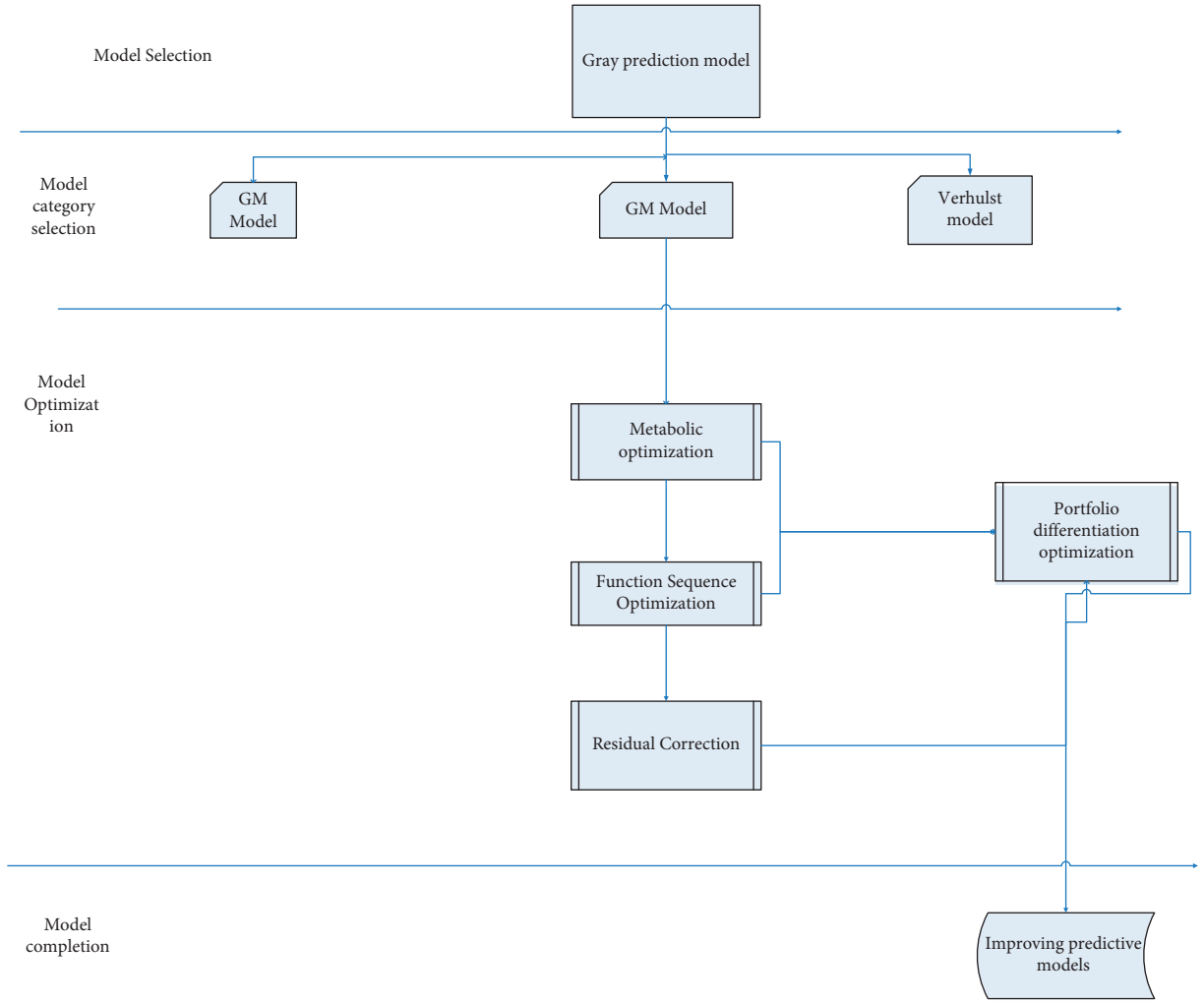

Figure 3: Prediction model optimization diagram.

$$\widetilde{F}_a = b_a + \tau_1 b_{a-1} + \tau_2 b_{a-2} + \cdots + \tau_\gamma b_{a-\gamma}. \tag{2}$$

In this case, there are weighted coefficients, where τ_γ are the sliding average coefficients.

In order to make the model more flexible for practical use, we use both the autoregressive and sliding average components, so that the model is mathematically expressed as follows:

$$\begin{aligned}\widetilde{F}_a = {} & \delta_1 \widetilde{F_{a-1}} + \delta_2 \widetilde{F_{a-2}} + \cdots + \delta_q \widetilde{F_{a-q}} + k_a - \tau_1 b_{a-1} \\ & - \tau_2 b_{a-2} - \cdots - \tau_\gamma b_{a-\gamma},\end{aligned} \tag{3}$$

where q and γ denote the order of the different models, and δ_q and τ_γ denote the autoregressive and sliding average coefficients of the different components.

