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Retraction

Retracted: Research and Implementation of Association Analysis of Agricultural Insurance Based on Data Mining Algorithm

Mathematical Problems in Engineering

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This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

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[1] W. Shao, "Research and Implementation of Association Analysis of Agricultural Insurance Based on Data Mining Algorithm," *Mathematical Problems in Engineering*, vol. 2022, Article ID 3690346, 8 pages, 2022.

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Research Article

Research and Implementation of Association Analysis of Agricultural Insurance Based on Data Mining Algorithm

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In order to establish the comprehensive competitive intelligence system of agricultural insurance companies, the process model of agricultural insurance competitive intelligence is constructed by combining data mining and process mining. The model is based on the relationship between data mining, process mining, and competitive intelligence based on analytic hierarchy process, and combines the current agricultural insurance subsidy policy, and the demand characteristics of competitive intelligence of agricultural insurance companies. Experimental results show that, among 11 secondary indicators, 6 indicators are rated above 4.0, that is, good grade or above, and 5 indicators score below 4.0, and still need to be improved. Prove data mining and the AHP algorithm can effectively improve the sustainability of agricultural insurance.

1. Introduction

Data mining, also known as knowledge discovery in databases, is a process of extracting useful information from massive data using various analytical methods and tools and analyzing and discovering potential relationships between models and data [1].The content is very extensive, and association analysis, statistical analysis, cluster analysis, decision tree method, genetic algorithm, neural network algorithm, Bayesian network, fuzzy set, and rough set theory are all commonly used analysis and processing methods. Since the reform and opening up, the country's insurance business has grown rapidly, the service field has been continuously expanded, the market system has been gradually improved, the laws and regulations have been gradually improved, the supervision level has been continuously improved, and the overall strength has been significantly enhanced. The "Several Opinions of the State Council on the Reform and Development of the Insurance Industry" issued in 2006 clearly pointed out that insurance has the functions of economic compensation, financing, and social management which is the basic means of risk management in the market economy and is an important component of the financial system and social security system. Part of it plays an important role in the construction of a socialist harmonious society. This dissertation solves the problem of the insurance industry's orientation in building a harmonious society and perfecting the socialist market economic system theoretically and in practice and elevates the function and role of insurance to a new height.

Since the insurance industry is an important part of the national economy, it is necessary to promote financial market stability, develop financial markets, promote trade and business development, promote savings growth, improve the efficiency of social risk management, promote social loss reduction, and promote more efficient social allocation of funds. Having played an irreplaceable role, all countries have spared no effort to promote the reform of the insurance industry and strengthen supervision. With the deepening reform and reorganization of the domestic insurance industry, the market environment of the insurance industry has undergone tremendous changes. China's insurance market has changed from a monopoly of individual companies to a number of large insurance companies dominated by a number of small and medium-sized insurance

