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Research Article

Application of Big Data Analysis in Cost Control of Marine Fishery Breeding

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In order to improve the stability of the cost control of marine fishery culture, a method of controlling the cost of marine fishery culture based on big data analysis algorithm was proposed. We establish the cost analysis model of marine fishery, use the big data correlation analysis method to conduct distributed mining on the cost characteristics of marine fishery, deeply grasp the relevance of data characteristics, use the information fusion method to build the constraint parameter analysis model of aquaculture cost operation, limit the amount of calculation, and use the adaptive neural network weighted training method to adaptively optimize the cost control to avoid falling into local optimization. The objective model of aquaculture cost control is established, and the cost constraint is carried out by the parameter optimization method. The statistical feature quantity of marine fishery cost control is obtained, and the cost control of marine fishery is realized by the feature recombination method. The simulation results show that this method is more stable in the cost control of marine fishery culture and improves the adaptability of the cost control of marine fishery culture.

1. Introduction

With the continuous improvement of marine fishery culture management, it is necessary to construct a dynamic cost analysis model of marine fishery culture, analyze the dynamic cost distribution characteristics of marine fishery culture, adopt fuzzy information fusion method, carry out dynamic cost analysis of marine fishery culture, improve the dynamic cost operation and control management ability of marine fishery culture, and study the dynamic cost control method of marine fishery culture [1, 2]. It has great significance in optimizing the dynamic cost prediction and control of marine fishery culture. In the traditional method, the dynamic cost control of marine fishery culture is based on the cost parameter analysis [3–6], combined with the quantitative equilibrium analysis method, the dynamic cost control of marine fishery culture is carried out, and the cost analysis model of marine fishery culture based on adaptive game equilibrium model is proposed in reference [7, 8]. The cost control method of marine fishery culture based on the principal component analysis method is proposed by Oken and Essington [9, 10]. However, in the cost analysis, there are some problems, such as over dispersion and easy to fall into local optimization, which lead to low reliability of the results.

Big data analysis can quickly collect information data related to marine fishery aquaculture costs, analyze the correlation between data, classify and mine data, obtain data characteristics, and obtain more accurate centralized processing results. In view of the abovementioned problems, this paper proposes a cost control method for marine fishery culture based on big data analysis. The analysis model of marine fishery culture cost is established, the big data correlation analysis method is used to carry out the characteristic distributed mining of marine fishery culture cost, the fuzzy constraint parameter identification model of marine fishery culture cost control is established, and the characteristic distributed reorganization method is adopted to realize the marine fishery culture cost control [11–14]. Finally, the simulation analysis shows the superior performance of this method in improving the cost control ability of marine fishery culture.

2. Materials and Methods

We use the HBase method to store big data of aquaculture, and according to this data to study the parameters and objectives of cost control of the marine fishery. In aquaculture data, the daily increment of single remote sensing monitoring data is increased by geometric order of magnitude [15–17]. In order to reduce the processing pressure and improve the efficiency of big data storage, the system chooses HDFS distributed storage. In order to read the database in real-time, the column-oriented distributed database HBase is used.

The HBase datastore is in region, and there are multiple stores inside the region, and the store has the corresponding column clusters [18]. The specific data are stored in each file as <key, value>, and the file is encapsulated by the store file. HBase composition is shown in Figure 1.

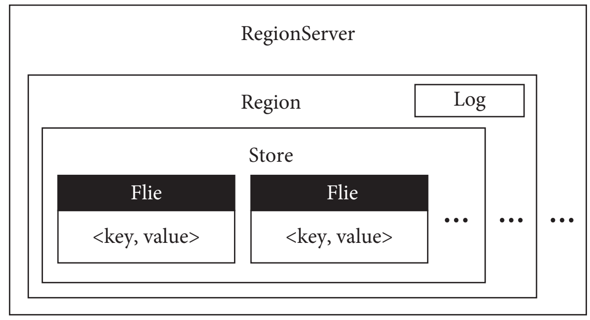

Figure 1: The composition of HBase.

2.1. Restraining Parameters and Object Model of Marine Fishery Culture Cost Control

2.1.1. Control Parameters of Marine Fishery Aquaculture Cost. In order to realize the cost control of marine fishery culture based on big data analysis, the constraint parameters and object model of marine fishery culture cost control are first constructed, and the marine fishery culture scenario is shown in Figure 2.

Figure 2: Marine fisheries culture scenario.

