Prediction and Analysis of Medical expenses in General Hospitals in China based on GM (1, 1) Model

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Abstract. GM (1, 1) is a long-term forecasting model, which should be credible without large market volatility and policy changes. The purpose of carrying out cost accounting in hospital is to renew the concept of economic management of hospital and raise the cost consciousness of all staff through the accounting and management of hospital and medical service cost, so as to improve the economic benefit of hospital. The grey model has strict theoretical basis, its biggest advantage is practical, and the prediction result is relatively stable, which is suitable for forecasting a large number of data, and the prediction results are very accurate when the amount of data is small. The paper presents Prediction and Analysis of Medical expenses in General Hospitals in China based on GM (1, 1) Model.

1. Introduction
The theory of grey system holds that the system with some known information and some unknown information is called "grey system". The hydrological system itself has some basic characteristics of grey system. In other words, the hydrological data observed in the hydrological system for a long time are only a very small part of the hydrological system, such as the rainfall in the finite period, the flow record and so on [1]. There are unknown information parts, such as rainfall in the coming years, discharge, flood, the time of drought and the change of water environment. Therefore, hydrological system is a grey system, which can be analyzed and studied by grey system theory.

The real estate industry is one of the pillar industries of the national economy, which is closely related to the life of the people. Its development has a great impact on the overall situation of the national economy and the standard of living of the people of the whole country. China's real estate industry has developed rapidly, which has not only contributed to the development of the whole national economy, but also played a decisive role in improving the living conditions of the people, but at the same time, it also faces more serious problems and challenges. Cause a lot of controversy, all parties adhere to their own views, but most of them from the policy level, psychological level and financial aspects to consider. Qualitative analysis is more than quantitative analysis. Obviously, from a quantitative perspective to grasp the quantitative relationship between the indicators, can more accurately foresee the development of the real estate industry, so as to effectively regulate and control. Therefore, it is worth exploring to establish a mathematical model to quantitatively study the real estate problem in China.

In the absence of large market fluctuations and policy changes, the prediction value should be credible. When the grey system theory is used to carry out quantitative prediction. If there are factors which have a great influence on the prediction object, we should find the quantization value of the mutation point of the original data information on the basis of qualitative analysis, and then make necessary correction to the forecast value. The prediction value is closer to the actual situation, the
reliability of the prediction value is improved, and reliable data are provided for scientific decision making. In addition, if long-term prediction is made, the constraint conditions on the upper limit value should be considered.

Grey system refers to the "small sample" and the "poor information" uncertainty system of "partial information is known, part information is unknown". It understands and understands the real world through the generation and development of "partial" known information. To realize the correct understanding and description of the system running are behavior and evolution law.

With the promotion of the new medical reform and the implementation of the new "hospital financial system" and the "hospital accounting system", the importance of cost management in hospital management has become increasingly prominent. The issued policy requires public hospitals to standardize accounting and strengthen cost control [2]. The purpose of implementing cost accounting in hospitals is to update the concept of hospital economic management by accounting and managing the costs of hospitals and medical services. Improve the cost awareness of all staff, thereby improving the economic efficiency of the hospital.

Grey prediction model is an important part of grey theory, and GM1) model is the most basic prediction model in grey prediction model, which has been widely used in many fields. [However, the prediction accuracy of the model is not high in many cases, even if the pure exponential series is fitted, the results are not satisfactory. Therefore, some scholars have studied it. Liu Sifeng has studied the applicable range of the GMX1 model. [4], Zhang Xiaoxuan pointed out that the whitening response formula of GMX1 model is not the real solution of its grey differential equation [3]. [Other scholars have done a lot of meaningful research. [In this paper, based on the difference between the whitening response formula and the grey differential equation, a discrete GM1) model is established based on the grey differential equation. The model simulation sequence is still an exponential sequence.

The sum of direct economic benefit and indirect economic benefit caused by equipment in hospital is the net value of equipment economic benefit after deducting depreciation expenses. The so-called direct economic benefit refers to the direct related income generated by the use of equipment. Fee. Such as diagnostic fees, treatment fees; Indirect economic benefit refers to the indirect related charges brought by the existence and use of equipment, such as the additional benefits (inconsistency in the price of incoming and outgoing storage) brought by the consumables or reagents used in the equipment. Other related benefits brought about by hospitalization and the attraction of the advanced nature of the equipment to the source of the disease cannot be directly increased when calculating the total economic benefits of the equipment. It should be multiplied by a correlation coefficient function γ, because the calculation of indirect income is more complicated, so in practical application, only the direct charges brought by the equipment are often calculated.

