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INTRODUCTION

In statistics Frequency distribution can broadly be classified under two heads:

(1)Actual Frequency Distribution and,(2)Probability or Theoretical Frequency Distribution.

1.Actual frequency distribution-It is also known as observed frequency distribution. It is constructed on the basis of data available or observed in the statistical experiments.

2.Theoretical Or Probability Frequency Distribution-It It is also known as expected all probability or model frequency distribution.Theoretical frequency distribution as a distribution of frequency which is not based on actual experiment or observation but it is constructed through expected frequency contained by mathematical computation based on certain hypothesis.

Importance Of Theoretical Frequency distribution

a.On the basis of theoretical frequency distribution the nature and range of frequency distribution can be estimated under certain assumption and conditions.

b.the phenomenon of risk and uncertainty can be analysed on the basis of theoretical distribution.

c.theoretical frequency distribution provide base for prediction, projection and forecasting.

d.They can be used as substitutes for actual distribution, when two obtain the letter is costly or cannot be obtained at all.

Types of probability distribution

1.Binomial distributionby nominal distribution is associated with the name of swiss mathematician**James Bernoulli(1654-1705)**.In this distribution frequency are divided on the basis of two aspect or two possible outcome, which for the sake of convenience, are called as success and failure.

Definition

Binomial distribution is a discrete frequency distribution, which is based on dichotomous alternative i.e., on the basis of probability of data of success and failure.

$$P(x) = {}^n C_x q^{n-x} P^x$$

Whereas,

P = Probability of success

q = Probability of failure

n = number of trials, x or r = number of successes in n trials

Assumption of binomial distribution

a) Finite number of trials: In this distribution the number of trials should be finite and fixed.

b) Mutually exclusive outcomes: In each trial, there must be only two possible outcomes of the event which are mutually exclusive.

c) All trials independent: All trials must be independent of each other i.e. the result of any trials should not be affected by the result of a previous trial.

Characteristics

- Binomial distribution is a theoretical frequency distribution based on Bernoulli's theory of algebra.
- The binomial distribution is a discrete probability distribution in which the number of successes 0, 1, 2, 3, ..., n are given in whole number and not fractions.
- The binomial distribution can also be presented graphically.

2. Poisson Distribution- Poisson distribution was originated by French mathematician **simon Denis Poisson** in the year 1837. It is a discrete probability distribution. It is used in such cases where the value of p is very small p approaches to zero and the value of n is very large. In such cases binomial distribution does not give appropriate theoretical frequencies, Poisson distribution is found very appropriate.

Poisson Distribution is used to describe the behaviour of rare events such as a number of germs in one drop of pure water, number of printing errors per page, number of telephone calls arriving per minute at a telephone switchboard, etc.

$$\text{Poisson Distribution} = P(X=x) = e^{-m} \cdot \frac{m^x}{x!}$$

Where X = Probability of Success, e the base a natural logarithm, whose value is 2.71828.

Use of Poisson Distribution

- In insurance problems To count the number of casualties,
- In determining the number of deaths due to suicide or rare diseases,
- in biology to count the number of bacteria,
- in physics to count the number of practical emitted from a radioactive substances,
- Number of accidents taking place per day on a busy .

3) Normal Distribution: The normal distribution was first discovered by English mathematician **Abraham De-Moivre** in the year 1733 but the credit of its practical application goes to French mathematician **Laplace** and germanastronomer **Karl Gauss**.

- **Meaning-** NormalDistribution is a continuous probability distribution in which the relative frequencies of a continuous variable are distributed according to normal probability law.

$$P(x) = \frac{1}{\sigma\sqrt{2\pi}} \cdot e^{-\frac{1}{2} \left(\frac{x-\bar{X}}{\sigma} \right)^2} \quad -\infty < X < +\infty$$

Where \bar{X} = Mean, σ = Standard deviation, e (base of natural logarithm).

Importance

- The distribution isn't universal distribution because except certain condition almost in all area nature of frequency distribution is normal
- The normal distribution serves as a good approximation to binomial and poisson distribution particularly when the number of observations increases
- It is very useful in statistical quality control where the control limits are set by using this distribution.
- The whole theory of a small sample is based on the fundamental assumption that the pairings population from which the sample had been drawn follow normal distribution.

Difference between Binomial, Poisson And Normal Distribution

- **Nature of distribution:** Binomial distribution and Poisson distributions whereas Normal distribution is a continuous probability function.
- **Value of n:** In a binomial distribution the number of trials or the value of n is finite, whereas it is infinite or very large in Poisson and normal distributions.
- **Shape:** The binomial distribution can be symmetrical and asymmetrical and it depends on the value of p and q .
- **Value of p and q :** In a binomial distribution the value of p and q are approximately equal. In a Poisson distribution p approaches to zero and q approaches to 1, whereas in normal distribution neither the value of p nor the value of q is very small.
- **Parameters:** the binomial distribution has a two parameter n and q . The normal distribution also has a two parameter but they are μ and σ . The Poisson distribution has only one i.e., m .

Short Questions

1. What is Binomial distribution ?
2. What is meant by theoretical distribution?

Long Questions

1. Distinguish between the normal and binomial distribution and discuss briefly the importance of normal distribution.

Reference

- **Statistical Analysis-** Dr. S.M. Shukla, Dr. K.L. Gupta, Sahitya Bhawan publications
- www.wikipedia.com

Thank you