Application of Multiple Linear Regression in Campus Satisfaction

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***Abstract*— Campus satisfaction is an important basis and dimension for building a harmonious campus. This paper studies campus satisfaction by using multiple linear regression analysis. The author selected 7 factors that affect satisfaction and obtained relevant data through questionnaire survey. After pre-processing the data, SPSS22.0 software was used for multiple linear regression analysis, and the non-significant variables were eliminated one by one by backward culling method to screen out several factors that were significant to campus satisfaction, and finally the optimal regression equation was obtained. To provide some theoretical support for improving university satisfaction**

***Index Terms*— multiple linear regression; Campus satisfaction; SPSS**

I. INTRODUCTION

Campus satisfaction is the students' overall cognitive evaluation of their most campus life or continuous campus life according to their living standards. It is an important parameter to evaluate the quality of life of college students. Research on campus satisfaction is conducive to improving students' physical and mental health, improving their living standards, and playing a crucial role in building a harmonious campus [1].

College students' satisfaction with their own campus is a problem that colleges and universities should pay attention to, which will affect the enthusiasm of students and the reputation of the school. Therefore, it is particularly important to study campus satisfaction [2]. In recent years, many experts and scholars at home and abroad have used different methods to study college students' campus satisfaction. CAI shuguang [3] used Spearman correlation coefficient to study campus life satisfaction. Zhang yan [4] applied variance analysis to study campus life satisfaction.

Multiple linear regression is to solve the problem of multiple factors and explore the factors with strong correlation with the phenomenon. It is widely used in medicine, construction engineering, finance and education. For example, zhang erli [5] used multiple linear regression method to analyze the satisfaction of library readers. Wang xianghua [6] used multiple regression to predict the risk of stroke.

In this paper, multiple linear regression analysis is applied to study campus satisfaction. The most significant factors of campus satisfaction were obtained, and a multivariate linear model was established to provide theoretical support for improving the satisfaction of colleges and universities.

II. MULTIPLE LINEAR REGRESSION ANALYSIS

2.1 establishment of multiple linear regression model

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Let's say that $x_1, x_2, \cdots x_m$ is linearly dependent on Y. n sets of data $(y_t, x_{t1}, x_{t2}, \cdots x_{tm})$ $(t = 1,2,\cdots n)$ collected. Satisfy the following regression model:

$$\begin{cases} y_t = \beta_0 + \beta_1 x_{t1} + \cdots + \beta_m x_{tm} + \varepsilon_t (t = 1,2,\cdots n) \\ E(\varepsilon_t) = 0, D(\varepsilon_t) = \sigma^2, Cov(\varepsilon_i, \varepsilon_j) = 0 (i \neq j) \\ \text{or } \varepsilon_t \sim N(0, \sigma^2), \text{mutual independen ce} \ (t = 1,2,\cdots n) \end{cases} \quad (1)$$

$$Y = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{bmatrix}, \beta = \begin{bmatrix} \beta_0 \\ \beta_1 \\ \vdots \\ \beta_m \end{bmatrix}, \varepsilon = \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_n \end{bmatrix}.$$

Then the matrix form of regression model (1) is:

$$\begin{cases} Y = C\beta + \varepsilon \\ E(\varepsilon) = 0_n, D(\varepsilon) = \sigma^2 I_n \end{cases} \quad (2)$$

Or

$$\begin{cases} Y = C\beta + \varepsilon \\ \varepsilon \sim N_n(0, \sigma^2 I_n) \end{cases} \quad (3)$$

The model (2) or (3) is called a classical multiple linear regression model [7], where Y is an observable random vector ε is an unobservable randomis an unobservable random vector (random disturbance),C is a known matrix, β, σ^2 is an unknown parameter,and parmeter,and $n > m$ $rank(C) = m + 1$

III. APPLICATION OF MULTIPLE LINEAR REGRESSION ANALYSIS IN CAMPUS SATISFACTION

3.1 questionnaire survey and data processing

There are many factors affecting campus satisfaction, among which 7 are selected in this paper: a. campus facilities and environment; b. campus recreational activities; c. restaurants, catering and sanitation; d. dormitory distribution and environment; f. school management and measures; f. teaching quality and atmosphere; g. graduation employment and planning [8].

