

Exercise – A visual approach to hypothesis testing

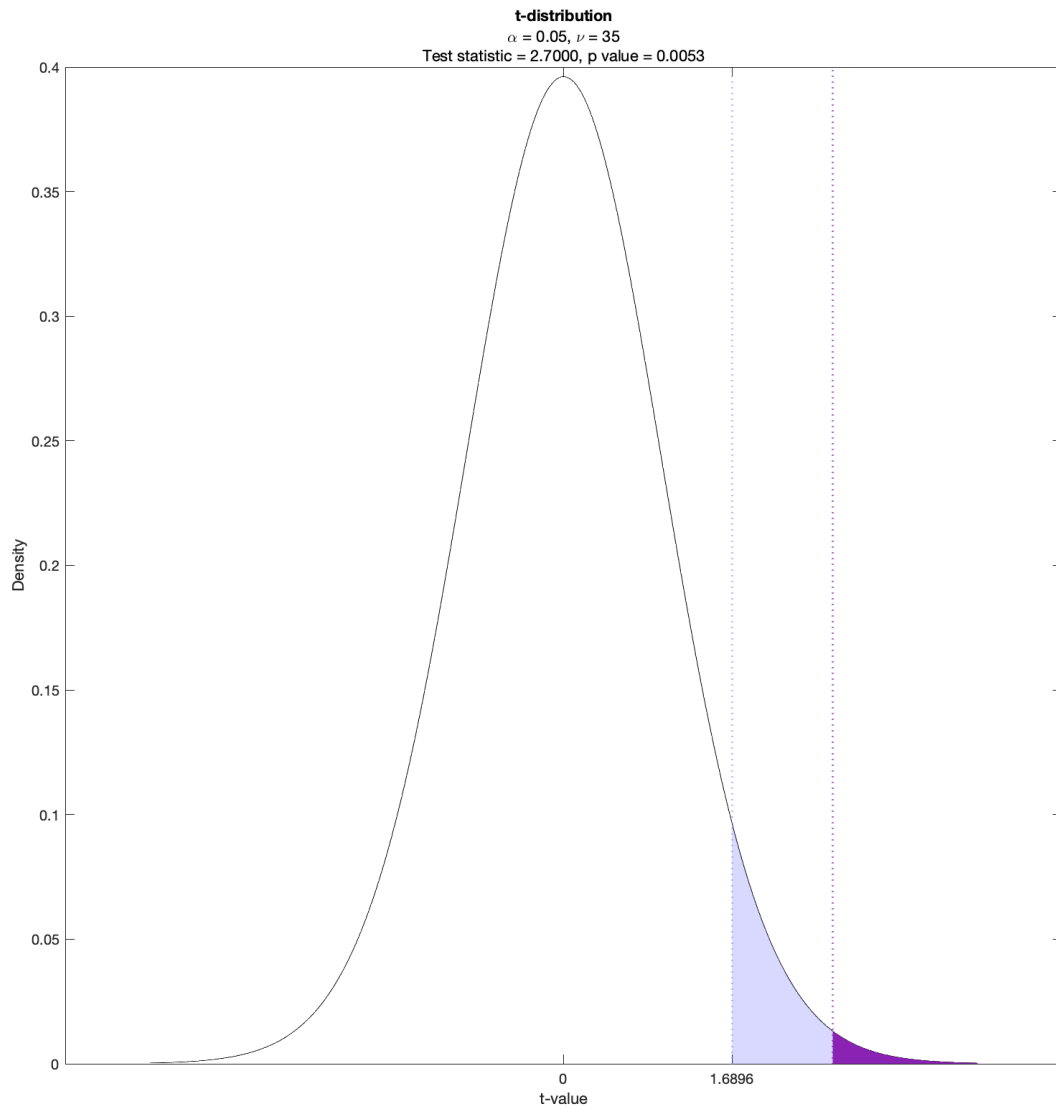
1. Aim of the exercise

Traditionally, books and teachers instruct students to pick critical values from tables found at the back of textbooks to conduct hypothesis tests. Students often find this method un-intuitive and cumbersome. Using a simple script file in MATLAB, we propose to visualize hypothesis testing as a more modern and intuitive method. Showing the distribution of the test statistic, and marking on it the critical value, value of the test statistic and the associated probability areas, can make the learning experience more engaging and effective. We apply this method to the t, F, and Chi-square tests.

2. Application

The TTesting.m script file conducts the t-test. In the script file, the user calls the TTest.m function that accepts test parameters as input arguments. In particular, the user specifies the degrees of freedom of the t-distribution, the significance level, and the value of the t-statistic as the input arguments. The function returns a plot that conducts the t-test as output. The figure below shows an example output for the right-tailed t-test. FTesting.m and CsTesting.m are the script files to conduct F and Chi-square tests, respectively. They can be found at the link at the end of this file.

```
1 % -----
2 % TTest(TAIL, NU, ALPHA, TSTAT) conducts the t-test.
3 %
4 % TAIL is the type of the hypothesis test. Possible types are:
5 % - 'LeftTailed' for a left-tailed t-test
6 % - 'RightTailed' for a right-tailed t-test
7 % - 'TwoTailed' for a two-tailed t-test
8 %
9 % NU is the degrees of freedom. It must be a positive integer.
10 %
11 % ALPHA is the significance level. It must be a real number between
12 % 0 and 1 (exclusive).
13 %
14 % TSTAT is the value of the t-statistic. It can take any finite
15 % value. TSTAT is optional. If provided, the function will plot the
16 % value of the t-statistic and indicate whether the null hypothesis
17 % can be rejected.
18 %
19 % The size of the plot can be customized by changing the values of
20 % TTRT.scale, TTLT.scale, TTTT.scale in their corresponding function
21 % files.
22 % -----
23 TTest('RightTailed', 35, 0.05, 2.7)
```



3. Final notes

This file is prepared and copyrighted by Akash Boelens and Tunga Kantarcı. This file and the accompanying MATLAB files are available on GitHub and can be accessed via this [link](#).