A Study Evaluation Model and Index System of Industrial Resource and Energy Consumption in Small Towns

ZHANG Tong-sheng *

China Center for Town Reform and Development, National Development and Reform Commission, Beijing 100045, China

Abstract Based on the principles of hierarchy, representativeness, operability and completeness, 10 indices are selected from 3 aspects of resource consumption, energy consumption and enviromental emissions during small town development. Comprehensive evaluation index system for industrial *source-energy saving and pollution reducing* in small towns is constructed. According to the fuzzy mathematical method, qualitative calculation model of two-level hierachical structure is constructed. Among them, the first-level model focuses on each specific evaluation index. It calculates the membership degree of region to *resource-energy saving and pollution reducing* in evalution index set, and sorts the calculation results. The second-level model focuses on the first-level evaluation index set based on the sorting result. It calculates the membership degree of region to *resource-energy saving and pollution reducing* in the whole evaluation index system and sorts the calculation results. The weight of each evaluation indicator at each level is determined by analytich hierarchy process and information entropy method. Result shows that this model can be applied in quantitative and comprehensive measurement on industrial *energy saving and pollution reducing* degree in small towns. This model can help to judge the resource and energy consumption in different areas and industries, as well as the improvement or deteriation degrees of enviromental emission.

Key words Small towns, Resource, Energy, Energy saving, Pollution reducing, China

According to the Eleventh Five-Year Planning, there is a need to change the growth mode and improve the efficiency of energy use to construct a energy saving, enviroment friendly society. The energy consumption during the Eleven Five-Year Planning should be cut down by 20% per GDP, averaging cut down by 4.4% per year. Yet it has not been well accomplished in recent 2 years. In 2006, the reduction of energy consumption had not reached by 2%, and by 3.27% in 2007. The main reason is that the secondary industry develops so rapidly , which lead to a sharp increase in industrial energy consumption. Besides the big cities, the development of industries in small towns accelerates the speed of energy consumption in general. Study on the evaluation model and index system of industrial resources and energy consumption in small towns will help to afford some qualitative assistance in changing the growth mode from a perspective of practice. And finally promote sustainable social and economic development.

1 Selection of index system

The evaluation of the industrial resource and energy consumption in small towns is virtually the general evaluation of *energy saving and pollution reducing* development of local industries. It's hard to measure by just one or two indexes because it involves many indicators of different aspects just like industrial resource, energy consumption and enviromental emission and so on. So, it is a must to establish a scientific, complete and qualitative index system.

1.1 The construction principles of evaluation index system In order to evaluate the level of industrial resource and energy consumption in small towns in an objective, comprehensive and scientific way, 4 principles must be followed.

1.1.1 Hierarchical principle. Industrial energy saving and pollution reducing is a complex and multi-level concept. It can be divided into several smaller subsystems, each of which can be further divided into even smaller subsystems again, and so on. The higher the level, the more comprehensive the index. The lower the level, the more specific the index. We should have the aim and the index related organically to form a hierarchical entity.

1.1.2 Representative principle. Index system is mainly targeted on the evaluation of the consumption degree of industrial energy. Therefore, analysis of the system and selection of the index must reflect practically the specific resource and energy consumption in the production of industries. And they must be target-oriented.

1.1.3 Operational principle. The index content of evaluation index system should make itself as much simple, concise, easily understood as possible, with great comparabilities, easy data aquisition and quantification. In designing the index system, the amount of index difficult to make it quantitative or qualitative indicators should be minimized as much as possible.

1.1.4 Complete principle. The index system should sum up the main aspects of industrial energy and resource consumption and enviromental emission, reflecting in a full view of the degree of industrial energy saving and pollution reducing in small

Received: December 28, 2009 Accepted: January

Supported by the Key Project of National 11th Five-year Plan to Support Science and Technology(2006BAJ05A06).

* Corresponding author. E-mail: ningxin1981@163. com

towns.

1.2 Index designation Based on the above principles, a 2-level, 10-index comprehensive evaluation index system has been constructed (Table 1)

From the perspective of industrial resource consumption, there are natural resource consumption and social resource occupation. Natural resources refer to some natural factors in natural enviroment which bear some relations to the development of human society and which can be made use of to generate value and to influence labor productivity. They generally include minerals, land, water resources, climate and biological resources. In terms of university of industrial energy consumption and easy availability of data, indexes of water and land consumption are representative. The social resources, corresponding to the narural resources, refer to the labor or employees, which is an essential factor of production. Therefore, the water resources, land resources and labor resources consumption per productivity unit, these 3 indexes may to some degree reflect the degree of the energy consuption of some general industries.

