Purpose

This document extends the analysis of spatial autocorrelation from the document titled Testing_spatial_subsampling.Rmd to the statistical analysis of spatial correlations with semivariograms. Instead of just visually assessing the spatial autocorrelation in the reconstructions, we can fit empirical variograms to the reconstructions at each time step for each taxon.

Semivariances

First, I used the `semivariogram` function from the `gstat` package to fit spherical, exponential, and Gaussian variograms to each taxon at each time period. This function returns the semivariances of the relative abundances, as well as the sill, nugget, and range parameter estimates. The range is an estimate of how far away the grid cells need to be to be considered independent. The ratio of nugget:sill is an indicator of the strength of spatial dependence in the relative abundance, with high ratio (>75%) indicative of low spatial dependence.

Since I replaced the x-y distances with cell number, the distance and range can be interpreted as number of cells in the following analysis.

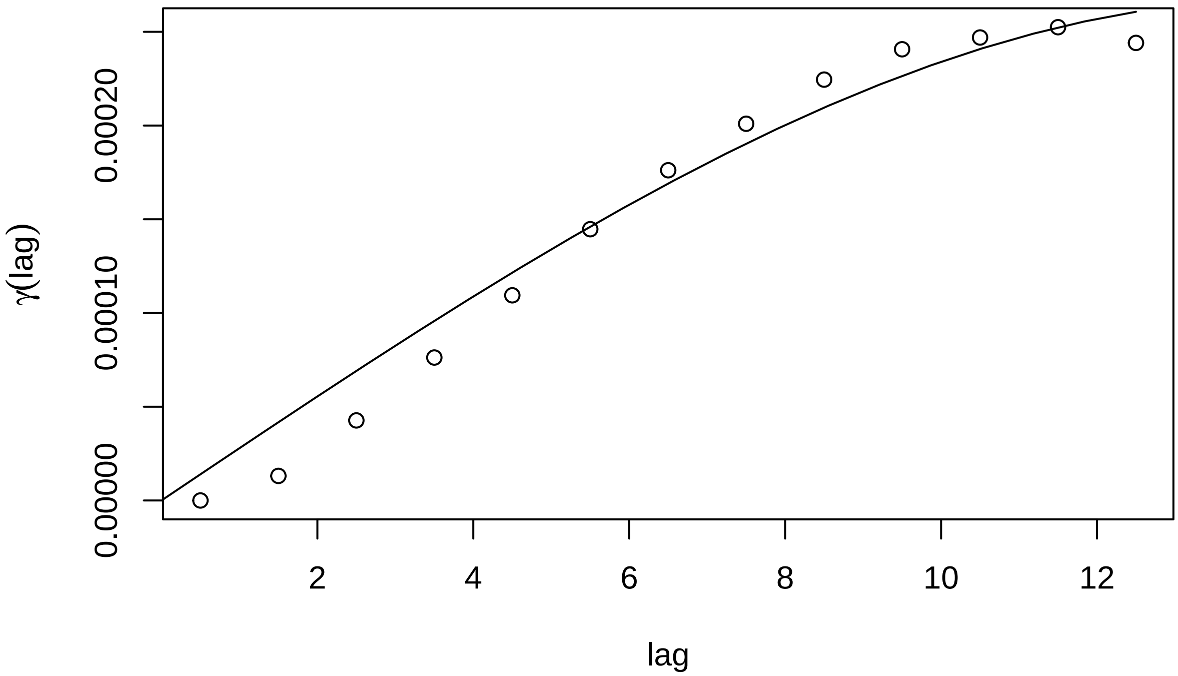
My expectation is that of these three options, the Guassian variogram will be the best fit because this is the closest to the nugget used for model fitting, but the actual nugget is an inverse power law kernel, which I believe is the same as the powered exponential kernel.

```
ash_spherical_params <- matrix(, nrow = length(time), ncol = 4)
ash_exponential_params <- matrix(, nrow = length(time), ncol = 4)
ash_gaussian_params <- matrix(, nrow = length(time), ncol = 4)

for(i in 1:length(time)){
  t <- time[i]
  sub <- dplyr::filter(ash_melt,
                       time == t,
                       !is.na(ash))
  sv <- geostats::semivariogram(x = sub$x, y = sub$y, z = sub$ash,
                                model = 'spherical')
  ash_spherical_params[i,1] <- t
  ash_spherical_params[i,2:4] <- sv$snr

  sv <- geostats::semivariogram(x = sub$x, y = sub$y, z = sub$ash,
                                model = 'exponential')
  ash_exponential_params[i,1] <- t
  ash_exponential_params[i,2:4] <- sv$snr

  sv <- geostats::semivariogram(x = sub$x, y = sub$y, z = sub$ash,
                                model = 'gaussian')
  ash_gaussian_params[i,1] <- t
  ash_gaussian_params[i,2:4] <- sv$snr
}
```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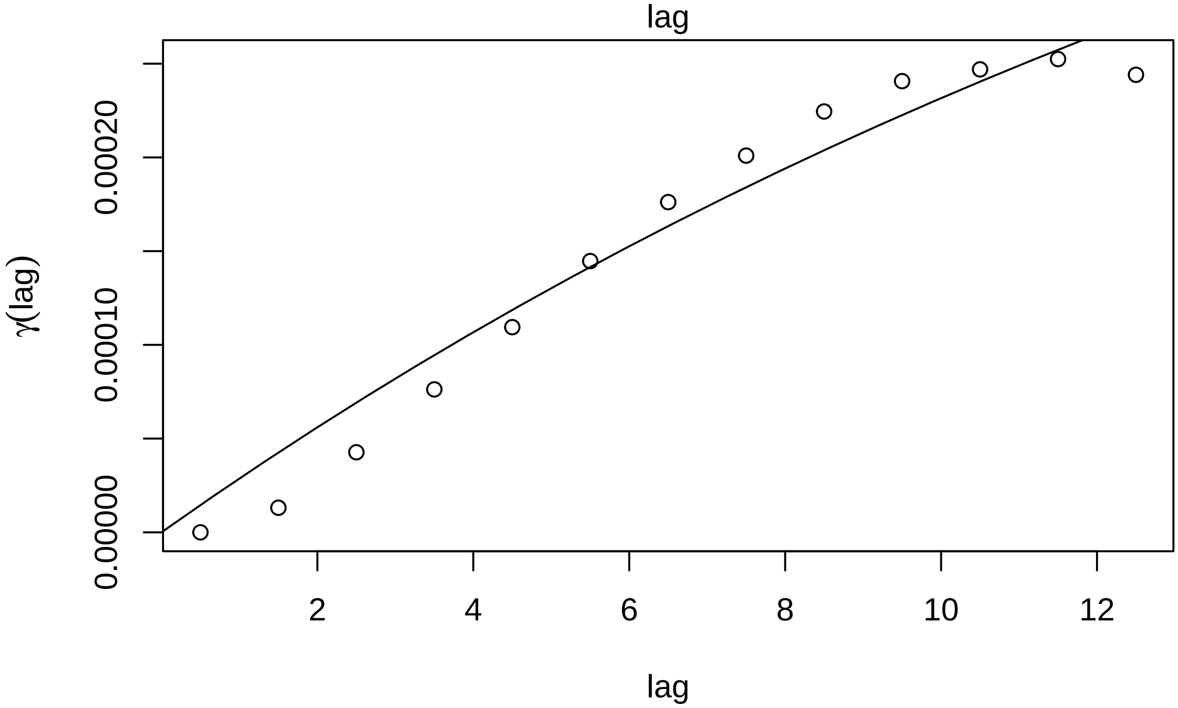
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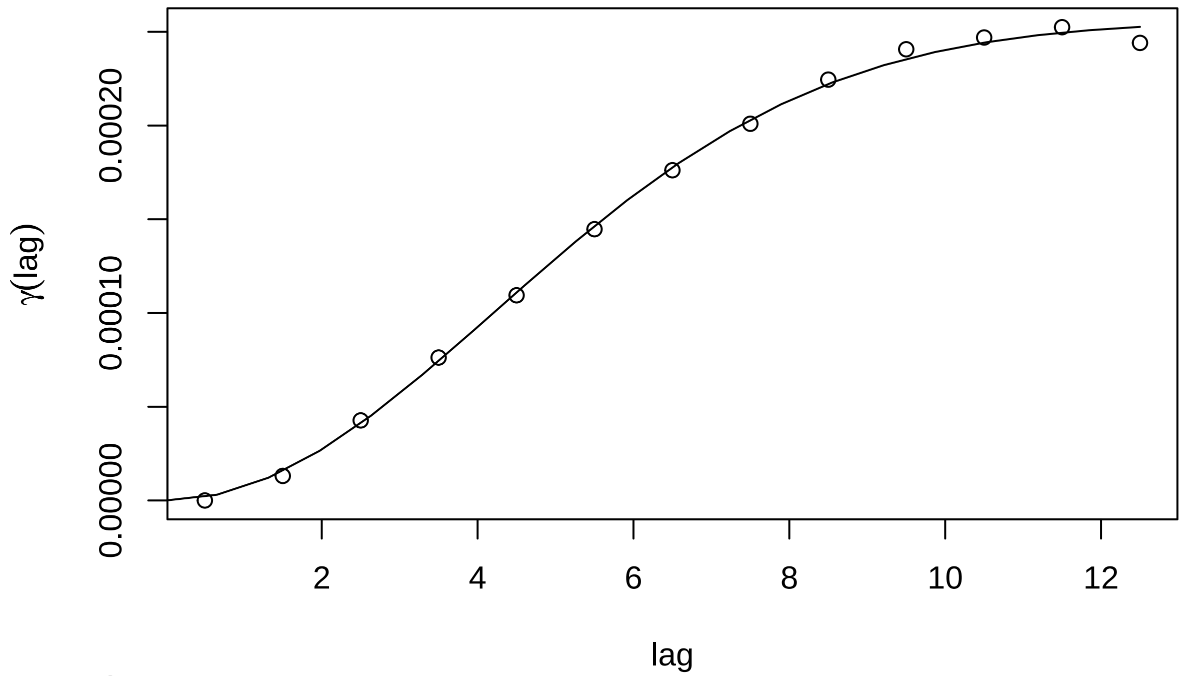
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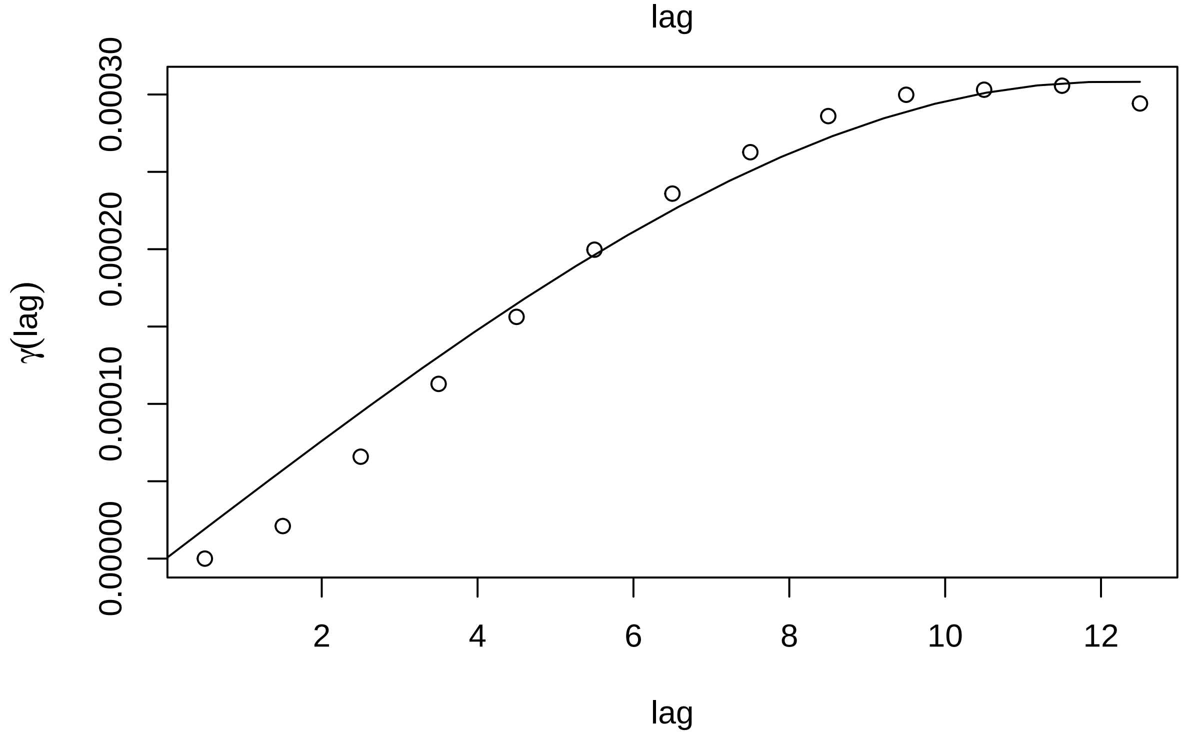
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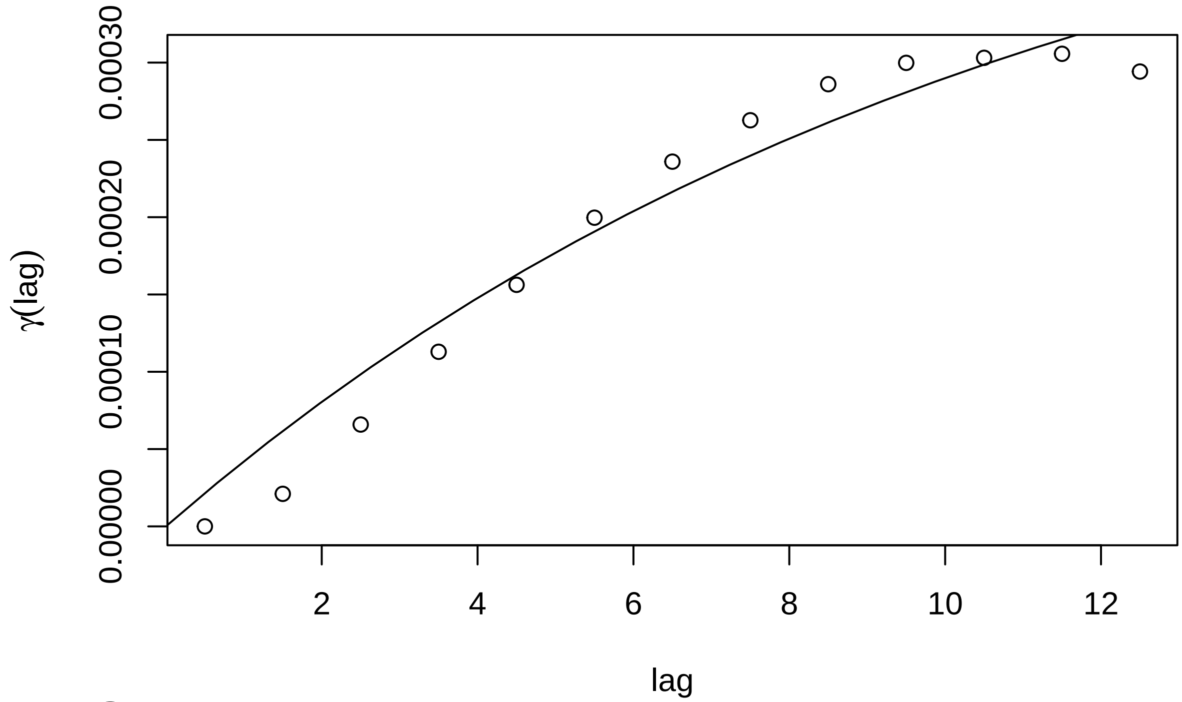
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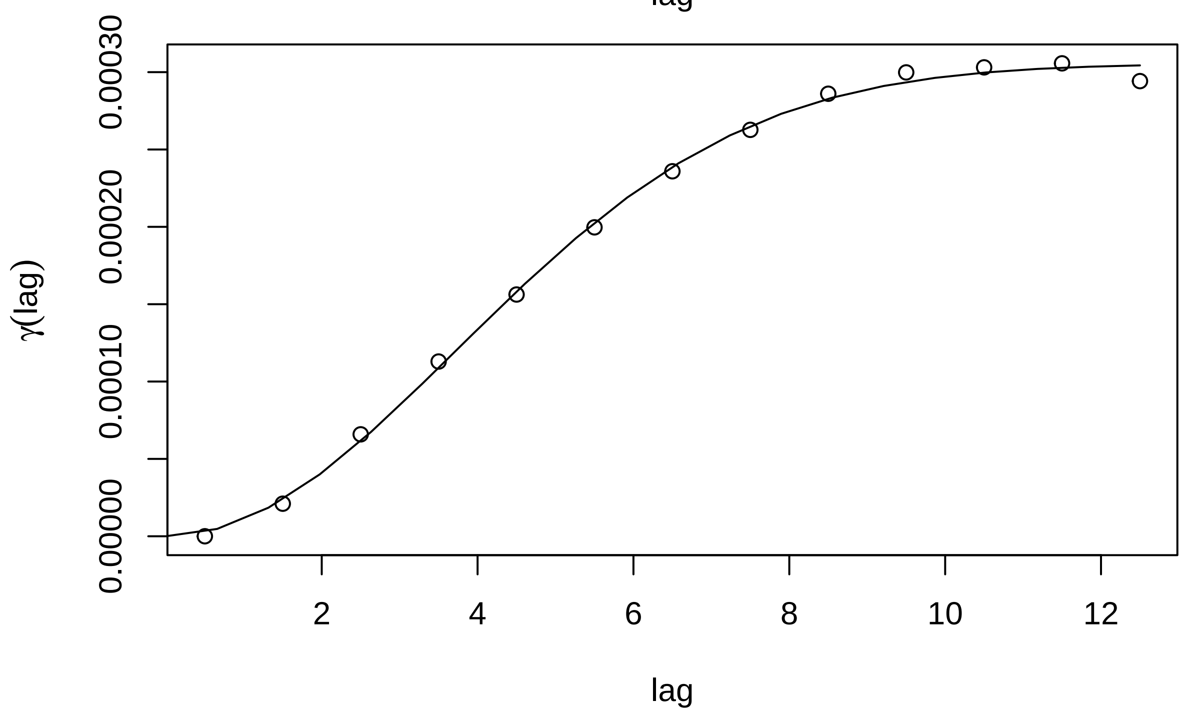
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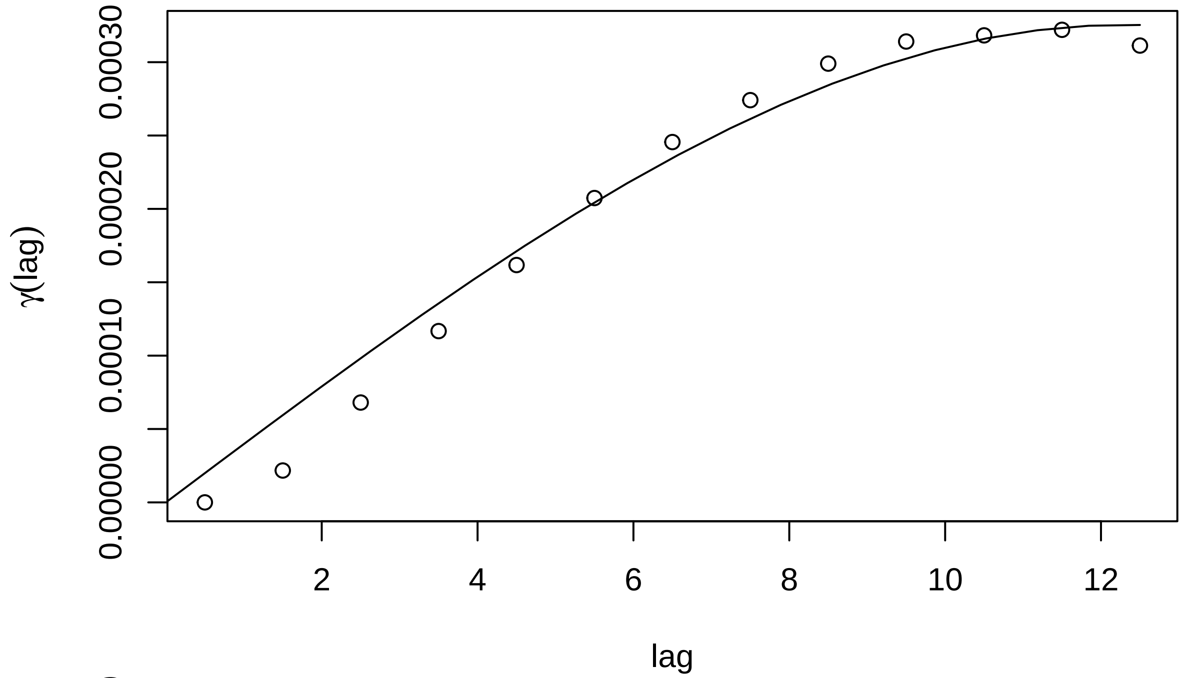

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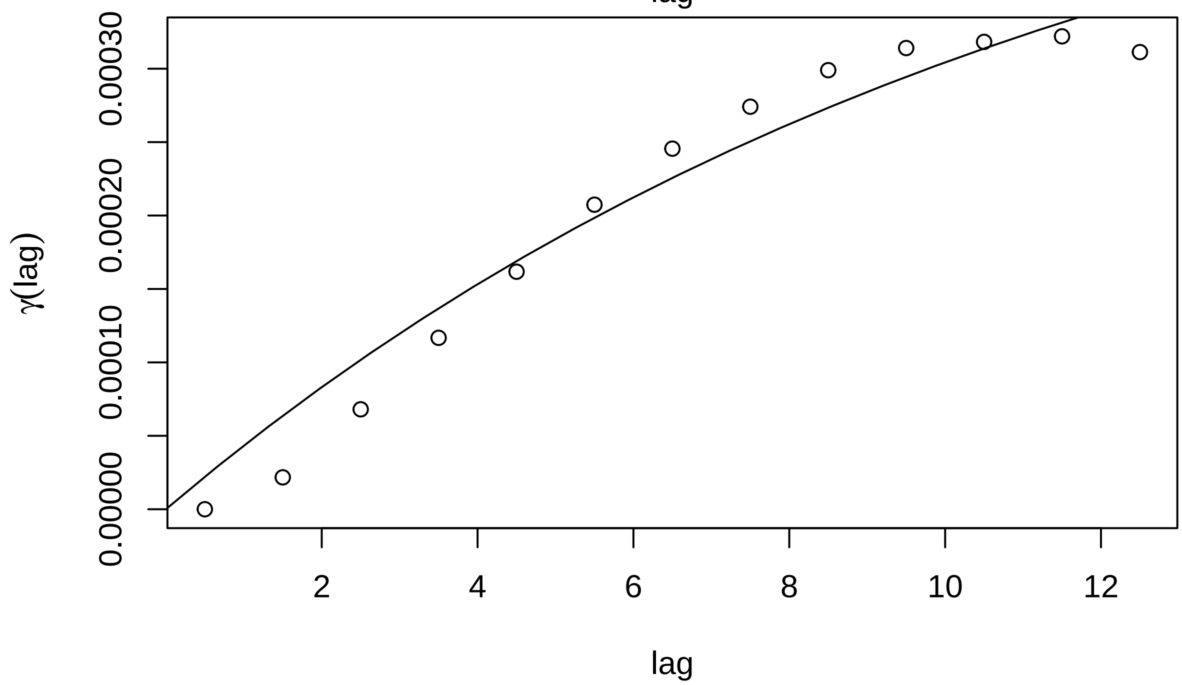

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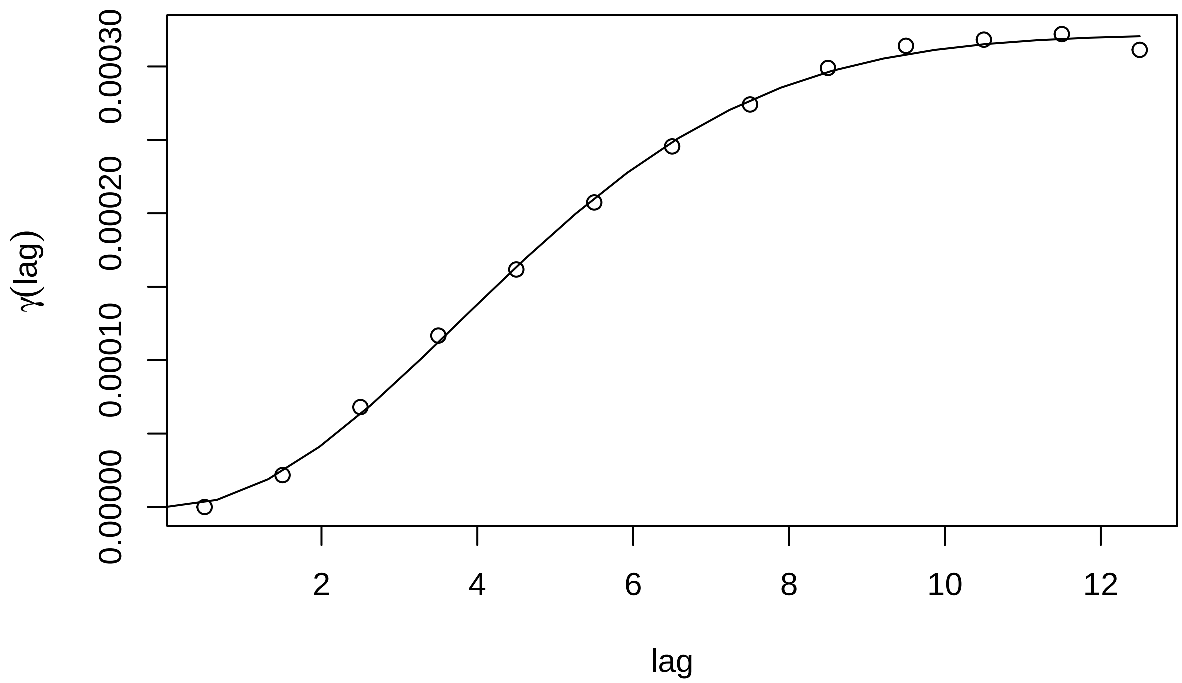

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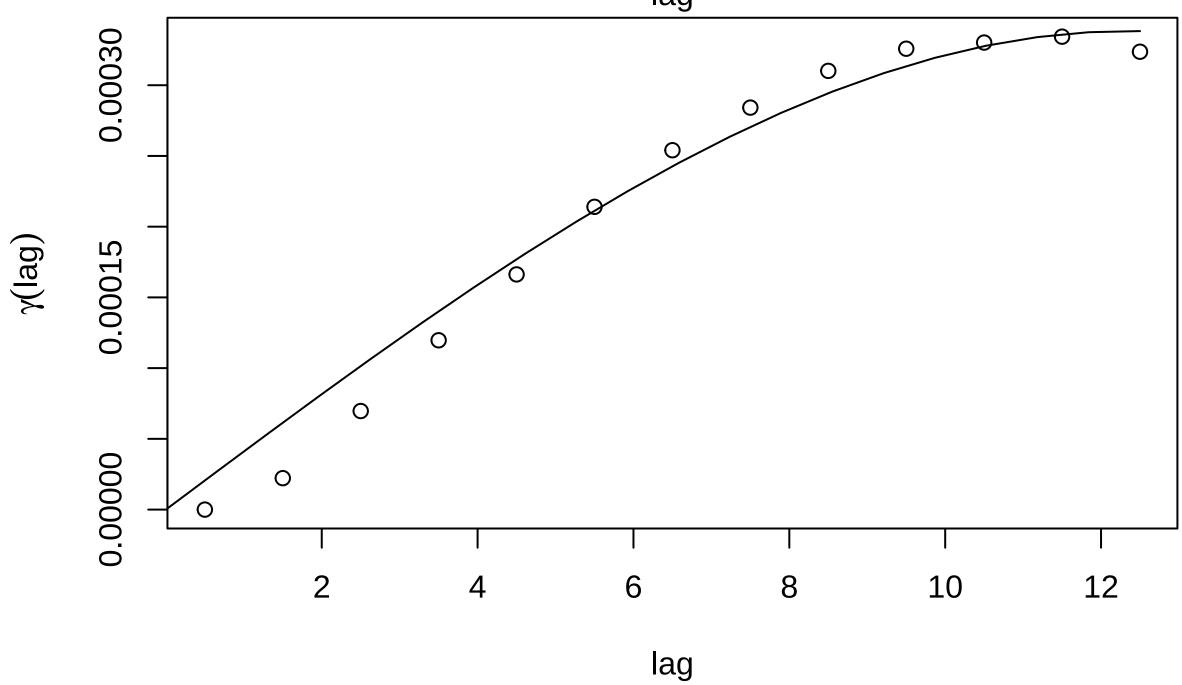

