Applied Mathematics and Nonlinear Sciences

<https://www.sciendo.com>

Analysis of the causes of the influence of the industrial economy on the social economy based on multiple linear regression equation

Yuting Zhao^{1†}, Ali Altalbe²

¹School of Economics and Management, Harbin University, Heilongjiang, Harbin, China

²Department of Information Technology, Faculty of Computing and Information Technology, King Abdulaziz University, Jeddah, Saudi Arabia

Submission Info

Communicated by Juan Luis García Guirao

Received June 16th 2021

Accepted September 24th 2021

Available online December 15th 2021

Abstract

In industrial economy, the main factors influencing the urban construction and development of social economy is linked to the high-speed rail site accessibility, and this has its influence on the regional economy as a whole, and as an example, this can be explained through the study using a multiple linear regression equation model, built and compared before and after 2 years of data and information. Based on the weighted average travel time and economic potential, it is clear that the construction of urban expressway can help accelerate the aggregation and flow of production factors within the region, to guide the integrated development of local society and economy.

Keywords: multiple linear regression, industrial economy, social economy, The highway.

AMS 2010 codes: 76U05

1 Multivariate linear regression equation

1.1 Model

Combined with the analysis of the operation process shown in Figure 1, it can be seen that from the perspective of a linear model with one variable, the index Y studied is a random variable with many factors affecting this. Assuming that the index Y is a Q -element random vector, then there are p factors affecting the index. At the same time, the conditional mathematical expectation of the index meets the linear relationship with these factors. Therefore, the relationship between the index vector Y and the factors can be studied by using the following multivariate linearity [1].

[†]Corresponding author.

Email address: zhaoyuting725@hotmail.com

Fig. 1 Operation flow chart.

Definition 1. Taking the industrial economy and social economy studied in this paper as an example, the social economy is regarded as Y , then there are P factors that affect this indicator $(x_{i1}, x_{i2}, \dots, x_{ip})$. Assume that the observed value of the index vector Y of the corresponding factor is:

$$(Y_{i1}, Y_{i2}, \dots, Y_{ip}), 1 \leq i \leq n,$$

Theorem 1. Then the observed value of index vector Y is the relationship between these factors, and the specific matrix is shown as follows:

$$\begin{bmatrix} Y_{11} & Y_{12} & \dots & Y_{1q} \\ Y_{21} & Y_{22} & \dots & Y_{2q} \\ \vdots & \vdots & & \vdots \\ Y_{n1} & Y_{n2} & \dots & Y_{nq} \end{bmatrix} = \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1p} \\ x_{21} & x_{22} & \dots & x_{2p} \\ \vdots & \vdots & & \vdots \\ x_{n1} & x_{n2} & \dots & x_{np} \end{bmatrix} \begin{bmatrix} \beta_{11} & \beta_{12} & \dots & \beta_{1p} \\ \beta_{21} & \beta_{22} & \dots & \beta_{2p} \\ \vdots & \vdots & & \vdots \\ \beta_{p1} & \beta_{p2} & \dots & \beta_{pq} \end{bmatrix} + \begin{bmatrix} e_{11} & e_{12} & \dots \\ e_{21} & e_{22} & \dots \\ \vdots & \vdots & \\ e_{n1} & e_{n2} & \dots \end{bmatrix}$$

And, the above formula can be simplified into:

$$Y = (Y_{ij})_{n \times q}, x = (x_{ij})_{n \times p}, \beta = (\beta_{ij})_{p \times q}, e = (e_{ij})_{n \times q}$$

$$Y = x\beta + e$$

Proposition 2. Where e represents the i th observation error of index vector Y . Assuming that there are differences in each observation value, and the mean value is 0, and the difference matrix is V , then the following expression can be obtained [2]:

$$\begin{cases} Y = x\beta + e, \\ E(e) = 0, \text{var}(e_{i\cdot}) = V, \end{cases}$$

