Research on the Forecasting Model of Total Human Resource Demand of Large Central Enterprise Group Based on C-D Production Function

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Abstract. Enterprise human resources demand forecasting is an important part of human resources planning, constructing the human resource demand forecasting model which matches with the organization development can support the enterprise development strategy and has an important significance for the development of enterprise. Aiming at the large central enterprise group staff characteristics and practice features of human resource management, this paper builds a forecasting demand model of human resources including performance development model, and take domestic grid enterprises of large-scale power as an example to carry out empirical research. The results show that the model can effectively reflect the strategic objectives of enterprise, and has an important effect on further development of the strategic human resource management superiority and the promotion of enterprise human resources demand forecasting’s accuracy.

Introduction

Human resource demand forecasting is related to the personnel structure and personnel supply and an important part of human resource planning. Constructing the human resource demand forecasting model which matches with the organization development can support the enterprise development strategy and have an important significance for the development of enterprise. However, for many enterprises, especially large central enterprise group, on the one hand, their total employment allocation is not strongly related to corporate performance, on the other hand, the traditional labor management planning is not strongly related to enterprise development, the staff overcrowding or the staff lack is common, which leads to the result that the labor productivity of enterprise human resources is generally low. In the future, as China's economy is into the new normal stage of rapid development, growth in the performance of the industry will be generally affected, improving quality, cutting the cost, promoting efficiency are the current and future important targets of the management of central enterprises. Aiming at the large central enterprise group staff characteristics and practice features of human resource management, this paper builds a forecasting demand model of human resources including performance development model, and take domestic grid enterprises of large-scale power as an example to carry out empirical research. The results show that the model can effectively reflect the strategic objectives of enterprise, and has an important effect on further development of the strategic human resource management superiority and the promotion of enterprise human resources demand forecasting’s accuracy, at the same time, they are very significant to promote and apply in the central enterprises and also very significant to enrich the research in the field of academic.

Modeling

In the enterprise human resources management, in order to achieve the key performance growth targets that ensure the development of strategic planning, enterprise need to configure the appropriate number of human resources. Based on the above, this paper builds a forecasting demand model of human resources including performance development model. The model is as follows.
Building C-D function. Cob-Douglas production function is created by American mathematician Cob (C.W. Cobb) and economist Paul Douglas (Paul H. Douglas) to discuss the relationship between input and output, which is used to forecast the production of industrial systems or large enterprises in the country and region and analyze the development of production, it’s the most widely used form of production function in Economics.

According to the basic structure of C-D production function, in the case of the overall economic development goal and the asset scale development goal of the enterprise, we can reverse the total amount of labor demand; the general idea is to calculate the key performance indicators to achieve the allocation of labor scale.

In the process of modeling used C-D production function, we usually select the number of labor as the calculation index, the quality of all the labor force will be considered in accordance with the unchanging principles. But in reality, the quality of the labor force presents a trend of increasing year by year. Therefore, in the process of modeling, the factors of talent quality are fully considered in this paper, choose "human capital stock" variable instead of a simple "labor quantity" index, human capital stock is obtained by means of the comprehensive index of the quality of talents—multiplied talent equivalent density by number of personnel.

The specific process is as follows,

According to Cobb-Douglas function,

\[ E = A(t)K^\alpha L^\beta \]  

\( E \) is the index of industrial added value, \( A(t) \) is the comprehensive technical level, \( K \) is material capital stock(assets at the end of the year), \( L \) is human capital stock. \( \alpha \) and \( \beta \) are the parameters to be estimated, and \( \alpha + \beta = 1 \), \( \alpha \) is the elastic coefficient of capital output in economic meaning, \( \beta \) is the elastic coefficient of the output of human capital in economic meaning. So,

\[ E = A(t)K^\alpha L^{1-\alpha} \quad (2) \]

Solving the growth rate of human capital. Taking natural logarithm on both sides of the equation,

\[ \ln E = \ln A(t) + \alpha \ln K + (1-\alpha) \ln L \quad (3) \]

Taking the derivative of the time on both sides of the equation,

\[ \frac{d \ln(E)}{Y} = \alpha \frac{d \ln(K)}{K} + (1-\alpha) \frac{d \ln(L)}{L} \quad (4) \]

Setting growth rate as \( g \), then the industrial added value growth rate is \( g_E \), the growth rate of physical capital is \( g_K \), the stock of human capital growth rate is \( g_L \).