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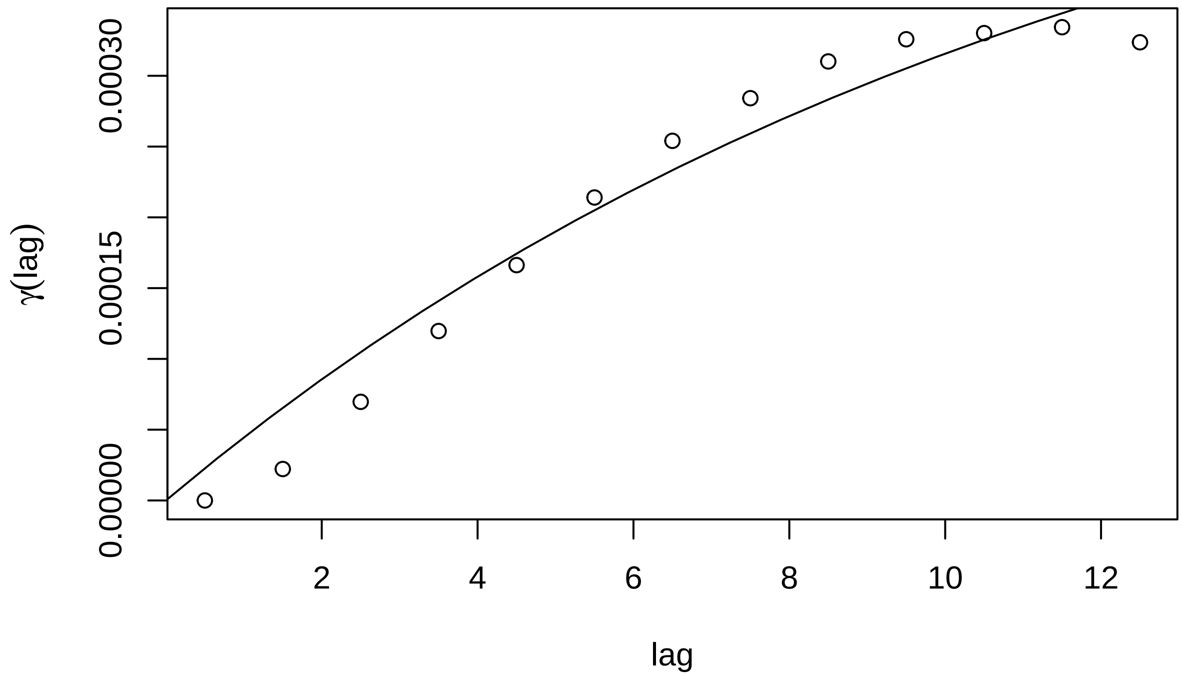
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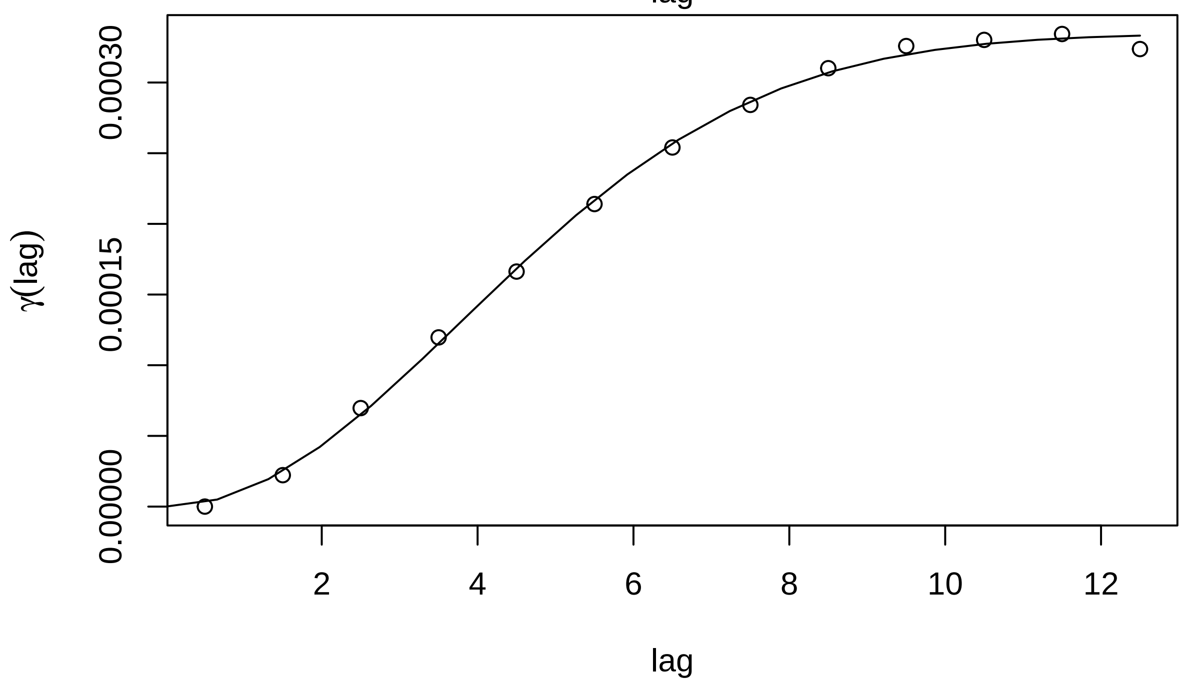
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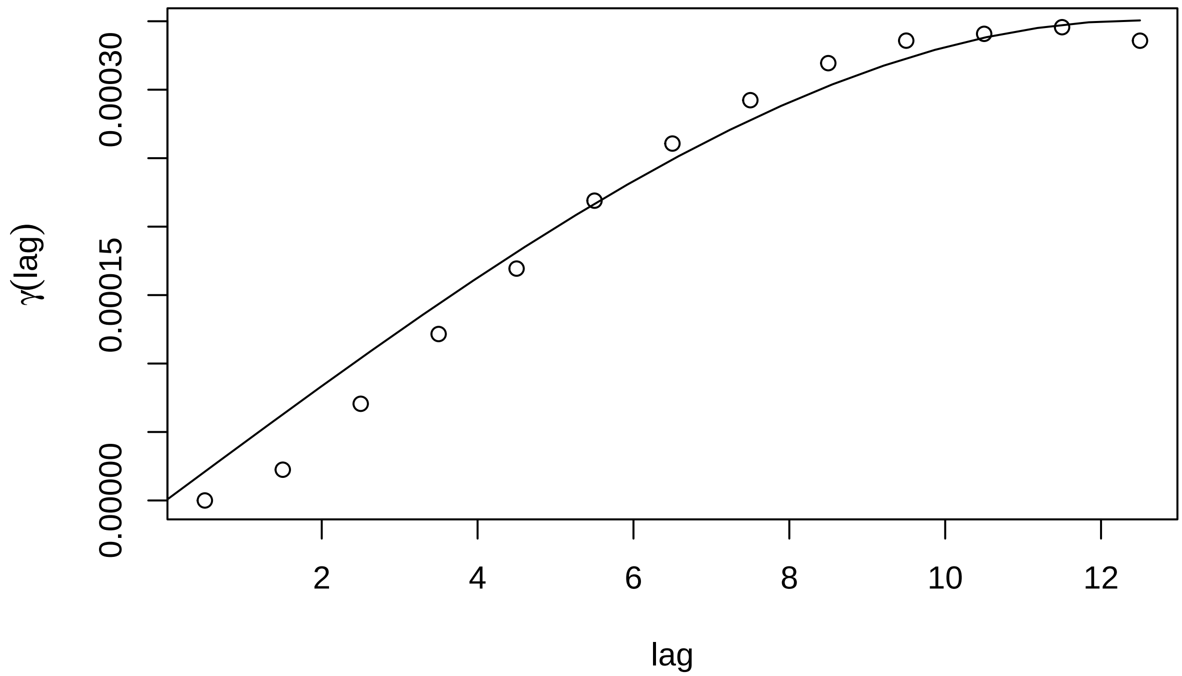

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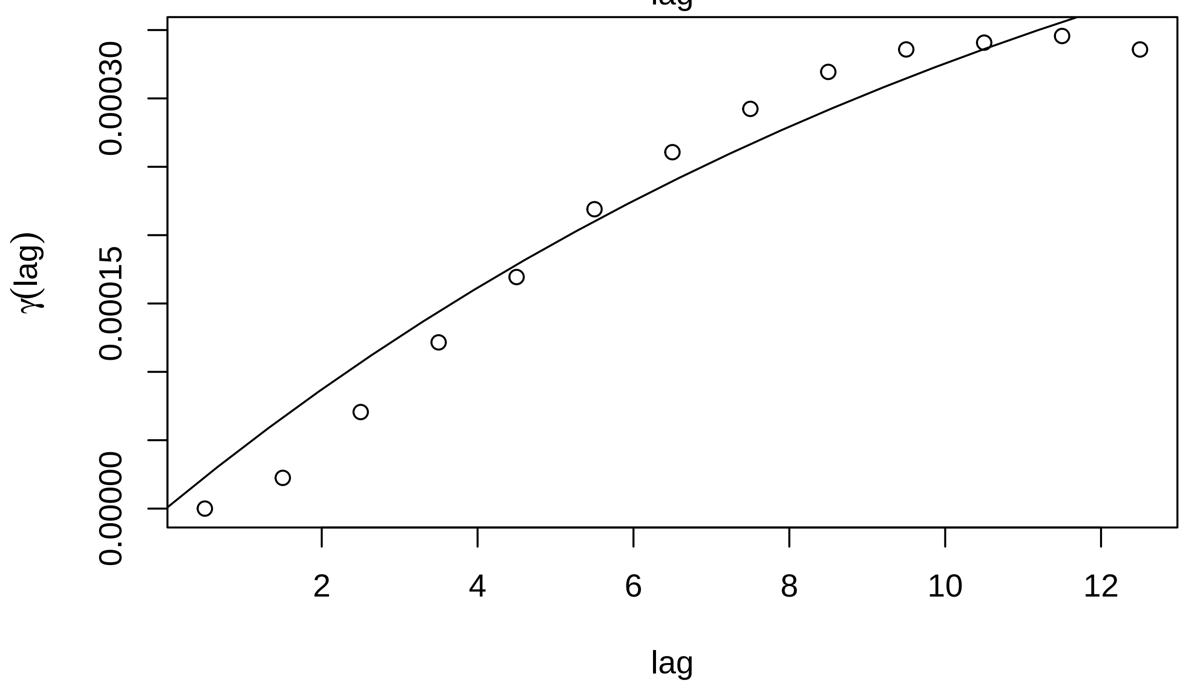

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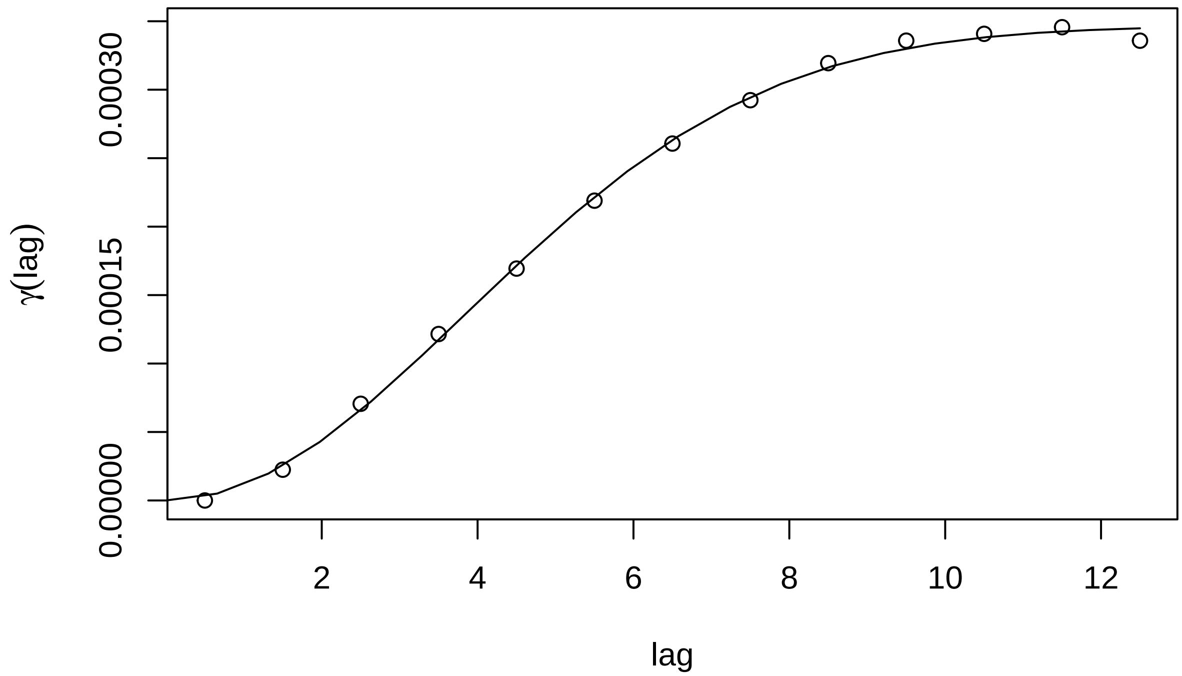
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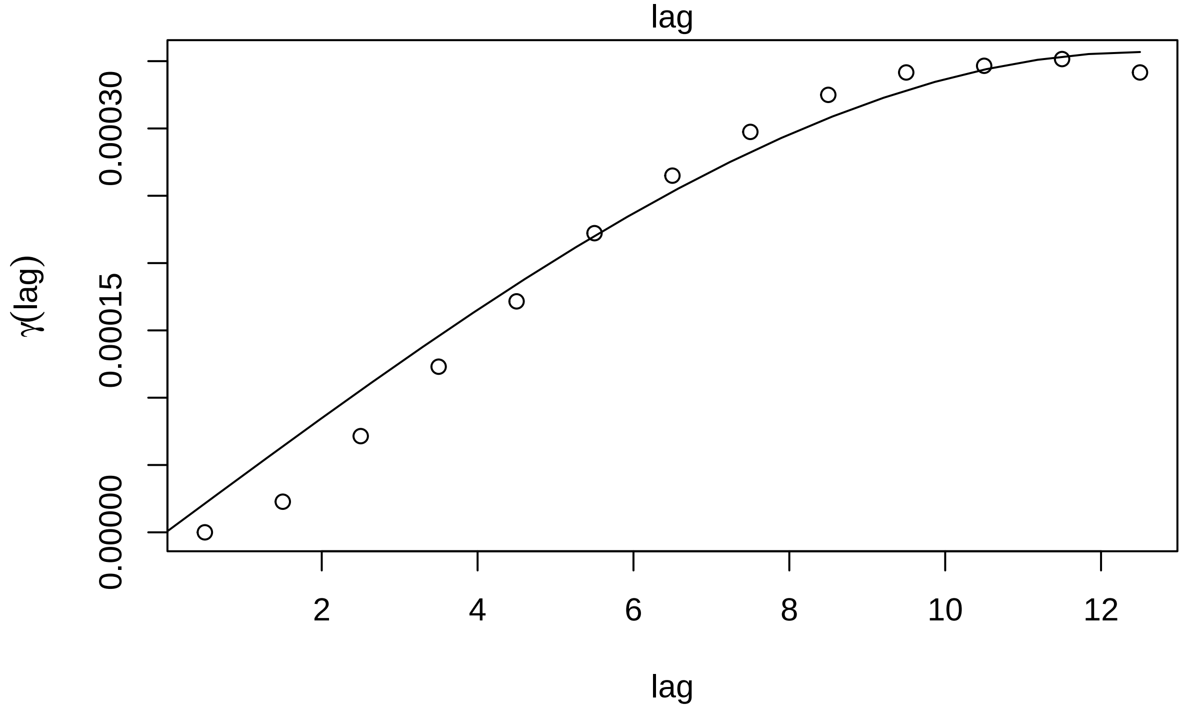
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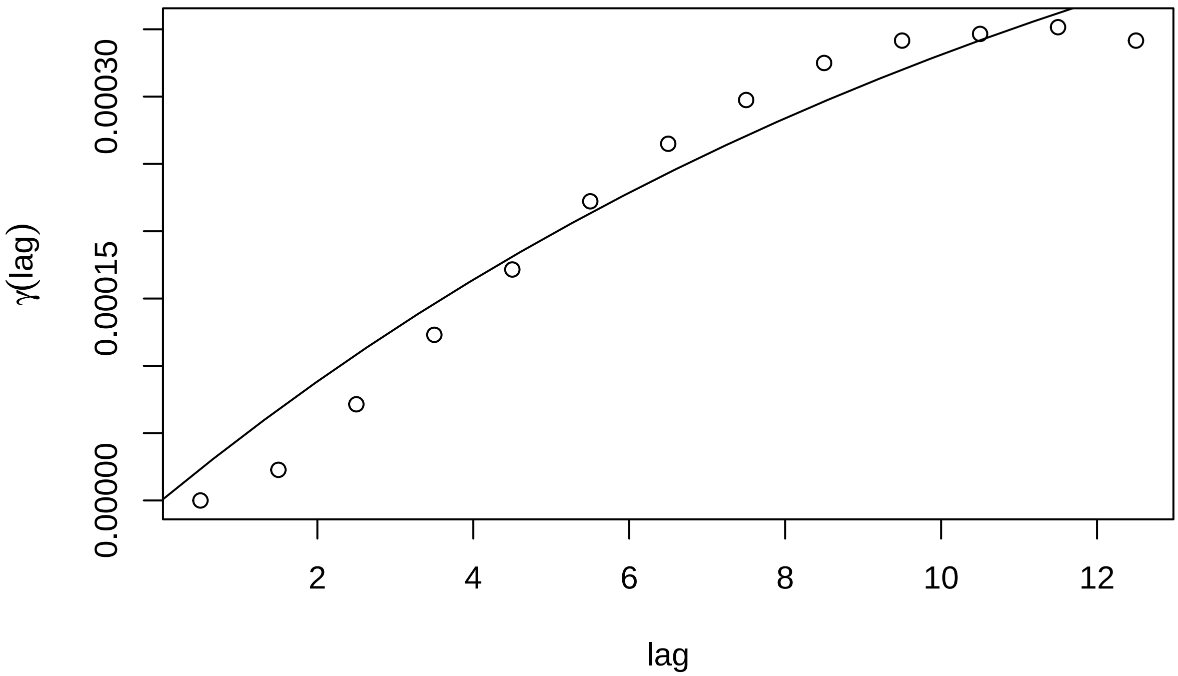

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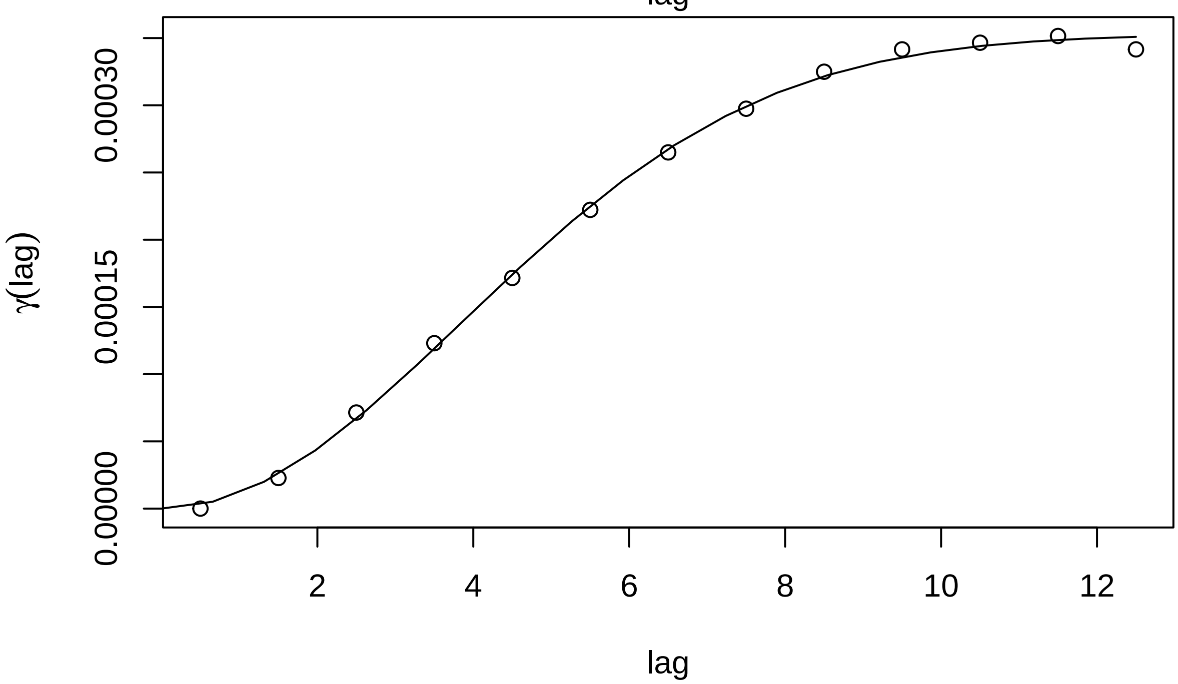

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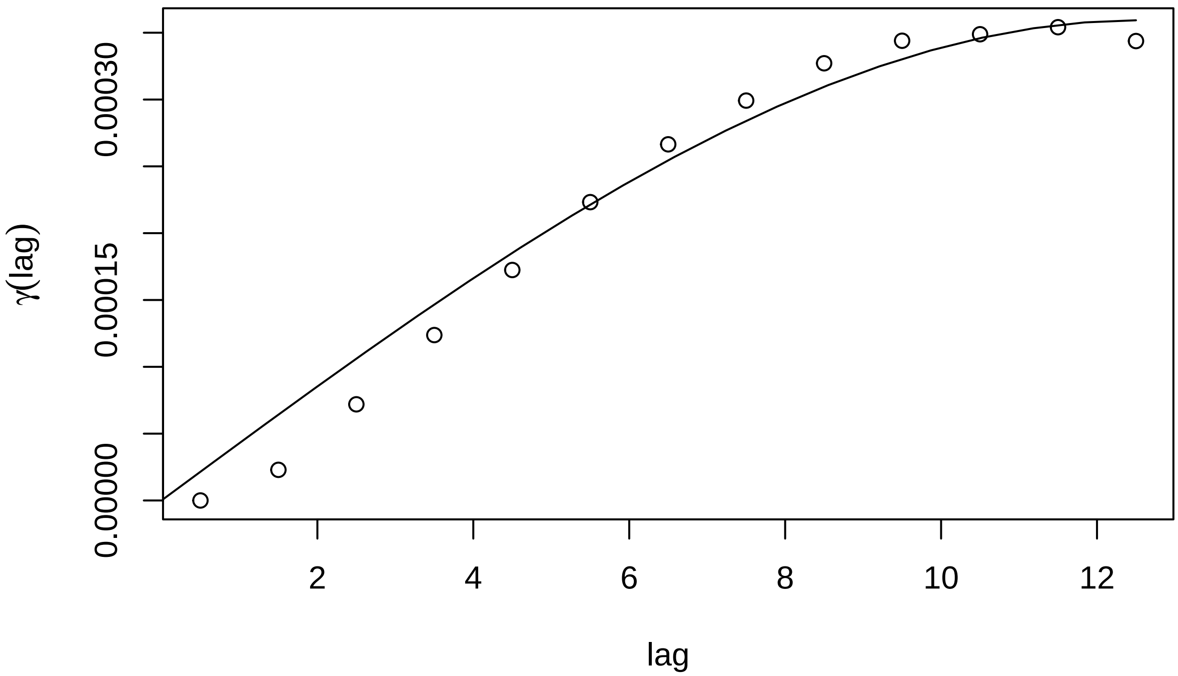
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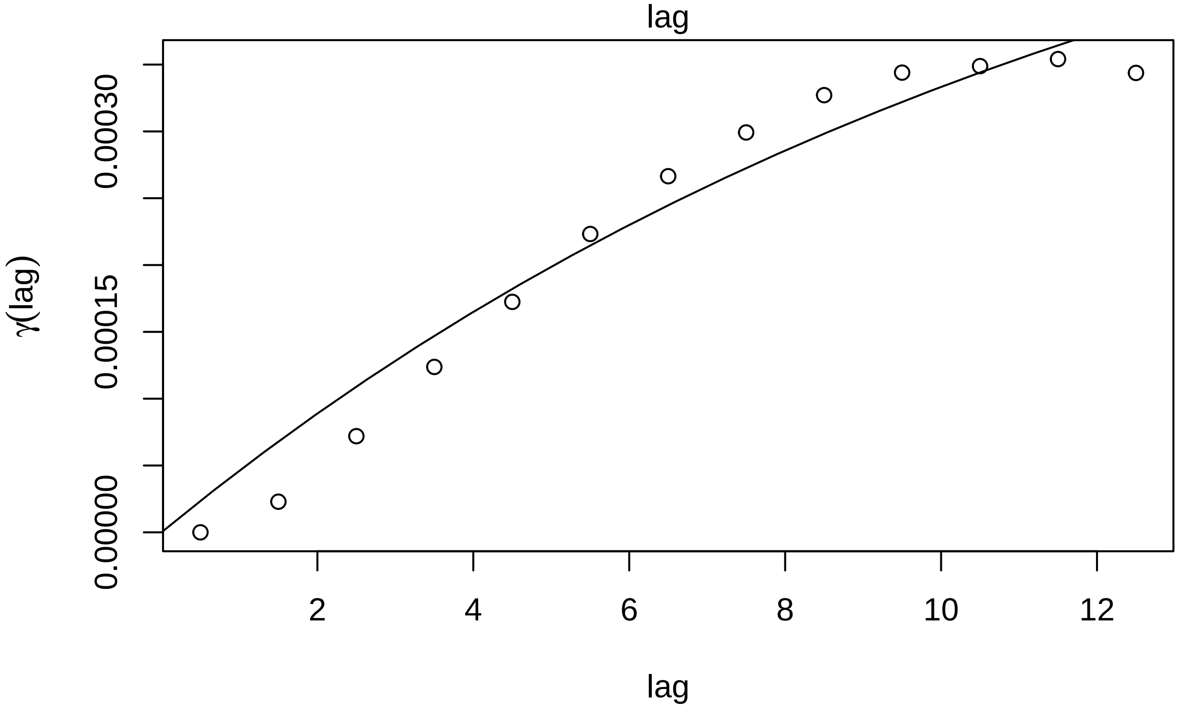
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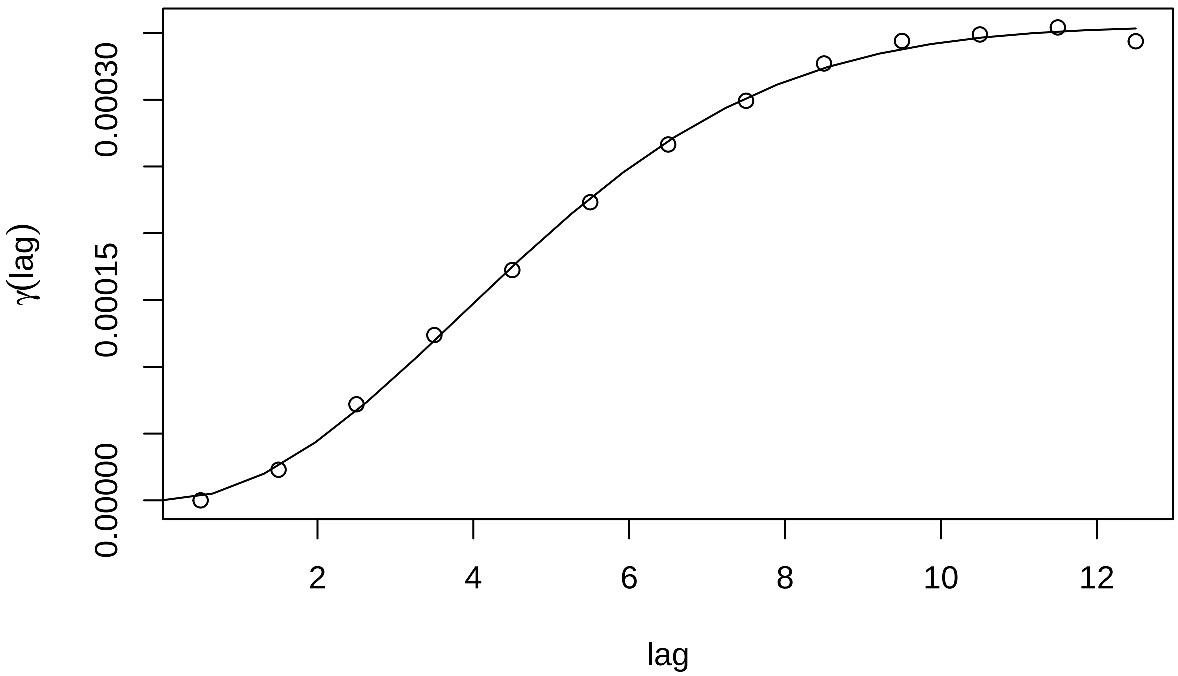
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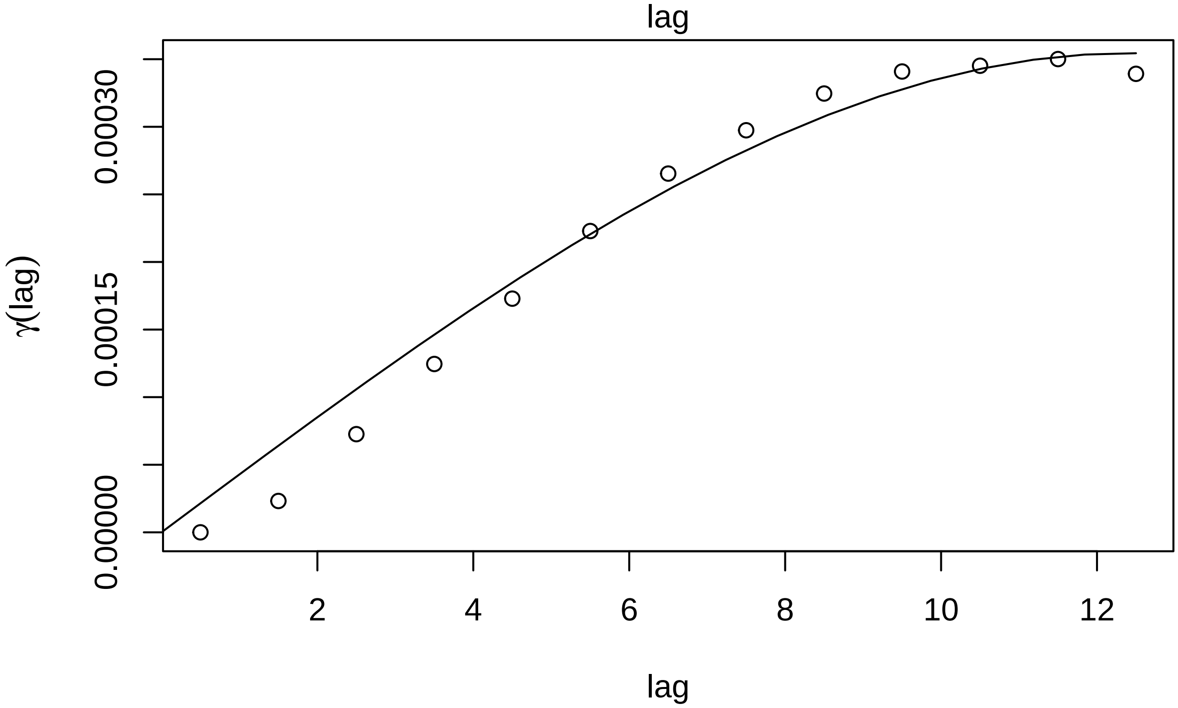
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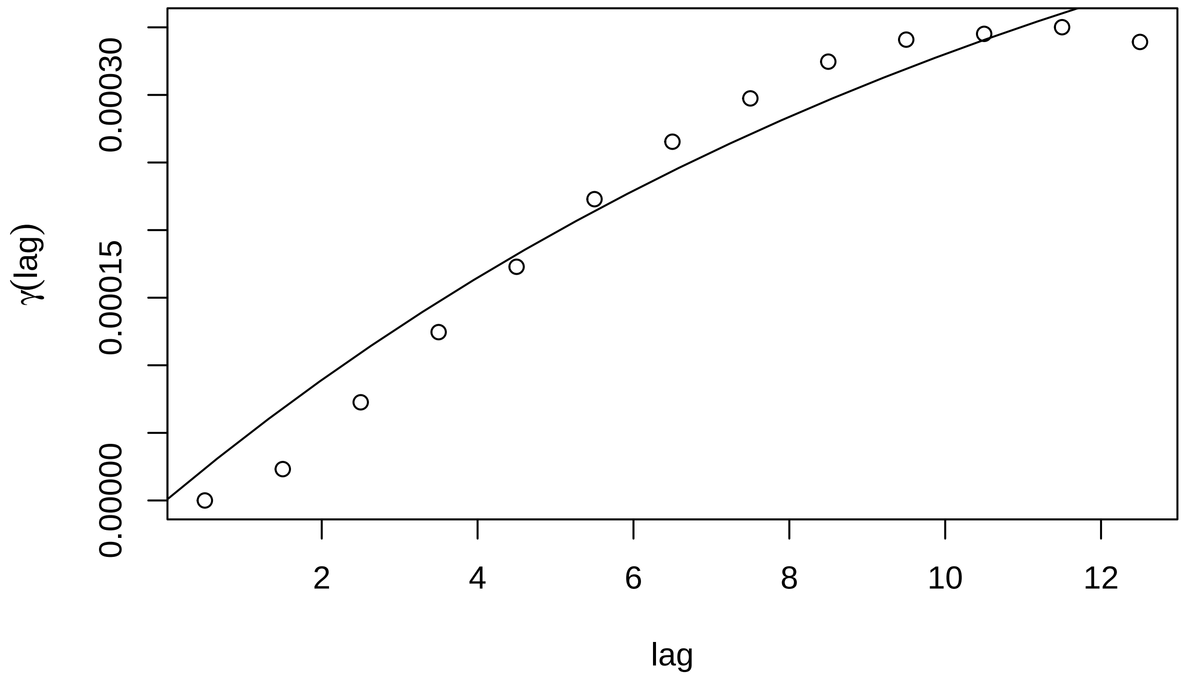
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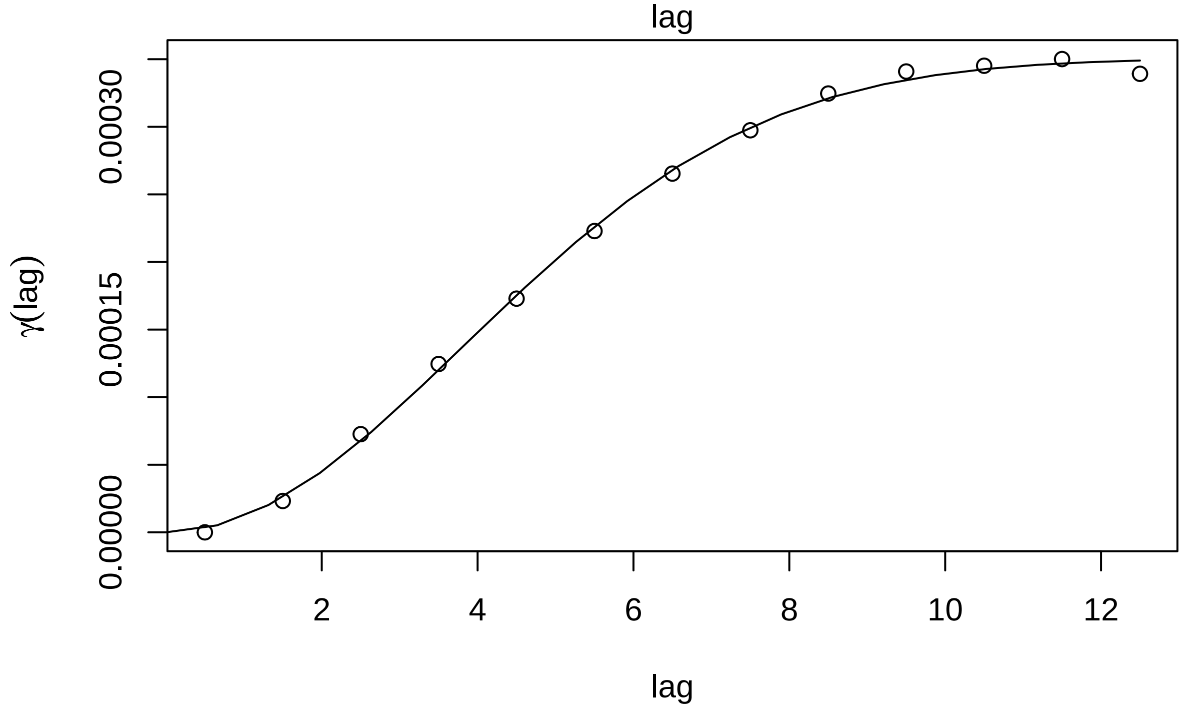
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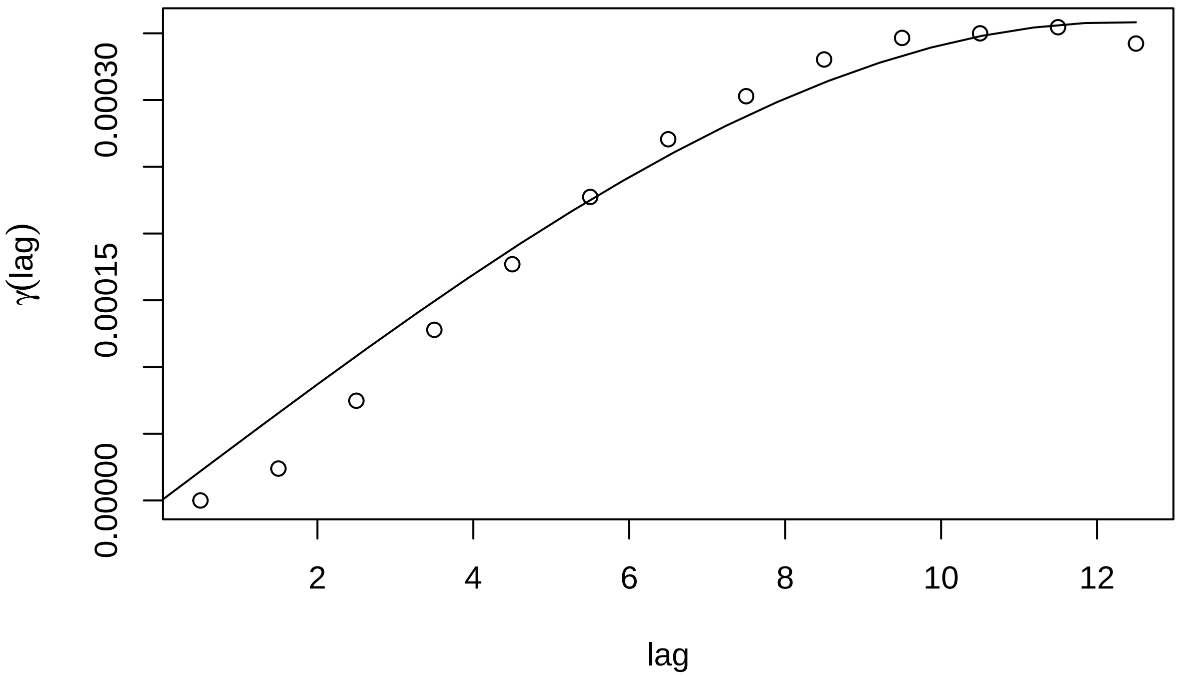
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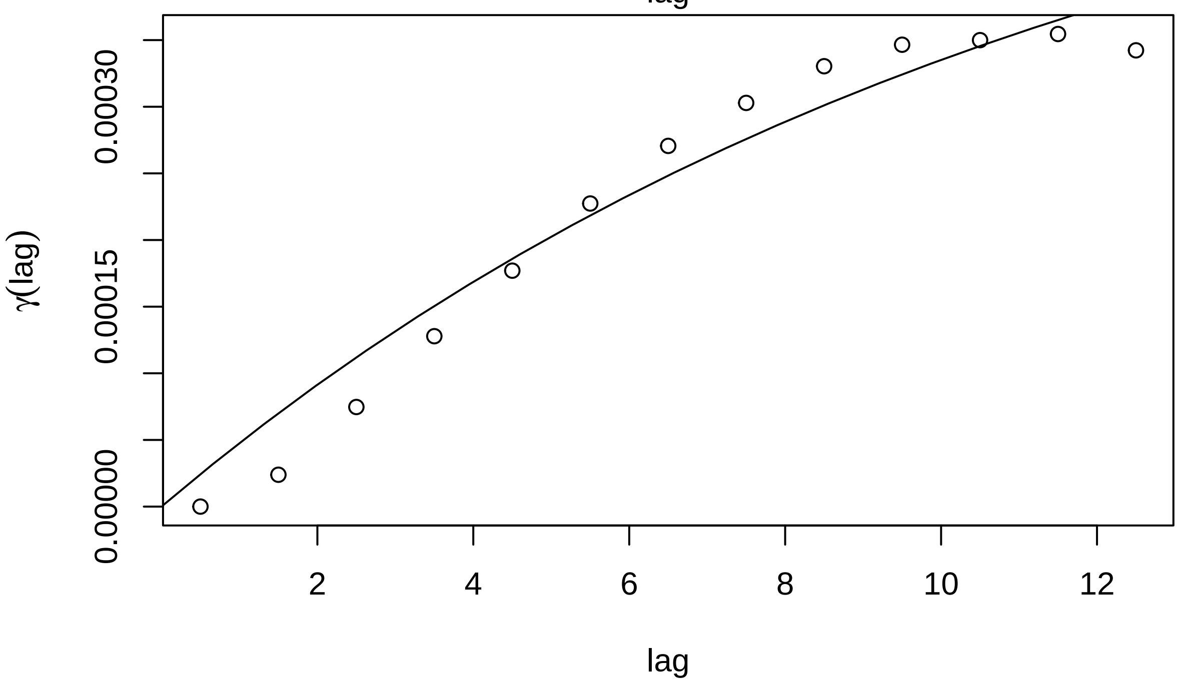
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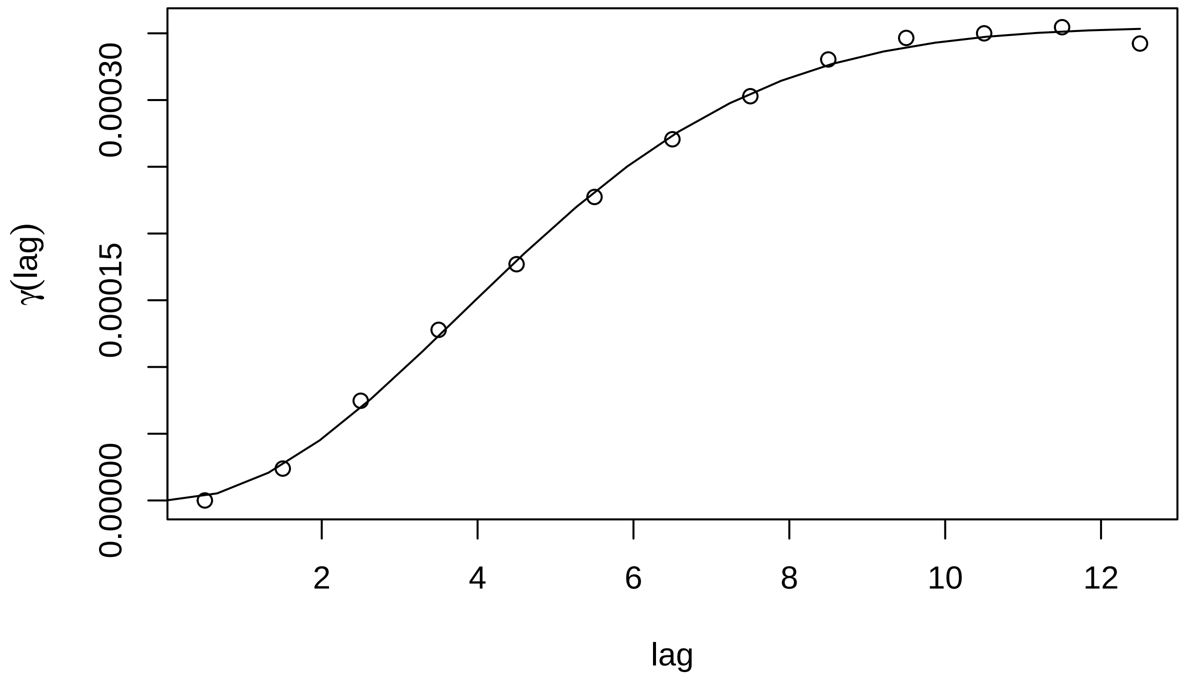
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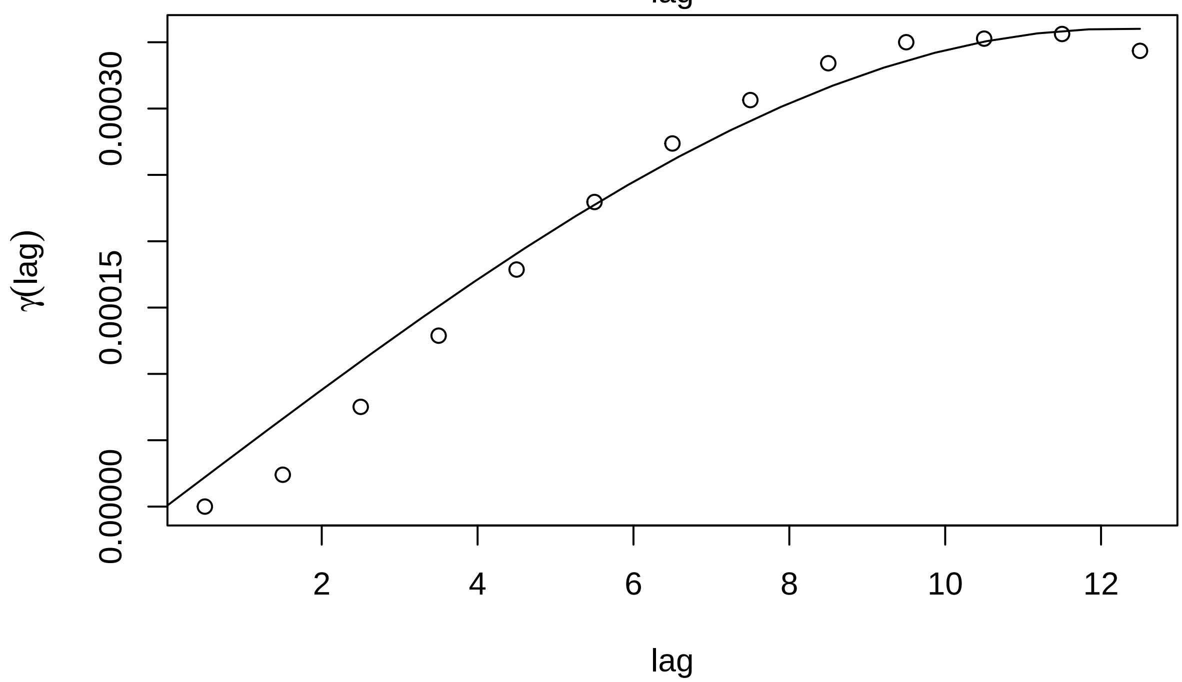
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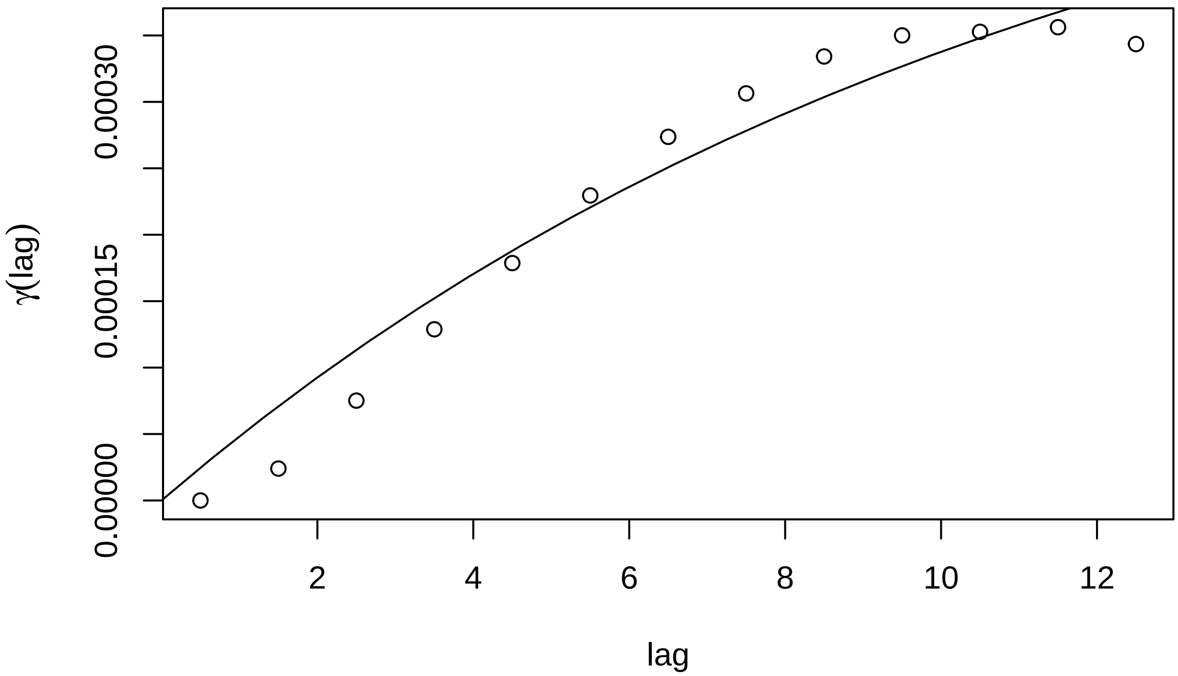

