IOP Conf. Series: Journal of Physics: Conf. Series **1176** (2019) 042073 doi:10.1088/1742-6596/1176/4/042073

A Research on the Development of Artificial Intelligence and Consumer Finance in China

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Abstract. Consumer finance refers to provide consumers with various financial services to meet consumer needs. China's consumer finance is at a quick development stage, and its future is very promising. Although it has experienced a rapid development for the consumer finance industry in China, there are also many development problems: (1) The legal norms and regulation of consumer finance are not inadequate. (2) Problems arising from the over-development of "cash lending". (3) The development problem of the scenario consumer finance. (4) Consumer finance competition is becoming increasingly fierce and challenged by disorderly market competition. (5) The problem of contradiction between financial technological innovation and consumer rights protection. With the rapid development of financial science and technology, artificial intelligence is also deepening its application in the field of consumer finance, including credit reporting, intelligent risk management, intelligent marketing, intelligent customer service, intelligent collection and intelligent regulation. Consumer Finance which is combined consumer and finance is gradually infiltrated by Artificial Intelligent. Consumer finance companies will rely on more help of machines and Artificial Intelligent to develop consumer finance. Although there are many challenges and problems in consumer finance at present, Artificial Intelligence will have more applications in the field of consumer finance, so as to make consumer finance smarter.

1. Introduction

Consumer finance has different definitions because of the regional differences of countries, the complexity of financial activities and the heterogeneity of development paths. Consumer finance is not defined as consume finance but consumer finance, which refers to provide consumers with various financial services (such as internet credit) to meet consumer needs. Li Liao (2010) believes that consumer finance is that financial institutions provide lots of financial products and services to consumers, including consumer loans. Melton & Bodie (1995) proposed to define with basic financial functions. Tufano proposes that it should define the scope of consumer finance by means of financial function which is needed by consumer. There are four aspects: payment, such as check and credit card; risk management, such as life insurance and savings; credit, such as mortgage; investment. The author believes that consumer finance is a credit loan with the goal of consumption in the new era of China. It mainly refers to modern financial services such as banks, consumer finance companies, and internet companies that provide consumer loans to all kinds of consumers. It enhances the economic capabilities of financial services by deepening the application of financial technology (FinTech), it

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provides more inclusive financial services to consumers by deepening the application of financial technology.

China's consumer finance is at a quick development stage by deepening Financial Technology, and its future is very promising. (1) With the increasing income of Chinese residents, the development of consumer credit has been increasing year by year. The proportion of consumer finance to consumer spending has increased from 3.6% in 2008 to around 16% at the end of 2017, but it is far below the proportion (41%) in South Korea and 30% in the United States. In the terms of consumer credit and Gross Domestic Product (GDP), the ratio is only about 7% in China, but it is nearly 20% in the United States and about 24% in South Korea. The ratio of consumer finance to retail sales of consumer goods is as high as 66% in the United States and only about 16% in China. (2) China's consumer credit and finance penetration rate is not high, and there is still a huge room for growth in the future of consumer credit and finance. By the end of 2017, China's consumer finance market (excluding mortgages) exceeded 7 trillion yuan. If it grows at a rate of 20% per year, it is expected to exceed 12 trillion yuan by the year 2020. (3) Licensed consumer financial institutions have begun to enter a “golden period” and had a good profit. In the face of a huge market, more and more institutions have entered consumer finance industry. China’s licensed consumer finance companies have been approved by the first batch of four pilot enterprises in the year of 2010, and they have grown to 25 mature companies and shown a very steady development. Their profitability has improved continuously. In 2017, even there are 3 consumer finance companies in the among of 25 companies with a net profit of over 1 billion yuan.

