

Tutorial Topic 3

Numerical Descriptive Measures

Introduction

In this topic we will be looking at Numerical Descriptive Measures or, specifically, Measures of Central Tendency and Measures of Variation.

In the element Measures of Central Tendency one of the items we will be investigating is a pretty common term, an average. An average is a typical value but there are different types of averages. The most common average we use in everyday life is actually called the arithmetic mean. But there are two other types of averages. One is the Median, or the middle value (and this is the average we use when quoting an average house price in Real Estate) and the other is the Mode or the most occurring. And if I'm after a typical value, then I need to decide whether to use the Mean, the Median or, in some instances, the Mode.

Therefore, the aims of this tutorial are to:

- calculate and interpret numerical descriptive measures of central tendency, variation and shape for numerical data
- calculate and interpret descriptive summary measures for a population
- construct and interpret a box-and-whisker plot
- calculate and interpret the covariance and the coefficient of correlation for bivariate data

Textbook Questions

- 3.13 A manufacturer of torch batteries took a sample of 13 batteries from a day's production and used them continuously until they were drained. The numbers of hours they were used until failure were: [Dataset: BATTERIES.XLS]

342	426	317	545	264	451	
1049	631	512	266	492	562	298

- Calculate the mean, median and mode. Looking at the distribution of times to failure, which measures of central tendency do you think are most appropriate and which least appropriate to use for these data? Why?
 - Calculate the range, variance and standard deviation.
 - What would you advise if the manufacturer wanted to say in advertisements that these batteries 'should last 400 hours'? (Note: There is no right answer to this question; the point is to consider how to make such a statement precise.)
 - Suppose that the first value was 1,342 instead of 342. Repeat (a) to (c), using this value. Comment on the difference in the results.
- 3.27 A company wished to study its accounts receivable for two successive months. An independent sample of 50 accounts was selected for each month. The results are in the table below.

Frequency Distributions for Accounts Receivable		
Amount	March Frequency	April Frequency
\$0 to under \$2,000	6	10
\$2,000 to under \$4,000	13	14
\$4,000 to under \$6,000	17	13
\$6,000 to under \$8,000	10	10
\$8,000 to under \$10,000	4	0
\$10,000 to under \$12,000	0	3
Total	50	50

- For each month, approximate the:
 - Mean
 - Standard Deviation
- On the basis of your answers in (a), do you think the mean and the standard deviation of the accounts receivable have changed substantially from March to April? Explain.

3.33 The sales per day, in dollars, at a certain store are: (from question 3.8) [Dataset: SALES.XLSX]

1520	2620	3360	3550	1350	2545	1430	2400	3580
2390	1525	2400	1420	1550	2390	1560	1680	2330

- List the five-number summary.
- Construct the box-and-whisker plot and discuss the daily sales distribution for the stores.

3.39 A local council is interested in the relationship between the size of local restaurants, measured as number of seats, and their annual water usage, in kilolitres. From a random sample of 10 local restaurants the following information was obtained. [Dataset: WATER2.XLS]

Number of seats X	Annual water usage Y (kilolitres)
60	880
45	550
54	720
68	725
70	932
55	922
67	950
45	560
64	726
42	405

- Construct a scatter diagram for the data and comment on any apparent relationship between restaurant size and annual water usage.
- Calculate the sample covariance and coefficient of correlation. Are these values what you expected from the scatter diagram?
- What conclusions can you reach about the relationship between restaurant size and annual water usage?

TEXTBOOK REFERENCE:

Basic Business Statistics: Concepts and Applications. *Berenson, M.L. Levine, D.M. Szabat, K.A. O'Brien, M. Jayne, N. Watson, J.* 5th edition. 2019. Pearson Australia Group Pty Ltd. ISBN 9781488617249. Chapter 3, sections 3 to 3.6