

Contents

EXAMPLE ON VARIANCE & STANDARD DEVIATION	2
NORMAL DISTRIBUTION(BELL SHAPED CURVE)	2
MEASURES OF SHAPE	3
DEGREE OF SKEWNESS.....	4
SKEWNESS EXAMPLE	4
SKEWNESS INTERPRETATION.....	4
KURTOSIS.....	5
TYPES OF KURTOSIS:	5
EXAMPLE	5
CUMULATIVE FREQUENCY:	6
EXAMPLE	6
TYPES OF GRAPH.....	6
OGIVES.....	6
BAR CHART.....	7
PIE CHART	8
LINE CHART	9
SCATTER PLOT	10
DESCRIPTIVE STATISTICS	11
EXAMPLE	11

EXAMPLE ON VARIANCE & STANDARD DEVIATION

A firm is starting a delivery service for a new client between 2 points. Since it is a new client, the firm wants to send more consistent delivery boy to deliver the product.

Delivery boy 1 (Time in minutes) – 12,13,17,21,24, 24, 26,27, 27, 30, 32, 35, 37, 38, 41, 43, 44, 46,53,60

Delivery boy 2 (Time in minutes)- 34, 14, 31, 59, 11, 50, 27, 33, 53, 34, 13, 13, 42, 29, 33, 42, 34, 33, 44, 21

The average time taken by both the delivery boys is same i.e **32.5 minutes**

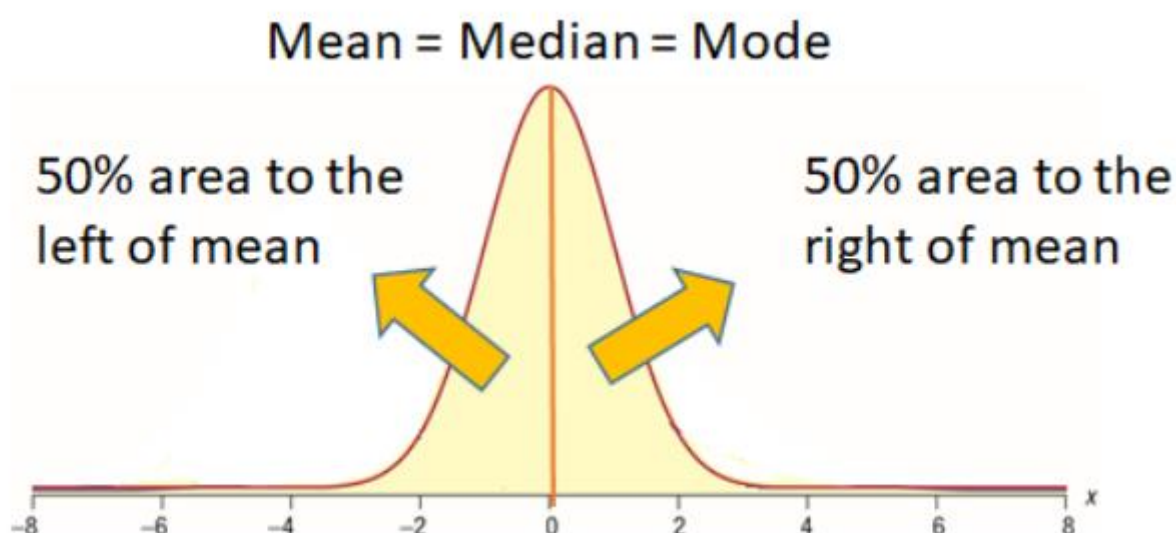
How can the firm arrive on a conclusion?

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NORMAL DISTRIBUTION(BELL SHAPED CURVE)

A normal distribution is the distribution in which most values cluster in the middle of the range and the rest taper off symmetrically toward either extreme.

Height is one simple example of something that follows a normal distribution pattern: Most people are of average height, the number of people that are taller and shorter than average are fairly equal and a very small (and still roughly equivalent) number of people are either extremely tall or extremely short.

