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Evaluation and Analysis of the Economic Efficiency of the Tobacco Industry Based on the Factor Analysis Method

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Abstract. In order to broaden the application of factor analysis, the economic benefit evaluation analysis of tobacco industry based on factor analysis was proposed. Using factor analysis and SPSS statistical software correctly, the economic benefits of 7 cigarette industrial enterprises in a certain place were evaluated quantitatively and qualitatively. The results showed that: using Euclidean distance and class average method, the threshold value was 1.6, and seven cigarette enterprises were divided into four categories: the first category: the second cigarette factory in A city. Category II: Cigarette Factory in City B, Cigarette Factory in City C and Cigarette Factory in City D. Category III: No. 1 Cigarette Factory in City A, and No. 1 Cigarette Factory in City E. Category IV: F City Cigarette Factory. The first cigarette factory in city A has a big difference in comprehensive rankingF (Summarize) Only ranked 5th; Cigarette Factory in City B, Cigarette Factory in City C, and Cigarette Factory in City D, where comprehensive F is ranked higher in turn, due to asset operation factorsF_"1 ", capital preservation and enhancement factorsF_"3" It is better than No. 1 Cigarette Factory in City A, so it ranks before No. 1 Cigarette Factory in City A. Conclusion: The determination of the number of factors and the naming of factors reflect the actual data, and the evaluation is more objective.

Keywords. Factor analysis, Comprehensive evaluation, Economic efficiency, Tobacco industry

1. Introduction

As one of the industries managed by the Ministry of Industry and Information Technology, tobacco plays a pivotal role in the national economy. Tobacco industry to realize tax profits ranked in the forefront of the national economy of all industries. The reason for this is the special nature of China's tobacco industry, has long been in a monopoly position, from production to sales of all aspects of the maintenance of a high degree of monopoly, and therefore get a high profit, thus becoming an important part of the national economy, and has always been an important source of revenue at all levels of finance. Although not within the jurisdiction of the State-owned Assets Supervision and Administration Commission (SASAC), the tobacco system has always been strictly demanding itself, from the point of view of safeguarding the national interest, and has long been committed to promoting and practicing the construction and improvement of the business performance appraisal system of the industry enterprises [1]. Since the

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reform and opening up, China's economic system has basically completed the conversion from a planned economy to a market economy, the quality and efficiency of the stateowned economy are constantly improving. In line with this, the financial accounting reform also according to the changes in the situation, experienced with the international accounting standards, harmonization, convergence to the equivalent of the development process. Enterprise performance evaluation has also gone through different evolutionary processes. Performance appraisal is one of the most important components of the enterprise human resources management system, how to design a set of scientific, in line with China's national conditions and to meet the needs of the development of tobacco enterprises in the era of economic globalization of the performance appraisal system, for domestic tobacco enterprises, is an important issue [2].

According to the macroeconomic situation, the State Tobacco Monopoly Administration (STMA) fine-tunes the assessment rules every year in accordance with the actual situation of last year and the current year. However, from the perspective of these assessment rules and the effect of implementation in recent years, the current tobacco industry business performance appraisal system is still problematic to a certain extent. Since the separation of tobacco industry and commerce, the tobacco industry enterprises as the main body of cigarette research and development and production, the annual realization of tax profits accounted for the total tax profits of the tobacco industry [3]. Tobacco industry enterprises as the tobacco industry to realize the main part of the tax revenue, the effectiveness of its business performance appraisal directly determines the overall performance level of the tobacco industry, improve the effectiveness of the performance appraisal system is also mainly reflected in the tobacco industry enterprises. Therefore, the tobacco industry enterprises should combine their own characteristics, improve the existing business performance appraisal system, and establish a set of scientific and reasonable performance evaluation system in line with the actual performance of the enterprise.

2. Literature Review

The telecommunication industry is subject to different degrees of regulation in various countries, and the single market model analyzes the return on investment and marginal cost pricing of the U.S. telecommunication industry under regulation, and finds that inappropriate price control by the government will lead to a waste of resources in the telecommunication industry; the regulatory agencies have the tendency to subsidize or reduce taxes for telecommunication enterprises that are in the public interest. The tendency of regulatory agencies to provide subsidies or tax cuts to telecommunications enterprises in the "public interest", and because the regulatory agencies are unable to judge what is the public's most needed telecommunications services, can only provide subsidies or tax cuts to telecommunications enterprises through subjective judgments, this subjective judgment-led policy direction often makes telecommunications enterprises regardless of input-output efficiency, to some of the unprofitable, but is considered to be the "public interest" of the business investment [4]. Business investment [4]. Related research found that the British telecommunications industry in 1984 after the privatization reform, the overall performance of the industry significantly improved [5].

