Time series topic 3: Seasonal Kendall Tests

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Objectives for the session (4:15 - 5:00)

- What is and why would we use a Kendall test
- What is a why would we use a *Seasonal* Kendall test
- Application with NERRS data
  - Data prep
  - Execution
  - Interpretation

Interactive portion

Follow along as we go:

- flash drive
- online: swmprats.net 2016 workshop tab

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You will run examples whenever you see this guy:

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We will use functions in the EnvStats package

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Option 2, install the source file from the flash drive:

```
# change as needed
path_to_file <- 'C:/Users/mbeck/Desktop/EnvStats_2.1.1.tar.gz'

# install, load
install.packages(path_to_file, repos = NULL, type="source")
library(SWMPr)
```

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- Provide a slope as the rate of change

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The ***Kendall test*** for time series:

$$\tau = \sum_{i=1}^{n-1} \sum_{j=i+1}^{n} sign\left[\left(X_j - X_i\right)\left(Y_j - Y_i\right)\right]$$

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$$\hat{\beta}_1 = Median\left(\frac{Y_j - Y_i}{X_j - X_i}\right), i < j$$

$\hat{\beta}_1$ is the Theil (Sen) non-parametric estimate of slope or the rate of change in the interval

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More info in help documentation for `kendallTrendTest`, `kendallSeasonalTrendTest` in EnvStats,
[Hirsch et al., 1982, Millard, 2013]

Using `decomp` with NERRS data

Load some water quality data

Summary

Things to ask before Seasonal Kendall

- test

What does Seasonal Kendall not tell us

Up next... nothing!

Questions??

References

Hirsch RM, Slack JR, Smith RA. 1982.
Techniques of trend analysis for monthly water quality data.
Water Resources Research, 18:107–121.

Millard SP. 2013.
EnvStats: An R Package for Environmental Statistics.
Springer, New York.