

Analysis on Trend Forecast of E-Commerce Transaction Volume—Taking Zhejiang Province as an Example

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Abstract

As a brand-new business transaction model, e-commerce has gradually become the most active economic field in the national economy. The grey prediction model that can reasonably predict the e-commerce transaction volume in the next few years is used in this paper to forecast the e-commerce transaction volume in Zhejiang Province. The results show that Zhejiang E-commerce will continue to develop rapidly in the next few years and will become an important economic growth point in Zhejiang Province. According to the research results, several specific policies and measures are proposed to provide suggestions and references for the development policy of Zhejiang e-commerce at this stage.

Keywords

E-commerce transaction volume; Grey prediction model; Countermeasure proposal.

1. Introduction

E-commerce will build a new framework of economic and trade system in twenty-first century, and it is also the application direction of future network development. The development of electronic commerce is of great strategic significance for the country to realize the cross regional economic development, to realize the information driven industrialization and to enhance the national competitiveness. In recent years, Zhejiang has paid great attention to the development of e-commerce. The construction of e-commerce infrastructure, the consumption level of residents, and the upgrading of e-commerce market have made great progress. The analysis of the trend forecast of e-commerce trading volume in Zhejiang can provide the decision basis for the government to make strategic and planning policies, and provide reference for the decision of the enterprise managers and the future direction of development.

As early as the 90s of last century, scholars in some countries studied e-commerce, and the theoretical research on e-commerce was increasing. In 2000, the European Union launched the electronic European action plan, which mentioned the plan to promote the development of e-commerce, and collect and analyze the electronic commerce data of 18 countries, including the member countries, so that the government could grasp the decision. Hartmut (2002) used the qualitative research method (Delphy method) to predict the development of the German e-commerce. By comparing with the theoretical expectation, he established the prediction model of the German B2B market development, which provided the theoretical basis for the future empirical research on e-commerce forecasting[1]. Piotr kulyk, Mariola Michalowska (2016) used the electronic customer model to analyze consumer behavior in Poland's e-commerce market[2]. Wang Dongfeng (2014) analyzed the influencing factors of e-commerce transaction volume in China by means of grey correlation analysis[3]. Li Honglei and Wang Dechuang (2016) used the combination of grey theory and RBF neural network algorithm to predict future e-commerce transactions, and compared the forecast results with the single GM (1,1) model and the RBF neural network model to get higher accuracy[4]. Zhang Diping and Zhang Lin (2017) analyzed the current situation of electronic commerce in Zhejiang Province, constructed a

comprehensive evaluation index system for the development level of electronic commerce, and established the quantitative analysis of the measurement model on the contribution degree and the influencing factors of e-commerce to promote the economic development of Zhejiang Province[5]. Based on the research of relevant scholars, this paper will use grey prediction model that can reasonably predict the e-commerce transaction volume in the next few years to forecast and analyze the e-commerce transaction volume in Zhejiang Province.

2. The current situation of e-commerce in Zhejiang

In recent years, with the attention and support of Zhejiang Provincial Committee and provincial government, the e-commerce of Zhejiang has made rapid development, the scale of e-commerce market is expanding rapidly, the application degree is constantly popularizing, the operation format is increasingly rich, the supporting support is gradually perfected, and the degree of industrialization is increasing, which has become an important growth point of Zhejiang economy.

According to the data provided by the China Internet Information Center and the e-Business Research Center, the volume of e-commerce transactions in Zhejiang has increased year by year in 2010-2015, especially in 2013-2015, the volume of e-commerce transactions has increased rapidly. In 2016, the amount of e-commerce transactions in Zhejiang reached 3 trillion and 650 billion yuan, which contributed greatly to Zhejiang's GDP. In 2017, the network retail volume of Zhejiang province reached 13336 billion yuan, up 29.4% from the same year, of which the cross-border network retail export was 43 billion 810 million yuan, and the region in the province maintained a good trend of rapid development.

The rapid development of e-commerce in Zhejiang province has not only promoted the economic growth of Zhejiang Province, but also promoted the concept of Zhejiang residents' online consumption. The net consumption of Zhejiang residents has also increased year by year, especially in 2015-2017, and the consumption structure has been accelerated.

Overall, the development of e-commerce in Zhejiang is in the leading position in the whole country, and a more complete electricity supplier industrial system has been formed. The enterprises represented by Alibaba and Taobao, as well as the third party trading platform of e-commerce, are developing rapidly. The application of e-commerce in small and medium enterprises has been popularized. The popularity of e-commerce in all areas of the economy has been increasing, and e-commerce has become a booster for the development of private enterprises.

3. Grey prediction model

The grey prediction is based on the existing data to predict the future development trend. It is mainly handled by the GM (1,1) model in grey system theory.

