

# Cost Planning and Scale Analysis of Colleges and Universities based on Statistical Modeling

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**Abstract:** With the rapid development of higher education, it is an urgent need for the development of higher education in China to expand the enrollment scale and improve the quality of the whole nation. Faced with relatively fixed financial revenue and state subsidies, it is an urgent problem for universities to analyze the cost of running a university and optimize the scale of running a school. Based on the statistical modeling method and CVP model, this paper analyses the running situation of a provincial university, establishes the calculation model of sharing equally and sharing equally, calculates the average running cost of each department of the university, and gives corresponding countermeasures and suggestions for its current running situation.

**Keywords:** Higher education; Average cost per student; CVP model

## 1. Introduction

In recent years, with the continuous development of the socialist market economy, the rapid expansion of the scale of running colleges and universities involving the cost, scale and efficiency of running schools has increasingly become the key to the sustainable development strategy of colleges and universities. The cost of running schools is one of the important indicators to measure the efficiency of running schools. From the analysis of the trend of higher education cost and economic scale, it is found that there is a correlation between the scale and cost of higher education, that is, the optimal and critical scale of running a school exists in higher education, that is to say, the scale affects the cost size, thus becoming an important factor affecting the efficiency of running a school. However, most of the recognition and measurement of educational benefits is still a difficult problem in educational economics. Restricted by the current accounting system and accounting methods, the current cash realization system replaces cost accounting, ignoring the management and research of school-running costs. Due to insufficient government investment, the contradiction between talent training and social demand is becoming increasingly prominent in some universities, and the shortage of educational funds is becoming more and more serious. Under the pressure of running schools, only fees can be raised, and some even arbitrarily charged. As a result, various circles of society have questioned the cost and charges of Running Colleges and universities, thus putting them in a position to be subjected to challenge. A dynamic situation. Therefore, to study the

cost of running a university, to establish a cost accounting system for running a university, to clarify the cost accounting method for running a university, and to roughly predict the cost of running a university in the next few years is an important problem that needs to be solved urgently under the current physical condition. This paper takes a Province-affiliated University as an example and uses CVP model to carry out a comprehensive analysis of this problem. Ground analysis.

## 2. Establishment and Solution of a University's Cost Model

In this paper, we take a Province-affiliated University in Hunan Province as an example, and calculate the running cost of each secondary college according to the relevant teaching cost expenditure data of each department of the University for three school-running years from 2014 to 2017. Relevant analysis of the final results and formulation of relevant decision-making recommendations.

Through the study of the three-year data of the university, we find that the expenditure of running a school can be divided into clear distribution expenditure and unknown boundaries expenditure, that is, some expenditure can be directly allocated to each college, and some expenditure is shared by all the students in the school or the daily expenditure of the school's management agencies or organizations. After that, the following two calculation models are determined to carry out relevant cost accounting.

### 2.1. Establishment of computing model

#### 2.1.1. Average allocation model

For the problems that need to be studied in this project, in the first model, we collect the relevant data of the five elements of running costs of the provincial universities, and process the data according to the relevant accounting statistical definitions. This paper assigns the expenses according to the expenditure lead department, and calcu-

lates the cost of running a school for the students of each department in the year of running a school. In the process of cost allocation, the Institute is taken as the statistical unit to calculate the expenditure of each institute in each school year.

**Table 1. The Expenditure of Each Institute in Each School Year**

No	Name of College	No	Name of College
01	School of architectural planning	07	College of art
02	Municipal College of Surveying and Mapping Engineering	08	College of Materials Chemical Engineering
03	School of civil engineering	09	School of Science
04	School of management	10	Institute of Physical Education
05	College of Humanities	11	College of Mechanical and Electrical Engineering
06	College of Information Electronics Engineering	12	Public unit

In the equalization model, we divide the cost of higher education into five parts: expenditure of teaching staff, expenditure of teaching management, expenditure of students, depreciation of fixed assets and other public expenditure. After summarizing, we can calculate the cost of higher education as follows: expenditure of teaching staff, expenditure of teaching management, expenditure of students, depreciation of fixed assets and other public expenditure.

$$E_{\text{总}} = E_1 + (E_{21} + E_{41})N / N_{\text{总}} + E_3 + E_5 + E_{22} + E_{42}$$

Among them: the total cost of College education; the expenditure of college teaching staff; the fee of school and school education management affairs; the expenditure of College students; the depreciation fee of fixed assets of schools and colleges; Other public expenditures of the institute: the number of persons in the Institute and the school.