From the perspective of industrial energy consumption, generally, according to some related statistics of the nation and the province, energy types include coal, coke, crude, gasoline, refinery, diesel fuel, fuel oil, natural gas and electric and so on. In terms of the general consumption types of industries, coal, gasoline, natural gas and electric are 4 essential types needed during industries processes. Selecting these four as the indexes of energy consumption for its strong representation.

From the perspective of enviromental emission of industries, the indexes used to measure the pollution of industrial wastewater usually include Chemical Oxygen Demand, Oil, Cyanide, Arsenic, Mercury, Lead, Cadmium, Hexavalent chromium and so on. And wastegases mainly includes dust, Carbon monoxide, Carbon dioxide, Hydrogen sulfide and so on. Corresponding to wastegases and wastewater is Solid Wastes, referring to every kinds of solid entities and pulpy substances which people discard in daily life and during production process, includes organic and inorganic wastes, solid wastes, pulpy wastes and radioactive wastes and so on.

From perspectives of the evaluation aims, the representation and operation of the indexes selected, there is no need to lay out all kinds of the evaluation indexes about enviromental emission of the related industries, but using the total amount of these 3 indexes that industries usually emit. Therefore, the emission of wastewater, wastegases and solid wastes per unit output value are selected as representatives of enviromental emission indexes.

Table 1 Indicator system and structure of resources-energy consumption and enviroment emission of urban industries

Evaluation objectives	Evaluation index set	Specific evaluation
The degree (U) of energy consumption and emission reduction of industries in small towns and cities	Resources consumption index U_1	U_{11} water consumption per unit output value (ton per million)
		U_{12} land occupation per unit output value (squaremeter per million)
		U_{13} Labor consumption per unit output value (person per million)
	Energy consumption index U_2	U_{21} Coal consumption per unit output value (ton per million)
		U_{22} gasoline consumption per unit output value (ton per million)
		U_{23} natural gas consumption per unit ooutput value (cubic meter per million)
		U_{24} electric consumption per unit ooutput value (kw·h per million)
	Enviromental emission index U_3	U_{31} wastewater discharge per unit ooutput value (ton per million)
		U_{32} wastegases emission per unit ooutput value (cubic meter per million)
		U_{32} solid wastes discharge per unit ooutput value (ton per million)

2 The evaluation model construction of industrial energy and resources consumption in small towns and cities

The evaluation index system of industrial resource-energy consumption in small towns is a 2-level hierarchical structure, thus we can construct a 2-level evaluation model[1].

2.1 The construction of evaluation mode of industrial resources-energy, consumption

2.1.1 The first-level evaluation model. The first-level evaluation model is based on the specific evaluation index U_y ($i=1,2,3$; $j=1,2,\cdots n_1$, $n=3,4$), which is on the basis of the evaluation index series U_i, the mode from U_{ij} to U_i.

Supposing that the evaluation mode includes p regional units, the measured number of the j index U_{ij} in the collection of indexes U_i on the s regional units (statistics or the surveyed facts) is u_{ij}^s ($s=1,2,\cdots,p$). The largest index value of J in the specific region is the largest theoretical value, and of course the smallest is the smallest theoretical value,

$$u_{ij}^{max} = \max_s u_{ij}^s, u_{ij}^{min} = \min_s u_{ij}^s.$$

If the larger of the U_{ij}, the more excellent of it (positive index), Half-liter model trapezoid fuzzy membership function would be adopted,

$$a_{ij}^s = \begin{cases} 0 & u_{ij}^s \leqslant u_{ij}^{min} \\ (u_{ij}^s - u_{ij}^{min})/(u_{ij}^{max} - u_{ij}^{min}) & u_{ij}^{min} < u_{ij}^s < u_{ij}^{max}, \\ 1 & u_{ij}^s \geqslant u_{ij}^{max} \end{cases} \quad (1)$$