Regression analysis is the most used part of statistical analysis, mainly to establish regression equations to test the reliability and to calculate the accuracy that can be achieved by the prediction.

The univariate linear regression model is a statistical model on the dependent and independent variables, which is expressed mathematically as follows:

$$p_a = \rho_0 + \rho_1 t_a + \tau_a \ , \ a = 1, 2 \ , \ \cdots \ , \ k, \tag{4}$$

where τ_a is each independent distribution, ρ_0 is the intercept, ρ_1 is the slope, and τ_a denotes the error.

The regression coefficients are most commonly used by the least squares method, and the mathematical expressions obtained are

$$\begin{aligned}\breve{\rho}_1 &= \frac{w_{ab}}{w_{aa}}, \\ \breve{\rho}_0 &= \overline{p} - \breve{\rho}_1 \overline{t}, \\ \overline{t} &= \frac{1}{m}\sum t_a \ , \ \overline{p} = \frac{1}{m}\sum p_a, \\ w_{aa} &= \sum (t_a - \overline{t})^2 = \sum t_a^2 - \frac{1}{m}\left(\sum t_a\right)^2, \\ w_{ab} &= \sum (t_a - \overline{t})(p_a - \overline{p}) = \sum t_a p_a - \frac{1}{m}\left(\sum p_a\right).\end{aligned} \tag{5}$$

From the above equation, we can see that as long as we are able to find the sum given m pairs of data, then we can derive

$$\overline{p} = \breve{\rho}_0 + \rho_1 \breve{w}. \tag{6}$$

However, the regression equation obtained by this method is not necessarily meaningful, so we perform a validity study on the equation obtained. We assume zero, and then there is no linear variation. We express the equation for the statistic as

$$A = \frac{T}{R/(m-2)}, \tag{7}$$

where T is the sum of squares, $T = \sum(\overline{p_a} - \overline{p})^2$; R is the sum of squares, and $R = \sum(P_a - \overline{p_a})^2$. When A is larger, the assumption can be dispensed with.

In practice, we usually use the correlation coefficient to test the regression equation, and we can express the expression as

$$W = \frac{\sum(t_a - \overline{t})(p_a - \overline{p})}{\sqrt{\sum(t_a - \overline{t})^2 \sum(P_a - \overline{p_a})^2}}. \tag{8}$$

In fact, by calculation, we can conclude that

$$w^2 = \frac{A}{A + m - 2}. \tag{9}$$

According to this formula, we can see that w^2 is a monotonically increasing function of A. It was mentioned above that when A is large, it is possible to disallow the assumption, and then we express this range as

$$e = \sqrt{\frac{A_{1-\delta}(1\ ,\ m-2)}{m - 2 + A_{1-\delta}(1\ ,\ m-2)}}. \tag{10}$$

When the absolute value of w is greater than d, we can remove the assumption step.

When the validity of the equation is verified through, it can be used for prediction. When making a prediction, the prediction accuracy needs to be given, and we express its mathematical expression as follows:

$$\rho = p_{1-0.5\varepsilon}(m-2) \cdot k \cdot \sqrt{1 + \frac{1}{m} + \frac{(t_0 - \overline{t})^2}{w_{aa}}}. \tag{11}$$

Or

$$\rho = \sqrt{A_{1-\delta}(1\ ,\ m-2)\left[1 + \frac{1}{m} + \frac{(t_a - \overline{t})^2}{w_{aa}}\right]} \cdot k, \tag{12}$$

where k denotes unbiased estimation:

In practice, the dependent variable generates several independent variables. When there are several independent variables, we can express them in a multiple linear regression equation with the mathematical expression:

$$p_a = \rho_0 + \rho_1 t_1 + \cdots + \rho_a t_\tau + k_a\ ,\ a = 1, 2\ ,\ \cdots\ ,\ m, \tag{13}$$

where ρ_0, ρ_1 are the parameters of the multiple linear regression equation. We express the matrix expression of the multiple regression model as

$$T = Q\rho + \tau, \tag{14}$$

where T is the random variable observation vector, Q is the outcome matrix, ρ is the unknown vector, and τ is the error vector.