Using fuzzy information analysis method, the panel data distribution relation of marine fishery culture cost control is as follows:

$$\begin{aligned} 2\xi^T(t)W\left[x(t-d_1(t)) - x(t-h_1) - \int_{t-h_1}^{t-d_1(t)} \dot{x}(t)\mathrm{d}t\right] &= 0, \\ 2\xi^T(t)K\left[x(t) - x(t-d_1(t)) - \int_{t-d_1(t)}^{t} \dot{x}(t)\mathrm{d}t\right] &= 0, \\ 2\xi^T(t)M\left[x(t-d_1(t)) - x(t-d(t)) - \int_{t-d(t)}^{t-d_1(t)} \dot{x}(t)\mathrm{d}t\right] &= 0, \\ 2\xi^T(t)L\left[x(t-d(t)) - x(t-h) - \int_{t-h}^{t-d(t)} \dot{x}(t)\mathrm{d}t\right] &= 0, \end{aligned} \tag{1}$$

where in $\xi^T(t)$ means the deterministic component of marine fishery culture cost control, K means the artificial cost of marine fishery culture cost control, $d_1(t)$ means the quality distribution set of marine fishery culture cost control, and adopts dynamic optimization method to control the marine fishery culture cost [19, 20]; Combined with the discrete control variable analysis method, the characteristic equations of marine fishery culture cost control are as follows:

$$\begin{cases} b_{20}(t;\lambda) = \dfrac{1}{2}(1-\lambda t)(1-t)^3, \\ b_{21}(t;\lambda) = \dfrac{1}{2}\left[1 + (\lambda+3)t - 3(\lambda+1)t^2 + 4\lambda t^3 - 2\lambda t^4\right], \\ b_{22}(t;\lambda) = \dfrac{1}{2}(1-\lambda+\lambda t)t^3. \end{cases} \tag{2}$$

In minimizing the cost constraint method, establishing the marine fishery culture cost control function, combining with the descriptive statistical analysis method [21, 22], establishing the correlation characteristic distribution set of marine fishery culture cost control is as follows:

$$\begin{aligned} \text{Subject.to.} Q_i &\geq Q_{th}, \\ E_i &\geq E_{th}, \\ C_i &\leq C_{th}, \\ Q_{jk} \geq 0, E_{jk} &\geq 0, C_{jk} \geq 0, \\ \sum_{j=1}^{Nj} x_{jk} &= 1, \quad \forall i, 1 \leq k \leq M,\ 1 \leq j \leq N_j. \end{aligned} \tag{3}$$

This paper constructs a fuzzy evaluation decision model for marine fishery aquaculture cost control and dynamic optimization to improve the stability of marine fishery aquaculture cost control [23].

2.1.2. Object Model of Marine Fisheries Cost Control. Combined with the game equilibrium method, the net cash flow distribution of marine fishery culture cost control is expressed as

$$f(k) = \begin{cases} f(k-1) - \dfrac{1}{n}, & 1 \leq k < n, \\ 1, & k = n. \end{cases} \tag{4}$$

Based on the lever benchmark virtual variable analysis method, the cost control of marine fishery culture is carried out, and the statistical cost function of marine fishery culture cost control is obtained by using the sensitivity constraint method as follows:

$$i = \max_{j} \left\{ \frac{P(Y|\lambda_j)}{P(Y|\lambda_j) > P(Y|\lambda_T)} \right\} \quad (j = 1, 2, 3, \ldots, C). \tag{5}$$

Based on the relation of fixed assets ratio and cash ratio of marine fishery culture cost, the cost function of marine fishery culture cost control is obtained by using the spatial statistical analysis method:

$$\mathrm{EST}_1(v_i, p_q) = \max_{v_j \in \mathrm{prnt}(v_i)} \left\{ \begin{array}{c} p\_\mathrm{available}(q), \\ \mathrm{EFT}(v_j, p_m) + k \cdot C(v_j, v_i) \end{array} \right\}. \tag{6}$$

According to the abovementioned cost function, the adaptive equilibrium game is used to quantitatively analyze the cost control of marine fishery culture [24], and the constraint function of marine fishery culture is as follows:

$$"Z_1 = B \sum_{w \in W} q^w - \sum_{a \in A} x_a [t_a(x_a) + \beta v_a], \quad \forall v_{\min} \le v_a \le v_{\max}. \tag{7}$$

The nonlinear index sequence $y'(n)$ is used to represent the fuzzy evaluation characteristic of marine fishery culture, and the mathematical modeling of marine fishery culture control is as follows:

$$\int_{t-\sigma}^{t} \begin{bmatrix} y(s) \\ f(y(s)) \end{bmatrix}^T \begin{bmatrix} R_1 & E \\ E^T & R_2 \end{bmatrix} \begin{bmatrix} y(s) \\ f(y(s)) \end{bmatrix} \mathrm{d}s. \tag{8}$$

Using the adaptive neural network weighted training method, the fuzziness function of marine fishery culture control is established:

$$\int_{t-\sigma}^{t} \left[y^T(s) R_1 y(s) + f^T(y(s)) R_2 f(y(s)) \right] \mathrm{d}s. \tag{9}$$

Using the principal component analysis method, the optimization model of marine fishery breeding is expressed as follows:

$$x_i(k+1) = x_i(k) + s \left(\frac{x_j(k) - x_i(k)}{\left\| x_j(k) - x_i(k) \right\|} \right), \tag{10}$$

where $\|\vec{x}\|$ denotes the norm of $\vec{x}$. In summary, the model of marine fishery culture control object is established, combined with the parameter optimization method to carry out marine fishery culture restraint and cost control [25].

