

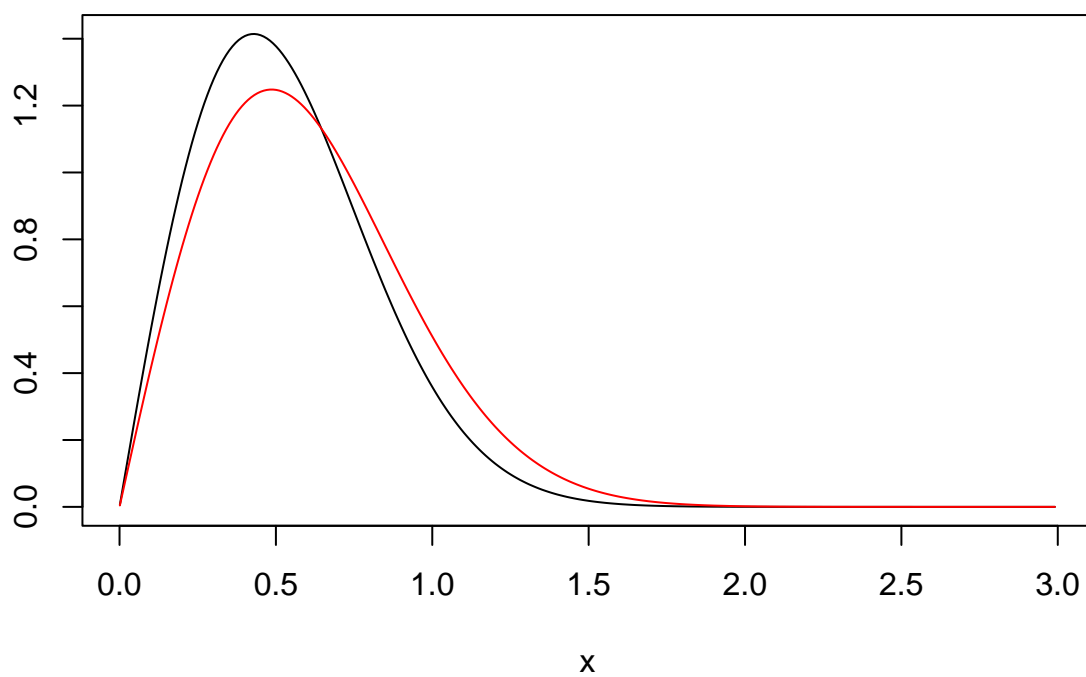
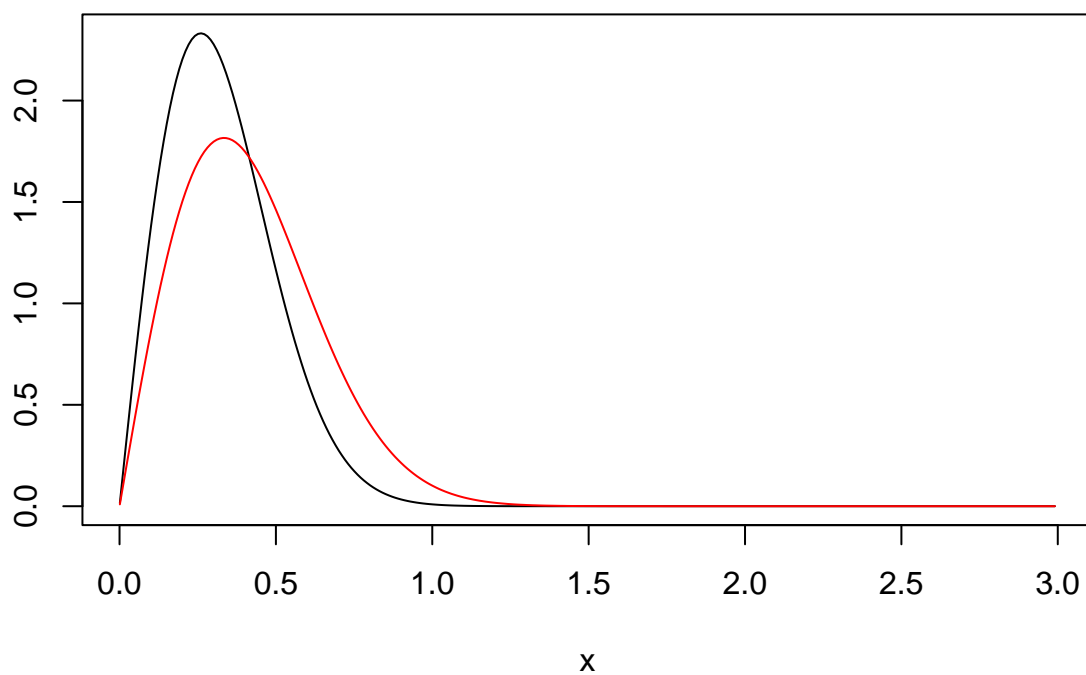
Sensitivity Analysis

Florian Stijven

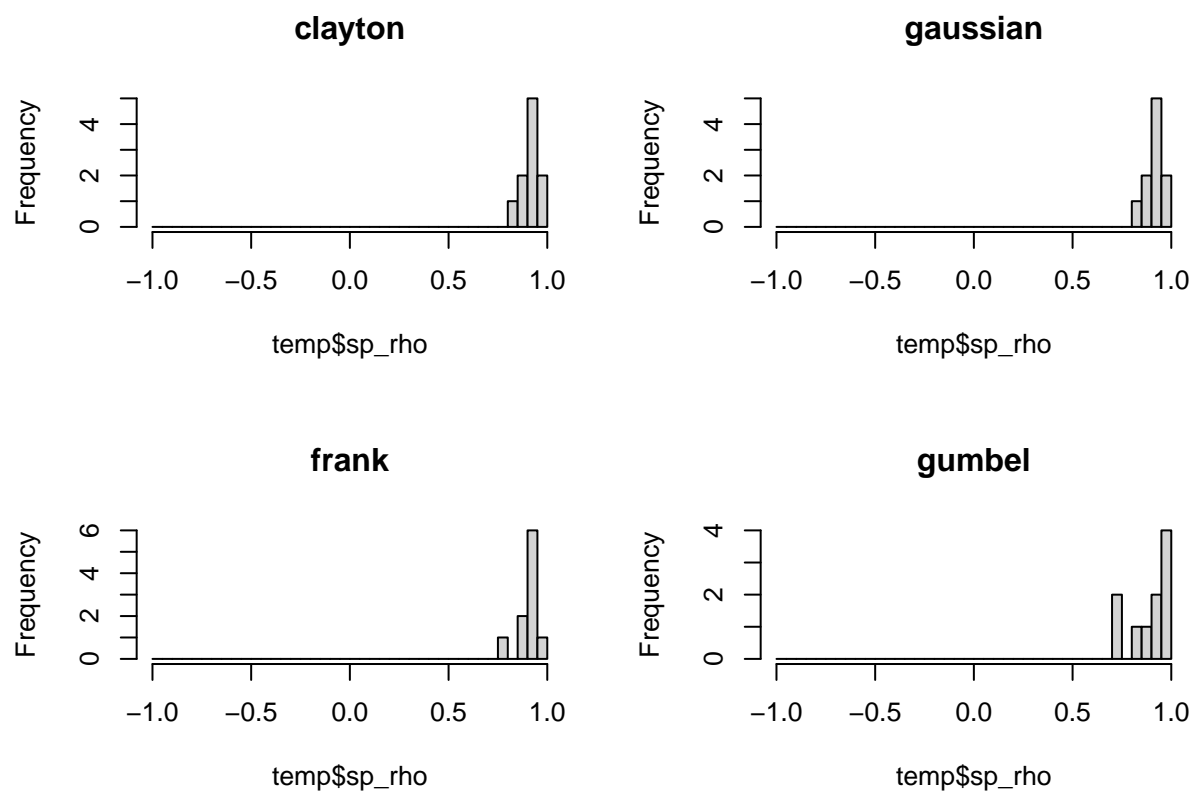
6-5-2022

Without time ordering

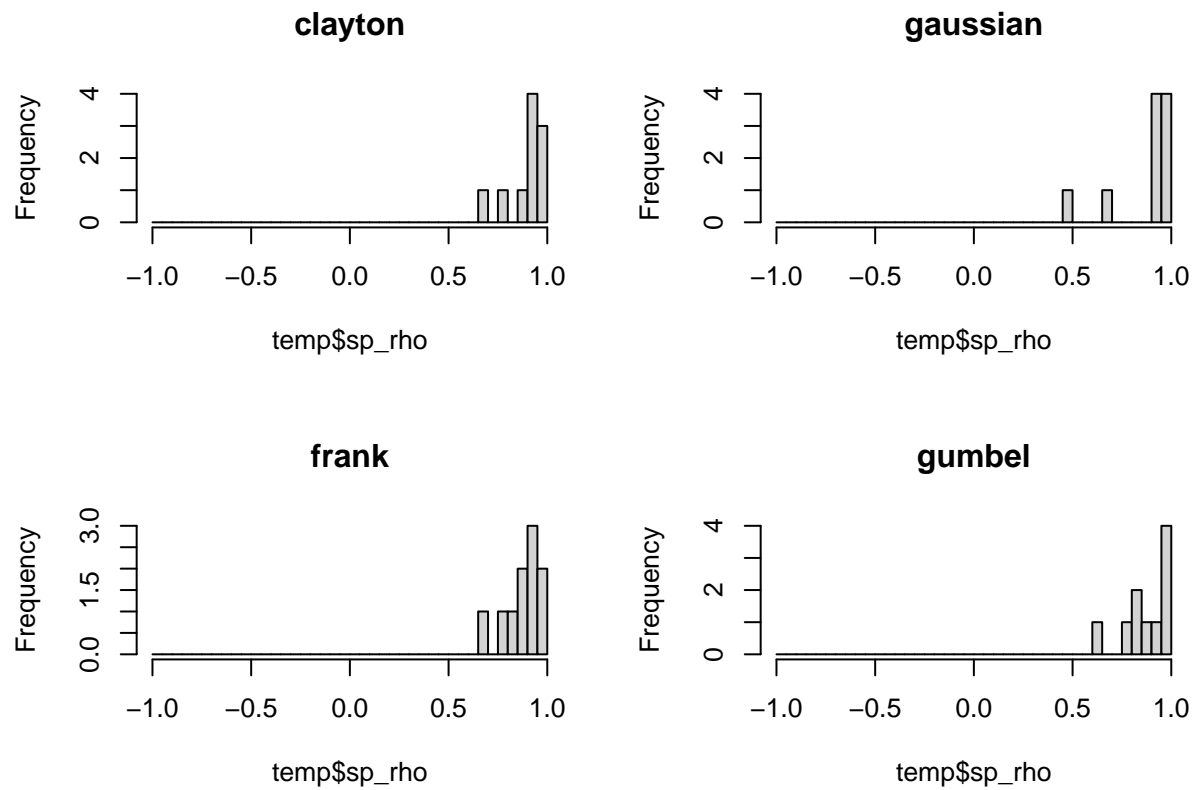
dsurv spline0(x = x, gamma0 = 2, gamma1 = 2, knots = knot



