



The model study of the market impact of online takeout for catering industry

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Abstract: With the popularization of smart phones and the improvement of online payment channels, the OTO business model of catering industry has gradually become a new trend. In recent years, online takeout has been rapidly growing, which has brought great convenience to residents' food and beverage life, which has caused a certain impact on catering industry. We have established a regression analysis model for the impact of the market size of online takeout on catering industry revenue and the impact of online delivery on the revenue of catering industry. Use EVIEWS software the restaurant revenue as the online delivery of the size of the market, online delivery of user size increased with the increase of conclusions, and put forward the catering businesses shall be online take-out seize market opportunities, perimeter take-out platform should perfect service system. The results of model research can provide data analysis for catering industry.

Keywords: online takeout; The restaurant industry; Linear regression; The new retail

1. Background of model research

1.1 the status of OTO business development

OTO, as a new mode of e-commerce, has entered the business from all walks of life, solve the problem of the traditional quantitative business promotion effect, reduce the cost of the product and the communication with the customer cost even bring it down to zero, speed up progress of the product sales, especially with the advent of mobile network, OTO ranging from more and more widely, pushed to the whole country and the world [1].

1.2 development status of online delivery

With the advent of OTO commercial mode, reforming the traditional food and beverage, a growing number of food businesses to join online delivery platform, online delivery also gradually penetrated into people's life, and more customers to the company white-collar, groups such as students mainly [2]. There are four participants in the online delivery industry: takeout customers, takeout merchants, delivery platforms, and third party delivery. , according to the report [3] online reservation market since 2011, China has maintained relatively high growth, the size of the market in 2016 reached 166.24 billion yuan, in 2017, the size of the market reached 204.56 billion yuan, the growth rate of 23.1%, the size of the online delivery market in China to maintain steady growth trend, online catering takeout basic pattern has been formed, each big merchants formed between differentiated competition, profit model is more visual, user habits has been basically formed, online delivery market began to high expansion [4].

Take-out online market scale is one of the factors influencing the income of catering industry, online delivery of user scale is one of the factors influencing the number of consumers of catering industry, both of which belong to the online takeout form factor, so the online delivery of the size of the market, online delivery of user scale as explanatory variables affecting restaurant revenue, respectively, set up a yuan regression model,



the catering industry is analyzed on the relationship between income and online take-out ^[5].

2. The establishment of the regression model

2.1 selection of independent variables

For analysis of online delivery of the relationship between the size of the market and restaurant revenue selection is "restaurant meals income" as the explained variable, select "online delivery market scale", "online take-out user scale" as the explained variable, restaurant meals income data from the national bureau of statistics of the People's Republic of China, the online takeout market scale, the online takeout user data from China industry information network, select data from 2011 to 2016 as follows (see table 1).

Table 1 analysis data of restaurant fee income

Year	catering industry dining fee income Y/ 100 million yuan	online delivery market scale X1/ 100 million	online delivery user scale X2/ 100,000.
2011	3433.77	217.00	600.00
2012	3966.73	336.00	800.00
2013	4056.07	503.00	1100.00
2014	4120.20	861.00	1600.00
2015	4343.47	1250.00	2100.00
2016	4562.14	1662.00	2600.00

2.2 establishment of regression model

Preliminary analysis for restaurant meals revenue and online delivery market scale, restaurant meals income and online take-out user scale, the relationship between building restaurant meals online delivery market scale and scatter diagram (see figure 1), restaurant meals income and online take-out scatterplot user scale (see figure 2).