Lemma 3. And the analysis process of one variable linear, according to the least square principle, calculate $B_0, B_1, \dots$, by, to minimise the residuals and their squares of all observed values and regression values Y_1 . At this point, the residual $\hat{y}_i$ square and the following formula belong to $B_0, B_1, \dots$. The non-negative quadratic of y_i , so it has to have a minimum.

$$Q = \sum_{i=1}^x (y_i - \hat{y}_i)^2 = \sum_{i=1}^x [y_i - (b_0 + b_1x_{i1} + b_2x_{i2} + \dots + b_px_{ip})]^2$$

Corollary 4. According to the analysis of extreme value principle, in the process of calculating the extreme value of $Q, B_0, B_1, \dots, B_Y$ must meet the following conditions [3]:

$$\frac{\partial Q}{\partial b_j} = 0 \quad (j = 0, 1, 2, \dots, p)$$

The following normal equations are obtained:

$$\begin{cases} \sum_{i=1}^x [y_i - (b_0 - b_1x_{i1} + b_2x_{i2} + \dots + b_px_{ip})] = 0 \\ \sum_{i=1}^x [y_i - (b_0 - b_1x_{i1} + b_2x_{i2} + \dots + b_px_{ip})] x_{i1} = 0 \\ \sum_{i=1}^x [y_i - (b_0 - b_1x_{i1} + b_2x_{i2} + \dots + b_px_{ip})] x_{ij} = 0 \\ \sum_{i=1}^x [y_i - (b_0 - b_1x_{i1} + b_2x_{i2} + \dots + b_px_{ip})] x_{ip} = 0 \end{cases}$$

And simplified to:

$$\begin{cases} n\zeta_0 + \left(\sum_{i=1}^n x_{i1}\right)b_1 + \left(\sum_{i=1}^n x_{i2}\right)b_2 + \dots + \left(\sum_{i=1}^n x_{ip}\right)b_p = \sum_{i=1}^n y_i \\ \left(\sum_{i=1}^n x_{i1}\right)b_0 + \left(\sum_{i=1}^n x_{i1}^2\right)b_1 + \left(\sum_{i=1}^n x_{i1}x_{i2}\right)b_2 + \dots + \left(\sum_{i=1}^n x_{i1}x_{ip}\right)b_p = \sum_{i=1}^n x_{i1}y_i \\ \vdots \\ \left(\sum_{i=1}^n x_{ip}\right)b_0 + \left(\sum_{i=1}^n x_{ip}x_{i1}\right)b_1 + \left(\sum_{i=1}^n x_{ip}x_{i2}\right)b_2 + \dots + \left(\sum_{i=1}^n x_{ip}^2\right)b_p = \sum_{i=1}^n x_{ip}y_i \end{cases}$$

Conjecture 5. Assuming that A is used to represent the coefficient matrix of the above equations, then it can be clear that A belongs to a symmetric matrix through observation and analysis, and the following can be obtained [4]:

$$A = \begin{pmatrix} n \sum_{i=1}^n x_{i1} \sum_{i=1}^n x_{i2} \dots \sum_{i=1}^n x_{ip} \\ \sum_{i=1}^n x_{i1} \sum_{i=1}^n x_{i1}^2 \sum_{i=1}^n x_{i1} x_{i2} \dots \sum_{i=1}^n x_{i1} x_{ip} \\ \vdots \vdots \vdots \\ \sum_{i=1}^n x_{ip} \sum_{i=1}^n x_{ip} x_{i1} \sum_{i=1}^n x_{ip} x_{i2} \dots \sum_{i=1}^n x_{ip}^2 \end{pmatrix} = \begin{pmatrix} 111 \dots 1 \\ x_{11}x_{21}x_{31} \dots x_{n1} \\ x_{12}x_{22}x_{32} \dots x_{n2} \\ \vdots \vdots \vdots \\ x_{1p}x_{2p}x_{3p} \dots x_{np} \end{pmatrix} = \begin{pmatrix} 1x_{11}x_{12} \dots x_{1p} \\ 1x_{21}x_{22} \dots x_{2p} \\ 1x_{31}x_{32} \dots x_{3p} \\ \vdots \vdots \\ 1x_{n1}x_{n2} \dots x_{np} \end{pmatrix} = X'X$$