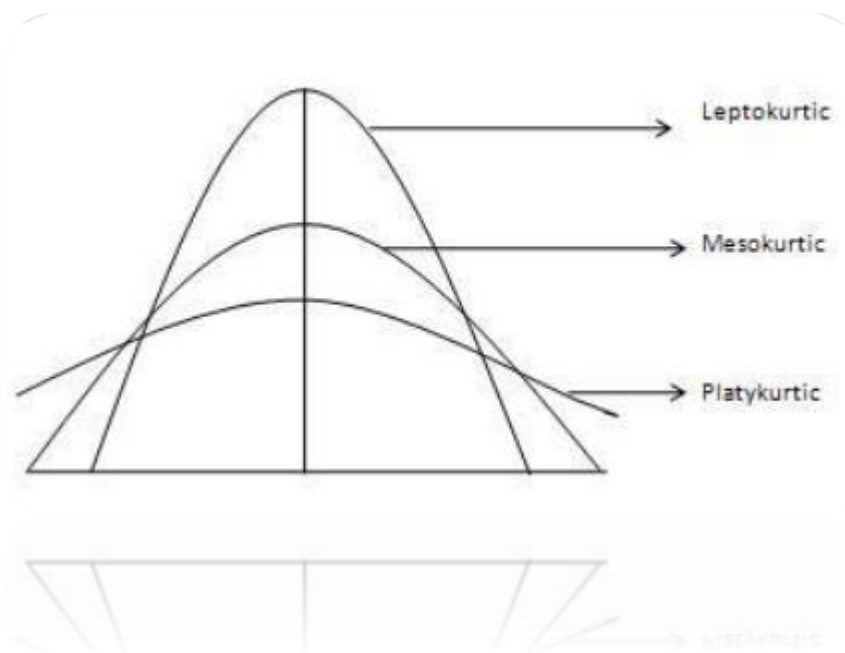
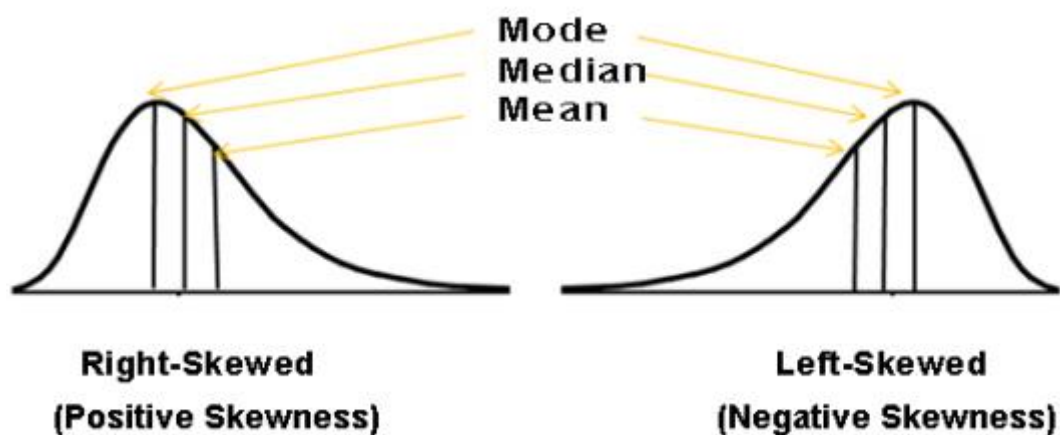


MEASURES OF SHAPE

- Measures of shape describes the distribution or pattern of the data in a set
- The distribution shape of the quantitative data can be described as there is a logical order to the values and the low and high end values on the horizontal axis of the histogram
- The distribution shape of the qualitative data cannot be described.

Measures of shape are as follows:

- ✓ Degree of Skewness
- ✓ Kurtosis



DEGREE OF SKEWNESS

- ✓ Skewness is the tendency for the values to be more frequent around the high or low ends of the x axis
- ✓ Skewness is a measure of symmetry
 - **Symmetric data** – The data is symmetrically distributed on both side of medium
mean = median = mode
 - **Positively Skewed data** – Tail on the right side is longer than the left side
mode < median < mean
 - **Negatively Skewed data** – Tail on the left side is longer than the right side
mode > median > mean

SKEWNESS EXAMPLE

How skewed is Virat Kohli's innings ?

23, 1, 1, 3, 38, 44, 33, 33, 46, 107, 8, 3, 4, 9, 139, 66, 53, 49, 22, 127, 62, 2, 13, 1, 40, 0, 5, 48, 136, 82, 2, 6, 78, 123, 0, 31, 19, 99, 86, 0, 115, 68, 100, 61, 68, 14, 115, 2, 31, 102, 2, 11, 43, 58, 22, 22, 31, 0, 26, 77, 37, 15, 7, 6, 0, 23, 128, 38, 1, 106, 183, 66, 108, 133, 21, 66, 12, 15, 18, 77, 31, 80, 23, 20, 117, 3, 0, 86, 35, 112, 37, 107, 16, 7, 9, 55, 94, 22, 0, 81, 2, 35, 9, 24, 59, 1, 12, 34, 8, 100, 2, 87, 28, 22, 54, 2, 0, 63, 64, 105, 118, 37, 8, 0, 28, 10, 18, 11, 68, 18, 82, 0, 57, 31, 2, 102, 71, 91, 9, 107, 54, 27, 10, 30, 79, 16, 2, 31, 54, 25, 37, 12.

