Multivariate linear regression analysis on online image study for IoT

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Abstract

To improve the effectiveness of national image study on the "Belt and Road" countries in Central Asia, a national image study method based on the multivariate linear is proposed in this paper. First, the national competitiveness database of International Institute for Management Development (IMD) and World Economic Forum is adopted to construct the evaluation index system of the "Belt and Road" countries; second, the multivariate linear regression analysis method is introduced to analyze the evaluation index system model of the "Belt and Road" countries mentioned above; third, the effectiveness of the proposed algorithm is verified through the simulation experiment.

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1. Introduction

The "Belt and Road" proposed by China is an important development strategy designed on the basis of coordinating the domestic and international economic development in line with the principle of mutual benefit to bring benefits to people in countries along the route. The strategy is of important significance to build the new external development pattern, improve the Chinese economic development level rapidly and achieve the great rejuvenation. Also, the "Belt and Road" key development strategy has played a promoting role in providing opportunities for the development of special language disciplines at colleges and universities (Christenson et al., 2015; Goodsitt et al., 2014; Iidaka, Anderson, Kapur, Cabez, & Craik, 2014; Lawler et al., 2014; Yamasaki et al., 2015).

In the "Belt and Road" key development strategy, interconnection and intercommunication is the basic requirement of this strategic development and main goal of the "Belt and Road" development strategy. It's a huge system engineering to realize the interconnection and intercommunication, in which, the language intercommunication is the foundation and premise that plays an important role in non-governmental exchange, trade communication, facility construction and policy coordination etc. There are 65 countries along the "Belt and Road" development strategy involving 65 languages, among which most are the special languages. However, the domestic colleges and universities fall far behind the requirement of the "Belt and Road" strategy development in cultivating the talents in special language; the talent resources are scarce. According to statistics, only about 20 special languages are available in mainland China, among which most are centralized in one college. Under this educational background, it fails to match with the requirements of the "Belt and Road" strategy development. Talents in the special language generally become the indispensable resources for the national strategic development (Jørgensen et al., 2014; Raza & Khosravi, 2015; Tsai, Lai, & Vasilakos, 2014; Xu, Yang, Yang, & Lei, 2014; Yan, Ricci, Subramanian, Liu, & Sebe, 2014).

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In the "Belt and Road" key development strategy, without language fusion in advance (Feng, Hu, Chen, & Song, 2014; Groenendijk, Sass-Klaassen, Bongers, & Zuidema, 2014; Ingraffea, Wells, Santoro, & Shonkoff, 2014; Toporcov et al., 2015), it will be difficult to make the cultural exchange and communication, not mention the economic and non-governmental exchange; also, the effect of interconnection and intercommunication will be discounted greatly. In the meantime, without language communication, the governmental communication is unavailable while the development of international trade, accommodation of funds will be influenced as well (Ashokkumar, Arunkumar, & Don, 2018; Hussein, ArunKumar, et al., 2018; Hussein, Kumar, et al., 2018; Khanna et al., 2018; Wei, Meng, & Arunkumar, 2018). Therefore, to implement the "Belt and Road" key development strategy, the cultivation of talents in special language must be put on the agenda to strengthen the construction of relate courses at colleges and universities, which need to be pushed gradually due to the greater difficulties according to the current development (Abdulhay, Elamaran, Arunkumar, & Venkatraman, 2018; Abdulhay, Arunkumar, Narasimhan, Vellaiappan, & Venkatraman, 2018; Elhoseny et al., 2018; Sarvaghad-Moghaddam et al., 2018; Tharwat, Elhoseny, Hassanien, Gabel, & Arunkumar, 2018; Vardhana, Arunkumar, Abdulhay, & Ramirez-Gonzalez, 2018).

2. Model description

The international competitiveness database of IMD and WFF in 1995 is adopted in this paper, data from 2007 to 2012 are selected to analyze the soft index national image (image abroad). This database contains 59 countries with 206 hard indexes and 117 soft indexes. In this paper, the research results of Li Wangyue et al. are consulted; 11 of all indexes are selected to interpret the national image as shown in Table 1 from the perspective of relativity and regression results after considering the missing values in the database. In Table 1, (T) means that the more suitable it is to the condition, the higher the index score; i.e., in the

urbanization indexes, the more supportive the cities to the business development in the country, the higher its urbanization index score, otherwise, the lower it is.

3. Multivariate regression analysis

The theory of multivariate regression analysis is the same with that of the univariate linear regression analysis only with the free variable being extended from unitary into multivariate; therefore, the calculation will be relatively complicate. The multivariate linear regression analysis will be briefly introduced now.

3.1. Building of mathematical model

Assume there is the following relationship between the variable y and $x_1, x_2, \ldots, x_m$:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_m x_m + \varepsilon \quad (1)$$
$$\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_m x_m$$

In which, y is the random variable, $x_1, x_2, \ldots, x_m$ is the nonrandom variable and $\beta_1, \beta_2, \ldots, \beta_m$ is called the regression coefficient. ε is the random variable as the random error, it can be understood as the error caused by other various random factors that cannot be interpreted by $x_1, x_2, \ldots, x_m$ in y. We must adopt $\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_m x_m$ to estimate the mean value $E(y)$ of y, which means

$$E(y) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_m x_m.$$

Assume that $\varepsilon \sim N(0, \sigma^2)$, $y \sim N(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_m x_m, \sigma^2)$, $\beta_0, \beta_1, \ldots, \beta_m, \sigma^2$ are the undetermined constants unrelated to $x_1, x_2, \ldots, x_m$.

To estimate $\beta_i (i = 0, 1, 2, \ldots, m)$, n independent tests (or observations) are made on variable $(x_1, x_2, \ldots, x_m, y)$ to obtain n groups of independent observation data as:

$$(x_{i1}, x_{i2}, \ldots, x_{im}, y_i), \quad i = 1, 2, \ldots, n. \quad (2)$$

On the other hand, the n groups of independent observation data $(x_{i1}, x_{i2}, \ldots, x_{im}, y_i)(i = 1, 2, \ldots, n)$ of variable $(x_1, x_2, \ldots, x_m, y)$ shall meet:

Table 1
Factors influencing the national image.

	Index category	Index name and connation
Soft index	Economic development	1. Urbanization: the city supports the business development; the city doesn't support the business development
		2. Economic recovery capacity: strong or slow
		3. Employment relationship: the relationship between the managers and employees is efficient or hostile
	Government administration	4. Risk of political instability: very low or high
		5. Human and property safety: confident or not confident about the human and property safety being protected
Soft index	Financial efficiency	6. Difficulty level of entering the domestic and foreign capital markets: very easy or not easy
	Trade liberalization	7. Attitude to globalization: positive or negative in your homeland
Hard index	Government administration	8. Proportion of the central government expenditure in GDP
	Financial construction	9. National credit rating: percentile rating according to the assessment in the magazine Institutional Investor
	Educational level	10. Humanity development index:composite index of economy, society and education
	Population structure	11. Proportion of population above 65 years old in the total population (%)