And if the smaller of the U_{ij}, the more excellent of it (negative index), Half-drop model trapezoid fuzzy membership function would be adopted,

$$a_{ij}^s = \begin{cases} 1 & u_{ij}^s \leqslant u_{ij}^{min} \\ [u_{ijk}^{max} - u_{ijk}^s]/[u_{ijk}^{max} - u_{ijk}^{min}] & u_{ij}^{min} < u_{ij}^s < u_{ij}^{max}, \\ 0 & u_{ij}^s \geqslant u_{ij}^{max} \end{cases} \quad (2)$$

The evaluation model of the degrees of energy consumption and pollution reduction designed by the author belongs to the smaller of the U_{ij}, the more excellent of it (negative index), so the second model is adopted in this paper. Obviously, the a_{ij}^{s} is corresponding to the U_{ij}, the membership degree of s unit to the industrial energy consumption and pollution reducing. So, we may get a belonging degree frame as follows:

$$A_i = \begin{bmatrix} a_{i1}^{1} & a_{i1}^{2} & \cdots & a_{i1}^{p} \\ a_{i2}^{1} & a_{i2}^{2} & \cdots & a_{i2}^{p} \\ \vdots & \vdots & \cdots & \vdots \\ \mu_{in_i}^{1} & \mu_{in_i}^{2} & \cdots & \mu_{in_i}^{p} \end{bmatrix} \quad (3)$$

In the evaluation index set U_1, if the weight distribution of each evaluation index is $W_i = (w_{i1}, w_{i2}, \cdots, w_{in_i})$, then the evaluation result of the 1^{st} grade could be gotten through the following formula:

$$V_i = (V_i^1, V_i^2, \cdots, V_i^p) = W_i g A_i \quad (4)$$

In the formula, $V_i^s (s = 1, 2, \cdots, p)$ represents that in terms of the index set U_1, the membership degree of the s regional unit to the industrial energy saving and pollution reducing.

2.1.2 The second-level evaluation mode. The second-level evaluation model is based on the specific evaluation index $U_i (i = 1, 2, 3)$, which is on the basis of the evluation index series U, the mode from U_i to U.

Based on the calculation results of the first-level evaluation model, make

$$A = \begin{bmatrix} v_1 \\ v_2 \\ v_3 \end{bmatrix} = \begin{bmatrix} v_1^1 & v_1^2 & \cdots & v_1^p \\ v_2^1 & v_2^2 & \cdots & v_2^p \\ v_3^1 & v_3^2 & \cdots & v_3^p \end{bmatrix} \quad (5)$$

In the evaluation index set U, if the weight distribution of each evaluation index is $W = (w_1, w_2, w_3)$, then the evaluation results of the second-level is

$$V = (v^1, v^2, \cdots, v^p) = WgA \quad (6)$$

In the formula, $v^s (s = 1, 2, \cdots, p)$ represents that in terms of the index set U_1, the member degree of the s regional unit to the industrial energy saving and pollution reducing. Arranging $v^s (s = 1, 2, \cdots, p)$ in an order from big to small, we may gain the order from good to bad of the comprehensive evaluation of energy saving and pollution reducing of industries in small towns and cities to be evaluated. And this model can be called the REA model used in evaluation of energy and resources consumption of industries in small towns and cities.

2.2 The determination of weight distribution of each level evaluation index In the evaluation model of industrial energy and resources consumption of small towns and cities, weight distribution of each indicator should be determined. Here, we may firstly get the results through *AHP* method, then use the method of information entropy to mend them[2].

2.2.1 Calculation steps of AHP

(1) Problem clarifying. Make it clear that what the content, the extent, the including factors and the relations between the factors of the problem are in order to master a full knowledge of the problem.

(2) Hierarchical structure constructing. In this step, there is a need to classify all the factors included into groups, viewing each group as a level and arranging them into a way in terms of the toppest (aim level), several middle levels (principles level) and the lowest level (objectives). This kind of hierarchical structure is usually represented by a diagram. And in the diagram, the relations between different levels are needed to be marked.

(3) Judgment matrix designing. This step is the key one in the steps of AHP. Judgment matrix refers that to some certain factor in the superordinate level, the comparative importantce among the related factors in this level. And the form is just like that in the Table 2:

Table 2 Forms of the judgement matrix

A_k	B_1	B_2	$\cdots$	B_n
B_1	b_{11}	b_{12}	$\cdots$	b_{1n}
B_2	b_{21}	b_{22}	$\cdots$	b_{2n}
$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$
B_n	b_{n1}	b_{n2}	$\cdots$	b_{nm}

In Table 2, b_{ij} refers to the importance of B_i to B_j in terms of A_k. Generally, b_{ij} would have 1, 3, 5, 7, 9 these 5 number as its selected scale, which means respectively that number 1, the same degree of improtance between Bi and Bj; number 3, B_i is a little more important than B_j; number 5, B_i is much more important than B_j; number 7, B_i is much more important than B_j, and number 9, B_i is extremely important. While 2, 4, 6, 8 are the mean value of the adjacent number, which may be used when the above 5 numbers are not enough.

