# **AIM**

To investigate how insurance firms use descriptive statistics and probability distributions to quantify and manage risks associated with different policy types.

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## **PREREQUISITES**

**Risk assessment by insurance firms**, focusing only on probability distributions and descriptive statistics are done using the following topics from the syllabus.

* **Descriptive Statistics:**

**-Mean, Median, and Mode:** To average claim amounts and typical claim sizes.

**-Standard Deviation and Variance:** To measure how much claim amounts vary, which is essential for assessing risk.

* **Probability Distributions**

**-Binomial Distribution:** Used for modelling risks with two outcomes like making a claim or not.

**-Poisson Distribution:** Models the frequency of claims for example number of accidents per year.

**-Normal Distribution:** This is assumption, it assumes that the claim or

other financial data follow a symmetric distribution around a mean,

useful for analyzing average costs.

### **OBJECTIVE of STUDY**

**Understanding Risk in few insurance policies**

* **Purpose of Risk Assessment:** Insurance companies use risk assessment to predicts potential future claims and to ensure they can cover these claims while remaining profitable.
* **Descriptive Statistics in Risk Analysis**

**. Role of Descriptive Statistics:** Descriptive Statistics helps insurers

summarize and analyze historical data on claims, which is used by the

insurance companies.

**. Key Measures** that are used are mentioned in the prerequisites.

* **Probability Distributions**

**. Importance in Risk Assessment:** Probability Distributions model the

likelihood of certain types of the occurring of claims. So due to this the insurers select a distribution that best fits the nature of risk.

**. Distributions** that are used are mentioned in the prerequisites.

#### **RESEARCH QUESTION**

**How do insurance firms utilize descriptive statistics and probability distributions to analyze data, predict potential risks, and determine fair premiums for policyholders?**

##### **METHODOLOGY**

**Identify Key Risk Factors**

- Determine the variables affecting risk (e.g., age, health conditions, frequency of claims, claim amounts).

- Group the data into categories based on these factors.

**Calculate Descriptive Statistics**

- Compute measures of central tendency (mean, median, mode) to identify typical values in the dataset, such as the average claim amount or age of policyholders.

- Calculate measures of dispersion (range, variance, standard deviation) to assess the variability in data, such as differences in claim amounts.

**Choose Appropriate Probability Distributions**

- Analyze the dataset to determine the suitable probability distribution:

- Binomial Distribution: For events with two outcomes (e.g., claim or no claim).

- Poisson Distribution: For the frequency of claims in a specific time period

- Normal Distribution: For continuous variables like claim amounts or ages of policy holders

**Estimate Probabilities**

- Calculate probabilities for specific events using the chosen distribution models

- Likelihood of high-value claims.

- Frequency of claims in a given period.



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**Determine Expected Value**

- Use the formula

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* E(X): Expected value
* P(xi): Probability of outcome xi
* Xi: Value of the outcome
* N: No of possible outcomes.

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###### **EVIDENCE & ANALYSIS OF DATA**

**Dataset used in the project:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Policyholder ID | **Age** | **Health Score (1-10)** | **Claim Frequency (per year)** | **Average Claim Amount (₹)** |
| **1** | **25** | **8** | **3** | **5000** |
| **2** | **30** | **7** | **1** | **4500** |
| **3** | **45** | **6** | **2** | **7000** |
| **4** | **50** | **5** | **4** | **10000** |
| **5** | **35** | **7** | **2** | **6000** |
| **6** | **60** | **4** | **5** | **12000** |
| **7** | **40** | **6** | **3** | **8000** |
| **8** | **55** | **5** | **4** | **9500** |
| **9** | **28** | **9** | **1** | **4000** |
| **10** | **32** | **8** | **1** | **4200** |
| **11** | **38** | **7** | **2** | **6100** |
| **12** | **46** | **6** | **3** | **7500** |
| **13** | **53** | **5** | **4** | **9800** |
| **14** | **29** | **9** | **1** | **3900** |
| **15** | **48** | **5** | **3** | **7400** |
| **16** | **42** | **6** | **2** | **8100** |
| **17** | **31** | **8** | **1** | **4300** |
| **18** | **34** | **7** | **2** | **5600** |
| **19** | **36** | **7** | **2** | **6200** |
| **20** | **39** | **8** | **1** | **5900** |
| **21** | **27** | **9** | **1** | **4000** |
| **22** | **33** | **8** | **2** | **6000** |
| **23** | **41** | **6** | **3** | **7400** |
| **24** | **37** | **7** | **2** | **8000** |
| **25** | **49** | **5** | **4** | **10500** |