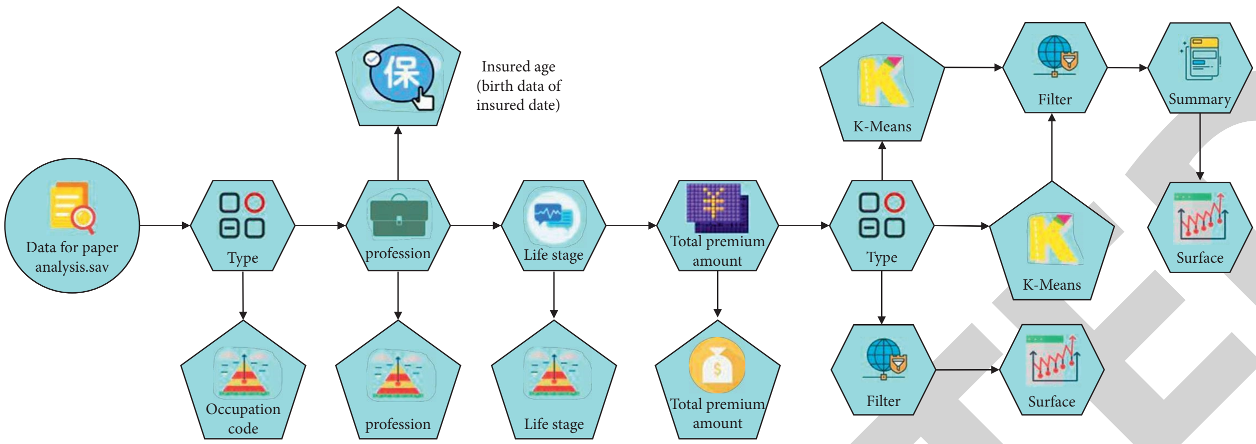

FIGURE 1: Overall mining process.

companies, the competitive landscape that companies are constantly entering. At the same time, since China's accession to the WTO, China's insurance market has been fully opened from the previous closed form to the current full opening. Foreign insurance companies have entered the Chinese insurance market on a large scale, making the balanced market pattern continue to differentiate. Therefore, insurance companies are facing a new and fiercely competitive market environment in which insurance profits are declining and forcing insurance companies to consider and develop new profit models and management methods to enhance their competitiveness. With the attention of various insurance companies, the agricultural insurance market will face increasingly fierce competition, and agricultural insurance companies will pay more and more attention to establishing a complete competitive intelligence system (CIS). As shown in Figure 1, this paper introduces two important information processing technologies: data mining and process mining, into the construction process of agricultural insurance competitive intelligence system. According to the characteristics of agricultural insurance itself, an integrated competitive intelligence system model is established and analyzed in detail. The specific working process of agricultural insurance comprehensive competitive intelligence system is also analyzed [2].

On the basis of this research, this paper proposes a research and implementation of agricultural insurance correlation analysis based on the data mining algorithm. On the basis of studying the relationship between data mining, process mining, and competitive intelligence, the comparative method based on the AHP method is used to scientifically evaluate the poverty alleviation efficiency evaluation research of agricultural insurance subsidy policy at this stage. Combined with the demand characteristics of agricultural insurance companies' competitive intelligence, the integrated data are constructed. The agricultural insurance competitive intelligence process model of mining and process mining has established an integrated competitive intelligence system model for agricultural insurance companies.