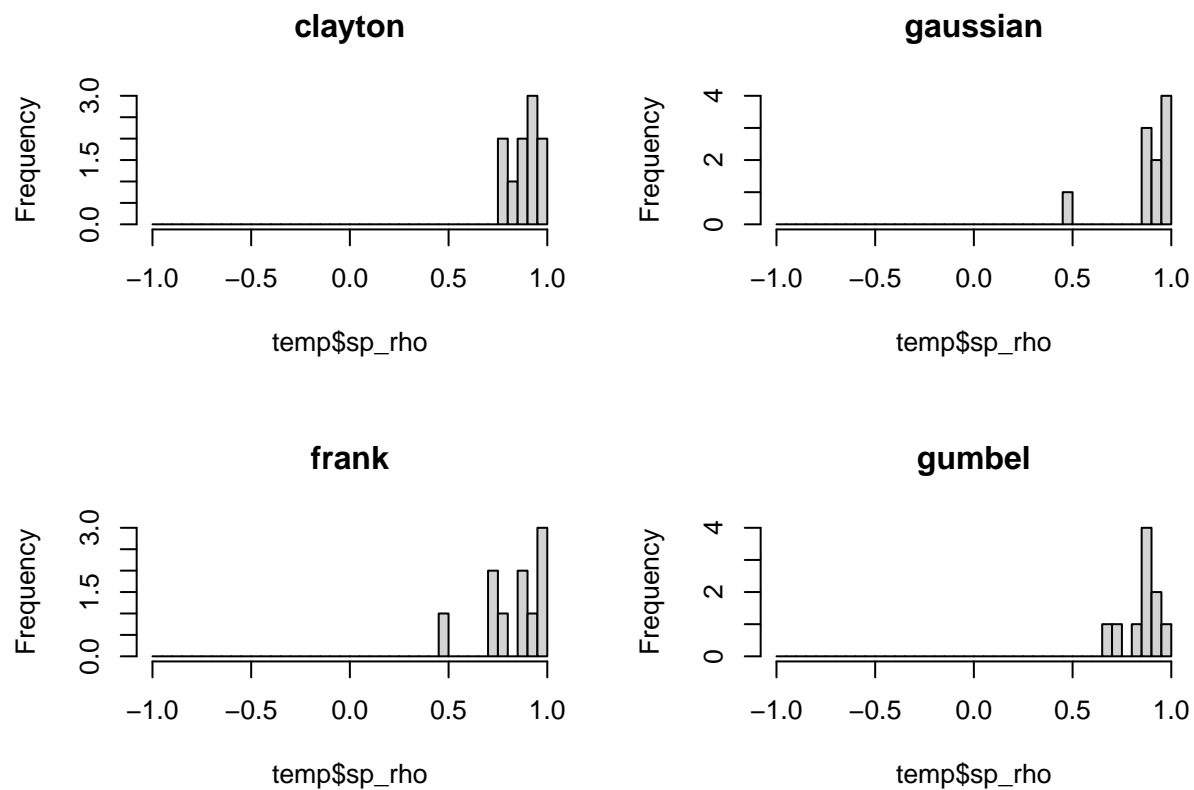
Strong



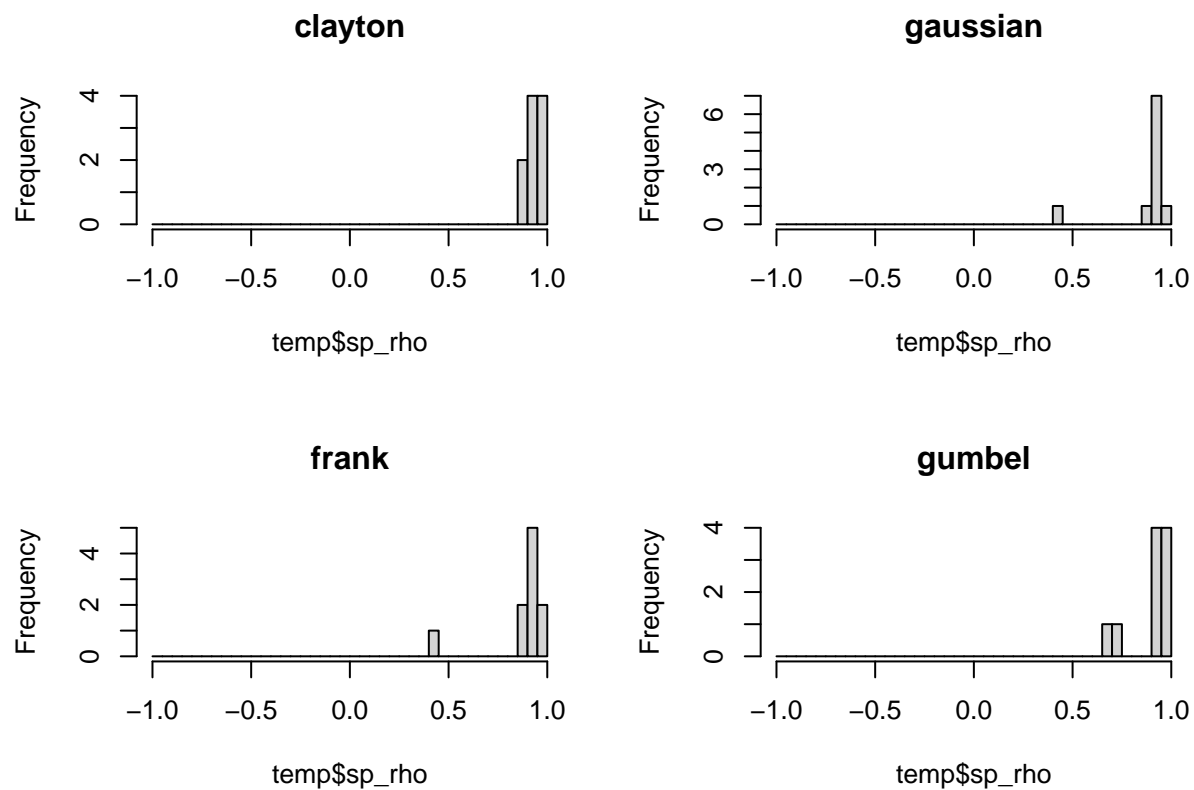
```
## # A tibble: 4 x 8
##   unid      min  max mean median   p1  p99   sd
##   <chr>   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 clayton 0.842 0.966 0.922 0.936 0.845 0.966 0.0411
## 2 frank   0.776 0.978 0.912 0.923 0.786 0.975 0.0556
## 3 gaussian 0.842 0.977 0.920 0.937 0.843 0.975 0.0450
## 4 gumbel  0.740 0.990 0.891 0.926 0.741 0.987 0.0914
```



```
## # A tibble: 4 x 8
##   unid      min  max mean median   p1   p99    sd
##   <chr>   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 clayton 0.665 0.970 0.891 0.918 0.675 0.969 0.0976
## 2 frank   0.666 0.987 0.881 0.905 0.678 0.984 0.0951
## 3 gaussian 0.498 0.991 0.880 0.938 0.516 0.989 0.157
## 4 gumbel  0.612 0.991 0.877 0.918 0.626 0.989 0.119
```

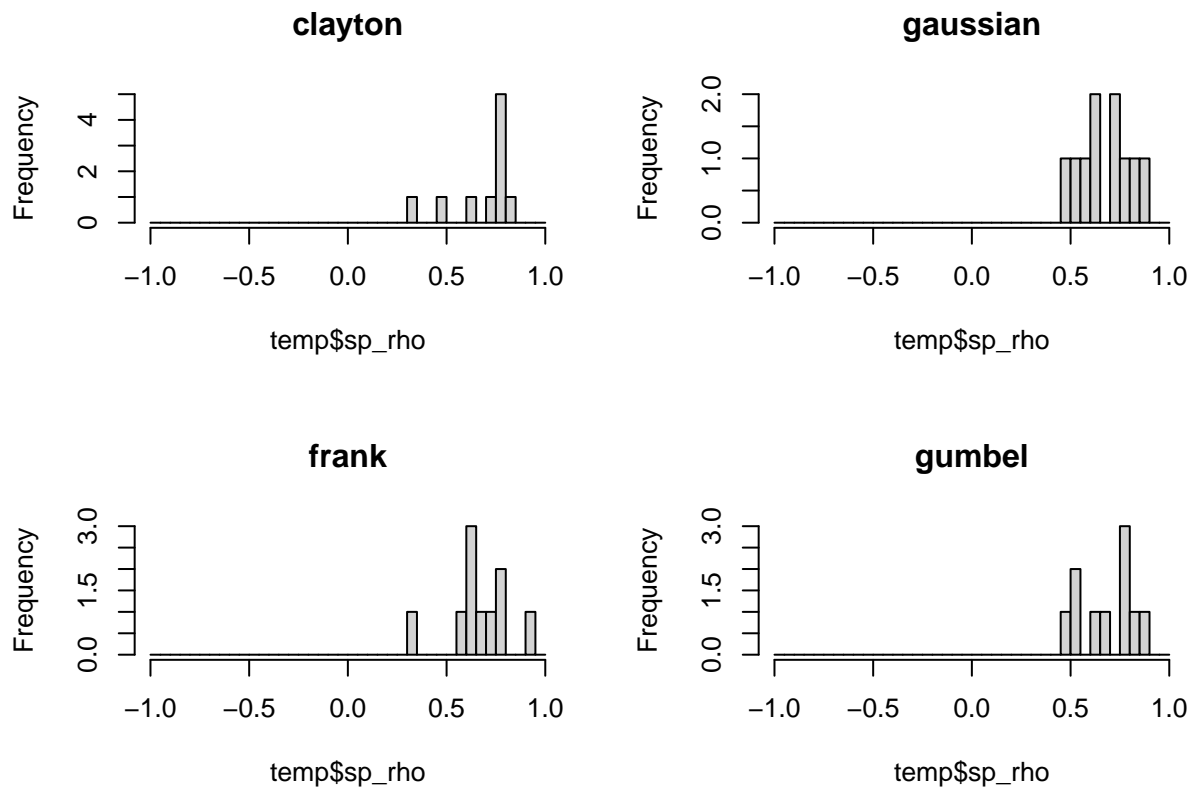


```
## # A tibble: 4 x 8
##   unid      min  max mean median   p1   p99    sd
##   <chr>   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 clayton 0.760 0.975 0.884 0.908 0.762 0.974 0.0797
## 2 frank   0.466 0.969 0.834 0.883 0.491 0.969 0.157
## 3 gaussian 0.485 0.979 0.884 0.917 0.519 0.978 0.145
## 4 gumbel  0.677 0.969 0.862 0.887 0.681 0.967 0.0934
```