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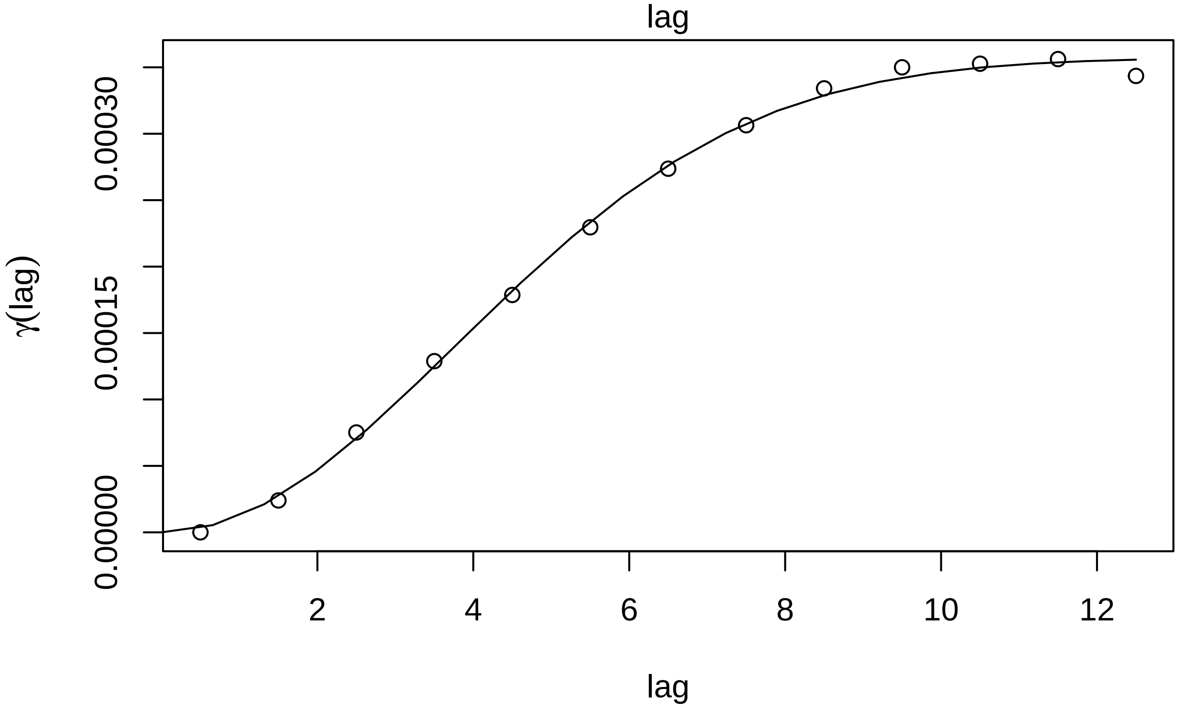

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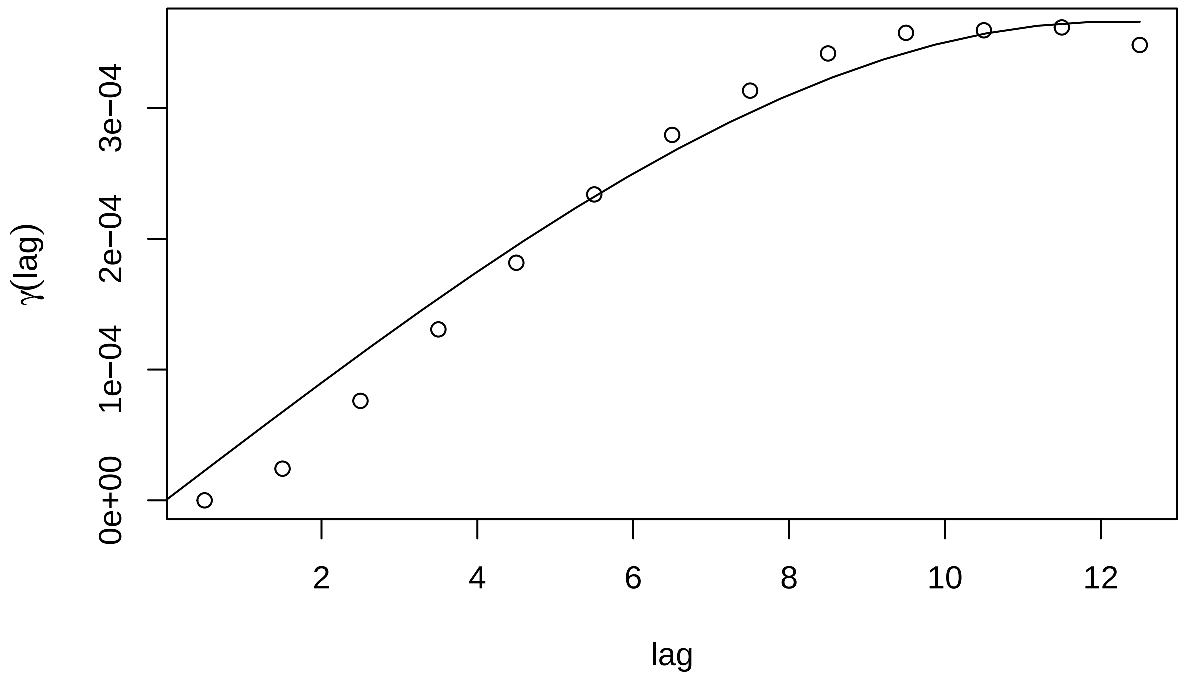

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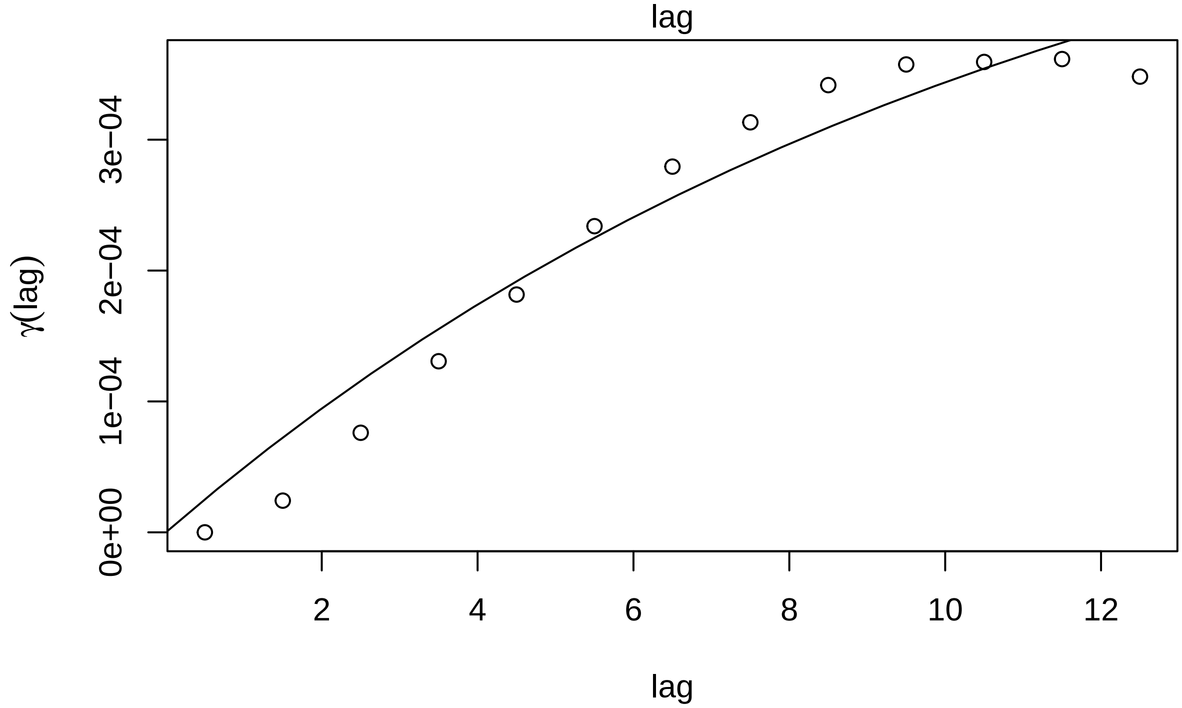