2. Literature Review

Based on association rules and neural network technology in data mining, Vyas et al. carried out the mining of insurance business data and found out the use of traditional statistical theories, undiscoverable potential operating rules, and business forms of the insurance industry [3]. Xu et al. proposed to talk about data mining technology and used to help life insurance companies improve their business management; They used the marketing data of relevant life insurance products of Swiss life insurance companies to conduct an empirical study, and concluded that OLAP technology can effectively assist the operation and management of life insurance companies [4]. Ahmed and Serra used neural network technology in data mining technology and combined relevant data to predict the price sensitivity of life insurance company customers, reprice insurance products, and help life insurance companies prevent customer risks [5]. Leidig and Teeuw think that the insurance industry has accumulated a large number of customers, products, and competing companies in the development process and socioeconomic environment data. It is necessary to integrate data mining theory and methods, apply in research in the insurance industry, And further analyze the homogeneity of data and the impact of different processing methods of information extraction on the application environment of data mining [6]. Zhang et al. elaborated on three types of models in data mining: decision trees, multiple adaptive, and hybrid models. They are the feasibility and ideas of insurance risk modeling [7]. Deng et al. use data warehouse and data mining technology to analyze the data of Hong Kong insurance agents and discuss how to choose an insurance agent [8]. Wei and Dan use the data mining tool Mineset from the insurance business data to find out the association rules that guide insurance companies and help insurance companies and control investment risks [9]. Khiareddine et al. through comparative research ideas, explain data mining methods, statistical analysis, data warehouse, and other fields, respectively; discuss their pros and cons and come to the data mining technology; and analyze the cost and income of the customer throughout the life cycle. It is possible to mine high loyal customers and predict the conclusion of the product offering time [10]. Pelka et al. used data mining technology to analyze the customer experience survey data of automobile insurance telemarketing, in order to explore the part of automobile insurance telemarketing and insurance process that customers most want to optimize and improve, so as to help insurance companies improve the success rate of automobile insurance telemarketing with low investment cost [11]. According to Fang et al., based on data mining technology, the analysis summarizes the current situation of fraud prevention in the life insurance industry and the shortcomings of the antifraud system currently used by domestic and foreign life insurance companies, and using data provided by a central branch of China Pacific Life Insurance Co., Ltd., designed the various modules of the enterprise antifraud system. The modules include system business modules, system logic modules, and system physical model modules, and the author also combines the characteristics of each business model, the SPRINT algorithm in data mining. It has been successfully applied to the fraud prevention system of life insurance companies [12]. Kirubakaran and Ilangkumaran, using cluster analysis method to group Pacific Insurance Company's customer base, determined the strong business of different customer groups, used it in practice, and improved the sales success rate of old customers [13]. Wang et al. introduced the ant colony optimization algorithm into data mining and used six public data sets to compare the classification effect of the ant colony algorithm and the CN2 classification algorithm. In terms of association rule discovery, the resulting association rules are simpler than those obtained by the CN2 classification algorithm [14]. Jiang proposed an improved K-means classification algorithm, K-modes, which can handle categorical data. The main idea is to replace the mean with the pattern and to continuously update the pattern type in the clustering process based on the frequency to reduce the loss of clustering information. And in a database of millions of health insurance records, based on 34 categorical variables for data mining, the results show that the K-modes algorithm has good scalability in both categorical and numerical variable clustering [15].

3. Analysis of Efficiency Evaluation Software System Based on AHP Method

The author tried to build a software system for evaluating the efficiency of poverty alleviation in agricultural insurance operations, collect effective data information, perform empirical analysis using analytic hierarchy process (AHP), and draw research conclusions.

3.1. Sources of Sample Data Indicators. In order to better evaluate the operational poverty alleviation efficiency implemented by the subsidy policy, various indicators of the poverty alleviation efficiency evaluation system of policy-based agricultural insurance operations, regarding the efficiency of agricultural insurance operations as the target level, based on the three levels of macro, meso, and micro, designed the first-level indicators of the poverty alleviation efficiency evaluation system of China's agricultural insurance operations. Then, decompose layer by layer according to the main content and logical relationship of each first-level indicator and decompose the 3 first-level indicators into 13 second-level indicators. Thus, a relatively complete evaluation system of poverty alleviation efficiency of agricultural insurance operations is obtained [14].

3.2. Evaluation of the Software Process. Setting up an evaluation set based on agricultural insurance efficiency evaluation indicators refers to a language description of various levels of indicators. It is an evaluation collection of each evaluation index. $U = \{u_1, u_2, \ldots, u_n\}$, in this model, if $n = 5$, the evaluation set is as follows:

$$U = \{u_1, u_2, \ldots, u_5\} = \{\text{excellent, good, medium, poor}\}. \quad (1)$$

Weight set refers to the weight coefficient of the target layer occupied by each indicator. Among $\sum_{i=1}^{m} b_i = 1$, the weight set of the first-level indicators is $B = (b_1, b_2, \ldots, b_m)$, $m = 4$, and $\sum_{j=1}^{k} b_i = 1$, the weight set of the secondary indicators is $B = (b_{i1}, b_{i2}, \ldots, b_{ik})$, $k = 4, 5$.

The author uses analytic hierarchy process (AHP), that is, the subjective assignment method of weight set, and the weight is obtained by the expert based on subjective judgment of experience. The weight of each indicator is determined [15].