(4) Single-level sorting. The aim of the single-level sorting is to some factor in the superordinate level, which is the weighting value in affirming the arranging order of some factors related to this level. It is the basis of the arrangment order of the factors according to the superordinate level.

Targets of the single-level sorting may be classified into calculating the eigenvalue and eigenvector of the matrix. For example, in judging matrix B, calculating the eigenvalue and the eigenvector for $BgW = \lambda_{max} gW$ is ok. And λ_{max} in this formula is the biggest eigenvalue of B, while W is the normalization eigenvector to λ_{max}, the sub-number W_i of W is the weight value of single-level in arrangment order corresponding to some factors.

When the matrix B has its absolute consistency, then $\lambda_{max} = n$. But generally, it is impossible. In order to check the consistency of the matrix B, it is necessary to calculate its consistency index:

$$C.I. = (\lambda_{max} - n)/n - 1 \quad (7)$$

In the formula, n is the level number. When $C.I.$ is zero, then the matrix has its absolute consistency. On the contrary, the bigger the $C.I.$, the worse consistency the matrix.

In order to check whether the matrix has the satisfying consistency, there is a need to compare $C.I.$ with the average random consistency index $R.I.$ (Table 2). Generally, the indexes at level 1 and 2 are always consistent. In terms of the matrix above the level 2, the proportion of consistency $C.I.$ to the average random consistency index $R.I.$ at the same level is called the proportion of random consistency $C.R.$, also, $C.R. = \frac{C.I.}{R.I}$. And generally, when $C.R.$ is smaller than 0.1, then we say that it has a satisfying consistency. Otherwise, when it is bigger than 0.1, then we need to mend the matrix until we get a satisfying answer.

Table 3 Average random consistency index

Order	*R. I.*	Order	*R. I.*
1	0	9	1.46
2	0	10	1.44
3	0.52	11	1.52
4	0.89	12	1.54
5	1.12	13	1.56
6	1.26	14	1.58
7	1.36	15	1.59

(5) General layer ranking. Based on the results of the single level sorting at the same level, we may calculate the weight value of the related factors at the same level on the run of the superordinate level, and which is named the general layer ranking. The general layer ranking is carried out from the top to the bottom and step by step. And the single level sorting of the toppest is also the general layer ranking.

If the general layer ranking of all the elements in the superordinate has been accomplished and gain the weigh value are respectively a_1, a_2, . . . , a_m. And the results of the single level sorting of the factors B_1, B_2, . . . , B_n at the same level corresponding to aj are $(b_1{}^j, b_2{}^j, \cdots, b_n{}^j)^T$, (when there is no relation between B_i and A_j, then $b_i^j=0$), then the general sorting lies in the following Table 4. Obviously, when $\sum_{i=1}^{n}\sum_{j=1}^{m} a_j b_i^j = 1$ appeared, it means that the general layer ranking is normalized vector.

Table 4 General layer ranking

Layer *B*	A_1	A_2	$\cdots$	A_m	General ranking of *B* layer
B_1	b_1^1	b_1^2	$\cdots$	b_1^m	$\sum_{j=1}^{m} a_j b_1{}^j$
B_2	b_2^1	b_2^2	$\cdots$	b_2^m	$\sum_{j=1}^{m} a_j b_2{}^j$
$\vdots$	$\vdots$	$\vdots$	$\cdots$	$\vdots$	$\vdots$
B_n	$b_n{}^1$	$b_n{}^2$	$\cdots$	$b_n{}^m$	$\sum_{j=1}^{m} a_j b_n{}^j$

(6) consistency checking. It is necessary to carry out the consistency experiment to evaluate the degree of consistency of the general layer ranking results. Therefore, we should calculate the following indexes respectively:

$$C.I. = \sum_{j=1}^{m} a_j C.I._j \quad (8)$$

$$R.I. = \sum_{j=1}^{m} a_j R.I._j \quad (9)$$

$$C.R. = \frac{C.I}{R.I.} \quad (10)$$

In the formula, *C. I.* is the consistency index of genral layer ranking, *C. I.* is the consistency index of matrix at *B* level corresponding to a_j. *R. I.* is the random consistency index of general layer ranking, $a_j R.I._j$ is the random consistency index of matrix at *B* level corresponding to a_j. *C. R.* is the random consistency proportion of general layer ranking. When $C.R. < 0.10$, it reflects that the results of general layer ranking are satisfying, or the ranking of the matrix need to be adjusted again to reach the satisfying result.

