Research on the Competitive Relationship between JD.COM and Tmall Based on Lotka-Volterra Model

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Abstract: The paper presents the dynamic analysis of the market competition of the two main competitors of China's JD.COM and Tmall business platform using Lotka-Volterra model. According to the analysis results of the model, the Lotka-Volterra model in the analysis is suitable for the competitive market, the Logistic model has a better fitting degree. From the analysis of the results, the JD.COM exceeds Tmall in the development of power and expands the market share, and it obtains substantial gains in the process of imitation innovation; And the competition between JD.COM and Tmall is the prey-predator relationship, although the gap between JD.COM and Tmall is narrowing, in recent years, there will be no equilibrium point, there is a big gap between the two.

1. INTRODUCTION

The accelerating process of globalization, the market environment changes unpredictably, the industry is very competitive, the government has been increasing in the field of electronic commerce in support of the development of China's e-commerce market soon, trading volume rapid growth. According to the Ministry of Commerce statistics, by the end of 2016, China's e-commerce transaction volume is expected to reach 22 trillion yuan, of which online retail sales reached 5 trillion and 500 billion yuan, accounting for 12.6% of total retail sales of consumer goods. The number of Internet users in China is growing rapidly. As of the end of 2016, China's Internet users reached 731 million, the popularity rate reached 53.2%, and the number of online shopping users reached 467 million, accounting for 63.8% of the proportion of Internet users. At present, China's e-commerce has entered a new era. In the fast changing Internet era, the innovation of business models is an important task for e-commerce enterprises to maintain their advantages in the fierce competitive environment. At present, China's B2C market is still Tmall leader, JD.COM ranked second, while there are many other e-commerce companies, and Tmall and JD.COM business model innovation and innovation between the relationship. Therefore, the research on the competitive relationship between enterprises in e-commerce platform provides a new way of thinking and direction for people to understand the e-commerce industry more comprehensively.

2. LITERATURE REVIEW

The Lotka-Volterra model is based on the Logistic curve, and is the extension of the Logistic model in the process of competing non single species in the system. The competition model Lotka-Volterra in biology is introduced into the market competition diffusion, which provides a good way to solve the relationship in the market competition [1-2]. Lee et al. (2005) analyzed the dynamic competition relationship of stock market with Lotka-Volterra model, and proved that the role of competitors would change over time [3-5]. Kim, Lee, Ahn (2006) through the Lotka-Volterra model to study the mobile communication market and find a symbiotic relationship between competitors [6]. The other (2009) research management competition based on Lotka-Volterra model Morgan Taiwan stock index futures and futures contracts showed that with continuous change of competitiveness and market capacity, market competition is also constantly changing [7]. Roeger (2005) pointed out that e-commerce business model can be copied easily, the market is often dynamic competition environment innovators and imitators coexist, single subject innovation diffusion model to reflect the dynamic competition, his views and Armstrong (2006) using Lotka-Volterra model to analysis the premise of many competitors agree without prior without previous consultation [8-9]. By reading the relevant literature, this paper is to model and dynamic competition imitators as a starting point, to the electricity supplier platform in the field of electronic commerce in China as an example, using the Lotka-Volterra model analysis of China's B2C business platform of dynamic competition, put forward the following three questions and solutions are given: (1) using Lotka-Volterra model to estimate the demand function of the retail market of electronic commerce in China; (2) analysis of the relationship between the competition in the field of electronic commerce B2C business platform dynamic in China; (3) according to the characteristics of dynamic competition between analysis and stability of equilibrium point demand function. Through quantitative analysis, we can clearly and accurately reflect the competition pattern of the retail online shopping market in China, which is composed of imitators and imitators, and make clear the relationship between competitors.

related links in general. For the Internet background of the rookie logistics, the establishment of Sky-net does not exist any technical difficulties, but to establish a complete and efficient network platform is not easy to complete between the times, it requires a large number of

early Government negotiations, take the land, build warehousing. Once the accumulation of a large number of land, and sometimes difficult to systematically developed, it may be accused of fabricating excuses, involved in real estate development rather than the real main business logistics warehousing. At this point a series of policy support may be suspended or suspended may be. The Ministry of Commerce has been targeted for individual electricity business logistics companies deviate from their own direction, hoarding a large number of land behavior criticized. Therefore, the ability to clear their own development direction, to avoid some problems on the deviation, with the government departments to communicate well will determine whether the enterprise can obtain sustained policy support.