2. Main problems of Consumer Finance

Although consumer finance industry has experienced a rapid development in China and had a very promising future, there are also many development problems: (1) The legal norms and regulations of consumer finance are not inadequate. Acts of consumer finance are not self-sufficient, and there may be "regulatory vacuum", "regulatory arbitrage", "regulatory capture" and other issues in the current legal norms. (2) Problems arising from the over-development of "cash lending". Despite consumer finance promotes the improvement of consumer demand and the real economy, the "cash loan" under the four characteristics develops too fast and the scenario consumer finance develops relatively slowly, which leads to the problems of excessive borrowing, repeated credit, improper collection, excessive interest rate and invasion of privacy. (3) The development problem of the scenario consumer finance. The business model of "cash loan" is relatively simple. The scenario consumer finance has both substantive attributes of scenario consumption and financial attributes of consumer finance. Although consumer finance is conducive to boosting real economic growth, when the two are combined, the expansion of its business model is not easy. In addition, it is easy to breed more risks for consumer finance. (4) Consumer finance competition is becoming increasingly fierce and challenged by disorderly market competition. Although the "upsurge" of consumer finance in the new regulatory situation gradually recedes, the scenario of consumer finance, which is naturally coupled with the real economy, is still in the "blue sea" of development. For this reason, consumer finance in the scenario begins to rise, regardless of the enterprises with financial licenses companies (commercial banks, consumer finance companies, network micro-finance companies), or enterprises without consumer finance licenses (E-commerce platform, P2P internet lending platform, etc.) are engaged in related consumer finance business, which has brought difficulties for the healthy and orderly development of the market and effective supervision. (5) The problem of contradiction between financial technological innovation and consumer rights protection. Under the background of the new era, consumer financial institutions also use Financial Technology in big data risk control, precision marketing, intelligent customer service, and other fields. However, the excessive application of financial technology also brings difficulties in user information security and user rights protection. How to effectively protect the rights of consumers who belong to the disadvantaged groups in the era of financial technology, the test of Regulation Technology system and regulatory sandbox is imminent.

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3. How to use Artificial Intelligence to develop Consumer Finance in China

With the rapid development of financial science and technology, artificial intelligence is deepening its application in consumer finance, including credit reporting, intelligent risk management, intelligent marketing, intelligent customer service, and intelligent collection.

3.1 Credit Reporting

Intelligent credit reporting refers to obtaining multi-dimensional data of users (such as social data, consumption data, financial data, etc.) through multiple channels, and then extracting various feature building models and multi-dimensional portraits from user information, and then crediting users according to the model. The most successful credit reporting system is the FICO Score in the USA.

The FICO Score helps lenders make accurate credit risk decisions across the customer lifecycle. The credit risk score rank-orders consumers by how likely they are to pay their credit obligations as agreed. FICO Scores which can break down five categories are available for lenders through FICO credit reporting agency partners.

Table 1. How a FICO Score breaks down

Constituent elements	Proportion	Remarks
Payment History	35%	Public Records and Collection Matters
Amounts Owed	30%	Arrears in all accounts, types of accounts in arrears, utilization of revolving credit accounts, how many accounts have not been repaid, and how many have not been repaid compared to the total instalment loans
Length of Credit History	15%	People with shorter credit history may also have higher FICO scores, depending on information in their credit reports other than credit histories.
Credit Mix	10%	Credit card, department store account, installment loan account, finance company account and mortgage account
New Credit	10%	Does it open a large amount of credit information in a short period of time?