On the basis of establishing a hierarchy, for each layer of structure and the elements of the next layer under the structure constitute subareas, for each element in this subregion, the Saaty1–9 scale method is adopted to construct the judgment matrix. That is, suppose that the element $B_1, B_2, \ldots, B_n$ in the B level is related to the upper element A, then it can be represented by the following judgment matrix formula:

$$S = \left(B_{ij}\right)_{n\times n} = \begin{bmatrix} b_{11} & b_{12} & \ldots & b_{1n} \\ b_{21} & b_{22} & \ldots & b_{2n} \\ \ldots & \ldots & \ldots & \ldots \\ b_{n1} & b_{n2} & \ldots & b_{nn} \end{bmatrix}. \quad (2)$$

The value of b_{ij} is determined by the Saaty1–9 scaling method.

Use MATLAB software to find the maximum eigenvalue $\lambda_{\max}$ and standard eigenvector ω of the judgment matrix; among them, the value of ω element is the index of this level, the relative importance ranking weight value of a factor relative to the superior index is shown in the following formula:

$$\mathrm{CI} = \frac{(\lambda_{\max} - n)}{(n-1)}. \quad (3)$$

According to the order, n of the judgment matrix can find the corresponding consistency index RI. Figure 2 shows the value of Saaty's RI for 1–9 [16].

The formula for calculating the consistency ratio is $\mathrm{CR} = \mathrm{CI}/\mathrm{RI}$. When $\mathrm{CR} < 0.1$, the judgment matrix has good

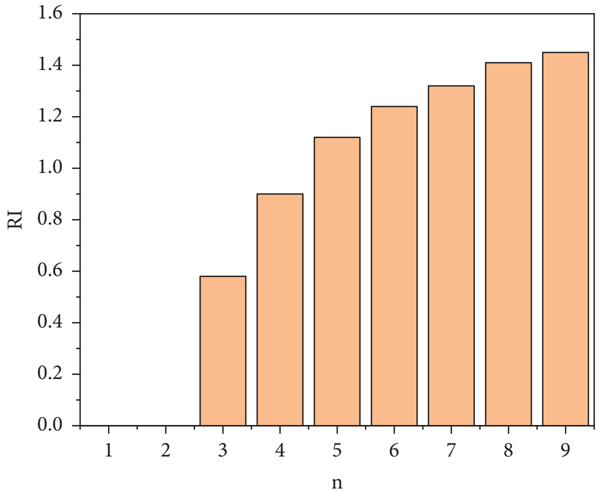

Figure 2: Consistency index RI.

consistency, reasonable judgment. When CR = 0.1, the judgment matrix has better consistency and the judgment is more reasonable. When CR >0.1, the judgment matrix does not conform to the principle of consistency, and it needs to be revised again until the consistency check is met. The standard vector ω corresponds to $\lambda_{\max}$ after meeting the consistency check, and it is the weight value of this level index to the upper level index. As a result, the software can calculate indicators at all levels in turn, relative to the absolute weight of the target layer [17].

Comprehensive scoring of software evaluation indicators and evaluation of China Agricultural Insurance's operational poverty alleviation efficiency can be achieved by scoring 13 secondary indicators. The author uses expert scoring and self-evaluation scoring to improve the accuracy and effectiveness of its scoring and, using the average weight method, both account for 1/2 each. After the weighted average, the scores of each index of the evaluation object are obtained, respectively, denoted as p_i, the score value of each indicator is multiplied by the corresponding weight U_i, that is, the evaluation result R of the poverty alleviation efficiency of agricultural insurance operations can be obtained.

Excellent: the poverty alleviation efficiency of agricultural insurance operations is very high, and there is no need for improvement; good: the poverty alleviation efficiency of agricultural insurance operations is relatively high, but there are still problems, the problem has been found, measures have been found, and the desired effect has been achieved; moderate: the poverty alleviation efficiency of agricultural insurance operations is not high, the problem has been found, and measures have been formulated but the desired effect has not been achieved; poor: agricultural insurance operations are inefficient in poverty alleviation, the problem has been found, but no specific improvement measures have been formulated; poor: the poverty alleviation efficiency of agricultural insurance operations is low, and the problem has not been found yet [18].

