Assessment of Risk Management Capability and Effectiveness of Intelligent Algorithms in Energy Finance

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Abstract: With the rapid development of the energy internet and renewable energy, the application of intelligent algorithms in energy finance is more and more promising. How to evaluate the risk management ability and effect of intelligent algorithms when it is widely used in the field of energy finance has become an urgent problem to be solved. This paper combs the status quo and problems of intelligent algorithms in the field of energy finance, and puts forward some suggestions to improve the level of energy finance service in China. Experimental results show that the Risk-return ratio of risk management in intelligent algorithm can reach up to 330%.

Keywords: Energy Finance, Intelligent Algorithm, Risk Management Capability, Risk Management Effectiveness

1. Introduction

Intelligent algorithms are models that are trained over a large amount of data and can be trained on specific problems and tasks with specific precision, rather than on a wide range of data and samples. The core idea of intelligent algorithms is to use algorithms to deal with a large number of complex problems. In the field of energy finance, intelligent algorithms can be used to predict users' energy consumption habits, risk preference and investment behavior, thus providing more accurate risk management strategies. For example, a machine learning algorithm can be used to classify customers and manage their credit according to their credit status and behavior preferences, or to design targeted investment products and trading strategies according to the actual needs and risk characteristics of different customers.

In recent years, many excellent scholars and experts have discussed and studied energy finance. Starting from the connotation of energy finance, Feng Baoguo puts forward the issues of energy price, exchange rate risk, energy financing innovation and risk management faced by China's energy security, and suggests strengthening the construction of China's energy derivatives market system, promoting the internationalization of RMB, strengthening international integration of financial regulation and enhancing the energy financial capacity of China's energy enterprises

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[1]. Through analyzing the internal meaning of energy financial melting, taking Shaanxi Coal Group as an example to carry on the concrete interpretation, and summarized the existing problems in the development. Facing the risks and challenges brought by energy finance to financial market and energy market, we should start from energy marketization, broaden financing channels and standardize financial behaviors to promote energy finance and promote high-quality development of energy enterprises [2]. Based on the CNKI database, Bai Ping sorted through the research results of domestic energy financial issues and found that China's energy prices had relatively weak international influence, green energy products lacked financing channels, and the carbon emission trading market was gradually taking shape. In the future, China should enhance its voice in energy pricing, improve the market system for energy financial derivatives, and establish a complete risk warning and management system for the energy financial market [3]. The above content for energy finance research more thorough, but still not perfect.

This paper focuses on the risk management strategy selection and evaluation of intelligent algorithms in the field of energy finance. Firstly, the main risks in the application of intelligent algorithm in the field of energy finance are sorted out. Secondly, the intelligent algorithm is selected from renewable energy generation and traditional power generation.Through the study, we can draw the following conclusions: ① Intelligent algorithm in the field of energy finance is facing greater risk management difficulties;② Establishing appropriate risk assessment model is the key to improve the application effect of intelligent algorithm.

2. Energy Finance Overview

Energy finance refers to the integration of energy industry and finance on the basis of energy industry, through the cross integration with other industries, to promote the integrated development of energy industry and finance, thus building a complete energy finance industry chain. China's energy financial market system develops slowly, and there is still a big gap compared with Europe and the United States, mainly reflected in: first, the lack of scientific and standardized regulatory system. In China, the government's management function of energy finance is scattered in many departments, but there is no coordination mechanism between the departments, lack of a unified, standardized and complete regulatory system; second, the lack of professional regulatory agencies. At present, China's energy finance industry does not have a professional, authoritative and unified regulatory agencies, which led to China's energy finance market chaos; third, the lack of relevant laws and regulations. At present, China's supervision of energy finance is still in the exploratory stage, and has not yet formed a complete and effective regulatory system suitable for China's national conditions; fourth, the lack of a sound risk assessment system. Due to the lack of research on energy financial risk assessment system, China is facing great challenges in risk management [4].

2.1 Risk Management

The risk management of energy finance mainly refers to the process of identifying, measuring, evaluating, monitoring, controlling and dealing with the energy financial risk. The main work of risk management is to identify the possible risks in energy finance, and to evaluate the possible impact and find out the countermeasures. At present, risk management has become an indispensable part of the financial industry, financial enterprises usually use a variety of ways to manage risk.

In order to reduce the risk, financial enterprises have taken many measures, such as: establish a sound credit rating system; improve the risk warning system; improve the quality of staff, strengthen risk management awareness. However, China's energy finance industry lacks a complete and effective risk assessment system, so it is necessary to establish a complete and effective assessment system in order to grasp the risk of energy finance [5].

