Research on The Application of Big Data Technology in The Financial Industry

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Abstract: In recent years, with the continuous development of financial business, financial institutions have massive data, and the accumulation of data volume has grown explosively, prompting many financial institutions to start promoting big data strategies. With the deepening of the application of big data technology and the continuous improvement of data processing and analysis capabilities, financial institutions will usher in new development opportunities, and at the same time, this will also bring challenges to the financial supervision of big data applications. This paper starts from the specific application of big data in the financial industry and the specific problems faced by big data in the financial industry, and puts forward some regulatory suggestions in this regard, in order to promote the development and application of big data in the financial industry.

Keywords: Big data; Financial industry; Data application

1 Introduction

With the continuous iteration of various information technologies, information data has silently penetrated into people's lives, work and other aspects, and has inadvertently entered the era of big data. In the financial industry, the popularization and application of big data has made the pace of informatization faster and faster, real-time processing and data analysis capabilities have also been comprehensively improved, the speed of information acquisition in the financial market has been improved by leaps and bounds, and the accuracy, richness and timeliness of information have changed significantly. The transformation of traditional finance to technology finance is an undoubted trend, especially in the face of the service requirements of new models such as "focusing on consumption" and "zero contact", the embodiment of digitalization in the financial industry is particularly profound, the degree of integration between the financial industry and information technology is closer, and big data technology has been more widely valued and applied in the financial field. In this environment, it is particularly important to study the application of big data technology in the financial industry.

2 The concept of big data and big data finance

In May 2011, the McKinsey Research Institute in the United States in the report *The Next Frontier of Innovation, Competition and Productivity* for the first time comprehensively and clearly expounded the definition and connotation of big data, that is, "big data refers to data sets whose size exceeds the ability of conventional database tools to obtain, store, manage and

analyze". Viktor Mayer-Schnberger, a professor at the University of Oxford, pointed out in the 2012 "Big Data Era" that data analysis will evolve from the traditional mode of "random sampling", "accurate solution" and "emphasis on cause and effect" to a new model of "whole data", "approximate solution" and "only look at correlation without asking cause and effect" in the era of big data, which has triggered extensive thinking and discussion on big data methods in commercial applications. Bao Shuowang (2016) believes that big data is a collection of data that cannot be collected, analyzed, stored and processed with traditional IT technologies and tools in a limited time.

3　The application of big data in the financial field

The financial industry is a typical data-based industry, and the data generated daily is quite large and rich, such as customer information, card number, transaction amount, sales report, transaction flow, income and other data. To this end, the use of big data technology as a productivity driver to achieve business innovation in the financial industry has become an unstoppable trend.

3.1Credit risk management

Credit risk management mainly refers to the bank's risk management of the entire process of the borrower from the beginning of the loan application to the end of the loan repayment, the core of which is the risk management of the three links of pre-loan, loan and post-loan, through the identification of the borrower, credit review, fraud investigation, qualification inspection and collection management to minimize the probability of loan cost and loan risk. At present, bank credit risk management can not only obtain data through the bank's internal data warehouse with the help of big data technology, but also collect massive data from external information sources such as the Internet and third-party systems, including the basic information of individual customers, existing assets, historical credit records, various online and offline consumption behaviors, as well as the financial capital status, business model and situation, industry prospects, and business areas of corporate customers, getting rid of the single dependence of bank credit business on internal data. Then, after analyzing a large amount of data, an auxiliary credit evaluation model with high credibility of individuals or enterprises is constructed, and credit management is continuously strengthened, which effectively improves the auditability of pre-loan credit. In terms of post-loan, big data technology can be used to track the flow of funds of borrowers and borrowers, and determine the real use of funds of borrowers. The following figure 1 is the flow chart of enterprise big data credit management.
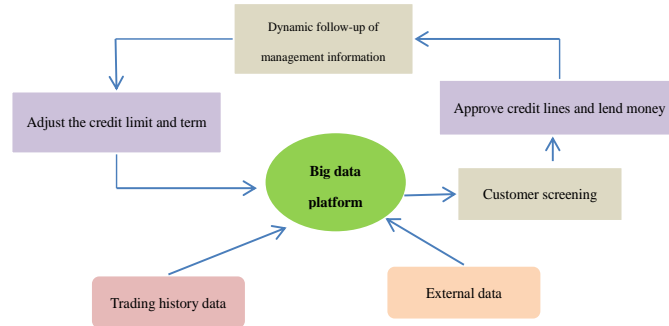
Figure 1 Enterprise big data credit management platform

