Chapter 4: Measures of Location

(part 2)

Learning Outcomes

After Completing the chapter ,you will able to :

- Compute the different types of measures of location.
- Understand the applications of different types of measures of location.
- Box plot and construction process of box plot.

Contents

From this lecture, you are going to learn…

- Construction of Box-Whisker-Plot
- Uses of it

Box-Whisker plot

The Summary statistics, required to draw Box-Whisker-plot are:

1. 1st quartile = Q_1
2. 2nd quartile = Q_2= Median
3. 3rd quartile = Q_3
4. Smallest value = S
5. Highest value = H
6. Inter Quartile Range, IQR= Q_3- Q_1

Box-Whisker plot

The fences to detect outliers in the Box-Whisker-Plot are:

Inner Fences:

Q_1-1.5×IQR

&

Q_3 +1.5×IQR

Outer Fences:

Q_1- 3×IQR

&

Q_3 + 3×IQR

Box-Whisker plot

Example: The monthly starting salaries in dollar for a random sample 12-business school graduates are as follows:

2900, 2765, 2960, 2890, 2880, 2720, 2930, 2950, 2860, 3060, 3260, 3525

Solution:

Arranging the data to the smallest to largest,

2720, 2765, 2860, 2880, 2890, 2900, 2930, 2950, 2960, 3060, 3260, 3525

1. Position of 1st quartile $Q_1 = \frac{1 \times 12}{4} = 3$

$\therefore$ 1st quartile $Q_1 = \frac{3rd + 4th}{2} = \frac{2860 + 2880}{2} = 2870$

Box-Whisker plot

2729, 2765, 2860, 2880, 2890, 2900, 2930, 2950, 2960, 3060, 3260, 3525

2. Position of 2nd quartile $Q_2 = \frac{2\times12}{4} = 6$

$\therefore$ 2nd quartile $Q_2 = \frac{6th+7th}{2} = \frac{2900+2930}{2} = 2915$

3. Position of 3rd quartile $Q_3 = \frac{3\times12}{4} = 9$

$\therefore$ 3rd quartile $Q_3 = \frac{9th+10th}{2} = \frac{2960+3060}{2} = 3010$

Box-Whisker plot

2720, 2765, 2860, 2880, 2890, 2900, 2930, 2950, 2960, 3060, 3260, 3525

4. Smallest value = 2720

5. Highest value = 3525

6. Inter Quartile Range, IQR = Q_3-Q_1 = 3010-2870= 140

Box-Whisker plot

2729, 2765, 2860, 2880, 2890, 2900, 2930, 2950, 2960, 3060, 3260, 3425

Inner Fences:

Q_1-1.5×IQR = 2870- 1.5*140=2660

&

Q_3 +1.5×IQR = 3010+1.5*140= 3220

Outer Fences:

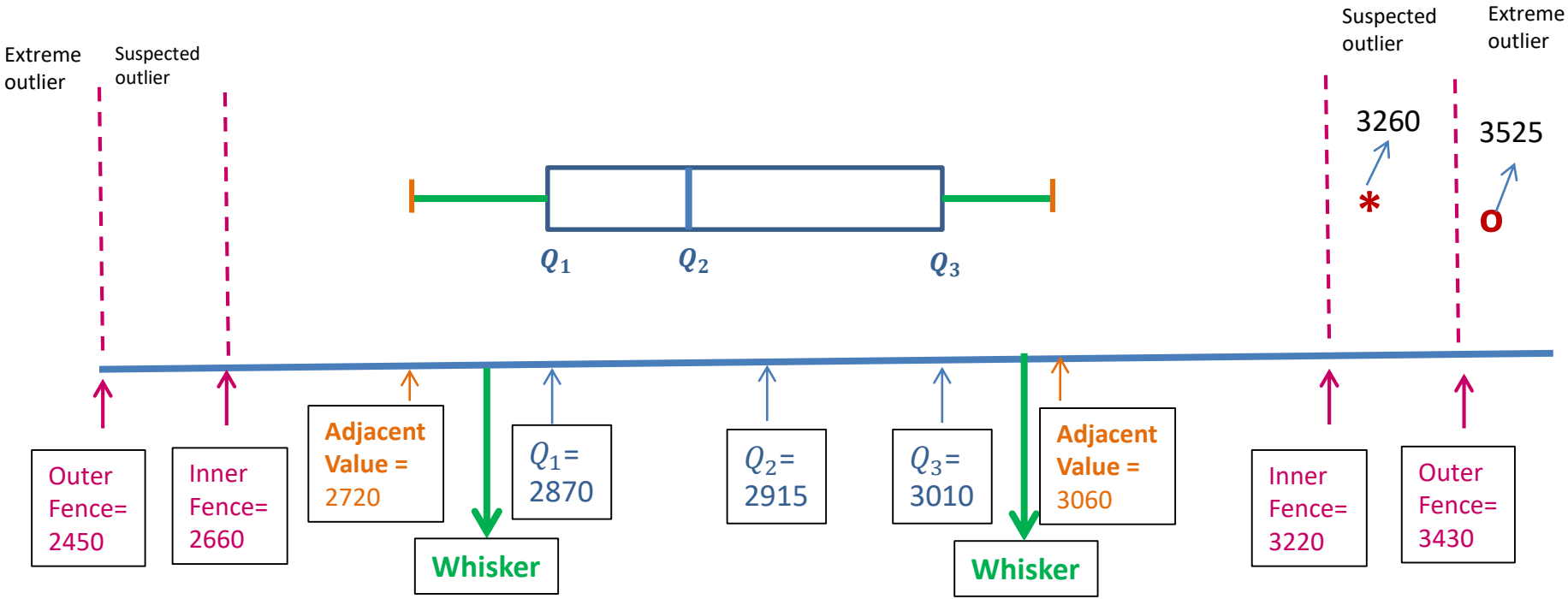
Q_1-3×IQR = 2870- 3*140=2450

&

Q_3 + 3 ×IQR = 3010+3*140= 3430

Box-Whisker plot

2720, 2765, 2860, 2880, 2890, 2900, 2930, 2950, 2960, 3060, 3260, 3525



Box-Whisker plot

Uses:

1. To get idea of the shape of the distribution
2. To detect outliers from the data.
3. To get idea about the spread ness of the data set.

From the previous Box-Plot we see that,

1. The shape of the distribution is positively skewed since the right part from the median is longer compared to left part.
2. There are 2 outliers in the data. Which are 3260 and 3430.
3. IQR gives the idea of spread ness of data set. The middle 50% data lies within the range of 140.

Exercise

- Construct a Box-and- Whisker Plot for these data and identify if any outliers:

  3, 9, 10, 2, 6, 7, 5, 8, 6, 6, 4, 9, 22.


Thank
You