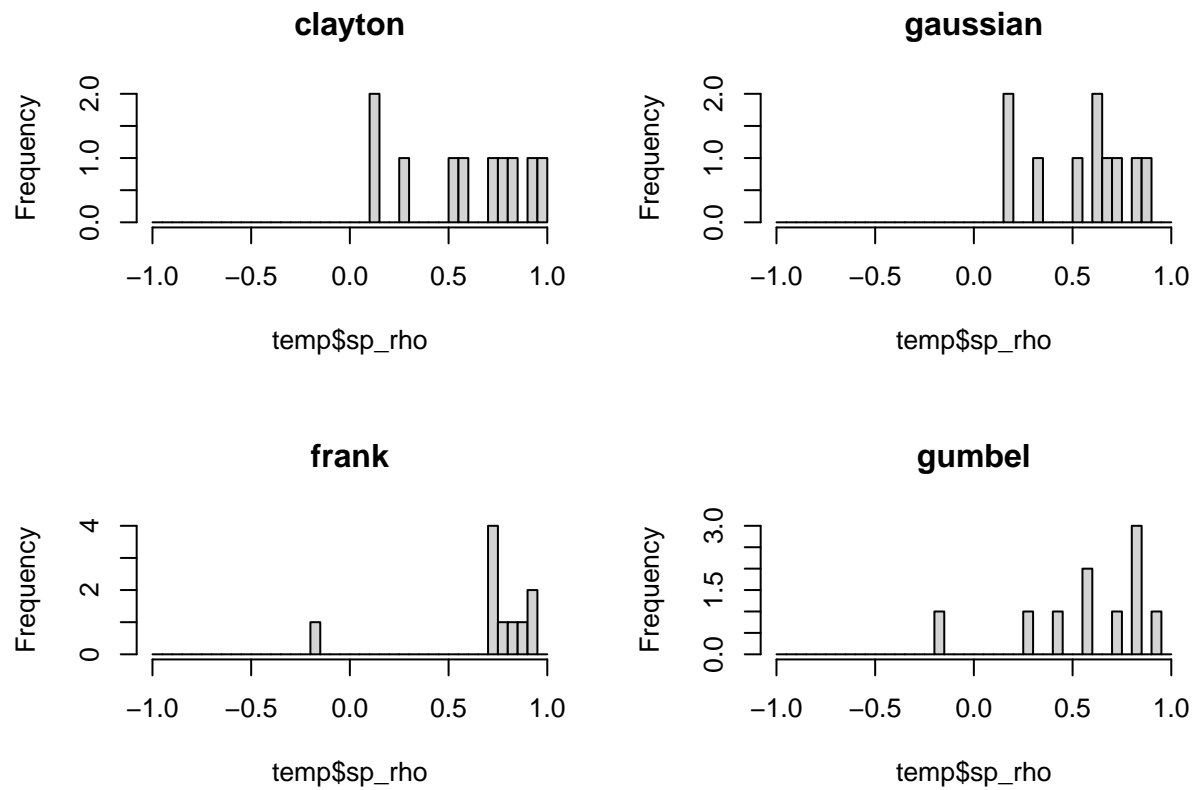


```
## # A tibble: 4 x 8
##   unid      min  max mean median   p1   p99    sd
##   <chr>   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 clayton 0.858 0.974 0.932 0.941 0.858 0.973 0.0435
## 2 frank   0.415 0.968 0.874 0.924 0.456 0.966 0.164
## 3 gaussian 0.424 0.986 0.878 0.917 0.466 0.983 0.162
## 4 gumbel  0.677 0.967 0.899 0.941 0.683 0.967 0.103
```

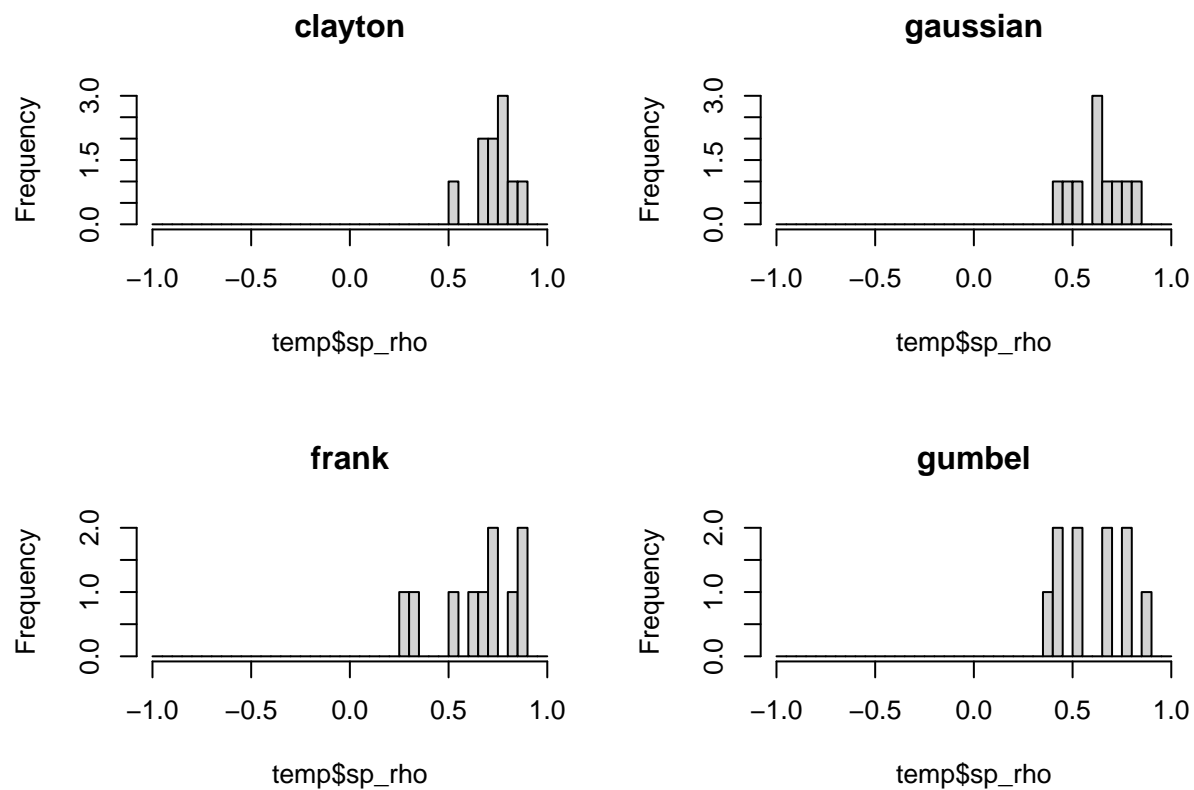
Moderate



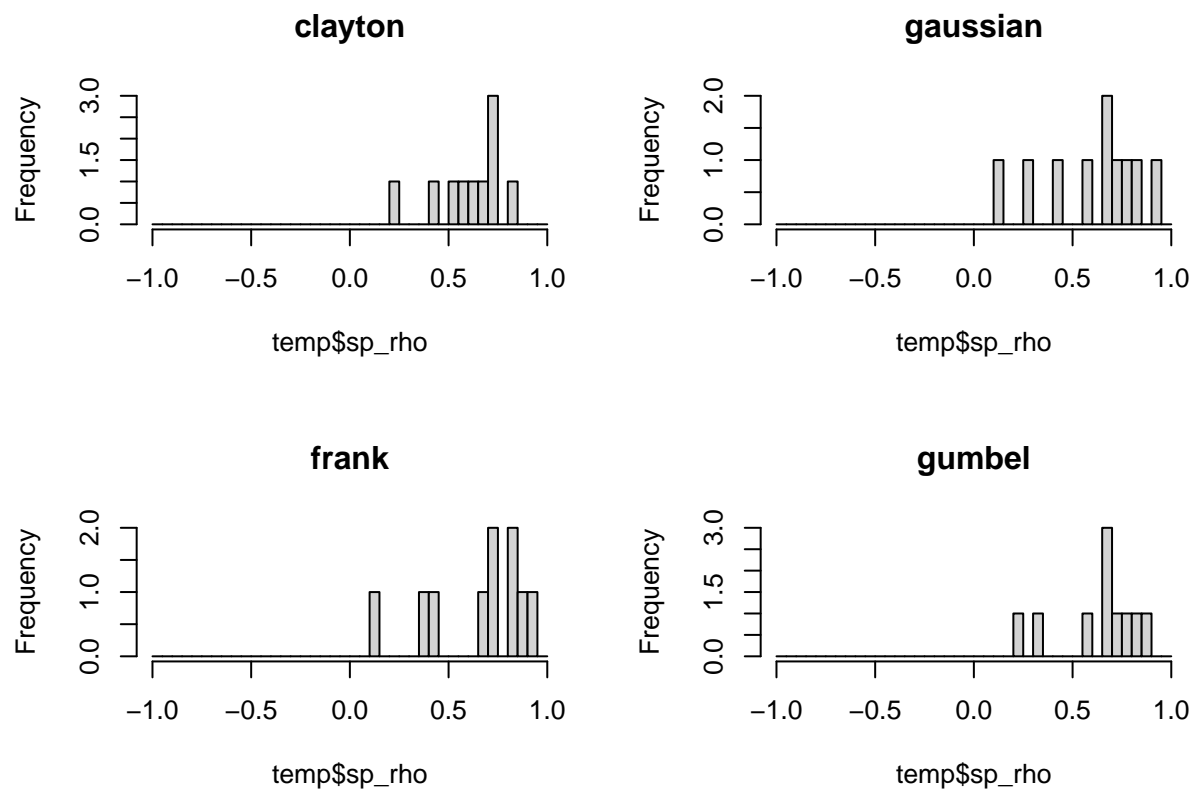
```
## # A tibble: 4 x 8
##   unid      min  max mean median  p1  p99  sd
##   <chr>   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 clayton 0.301 0.827 0.686 0.770 0.319 0.824 0.169
## 2 frank   0.304 0.907 0.652 0.637 0.327 0.895 0.161
## 3 gaussian 0.484 0.874 0.675 0.684 0.488 0.870 0.129
## 4 gumbel  0.497 0.873 0.688 0.713 0.500 0.868 0.135
```



```
## # A tibble: 4 x 8
##   unid      min  max mean median    p1  p99   sd
##   <chr>   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 clayton  0.120 0.952 0.592 0.654 0.123 0.951 0.313
## 2 frank   -0.187 0.920 0.709 0.773 -0.105 0.919 0.324
## 3 gaussian 0.154 0.883 0.550 0.627 0.154 0.879 0.260
## 4 gumbel  -0.189 0.917 0.574 0.653 -0.148 0.908 0.336
```