3.2 Quantitative investing

In recent years, quantitative investment has become one of the hottest investment methods in the securities industry, and five of the world's top six asset management institutions have adopted quantitative investment methods for trading and management, and the scale of funds under management has exceeded 100 billion. Quantitative investment is based on the scientific investment ideas of rules and data and combined with a large amount of real data to build a mathematical investment model that conforms to its own trading logic strategy, and during the trading session, you can choose to use the computer to use the investment model for automatic trading, so that traders become more rational and efficient in the entire investment transaction process while effectively avoiding losses caused by irrational emotions, and a new type of investment method to diversify investment to improve the success rate of investment and obtain excess returns. The main data basis of quantitative investment lies in historical market data (including stocks, futures, options, funds, etc.) and related expansion data, financial data reports of enterprises and artificially generated data (such as account opening data in a certain period, investment consulting business purchase volume, hot search, etc.), which constitute a factor library of market fluctuations, involving related factors such as value, growth, sentiment, technology and so on. At present, machine learning algorithm is the most commonly used big data technology in quantitative investment, through the computer automatically try to establish a machine learning model between various factor combinations to predict the rise and fall, and evaluate the effectiveness, and finally build an excellent investment model, and then can predict the success rate of the relevant portfolio according to the model, and can also execute the trading plan according to the established stock selection strategy of the model to effectively improve the success rate and return of investment.

The financial field uses portfolio return variance to measure risk, uses mean variance analysis to determine the optimal portfolio, and proposes the principle of risk diversification. That is, the expected return E is used to measure the return of securities, the variance $\delta2$ of the return measures the investment risk, and the weighted average of the expected return of each asset represents the total return of the asset portfolio, then the mean variance model 1 is as follows:

$$\text{Min}\delta^2(r_p)=\Sigma\Sigma\omega\omega\text{cov}(r_ir_j),\ E(rp)=\Sigma\omega_ir_i \tag{1}$$

where r_p stands for portfolio return; r_i, r_j represents the expected rate of return of asset i and asset j; ω_i, ω_j represent the weight of asset i and asset j in the portfolio; $\delta^2(r_p)$ represents the variance of the portfolio return, that is the overall risk; $cov(r_i,r_j)$ represents the covariance between two assets. The goal of the model is to form a portfolio with the highest rate of return at a given risk level. Portfolio theory is of great significance for the development of quantitative investing. It quantitatively defines risk while introducing mathematical tools that can deal with a variety of complex problems in reality. The application of big data has allowed quantitative investment to flourish.

3.3 Financial leasing asset management

At present, big data technology is also cleverly applied to the asset management of financial leasing companies. By the end of 2020, the total value of the national financial leasing market has reached 7 trillion yuan, of which the financial leasing business is mainly carried out in the form of financial leasing or sale-leaseback asset leasing, mainly involving large liquid assets such as aircraft, ships, and subways, and post-lease asset management is a very important part of the entire financial leasing business. Due to the strong liquidity of leased assets, it is necessary to adopt an information-based method to manage them around the clock without interruption. Taking ship assets as an example, the leasing company mainly simulates and digitally manages the leased assets by combining big data, the Internet of Things and other technologies, which can not only track and obtain the position changes of the ship in real time, the performance of navigation tasks, and even the current speed and weight data, but also draw the life cycle view of the ship assets by collecting various relevant data such as the ship's departure from the factory to the start of use, the usage data of the historical chartering company, and the current usage. And realize the functions of asset data anomaly detection and early warning, so as to achieve the goal of intelligent, visualized and all-round management of assets.