2.2 Intelligent Algorithm

Intelligent algorithm is a kind of algorithm which is based on artificial intelligence technology and has the characteristics of self-learning and self-adaptation. Intelligent algorithms can be divided into two categories: classical algorithms and modern algorithms. Classical intelligent algorithms include decision trees (Formula 1), genetic algorithms (Formula 2), ant colony systems (Formula 3) and neural networks (Formula 4).

$$f\left(x_i\right) = -\log_2 k\left(x_i\right) \tag{1}$$

$$h(a,b) = \sin(a) + \cos(b) + 0.1a + 0.1b \tag{2}$$

$$\delta(i,j) = (1-\tau)\cdot\delta(i,j) + \tau\cdot\delta_0 \tag{3}$$

$$t = g\left(\sum_{j=1}^{n} \omega_j m_j - p\right) \tag{4}$$

In Formula (1), $k(x_i)$ indicates the probability of selecting a category; in Formula (2), both a and b indicate the indicators of the object's h; in Formula (3), τ indicates the local volatilization rate of the pheromone; and in Formula (4), g is an activation function.

In the field of energy finance, the main applications of intelligent algorithms are: one is quantitative investment; two is financial derivatives pricing; three is financial risk control. Quantitative investment is to transform a complex mathematical model into an easy-to-understand one, and then compute it by computer program to get the optimal portfolio decision. Financial derivatives pricing is the use of risk-neutral principle, through the market on a variety of derivatives pricing to meet the needs of different investors. But the risk control is through carries on the management to the

risk asset, realizes in the market obtains the biggest income the goal [6].

3. Application of Intelligent Algorithm in Energy Finance

Energy finance is a multi-objective, multi-attribute, multi-subject and multi-link comprehensive service, which covers all the contents of traditional energy financial services, including but not limited to financial planning, enterprise financing, asset securitization, energy transactions, etc. In the process of these services, financial institutions need to comprehensively assess the credit status, repayment ability, financial status and repayment willingness of financing subjects, and use intelligent algorithms to analyze the data, so as to provide more accurate financial services for customers.

Before the intelligent algorithm is widely used in the field of energy finance, the traditional financial institutions seldom involve these fields, so the application of intelligent algorithm is still in its infancy. With the rapid development of information technology and the great importance attached by our country to the new generation of information technology industry, the application of intelligent algorithm in the field of energy finance has gradually entered a stage of rapid development. At present, a large number of studies have shown that intelligent algorithms have good prospects in the field of energy finance. In the field of electricity market, intelligent algorithm can help power companies analyze and predict consumers' behavior of using electricity, and formulate optimal generation strategy for them; in the aspect of carbon trading, intelligent algorithm can help market management institutions of carbon emission trading to evaluate credit and give risk warning for enterprises participating in carbon trading; in the aspect of financial market, intelligent algorithm can help stock exchanges to make price forecast and formulate trading strategy [7].

Although the intelligent algorithm has a broad application prospect in the field of energy finance, its application faces greater risks. The first is credit risk. Because of a great deal of information asymmetry between energy enterprises and users, it is difficult for energy enterprises to master users' credit information by traditional means. Therefore, the intelligent algorithm cannot be directly applied to energy enterprises for credit evaluation, but need to use traditional methods to data processing and analysis, and extract valuable information. The second is price risk. In the energy financial market, price risk is caused by many factors. Among them, the violent fluctuation of market price will cause a great deal of capital loss or income loss, so it is necessary to forecast the price fluctuation and take preventive measures in advance. However, there are few researches on this issue. Because intelligent algorithm involves a lot of complex data processing and calculation, it is necessary to build corresponding legal rules and specifications to ensure that the algorithm model will not infringe others' rights or be punished [8].

There are a lot of data information in energy financial services, including customer transaction records, economic data, etc. If the data cannot be effectively analyzed and used, it will not only increase the operating costs and risk management costs of financial institutions, but also reduce customer satisfaction and loyalty. Therefore, the

application of intelligent algorithm in the field of energy finance needs to classify, analyze and process the data according to the characteristics of energy finance service [9].

4. Risk Management Capability and Effectiveness Assessment Method

The application of intelligent algorithm in the field of energy finance will have a certain impact on the traditional financial business. There are three main risk assessment methods: one is the traditional risk management methods, such as artificial neural network, support vector machine, etc.; the other is the risk management methods based on intelligent algorithm, such as artificial neural network, support vector machine, genetic algorithm, etc.; and the third is the combination of intelligent algorithm and traditional risk management methods to form a comprehensive assessment method [10-11].

