Risk Analysis of Enterprise Management Accounting Based on Big Data Association Rule Algorithm

Zhenkun Wang¹, Makai Qiong¹ and Hanjie Wang²

¹ School of Accounting, Nanjing University of Finance & Economics, Nanjing, Jiangsu, China
² Faculty of Info and Media Studies, Western University, 230 Sarnia Road London, Ontario, Canada
Email: wanghanjie0218@gmail.com

Abstract. With the popularization of the development and applications of information technology, enterprise's management in making decisions is paying more attention to “data driven” and depend on the objective data rather than subjective judgement, in addition to the basic financial data, enterprises in daily operation will produce a very large number of data, despite big data itself is a special kind of enterprise assets, but in order to get valuable information from these data, we must filter out the useless data based on the analysis method of big data, mine and sort out the comparable information, and provide reference for decision makers. The combination of big data and management accounting is the inevitable development trend in future, this article adopted the method Empirical Analysis to establish enterprise management accounting risk analysis model and simulated enterprise using big data analysis method, determined ten key financial indicators the enterprise needed to pay attention to in enterprise risk control, to show the application of big data analysis method in the process of enterprise management accounting, and looked forward to the future of interdisciplinary integration of big data and management accounting.

1. Introduction
In recent years, Internet technology began to show a high-speed development trend. With the change of science and technology and consumer behavior, modern enterprises are in a more complex business environment. The use of the Internet makes the daily operation of enterprises more intelligent, and at the same time, it also begins to produce a large number of data. Huge competition and challenges are presented in front of the decision-making management of enterprises. In this period, management accounting has also entered the research scope of scholars in China, and gained the attention of enterprise managers. The information obtained only by financial accounting is not enough to support the survival of enterprises in the complex environment. Management accounting and financial accounting begin to run in parallel in enterprise management, and continue to surpass the position of financial accounting in enterprises. The market value behind big data is a kind of potential capital for enterprises. The big data analysis method is to mine the hidden value of the data so that the internal personnel of the enterprise can carry out comprehensive management, business management, investment management and budget management strategies. From the perspective of cost management and performance management, the value of data is used to provide useful information for management's decision-making by identifying the logical patterns and potential trends of data. The important role in the application of management accounting, as well as the extensive analysis of enterprise production...
data, enables managers to grasp the market dynamics, respond quickly, and help enterprises to provide faster and more targeted services to consumers. Develop more accurate and effective marketing strategies and support decision-making. Help enterprises to save costs, prevent risks, improve profits, improve the social value of enterprises, and promote economic development. In this paper, through the construction of big data mining model, it is applied to enterprise management accounting, analyzes the high-risk indicators that may appear in enterprise management accounting, simulates the application of big data technology to analyze and make corresponding decisions, and provides information to enterprise managers, which has certain meaning for managers who may use big data analysis method to make daily business decisions Righteousness.

2. Literature Review on Management Accounting and Big Data
Zhang [1] pointed out the impact of artificial intelligence on the actual accounting work in the current era of big data, what enterprise management accounting faced and put forward effective strategies to deal with the challenges, and stressed the importance of professional talents. Wang [2] discusses the impact of data mining technology on management accounting in the era of big data. Combined with relevant practical experience, this paper explains the application of data mining technology in management accounting from value chain analysis and activity-based cost. Zhou [3] discusses the shortcomings of training management accounting professionals in China’s colleges and Universities under the current data-driven era, and puts forward suggestions for the training and research of high-quality talents in management accounting. Xu [4] believes that in higher education institutions, the application of big data technology can expand the application of accounting management, promote the innovation of management accounting, promote the innovation of management accounting, so as to promote the development and reform of universities and the improvement of service ability. Lu [5] pointed out that in order to realize the transformation and development of financial accounting to management accounting, enterprises should be based on the background of the times, actively change accounting concepts, and establish a sound financial management system. Li [6] pointed out that in the era of big data, there are challenges in the management industry, such as the underdeveloped information security system, the lack of data processing professionals, and the lack of internal hardware facilities, and proposed corresponding measures for the above three challenges. Fu [7] pointed out that the transformation from financial accounting to management accounting is an urgent thing. In view of the problems existing in the transformation in the function of financial organization, the application of management accounting and the quality of financial personnel, he proposed five transformation paths. Bai [8] expounds the necessity of the integration of enterprise performance management and management accounting, points out that there are some problems in the application of management accounting in enterprise performance management, such as the lack of practical guidance, the imperfection of performance evaluation system and the imperfection of data management mechanism, and the corresponding countermeasures. Akhtar [9] analyzed the relationship between the use of big data Mastery (BDS) team skills, big data-driven (BDD) actions and business performance. Through structural equation modeling, the BDS team emphasized the insight of transforming traditional business operations into modern data-driven, so as to achieve BDD actions to improve business performance. Dubey [10] discussed the role of external institutional pressure of manufacturing industry in the adjustment of big data culture, the role of resource selection and its use in the construction of big data, and how this ability affects cost, improves supply chain and operation performance.