Example 6. Where, X in the formula represents the data structure matrix in the multiple linear regression model, and X' represents the transpose matrix of the structure matrix X . At the same time, the matrix D can also be used to represent the constant term on the right side above, as follows:

$$D = \begin{pmatrix} \sum_{i=1}^n y_i \\ \sum_{i=1}^n x_{i1}y_i \\ \sum_{i=1}^n x_{i2}y_i \\ \vdots \\ \sum_{i=1}^n x_{ip}y_i \end{pmatrix} = \begin{pmatrix} 111 \dots 1 \\ x_{11}x_{21}x_{31} \dots x_{n1} \\ x_{12}x_{22}x_{32} \dots x_{n2} \\ \vdots \vdots \\ x_{1p}x_{2p}x_{3p} \dots x_{np} \end{pmatrix} \begin{pmatrix} y_1 \\ y_2 \\ y_3 \\ \vdots \\ y_n \end{pmatrix} = XY$$

From this, we can get:

$$Ab=D$$

And

$$(XX)b \bullet XY$$

Assuming the full rank of A , in other words, the determinant of A is $|A| \neq 0$ then it has the inverse matrix A^{-1} , and the least squares of β can be calculated by combining the above formula to get:

$$b = A^{-1}D = (X'X)^{-1}X'Y$$

This is the regression coefficient of the multivariate linear regression equation [4].

1.2 Inspection and analysis

Note 7. First, the goodness of fit test. The decomposition process of the total deviation square can be written as:

$$TSS = \sum (Y_i - \bar{Y})^2 \text{ the sum of squares of total deviation}$$

$$ESS = \sum (\hat{Y}_i - \bar{Y})^2 \text{ return to the sum of squares}$$

$$RSS = \sum (Y_i - \hat{Y}_i)^2 \text{ sum of residual squares}$$

And we can get:

$$\begin{aligned} TSS &= \sum (Y_i - \bar{Y})^2 \\ &= \sum (Y_i - \hat{Y}_i)^2 + \sum (\hat{Y}_i - \bar{Y})^2 \\ &= \sum (Y_i - \hat{Y}_i)^2 + 2 \sum (Y_i - \hat{Y}_i) (\hat{Y}_i - \bar{Y}) + \sum (\hat{Y}_i - \bar{Y})^2 \end{aligned}$$

It can be concluded that:

$$\begin{aligned} (Y_i - \bar{Y}) &= (Y_i - \hat{Y}_i) + (\hat{Y}_i - \bar{Y}) \\ (Y_i - \bar{Y})^2 &\neq (Y_i - \hat{Y}_i)^2 + (\hat{Y}_i - \bar{Y})^2 \\ \sum (Y_i - \bar{Y})^2 &= \sum (Y_i - \hat{Y}_i)^2 + \sum (\hat{Y}_i - \bar{Y})^2 \end{aligned}$$

What needs to be noted is:

$$\begin{aligned} TSS &= \sum (Y_i - \hat{Y}_i)^2 + \sum (\hat{Y}_i - \bar{Y})^2 = RSS + ESS \\ \sum (Y_i - \hat{Y}_i) (\hat{Y}_i - \bar{Y}) &= \sum e_i (\hat{Y}_i - \bar{Y}) \\ &= \hat{\beta}_0 \sum e_i + \hat{\beta}_1 \sum e_i X_{1i} + \dots + \hat{\beta}_k \sum e_i X_{ki} + \bar{Y} \sum e_i \\ &= 0 \end{aligned}$$

Second, the coefficient of determination. The formula is as follows:

$$R^2 = \frac{ESS}{TSS} = 1 - \frac{RSS}{TSS}$$

The closer this value is to 1, the higher the goodness of fit of the model is proved. When new explanatory variables are found in the model during the application, the R^2 value will increase accordingly. In this case, the change in the R^2 value caused by the increase in the number of explanatory variables has nothing to do with the goodness of fit but requires scientific adjustment of R^2 .

