Acta Technica *62* (2017), No. 6B, 633–644

Causal reasoning method of influence factors based on degree correlation variable impact analysis

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Abstract. The preferential tax policy of commercial health insurance is a kind of financial means through which the State motivates residents to participate in commercial health insurance through the transfer of government tax revenue. However, as the motivation effects and tax costs produced by various preferential tax modes are different, the selection of preferential tax mode becomes the major problem for policy implementation due to the influence of the both. In the Thesis, an empirical analysis methods based on the influence of preferential tax policy on commercial health insurance is proposed. It is based on the linear discriminant regression of the generalized income tax rate function to realize the empirical analysis of the influence on commercial health insurance through the relation between the test sample for subspace classifier measurement and single classification. The experimental results verify the effectiveness of the algorithm.

Key words. Commercial health insurance, Empirical analysis, Linear discriminant regression, Subspace classification, Preferential tax

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1. Introduction

The reform of commercial health security is an important arrangement to realize social equity, improve people's welfare level and realize sustainable development of various countries in the world. No matter the developed capitalist countries such as the United Sates, the United Kingdom, or developing socialist countries as China have started drastic reform of the commercial health security system in recent years, in which the commercial health insurance reform as an important link to improve the security system is the key to the success or failure in commercial health security reform of various countries. The commercial health insurance system mainly

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includes two aspects: firstly, the social and commercial health security organized by the government depending on compulsory forces; secondly, the commercial health insurance spontaneously formed by market mechanism. From the perspective of the current reform practice of the commercial health security of various countries, the both are mutually complemented and they are the indispensable security for the health of residents.

Since 1980s when China launched commercial health insurance, it is still at primary stage even after more than 20 years of development. In 2009, the premium income of health insurance of our country was 57.4 billion yuan accounting for about 700 of the premium income of life insurance in the insurance market, far below 30% of the standard of mature insurance market (Zhu Minglai et al, 2009). At present, nearly one hundred insurance companies throughout the country sale more than 1500 kinds of health insurance products. However, the product type is single which is mainly focused on commercial health insurance and disease insurance such as serious disease quota payment insurance, hospitalization expense compensation insurance for commercial health security and hospitalization allowance, rarely involving such types of insurance as nursing insurance, comprehensive insurance and insurance for income loss due to disability. The interregional development of health insurance market is very unbalanced and regions of which the premium income of health insurance ranks top 10 (such as Beijing, Guangdong, Shanghai and etc.) occupy 60.1% of market shares. In accordance with the 4th national health services survey, only 6.9% urban and rural residents purchased commercial health insurance in 2008.

Since 2003, the government of China has began to vigorously promote commercial health security reform in rural areas to establish new rural cooperation commercial health security system (hereinafter referred to as NCMS) and firstly carry out pilot projects in 304 counties of 31 provinces and cities, expanding to 620 counties in 2005 and basically covering all counties at the end of 2010. In urban areas, the government of China established the basic commercial health insurance for urban employees in 1998 and carried out the pilot work of the basic commercial health insurance for urban residents (hereinafter referred to as BCHIUR) in 79 urban areas in 2007 and comprehensively launched it in 2010. So far, the basic commercial health security system covering urban and rural residents of China has been formed basically. However, the main objective of NCMS and BCHIUR is to provide convenient and low-cost basic commercial health security service for residents. Therefore, for the system design, it can not provide complete commercial health security for all residents. In April 2009, the State Council published the *Opinions on Deepening the Reform of Medical and Health System* which clearly put forward that the basic commercial health security system shall be supplemented by the diversified basic commercial health security assistance and commercial health insurance to meet the multi-level commercial health security demands. Then, in the construction of the multi-level commercial health security system, how the commercial health insurance can give full play to the important supplementary role for the basic commercial health security? The overseas researches show that the role and function of commercial health insurance depend on multiple factors such as the economy, society and system of a country. It is a pity that under the general background of com-

mercial health security reform in China, empirical researches on commercial health insurance of China at home and abroad are very limited..

