

## Repeated Measures ANOVA and Adjusted $F$ -Tests When Sphericity is Violated: Which Procedure is Best?

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Exact values of  $\varepsilon$ :

$K = 3$ :  $\varepsilon = .50516525, .60098722, .70276994, .80099907, .90012654, 1$

$K = 4$ :  $\varepsilon = .34791979, .40126561, .50052295, .60785892, .70991146, .80098645, .90084738, 1$

$K = 6$ :  $\varepsilon = .2081422, .30134424, .4008269, .5027216, .5985405, .7090667, .8007163, .9036866, 1$

Table 1. Type I error rates (in percentages) for the  $F$ -statistic and for  $F$  adjusted by the Greenhouse-Geisser ( $F$ -GG) and Huyhn-Feldt ( $F$ -HF) procedures as a function of epsilon ( $\varepsilon$ ) for  $K = 3$ . Type I error rates outside the boundary of Bradley's liberal criterion are in bold (conservative:  $< 2.5$ ; liberal:  $> 7.5$ ).

|     | $\varepsilon = .50$ |         |         | $\varepsilon = .60$ |         |         | $\varepsilon = .70$ |         |         | $\varepsilon = .80$ |         |         | $\varepsilon = .90$ |         |         | $\varepsilon = 1$ |         |         |
|-----|---------------------|---------|---------|---------------------|---------|---------|---------------------|---------|---------|---------------------|---------|---------|---------------------|---------|---------|-------------------|---------|---------|
| $N$ | $F$                 | $F$ -GG | $F$ -HF | $F$                 | $F$ -GG | $F$ -HF | $F$                 | $F$ -GG | $F$ -HF | $F$                 | $F$ -GG | $F$ -HF | $F$                 | $F$ -GG | $F$ -HF | $F$               | $F$ -GG | $F$ -HF |
| 10  | <b>8.44</b>         | 4.56    | 4.68    | <b>8.08</b>         | 4.94    | 5.42    | 6.40                | 4.68    | 5.30    | 6.34                | 4.76    | 5.44    | 5.40                | 4.18    | 4.84    | 5.28              | 4.12    | 4.80    |
| 15  | <b>9.42</b>         | 5.30    | 5.36    | 7.44                | 5.34    | 5.48    | 7.06                | 5.02    | 5.50    | 6.36                | 5.04    | 5.52    | 5.14                | 4.26    | 4.76    | 4.98              | 4.38    | 4.68    |
| 20  | <b>8.48</b>         | 5.08    | 5.08    | <b>8.00</b>         | 5.42    | 5.62    | 6.82                | 5.16    | 5.50    | 5.64                | 4.50    | 4.90    | 4.68                | 4.00    | 4.42    | 4.94              | 4.56    | 4.80    |
| 25  | <b>8.24</b>         | 4.88    | 4.90    | 7.40                | 4.68    | 4.94    | 7.14                | 5.26    | 5.66    | 6.28                | 5.08    | 5.30    | 5.62                | 4.76    | 5.06    | 4.60              | 4.16    | 4.46    |
| 30  | <b>8.50</b>         | 5.22    | 5.22    | <b>7.76</b>         | 4.70    | 4.82    | 5.80                | 4.24    | 4.40    | 5.82                | 4.64    | 4.96    | 5.16                | 4.44    | 4.68    | 4.98              | 4.80    | 4.94    |
| 40  | <b>8.14</b>         | 4.62    | 4.64    | 7.48                | 5.02    | 5.06    | 6.94                | 5.30    | 5.50    | 6.48                | 5.36    | 5.56    | 5.20                | 4.72    | 4.90    | 4.96              | 4.82    | 4.92    |
| 50  | <b>8.24</b>         | 5.00    | 5.00    | <b>7.74</b>         | 5.16    | 5.22    | 6.60                | 4.68    | 4.80    | 6.72                | 5.46    | 5.78    | 5.24                | 4.70    | 4.82    | 5.08              | 4.96    | 5.06    |