The evaluation model of the poverty alleviation efficiency of agricultural insurance operations is shown in the following formula:

$$R = \sum_{i=1}^{n} \left(P_i \times U_i\right), \tag{4}$$

where R is the evaluation value of the poverty alleviation efficiency of China's agricultural insurance operation; p_i is the scoring value of each evaluation index; and U_i is the weight of each evaluation index.

3.3. Agricultural Insurance Competitive Intelligence Collection Module. The main functions of the competitive intelligence collection module are to collect, sort, and classify the relevant information of agricultural insurance companies, and the classified information is then stored in the intelligence information database. The information processed by this module is first divided into two main sources, that is, the internal information system of the enterprise and the outside of the enterprise. At the same time, the information, it processes can also be divided into two types: data information and process information. The data information includes the operation of agricultural insurance companies; the decisive catastrophe loss data, compensation data; expense data for policy acquisition; indirect claims and policy maintenance, as well as the regulatory fee rate, market fee rate, and sales fee commission level data on market information, respectively, from regulatory information, market research, and peer analysis reports; external information and core business systems of enterprises, such as agricultural production, geography and meteorology; reinsurance business system; and financial management system and other internal enterprise information systems. Process information includes work lists and process logs about sales management and underwriting claims process, and these process information, mainly from internal information systems such as customer management, administrative management systems, and procurement management systems within the enterprise. The above data information and process information, data file converters, and process encoders that will navigate through categories, for conversion and collection, are imported into the intelligence information database [19].

3.4. Agricultural Insurance Competitive Intelligence Storage Module. Intelligence knowledge storage module, mainly composed of intelligence information database and competitive intelligence knowledge base, is used to store the intelligence information obtained by the intelligence collection module and the competitive intelligence knowledge obtained by the intelligence analysis and production module. Different from traditional competitive intelligence systems, information in the intelligence information base and intelligence knowledge base, according to their characteristics, is divided into two categories: data and process. The data information in the intelligence information database, obtained by the intelligence collection module, will be passed to the data mining submodule of the intelligence analysis production module, through traditional statistical mining and cutting-edge intelligent mining technology, and obtain static data intelligence with application value. The process information in the intelligence information database, obtained by the intelligence collection module, will be passed to the process mining submodule of the intelligence analysis production module. Through semantic integration and mining engine processing, we obtain dynamic process intelligence with application value. Analyze the static data intelligence and dynamic process intelligence, obtained by the production module, which will be imported into the intelligence knowledge base for storage [20].

4. Experimental Results and Analysis

The following solves the AHP model for evaluating the poverty alleviation efficiency of agricultural insurance operations in a certain province and gets the weights of indicators at all levels. The model calculation is as follows.

(1) Matrix judgment: find the weight value of each primary and secondary index relative to the target layer

Set first-level indicators $A_i = \{A_1, A_2, A_3\}$ ={farmers, insurance companies, and government departments}, construct a first-level index judgment matrix, and solve to get the weight value of each level index relative to the target layer in the following formula:

$$S = \left(A_{ij}\right)_{3\times 3} = \begin{bmatrix} 0 & \frac{1}{2} & \frac{1}{3} \\ 0 & 0 & \frac{1}{2} \\ 0 & 0 & 0 \end{bmatrix}. \quad (5)$$

The calculated maximum eigenvalue $\lambda_{\max} = 3.01032$, corresponding to the standard vector $\omega = (0.1638, 0.2972, 0.5390)$. Calculate the consistency index $CI = \lambda_{\max} - 3/3 - 1 = 0.00516$.

