

**Figure 13.13a. 50th PERCENTILES FOR THE  $F$  DISTRIBUTION  $[F_{v_1, v_2}]$**  [Calculated with  $qf$  in R Version 3.3.2 using 17-digit arithmetic; the accuracy of all digits in the table entries has not been verified]

| df         | Each table entry is the value (y) of the random variable $Y \sim F_{v_1, v_2}$ such that $\Pr(Y \leq y) = 0.5$ ( $v_1$ is the numerator, $v_2$ the denominator, degrees of freedom) |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |                       |    |  |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-----------------------|----|--|
|            | $v_2 \backslash v_1$                                                                                                                                                                | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     | 12     | 15     | 20     | 25     | 30     | 40     | 50     | 60     | 75     | 100    | 175    | 350    | 1,000                 |    |  |
| 2006-12-20 | 1                                                                                                                                                                                   | 1.0000 | 1.5000 | 1.7092 | 1.8227 | 1.8937 | 1.9422 | 1.9774 | 2.0041 | 2.0250 | 2.0419 | 2.0674 | 2.0931 | 2.1191 | 2.1347 | 2.1452 | 2.1584 | 2.1663 | 2.1716 | 2.1769 | 2.1822 | 2.1890 | 2.1935 | 2.1965                | 1  |  |
|            | 2                                                                                                                                                                                   | .66667 | 1.0000 | 1.1349 | 1.2071 | 1.2519 | 1.2824 | 1.3046 | 1.3213 | 1.3344 | 1.3450 | 1.3610 | 1.3771 | 1.3933 | 1.4031 | 1.4096 | 1.4178 | 1.4228 | 1.4261 | 1.4294 | 1.4327 | 1.4370 | 1.4398 | 1.4417                | 5  |  |
|            | 3                                                                                                                                                                                   | .58506 | .88110 | 1.0000 | 1.0632 | 1.1024 | 1.1289 | 1.1482 | 1.1627 | 1.1741 | 1.1833 | 1.1972 | 1.2111 | 1.2252 | 1.2337 | 1.2393 | 1.2465 | 1.2507 | 1.2536 | 1.2565 | 1.2593 | 1.2630 | 1.2655 | 1.2671                |    |  |
|            | 4                                                                                                                                                                                   | .54863 | .82843 | .94053 | 1.0000 | 1.0367 | 1.0617 | 1.0797 | 1.0933 | 1.1040 | 1.1126 | 1.1255 | 1.1386 | 1.1517 | 1.1596 | 1.1649 | 1.1716 | 1.1756 | 1.1782 | 1.1809 | 1.1836 | 1.1870 | 1.1893 | 1.1908                |    |  |
|            | 5                                                                                                                                                                                   | .52807 | .79877 | .90715 | .96456 | 1.0000 | 1.0240 | 1.0414 | 1.0545 | 1.0648 | 1.0730 | 1.0855 | 1.0980 | 1.1106 | 1.1183 | 1.1234 | 1.1297 | 1.1336 | 1.1361 | 1.1387 | 1.1413 | 1.1446 | 1.1468 | 1.1483                |    |  |
|            | 6                                                                                                                                                                                   | .51489 | .77976 | .88578 | .94191 | .97654 | 1.0000 | 1.0169 | 1.0298 | 1.0398 | 1.0478 | 1.0600 | 1.0722 | 1.0845 | 1.0919 | 1.0969 | 1.1031 | 1.1068 | 1.1093 | 1.1118 | 1.1143 | 1.1176 | 1.1197 | 1.1211                | 10 |  |
|            | 7                                                                                                                                                                                   | .50572 | .76655 | .87094 | .92619 | .96026 | .98334 | 1.0000 | 1.0126 | 1.0224 | 1.0304 | 1.0423 | 1.0543 | 1.0664 | 1.0737 | 1.0785 | 1.0846 | 1.0883 | 1.0908 | 1.0932 | 1.0957 | 1.0989 | 1.1010 | 1.1023                |    |  |
|            | 8                                                                                                                                                                                   | .49898 | .75683 | .86004 | .91465 | .94831 | .97111 | .98757 | 1.0000 | 1.0097 | 1.0175 | 1.0293 | 1.0412 | 1.0531 | 1.0603 | 1.0651 | 1.0711 | 1.0747 | 1.0772 | 1.0796 | 1.0820 | 1.0851 | 1.0872 | 1.0886                |    |  |