To estimate the multiple linear regression equation model by the least squares method, it is necessary to make

$$W = \sigma\sigma = (T - Q\rho)(T - Q\rho) = TT - 2\rho(QT) + \rho(QQ)T. \tag{15}$$

It is the minimum, and using the calculus principle to derive the derivative for w, we get

$$\frac{\theta Q}{\theta \rho} = -2Q\rho + 2QQ\rho. \tag{16}$$

2.3. Embedded Data Analysis System

2.3.1. Status of Embedded Technology. Embedded System is "a device used to control, monitor, or assist the operation of machines and equipment," which is an application-centered, computer technology-based, hardware and software that can be reduced to fit the application system requirements for functionality, reliability, cost, size, and power consumption of a dedicated computer system [18]. Embedded systems usually consist of embedded microprocessors, peripheral hardware devices, device drivers, embedded operating systems, support software, and various application software devices. The embedded system has strong professionalism, small size, good real-time performance, good tailorability, high reliability, and low power consumption, which can maximize the software and hardware capabilities of the system, thereby obtaining higher performance and lower cost. Optimize the design. At the end of the 20th century, embedded technology has been developed rapidly, especially in the field of communication and consumer use. In the field of communication, the analog computing, which was widely used before, is gradually withdrawn and replaced by the digital technology. In the field of TV broadcasting, analog TV is replaced by digital TV; for example, digital TV broadcasting technology in the West, especially in Europe, is being promoted worldwide. In the personal field, embedded system is mainly used in the business field, mainly responsible for communication, recording, and processing matters. In terms of product hardware, major R&D companies have developed microprocessor chips, and various supporting development kits cover various fields of learning and R&D. After a long period of development, the underlying system and hardware platform have been relatively mature and can solve a variety of challenges. In terms of product software, the embedded system is mainly used in the fields of handheld devices, electronics, and industrial control [19, 20]. Figure 4 shows the appearance of the embedded core board.

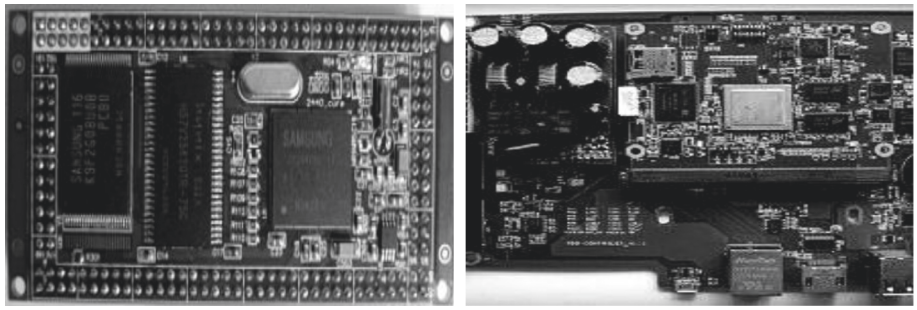

Figure 4: Embedded core board appearance.

2.3.2. The Development Trend of Embedded Technology. With the development of the digital age, the complexity of the system is also increased and, at the same time, brings new challenges to the embedded technology, and the current embedded technology mainly has the following development trend [21]. Figure 5 shows the embedded network CNC technology and systems.

(1) Systematization.

(2) Multiple functions. Complete functions, complex structure, simplified design, and short development cycle.

(3) Networking. With network interface, complete system design.

(4) The kernel is streamlined. The system power consumption is small, and the model is optimized.

(5) Friendly interaction. The equipment has a friendly interface and flexible control, is a simple method, and is suitable for promotion.

The development of embedded systems has roughly gone through the following three stages.

The first stage: the early stage of embedded technology. The embedded system exists in the form of programmable controller with simple function of special computer or microcontroller as the core, with functions such as monitoring, servo, and equipment indication. Most of such systems are used in various types of industrial control and weapons and equipment such as aircraft and missiles.

The second stage: marked by high-end embedded CPU and embedded operating system. The main feature of this stage of the system is the emergence of computer hardware with highly reliable, low-power embedded CPUs, such as ARM and PowerPC, and support for operating systems to support the development and operation of complex applications.

The third stage: marked by chip technology and Internet technology. Microelectronics technology is developing rapidly, and system on a chip (SOC) makes embedded systems smaller and smaller, but more and more powerful. At present, most embedded systems are still isolated from the Internet, but with the development of the Internet and Internet technology and information appliances, industrial control technology, and other increasingly close combinations, embedded technology is entering a period of rapid development and widespread use [22, 23].

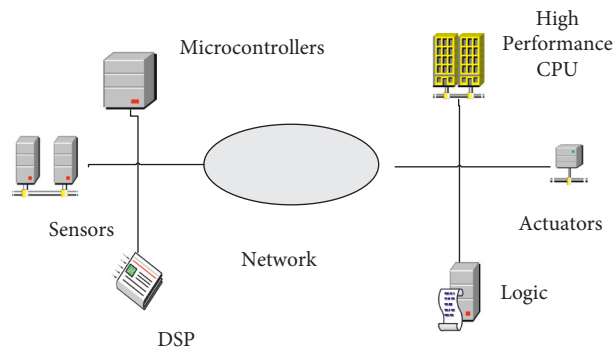

Figure 5: Embedded network CNC technology and system.

