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Study of Service Trade Based on Multiple Linear Regression

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Abstract:

Service trade is a key part of the economic system. This passage aims to use the multiple linear regression model and the least square method to figure out the factors, which would influence the development of the service trade. In addition to that the author lists the data during the recent years to make sure the correctness and rigor of the article. The article will use China as the experimental subject, in order to analyze the current situation of the service trade markets. The reason why the passage would like to study this question is attributed to that there are some faults in the service trade market. For example, the unreasonable planning, the misuse of the staff. The article found that there is the shortage of relevant talents, and the service trade has a negative correlation between itself and the other trades. As a result, the service trade markets will learn about the detailed issue, so that the people in the service trade industry will take the appropriate measures to promote the development of service trade industry. Since many of the service trade companies will face certain kinds of the problems, so the passage aims to provide some reliable method to help the companies avoiding the problems.

Keywords: Least square method, Service trade market, Multiple linear regression model.

1. Introduction

Over the past decade, since the improvement of service trade method, the industry of it experienced an enormous and deep change. There are some valuable information that were researched. Also, in the history of development of economics, service trade has been a essential factor of Chinese economy. Even the significant progress made in Chinese trade industry, the obvious essential gap still exists in the understanding of service trade markets. Compared with Chinese merchandise trade, the development of service trade in China is lagging behind the former. Even though the growing rate of China is not short. With a policy environment adjusted in China's 12th 5-Year Plan, there is a highly essential impact of China's service trade to both China and the global economy, this situation is more likely under the prospective development strategy. The service trade industry in China already had large impacts on China's economic growth, employment, and technology diffusion. This passage suggest that even more major impacts will follow in

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the years to come and that there are implications for global trade, FDI, and labor migration [1]. The findings of this study can inform policy makers and practitioners in the service trade industry.

Unlike the previous studies that primarily focused on normal liberal art, this passage would like to use the least square method and the multiple linear regression model to analysis and assess the development of Chinese trade service in the future. At the same time the author would like to table some feasible proposals to explain why the negative factors happens, and how to solve these problems [2].

The paper would give the method that the author would use to calculate the result, which is the methods and theory. Then the paper would like to list some tables that have some recent data to prove the authenticity of the passage, after the article would introduce the material problems and the solving methods of service trade industry. And the result that the paper suggests is nearly fair, so it can be a factual conclusion to use in the daily life. In order to let the staff in the service trade industry has a better solution to solve the problems, which they may face in the future, even the problems that is happening.

2. Methods and Theory

2.1 Background Knowledge and Method

The author can use the multiple linear regression model and the least square method to calculate the answer of the problem that mentioned above. The linear regression model is a mathematical model which could determine the variable correlations. It uses the regression analysis in mathematical statistics to determine quantitative relationships of multifarious variables [3]. The formula of the regression linear regression model is

$$y = w'x + e, \tag{1}$$

where $w'x$ means the linear combination of independent variable, e means error term with $en(0,1)$ [4]. The most fundamental principle of the least square method is a mathematical optimization technique, which could minimize the square error and find the most suitable function matching of data. The formula of the least square method is

$$\hat{y} = \hat{b}x + \hat{a} \tag{2}$$

in which

$$b = \frac{\sum_{i=1}^{n}(x_i - x) + \left(y_i - \bar{y}\right)}{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)\left(x_i - \bar{x}\right)}, a = \bar{y} - b\bar{x}. \tag{3}$$

2.2 Analysis of Trade Status

The Table 1 collects the information of Trade export volume in China from 2000 to 2017.

Table 1. The information of Trade export volume in China from 2000 to 2017.

YEAR	Trade export volume		Trade import volume		Total trade volume	
2000	Service	Object	Service	2000	Service	Object
2001	305	2482	362	2001	306	2495
2002	312	2671	357	2002	312	2670
2003	384	3156	462	2003	399	3258
2004	463	4282	550	2004	463	4384
2005	623	5923	716	2005	620	5935
2006	741	7622	840	2006	746	7630
2007	914	9692	1002	2007	924	9692
2008	1221	12203	1303	2008	1223	12204
2009	1372	14308	1521	2009	1378	14312
2010	1434	12014	1598	2010	1441	12014
2011	1782	15780	1990	2011	1790	15778
2012	2011	18978	2481	2012	2015	18990
2013	2018	20487	2901	2013	2019	20487
2014	2070	22091	3310	2014	2073	22092
2015	2197	23420	4327	2015	2200	23523
2016	2184	22725	4357	2016	2184	22737

