ECOLOGICAL PROTECTION AND ENVIRONMENTAL GOVERNANCE IN THE ERA OF BIG DATA CORPORATE FINANCE POLITICAL PERFORMANCE STUDIES

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ABSTRACT

The theory of sustainable development based on ecological protection and environmental governance places greater emphasis on the coordination between ecological civilization and economic construction. In response to the contradiction between economic development and ecological protection and environmental governance. We combine big data processing and big data mining techniques to conduct an in-depth study of ecological protection and environmental governance. In addition, we focus on exploring the relationship between relevant corporate financial performance and ecological protection and environmental governance. The results show that our proposed ecological conservation and environmental governance model has a maximum error of 2.37% and 1.27% in predicting ecological change and environmental governance respectively. The improvement in ecological conservation prediction is 63.72% and 65.93% respectively. In environmental governance, the improvement is 11.6% and 14.47%. The corresponding corporate earnings can be further increased by up to 37.81% and 41.36%. This shows that the adjustment of corporate finance can effectively solve the fluctuation of earnings caused by ecological protection and environmental management, and also promote the steady growth of corporate earnings.

KEYWORDS

Ecological protection; environmental governance; economic construction; big data; corporate finance

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1. INTRODUCTION

Nowadays, China's economic development has been remarkable and it has become the second-largest economy in the world [1]. However, the rapid development of China's economy [2, 3] has come at the expense of the environment [4], with human activities, especially those of industrial enterprises, causing more damage to the environment every year [5]. Therefore, it is urgent for environmental management and ecological protection. Therefore, the task requirements should be to accelerate green and low-carbon development, continuously improve the quality of the environment, enhance the quality and stability of the ecosystem, and comprehensively improve the efficiency of resource use. At present, the construction of ecological civilization has gradually made positive progress [7, 8]. The rough and fast-growing economy needs to be transformed into a green and low-carbon sustainable development model [9, 10]. China is currently accelerating the process of environmental pollution control [11], while more stringent regulation of heavily polluting enterprises is being implemented. In the process of ecological protection and environmental management, to enable healthy, stable, and sustainable economic development [12], it is also necessary to take into account the environmental carrying capacity when society conducts economic behavior. We also need to consider the impact of environmental governance on business finances. We, therefore, need to establish a virtuous ecosystem and take a good ecological path in economic development, we must insist on putting the ecological environment before economic benefits while considering the benefits to the enterprise and dealing with the harmonious relationship between the ecology and the enterprise. We cannot let environmental management and ecological protection lead to an increase in the risk factor of enterprises and affect their development. What we should do now is to change the initial concept of economic development and use ecology and economics to combine the two concepts to explore methods and paths that can solve the problems of environmental governance, ecological protection, and economic development.

Due to the promotion of ecological protection and environmental management, various research scholars have contributed their ideas. It is hoped that ways can be found for environmental and ecological development and economic development of enterprises. New approaches to environmental governance can help to mitigate adverse socio-economic and ecological impacts. Broadbent, E.N [13] develops CoP-L on tools and strategies to improve infrastructure governance that can be used as a mechanism. Their research promotes learning and action on factors related to governance effectiveness. In addition, they used mixed methods [14, 15] to explore textual analysis and regional multi-iterative discussions with stakeholders. Zuo, L [16] argue that understanding the relationships between ecosystem services and exploring their drivers is necessary for effective ecosystem management. They quantified four factors: soil conservation, water production, net primary productivity, and habitat quality [17, 18]. Ecological priority conservation areas and ecological priority restoration areas are then identified, which facilitates targeted conservation. In terms