2.2. Optimization of Marine Fisheries Cost Control. After investigating and understanding the actual situation of each marine fishery aquaculture by using big data technology, it is found that the main causes of the disease are as follows:

2.2.1. Cost Management Thinking Is Limited. At present, the cost management concept of most breeding bases is deficient, which is mainly manifested in the absence of a strategic cost management idea and the lack of an overall concept of cost management. The cost management mode that the enterprise implements at present are simpler, mainly saving costs [26]. The current cost concept of enterprises believes that cost management is cost saving and reduction, mainly relying on cost saving and cost reduction. For example, strict control of staff reimbursement, procurement of raw materials, and other controls are also very strict and strive to minimize expenditure and control business-related costs [27]. But this kind of single link saving has not brought the enterprise overall cost reduction. The current concept of cost control is more limited, only unilateral cost reduction, and not with the development of the enterprise strategy. At the same time, the key point of cost control is to reduce the cost of direct cultivation and to reduce the expenditure on feed and medicine as far as possible [28].

2.2.2. Unreasonable Control of Cost Occurrence. The unreasonable cost is mainly embodied in three aspects, first is the increase in seedling, feed, and medicine costs, second is the waste of feed and medicine, and third is the excessive amount of fishery insurance. The high cost of seedlings, feed, and medicine is caused by the improper control of the enterprise. In the selection of seedlings and medicines, enterprises do not pay attention to establishing strategic alliances with suppliers of seedlings and medicines, which causes changes in the quality and price of raw materials. In the selection of feed, there is no attention to the nearby call feed, which will cause an increase in the amount of freight [29, 30]. Secondly, the feeding process did not pay attention to the feed ratio, which also increased the cost. Due to the lack of a systematic cost control system, the calculation of the insured amount of fishery lacks data basis, which may lead to inaccurate calculation and loss of enterprises.

2.2.3. An Unsystematic Cost Control System. Enterprises lack of systematic cost control system. The cost control of enterprises' aquaculture is mainly embodied in the following two aspects: Firstly, the management system is not sound; with the continuous increase of the scale of marine fishery enterprises and the gradual increase of business volume, the problem of lack of a systematic cost control system is more prominent. The current cost control is mainly carried out separately, and a set of cost control systems for fishery aquaculture that meet the actual conditions of enterprises has not been formed. Second, the management mode is backward, marine fishery enterprises still use the traditional cost control mode, the traditional cost management mode has many shortcomings, and cannot adapt to the development of modern enterprise cost management.

2.2.4. Imperfect Management and Restraint Mechanism. The restraint mechanism of marine fishery aquaculture for salesmen and breeding households is imperfect, and there is information asymmetry between the company and breeding households. On the one hand, because the wages of salesmen are included in labor costs, and because wages are calculated on the basis of stocking volume, there is a possibility that salesmen make false reports about taking medicines and materials. At the same time, they will deceive the company with the farmers on the survival rate of breeding, and the company will not know. On the other hand, the oil subsidies of the staff are reimbursed by the company according to the number of kilometers of the staff, which is very false, these are the reasons for the increase in direct labor costs so that the company's breeding costs exist inflated and wasted. In terms of the payment and management of customer subsidies, special subsidies are granted to farmers according to the memorandum brought back by the salesman. Although the general manager has signed the special subsidies, the authenticity of the contents remains to be examined. The MOU is the basis for the salesman to record all the circumstances of the aquaculture farmers that need subsidies in the process of aquaculture and the company to make subsidies. However, when the salesman fills out a memorandum, the bonus the salesman will be deducted accordingly, and the company can only make subsidies to the aquaculture farmers by relying on the memorandum.

2.2.5. Inadequate Level of Human Resources Management. The company's management has always focused on the company's profits, because more branches, complex business, management, and personnel are imperfect. Because the seedlings are raised by the farmers, so the company will give all the work to the salesman to deal with, too dependent on the salesman, leading to a lot of serious information asymmetry between the company and the farmers. At the same time, due to the dispersed management of farmers, the company has difficulties in management, and the company does not have a complete set of human resources management programs, or a sound cost management team, but the company's manager and the financial department are responsible. Finally, causes the company costs to increase year by year, and the company profit suffers the loss.

Therefore, based on the abovementioned analysis, the optimal design of the cost control of aquaculture is carried out.