2.2.2 Correction steps of information entropy. Technology identifying problems of AHP is strongly systematic and highly reliable. When by adopting expert advising, it easily tends to generate recursiveness and does not match the transitive axiom, which results in such problems as scale not well grasped and information loss and so on. And the way to solve these problems is to use entropy to correct the weight value determined by AHP.

Supposing there is the evaluation index set $U = \{U_1, U_2, \cdots, U_q\}$, we gain its weight distribution $W = \{w_1, w_2, \cdots, w_q\}$ through AHP and its judgement matrix $(U \rightarrow U_i)$ is $B = (b_{gh})_{q\times q}$. Then the correction steps with information entropy are:

Firstly, normalize B, and the formula is $b_{gh}' = b_{gh}/\sum_{g=1}^{q} b_{gh}$, $g, h = 1, 2, \cdots, q$ secondly, the entropy tansmitted by the defining index U_h is $E_h = -\sum_{g=1}^{q} b_{gh}' \ln b_{gh}' / \ln q$ thirdly, calculating the deviance degree dh of U_h, $d_h = 1 - E_h$; fourthly, making sure the information weight value of U_h $\mu_h = d_h / \sum_{h=1}^{q} d_h$ at last, correct the distribution set $W = (w_1, w_2, \cdots, w_q)$ to $W' = (w_1', w_2', \cdots, w_q')$. And $W'_h = \mu_h w_h / \sum_{h=1}^{q} \mu_h w_h$.

3 Discussion

The *REA* model mainly uses fuzzy transform and fuzzy comprehensive judgement to solve the ranking problems of industrial energy consumption and enviroment emission in small towns and cities, which has its features and fresh points as the following 4 aspects:

(1) From the perspective of mathematics, the industrial energy consumption and enviromental pollution is a kind of fuzzy concept of which has clear meaning yet fuzzy extension. Therefore, it is scientific to use fuzzy subset and the membership degree method for reference. The theoretical significance of the model lies in the fact it measures industrial energy saving and pollution reducing in a comprehensive and quantitative way by using the methods of fuzzy transform and fuzzy comprehensive judgment[3-4].

(2) The model can not only measure the development of towns, but aslo take in account the comparisons among towns and cities. To the comprehensive evaluation and ranking of industrial energy saving and pollution reducing in small towns and cities, the mode adopt the same standards and calibre in calculation. Therefore, the evaluation results are comparable in different towns and cities among the whole region.

(3) Because in the evaluation mode, the practical measured maximum $S^{\max} U_{ij}^{s}$ and minimum index $S^{\max} U_{ij}^{s}$ are different in different years. In other words, the theoretical values affirmed in different years are variable, therefore, the normal evaluation index gained at last lacks longitudinal comparability, only suitable for horizontal comparison among different regions in the same year. For example, if there is a need to carry out the longitudinal comparisom of diffrent years among regions, we may select the maximum, the minimum and the suitable index during dimensionless process. In other words, using the data base, then the final evaluation indexes are not only longi-

tudinal comparable but also measure the degree of improvement or deterioriation of energy resources and emission of different industries in different regions.

(4) To those published statistics nowadays about small towns and cities, many kinds of data in the evaluation index system may not be gained directly, most of which should be gained through practical research or sample survey. But the results gained through this kind of research are not comprehensive and systematic enough, or even not representative. Because the industrial development of small towns and cities plays an important role in the national industrial development system, it hints that in the published statistics, some related departments should pay more attention to those statistical data collection on industrial energy, resources consumption and enviromental emission in small cities and towns.