|            | 9                                                                                                                                                                                   | .49382 | .74938 | .85168 | .90580 | .93916 | .96175 | .97805 | .99037 | 1.0000 | 1.0077 | 1.0194 | 1.0311 | 1.0429 | 1.0500 | 1.0548 | 1.0608 | 1.0643 | 1.0667 | 1.0691 | 1.0715 | 1.0746 | 1.0767 | 1.0780                |    |  |
|            | 10                                                                                                                                                                                  | .48974 | .74349 | .84508 | .89882 | .93193 | .95436 | .97054 | .98276 | .99232 | 1.0000 | 1.0116 | 1.0232 | 1.0349 | 1.0420 | 1.0467 | 1.0526 | 1.0562 | 1.0585 | 1.0609 | 1.0633 | 1.0664 | 1.0684 | 1.0697                |    |  |
|            | 11                                                                                                                                                                                  | .48643 | .73872 | .83973 | .89316 | .92608 | .94837 | .96445 | .97660 | .98610 | .99374 | 1.0052 | 1.0168 | 1.0284 | 1.0354 | 1.0401 | 1.0460 | 1.0495 | 1.0519 | 1.0542 | 1.0566 | 1.0597 | 1.0617 | 1.0630                | 15 |  |
|            | 12                                                                                                                                                                                  | .48370 | .73477 | .83531 | .88848 | .92124 | .94342 | .95943 | .97152 | .98097 | .98856 | 1.0000 | 1.0115 | 1.0231 | 1.0300 | 1.0347 | 1.0405 | 1.0440 | 1.0464 | 1.0487 | 1.0511 | 1.0541 | 1.0561 | 1.0575                |    |  |
|            | 13                                                                                                                                                                                  | .48140 | .73145 | .83159 | .88455 | .91718 | .93927 | .95520 | .96724 | .97665 | .98421 | .99560 | 1.0071 | 1.0186 | 1.0255 | 1.0301 | 1.0360 | 1.0395 | 1.0418 | 1.0441 | 1.0465 | 1.0495 | 1.0515 | 1.0528                |    |  |
|            | 14                                                                                                                                                                                  | .47944 | .72863 | .82842 | .88119 | .91371 | .93572 | .95160 | .96360 | .97298 | .98051 | .99186 | 1.0033 | 1.0147 | 1.0216 | 1.0263 | 1.0321 | 1.0355 | 1.0379 | 1.0402 | 1.0425 | 1.0455 | 1.0475 | 1.0488                |    |  |
|            | 15                                                                                                                                                                                  | .47775 | .72619 | .82568 | .87830 | .91072 | .93267 | .94850 | .96046 | .96981 | .97732 | .98863 | 1.0000 | 1.0114 | 1.0183 | 1.0229 | 1.0287 | 1.0322 | 1.0345 | 1.0368 | 1.0391 | 1.0421 | 1.0441 | 1.0454                |    |  |
|            | 16                                                                                                                                                                                  | .47628 | .72406 | .82330 | .87579 | .90812 | .93001 | .94580 | .95772 | .96705 | .97454 | .98582 | .99716 | 1.0086 | 1.0154 | 1.0200 | 1.0258 | 1.0292 | 1.0315 | 1.0338 | 1.0362 | 1.0391 | 1.0411 | 1.0424                | 20 |  |
|            | 17                                                                                                                                                                                  | .47499 | .72219 | .82121 | .87357 | .90583 | .92767 | .94342 | .95532 | .96462 | .97209 | .98335 | .99466 | 1.0060 | 1.0129 | 1.0175 | 1.0232 | 1.0266 | 1.0289 | 1.0313 | 1.0336 | 1.0365 | 1.0385 | 1.0398                |    |  |
|            | 18                                                                                                                                                                                  | .47384 | .72054 | .81935 | .87161 | .90381 | .92560 | .94132 | .95319 | .96247 | .96993 | .98116 | .99244 | 1.0038 | 1.0106 | 1.0152 | 1.0209 | 1.0244 | 1.0267 | 1.0290 | 1.0313 | 1.0342 | 1.0362 | 1.0375                |    |  |
|            | 19                                                                                                                                                                                  | .47282 | .71906 | .81770 | .86986 | .90200 | .92375 | .93944 | .95129 | .96056 | .96800 | .97920 | .99047 | 1.0018 | 1.0086 | 1.0132 | 1.0189 | 1.0223 | 1.0246 | 1.0269 | 1.0292 | 1.0322 | 1.0341 | 1.0354                |    |  |
