

APPENDIX B

CRITICAL VALUES FOR t-DISTRIBUTIONS

Table B.1 contains critical values or percentiles for t-distributions; a description of how to use the table precedes it. Figure B.1 illustrates how to use the table to find bounds for an upper tail p-value. Bounds for a lower tail p-value involve a similar procedure for the negative (left-hand) side of the density curve. To find bounds for a two tail p-value, multiply each bound for the corresponding upper tail p-value by 2; for example, the two tail p-value for the situation in Figure B.1 lies between 0.05 and 0.10.

Use Table B.1 and Figure B.2 to find critical values or percentiles for t-distributions; each row of the table corresponds to a t-distribution with the degrees of freedom shown in the left-hand column. The critical values in the body of the table represent values along the horizontal axis of the figure. Each upper tail significance level in bold at the top of the table represents the area under the curve to the right of a critical value. For example, if the curve in the figure represents a t-distribution with 60 degrees of freedom, the right-hand shaded area under the curve to the right of the critical value 2.000 represents an upper tail significance level of 0.025. Each two tail significance level in bold at the bottom of the table represents the sum of the areas to the right of a critical value and to the left of the negative of that critical value. For example, for a t-distribution with 60 degrees of freedom, the sum of the shaded areas under the curve to the right of the critical value 2.000 and to the left of -2.000 represents a two tail significance level of 0.05.

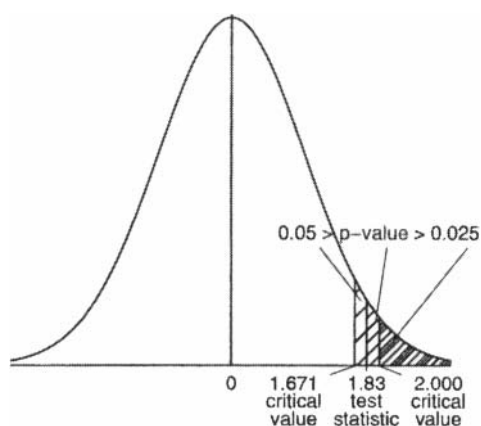


Figure B.1. Density curve for a t-distribution showing two critical values from Table B.1 immediately to the left and to the right of a calculated test statistic. The upper tail p-value is between the corresponding upper tail significance levels at the top of the table, in this case 0.025 and 0.05.

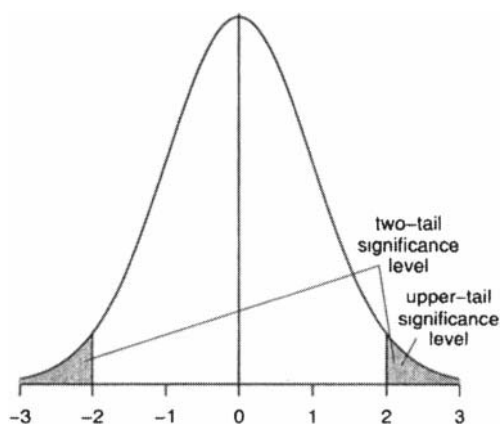


Figure B.2. Density curve for a t-distribution showing critical values (or percentiles or t-statistics) along the horizontal axis and significance levels (or probabilities or p-values) as areas under the curve.

For t-distributions with degrees of freedom *not* in the table (e.g., 45), use the table row corresponding to the next *lowest* number (i.e., 40 for 45 degrees of freedom). Alternatively, use Microsoft Excel function `TINV(P, DF)`, where *P* is the two tail significance level and *DF* is the degrees of freedom. For example, `TINV(0.05, 40)` is 2.021, while `TINV(0.05, 45)` is 2.014. For an upper tail test, multiply the upper tail significance level by 2 to convert it into a two tail significance level, and then use the `TINV` function. For example, the critical value for an upper tail test using (upper tail) significance level 0.05 is `TINV(0.1, 40)` (which comes to 1.684). Excel can also be used to turn these calculations around. For example, to calculate tail areas (p-values) from values along the horizontal axis (test statistics), use `TDIST(T, DF, TAILS)`, where *T* is the value of the test statistic, *DF* is the degrees of freedom, and *TAILS* is the number of tails (1 for upper tail tests, 2 for two tail tests). Thus, `TDIST(2.021, 40, 2)` is 0.05, while `TDIST(2.021, 40, 1)` is 0.025.

