PREFACE

From the beginning of the civilization, human being has always been in search of security and protection in life and business activity. In any business activity as well as in human life, at the same time, risk is inevitable. Risk is defined as 'the variation in potential outcomes to which an associated probability can be assigned. In statistical terms, the distribution of the variable is known, but not the value from the distribution, which will be realized. One of the common methods of handling risk is Insurance. Because risk is associated with probability, risk can be managed or accommodated through purchase of 'Insurance'. One does not know if one will be in an automobile accident next year. But because of the probability of being in an accident is known, one can buy insurance to protect against that unfortunate outcome. Insurance may be described as a social device to reduce or eliminate risk of loss to life and property. Insurance is a protection against financial loss arising on the happening of an unexpected event. Insurance provides financial stability and security to both individuals and organizations by this distribution of losses of a few among many by building up a fund over a period of time. Insurance sector in India is booming up but not to level comparative with the developed economies.

Automobile industry is one of the key industries in Indian economy. The growth of this industry is playing key role in the country's overall industrial growth. The Indian automobile industry is the second fastest growing in the world. Developing countries represent underinsurance status. The motor premium rates are
among the lowest in the world. Insurance services represent the logical step of financial integration of the owner, drivers and passengers. Auto insurance company set premium according to the driver's previous performance. Each and every auto insurance agency, company and also provider has its own auto insurance policy. For any type of damage to the vehicle an auto insurance policy is the best way to get rid of it. For each and every automobile it is necessary to have a policy of insurance as automobiles are prone to accidents and also damage.

In a competitive market, the products need to be priced equitably based on their individual risk experience which is not practiced due to tariff restrictions. It is alleged that tariffs are rigid based on out-dated statistical data, and that premium rates are not revised in response to the market dynamics. However, in order to derive the rates in a scientific manner based on market dynamics, it is essential to have accurate data on the different lines of business, which is abysmal in the motor insurance industry. The insurers are unable to generate adequate database to enable scientific calculations for risk assessment and rating of different groups of vehicles.

Many concepts in applied probability and statistics those are particularly useful for actuaries working in general or non-life insurance as well as in automobile insurance. The topics include Bayesian theory and credibility, simulation, run-off triangle as well as concepts of rating, Markov chain, logistic regression, correspondence analysis and many others. This thesis elaborates more on these particular topics, propose some new methods or extend some existing
models and indicates why they are important for the general insurance actuary as well as in this study.

Keeping in view the importance of the study, the present work has been undertaken with the following objectives:

- To propose alternative Bayesian Credibility models and to test these with conventional approach to explore the claim frequency as well as premium.
- To modify the loss reserving model and to compare it with existing one to know the loss reserve pattern.
- To study the stochastic behavior of NCD system of professional automobile drivers and to know the long run claim pattern.
- To identify the socio-economic and demographic factors affecting the life insurance policy of professional automobile drivers.
- To observe prevalence of the risk factors of driving among the professional automobile drivers.

Outline of the work under different chapters of the thesis are given below:

The introductory chapter of the thesis, chapter I, covers brief conception of insurance, importance of the study and review of important literatures pertaining to the objective of the study, need and objective of the study and data sources. This chapter ends with the description of the organization of the study.

Chapter II looks at the Bayesian credibility models for automobile insurance and its applications in automobile insurance. Credibility theory in automobile insurance is essentially a form of experience-rating, which attempts to
use the data in hand as well as the experience of others in determining rates and premiums. In classical credibility theory, a linear Bayesian forecast of the premium earned or claim frequency for an individual risk is made using prior estimates of the collective premium or claim frequency and individual experience data. The Poisson/Gamma model and Normal/Normal model are two popular models for estimating claim frequency and amount of premium earned respectively. But these two models may not be sufficient to study the behaviour of the risks in different situations. In this thesis, two more Bayesian models under different set of assumptions have been proposed viz. Poisson/Chi-square and Poisson/Exponential model. From the study it is found that Poisson/Gamma model and Normal/Normal model are suitable for our secondary datasets of number of claims and amount of premium. For the simulated dataset of number of claims, Poisson/Gamma model as well as Poisson/Chi-square model are appropriate. Poisson/Exponential model also may describe for monthly or quarterly data where the number of claims gradually decreasing.