When applying intelligent algorithm to energy finance, risk management ability and effect evaluation should be combined with the characteristics of energy finance business. First of all, the risk of energy finance business is characterized by diversity, complexity and dynamics. Different types of energy finance business have different emphasis on risk management. For example, in financial leasing business, banks pay more attention to the value of collateral, the borrower's repayment ability and credit status. Secondly, compared with other traditional financial business, energy financial business is more volatile. For example, in short-term financing bills, medium-term notes and other financing instruments, the borrowing period is often shorter, while the financing price is also more uncertain. Finally, energy finance business involves many customers and counterparties, these customers and counterparties may have a variety of credit risk, market risk and operational risk. Therefore, when evaluating the risk management ability and effect of intelligent algorithm in the field of energy finance, we should pay more attention to all kinds of risk factors [12-13].

Since there are many risk management capability and effect assessment methods in energy financial business, the following principles shall be followed in the selection: First, the scientific principle. It is more scientific and effective to evaluate the risk management ability and effect of intelligent algorithm in the field of energy finance by scientific method; second, the principle of comprehensiveness. That is, the energy of the financial business risk factors exist in a comprehensive, comprehensive and in-depth analysis and research; Third, the principle of systematization. That is to say, the potential impact of various intelligent algorithms on energy finance should be comprehensively and systematically analyzed and studied; Fourth, dynamic principle. That is, different types of intelligent algorithms applied in the field of energy finance when the risk management effect of dynamic tracking and evaluation [14-15].

5. Risk Management Assessment Results

Firstly, the article lists 4 evaluation indicators in risk management evaluation, as shown in Table 1.

Table 1. Evaluation Indicators

Index	Measure the object	Ideal trend
Risk-Return Ratio	Management effect	High
Sharpe Ratio	Rate of return	High
Maximum Drawdown	Extreme loss degree	Low
Cumulative Return	Overall report	High

As can be seen from Table 1, the Risk-Return Ratio is a measure of the effectiveness of a risk management strategy, that is, the return that can be achieved on assumption of a given risk. A higher Risk-return ratio indicates a relatively effective risk management strategy. The Sharpe Ratio is a measure of the risk-adjusted rate of return, or excess returns that can be earned on a unit of risk. A high Sharp ratio indicates a relatively good risk management strategy. The Maximum Drawdown is a measure of the extent to which a strategy is likely to suffer in the worst-case scenario, i.e. the maximum amount by which the net value of the strategy is withdrawn from its highest point. A smaller maximum retreat indicates a relatively stable risk management strategy. Cumulative Return measures the overall return performance of a strategy over time. Higher cumulative return indicates a relatively successful risk management strategy. Then the Risk-return ratio and Sharp ratio are selected as the evaluation indicators for the comparative analysis experiment. The experimental results are shown in Figures 1 and 2.

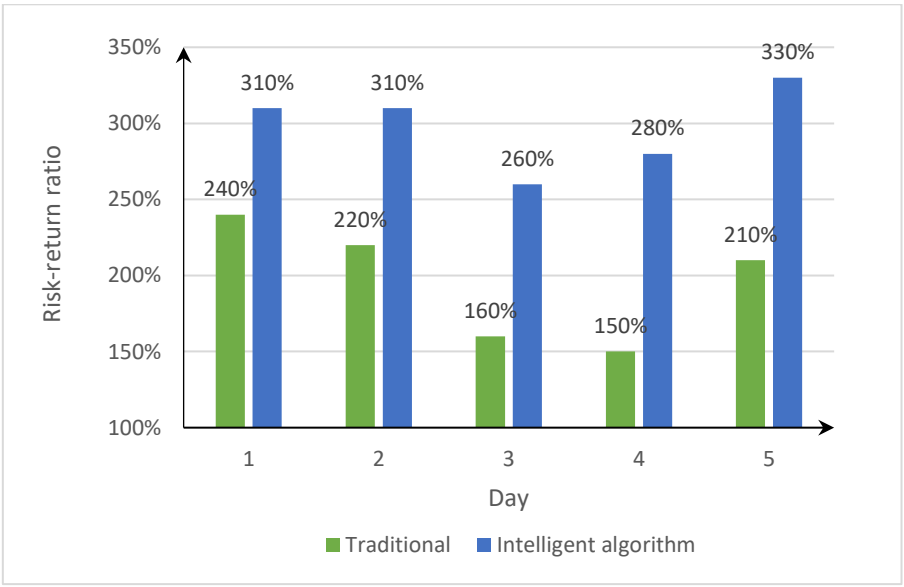

Fig.1 Risk-return ratio

As can be seen from Figure 1, the risk-to-return ratio in the traditional approach is only 240% highest and 150% lowest, with a calculated average risk-to-return ratio of 196%; the risk-to-return ratio in the intelligent algorithm is 330% highest and 260% lowest, with an average risk-to-return ratio of 298%. Therefore, risk management in intelligent algorithms has higher risk-return ratio.