Electricity companies can implement peak load pricing at times of peak consumption, breaking the dogma of the original marginal pricing [6]. The researchers

noted the property rights of the power industry, they pointed out that privatization is not equal to the liberalization of competition, and the benefits of restructuring the monopoly industry mainly come from increased competition, rather than changes in ownership [7]. They suggested that electricity reform in the United Kingdom should not only involve privatization but also vertical separation (separation of plant and network). In deregulation pilots in California and Texas, deregulation reforms increased airline productivity and reduced fare levels, concluding that regulation leads to low performance [8]. Regulation by the United States Civil Aeronautics Board led to overcapacity in airlines [9]. Therefore, it was proved that deregulation and introduction of more competition to trunk routes led to optimization of the route network structure, relief of congestion, reduction of fare levels in the trunk route market, and improvement of industry-wide performance [10]. An econometric analysis of the output efficiency of state-owned and private railroads found that competitive factors motivate managers to improve their operations and increase railroad performance [11].

This paper has a novel idea and broadens the application of factor analysis. However, the correct application of factor analysis needs to be further deepened, such as how to correctly recognize the factor analysis, the determination of the number of factors, the naming of factors, etc. These issues will directly affect the effectiveness and objectivity of the comprehensive evaluation of the factor analysis method, and this paper will rediscuss these issues and give a more objective results of the comprehensive evaluation.

3. Research methodology

The factor analysis method is concluded in following:

1) Definition, basic idea of factor analysis method see.

2) Mathematical modeling of the factor analysis method: , , and R The mathematical model of type factor analysis is represented by the following matrix of equation (1).

$$\begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_P \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1m} \\ a_{21} & a_{22} & \cdots & a_{2m} \\ -\dots - \dots & -\dots & \dots & \dots \\ a_p 1 & a_p 2 & \cdots & a_{pm} \end{bmatrix} \begin{bmatrix} F_1 \\ F_2 \\ \vdots \\ F_m \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_p \end{bmatrix}$$
(1)

3) Determination of the number of factors:Determined on the basis of the cumulative contribution of eigenvalues \geq 85%, large differences in the absolute values of the factor loadings, and no loss of variables.

4) Naming of factor F i : the corresponding variable with large absolute value of factor load matrix after rotation is classified as F i , and F i is named accordingly [12].

5) Factor scores: Because the common factor can reflect the correlation of the original variables, when using the common factor to represent the original variables, sometimes it is more conducive to the characterization of the object, and thus it is often necessary to reverse the common factor as a linear combination of the variables, i.e., the following formula (2).

$$F_{j} = \beta_{1}X_{1} + K + \beta_{jp}X_{p}(j = 1, \cdots, m)$$
⁽²⁾

The above formula is called factor scoring function. Thomson factor score (regression) function is used in this paper.

4. Analysis of Results

Factor analysis method to synthesize and evaluate the economic efficiency of the tobacco industry in a certain place setX_1-Total asset contribution margin,X_2-Capital Preservation and Appreciation Rate,X_3-Gearing ratio,X_4-Current asset turnover,X_5-Cost margin,X_6-Total labor productivity,X_7-Product sales rate, -p = 7. Industrial enterprises (sample): No. 1 Cigarette Factory in City A, No. 2 Cigarette Factory in City B, No. 1 Cigarette Factory in City C, No. 1 Cigarette Factory in City D, No. 1 Cigarette Factory in City E and No. 1 Cigarette Factory in City F,n= The indicator system and raw data for 7.7 cigarette companies are shown in Table 1.

Cigarette companies	<i>X</i> ₁	X_2	X ₃	X ₄	X_5	X ₆	<i>X</i> ₇
No. 1	72.73	96.62	34.8	2.18	14.79	96.86	9.68
Factory in							
City A							
No. 2	96.39	129.79	18.49	2.53	53.89	181.63	100.09
Factory of							
City A							
Factory in	72.67	125.88	39.07	2.64	3.73	93.6	100
City B							
City C	8.23	15.71	59.95	3.03	6.05	61.08	100
Factory							
D City	79.6	16.97	48.16	2.22	14.21	56.65	100.38
Factory							
E City	53.28	104.41	53.09	2.28	2.58	5.49	100
Factory							
F City	12.75	123	82.36	0.49	2.47	8.3	103.9
Factory							

Table 1. Data on the main economic benefits of cigarette industry enterprises in a certain place.

Using SPSS software, input the data in Table 1, and get the explanation of total variance as shown in Table 2, and the factor load matrix after rotation as shown in Table 3.

Fable 2. Total Variance Explain

	Initial Eigenvalues			Rotation Sums of Squared Loadings			
	Total	% of	Cumulative	Total	% of	Cumultive	
		Variance	%		Variance	%	
1	4.416	63.06	63.05	2.896	41.37	41.36	
2	1.675	23.91	86.97	2.748	39.25	80.62	
3	0.687	9.82	96.7	1.132	16.16	96.7	

Table 3. Rotated	Component	Matrix.
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	Component				
_	F_1	F_2	F_3		
x1	0.835	0.488	0.086		
x2	-0.098	0.18	0.973		
x3	-0.51	-0.824	0.081		
x4	0.988	0.105	-0.024		
x5	0.055	0.944	0.235		
x6	0.389	0.897	0.127		
x7	-0.892	-0.31	0.314		

Based on the cumulative contribution of eigenvalues $\geq 85\%$, the absolute value of the factor loadings of the <u>a_ij</u> |The number of factors that are highly variable and do not appear to be missing determinants of the variablem = 3. The cumulative contribution at this point is 96.77%.