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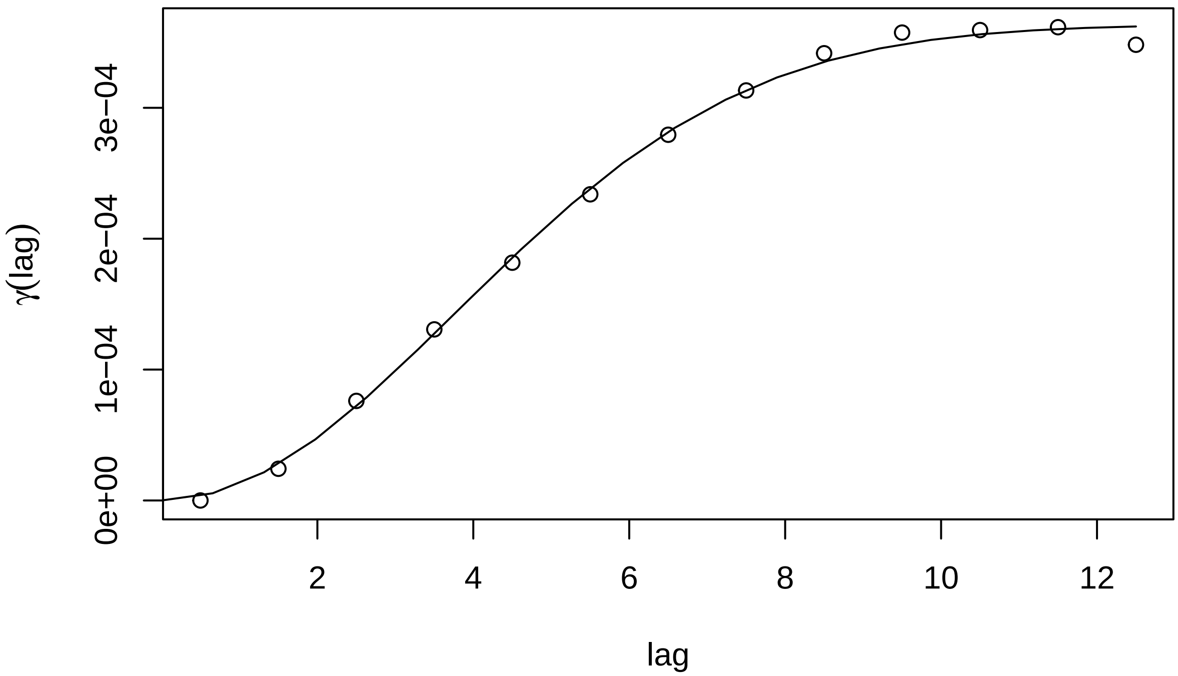
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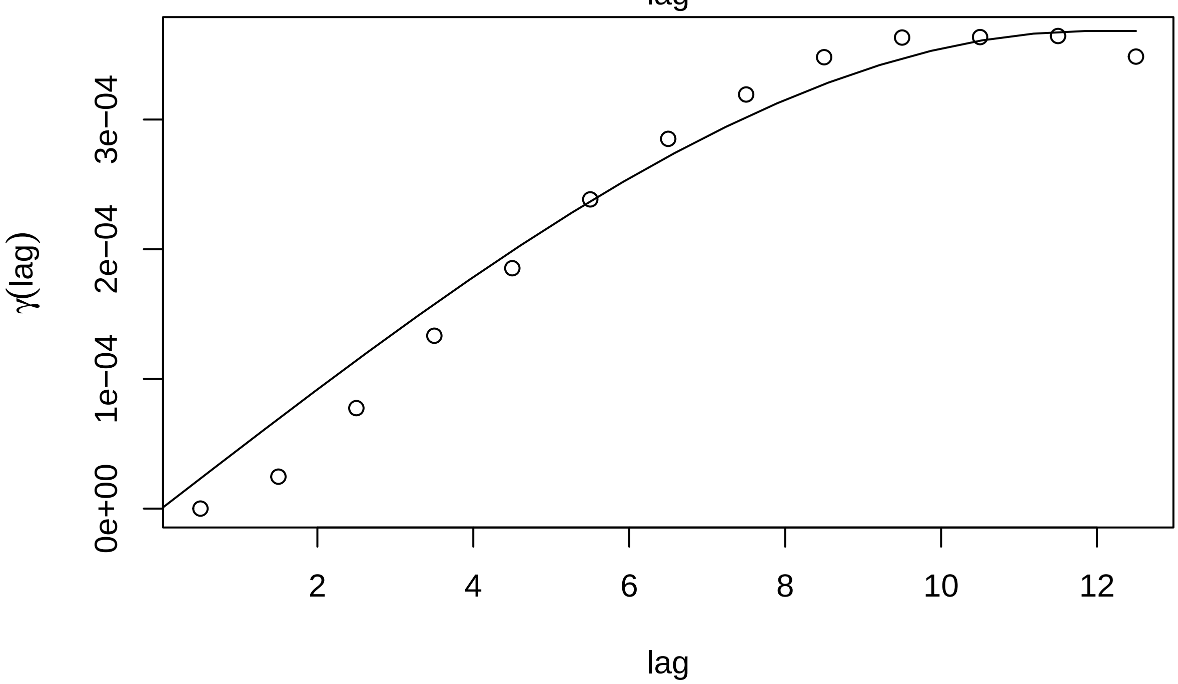
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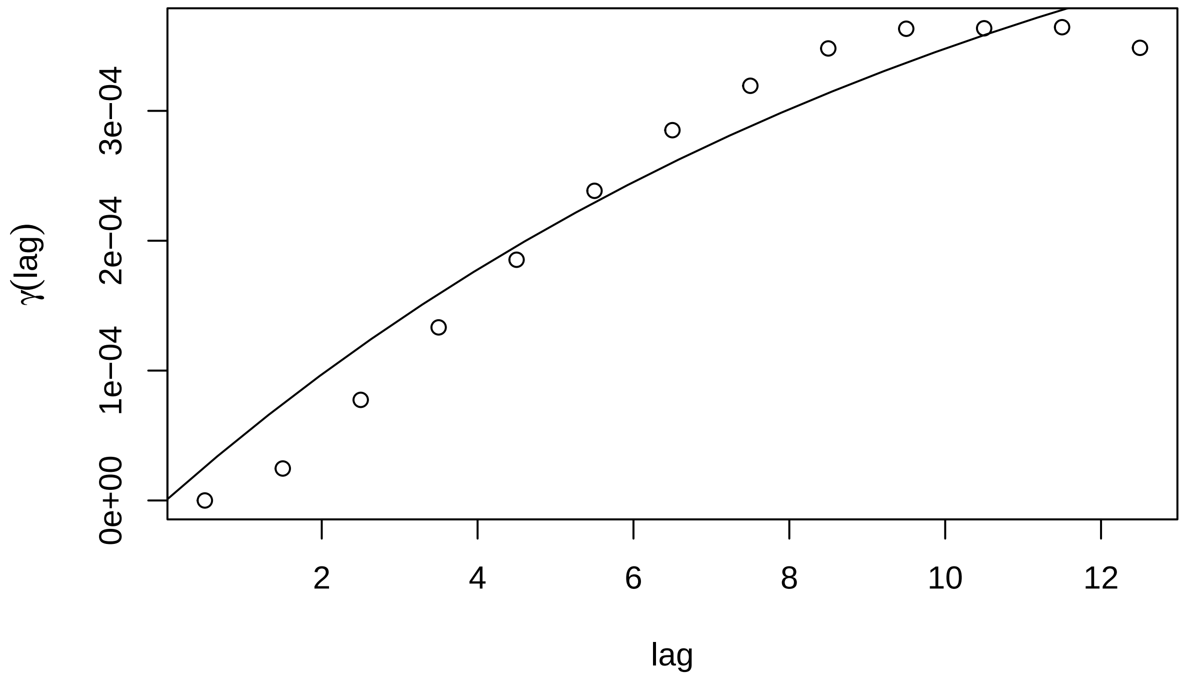
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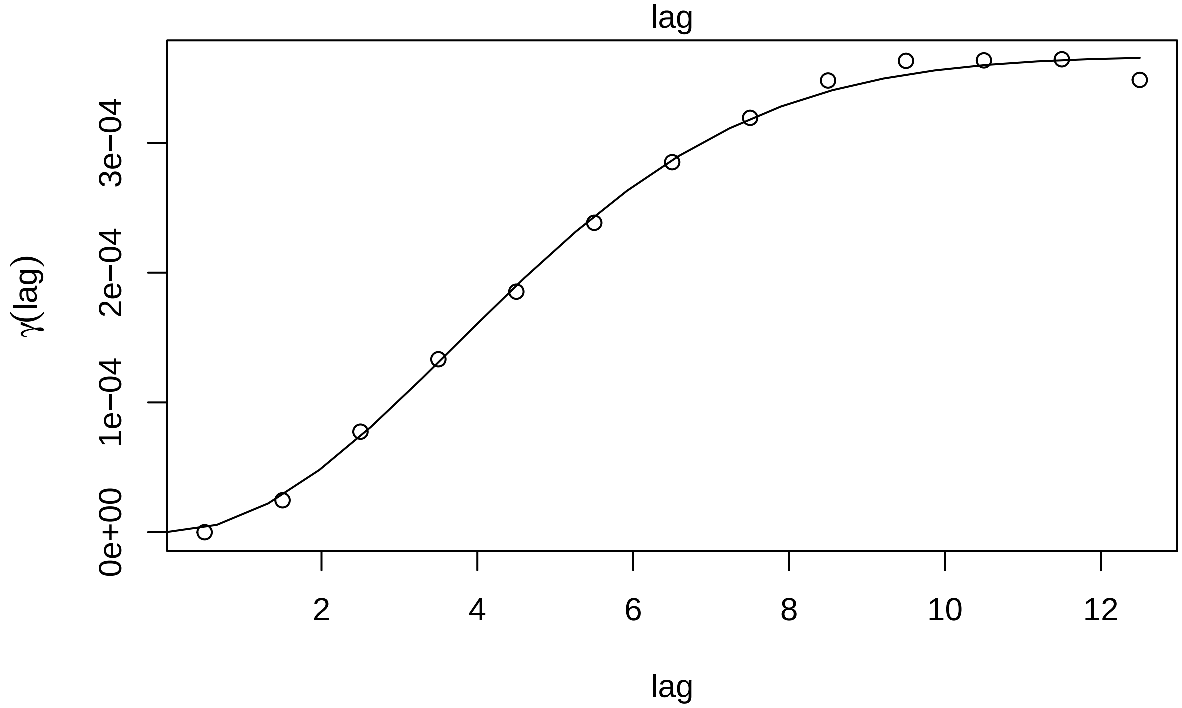
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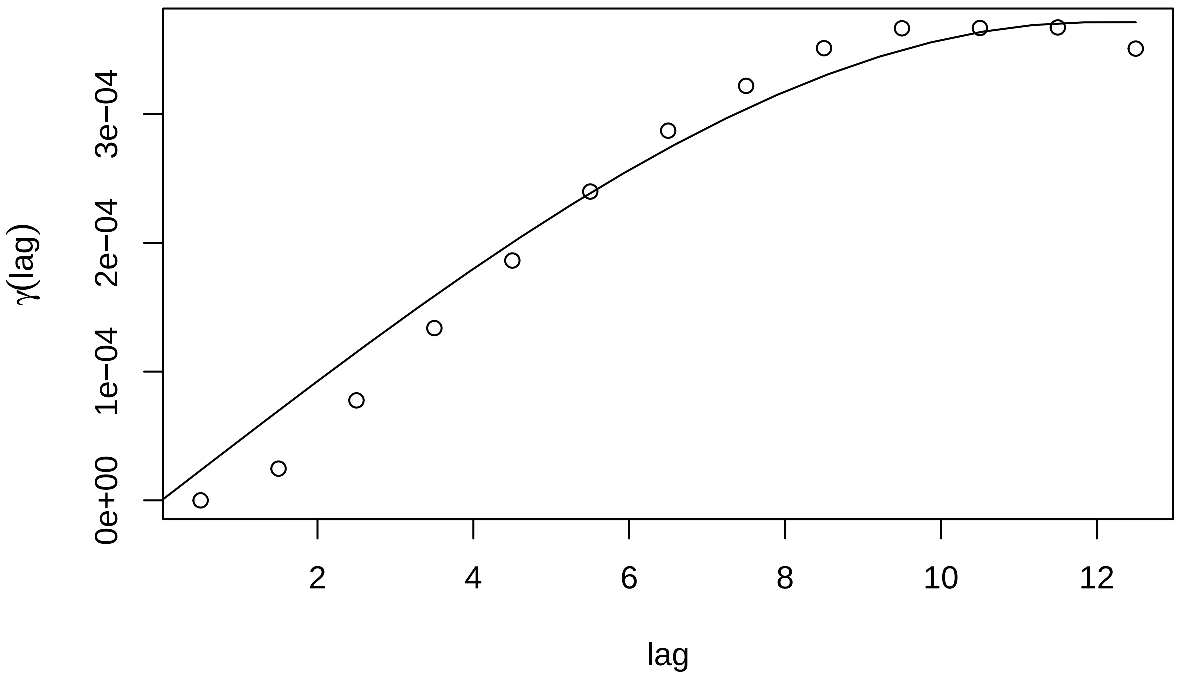
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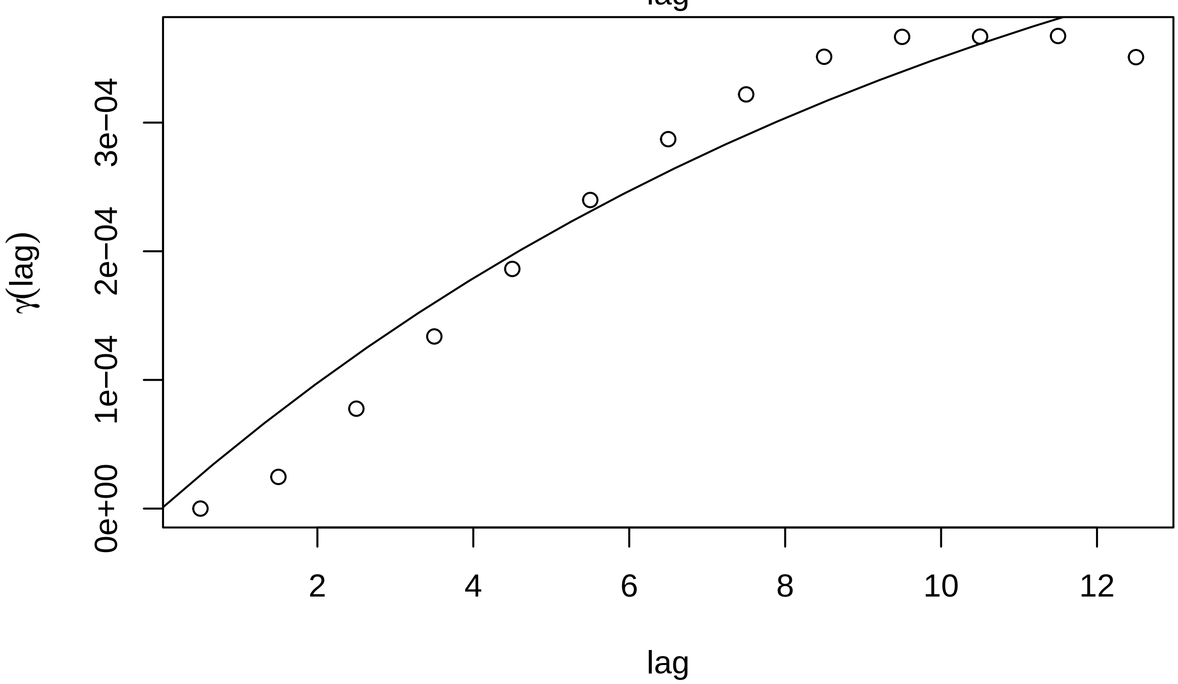
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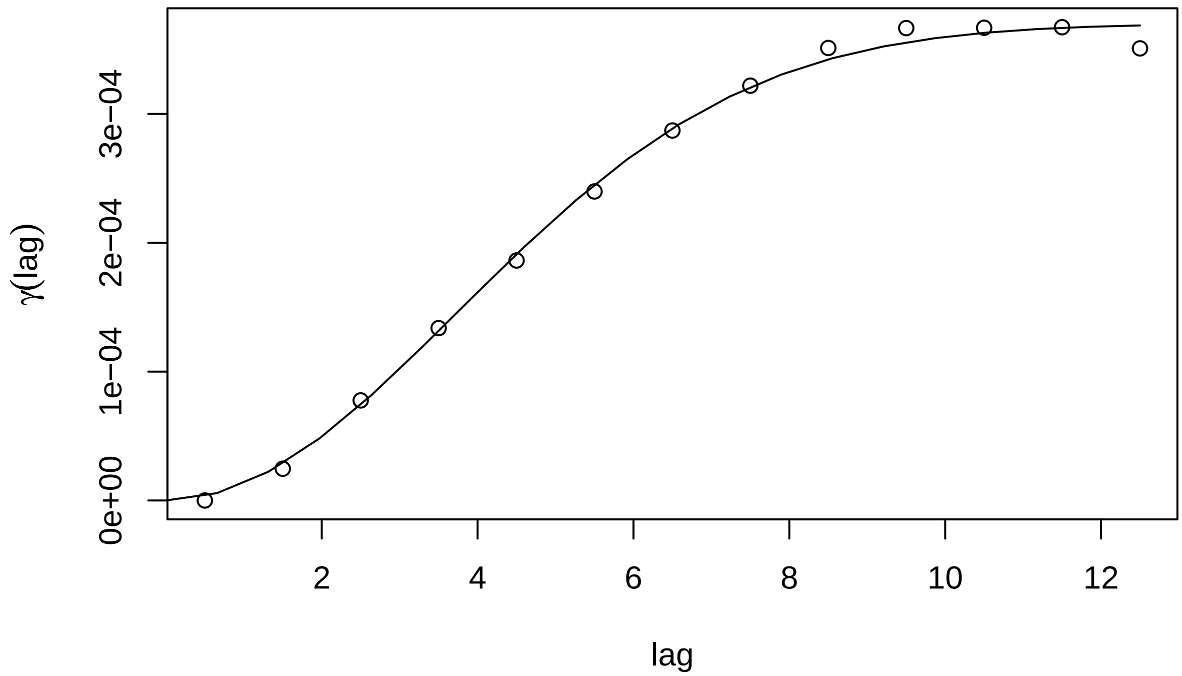
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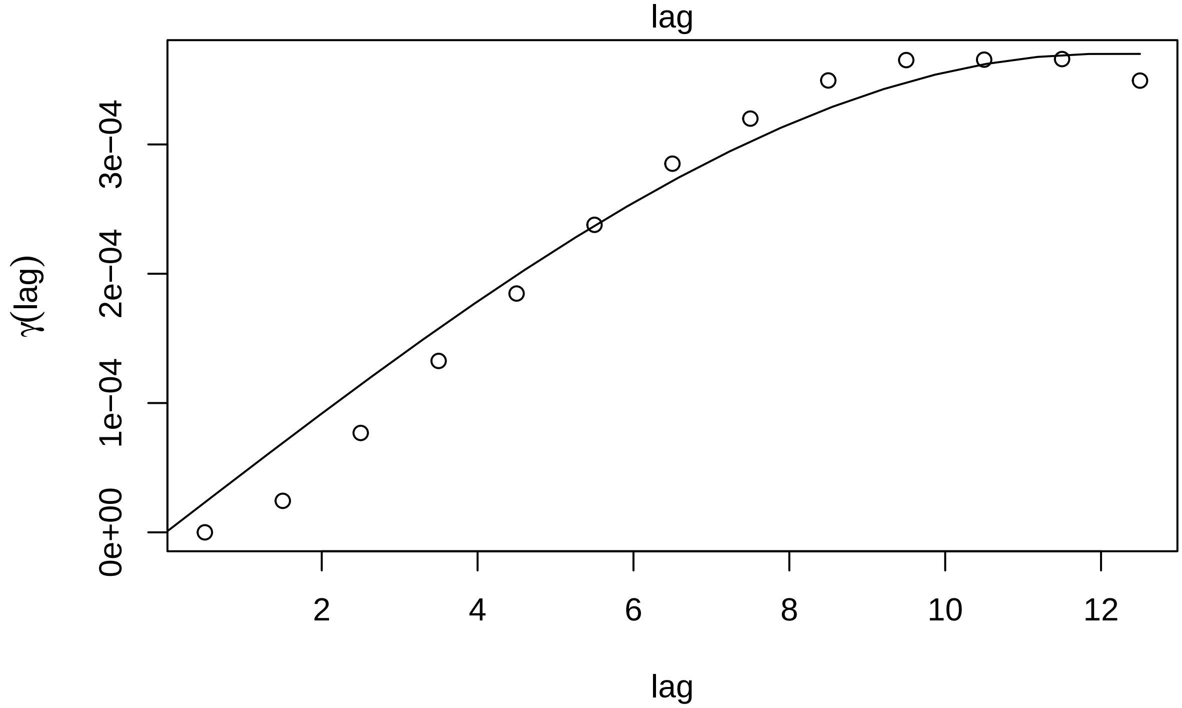
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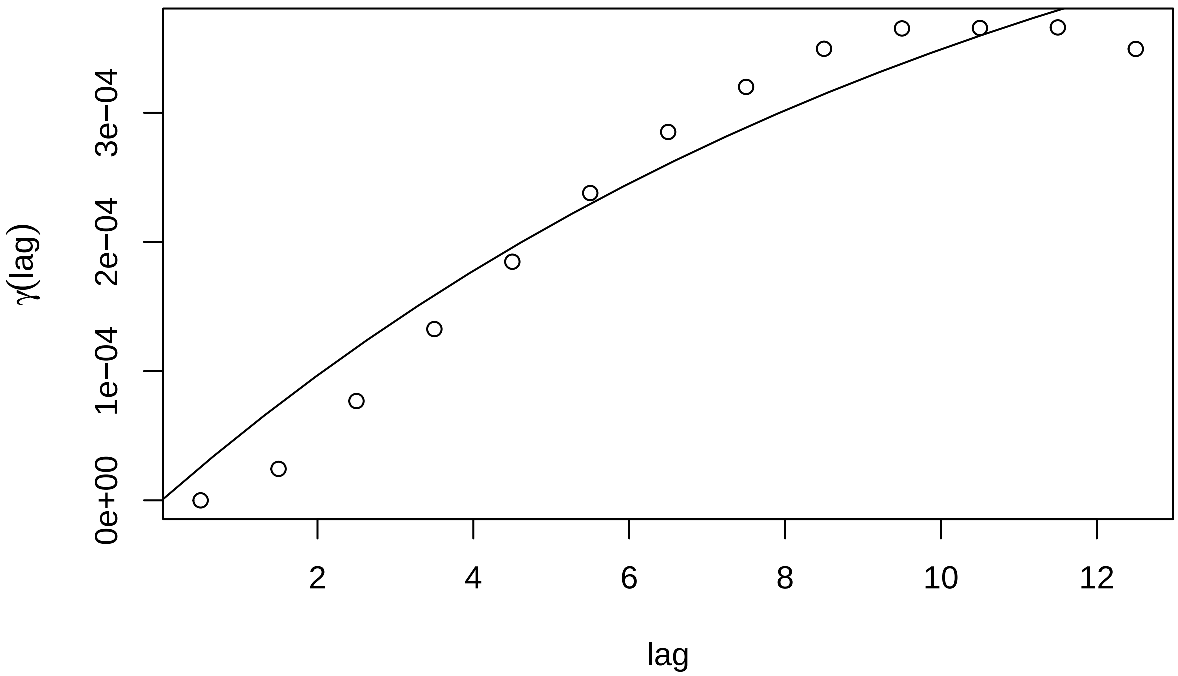

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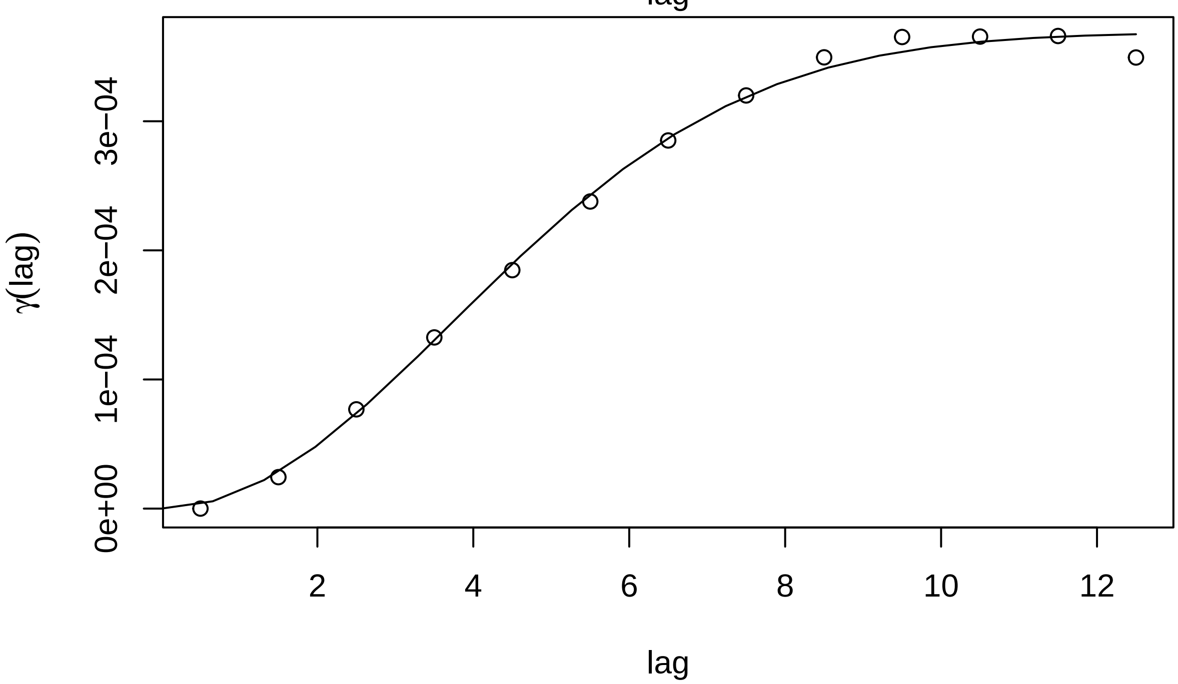

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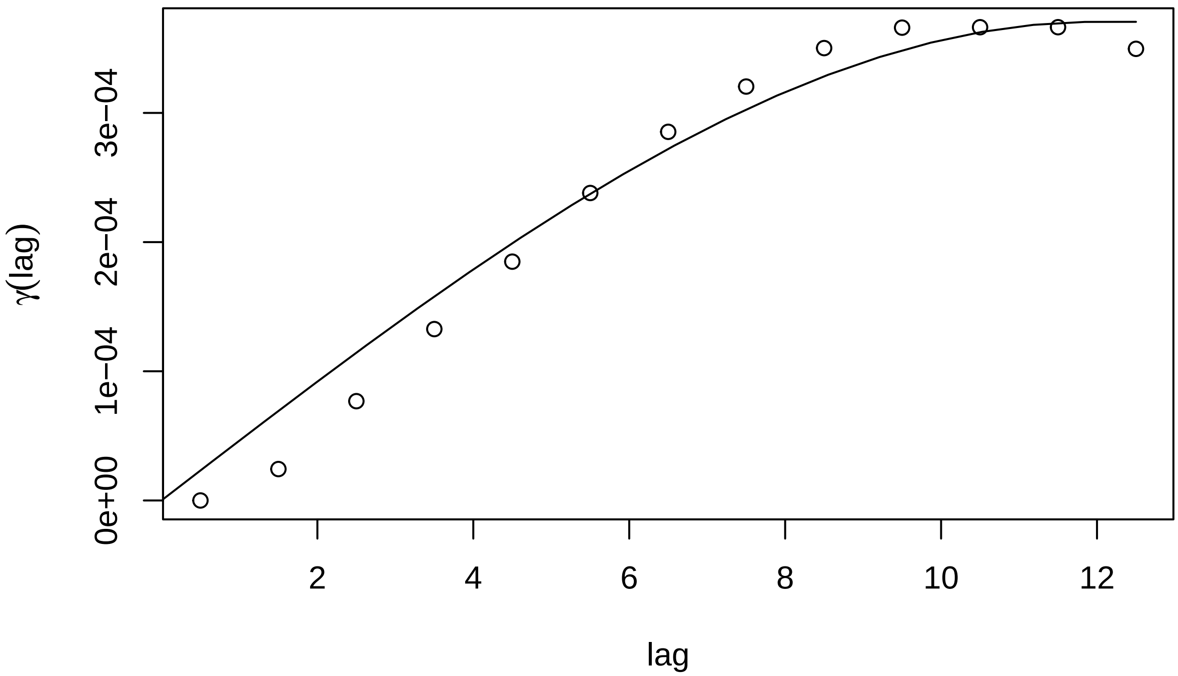
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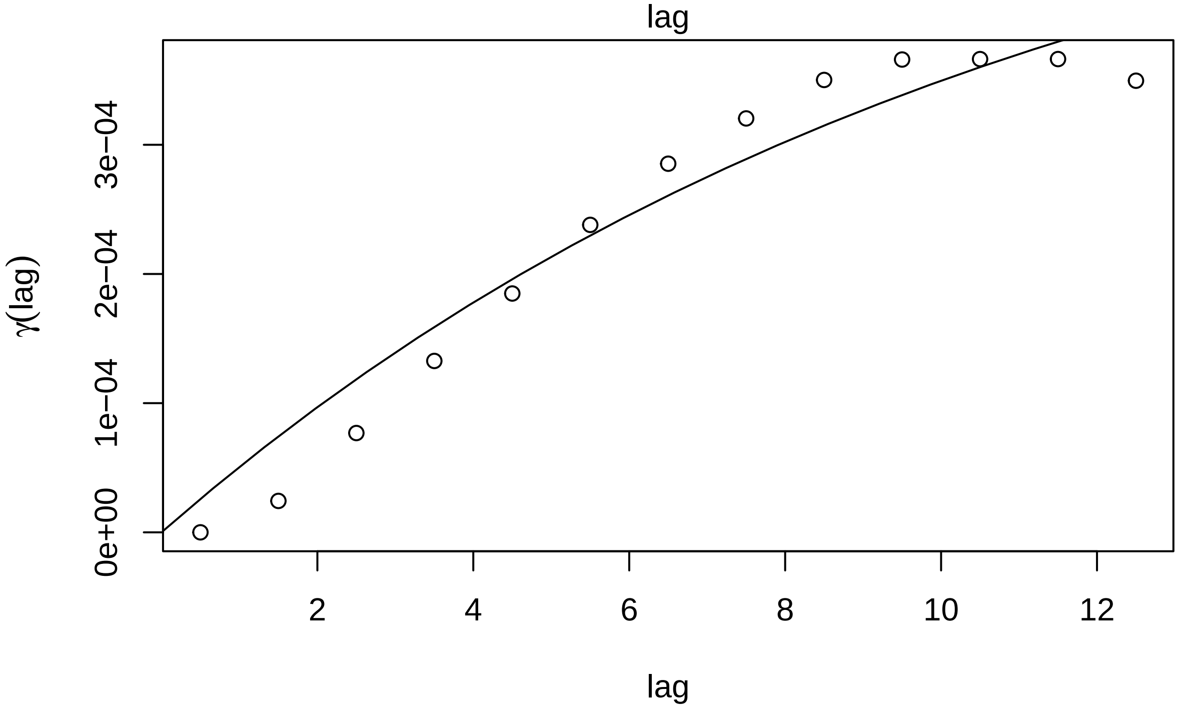
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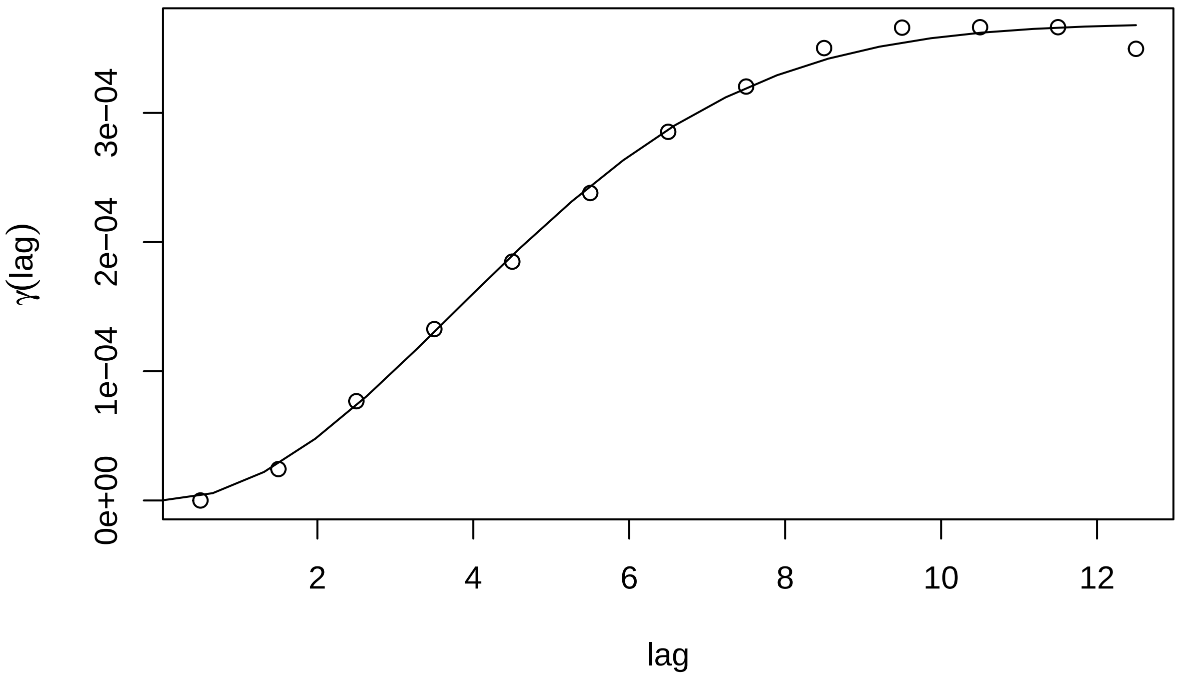
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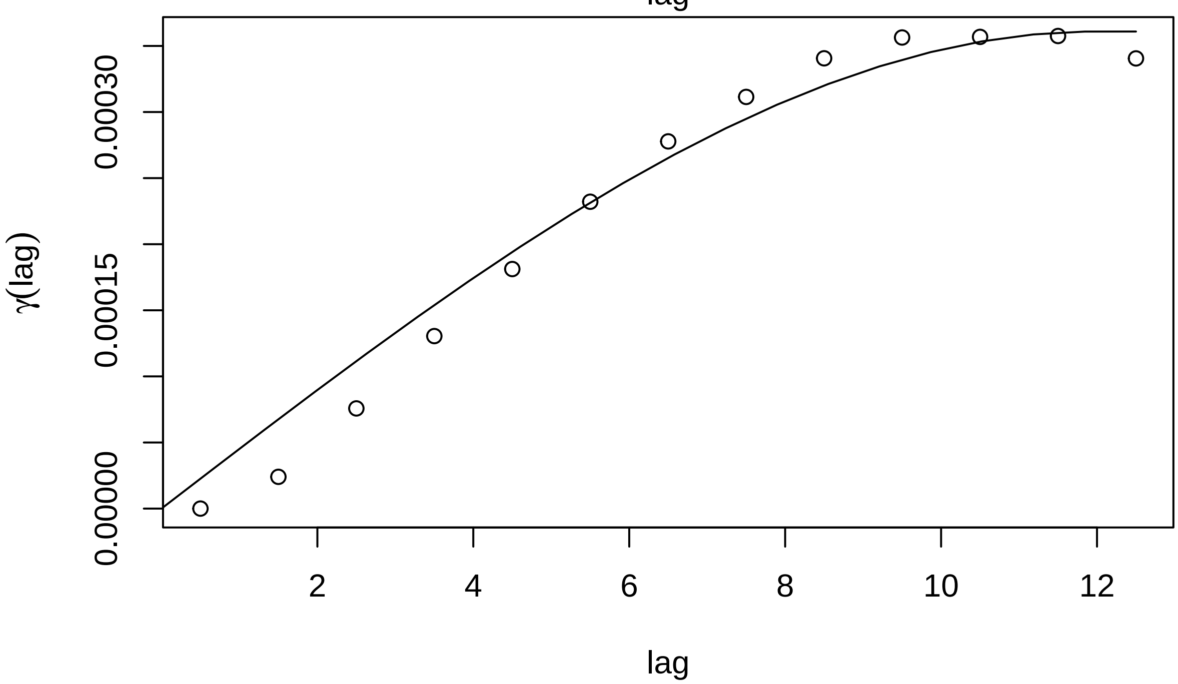
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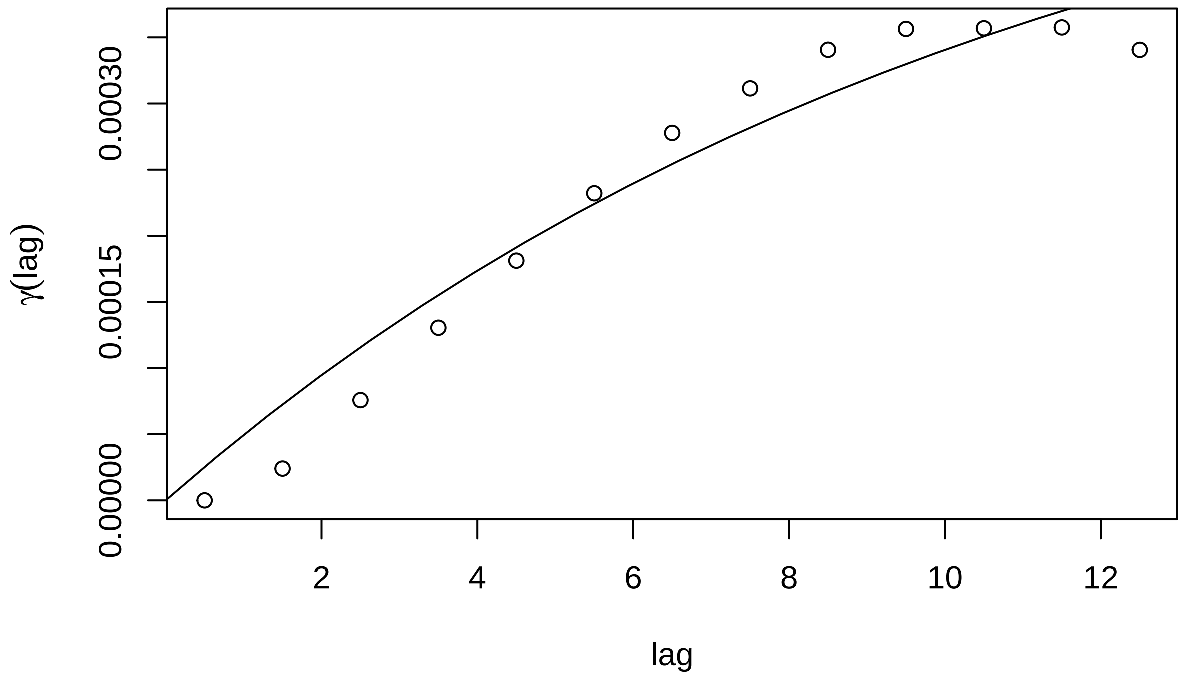
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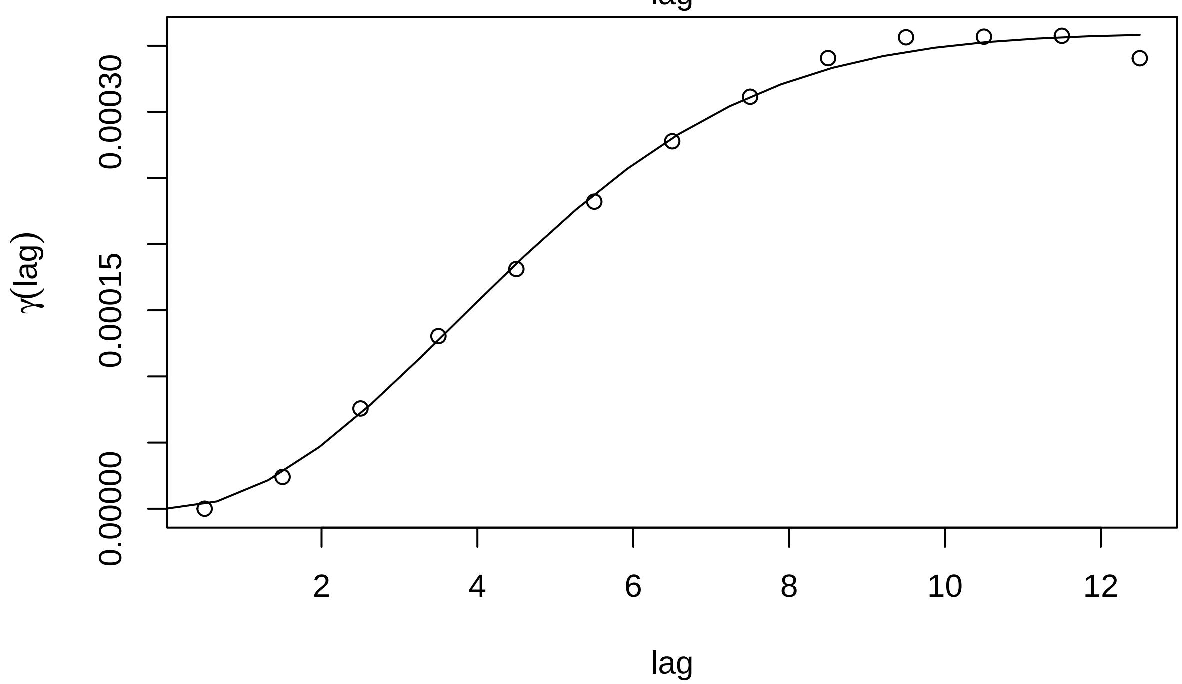
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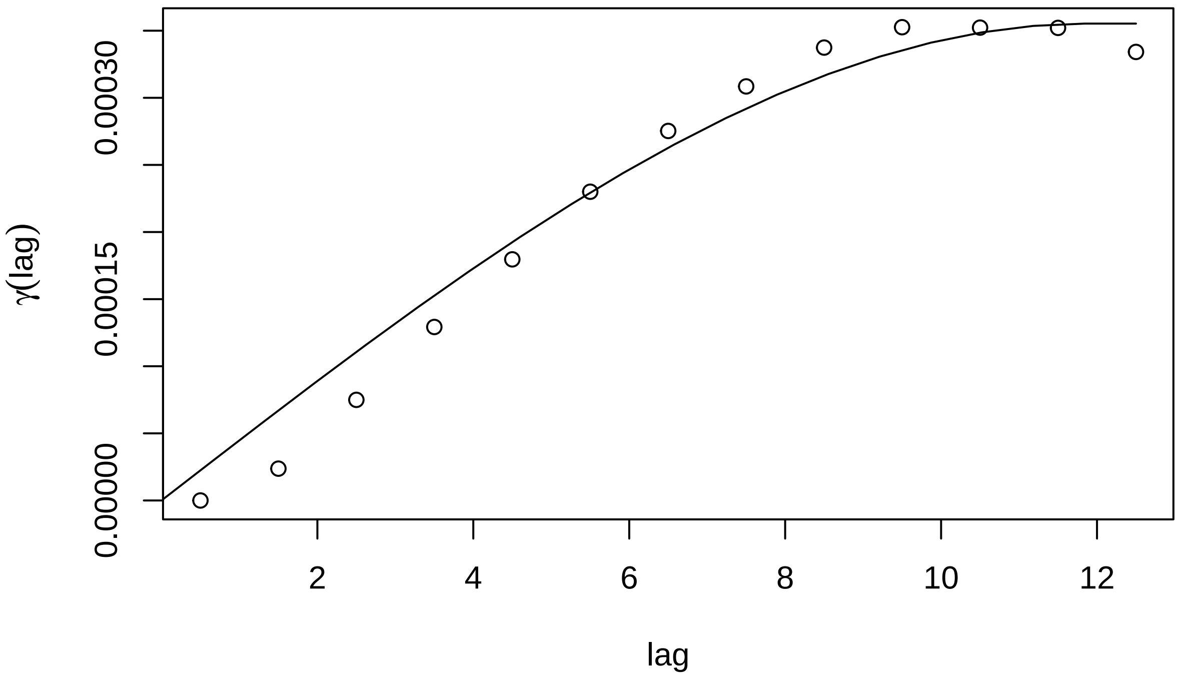
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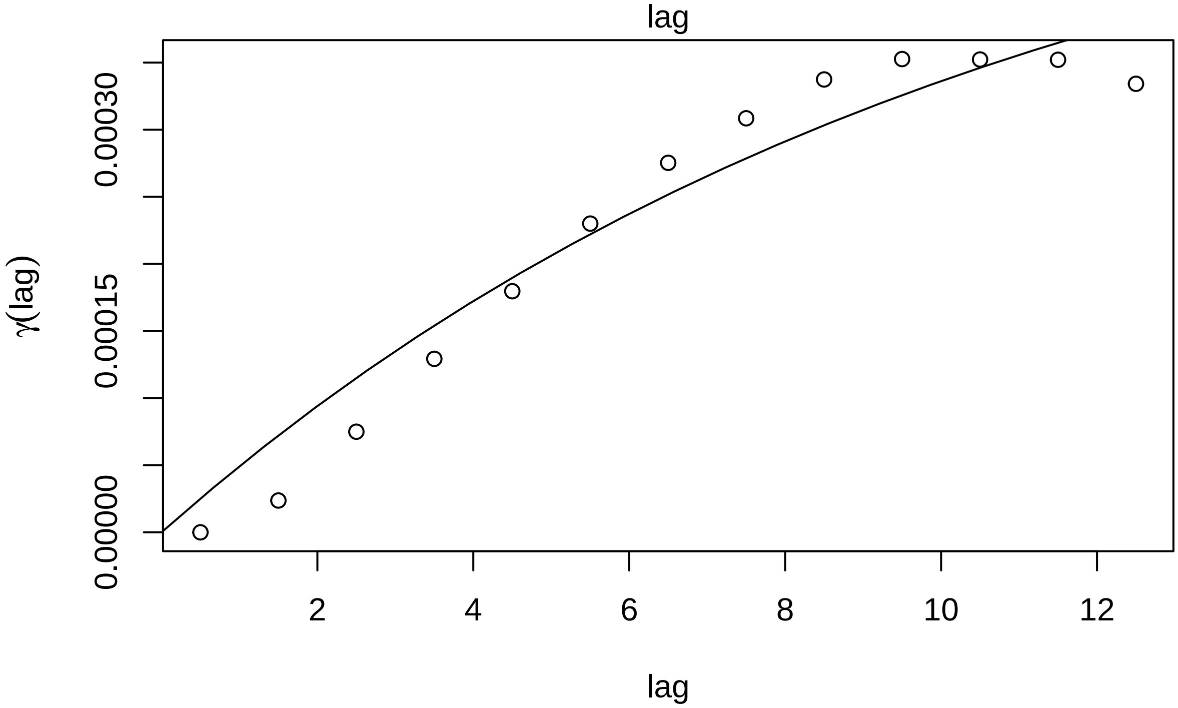
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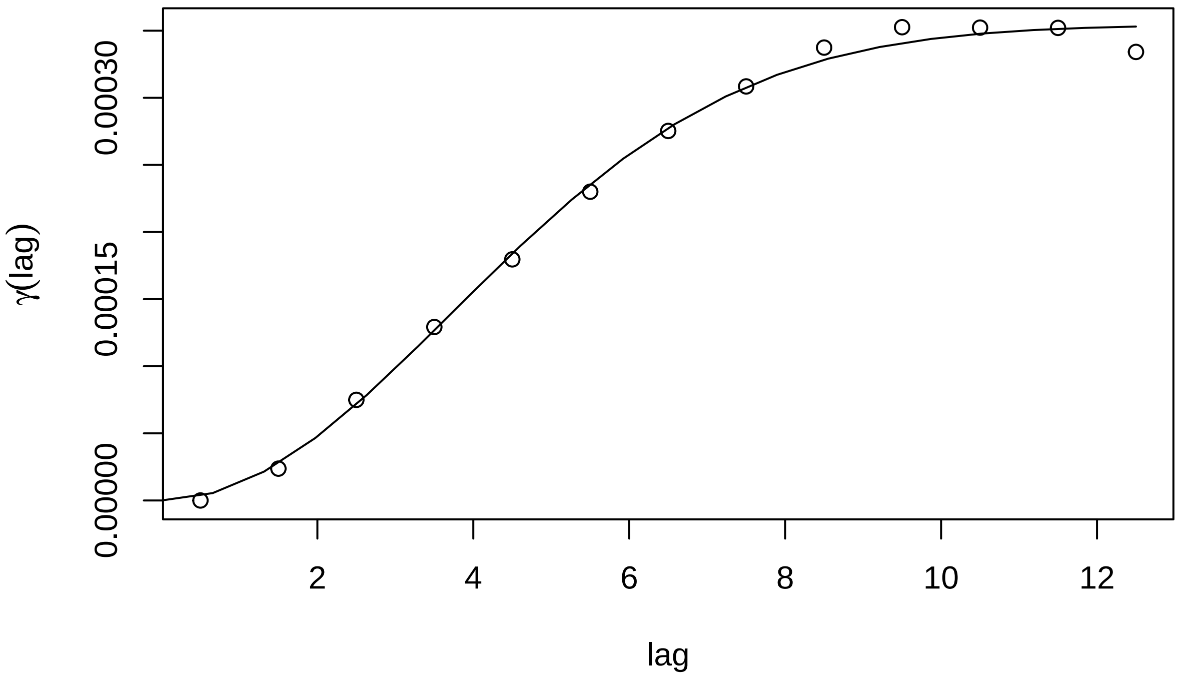
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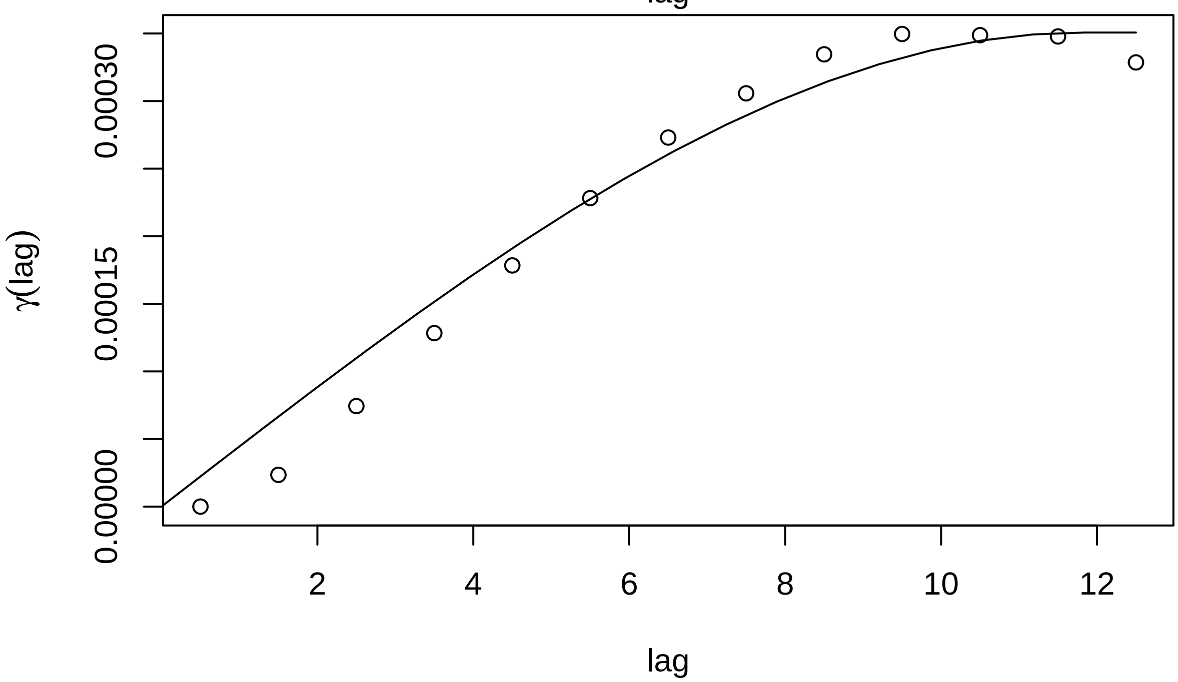
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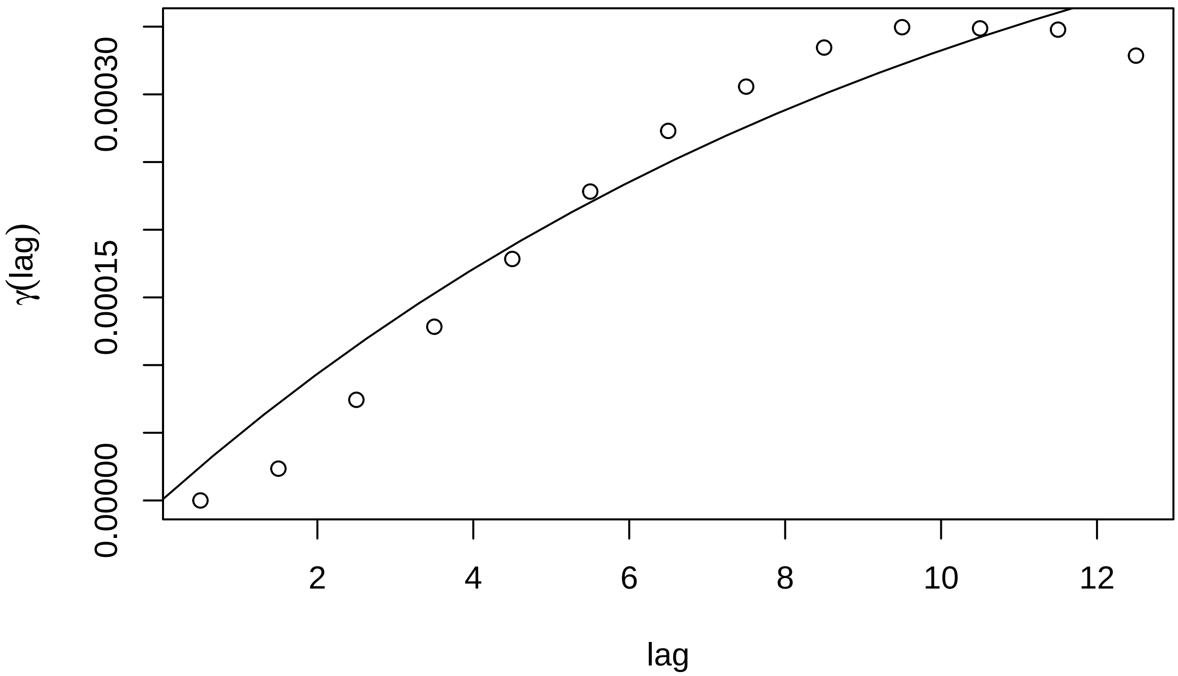