3. Big Data Algorithms Applied to the Empirical Analysis of Enterprise Management Accounting

3.1. Empirical Research Design
The main object of this empirical analysis is st concept enterprises. As much as possible, select indicators that reflect the financial status of enterprises in all aspects, including solvency, operating ability, profitability, growth ability and stock investment analysis indicators. First of all, a simple correlation analysis is carried out for the selected enterprise indicator data samples, and the financial indicators with
high correlation degree are eliminated, so as to reduce the calculation amount of later test. Secondly, the risk analysis model of management accounting is constructed to visualize the logic of data mining, transform the original financial data into information that can be used for risk analysis of enterprise management accounting, and judge the most representative financial indicators when the risk of management accounting is exposed. Then, the financial indicators of the sample enterprises are transformed into discrete risk indicators corresponding to the risk classification standards basically recognized in the industry, and the association rule algorithm is used to find the relationship between the financial indicator data under the association rules and the enterprise risk. According to the distribution of the financial indicators exceeding the standards when the risk occurs, the indicators that appear frequently when the enterprise risks are obtained as the enterprise Focus on estimating financial risk. Finally, we use the kruskar Wallis test to judge whether there is a significant difference between the selected initial indicators, that is, whether it is an indicator with high probability when the enterprise has financial risk, and compare the conclusions of association rule algorithm to test the correctness of the empirical results.

3.2. Selection Principles of Financial Indicators of Listed Companies
In the empirical analysis of financial risk, there is no uniform standard for the selection of financial indicators. In order to reflect the financial situation of the company more comprehensively and objectively, this paper follows the following principles in the selection of financial indicators:

• The principle of comprehensiveness. Many factors can affect the company's financial situation. To fully reflect these factors, we can select as many indicators as possible to reflect the company's financial situation and development level in an all-round way when selecting indicators according to the determined five aspects, namely, solvency, operating ability, profitability, growth ability and investment analysis.

• Principle of availability. The financial information of listed companies will be disclosed to the public through statements. Therefore, when selecting indicators, it is reasonable to avoid spending a lot of time on statistical analysis of indicators, and select relevant financial indicators through the information disclosed by the company, so as to ensure that the selected indicator data source is available and true.

• Principle of relevance. When selecting financial indicators, try to ensure that the selected indicators can directly or indirectly reflect the financial situation of the company. We can refer to the research indicators of the existing literature, and take into account the representative indicators that appear more frequently in the past literature, so that the selected indicators have certain relevance and rationality.

• Testability principle. The financial indicators selected in the study are observable and quantifiable. Because the modeling and analysis of the company’s financial distress is to predict the probability of financial crisis in the future, the selected indicator data must also be used for prediction.

3.3. Primary Financial Indicators of Listed Companies
The research sample of this paper is the financial indicators of 140 st concept listed companies in 2019. These 140 companies are from different industries, in order to cover the possibility of different types of enterprises responding to financial indicators when financial risks occur. At present, most enterprises' management accounting will still focus on financial indicators, and the selection of financial indicators is often subjective. This paper uses association rule algorithm to analyze the correlation of financial indicators, selects as many financial indicators as possible, and then selects the most representative financial indicators.
4. Data Analysis

4.1 Correlation Analysis of Financial Indicators of Management Accounting

According to the selection principle mentioned above, this paper uses Dongfang wealth choice financial terminal software to summarize and summarize 16 financial indicators to reflect the information of the enterprise in the above five aspects. These 16 indicators are current ratio a, asset liability ratio B, property right ratio C, shareholder equity ratio D, total asset turnover ratio e, fixed asset turnover ratio F, gross sales rate G, net sales Interest rate h, net asset interest rate I, weighted return on net assets J, sales growth rate k, net profit growth rate L, earnings per share m, net assets per share n, undistributed profits per share o, and accumulation fund per share P. Because there is a certain correlation between these financial indicators, in order to save the cost of data conversion, we first analyze the correlation of 140 listed companies.