In China, The Sesame Score is an independent third-party credit evaluation institution-China Sesame Credit Management Co., Ltd. under the authorization of users, according to the various consumption and behavior data of users on the Internet, combined with Internet financial lending information, using cloud computing and machine learning technology, through logical regression, decision tree, random forest and so on. The model algorithm synthetically processes and evaluates the data of each dimension, and objectively presents the comprehensive score of personal credit status in five dimensions: (1) User credit history (35%)：Past transaction records, performance behaviors and dishonest behaviors, including the dishonest behaviors concerning Alibaba series products, such as Taobao and Alipay. (2) Behavior preference(25%)：behavior characteristics in shopping, payment and transfer activities; (3) Performance capability(20%): payment account balance, Yu'e Bao Account Balance, vehicle property information, real estate information ; (4) Identity Characteristics (15%)：Rich and authentic information about learning and professional experience, as well as personal real-name consumption behavior，such as hotel, air ticket, insurance and other consumption, is one of the evaluation factors of sesame score; (5) Human relationship(5%): personal social network, personal influence in interpersonal communication，and the credit status of friends. The sesame score ranges from 350 to 950，Among of them, it is divided into several credit conditions. The credit status of people is not good between 350 and 549 points, it is medium for 550-599 points, the credit status of 600-649 points is good, it is excellent for 650-699 points, and the credit status of 700-950 points is excellent. The higher the score, the better the credit, the lower the default rate. The higher the sesame score, the more efficient and better the service.

Although China's consumer finance industry has developed rapidly depending on credit scoring, there are also relatively large financial risks. Consumer financial institutions operate in different

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directions: some intend to occupy the credit market of banks, others find new ways to mine and subdivide the customer groups, but the risk control system they uphold is highly similar: scenario data、People's Bank of China's credit reporting, operation service provider data, and mining data, which together constitute the mainstream consumer financial companies' core risk management. At present, the People's Bank of China's credit reporting covers about 20-30% of China market, while the third-party credit reporting institutions, including sesame and Qianhai, claim to cover about 70-80% of China market. It seems that the "big data credit reporting" of the three parties can "perfectly" cover the credit demand of the blank market, and protect consumer financial institutions in exploiting the blue sea market. However, behind the "prosperity" of big data risk control, there are many hidden risks that need to be guarded against.

3.2 Intelligent risk *management*

Artificial intelligence plays an important role in risk control. Machines can learn knowledge and rules from huge amounts of transaction data and find abnormalities, such as preventing card theft, false transactions, malicious cash, garbage registration, marketing cheating, etc, and provide timely and reliable security for users and institutions.

In the aspect of consumer finance anti-fraud, (1) Consumer finance companies use deep learning and image recognition technology to intelligently identify users' identities and make intelligent judgments of age, gender, status and mood. The recognition accuracy can reach more than 95%; (2) Consumer finance companies use Optical Character Recognition (OCR) technology, such as information input, edge detection, LSTM classification, and finally get correct results to identify users more accurately; (3) Consumer finance companies establish connections among massive nodes through artificial intelligence technology, and adopt social association, customer behaviour, image processing, text mining and other methods to intelligently identify fraudulent patterns.

Taking the "Magic Mirror" intelligent risk control pricing system of PPDAI in Shanghai as an example, based on the accumulation of 10 billion pieces of data, including Repayment, identity information, Education, Consumption, Social network, Credit reports, Mobile communication. "Magic Mirror" system establishes a model through big data technology and machine learning technology and then gets a risk rating for each loan to reflect the prediction of overdue rate. And "Magic Mirror" system ensures the matching effect of return and risk based on risk rating pricing.

Table 2. Standard loan products subject and not subject to quality assurance program

	Standard Loan Products Not Subject to Quality Assurance Program		Standard Loan Products Subject to Quality Assurance Program		
Credit Level(1)	Transaction Fee Rate	Monthly Cost(2)	Transaction Fee Rate	Quality Assurance Fund Contribution (Upfront Portion)	Monthly Cost(2)
I	4.00% - 6.00%	0.74%	—	—	—
II	4.00% - 6.00%	0.83%	—	—	—
III	6.00% - 7.00%	0.93%	—	—	—
IV	7.00% - 8.00%	1.03%	—	—	—
V	8.00%	1.22%	8.00% - 8.50%	2.20% - 2.70%	1.28% - 1.45%
VI	12.00%	1.51%	8.00% - 10.00%	3.30% - 5.30%	1.65% - 2.32%
VII	—	—	8.00% - 12.00%	4.70% - 5.30%	2.12% - 2.32%

(1) Borrowers of the same credit level may be subject to different transaction fee rates depending on multiple factors, such as their respective acquisition channels and whether they are repeat borrowers.
(2) Monthly cost is comprised of monthly interest payment and monthly quality assurance fund contribution, if any.