3.4 Precision marketing

In the era of big data, any piece of consumer consumption data contains potential value. From the perspective of big data, consumer behavior data often have a certain precursor, which can objectively reflect consumers' purchasing tendencies and consumption concepts. Therefore, financial institutions have achieved accurate customer acquisition of investment and wealth management products or insurance products through the help of big data technology. Precision marketing in the financial industry through big data is actually quite mature in the industry. Financial institutions mainly through the creation of customer information database, through the way of multi-platform data collection, to obtain the basic information including users, various consumption information, historical financial product purchase information, etc., on the one hand, constantly add and update database information, the pursuit of data timeliness, on the other hand, but also pay attention to the exploration of data to achieve personalized marketing to customers. After selecting the important characteristic information of customers in the database, the amount institution constructs a feature model for accurate classification of customers with the help of big data algorithms, and divides customers into corresponding groups according to the results of model analysis, and each customer group has similar consumption tendencies, interest preferences and other characteristics. Therefore, corresponding financial or insurance product marketing plans and promotion strategies can be

formulated according to the relevant group characteristics to achieve the purpose of precision marketing. Financial institutions will regularly push tailor-made financial product information to customers through mobile phone SMS, APP, PC client and other means, which greatly improves the success rate of marketing. Table 1 and Table 2 are the popularity of Internet applications of small and medium-sized enterprises in China and the proportion of enterprise application media in marketing promotion activities, respectively, which can be seen that the role of big data in marketing is becoming more and more important.

Table1   Internet adoption in small and medium-sized enterprises

classify	apply	Usage penetration
Communication class	Send and receive emails	64.5%
	VOIP	18.9%
Information class	Learn about goods or services	54.5%
	Get information from government agencies	49.8%
	Post or instant messages	47.3%
Business services	Online customer service	41.4%
	Online banking	49.1%
Internal support class	Online recruitment	40.5%
	Online employee training	16.6%

Table2   The proportion of   enterprises applying media for marketing and promotion activities

media	proportion（%）
internet	23
newspaper	11.5
Outdoor advertising	10.8
magazine	8.3
TV	6.4
radio station	4.1

4   Big data in financial applications need to pay attention to

4.1 Relevant policies are not perfect enough, and potential application risks

In recent years, big data technology has developed rapidly, and the state has begun to attach importance to the application of big data in the financial industry and has introduced many policies. However, due to the imperfect current policies, there are risks in the innovative application of big data in the financial industry, and even the phenomenon of financial technology monopoly has occurred, which has a serious impact on the healthy and sustainable development of the financial industry. There are also problems with the open sharing and data integration of big data, such as the proliferation of noisy information and false information. At the same time, the application of big data in the financial industry also brings great risks to the

security protection of data resources and user information. And due to the lack of supervision in place, user information is lost and the legitimate rights and interests of customers are infringed frequently.

4.2 Financial data management is chaotic and the level of application is not high

With the rapid development of Internet financial business, the amount of financial data has increased rapidly, which has also made financial data management more difficult. It is mainly manifested in the following aspects. First, although there is a lot of data in many industries or departments, due to insufficient comprehensive management capabilities, the quality of data processing and extraction is not high, and data loss or data duplication occurs frequently. Second, the source of data is too single, most of the data sources are limited to this field, there are few data sources in other fields, and it is difficult to strengthen the collection of data in other fields. Third, the degree of data standardization needs to be strengthened, the ability of data collection and application is insufficient, and the degree of data standardization is not high.

4.3 It is difficult to improve the application technology of big data

The big data application system in the financial industry itself is complex, so when financial institutions use big data technology, they must invest a large cost to transform the application system, so as to ensure that the big data application system has high work efficiency. However, at present, most financial institutions do not pay enough attention to the improvement of the financial system, resulting in the efficiency of the system cannot be improved, which affects the development of enterprises.

4.4 Big data application systems lack security norms and standards

The data of financial institutions has high value and the connection between data is high, and if a data breach occurs, it may lead to the leakage of all data assets, resulting in more serious consequences. Therefore, big data application systems put forward higher requirements for the data security management of institutions. At present, big data security issues have received more and more attention, but the big data systems of many financial institutions still lack security norms and standards, which affects the healthy development of financial enterprises.