For this purpose, in the Thesis, the purchasing behavior model of commercial health insurance for residents is established through the behavior analysis of the Supplier and Purchaser in the health insurance market. The following is discussed from the empirical point of view by using the data from China Health and Nutrition Survey and econometrics analysis method: what are the macro and micro factors influencing the purchasing behavior of commercial health insurance for urban and rural residents in China? Especially, how serious is the influence on the health condition of residents? As the insurance company in the insurance market will refuse demanders with high health risk for the profit maximization, the influence of residents' health on the purchasing behavior of commercial health insurance include two decision-making processes—the potential demand decision-making of residents for commercial health insurance and supply decision-making of insurance company. In the Thesis, the empirical analysis of influence of preferential tax policy on commercial health insurance is conducted and the empirical analysis of influence on decision-making through the method of linear discriminant regression subspace classification is also realized.

2. Measurement model and data description

2.1. Basic assumption

Total personal income (I) deducting various social insurance premiums (S) and individual income tax (T) plus government subsidies (B) is the actual current personal income. The various social insurance premiums (S) plus individual income tax (T) minus government subsidies (B) can be defined a kind of generalized income tax (T^+), as follows:

$$T^+ = S + T - B\,. \tag{1}$$

The preferential tax policy mentioned in the Thesis is also the preferential policy carried out by this kind of generalized income tax. The rate of various social insurance premiums is a fixed proportion (λ); the individual income tax rate (t) is progressive by sections for total personal income (I) and the government subsidy rate (b) is regressive by sections for total personal income (I). For simplification, we set them respectively as follows:

$$s = \frac{S}{I} = \lambda\,. \tag{2}$$

$$t = \frac{T}{I} = t\,(I)\,, t'\,(I) \geq 0, t''\,(I) \leq 0\,. \tag{3}$$

$$b = \frac{B}{I} = b\,(I)\,, b'\,(I) \leq 0, b''\,(I) \geq 0\,. \tag{4}$$

The ratio of generalized income tax (T^+) in total personal income (I) can be defined as individual income tax rate (t^+), then:

$$t^+ = \frac{T^+}{I} = \lambda + t(I) - b(I) = t^+(I)\,. \tag{5}$$

Here, the generalized individual income tax rate (t^+) is the increasing function of income I and marginal tax rate is regressive, as follows:

$$t^{+\prime}(I) \geq 0, t^{+''}(I) \leq 0\,. \tag{6}$$

Assume that the premium which can be drawn before taxes for the individual to purchase commercial health insurance is F, the preferential tax obtained is:

$$TD = t^+(I) \cdot I - t^+(I - F) \cdot (I - F)\,. \tag{7}$$

As shown in Fig.1, dash area represents the preferential tax enjoyed for the individual to purchase commercial health insurance.

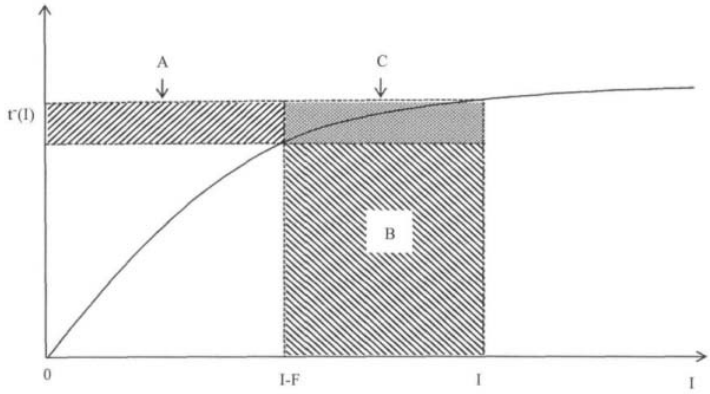

Fig. 1. Schematic diagram for the function of generalized income tax rate and construction of preferential tax