| 20         | .47191                                                                                                                                                                              | .71773 | .81621 | .86829 | .90038 | .92209 | .93776 | .94959 | .95884 | .96626 | .97745 | .98870 | 1.0000 | 1.0068 | 1.0114 | 1.0171 | 1.0205 | 1.0228 | 1.0251 | 1.0274 | 1.0303 | 1.0323 | 1.0336 |                       |    |  |
| 22         | .47033                                                                                                                                                                              | .71545 | .81365 | .86559 | .89758 | .91924 | .93486 | .94665 | .95588 | .96328 | .97444 | .98565 | .99692 | 1.0037 | 1.0082 | 1.0139 | 1.0173 | 1.0196 | 1.0219 | 1.0242 | 1.0271 | 1.0291 | 1.0304 | $F_{v_1, v_2}$<br>.50 |    |  |
| 24         | .46902                                                                                                                                                                              | .71356 | .81153 | .86335 | .89526 | .91687 | .93245 | .94422 | .95342 | .96081 | .97194 | .98312 | .99436 | 1.0011 | 1.0057 | 1.0113 | 1.0147 | 1.0170 | 1.0193 | 1.0216 | 1.0245 | 1.0265 | 1.0277 |                       |    |  |
| 26         | .46791                                                                                                                                                                              | .71196 | .80974 | .86145 | .89331 | .91487 | .93042 | .94217 | .95135 | .95872 | .96983 | .98099 | .99220 | .99896 | 1.0035 | 1.0091 | 1.0125 | 1.0148 | 1.0171 | 1.0193 | 1.0223 | 1.0242 | 1.0255 |                       |    |  |
| 28         | .46697                                                                                                                                                                              | .71059 | .80821 | .85984 | .89164 | .91316 | .92869 | .94041 | .94958 | .95694 | .96802 | .97917 | .99036 | .99710 | 1.0016 | 1.0073 | 1.0106 | 1.0129 | 1.0152 | 1.0175 | 1.0204 | 1.0223 | 1.0236 |                       |    |  |
| 30         | .46616                                                                                                                                                                              | .70941 | .80689 | .85844 | .89019 | .91169 | .92719 | .93890 | .94805 | .95540 | .96647 | .97759 | .98877 | .99550 | 1.0000 | 1.0056 | 1.0090 | 1.0113 | 1.0135 | 1.0158 | 1.0187 | 1.0207 | 1.0220 |                       |    |  |
| 35         | .46453                                                                                                                                                                              | .70706 | .80425 | .85565 | .88731 | .90874 | .92420 | .93587 | .94500 | .95232 | .96336 | .97445 | .98560 | .99231 | .99679 | 1.0024 | 1.0058 | 1.0080 | 1.0103 | 1.0126 | 1.0155 | 1.0174 | 1.0187 | 30                    |    |  |
| 40         | .46332                                                                                                                                                                              | .70530 | .80228 | .85357 | .88516 | .90654 | .92197 | .93361 | .94272 | .95003 | .96104 | .97211 | .98323 | .98992 | .99440 | 1.0000 | 1.0034 | 1.0056 | 1.0079 | 1.0101 | 1.0130 | 1.0150 | 1.0162 |                       |    |  |
| 45         | .46237                                                                                                                                                                              | .70393 | .80075 | .85195 | .88349 | .90484 | .92024 | .93186 | .94095 | .94825 | .95924 | .97029 | .98139 | .98807 | .99254 | .99813 | 1.0015 | 1.0037 | 1.0060 | 1.0082 | 1.0111 | 1.0131 | 1.0143 |                       |    |  |
| 50         | .46162                                                                                                                                                                              | .70285 | .79953 | .85066 | .88216 | .90348 | .91885 | .93047 | .93954 | .94683 | .95781 | .96884 | .97992 | .98660 | .99106 | .99664 | 1.0000 | 1.0022 | 1.0045 | 1.0067 | 1.0096 | 1.0115 | 1.0128 |                       |    |  |