Based on clarifying the sample size, the degree of freedom will inevitably be reduced if the explanatory variables are added. Therefore, the sum of squares of residuals and the sum of squares of total deviations should be divided by the corresponding degrees of freedom respectively during the adjustment, to exclude the influence of variables on the degree of good fit. The specific equation is [5]:

$$\bar{R}^2 = 1 - \frac{RSS/(n-k-1)}{TSS/(n-1)}$$

Where, $n-k-1$ represents the degree of freedom of the sum of squares of residuals, and $n-1$ represents the degree of freedom of the sum of squares of the population.

The two are respectively:

$$R^2 = \frac{ESS}{TSS} = \frac{\sum (\hat{Y}_i - \bar{Y})^2}{\sum (Y_i - \bar{Y})^2} = \frac{TSS - RSS}{TSS} = 1 - \frac{\sum e_i^2}{\sum y_i^2}$$

$$\bar{R}^2 = 1 - \frac{\sum e_i^2 / (n-k-1)}{\sum y_i^2 / (n-1)} = 1 - \frac{n-1}{n-k-1} \frac{\sum e_i^2}{\sum y_i^2} = 1 - \frac{n-1}{n-k-1} (1 - R^2)^2$$

Third, Akachi Information Criteria (AIC) and Schwartz Criteria (AC). In addition to using the above coefficients for analysis, Akakchi Information Criteria and Schwartz Criteria can also be used for analysis. The specific formula is:

$$AIC = \ln \frac{e'e}{n} + \frac{2(k+1)}{n}$$

$$AC = \ln \frac{e'e}{n} + \frac{k}{n} \ln n$$

Fourth, the F test. If the calculated value of F exceeds the critical value, then the original hypothesis must be rejected and the regression model is proved to be significant, which proves that all explanatory variables connected together have a direct impact on Y. Otherwise, the original hypothesis is not rejected, which proves that the regression model has no significant significance. In other words, all explanatory variables connected together have no obvious influence on Y.

Open Problem 8. The original hypothesis and the alternative hypothesis are respectively:

$$H_0 : \beta_0 = \beta_1 = \beta_2 = \dots = \beta_k = 0$$

$$H_1 : \beta_j \text{ not all is } 0$$

And the actual test idea is derived from the decomposition equation of the sum of squares of the total deviation, as shown below:

$$TSS = ESS + RSS$$

The specific test model is as follows:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki} + \mu_i$$

$$i = 1, 2, \dots, n$$

Among, the parameter β_j is not 0, whether significant or not [6].

The actual ANOVA table is as follows:

Table 1 Analysis of variance table

Sources of variation	Sum of squares	Degrees of freedom	The variance
Regression model	$ESS = \sum (\hat{Y}_i - \bar{Y})^2$	k	$\sum (\hat{Y}_i - \bar{Y})^2 / k$
Due to the remaining	$RSS = \sum (Y_i - \hat{Y}_i)^2$	n-k-1	$\sum (Y_i - \hat{Y}_i)^2 / (n-k-1)$
Total variable	$TSS = \sum (Y_i - \bar{Y})^2$	n-1	$\sum (Y_i - \bar{Y})^2 / (n-1)$

Fifth, the t-test. The significant overall linear relationship of the equation does not mean that all explanatory variables are significant to the explained variables. Therefore, all explanatory variables should be tested to determine whether they should be retained in the model. The t-test is required to carry out the testing work.