| 60  | <b>8.02</b>         | 4.56    | 4.58    | 7.26                | 4.78    | 4.84    | 5.96                | 4.40    | 4.60    | 6.64                | 5.44    | 5.50    | 5.30                | 4.80    | 4.90    | 5.12              | 5.06    | 5.08    |
| 70  | <b>8.50</b>         | 5.58    | 5.58    | <b>7.74</b>         | 5.44    | 5.46    | 6.46                | 4.88    | 4.90    | 6.44                | 5.26    | 5.34    | 5.62                | 4.94    | 5.06    | 5.22              | 5.08    | 5.16    |
| 80  | <b>7.94</b>         | 5.00    | 5.00    | 7.32                | 4.90    | 4.94    | 6.78                | 4.96    | 4.98    | 5.46                | 4.30    | 4.36    | 5.28                | 4.78    | 4.84    | 5.72              | 5.58    | 5.68    |
| 90  | <b>8.38</b>         | 5.12    | 5.14    | 7.38                | 4.82    | 4.86    | 7.04                | 5.48    | 5.56    | 5.80                | 4.64    | 4.70    | 5.28                | 4.60    | 4.72    | 4.52              | 4.42    | 4.46    |
| 100 | <b>8.26</b>         | 5.26    | 5.26    | <b>7.96</b>         | 5.62    | 5.64    | 6.50                | 5.06    | 5.06    | 6.08                | 5.02    | 5.14    | 5.44                | 4.86    | 4.92    | 5.00              | 4.96    | 4.98    |
| 120 | <b>8.14</b>         | 4.78    | 4.78    | 7.40                | 4.72    | 4.72    | 6.46                | 4.80    | 4.82    | 6.16                | 4.90    | 4.96    | 5.36                | 4.64    | 4.76    | 4.60              | 4.54    | 4.58    |
| 150 | <b>7.62</b>         | 4.86    | 4.88    | 7.40                | 5.22    | 5.24    | 6.46                | 4.64    | 4.66    | 5.42                | 4.36    | 4.36    | 5.58                | 4.94    | 4.98    | 5.24              | 5.14    | 5.16    |
| 180 | <b>9.02</b>         | 5.18    | 5.18    | 6.96                | 4.50    | 4.52    | 6.12                | 4.84    | 4.84    | 5.86                | 4.90    | 4.96    | 5.60                | 5.16    | 5.16    | 5.08              | 5.04    | 5.06    |
| 210 | <b>7.96</b>         | 4.78    | 4.78    | 7.50                | 5.00    | 5.00    | 6.86                | 5.32    | 5.36    | 6.06                | 4.88    | 4.88    | 5.02                | 4.40    | 4.52    | 5.12              | 5.04    | 5.04    |
| 240 | <b>8.56</b>         | 4.82    | 4.82    | 7.50                | 4.52    | 4.52    | 7.40                | 5.70    | 5.70    | 6.30                | 5.30    | 5.32    | 5.28                | 4.72    | 4.76    | 5.20              | 5.20    | 5.20    |
| 270 | <b>8.50</b>         | 5.20    | 5.20    | 7.42                | 5.14    | 5.14    | 7.18                | 5.30    | 5.34    | 6.08                | 4.84    | 4.88    | 5.76                | 5.26    | 5.28    | 4.90              | 4.86    | 4.90    |
| 300 | <b>8.22</b>         | 4.98    | 4.98    | 7.34                | 5.60    | 5.62    | 6.34                | 4.80    | 4.80    | 6.34                | 5.04    | 5.08    | 5.04                | 4.72    | 4.74    | 5.20              | 5.18    | 5.20    |

Table 2. Type I error rates (in percentages) for the  $F$ -statistic and for  $F$  adjusted by the Greenhouse-Geisser ( $F$ -GG) and Huyhn-Feldt ( $F$ -HF) procedures as a function of epsilon ( $\varepsilon$ ) for  $K = 4$ . Type I error rates outside the boundary of Bradley's liberal criterion are in bold (conservative:  $< 2.5$ ; liberal:  $> 7.5$ ).

