

In The Name of GOD

The Compassionate, The Merciful



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Investigating the Impact of Type of Car and some Driver's Characteristics on the Number of Car Accident

The case of study Tehran and Isfahan Cities

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ABSTRACT

Exploratory analyses of data related to accident during last years show that there are some relationships between the number of accident and some qualified factors such as type of car. In this research I examined the influence of type and color of car and also some driver's characteristics such as gender, marital status, job and amount of car insurance demand upon the number of accident occurred during 1387-1390. This research was going to find possible correlation between the accident rate and the characteristics of drivers. In other words, the purpose of this research was to find out whether risk level of drivers (or their risk aversion level) could be determined based on some of their characteristics or not. For this purpose we distributed a questionnaire in two cities (Tehran and Isfahan) to gather data about those factors. For this aim required sample size should be taken from these two cities was calculated 517 which applying Cochran and Proportional Allocation formula the number of required samples from Tehran and Isfahan were determined 434 and 83 respectively. Then by means of software SPSS.20 and applying related tools gathered data were described by presenting statistical summary and graphical displays. For analyzing the data and investigating the relationship between mentioned factors and number of accident some statistical tests were used, which the obtained results showed that all the factors had impact on the number of accident. Consequently insurance companies can consider these factors in the rate-making process in order to obtain more accurate rate for their contracts.

This study also presented appropriate statistical models in order to mathematically express the impact of mentioned factors upon the number of accident. For this analysis two suitable models (Poisson and Negative Binomial) were compared and finally Negative Binomial was selected as the appropriate model for stating this relationship. Obtained results of Paired-sample t-test indicated that this selected model can be fitted on the data as a valid and reliable model to estimate the frequency of accident based on the some characteristics of car and drivers in two cities Tehran and Isfahan.

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Table of Contents

ABSTRACT.....	I
ACKNOWLEDGEMENTS.....	II
LIST OF ABBREVIATIONS.....	V
LIST OF FIGURES.....	VI
LIST OF TABLES.....	VII
CHAPTER 1: INTRODUCTION.....	1
1.1 Introduction.....	1
1.2 Importance of the thesis subject.....	2
1.3 Risk.....	5
1.3.1 Definition of Risk.....	5
1.3.2 Classification of Risk.....	5
1.3.3 Nature of Management tools.....	5
1.3.4 Risk Management tools.....	6
1.4 Insurance.....	6
1.4.1 History of Insurance in Iran.....	6
1.4.2 Types of Automobile Insurance in Iran.....	7
1.5 Methodology.....	8
1.5.1 Specifying Factors.....	8
1.5.2 Main Hypothesis.....	9
1.6 Data Requirement.....	9
CHAPTER 2: LITERATURE REVIEW.....	11
2-1 introduction.....	11
2-2 Iranian automobile industry.....	11
2-3 Type and Registration Year of Car and Risk of Accident.....	14
2-4 Having Insurance and Traffic Fatalities.....	14
2-5 Gender and Risk of Accident.....	16
2-6 Marital Status and Car Crash Injuries.....	19
CHAPTER 3: Methodology.....	20
3-1 Theoretical Foundation.....	20
3-2 Source of Data.....	25
3-2-1 Method of Data Collection.....	25
3-2-2 Sampling Approach.....	27
3-2-2-1 Population.....	27
3-2-2-2 Sample.....	27
3-2-2-3 Simple Random Sampling.....	27
3-2-2-4 Sample Size.....	28
3-3 Reliability of Questionnaire.....	29
3-4 Data Description.....	30
3-4-1 Gender.....	30

