02 Descriptive Statistics-II

May 1, 2018

1 Measuring Variability and spread

1.1 "Range" to diffrentiate dataset

So far we've looked at calculating averages for sets of data, but quite often, the average only gives part of the picture. Averages give us a way of determining where the center of a set of data is, but they don't tell us how the data varies. Each player has the same average score, but there are clear differences between each data set. We need some other way of measuring these differences.

We can differentiate between each set of data by looking at the way in which the scores spread out from the average. Each player's scores are distributed differently, and if we can measure how the scores are dispersed, the coach will be able to make a more informed decision.

1.2 Measuring the range

We can easily do this by calculating the ***range***. The range tells us over how many numbers the data extends, a bit like measuring its width. To find the range, we take the largest number in the data set, and then subtract the smallest. The smallest value is called the ***lower bound***, and the largest value is the ***upper bound***.

Let's take a look at the set of scores for one of the players and see how this works. Here are the scores:

To calculate the range, we subtract the lower bound from the upper bound. Looking at the data, the smallest value is 7, which means that this is the lower bound. Similarly, the upper bound is the largest value,or 13. Subtracting the lower bound from the upper bound gives us:

Range = upper bound - lower bound

```
= 13 - 7

= 6

so, the range is 6
```

Note: *The range is a way of measuring how spread out a set of values are. It's given by Upper bound - Lower bound where the upper bound is the highest value, and the lower bound the lowest.*

```
In [13]: # import required librarires
         import numpy as np
         import pandas as pd
```

```
          import matplotlib.pyplot as plt
          %matplotlib inline
          plt.style.use('fivethirtyeight')
```

Importing India premere league dataset

```
In [14]: dataset = pd.read_csv('./data/statistics/IPL_venue_won.csv')
         print(dataset.keys())
         print('\n')
         print(dataset.info())

         dataset.head()
```

```
Index(['Venue_Name', 'Won_By'], dtype='object')


<class 'pandas.core.frame.DataFrame'>
RangeIndex: 577 entries, 0 to 576
Data columns (total 2 columns):
Venue_Name    577 non-null object
Won_By        568 non-null float64
dtypes: float64(1), object(1)
memory usage: 9.1+ KB
None
```

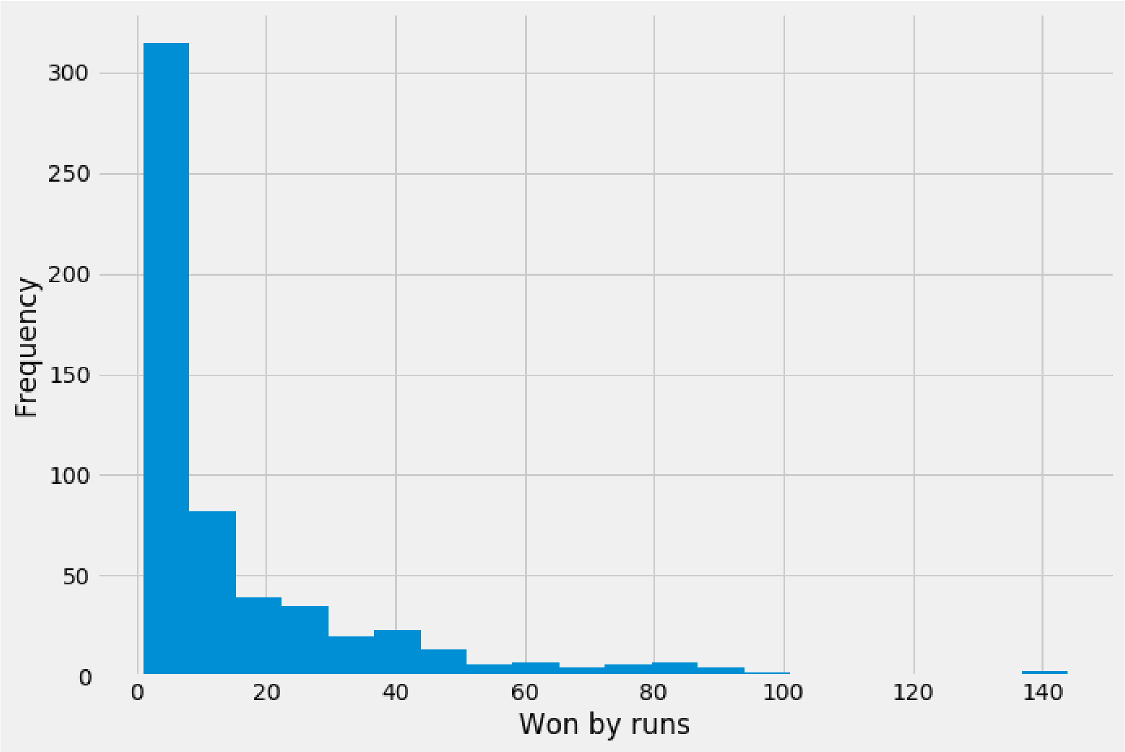
```
Out[14]:                                      Venue_Name  Won_By
         0                        M Chinnaswamy Stadium   140.0
         1   Punjab Cricket Association Stadium, Mohali    33.0
         2                             Feroz Shah Kotla     9.0
         3                             Wankhede Stadium     5.0
         4                                 Eden Gardens     5.0
```