|     | $\varepsilon = .33$ |         |         | $\varepsilon = .40$ |         |         | $\varepsilon = .50$ |         |         | $\varepsilon = .60$ |         |         | $\varepsilon = .70$ |         |         | $\varepsilon = .80$ |         |         | $\varepsilon = .90$ |         |         | $\varepsilon = 1$ |         |         |
|-----|---------------------|---------|---------|---------------------|---------|---------|---------------------|---------|---------|---------------------|---------|---------|---------------------|---------|---------|---------------------|---------|---------|---------------------|---------|---------|-------------------|---------|---------|
| $N$ | $F$                 | $F$ -GG | $F$ -HF | $F$                 | $F$ -GG | $F$ -HF | $F$                 | $F$ -GG | $F$ -HF | $F$                 | $F$ -GG | $F$ -HF | $F$                 | $F$ -GG | $F$ -HF | $F$                 | $F$ -GG | $F$ -HF | $F$                 | $F$ -GG | $F$ -HF | $F$               | $F$ -GG | $F$ -HF |
| 10  | <b>12.14</b>        | 4.62    | 4.62    | <b>11.20</b>        | 5.62    | 6.18    | <b>8.38</b>         | 4.48    | 5.48    | <b>8.02</b>         | 4.66    | 5.88    | 6.40                | 4.18    | 5.40    | 6.22                | 3.82    | 5.10    | 5.90                | 3.64    | 5.08    | 4.86              | 3.44    | 4.62    |
| 15  | <b>11.50</b>        | 4.96    | 4.96    | <b>10.18</b>        | 5.32    | 5.48    | <b>9.20</b>         | 5.28    | 5.70    | <b>8.64</b>         | 5.02    | 5.86    | 6.44                | 4.18    | 5.12    | 5.74                | 3.88    | 4.86    | 5.42                | 3.84    | 4.74    | 5.38              | 4.20    | 5.08    |
| 20  | <b>10.74</b>        | 4.94    | 4.94    | <b>10.56</b>        | 5.12    | 5.20    | <b>8.40</b>         | 4.72    | 5.06    | <b>8.02</b>         | 4.84    | 5.46    | 6.62                | 4.42    | 5.00    | 6.34                | 4.52    | 5.44    | 5.42                | 4.22    | 4.86    | 4.80              | 3.88    | 4.62    |
| 25  | <b>10.72</b>        | 5.10    | 5.10    | <b>10.28</b>        | 5.04    | 5.16    | <b>9.42</b>         | 5.44    | 5.72    | <b>7.88</b>         | 4.76    | 5.08    | 7.04                | 5.06    | 5.48    | 6.58                | 4.98    | 5.46    | 5.58                | 4.56    | 5.08    | 5.48              | 4.44    | 5.24    |
| 30  | <b>10.94</b>        | 4.94    | 4.94    | <b>10.10</b>        | 5.46    | 5.60    | <b>8.34</b>         | 5.34    | 5.48    | <b>7.58</b>         | 4.32    | 4.80    | 6.88                | 4.98    | 5.48    | 5.58                | 4.12    | 4.52    | 5.82                | 4.66    | 5.20    | 4.88              | 4.20    | 4.68    |
| 40  | <b>10.64</b>        | 5.12    | 5.12    | <b>10.00</b>        | 4.80    | 4.84    | <b>8.34</b>         | 4.80    | 4.94    | <b>7.82</b>         | 4.56    | 4.80    | 6.68                | 5.02    | 5.36    | 5.70                | 4.32    | 4.60    | 5.64                | 4.72    | 5.18    | 5.44              | 5.02    | 5.34    |
| 50  | <b>11.34</b>        | 5.32    | 5.32    | <b>10.22</b>        | 5.20    | 5.24    | <b>8.48</b>         | 5.10    | 5.22    | <b>7.58</b>         | 4.74    | 4.84    | 6.34                | 4.40    | 4.56    | 5.46                | 4.36    | 4.58    | 5.14                | 4.28    | 4.50    | 4.46              | 4.12    | 4.40    |
| 60  | <b>10.68</b>        | 4.74    | 4.74    | <b>10.34</b>        | 5.04    | 5.06    | <b>8.12</b>         | 5.00    | 5.12    | <b>7.58</b>         | 5.24    | 5.42    | 6.56                | 4.44    | 4.60    | 5.98                | 4.68    | 5.00    | 5.08                | 4.14    | 4.42    | 4.92              | 4.52    | 4.74    |