3. Experimentation and Analysis of Tourism Market Forecasting Models for Analytical Systems

3.1. Tourism Market. Tourism as an important channel of foreign trade foreign exchange revenue generation can attract international idle capital investment, participate in the international market competition, improve foreign economic relations, and can attract a large number of foreign tourists to enter the tourism, thereby increasing foreign exchange earnings [24, 25]. Therefore, international tourism income becomes an important part of the tourism market, and according to China's statistical years, we can conclude the following.

As can be seen from Figure 6, in 2010, China's foreign exchange revenue was 4,500 billion yuan, up 10%; in 2011, China's foreign exchange revenue was 4,800 billion yuan, up 60%; in 2012, China's foreign exchange revenue was 500,000 billion yuan, up 40%; in 2013, China's foreign exchange revenue was 5,400 billion yuan, up 57%; in 2014, China's foreign exchange revenue was 5.7 trillion yuan in 2014, up 48%; China's foreign exchange revenue was 5.8 trillion yuan in 2015, up 18%; China's foreign exchange revenue was 5.869 billion yuan in 2016, up 13%; China's foreign exchange revenue was 600 billion yuan in 2017, up 32%; China's foreign exchange revenue was 6.4 trillion yuan in 2018, up 27%; China's foreign exchange revenue in 2019 was 6,700 billion yuan, up 30% year-on-year; and China's foreign exchange revenue in 2020 was 700,000 billion yuan, up 45% year-on-year. China's foreign exchange earnings have maintained a relatively stable development, and inbound

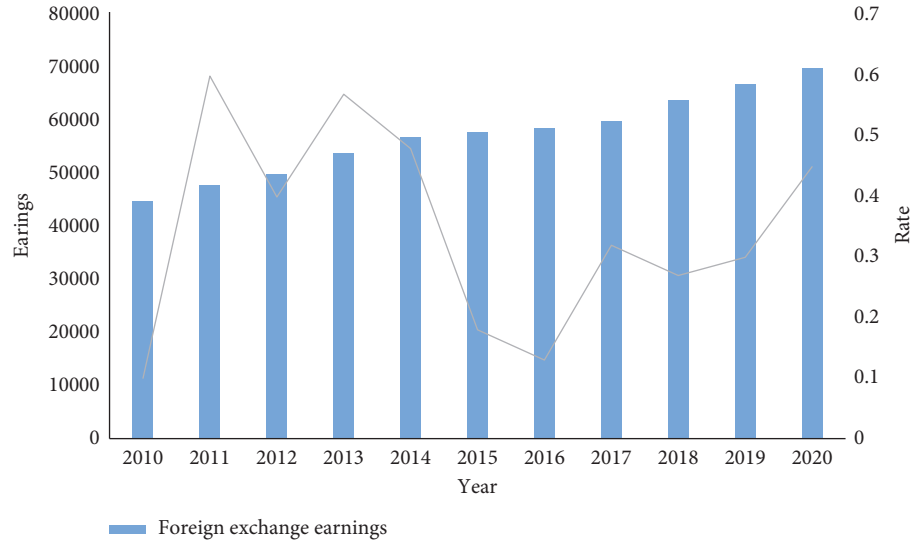

Figure 6: Foreign exchange earnings.

tourism mainly receives tourists from Europe, America, Japan, Korea, and other developed countries and, therefore, is subject to the economic conditions and social environment of the source countries, and their own economic conditions also have a profound impact on the tourism market, especially the arrival of the epidemic, resulting in a significant contraction of the international tourism market, and the main reliance is still driven by domestic demand in the country [26].

As can be seen from Table 1, the proportion of tourism revenue generation is larger in the proportion of food and beverage, accommodation, and transportation. The proportion of sightseeing is stable between 4% and 8%, with little difference between the extremes; the proportion of the food and beverage part is maintained at 9%–13%, and as a necessary part of tourism travel, the extremes do not differ significantly; the entertainment part also differs a little, maintained at about 7%; regarding the highest proportion of the transportation part, as a necessary tool for travel, the gap lies in which level of transportation travel is chosen every year; the proportion of the accommodation part is higher, maintained at about 15%–18%, and the proportion of shopping increased the difference. This is closely related to the level of economic development and policies of the source and tourism location at the time [27].