References

[1] QIU D. System analysis of the multi-index comprehensive evaluation method[J]. Research on Financial and Economic Issues, 1988(9): 49 –55. (in Chinese).
[2] LIN W. Study on the evaluation and countermeasures of development of the town in China[D]. Beijing:China Agricultural University, 2003. (in Chinese).
[3] XIAO WS. Fuzzy mathematics foundation and application[M]. Beijing: Aviation Industry Press, 1992:152 –192. (in Chinese).
[4] ZHANG JJ. Fuzzy analytical hierarchy process[J]. Fuzzy Systems and Mathematics, 2000(2):80 –88. (in Chinese).
[5] CHENG DW. Development path on small town in underdeveloped areas——a case of Ganzhou City in Jiangxi Province[J]. Asian Agricultural Research, 2009, 1(5):10 –15.
[6] ZHU A, ZHAO QM, YU YH, *et al*. Analysis on the feasibility and environmental benefits of the application of sewage source heat pump in Guiyang City[J]. Journal of Anhui Agricultural Sciences, 2010, 38 (5):324 –326. (in Chinese).
[7] WANG M. Sustainable development of rural economy based on resource endowment——a case of rural areas of Pengzhou City in China[J]. Asian Agricultural Research, 2009, 1(3): 1 – 4, 17.
[8] YAO GR, ZHANG ZM, CHEN NL, *et al*. Study on the verification of the effect of energy-saving and emission reduction in Northwest rural areas and its countermeasures[J]. Journal of Anhui Agricultural Sciences, 2009, 37(15):363 –366. (in Chinese).
[9] DING CM, DING LY. Study of coordinated development model and its application between the economy and resources environment in small town[J]. Systems Engineering —Theory & Practice, 2004, 24 (11):134 –139. (in Chinese).
[10] LU FX, QIN YC, LIU SS. Ecological footprint of campus and the action of energy –saving and waste –reducing[J]. Journal of Anhui Agricultural Sciences, 2008, 36(15):373 –375, 382. (in Chinese).
[11] GUAN ZP, LIU XC. The sustainable development of small towns [J]. Construction Management Modernization, 2004(3):23 –25. (in Chinese).

小城镇产业资源能源消耗评价技术模型与指标体系

张同升 （国家发展和改革委员会小城镇改革发展中心，北京 100045）

摘要 基于层次性、代表性、可操作性、完备性原则，从小城镇产业发展的资源消耗、能源消耗、环境排放3个方面选取了10个指标，构建了小城镇产业"节能减排"程度综合评价指标体系，并借鉴模糊数学方式，构建了2级层次结构的定量化计算模型。其中，1级模型着眼于每一个具体的评价指标，在评价指标集合上计算各区域从属于"节能减排"的隶属度，并对计算结果进行排序；2级模型则根据1级模型的排序计算结果，着眼于每个1级评价指标集合，在整个评价指标体系上计算各区域从属于"节能减排"的隶属度，最终以此计算结果进行排序。从层次分析法和信息熵方法2个角度介绍了各级评价指标权重的确定方法。结果表明，该模型可用于小城镇产业"节能减排"程度的定量化、综合化测度；运用该模型有助于判断不同地区、行业的资源、能源消耗及环境排放的改善或恶化程度。
关键词 小城镇；资源；能源；节能减排

(From page 36)

基于 ARIMA 模型的陕西省 GDP 分析与预测

魏 宁，边宽江*，袁志发 （西北农林科技大学理学院，陕西杨凌 712100）

摘要 依据2008年陕西统计年鉴与1952～2007年陕西省GDP相关数据，采用SPSS统计软件及时间序列分析法，通过时间序列的平稳性检验、根据时间序列模型的识别规则进行定阶、模型检验、模型预测4大步骤在AIC准则下建立了ARIMA(1,2,1)时间序列模型，并根据ACF图和PACF图对模型做了适应性检验，然后对2002～2007年的实际值与预测值作比较，并利用该模型对陕西省未来6年的GDP做出预测。结果表明，各年实际值与预测值之间的相对误差均控制在5%以内，该模型的预测效果相对较好；根据模型预测的2008～2013年陕西GDP数据分别为6 477.50亿、7 656.62亿、9 058.66亿、10 735.10亿、12 744.69亿、15 158.20亿元，从预测结果看，陕西省的GDP在2008～2013年6年内仍将呈现出较高的增长趋势；该模型得出的预测结果只是一个预测值，而国民经济是一个复杂多变的动态系统，应随时注意经济运行中蕴藏着调整的风险，适时根据实际情况调整相应的目标值。
关键词 GDP；ARIMA 模型；ACF 图；PACF 图；时间序列分析