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of corporate ecological protection, micro-enterprises with profit-seeking characteristics have not developed sufficient motivation for environmental governance. hu, J [19] proposed that environmental protection departments carry out environmental regulation and their strength in enforcing regulations has an important impact on corporate environmental governance. wang, X [20] proposed an environmental monitoring system based on a ZigBee wireless sensor network. The system consists of a wireless monitoring network and a remote PC to achieve real-time remote monitoring of environmental information such as temperature and humidity, light intensity, rainfall, etc. Lu, S [21] looked at the legal system and established a corresponding ecological civilization system by legal norms, which has a positive effect on promoting environmental protection. They also focus on the current situation of China's ecological environment [22, 23], analyze its problems, and propose corresponding solutions in light of the problems. Guan, Y [24] combine the current requirements of China's ecological environmental protection. They introduced the macro background of the development of social organizations for environmental protection in China in terms of policies and regulations, material support, and propaganda guidance, and further analyzed the existing problems. Wu, M [25] conducted an in-depth discussion on the relationship between the economy, resources, and environment in the Greater Bay Area of China. The relationship between the green economy and the carrying capacity of resources and the environment in the Greater Bay Area is analyzed. By constructing a comprehensive economic-resource-environment index system, the entropy weighting method is used to calculate the index weights. They argue that the coordination of the economic-resource-environment system in China's Greater Bay Area is currently increasing and that economic development is moving towards high resource-carrying capacity and high environmental carrying capacity. Mazzanti, M [26] Their research questions cover everything from economic and financial performance to innovation adoption, to circular economy implementation and environmental protection. In addition in applying clustering techniques [27, 28] to better design and target policy tools for circular economy, environmental protection, and eco-innovation in areas related to ecological/ sustainability transition. Nowadays, due to the spread of information technology, computer network computing has developed [29, 30]. The processing of various complex problems through big data has also received increased attention. Fu-sheng [31] drew on the international BOT model to construct urban big data based on next-generation information technology such as artificial intelligence, cloud computing, and the Internet of Things to help the ecological construction of smart cities. Chen, F [32] used big data as a research context to construct a rural agroecological system ecological based on complex systems theory The study was based on the complex system theory to build an ecological management system for rural agricultural ecosystems. Among the many research scholars mentioned above on ecological protection and environmental quality, they have studied various aspects from the perspective of laws and regulations, ecological service system relationships, and artificial intelligence. In addition to the purely ecological influences and related governance methods, economic orientation has a great influence on ecological protection and environmental governance. In particular, with the rapid development of

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information technology, it is essential to analyze the relationship between ecological conservation, environmental governance, and related corporate finance based on big data.

The theory of sustainable development based on ecological protection and environmental governance places greater emphasis on the coordination between ecological civilization and economic construction. This research plays a guiding role in the construction and development of ecological protection and governance. The results of the research are conducive to promoting the common progress of the environment, economy, and society. Therefore, we combine big data processing and big data mining technology to conduct in-depth research on ecological protection and environmental governance. In addition, we focus on exploring the relationship between relevant corporate financial performance and ecological protection and environmental governance. It is a win-win situation for enterprises if they can maintain a healthy and stable growth of their revenue in the process of ecological protection and environmental management.

2. A FRAMEWORK FOR APPLYING BIG DATA FINANCIAL PERFORMANCE ANALYSIS TO ECOLOGICAL PROTECTION AND ENVIRONMENTAL GOVERNANCE ENTERPRISES

In the context of the big data era, the establishment of a big data analysis platform for ecological protection and environmental governance enterprises enables the collection and acquisition of financial and performance information for ecological protection and environmental governance enterprises in real time. Through the pre-set ecological protection and environmental governance logic language of the financial analysts, the report output performance end is fed back and the output data is processed to derive the important information required by the various departments and management of the ecological protection and environmental governance enterprise in real-time.

This paper uses a proposed method based on the output of financial and performance information from the ecological conservation and environmental governance state network to predict the time series generated by different environmental systems. The results conclude that the performance of the state network with ecological protection and environmental governance is reliable.

2.1. THE GENERAL FRAMEWORK OF THE MODEL

Ecological conservation and environmental management state networks are artificial recurrent neural networks that remain active even in the absence of relevant environmental data. This is shown in Figure 1.

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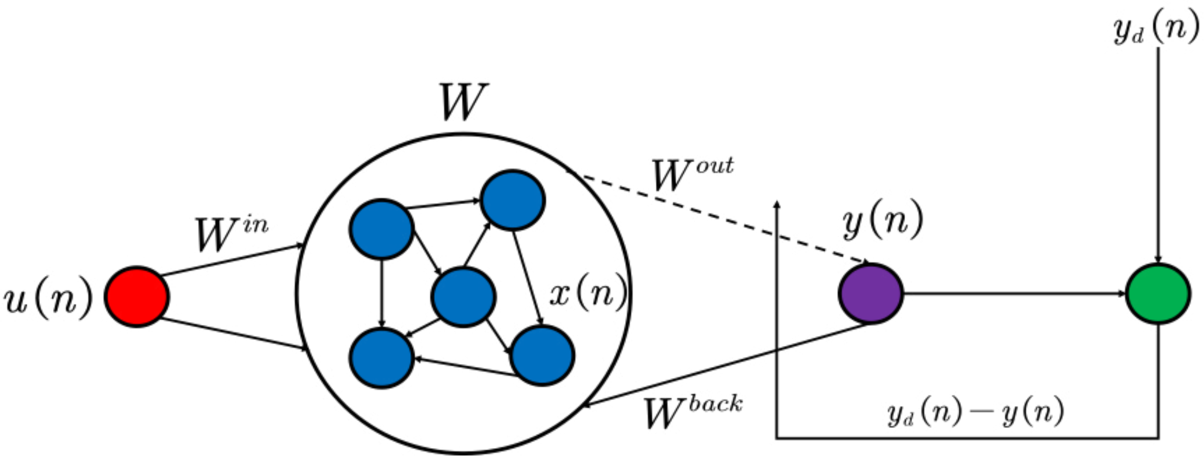

