Mississippi river flow

Get data on Mississippi river flow at St. Louis from our web site.

1. Filter the data to only use 2010 to the present day and convert it to a tsibble.
2. Make a time plot of the series. Notice the major floods in 2019?
3. Make a seasonal plot (with `gg_season` and/or `gg_subseries`) and describe how the river flow depends on the season.
4. Perform a classical decomposition and plot the series, the trend, the seasonal, and the random components.
5. Make a plot showing the series with the trend overlaid.

Calc 1 enrollments

Get data on total enrollments in Calculus 1 at SLU, from our web site.

1. Make the enrollments into a base R `ts` object with appropriate start and frequency. Plot it.
2. Compute the 2-MA and the 2×2-MA for the series using vector math operations.
3. Check your results using `stats::filter` in R. The 2×2-MA is the trend component of the classical decomposition.
4. Subtract the 2×2-MA from the series to de-trend it.
5. Compute the fall semester average and the spring semester average of the de-trended series. What is the average difference between fall and spring Calc 1 enrollment at SLU?
6. Adjust your fall and spring seasonal averages to have mean 0 by adding or subtracting the same number from each. These two numbers are the seasonal component.
7. Compute the seasonal decomposition with `decompose` and check that your calculations agree.

US Government employment

The fpp3 package has a large collection of time series called `us_employment`. Use filter (the dplyr one) to just pick out the series with `Title == "Government"`. This series has the monthly number of US Government employees (in thousands of persons) from 1970-2020.

1. Make a time plot of the series. Is the seasonal variation consistent over time?
2. Restrict to 1970 onward to remove the early instability.
3. Make a seasonal plot and describe how employment depends on the season.
4. Perform a classical decomposition and plot the series, the trend, the seasonal, and the random components. Observe how the heteroscedasticity of the series affects the random component.
5. Try a classical decomposition of the log of the Employment series. Does this help?
6. Now use the STL decomposition. Can you explain the pattern in the remainder series?