

Research on power grid corporation planning target selection technology based on grey correlation analysis

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Keywords: Grey relational analysis, Planning objectives, Selecting models.

Abstract: Aiming at the problem of incomplete information and strong subjectivity in the selection of power grid corporation planning objectives, a technical research on the selection of corporate planning objectives based on grey correlation analysis is proposed. Focus on how to achieve strategic value maximum, on the basis of the actual data, this paper uses the grey correlation analysis theory of quantitative analysis of the strong power grid, excellent assets, service quality, the development of globalization, the modern company, green development six class plan target of the influence degree of the strategic value, so as to provide reference for planning target selection and so on related work.

1. Introduction

Planning goal selection technology refers to a method or principle to select the planning goal of a company in order to achieve maximum strategic value when the overall strategy of the company has been determined [1]. With the continuous improvement of the company's degree of internationalization and the promotion of the global energy Internet construction, the scope of the company's resource planning and control has rapidly expanded, and the requirements for the company's planning have also become higher [2]. Grey relational analysis is a systematic analysis method to determine the essential factors that influence things and to clarify the "grey" relationship between various influencing factors [3]. At present, grey correlation analysis is mainly used for evaluation and decision making [4-7]. This paper analyzes the impact degree of each planning target by using the grey correlation analysis method and relying on the actual operation data of the company, so as to provide reference for the target selection and other related work [8].

2. The basic fundamental of Grey correlation analysis

Gray correlation analysis is a statistical analysis method for multiple factors. It takes the sample data of each factor as the object and the gray correlation degree as the analysis tool to describe the correlation degree among the factors. The essence of grey correlation analysis is to analyze and calculate the similarity degree of correlation sequence. If the object expressed by the sequence is more consistent in development and change situation, the correlation degree will be larger; otherwise, the correlation degree will be smaller. Grey correlation analysis has the advantages of low data requirements, low computational complexity and easy application. This paper USES grey correlation analysis method to study the correlation between corporate planning objectives.

Grey correlation analysis has the following steps:

(1) Determine the reference sequence X_0 and the comparison sequence X_i .

$$X_0 = \{X_0(t) | t = 1, 2, 3, \dots, n\} \quad (1)$$

$$X_i = \{X_i(t) | t = 1, 2, 3, \dots, n\} \quad (2)$$

(2) Data initialization. In order to facilitate the comparison and calculation, and to ensure the consistency and equivalence of the research problem, the dimensionless treatment of the parameters was carried out to obtain Y_0 and Y_i .

$$Y_i(t) = \frac{X_i(t) - \min_i X_i(t)}{\max_i X_i(t) - \min_i X_i(t)} \quad (3)$$

(3) Calculate the maximum and minimum absolute difference. The absolute difference at each point between the reference sequence and the comparison sequence. Where $\Delta(\min)$ is the two-stage minimum difference and $\Delta(\max)$ is the two-stage maximum difference;

$$\Delta_i(t) = |Y_0(t) - Y_i(t)| \quad (4)$$

$$\Delta(\max) = \max_i \max_t \Delta_i(t) \quad (5)$$

$$\Delta(\min) = \min_i \min_t \Delta_i(t) \quad (6)$$

(4) Calculate the correlation degree.

$$\xi_i(t) = \frac{\Delta(\min) + \rho \Delta(\max)}{\Delta_i(t) + \rho \Delta(\max)} \quad (7)$$

Where, ρ is the resolution coefficient, and the value range is 0~1, in this paper, $\rho = 0.5$.

(5) Calculate the correlation degree. The correlation degree between Y_0 and Y_i is r_i :

$$r_i = \frac{1}{n} \sum_{t=1}^n \xi_i(t) \quad (8)$$

(6) Identify effective planning goals. By calculating the correlation degree, the correlation degree between each comparison sequence and the reference sequence can be distinguished. The larger the correlation degree is, the closer the development trend of Y_0 and Y_i is, the more the overall goal of the company can be represented.

3. Results

The evaluation index of the power grid corporation planning target is divided into six levels: strong power grid, excellent assets, excellent service, global development, modern company and green development. This section will study the correlation between the company's planning sub-goals (comparison series) and the overall strategic goals (reference series) from these six aspects.