The composition of tourism consumption can be reflected by the composition of foreign exchange earnings. As can be seen from the data, an obvious problem with international tourism consumption expenditure is the disproportionate share of basic consumption, with transportation, accommodation, and food and beverage accounting for a larger than average share, and less expenditure on sightseeing and shopping and noninfrastructure. Compared to developed countries, nonbasic spending can reach about 60%. The proportion of nonbasic tourism expenditure is too low, which is not conducive to the improvement of tourism economic efficiency and not to upgrade the consumption structure. Therefore, for foreign exchange earnings, optimize the structure of tourism products and provide participatory and interactive entertainment products, more with strong local ethnic characteristics, and high-quality tourism shopping products are an important way to improve the effect of tourism consumption [28, 29].

According to the analysis of the data in Table 2, in terms of the age group of tourists, tourists are mainly concentrated in 25–45-years old and 45–65 years old, and the two age groups occupy almost the whole main body of tourism, accounting for about 80% of the total number of tourists and still maintain an upward trend.

According to the data in Table 3, it can be seen that tourists travel mainly for the main purpose of sightseeing, and the proportion of sightseeing tourism is maintained at about 60% of the total number of tourists, and conference tourism is temporarily in the second place, but the overall trend is slowly increasing. According to the data obtained, if we add up the tourism and conference tourists, the total number of both of them occupies about 90% of the total, but according to the ratio of income generation in Table 3, the proportion of tourism income generation is actually extremely small, which means that the output of tourism tourists is obviously low compared to the conference or other purposes of travel; in addition, the consumption of tourism products is often accompanied by excessive use of resources and the environment, even at the cost of environmental damage. To sum up, in order to improve the tourism consumption structure, the staff should reduce the development of tourism products and introduce new tourism products [30, 31].

3.2. Tourism Analysis and Forecast. In order to make the results more objective, we take the tourism reception attendance and tourism foreign exchange income as the reference sequence based on the operability by drawing on the previous work.

Table 1: Composition of foreign exchange earnings.

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Sightseeing (%)	4	4.2	5	4.7	6	7	5.3	6.2	5	7	5.6
Dining (%)	13	10.5	9.7	11.5	8.9	12	9.3	9.8	10.7	11.7	12.8
Entertainment (%)	7	6.8	6.5	7.3	7.5	7	6.7	5.9	6.4	6.3	7.5
Transportation (%)	27	25	20	28	27.6	25.6	28.3	27.6	24.4	23.9	27.9
Accommodation (%)	15	14.9	16.3	16.7	18	17.3	12.5	14.9	14.7	14.2	14.4
Shopping (%)	6	7.9	8.3	2.9	3.8	5.5	6.8	10.5	8.8	8.5	7.3

Table 2: Travel age group.

Year	2016	2017	2018	2019	2020
Under 14 years old	4	4.3	4.2	3.9	3.7
15–25 years old	7.6	8.2	7.94	8.04	8.07
25–45 years old	47	43.6	45.5	47.6	45.7
45–65 years old	32.4	36.2	36.7	35.9	37.2
Over 65 years old	9	7.7	5.66	4.86	5.33

Table 3: Purpose of tourism.

Year	2016	2017	2018	2019	2020
Conference	27.2	28.4	30.5	30.7	31
Sightseeing	60.3	59.4	61.1	58.7	59.6
Visit one's family	0.5	0.5	0.5	0.5	0.5
Jobs	12	11.7	7.9	10.1	8.9

According to the data in Table 4, we can see that the importance of the correlation between influencing factors is that the real effective exchange rate is greater than the number of hotels, and the CPI is greater than the number of overnight stays and the RMB nominal effective exchange rate index, which means that the tourism receipts are highly correlated with the RMB real effective exchange rate index exchange rate and the number of hotels, strongly correlated with the number of international travel agencies and the number of overnight tourists, and weakly correlated with the RMB nominal exchange rate index [23].

Due to the reality of urban-rural dual economic structure, the number of tourist arrivals and tourism revenue are divided into rural and urban areas for separate forecasting.

3.3. Urban Tourism Analysis and Forecast. In order to obtain the convenience of data, we mainly choose to do the correlation analysis from GDP, population, per capita income, Engel coefficient, and per capita tourism consumption and urban residents' tourism consumption demand [32].

From the data in Tables 5 and 6, it is clear that urban residents show a continuous growth trend in travel analysis and travel income, and although there was a global epidemic in 2020 that led to a certain decline in per capita travel consumption of urban residents, overall, travel income is still a reasonable situation under the given circumstances.

According to the forecast in Figure 7, the number of tourist arrivals will continue to rise, and the total tourism revenue will also maintain an upward trend overall. In 2025, the number of tourists will exceed 8.3 billion, and tourism revenue will be close to 10 trillion yuan.

