Dean&Francis
ISSN 2959-6130

Big Data Push Affects Personal Financial Decision-Making: Mechanisms, Controversies, and Governance Implications

Jiawei He[1, *]

[1]Keuka College, New York, United States
*Corresponding author: jhe19@keuka.edu

Abstract:

This paper analyzes the impact of push information on financial decision-making from the perspective of behavioral economics. Firstly, this article explores the effects of cognitive bias and introduces how various oversized data analysis methods can prevent "generalization" in promoting financial products. Secondly, this article analyzes from the perspective of emotional drive, mainly referring to the positive emotional impact of users' financial decisions being pleasantly surprised by push information. Finally, this study focuses on the effects of decision bias on users' long-term and short-term financial decisions. To address the current controversies and challenges, it will discuss how to solve the problem by analyzing data anonymization, user consent, and algorithm transparency. Finally, based on data analysis, the application of big data push in financial decision-making was discussed, and future research directions and policy recommendations were proposed in response to existing new challenges and opportunities, indicating the need to strengthen the combination of technological innovation and social benefits.

Keywords: Big data push; personal financial decision-making; behavioral economics; data privacy; push algorithm.

1. Introduction

With the rapid development of big data, research on personal wealth management products has attracted attention, especially on how commercial banks can use big data to innovate personal wealth management products. A large amount of literature mainly explores the development of personal finance from the perspective of traditional personal finance products. At the same time, there is relatively little research on the personal finance products of state-owned commercial banks in the background of big data finance.

ISSN 2959-6130

Among them, there are more studies on product innovation and risk avoidance, and the research perspective is relatively single, failing to deeply study the specific mechanism of big data on personal finance decision-making.

Moreover, most existing research results are purely theoretical analysis and discussion, lacking empirical research on decision-making behavior. In particular, big data in the field of personal finance in China is affected by the economic situation and the Internet application, and it is challenging to meet the characteristics of changes in the financial needs of Chinese consumers. Therefore, the empirical analysis of the impact of the big data push mechanism on personal financial decisions is of great significance.

In data processing, advanced information filtering algorithms can filter useful information and improve the efficiency level of financial decision-making [1]. To use quantitative and qualitative methods, empirical case analysis, and data mining to accurately locate the impact of big data push on personal financial decisions. This article selects Industrial and Commercial Bank of China (ICBC) Branch A for case analysis, which reflects the real operational methods of Chinese state-owned commercial banks in the face of big data at present, but also forms data support and a theoretical basis for related research in a broader range of studies. Further analysis and research on the influencing factors are conducted to fill the relevant gaps in existing literature and propose certain feasibility for commercial banks' design and optimization of personal wealth management products in the big data environment.

The intervention of reinforcement learning algorithms has made financial decision-making increasingly intelligent and automated, providing real-time risk warning and investment clue mining services for decision-making [2]. On the one hand, this study supplements the research field of personal wealth management products in commercial banks. On the other hand, it can provide references for real financial decision-making. By exploring the personal wealth management decision-making mechanism pushed by big data, commercial banks can gain a deeper understanding of customer needs, improve service levels, and provide governance references for policymakers, promoting the healthy development of the financial market.

2. Big Data Push Mechanism

2.1 Data Collection Methods

The data collection methods often use different data sources and acquisition techniques to collect, process, and store various types of data needed to support personal wealth decisions. The data collection for this study mainly includes web page collection, Application Programming Interface (API) interface, sensor data collection, and user data collection.

Page extraction refers to automated robots extracting information from web pages, typically through web crawlers, based on specified rules and intervals, to access and extract corresponding web page information from the destination website. API interface refers to a publicly available standardized data interface that calls API to obtain or publish real-time data from the system, used to extract transaction record information, user behavior information, etc.

Sensor data acquisition refers to collecting and recording relevant information during user behavior, such as transaction activities, geographic displacement, etc., through various hardware sensors such as financial terminals, Global Positioning System (GPS) in mobile devices, smart wearable devices, etc. The user input method is directly through the data actively submitted by the user on different platforms, such as online questionnaires and feedback, and inputting account information.

After data collection is completed, researchers will carry out data preprocessing work. Data preprocessing aims to improve the quality and consistency of data so that it can be analyzed and modeled more reasonably later. Data preprocessing mainly includes deleting noisy data, filling missing data, standardizing data, and deduplication. Deleting noisy data is mainly achieved by setting filtering rules to filter out useless and erroneous data. Filling in missing data is done through interpolation or taking the average to fill in the data. Standardizing data involves changing numerical data to smaller measures during the analysis process, which can eliminate the impact of anomalies on the measurement. Removing duplicate data is achieved through feature value matching, making the data simpler and cleaner.

