Applications Research of Data Mining Technology in Network Finance

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Abstract: In recent years, the blowout growth of internet finance has aroused great concern from all walks of life. The low-cost and high-efficiency service model of internet finance is changing the operation and market structure of traditional financial system. A large amount of data is deposited in network finance. The analysis and excavation of these data will help us clarify the bottleneck in the development of internet finance. In this paper, twenty network financial institutions in China are taken as the research object and the DEA method is used to mine the efficiency of network finance. The technical and scale recommendations are given to provide some references for relevant researchers.

1. Data Mining in Network Finance

Data mining is a mainstream topic in artificial intelligence and database. It is to find the hidden, unknown, but potentially valuable knowledge from a large amount of cluttered information. Data mining refers to a series of behaviors which are aimed at massive, incomplete, noisy, lack of clarity, and random data and apply various techniques to extract unknown and valuable information. The information extracted can be concepts, rules, patterns and other forms. Objects that are excavated are also varied, such as file systems, databases, or other data sets. The information and knowledge acquired by applying seed-feeding techniques should be practical, effective, and previously unknown. The main purpose of data mining is to mine the information behind the data in a way that human resources cannot obtain. Perhaps the information mined is contrary to people's common sense, but as far as practical experience is concerned, such information is usually more valuable. Data mining can also provide people with more high-end services. Forecasting refers to the establishment of a model through historical data, using the latest data as input values, to obtain future trends or to assess the range of possible attribute values or values for a given sample. In recent years, with the rapid development of Internet technology, and the popularity of mobile terminals, a variety of traditional financial products into the Internet, Internet finance is emerging under the development of internet technology. Internet finance is a new type of finance, which is based on the Internet, and combines the open, equal, cooperative and sharing internet technology with traditional finance.

2. Principles and Models of DEA

2.1 Principles of DEA.

Data envelopment analysis (DEA) is a model used to evaluate the efficiency of multiple input and output decision making units of the same type. The model is based on the iso-production line and constructs an efficient convex production boundary by using linear programming. If DMUs are located above the production boundary, the technology is efficient; if DMUs are located below the production boundary, the technology is inefficient and needs to be improved. This model has been widely used in performance evaluation. In recent years, DEA method has been gradually introduced into public financial management, and has become one of the main empirical tools to evaluate the performance of various financial expenditures. Compared with other performance evaluation methods, DEA method has incomparable advantages in science, objectivity and practicality. First, the DEA method has advantages in the study of multiple input and multi output problems. DEA method

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can comprehensively evaluate the economic, social and environmental effects of different inputs to explore the problems existing in various inputs and outputs. Secondly, the DEA method calculates the optimal weight through the input and output data of the decision-making unit. As a variable, the weight does not need to be set artificially, thus avoiding the interference of subjective factors and ensuring the objectivity of the evaluation results. Thirdly, DEA method can not only evaluate the effectiveness of input and output, but also find out the ineffective reasons and what improvements need to be made to achieve the effective state.

2.2 CCR Model.

This paper uses DEA (Envelopment Analysis Data) to study the efficiency of Hunan logistics industry. The most basic model of DEA is the CCR model. It is assumed that the scale of remuneration is fixed to calculate the relative comprehensive technical efficiency. If there are n decision making units, m input variables for each decision unit, and p output variables.

$X_j = (x_{1j}, x_{2j}, \ldots, x_{mj})^T \; j = 1, 2, \ldots n$ and $Y_j = (y_{1j}, y_{2j}, \ldots, y_{mj})^T \; j = 1, 2, \ldots n$ are input variables and output variables for decision making unit DMU. CCR model is described as follows:

$$\min \theta$$

$$s.t. \begin{cases} \sum_{j=1}^{n} \lambda_j x_j + s^- = \theta x_0 \\ \sum_{j=1}^{n} \lambda_j y_j - s^+ = y_0 \\ s^- \geq 0, s^+ \geq 0, \lambda_j \geq 0, \\ \theta \end{cases}$$

2.3 BCC Model.

The above CCR model assumes that the size reward of the decision-making unit remains unchanged. In fact, changes in scale can lead to changes in the efficiency of decision-making units. Therefore, we introduce the BCC model. The pure technical efficiency and scale efficiency of each decision-making unit can be calculated by BCC model. The product of the two is comprehensive technical efficiency. Pure technical efficiency can reflect the level of investment management and application technology level, and scale efficiency can reflect the scale of investment returns. Therefore, BCC model can not only evaluate whether the DMU is DEA effective and put forward suggestions for improvement, but also evaluate the size of the DMU returns. It is widely used in the field of network financial evaluation.

3. Empirical Research of Financial Efficiency Based on DEA

On one hand, we must grasp the concept of financial efficiency accurately; on the other hand, we must grasp its nature not only from the qualitative point of view, but also from the quantitative aspect. It is very important to build an index system that conforms to the theoretical requirements and accords with the actual development of our country. The selection of indicators should be based on objective facts and the meaning of indicators should be clear. It should not only reflect the connotation of financial efficiency, but also reflect the impact of Internet Finance on financial efficiency. Index selection should not only reflect connotation, but also consider data availability. Considering the difficulty of collecting index data, China's measurement standards try to ensure data continuity, authenticity and authority. Efficiency analysis has a certain degree of subjectivity, different professional angle selection methods are different, the use of standards may be different, as far as possible from different methods to select indicators, reflecting the content of the object of study. Based on the production method, this paper selects bank deposits, shareholders' rights and interests,

human resources as three indicators to reflect financial input; bank loans, operating income, net profit as three indicators to reflect financial output, using input-output efficiency to analyze financial efficiency. Internet financial data is difficult to obtain, the use of the Internet Jincheng development of the most perfect, market share of the largest third-party payment transactions as Internet financial data, to analyze the impact on financial efficiency. In this paper, 15 banks and 5 internet financial companies are selected as decision-making units, and the BCC model based on DEA is used to calculate the network financial efficiency.