Figure 1. Model diagram of the ecological protection and environmental governance state network.

The ecological protection and environmental governance state network consists of a front-end input layer, an intermediate reserve pool, and an output layer, whose corresponding input vectors, state connection vectors, and output vectors can be expressed as follows.

$$u(n) = \left(u_1(n), u_2(n), \ldots, u_k(n)\right)^T \quad (1)$$

$$x(n) = \left(x_1(n), x_2(n), \ldots, x_r(n)\right)^T \quad (2)$$

$$y(n) = \left(y_1(n), y_2(n), \ldots, y_l(n)\right)^T \quad (3)$$

Among them, $u(n)$ is a dimensional input vector; $x(n)$ is a r dimensional state continuum vector; and $y(n)$ is a l dimensional output vector. At sampling time n, the state equation update and the financial and performance information output equation of the ecological protection and environmental governance state network are shown below.

$$x(n+1) = \tanh\left(W^{in}u(n+1) + Wx(n) + W^{\text{back}}\, y(n) + v(n)\right) \quad (4)$$

$$y(n+1) = W^{\text{out}}\, x(n+1) \quad (5)$$

Where the weight ratio W within the reserve pool is a $r \times r$ dimensional matrix, the weight ratio W^{in} at the input layer is a $r \times k$ dimensional matrix, and the W^{back} from the financial and performance information output layer and then the feedback connection is a $r \times l$ dimensional matrix of warrant ratios. $v(n)$ is the noise vector and the hyperbolic tangent is used as the activation function in this paper. In equation (5), which is the output equation of the single output network, the weight ratio W^{out} of the output financial and performance information is a $l \times r$ dimensional matrix. $y(n)$ is the financial and performance information output of the ecological protection and environmental governance state network. $u(n)$ is composed of the hyperbolic tangent activation function and the weight ratio of the output financial and performance

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information after passing the training. The network is continuously activated even in the absence of relevant environmental data.

The main component of the ecological conservation and environmental management state network is the use of a large-scale stochastic sparse reserve pool as the relevant environmental data processing medium. After processing the environmental data input signals are mapped from a low-dimensional input space to a high-dimensional state space. The network is eventually trained in the high-dimensional state space using linear regression methods for partial connection weight ratios.

2.2. ECOLOGICAL PROTECTION AND ENVIRONMENTAL GOVERNANCE STATE NETWORK INDICATORS

This subsection first gives definitions of the relevant ecological conservation and environmental management state network indicators, including definitions of prediction steps, sparsity, energy loss (energy consumption), energy efficiency (energy efficiency), and contribution.

1. The number of prediction steps is the minimum number of steps at a moment in time. This is described as follows:

$$\left| \frac{y_{predict}(n) - y_{original}(n)}{y_{original}} \right| \leqslant \Delta \tag{6}$$

where $\Delta = 0.001, y_{original}(n)$ are the values of the signal sequence at moment n and $y_{predict}(n)$ is the output value of the corresponding prediction sequence at moment n. reflects the predictive performance of the ecological conservation and environmental management state network.

2. Sparsity α is a connection probability between the neurons in the reserve pool and the financial and political performance information output neurons. This is described as follows.

$$\alpha = \frac{(N - S)}{N} \tag{7}$$

where S denotes the number of dormant synapses in the conservation and environmental governance state network and N denotes the number of all tunable synapses in the ecological conservation and environmental governance state network.

3. Energy loss E is the total energy loss of the output synapses activated in the ecological conservation and environmental management state network. This is calculated as follows.