$CI = \lambda_{\max} - 3/3 - 1 = 0.00516$ shows that the matrix has good consistency and reasonable judgment. Therefore, the first-level weights (u) of China's agricultural insurance operation efficiency evaluation are as follows:

$$u_1 = 0.1638, u_2 = 0.2972, u_3 = 0.5390. \quad (6)$$

Judging from the results of the evaluation, in the evaluation index system for the efficiency of business poverty alleviation, the efficiency of poverty alleviation by government departments is the most critical, followed by the operating capacity of insurance companies and finally the insurance of farmers [4].

In the same way, the weight of each secondary index to the target layer can be solved. The weight $U_{ij} = u_i \times u_{ij}$ of each secondary index to the target layer is where $i = \{1, 2, 3\}$ and $j = \{1, 2\}/\{1, 2, 3, 4\}/\{1, 2, 3, 4, 5\}$. At the microfarmer level, calculate matrix $A_1 = (B_{ij})_{5\times 5}$, the largest eigenvalue $\lambda_{\max} = 5.4376$, corresponding to the standard vector $\omega = 0.071, 0.132, 0.52, 0.217, 0.06$, and then calculate consistency index $CI = 0.1094$ and $CR = 0.0977$ and $CR < 0.1$, with good consistency and reasonable judgment. Therefore, the weights of the secondary evaluation indicators are $u_{11} = 0.071, u_{12} = 0.132, u_{13} = 0.52, u_{14} = 0.217$, and $u_{15} = 0.06$. At the level of Zhongguan insurance company, calculate matrix $A_2 = (B_{ij})_{4\times 4}$, the largest eigenvalue $\lambda_{\max} = 4.223$, corresponding to the standard vector $\omega = (0.248, 0.123, 0.569, 0.061)$ and then calculate the consistency index $CI = 0.0742$, $CR = 0.0824$, and $CR < 0.1$, with good consistency, the judgment is reasonable [13, 21]. Therefore, the weights of the secondary evaluation indicators are $u_{21} = 0.248, u_{22} = 0.123, u_{23} = 0.569$, and $u_{24} = 0.061$.

According to the above calculation principle, it can also be calculated that the weights of the secondary indicators of macro government departments are $u_{31} = 0.833$ and $u_{32} = 0.167$.

In the process of scoring 11 indicators, two scoring methods are used comprehensively, the scoring subject will quantify each evaluation object according to the scoring standard and obtain their respective scores. After weighted average, the evaluation score p_i is obtained.

On the basis of calculating the weights (U_i) and scoring results (P_i) of indicators at all levels, multiply the score of each indicator with its corresponding weight, that is, the evaluation result (R) of the poverty alleviation efficiency of China's agricultural insurance operation is obtained, and the calculation is as follows:

$$R = \sum_{i=1}^{n} \left(P_i \times U_i\right). \quad (7)$$

The reference standard for the evaluation result R is $0 < R < 2.9$, indicating poor poverty alleviation efficiency, need to find out where the problem lies and make effective adjustments and improvements; $2.9 < R < 3.5$, indicating that the efficiency of poverty alleviation is poor, and the problems found need to be addressed and develop practical measures to improve; $3.5 < R < 4.0$, indicating that the poverty alleviation efficiency is moderate, and the rectification measures need to be revised and make the improvement of the problems to achieve the desired effect; $4.0 < R < 4.5$, indicating that the poverty alleviation efficiency is good, due to effective rectification and improvement of the problem, and the expected effect has been achieved; $4.5 < R < 5.0$, indicating that the efficiency of poverty alleviation is excellent and no improvement is needed [21]. In order to be able to visually see the changing trend of the data over the years and in order to facilitate analysis and research, we have reflected the above data in the icon, and the details are shown in Figures 3–6 and 7.