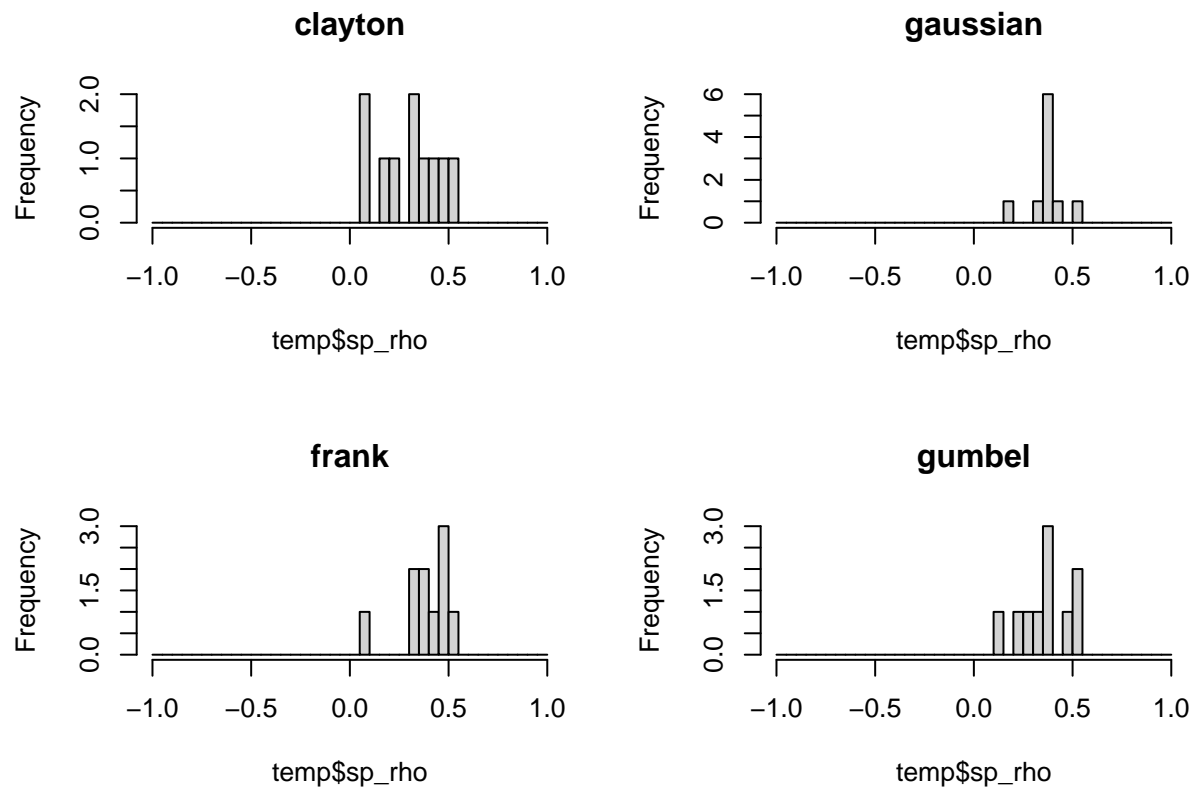



```
## # A tibble: 4 x 8
##   unid      min  max mean median   p1   p99    sd
##   <chr>   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 clayton 0.530 0.856 0.732 0.746 0.541 0.852 0.0952
## 2 frank   0.260 0.856 0.641 0.699 0.265 0.856 0.214
## 3 gaussian 0.437 0.849 0.631 0.615 0.440 0.840 0.128
## 4 gumbel  0.372 0.892 0.599 0.595 0.376 0.881 0.176
```

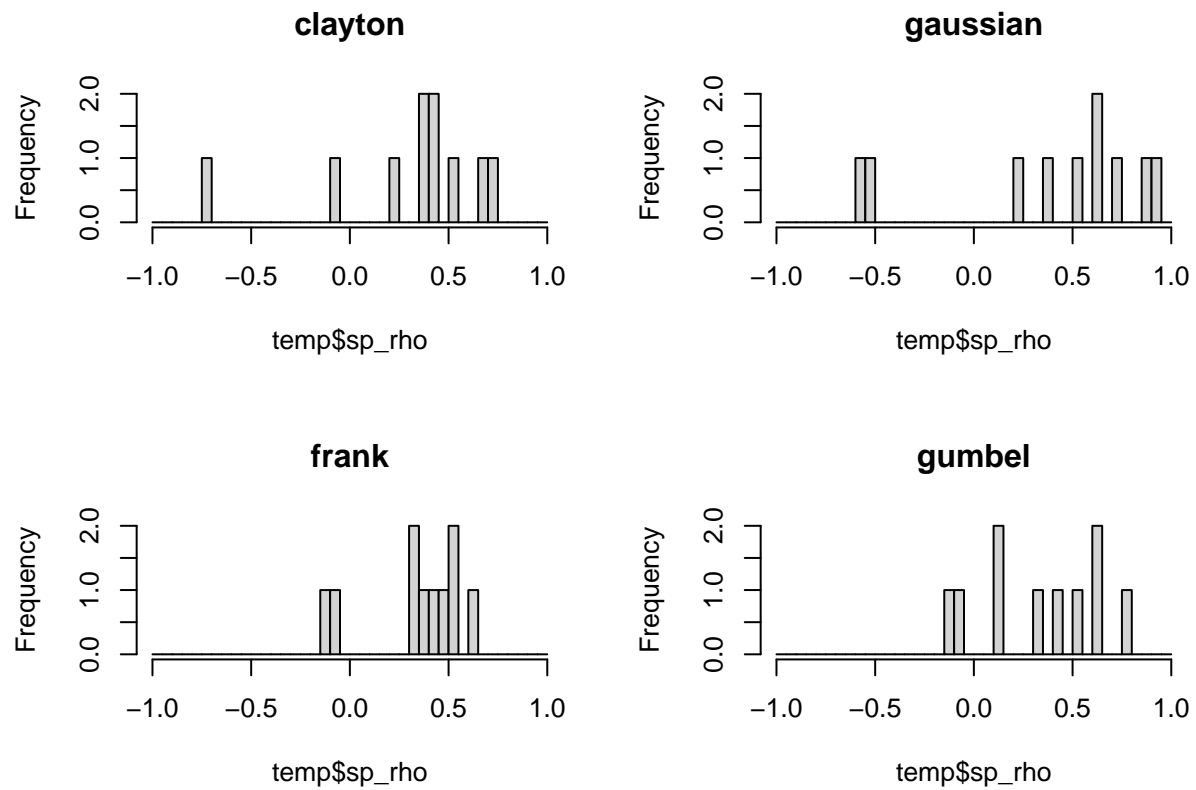


```
## # A tibble: 4 x 8
##   unid      min  max mean median    p1  p99   sd
##   <chr>   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 clayton 0.215 0.822 0.613 0.647 0.236 0.816 0.179
## 2 frank   0.119 0.937 0.649 0.721 0.144 0.930 0.257
## 3 gaussian 0.129 0.923 0.600 0.689 0.142 0.913 0.253
## 4 gumbel  0.207 0.884 0.635 0.677 0.216 0.880 0.217
```

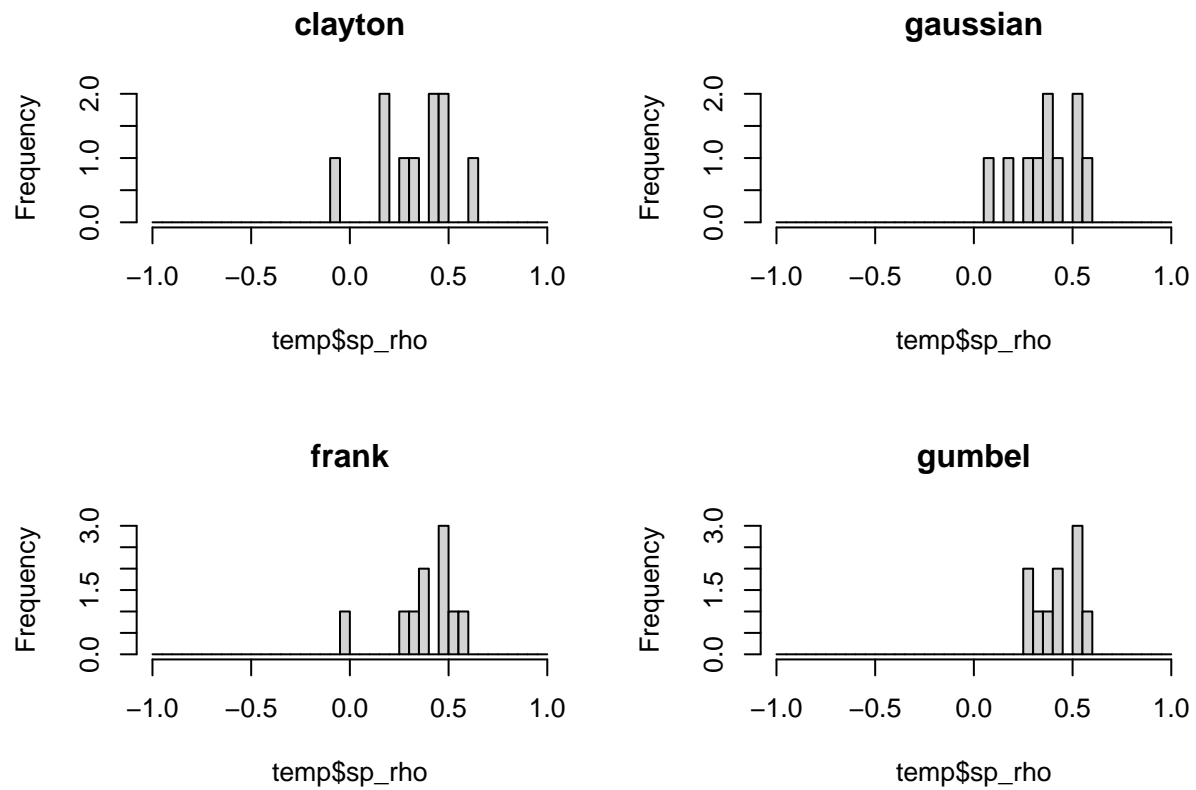
Weak



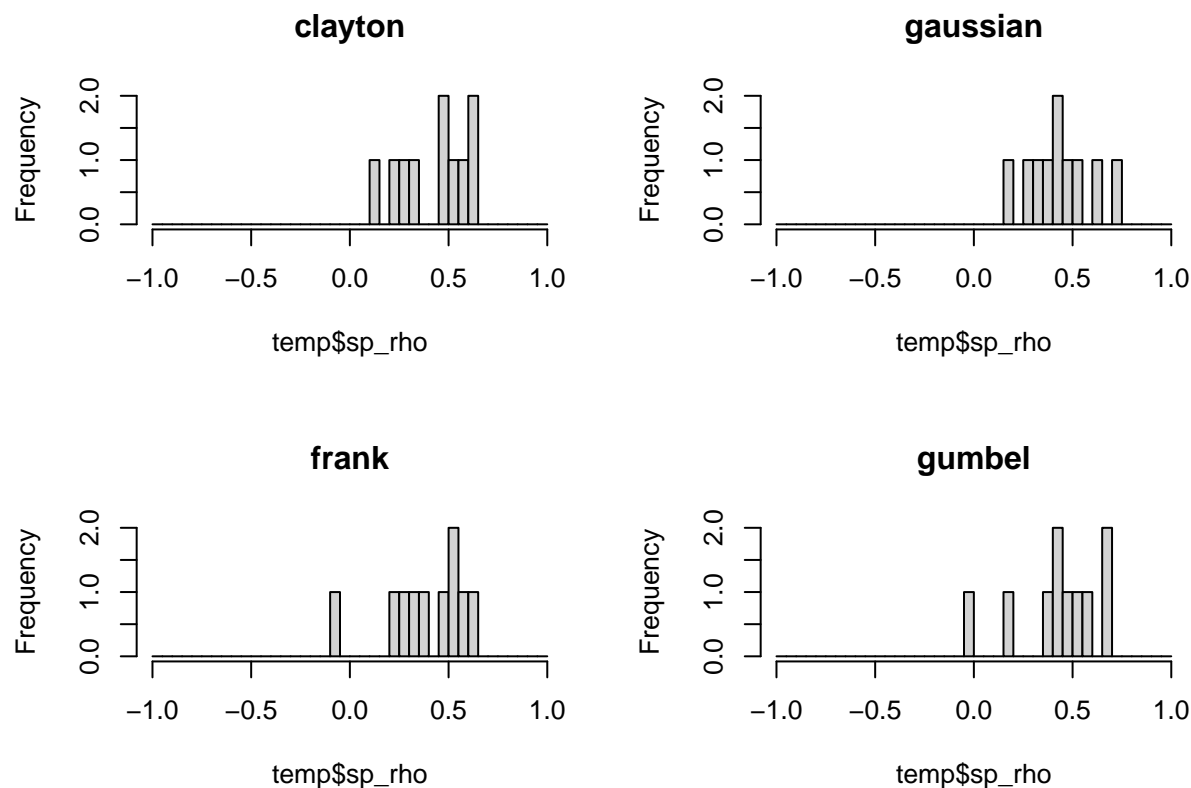
```
## # A tibble: 4 x 8
##   unid      min  max mean median    p1  p99    sd
##   <chr>    <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 clayton 0.0697 0.518 0.302 0.337 0.0720 0.513 0.153
## 2 frank   0.0675 0.539 0.392 0.419 0.0905 0.534 0.132
## 3 gaussian 0.160 0.518 0.366 0.375 0.176 0.508 0.0876
## 4 gumbel  0.117 0.532 0.362 0.389 0.127 0.532 0.133
```



```
## # A tibble: 4 x 8
##   unid      min  max mean median    p1  p99   sd
##   <chr>   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 clayton -0.722 0.750 0.295 0.400 -0.665 0.744 0.426
## 2 frank   -0.113 0.629 0.343 0.404 -0.111 0.621 0.251
## 3 gaussian -0.597 0.925 0.377 0.554 -0.589 0.920 0.533
## 4 gumbel  -0.109 0.759 0.329 0.356 -0.108 0.748 0.311
```



```
## # A tibble: 4 x 8
##   unid      min    max  mean median      p1    p99    sd
##   <chr>    <dbl> <dbl> <dbl> <dbl>    <dbl> <dbl> <dbl>
## 1 clayton -0.0509 0.605 0.322 0.372 -0.0318 0.593 0.189
## 2 frank   -0.0175 0.552 0.375 0.416 0.00914 0.548 0.163
## 3 gaussian 0.0782 0.590 0.370 0.380 0.0855 0.586 0.166
## 4 gumbel   0.256 0.551 0.417 0.439 0.257 0.548 0.108
```