3.4. Rural Residents' Tourism Analysis and Forecast. From the data in Figure 8 and Table 7, the highest correlation between tourism consumption, tourism number, and tourism income and net personal income of rural residents can be seen, followed by per capita consumption expenditure, and GDP and CPI have a small difference in correlation, and the lowest ranking is the number of travel agencies. Overall, the correlation between tourism indicators and influencing factors of tourism consumption of rural residents and urban residents has great similarity; from the prediction model of tourism consumption per capita, the residuals are more evenly distributed and show an increasingly smooth trend, except for the abnormal data in abnormal years, and the overall data are more accurate, indicating that the model can be used to predict tourism consumption of rural residents [33].

From the data in Figure 9, it can be observed that the lagged residual data of the data obtained as a whole have a small difference, and excluding the abnormal data of the abnormal years, the number of rural residents' tourism as a whole maintains an upward trend, and the refinement of the fit is good, thus indicating that the model can be used to predict the number of rural residents' tourism.

From the data in Figure 10, it can be seen that the distribution of each residual is relatively uniform, and there is an obvious trend of convergence in the data. From the fitted values and absolute values, the overall prediction results are in the normal range except for the abnormal data in the abnormal

Table 4: Correlation between tourist arrivals, tourist foreign exchange, and influencing factors.

	Number of inbound visitors	Foreign exchange earnings
Renminbi real effective exchange rate index	0.9456	0.9598
Renminbi nominal effective exchange rate index	0.4836	0.6103
Number of travel agencies	0.4969	0.6352
Number of hotels	0.9241	0.9532
CPI	0.6025	0.7125
Number of overnight stays	0.5743	0.6316

Table 5: Factors influencing the analysis of urban residents' travel.

Factor name	2016	2017	2018	2019	2020
GDP	746396	832036	919281	986515	1015986
Population	83598	85673	88753	89954	90199
Per capita income	33616	36396	39252	42359	43834
Per capita tourism spending	8649	9056	9765	9876	9954
Engel's coefficient	30	28.9	28.4	27.6	29.2

Table 6: Correlation between tourism operation index of urban residents and various factors.

	Travel expenses	Number of tourists	Tourism revenue
Disposable income	0.9997	0.9969	0.9954
GDP	0.9979	0.9965	0.9961
CPI	0.9986	0.9964	0.9971
Number of travel agencies	0.9959	0.9956	0.9974
Population share	0.9913	0.9916	0.9914

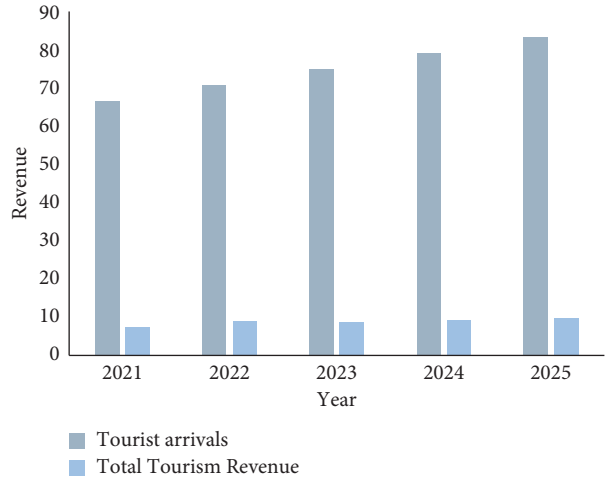

Figure 7: Tourism forecast for 2021–2025.

years. In summary, the model is adapted to predict the tourism income of rural residents.

4. Discussion

According to the experiments, overall, the whole tourism market in China is developing rapidly in a good direction; whether it is domestic demand or foreign exchange, the prospect of China's tourism market is clear, but there is still a certain gap between the tourism consumption structure and developed countries, so, in the future, the tourism market planning still needs to pay attention to the adjustment of consumption structure.

The urban-rural dichotomy is a unique feature of the Chinese market. In the tourism market forecast, we also conducted an independent analysis; first of all, urban tourism consumption is faster than rural consumption, and both overall and in the refinement of consumption, rural tourism consumption is developing at a very rapid pace, especially in recent years, urban tourism consumption experience is developing rapidly, but the consumption level is still not high, basic consumption occupies the main part,