3-4-2 Marital Status.....	31
3-4-3 Job.....	32
3-4-4 Amount of Insurance Cover.....	34
3-4-5 Type of Car.....	36
3-4-6 Color of Car.....	39
3-5 Chapter Summery.....	42
CHAPTER 4: DATA ANALYSIS.....	43
4-1 Introduction.....	43
4-2 Summery of Data Analyzing Methodology.....	43
4-3 Factors and their impact on the number of accident.....	44
4-3-1 Gender and Number of Accident.....	44
4-3-2 Marital Status and Number of Accident.....	45
4-3-3 Job and Number of accident.....	46
4-3-4 Amount of Car Insurance Demand and Number of Accident.....	48
4-3-5 Type of Car and Number of Accidents.....	50
4-3-6 Color of Car and Number of Accident.....	53
4-4 Summery of This Chapter.....	55
CHAPTER 5: Model.....	56
5-1 Introductions.....	56
5-2 Model Description.....	56
5-2-1 Poisson.....	57
5-2-2 Negative Binomial Regression Model.....	59
5-3 Empirical model.....	62
5-4 Model Validation.....	69
CHAPTER 6: Conclusions & Recommendations.....	71
6-1 Conclusion.....	71
6-2 Limitations.....	72
6-3 Suggestions.....	73
References.....	74
APPENDICES.....	78
<i>Appendix 1: Questionnaire.....</i>	<i>79</i>
<i>Appendix 2: SPSS Codes (Poisson Model).....</i>	<i>81</i>
<i>Appendix 3: SPSS Codes (Negative Binomial Model).....</i>	<i>82</i>
<i>Appendix 4: Definition of Tests.....</i>	<i>84</i>

List of Abbreviations

G0	Gender = Female
G1	Gender = Male
MS0	Marital Status = Married
MS1	Marital Status = Single
TI0	Type of Insurance: Third Party and Body
TI1	Type of Insurance: Third Party
TI2	Type of Insurance: Body
TJ0	Type of Job: Jobless
TJ1	Type of Job: Governmental
TJ2	Type of Job: Nongovernmental
TJ3	Type of Job: Student
TC0	Type of Color: Bright
TC1	Type of Color: Dark
TC2	Type of Color: Uncommon
TCA0	Type of Car: Pride
TCA1	Type of Car: Peagout 405
TCA2	Type of Car: Peagout 206
TCA3	Type of Car: Samand
TCA4	Type of Car: Others

LIST OF FIGURES

2.1 Average Claims Cost per Policy for Motor Insurance	17
2.2 Drivers in Fatal Crashes per 100 Million Miles, 1977-95.....	18
3.1 Optimal Choice of Cover.....	22
3.2 QuasiConcavity	24
3.3 Frequency of Accidents for Women Drivers.....	30
3.4 Frequency of Accidents for Men Drivers.....	31
3.5 Frequency of Accidents for Single Drivers	32
3.6 Frequency of Accidents for Married Drivers	32
3.7 Frequency of Accidents for Drivers with Governmental Job.....	33
3.8 Frequency of Accidents for Drivers with Nongovernmental Job	33
3.9 Frequency of Accidents for Student Drivers.....	34
3.10 Frequency of Accidents for the Jobless Drivers	34
3.11 Frequency of Accidents for the Drivers with Third Party Car Insurance.....	35
3.12 Frequency of Accidents for the Drivers with Body Car Insurance.....	35
3.13 Frequency of Accidents for the Drivers with Both Third Party and Body Car	36
3.14 Frequency of Accidents for the Pride.....	37
3.15 Frequency of Accidents for the Peagout 405.....	37
3.16 Frequency of Accidents for the Peagout 206.....	38
3.17 Frequency of Accident for the Samand.....	38
3.18 Frequency of Accidents for the other vehicle types	39
3.19 Frequency of Accidents for the Bright Color Cars.....	41
3.20 Frequency of Accidents for the Dark Color Cars.....	41
3.21 Frequency of Accidents for the Uncommon Color Cars.....	42
5.1 Histogram of Frequency of Accidents.....	62

