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Topic: Probability distribution

Probability distribution

A probability distribution is a statistical function that describes all the possible values and likelihoods that a random variable can take within a given range. This range will be bounded between the minimum and maximum possible values, but precisely where the possible value is likely to be plotted on the probability distribution depends on a number of factors. These factors include the distribution's mean,stander deviation ,skewness, and Kurtosis.

- A probability distribution depicts the expected outcomes of possible values for a given data generating process.
- Probability distributions come in many shapes with different characteristics, as defined by the mean, standard deviation, skewness, and kurtosis.
- Investors use probability distributions to anticipate returns on assets such as stocks over time and to hedge their risk.

Types of Probability Distributions

- There are many different classifications of probability distributions.
- Some of them include the normal distribution, chi square distribution, square,binomial distribution, and Poisson distribution.
- The different probability distributions serve different purposes and represent different data generation processes.
- **Discrete Probability Distributions**

The probability distribution of a discrete random variable can always be represented by a table. For example, suppose you flip a coin two times. This simple exercise can have four possible outcomes: HH, HT, TH, and TT. Now, let the variable X represent the number of heads that result from the coin flips. The variable X can take on the values 0, 1, or 2; and X is a discrete random variable.

The table below shows the probabilities associated with each possible value of X. The probability of getting 0 heads is 0.25; 1 head, 0.50; and 2 heads, 0.25. Thus, the table is an example of a probability distribution for a discrete random variable.

Number of heads, x	Probability, P(x)
0	0.25
1	0.50
2	0.25

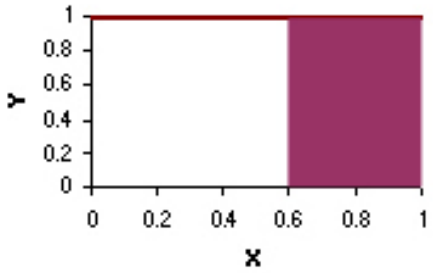
Note: Given a probability distribution, you can find cumulative probabilities. For example, the probability of getting 1 or fewer heads [P(X < 1)] is P(X = 0) + P(X = 1), which is equal to 0.25 + 0.50 or 0.75.

➢ Continuous Probability Distributions

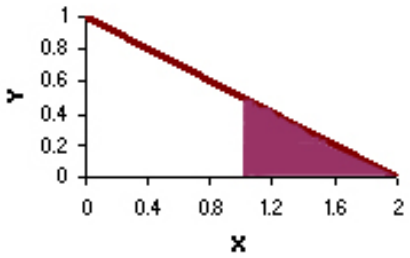
The probability distribution of a continuous random variable is represented by an equation, called the **probability density function** (pdf). All probability density functions satisfy the following conditions:

- The random variable Y is a function of X; that is, y = f(x).
- The value of y is greater than or equal to zero for all values of x.
- The total area under the curve of the function is equal to one.

The charts below show two continuous probability distributions. The first chart shows a probability density function described by the equation y = 1 over the range of 0 to 1 and y = 0 elsewhere. The second chart shows a probability density function described by the equation y = 1 - 0.5x over the range of 0 to 2 and y = 0 elsewhere. The area under the curve is equal to 1 for both charts.



y=1



y=1-0.5x

The probability that a continuous random variable falls in the interval between *a* and *b* is equal to the area under the pdf curve between *a* and *b*.

For example, in the first chart above, the shaded area shows the probability that the random variable X will fall between 0.6 and 1.0. That probability is 0.40. And in the second chart, the shaded area shows the probability of falling between 1.0 and 2.0. That probability is 0.25.

Note: With a continuous distribution, there are an infinite number of values between any two data points. As a result, the probability that a continuous random variable will assume a particular value is always zero. For example, in both of the above charts, the probability that variable X will equal *exactly* 0.4 is zero.

Problem 1

The number of adults living in homes on a randomly selected city block is described by the following probability distribution.

Number of adults, x	Probability, P(x)
1	0.25
2	0.50
3	0.15
4 or more	???

What is the probability that 4 or more adults reside at a randomly selected home?

(A) 0.10
(B) 0.15
(C) 0.25
(D) 0.50
(E) 0.90

Solution

The correct answer is A. The sum of all the probabilities is equal to 1. Therefore, the probability that four or more adults reside in a home is equal to 1 - (0.25 + 0.50 + 0.15) or 0.10.