3. BUILD MODELS AND DATA ANALYSIS

3.1 Lotka-Volterra of model

The characteristics of China's retail online shopping market in line with the Lotka-Volterra model setting conditions, in the B2C business platform domain, there are two major competitors are JD.COM and Tmall. There are a number of B2C e-commerce sites in the retail market occupies a small part of the online shopping share, not because of them as the main object of study: JD.COM and Tmall species competition interaction parameter, which indicates the presence of p_1, the diffusion process is the interaction of the p_2. According to the actual situation of the survey data, most of them are based on discrete time series, and the data required by the Lotka-Volterra model must conform to the characteristics of continuity. The model is transformed into a model that conforms to the discrete data as follows:

$$P_1(t+1) = \frac{\lambda_{p_1} p_1(t)}{1+\beta_{p_1} p_1(t)+\gamma_{p_1} p_2(t)} \quad (1)$$

$$P_2(t+1) = \frac{\lambda_{p_2} p_2(t)}{1+\beta_{p_1} p_2(t)+\gamma_{p_2} p_1(t)} \quad (2)$$

In equation (1) as an example, λ_{p_1} and beta β_{p_1} is a species of p_1 (JD.COM) when the Logistic parameters alone when the gamma γ_{p_1} on behalf of the species of p_1 (JD.COM) the ability of growth effects on other species. The meaning represented by a sign in formula (2) is the same as formula (1). In the process of discretization, formula and formula (1) - (2) expressed by the following formula corresponding to a number of parameters after transformation:To make the above equation must meet the full significance of lambda$\lambda_{p_1} >$, $\lambda_{p_2} > 0$ and lambda $\lambda_{p_1} \neq 1$, $\lambda_{p_2} \neq 1$, it can be concluded that the L_1 and γ_{p_1} , L_2 and γ_{p_2} conclusion of the same sign in:

$$\mathrm{M} = \frac{L_1}{\beta_{p_1}} = \text{Attacker advantage}$$

$$\mathrm{N} = \frac{L_2}{\beta_{p_2}} = \text{Defenders counter attack}$$

3.2 Lotka-Volterra Model parameter estimation

According to the characteristics of the Lotka-Volterra model to estimate the demand function Chinese B2C market, the first equation (1) and estimate equation (2) by the number of relationships. The final demand function. According to the features of the data using nonlinear least squares estimation in Eviews3.0 equation (1) and (2) equation parameters in the convergence of standard value is set to 0.001, if the highest percentage of its variation coefficient is less than 0.1%, then the iteration stops. Cumulative demand estimates for JD.COM and Tmall from the first quarter of 2013 to the second quarter of 2016. The demand function that is S growth in this period of time the JD.COM and Tmall two company development, meet the initial requirements of the Lotka-Volterra model, by calculating the parameter estimation results are shown in table 1and table2 are as follows.

Table 1 discrete estimation of Lotka-Volterra model parameters

parameter	Estimated value	p
λ_{p_1}	1.456	0
β_{p_1}	0.0347	0.03
γ_{p_1}	-0.023	0.04
R^2	0.998111	
SSR	3.348932	

Table 2 discrete estimation of Lotka-Volterra model parameters

parameter	Estimated value	p
λ_{p_2}	1.374	0
β_{p_2}	-0.007	0.04
γ_{p_2}	0.0122	0.03
R^2	0.99885	
SSR	3.10797	