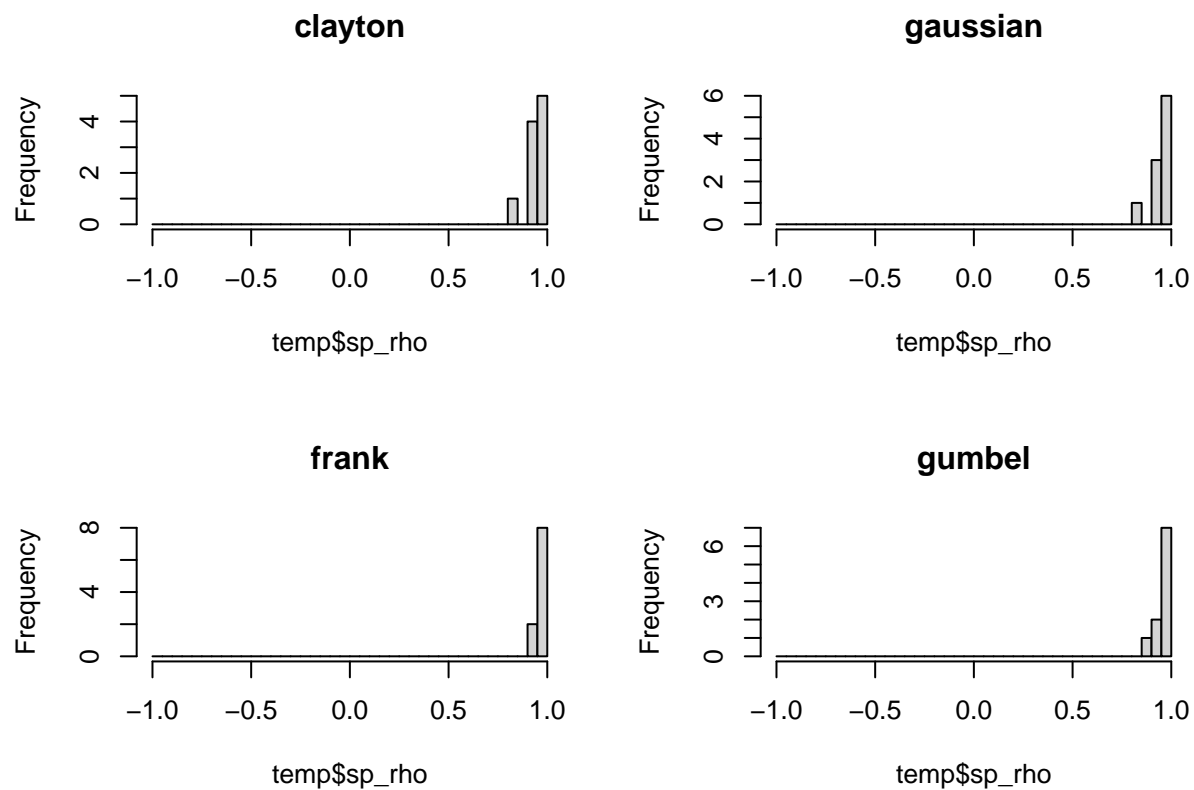
```
## # A tibble: 4 x 8
##   unid      min    max  mean median    p1    p99    sd
##   <chr>    <dbl> <dbl> <dbl> <dbl>  <dbl> <dbl> <dbl>
## 1 clayton  0.122  0.619 0.421  0.470  0.133  0.617 0.172
## 2 frank   -0.0635 0.641 0.387  0.437 -0.0378 0.634 0.206
## 3 gaussian 0.197  0.719 0.441  0.423  0.204  0.712 0.161
## 4 gumbel  -0.0292 0.666 0.425  0.444 -0.0102 0.666 0.215
```

With time ordering

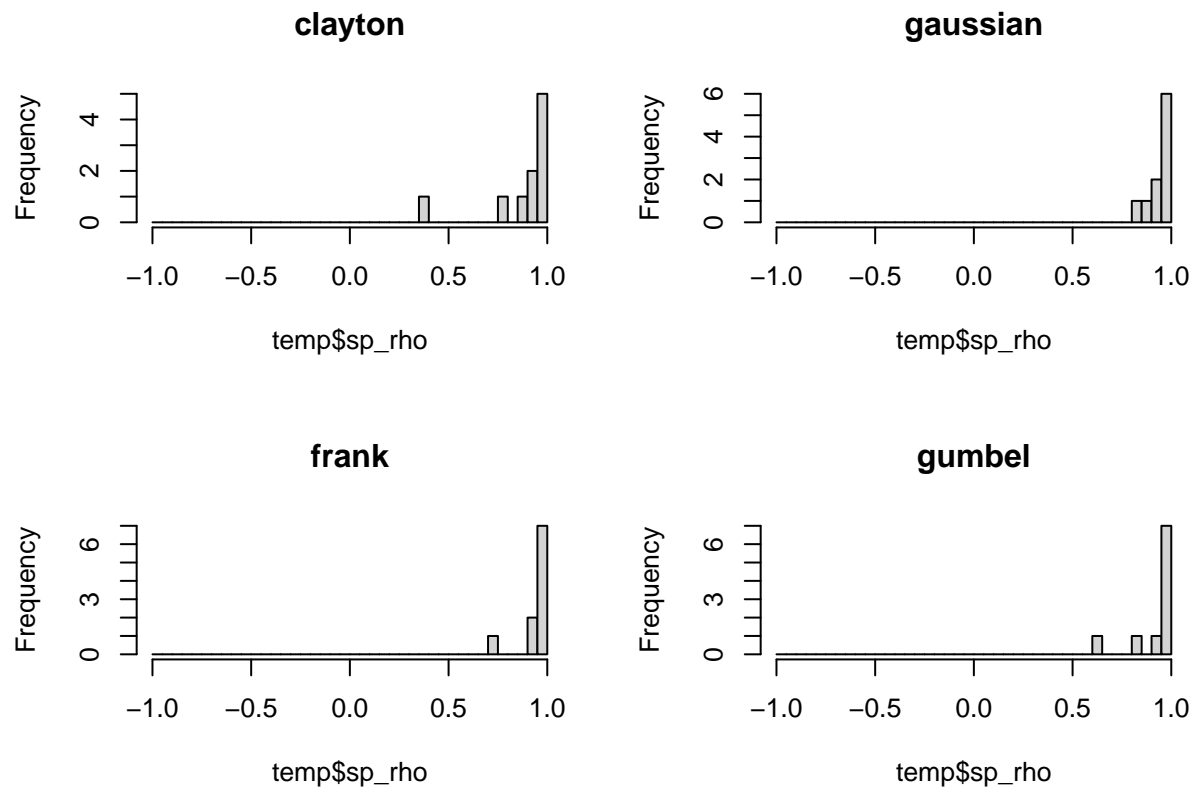
The marginal parameters should be determined such that around 20% of the observations are censored by death. This is a more or less realistic situation, but could be varied.

