



An R Introduction to Statistics

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## Wilcoxon Signed-Rank Test

Two data samples are **matched** if they come from repeated observations of the same subject. Using the **Wilcoxon Signed-Rank Test**, we can decide whether the corresponding data population distributions are identical *without* assuming them to follow the **normal distribution**.

### Example

In the built-in data set named **immer**, the barley yield in years 1931 and 1932 of the same field are recorded. The yield data are presented in the **data frame columns** Y1 and Y2.

```
> library(MASS)           # load the MASS package
> head(immer)
  Loc Var   Y1   Y2
1  UF   M  81.0  80.7
2  UF   S 105.4  82.3
....
```

### Problem

Without assuming the data to have normal distribution, test at .05 significance level if the barley yields of 1931 and 1932 in data set immer have identical data distributions.

### Solution

The null hypothesis is that the barley yields of the two sample years are identical populations. To test the hypothesis, we apply the `wilcox.test` function to compare the matched samples. For the paired test, we set the "paired" argument as TRUE. As the p-value turns out to be 0.005318, and is less than the .05 significance level, we reject the null hypothesis.

```
> wilcox.test(immer$Y1, immer$Y2, paired=TRUE)

      wilcoxon signed rank test with continuity correction

data:  immer$Y1 and immer$Y2
v = 368.5, p-value = 0.005318
alternative hypothesis: true location shift is not equal to 0

Warning message:
In wilcox.test.default(immer$Y1, immer$Y2, paired = TRUE) :
cannot compute exact p-value with ties
```

### Answer

At .05 significance level, we conclude that the barley yields of 1931 and 1932 from the data set immer are *nonidentical* populations.

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