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$$E = \sum_{i=1}^{N} \left(W_i^{out}\right)^2 \tag{8}$$

where W_i^{out} is a matrix of weights between the i connecting financial and performance information output neurons.

(4) Energy efficiency C is the energy loss per unit corresponding to the predicted number of steps in the ecological protection and environmental management state network. This is calculated as follows.

$$C = \frac{steps}{E} \tag{9}$$

2.3. ACCURACY OF ECOLOGICAL CONSERVATION AND ENVIRONMENTAL GOVERNANCE MODELS

This section discusses the comparison of the outputs derived from the ecological conservation and environmental management state network predictions with the experimental results. In Figure 2 the horizontal coordinates indicate the number of prediction steps and the vertical coordinates indicate the accuracy of the predicted values. In this paper, the number of prediction steps is set to 20, 40, 60, 80, and 100 for comparison. It can be seen that as the number of prediction steps increases, the prediction accuracy of the network model increases. When the number of prediction steps is 40, the model prediction accuracy can reach 95.61%. When the number of prediction steps reaches 100, the model prediction accuracy is 97.45%, which is only a 1.84% increase in prediction accuracy. At the same time, the network will increase the computational cost as the number of prediction steps increases. Therefore, 40 is chosen as the number of prediction steps for the network iteration in this paper.

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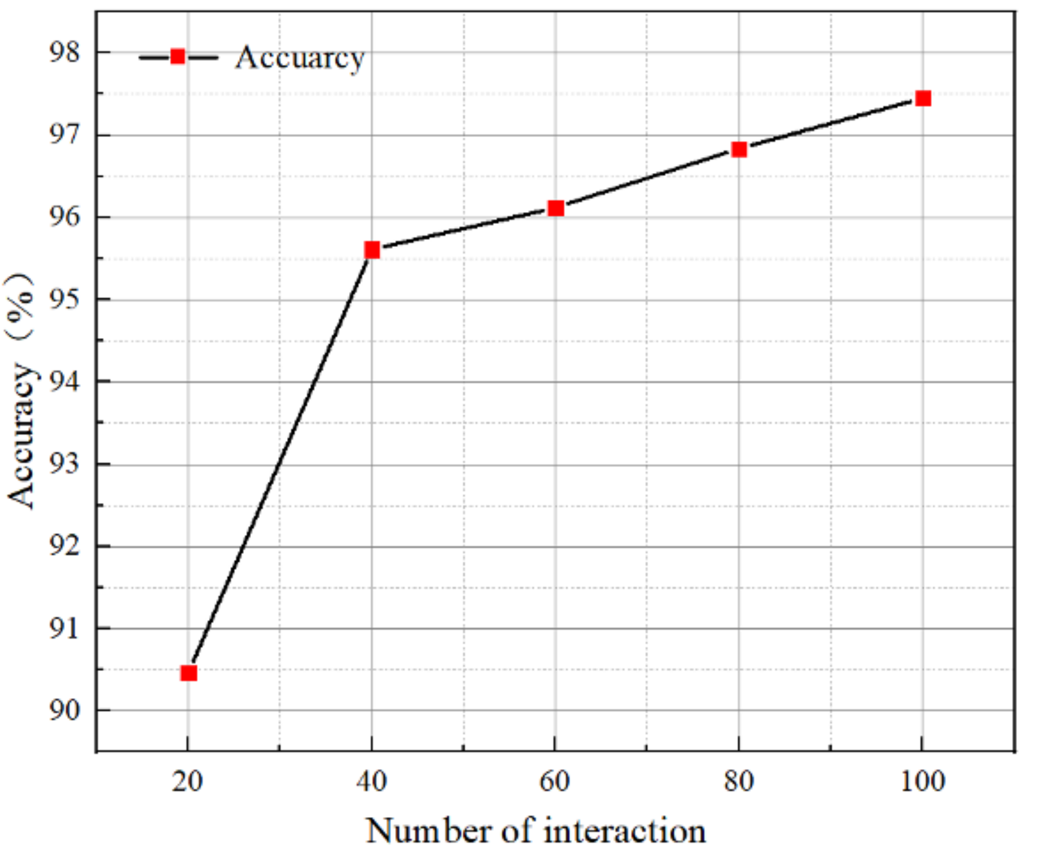

Figure 2. Plot of the number of ecological protection and environmental management state network prediction steps versus prediction accuracy.