Strong

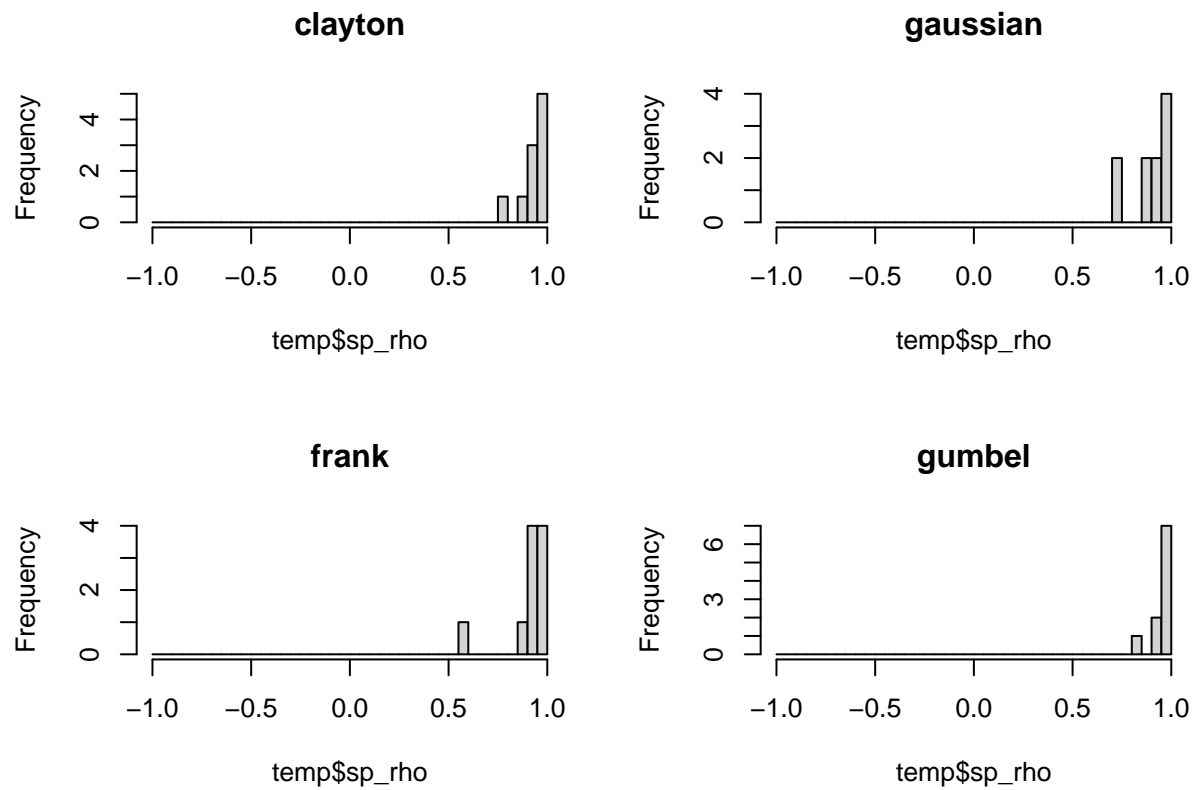
```
## [1] 0.1438
## [1] 0.1474
```



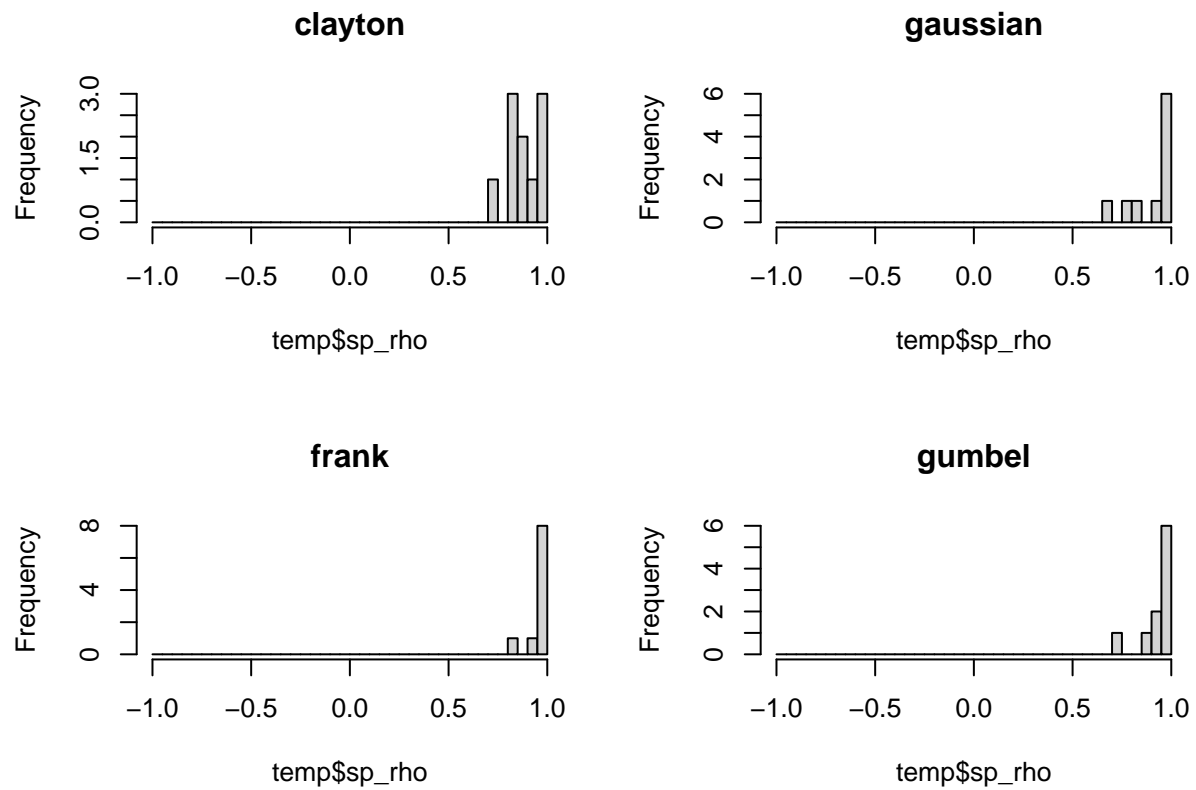
```
## # A tibble: 4 x 8
##   unid      min  max mean median    p1  p99    sd
##   <chr>   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 clayton 0.841 0.974 0.939 0.955 0.846 0.974 0.0423
## 2 frank   0.919 0.988 0.958 0.962 0.921 0.986 0.0186
## 3 gaussian 0.821 0.981 0.942 0.954 0.831 0.980 0.0454
## 4 gumbel  0.885 0.984 0.950 0.959 0.887 0.984 0.0345
```



```
## # A tibble: 4 x 8
##   unid      min  max mean median   p1  p99    sd
##   <chr>   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 clayton 0.380 0.992 0.879 0.954 0.417 0.992 0.187
## 2 frank   0.742 0.980 0.934 0.959 0.758 0.979 0.0699
## 3 gaussian 0.811 0.987 0.933 0.958 0.816 0.986 0.0552
## 4 gumbel  0.611 0.992 0.921 0.971 0.629 0.992 0.121
```

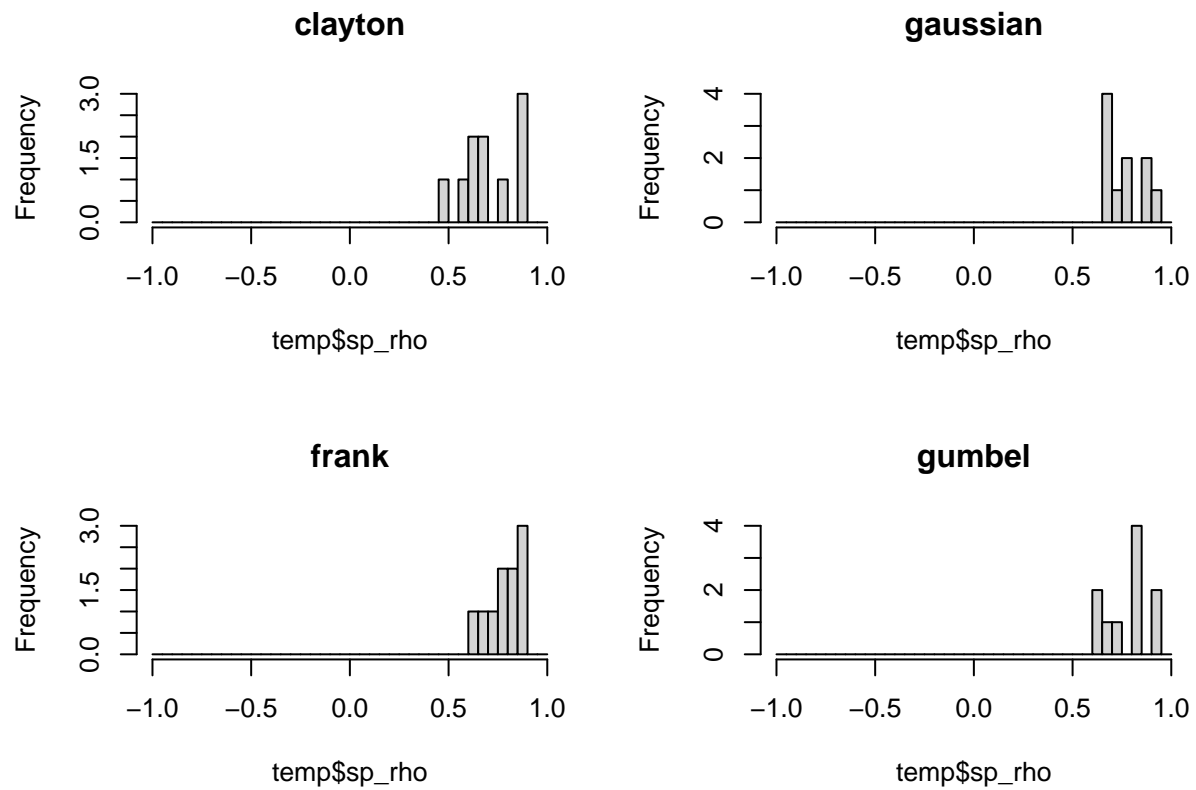
```
## # A tibble: 4 x 8
##   unid      min  max mean median   p1   p99    sd
##   <chr>   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 clayton 0.776 0.995 0.935 0.953 0.786 0.994 0.0642
## 2 frank   0.562 0.985 0.907 0.941 0.591 0.984 0.125
## 3 gaussian 0.712 0.982 0.896 0.939 0.714 0.981 0.0964
## 4 gumbel  0.840 0.992 0.952 0.959 0.850 0.991 0.0421
```



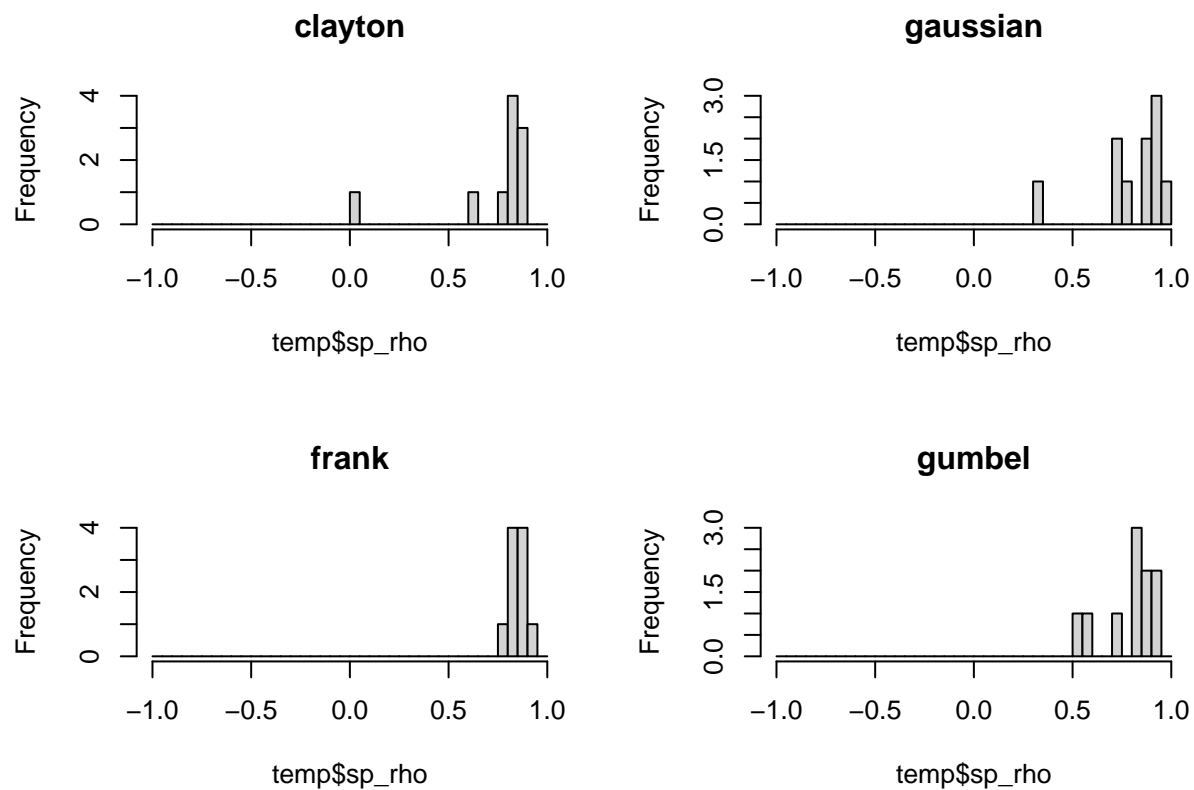
```
## # A tibble: 4 x 8
##   unid      min  max mean median   p1  p99    sd
##   <chr>   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 clayton 0.745 0.981 0.878 0.867 0.750 0.980 0.0794
## 2 frank   0.827 0.985 0.948 0.960 0.835 0.984 0.0465
## 3 gaussian 0.699 0.981 0.904 0.966 0.705 0.981 0.103
## 4 gumbel  0.741 0.988 0.932 0.959 0.755 0.988 0.0737
```