LIST OF TABLES

1.1 Disease Burden (DALYs lost) for 10 Leading Causes.....	3
2.1 Productions of Tow Major Iranian Automaker Companies	12
2.2 Iran Passenger Car Trade Balance.....	13
3.1 Statistical Summary of Accidents Based on the Gender of Drivers	31
3.2 Statistical Summary of Accidents Based on Marital Status of Drivers.....	32
3.3 Statistical Summary of Accidents Based on the Driver's Job.....	34
3.4 Statistical Summary of Accidents Based on the Amount of Insurance Demand.....	36
3.5 Statistical Summary of Accidents Based on the Type of Car.....	39
3.6 Classifying the Colors of Cars.....	40
3.7 Statistical Summary of Accidents Based on the Color of Car.....	42
4.1 Levene's Test for Equality of Variances for Male and Female	44
4.2 T-Test for Testing the Equality of Means of Accidents in Male and Female.....	45
4.3 Levene's Test for Equality of Variances marital status.....	45
4.4 T-Test for Testing the Equality of Mean of Accidents of Marital Status.....	46
4.5 ANOVA for Testing the Equality of Mean of Accidents in the Job Groups.....	47
4.6 Levene's Test for Equality of Variances for Job Groups	47
4.7 Dunnet's T3 Test for Comparison the Mean of Accidents in the Job Groups.....	48
4.8 ANOVA for Testing the Equality of Means of Accidents in Insurance Demand Groups.....	49
4.9 Levene's Test for Equality of Variances for Insurance Demand Groups.....	49
4.10 Dunnett's T3 Test for Comparison the mean of accident in the insurance demand groups.....	50
4.11 ANOVA for Testing the Equality of Means of Accidents in the Car Type Groups.....	51
4.12 Levene's Test for Equality of Variances for Car Type Groups	51
4.13 Dunnet's T3 Test for Comparison the Mean of Accidents in the Car Type Groups.....	52
4.14 ANOVA for Testing the Equality of Mean of Accidents in the Colors Groups.....	53

4.15 Levene's Test for Equality of Variances for Color Groups.....	54
4.16 Dunnet's T3 test for Comparison the Mean of Accidents in the Color Groups.....	54
5.1 Descriptive Statistic of Dependent Variable.....	61
5.2 Chi-Square Statistic, the Goodness of Fit Test for Poisson Model.....	63
5.3 Chi-Square Statistic Obtained from the Negative Binomial Model	64
5.4 Information of the Model.....	65
5.5 Overall Fitting Test for Negative Binomial Model.....	65
5.6 Goodness of Fit for Negative Binomial Model.....	66
5.7 Estimated Regression Coefficients and Model Significance Test of these Coefficients.....	67
5.8 Over dispersion factor and its confidence level of 0.95.....	69
5.9 Paired Sample T-Test for Model Validation.....	70
5.10 Percentage of Model Prediction for Indicating Model Accuracy.....	70

CHAPTER 1: INTRODUCTION

1-1 Introduction:

These days several millions of people have been significantly affected by accident. In many countries owners of automobiles are not allowed to drive their vehicle without some kind of insurance coverage, Iran is no exception and all driver require to have at least third party insurance so insurance companies are one part of society which should bear the costs caused by accidents. If we examine this problem and its importance closely and present appropriate and applicable solutions, not only help the society to protect lives and properties of individuals but also will be profitable for insurance companies. Today, the world's most developed countries have done a lot of researches and presented many applicable solutions to reduce accidents which some of the solutions can be noted such as: examining, changing and reforming insurance contracts and traffic rules and also increasing road safety. Since in our country third party insurance is compulsory, insurance companies face with diverse population of drivers with different personality characteristics, that can play an important role in number of accident. Unfortunately there is no sufficient studies about this kind of insurance contracts and most of times having insurance makes sure drivers to be compensated about their losses and it causes they drive with high risk level and don't worried about the accident may occurred. Thus it's worthy to study about the automobile insurance in details and more carefully. In this research we are going to investigate some factors that may have influence on the number of accident and considering them in the third party contracts as a tool of decreasing the loss of insurance company. For this purpose this research has been presented in six chapters:

Chapter one: Introduction

Chapter two: Literature Review

Chapter three: Methodology

Chapter four: Data Analyzing

Chapter five: Statistical Modeling

Chapter six: Conclusion and Recommendation

1-2 Importance of the thesis subject:

Based on statistical records, every year a considerable number of Iranian citizens lose their lives in car accident or suffer from injury or damage caused by it. A research in this area shows that traffic accident is the most important factor of cause of death in Iran. This is evident in the fact that about 23, 000 deaths-average of three per hour, as a result of traffic accident were recorded in 2009 and the road fatality rate for the same period was 30.96 Per 100,000 population. In addition, the rate of road injuries between 2007 and 2009 increased by 10%. Also, the total cost implication of accidents within the urban and suburban areas were put at about \$18 billion, this is equivalent to 1.39% of gross domestic product (GDP) of Iran in 2007 (Towhid Pour, 2011).

Another research in Iran shows that: over 30,000 people die annually in Iran from road traffic crashes, amounting to a death rate of 44 per 100,000. Similarly, the annual mortality of road traffic crashes is substantially higher than the number of deaths from the 2003 Bam earthquake, one of the worst natural disasters of recent decades (Naghavi, 2007). Automobile insurance produced about 53% of total insurance revenue. And also about 61% of the Insurance industry losses belongs to automobile insurance (calendar of Central Insurance of Iran, 1389)

The problem of deaths and injury as a result of road accidents is now acknowledged to be a global phenomenon with authorities in virtually all countries of the world concerned about the growth in the number of people killed and seriously injured on their roads. In recent years there have been two major studies of causes of death worldwide which have been published in the 'Global Burden of Disease' (1996, World Health Organization, World Bank and Harvard University) and in the 'World Health Report –Making a Difference' (WHO 1999). These publications show that in 1990 road accidents as a cause of death or disability were by no means insignificant, lying in ninth place out of a total of over 100 separately identified causes. However, by the year 2020 forecasts suggest that as a cause of death, road accidents will move up to sixth place and in terms of years of life lost

(YLL) and ‘disability adjusted life years’ (DALYs)1 will be in second and third place respectively(Jacobs & Thomas,2000).Following table indicates this fact.

Table 1.1: Disease Burden (DALYs lost) for 10 Leading Causes

1998 Disease or Injury	2020 Disease or Injury
1 - Lower respiratory infections	1- Ischaemic heart disease
2 - HIV/AIDS	2 -Unipolar major depression
3 - Perinatal conditions	3 - Road traffic injuries
4 - Diarrhoeal diseases	4 -Cerebrovascular disease
5 - Unipolar major depression	5 - Chronic obstructive pulmonary disease
6 - Ischaemic heart disease	6 - Lower respiratory infections
7 - Cerebrovascular disease	7 -Tuberculosis
8 – Malaria	8 - War
9 - Road traffic injuries	9 - Diarrhoeal diseases
10 - Chronic obstructive pulmonary disease	10 - HIV/AIDS

Source: WHO, Evidence, Information and Policy, 2001

The accidents claim over 40,000 lives each year in the United States, roughly the same as the number of Americans killed during the Vietnam War. Americans spend roughly \$100 billion each year on automobile insurance premia , and they bear over \$250 billion in uninsured accident costs each year. Each year a large amount of insurance coverage for automobile accidents is purchased in the US. Total automobile liability insurance premia are over \$100 billion annually (Cohen & Dehejia, 2004).

On September 11, 2001, the twin towers of the World Trade Center were destroyed and history recorded that over 3,000 people were killed. Not many people know that about the same number of people die every day on roads worldwide. It is obvious that road traffic injuries are a major public health problem globally (World Road Association and Global Road Safety Partnership, 2002).

The number of fatalities and injuries from traffic accidents has fallen steadily since the1970s in Germany and many other European countries but, despite this, around 5000 people still die each year as a result of traffic accidents in Germany, with more than 400,000 suffering injuries (Staubach,2009).

Another study in Thailand states that road accidents have not caused only death and disability to Thailand citizens but also substantial damage to the country's economy. It was estimated that the economic losses due to road accidents in Thailand are over 100,000 million Baht (approximately 2,500 million US\$ or 300,000 million Yen) per year, which means over 12 million Baht per hour or about 3.4% of the country's GNP(Tanaboriboon & Satiennam,2004).

