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Classifying Age of Policyholders According to the Claim Rates in Iran

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Abstract

According to Note 1, Article 18 of Third Party Liability (TPL) Insurance Law 1395 (2016), Central Insurance of I. R. Iran (CII) in cooperation with Law Enforcement Force of I. R. Iran is obliged to work out to allow for the issuance of TPL policy based on the characteristics of the driver by the end of Sixth Five-Year Development Plan. As a result, in the premium calculation and the third-party claims, the characteristics of the driver must be taken into account. Thus, using six-year data from an insurance company, the effect of the policyholders' age on the incurred damages are investigated. In this study, initially, with the help of Kolmogorov-Smirnov two-sample test, the age distribution of the reckless policyholders and drivers were compared. The results indicated that 'age' characteristic plays a role in causing damages. Due to the age differences among policyholders and the four major vehicle types, the calculations were distinctively performed based on each set of vehicles. Using conditional probability, the possibility of damages caused by different age groups was measured. Furthermore, the decision tree model was developed based on the three registered characteristics of the policyholders including age, gender, and type of customer. The results indicated that among the passenger cars, trucks, and motorcycles, the probability of damages caused by policyholders having less than 22, 30, and 25 years of age is respectively considerably high. Thus, according to actuarial principles, these policyholders must reasonably pay more premiums. The results further showed that more than 50% of the claims that involved fatality in all types of vehicles were related to drivers that had no insurance policy. Therefore, several drivers that share the same vehicle must pay more premiums. The age characteristic of the policyholders does not have any significant effect on claims involving buses or vans.

Keyword: Third Party Automobile Insurance, Conditional Probability, Decision Tree, Accuracy Classification Matrix.

JEL Classification: C11, C53, C55.

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1. Introduction

According to Note 1 of Article 18 of the Third Party Insurance Law (1395) 2016, the Central Insurance is obliged to adopt an arrangement with the cooperation of the police of the Islamic Republic of Iran to allow the issuance of third party insurance based on "driver" characteristics by the end of the sixth five-year development plan. Accordingly, in calculating the insurance premiums in the field of insurance for damages to third parties due to accidents caused by vehicles, the characteristics of the driver must also be taken into account. Therefore, in this article, using the data of an insurance company during six years, we have examined how the age characteristic of insurers affects the occurrence of damages.

2. Background

All papers examining how driver characteristics affect the rate of damage show that young drivers and newly licensed drivers are more likely to be the cause of accidents (hams Esfandabadi, 2020), (Anon, 2018), (Dussault, 1999), (Maag, 1999), (Williams, 1999). In this article, using the data of insurance policies in the field of third-party vehicle insurance, we have examined the effect of age on the rate of damages in Iran.

3. Data description

Table 1 lists the number of insurance policies and claims recorded in the database used in this paper. Also, the percentage of the number of damages in which the policyholders themselves, were the drivers has been calculated separately for the car group and injury or fatal and property damages. According to this table, only about 48% of the financial losses and 42% of the injury or fatal losses in the field of third-party insurance belonged to the drivers who were the policyholders. This statistics show that the issue of driver-centric third-party insurance is very important. Accidents caused injuries or fatal are high-intensity accidents, and statistics show that about 58% of these accidents occur to non-policyholder drivers. This suggests a reasonable 60% increase in premium rates for policies that cover multiple drivers. It is worth noting that the legislator's goal in terms of driver characteristics is to set fair rates. Therefore, as premium rates for high-risk drivers increase, rates for safe drivers will decrease.

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Table 1. The number Dossier claims in the field of third party insurance by types of vehicle groups

Measures / Categories	No of Policies	The number of dossier claims for injury and fatal accidents		The number of dossier claims for property damage		The number of policyholders who themselves caused accidents with injury or fatal		The number of policyholders who themselves caused accidents with property damage	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Total	5693418	58788	1	212204	4	24931	42	102972	48
Bus	115795	2390	2	9820	8	1080	45	5174	42
Trucks	839981	11195	1	49869	6	4695	42	22879	53
Sedan	2806014	38979	1	144206	5	16794	43	71001	46
Motorcycle	1931627	6224	0	8309	0	2362	38	3918	49

Statistics of the number of insurance policies issued and the number of injury and fatal damages and only property claims cases of an insurance company over a period of six years. What should be considered in addition to these statistics is the statistical population of the entire insurers. In other words, the pattern of the Sunni population of the country in the years 1387 to 1392 has been such that in the age groups around 35 years of population density has been higher. Therefore, it is natural that more damage rates have been observed from these age groups, and this cannot be considered as a risk factor for these age groups. Therefore, in order to examine the effect of age on the rate of damages, it is necessary to consider the demographic model of the target community.

4. Estimating the probability of damages for different ages of policyholders

If A is the random variable of the age of the drivers and C is the value of the random variable of fatal or injury claims, which in the case of damage is 1 and in the absence of damage is 0, then the probability of damage for age i according to Bayesian law is as follows:

$$P(C = 1|A = i) = \frac{P(A = i|C = 1) * P(C = 1)}{P(A = i)}$$

For estimating the value of $P(A = i|C = 1)$, claims data are used and the total number of claims observed by drivers aged i is divided by the total number of claims. The value of $P(A = i)$, is obtained by dividing the number of policyholders by age i by the total number of policyholders. Actually, it is assumed that the age distribution of policyholders and drivers is almost the same.

In addition to calculating the above conditional probability in order to predict the occurrence of damage based on the characteristics of the policyholders, include age, customer type and gender, we have calculated Decision tree separately for car groups (Charani, 2020) , (Kozak, 2017).

5. Results

In summary, the results of this article show that for different groups of vehicles, the age of the policyholders has a different effect on the claims rate. The age of the policyholders has an effect on the occurrence of fatalities in passenger cars and this feature does not have a significant effect on the occurrence of fatal or injuries in buses. In order to calculate fair rates in the field of third party insurance, it is necessary to set higher rates for younger people in the Sedans, Trucks and motorcycles groups, and on the other hand, reduce rates for other insurers, thus bringing premium rates closer to fair rates. Raising rates will be undesirable for young insurers, and in many countries, including the United Kingdom, to solve this challenge, younger people can install telematics tools to reduce the premiums of otherwise they will be forced to Premium payments increase.

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