The parameters of Logistic curve estimation result of Lotka-Volterra model in competitive markets, two electricity supplier companies and single species monopoly market is estimated to do comparison, applicability and estimation accuracy of Lotka-Volterra model to further explore the competitive diffusion problem in a dynamic market. The estimation results of the Logistic model are shown in table1-2. The Logistic model is as follows:

$$y = \frac{1}{\frac{1}{u}+m_0 m_1^x} \quad (3)$$

Table 3 Logistic model parameter estimation

JD.COM		
parameter	Estimated value	p
m_{0p_1}	0.346	0
m_{1p_1}	0.812	0
F	155.46	0
R^2	0.928	

Table 4 Logistic model parameter estimation

Tmall		
parameter	Estimated value	p
m_{0p_2}	0.547	0
m_{1p_2}	0.777	0
F	240.98	0
R^2	0.953	

Seen from the comparison of the two models, the Lotka-Volterra model of market B2C business platform fitting effect is better than Logistic model (0.928<0.953) is also described in the B2C online shopping retail market, JD.COM and Tmall mutual influence is very obvious. The above results show that the Lotka-Volterra model is more suitable for the study of competitive market dynamics.

4. EQUILIBRIUM AND STABILITY ANALYSIS

Analysis of competitive track can provide dynamic balance of information and changes over time through the Lotka-Volterra model.

$$\frac{d\alpha_{p_1}}{dt} = 0 \qquad \frac{d\alpha_{p_2}}{dt} = 0 \qquad (4)$$

Equation (6) means that when the JD.COM and Tmall reach equilibrium, the growth rate is 0, thus the following equations are obtained:

$$\alpha_{p_1} p_1 - k_{p_1} p_1^2 - L_{p_1 p_2} p_1 p_2 = 0 \qquad (5)$$

$$\alpha_{p_2} p_2 - k_{p_2} p_2^2 - L_{p_2 p_1} p_2 p_1 = 0 \qquad (6)$$

Solution equation (7) obtains the following solution:

$$p_1 = \frac{\alpha_{p_1} - L_{p_1 p_2} p_2}{k_{p_1}} \qquad p_2 = \frac{\alpha_{p_2} - L_{p_2 p_1} p_1}{k_{p_2}} \qquad (7)$$

Take the value into the equation (7) and get the following analytic relation. Therefore, there is no balance between the two competition companies in the future. According to the analysis of dynamic competition at present, the JD.COM market share is difficult to grow, if not to break the existing business model innovation, its sales growth will slow further, the gap between JD.COM and Tmall will be more and more. JD.COM will hardly surpass Tmall.

5. CONCLUSIONS

Through the competition diffusion model on the market Lotka-Volterra platform B2C online shopping and Chinese competition analysis, get the fitting effect is very good for data processing, results show that the applicability of the model to the B2C business platform, analysis of a B2C business platform competition dynamic good try. The Lotka-Volterra model is introduced in the field of electronic commerce B2C analysis, using the model of dynamic competition on B2C in the field of big two JD.COM and Tmall, the conclusions are as follows: (1) through the analysis of the dynamic relationship between Lotka-Volterra model of JD.COM and Tmall is effective, the results of parameter fitting test shows that the parameters of Lotka-Volterra model are estimated through the inspection. From the current market demand function form Lotka-Volterra model estimation results well explain the internal market advantage and development of JD.COM that imitate innovator at the beginning of the business problems, also shows that the strong performance of Tmall rely on the service innovation of its parent company Alibaba as the core competitiveness in the competition in the market. (2) JD.COM and Tmall, an imitator and innovator of B2C electronic business platform market, fully demonstrates the typical relationship between predator and predator. By quantitative analysis of the periodic data, the results show that the JD.COM is unlikely to have a rapid growth in the present situation. Therefore, JD.COM also want to have a fast market share, it is necessary to constantly improve their own scientific and technological innovation and service innovation. (3) according to the current data, there is no balance between JD.COM and Tmall in the competitive market, and the two platforms will continue to grow according to the existing business model, and the gap will gradually increase

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