In order to better characterize the seven cigarette companies, the factor score function was obtained from the matrix of factor score coefficients.

$$\begin{split} F_1 &= 0.327ZX_1 + 0.154ZX_2 + 0.036ZX_3 + 0.531ZX_4 - 0.257ZX_5 - 0.075ZX_6 \\ &\quad -0.312ZX_7 \\ F_2 &= -0.037ZX_1 - 0.158ZX_2 - 0.349ZX_3 - 0.301ZX_4 + 0.497ZX_5 + 0.375ZX_6 \\ &\quad +0.042ZX_7 \\ F_3 &= 0.176ZX_1 + 0.956ZX_2 + 0.2ZX_3 + 0.226ZX_4 - 0.031ZX_5 - 0.036ZX_6 \\ &\quad +0.178ZX_7 \end{split}$$

(ZX_ibeX_i (standardized variables) The composite factor score function was constructed from the rotated factor contributions in Table 2, as follows (3).

$$F_{\text{Summarize}} = 0.4136F_1 + 0.3925F_2 + 0.1616F_3 \tag{3}$$

Substitute the standardized sample data into the above function, we can get the factor score of each enterprise, the overall factor scores and the ranking of the seven cigarette companies in Table 4.

Enterprises	F1	Ranking	F2	Ranking	F3	Ranking	F	Ranking
							comprehensive	
No. 1 Factory in City A	-0.067	6	0.598	2	-1.782	7	-0.081	5
No. 2 Factory of City A	-0.018	5	1.96	1	0.85	1	0.913	1
Factory in City B	0.732	2	-0.358	4	0.807	2	0.294	2
City C Factory	1.085	1	-0.907	7	0.417	4	0.16	3
D City Factory	0.246	3	-0.202	3	0.151	5	0.048	4
E City Factory	0.075	4	-0.44	5	-0.982	6	-0.303	6
F City Factory	-2.052	7	-0.685	6	0.541	3	-1.032	7

Table 4. Factor, composite factor score values.

The data in Table 1 are then subjected to systematic cluster analysis, and the threshold value is 1.6 by using Euclidean distance and class average method. Seven cigarette enterprises are divided into four categories: the first category: the second cigarette factory in City A. Category II: Cigarette Factory in City B, Cigarette Factory in City C and Cigarette Factory in City D. Category III: No. 1 Cigarette Factory in City A, and No. 1 Cigarette Factory in City E. Category IV: F City Cigarette Factory. This verifies that the ranking in Table 4 is correct.

Compared with Table 2, the first cigarette factory in City A has a big difference in comprehensive rankingF_(Summarize)Only ranked 5th; Cigarette Factory in City B, Cigarette Factory in City C, and Cigarette Factory in City D, where comprehensive F is ranked higher in turn, due to asset operation factorsF "1", capital preservation and

enhancement factorsF_"3" It is better than No. 1 Cigarette Factory in City A, so it ranks before No. 1 Cigarette Factory in City A.

The situation of No. 1 Cigarette Factory in City A is: comprehensive factor scoreF_(Summarize)Negative values indicate that the composite situation is below the average composite level, and on specific factors, the effectiveness factorF_"2" ranked 2nd, with a clear advantage, but its asset operating factorF_"1 " Listed 6th, Capital Preservation and Appreciation FactorF_"3 " The 7th place, both backward and lower than the average level of the corresponding factor, is not optimistic. The plant should keep the efficiency factor in playF_"2 " The premise of the advantage of the asset operation factor, theF_"1 " , capital preservation and enhancement factorsF_"3 " Promote it. The rest of the enterprises are analyzed similarly and are omitted here.

5. Conclusion

Scientific business performance evaluation method can objectively measure the efforts of state-owned enterprise operators and enterprise performance contribution, and urge them to focus on the business performance of the enterprise; scientific business performance evaluation method provides state-owned enterprise operators with more real, comprehensive and effective information, and helps to guide the development of state-owned enterprises to the benign side; scientific and reasonable business performance evaluation method can reasonably and objectively judge the actual business level of the enterprise, and promote the enterprise to improve the improper management in the daily production and operation, and improve the overall business efficiency of the enterprise. The scientific and reasonable business performance evaluation method can reasonable business performance evaluation and operation, and improve the overall business efficiency of the enterprise. The scientific and reasonable business performance evaluation method can reasonably effectively and objectively judge the actual operation level of the enterprise, promote the enterprise to improve the improper management in daily production and operation, and improve the overall operation efficiency of the enterprise. In summary, the evaluation is more objective because the number of factors and the naming of factors reflect the actual data.

Acknowledgements

2023 Science and Technology Project of China Tobacco Yunnan Industry Co., Ltd(2023CP04): Product-oriented R&D Design Phase I Based on Consumer Perspective.

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