

2018-19 Scenario Response

Topic 1: Automobile Insurance



A program of The Actuarial Foundation

**Modeling The Future
Challenge**



Auto Insurance Topic Overview

Worldwide Insurance is a property and casualty insurance company based out of Hartford, Connecticut. This past year, the company had 10,008 auto insurance policy holders. The company has asked your firm to perform a preliminary analysis of their data, and provide recommendations to management on how they can better understand their insurance policies related to four car brands: Tonga, Bergen, Davis, and Montes.

Data Summary:

You have been given 10,008 observations of policies, with 2,502 policies in each of four car brands (Tonga, Bergen, Davis, and Montes). These observations were pulled from Worldwide Insurance's internal databases. Each policyholder is identified by their policy number (column A), car brand (column B), gender (column C), and age (column D, y=young, m=middle-aged, o-old).

Worldwide Insurance has asked your firm to answer a series of questions after analyzing their data and provide recommendations to their management.



Questions

Question 1: Estimate the probability that a Tonga owner has a loss during one year.

Question 2: Estimate the loss on a policy, given that the policyholder owned a Bergen.

Question 3: Do you see a relationship between Age and Loss, given a loss has occurred? If so, what type of relationship? What could be a logical reason for this trend?

Question 4: Do you see a relationship between gender and the frequency of a loss occurring?

Question 5: Which car brand and gender combination has the least expected payout?

Question 6: What type of distribution does a Davis policyholder's loss have, given that there is a loss? Graph the distribution and comment on its shape.

Question 7: A family owns two cars, a Davis and a Tonga. What is the probability that exactly one of the policies will have a loss in the next year? The parents (middle-aged) drive the Tonga, while the children (young) drive the Davis.

Question 8: Joe, a 20-year old male is looking to buy insurance for a new Davis. His quote is \$1800 per year. Joe comes to you, and asks you to analyze the data to see if the quote is higher than the expected amount that he would lose each year without insurance. What is the expected loss per year? What additional value does an insurance policy provide, if the expected loss is lower than the quote?

Question 9: Calculate the pure premium for a young male driving a Davis, using a profit margin of 15% and fixed costs of \$134 per policy holder. If we ignore interest, pure premium of an insurable event equals the likelihood the event will happen (called the frequency) multiplied by the insurer's expected cost when the event happens (called the severity). Interpret this number.

Question 10: Do you think an insurance company should use car brand, gender, and age to determine a policyholder's premium? What other variables can you think of that might have an impact on expected loss, and why?



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