Visualizing histogram

```
In [15]: dataset['Venue_Name'].nunique()
```

```
Out[15]: 35
```

```
In [16]: plt.figure(figsize=(10,7))
         dataset['Won_By'].plot.hist(bins = 20)
         plt.xlabel('Won by runs')
         plt.show()
```



```
In [17]: Range = dataset['Won_By'].max() - dataset['Won_By'].min()
         print('The Range of dataset is {}'.format(Range))
```

```
The Range of dataset is 143.0
```

The range is a simple way of saying what the spread of a set of data is, but it's often not the best way of measuring how the data is distributed within that range. If your data has outliers, using the range to describe how your values are dispersed can be very misleading because of its sensitivity to **outliers**.

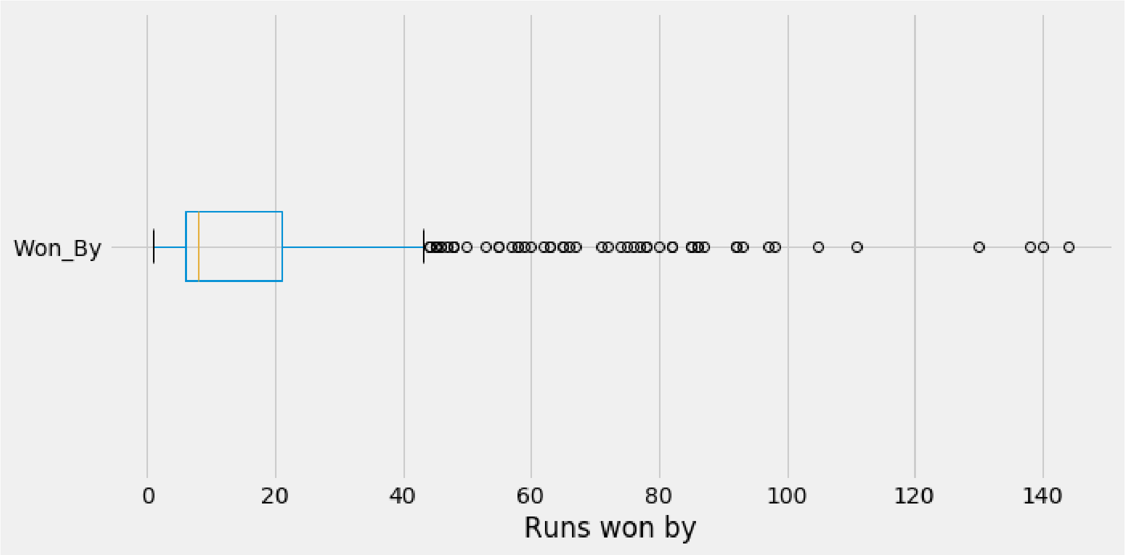
The primary problem with the range is that it only describes the width of your data. Because the range is calculated using the most extreme values of the data, it's impossible to tell what that data actually looks like—and whether it contains outliers. There are many different ways of constructing the same range, and sometimes this additional information is important.

