

11.1: Prelude to The Chi-Square Distribution

CHAPTER OBJECTIVES

By the end of this chapter, the student should be able to:

- Interpret the chi-square probability distribution as the sample size changes.
- Conduct and interpret chi-square goodness-of-fit hypothesis tests.
- Conduct and interpret chi-square test of independence hypothesis tests.
- Conduct and interpret chi-square homogeneity hypothesis tests.
- Conduct and interpret chi-square single variance hypothesis tests.

Have you ever wondered if lottery numbers were evenly distributed or if some numbers occurred with a greater frequency? How about if the types of movies people preferred were different across different age groups? What about if a coffee machine was dispensing approximately the same amount of coffee each time? You could answer these questions by conducting a hypothesis test.

You will now study a new distribution, one that is used to determine the answers to such questions. This distribution is called the chi-square distribution.



Figure 11.1.1: The chi-square distribution can be used to find relationships between two things, like grocery prices at different stores. (credit: Pete/flickr)

In this chapter, you will learn the three major applications of the chi-square distribution:

- a. the goodness-of-fit test, which determines if data fit a particular distribution, such as in the lottery example
- b. the test of independence, which determines if events are independent, such as in the movie example
- c. the test of a single variance, which tests variability, such as in the coffee example

Though the chi-square distribution depends on calculators or computers for most of the calculations, there is a table available (see [link](#)). TI-83+ and TI-84 calculator instructions are included in the text.

COLLABORATIVE CLASSROOM EXERCISE

Look in the sports section of a newspaper or on the Internet for some sports data (baseball averages, basketball scores, golf tournament scores, football odds, swimming times, and the like). Plot a histogram and a boxplot using your data. See if you can determine a probability distribution that your data fits. Have a discussion with the class about your choice.



Goodness of Fit

- Tests to see if a distribution fits a known or expected distribution.
- No assumptions needed (other than random sampling)
- Typically used to see if a distribution is normal, uniform, or the same as the larger population or previous population.

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