According to the correlation results in Table 1, delete the indicators with high correlation in 16 financial indicators, and keep 13 financial indicators, namely current ratio, asset liability ratio, property right ratio, total asset turnover ratio, fixed asset turnover ratio, sales gross profit rate, sales net interest rate, weighted net asset return rate, sales growth rate, net profit growth rate, earnings per share, per share Net assets, undistributed profit per share. These indicators will be used for subsequent risk matching analysis.

Table 1. Correlation coefficient between financial indicators.

|   | a   | b   | c   | d   | e   | f   | g   | h   | i   | j   | k   | l   | m   | n   | o   | p   |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| a | 1   | -0.156 | -0.031 | 0.156 | 0.021 | 0.119 | 0.047 | 0.120 | 0.139 | 0.041 | -0.039 | 0.068 | 0.109 | 0.144 | 0.040 | 0.144 |
| b | -0.156 | 1   | -0.052 | 1.000 | **-0.077** | **-0.039** | **-0.021** | **-0.129** | **-0.604** | **-0.027** | **-0.006** | **0.028** | **-0.067** | **-0.321** | **-0.259** | **-0.071** |
| c | -0.031 | -0.052 | 1   | 0.052 | 0.008 | -0.012 | -0.035 | -0.038 | 0.104 | 0.178 | **-0.112** | 0.027 | 0.115 | 0.066 | 0.094 | -0.044 |
| d | 0.156 | -1.000 | 0.052 | 1   | 0.077 | 0.039 | 0.021 | 0.129 | **0.604** | 0.027 | 0.006 | **-0.028** | **0.067** | **0.321** | **0.259** | 0.071 |
| e | 0.021 | -0.077 | 0.008 | 0.077 | 1   | **0.246** | **-0.070** | **0.194** | 0.132 | -0.026 | -0.031 | **0.074** | 0.123 | -0.036 | -0.072 | 0.021 |
| f | 0.119 | -0.039 | -0.012 | 0.039 | **0.246** | 1   | **-0.048** | **0.037** | 0.053 | 0.016 | 0.006 | 0.017 | 0.037 | -0.004 | -0.124 | **0.183** |
| g | 0.047 | -0.021 | -0.035 | 0.021 | **-0.070** | **-0.048** | 1   | **0.359** | **0.081** | -0.030 | **0.089** | -0.003 | 0.163 | -0.070 | -0.014 | -0.090 |
| h | 0.120 | -0.129 | 0.038 | 0.129 | **0.194** | **0.037** | **0.359** | 1   | **0.408** | 0.005 | **0.003** | 0.005 | 0.111 | 0.130 | 0.056 | 0.077 |
| i | 0.139 | -0.604 | 0.104 | **0.604** | 0.132 | 0.053 | 0.081 | **0.408** | 1   | 0.102 | -0.028 | 0.065 | 0.155 | **0.245** | **0.201** | 0.063 |
| j | 0.041 | -0.027 | **0.178** | 0.027 | **-0.026** | 0.016 | **-0.030** | 0.005 | 0.102 | 1   | 0.001 | **-0.013** | 0.095 | 0.095 | 0.072 | 0.034 |
| k | -0.039 | -0.006 | -0.112 | 0.006 | **-0.031** | 0.006 | 0.089 | -0.003 | -0.028 | 0.001 | 1   | 0.022 | **-0.027** | **-0.050** | -0.029 | -0.040 |
| l | 0.068 | 0.028 | 0.027 | **-0.028** | 0.074 | 0.017 | **-0.003** | 0.005 | 0.065 | **-0.013** | **0.022** | 1   | **2.26** | 0.022 | **-0.090** | 0.128 |
| m | 0.109 | -0.067 | 0.115 | 0.067 | 0.123 | 0.037 | 0.163 | 0.111 | 0.155 | 0.095 | **0.027** | **0.226** | 1   | **3.14** | **1.77** | -0.017 |
| n | 0.144 | -0.321 | **0.066** | **0.321** | **-0.036** | **-0.004** | -0.070 | 0.130 | **0.245** | **0.095** | **-0.050** | 0.022 | **3.141** | **1.764** | **0.764** | -0.295 |
| o | 0.040 | **-0.259** | 0.094 | **0.259** | **-0.072** | **-0.124** | -0.014 | 0.056 | **0.201** | 0.072 | **-0.029** | **-0.090** | **0.177** | **0.764** | 1   | **-3.54** |
| p | 0.144 | -0.071 | -0.044 | 0.071 | 0.021 | 0.183 | **-0.090** | 0.077 | 0.063 | 0.034 | **-0.040** | 0.128 | **-0.017** | **0.295** | -0.354 | 1   |

Note: "**"at 0.01 level (two-tailed), the correlation is significant; "at the 0.05 level (two-tailed), the correlation is significant.