3. RESULTS AND DISCUSSION RELATED TO ECOLOGICAL PROTECTION AND ENVIRONMENTAL GOVERNANCE

Currently, some large and medium-sized energy companies in the Chinese energy industry are facing trade-off decisions and constraints between the dilemma of ecological protection and environmental treatment and energy production. The needs in terms of energy production, ecological protection, and environmental treatment all need to be assessed through the indicators of an ecological and environmental protection enterprise. However, there are enormous tests in the area of environmental management and ecological protection, and it is, therefore, necessary to make a targeted analysis of the financial situation of ecological protection and environmental management companies and the corresponding performance results. The problems faced by companies in the field of ecological protection and environmental management are (1) a lack of awareness of ecological protection among the population and (2) insufficient investment in the ecological economy and research and development by the companies themselves. Research on environmental management, pollution treatment, and sustainable development has been relatively in-depth or at the application R&D stage in previous years and needs to be further assessed from the application environment; (3) In recent years, with the domestic

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economy, especially in some of the faster-growing regions, the development of research, development and application environment in ecological protection and environmental management has been full of vitality and vigor. However, in the rapid economic development, pollution problems in various industries have become more and more prominent. The current market environment for ecological protection and environmental management enterprises in the new era is undergoing the pressure of social opinion, means of publicity, innovation in business methods, and the combined impact of energy efficiency and environmental conditions. At the same time, the development and innovation of various big data technologies are gradually influencing the methods of financial analysis, analyzing and predicting the future development from the financial situation of the business community. The purpose of this is to serve the wider ecological and environmental management business community. In turn, it provides further policy and economic guidance to enterprises. It also guides the future of ecological protection and environmental management in China.

3.1. IMPACT OF ECOLOGICAL PROTECTION AND ENVIRONMENTAL GOVERNANCE INDICATORS

For this purpose, we collected information related to the financial performance of companies regarding ecological protection and environmental management from 2016-2020 and used an artificial recurrent neural network (ANN) to make non-linear predictions of the categorical data. One of the data sources was collected using a city in Guangdong Province, China as the base database. The input parameters include forest conservation indicators, water conservation indicators, air quality indicators, and pollutant and waste treatment indicators. For the output parameters, we used comprehensive evaluation indicators, which were set up as ecological protection indicators and environmental management indicators. In Table 1, we summarise the annual average forest protection indicators, water resource protection indicators, air quality indicators, and pollutant and waste treatment indicators for a municipality for the five years 2016-2020. It is observed that there is a huge crisis in ecological protection indicators as well as environmental governance in a city in Guangdong Province during the period 2016-2017. The figures for the area covered by forests, the total water reserves, and the overall air quality index decreased by 23.25%, 15.70%, and 26.87% respectively. This shows that the regulation of ecological protection is in great danger. The combination of massive illegal or unsustainable tree felling, water wastage, soil erosion, and pollution with the emission of harmful or greenhouse gases such as CO_2 has led to a simultaneous decline in the forest environment, water environment, and air quality. In addition, it was observed that the number of pollutant and waste treatment plants, which should be treated as pollutant emissions, did not increase significantly; the number of pollutant and waste treatment plants only increased by 5.8% between 2016 and 2017, which is far from enough to address a large number of ecological protection and environmental management issues and gaps during the period. As a result, there were huge ecological problems during this period. In the period 2017-2020, however, the significant development and promotion

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of ecological protection and environmental management enterprises and the related technological advances and developments have led to a significant improvement in all indicator parameters. The area covered by forests will increase by 5.62%, 10.88%, and 16.43% in the period 2018-2020 compared to the figures for 2017. Total water reserves have increased by 4.48%, 8.47%, and 12.26% year-on-year. The combined air quality index increased by 6.12%, 14.29% as well as 18.37% year-on-year. The number of pollutants and waste treatment plants increased by 28.125%, 55.80%, and 63.39% year-on-year.

Table 1. Annual average indicator data for a city in Guangdong Province for 2016-2020

Year	2016	2017	2018	2019	2020
Forest cover (in million hectares)	56.14	43.09	45.51	47.78	50.17
Total water reserves (in billions of cubic metres)	37.83	31.89	33.32	34.59	35.80
Air Quality Composite Index (0-1)	0.67	0.49	0.52	0.56	0.58
Pollutants and waste treatment plants	211	224	287	349	366