2.2.6. Cost Control of Marine Fisheries. Taking the abovementioned shortcomings of cost control as a reference, different cost control indicators are selected from four aspects to form the independent variables of cost control, which are uniformly expressed by $sp_{i,j}(t)$. To construct the relevant statistical analysis model of marine fishery culture cost [31], the characteristic quantity of marine fishery culture cost association rule is expressed as follows:

$$S_{i,j}(t) = \frac{p_{i,j}(t) - sp_{i,j}(t)}{p_{i,j}(t)}. \tag{11}$$

The $T_{i,j}(t)$ represents the operating characteristic set of the cost of marine fisheries culture:

$$T_{i,j}(t) = \frac{\left|p_{i,j}(t) - \Delta p(t)\right|}{p_{i,j}(t)}. \tag{12}$$

Using the multivariate regression analysis method, the dynamic mining of marine fishery culture cost is carried out, and the quantitative characteristic distribution function of marine fishery culture cost is obtained as follows:

$$U_{i,j}(t) = \exp\left[-b\left[z_i(t) - z_j(t)\right]^2\right], \tag{13}$$

wherein $p_{i,j}(t)$ is the cross-correlation characteristic of marine fishery culture cost prediction; $sp_{i,j}(t)$ is the independent variable of marine fishery culture cost control; $\Delta p(t)$ is the gain coefficient; And $z_i(t)$, $z_j(t)$ are expressed as the fuzziness function of marine fishery culture cost [32].

2.2.7. Fuzzy Clustering Function of Marine Fishery Cost Control. Using the big data information fusion method to carry on the marine fishery culture cost operation management and the statistical forecast, obtains the operation dynamic cost control training function $s_i = \left\{x_j\colon d(x_j, y_i) \le d(x_j, y_l)\right\}$, under the fuzzy information guidance, obtains the marine fishery culture cost control fuzzy degree characteristic quantity:

$$\begin{aligned} \mathrm{Min}WH &= \min\{w(cc), h(cc)\}, \\ \text{Area\_Ratio} &= \frac{\mathrm{Area}(cc)}{\mathrm{Area}(\mathrm{pic})}. \end{aligned} \tag{14}$$

Using RBF neural network learning, the weighted vector of marine fishery culture cost control is obtained:

$$U = \{\mu_{ik} | i = 1, 2, \ldots, c, k = 1, 2, \ldots, n\}. \tag{15}$$

Under the guidance of association rules, using global statistical information to extract the characteristics of marine fishery culture cost [33], the optimized objective function is as follows:

$$J_m(U, V) = \sum_{k=1}^{n} \sum_{i=1}^{c} \mu_{ik}^m (d_{ik})^2. \tag{16}$$

Based on the differential grouping model [34], the fuzzy clustering function is obtained as follows:

$$\begin{aligned} \mu_{ik} &= \frac{1}{\sum_{j=1}^{c} \left(d_{ik}/d_{jk}\right)^{2/m-1}}, \\ V_i &= \frac{\sum_{k=1}^{m} (\mu_{ik})^m x_k}{\sum_{k=1}^{n} (\mu_{ik})^m}. \end{aligned} \tag{17}$$

In the formula, m is the embedded dimension of the dynamic control of marine fishery culture cost and $(d_{ik})^2$ is the measured distance between the sample x_k and the characteristic distribution set V_i. According to the abovementioned analysis, the cost control model of marine fishery culture is established to improve the cost control ability of marine fishery culture [35].

3. Results

3.1. Experimental Environment and Conditions. In order to verify the application performance of this method in the cost prediction and control of marine fishery aquaculture, the simulation experimental analysis is carried out. The experiment was carried out in a recycling aquaculture enterprise located in Binhai New Area, Tianjin. Circulating water aquaculture workshop construction area 45000 m^2, net aquaculture water 25000 m^2. The wastewater discharged from the aquaculture pool is returned to the aquaculture pool for reuse after physical filtration, biological filtration, degassing, pure oxygen addition, and ultraviolet disinfection. The system changes about 20% of the new water every day. In the heating season of each year, that is, from October of the current year to April of the next year, using geothermal water and aquaculture wastewater source heat pump heating system, the temperature of the added water can be adjusted to 30°C–32°C to maintain the water temperature of the aquaculture system above 25°C, so that grouper can be in the best growth water temperature in the whole year. Breeding wastewater is discharged after purification. The system has successfully bred varieties such as the *Epinephelus coioides* and the *Plectropomus leopardus*, all of which have achieved balanced growth throughout the year. The experiment was carried out in a recycling aquaculture enterprise located in Binhai New Area, Tianjin. Circulating water aquaculture workshop construction area 45000 m^2, net aquaculture water 25000 m^2. The wastewater discharged from the aquaculture pool is returned to the aquaculture pool for reuse after physical filtration, biological filtration, degassing, pure oxygen addition and ultraviolet disinfection. The system changes about 20% of the new water every day. In the heating season of each year, that is, in October of the current year to April of the next year, using geothermal water and aquaculture waste water source heat pump heating system, the temperature of the added water can be adjusted to 30°C–32°C to maintain the water temperature of the aquaculture system above 25°C, so that grouper can be in the best growth water temperature in the whole year. Breeding wastewater is discharged after purification. The system has successfully bred varieties such as the *Epinephelus coioides*, the *Epinephelus fuscoguttatus,* and the *Plectropomus leopardus*, all of which have achieved balanced growth throughout the year.

