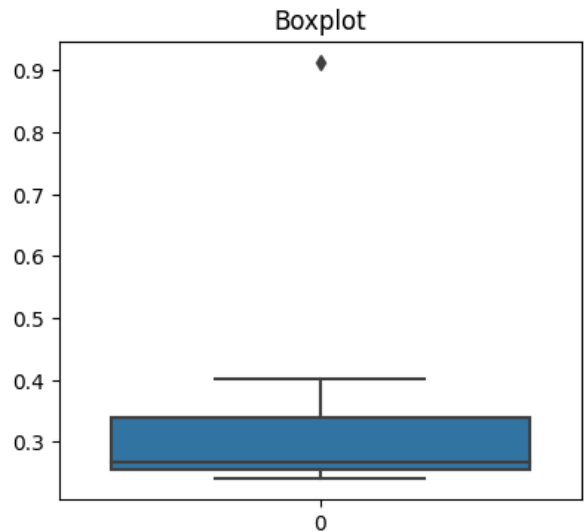
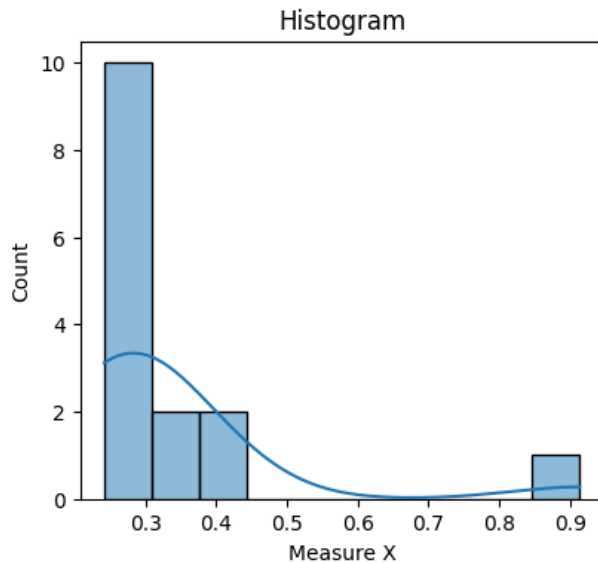


Topics: Descriptive Statistics and Probability

1. Look at the data given below. Plot the data, find the outliers and find out μ, σ, σ^2

Name of company	Measure X
Allied Signal	24.23%
Bankers Trust	25.53%
General Mills	25.41%
ITT Industries	24.14%
J.P.Morgan & Co.	29.62%
Lehman Brothers	28.25%
Marriott	25.81%
MCI	24.39%
Merrill Lynch	40.26%
Microsoft	32.95%
Morgan Stanley	91.36%
Sun Microsystems	25.99%
Travelers	39.42%
US Airways	26.71%
Warner-Lambert	35.00%



