محاضرات إحصاء طبي / نظري 5

المرحلة الثانية

قسم التخدير

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MEASURES OF DISPERSION

Quartile Deviation or Semi-inter quartile Range (QD)

- ✓ QD is defined as the half of the range between the quartiles
- ✓ It is based on the upper and the lower Quartile and covers 50% of the observations.
- ✓ It does not depend on all observations
- ✓ For distributions with the Open Ends QD is the best measure of dispersion
- ✓ QD is independent of the change of Origin but dependent on the change of Scale.

Merits Of Quartile Deviation

- ✓ It's easy to understand and easy to calculate.
- ✓ It is least affected by extreme values.
- ✓ It can be used in the open-end frequency distribution.

What is Quartile Deviation Formula?

The Quartile Deviation (QD) is the product of half of the difference between the upper and lower quartiles. Mathematically we can define it as:

$$\mathbf{QuartileDeviation(QD)} = \frac{\mathbf{Q_3 - Q_1}}{\mathbf{2}}$$

And

$$Q_1 = \frac{1}{4}(N+1)^{th}\text{position}$$

$$Q_3 = \frac{3}{4}(N+1)^{th}\text{position}$$

N is the number data.

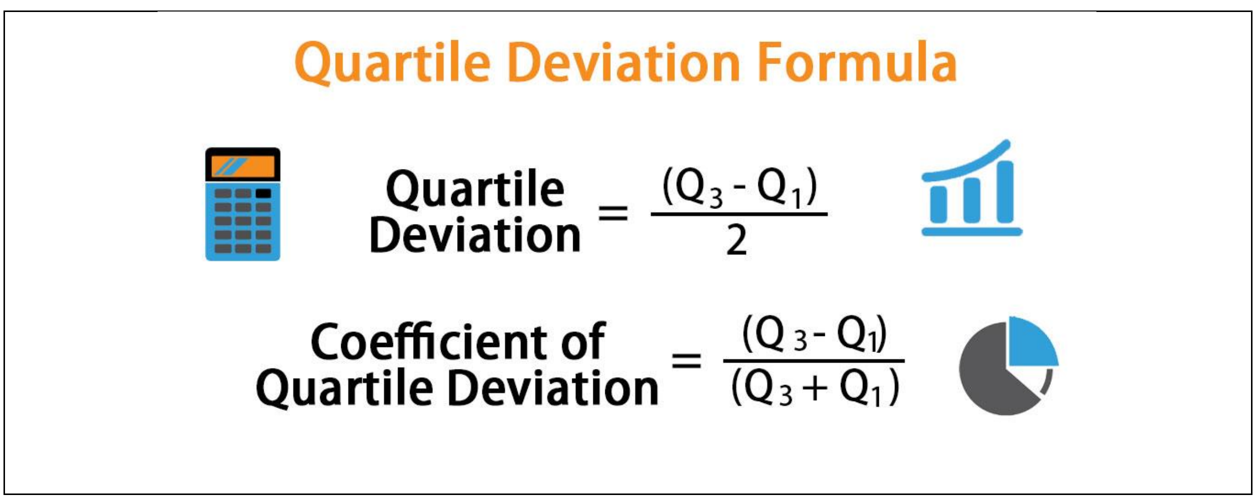
Q_1 is the lower quartile.

Q_3 is the upper quartile.

So, to calculate Quartile deviation, you need to first find out Q_1, then the second step is to find Q_3 and then make a difference of both, and the final step is to divide by 2.

Coefficient of Quartile Deviation

$$\textbf{Coefficient of QuartileDeviation}(\textbf{CQD}) = \frac{\mathbf{Q_3 - Q_1}}{\mathbf{Q_3 + Q_1}}$$



Example 1

Obtained Scores

24,25,23,26,29,30,27,35,34,36,28

Find Quartile Deviation and Coefficient of Quartile Deviation?

Solution:

First, we need to arrange data in ascending order to find Q_1 and Q_3 and avoid any duplicates.

23,24,25,26,27,28,29,30,34,35,36

Calculation of Q_1 and Q_3 can be done as follows,

هنا نجد قيمة Q_1 $Q_1 = \frac{1}{4}(N+1)^{th}\text{position}$ $Q_1 = \frac{1}{4}(11+1)^{th}$ $Q_1 = \frac{1}{4}(12)^{th}$ $Q_1 = \frac{12}{4} = 3^{th}\text{ position}$ $Q_1 = 25$	هنا نجد قيمة Q_3 $Q_3 = \frac{3}{4}(N+1)^{th}\text{position}$ $Q_3 = \frac{3}{4}(11+1)^{th}$ $Q_3 = \frac{3}{4}(12)^{th}$ $Q_3 = \frac{36}{4} = 9^{th}\text{ position}$ $Q_3 = 34$

$$\text{QuartileDeviation}(QD) = \frac{Q_3 - Q_1}{2} = \frac{34-25}{2} = \frac{9}{2} = 4.2$$

$$\text{Coefficient of } QuartileDeviation(CQD) = \frac{Q_3 - Q_1}{Q_3 + Q_1} = \frac{34-25}{34+25} = \frac{9}{59} = 0.1525$$

Example 2

Consider a data set of the following numbers:

22, 12, 14, 7, 18, 16, 11, 15, 12

You are required to calculate the Quartile Deviation.

Solution:

First, we need to arrange data in ascending order to find Q3 and Q1 and avoid any duplicates.

7, 11, 12, 13, 14, 15, 16, 18, 22

Calculation of Q_1 and Q_3 can be done as follows,

هنا نجد قيمة Q_1 $Q_1 = \frac{1}{4}(N+1)^{th}\text{position}$ $Q_1 = \frac{1}{4}(9+1)^{th}$ $Q_1 = \frac{1}{4}(10)^{th}$ $Q_1 = \frac{10}{4} = 2.5^{th}\text{ position}$	هنا نجد قيمة Q_3 $Q_3 = \frac{3}{4}(N+1)^{th}\text{position}$ $Q_3 = \frac{3}{4}(9+1)^{th}$ $Q_3 = \frac{3}{4}(10)^{th}$ $Q_3 = \frac{30}{4} = 7.5^{th}\text{ position}$

Calculation of quartile deviation can be done as follows,

- Q_1 is an average of 2-position, which is11 and the difference between 3 and 2 position and multiply in 0.5, which is

$$Q_1 = (12 - 11) * 0.5 = 11.50$$

- Q_3 is the 7-position term and product of 0.5, and the difference between the 8 and 7 position, which is

$$Q_3 = (18 - 16) * 0.5 = 17$$

$$\text{QuartileDeviation(QD)} = \frac{Q_3 - Q_1}{2} = \frac{17 - 11.50}{2} = \frac{5.5}{2} = 2.75$$