Grouper culture cost mainly consists of seedling, feed, artificial, water and electricity, depreciation, management, epidemic prevention, liquid oxygen, and so on. Under the condition of full load operation, the expenses for labor, water and electricity, depreciation, management, epidemic prevention, and liquid oxygen are basically fixed expenses for the whole year, which shall be calculated according to the actual expenses. Based on the cultured data of *Epinephelus* gentianus, the cultured cost was estimated [36]. Unit grouper costs are calculated by dividing the actual costs incurred under a single heading by the total yield estimated for the cultured unit yield.

Seedling cost calculation:

$$C_{\text{FRY}} = \frac{C_s}{(S_r/100 \times W)}. \quad (18)$$

In the formula, C_{FRY} is unit grouper seed cost, yuan/kg; C_s is price of single-tailed grouper, yuan; S_r is survival rate of grouper culture, %; and W is listing quality of single-tailed fish, kg.

Calculation of feed cost:

$$C_{\text{feed}} = (1 \times F_{CR} + F_{\text{dead}}) \times P. \quad (19)$$

In the formula, C_{feed} is feed cost per grouper, yuan/kg; C_{feed} is feed coefficient of grouper culture; F_{dead} is fodder quality of dead grouper shared by listed grouper; and P price of unit fodder, yuan/kg.

3.2. Data Analysis of Breeding Cost. The circulating water aquaculture system shall operate normally. During the coldest winter, the temperature of the system aquaculture shall be above 25°C, the daily water exchange volume shall be 20% of the aquaculture water body, the ammonia nitrogen and nitrite nitrogen in the water shall be kept below 0.2 mg/L and 0.02 mg/L, respectively, the average aquaculture cycle from dissolved oxygen 6–8 mg/L, and the culturing of pearl gentian macula to the market specification (0.8 kg) shall be one year, the culturing density of finished fish shall be 30–40 kg/m^2, and the survival rate of each batch shall be 60%–80%.

3.2.1. Seedling Cost. Based on the estimation of cultured pearl gentian stone spot varieties, the average marketed specifications are 0.8 kg (one-tail quality), the survival rate is 60%–80%, and the one-tail price of the seedling is CNY6. When the survival rate is 60%, 70% and 80%, the cost of the seedling is CNY12 5/kg, CNY10 72/kg, and CNY9 38/kg, respectively.

3.2.2. Feed Cost. The feed coefficient (FCR) is 1.1 in the process of culturing the stone spot of pearl gentian, the feed price is 12 yuan/kg, and the feed cost is calculated when the yield per unit is 30 kg/m^2, 40 kg/m^2 and the survival rate is 60%, 70%, and 80%, respectively. The cost of feed will change with the change in survival rate, mainly the feed consumed by the dead grouper should be taken into account in the feed cost of the adult fish. The death of grouper occurred mainly at the seedling stage of 10–15 cm in length. According to the empirical data, the average consumption of feed for grouper was 20 g/tail. At a yield of 30 kg/m^2 per unit area, 937500 groupers, totalling 750000 kg, need to be produced on the basis of the effective area of 25000 m^2. When the survival rate is 60%, 70%, and 80%, respectively, the tail number of the dead grouper is 625000, 401786, and 234375, respectively, and the consumed feed is 12500 kg, 8036 kg, and 4688 kg, respectively, which are apportioned to 0.0168 kg, 0.0108 kg, and 0.0062 kg for each kg of cultured fish, and the cultured 1 kg of Gentian grouper consumes 1.1168 kg, 1.1108 kg, and 1.106 kg of feed, respectively, and the corresponding feed cost is 13.40 yuan, 13.33 yuan, and 13.27 yuan, respectively. Similarly, at 40 kg/m^2, 1250000 groupers would have to be produced, totalling 1000 kg. When the survival rate is 60%, 70%, and 80%, respectively, 1.1167 kg, 1.1107 kg, and 1.1063 kg are consumed for culturing 1 kg Gentian grouper,

Table 1: Production cost (yuan/kg) and its percentage accounting for the total cost under different survival rates.