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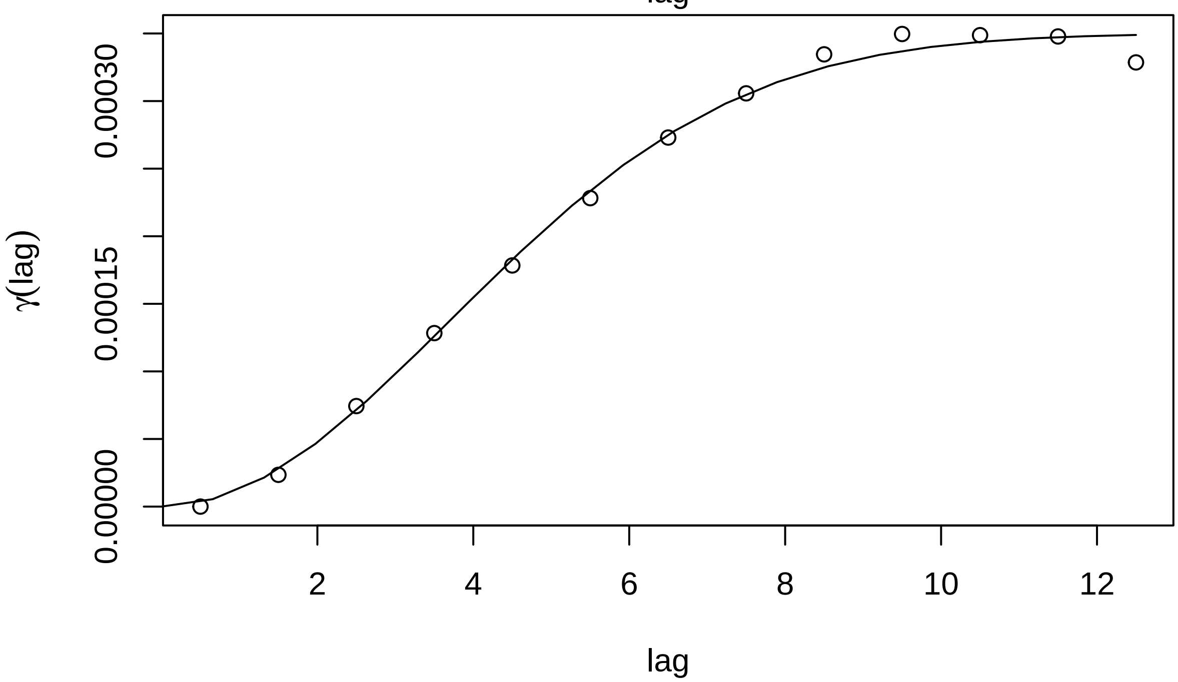

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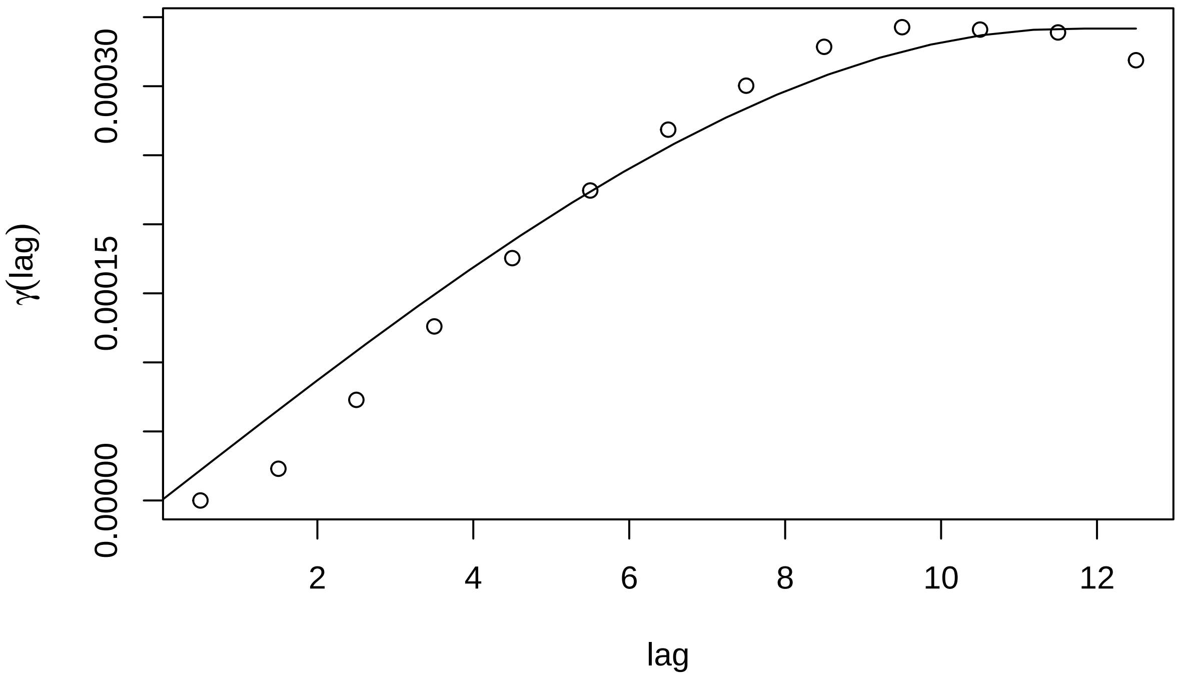

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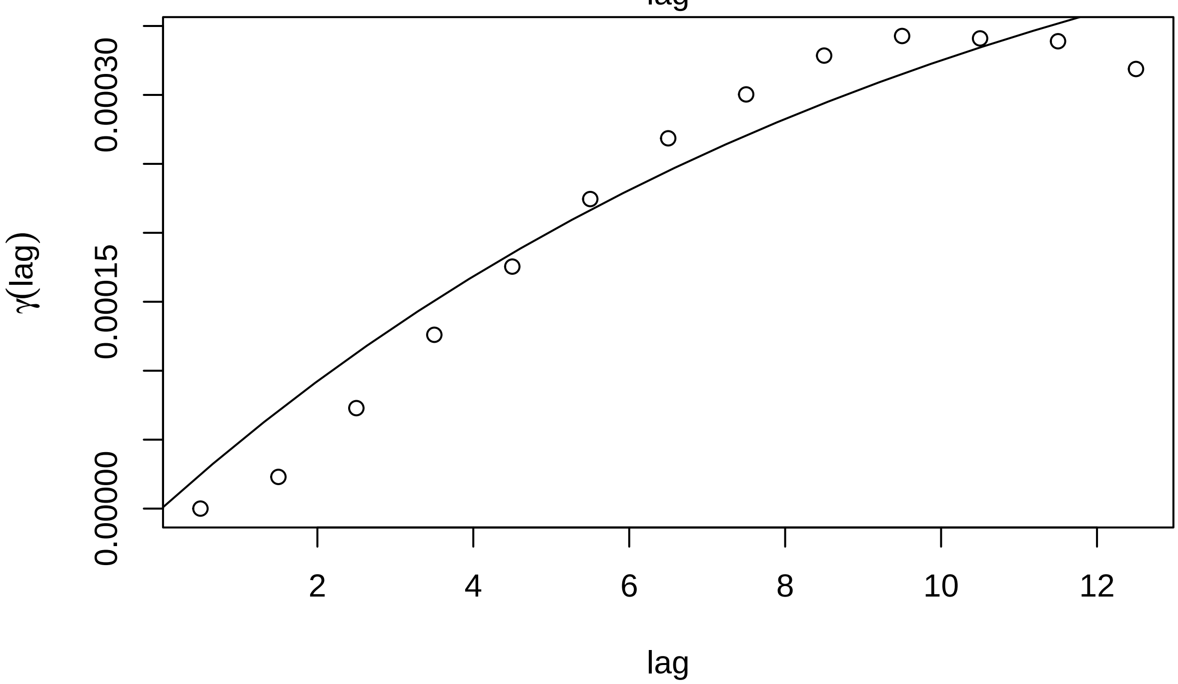

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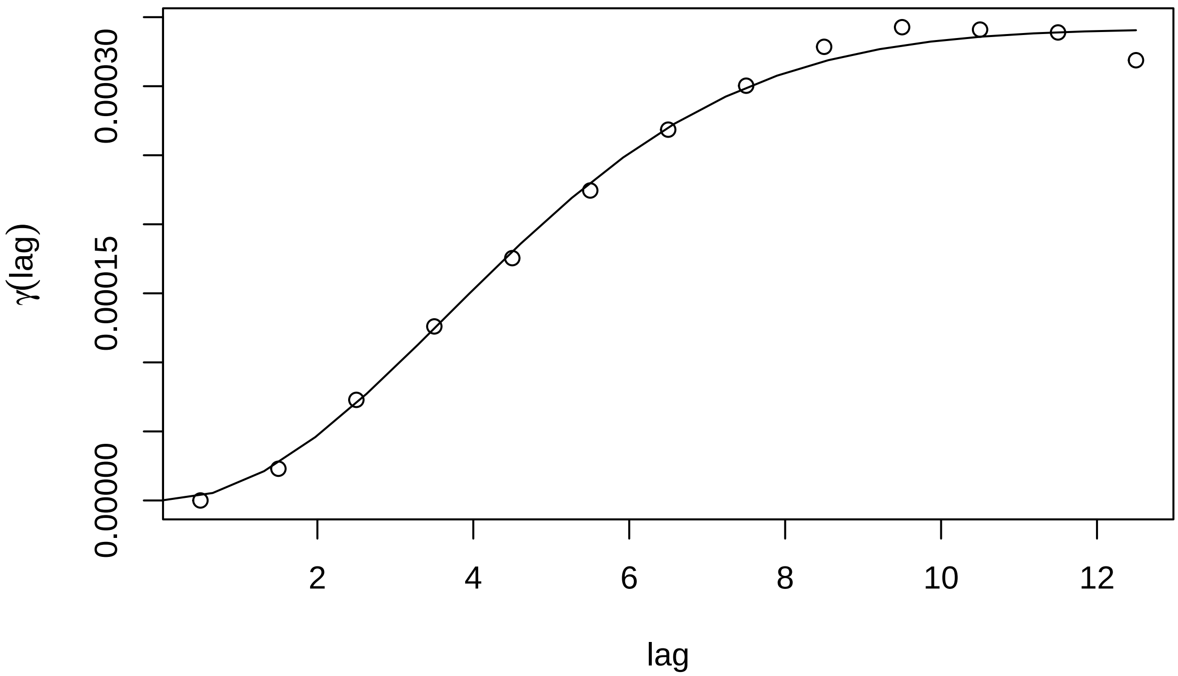
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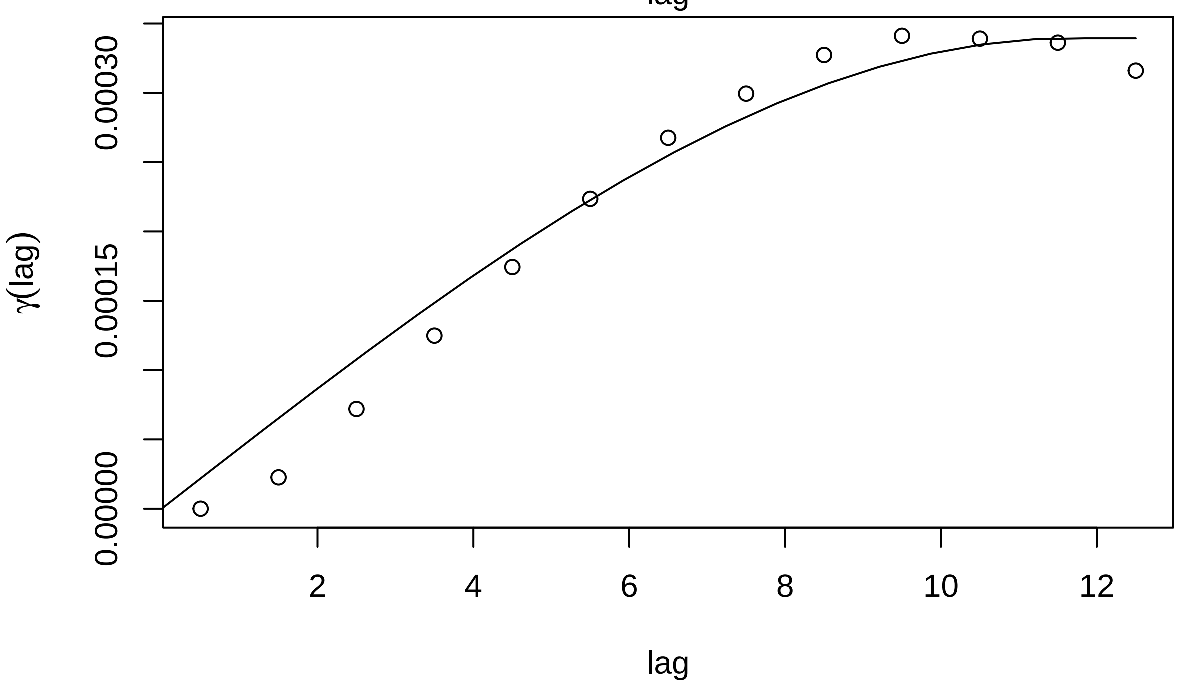
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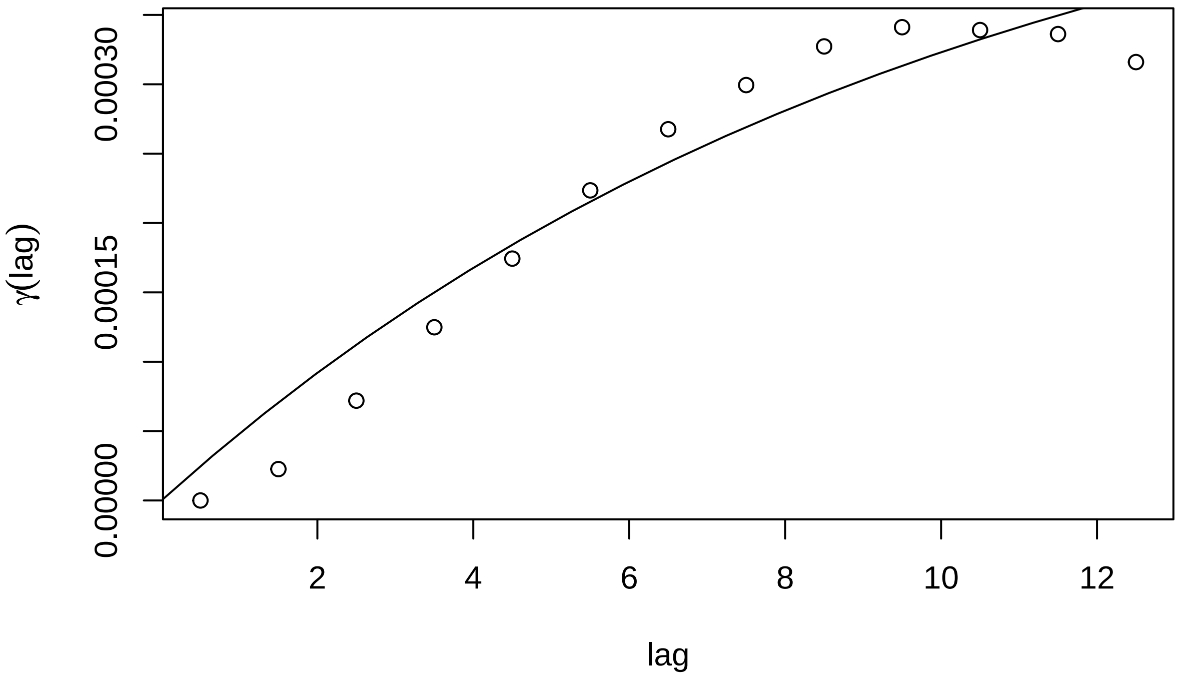

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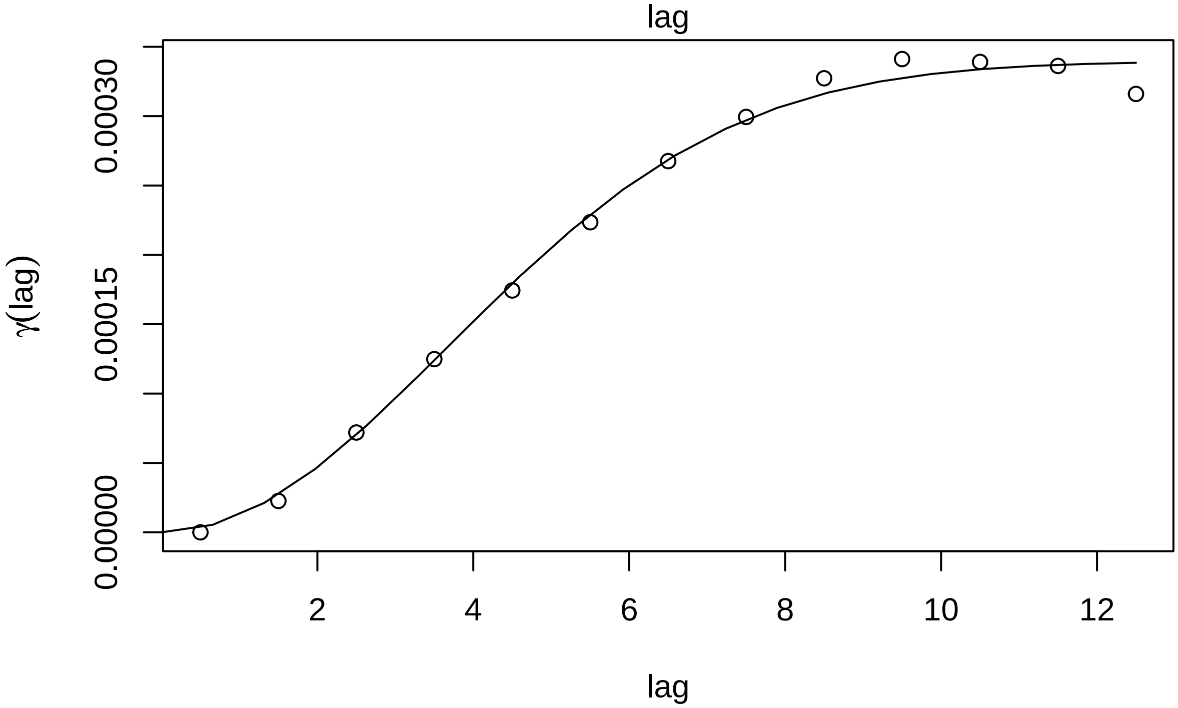