2017	2096	20876	4520	2017	2097	20980

The article choses the variable from Service industry market factors, Service trade demand conditions, Service related and supportive industries and Competitiveness of Service Trade, as the chosen standard. These four is $X_1X_2X_3X_4$, respectively. Then the paper starts to analyze. In addition to that, the paper uses the least square method model, linear regression result. After that, the author uses some tests to prove that the empirical model has a positive impact on the fitting degree of data. The paper uses the Multicollinearity test finds that the number of people those who engaged in service and the openness of service trade has no strong correlation. So, in the certain degree that it is possible that there is a Multicollinearity. Beside to that the people in job and the total salary of all local companies. Then the paper uses the White test to figure out if there is Heteroscedasticity test or not. The result illustrates that there is no Heteroscedasticity, after that the author uses Autocorrelation test to estimate if the model has Autocorrelation. Though Eviews, the result shows there is no correlation between the data.

3. Result and Application

3.1 Basic Datas

The paper uses multiple linear regression model and statistical tests to get the answer and data. The data in Table 2 is the result of linear regression, which is used for testing statistical significance. Table 3 is correlation coefficient matrix, the data in it is used to validate and revise the model. The data in Table 4 is the result that after correcting, which can show the accurate result.

Table 2. The data that will use in multiple linear regression model and statistical tests.

variable	estimators	Estimated standard deviation	T statistical	Two-tailed probability
b_0	-1.831	0.480	-3.813	0.001
x_1	-0.025	0.470	-0.051	0.959
x_2	0.578	0.163	3.538	0.003
x_3	0.450	0.083	5.362	0.000
x_4	0.297	0.23	1.278	0.220

Table 3. The data that will be use to calculate the result.

Correlation coefficient	Y	X_1	X_2	X_3	X_4
Y	1.000000	0.962065	0.984677	0.980368	-0.069660
X_1	0.962065	1.000000	0.986019	0.899086	-0.178560
X_2	0.983677	0.997009	1.000000	0.935618	-0.208011
X_3	0.980298	0.899086	0.925618	1.000000	0.062332
X_4	0.411085	-0.188560	0.140244	0.063232	1.000000

Table 4. The data that the article will use to explain the situation

variable	Parameter estimate	Estimated standard error	T-statistics	variable
C	-2.677	0.128	-20.766	C
x_2	0.507	0.030	16.392	x_2
x_3	0.525	0.036	14.409	x_3

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3.2 Regressive Analysis

The formula for the linear regression is

$$Y = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + U, \#(4)$$

Where U means Random Error term and b_i (i=1, 2, 3, 4) means model parameter [5]. By using the Least squares estimation model parameters, it is found that $Y = -1.831 - 0.025x_1 + 0.578x_2 + 0.45x_3 + 0.297x_4$. IN addition, $t = -3.813, -0.051, 3.538, 5.362, 1.278, R^2 = 0.998,$ $F = 1998.760, n = 20$. For the Goodness of fit test, t is Regression parameter significance test, R^2 is Determination coefficient of regression model, F is the data of Overall significance test of regression model, n is the sample size, all the data can be seen in the above graphs. Because of the coefficient of determination R^2 is 0.998, so it can be proven that the model has a positive influence on fitting degree. In the F test, the Null Hypothesis H_0: b_i=0, alternative hypothesis is not all zero. Since F =1999.760 is bigger than $F_{0.05}$(4, 15)=3.06, so the null hypothesis is rejected.

For the t test, the null hypnosis is H_0: b_i(i=1, 2, 3, 4) =0, the alternative hypnosis H_1: b_i is not equal to 0 (i=1, 2, 3, 4), in the Significance level of 5% $t_{0.025}$(15)=2.131, t(b_2)=3.538, t(b_1) =-0.52, t (b_4) =1.278, the absolute value of these all smaller than $t_{0.025}$ (15) respectively. It is found that Y =-2.677 +0.507 X_2 +0.525 X_3, t=(-20.765), (16.392), (14.409), R^2 =0.997, F=3684.573, n=20, t is the statistical data of Regression parameter significance test, R^2 is Determination coefficient of regression model. F is the statistical data of Overall significance test of regression model. n is sample size [6]. Though Eviews application, in the Significance level of 0.05, n R^2 =5.175, P=0.3949 is bigger than 0.05, so there is no heteroscedasticity. n is sample size , R^2 is coefficient of determination.