Moderate

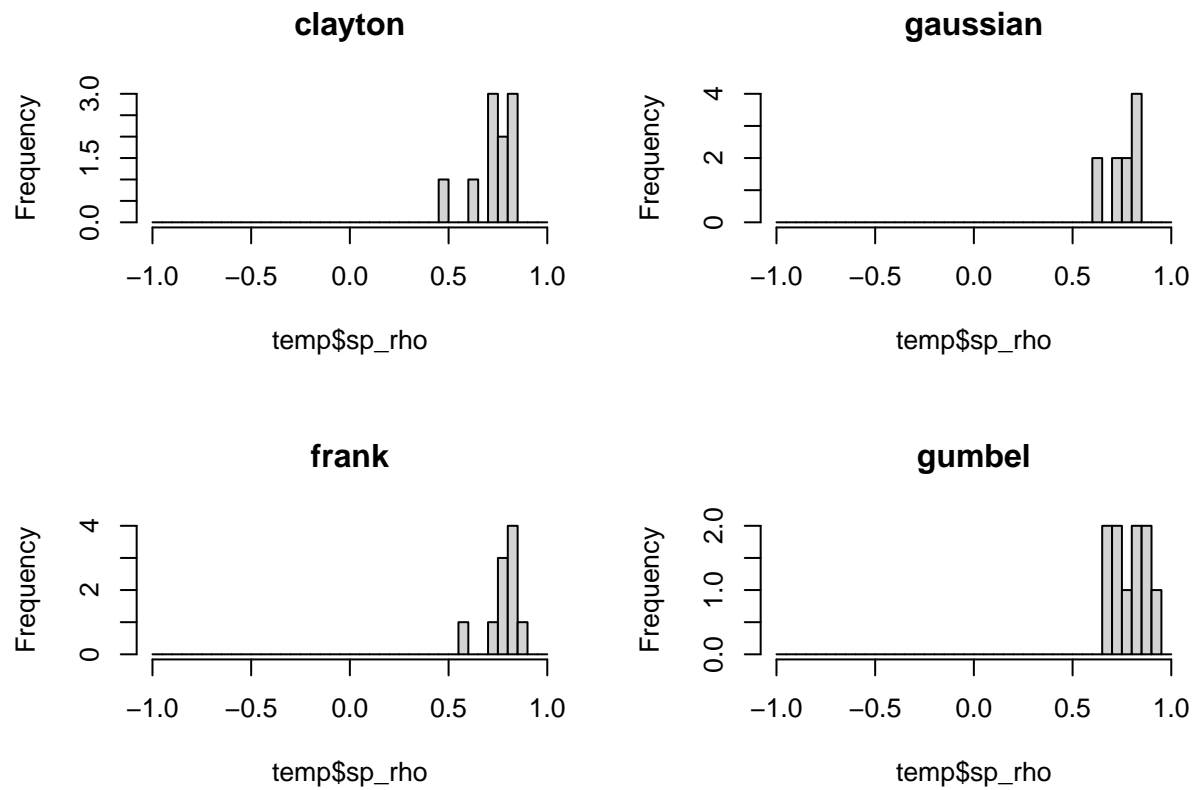
```
## [1] 0.161
## [1] 0.1569
```



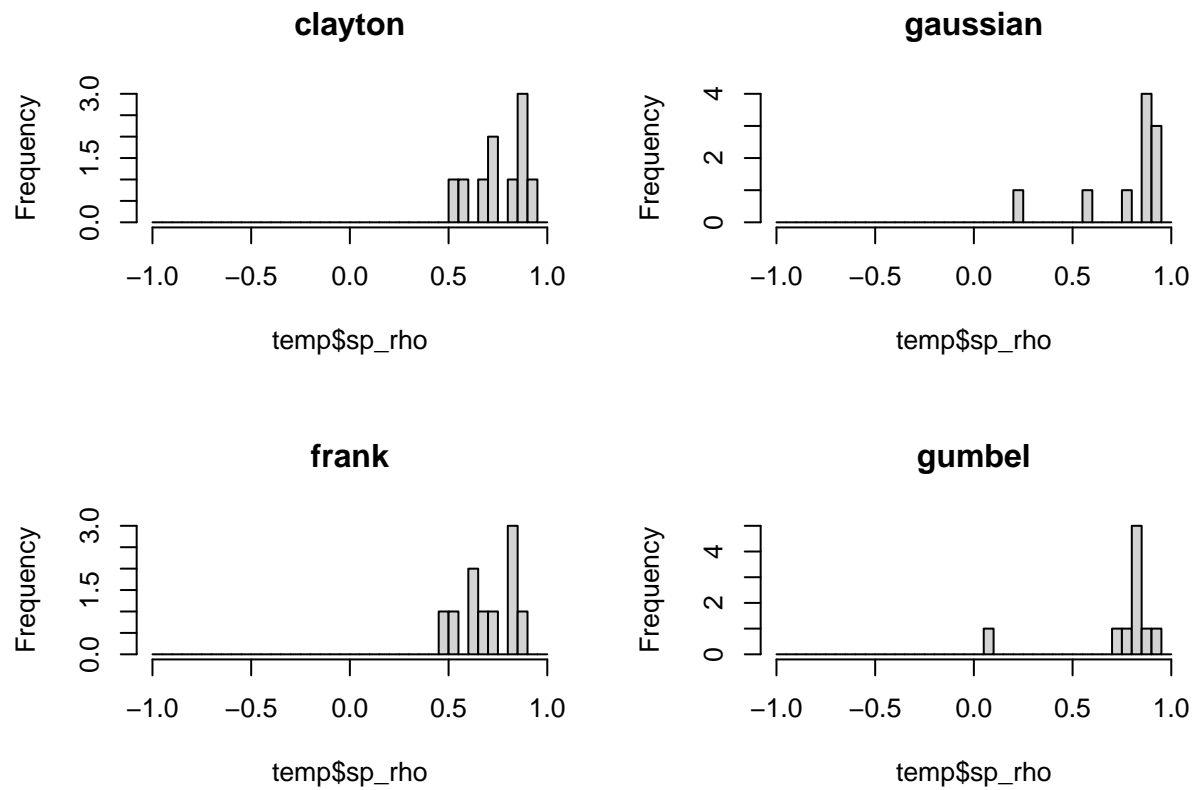
```
## # A tibble: 4 x 8
##   unid      min  max mean median    p1  p99    sd
##   <chr>   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 clayton 0.479 0.900 0.711 0.682 0.487 0.898 0.141
## 2 frank   0.633 0.876 0.784 0.795 0.638 0.876 0.0804
## 3 gaussian 0.668 0.936 0.770 0.737 0.668 0.932 0.103
## 4 gumbel  0.614 0.923 0.778 0.821 0.614 0.922 0.115
```



```
## # A tibble: 4 x 8
##   unid      min    max  mean median    p1   p99    sd
##   <chr>    <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 clayton 0.00771 0.891 0.737  0.827 0.0631 0.890 0.268
## 2 frank   0.794    0.926 0.852  0.846 0.795  0.923 0.0450
## 3 gaussian 0.342    0.957 0.805  0.868 0.377  0.955 0.182
## 4 gumbel  0.513    0.946 0.790  0.812 0.519  0.946 0.145
```



```
## # A tibble: 4 x 8
##   unid      min  max mean median   p1   p99    sd
##   <chr>   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 clayton 0.492 0.840 0.734 0.754 0.506 0.840 0.104
## 2 frank   0.566 0.890 0.784 0.810 0.579 0.886 0.0913
## 3 gaussian 0.631 0.831 0.753 0.771 0.632 0.830 0.0704
## 4 gumbel  0.692 0.907 0.786 0.785 0.693 0.903 0.0782
```

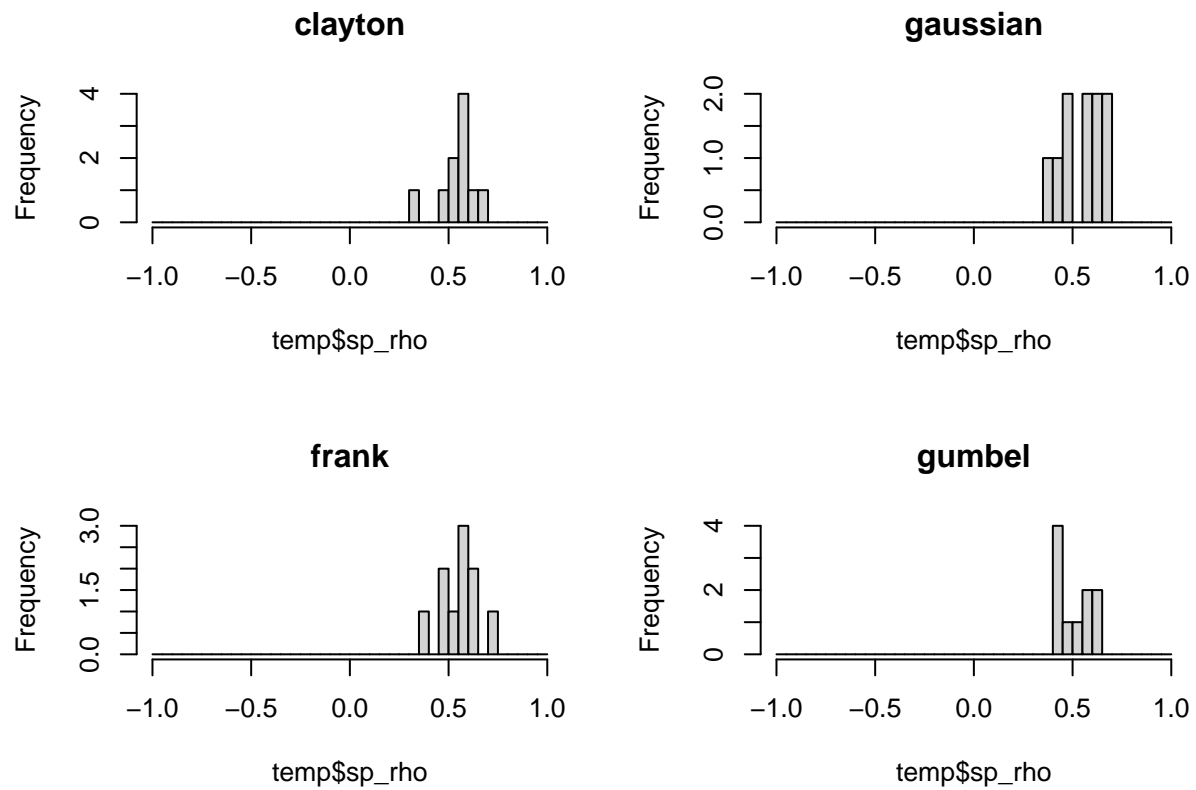


```
## # A tibble: 4 x 8
##   unid      min  max mean median  p1  p99  sd
##   <chr>    <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 clayton  0.548  0.905 0.762  0.767 0.550 0.904 0.133
## 2 frank    0.494  0.857 0.704  0.721 0.498 0.856 0.129
## 3 gaussian 0.223  0.919 0.775  0.864 0.253 0.919 0.221
## 4 gumbel   0.0501 0.932 0.756  0.820 0.113 0.928 0.253
```