5   Regulatory advice on big data in financial applications

5.1 Further improve relevant regulations and policies on the application of big data

In the current chaotic situation of financial data management, it has become necessary to improve the relevant regulations and policies of big data technology in the financial industry. It is recommended to improve it from three aspects. First, it is necessary to deeply understand the development trend and current situation of the current financial market, and introduce reasonable big data development policy standards for the current situation to lay a reliable foundation for the application of big data technology in the financial industry. Second, it is necessary to indicate the current development goals of the financial industry in relevant policies, improve the guarantee system for the development of the financial market, establish a scientific development ability evaluation system, ensure that relevant policies do not deviate

from actual needs, and effectively promote the development of the financial industry. Third, to further standardize the application of industry standards in the big data industry in the financial field, national policies should have a certain restraining effect on the big data industry, and give full play to the actual functions of national policies to ensure the benign development of big data applications.

5.2 Establish a unified or compatible big data application platform for the financial industry

Global data production shows an explosive growth trend, coupled with the characteristics of large quantity, scattered sources, diverse formats, etc., through the establishment of a unified or compatible financial industry big data application platform, to open up the information data of banking and financial institutions such as industrial and agricultural China Construction Corporation, microfinance companies, financial leasing companies, local asset management companies and other financial institutions (non-bank institutions), and at the same time collect the information data of government functional departments, and effectively collect and integrate large, scattered and diversified data. The useful information hidden in the data is extracted, and the information is shared and open, and finally the information is used to serve the decision-making process of financial big data application, improve the decision-making efficiency and correctness of decision-making, thereby improving financial innovation ability and competitive advantage, and promoting the healthy development of the financial industry.

5.3 Strengthen resource integration, deeply cultivate the small and micro enterprise market, and achieve full coverage of big data applications

Under the guidance of national policies, there are more and more small and micro enterprises in China, providing more project needs for commercial banks, so in the process of applying big data in the financial industry, attention should be paid to the small and micro enterprise market. It is necessary to further improve the integration of big data resources in the small and micro enterprise market, provide services such as loans for small and micro enterprises through the big data platform, improve the efficiency of loan approval, make credit methods more simple and flexible, reduce credit operation costs, and make credit channels more diverse, so as to promote the benign and healthy development of Internet financial business and enable commercial banks to stand out in the fiercely competitive market.

5.4 Build a security protection mechanism for big data applications in the financial industry

In order to ensure the security and stability of big data in the application process, it is necessary to build a security protection mechanism for big data applications in the financial industry to effectively avoid data leakage and data tampering. First, it is necessary to clarify the data security responsibilities of all parties involved in data application and further implement the responsibilities. Second, unified norms and standards should be set for the application of big data technology in the financial industry, risk management and control mechanisms should be established, and possible data risks should be supervised and controlled in a timely manner to comprehensively ensure the security of data information. Third, an information security protection system should be created as soon as possible to make the application of data more reliable.

6 Conclusion

In the face of an increasingly complex financial market and economic environment, the construction of an intelligent financial system centered on big data technology is an inevitable development trend, and it is also an important way for China to maintain the stable development of the economic environment and keep pace with the times. Existing research shows that big data technology has been successfully applied to credit risk management, quantitative investment, financial leasing asset management, precision marketing, etc. However, there are still problems such as imperfect relevant policies, potential application risks, chaotic financial data management, low application level, high difficulty in improving big data application technology, and lack of security norms and standards for big data application systems. Based on this, this paper puts forward suggestions for improving relevant laws and policies for big data applications, establishing a unified or compatible big data application platform for the financial industry, strengthening resource integration, deeply cultivating the small and micro enterprise market, achieving full coverage of big data applications, and building a security protection mechanism for big data applications in the financial industry. In order to accelerate the in-depth interoperability of big data technology and the financial field, promote the innovation and development of the financial field, drive the upgrading of the financial industry, and accelerate the progress of China's financial industry towards high quality and diversification.

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