These statistical researches show that a substantial and serious work must be done in order to reduce the number of accidents.

Automobile insurance among the other types of insurance fields, has a special features. May be surprised to know that people are more sensitive to the increase in car insurance premiums in compared with other insurance fields. Car insurance actually is considered as a political–social problem and in advanced industrial countries specially America, In order to solve technical and political problems, relevant organizations must work together.(karimi,1386)

In our country only a few parameters of vehicle and driver affect insurance contract price. Risk level of each policyholder is solely determined based on the characteristic of vehicle, while conducted researches during last years indicated that there are many factors that have positive or negative influence on the risk level of individuals. They also suggested insurance companies to consider these factors in rate-making process. According to the results of these studies, Most advanced countries changed their policies and the method of determining their premiums, in fact they decided to determine risk level of each policyholder based on their characteristics and then considered different premium for each risk level. For example:

Washington State Office of the Insurance Commissioner states that Insurance companies base auto rates on a variety of factors. The paid premium consists of a “base rate.” The base rate is adjusted based on factors such as age, sex, marital status, driving pattern, claims history, location, credit history, and the make model and year of vehicle(Washington State Office of the Insurance Commissioner).

1-3 Risk

1-3-1 Definition of Risk

Risk is a condition in which there is a possibility of an adverse deviation from a desired outcome that is expected or hoped for. (J. Vaughan & M.Vaughan,2007)

1-3-2 Classification of Risk

Risks may be classified in many ways, such as(J. Vaughan & M.Vaughan,2007):

➤ **Financial and Nonfinancial:**

The term of risk is referred to exposure to adversity. In some cases this adversity involves financial loss, while in others it doesn't.

➤ **Static and Dynamic**

Dynamic risks are those resulting from changes in the economy such as changes in technology and consumer tastes and etc. Static risks arise from causes other than the changes in the economy such as perils of nature.

➤ **Fundamental and Particular**

Fundamental risks involve losses that are impersonal in origin and consequence for instance: inflation, floods, that are grouped risks .Particular risks involve losses that are out of individual events such as robbery of a bank.

➤ **Pure and Speculative Risks**

Pure risk is referred to those situation that involve only the chance of loss or no loss ,While speculative risks describes a situation where there is a possibility of loss, but also a possibility of gain for example gambling .

1-3-3 Nature of Risk Management:

Risk management is a scientific approach to the problem of dealing with the pure risks faced by individuals and businesses.

1-3-4 Risk management tools

Risk Control and Risk Avoidance are defined as two general risk management tools. (J. Vaughan & M. Vaughan, 2007):

1-Risk Control includes Risk Avoidance and Risk Reduction

➤ **Risk Avoidance:**

Avoidance takes place when decisions are made that prevent a risk from even coming into existence.

➤ **Risk Reduction:**

Risk reduction consists of all techniques that are designed to reduce the likelihood of loss, or the potential severity of those losses that do occur.

Risk financing includes Risk Retention and Risk Transfer:

➤ **Risk Retention:**

When nothing is done about a particular exposure, the risk is retained.

➤ **Risk Transfer:**

Transfer may be accomplished in a variety of ways. The purchase of insurance contracts is, of course, a primary approach to risk transfer .

1-4 Insurance

As mentioned before Insurance can be used as a tool for transferring the risk in order to deal with risk. Insurance is a contract in which one party undertakes to indemnify the loss sustained by the other party caused by the occurrence of specific events, in consideration of receipt of a certain sum or sums of money from the other party. The undertaking party is named the Insurer, the other party the Insured, the money paid by the insured to insurer is termed premium and the subject of insurance is termed interest (Iran Insurance co).