4.2 Risk Analysis of Management Accounting Based on Association Rules

Over 13 financial indicators have been selected through correlation analysis. In order to analyze association rules, financial indicators should be transformed into discrete data. According to the general cognition of conventional financial analysis, financial indicators of sample companies should be transformed into risk levels. By comparing the association rule entries under different confidence levels and support thresholds, ten representative financial indicators are selected, that is, the indicators that appear frequently when the sample enterprise has risks, which can be the focus of the enterprise's financial risk prediction.

4.3 K-W Test of Empirical Analysis Results

Kruskal Wallis test, commonly referred to as “K-W test”, is a nonparametric test commonly used to test more than two groups of data. It is mainly to test whether these samples obey the same probability distribution. Because most of the financial data do not obey normal distribution, it is suitable for
nonparametric test. Therefore, this paper uses K-W test to test whether there is significant difference between the selected initial value indicators, and can judge whether the above ten financial indicators are indicators with high probability when the enterprise has financial risk. Our test results show that there are no significant differences in the main indicators of current ratio, property right ratio, total asset turnover rate, net sales interest rate, growth rate of net profit, earnings per share, net assets per share, undistributed profit per share, which shows that the high frequency of occurrence in companies with high risk of enterprise management accounting needs to be focused on, which is basically consistent with the conclusion drawn by association rule algorithm Close.

5. Summary and Outlook
In the above empirical analysis process, through the construction of enterprise management accounting risk analysis model, simulation big data analysis method is used to extract effective information in the process of enterprise management, and systematically show the logic between the data for users to make relevant decisions, and pay attention to the indicators with higher risk in advance to prevent the overall collapse of financial situation. It can be predicted that in the future, the method of big data prediction and analysis will be widely applied to the key means for enterprises to gain competitive advantage and strategic objectives. The necessary analysis tools can be used to determine the causes of some events, such as typical consumer behaviors such as “beer and diapers”, which are used to predict the possible future situation. The core competitiveness of enterprises will also be Get a significant improvement.

The continuous improvement of technology still needs to be implemented through interdisciplinary data fusion analysis and application. The lack of interdisciplinary and interdisciplinary research on big data technology and application is needed for the lack of interdisciplinary and interdisciplinary research on big data technology and application, especially the interdisciplinary and interdisciplinary research on hot technology fields such as Internet of things and cloud computing.

In addition, enterprises need to pay attention to information security. The information that people write in social networking sites will encounter the risk of leakage, so maintaining business secrets and preventing information theft are all the content that enterprises need to pay attention to.

Acknowledgments
Paper supported by Jiangsu Social Science Fund (grant no.20WTB004), Late-stage projects funded by the Social Science Foundation (grant no.16HQ015 and 17HQ021), and the second batch of cooperative education projects between industry and University by the Ministry of Education of China (grant no.201702022005 and 201802100011).

References
[1] Zhang H 2019 explores the opportunities and challenges faced by management accounting in the era of big data Modern Marketing 12 249-250.
[2] Wang J 2020 Discussion on the application of data mining in management accounting in the era of big data Modern Business Industry 41 97-98.
[3] Zhou X Y 2020 Research on management accounting personnel training innovation in the data-driven era Modern Marketing 21 4.
[4] Xu J Y 2020 Management accounting system innovation research based on big data technology Modern Marketing 21 157-158.
[5] Lv L Y 2020 Financial accounting transformation to management accounting under the background of big data Modern Marketing 21 219-220.
[6] Li J 2019 Management accounting challenges and countermeasures in the era of big data Modern Business 33 180-181.
[7] Fu H Y 2019 Transformation path analysis of financial accounting to management accounting in the era of big data National Circulation Economy 28 164-165.
[8] Bai H X 2019 Application of management accounting in enterprise performance management in the era of big data China Accounting for Township Enterprises (10) 220-221.
[9] Akhtar P, Jędrzej G F, Mellahi K and Ullah S 2019 Big data-savvy teams’ skills, big data-driven actions and business performance Br. J. Manage. 30 (2) 252-271.

[10] Dubey R, Gunasekaran A, Childe S J, Blome C and Papadopoulos T 2019 Big data and predictive analytics and manufacturing performance: type of microcomputer theory, resource-based view and big data culture Br. J. Manage. 30 (2) 341-361.