3.3 Result and Prediction of Future

Based on the graphs and formulas above, the passage could figure out that when the coefficient of variable $x_2 and x_3$ are bigger than zero, the staff salary, objects trade has a positive effect on the change of service trade. On average, for every 1% increase in personnel's wage level, the total amount of service trade increases by 0.507%: for every 1% increase in trade in goods, the total amount of trade in services increases by about 0.525%. However, the number of service industry practitioners and the openness of service trade do not play a significant and positive role in service trade.

First of all, in the process of empirical analysis, according to Table 3, it can be seen that the number of people engaged in the tertiary industry does not play a role in promoting the development of service trade. The coefficient is negative, and the test is not significant. The main reason is that due to the relative shortage of service trade talents in China, and also the problems which are related to the former, it is difficult for service trade to enter a higher level of development. For example, in the emerging field of service trade, including innovation, intellectual property rights, which need the staff in these fields have a highly professional knowledge [7]. As a result, there is a shortage of high-end talents in its industry. Secondly, the regression coefficient of the total goods trade variable is relatively low, which means that there is no obvious effect on the aspect of improving trade in services. Indicating that China's service trade has a weak linkage effect with its related industries and still needs to be further improved. So, it can be seen that all the industrial structure in the service trade industry are mutual check and balance. In the end, the coefficient of openness in trade in services is positive, but the test is not significant, which means the other industrial structure in the service trade industry has a positive and main effect, instead of the openness of it. Indicating that the degree of opening up of Chinese service trade needs to be further improved. The management policies of government departments are relatively strict, and there are relatively many restrictions on access to the service trade market, including policy, finance, technology and other fields, resulting in a certain degree of industry monopoly behavior in service trade, that leads to a result, in the market, it is extremely hard to innovate [7].

In the future, China should notice that the traditional trade service is no longer the main domain. So, trying to innovate the modern trade service is a highly significant. At the same time China should increase the corresponding capital investment continuously. In particular, one should increase investment in scientific innovation, which is owing to that innovation is the primary productive force. Only continuous innovation within the industry can provide development impetus for relevant industries, and capital investment creates a material premise for service trade innovation. In addition, the healthy development of any industry cannot be separated from the correct development concept and management system. Therefore, promoting new ideas about the modern trade service experience is also essential, since it can accelerate the development of relative industry [8]. Then, China should Strengthen the cultivation of high-quality service trade talents, takes the learning of basic professional theoretical knowledge as

the basic premise, also Improve the professional ability of service trade talents. In addition to that, China should Strengthen the linkage between service trade and related industries, in order to meet the orientation of enterprises related to goods trade, pay attention to the innovation and reform of enterprises in the related fields of the service industry, and then improve the synergy of trade in goods and services to create a favorable external environment. Improve the degree of opening up to the outside world. At the beginning, one should reasonably promote the gradual opening up of all aspects of service trade and promote the healthy competition of relevant enterprises. Strengthen the study of foreign countries is also a key factor for helping the development of service trade industry. At the same time, it provides impetus for the enterprise's own reform and brings a positive and positive effect to the innovation of related industries. Secondly, in the field of modern service trade, market access conditions should be moderately relaxed [9].

Only in this way can people better introduce and rationally use foreign capital, and enhance the positive role of foreign capital and advanced technology in promoting the transformation of the service trade structure. In the process of introducing foreign capital, one should not only pay attention to the growth of the quantity of foreign capital, but also pay attention to the substantial improvement of the quality of foreign capital and the direction of investment after the introduction of foreign capital [10]. High-quality foreign capital should be able to help technological innovation within the service industry and make substantial contributions to the internal restructuring of service trade.

4. Conclusion

In conclusion, this essay has argued that accelerating the development of modern service trade, Strengthen the cultivation of high-quality service trade talents, Strengthen the linkage between service trade and related industries, and improve the degree of opening up to the outside world are the best instrument to solve the problems of service trade industry. By using the multiple linear regression model and the least square method to calculate and estimate the result, also using the data during the last two decades to make sure the truth and validity of the paper. However, there are also some limitations in the passage, that is important to note. Especially in the promotional, since that it is hard to put into force in the short term. For instance, it is highly difficult to make the talents and foreign enterprise to accede to the service trade industry. Given that it will spend tones of labors, time, money, and the other implicit cost. The most formidable point is that if the employers would like to try the completely new method or not. Future research could explore how different factors, external visibility, conform to the latest trend of time, finding new potential customers and markets. Ultimately, keeping pace with the times, and to be an active learner of this complex issue is extremely essential to determine if the service trade industry will be better or not.

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