Lab Activity: Hypothesis Testing – Single Variance

In this lab activity, you will conduct a hypothesis test for claims involving a single variance or standard deviation.

Student Learning Outcomes

By the end of this chapter, you should be able to do the following:

- Perform a hypothesis test of a single variance using Statcato

Preliminary

Read Chapter 11 The Chi-Square Distribution in:


Guided Problems

1. Suppose a study involving 500 adult females in your community found that the variance of their heights is 9.0 inches. Using a 0.05 significance level, test the claim that the population variance of adult females in your community is 7.84 inches.

Formulating the Hypothesis Test

Answer the following questions in LR: Problem 1 – Hypotheses.

- State the claim that you are testing.
- State the null and alternative hypotheses.
  - H₀:
  - H₁:
- Is this a right-tailed, left-tailed, or two-tailed test?

Performing the Hypothesis Test

Using Statcato, you will perform calculations for the hypothesis test.

Performing a Hypothesis Test for a Single Variance (Summary Data)

Go to Statistics > Hypothesis Tests > 1-Population Variance.

- In the Inputs panel, select Summarized sample data radio button. Enter the sample size (500) in the provided text box. Select Variance and enter the sample variance (9).
- For Significance Level, enter 0.05.
- In the Alternative Hypothesis panel, select the form of the alternative hypothesis (<, ≠, or >). Select Hypothesized variance, and enter the hypothesized variance (7.84).
- Click OK.
Copy the computation results to LR: Problem 1 – Hypothesis Test.

Making Conclusions
Based on the computer-generated results, draw conclusions for the hypothesis test. Record your answers in LR: Problem 1 – Conclusion.

- Based on the significance level $\alpha$ and the computed $p$-value, decide whether to reject $H_0$ and explain why.
- Based on your decision on the null hypothesis, make a conclusion about your claim.

2. Assume that the standard deviation of U.S. male heights is 2.8 inches. Given the heights of the L.A. Lakers players, test the claim that the heights of L.A. Lakers players vary more than those of the population of U.S. males. Use a 0.05 significance level.

<table>
<thead>
<tr>
<th>Player</th>
<th>Height (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ariza, Trevor</td>
<td>80</td>
</tr>
<tr>
<td>Bryant, Kobe</td>
<td>78</td>
</tr>
<tr>
<td>Bynum, Andrew</td>
<td>84</td>
</tr>
<tr>
<td>Crawford, Joe</td>
<td>77</td>
</tr>
<tr>
<td>Farmar, Jordan</td>
<td>74</td>
</tr>
<tr>
<td>Fisher, Derek</td>
<td>73</td>
</tr>
<tr>
<td>Gasol, Pau</td>
<td>84</td>
</tr>
<tr>
<td>Giles, C.J.</td>
<td>83</td>
</tr>
<tr>
<td>Heath, Brandon</td>
<td>76</td>
</tr>
<tr>
<td>Mbenga, DJ</td>
<td>84</td>
</tr>
<tr>
<td>Mihm, Chris</td>
<td>84</td>
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<tr>
<td>Mitchell, Dwayne</td>
<td>77</td>
</tr>
<tr>
<td>Odom, Lamar</td>
<td>82</td>
</tr>
<tr>
<td>Powell, Josh</td>
<td>81</td>
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<tr>
<td>Radmanovic, Vladimir</td>
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</tr>
<tr>
<td>Vujacic, Sasha</td>
<td>79</td>
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<tr>
<td>Walton, Luke</td>
<td>80</td>
</tr>
<tr>
<td>Yue, Sun</td>
<td>79</td>
</tr>
</tbody>
</table>


Formulating the Hypothesis Test
Answer the following questions in LR: Problem 2 – Hypotheses.

- State the claim that you are testing.
- State the null and alternative hypotheses.
Performing the Hypothesis Test

Performing a Hypothesis Test for a Single Variance (Sample Values)

Enter the 18 heights in column C1.

Go to Statistics > Hypothesis Tests > 1-Population Variance.

- In the Inputs panel, select Samples in column radio button. Choose C1 in the drop-down menu.
- For Significance Level, enter 0.05.
- In the Alternative Hypothesis panel, select the form of the alternative hypothesis (<, ≠, or >). Select Hypothesized standard deviation, and enter the hypothesized standard deviation (2.8).
- Click OK.

Copy the computation results to LR: Problem 2 – Hypothesis Test.

Making Conclusions

Based on the computer-generated results, draw conclusions for the hypothesis test. Record your answers in LR: Problem 2 – Conclusion.

- Based on the significance level $\alpha$ and the computed p-value, decide whether to reject $H_0$ and explain why.
- Based on your decision on the null hypothesis, make a conclusion about your claim.

Problems

Repeat the procedures described above for the following two problems (record answers in LR: Problem 3 and LR: Problem 4):

3. Assume that IQ scores of adults are normally distributed with a mean of 100 and standard deviation of 15. A sample of 100 IQ scores of students at XYZ College yields a standard deviation of 16. Use a 0.01 significance level to test the claim that the standard deviation of IQ scores of students at XYZ College is greater than 15.

4. The weights of a sample of 50 female ballet dancers have a standard deviation of 15 lbs. Assume that the standard deviation of weights of the population of females is 20 lbs. Test the claim that weights of ballet dancers vary less than the weights of women in general. Use a 0.01 significance level.