After data preprocessing, it enters the data storage stage, and typical systems in this stage are high-performance data storage systems, including relational databases, Not only SQL (NoSQL) databases, and distributed file systems. The main purpose is to efficiently and reliably store preprocessed data for subsequent data mining and decision support system use.

2.2 Analysis of Push Algorithm

Through studying big data push mechanisms, it is necessary to analyze their push algorithms. Due to different push algorithms, their push effects, whether they meet the needs, and implementation complexity are also different. Firstly, the Collaborative Filtering Algorithm utilizes the similarity between users and items to calculate and generate recommendations, emphasizing similar behavioral data of users of the same category. This method focuses on data on the same behavior of the same user.

Compared with collaborative filtering algorithms, the Content-Based Recommendation Algorithm recommends content based on relevant feature information, with main

parameters including Term Frequency - Inverse Document Frequency (TF-IDF) weight values and content matching degree. When comparing and analyzing multiple algorithms, the push algorithm comparison table reflects each algorithm's relevant parameters, advantages, disadvantages, and actual application effects. Taking content-based recommendation algorithms as an example, their advantage is that they do not need to consider users' past behavior or preference data, thus solving the problem of cold start. However, their recommendation diversity is poor. In addition, the Hybrid Recommendation Algorithm integrates the advantages and disadvantages of collaborative filtering and content-based recommendation algorithms, further improving the recommendation performance by adjusting the user similarity threshold and TF-IDF weight parameters. Although the computational complexity has increased, the recommendation performance and user loyalty have significantly improved.

The Deep Learning Based Recommender Algorithm is a derivative of classical methods that utilizes Deep Neural Networks (DNNs) for personalized recommendations. Training a deep neural network typically involves four or more layers of neurons, with each layer optimized by the weights and offsets of the input, hidden, and output layers. This method uses optimization algorithms such as Adam Optimizer for optimization, with a high training rate and requiring strong hardware support to complete. Rule-Based Recommendation Algorithm completes recommendations through pre-set rules, with clear and intuitive logic. Its application is generally used in limited business scenarios, and the flexibility and scalability of rules are poor, resulting in recommendation results that cannot be efficiently presented in complex recommendation business scenarios.

Different push algorithms have their own advantages and disadvantages regarding mechanism and effectiveness. Choosing and adjusting appropriate push algorithms and parameters can effectively promote push effects and user satisfaction in big data push mechanisms. Based on the analysis and comparison of the above push algorithms, it can be seen that in different application scenarios and push business requirements, whether it is collaborative filtering based on historical data, content-based push based on content features, hybrid recommendation that combines the advantages of both, or push algorithms that apply deep learning technology, they all have their specific application scenarios and applicable push effects. In practical applications, push algorithms should be selected and optimized based on specific business and data characteristics to achieve the best push results.

3. Affects Financial Decision-making

3.1 The Role of Pushing Information

The impact of big data push on personal financial choices is significant, mainly reflected in various aspects of information influence. Firstly, big data push is becoming more prone to information explosion and filtering phenomena. Users often face a large amount of data input, which can be interfered with by noisy data and cause information overload. Therefore, advanced information filtering algorithms are needed to screen useful information and improve the efficiency level of financial decision-making. Technical recommendation engines are based on user preference and content-based recommendation algorithms, which can filter useful information from big data sets and quickly and efficiently filter financial choices and investment opportunities.

In addition, big data push helps implement risk identification and reminder functions, issuing risk warnings to investors in advance through risk assessment models and real-time risk control mechanisms. By comparing historical data with big data and using risk warning models, it is possible to provide early warnings of potential market volatility and remind users to take timely risk prevention measures. This risk assessment mechanism can help investors achieve safer financial management and generate better economic value [3]. Based on the information push function, financial risks can be predicted in advance, and comprehensive and multi-faceted data analysis methods can be used to interpret risks comprehensively.

Investment opportunity mining - The investment opportunities pushed by big data to investors are mainly obtained through the judgment of market hotspots and industry trends. Mining market hotspots and industry trends mainly rely on machine learning and big data mining techniques to predict data, providing investors with more realistic market analysis and stock recommendations through push technology.

The second application of precise push of financial products is personalized financial recommendations. Based on the user profile, using the judgment of user needs and behavior patterns, provide personalized financial recommendations according to each customer's needs, specific behaviors, and personal characteristics, recommending suitable products and services. Mainly relying on personalized recommendation mechanisms, designing financial products and recommending them to users through deep learning algorithms (CNN+RNN) and reinforcement learning algorithms, so that users can receive better product services.

From the perspective of behavioral finance theory, pushing information also has a certain impact on users' cognitive biases and behavioral decisions. Promotional infor-

ISSN 2959-6130

mation mostly relies on heuristic judgments to influence users' cognition, such as framing effects, overconfidence, etc. Therefore, relevant cognitive bias factors must be considered when designing a financial information push to prevent misleading users' decisions. For example, emotion-driven push methods combined with shame and social identity effects can enhance users' confidence in financial decision-making and reduce decision-making errors caused by information asymmetry [4].