2 Box Plot

```
In [18]: plt.figure(figsize=(10,5))
         dataset['Won_By'].plot.box(vert = False)
         plt.xlabel('Runs won by')
         plt.show()
```

attachment:image.png

image.png



3 Variance

The variance is a way of measuring spread, and it's the average of the distance of values from the mean squared.

This method of measuring spread is called the variance, and it's a very common way of describing the spread of a set of data. Here's a general form of the equation: attachment:image.png

4 Standard Deviation

Statisticians use the variance a lot as a means of measuring the spread of data. It's useful because it uses every value to come up with the result, and it can be thought of as the average of the distances from the mean squared.

All we need to do is take the square root of the variance. We call this the ***standard deviation***.

```
In [19]: print('Variance :',dataset.var())
         print('Standard Deviation :',dataset.std())
```

attachment:image.png

image.png

```
Variance : Won_By    479.970511
dtype: float64
Standard Deviation : Won_By    21.908229
dtype: float64
```

5 Z - Scores

Z – score is measure of distance from mean. Units for Z- score is “standard deviation”It help to find answer for question below.

How far is any given data point from the mean ? (Distance)

```
Z - score can help us answer
```

How many standard deviation away (above and below) from the mean is a data point ?

```
In [20]: dataset.head()
```

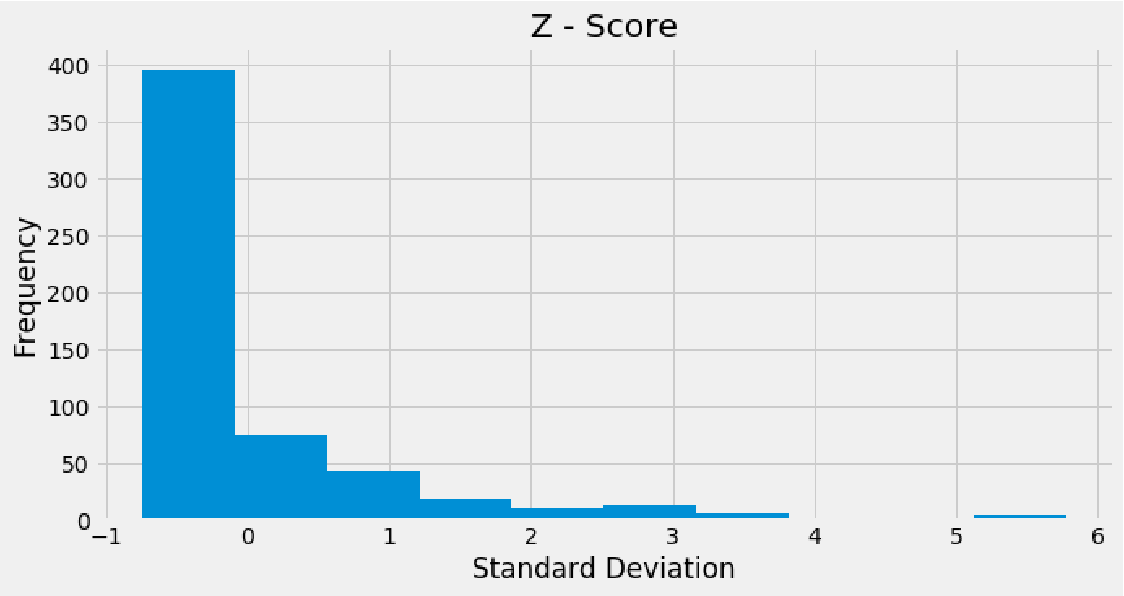
```
Out[20]:                                  Venue_Name  Won_By
         0                     M Chinnaswamy Stadium   140.0
         1  Punjab Cricket Association Stadium, Mohali    33.0
         2                          Feroz Shah Kotla     9.0
         3                          Wankhede Stadium     5.0
         4                              Eden Gardens     5.0
```

```
In [21]: dataset['Z-Score'] = (dataset['Won_By'] - dataset['Won_By'].mean())/ dataset['Won_By'].
         dataset.head()
```

