

## Appendix C

### Statistical Tables

These abbreviated tables cover the critical values used in this book's worked examples and exercises. For values not tabulated, use R (`qt()`, `qchisq()`, `qf()`, `qnorm()`) or Python (`scipy.stats.t/chi2/f/norm.ppf()`).

#### C.1: Student's $t$ Distribution: Two-Sided Critical Values

| d.f. | $t_{0.10}$ | $t_{0.05}$ | $t_{0.025}$ | $t_{0.01}$ | $t_{0.005}$ |
|------|------------|------------|-------------|------------|-------------|
| 1    | 3.078      | 6.314      | 12.706      | 31.821     | 63.657      |
| 2    | 1.886      | 2.920      | 4.303       | 6.965      | 9.925       |
| 3    | 1.638      | 2.353      | 3.182       | 4.541      | 5.841       |
| 4    | 1.533      | 2.132      | 2.776       | 3.747      | 4.604       |
| 5    | 1.476      | 2.015      | 2.571       | 3.365      | 4.032       |
| 6    | 1.440      | 1.943      | 2.447       | 3.143      | 3.707       |
| 8    | 1.397      | 1.860      | 2.306       | 2.896      | 3.355       |
| 10   | 1.372      | 1.812      | 2.228       | 2.764      | 3.169       |
| 12   | 1.356      | 1.782      | 2.179       | 2.681      | 3.055       |
| 14   | 1.345      | 1.761      | 2.145       | 2.624      | 2.977       |
| 16   | 1.337      | 1.746      | 2.120       | 2.583      | 2.921       |

|          |       |       |       |       |       |
|----------|-------|-------|-------|-------|-------|
| 18       | 1.330 | 1.734 | 2.101 | 2.552 | 2.878 |
| 20       | 1.325 | 1.725 | 2.086 | 2.528 | 2.845 |
| 24       | 1.318 | 1.711 | 2.064 | 2.492 | 2.797 |
| 30       | 1.310 | 1.697 | 2.042 | 2.457 | 2.750 |
| 60       | 1.296 | 1.671 | 2.000 | 2.390 | 2.660 |
| $\infty$ | 1.282 | 1.645 | 1.960 | 2.326 | 2.576 |

### C.2: Chi-Square Distribution — Upper-Tail Critical Values

| d.f. | $\chi^2_{0.10}$ | $\chi^2_{0.05}$ | $\chi^2_{0.025}$ | $\chi^2_{0.01}$ |
|------|-----------------|-----------------|------------------|-----------------|
| 1    | 2.706           | 3.841           | 5.024            | 6.635           |
| 2    | 4.605           | 5.991           | 7.378            | 9.210           |
| 3    | 6.251           | 7.815           | 9.348            | 11.345          |
| 4    | 7.779           | 9.488           | 11.143           | 13.277          |
| 5    | 9.236           | 11.070          | 12.833           | 15.086          |
| 10   | 15.987          | 18.307          | 20.483           | 23.209          |
| 15   | 22.307          | 24.996          | 27.488           | 30.578          |
| 20   | 28.412          | 31.410          | 34.170           | 37.566          |

### C.3: $F$ Distribution – Upper 5% Critical Values ( $F_{0.05}$ )

| $df_1 \backslash df_2$ | 5    | 8    | 10   | 12   | 18   | 20   | 24   |
|------------------------|------|------|------|------|------|------|------|
| 1                      | 6.61 | 5.32 | 4.96 | 4.75 | 4.41 | 4.35 | 4.26 |
| 2                      | 5.79 | 4.46 | 4.10 | 3.89 | 3.55 | 3.49 | 3.40 |
| 3                      | 5.41 | 4.07 | 3.71 | 3.49 | 3.16 | 3.10 | 3.01 |
| 5                      | 5.05 | 3.69 | 3.33 | 3.11 | 2.77 | 2.71 | 2.62 |
| 8                      | 4.82 | 3.44 | 3.07 | 2.85 | 2.51 | 2.45 | 2.36 |

**C.4: Standard Normal CDF and Probit Values**

| $z$   | $\Phi(z)$ | Probit ( $z + 5$ ) |
|-------|-----------|--------------------|
| -2.33 | 0.01      | 2.67               |
| -1.64 | 0.05      | 3.36               |
| -1.28 | 0.10      | 3.72               |
| -0.84 | 0.20      | 4.16               |
| -0.52 | 0.30      | 4.48               |
| 0.00  | 0.50      | 5.00               |
| 0.52  | 0.70      | 5.52               |
| 0.84  | 0.80      | 5.84               |
| 1.28  | 0.90      | 6.28               |
| 1.64  | 0.95      | 6.64               |
| 2.33  | 0.99      | 7.33               |

**C.5 Generating Exact Values Programmatically****R:**

```
qt(0.975, df =24)           # exact t critical
                             value
qchisq(0.95, df =5)         # exact chi-square
                             critical value
qf(0.95, df1 =1, df2 =20)
qnorm(0.90)                 # exact normal
                             quantile
```

**Python:**

```
from scipy import stats
stats.t.ppf(0.975, df=24)
stats.chi2.ppf(0.95, df=5)
stats.f.ppf(0.95, dfn=1, dfd=20)
stats.norm.ppf(0.90)
```