Project	60% survival rate				70% survival rate				80% survival rate			
	30 kg/m^2		40 kg/m^2		30 kg/m^2		40 kg/m^2		30 kg/m^2		40 kg/m^2	
	Prime cost	Proportion	Prime cost	Proportion	Prime cost	Proportion	Prime cost	Proportion	Prime cost	Proportion	Prime cost	Proportion
Offspring seed	12.50	22.4	12.50	25.9	10.72	19.9	10.72	23.1	9.38	17.8	9.38	20.8
Forage	13.40	24.0	13.40	27.7	13.33	24.7	13.33	28.7	13.27	25.3	13.27	29.4
Man-made	7.80	14.0	5.86	12.1	7.80	14.5	5.86	12.6	7.80	14.8	5.86	13.0
Hydroelectricity	7.80	14.0	5.86	12.1	7.80	14.5	5.86	12.6	7.80	14.8	5.86	13.0
Depreciation	7.80	14.0	5.86	12.1	7.80	14.5	5.86	12.6	7.80	14.8	5.86	13.0
Manage	1.56	2.8	1.18	2.4	1.56	2.9	1.18	2.5	1.56	3.0	1.18	2.6
Epidemic prevention	1.30	2.3	0.98	2.0	1.30	2.4	0.98	2.1	1.30	2.5	0.98	2.2
Liquid oxygen	3.64	6.5	2.74	5.7	3.64	6.7	2.74	5.9	3.64	6.9	2.74	6.1
Total	55.80	100.0	48.34	100.0	53.95	100.0	46.47	100.0	52.55	100.0	45.07	100.0

Table 2: Descriptive statistical analysis of marine fisheries culture control.

5Statistical period	Marine fisheries control rate	Cost control level	Capital holdings	Cost ratio
First quarter	0.367	0.678	0.465	0.433
Second quarter	0.655	0.665***	0.656	0.345**
Third quarter	0.467	0.535	0.654***	0.434
Fourth quarter	0.545***	0.456	0.345	0.454**
Full sample	0.567	0.656	0.456	0.432

Note. The symbols *, **, and *** represent significant levels of 1%, 5%, and 10%, respectively.

and the corresponding feed costs are 13.40 yuan, 13.33 yuan, and 13.28 yuan, respectively.

3.2.3. Apportioned Cost. The apportioned expenses for artificial, hydroelectric, and other expenses are relatively fixed each year, and the values are the same under different survival rates for the same unit output. At the yield of 30 kg/m^2, the expenses for artificial, hydroelectric, depreciation, management, epidemic prevention, and liquid oxygen of grouper kg are CNY7.8, CNY7.8, CNY1.56, CNY1.3, and CNY3.64, respectively. At the yield of 40 kg/m^2, the cost per unit was 5.86 yuan, 5.86 yuan, 5.86 yuan, 1.18 yuan, 0.98 yuan, and 2.74 yuan, respectively.

3.2.4. Total Breeding Cost and Proportion of Each Cost. The proportion of total culture cost and each unit culture cost is shown in Table 1. Breeding cost, as high as 30 kg/m^2, 55.80 yuan/kg at 60% survival rate, as low as 40 kg/m^2, and 45.07 yuan/kg at 80% survival rate. Feed, seedling, labor, water and electricity, and depreciation constitute the main cost of grouper culture, accounting for 88%–90% of the total cost. Under different yields and survival rates, each single cost accounts for 18%–26%, 24%–29%, 12%–15%, 12%–15%, 12%–15%, and 12%–15%. The survival rate of grouper larvae was 22%, 20%, and 18% of the total cost when the yield was 30 kg/m^2, and 26%, 23%, and 21% when the yield was 40 kg/m^2. The cost of depreciation, manpower and hydropower at 40 kg/m^2 is reduced by 2% and liquid oxygen by 1%, respectively, compared with that at 30 kg/m^2.

3.3. Data Statistics Results. The abovementioned cost-related data are counted, and the descriptive statistical analysis method is adopted to obtain the descriptive statistical results of marine fishery aquaculture cost control as shown in Table 2. It can be seen from Table 2 that except for the first quarter, the cost control items in other quarters show a significant correlation, which indicates that the application of this method has a significant effect on cost control. However, due to the characteristics of fishery aquaculture, the first quarter is the low input period of aquaculture cost, so the cost control effect is not obvious, which is not relevant to a certain extent, but based on the characteristics of the industry, it can be ignored.

According to the result of marine fishery culture cost control, the logarithmic relation between the cost deviation coefficient and the total assets is shown in Figure 3.

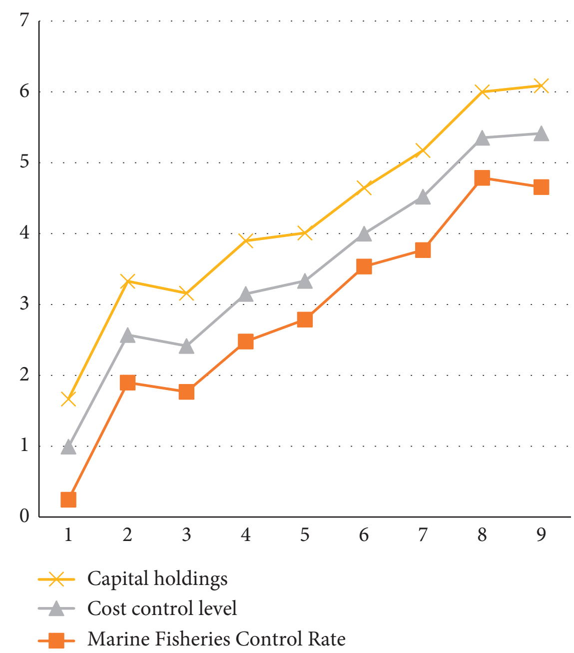

Figure 3: Relation between the cost bias coefficient and total assets.