3.3 Intelligent marketing

The three major difficulties of consumer finance are marketing, scenario and risk control. Marketing, as the connecting entrance of consumer finance users, has become the most difficult point in the context of artificial intelligence era, with the rising cost of marketing customers. On the platform of consumer finance, how to reach more users, how to get more intelligent and accurate marketing customers, how to sell more cheaply and efficiently, have become the core of consumer finance.

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With the development of Artificial Intelligence technology, the "Internet +" era has gradually escalated into the era of "AI +". Faced with the sudden rise of intelligent technology, all industries are looking for the entrance of the next era, so is marketing, which naturally insights into the forefront of the market. Intelligent marketing of consumer finance is an innovative marketing method that integrates computer, network, mobile internet, Internet of things and other science and technology into brand marketing of consumer finance through people's creativity, innovation, and creative wisdom. By means of artificial intelligence technology, users can be found accurately by using user portraits and large data models, so as to realize intelligent and accurate marketing, reduce the cost of customer acquisition and improve the efficiency of accurate marketing in consumer finance.

Intelligent marketing of consumer finance is also the inevitable development of marketing from 1.0 to 4.0. The era of marketing 1.0 is the era of the seller's market, in which products are fewer and products are mainly sold in the centre; the era of marketing 2.0 is the era of a buyer's market, in which market rights are transferred from seller to buyer, and marketing is transferred from the product centre to consumer as the centre; and the era of marketing 3.0 is mainly the era of Internet marketing. In this stage, the innovation of media, content and communication mode is used to acquire target users. The more common marketing theories are precision marketing, network marketing, word-of-mouth marketing and so on. This stage pays attention to the use of Internet technology in digital marketing "technology genre". At present, Intelligent Marketing is in the age of marketing 4.0. It mainly focuses on the individualized and fragmented needs of consumers all the time to meet the dynamic needs of consumers.

3.4.Intelligent customer service

In the customer service of consumer finance industry, the problems of customer consultation are mostly repetitive, and often limited to a few specific areas. These characteristics make it an excellent choice for natural language processing and intelligent customer service robots. Intelligent customer service can solve most of the user's questions. When the answer is determined, it can answer directly. When the answer is uncertain, it can provide the possible answer to the artificial customer service, so as to realize human-computer interaction, and send the best answer to the user by the judgment of the artificial customer service.

Intelligent customer service is an industry-oriented application developed on the basis of large-scale knowledge processing. It is suitable for large-scale knowledge processing, natural language understanding, machine learning, automatic question and answer system, customer management and other services. Intelligent customer service not only provides enterprises with fine-grained knowledge management technology, but also establishes a fast and effective technical means based on natural language for communication between enterprises and mass users, and can also provide enterprises with statistical analysis information needed for fine management.

Intelligent customer service of consumer finance has many advantages and applications: (1) Intelligent customer service robot liberates repetitive work and improves work efficiency; (2) Intelligent customer service robot, which is tireless, can provide continuous service 7*24 hours a week ; (3) Intelligent customer service can effectively solve customer questions, explore the deep needs of users, explain and recommend products, but also bring sales transformation through machine learning and knowledge mapping technology; (4) Intelligent customer service can provide on-line customer service, mobile customer service and intelligent customer service through all channels, which makes the operation of customer service easier and faster; (5) Intelligent customer service has intelligent analysis and quality inspection, which can effectively guarantee the quality of customer service and help companies to analyze and solve customer service problems; (6) It is conducive to improving customer service, customer service efficiency, user experience; while reducing human costs for intelligent customer service.