| 70  | <b>10.42</b>        | 4.56    | 4.56    | <b>10.40</b>        | 5.66    | 5.70    | <b>7.64</b>         | 4.54    | 4.60    | 7.36                | 4.78    | 4.88    | 6.38                | 4.58    | 4.72    | 6.40                | 4.92    | 5.12    | 5.76                | 4.84    | 5.06    | 5.22              | 4.88    | 5.16    |
| 80  | <b>10.86</b>        | 4.84    | 4.84    | <b>10.90</b>        | 5.56    | 5.62    | <b>8.92</b>         | 5.22    | 5.30    | <b>7.58</b>         | 4.66    | 4.84    | 6.68                | 4.80    | 4.96    | 5.74                | 4.42    | 4.62    | 5.34                | 4.52    | 4.74    | 5.40              | 5.20    | 5.40    |
| 90  | <b>10.94</b>        | 5.18    | 5.18    | <b>10.44</b>        | 5.28    | 5.32    | <b>8.36</b>         | 4.74    | 4.80    | <b>8.28</b>         | 5.50    | 5.58    | 6.58                | 4.90    | 5.00    | 5.80                | 4.52    | 4.72    | 6.18                | 5.32    | 5.54    | 5.70              | 5.56    | 5.66    |
| 100 | <b>10.36</b>        | 4.82    | 4.82    | <b>9.68</b>         | 4.88    | 4.88    | <b>8.32</b>         | 4.64    | 4.70    | <b>8.54</b>         | 5.32    | 5.42    | 6.34                | 4.64    | 4.74    | 6.34                | 5.26    | 5.32    | 5.52                | 4.70    | 4.86    | 5.16              | 4.92    | 5.16    |
| 120 | <b>11.06</b>        | 5.08    | 5.08    | <b>9.16</b>         | 4.82    | 4.84    | <b>8.54</b>         | 4.60    | 4.66    | <b>7.52</b>         | 4.78    | 4.84    | 6.62                | 4.94    | 5.04    | 6.26                | 4.92    | 5.04    | 5.02                | 4.28    | 4.44    | 4.68              | 4.54    | 4.66    |
| 150 | <b>11.32</b>        | 5.42    | 5.42    | <b>9.46</b>         | 4.78    | 4.84    | <b>8.38</b>         | 4.66    | 4.72    | <b>7.68</b>         | 5.02    | 5.10    | 6.92                | 5.32    | 5.40    | 6.16                | 4.82    | 4.92    | 5.76                | 4.90    | 5.00    | 4.88              | 4.72    | 4.84    |
| 180 | <b>10.94</b>        | 5.20    | 5.20    | <b>9.58</b>         | 4.82    | 4.88    | <b>7.68</b>         | 4.78    | 4.80    | 7.16                | 4.58    | 4.64    | 6.46                | 4.76    | 4.82    | 5.96                | 4.78    | 4.90    | 5.04                | 4.46    | 4.50    | 4.80              | 4.74    | 4.80    |
| 210 | <b>9.80</b>         | 4.78    | 4.78    | <b>10.52</b>        | 5.60    | 5.64    | <b>8.18</b>         | 4.54    | 4.56    | <b>7.60</b>         | 5.34    | 5.36    | 7.02                | 4.82    | 4.92    | 5.90                | 4.56    | 4.70    | 5.42                | 4.62    | 4.72    | 4.78              | 4.68    | 4.76    |
| 240 | <b>10.24</b>        | 4.82    | 4.82    | <b>9.82</b>         | 4.88    | 4.90    | <b>7.84</b>         | 4.44    | 4.46    | 6.98                | 4.44    | 4.48    | 6.54                | 4.58    | 4.70    | 6.02                | 4.70    | 4.78    | 5.32                | 4.48    | 4.56    | 4.44              | 4.26    | 4.40    |
| 270 | <b>10.70</b>        | 5.06    | 5.06    | <b>9.62</b>         | 4.98    | 5.02    | <b>8.22</b>         | 4.76    | 4.76    | 6.98                | 4.68    | 4.68    | 6.94                | 5.02    | 5.06    | 6.54                | 5.08    | 5.10    | 5.48                | 4.94    | 4.98    | 4.88              | 4.80    | 4.88    |
| 300 | <b>10.00</b>        | 4.62    | 4.62    | <b>9.94</b>         | 5.04    | 5.04    | <b>8.50</b>         | 4.88    | 4.88    | 7.26                | 4.94    | 5.02    | 6.78                | 4.92    | 4.94    | 5.76                | 4.42    | 4.46    | 5.28                | 4.64    | 4.66    | 4.98              | 4.96    | 4.96    |