As the industrial added value growth rate and material capital growth rate are determined by the company’s development strategy, so we can get the growth rate of human capital, that is:

\[ g_E = \alpha g_K + (1-\alpha) g_L \quad (5) \]

\[ g_L = \frac{g_E - \alpha g_K}{1-\alpha} \quad (6) \]

Solving the total growth rate of human resource. Based on the known human capital growth rate, by obtaining the equivalent density of trend extrapolation talent growth rate, we can get the growth rate of the total employment of human resources, this is,
\[ Y_t = Y_0 \cdot (1 + g_L) \cdot \frac{Ted_t}{Ted_{t+1}} \]

(7)

\( Ted_t \) and \( Ted_{t+1} \) represent the talent density of the current and forecast period respectively. \( Ted_{t+1} \) can be obtained by the trend extrapolation or the weighted average of the previous three years.

**Empirical Analysis**

In this part, we select a large power grid enterprise group to carry out the empirical analysis. The company takes building the power grid as the core business. It’s an extra large state-owned key enterprise which connects with the lifeline of the national economy and the energy security of the country. It is the world largest public utility company.

At present, the company has been divided into plate to carry out the relevant research and application of human resources demand forecast, the research and application of the demand forecasting model is carried out aiming at the total employment of the power grid sector, the financial sector and the industry sector. The results are applied to the work of each unit labor plan, staff recruitment and internal human resources market construction. In"13th Five-Year", the company is facing the complex economic, policy and social environment."13th Five-Year" is the key period of deepening the "two change", fully completing the "one strong three excellent" modern company, initially realizing the "two first-class" targets, so there are higher requirements on the level and quality of human resource allocation. At present, although the company has carried out three major business segments of the human resources demand forecast research, it lacks research from the overall perspective.

**Empirical Analysis of the Performance Development Model**

Step one: organize original data. Collect and organize the industrial added value and the net value of fixed assets at the end of the year from 2009 to 2015, and human resources such as the total amount of labor and personnel equivalent density.

Step two: construct regression equation to solve the coefficient,

We use measurement software E-views to get the results shown in table 1.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>c</td>
<td>8.260317</td>
<td>2.576435</td>
<td>3.206104</td>
<td>0.0327</td>
</tr>
<tr>
<td>ln(K)</td>
<td>1.726515</td>
<td>0.340914</td>
<td>5.064366</td>
<td>0.0072</td>
</tr>
<tr>
<td>ln(L)</td>
<td>-0.560877</td>
<td>0.367159</td>
<td>-1.527616</td>
<td>0.2013</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td></td>
<td></td>
<td></td>
<td>0.926967</td>
</tr>
<tr>
<td>Durbin-Watson stat</td>
<td></td>
<td></td>
<td></td>
<td>1.447533</td>
</tr>
<tr>
<td>F-statistic</td>
<td></td>
<td></td>
<td></td>
<td>39.07729</td>
</tr>
<tr>
<td>Prob(F-statistic)</td>
<td></td>
<td></td>
<td></td>
<td>0.002371</td>
</tr>
</tbody>
</table>

Adjusted \( R^2 \) reaches 0.93, that shows the fitting effect of the model is good, and it can be used for future data prediction.

The coefficient value is: \( \alpha = 1.726515 \),

\[ g_L = \frac{g_E - \alpha g_K}{1 - \alpha} = 0.054008548 \]

That shows the growth rate of human capital is 0.054008548. \( g_E \) is the industrial added value growth rate, \( g_K \) is growth rate of physical capital, and the growth rate during "12th Five-Year" is the growth rate of talent density, according to formula (5) to (7), the total corporate employment growth rate is -0.01852263. According to the
growth rate of total employment in the base period, we can get total human resources of the company in the forecast period.

**Conclusions**

Under the guidance of the company's development strategy, based on the analysis of the current situation and strategic analysis of the company's human resources, and through the correlation coefficient analysis, we can identify key factors that influence the total employment of the company. From the performance development needs, and combined with the consideration, the forecast model is constructed to get the forecast results of company's overall labor demand, to achieve scientific and accurate prediction of the company's overall human resources, to clear the company’s human resources development direction, to provide a strong basis for the company to develop human resources strategic planning and provide decision support to help the company control the size of labor, enhance human resource efficiency, and further boost the company's strategic objectives.

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**Reference**