Table 1. Network financial efficiency of twenty organizations

Organization	TE	PTE	SE	SR
Shanghai Pudong Development Bank	0.778	0.844	0.922	drs
People's Bank of China	0.810	0.900	0.900	irs
Bank of Communications	0.698	0.769	0.908	irs
China merchants bank	0.770	0.899	0.856	irs
Industrial and Commercial Bank of China	0.775	0.789	0.982	irs
Agricultural Bank of China	0.739	0.859	0.86	irs
China Development Bank	0.808	0.949	0.852	irs
China Agricultural Development Bank	0.708	0.744	0.951	irs
Export-Import Bank of China	0.656	0.774	0.848	irs
China Minsheng Bank	0.817	0.972	0.841	irs
Huaxia Bank	0.517	0.649	0.881	irs
Everbright Bank of China	0.862	1	0.862	irs
CITIC Industrial Bank	0.772	0.819	0.943	irs
Bank of China	1	1	1	-
Industrial Bank	0.796	0.889	0.895	irs
Alibaba company	1	1	1	-
Baidu company	0.957	0.999	0.958	drs
Tecent company	0.985	0.996	0.989	irs
Jingdong company	0.982	1	0.982	irs
Net Ease company	0.817	0.821	0.895	drs

4. Results Analysis and Promotion Paths

4.1 Technology Efficiency.

There are twenty banks and internet financial companies in China, and the comprehensive efficiency of the two institutions of Bank of China and Alibaba Company reaches a peak value of 1. In the other organizations, the minimum time is only 0.517, the maximum time is 0.982. Obviously, the network financial efficiency of Internet companies is higher than that of banks. The essence of finance is to allocate resources across time and space. Internet finance, a new form of financial organization, has not changed the essence of finance. At present, Internet finance has not subverted the traditional finance, which is a useful supplement to the traditional finance. It reduces the transaction cost, reduces the information asymmetry, and enlarges the transaction possibility set. Network finance connects countless small market, forming a huge long tail. The long tail market is constantly merging with the traditional financial head market. With the development of trading technology, the transaction cost will be further reduced, and the long tail market will be thickened,

prolonged, and may even reverse into the head. Financial regulators should adopt the same attitude towards state-owned banks and Internet financial companies as they should exercise prudent supervision over Internet finance. We are ensuring orderly and efficient financial markets under the premise of deregulation, so that the full and free development of Internet finance. At the same time, we should also pay attention to standardizing the Internet gold market structure, reduce financial risks, and ensure the safety of funds.

4.2 Pure Technology Efficiency.

The low efficiency of network finance is mainly caused by two aspects: pure technology efficiency and scale efficiency. In terms of pure technical efficiency, there are both maximum 1 and minimum 0.649. The pure technical efficiency of Bank of China and Everbright Bank is 1, which is the same as Alibaba and Jingdong. It shows that the head of the bank has technically achieved the level of the large-scale advanced internet company. The larger state-owned banks have the advantage of taking advantage of new technology and strong capital. Joint-stock banks are weak. Then technology is widely used, technology level tends to mature, the role of improving financial efficiency slowly weakened, efficiency changes tend to average, and its marginal utility diminishes. At the same time, make full use of the advantages of Internet financial data, through the establishment of online financing platform, according to the financing needs of small and medium-sized private enterprises, design financing programs, to provide targeted financing services. China's commercial banks should improve their management level to adapt to the changes of the economic environment under the Internet finance, to enhance the pure technical efficiency of commercial banks. Using Internet finance to optimize the traditional mode of operation, the pursuit of economies of scale will be transformed into the pursuit of sustainable development of resource utilization efficiency. Through the introduction of large data analysis, we provide customers with high-quality services to enhance the competitive advantage of commercial banks.

4.3 Scale Efficiency and Scale Return.

From the perspective of scale efficiency, except Bank of China and Alibaba peaked at 1, the other institutions are below 1. From the perspective of scale returns, except for Baidu and Netease two Internet companies, scale returns have been in the growth stage. The average comprehensive efficiency and average pure technical efficiency of the financial products of E-commerce series are higher than those of the banking series, but the average scale efficiency is lower than that of the financial products of banking series. Look at the scale of Internet financial products and improve scale efficiency. Most of the financial products of e-commerce series are in the state of diminishing scale benefit. Their input-output index has not reached the optimum ratio. The operating scale of the platform has reached the saturation state. Even if more input cannot get more proportion of output, there is no need to increase input. The financial products of the bank series can improve efficiency by increasing investment, and the yield of most financial products has been raised very high. However, due to the hindrance of technological progress, the utilization of resources is not high. By increasing the input of information technology, with the help of advanced science and technology such as large data, to achieve efficient and convenient business processes to improve the scale efficiency of banks through fine management of the existing market segmentation, and then provide targeted support services. Financial institutions should increase the financing of SMEs and individuals, effectively integrate existing resources and reduce transaction costs and operating costs to achieve scale efficiency.

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