3.2. ASSESSMENT AND PREDICTION OF ECOLOGICAL CONSERVATION INDICATORS

In the process of ecological protection, the number of ecological protection indicators can clearly show how effective it is for ecological protection. Therefore, we have collected the ecological protection index between 2016 and 2020 and analyzed the index for these years using our proposed ecological protection and environmental governance model. As shown in Figure 3, in the actual ecological protection index, the figures for 2016 to 2022 are 0.557,0.313,0.361,0.397 and 0.431 respectively. the predicted figures in our proposed ecological protection and environmental governance model are 0.562,0.317,0.359,0.394 and 0.421 respectively. the maximum fluctuation values are below 0.01, and the maximum error is within 2.37%, which indicates that our proposed model has good accuracy. In addition, we have used the Ecological Conservation and Environmental Management model to predict the Ecological Conservation Index for subsequent years. According to our predictions, in 2024 and 2025, the relevant indices reach 0.519 and 0.526, an increase of 63.72% and 65.93% compared to 0.317 in 2017. This indicates that after 2017, China's commitment to ecological protection has become more and more powerful. China is not pursuing pure economic growth, they are building their economy while paying more and more attention to the ecological protection of the country. Strengthening ecological protection is conducive to strengthening China's green and low-carbon science and technology innovation, and sustaining the growth of green and low-carbon industries. This will be conducive to the formation of new green economic dynamics and sustainable growth poles. It will significantly improve the quality and efficiency of

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economic and social development, and provide a strong impetus for China to build a strong socialist modern state comprehensively.

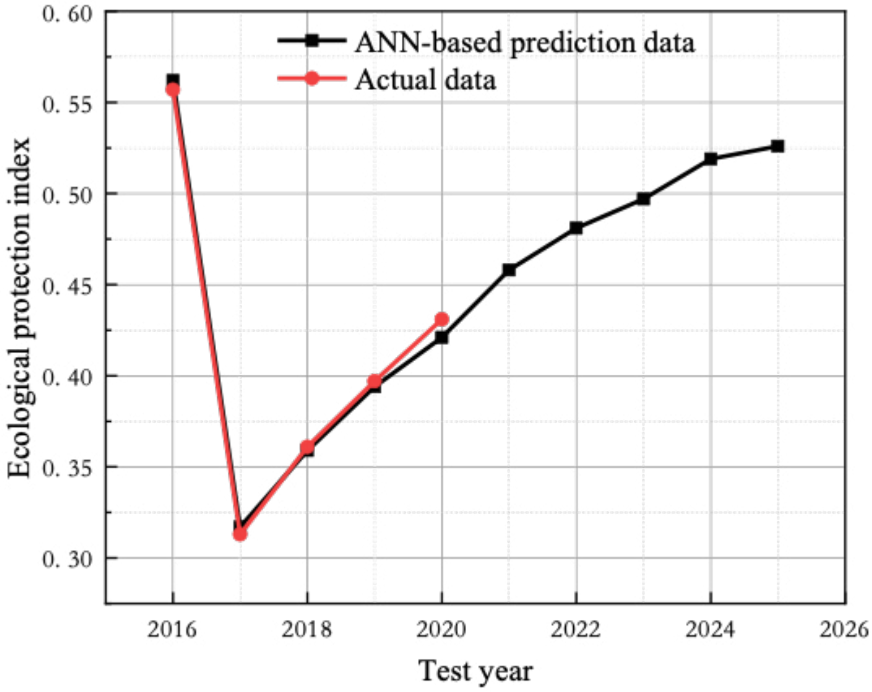

Figure 3. Assessment and prediction maps for ecological conservation indicators

3.3. ASSESSMENT AND PREDICTION OF ENVIRONMENTAL GOVERNANCE INDICATORS

China's fight against environmental pollution is of great theoretical and practical significance in achieving sustainable economic development, building a moderately prosperous society, and ultimately realizing the overall harmony of human society. It is conducive to the sustainable development of China's economy. When building an economy, there is a need to establish a way of development that meets the development needs of the present without compromising the ability of future generations to meet their needs. China is a developing country and the biggest problem it faces is developing its economy, which depends on the environment and resources to support it. The state of environmental governance is conducive to building a moderately prosperous society in all aspects. In the previous decades, China's rapid economic development had caused serious environmental pollution. Environmental pollution has become a major public hazard today. The Chinese government's efforts to manage the environment, properly manage the relationship between the economy and the environment, and manage the environment and protect the environment will provide an important foundation and prerequisite for China to build a moderately prosperous society and is a strong guarantee for China to achieve moderately prosperous for all people at an early date. Therefore, we have conducted