In summary, in the process of big data push, integrating information screening, risk identification, discovery of investment opportunities, and personalized financial advice has greatly benefited personal finance's scientific and accurate decision-making. However, many problems and challenges also need to be solved. Regarding legal compliance and privacy protection, measures should be taken to overcome the dilemma of user experience and data security.

3.2 Behavioral

Economics Perspective Another key aspect of studying the impact of behavioral economics on financial decision-making is that this perspective reflects the internal psychology and behavioral patterns that influence consumer decision-making behavior. The big data push mechanism utilizes massive amounts of personalized information and financial recommendations to influence users' decisions, which can be summarized into the following factors.

Firstly, cognitive biases profoundly impact users' financial decisions, involving various errors in user judgment and decision-making, such as heuristic judgments and framing effects. Users may be influenced by simple and empirical rules brought about by heuristic judgments, leading to a lack of thoughtful consideration when faced with complex decisions. When users see a recommended financial product, they may be influenced by cognitive shortcuts and make hasty purchases without considering its risks and benefits. The framing effect refers to using different expressions in the same context, leading to different decisions.

Secondly, emotional drive is an important factor influencing users' financial decisions. This factor is reflected in the impact of emotional reactions on decision-making behavior, including the effects of humiliation, envy, fear, and greed. Moreover, these emotions may be stimulated by the personalized content pushed by big data. Suppose someone else's account of investment success is included in the push content. In that case, it may stimulate users' envy psychology, and they may try to imitate the experience of successful people and unthinkingly invest [5].

Thirdly, decision-making bias. For example, users may have different risk preferences when faced with the same investment choices due to social status and economic level differences. For example, loss aversion can make users more sensitive to potential losses than to losses with equal returns, affecting their financial decision-making behavior. In addition, first-mover advantage and status quo preference are decision-making factors affecting users' financial choices. First mover advantage drives users to choose financial products that already have obvious advantages in the market. At the same time, status quo preference encourages users to be more inclined to maintain the status quo [6].

Motivation equally influences users' financial decisions. External incentives mainly involve pushing information and giving rewards to users, encouraging them to make financial decisions. Internal motivation refers to the motivation for users to pursue a sense of achievement and self-actualization, which can be discovered through big data analysis and applied in push notifications. Research has shown that utilizing personalized and targeted rewards in push systems can enhance user investment motivation and decision-making efficiency [7].

It can be said that, from the perspective of the impact of big data push on behavioral economics, it provides a richer explanation for a comprehensive understanding of users' financial decision-making behavior. This is because big data push affects users' cognition and emotions and effectively motivates and guides user behavior, achieving the goal of "economic rationality" to optimize decision-making and improve returns. Of course, its influence can lead to decision-making biases and investment risks for users. Therefore, the next step of governance and regulation needs to strengthen the improvement of data privacy protection and algorithm interpretability, and seek scientific and reasonable user decision-making.

4. Controversy and Challenges

4.1 Privacy Protection Issues

In the context of big data, protecting personal privacy is a critical issue in personal finance, because in the era of big data, many people's data is open. In order to ensure strong protection and security of personal privacy in the context of big data, the complex collection and storage of data has led to a great crisis of privacy leakage. Therefore, banks, financial institutions, and technology companies have used various technologies and methods to protect customer data.

Privacy protection is an essential encryption measure: Financial institutions and technology companies generally use high-strength encryption algorithms and the Secure Sockets Layer (SSL) protocol to ensure high security during data transmission. Although the implementation cost is relatively high, it can largely avoid interception and decryption during data transmission, and improve data

and user security. Data anonymization is also a commonly used privacy protection method, mainly applied when banks and securities companies collect user data.

Data anonymization and masking methods are used to mask or tamper with identifiable personal information in the original data, reducing the occurrence of data leaks without affecting the effectiveness of data processing and analysis.

Consent management can improve data transparency and user autonomy. Fintech companies design consent boxes and privacy settings to inform users of how their data will be used and the time frame during which it will be used, at a lower cost. This dramatically improves customers' right to know and choose when to use their data.

4.2 Preference Manipulation Questioning

In the research on the impact of big data push on personal financial decisions, the controversy and challenges of preference manipulation questioning are reflected in the following aspects: firstly, the emergence of interpretability issues in algorithms is quite serious. Many existing push algorithms are based on machine learning and deep learning, and complex algorithms are classified as "black boxes" that are difficult to understand and supervise due to their difficulty in explaining internal working reasons. Both users and regulators find it difficult to judge the fairness and neutrality of algorithms, and some studies have shown that users can understand insufficient transparency as pushing information designed to manipulate consumer behavior and decisions. Therefore, seeking solutions to such problems is the approach proposed by some researchers to develop explanatory machine learning methods [6].