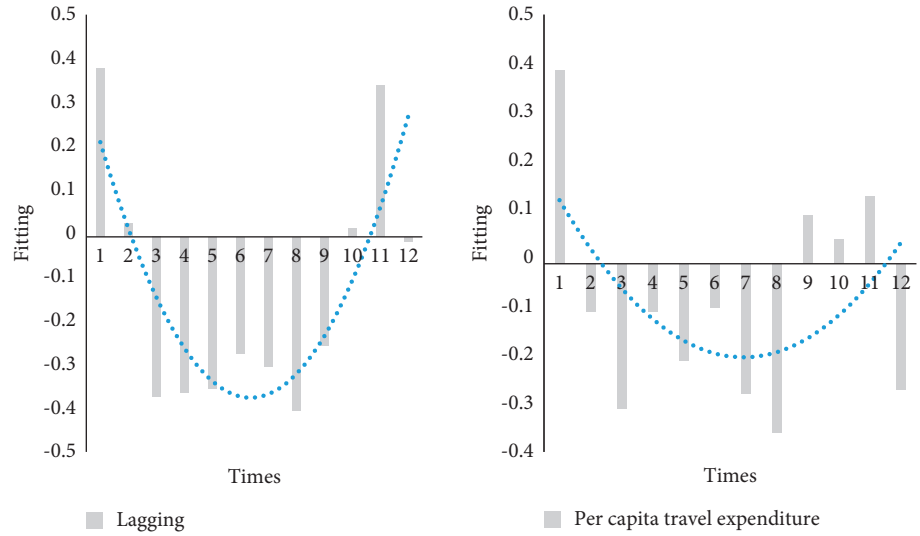

Figure 8: Tourism consumption per capita forecast model.

Table 7: Correlation of rural residents' tourism indicators with each influencing factor.

	Per capita tourism spending	Number of tourists	Tourism revenue
Net income per capita	0.9998	0.9992	0.9994
Per capita consumption expenditure	0.999857	0.99969	0.999792
GDP	0.99957	0.99963	0.99970
CPI	0.99927	0.99942	0.99937
Number of travel agencies	0.99758	0.99297	0.999549

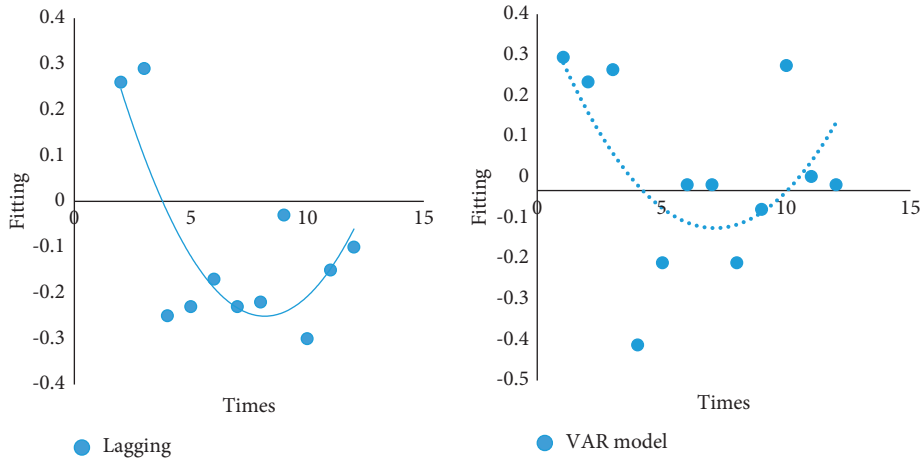

Figure 9: Residuals of the model for predicting the number of rural residents.

entertainment, and consumption items are not sound, which is the focus of improving the consumption structure at present.

Tourism consumption composition can not only reflect the consumption situation and characteristics of tourists, but also can allocate tourism resources and elements for tourism destination countries or regions, improve the scientific basis for the combination of tourism products, and provide an important reference index for the study of tourism consumption effect and consumption rationalization. Tourism consumption composition refers to the tourist in the process of tourism, the travel, tourism, accommodation, food, shopping, entertainment, and other aspects of consumption ratio. Tourism foreign exchange income according to the different elasticity of demand can be divided into basic tourism income and nonbasic tourism income. Basic tourism income refers to the tourism economy in the process of operation, the tourism sector to provide tourists with the