3.5.Intelligent Collection

With the rapid expansion of the domestic consumer financial market and the increasingly fierce market competition, a large number of overdue accounts such as credit cards, P2P, consumer finance, micro-loans began to emerge. The rise of these institutions has made the consumer financial collection

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industry a new increase in "small scattered" cases. The traditional point-to-point collection model is difficult to adapt to. Therefore, the consumer finance industry urgently needs more compliant, efficient and cost-effective tools.

Artificial intelligence has the abilities of deep learning, information mining, strategy research and so on, which can effectively subvert the traditional way of collection. (1) Intelligent collection can ensure the standardization of speech and avoid the violence of language behaviour; (2) Intelligent collection can help release a large number of short account collection manpower, so that enterprises can nearly achieve zero-cost expansion; (3) Intelligent collection can achieve full coverage and uninterrupted work within an effective period of time, and break through waiting time, many mistakes and imitations of time breakpoints of the artificial collection; (4) Intelligent collection does not require training, promotion and quality inspection as manual work, which can effectively save the related costs of enterprises.

Recently, Suning Consumer Finance Company directly docked its intelligent voice collection system with its own intellectual property rights with the intelligent voice collection robot of IFLYTEK Co.,Ltd. In China, and set up an intelligent collection laboratory. Intelligent voice collection laboratory will collect a large number of real voice databases, continuously build intelligent voice collection model through machine learning, train intelligent voice collection robot to carry out real-time, continuous and good "Human-Computer dialogue" with customers through flexible process and strategy configuration, and play a close role in the practice of artificial voice collection. At the same time, in dealing with complex scene problems, intelligent voice robots have also achieved seamless connection with manual collection experts, and realized the continuous growth and progress of machine learning.

This paper takes the application of an intelligent collection robot in the early collection scene in China as an example. If the collection cases are randomly divided into two groups, manual and intelligent collection are used for collection. The experimental data shows that the repayment rate of intelligent collection can reach more than 90% of the result of manual processing when dealing with the cases within 3 days of overdue payment.