The preferential tax mainly consists of three parts as a whole: part 1 is the preferential tax brought about by constant tax rate and reduction of tax amount payable and it can be expressed as follows:

$$TD_{B+C} = t^+(I) \cdot F\,. \tag{8}$$

Part 2 is the preferential tax brought about by constant tax amount payable and reduction of tax rate and it can be expressed as follows:

$$TD_{A+C} = [t^+(I) - t^+(I - F)] \cdot I\,. \tag{9}$$

In addition, the losses caused by a part of preferential tax shall be excluded and it

can be expressed as follows:

$$TD_c = [t^+(I) - t^+(I-F)] \cdot (I-F)\,. \tag{10}$$

Therefore, the overall preferential tax (Formula (7)) can be further expressed as follows:

$$\begin{aligned} TD &= TD_{B+C} + TD_{A+C} - TD_c \\ &= t^+(I) \cdot F + [t^+(I) - t^+(I-F)] \cdot I - [t^+(I) - t^+(I-F)] \cdot (I-F)\,. \end{aligned} \tag{11}$$

Influence of preferential tax on individual to purchase commercial health insurance is mainly influenced by the above three main effects. Hereby, we propose the following fundamental assumption: fundamental assumption one (overall effect): the more preferential tax is, the stronger individual purchase intension of commercial insurance will be; fundamental assumption two (tax base effect): the tax rate is invariant, the more preferential tax by decline of tax amount payable is, the stronger individual purchase intension of commercial insurance will be; fundamental assumption three (tax rate effect): the tax amount payable is invariant, the more preferential tax by decline of tax rate is, the stronger individual purchase intension of commercial insurance will be; fundamental assumption four (tax loss effect): the less preferential tax loss is, the stronger individual purchase intension of commercial insurance will be.

2.2. Econometric model

Then establish econometric model. We establish Probit model for purchase intention of commercial health insurance:

$$\text{Prob}(q_i = 1) = \text{constant} + \beta TD_i + \theta' H_i + \gamma' Z_i + u_i\,. \tag{12}$$

In the formula, the TD_i means the preferential tax that can be gained by individual from purchasing commercial health insurance. Its coefficient $\beta > 0$ represents the total effect of preferential tax is positive. For the convenience of calculating, it is necessary to make some simplifying assumptions due to limited data. The function of effect of tax base is built as follow:

$$TD_{B+C} = \alpha_1 \text{Income}^{\text{a}} \cdot \text{Premium}\,. \tag{13}$$

$$TD_{A+C} = \alpha_2 b^{\text{-Income}}\,. \tag{14}$$

Where, the Income is personal income, the Premium is the health insurance fee for enjoying the preferential tax, the $\alpha_1 > 1$ means the positive effect of tax base, the α is the exogenous constant and $0 < \alpha \leq 1$. The function of effect of tax rate is built as follow:

Where, the $\alpha_2 > 0$ means the positive effect of tax rate, the b is the exogenous

constant and $b > 1$. The function of effect of tax lost is built as follow:

$$TD_C = \alpha_3 \text{Premium}\,. \tag{15}$$

Where, the $\alpha_3 < 0$ means the negative effect of tax lost. So the function of overall effect of preferential tax is built as follow:

$$\text{TD} = \alpha_1 \text{Income}^{\text{a}} \cdot \text{Premium} + \alpha_2 \text{b}^{-\text{Income}} + \alpha_3 \text{Premium}\,. \tag{16}$$

We can substitute the formula (16) into the formula (20) to regress the neural network directly, and the symbol of each variation coefficient is consistent with the coefficient a_j $(j = 1, 2, 3)$ of matching effect function due to $\beta > 0$.

Two sets of control variable will be selected in model, including main variables as follows:

1. Variables of personal health status, including the number of outpatient visits, the number of hospitalizations, whether suffering from particular diseases or not and whether suffering from major diseases or not, etc. The worse the personal health status is, the greater requirements for health insurance become and the stronger the willingness to purchase health insurance is.