**2.1.2. Uneven allocation model**

However, when comparing the majors of different departments in the same school, we expect to get a relatively concise cost conclusion, which can directly reflect the detailed situation of professional expenditure. It is meaningless to share the cost of school public expenditure equally. Therefore, in this model, we only calculate the costs directly related to students, and propose an unequal cost sharing model.

$$E_{\text{总}} = E_1 + E_{22} + E_3 + E_{42} + E_5$$

**2.1.3 Average cost of life**

After calculating the total cost of College education, in order to calculate the cost to the students of the college, the formula for calculating the average cost of students is obtained as follows:

$$\bar{c} = E_{\text{总}} / N$$

$\bar{c}$  : Average cost per student

$E_{\text{总}}$  : Total Cost of College Education ;

$N$  : Number of students in school ;

**2.2. Establishment of computing model**

In this paper, we take a university in Hunan Province as an example, according to the teaching cost expenditure of each department of the University in the three school-running years from 2014 to 2017, we can directly explain the essence of things with the data facts, and how to process the data will directly affect the final results. Data processing, and take 2017 data as an example to illustrate the relevant steps of data processing in this paper. Firstly, according to the detailed expenditure tables collected in 2017, excluding the data items unrelated to the study in this paper. After the relevant statistics, the statistical items table can be obtained as follows:

**Table 2. Cost Expenditure Statement (2017)**

NO	2017 Full Year Salary	Pension Insurance Paid By Units	Medical Insurance	Guild Benefits	Year-end Awards And Allowances	Comprehensive Award	Total
01	6718351.18	1032463.33	64000	160000	779319.04	472192	9226325.55
02	5658540.2	863606.67	53000	132500	670461.35	393940	7772048.22
03	12438056.83	1919058.33	118000	295000	2387723.17	865022	18022860.33
04	7418015.8	1141865	69000	172500	1194984.4	525505	10521870.2
05	14624231.52	2269836.67	131000	327500	1531087.99	1041115	19924771.18
06	10098269	1540116.67	90000	225000	2367052.57	700217	15020655.24
07	11098462.28	1680910.01	113000	282500	1881849.83	786739	15843461.12
08	4720170.8	707785.01	48000	120000	1579878.03	325779	7501612.84
09	5556507.12	857400	48000	120000	1144479.49	389908	8116294.61
10	6757087.63	1032720	59000	147500	1496747.25	470381	9963435.88

11	2641234.9	403950.01	27000	67500	522644.02	185475	3847803.93
12	63506728.63	6152451.65	715000	1787500	4061800.55	4485211.86	80708692.69

**Table 3. Converted Value of Fixed Assets**

(The Sum of the Amount of the Purchase before 2017 in the Discount Period and the Increase in the Current Year)

NO	Land, Houses and Structures	General Equipment	Special Equipment	Furniture
01	6000	78016	202102	899435
02	0	101205	3135150	908549
03	0	175440	627384.76	287800
04	0	123981.99	293600	86478
05	0	812073	353270	31223
06	0	235200	1014632	1317279
07	2850	7323094	10500	427786
08	0	108566	144470	20054
09	0	38231	600	33220
10	0	111581	369841	14140
11		115960	1185100	60090
12	30070067.67	2916876.6	195976.58	723852

**Table 4. Converted Value of Fixed Assets**

(The Sum of the Amount of the Purchase before 2017 in the Discount Period and the Increase in the Current Year)

NO	Land, Houses and Structures	General Equipment	Special equipment	Furniture
Useful Life of Fixed Assets	30	10	20	5
01	200	7801.6	10105.1	179887
02	0	10120.5	156757.5	181709.8
03	0	17544	31369.24	57560
04	0	12398.2	14680	17295.6
05	0	81207.3	17663.5	6244.6
06	0	23520	50731.6	263455.8
07	95	732309.4	525	85557.2
08	0	10856.6	7223.5	4010.8
09	0	3823.1	30	6644
10	0	11158.1	18492.05	2828
11	0	11596	59255	12018
12	1002336	291687.7	9798.829	144770.4