SKEWNESS INTERPRETATION

- ✓ If skewness is less than -1 or greater than 1, the distribution is highly skewed.
- ✓ If skewness is between -1 and -0.5 or between 0.5 and 1, the distribution is moderately skewed.
- ✓ If skewness is between -0.5 and 0.5, the distribution is approximately symmetric, close to Normal Distribution.

KURTOSIS

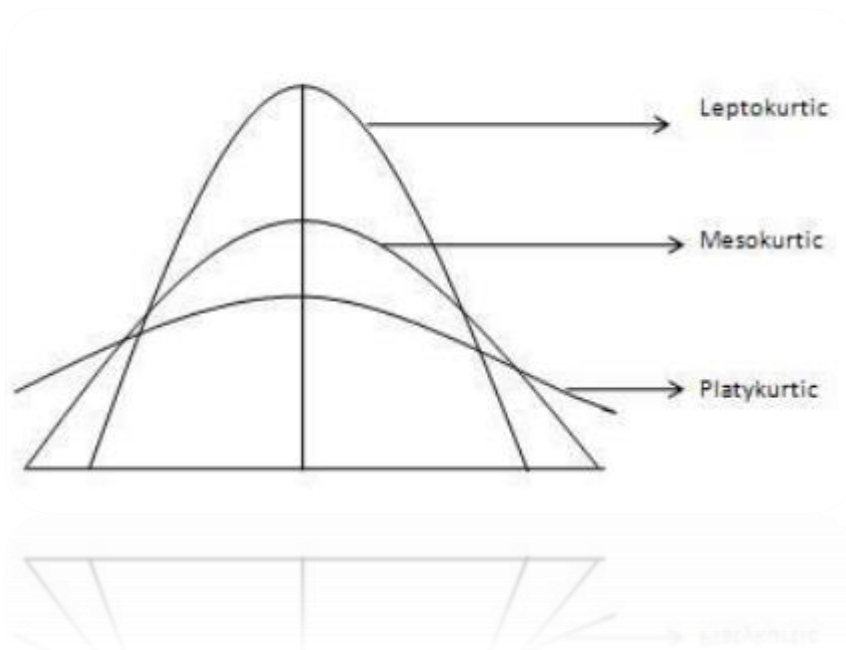
- ✓ Kurtosis is the sharpness of the peak of a frequency-distribution curve.
- ✓ It describes the shape of the distribution of the tail's in relation to its shape

TYPES OF KURTOSIS:

Mesokurtic – It has flatter tail than standard normal distribution and slightly lower peak

Leptokurtic – It has extremely thick tail and a very thin and tall peak

Platykurtic – It has slender tail and a peak that's smaller than Mesokurtic distribution



$K = 3$ indicates a normal "bell-shaped" distribution (mesokurtic).

$K < 3$ indicates a platykurtic distribution (flatter than a normal distribution with shorter tails).

$K > 3$ indicates a leptokurtic distribution (more peaked than a normal distribution with longer tails).

EXAMPLE

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CUMULATIVE FREQUENCY:

Cumulative frequency for each class interval is the frequency for that class interval added to the preceding cumulative total.

CUMULATIVE RELATIVE FREQUENCY:

It is similar to relative frequency. However, here the cumulative frequency is divided by the no. of observations.

$$\text{CUMULATIVE RELATIVE FREQUENCY} = \frac{\text{CUMULATIVE FREQUENCY}}{n}$$

EXAMPLE

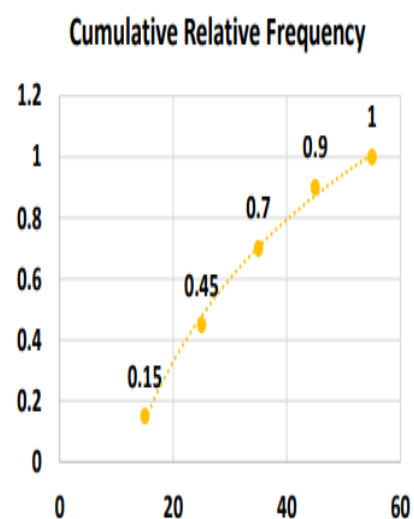
See excel

TYPES OF GRAPH

OGIVES

- ✓ An ogive is a graph of the cumulative relative frequency from a relative frequency distribution
- ✓ Ogives are sometime shown in the same graph as a relative frequency histogram
- ✓ Example: 12, 13, 17, 21, 24, 24, 26, 27, 27, 30, 32, 35, 37, 38, 41, 43, 44, 46, 53, 58
- ✓ Add a cumulative relative frequency column:

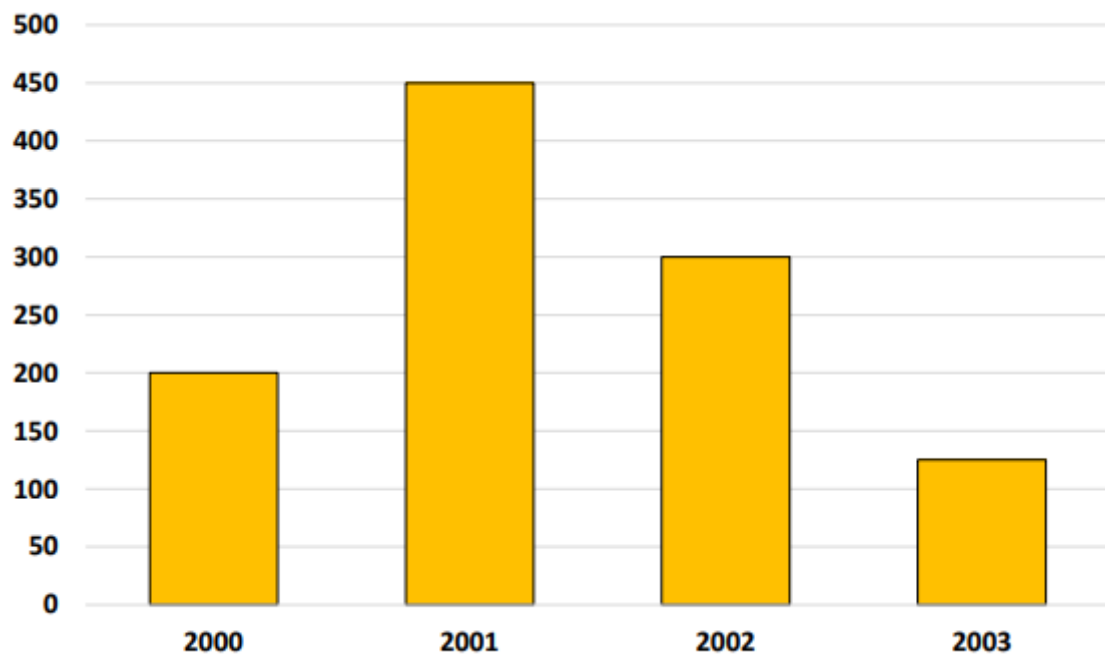
Frequency Distribution					
Class	Frequency	Relative Frequency	Class Midpoint	Cumulative Frequency	Cumulative Relative Frequency
10 under 20	3	0.15	15	3	0.15
20 under 30	6	0.3	25	9	0.45
30 under 40	5	0.25	35	14	0.7
40 under 50	4	0.2	45	18	0.9
50 under 60	2	0.1	55	20	1
Total	20	1			



BAR CHART

Bar charts is often used for qualitative (category) data.

Bar charts can also be displayed with horizontal bars



BAR CHART IN EXCEL

See excel

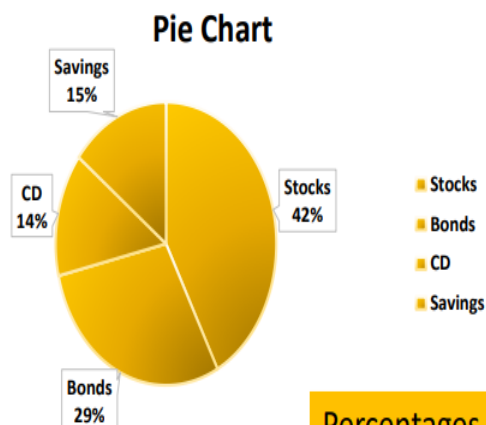
PIE CHART

- ✓ A pie chart is a circular statistical graphic which is divided into slices to illustrate numerical proportion.
- ✓ In a pie chart, the arc length of each slice, is proportional to the quantity it represents.
- ✓ Size of pie slice shows the frequency or percentage for each category