2. GMM (1,1) Model and its Matlab implementation

Gray Model (Gray Model) has a strict theoretical basis, and its greatest advantage is practicality. The prediction results are relatively stable, which is applicable to the prediction of a large number of data. The prediction results are also accurate when the amount of data is small. [(2) the data provided in this paper (i.e., the data of the current sales price of commercial housing from 1991 to 2009) are used to establish the first order linear differential equation model of the single sequence in the grey system.

Compared with other conventional time series prediction methods, the grey prediction model GM1 / 1 has the following remarkable characteristics.

Grey model is a long-term prediction model, the random elements in the prediction system are treated as grey data, and the inherent rules of the data are found out. The original data amount required for prediction is small. The accuracy of prediction is high, so it is not necessary to give coefficients by experience because of the large amount of data and strong regularity as other forecasting methods do.

2) The theory is strong, the calculation is convenient, the computer and its programming language or the related software are used to calculate indirectly, which makes the data processing simple, fast and accurate.
3) Analyzing the inherent law of the system with finite external elements which represent the behavior characteristics of the system. The grey system theory adopts the method of generating the characteristic data of the system behavior. The unique feature of this method is to deal with the behavior characteristic data of a chaotic system and to find out the inherent law of the system from the chaotic phenomenon.

The grey model can be used not only to predict the system behavior of periodic variation, but also to predict the behavior of system with aperiodic variation. It can be used not only for macro-long-term prediction, but also for micro-short-term prediction [4].

The characteristics of the grey system model: there are no special requirements and restrictions on the experimental observation data and its distribution. It is a very simple new theory and has a very broad application field, as is shown by equation (1).

\[
Y = \begin{bmatrix}
    x^{(0)}(2) \\
    x^{(0)}(3) \\
    \vdots \\
    x^{(0)}(n)
\end{bmatrix} \tag{1}
\]

At present, grey system has become one of the most important methods for prediction, decision making, evaluation, planning, control, system analysis and modeling in many fields, such as society, economy, science and education, technology and so on.

Especially, it has a unique effect on modeling and analysis of short time series, less statistical data and incomplete information.

In 80s, Professor Deng Julong of Huazhong University of Science and Technology put forward the theory of grey system, and published several monographs such as grey control, grey prediction, grey decision, and grey system theory and so on. In this paper, the origin, theory, method and application of grey system theory are expounded in detail. From the middle and late 80s to the beginning of 90s, more than ten international and domestic seminars on grey system theory were held. There has been a wave of research and application of grey system theory all over the country. Mr. Deng Julong won the first prize for the progress of science and technology for his contribution to grey system theory.

What's gray? In Mr. Deng's own words: "completely known systems are called white systems;" Completely unknown systems are called black systems or black boxes; A partially known, partially unknown system is called a grey system. "in this case, the extent to which it is known or unknown is not specified. So the meaning of "grey" is not very clear [5]. For example. The true value of a known quantity is not likely to fall outside the closed interval, but it is completely unknown where it falls. Then, the quantity is called grey and can be specified as. It is called interval grey number. Obviously, interval grey number exists in objective reality, except knowing that the true value is on top, but no longer has any known information; this is the most basic prototype of grey quantity.

The prediction based on the GM-1) model of grey system theory is called grey prediction. It can be divided into the following seven categories:

Prediction of a sequence: a prediction of the trend of development of something.

(2) Catastrophe prediction: that is, the prediction of the time of occurrence of cataclysm, there are many kinds of disasters, such as flood, drought, waterlogging and so on.

Seasonal disaster prediction: a prediction of a particular time zone in which a disaster occurs within a year.

Topographic disaster prediction: also known as waveform prediction, integral prediction is the use of the GM1) model to predict the future development of the entire waveform.

System prediction: a comprehensive prediction of a comprehensive research institute of a system.