Table 3. Type I error rates (in percentages) for the  $F$ -statistic and for  $F$  adjusted by the Greenhouse-Geisser ( $F$ -GG) and Huyhn-Feldt ( $F$ -HF) procedures as a function of epsilon ( $\epsilon$ ) for  $K = 6$ . Type I error rates outside the boundary of Bradley's liberal criterion are in bold (conservative:  $< 2.5$ ; liberal:  $> 7.5$ ).

|     | $\epsilon = .20$ |         |         | $\epsilon = .30$ |         |         | $\epsilon = .40$ |         |         | $\epsilon = .50$ |         |         | $\epsilon = .60$ |         |         |
|-----|------------------|---------|---------|------------------|---------|---------|------------------|---------|---------|------------------|---------|---------|------------------|---------|---------|
| $N$ | $F$              | $F$ -GG | $F$ -HF | $F$              | $F$ -GG | $F$ -HF | $F$              | $F$ -GG | $F$ -HF | $F$              | $F$ -GG | $F$ -HF | $F$              | $F$ -GG | $F$ -HF |
| 10  | <b>15.86</b>     | 5.32    | 5.46    | <b>12.76</b>     | 5.42    | 6.06    | <b>10.46</b>     | 4.66    | 6.34    | <b>9.54</b>      | 4.08    | 5.86    | <b>8.08</b>      | 3.76    | 5.56    |
| 15  | <b>13.88</b>     | 4.54    | 4.60    | <b>11.84</b>     | 5.22    | 5.74    | <b>10.56</b>     | 5.28    | 6.20    | <b>10.22</b>     | 4.60    | 5.72    | <b>7.74</b>      | 3.68    | 5.14    |
| 20  | <b>13.70</b>     | 5.20    | 5.20    | <b>12.96</b>     | 5.56    | 5.86    | <b>9.38</b>      | 4.48    | 5.00    | <b>9.50</b>      | 4.28    | 5.28    | <b>7.54</b>      | 4.32    | 5.14    |
| 25  | <b>13.92</b>     | 5.18    | 5.28    | <b>12.34</b>     | 5.10    | 5.30    | <b>10.06</b>     | 4.28    | 4.66    | <b>9.32</b>      | 4.78    | 5.52    | <b>7.82</b>      | 4.28    | 5.12    |
| 30  | <b>13.80</b>     | 4.78    | 4.80    | <b>12.26</b>     | 5.16    | 5.34    | <b>9.96</b>      | 4.74    | 5.14    | <b>8.84</b>      | 4.48    | 4.86    | <b>7.88</b>      | 4.74    | 5.36    |
| 40  | <b>14.30</b>     | 5.16    | 5.18    | <b>11.14</b>     | 4.24    | 4.38    | <b>9.60</b>      | 4.88    | 5.10    | <b>9.08</b>      | 4.78    | 5.10    | <b>8.66</b>      | 5.04    | 5.44    |
| 50  | <b>14.32</b>     | 5.24    | 5.26    | <b>12.92</b>     | 6.02    | 6.18    | <b>9.66</b>      | 4.82    | 5.04    | <b>9.08</b>      | 4.58    | 4.90    | 7.36             | 4.40    | 4.70    |