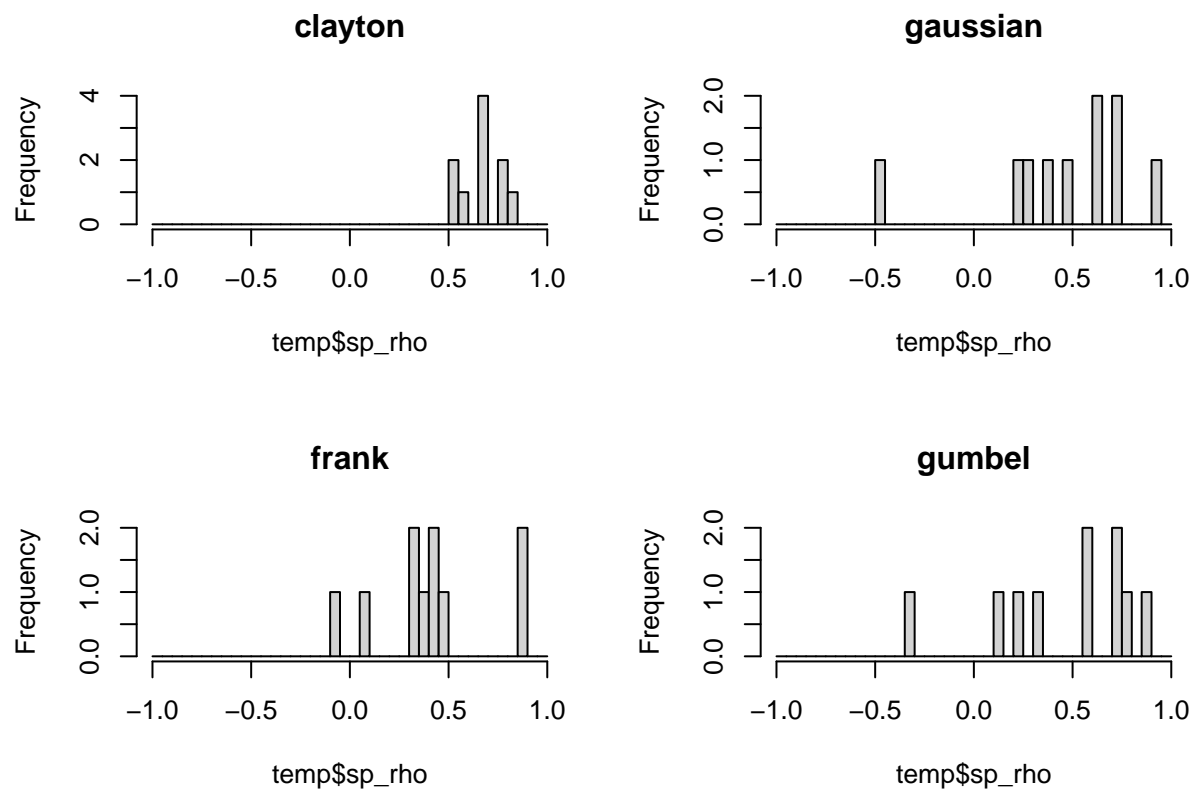
Weak

```
## [1] 0.1532
```

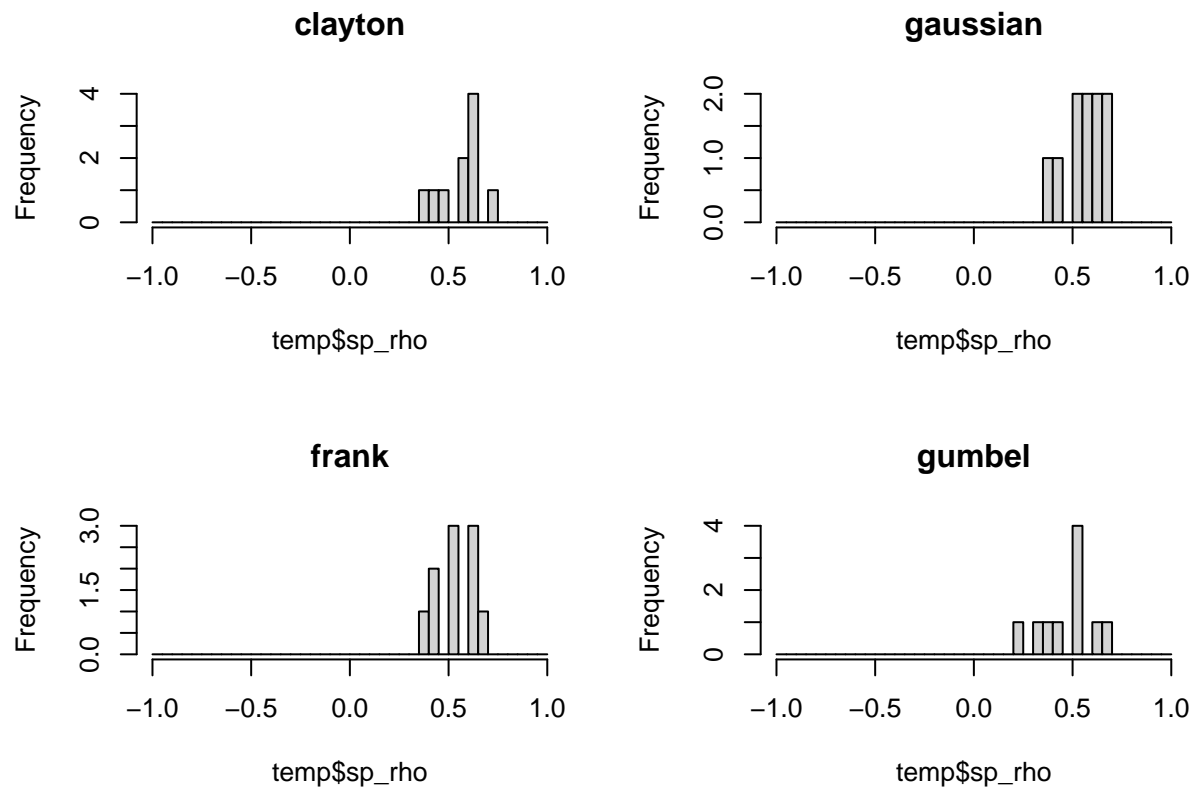
```
## [1] 0.1571
```



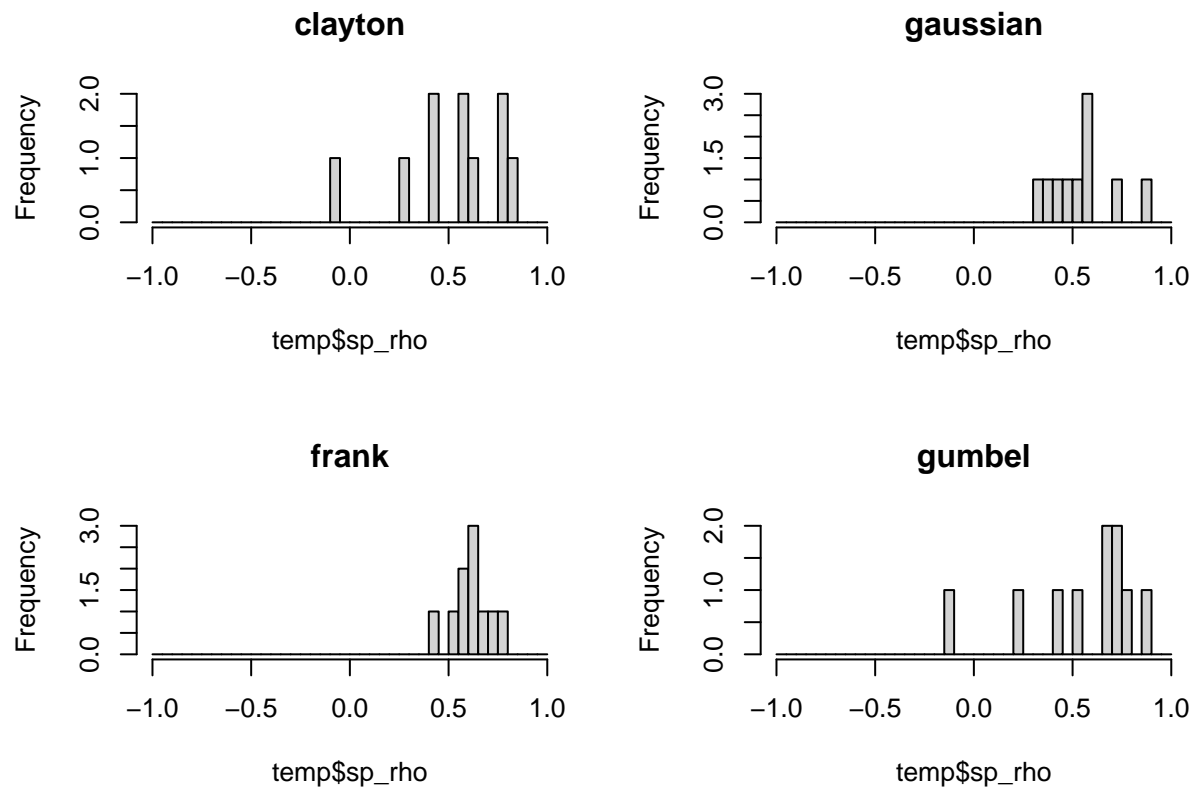
```
## # A tibble: 4 x 8
##   unid      min  max mean median   p1   p99    sd
##   <chr>   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 clayton 0.349 0.675 0.547 0.559 0.361 0.671 0.0868
## 2 frank   0.370 0.738 0.560 0.572 0.380 0.729 0.101
## 3 gaussian 0.395 0.668 0.553 0.587 0.398 0.666 0.103
## 4 gumbel  0.433 0.634 0.518 0.498 0.434 0.633 0.0817
```



```
## # A tibble: 4 x 8
##   unid      min    max  mean median    p1    p99    sd
##   <chr>    <dbl> <dbl> <dbl> <dbl>  <dbl> <dbl> <dbl>
## 1 clayton  0.506  0.814 0.660  0.666  0.508  0.811 0.105
## 2 frank   -0.0650 0.894 0.414  0.388 -0.0530 0.893 0.302
## 3 gaussian -0.500  0.925 0.447  0.553 -0.435  0.909 0.401
## 4 gumbel  -0.332  0.896 0.456  0.571 -0.292  0.884 0.380
```

```
## # A tibble: 4 x 8
##   unid      min  max mean median    p1   p99    sd
##   <chr>   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 clayton 0.362 0.718 0.566 0.590 0.369 0.711 0.109
## 2 frank   0.383 0.674 0.534 0.525 0.387 0.671 0.0998
## 3 gaussian 0.356 0.689 0.560 0.564 0.363 0.688 0.103
## 4 gumbel  0.204 0.693 0.472 0.504 0.215 0.688 0.145
```



```
## # A tibble: 4 x 8
##   unid      min    max  mean median    p1    p99    sd
##   <chr>    <dbl> <dbl> <dbl> <dbl>  <dbl> <dbl> <dbl>
## 1 clayton -0.0553 0.831 0.516 0.581 -0.0276 0.825 0.269
## 2 frank   0.409 0.768 0.605 0.622 0.417 0.762 0.102
## 3 gaussian 0.317 0.863 0.543 0.542 0.324 0.849 0.162
## 4 gumbel  -0.132 0.857 0.546 0.658 -0.0983 0.849 0.299

## Time difference of 14.04549 mins
```