(6) Grey interval prediction of envelope GM-1): a grey prediction zone with upper and lower envelope boundaries is constructed by referring to the distribution trend of sequence of numbers, and two envelope models are established.
(7) Excitation-damping prediction: the prediction of excitation and damping factor, which is reflected in the GM-1) model in quantitative form, is called excitation-damping prediction [6].

\[ \omega_1 = \{3, 4, 5\} \]
\[ \omega_2 = \{3, 4, 5, 6, 7, 8\} \]
\[ \omega_3 = \{3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 17, 20, 22\} \]
\[ \omega_4 = \{3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 17, 20, 22, 23, 25, 28, 29, 33\} \]
\[ \omega_5 = \{3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 17, 20, 22, 23, 25, 28, 29, 33, 34, 37, 38, 41, 43\} \]
\[ \omega_6 = \{3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 17, 20, 22, 23, 25, 28, 29, 33, 34, 37, 38, 41, 43, 46, 50, 51, 52, 53\} \]
\[ \omega_7 = \omega \]

Grey theory holds that the behavior of the system is hazy and the data is complex, but it is orderly and has the whole function after all. The generation of grey number is to find out the law from clutter [7]. At the same time, the grey theory establishes the data model, not the original data model. Therefore, the grey prediction data is the inverse processing result of the predicted value obtained by the GM-1) model which generates the data.

The grey system theory from the outset not based on strict set theory basis, so the lack of necessary mathematical support, which greatly limits the development of grey system theory and its application. Although the prediction of grey system theory in decision-making, control, is widely used in many fields; but in its essence, is also GM (1,1) model. Even now, in certain cases, GM (1, 1) is also useful, still be applied, and the prediction effect is very good. The limitation is: the original data is monotonous, forecasting background showing steady development trend; its advantages are: the prediction problem is applied to the original observation data less because, a small amount of data, statistical methods for statistical law cannot be applied, and the GM (1, 1) model can compensate for this gap, the GM (1, 1) algorithm is simple, the prediction accuracy is relatively high, so in some specific problems, GM (1, 1) is still a prediction model that decision-makers are willing to choose.

The development trend of the above mentioned background stability refers to the following: such as corrosion of chemical equipment, with the passage of time the use of corrosion increases, showing a stable development trend, and the measurement of corrosion is often difficult (such as production to measure), so the actual observation data is less. This kind of problem is very suitable for GM (1, 1) model, as is shown by equation (2).

\[ x^{(3)}(t) = \left[ x^{(0)}(t) - \frac{\mu}{\alpha} \right] e^{\alpha t} + \frac{\mu}{\alpha} = 199.06e^{0.020t} - 195.15 \]  

(2)

Grey prediction model is an important part of grey theory, and GM1) model is the most basic prediction model in grey prediction model, which has been widely used in many fields.

However, the prediction accuracy of the model is not high in many cases, even if the pure exponential series is fitted, the results are not satisfactory. Therefore, some scholars have studied it. Liu Sifeng has studied the applicable range of the GMX1) model [8], Zhang Xiaoxuan pointed out that the whitening response formula of GMX1) model is not the real solution of its grey differential equation.

Other scholars have done a lot of meaningful research. [In this paper, based on the difference between the whitening response formula and the grey differential equation, a discrete GM1) model is established based on the grey differential equation. In order to extend the scope of application, a discrete GM-1) model of approximate inhomogeneous exponential sequence is established, which is called NDGM (1). At last, the improved direct discrete GM1 / 1) model is used to predict the software defects. The results show that the model can help the software organization to measure the software process to some extent.

3. Analysis of medical expenses and economic benefits of medical equipment in Chinese general hospitals

The cost-benefit analysis, also called the cost-saving analysis, the break-even point analysis, is a method to analyze the relationship among cost, output (sales volume, profit). Abbreviated as CVP analysis, this
analysis can help hospitals analyze profit and loss reasons, plan target profits, provide reliable data sources for future management level of hospital budget, and provide a reliable data source for hospital management decisions. It is of great significance for the hospital to carry on the management decision correctly and to plan the hospital economic activities reasonably.

For both non-profit hospitals and for-profit hospitals, the cost of medical equipment and the price of medical services related to the equipment are important factors related to the survival and development of the hospital.

(I) definition and content of the cost of medical instruments and equipment

The cost of medical instruments and equipment refers to the sum of the material and living labor consumed by the hospital in order to ensure the normal diagnosis and treatment of the equipment, the cost of which is as follows:

Depreciation and overhaul of fixed assets (including medical equipment, houses, clothing, etc.); Cost of medical materials (including reagents, sanitary materials, etc.); Consumption cost of low value consumable goods; Operating expenses (utilities, printing materials, miscellaneous medical expenses, etc.); Official expenses (related sections, office expenses, etc.); Labor expenses (related personnel expenses, including salary bonuses, pensions, provident funds, medical insurance units and other subsidies and so on, as is shown by figure1.