(1) Due to the different dimensions of different index units, there is no direct comparison value between the data, so the data is first processed dimensionless. As shown in Table 1.

Table.1. Index initial value

	Y0	Y1	Y2	Y3	Y4	Y5	Y6
1	0.3280	0.5163	0.2211	0.6971	0.1230	0.1824	0.5103
2	0.3610	0.4291	0.2730	0.8405	0.2741	0.2694	0.3630
3	0.2958	0.3810	0.2566	0.7075	0.1212	0.2154	0.3584
4	0.3548	0.6042	0.0420	0.7442	0.1247	0.2717	0.7429
5	0.6377	0.4587	0.9555	0.9434	0.7082	0.3329	0.3781
6	0.6261	0.4079	0.8852	0.9363	0.8046	0.3246	0.3338
7	0.4432	0.4049	0.6512	0.7669	0.3090	0.2596	0.3630
8	0.5102	0.3555	0.4840	0.9243	0.7360	0.3175	0.3391

(2) According to Formula (4-6), the absolute difference between the comparison sequence and the reference sequence is calculated, as shown in Table 2. The $\Delta 1 \sim \Delta 6$ for reference sequence (strategic total goal) and compare the sequence (strong power grid, excellent assets, service quality, service of globalization, modern company, green service) of absolute difference.

Table.2. The maximum and minimum absolute difference.

$\Delta 1$	$\Delta 2$	$\Delta 3$	$\Delta 4$	$\Delta 5$	$\Delta 6$
0.1883	0.1069	0.3691	0.205	0.1456	0.1823
0.0681	0.088	0.4795	0.0869	0.0916	0.002
0.0852	0.0392	0.4117	0.1746	0.0804	0.0626
0.2494	0.3128	0.3894	0.2301	0.0831	0.3881
0.179	0.3178	0.3057	0.0705	0.3048	0.2596
0.2182	0.2591	0.3102	0.1785	0.3015	0.2923
0.0383	0.208	0.3237	0.1342	0.1836	0.0802
0.1547	0.0262	0.4141	0.2258	0.1927	0.1711

(3) The association coefficients of the overall strategic goals of the globalization stage with the strong grid, prime assets, prime services, global development, modern companies, and green development are calculated using formula (7), as shown in Table 3.

Table.3. Correlation coefficient

$\xi 1$	$\xi 2$	$\xi 3$	$\xi 4$	$\xi 5$	$\xi 6$
0.781682	1	0.526416	0.748171	0.882781	0.794466
0.785285	0.737605	0.336114	0.740089	0.729591	1
0.841952	1	0.39681	0.644106	0.85607	0.912833
0.625535	0.547389	0.475603	0.653955	1	0.476664
0.678899	0.481225	0.493758	1	0.494716	0.548148
0.893651	0.805408	0.716957	1	0.730618	0.745641
1	0.541165	0.412213	0.676068	0.579389	0.826895
0.644782	1	0.375513	0.53887	0.58349	0.616819

(4) According to Formula (8), the correlation degree $R1 \sim R6$ between the overall strategic objective and the strong power grid, excellent assets, excellent service, globalization development, modern company, and green development is 0.781, 0.764, 0.467, 0.750, 0.732, and 0.740 respectively.

4. Conclusions

By grey correlation analysis available: $r1 > r2 > r4 > r6 > r5 > r3$, so the development stage of globalization and maximum total target associated company strategic planning goal is strong power grid, the second is good assets and globalization development, the development of modern company and green, the last is the service quality, the strong power grid, excellent assets, globalization, modern company and green development correlation were greater than 0.600, the connection strength to strength, to illustrate the several levels of indicators have important effects on company target planning strategy.

Acknowledgments

This work was financially supported by the science and technology project of the headquarters of State Grid Corporation of China, "Research on Corporate Planning Methods and Collaborative Optimization Techniques for the Development Stage of Global Enterprises". So I would like to express my gratitude to all those who have helped me during the writing of this paper.

Funding: This research was funded by State Grid Corporation of China

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