The explanatory variable selected in the paper is the satisfaction of student Y

The explanatory variables selected in this paper are:

1. X_1 students' satisfaction with campus facilities and environment is used to reflect the influence of

campus facilities and environment on campus satisfaction.

2. X_2 students' satisfaction with campus recreational activities is used to reflect the influence of campus recreational activities on campus satisfaction.
3. X_3 students' satisfaction with the catering and hygiene of the restaurant is used to reflect the impact of catering and hygiene on campus satisfaction.
4. X_4 students' satisfaction with dormitory allocation and environment reflects the influence of dormitory allocation and environment on campus satisfaction.
5. X_5 students' satisfaction with school management and measures is used to reflect the impact of school management and measures on campus satisfaction
6. X_6 students' satisfaction with teaching quality and atmosphere reflects the influence of teaching quality and atmosphere on campus satisfaction.
7. X_7 students' satisfaction with graduation employment and planning is used to reflect the influence of graduation employment and planning on campus satisfaction.

This paper obtained data through the form of questionnaire. There were 23 questions in the questionnaire, with 2 to 4 questions for each factor. The score for this factor is the average score of these questions [9]. The respondents were mainly students from a certain university. A total of 180 questionnaires were distributed and 150 were collected, among which 128 were valid.

3.2 establishment and analysis of the model

establish multiple linear regression model

$$y_t = \beta_0 + \beta_1 x_{t1} + \beta_2 x_{t2} + \beta_3 x_{t3} + \beta_4 x_{t4} + \beta_5 x_{t5} + \beta_6 x_{t6} + \beta_7 x_{t7} + \varepsilon_t$$

Where $t = (1,2,\cdots n)$, ε_t is the random sample error term, which satisfies $E(\varepsilon_t) = 0$ and $\varepsilon_t \sim N(0,\sigma^2)$.

SPSS22.0 software was applied to perform multiple linear regression analysis on the data in schedule 1, and the results were shown in table 1-2:

Table 1 Analysis of Variance

model	Sum of squares	df	Mean square	F	significant
regression	6349.284	4	1587.321	19.740	.000[b]
residual	9890.685	123	80.412		
total	16239.969	127			

Dependent variable：y

Predictive value：x7, x4, x1, x6

Table 2 Coefficient

model	Nonstandardized coefficient		Standardization coefficient	T	significant
	B	Standard error	Beat		
1 (constant)	16.463	7.873		2.091	.039
*X*1	.229	.101	.182	2.266	.025
*X*2	.256	.093	.209	2.760	.007
*X*3	.175	.073	.259	2.395	.018
*X*4	.174	.068	.260	2.550	.012

Dependent variable：y

From table 1, it can be determined whether the regression equation is significant, where $P(Sig) = 0 < 0.05$, so the regression equation is significant.

From table 2, the estimation and significance of regression coefficient can be obtained. It can be seen from table 2 that $P < 0.05$ of X_1, X_4, X_6, X_7 has a significant influence on *Y*, and the regression coefficients of independent variables are 0.229, 0.256, 0.175 and 0.174, respectively. The regression equation can be obtained:

$$Y = 0.229X_1 + 0.256X_4 + 0.175X_6 + 0.174X_7 + 16.463$$

It indicates that campus facilities and environment, dormitory allocation and environment, teaching quality and atmosphere, and graduation employment and planning have a multiple

linear relationship with campus satisfaction, and a positive correlation.

Through the study found that the campus facilities and environment, the dormitory allocation and environment, teaching quality and atmosphere and graduate employment and planning to a certain extent, affects the student satisfaction. Satisfaction in order to improve campus, schools should improve the hardware facilities and environmental health of the campus, and make students have a good dormitory environment, improve the quality of school teaching, create a good learning atmosphere, and improve their personal ability, to prepare for future employment and future planning.

CONCLUSION

The author selected 7 factors that affect campus satisfaction, obtained relevant data through questionnaire survey, and used SPSS22.0 software to conduct regression analysis on the data, and established a multiple linear regression model of campus satisfaction.Some Suggestions for improving campus satisfaction are put forward in order to provide theoretical guidance for building a harmonious and beautiful campus.

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