![Figure1. Depreciation and overhaul of fixed assets](image)

In the face of fierce medical market competition, hospitals must improve the level of operation and management. As an important part of cost management, cost-benefit analysis has been paid more and more attention. It plays a great role in improving and perfecting the analysis system of profit and loss balance in hospital institutions.

The cost of hospital consists of fixed cost and variable cost. The fixed cost includes depreciation of fixed assets and daily utilities. The variable cost refers to the cost that has a direct positive correlation with the volume of business, such as the cost of medicine, health materials, medical risk fund and so on.

According to the need of research, according to the relationship between cost and service, total cost = direct cost + indirect cost, and according to the relationship between cost and workload, total cost = fixed cost + variable cost.

Direct cost: the direct cost of medical equipment consumed in a medical service project. Includes depreciation of the equipment itself and auxiliary equipment, depreciation of the premises and other fixed assets used, and labor costs. Utilities, medical materials, maintenance, etc.

Indirect cost: incurred to provide services to the department that uses the equipment. And apportioned to the medical service project or department. Includes depreciation of fixed assets and management fees of the administrative and logistics department of the hospital. Maintenance costs, etc. Apportioned to equipment cost according to the benefit principle.

Variable cost: total cost changes in proportion to workload. Includes reagents, sanitary materials, etc.
Mixed cost: that is, the total amount changes, but the amount of change is not proportional to the change of workload, such as office labor costs, etc. It can be divided into fixed cost or variable cost after decomposing it to a certain extent [9].

According to the formula of the cost-benefit model, it can be concluded that:

Dermatology profit = (unit medical income per unit medical cost) x number of patients received one fixed cost

Medical income = unit medical income x number of patients received

Variable cost of medical treatment = unit cost of medical treatment × number of times of receiving patients

Total medical cost = variable medical cost fixed cost

Unit marginal contribution = unit medical fee price-unit variable cost

The amount of business that makes the total cost of medical treatment equal to the medical revenue is the point of capital preservation. Fixed cost of specific medical treatment variable cost = unit medical revenue × number of times of receiving patients, as is shown by equation (3)

\[
B = \begin{bmatrix} -z^{(1)}(2) & 1 \\ -z^{(1)}(3) & 1 \\ -z^{(1)}(4) & 1 \\ -z^{(1)}(5) & 1 \\ -z^{(1)}(6) & 1 \\ -z^{(1)}(7) & 1 \\ \end{bmatrix} \begin{bmatrix} -107.3 & 1 \\ -179.7 & 1 \\ -251.95 & 1 \\ -323.7 & 1 \\ -359.4 & 1 \\ -467.2 & 1 \\ \end{bmatrix}
\]

(3)

Unit medical cost x capital preservation point fixed cost = unit medical income x capital preservation point

( unit medical income-unit medical cost) x capital preservation point = fixed cost

Capital preservation point = fixed cost / / (unit medical income / unit medical cost)

The medical profit is zero when the number of times received is equal to the capital preservation point.

As long as the number of times to receive patients more than capital-preserving point, the hospital can obtain the corresponding medical profit.

If the number of patients received less than capital-preserving point, the hospital will be a loss.

In addition to the above cost classification, control or not can be divided into controllable cost and uncontrollable cost: according to the average degree can be divided into total cost and unit cost.

Quality costs are the costs incurred to ensure satisfactory quality and the losses incurred when satisfactory quality is not obtained. Quality costs include four aspects:

- Inspection cost: usually includes the cost of inspectors, equipment costs and indirect costs of the management inspection department.
- Prevention cost: including staff training costs, etc.
- Error cost: it consists of two parts: One is the cost of internal error, that is, the cost of product abandonment, rework and warranty, and the other is the cost of external error, which refers to the loss incurred by the customer who does not buy the product.
- Cost of implementation: the cost of establishing a quality system, including the costs of personnel, documentation, stationery, printing, registration and auditing.

Quality cost management is a series of activities that direct departments and employees concerned with quality functions to predict, plan, analyze, control, report and improve quality costs.