2. The categories of basic commercial health security and insurance, include basic commercial health security and insurance for urban employees, basic commercial health security and insurance for urban residents, commercial health security of new rural cooperation, commercial health security with public expense and insurance for failure to participate in any basic commercial health security. Different types of basic medical insurance are different in the categories and the level of the assurance, the individual who participating in different types of basic health insurance will have different needs for health insurance.

3. The reimbursement conditions of commercial health insurance expenses and basic medical insurance, include outpatient expenses, outpatient reimbursement, hospitalization expenses and hospitalization reimbursement. In general, the higher the commercial health insurance expenses is, the lower the basic medical insurance reimbursement is, and the stronger the individual have a willingness to purchase health insurance become.

4. The subjective evaluation to the basic medical insurance, including the three major directories, designated hospital services, etc. The places where exist low satisfaction of the basic medical insurance exactly are the development direction of the supplementary insurance, so the satisfaction of the basic medical insurance is negatively related to the purchase willingness of commercial health insurance.

5. The arrangement of the commercial health insurance expenses at one's own expense, that is, the position of commercial health insurance in a number of alternative ways, and other alternative ways include precautionary savings, borrow money from relatives and friends, etc. The more front position of commercial health insurance is, which represents the more recognized to the function of the individual, and the stronger the purchase willingness become.

6. Acknowledgement to the function of commercial health insurance. The previous use and awareness condition of commercial health insurance also affect the

willingness of individuals to buy commercial health insurance again. Another set of control variables is the individual's basic situation, including gender, age, income, marital status, occupation, education level, etc, which is expressed by a vector Z_i. Among which, whereas the health risk of middle-aged and middle-income people is more prominent, and the willingness to purchase commercial health insurance is more intense, so the square of variables, age and income will be added to the measurement model. Generally, as the main source of income for the family, male has stronger demands for health insurance than female. Marital status, employment status, education level and other variables as the representative indicators of personal stability preferences indicate that individuals will have the greater willingness to purchase the health insurance if they have higher risk aversion and the stronger ability to identify.

3. Linear discriminant regression subspace classification

3.1. Linear discriminant regression

Supposed that there are N objects, including p_i training sample from the class i $i = 1, 2, ..., N$, project the sample on the insurance data space, and matrix $\mathbf{W}$ contains all eigenvectors from N objects, that is $\mathbf{W} = [\mathbf{W_1}, ..., \mathbf{W}_i, ..., \mathbf{W}_N]$. In order to the specific model of applied regression analysis estimation, constitute all involved class member column vector $w_{i,j}$ into a set, therefore, for the class i, there is as follow:

$$\mathbf{W_i} = [w_{i,1}, ..., w_{i,j}, ..., w_{i,pi}] \in \mathbf{R}^{L \times pi} . \tag{17}$$

In the above formula, each vector is the column vector with the size of $L \times 1$, and in the training period, class i is expressed by vector space $\mathbf{W_i}$, which is called the predictor of each vector. If y belongs to class i, it can be expressed by a linear combination of training sample of class i, the definition is as follow:

$$y = \mathbf{W_i}\beta_i + e, \quad i = 1, 2, ..., N . \tag{18}$$

In the above formula, $\beta_i \in \mathbf{R}^{p_i \times l}$ is the vector of regression parameter, $\tilde{\beta}_i$ is an error vector and the mean of its independent identically distributed random variable is zero. The goal of linear regression is to find $\tilde{\beta}_i$ to minimize the residual error.

The linear regression is explored on the basis of minimum distance between source vector and projected vector, if the source vector belongs to subspace of class i, the predictor vector $\tilde{\mathbf{y}}_\mathbf{i}$ will be nearest to source vector. The calculation of Euclidean distance between source vector and predictor vector can be identified as i^*, that is as follow:

$$i^* = \arg\min_i \|\tilde{\mathbf{y}}_i - y\| , i = 1, 2, ..., N . \tag{19}$$

3.2. Nearest subspace classifier

After the selection of characteristic space, the next step is to correctly classify the new test samples. The Nearest Subspace(Nearest Subspace, NS)Classifier [10] is the most important branch in non-parametric algorithm, but NN Classifier is the most simple and feasible identification method for insurance data, NS needs to find the training samples that have the nearest distance between test samples and all prototype samples, then confirm the class label of test samples.