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an in-depth discussion on China's environmental governance, reflecting the extent of China's environmental governance through the environmental governance indicator factor. In Figure 4, we present the environmental governance factors for China between 2016 and 2020 and compare them with the results predicted by our proposed ecological conservation and environmental governance model. We can see that the actual environmental governance factors are 0.513,0.519,0.532,0.537 and 0.558 respectively, with environmental governance showing a steady and slow increase. The model predicts governance factors of 0.512, 0.518, 0.529, 0.534, and 0.551 for the period 2016 to 2020, with a maximum fluctuation of 0.007 or 1.27% compared to the actual values. This is mainly due to several factors in the environmental management process, including relevant laws and regulations, the enforcement efforts of law enforcement officers, and some local environmental influences. By forecasting the environmental governance in 2024 and 2025, the relevant factors are large 0.586 and 0.593. Compared with 2017, the steady increase of 11.6% and 14.47% indicates that environmental governance is steadily progressing.

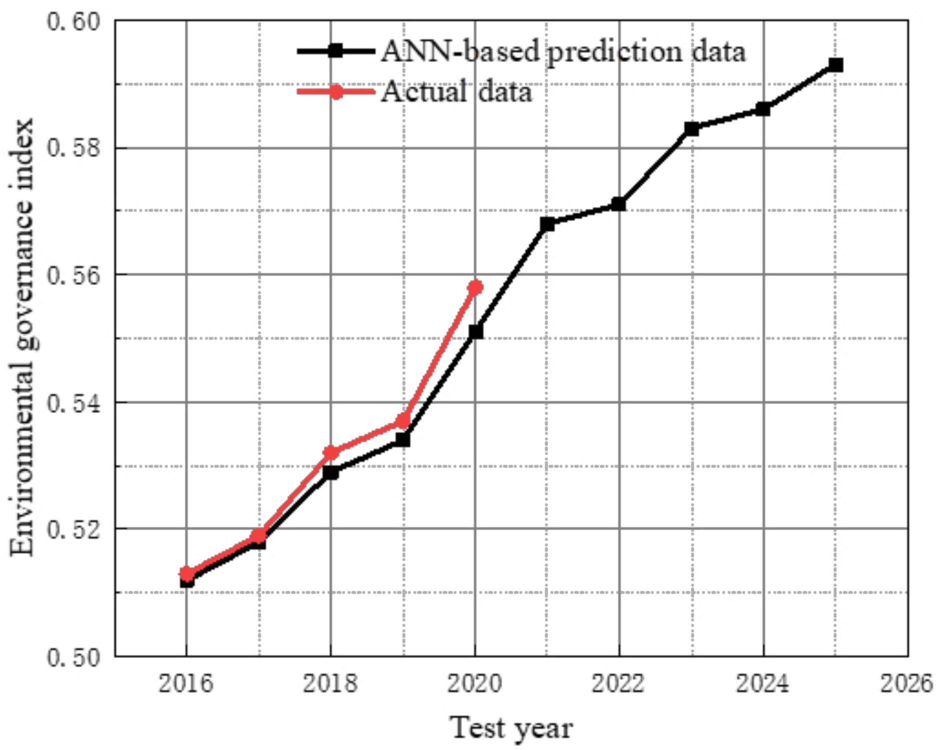

Figure 4. Assessment and prediction of environmental governance indicators

3.4. CORPORATE FINANCIAL RETURNS

Corporate finance needs to help decision-makers make the right judgment on the market based on the data provided by the finance department so that the company can grasp the right business direction in the market, develop steadily and stay in the

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invincible position. The focus of finance in an enterprise varies with the stage of development of the enterprise. To verify the impact of ecological protection and environmental management on corporate earnings, we track the earnings of a particular enterprise. As can be seen in Figure 5, between 2016 and 2020, the actual annual earnings growth of the enterprise is at 3.58%, 3.66%, 3.98%, 4.07%, and 4.14%. In our proposed model, the corresponding economic growth is 3.6%, 3.65%, 3.95%, 4.1%, and 4.12%. In addition, we forecast economic returns for the coming years, which are expected to grow by 5.03% and 5.16% in the years 2024 and 2025. This indicates that there will be no impact on the company's finances when it comes to ecological and environmental management. The corresponding increase in revenue could be as high as 37.81% and 41.36%. This shows that the adjustment of corporate finance can effectively solve the fluctuation of earnings caused by ecological protection and environmental management, and can also promote the steady growth of corporate earnings.