It is not difficult to see from Figure 3 that, from 2015 to 2020, agricultural insurance premium income in a certain province shows a steady increase and a significant growth rate from 2.31778 billion yuan in 2015 to 4.63987 billion yuan in 2017, almost doubled. Compared with the premium

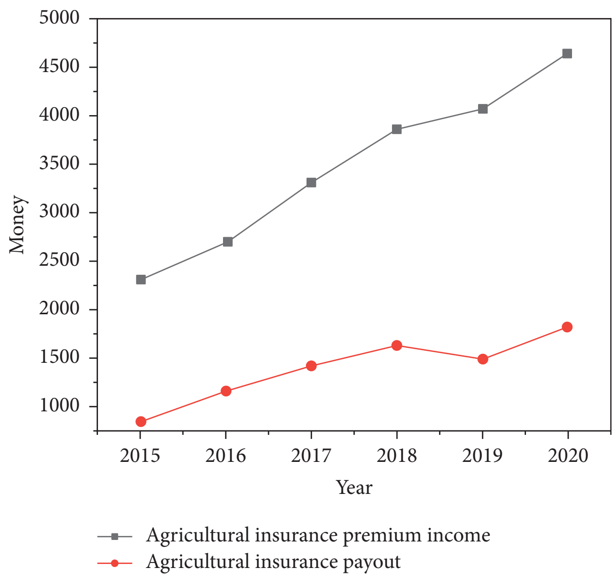

FIGURE 3: 2015–2020 agricultural insurance premium income and compensation expenditure in a certain province.

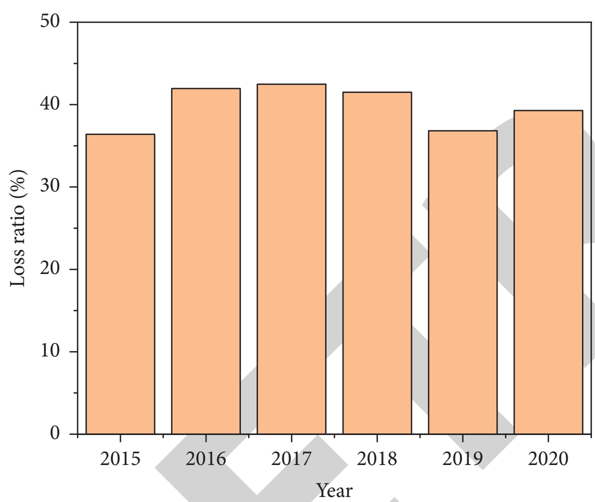

FIGURE 4: The average annual loss rate of agricultural insurance in a certain province from 2015 to 2020.

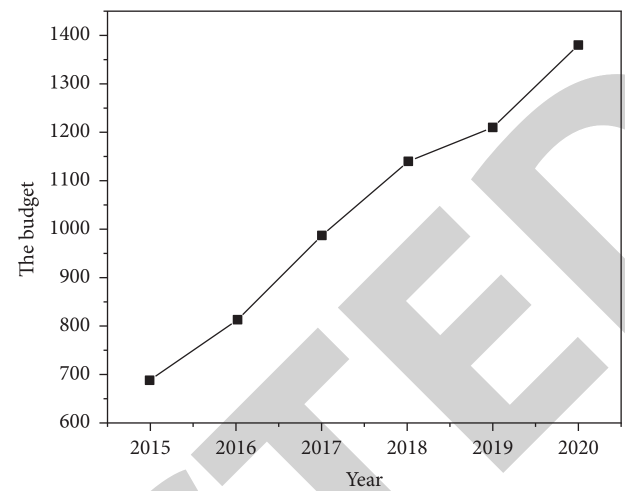

FIGURE 5: A province's agricultural insurance management cost budget from 2015–2020.