| 60  | <b>13.14</b>     | 4.92    | 4.92    | <b>11.28</b>     | 5.20    | 5.34    | <b>9.32</b>      | 4.40    | 4.56    | <b>9.22</b>      | 4.54    | 4.74    | <b>8.30</b>      | 4.98    | 5.20    |
| 70  | <b>14.06</b>     | 4.96    | 4.96    | <b>12.10</b>     | 5.20    | 5.32    | <b>9.92</b>      | 5.24    | 5.32    | <b>9.10</b>      | 5.16    | 5.42    | <b>8.18</b>      | 5.06    | 5.32    |
| 80  | <b>14.46</b>     | 5.06    | 5.06    | <b>11.46</b>     | 5.06    | 5.12    | <b>9.80</b>      | 5.00    | 5.06    | <b>9.42</b>      | 5.04    | 5.24    | 7.32             | 4.58    | 4.80    |
| 90  | <b>13.68</b>     | 4.82    | 4.82    | <b>11.46</b>     | 5.24    | 5.30    | <b>10.00</b>     | 5.30    | 5.44    | <b>9.84</b>      | 5.42    | 5.56    | <b>8.62</b>      | 5.08    | 5.32    |
| 100 | <b>13.50</b>     | 5.10    | 5.10    | <b>11.66</b>     | 5.14    | 5.18    | <b>9.64</b>      | 4.80    | 4.92    | <b>9.02</b>      | 4.82    | 4.96    | <b>7.60</b>      | 4.56    | 4.62    |
| 120 | <b>13.92</b>     | 4.88    | 4.90    | <b>11.20</b>     | 4.54    | 4.58    | <b>9.78</b>      | 4.92    | 5.04    | <b>9.42</b>      | 4.56    | 4.74    | <b>7.96</b>      | 5.04    | 5.14    |
| 150 | <b>13.74</b>     | 5.08    | 5.08    | <b>11.70</b>     | 5.00    | 5.00    | <b>9.74</b>      | 4.82    | 4.90    | <b>9.44</b>      | 4.98    | 5.12    | <b>8.16</b>      | 4.90    | 5.06    |
| 180 | <b>13.58</b>     | 4.86    | 4.86    | <b>11.12</b>     | 4.70    | 4.76    | <b>9.82</b>      | 4.82    | 4.88    | <b>9.08</b>      | 4.98    | 5.10    | <b>7.78</b>      | 4.80    | 4.92    |
| 210 | <b>14.30</b>     | 5.06    | 5.06    | <b>10.98</b>     | 4.60    | 4.68    | <b>9.34</b>      | 4.54    | 4.54    | <b>8.70</b>      | 4.76    | 4.84    | <b>8.36</b>      | 5.08    | 5.16    |
| 240 | <b>13.56</b>     | 5.02    | 5.02    | <b>11.80</b>     | 5.22    | 5.24    | <b>9.56</b>      | 4.62    | 4.72    | <b>9.48</b>      | 5.04    | 5.08    | <b>8.06</b>      | 4.74    | 4.88    |
| 270 | <b>14.64</b>     | 5.44    | 5.44    | <b>11.06</b>     | 4.44    | 4.46    | <b>9.98</b>      | 5.34    | 5.42    | <b>9.42</b>      | 4.96    | 4.98    | <b>8.08</b>      | 5.38    | 5.40    |
| 300 | <b>13.38</b>     | 5.12    | 5.12    | <b>12.56</b>     | 5.50    | 5.52    | <b>9.38</b>      | 4.54    | 4.58    | <b>8.14</b>      | 4.74    | 4.82    | <b>8.30</b>      | 4.64    | 4.74    |