3. The application and analysis of this analysis in the dermatology department of ZX hospital
For example, the direct fixed assets cost of dermatology is 50,000 yuan per month, the variable cost of each visit is 40 yuan, and the cost of dermatology is 60 yuan per person (unit income of hospital.

Unit marginal contribution = unit medical fee price per unit variable cost = 20 yuan,

Capital preservation point = fixed cost / (per unit medical income per unit of medical cost) = 50,000 yuan / / / 2, 500 times per unit of medical revenue / unit / unit / unit / unit of medical cost
Capital-preserving business income = 60 & 2500 & 15000, that is, 15,000 yuan, as is shown by figure 2.

Figure 2. Capital preservation point

Through investigation and data, we can calculate that the times of receiving patients in dermatology department of ZX hospital is 3,000, and the fixed cost is 50,000 yuan. Unit medical fee price 60 yuan, expected profit is 40,000, if you want to achieve the expected profit target: unit variable cost = unit medical revenue

\[(\text{fixed cost of medical profit} / \text{volume of business})\] 30. Compared with the current unit variable cost of 40 yuan. But also as much as possible in the unit cost reduction of 10 yuan. Hospitals can take measures to reduce material consumption and other measures, refined responsibility, investigated to specific individuals. Strengthen the sense of economy in order to achieve the target profit.

The whole course cost accounting method of medical instrument and equipment maintenance is being tried out in most large hospitals. Through investigation, it is found that the cost accounting problem of equipment maintenance is more prominent. The main reason for the contradiction is that there is not a formal one up to now. Repair: Standard of charge of maintenance or regulation. The standard that equipment branch uses basically is to follow a few old standard, not only outdated, and vaguer, not easy to grasp, or charge at it. Cause the dissatisfaction of the department. In the hospital quality system certification, this is also a relatively prominent problem. We found through a large number of research, want to be adequate. In order to establish the maintenance cost accounting mechanism of medical instruments and equipments in hospital, the following aspects should be done well.

4. Prediction and Analysis of Medical expenses in General Hospitals in China based on GM(1,1) Model

Through the analysis of the relationship between efficiency and cost, the hospital can improve the medical technology, reduce the medical cost, improve the quality of service, and attract the source of disease. At the same time, we should strengthen the cost management and control the expenditure. First of all, to reduce the cost, from the point of view of fixed cost, we should take advantage of the favorable opportunities of personnel, distribution system reform and hospital logistics service socialization, follow the principles of simplification and efficiency. The algorithm is as follows:

```alg
procedure mine (S T (k1, ⋯, km)) {
1) for i = km - 1 down to 1 do{
2) if (S T (k1, ⋯, km), count [ i ] > =min_count ) {
3) FP[ ++ length ] = item ( i);
4) output FP and its support S T (k1, ⋯, km). count [ i ]/ n ;
5) build S T (k1, ⋯, km, i) based on S T (k1, ⋯, km) ;
6) if (there is an non-root node in S T (k1 , ⋯, km, i )
7) mine (S T (k1, ⋯, km, i)) ;
8) length - - ;
```
To set up posts due to the post, reasonably determine the post; for different posts, according to the characteristics of each post and the quality of the relevant employees, the personnel configuration structure should be adjusted while the departments should establish appropriate assessment standards of personnel rewards and punishments according to the service cost and efficiency. In addition, we should pay more attention to strengthening the management of hospital fixed assets, and carry out the feasibility analysis of investment cost and income before the purchase of instruments and equipment, and carry out prior control. Make the optimal fixed assets decision; To the purchased equipment according to its service life and nature, take appropriate methods to extract depreciation, as is shown by equation(4).

\[
B = \begin{bmatrix}
-0.5x'(1) + 0.5x'(2) & 1 \\
-0.5x'(2) + 0.5x'(3) & 1 \\
\vdots & \vdots \\
-0.5x'(18) + 0.5x'(19) & 1
\end{bmatrix}
\]

Medical equipment cost accounting is in accordance with the relevant provisions of "hospital financial system", occurred in the process of accounting of hospital investment or the use of medical devices (investment forecast) or have occurred (use) of the material consumption, labor remuneration and related expenses amount and composition, the goal is the financial status and operating results and real reflect the medical activities.