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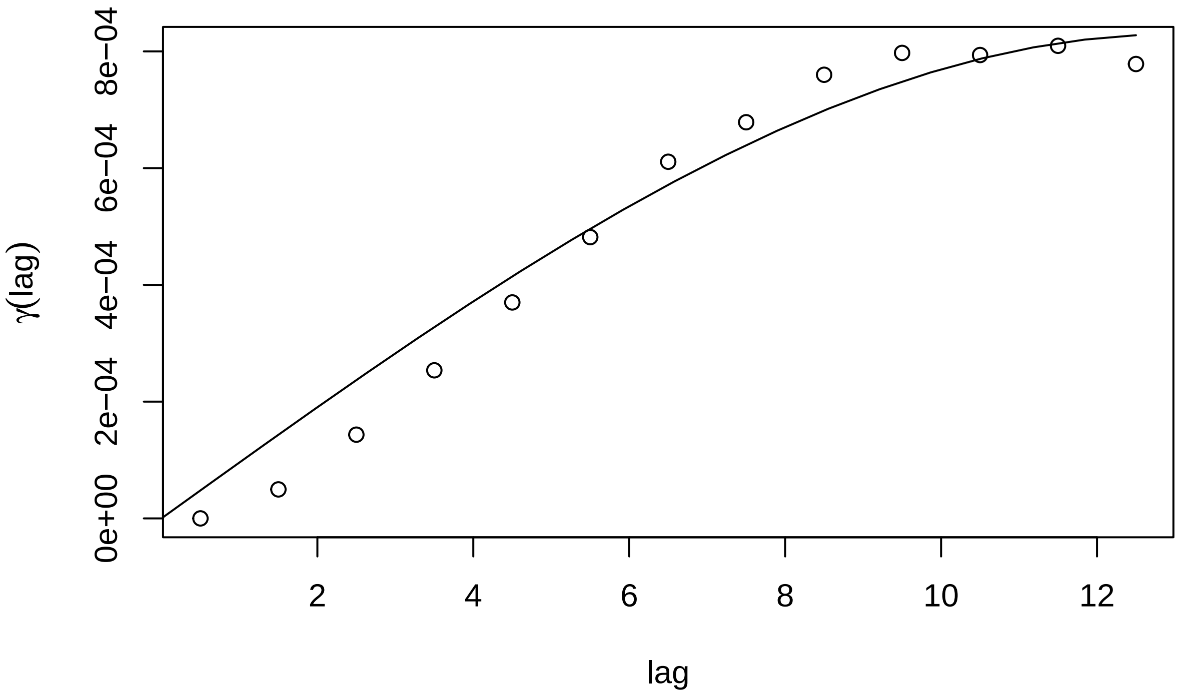
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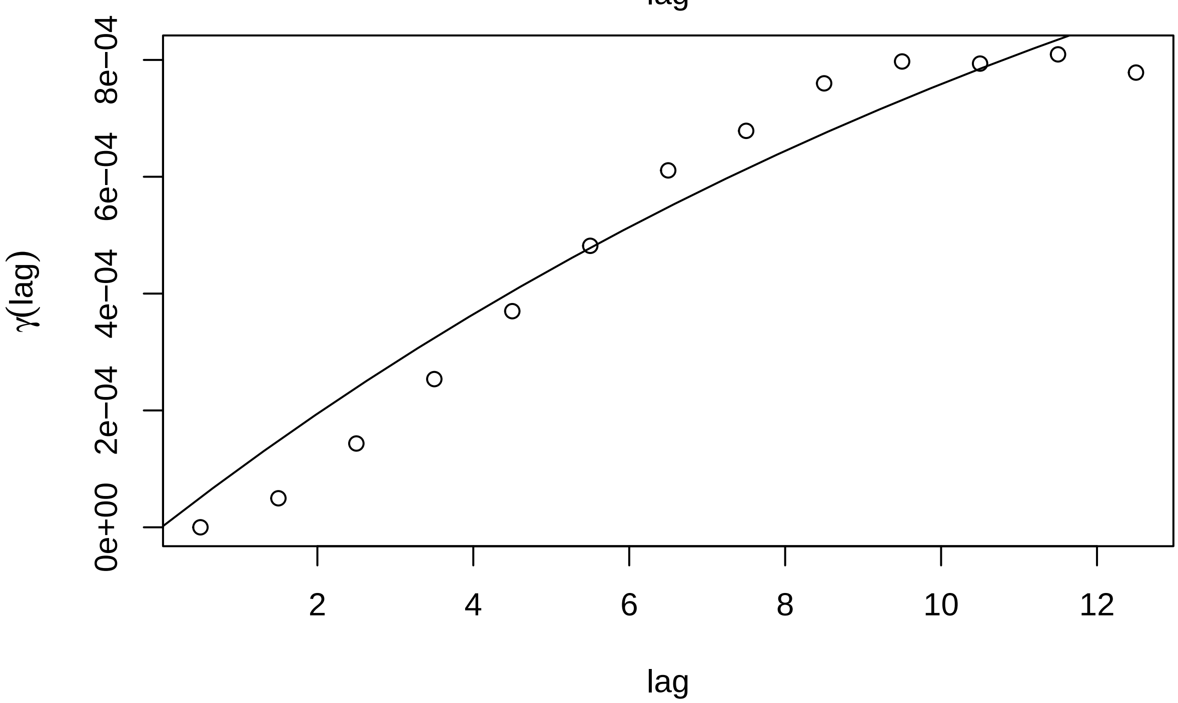
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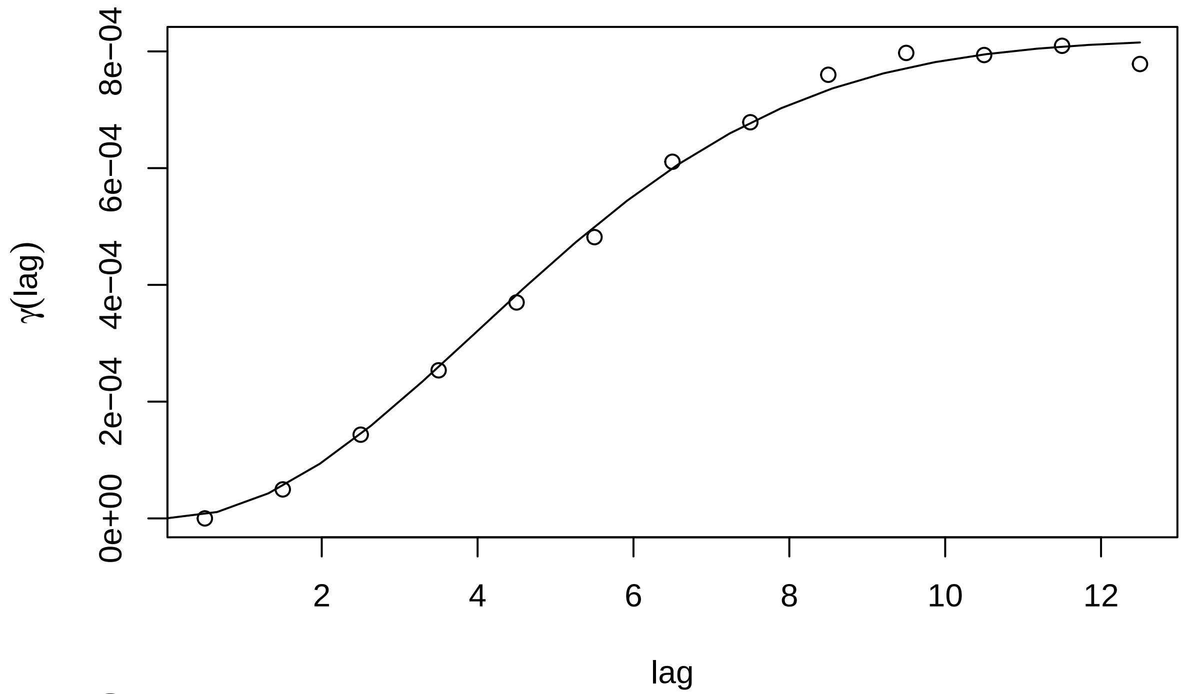
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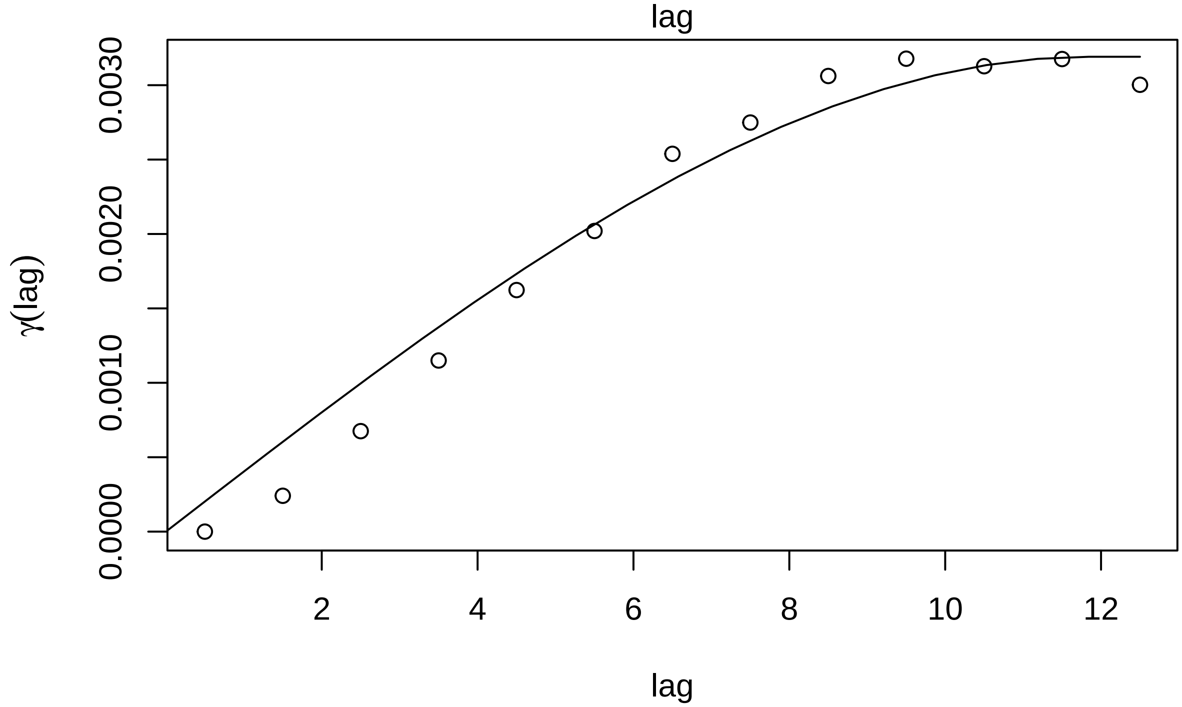
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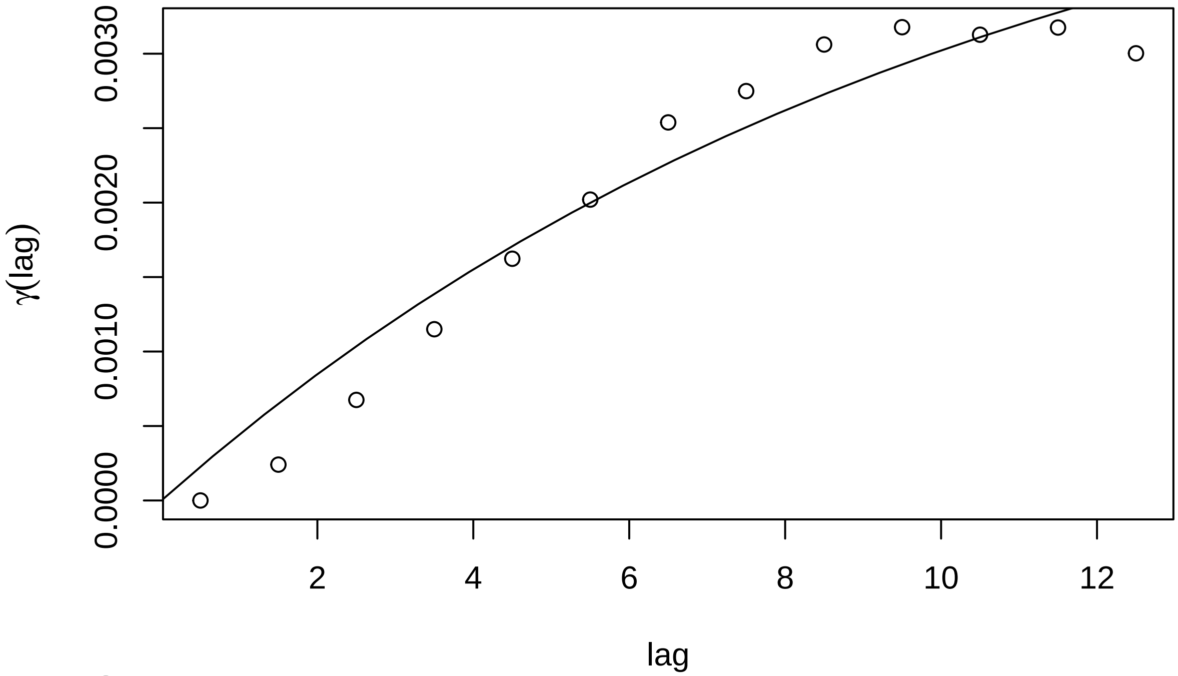
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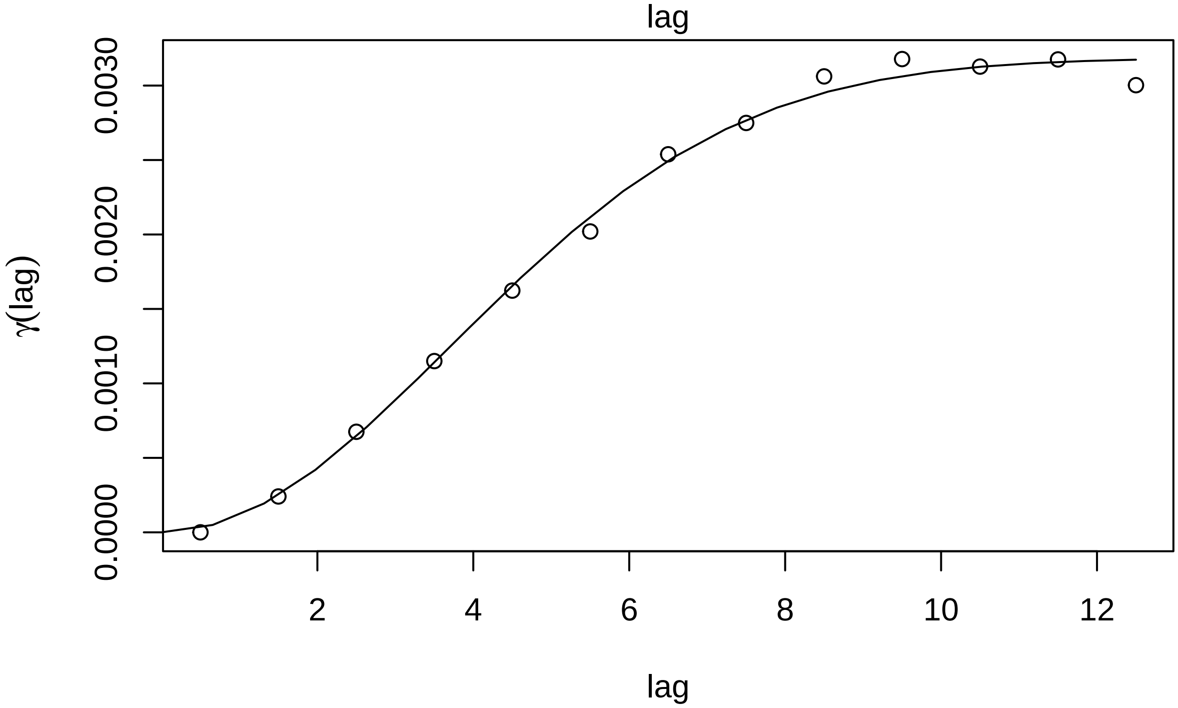
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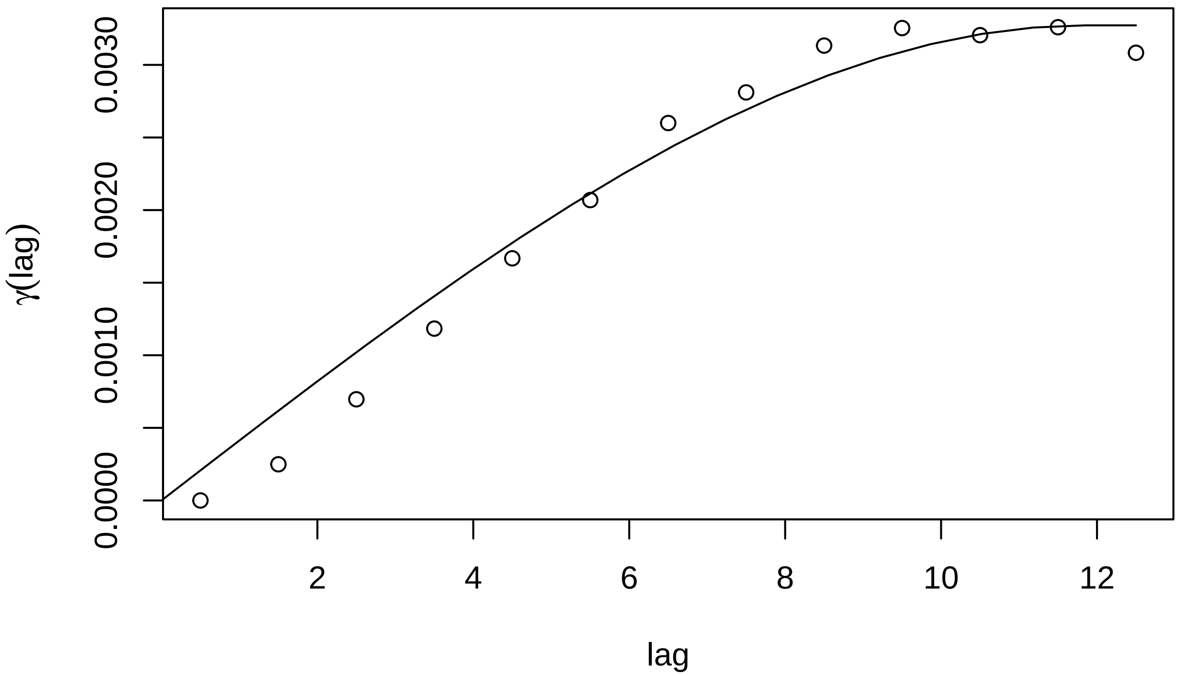
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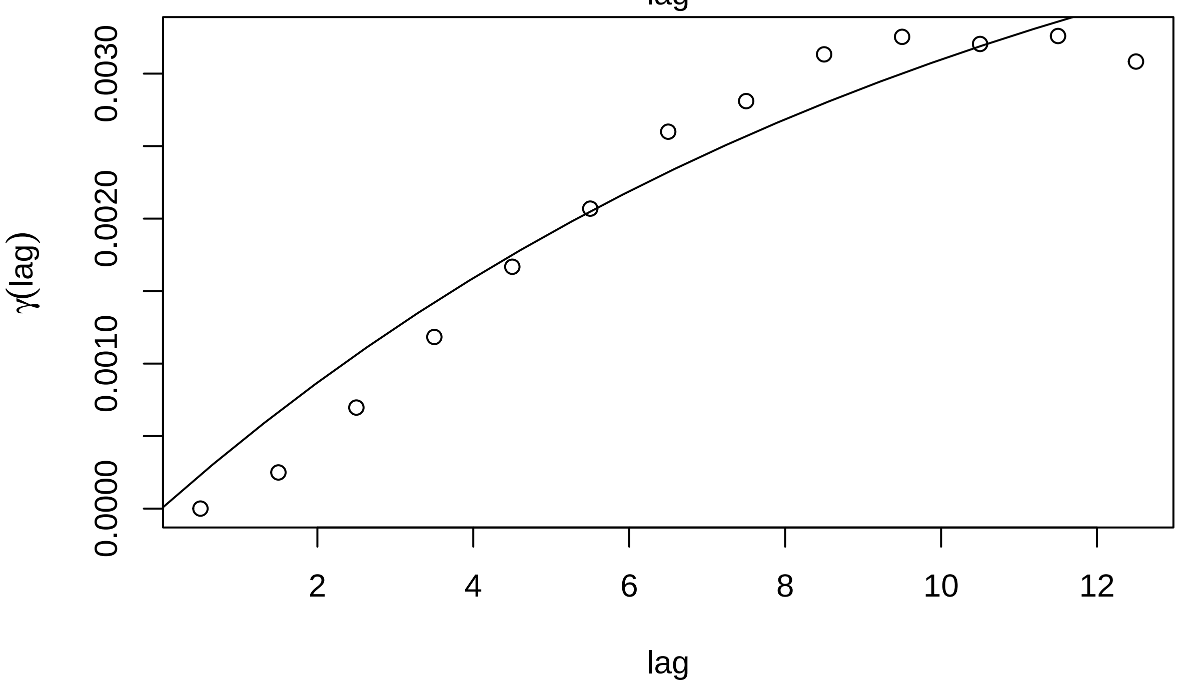
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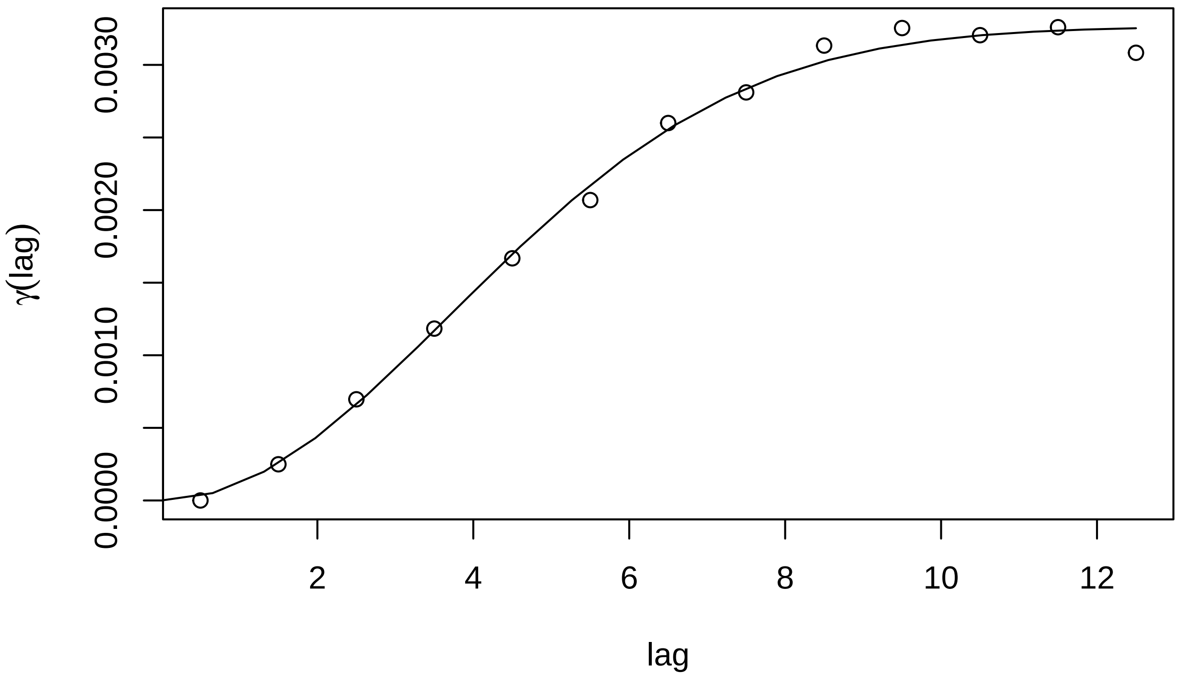
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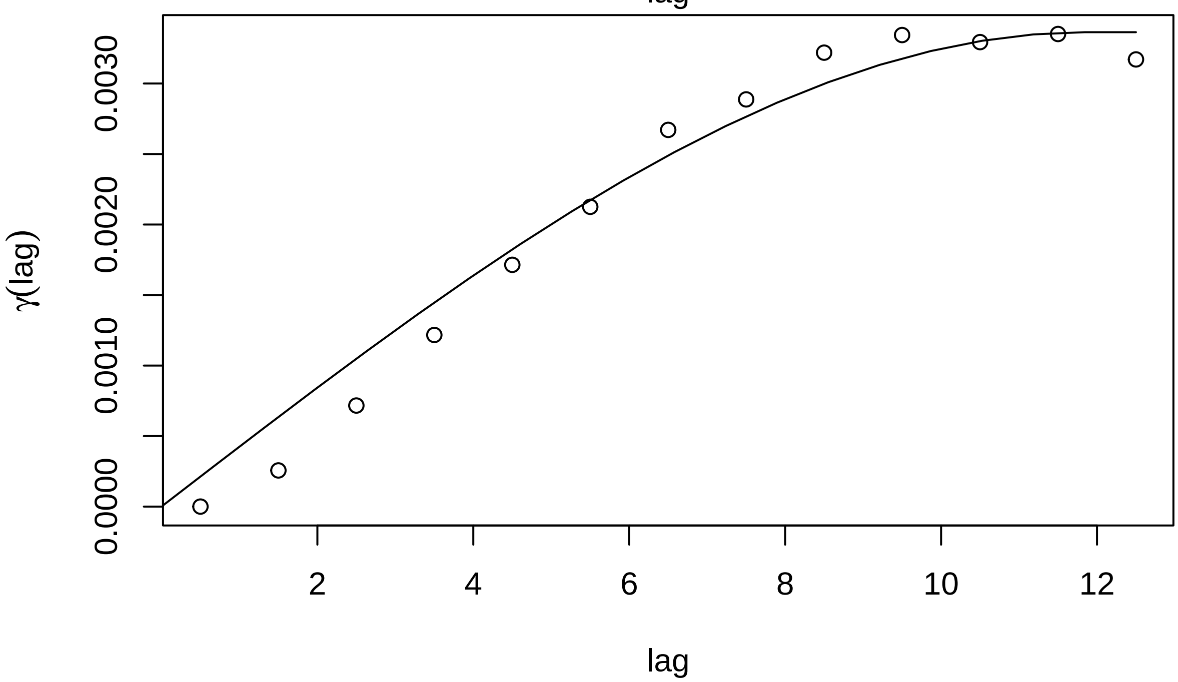
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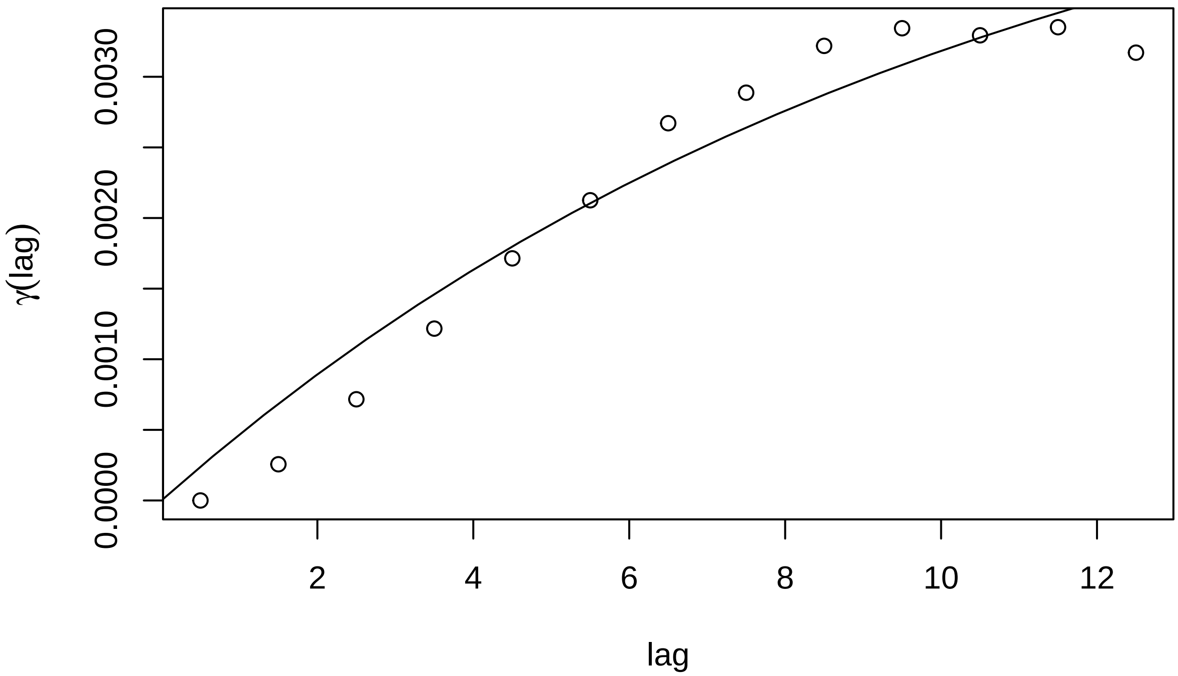
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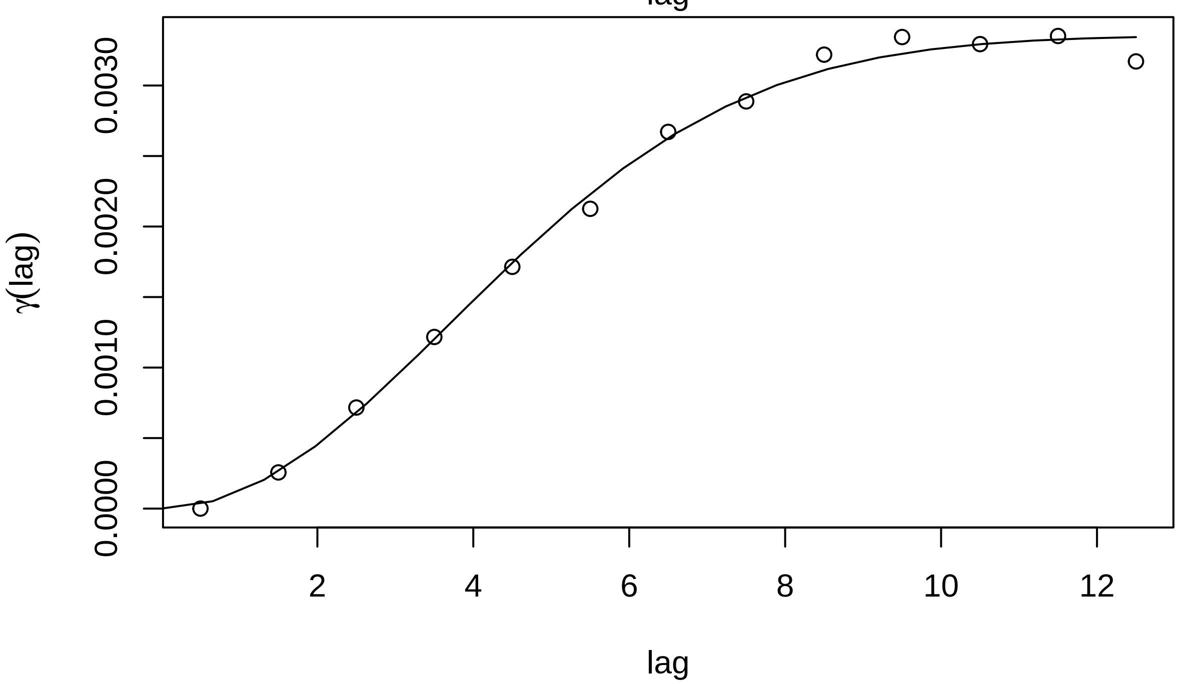
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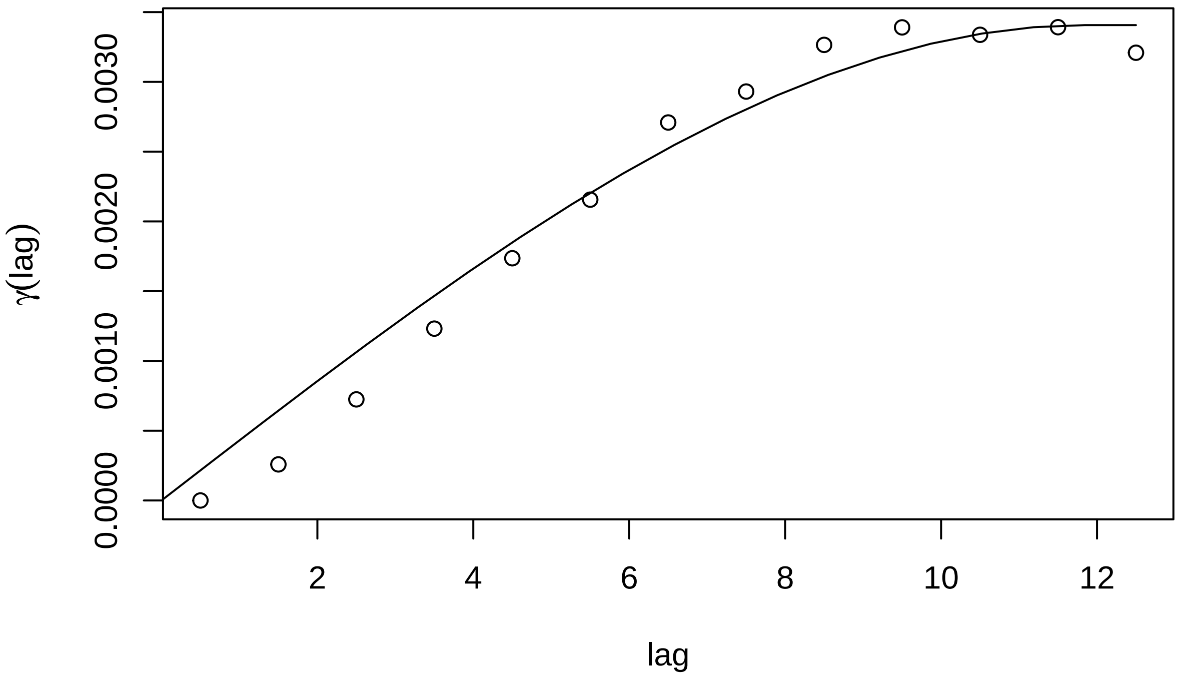
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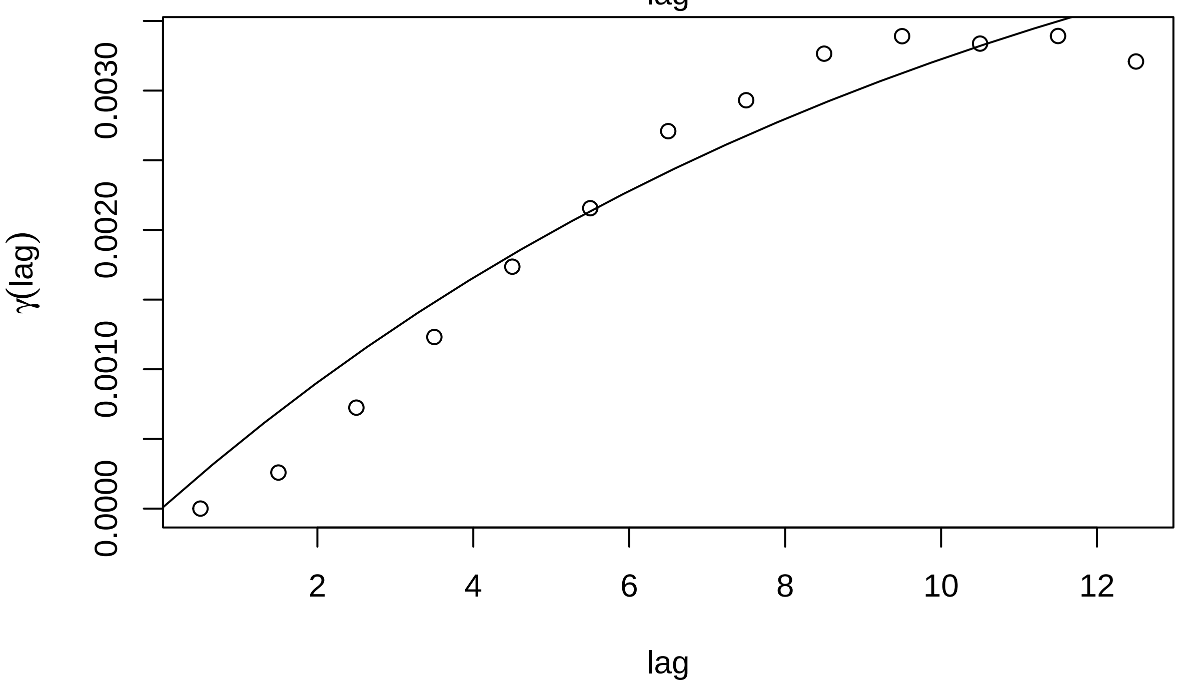
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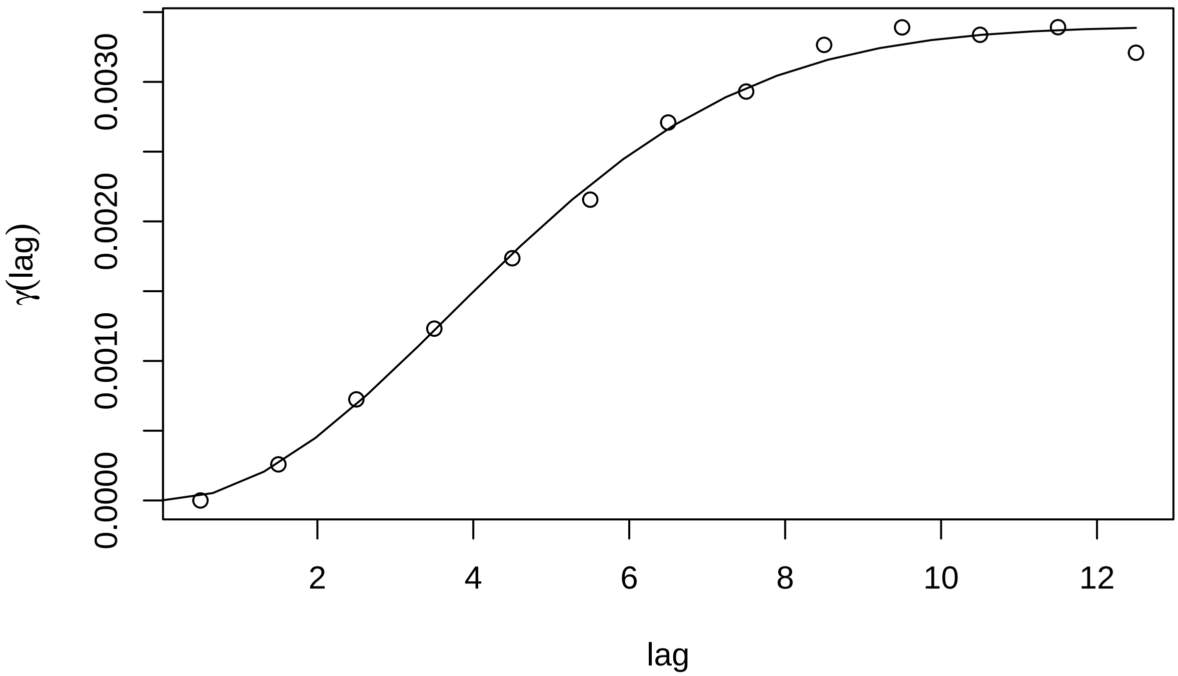
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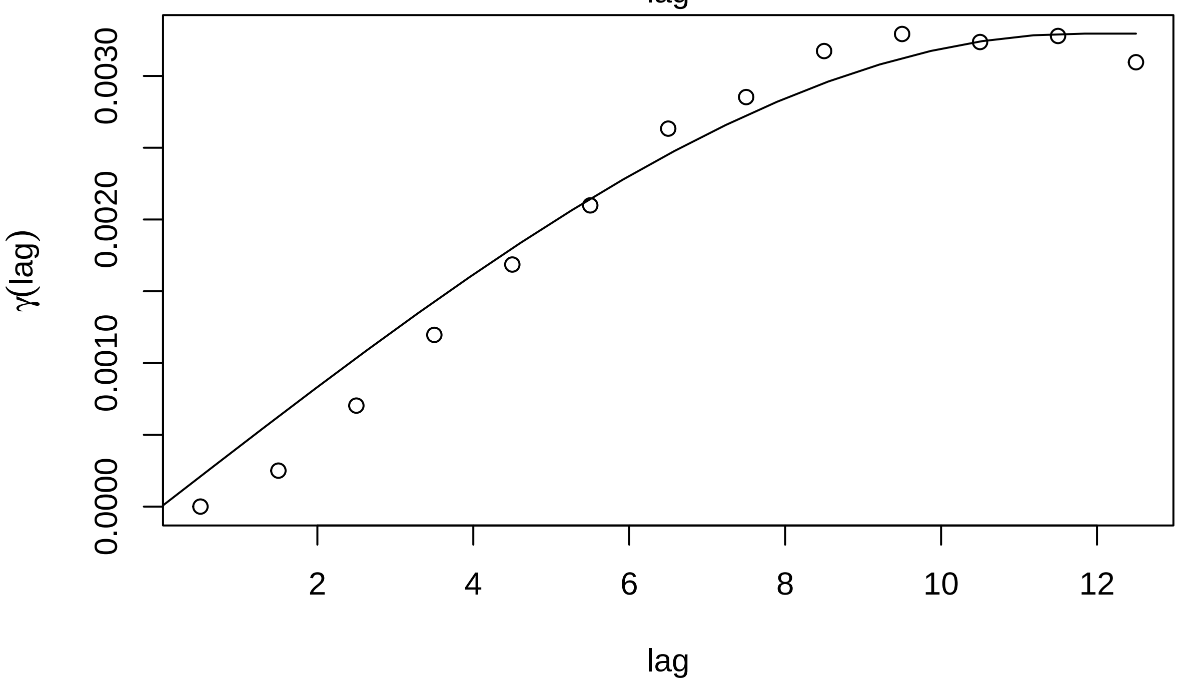
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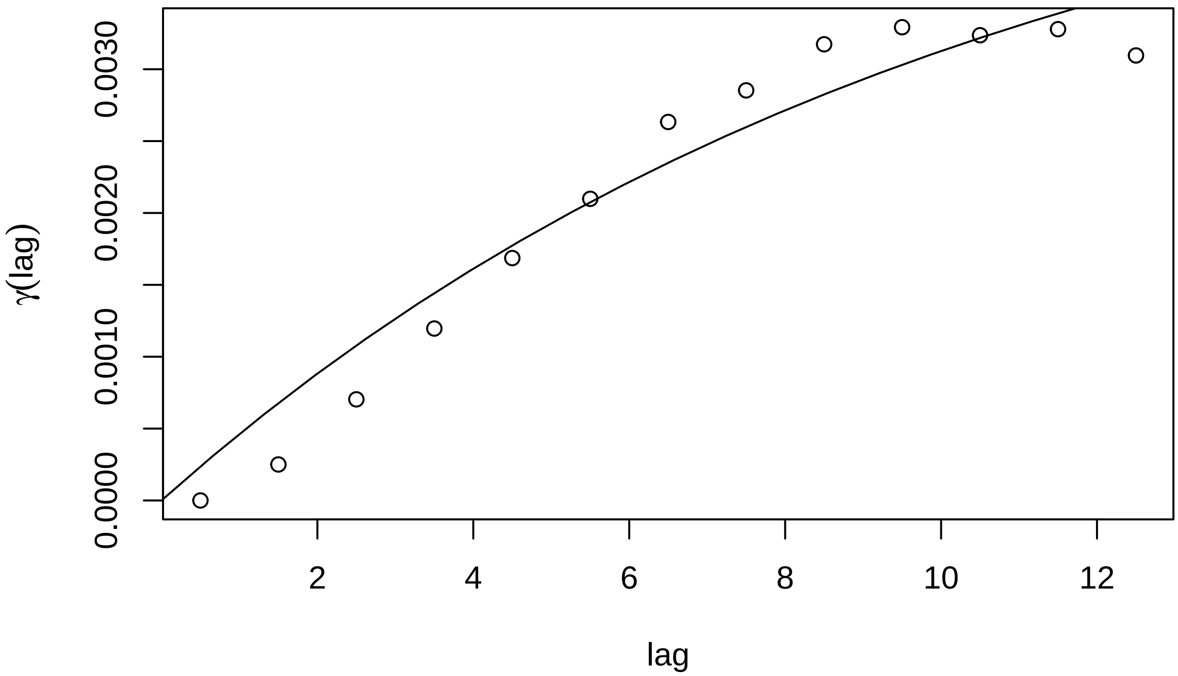
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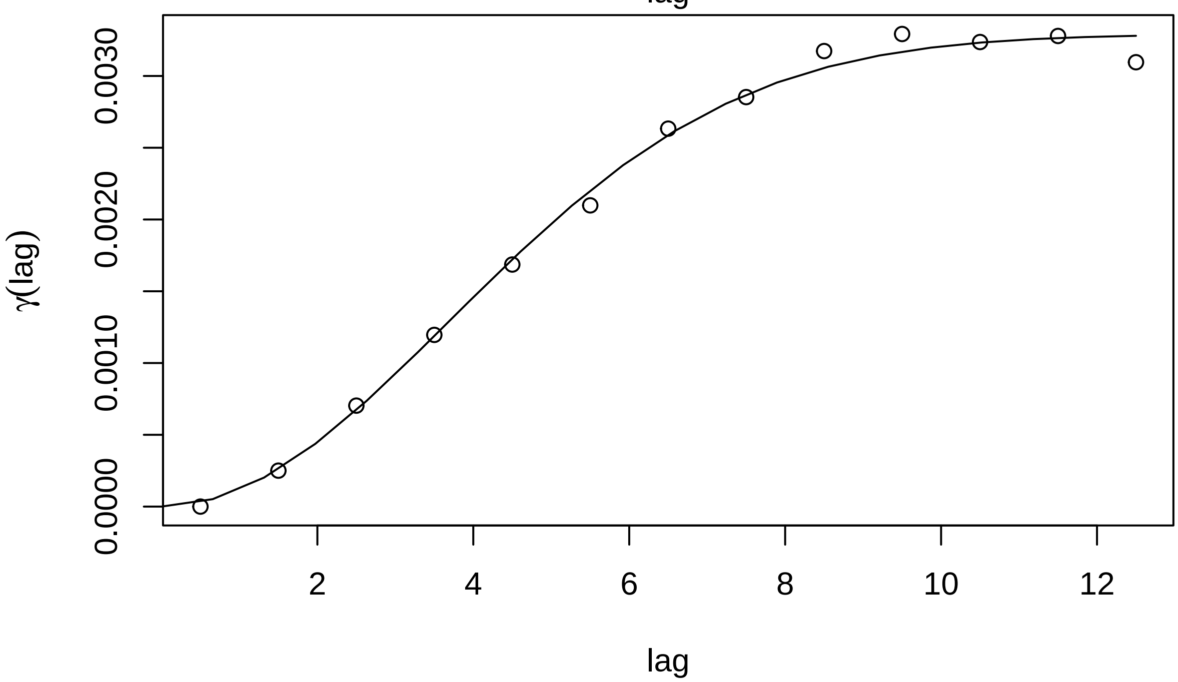
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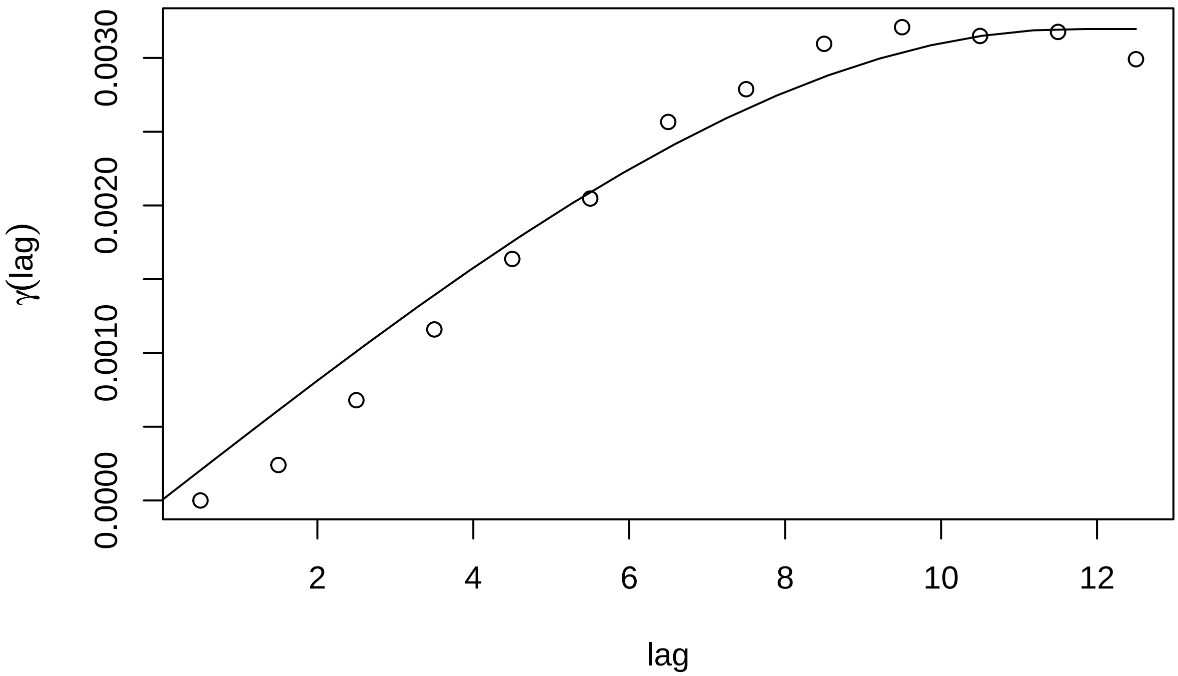
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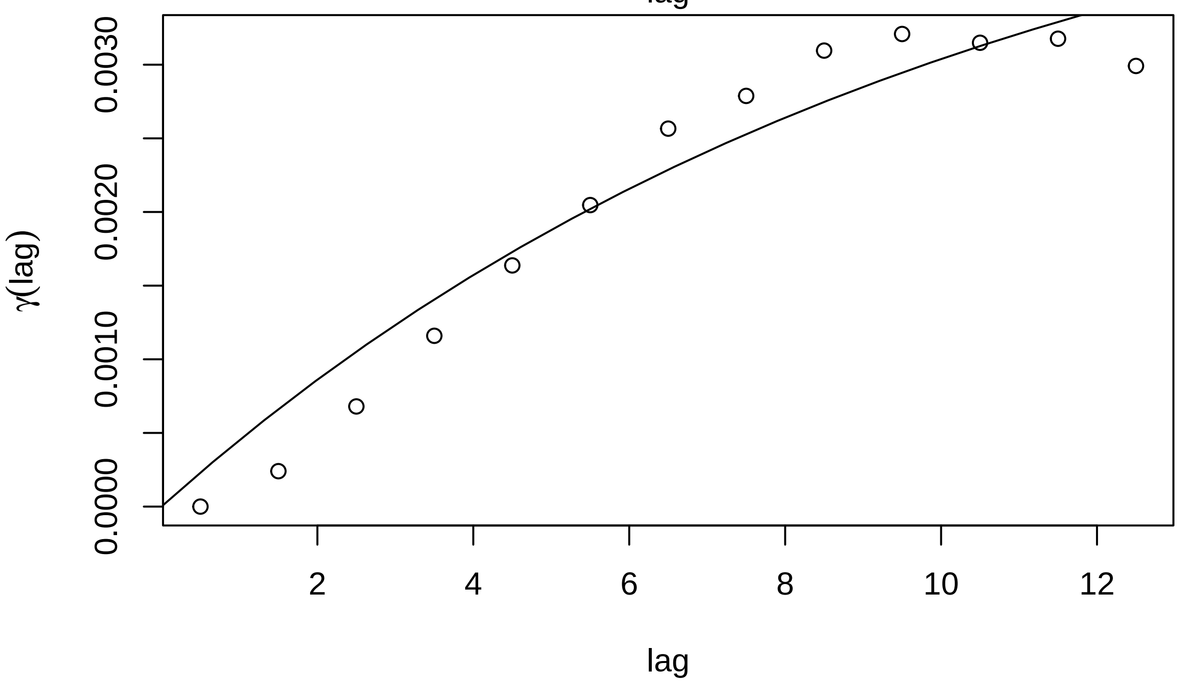
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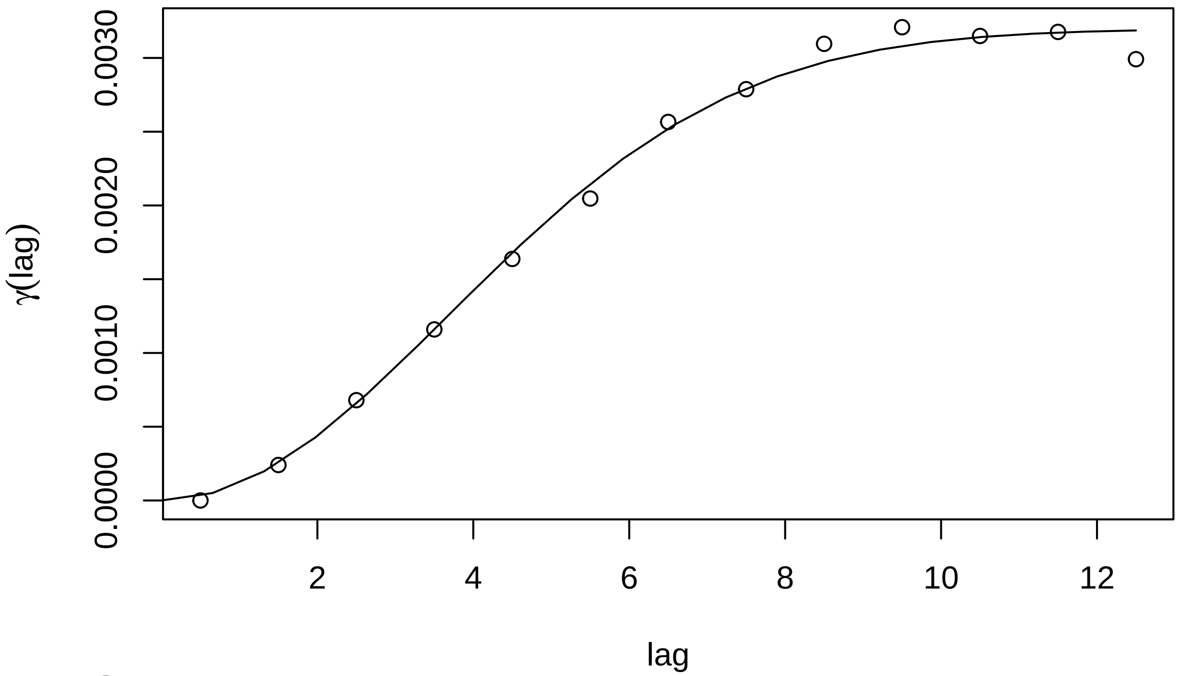