Chapter III deals with the development of loss reserving models and its applications to automobile insurance. In some areas of automobile insurance, there may be considerable delay between the time of a claim inducing event and the determination of the actual amount the company will have to pay in settlement. In the case of an accident the incident may be quickly reported, but it may be a considerable amount of time before it is determined actually who is liable and to what extent. There may be considerable delay between the time of claim inducing
event and the determination of the actual amount the company will have to pay in settlement. To get the correct picture of its liabilities, an insurance company should set aside the correctly estimated amount of money to meet the claims arising in the future on the written policies. The past data are used to construct estimate for the future payments consist of a triangle, called run-off triangle of incremental claim. Various methods are available for estimating amount of reserve to be kept for making timely claim paid and distribution free chain ladder method is one of them. This thesis tries to extend this technique which allows one to evaluate fitness, variability and basic assumptions better. From this it is found that the extended techniques can be effective methods of estimating the reserves in the incremental run-off triangle.

Chapter IV is devoted to Markovian study of no claim discount (NCD) systems. NCD systems are experience-rating systems which are commonly used in motor insurance. NCD schemes represent an attempt to categorize policyholders into relatively homogeneous risk groups who pay premiums relative to their claims experience. Those who have made few claims in recent years are rewarded with discounts on their initial premium, and hence are enticed to stay with the company. Depending on the rules in the scheme, new policyholders may be required to pay the full premium initially and then will obtain discounts in the future as a result of claim free years. This chapter finds out the probabilities of claims by different categories of policyholders (motorists) according to their driving experience as well as previous accident records. Here, a transition probability matrix for different
discount levels following the Insurance Regulatory and Development Authority, India rules of NCD using Markov chains has been proposed. From the study of long run behavior of premium to be paid by different groups of policyholders, it is found that NCD rates are not parallel with probability of making a claim by policyholders.

Chapter V isolates the factors influencing professional automobile drivers' demand for life insurance. The professional automobile driving population is one of the most important sections for research of this field. It is necessary identify the most influencing factors in the life insurance demand that are taken by professional automobile drivers in our country. To obtain a better understanding of affecting factors, a logistic regression analysis has been applied in this study to identify the factors that might effects of taking life insurance policy. The life insurance policies of drivers are found to be strongly associated with the religion, health, family income and type of family, number of accident, geographical area driving, marital status, self car driving and age of license obtained. This study also reveals that nature of use (passenger carrying or goods carrying) of vehicle, highest qualification in the family and drinking behavior have no significance effect on taking the life insurance policies.

Chapter VI measures the levels of knowledge about drugs of professional automobile drivers. Professional automobile drivers are important segment of the population who are likely to be familiar with addictive drugs such as heroine, cocaine, aphim and others. Knowledge about drugs and its ill effects on human
health are important for both sound health as well as safe driving. This section of
the thesis gives a comprehensive explanation of the multivariate technique called
correspondence analysis (CA), applied in the context of the knowledge about
addictive drugs of professional automobile drivers. The CA technique has been
applied to study socio-demographic factors that explaining the knowledge about the
addictive drugs of the automobile drivers which may helpful directly or indirectly
in various insurance rate fixing. This study reveals that the knowledge about
addictive drugs varies with the factors like geographical location of driving, age,
social group or caste, education, health status, types of vehicle use, number of
friends and experience of driving.

Chapter VII presents overall summary and conclusion of the study pointing
out the main findings, possible future work, limitations and message to the policy
makers.

From the overall study, it has been found that new models (proposed
throughout the thesis) as well developments may be more consistent and sensitive
over conventional ones for appropriate dataset. The finding of the present work will
be helpful for better understanding of the claiming process. Present work may be
helpful for academicians, policyholders and planners to deal with automobile
insurance problems.