Because

$$Cov(\hat{\beta}) = \sigma^2 (X'X)^{-1}$$

Where C_{ii} represents the i-th element on the main line of the matrix $(X'X)^{-1}$, so the variance of the parameter estimator is:

$$Var(\hat{\beta}_i) = \sigma^2 c_{ii}$$

And represents the variance of the random error term, then the estimator should be used to replace in the calculation:

$$\hat{\beta}_i \sim N(\beta_i, \sigma^2 c_{ii})$$

Since it follows the normal distribution, we can get the T-statistic as follows:

$$t = \frac{\hat{\beta}_i - \beta_i}{S_{\hat{\beta}_i}} \frac{\hat{\beta}_i - \beta_i}{\sqrt{c_{ii} \frac{e'e}{n-k-1}}} \sim t(n-k-1)$$

2 Choice of accessibility and regional economic indicators

2.1 Accessibility

This content is generally the use of a certain mode of transportation, in the appropriate conditions to achieve people clearly requested a destination of a space transfer ability. By analysing the accessibility levels of different regions and thinking from the perspectives of economic and spatial dimensions, the differences in various aspects of the regions can be presented intuitively.

2.2 Regional economy

The influence of high-speed railway on the regional economy is mainly reflected in fully mobilising the growth rate of the regional economy and triggering the transformation and upgrading of the region. From the Angle of practice, the economic increase will inevitably bring more opportunities for the local development, and can increase the internal product production quantity and demand of labour, and industrial upgrading can rapid optimisation of various elements of the local, such as information, capital and technology, and the content of social and economic development also has a positive effect [7].

2.3 Selected indicators

In this paper, weighted average travel time and economic potential are used to study and analyse the impact of high-speed rail on the social and economic development of the region.

On the one hand, weighted average travel time. This index is mainly used to evaluate the time measurement of a node city to another destination. The level of this value will directly define the accessibility of a node and its close relationship with the economic centre. In the context of rising index scores, it is proved that the accessibility and regional connection of the region are very low, whereas the opposite is very high. The specific expression formula is as follows:

$$A_i = \sum_{j=1}^n (D_{ij} * M_j) / \sum_{j=1}^n (M_j)$$

Where, A_i represents the accessibility of node I, D_{ij} represents the time required for node I to reach the economic centre, M_j represents the strength of the economic centre and the GDP owned by the economic centre should be used for detection and analysis, and n represents the number of all nodes in the evaluation index except for the unexpected number of node I.

On the other hand, economic potential. In many cases, this index is determined according to the economic level of the node city. The node with a higher score indicates that the potential of the node is very large; otherwise, it indicates that the development potential of the city is too low. In the research and analysis, Newton's universal gravitation model should be used for operation, and the specific formula is as follows:

$$P_i = \sum_{j=1}^n M_j / C_{ij}^\alpha$$

Where, P_i represents the economic potential value of node I, C_{ij} represents the time required from node I to economic centre j, and α represents the friction coefficient, which can generally be regarded as 1.

2.4 Establishment of index system

To facilitate the research, this paper collected and sorted out the numerical changes of a place in the 2 years before and after the opening of high-speed rail, and conducted correlation analysis from the weighted average travel time and economic potential between major counties and cities. The cities in this region have four high-speed railway lines, namely 1, 2, 3 and 4, with A total distance of 1,000 km, and 10 important stations are designed along the border, including A, B, C and D, with an average speed of 230 km.

2.5 Data analysis

After the completion of the construction of a high-speed railway, the most obvious thing about the city is that the travel time between nodes is becoming less and less. Combined with the comparative analysis in Table 2 below, we can see that:

Table 2 Comparison of running time before and after construction of high-speed railway

Section	Before the construction of high-speed rail	After the construction of the high-speed rail
A—B	2 h and 9 min	45 points
A—C	1 h and 08 min	41 points
B—C	2 h and 30 min	1 h and 3 min
A—D	30 per minute	14 points

The construction of a high-speed railway reduces the urban transportation time, and at the same time effectively controls the cost, increases the speed of the flow of people and information, and speeds up the flow of

various elements between each node city.