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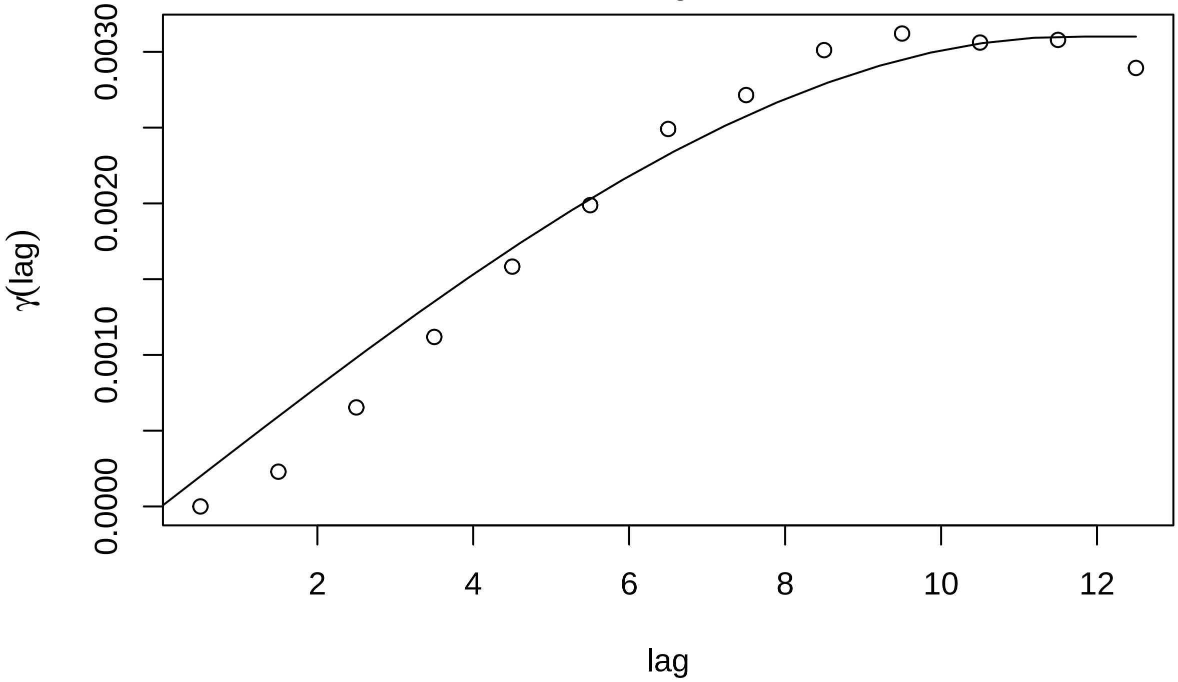

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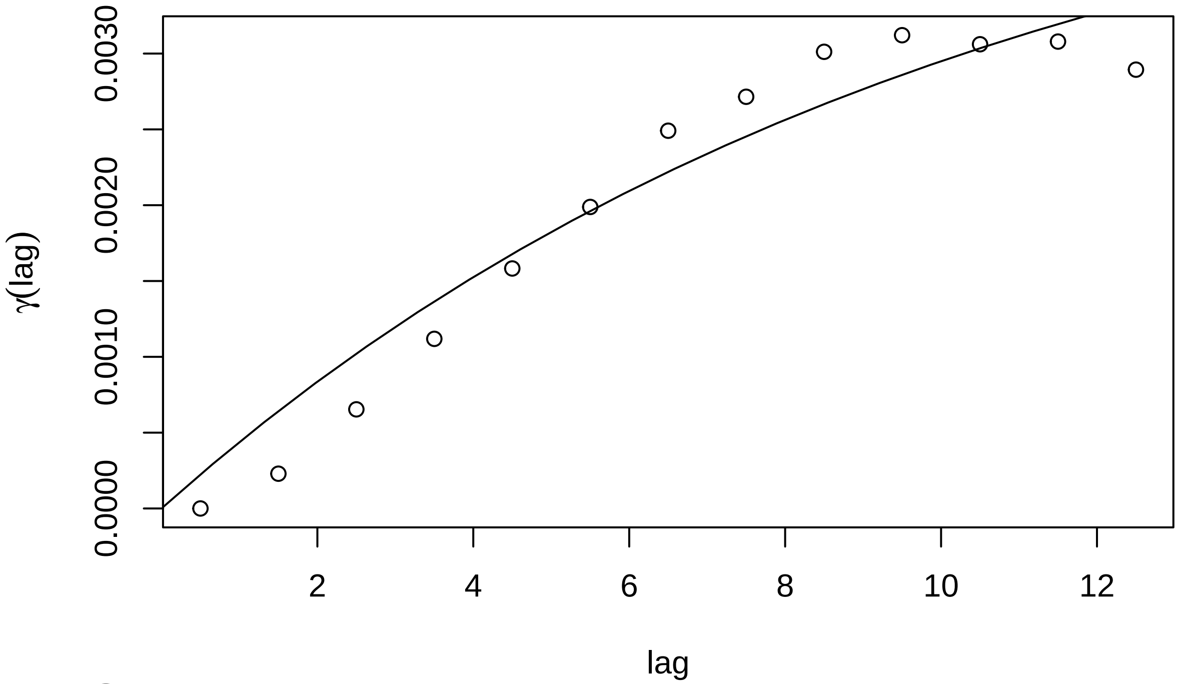

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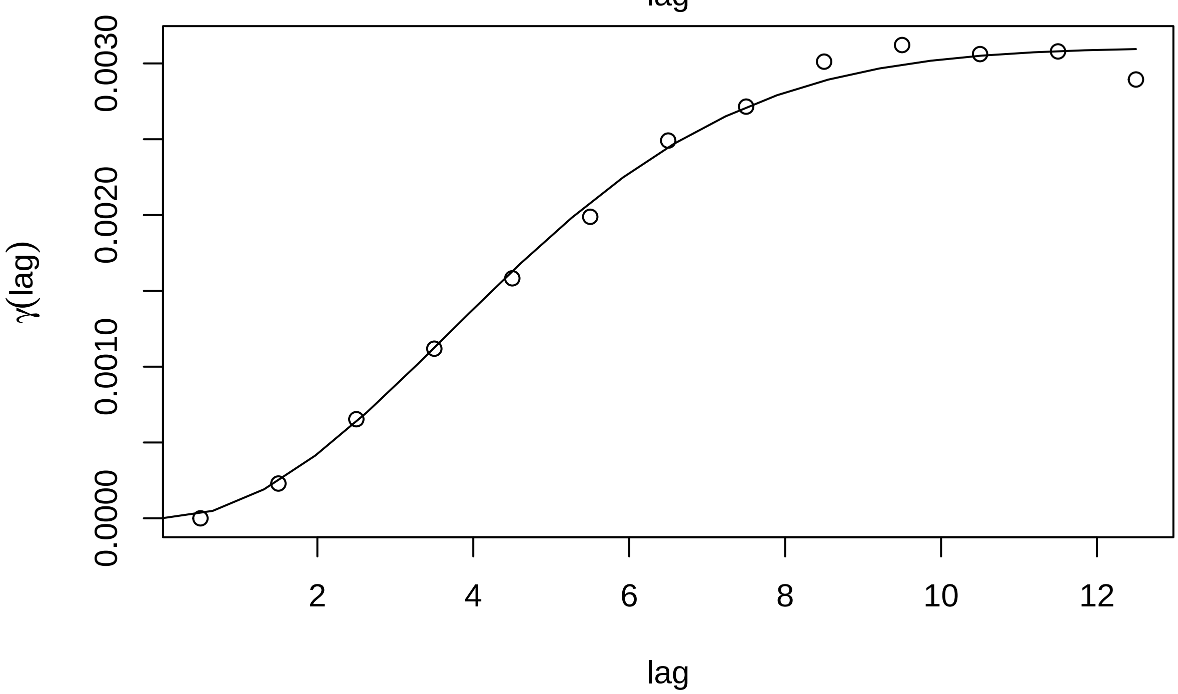

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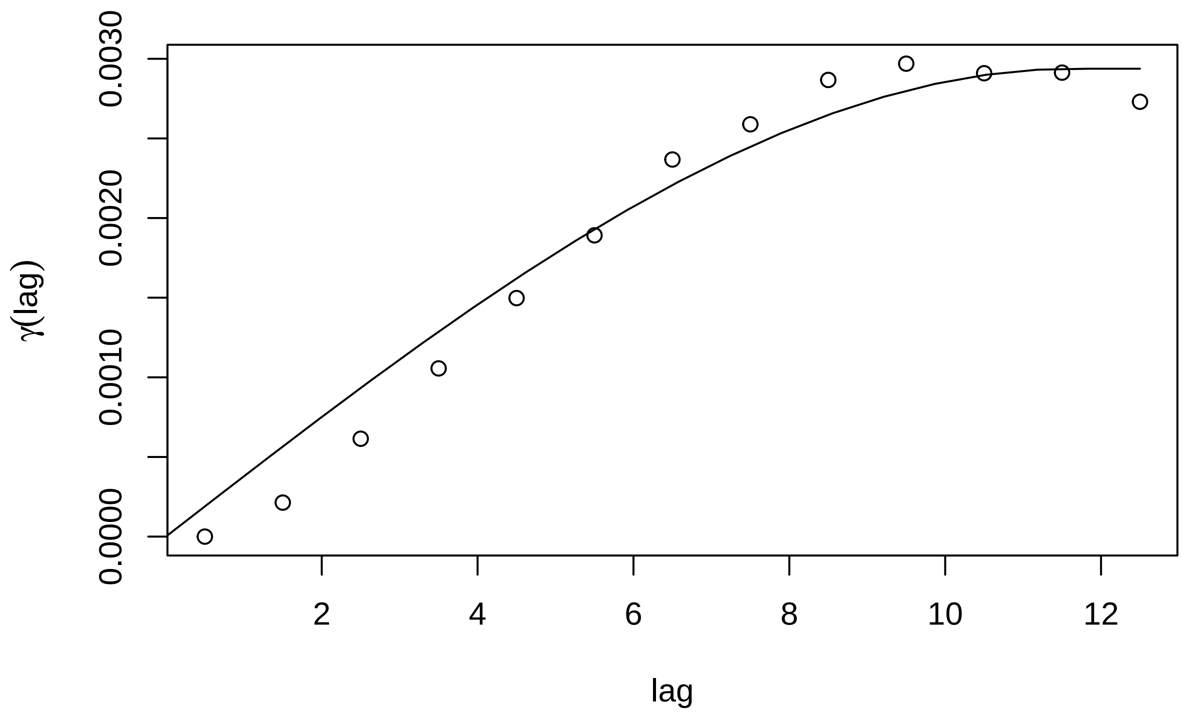