The analysis of Figure 3 shows that the general trend of capital holding, cost control level and marine fishery control rate is basically the same, which indicates that the method in this paper can effectively calculate the cost and effectively control the costs of various items under the analysis of capital input, thus realizing the control of marine fishery breeding cost and improving the asset control level and the dynamic control index distribution of test cost is tested, and the results are shown in Figure 4.

The analysis of Figure 4 shows that under the control of this model, the indicators of cost ratio, capital holding, cost control level and marine fishery control rate in different quarters can all show relatively stable control effects, and the fluctuation trend of all indicators is consistent, which indicates that this model carries out dynamic control of marine fishery culture cost, improves the cost dynamic control ability and improves the profit level of the enterprise.

4. Discussion

Cost control, as its name implies, is to control and manage the construction cost of marine fishery aquaculture, so as to reduce the cost of marine fishery aquaculture, and finally, realize the improvement of economic profit of marine fishery aquaculture. For any enterprise, cost control is the

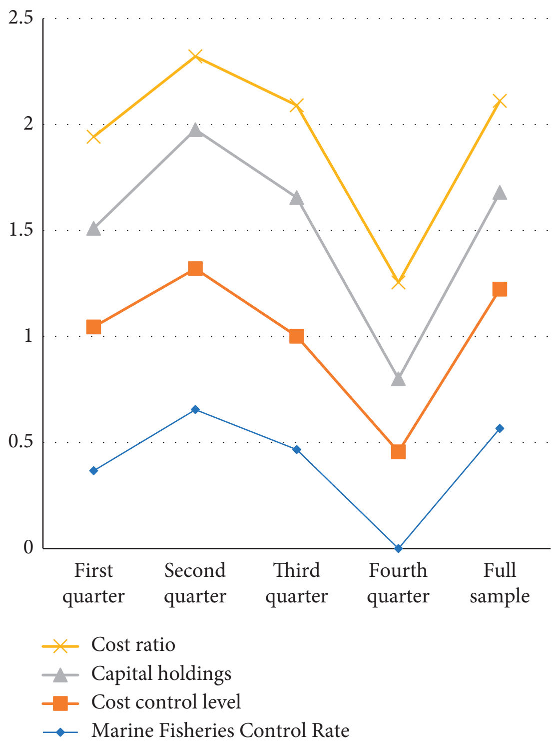

Figure 4: Cost dynamic control index distribution.

core part of its work, so it can be seen that cost control is important to every enterprise. Marine fishery aquaculture construction is a periodic work, in its work process, to involve a lot of content and process, and in each link and process, will involve the cost management problem, if there is one link of the cost management work is not done in place, will lead to the overall failure of cost management [37, 38]. In practical work, cost control can be divided into three stages, namely, early, medium, and late, while in each stage, cost control is divided into two components, one is personnel cost control, and the other is material and economic cost control, in addition to many indirect costs, we can use the sentence to summarize the cost control, which is the sum of the various kinds of expenses needed for the marine fishery aquaculture project as a whole:

(1) Culture of grouper in circulating water

The death of *Epinephelus gentianus* in aquaculture was mainly caused by putrefactive skin disease when the body length was 10–15 cm. After the occurrence of putrescence, grouper culture rarely occurred a major disease. At present, there is no effective treatment for epinephelus putrescens in grouper culture, which can only be achieved by improving the water environment and enhancing the autoimmunity of grouper fry. Controlling the occurrence of grouper putrescence is the key to improve the survival rate. The total survival rate of the grouper was 80.11%, the average feed coefficient was 1.03 and the density was 102 kg/m^3 in the circulating water test system with pH, pure oxygen, and ozone. In the large-scale circulating aquaculture system, the yield per unit area can exceed 30 kg/m^3, and the survival rate is over 90%. Systematic water circulation is one of the key factors in aquaculture. Large water circulation can remove the stool and bait in the fish pond in time and provide sufficient dissolved oxygen for aquaculture. Because of the different construction time, the design circulation quantity of the circulating water workshop in this experiment is different, and the growth rate and survival rate of one cycle per hour is obviously higher than that of one cycle per hour. The yield per unit area of different workshops is 30–40 kg/m^2, and the survival rate is 60–80%. There should be a lot of room for improvement in the survival rate, mainly from the prevention of grouper disease. One advantage of factory-farmed groupers in the North over groupers shipped to the North from the South is that, because of the short transport distance, grouper have longer shelves, better shelf-life, and longer shelf-life in fish stalls and temporary tanks in restaurants, which can be used to build market brands and achieve good quality at good prices.