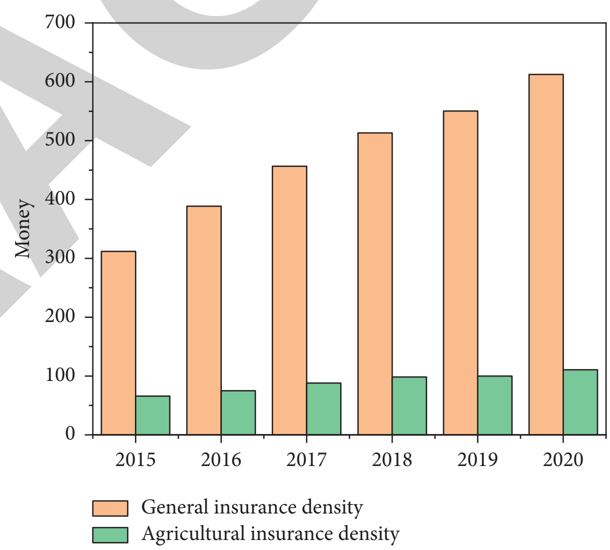

FIGURE 6: The density of property and agricultural insurance in a province from 2015 to 2020.

income, although the compensation expenditure has also increased correspondingly, but relatively speaking, the increase rate is not so obvious. In 2019, there is even a downward trend compared to 2018 [22].

As can be seen from Figure 4, from 2015 to 2020, the proportion of agricultural insurance premiums in a certain province in property insurance shows an upward trend; although in 2019 it has decreased slightly, but it does not affect the overall trend much, and this country's high and continuous emphasis on agricultural insurance for poverty alleviation has a lot to do with [23].

Because of the agricultural insurance management costs here, it is roughly estimated at 30% of the premium income, so the trend of change is the same as the trend of premium income.

As can be seen from Figure 7, between 2015 and 2020, although the density of agricultural insurance in a certain province follows the density of property insurance, showing an upward trend; however, the increase in agricultural insurance density is obviously not as fast as property insurance. In recent years, the depth of agricultural insurance has changed with the depth of property insurance, it is almost the same direction and the same speed. However, even if it is showing an increasing trend and it is also among the fast-growing ranks in various provinces and cities, it is still far from the average level in developed countries.

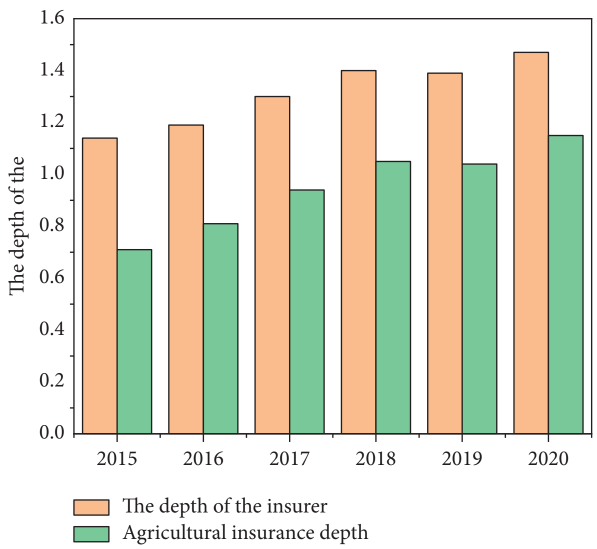

Figure 7: The depth of property and agricultural insurance in a province from 2015 to 2020.

5. Conclusion

The author, based on the research of data mining, process mining, and competitive intelligence theory, combines the demand characteristics of competitive intelligence of agricultural insurance companies and demonstrates the important significance of integrated data mining and process mining in the competitive intelligence work of agricultural insurance companies. The author refined and upgraded the general competitive intelligence process, constructed an agricultural insurance competitive intelligence process model integrating data mining and process mining, and analyzed its four main processes. Use the comparative method based on the AHP method to scientifically evaluate this stage, research on the evaluation of poverty alleviation efficiency of agricultural insurance subsidy policy, and put forward the agricultural insurance subsidy services in our province, the optimization mechanism, and guarantee measures for precise poverty alleviation.

Data Availability

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

Conflicts of Interest

The author declares that there are no conflicts of interest.

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