Firstly, a usual script description of insurance data identification shall be given, and given N different classes, class i, $i = 1, 2, ..., N$ has p_i pieces of prototype samples, and each prototype sample in the characteristic space represents a vector $a_i^{(m)} \in R^{q\times 1}$, in which $m = 1, 2, ..., p_i$ and q are the dimesionality of the characteristic space. Then, array the vectors of prototype samples of one class, to build a class-relying subspace model:

$$A_i = [a_i^{(1)} a_i^{(2)} \cdots a_i^{(p_i)}]\,. \tag{20}$$

Assumed that y is the point of characteristic samples that has no been labeled in characteristic space, then calculate the distance between y and subspace A_i, that is difference of y from class i and predictor vector $\hat{y}_i$:

$$d_i = \|y - \hat{y}_i\|_2\,. \tag{21}$$

In the above formula, $\hat{y}_i$ is given by simple least square estimation as follow:

$$\hat{y}_i = A_i(A_i^T A_i)^{-1} A_i^T y\,. \tag{22}$$

In the above formula, $A_i^T A_i$ shall be constrained. Finally, classify y until the class with the nearest distance d_i. However, NFC algorithm only takes the expression within the abilities of this sole class into account when measuring the test samples and the relationship between classes, but neglects that other classes also can express test samples.

4. Empirical analysis

The introduction of the concept of tax elasticity is mainly to observe the income with tax preferential policy and the effects with commercial health insurance changes that caused by tax rate changes, compare all modes of preferential tax according to the degree of sensitivity. When analyzing the elasticity, which will be usually divided into five kinds according to the degree of sensitivity, including perfect elasticity (elastic value is infinite), perfect inelasticity (elastic value is 0), unit elasticity (elastic value is 1), elasticity (elastic value is between 1 and infinity) and lack of elasticity (elastic value is between 1 and 0). Based on the above formulas and assumed conditions, the following will calculate and analyze the utility elasticity and the tax expenditure elasticity of the commercial health insurance under each tax preferential mode.

1. Tax elasticity of the purchasing power of commercial health insurance. Firstly,

using the formula (4) and (5) to calculate the customers' purchasing power of commercial health insurance under different preferential tax mode, because the age of consumers span from 25 to 75 years old and in order to express more concisely, take 5-year as a period of time, thus consumers had 10 periods after this arrangement, then to solve with the Matlab7.0 software, and the final results are shown in Table 1.

Table 1. Commercial health insurance under different preferential tax modes

t	TTT	TTE	TET	TEE	ETT	ETE	EET	EEE
0	69 022	74 319	72 218	77 870	69 231	74 527	72 427	78 078
1	74 101	79 787	77 532	83 599	74 324	80 010	77 756	83 823
2	79 553	85 657	83 236	89 750	79 793	85 897	83 476	89 990
3	85 406	91 959	89 360	96 353	85 663	92 217	89 618	96 611
4	91 689	98 725	95 935	103 443	91 966	99 002	96 212	103 719
5	98 435	105 989	102 993	111 053	98 732	106 286	103 291	111 350
6	105 678	113 787	110 571	119 224	105 997	114 106	110 890	119 543
7	113 453	122 159	118 706	127 996	113 795	122 501	119 049	128 338
8	121 800	131 147	127 440	137 413	122 168	131 514	127 808	137 781
9	130 762	140 796	136 816	147 523	131 156	141 190	137 211	147 918
10	140 382	151 155	146 883	158 377	140 806	151 578	147 306	15 8801

Take the logarithm from the purchasing power of above each optimal commercial health insurance, then purchasing power utility of each commercial health insurance is obtained by multiplying logarithm with the time preference of corresponding purchasing power, the consumers' purchasing power utility value of lifelong insurance commercial health under different preferential tax modes can be calculated by the total of summation formulas, which is as shown in Table 2.