(2) Breeding costs

The method of big data analysis is used to study the culture cost. The total unit production cost of Scophthalmus maximus is 44.64 yuan per kg and that of running water culture is 52.46 yuan/kg. The fixed unit production cost of the former is higher than that of the latter, and the variable unit production cost is lower than that of the latter. Under the combined effect of the two, the total unit production cost of circulating water culture is lower than that of running water culture. In this study, 30 kg/m^2 of cultured *Epinephelus gentianus* at 60% survival rate was 55.80 yuan/kg, and 40 kg/m^2 at 80% survival rate was 45.07 yuan/kg. According to the selling price of grouper in the northern market at present, it has certain market competitiveness. From the composition of culture cost, seedling, feed, artificial, water and electricity, depreciation constitute the main cost of grouper culture, accounting for 88% to 90% of the total cost. Among them, artificial, seedling, feed costs accounted for 58% to 65% of the total cost of breeding. The cost of feed, artificial and fry accounts for about 95% of the total cost of culturing large yellow croaker in cage. From this data, recycling aquaculture does have higher hydropower and depreciation costs, but its stability, resistance to typhoons and other natural disasters and environmental protection is cage culture cannot be compared. The survival rate was increased from 60% to 80%, and the cost of seedling was reduced from 12.5 yuan/kg to 9.385 yuan/kg. The cost of seedling decreased by 2% when the survival rate was increased by 10%. Increasing unit output can reduce labor, water and electricity costs, unit output from 30 kg/m^2 to 40 kg/m^2, the total cost from 29.9 yuan/kg to 22.48 yuan/kg. Therefore, the circulating aquaculture system needs to support the higher carrying capacity when it is designed. The labor cost can be reduced through the realization of breeding grading, automatic feeding, reducing the number of operating workers and so on. The cost of liquid oxygen is 2.7–3.64 yuan/kg, accounting for 6%–7%, which is related to the low efficiency of adding inflatable liquid oxygen in enterprises.

(3) In order to improve the level of the cost control management of the marine fishery aquaculture project, it is necessary to implement a sound and complete budget quota control process, ensure the flexibility of the conversion, set up an effective management plan, maintain the effectiveness of the management objectives and management results, and reduce the budget error of the cost control of the marine fishery aquaculture project to a certain extent, and create a good platform for the subsequent improvement of the effectiveness of the overall work process. It is worth mentioning that in the process of budget quota analysis and implementation, the relevant departments should actively integrate the management elements and control standards, consolidate the management foundation, and maintain the comprehensive value of the management mode according to the corresponding management control mode. In addition, we should pay more attention to the cost control work, and apply the whole process management mechanism to effectively take cost control as the management standard. Relevant personnel should complete the management system of marine fishery breeding funds in the project decision-making period on the basis of clear specific behavior, and provide a guarantee for the implementation of cost supervision work.

Marine fishery aquaculture construction is a relatively large use of funds comprehensive project, in the process of marine fishery aquaculture construction, there are different needs for funds in different links, which requires in the process of marine fishery aquaculture construction, we must actively adopt dynamic, scientific, and systematic cost management methods, combined with the consumption of funds in different links, and implement scientific and comprehensive cost management methods, so as to optimize the construction cost of marine fishery aquaculture as a whole, and promote the intensive and efficient development of marine fishery aquaculture industry in an all-round way.

5. Conclusion

This paper presents a method of controlling the cost of marine fishery aquaculture based on big data analysis. According to the characteristics of marine fishery culture, the cost of marine fishery culture is deeply analyzed. With the advantages of the comprehensive and strong correlation of big data analysis methods, the data features are deeply mined. On the basis of building the cost analysis model, the adaptive neural network is introduced to optimize parameter identification, and the feature distribution is reorganized to realize cost control. During the experiment, the culture condition of grouper was mainly analyzed. *Epinephelus*is a good breed in industrial culture in North China. Seedling, feed, artificial, hydropower, depreciation, management, epidemic prevention, and liquid oxygen constitute the cost of industrialized recirculating water culture of grouper, of which seedling, feed, artificial, hydropower, and depreciation constitute the main cost of grouper culture, accounting for 88%–90% of the total cost. The results showed that the key to reduce the cost of recirculating aquaculture was to increase the yield per unit and the survival rate in the process of aquaculture. How to improve survival rate by immunization, how to increase yield per unit area and reduce cost, how to realize automation and reduce labor cost, how to increase efficiency of adding liquid oxygen and reduce cost of liquid oxygen are the problems that industrial grouper culture enterprises need to face in the future. The analysis shows that the method has high stability of marine fishery culture cost control, improves the adaptability of marine fishery culture cost control, and improves the profit level of enterprises. In the application of the method, it is found that the fusion effect of big data and cost control is not very ideal, which affects the development of cost management under the big data environment. Therefore, in the future research, we will focus on the work of data fusion.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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