Challenges and Innovations of New Energy Vehicle Insurance under the Context of Intelligent Driving and UBI Mode

Xiaoli Wang

College of Finance, Chengdu Jincheng College, Chengdu, 611731, China

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Abstract: With the in-depth development of intelligent driving and UBI mode in the field of new energy auto insurance, related research is of great significance to the industry reform. This article focuses on intelligent driving and new energy auto insurance under UBI mode. Firstly, it expounds the theoretical basis of intelligent driving, UBI mode and new energy auto insurance, and analyzes the relationship among them. Then, it analyzes the challenges brought by the uncertainty of intelligent driving technology, the data problem of UBI model, product design pricing and operation service to new energy auto insurance. These include difficulties in risk assessment, data collection and privacy protection. Futhermore, this article puts forward corresponding innovation strategies by constructing multi-dimensional risk assessment system and integrating data pricing model, including innovative risk assessment ideas and designing products to meet new needs. The research shows that insurance companies need to actively respond to these changes and adopt innovative strategies to better adapt to the new environment and promote the healthy development of new energy auto insurance industry.

1. Introduction

With the rapid development of science and technology, intelligent driving technology is gradually moving from concept to reality, and the new energy automobile industry is also booming around the world [1]. Futhermore, the Usage-Based Insurance (UBI) model, as an innovative insurance pricing method, is gradually changing the pattern of traditional auto insurance [2]. Under this background, new energy auto insurance is undergoing unprecedented changes under the dual influence of intelligent driving and UBI mode [3]. With its advanced sensors, algorithms and communication technology, intelligent driving technology greatly improves the safety and convenience of vehicle driving. With its environmental protection and high efficiency, new energy vehicles have become an important direction for the future development of the automobile industry [4]. UBI model breaks the traditional pricing model of auto insurance based on vehicle attributes and driving history, and carries out risk assessment and pricing according to the actual driving behavior of drivers [5]. The combination of these three brings new opportunities and challenges to the development of new energy auto insurance.

From the perspective of opportunities, intelligent driving technology can reduce the accident rate, and UBI model can accurately price. Both of them are helpful to optimize the risk control and product design of new energy auto insurance, meet the diversified needs of consumers and promote the further development of new energy auto market [6]. However, challenges cannot be ignored. The safety and reliability of intelligent driving technology still need to be verified, and the problem of data privacy protection needs to be solved urgently [7]. UBI model also faces many obstacles in data collection, analysis and application. New energy auto insurance needs to adapt to new technologies and new models, and reconstruct the risk assessment system and product pricing model.

At present, the research on new energy auto insurance under intelligent driving and UBI mode is still in its infancy, and some studies only focus on the impact of a single technology or mode on auto insurance, lacking systematic and comprehensive analysis [8]. Therefore, it is of great significance to deeply study this field, analyze challenges and explore innovative paths to promote

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the healthy development of new energy auto insurance industry. The purpose of this article is to comprehensively discuss the challenges brought by intelligent driving and UBI mode to new energy auto insurance, and put forward targeted innovation strategies to provide guidance for the development of the industry.

2. Intelligent driving, UBI mode and new energy auto insurance

Intelligent driving technology relies on advanced sensors, such as cameras and radars, to perceive the surrounding environment information of vehicles in real time. Futhermore, these data are deeply analyzed and processed by means of complex algorithms, and then decisions are made and vehicles are controlled [9]. According to the degree of automation, intelligent driving is divided into multiple levels, from assisted driving to highly automatic driving. Its core goal is to realize the autonomous and safe driving of vehicles and reduce traffic accidents caused by human errors. UBI mode is an insurance pricing method based on the actual driving behavior of drivers. It collects data such as mileage, driving time and sudden braking frequency, and uses data analysis technology to evaluate the driver's risk level. Drivers with good driving habits and low risks can get lower premiums, while high-risk drivers have to pay higher premiums. This model breaks the traditional "one size fits all" pricing model of auto insurance, makes premium pricing more fair and reasonable, and reflects individual risk differences.

New energy auto insurance is a kind of insurance based on new energy vehicles. Compared with traditional fuel auto insurance, there are differences in power system and structure of new energy vehicles, which leads to different risk characteristics [10]. Intelligent driving technology can reduce the accident risk of new energy vehicles and provide more driving behavior data for UBI model. UBI model realizes accurate pricing based on these data and promotes the innovation of new energy auto insurance products. The development demand of new energy auto insurance reacts on intelligent driving technology and UBI model, which promotes their continuous improvement. The three are interrelated and influenced each other, and jointly build a new auto insurance ecology.