Combined with the calculation formula analysis of the above weighted average travel time index, the time values of each city are shown in Table 3 below:

Table 3 Weighted average travel time rating table

City	Before the construction of high-speed rail	After the construction of the high-speed rail	Growth probability%
A	119.35	43.76	36.67
B	121.36	62.00	51.08
C	91.84	32.06	34.90
D	117.79	45.79	38.20

Combined with the analysis results in the table above, the index scores of each region increase rapidly, and the accessibility growth rate of cities along the high-speed railway can exceed 30% or more. In this process, high-speed rail will surely accelerate the pace of local economic development and promote economic cooperation and exchanges between regions.

Combined with the above calculation formula analysis of economic potential, the following results can be obtained as shown in Table 4:

Table 4 Economic potential index analysis results

City	Before the construction of high-speed rail	After the construction of the high-speed rail	Growth probability
A	21.07	96.13	4.56
B	25.98	112.63	4.34
C	27.19	192.26	7.07
D	24.00	168.33	7.01

Combined with the analysis results in the above table, the growth rate of indicators in all regions after the construction of a high-speed railway is > 4 times, and the average growth value increases by 5.77 times. This proves that the construction of high-speed rail has a great impact on the accessibility of surrounding cities.

3 Result analysis

The construction of a high-speed railway can further optimise the local economic environment and allocate local resources, to promote the flow of local factors, improve the wage level, labour production efficiency and service level of surrounding cities, and thus accelerate the level of economic development of the region.

3.1 Flow and aggregation of production factors

According to the above build by multiple linear regression model analysis, and the weighted average travel time index and economic potential index, operation of high-speed railway construction inevitably can optimise the local traffic level, and improve accessibility in region, prompting the city economic integration development, and accelerate the flow of factors of production. Take Land A as an example. As the economic centre of urban construction and development, the capital and technological advantages contained in it will inevitably be transferred to regions with rich resources and low prices. At this time, regions with too low economic development levels can obtain more economic benefits based on the rapid flow of production factors [8].

In addition, after the completion of high-speed railway construction, various production factors, such as capital, technology and human resources, will continue to flow in the region, which will also promote the accu-

mulation of talents and funds in the region, to accelerate the improvement of social and economic development level.

3.2 Scientific adjustment of production structure

In the process of industrial structure adjustment and economic development, the construction of a high-speed railway has increased the opportunities for exchanges between talents and industries, and can rapidly expand the development scope of the tertiary industry, thus promoting the upgrading and adjustment of industrial structure. At the same time, the continuous flow of production factors can also help the steady development of modern emerging industries, thus improving the actual service level. For example, based on accelerating the development of the secondary industry, A also drives the development of the tourism and service industry. In this process, the construction of a high-speed railway can help the unreasonable industrial structure in the region to optimise and improve comprehensively.

3.3 Realise regional integrated development

The emergence of high-speed rail has reduced the distance between different regions and promoted the integration of urban construction across the country. In the context of the new era, regional integration refers to the proximity of regions from a geographical point of view and requires multiple cooperation and exchanges between regions to achieve common development goals, and finally constitutes a development process that integrates various elements of each other. According to the analysis of research results proposed by U. Blum et al., high-speed railway construction will optimise the urban market structure and organisation, drive the economic development of the station cities, comprehensively improve the local labour productivity and promote the economic development level of residents based on showing its own construction advantages. From a practical point of view, the goal of integrated development is to promote communication and cooperation between cities, give full play to their own advantages, solve problems existing in each other's development, and finally achieve the development goal of common progress.