Figure 1. Scatter diagram of catering income and online takeaway market scale

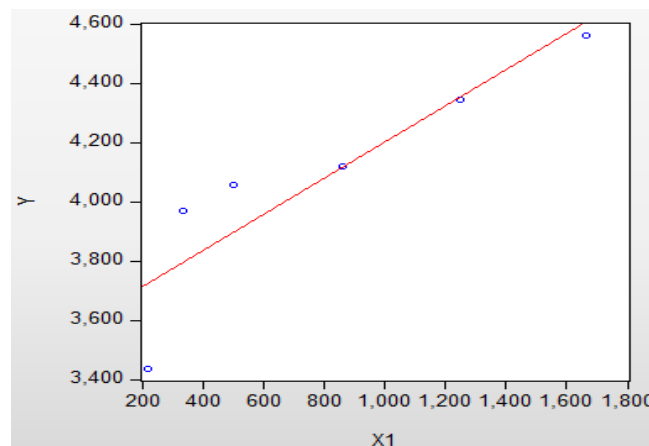
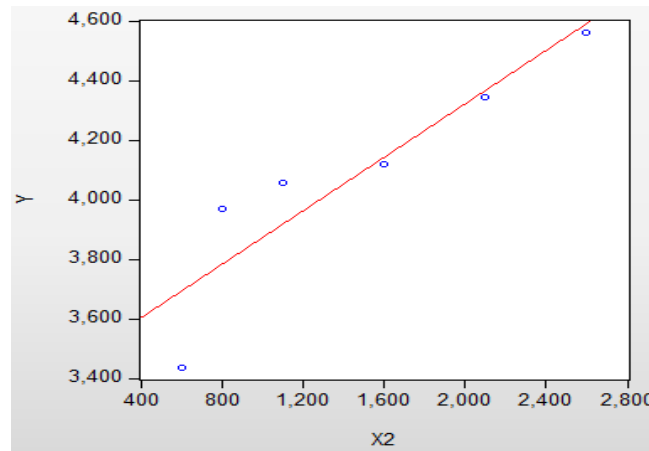




Figure 2. a scatter plot of restaurant meal fee income and online delivery user scale



As can be seen from the figure of a restaurant meal income online take-out increase with the increase of the size of the market, restaurant meals can be seen from the graph 2 as the online takeout users increase with the increase of the scale, thus establish restaurant meals revenue and online delivery market scale regression model (1), restaurant meals and take-out online user scale regression model (2) :

$$Y_{t,i} = \beta_{1,i} + \beta_{2,i} X_{t,i} + u_{t,i} \quad (1)$$

$$Y_{t,j} = \beta_{1,j} + \beta_{2,j} X_{t,j} + u_{t,j} \quad (2)$$

2.3 parameter estimation

The regression results of regression model (1) were obtained using EViews software (see figure 3) and regression results of regression model (2) (see figure 4).

Figure 3. regression model (1) regression results

Dependent Variable: Y				
Method: Least Squares				
Date: 04/27/18 Time: 19:08				
Sample: 1 6				
Included observations: 6				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3588.646	141.6633	25.33221	0.0000
X1	0.610997	0.148245	4.121531	0.0146
R-squared	0.809406	Mean dependent var	4080.397	
Adjusted R-squared	0.761757	S.D. dependent var	383.2770	
S.E. of regression	187.0779	Akaike info criterion	13.56213	
Sum squared resid	139992.5	Schwarz criterion	13.49272	
Log likelihood	-38.68639	Hannan-Quinn criter.	13.28426	
F-statistic	16.98702	Durbin-Watson stat	1.694350	
Prob(F-statistic)	0.014594			



Figure 4. regression model (2) regression results.

Dependent Variable: Y
 Method: Least Squares
 Date: 04/28/18 Time: 14:34
 Sample: 1 6
 Included observations: 6

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3421.362	163.4749	20.92897	0.0000
X2	0.449342	0.100296	4.480166	0.0110
R-squared	0.833831	Mean dependent var		4080.397
Adjusted R-squared	0.792289	S.D. dependent var		383.2770
S.E. of regression	174.6798	Akaike info criterion		13.42499
Sum squared resid	122052.2	Schwarz criterion		13.35557
Log likelihood	-38.27496	Hannan-Quinn criter.		13.14712
F-statistic	20.07189	Durbin-Watson stat		1.836988
Prob(F-statistic)	0.010988			

The parameter estimation and test results of regression model (1) are as follows:

$$\hat{Y}_{ti} = 35688.646 + 0.610997 X_{ti}$$

$$(141.6633) (0.148245)$$

$$t_i = (25.3322) (4.1215)$$

$$R_i^2 = 0.8094 \quad F_i = 16.9870 \quad n_i = 4$$

The parameter estimation and test results of regression model (2) are as follows:

$$\hat{Y}_{tj} = 3421.362 + 0.449342 X_{tj}$$

$$(163.4749) (0.100296)$$

$$t_j = (20.9290) (4.4802)$$

$$R_j^2 = 0.8338 \quad F_j = 20.0719 \quad n_j = 4$$

3. Model test

3.1 test of the regression model (1) of the scale regression model of catering industry and online takeaway market

3.1.1 economic significance test

Estimated parameters $\hat{\beta}_{1i} = 3588.646$; $\hat{\beta}_{2i} = 0.610997$. the result indicates that the online delivery market size increases by 100 million yuan, and the catering industry revenue will increase by 0.610997 billion yuan.