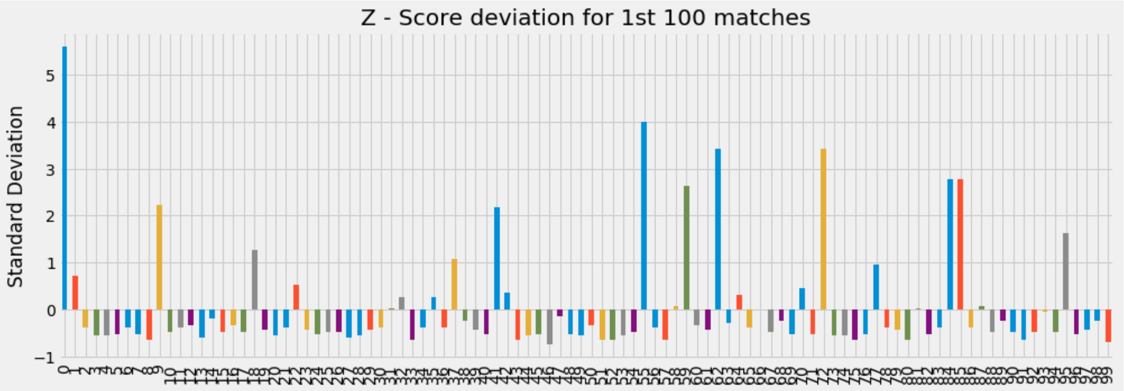
```
Out[21]:                                  Venue_Name  Won_By   Z-Score
         0                     M Chinnaswamy Stadium   140.0  5.598337
         1  Punjab Cricket Association Stadium, Mohali    33.0  0.714327
         2                          Feroz Shah Kotla     9.0 -0.381151
         3                          Wankhede Stadium     5.0 -0.563731
         4                              Eden Gardens     5.0 -0.563731
```

z score visualization

```
In [22]: plt.figure(figsize=(10,5))
         ax = plt.gca()
         dataset['Z-Score'].plot.hist(ax = ax)
         plt.xlabel('Standard Deviation')
         plt.title('Z - Score')
         plt.show()
```



```
In [23]: plt.figure(figsize=(15,5))
         ax = plt.gca()
         dataset['Z-Score'][:100].plot.bar(ax = ax)
         plt.ylabel('Standard Deviation')
         plt.title('Z - Score deviation for 1st 100 matches')
         plt.show()
```



So,list of matches whos run be score is greater that **3 times standard deviation (outlier)** is:

```
In [26]: dataset[dataset['Z-Score'] >= 3]

Out[26]:                                    Venue_Name  Won_By   Z-Score
         0                      M Chinnaswamy Stadium   140.0  5.598337
         55                          Wankhede Stadium   105.0  4.000764
```

```
62                                    St George's Park    92.0  3.407379
72                                    St George's Park    92.0  3.407379
123                                   Feroz Shah Kotla    98.0  3.681249
220                              M Chinnaswamy Stadium    85.0  3.087865
236       Himachal Pradesh Cricket Association Stadium   111.0  4.274633
320                    MA Chidambaram Stadium, Chepauk    86.0  3.133510
343                             Sawai Mansingh Stadium    87.0  3.179155
344                                   Feroz Shah Kotla    86.0  3.133510
351                              M Chinnaswamy Stadium   130.0  5.141887
405                               Sheikh Zayed Stadium    93.0  3.453024
482                    MA Chidambaram Stadium, Chepauk    97.0  3.635604
497                              M Chinnaswamy Stadium   138.0  5.507047
553  Dr. Y.S. Rajasekhara Reddy ACA-VDCA Cricket St...    85.0  3.087865
560                              M Chinnaswamy Stadium   144.0  5.780917
```