Set the known reference data as

$$x^{(0)} = (x^{(0)}(1), x^{(0)}(2), \dots, x^{(0)}(n)).$$

Make a sequence of accumulating (AGO) generating series

$$\begin{aligned} x^{(1)} &= (x^{(1)}(1), x^{(1)}(2), \dots, x^{(1)}(n)) \\ &= (x^{(1)}(1), x^{(1)}(2) + x^{(0)}(2), \dots, x^{(1)}(n-1) + x^{(0)}(n)) \end{aligned} \quad (1)$$

$$\text{In which } x^{(1)}(k) = \sum_{i=1}^k x^{(0)}(i) \quad (k = 1, 2, \dots, n).$$

Get the mean number sequence

$$Z^{(1)}(k) = 0.5x^{(1)}(k) + 0.5x^{(1)}(k-1), \quad k = 2, 3, \dots, n$$

$$\text{Then } Z^{(1)} = (Z^{(1)}(2), Z^{(1)}(3), \dots, Z^{(1)}(n)).$$

So the grey differential equation is set up as follows:

$$x^{(0)}(k) + aZ^{(1)}(k) = b, \quad k = 2, 3, \dots, n$$

The corresponding whitening differential equation is

$$\frac{dx^{(1)}}{dt} + ax^{(1)}(t) = b \tag{2}$$

$$\text{Set } u = (a, b)^T, Y = (x^{(0)}(2), x^{(0)}(3), \dots, x^{(0)}(n))^T, B = \begin{bmatrix} -Z^{(1)}(2) & 1 \\ -Z^{(1)}(3) & 1 \\ \vdots & \vdots \\ -Z^{(1)}(n) & 1 \end{bmatrix}$$

The least squares method is used to achieve the minimum value of $\hat{u} = (a, b)^T = (B^T B)^{-1} B^T Y$.

$$x^{(1)}(k+1) = (x^{(0)}(1) - \frac{b}{a})e^{-ak} + \frac{b}{a}, \quad k = 1, 2, \dots, n-1 \tag{3}$$

Then the forecast value is

$$x^{(0)}(k+1) = x^{(1)}(k+1) - x^{(1)}(k), \quad k = 1, 2, \dots, n-1 \tag{4}$$

4. The forecast of e-commerce trading volume

Because the grey prediction model does not need a large number of samples, and the related data of e-commerce transactions in Zhejiang province are less, so this paper uses the grey forecasting model to predict the e-business transaction volume in Zhejiang province. Through the official website and calendar Yearbook, we collected and collated Zhejiang e-commerce transaction volume in 2010-2016 (See table 1, $x^{(0)}$ represents the original sequence). Then we solve the grey prediction model.

Table 1 Zhejiang e-commerce transaction volume in 2010-2016

Year	2010	2011	2012	2013
Serial number	1	2	3	4
$x^{(0)}$	0.696	0.870	1.290	1.600
$x^{(1)}$	0.696	1.566	2.856	4.456
Year	2014	2015	2016	
Serial number	5	6	7	
$x^{(0)}$	2.180	2.810	3.650	
$x^{(1)}$	6.636	9.446	13.096	

By calculation, we have

$$B = \begin{bmatrix} -1.131 & 1 \\ -2.211 & 1 \\ -3.656 & 1 \\ -5.546 & 1 \\ -8.041 & 1 \\ -11.271 & 1 \end{bmatrix}, Y = \begin{bmatrix} 0.870 \\ 1.290 \\ 1.600 \\ 2.180 \\ 2.810 \\ 3.650 \end{bmatrix}$$

$$u = (a, b)^T = (-0.270066721, 0.632792425)^T$$

The prediction equation is obtained as

$$x^{(1)}(k+1) = 3.039096639e^{0.270066721k} - 2.343096639,$$

Finally, we get forecast results of Zhejiang e-commerce transaction volume in 2011-2020 (See Table 2).

Table 2 The forecast results in 2011-2020 (Trillion yuan)

Year	2011	2012	2013	2014	2015
Transaction volume	0.942	1.234	1.617	2.119	2.775
Year	2016	2017	2018	2019	2020
Transaction volume	3.636	4.763	6.240	8.175	10.710

Now we compare the forecast results of e-commerce transaction volume with the actual value in 2011-2016 (See table 3).

Table 3 Comparison between the predicted value and the actual value (Trillion yuan)

Year	Actual value	Predicted value	Relative error (%)
2011	0.87	0.942	8.28
2012	1.29	1.234	4.34
2013	1.60	1.617	1.06
2014	2.18	2.119	2.80
2015	2.81	2.775	1.25
2016	3.65	3.636	0.38

The comparison between the predicted results of e-commerce transaction volume and the actual value in 2011-2016 is shown in table 3.

From table 3, it can be seen that the error between the predicted value and the actual value is smaller, and the forecast results are close to the actual value, so the volume of e-commerce transaction in Zhejiang will grow rapidly in the next few years. By 2020, the e-business volume of Zhejiang province will reach 10 trillion and 710 billion yuan, which is in line with the development of electronic business in Zhejiang province.

5. Conclusion and suggestion

As a brand-new business transaction model, e-commerce has gradually become the most active economic field in the national economy. With the continuous expansion of the use of e-commerce and the depth of use, it has created a more open and competitive market for regional companies with its cross-temporal and global characteristics. This paper uses grey prediction model to forecast the volume of e-commerce transaction in Zhejiang Province. In the next few years, e-commerce in Zhejiang is still developing rapidly, and will become an important economic growth point in Zhejiang province. So we put forward the following suggestions: (1)The government and enterprises should take practical measures, vigorously develop the construction of electronic commerce infrastructure, increase the information construction, and increase investment in the logistics industry. The rapid and healthy development of the logistics industry will be counterproductive to the electronic commerce. (2) It is an important way for the development of electronic commerce in the future to develop rural e-commerce, to lead the domestic consumption of urban and rural consumption, to reshape the industrial structure and to promote the coordinated development of urban and rural areas. (3) The government and enterprises should establish and improve the network security and social credit system to solve the commercial credit problems existing in e-commerce transactions. Online retail should sell products to sell brand, improve the quality of its products, and enhance the credibility of users.

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