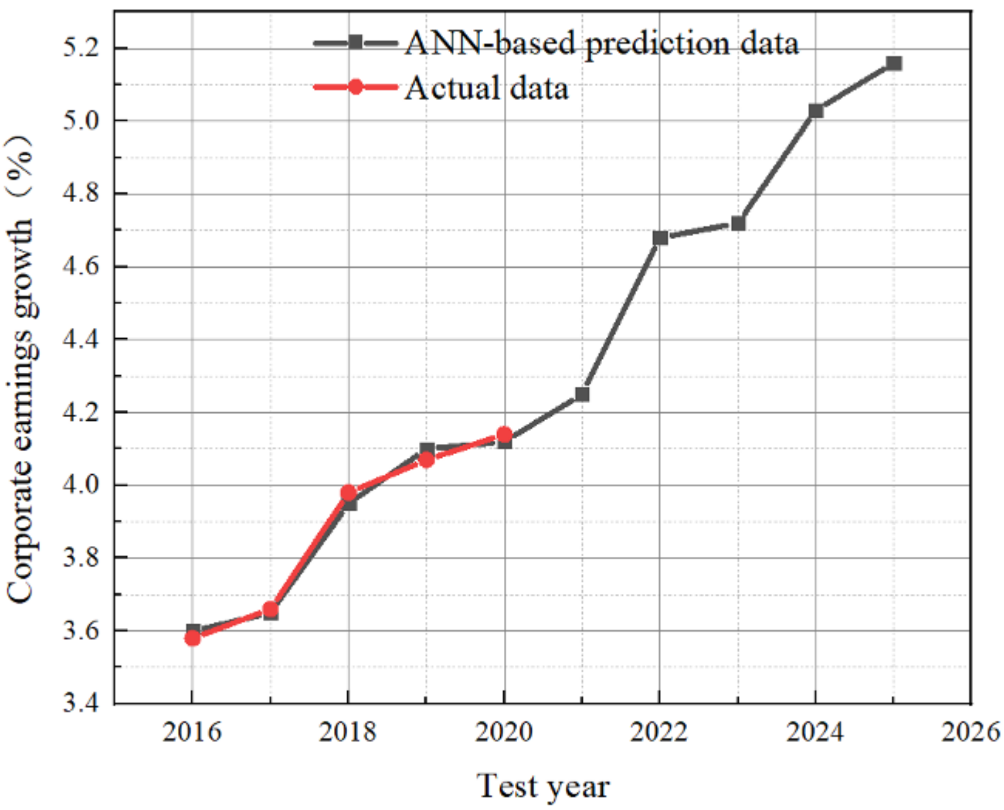

Figure 5. Graph of growth in corporate financial returns

4. CONCLUSION

Ecological protection and environmental management have a very significant and positive role to play in promoting sustainable development in China. In the process of ecological protection and environmental management, maintaining the economic growth of the enterprise according to specific circumstances is also a necessary environment for the development process. In business, finance permeates every aspect of business management, and all business management activities are ultimately reflected in financial data. These data can expose the loopholes and weaknesses in business management and provide early warning for the prevention of business risks. In the article, we combine big data technology for financial analysis to analyze and predict the future direction of development from the financial and fiscal status of the enterprise group. This is intended to provide further policy as well as economic guidance to the larger ecological conservation and environmental management business group. The findings of the study are as follows.

1. We used an artificial recurrent neural network (ANN) to make non-linear predictions of categorical data and summarised the data for a city's average annual forest conservation indicators, water conservation indicators, air quality indicators, and pollutant and waste treatment indicators for the five years 2016-2020. The results show a 23.25%, 15.70%, and 26.87% reduction in the total water reserves and air quality composite index respectively.

2. In the assessment and prediction of ecological protection and environmental management indicators, our proposed ecological protection and environmental management model has a maximum error of 2.37% and 1.27% in the prediction of ecological change and environmental management. This indicates that our model has good accuracy. It also improves 63.72% and 65.93% in ecological conservation prediction and 11.6% and 14.47% in environmental governance, respectively. It shows that our ecological protection and environmental governance are steadily progressing.

3. In carrying out ecological protection and environmental management, it is vital to ensure that companies earnings. In our forecasts, the corresponding corporate earnings can be further increased by 37.81% and 41.36%. This shows that the adjustment of corporate finance can effectively solve the fluctuation of earnings caused by ecological protection and environmental management, and also promote the steady growth of corporate earnings.

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