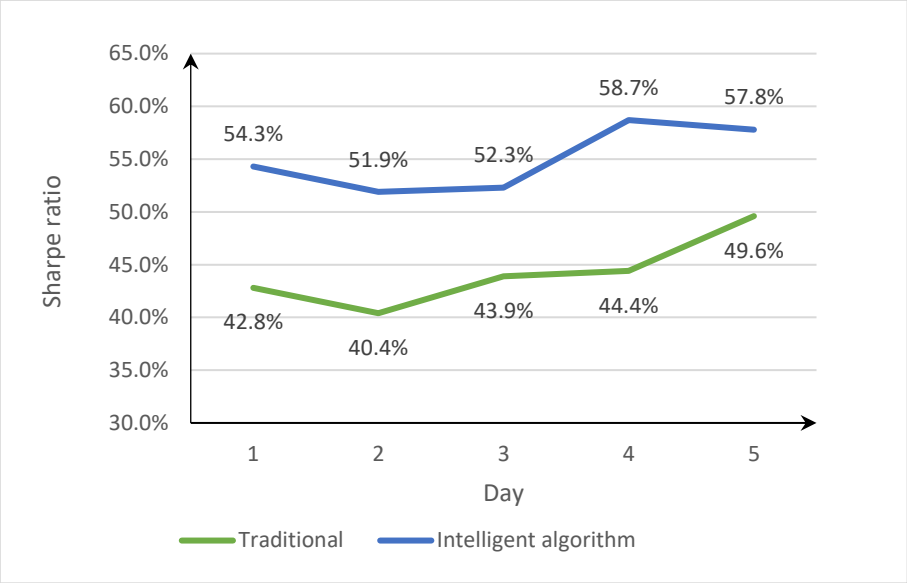

Fig.2 Sharp ratio

As can be seen from Figure 2, the Sharp ratio for risk management in the traditional approach is up to 49.6% and 40.4%, and the calculated average Sharp ratio is 44.22%, while the Sharp ratio for risk management in the intelligent algorithm is up to 58.7% and 51.9%, and the calculated average Sharp ratio is 55%. Thus, the intelligent algorithm of risk management has a higher Sharp ratio.

Financial risk management refers to the identification, evaluation and response of various risks in financial activities to protect the interests and stable operations of financial institutions and related parties.The following are common financial risk management methods: through risk identification and classification, risks are divided according to type and degree, such as credit risk, market risk, operational risk, liquidity risk, etc.Establish a sound internal control system, clarify the definition and identification methods of various risks, and ensure that risks can be discovered in a timely manner.Use risk measurement models and indicators to quantitatively evaluate various types of risks, including the probability of risks, influencing factors, and estimates of possible losses.Stress testing, sensitivity analysis and other methods can be used to simulate the risk situation in different situations and assess the risk

tolerance and response measures.Establish an effective risk control strategy, formulate corresponding risk limits and control indicators, and ensure that the risk is within an acceptable range.Set up risk monitoring and early warning mechanisms, regularly monitor risk indicators and risk exposure levels, and take timely measures when abnormal conditions are found.Based on the evaluation results and monitoring situation, formulate corresponding risk management strategies and response plans.For different types of risks, take corresponding preventive and management measures, such as establishing a credit review system, diversifying investment portfolios, and setting up risk reserves.Implement a risk information disclosure system and disclose the risk status, response measures and possible effects to relevant parties in a timely manner.Strengthen communication and cooperation with internal and external stakeholders, and establish a good crisis management and response mechanism.Establish a positive risk management culture, emphasizing full participation, risk awareness and risk responsibility.Strengthen personnel training and professional literacy improvement, and improve employees' understanding and application of risk management methods and tools.In summary, financial risk management requires comprehensive identification, evaluation and response.Through the establishment of a scientific risk management system and system, strengthening risk control and monitoring, formulating corresponding risk response strategies, and strengthening risk information disclosure and communication, financial risks can be effectively reduced and the stability and sustainable development of financial institutions and related parties can be ensured.

6. Conclusions

In order to ensure the healthy and orderly development of the application of intelligent algorithms in the field of energy finance, its risk management capability needs to be evaluated. Firstly, this paper reviews the research on energy finance and analyzes the main risks in this field. Then, based on the application of intelligent algorithm in the field of energy finance, some suggestions are put forward. This paper can provide reference for energy financial service institutions to evaluate the application of intelligent algorithm in this field scientifically and rationally. With the improvement of China's energy financial services, intelligent algorithms will have more and more extensive application prospects, which is the challenge of innovation and development of energy financial services.

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