Table 2. Consumers' purchasing power utility of lifelong insurance commercial health under different preferential tax modes

Mode	TTT	TTE	TET	TEE	ETT	ETE	EET	EEE
U(C)	4 166.63	4 208.32	4 333.84	4 381.39	4 169.00	4 210.54	4 335.66	4 383.08

According to the utility value of the commercial health insurance purchasing power calculated in Table 2, the degree of sensitivity of consumers to tax rate changes in different periods is shown in Fig 2. In the period of payment, the elasticity of the tax rate is negative and inelastic, and the elastic value is distributed between -0.05 and -0.03. In addition to the TTT model, which is relatively most sensitive in all models, and the elastic value is -0.044, while the minimum elastic value of TEE model is -0.033. This shows that when the proportion of personal income tax increased by 1%, the consumers' purchasing power utility value of lifelong commercial health insurance will reduce the total amount of 0.033% $\sim$ 0.044%. The tax rate in investment period is changed by the impact on the purchasing power utility of the commercial health insurance arising from the accumulation value of commercial health insurance benefit, and when implementing preferential tax in investment pe-

riod, consumers do not need to pay any tax, so under the *E* mode, the tax rate elasticity of the purchasing power utility of commercial health insurance is perfectly inelastic. While under the other modes, the calculation of elasticity is between -0.28 and -0.35. This shows that tax rate changes in purchasing power utility of commercial health insurance in this period is also lack of elasticity, when the tax ratio of investment income tax increases by 1%, the purchasing power utility of consumers for commercial health insurance will reduce the total amount of 0.287% $\sim$ 0.352%. Similar to the investment period, under the **E preferential tax mode, consumers do not need to pay any tax on gotten commercial health insurance benefits in the income period, so the purchasing power utility of commercial health insurance is completely inelastic to changes in tax rates. While under other preferential tax modes, the distribution of elastic value is around -0.11, and the tax rate changes of purchasing power utility of commercial health insurance is also lack of elasticity. When increasing the proportion of 1% of the tax ratio of individual income tax in income period, the purchasing power utility of commercial health insurance will reduce the total amount of 0.1111% $\sim$ 0.1143%.

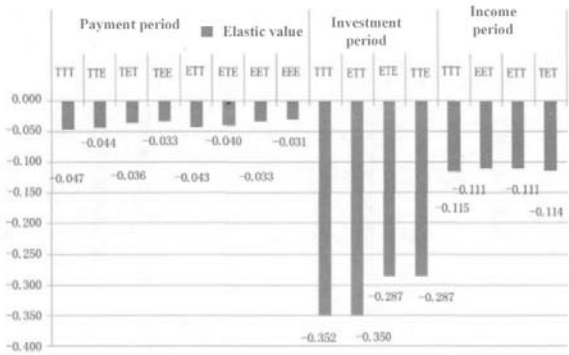

Fig. 2. Degree of sensitivity of purchasing power utility of commercial health insurance to tax rate under different preferential tax modes in each period

Through the calculation of the tax rate elasticity of the purchasing power utility of commercial health insurance, it is found that the degree of sensitivity is different in each period. The purchasing power utility of commercial health insurance is the most sensitive to the change of tax rate in the investment period, next is the payment period, and the most insensitive is the income period.

5. Conclusion

Preferential tax policy is an effective mean to promote commercial health insurance, but it is also a double-edged sword. It has a distinct effect on the government and taxpayers, so the tax expenditure of government and consumers' purchasing power utility of commercial health insurance on behalf of the costs and benefits of the preferential tax policy, the key to select the mode of preferential tax is to balance the relationship between the two.

