

CE311S Lab 7

Using Confidence Intervals to Determine Air Temperature Control System Design

Purpose

In this lab, you will investigate how confidence intervals may be used to determine the selection of a building temperature control system, as well as how this affects costs.


Introduction

Your engineering firm has been hired to create an air temperature control system for a large wine-storage warehouse. This system will consist of both mechanical (active) temperature control features as well as structural and insulation (passive) features. When dealing with wine, two temperatures are of prime importance: the optimum storage temperature for wine (55° F), and the freezing point of wine (25° F). Deviations from the optimum storage temperature will cause decreases in the quality of the stored wine, while temperatures below the freezing point will cause severe losses due to both quality changes in the wine as well as totally lost product (from broken bottles).

Though the client is willing to spend large amounts of money on a top quality air-conditioning system for the summer months, he/she has questioned the need for spending more than \$750,000 on a heating system for the cooler (winter) months. Your firm has decided to investigate whether the client's hesitation is well-placed. The client does not expect the warehouse to be used for more than 30 years, and during that time would like to see the lowest temperature in the warehouse go no lower than 50° F.

The heating system will be designed towards a certain "minimum temperature rating" which is the lowest outside (ambient) temperature at which the system theoretically can still maintain the desired temperature (55° F in this case). A program has been created by your firm to estimate the costs for different systems based on their minimum temperature rating. Also, a simulation program has been developed to test the performance of the system under a random *winter* month's minimum ambient temperature. You will use these programs to address the client's questions regarding the heating system.

Procedure

1. Download and open the file "ci.zip" from the Lab webpage and save the unzipped files to your desktop.
2. Open the file "CI1.vi" Select a minimum temperature rating for the system and click on the run button (\Rightarrow) on the toolbar to find the cost for that system. Do this for ten (tested). Enter your results in Table 1. Last, find the minimum temperature rating for the system that falls within the client's desired budget for the system (\$750,000). (Hint: For this last part, it may help to put the program in continuous run () mode.)
3. Answer Questions 1 and 2, located at the end of this report.
4. Open the file "CI2.vi." Select the minimum temperature rating for the client's budget that you found in Part 2. Click on the run button (\Rightarrow) and record the results in Sheet 1 of the Excel spreadsheet "CI.xls" included with the programs. Run 49 more trials and record the results. Next, run 50 trials at the minimum temperature rating that you selected in Question 2 and record the results in Sheet 2 of the spreadsheet. If you are low