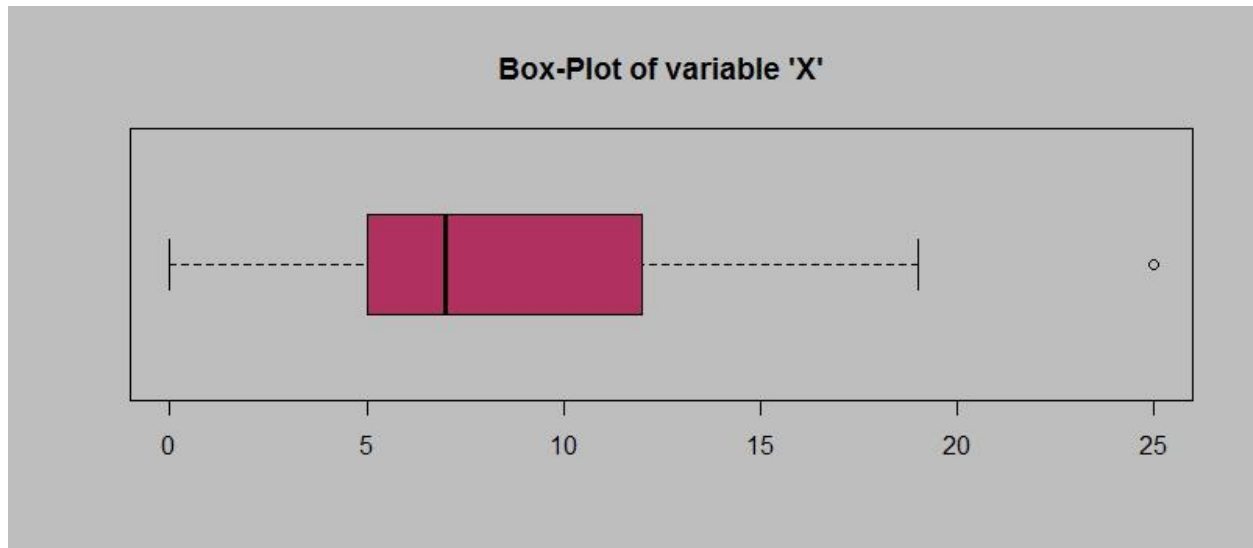
outliers are: Morgan Stanley | 91.36%

mean, $\mu = 33.27\%$

standard deviation, $\sigma = 0.1694$

variance, $\sigma^2 = 0.0287$

2.



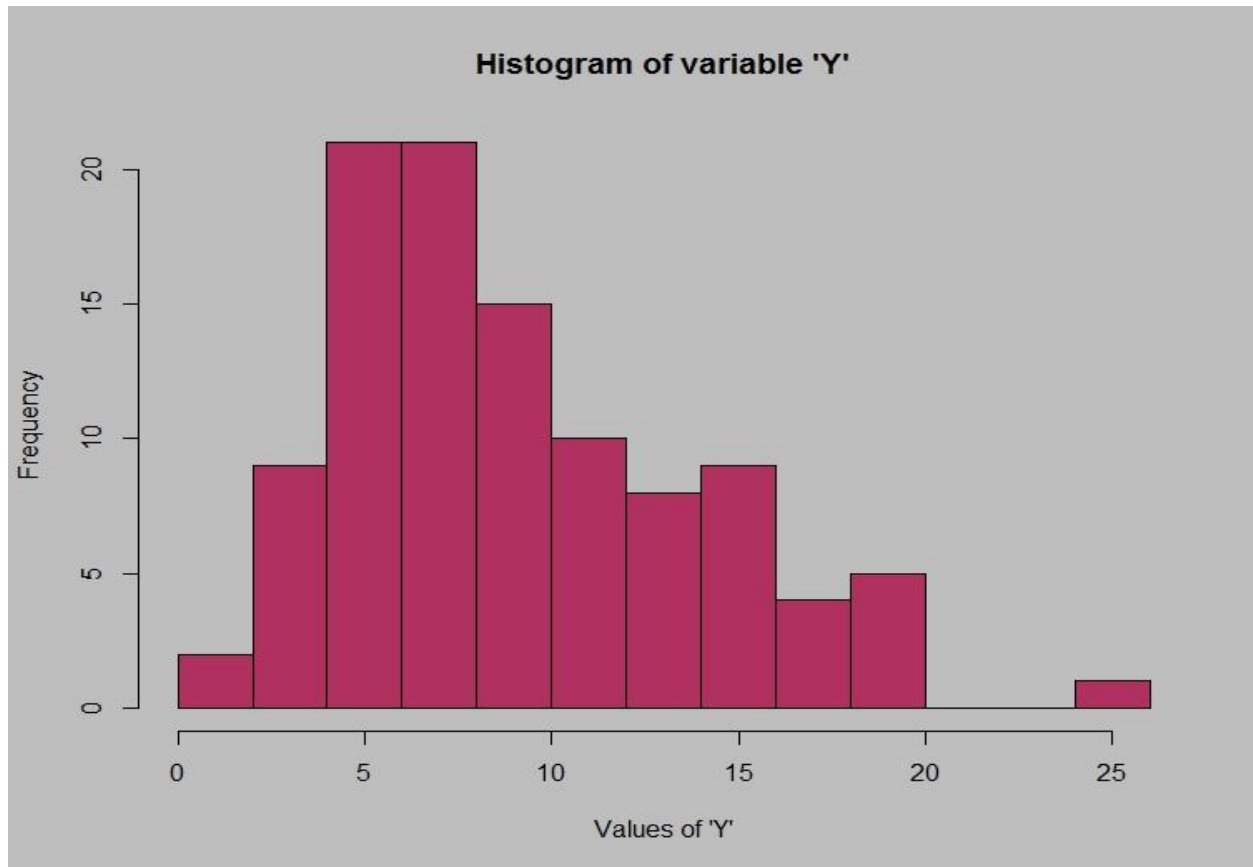
Answer the following three questions based on the box-plot above.