Current Investment Portfolio

Investment Type	Amount (in thousands \$)	Percentage
Stocks	46.5	42.27
Bonds	32	29.09
CD	15.5	14.09
Savings	16	14.55
Total	110	100

(Variables are Qualitative)



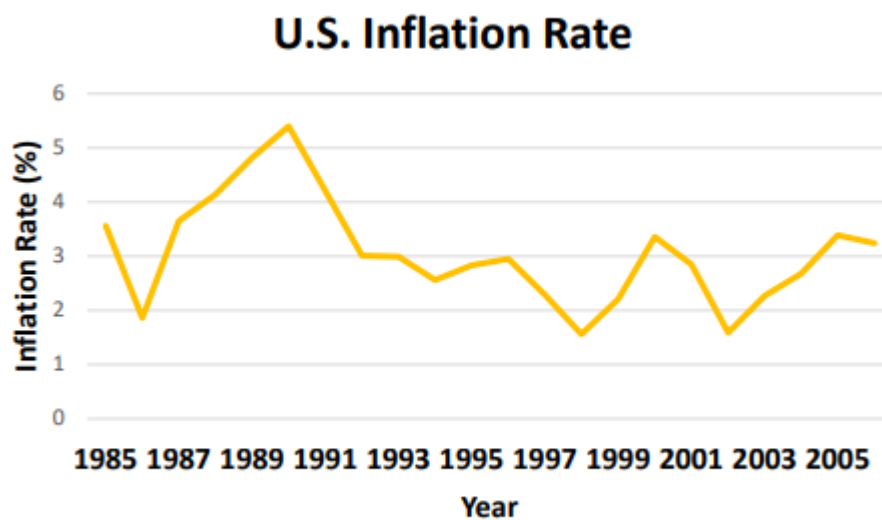
Percentages are rounded to the nearest percent

PIE CHART IN EXCEL

See excel

LINE CHART

- A line chart or line graph is a type of chart which displays information as a series of data points called 'markers' connected by straight line segments.
- Line charts show values of one variable vs. time
- Time is traditionally shown on the horizontal axis
- It is used to display trends over time (year, months, or days) or categories when the order is important.

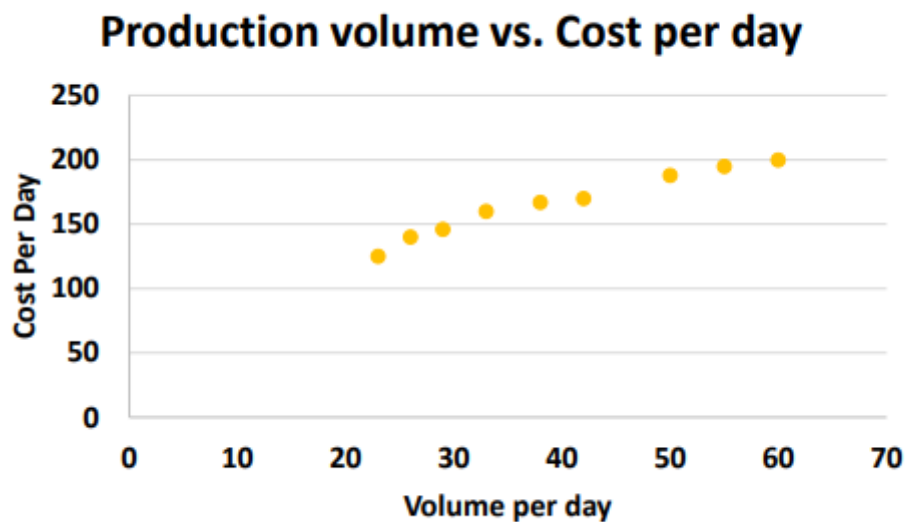


LINE CHART IN EXCEL

See excel

SCATTER PLOT

- Scatter Diagrams show points for **bivariate data**. One variable is measured on the vertical axis and the other variable is measured on the horizontal axis.
- **Purpose:** Scatter plots shows the relationship between two variables.



SCATTER PLOT IN EXCEL

See excel

DESCRIPTIVE STATISTICS

- Descriptive Statistics:
 - Measures of central tendency – mean, median, mode
 - Measures of dispersion – range, variance, standard deviation
 - Measures of shape – skewness, kurtosis

EXAMPLE

Types of questions asked in descriptive statistics

1. What is the average score of students?
2. What is the frequency distribution of the major streams of the student?
3. What is the average age of the students? What is mode?
4. What proportion of students are graduate?
5. What is the distribution of students by heights?

See Excel