3.1.2 test of goodness of fit

By figure 3 regression results by the model of determination coefficient of 0.8094, and explain the variable "online delivery market scale" to be explained variable "restaurant meals income" explains most of the differences.

3.1.3 t-test of regression coefficient

For the $H_0 : \beta_{1i} = 0$ and $H_0 : \beta_{2i} = 0$ The standard error of estimated regression coefficients $\hat{\beta}_{1i}$ and the value of t_i are: $SE(\hat{\beta}_{1i}) = 141.6633$; $t(\hat{\beta}_{1i}) = 25.3322$.The standard error of estimated regression coefficients $\hat{\beta}_{2i}$ and the value of t are: $SE(\hat{\beta}_{2i}) = 0.1482$, $t(\hat{\beta}_{2i}) = 4.1215$.For $\alpha = 0.05$, check the distribution table of t and find the degrees of freedom is: $n_1 - 2 = 6 - 2 = 4$.Its proximity is $t_{0.025}(4) = 2.776$

$t(\hat{\beta}_{1i}) = 25.3322 > t_{0.025}(4) = 2.776$. So $H_0 : \beta_{1i} = 0$ should be rejected

$t(\hat{\beta}_{2i}) = 4.1215 > t_{0.025}(4) = 2.776$.So $H_0 : \beta_{2i} = 0$ should be rejected

This shows that the scale of online delivery market has a significant impact on catering income.

3.2 the test of the regression model (2) of the catering fee income and the online delivery user scale (2)

3.2.1 economic significance test

The estimated parameters $\hat{\beta}_{1j} = 3421.362$, $\hat{\beta}_{2j} = 0.449342$.The result indicated that the online delivery users increased by 100 million yuan, and the catering industry revenue increased by 0.44934.2 billion yuan.

3.2.2 test of goodness of fit

By figure 4 regression results by the model of determination coefficient of 0.8338, and explain the variable "take-out online user scale" to be explained variable "restaurant meals income" explains most of the differences.

3.2.3 t-test of regression coefficient.

For the $H_0 : \beta_{1j} = 0$ and $H_0 : \beta_{2j} = 0$ The standard error of estimated regression coefficients $\hat{\beta}_{1j}$ and the value of t are: $SE(\hat{\beta}_{1j}) = 163.4749$, $t(\hat{\beta}_{1j}) = 20.9290$; The standard error of estimated regression coefficients $\hat{\beta}_{2j}$ and the value of t are: $SE(\hat{\beta}_{2j}) = 0.1003$, $t(\hat{\beta}_{2j}) = 4.4802$; For $\alpha = 0.05$, check the distribution table of t and find the degrees of freedom is: $n_1 - 2 = 6 - 2 = 4$.Its proximity



is $t_{0.025}^{(4)} = 2.776$

$t(\hat{\beta}_{1j}) = 20.9290 > t_{0.025}^{(4)} = 2.776$. So $H_0 : \beta_{1j} = 0$ should be rejected

$t(\hat{\beta}_{2j}) = 4.4802 > t_{0.025}^{(4)} = 2.776$.So $H_0 : \beta_{2j} = 0$ should be rejected

The results show that the online delivery user scale has a significant impact on catering income.

4. Conclusion of model research

Restaurant meals income and online take-out regression analysis of the dimension of the size of the market and users, according to the results of online delivery to a certain extent, promote the development of the catering industry, impact on the market. As a new retail mode of catering industry, online takeout has promoted the consumption times and will of consumers and promoted the national economy. For restaurant operators, online delivery not only offers the platform to improve the quality of business performance and management, and from the service form to broaden access to consumers for food.

5. Suggestions

5.1 Suggestions for catering operators

Restaurant operators should be timely grasp new retail business opportunity, seize the opportunity at the same time, more should pay attention to standardize management, conscience, good at discovering online take-out and actively to correct the problems in the management process, improve their own service system, improve consumer experience

5.2 recommendations for online delivery platforms

Online delivery platform in profits at the same time, should also constantly repair platform services vulnerabilities, perfect service and trade system, improve meal delivery efficiency, prudent choice cooperation meal, the pursuit of innovation, for online delivery of development in the future to lay a solid foundation.

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