According to the results of elastic calculation, consumers' purchasing power utility of commercial health insurance and the tax elasticity of tax expenditure are less than 1, and lack of elasticity. And the degree of sensitivity is not same in different preferential tax modes and preferential periods. But in comparison, the tax expenditure is affected by changes in tax rate, which is more direct and stronger than the purchasing power utility of commercial health insurance, the maximum elastic value of tax expenditure is 1, but the incentive effect of purchasing power of optimal commercial health insurance, the maximum elastic value of which is 0.4. For all purchasing power utilities of commercial health insurance, the impact of tax rate changes in the investment period is more obvious, the other two periods are relatively weak. As for the tax expenditure of government, the impact of tax rate changes is the most obvious, followed by the payment period.

Acknowledge

The research work was supported by province-level graduate professional practice base of Hebei Finance University and Ministry of Education of the People's Republic of China under Grant No.14YJC630044 and Hebei Planning Office of Philosophy and Social Science under Grant No. HB15YJ072 and soft science project of Hebei Science and Technology Department under Grant No. 164576472 and Baoding Science and Technology Bureau under Grant No. 16ZF014

References

[1] Cai X, Ding C, Nie F, et al.: (2013) *On the equivalent of low-rank linear regressions and linear discriminant analysis based regressions*[C]// ACM SIGKDD International Conference on Knowledge Discovery and Data Mining. ACM, 2013:1124-1132.

[2] Nour M A: (2014) *An Empirical Study of the Effect of Internet Services on the Preferential Adoption of Mobile Internet*[J]. International Journal of E-Business Research, 10(1):53-73.

[3] Liland K H, Høy M, Martens H: (2013) *Distribution based truncation for variable selection in subspace methods for multivariate regression*[J]. Chemometrics & Intelligent Laboratory Systems, 122(4):103-111.

[4] Wang G, Zhang Z, Sun J, et al.: (2014) *POS-RS: A Random Subspace method for sentiment classification based on part-of-speech analysis*[J]. Information Processing & Management, 51(4):458-479.

[5] Dosseto A, Buss H L, Suresh P O: (2012) *Rapid regolith formation over volcanic bedrock and implications for landscape evolution*[J]. Earth & Planetary Science Letters, s 337–338(4):47-55.

[6] Szent-Gyorgyi C, Stanfield R L, Andreko S, et al.: (2013) *Malachite Green Mediates Homodimerization of Antibody V L, Domains to Form a Fluorescent Ternary Complex with Singular Symmetric Interfaces*[J]. Journal of Molecular Biology, 425(22):4595.

[7] Shin D, Si S, Dhillon I S: (2012) *Multi-scale link prediction*[C]// ACM International Conference on Information and Knowledge Management. arXiv, 2012:215-224.

[8] Anastopoulos C, Savvidou N: (2012) *Time-of-arrival probabilities for general particle detectors*[J]. Physical Review A, 86(1):164-164.

[9] Schad T A, Penn M J, Lin H: (2013) *He I Vector Magnetometry of Field Aligned Superpenumbral Fibrils*[J]. Astrophysical Journal, 768(2):111.

[10] Feng Z, Qiu Z, Zi S, et al.: (2013) *Modeling the synergy between HSV-2 and HIV and potential impact of HSV-2 therapy*[J]. Mathematical Biosciences, 245(2):171.

[11] Chen S, Varma R, Singh A, et al.: (2015) *Signal Recovery on Graphs: Random versus Experimentally Designed Sampling*[J]. 2015:337-341.

[12] Daphalapurkar N P, Ramesh K T: (2012) *Orientation dependence of the nucleation and growth of partial dislocations and possible twinning mechanisms in aluminum*[J]. Journal of the Mechanics & Physics of Solids, 60(2):277-294.

[13] Gang Zheng, Yu Chen, Xavier Intes, et al.: (2012) *Contrast-enhanced near-infrared (NIR) optical imaging for subsurface cancer detection*[J]. Journal of Porphyrins & Phthalocyanines, 8(9):1106-1117.

Received May 7, 2017