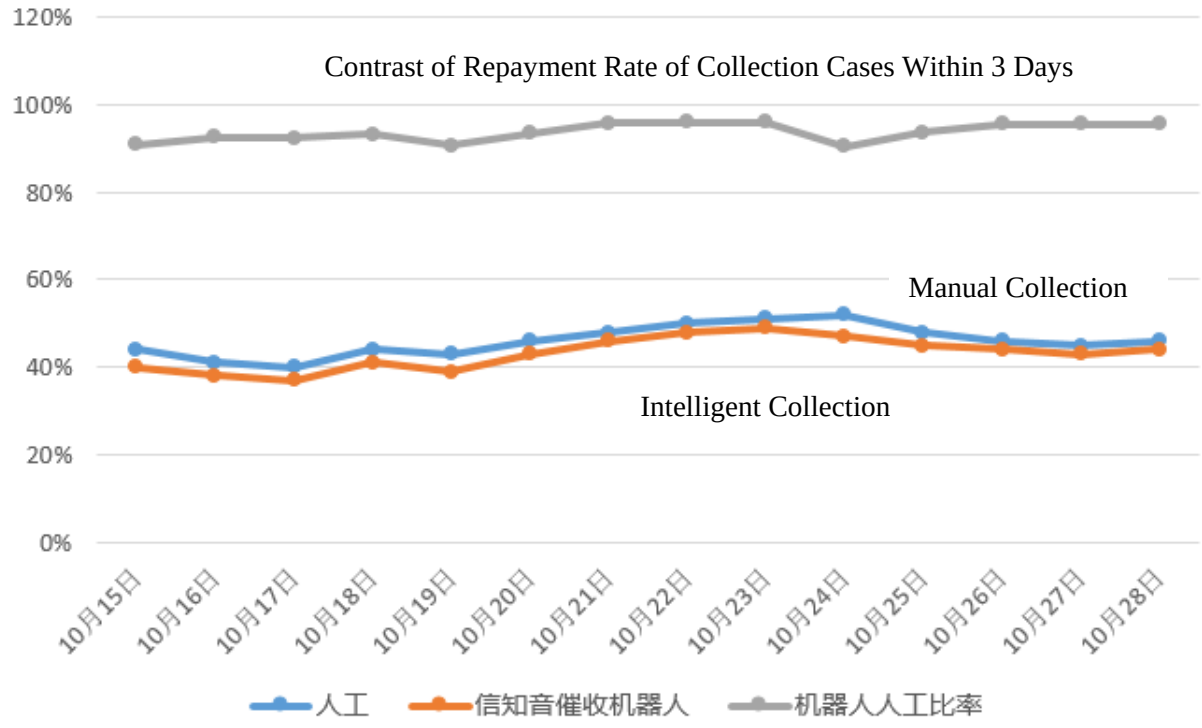

Figure 1. Manual Collection and Intelligent Collection

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3.6 Intelligent Regulation

Financial regulators have always attached importance to the application of artificial intelligence (AI) technology in consumer finance supervision. Recently, they have carried out a series of innovative work in the research of large data planning and supervision technology (SupTech).

In the aspect of intelligent supervision, it mainly includes micro-prudential supervision and macro-prudential supervision: (1) Micro-prudential supervision. Firstly, machine learning (ML) is used to evaluate credit risk. Bank of Italy (BoI) has begun to explore how to apply ML algorithm to predict loan default, mainly by combining different data sources to achieve this purpose, through machine learning (ML) can more effectively assess credit risk. Secondly, the neural networks is used to analyse liquidity risk. Through neural network, the liquidity risk can be analysed more widely and quickly. Bank of the Netherlands (DNB) is developing an automatic encoder to detect abnormal liquidity flows. (2) Macro Prudential Supervision. First, identify macro financial risks. Researchers at Bank of Italy (BoI) use a variety of techniques to predict house prices and inflation. Researchers at Bank of the Netherlands (DNB) use network indicators, operational indicators and liquidity flows to identify macro-financial risks. Second, identify emerging risk signals in financial markets. By combining technology, a large amount of data from FMI (such as payment system) can be used to identify risk signals. Third, the use of natural language processing (NLP) for emotional analysis. Bank of Italy (BoI) quickly predicts small and sporadic deposits by studying emotional expressions in instant tweets. Fourthly, safeguard financial stability and evaluate the policy of progress. The Federal Reserve, the European Central Bank and the Bank of England all use heat maps to highlight potential financial stability issues.

In recent years, China Banking and Insurance Regulatory Commission has launched the planning and construction of big data platform to further integrate data resources and dig deep into data value. New technologies such as database, cloud computing and AI have been studied to provide continuous and powerful technical support for intelligent supervision. China Banking and Insurance Regulatory Commission also actively develops intelligent applications, which are based on big data platform and take actual regulatory scenarios as landing sites. It continuously carries out research on new technologies and timely applies the research results to practical regulatory work: (1) using machine learning technology to achieve regulatory portraits; (2) using knowledge graph to conduct correlational analyses; (3) Use text mining technology to improve network regulatory capabilities.

4. Conclusion

Consumer Finance which is combined consumer and finance, is gradually infiltrated by Artificial Intelligent and Human-Computer Interaction. Consumer finance companies will rely more help of machines and Artificial Intelligent to develop consumer finance, and consumers will be more adapted to Artificial Intelligent application. Although there are many challenges and problems in consumer finance at present, including inadequate legal regulation, fierce market competition, cash loan problems and insufficient consumer rights protection, Artificial Intelligent will have more applications in the field of consumer finance, including credit reporting, intelligent risk management, intelligent marketing, intelligent customer service and intelligent collection, so as to make consumer finance smarter.

Acknowledgments

This work was financially supported by National Social Science Foundation.

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