Table 3 (continued). Type I error rates (in percentages) for the  $F$ -statistic and for  $F$  adjusted by the Greenhouse-Geisser ( $F$ -GG) and Huyhn-Feldt ( $F$ -HF) procedures as a function of epsilon ( $\varepsilon$ ) for  $K = 6$ . Type I error rates outside the boundary of Bradley's liberal criterion are in bold (conservative:  $< 2.5$ ; liberal:  $> 7.5$ ).

| $N$ | $\varepsilon = .70$ |         |         | $\varepsilon = .80$ |         |         | $\varepsilon = .90$ |         |         | $\varepsilon = 1$ |         |         |
|-----|---------------------|---------|---------|---------------------|---------|---------|---------------------|---------|---------|-------------------|---------|---------|
|     | $F$                 | $F$ -GG | $F$ -HF | $F$                 | $F$ -GG | $F$ -HF | $F$                 | $F$ -GG | $F$ -HF | $F$               | $F$ -GG | $F$ -HF |
| 10  | 6.78                | 3.28    | 5.34    | 6.04                | 2.88    | 4.96    | 6.16                | 2.72    | 5.36    | 5.50              | 2.80    | 4.90    |
| 15  | 6.98                | 3.90    | 5.38    | 5.90                | 3.54    | 5.08    | 5.74                | 3.32    | 5.00    | 4.54              | 2.52    | 4.02    |
| 20  | 7.24                | 4.12    | 5.22    | 6.40                | 4.24    | 5.34    | 5.18                | 3.38    | 4.60    | 4.96              | 3.54    | 4.74    |
| 25  | 7.10                | 4.36    | 5.28    | 6.68                | 4.42    | 5.54    | 6.18                | 4.44    | 5.74    | 5.18              | 3.88    | 4.94    |
| 30  | 7.08                | 4.24    | 5.12    | 6.44                | 4.68    | 5.18    | 6.34                | 4.52    | 5.82    | 4.94              | 3.78    | 4.78    |
| 40  | 6.76                | 4.12    | 4.72    | 5.76                | 4.10    | 4.70    | 5.02                | 3.88    | 4.44    | 4.94              | 4.04    | 4.74    |
| 50  | 6.48                | 4.04    | 4.46    | 6.62                | 4.94    | 5.24    | 5.56                | 4.12    | 4.72    | 5.04              | 4.26    | 4.92    |
| 60  | 7.36                | 4.62    | 4.94    | 6.50                | 4.90    | 5.28    | 5.86                | 4.66    | 5.22    | 5.32              | 4.70    | 5.22    |
| 70  | 7.26                | 4.80    | 5.16    | 6.22                | 4.12    | 4.70    | 5.64                | 4.62    | 5.06    | 4.78              | 4.38    | 4.74    |
| 80  | 6.68                | 4.76    | 4.98    | 5.94                | 4.36    | 4.74    | 5.74                | 4.72    | 5.06    | 5.42              | 4.96    | 5.32    |
| 90  | 6.78                | 4.56    | 4.80    | 6.08                | 4.72    | 4.90    | 5.82                | 4.76    | 5.08    | 5.70              | 5.38    | 5.66    |
| 100 | 6.78                | 4.58    | 4.70    | 6.64                | 5.08    | 5.42    | 6.00                | 4.92    | 5.20    | 4.56              | 4.24    | 4.48    |
| 120 | 7.38                | 4.96    | 5.20    | 7.16                | 5.20    | 5.48    | 5.34                | 4.54    | 4.70    | 4.94              | 4.62    | 4.86    |
| 150 | 6.70                | 4.78    | 4.86    | 6.62                | 4.78    | 4.94    | 6.00                | 5.18    | 5.46    | 5.10              | 4.82    | 5.06    |
| 180 | 7.22                | 5.04    | 5.24    | 5.90                | 4.64    | 4.78    | 5.38                | 4.72    | 4.84    | 4.72              | 4.54    | 4.70    |
| 210 | 6.94                | 4.80    | 4.86    | 6.34                | 4.80    | 4.96    | 5.44                | 4.78    | 4.88    | 5.36              | 5.16    | 5.32    |
| 240 | 6.72                | 4.80    | 4.90    | 6.32                | 5.02    | 5.10    | 6.06                | 5.40    | 5.56    | 5.30              | 5.14    | 5.30    |
| 270 | 6.94                | 4.82    | 4.88    | 5.98                | 4.64    | 4.72    | 5.48                | 4.64    | 4.84    | 4.82              | 4.74    | 4.82    |
| 300 | 7.12                | 5.14    | 5.28    | 6.50                | 4.96    | 5.00    | 5.72                | 5.02    | 5.10    | 4.92              | 4.78    | 4.90    |