**Table 5. Detailed Statement of Student Expenditure**

	National Scholarship	Inspirational Scholarship	School Award	National grants	Total
01	24000	235000	190343	897000	1346343
02	16000	175000	171348	807000	1169348
03	24000	410000	436885	2058000	2928885
04	40000	425000	250865	1182000	1897865
05	16000	205000	213006	1005000	1439006
06	24000	310000	299466	1410000	2043466
07	40000	335000	309553	1458000	2142553
08	16000	150000	141349	666000	973349
09	8000	65000	62094	294000	429094
10	0	80000	103359	486000	669359
11	0	10000	65238	306000	381238

**Table 6. Calculate The Number of Students**

	Number of New Students	Promote the Number of Students (persons)	Number of Seniors (persons)	Total Number (person)
1	253	50	1198	1501
2	321	35	904	1260
3	457	194	1710	2361
4	543	171	2040	2754
5	432	3	1149	1584
6	624	16	1552	2192

7	539	38	1791	2368
8	273	39	755	1067
9	158	0	338	496
10	203	0	570	773
11	139	1	118	258
<b>Total</b>	3942	547	12125	16614

Two models are used to calculate the total cost of education according to different adaptation conditions, and the

cost sharing model is used to calculate the total cost of education.  $E_{\text{总}} = E_1 + (E_{21} + E_{41})N / N_{\text{总}} + E_3 + E_5 + E_{22} + E_{42}$ .

**Table 7. The Total Cost of Education**

<b>Number</b>	1	2	3	4	5	6
<b>Total Cost of Education</b>	10770662	9289984	21058219	12464109	21468893	17401829
<b>Number</b>	7	8	9	10	11	12
<b>Total Cost of Education</b>	18804501	8497053	8555886	10665273	4311911	82157286

Calculating model based on unequal cost sharing:

$$E_{\text{总}} = E_1 + E_{22} + E_3 + E_{42} + E_5$$

The total cost of education is as follows:

**Table 8. The Total Cost of Education**

<b>Number</b>	1	2	3	4	5	6
<b>Total Cost of Education</b>	10770662	9289984	21058219	12464109	21468893	17401829
<b>Number</b>	7	8	9	10	11	12
<b>Total Cost of Education</b>	18804501	8497053	8555886	10665273	4311911	0

Calculating Model Based on Average Cost of Students  $\bar{c} = E_{\text{总}} / N$ , The average cost of each college is calculated separately, and the total cost of education obtained

by using the cost-sharing calculation model is calculated to obtain the average cost of education students. :

**Table 9. The Average Cost of Education Students**

<b>Number</b>	1	2	3	4	5	6
<b>Average Cost of Education</b>	7175.658	7373.003	8919.195	4525.82	13553.59	7938.79
<b>Number</b>	7	8	9	10	11	12
<b>Average Cost of Education</b>	7941.09	7963.498	17249.77	13797.25	16712.83	4945.064

According to the total cost of education obtained from the calculation model of unequal cost sharing, the

average cost of educating students is obtained as follows:

**Table 10. The Average Cost of Educating Students**

<b>Number</b>	1	2	3	4	5	6
<b>Average Cost of Education</b>	7175.658	7373.003	8919.195	4525.82	13553.59	7938.79
<b>Number</b>	7	8	9	10	11	
<b>Average Cost of Education</b>	7941.09	7963.498	17249.77	13797.25	16712.83	

**2.3. Analysis of model results**

Based on the analysis of the college composition and the present situation of running schools in the provincial colleges and universities, we can easily find that basic high-

er education, such as mathematics, Chinese, sports, English and other basic disciplines, is generally on the high side of running costs. Through the analysis of the model and the actual situation of the university, the teaching resources of the basic disciplines departments need to

meet the needs. For the basic education of all the students in the whole college, the cost of running a school needs to be borne by a small number of students who are not attached much importance to basic majors, which leads to the higher average cost of students in departments and colleges. Therefore, schools should attach importance to basic education disciplines, and under the same conditions of teachers, enrollment ratio can be enlarged to reduce the average cost of students.

### 3.Thanks

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