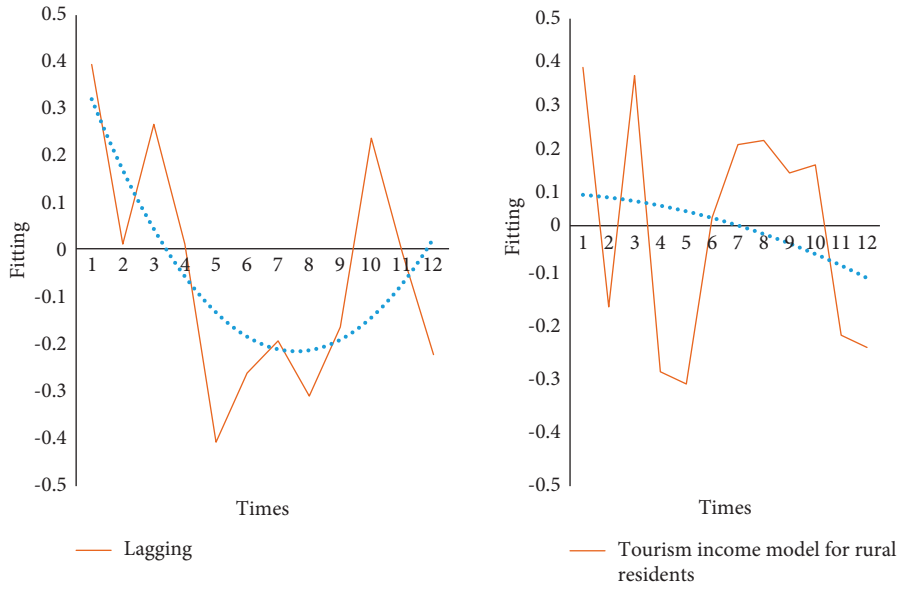

Figure 10: Residuals of the model for predicting tourism income of rural residents.

necessary or basic tourism facilities, and tourism services to obtain the monetary income. The amount of basic tourism income and the change of its rate of increase or decrease can generally reflect the development of tourism in the destination country or region. Basic tourism income comes from sectors such as tourism transportation, accommodation, and tourist attractions, where the price elasticity of demand for tourism products is usually low, and tourists are obliged to buy them; in other words, the basic tourism income from each tourist is relatively stable. For a destination country and region, with other things being equal, the total basic tourism income varies proportionally with the number of tourist arrivals and the basic tourism consumption expenditure per capita. Nonbasic tourism income refers to the monetary income obtained by the tourism sector through the sale of nonessential or nonbasic tourism products to tourists in the course of tourism economy, which is the consumption expenditure that tourists may incur in the process of tourism and is not a necessary expenditure, and it can vary greatly depending on the level of demand, income level, and interest preference of tourists. Because of the price elasticity of demand for such services, the nonbasic tourism income formed through the provision of such services is characterized by instability, and there is no necessarily positive relationship with the number of tourist arrivals, and the size of the share of nonbasic tourism income in the total tourism income can reflect the depth of tourism development in a country or region. The more developed the tourism industry, the more perfect the tourism economy operation mechanism, and the higher the proportion of nonbasic tourism income.

Gender, culture, occupation, age, and local customs and personal preferences all have varying degrees of influence on tourism consumption. For example, for teenagers, tourism consumption is mainly based on the entertainment items of food and drink, while the elderly are mainly based on the convenience of accommodation and transportation; in terms of gender, female consumers have a higher proportion of shopping in the proportion of tourism consumption, while male consumers are more concerned in the food and play items.

There is another important factor affecting the level of consumption and the level of personal income. In fact, this is still related to the occupation, different occupations will have different income levels and paid vacation time, and income level affects the quality of tourist spending, while paid vacation time affects the length of stay in the tourist destination. All of these affect the consumption structure of the tourist location.

Tourists' personal preferences have an important impact on tourism demand. If tourists have a preference for a particular country or region, they usually tend to return to the destination again and will be much less likely to visit unfamiliar destinations compared to others they have not reached. In fact, word-of-mouth plays a much greater role in a tourist's choice of destination than advertising. This choice is risk-averse.

5. Conclusions

Since the reform and opening up, tourism has developed significantly in China, and foreign exchange earnings have increased dramatically, which has promoted the development of China's economy, increased employment opportunities, and driven the development of related industries. In this article, we will analyze the development of tourism in depth through numerical understanding. The main conclusions from this article are as follows: (1) China's tourism market continues to expand and has great prospects for development, but the overall tourism consumption structure needs to be optimized and upgraded. (2) Tourism price is an important factor affecting tourism consumption, and in the

overall proportion, basic tourism consumption accounts for a high proportion, and nonbasic consumption, a small proportion, so the construction of entertainment and leisure places should be strengthened in the construction of tourism facilities to improve the overall satisfaction of tourists. (3) In the regression analysis model, the one-dimensional regression model and the multiple linear regression model were used to predict the amount of urban and rural residents' tourism, respectively, and the results obtained are well-fitted, and the number of tourists will exceed 8.3 billion in 2025, and the tourism revenue is close to 10 trillion yuan. (4) The main factors affecting the tourism market include the level of economic development in the source area, the tourism attractiveness of the tourism location, and unexpected events. However, there are still some shortcomings: (1) there are many factors affecting tourism, and it is difficult to make accurate predictions for unexpected events because there is no predictability. (2) The data are numerous and complicated, and the data obtained may be derived from different calibers, so the data need to be adjusted according to a uniform standard. (3) The system is still relatively accurate for short-term forecasting, but in the long term, it needs to further improve the accuracy, but how to improve the accuracy needs to be further studied.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The author declares that there are no conflicts of interest with respect to the research, authorship, and/or publication of this article.

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