# Dispersion Measures

## Agenda

- · What is Statistics?
- Central Tendency Measures
- Dispersion Measures
- Data Distributions



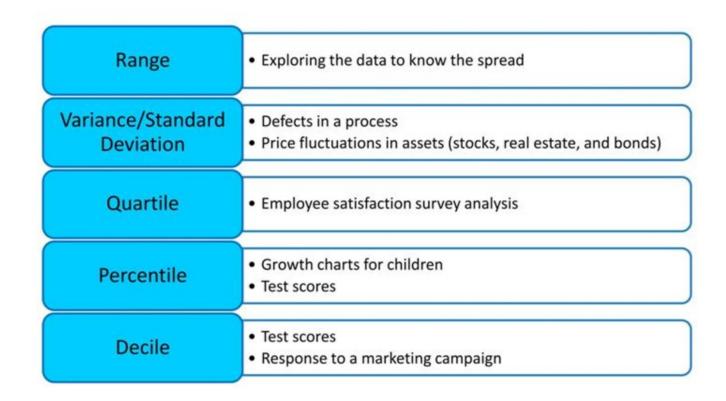
#### **Dispersion Measures**

**Measures of Dispersion** describe the data spread or how far the measurements are from the center.

#### The Measures of Dispersion are:

- Range
- Variance/Standard Deviation
- Mean Absolute Deviation
- Interquartile Range

#### Dispersion Measures: Examples



#### **Dispersion Measures: Calculations**

Calculate Range, Variance, and Standard Deviation for the dataset {2,2,3,5,5,5,7,14}.

- Range = 14 2 = 12
- Variance: Sum the square of the Deviations from the Mean and divide by number of records

Observation	Value	Deviation from Mean	Square of Deviation
1	2	-3.375	11.390625
2	2	-3.375	11.390625
3	3	-2.375	5.640625
4	5	-0.375	0.140625
5	5	-0.375	0.140625
6	5	-0.375	0.140625
7	7	1.625	2.640625
8	14	8.625	74.390625
Total	43	0	105.875

Variance: 105.875/8 = 13.234

Standard Deviation: Square root of Variance = 3.64

### **Dispersion Measures: Key Definitions**

- Range: Difference between lowest and highest value of data
  - Range = Maximum Minimum
  - Ignores outliers
  - Does not recognize the data distribution and consider two points in its estimation
- Mean Absolute Deviation (MAD): Mean of the absolute values of the deviations
  MAD = sum(|x mean(x)|) / n where n is the size of the sample

#### Dispersion Measures: Key Definitions (Cont'd)

- Variance indicates how close to or far from the Mean are most of the values for a particular variable
  - o Lower Variance → Values are concentrated around Mean
  - Larger Variance→ Values are spread away from the Mean

Population Variance 
$$\sigma^2 = \frac{1}{N} \sum_{i=1}^{N} (x_i - \mu)^2$$

Standard Deviation is square root of Variance

Population Standard Deviation 
$$\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^{N} (x_i - \mu)^2}$$