- (i) What is inter-quartile range of this dataset? (please approximate the numbers) In one line, explain what this value implies.
- (ii) What can we say about the skewness of this dataset?
- (iii) If it was found that the data point with the value 25 is actually 2.5, how would the new box-plot be affected?

Answers:

- (i) Inter-quartile range is approximately 7 units. ($IQR = Q3 - Q1 = 12 - 5 = 7$)
The inter-quartile range is difference between 75th and 25th percentiles of the data. It shows the statistical spread of data.
- (ii) This data is right-skewed.
- (iii) The box plot will not show any outliers, since all values will come inside $IQR \times 1.5$ range.

3.



Answer the following three questions based on the histogram above.

- (i) Where would the mode of this dataset lie?
- (ii) Comment on the skewness of the dataset.
- (iii) Suppose that the above histogram and the box-plot in question 2 are plotted for the same dataset. Explain how these graphs complement each other in providing information about any dataset.

Answers:

- (i) The mode will somewhere in those two tallest peaks in histogram.
Approximate between 4 and 8.
- (ii) Mean>Median>Mode
The data is right-skewed
- (iii) Both plots are right skewed.
Both plots have outliers near to 25.

4. AT&T was running commercials in 1990 aimed at luring back customers who had switched to one of the other long-distance phone service providers. One such commercial shows a businessman trying to reach Phoenix and mistakenly getting Fiji, where a half-naked native on a beach responds incomprehensibly in Polynesian. When asked about this advertisement, AT&T admitted that the portrayed incident did not actually take place but added that this was an enactment of something that “could happen.” Suppose that one in 200 long-distance telephone calls is misdirected. What is the probability that at least one in five attempted telephone calls reaches the wrong number? (Assume independence of attempts.)

Ans: Probability of calls getting misdirected, $p = \frac{1}{200}$

Probability of calls getting right, $q = 1 - \frac{1}{200} = \frac{199}{200}$

The probability of calls getting misdirected, $P(x) = \binom{n}{k} p^x q^{n-x}$

The probability of at least 1 call getting misdirected $P(X \geq 1) = 1 - P(X = 0)$

$$1 - P(X = 0) = {}^5C_0 \left(\frac{1}{200}\right)^0 \left(\frac{199}{200}\right)^5$$

$$1 - P(X = 0) = 1 - 0.99999960125$$

$$P(X \geq 1) = 0.0000039875$$

the probability that at least one in five attempted telephone calls reaches the wrong number is approximately 0.0000039875, or about 0.0004%.

5. Returns on a certain business venture, to the nearest \$1,000, are known to follow the following probability distribution

x	P(x)
-2,000	0.1
-1,000	0.1
0	0.2
1000	0.2
2000	0.3
3000	0.1

- (i) What is the most likely monetary outcome of the business venture?
- (ii) Is the venture likely to be successful? Explain
- (iii) What is the long-term average earning of business ventures of this kind? Explain
- (iv) What is the good measure of the risk involved in a venture of this kind? Compute this measure

Ans:

- (i) Looking at the table highest probability is 0.3 for x=2000. The most likely monetary outcome of this business will be 2000\$.

- (ii) Probability of earning 0 or more profits is equal to

$$P(X \geq 0) = 0.2 + 0.2 + 0.3 + 0.1 = 0.8$$

So, the chances of getting profits more than zero are 80% So venture is likely to be successful.

- (iii) The long-term average earning of business ventures can be calculated using the expectation

$$E(X) = \sum_i x_i P(x_i)$$

$$E(X) = 0.1(-2000) + 0.1(-1000) + 0 + 0.2(1000) + 0.3(2000) + 0.1(3000)$$

$$E(X) = 800$$

Therefore, the long-term average earning of business ventures is \$800.

- (iv) The good measure of the risk involved in a venture of this kind is Standard Deviation.

First, we will calculate variance

$$Var(X) = E(X^2) - (E(X))^2$$

$$E(X^2) = 0.1(4000000) + 0.1(1000000) + 0.2(1000000) + 0.3(4000000) + 0.1(9000000) \\ = 2800000$$

$$Var(X) = 2800000 - 640000 = 2160000$$

$$\sigma = \sqrt{Var(X)} = 1469.69$$

The standard deviation of this venture is around \$1470. Which can be consider as risky by comparing to the long-term earning.