The algorithm is as follows:
1) for i=k-1 down to 2 do 
2) if I is * then {
3) if S T (X).count[i] >= min_count 
4) build S T (X\i) based on S T (X);
5) if there is an non-root node in S T (X\i) and S T (X\i).count[ ] >= min_count 
6) then call Unid_FP-Max(S T (X\i), MFI)

Cost accounting of medical equipment mainly has the following function: through cost accounting, promote the hospital to follow and apply the law of value, reasonable use of manpower, material resources, financial resources, improve equipment utilization rate and profit rate, reduce the cost of the equipment and medical services prices; the cost accounting, to provide the basis of reasonable pricing formulation of internal and external hospital charges have always been government price departments, handle the patients satisfaction and development of both the hospital survival relationship; through cost accounting, forecast of hospital economic decision-making, planning, analysis and evaluation, in order to distinguish responsibility, grasp the financing, correctly handle the responsibility, right, the relationship between the three the; and to provide investment decision-making basis for the development of the hospital.

The purpose of the cost-benefit analysis is to increase the profit of the hospital, improve the economic benefit, and bring in the sales revenue. It is an effective method to analyze and study the variable relationship between sales cost and sales profit. The cost-benefit analysis is also an effective means to strengthen the hospital decision-making analysis, as is shown by equation (5).

\[
\begin{align*}
\zeta'(2) &= \frac{1}{2}[x'(1) + x'(2)] = 107.3 \\
\zeta'(3) &= \frac{1}{2}[x'(2) + x'(3)] = 179.7 \\
\zeta'(4) &= \frac{1}{2}[x'(3) + x'(4)] = 251.95 \\
\zeta'(5) &= \frac{1}{2}[x'(4) + x'(5)] = 323.7 \\
\zeta'(6) &= \frac{1}{2}[x'(5) + x'(6)] = 395.4 \\
\zeta'(7) &= \frac{1}{2}[x'(6) + x'(7)] = 467.2
\end{align*}
\]
The traditional view is to calculate the output and cost first. With the development of market economy and the transformation of hospital reform, profit becomes a very important part, contrary to the traditional method. It requires first to set a profit goal, then according to the profit requirements, to formulate the corresponding production and marketing plan and cost plan. Namely according to the target profit target cost one adapts the production volume and the variety such order organizes the production and the management activity, it variable passive management for the active operation.

This quantity benefit analysis is to find out the business volume, the cost. The best point of the combination of profit and profit is the biggest profit and the lowest cost. In applying the cost-benefit analysis method, we should analyze the relationship between the changes of these factors and compare the advantages and disadvantages by weighing the gains and losses. In order to make the correct decision, the hospital can obtain higher economic benefits.

The evaluation of the economic benefits of medical instruments and equipment is an important part of the management of medical equipment and the economic management of the whole hospital, and it is also an organic part of the evaluation of the overall economic benefits of the hospital. The purpose of the evaluation work is to understand the past, explain the present and predict the future. In order to comprehensively improve the comprehensive benefit of medical equipment, the evaluation work can not only improve the overall economic management quality of the hospital, strengthen the management, and realize the maximum benefit. Moreover, it can effectively analyze all aspects of medical equipment, promote the management of the equipment itself, tap the potential of the equipment, and improve the overall competitiveness of the hospital. At the same time, it is beneficial for the hospital to develop new business, new technology and promote the progress of science and technology; It is propitious to preserve and increase the value of equipment assets; It is conducive to macro-economic decision-making.

Grey system prediction theory has been widely used in the fields of society, economy, agriculture, meteorology, ecology, biology, water conservancy and so on. Some hydrologists have applied the theory of grey system prediction to the prediction of hydrological disasters, such as flood, drought, etc., but the reliability of the prediction of hydrological disasters by grey system forecasting theory has not been evaluated. Whether the grey system prediction theory is suitable for hydrological cataclysm prediction has not been answered, which is worth discussing at present.

5. Summary
The GM (1,1) model is a first order grey differential equation model suitable for prediction with one variable. It is modeled by using the generated sequence of numbers, and the original appearance of things is restored by inverse generation in prediction.

In the management of enterprises, the evaluation of the economic benefits of various equipment has formed a variety of evaluation systems, including mathematics, economics, accounting, etc. The cost composition of medical equipment is much more complex than in the enterprise. At the same time, the results of some technical services are often difficult to express in monetary form. This needs to be dealt with in an appropriate way. Therefore, the evaluation of economic benefits should be combined with the actual situation of the hospital, and some evaluation criteria or methods should not be copied directly.

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