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Non-parametric methods for the study of the correlation: Spearman's rank correlation coefficient and Kendall tau rank correlation coefficient

August 3, 2009

By [Todos Logos](#)

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(This article was first published on [Statistic on aiR](#), and kindly contributed to [R-bloggers](#))

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We saw in the previous post, how to study the correlation between variables that follow a Gaussian distribution with the [Pearson product-moment correlation coefficient](#). If it is not possible to assume that the values follow gaussian distributions, we have two non-parametric methods: the **Spearman's rho test** and **Kendall's tau test**.

For example, you want to study the productivity of various types of machinery and the satisfaction of operators in their use (as with a number from 1 to 10). These are the values:

Productivity: 5, 7, 9, 9, 8, 6, 4, 8, 7, 7
Satisfaction: 6, 7, 4, 4, 8, 7, 3, 9, 5, 8

Begin to use first the **Spearman's rank correlation coefficient**:

```
a b
cor.test(a, b, method="spearman")

Spearman's rank correlation rho

data: a and b
S = 145.9805, p-value = 0.7512
alternative hypothesis: true rho is not equal to 0
sample estimates:
rho
0.1152698
```

The statistical test gives us as a result $\rho = 0.115$, which indicates a low correlation (not parametric) between the two sets of values.

The p -value > 0.05 makes us not accept the value of rho calculated as being statistically significant.

Now we check the same data with the **Kendall tau rank correlation coefficient**:

```
a b
cor.test(a, b, method="kendall")

Kendall's rank correlation tau

data:  a and b
z = 0.5555, p-value = 0.5786
alternative hypothesis: true tau is not equal to 0
sample estimates:
      tau
0.146385
```

Also with the Kendall test, the correlation is very low ($\tau = 0.146$), and not-significant (p -value > 0.05).

Related

How to Calculate a Partial Correlation Coefficient in R: An Example with Oxidizing Ammonia to Make Nitric Acid	Kendall's Tau	Spearman Correlation Heat Map with Correlation Coefficients and Significance Levels in R
Introduction Today, I will talk about the math behind calculating partial correlation and illustrate May 5, 2013 In "R bloggers"	Kendall's Tau This is an example of Kendall's Tau rank correlation. This is similar to Spearman's Rho in that September 5, 2012 In "R bloggers"	Figure 1: Spearman correlation heat map with correlation coefficient and significance levels February 2, 2015 In "R bloggers"



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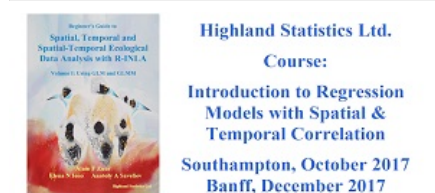
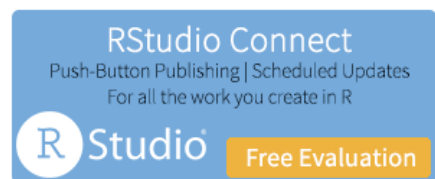
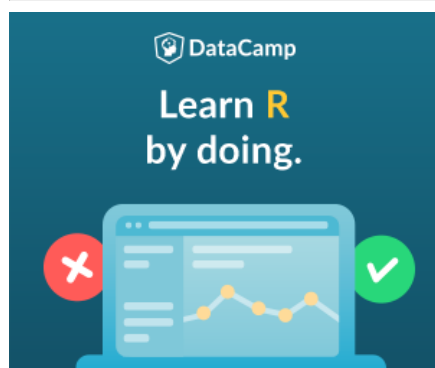
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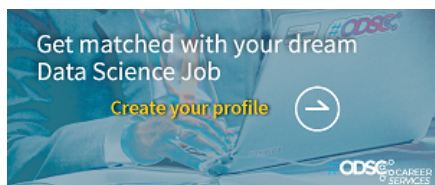
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A banner for ODSC EAST 2018. It features a dark background with a globe and a person's silhouette. The text "Acquire Data Science Skills 2018" is at the top, followed by a "Join in" button. At the bottom, it says "May 1-4 | Boston | ODSC EAST".

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Define Analytics: The
Changing Role of BI's
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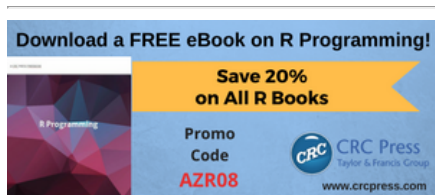
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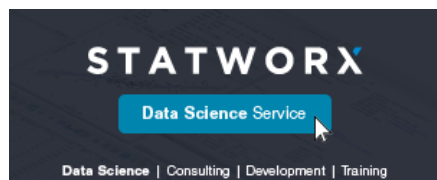
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A banner for CRC Press. It has a blue background with a geometric pattern. The text "Download a FREE eBook on R Programming!" is at the top, followed by "Save 20% on All R Books". Below is a "Promo Code AZR08" and the CRC Press logo with "Taylor & Francis Group" and "www.crcpress.com".

jumping rivers

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A banner for training. It has a black background with a white line graph. The text "jumping rivers" is above the graph, and "TRAINING: R, SCALA, STAN" is at the bottom in white.



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