3.4 Economic communication and development within and outside the region

According to the analysis results of this paper, the cooperation and communication between the economic development of central cities and surrounding cities can accelerate the flow of talents, technology and other elements by building a good cooperative relationship based on deepening mutual connection. For A city like A, which has A very high level of economic development, it has A lot of development opportunities, and the construction of a high-speed railway will certainly bring obvious influence on the development of other elements. For cities with weak development levels, the opening and construction of a high-speed railway can also give full play to this radiation effect, to provide more impetus for the optimisation of local industrial structure.

4 Conclusion

To sum up, based on the multiple linear regression equation to study the effect of the industrial economy on the social economy, the article mainly in somewhere of the high-speed rail, for example, before and after construction are obtained by calculation equation and economic potential of the weighted average travel time index, and then from the specific changes of practice development, analysis of the various elements of city construction and development around the change. The trend of economic integration based on transportation networks has not only increased the original high-speed railway distance to 2,500 kilometres, accounting for 15% of the national total but also further clarified the influence of the industrial economy on the local social and economic development process. In this process, the urban high-speed rail network constructed by the current urban development can not only fully show the advantages of various industrial elements, improve the actual economic development level, but also lay a foundation for the coordinated economic development of various

cities in the external communication and communication [9, 10].

Acknowledgements: Heilongjiang Province Philosophy and Social Science Fund (19JYE255). Heilongjiang Province Philosophy and Social Science Fund ‘Research on the Countermeasures for the Coordinated Development of Regional Economy and Resources in Heilongjiang Province’ (18JYC257). Heilongjiang Province Higher Education Teaching Reform Project (SJGSY2020037).

References

- [1] Graefe P. Personal Services in the Post-industrial Economy: Adding Nonprofits to the Welfare Mix[J]. *Social Policy & Administration*, 2010, 38(5):456-469.
- [2] Rushton P. The Matter In Variance: Adolescents and Domestic Conflict in the Pre-Industrial Economy of Northeast England, 1600–1800[J]. *Journal of Social History*, 1991, 25(1):89-107.
- [3] &Amp P, Neville K J. Forests, food, and fuel in the tropics: the uneven social and ecological consequences of the emerging political economy of biofuels.[J]. *Journal of Peasant Studies*, 2010, 37(4):631-660.
- [4] Martin C J, Thelen K. The State and Coordinated Capitalism: Contributions of the Public Sector to Social Solidarity in Post-Industrial Societies[J]. *World Politics*, 2007, 60(1):1-36.
- [5] Olsen G M. Re-Modeling Sweden: The Rise and Demise of the Compromise in a Global Economy*[J]. *Social Problems*, 2014(1):1.
- [6] Tanaka, Keiko. Agricultural Research in a Centrally Planned Economy: The Case of Rapeseed Research in the People’s Republic of China (PRC)[J]. *Asian Journal of Social Science*, 1998, 26(1):69-92.
- [7] Haslett S J, Govindaraju K. CLONING DATA: GENERATING DATASETS WITH EXACTLY THE SAME MULTIPLE LINEAR REGRESSION FIT[J]. *Australian & New Zealand Journal of Statistics*, 2009, 51(4).
- [8] Browne M W. A COMPARISON OF SINGLE SAMPLE AND CROSS-VALIDATION METHODS FOR ESTIMATING THE MEAN SQUARED ERROR OF PREDICTION IN MULTIPLE LINEAR REGRESSION[J]. *British Journal of Mathematical & Statistical Psychology*, 2011, 28(1).
- [9] Pilar F P, Miquel B V, Pedro T, et al. A Comparison between Multiple Regression Models and CUN-BAE Equation to Predict Body Fat in Adults[J]. *Plos One*, 2015, 10(3):e0122291-.
- [10] M García-Bárzana, Ramos-Guajardo A B, Colubi A, et al. Multiple linear regression models for random intervals: a set arithmetic approach[J]. *Computational Statistics*, 2020, 35(9).