1-4-1 History of Insurance in Iran

Historical background of insurance in Iran goes back to 80 years ago when two Russian companies ventured to open their branch offices, and following that Iran Insurance Company was established as the first independent and

state owned insurance market. In the early 1970s many new insurance companies were established and at the same time the Law establishing Bimeh Markazi Iran (Central Insurance of Iran) was passed in the Parliament. After the Islamic Revolution in 1979, the work permission of foreign insurance agencies in Iran has been withdrawn and ten of the insurance companies were merged in Dana Insurance Co. Bimeh Markazi Iran, while having the responsibility of regulating, supervising and promoting insurance business in Iran, is also the sole reinsure of the market and has a very reputable stand in the Middle East and various markets of the world.(karimi Ayat,1386)

1-4-2 Types of Automobile Insurance in Iran:

I –Vehicle (Body) Insurance:

Compensating damages incurred on the insured vehicle

II -Third Party Insurance:

Compensating damages incurred on persons, including:

1 – Financial Damages

2 – Physical Damages (death, physical defect or disability and medical expenses)

III -Passenger Coverage:

Compensating for damages incurred on passengers of the insured vehicle (death, physical defect, medical expenses) (Iran Insurance co.).

According to the Provisions of the Article one of the Law of Compulsory Third Party Liability Insurance, all the owners of land transport motor vehicles and all kinds of tuggers and trailers attached to the said vehicles and railway trains are liable for damages to persons and properties incurred by third parties as a result of the accidents of such vehicles of consignments thereof and are obligated to insure their liability in this respect with one of the Iranian insurance companies. Therefore, the damages resulting from the aforesaid vehicles are classified into the two following groups (Center of Insurance of Iran.):

1- Damages to persons

Compensation of damage to persons, means indemnification of third parties for the treatment expenses of physical damage or injuries resulting from traffic accidents as well as indemnities for failure and deficiency of body members, permanent, absolute or relative disablement or death resulting from accidents covered by insurance.

Therefore, the insurer indemnifies damages to persons under the three following titles:

A- Expenses for treatment of physical damage or injury.

B- Indemnity for failure and deficiency of body members, permanent, absolute or relative disablement.

C- Indemnity for death.

The amount of damages to persons shall be determined on the basis of the court judgment having due regard to the Islamic Penal Law.

2- Damages to properties.

“Indemnity for damages to properties consists of the provision and compensation for direct losses resulting from accidents covered by insurance, to the objects and properties under the ownership or legal possession of individuals.”

1-5 Methodology

1-5-1 Specifying Factors

As mentioned before this research is going to examine some factors that may have influence on the number of accident. First of all the factors that may affect the accident rate were specified: type and color of car, gender, marital status, job, and kind of insurance contract. Next categorizing factors into specific groups as following:

Cars into: Pride, Peagout 405, Peagout 206, Samand and others.

Color of car into three groups: Bright, dark, uncommon.

Classifying Jobs into: governmental, nongovernmental, student and jobless.

Kind of insurance policy into four groups: third party, Body, Third party and body, none.

Next Step devising the questionnaire, publishing it and gathering information from answered questionnaires (about 500 answered questionnaires).

In chapter four data collected were analyzed by mathematical and statistical software and using appropriate statistical test and graphs to test the hypothesis.

1-5-2 Main Hypothesis

1-Accident rate depends on the type of car.

2-Tendency to dark colors indicates the higher degree of risk levels.

3- Men have greater frequency of accidents than women.

4- Amount of car insurance demand has negative effect on the driver's number of accident.

5-Driver's kind of job has influence on the accident rate.

After testing mentioned hypothesis, In chapter 5 we present Poisson and also Negative Binomial models and expression the best model based on the result of statistical tests.

1.6 Data Requirement:

Required Data are provided using questionnaire. A questionnaire survey is carried out in Tehran and Isfahan. The number of questionnaires distributed in each of two cities is calculated using the proportional allocation. Simple random sampling is used in this research. And also the samples are taken from different parts of the cities to ensure that the process is completely random. This research includes both male and female drivers of all ages. The records related to four car types manufactured majorly by the two major Iranian companies (Saipa and Irankhodro) are taken into account. We also consider accidents occurred during 1387-1390.

Finally about 900 questionnaires were answered by people which 517 of them were usable.