3. Challenge of new energy auto insurance

3.1. Risk assessment problems caused by technical uncertainty

Although intelligent driving technology continues to develop, there are still many uncertainties. At present, the reliability of different levels of intelligent driving systems is uneven, and even the higher level of automatic driving is difficult to cope with all complex road conditions. In extreme weather (rainstorm, blizzard, etc.) or special scenes (road construction, emergencies, etc.), the intelligent driving system may fail or misjudge, which will increase the accident risk. This uncertainty makes the traditional risk assessment method based on historical accident data and driving experience difficult to apply accurately. It is difficult for insurance companies to predict when the intelligent driving system will be abnormal, so it is impossible to accurately evaluate the actual risk level of vehicles.

3.2. Data-related problems of UBI model

UBI model relies on a large number of driving behavior data to assess risks. However, the data collection process faces many obstacles. There are problems in the installation and compatibility of data acquisition equipment. The internal electronic systems of different brands and models of new energy vehicles are quite different, so it is not easy to ensure that the acquisition equipment can accurately obtain data without affecting the normal operation of the vehicle. Drivers' acceptance of data acquisition equipment varies. Some drivers are worried that the installation of equipment will affect the vehicle warranty, or have doubts about the accuracy and use of data collected by equipment, thus resisting data collection.

With the continuous expansion of data collection scope in UBI mode, it involves a lot of sensitive data such as driver's position information, driving trajectory and driving habits. How to protect the driver's privacy when collecting and using these data has become a key issue. Once the

data is leaked, it will not only bring troubles to drivers, such as harassing calls and information fraud, but also trigger a crisis of public trust in UBI model and even the entire insurance industry. Insurance companies need to invest a lot of resources to establish a sound data security protection system, but in the face of increasingly complex cyber attacks, the risk of data leakage still exists.

3.3. New challenge of new energy auto insurance product design

The integration of intelligent driving and UBI mode has changed the risk structure of new energy auto insurance and put forward new requirements for product design and pricing. Traditional auto insurance product design is mainly based on factors such as vehicle service life and brand, but in the new environment, the performance of intelligent driving system and driving behavior data collected by UBI mode should be taken into consideration. In terms of pricing, the traditional pricing model is difficult to adapt to new risk factors. To illustrate this situation, Figure 1 is introduced below:

Intelligent Driving Level		
L2 (Partial Automation)	Frequency of sudden braking, Mileage driven	Frequent sudden braking may increase premiums; Longer mileage may lead to a corresponding increase in premiums
L3 (Conditional Automation)	Number of intelligent system failures, Duration of night driving	A high number of intelligent system failures may lead to a significant premium increase; Increased duration of night driving raises risks, potentially increasing premiums
L4 (High Automation)	Number of takeovers, Mileage driven in specific scenarios	A high number of takeovers indicates poor stability of the autonomous driving system, leading to higher premiums; Long mileage driven in specific scenarios (e.g., highways) has a complex impact on premiums due to varying scenario risks

Figure 1 The influence of intelligent driving level and UBI data on auto insurance pricing

As can be seen from Figure 1, different intelligent driving levels and UBI data factors are intertwined, which makes it necessary to comprehensively consider many complex variables in auto insurance pricing. The traditional pricing model can't deal with it effectively, so insurance companies urgently need to build a new pricing model to accurately reflect the relationship between risk and premium.

3.4. Reform pressure of insurance company's operation and service

Intelligent driving and UBI mode require insurance companies to make major changes in their operations and services. In terms of operation, insurance companies need to set up a professional data processing and analysis team to deeply mine and analyze the massive data collected by UBI model, which increases labor costs and technical input. Furthermore, the business process needs to be redesigned to adapt to the new risk assessment and product pricing methods.

In terms of services, customers' expectations for insurance services have changed due to new technologies. Customers may expect to know the risk assessment results and premium changes based on UBI data in real time, and get fast and professional claims service when intelligent driving accidents happen. Insurance companies need to improve the speed and quality of service response and optimize service channels to meet the new needs of customers, otherwise it may lead to the loss of customers.