| 60         | .46050                                                                                                                                                                              | .70122 | .79779 | .84873 | .88017 | .90144 | .91679 | .92837 | .93743 | .94471 | .95566 | .96667 | .97773 | .98439 | .98884 | .99441 | .99776 | 1.0000 | 1.0022 | 1.0045 | 1.0074 | 1.0093 | 1.0105 |                       |    |  |
| 70         | .45970                                                                                                                                                                              | .70006 | .79640 | .84736 | .87875 | .89999 | .91531 | .92689 | .93593 | .94319 | .95413 | .96512 | .97617 | .98282 | .98726 | .99283 | .99617 | .99840 | 1.0006 | 1.0029 | 1.0058 | 1.0077 | 1.0089 | 50                    |    |  |
| 80         | .45910                                                                                                                                                                              | .69919 | .79543 | .84633 | .87768 | .89891 | .91421 | .92577 | .93480 | .94206 | .95299 | .96397 | .97500 | .98164 | .98608 | .99164 | .99498 | .99721 | .99944 | 1.0017 | 1.0046 | 1.0065 | 1.0077 |                       |    |  |
| 90         | .45863                                                                                                                                                                              | .69851 | .79467 | .84553 | .87686 | .89806 | .91336 | .92490 | .93393 | .94118 | .95210 | .96307 | .97409 | .98073 | .98516 | .99072 | .99405 | .99628 | .99851 | 1.0007 | 1.0036 | 1.0055 | 1.0068 |                       |    |  |
| 100        | .45826                                                                                                                                                                              | .69797 | .79407 | .84489 | .87620 | .89739 | .91267 | .92421 | .93323 | .94048 | .95139 | .96235 | .97337 | .98000 | .98443 | .98998 | .99332 | .99554 | .99777 | 1.0000 | 1.0029 | 1.0048 | 1.0060 |                       |    |  |
| 125        | .45759                                                                                                                                                                              | .69701 | .79298 | .84374 | .87501 | .89618 | .91144 | .92297 | .93198 | .93921 | .95011 | .96106 | .97206 | .97869 | .98311 | .98866 | .99199 | .99421 | .99644 | .99866 | 1.0015 | 1.0034 | 1.0047 |                       |    |  |
| 150        | .45715                                                                                                                                                                              | .69636 | .79226 | .84298 | .87422 | .89537 | .91062 | .92214 | .93114 | .93837 | .94926 | .96020 | .97119 | .97781 | .98224 | .98777 | .99110 | .99332 | .99555 | .99777 | 1.0006 | 1.0025 | 1.0038 | 100                   |    |  |
| 175        | .45683                                                                                                                                                                              | .69590 | .79174 | .84243 | .87366 | .89480 | .91004 | .92155 | .93055 | .93777 | .94865 | .95959 | .97058 | .97719 | .98161 | .98715 | .99047 | .99269 | .99491 | .99714 | 1.0000 | 1.0019 | 1.0032 |                       |    |  |
| 200        | .45660                                                                                                                                                                              | .69556 | .79136 | .84203 | .87324 | .89436 | .90960 | .92111 | .93010 | .93732 | .94820 | .95913 | .97011 | .97672 | .98114 | .98667 | .99000 | .99222 | .99444 | .99666 | .99952 | 1.0014 | 1.0027 |                       |    |  |
| 250        | .45626                                                                                                                                                                              | .69507 | .79082 | .84145 | .87265 | .89376 | .90899 | .92049 | .92948 | .93669 | .94756 | .95849 | .96946 | .97607 | .98049 | .98601 | .98934 | .99156 | .99378 | .99600 | .99886 | 1.0008 | 1.0020 |                       |    |  |
| 300        | .45604                                                                                                                                                                              | .69475 | .79046 | .84107 | .87226 | .89336 | .90858 | .92007 | .92906 |        |        |        |        |        |        |        |        |        |        |        |        |        |        |                       |    |  |