Information manipulation is one kind of risk issue. The information filtering foam is becoming more and more rampant. The push algorithm pushes content through filtering, so users can only access information consistent with their existing content preferences, thus strengthening the original view and weakening access to other information. This will affect users' decision-making behavior and have economic and social impacts. In order to avoid the above problems, the researchers proposed using diversified push content, injecting random noise data, and other strategies to break the information filtering foam [8].

Secondly, push algorithms may also lead to a lack of user autonomy. Push algorithms can impact users' decision-making autonomy, especially for financial activities. Users may completely trust the results recommended by the algorithm and reject autonomous judgment, thereby losing control over their wallets. In order to enhance user autonomy, efforts can be made to improve the transparency and controllability of push information, thereby providing users with more information and choices.

From a social perspective, the preference control of algorithms and data may further trigger social equity issues. Some vulnerable groups may be isolated due to a lack of data resources and be unable to obtain high-quality and personalized financial guidance. At the same time, big data push may lead to the atomization of the economy and cause imbalances in social wealth distribution. Therefore, fair data utilization policies should be formulated, and social equity factors should be considered in algorithm design to eliminate inequality caused by uneven data resources gradually [4].

In general, using big data to push people to make financial decisions will have considerable opportunities and face many challenges, including preference control and manipulation. It should take a multi-pronged approach, adopt more transparent algorithms, avoid the filtering of information foam, let users have a higher sense of control, and take into account social fairness measures, which will partially alleviate these problems and challenges, and promote big data technology to serve financial decisions better.

5. Conclusion

Research on the impact of big data push on residents' personal financial decisions, where various types of data collection and aggregation into big data provide sufficient basic data for push algorithms. The introduction of algorithms and the application of collaborative filtering and content recommendation algorithms have made personalized financial decision-making based on user profiles increasingly accurate. In contrast, the intervention of reinforcement learning algorithms has made financial decision-making more intelligent and automated.

While big data pushes optimization in financial decision-making, privacy protection and controversy over preference manipulation should also be given attention. Data anonymization is an effective technical solution to address the above issues. Although technologies such as homomorphic encryption and K-anonymity can improve the degree of anonymity, they still cannot adapt well to the big data environment. Implementing the user consent mechanism is subject to clarifying privacy policies and managing data access rights. The former is constrained by factors such as the responsibility requirements of the enterprise, while corresponding laws and regulations restrict the latter.

The threat of algorithmic decision-making and the issue of user autonomy have also been given attention. The transparency and black box nature of algorithmic information threaten users' right to know and make independent decisions. Algorithmic discrimination and information cocoons lead to incomplete information selection and recommendation, which may result in information coercion and algorithmic bias, leading to new cognitive biases

ISSN 2959-6130

among believers. In addition, balancing social equity with personalized services in the platform's information push is a new challenge that algorithms may trigger. Combining user education and information usage instructions is necessary to improve users' proactive decision-making.

Firstly, in terms of technology, further development is needed, especially in terms of algorithms and privacy protection, with the proposal of new and more intelligent and secure data algorithms and push models; Secondly, in terms of policy, stricter and more comprehensive legislation on data protection is needed. Enterprises should establish their responsibility mechanisms to effectively protect users' privacy and achieve the best protection and respect for it; Finally, in terms of social benefits, increasing the popularity of big data push in the wealth management market, promoting the general improvement of small and medium-sized customers' wealth management decision- making ability, promoting the development of the financial market, and supporting sustainable economic and social growth.

The decision-making of Renren Wealth Management, pushed by big data, reflects the management change of technology, with both advantages and challenges coexisting. Through the organic combination of technology, policies, social education, etc., the comprehensive, intelligent, and secure application of big data pushes for the achievement of everyone's financial decision-making, bringing opportunities and breakthroughs to everyone's wealth management.

References

[1] Han X Y. Applying big data to improve financial statistics research. New Economy, 2016, 12(33): 59-63.

[2] Li C L. Research on the development of financial statistics under the background of big data. 2021.

[3] Wang X Z. Exploration of financial risk management under the framework of big data. Modern Economic Information, 2022, (13): 12-17.

[4] Xiao Y, Zang G Q. Sensitivity identification and privacy measurement of personal financial data. Intelligence Theory And Practice, 2023, 46(09): 105-114.

[5] Hu Q J. Research on the development strategy of personal financial management in commercial banks . Zhengzhou University, 2025.

[6] Li Q. Research on machine learning based financial product recommendation algorithm. Beijing University of Technology, 2019.

[7] Li P P, Guo Y J. A brief discussion on Chinese residents' personal investment and financial planning methods. National Circulation Economy, 2021, 12(08): 148-151.

[8] Lin B. Exploration of optimization path for private wealth management in the era of big data. Caixun, 2019.