4. Innovation of new energy auto insurance based on intelligent driving and UBI

4.1. Innovative risk assessment ideas

In order to deal with the difficult problem of risk assessment caused by the uncertainty of intelligent driving technology, insurance companies should build a multi-dimensional risk

assessment system. On the one hand, the technical principle and operation logic of intelligent driving system are deeply studied, and the data such as system performance parameters and failure probability are obtained by cooperating with automobile manufacturers and scientific research institutions. On the other hand, combined with the driving behavior data collected by UBI model, the risk is comprehensively evaluated from two aspects: vehicle technical status and driver behavior habits. For vehicles with high level of intelligent driving, the stability and reliability of the system should be focused on. For UBI data, in addition to analyzing the traditional driving habits, we should also pay attention to the behaviors related to intelligent driving, such as proficiency in the operation of intelligent driving systems.

4.2. Constructing a pricing model with fused data

In view of the limitations of traditional pricing models, insurance companies should build a pricing model that integrates intelligent driving and UBI data. Table 1 shows an example of the weight of different factors in the pricing model:

Table 1 Weight of reference factors in auto insurance pricing

Pricing Reference Factors	Weight Range	Description
Intelligent driving level	20%-30%	Higher level means higher basic weight, but system stability should be considered for adjustment
Mileage	15%-20%	Longer mileage means relatively higher risk
Hard brake frequency	10%-15%	Higher frequency indicates more aggressive driving style and increased risk
Number of intelligent system failures	15%-25%	The number of failures directly affects the risk level
Driving time (night, etc.)	10%-15%	Higher risk in specific periods such as night

Insurance companies can dynamically adjust the weight of each factor according to actual data and market conditions. In this way, premium pricing can more accurately reflect the actual risk level of vehicles and drivers, realize differentiated pricing and improve market competitiveness.

4.3. Design new energy auto insurance products to meet new demands

In view of the product design challenges brought by intelligent driving and UBI mode, insurance companies should innovate product content. For example, develop special insurance for intelligent driving system failures to protect accident losses caused by system failures. Futhermore, combined with UBI data, a personalized insurance package was launched. For users with good driving habits and low risks, provide packages containing more value-added services, such as increasing the number of free road rescues and discounts on vehicle maintenance. For users with high risks, design basic packages that pay more attention to protection, and provide risk improvement suggestions and training services to help users reduce risks.

4.4. Innovating operation management and service system

In terms of operation management, insurance companies should strengthen digital transformation. Insurance companies should use big data, artificial intelligence and other technologies to realize automatic data processing and analysis, thus improving the efficiency of risk assessment and pricing. In addition, enterprises need to establish in-depth cooperation mechanisms with automobile manufacturers and technology companies to obtain vehicle technical information and driving behavior data in real time.

In terms of service system innovation, an intelligent service platform is built to provide customers with real-time risk assessment report, premium calculation, claim progress inquiry and other services through mobile phone applications or online platforms. Artificial intelligence customer service can also be introduced to quickly respond to customer questions and effectively improve service response speed. In addition, in view of the particularity of intelligent driving accidents, a professional claims team is set up to carry out targeted training to ensure that claims can be handled quickly and accurately in the event of accidents and improve customer satisfaction.

5. Conclusions

This article focuses on the challenges and innovations of new energy auto insurance under intelligent driving and UBI mode. Although intelligent driving technology has broad prospects, the uncertainty of technology makes risk assessment more difficult, and the traditional evaluation method based on historical data is difficult to adapt. Although UBI model can provide more accurate risk assessment basis, it is difficult in data collection and privacy protection. The superposition of these factors has caused the new energy auto insurance to face the demand of remodeling in product design and pricing, and the operation and service level of insurance companies are also under great pressure of change.

Aiming at these challenges, this article puts forward a series of innovative strategies. Insurance companies should build a multi-dimensional risk assessment system, combining the performance of intelligent driving system and UBI driving behavior data, so as to assess risks more comprehensively and accurately. At the same time, a pricing model integrating intelligent driving and UBI data is created, and premium pricing is dynamically adjusted according to the weights of different factors to achieve accurate pricing. In addition, it is necessary to design new energy vehicle insurance products that meet the new requirements, launch exclusive insurance for intelligent driving system failures, and provide personalized insurance solutions in combination with UBI data. Furthermore, insurance companies should accelerate digital transformation, innovate operation management and service system, and improve operation efficiency and service quality. By implementing these innovative strategies, insurance companies are expected to better cope with the challenges brought by smart driving and UBI mode and occupy a favorable position in the new energy auto insurance market.

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