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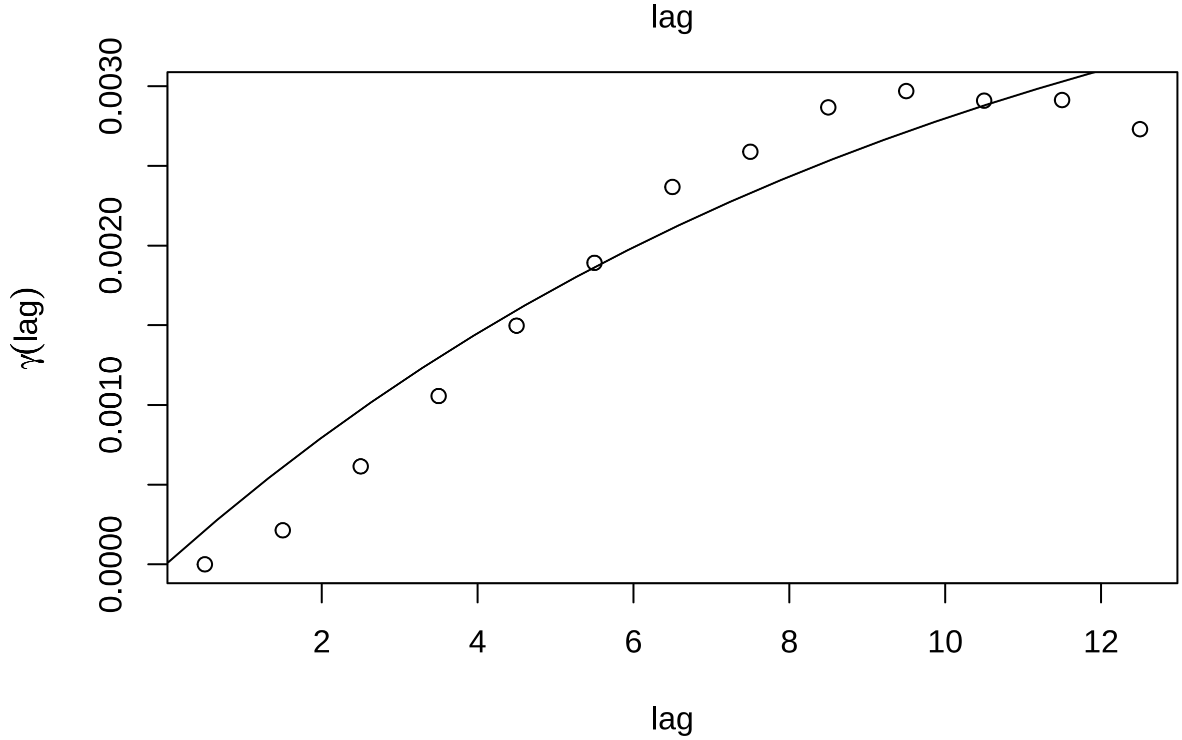

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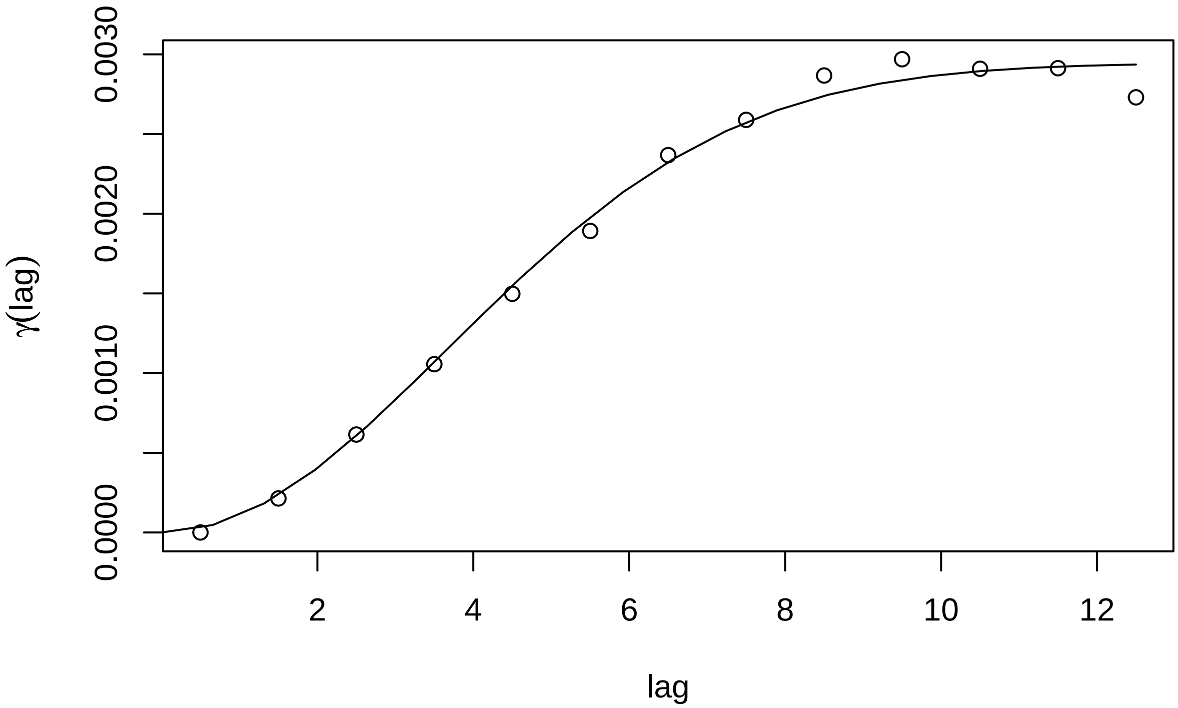

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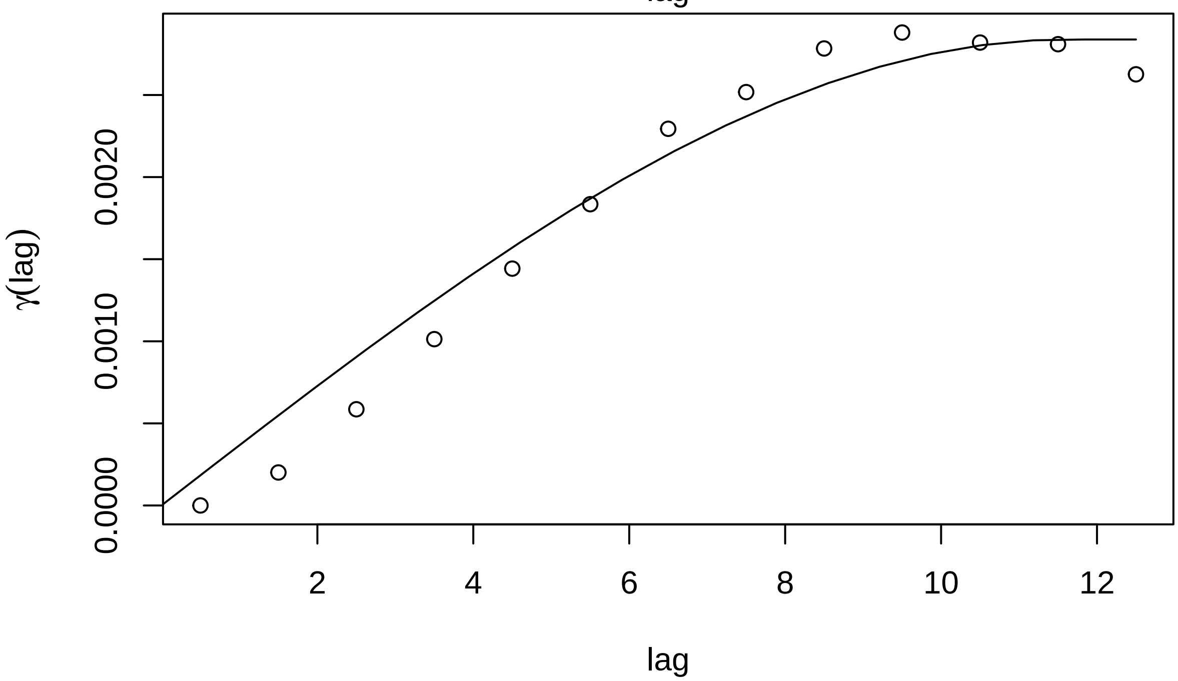

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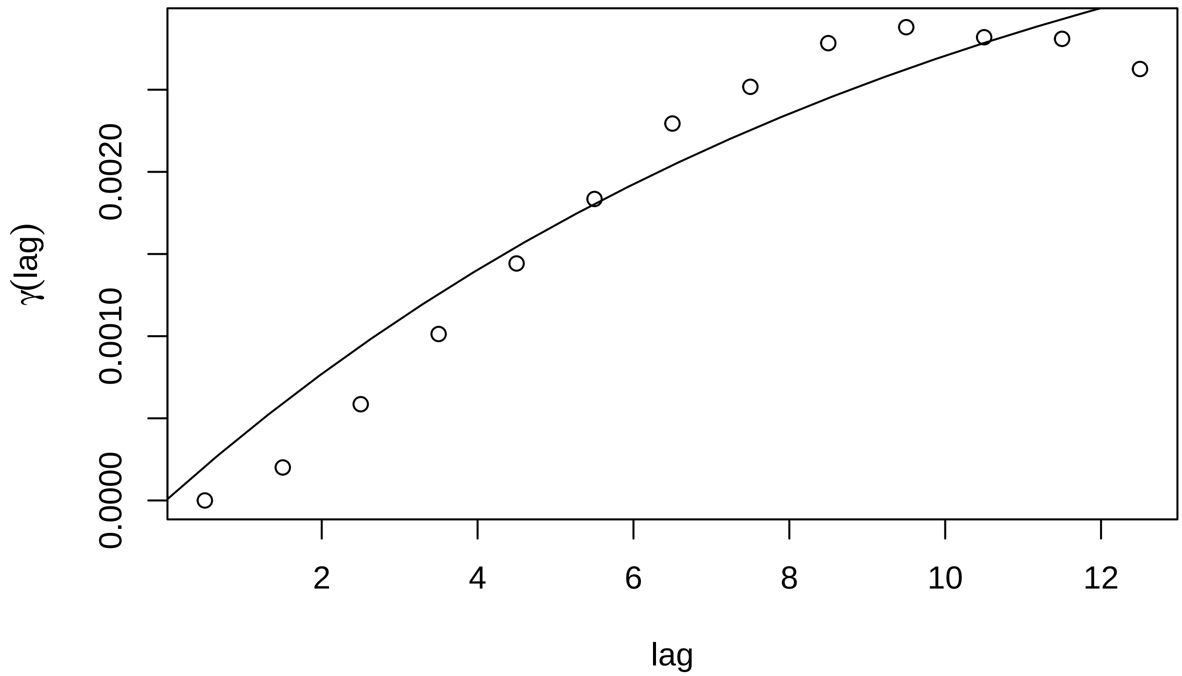
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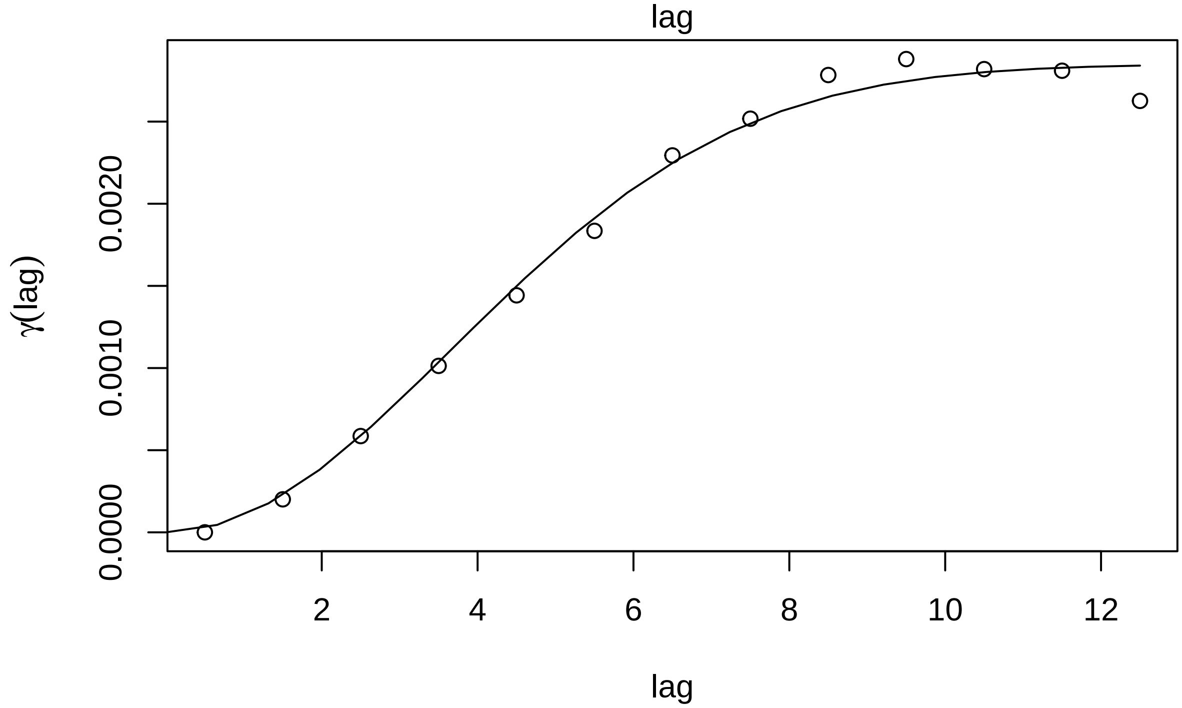
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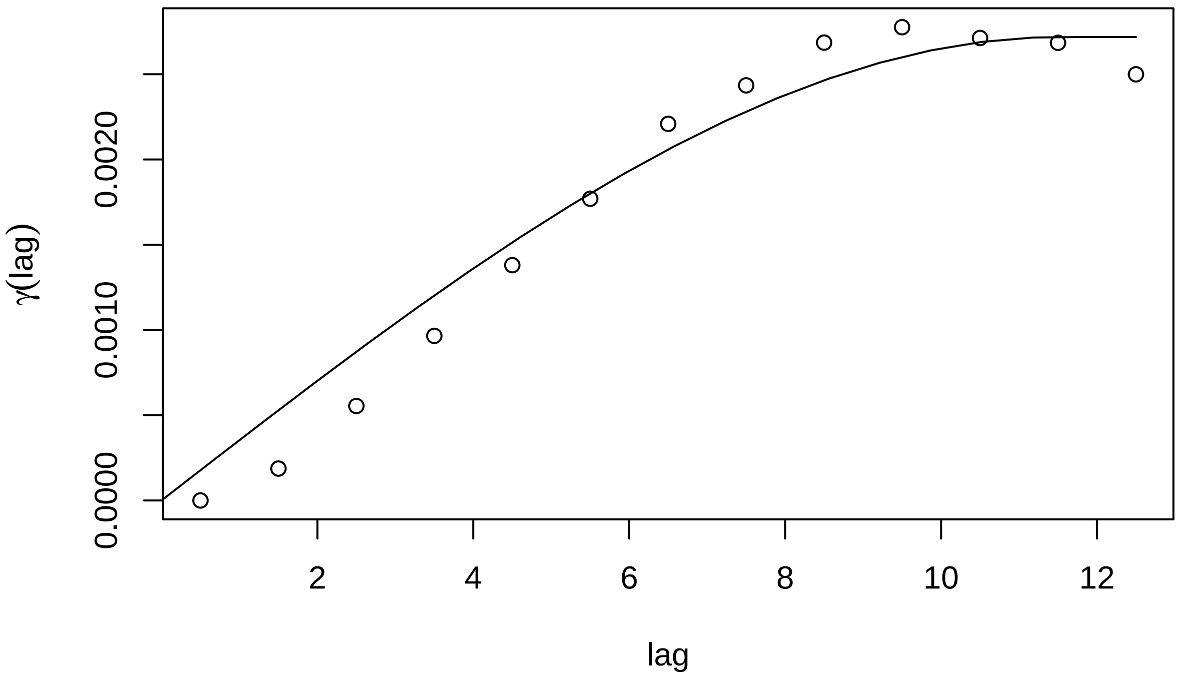
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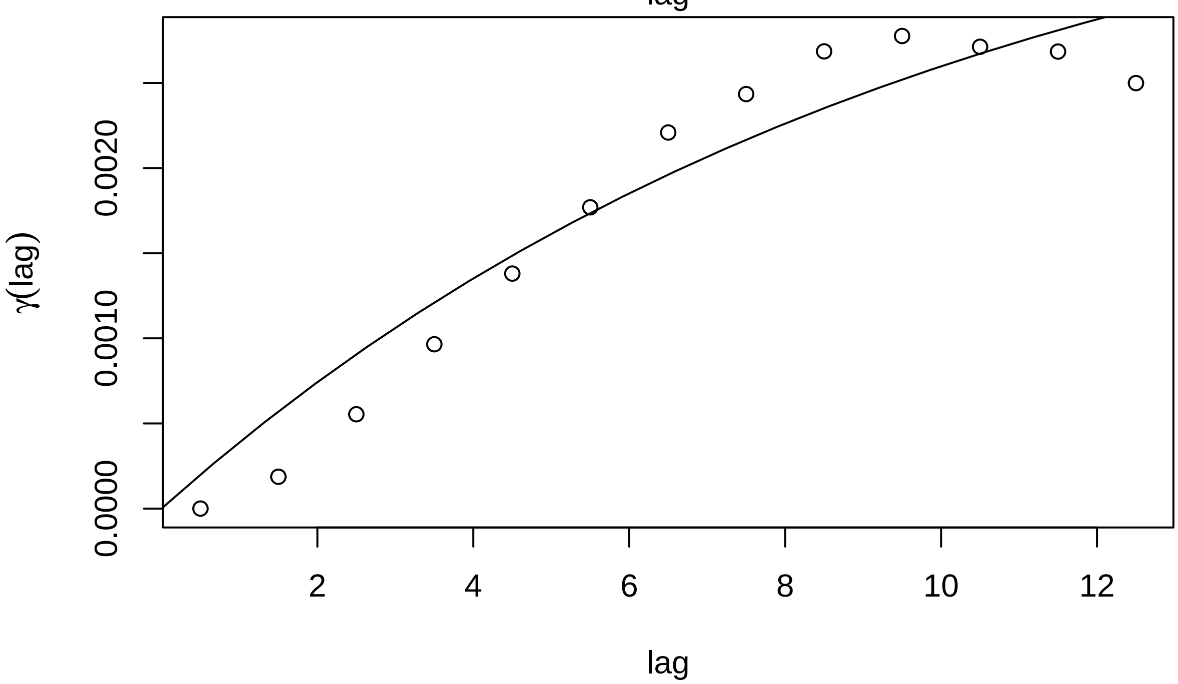
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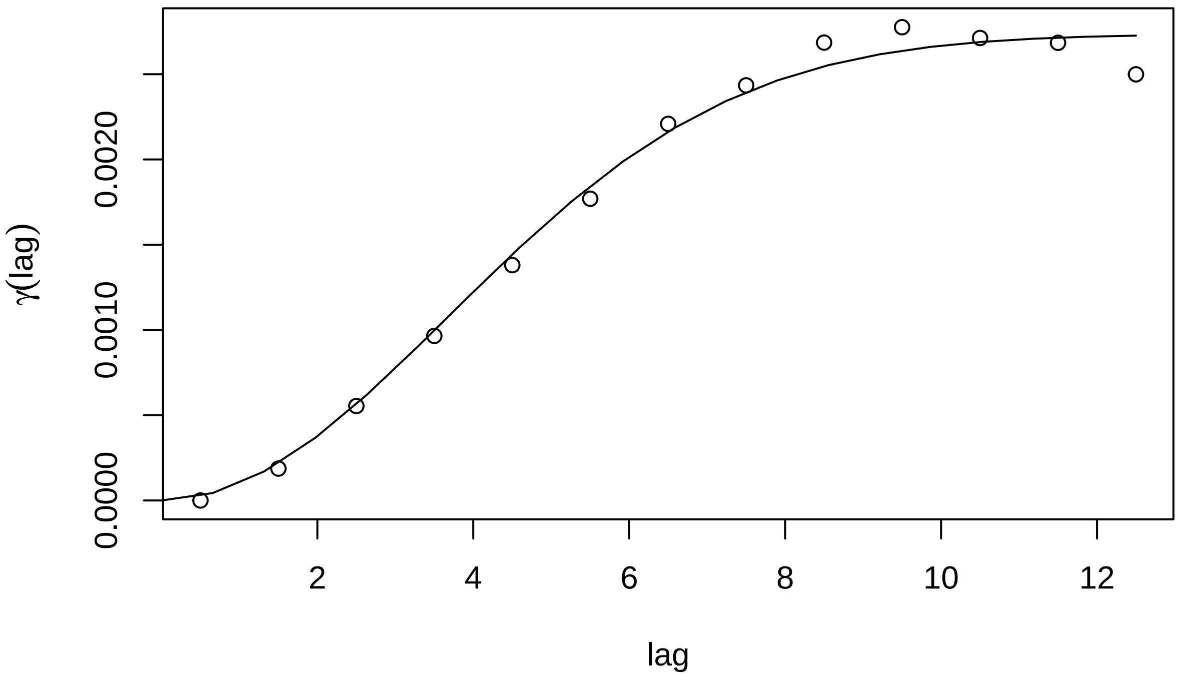
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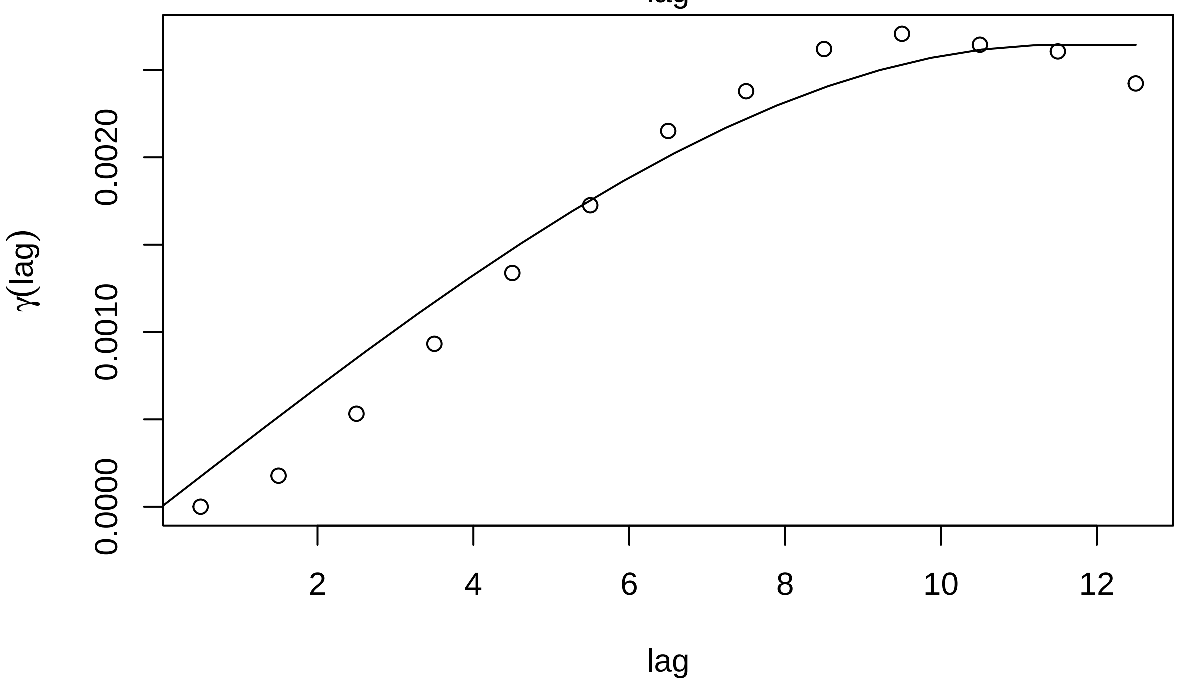
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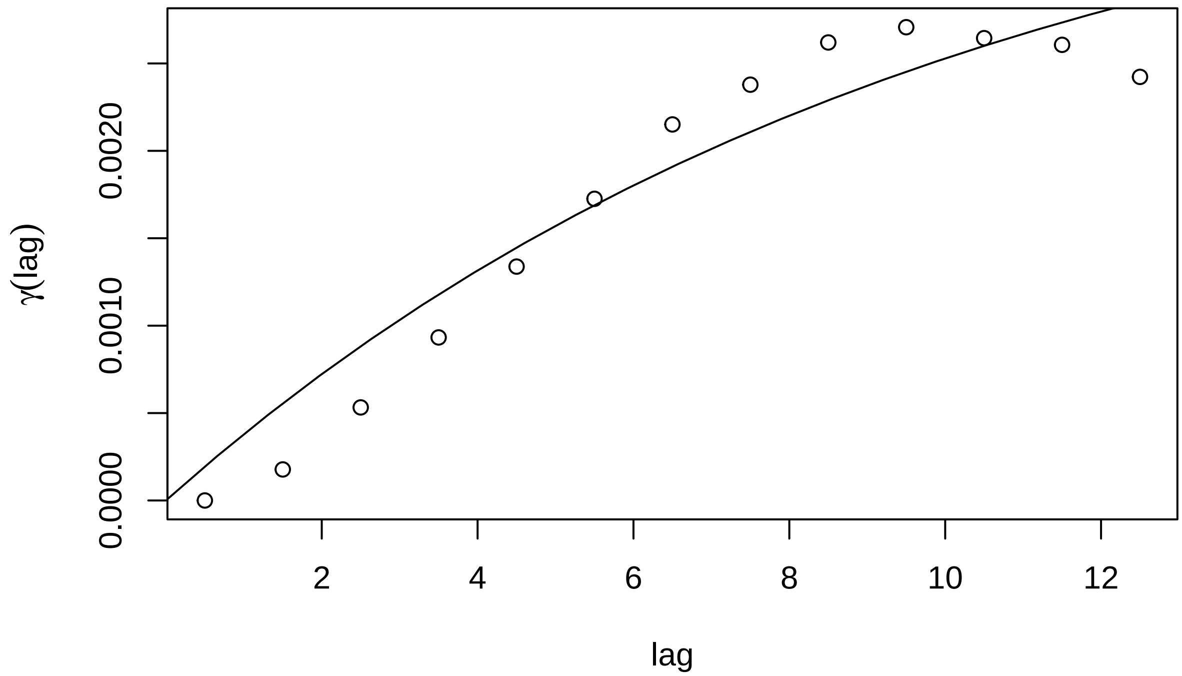
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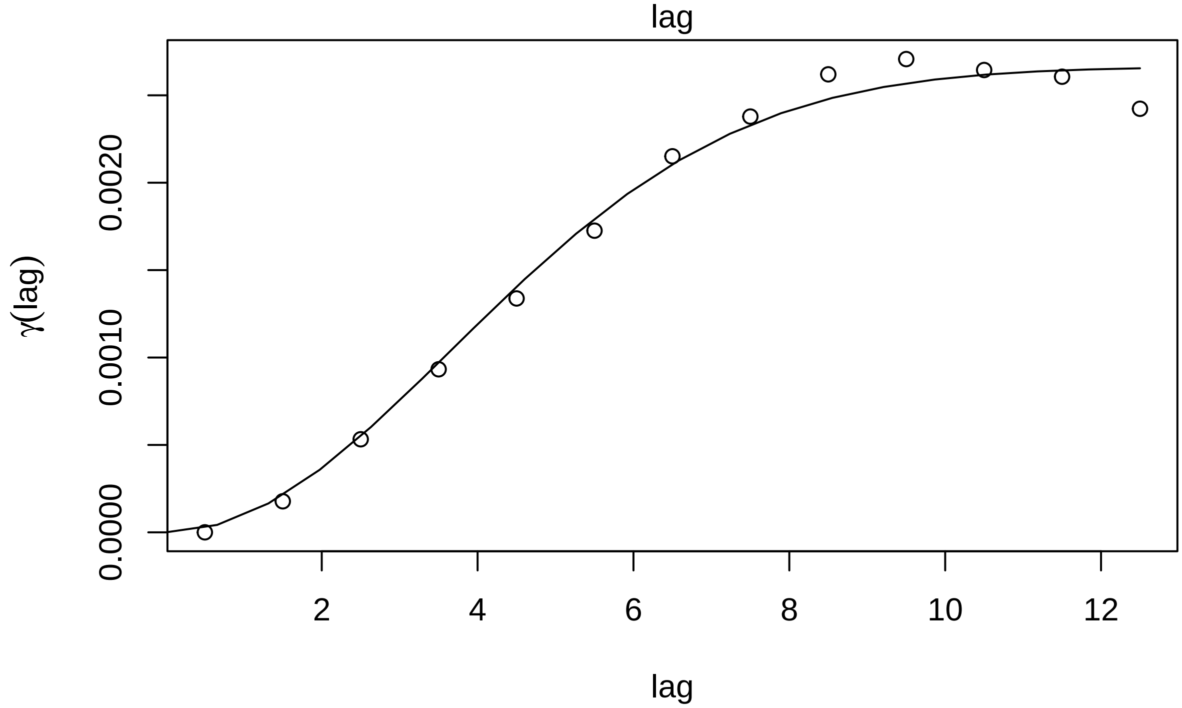
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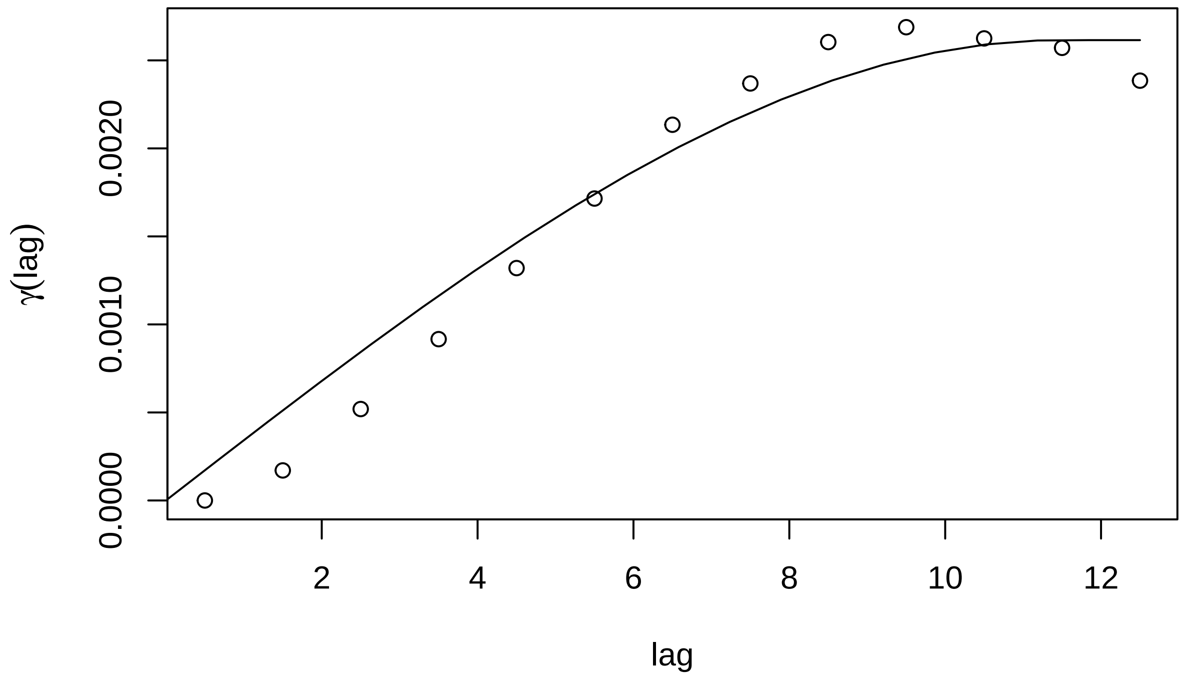
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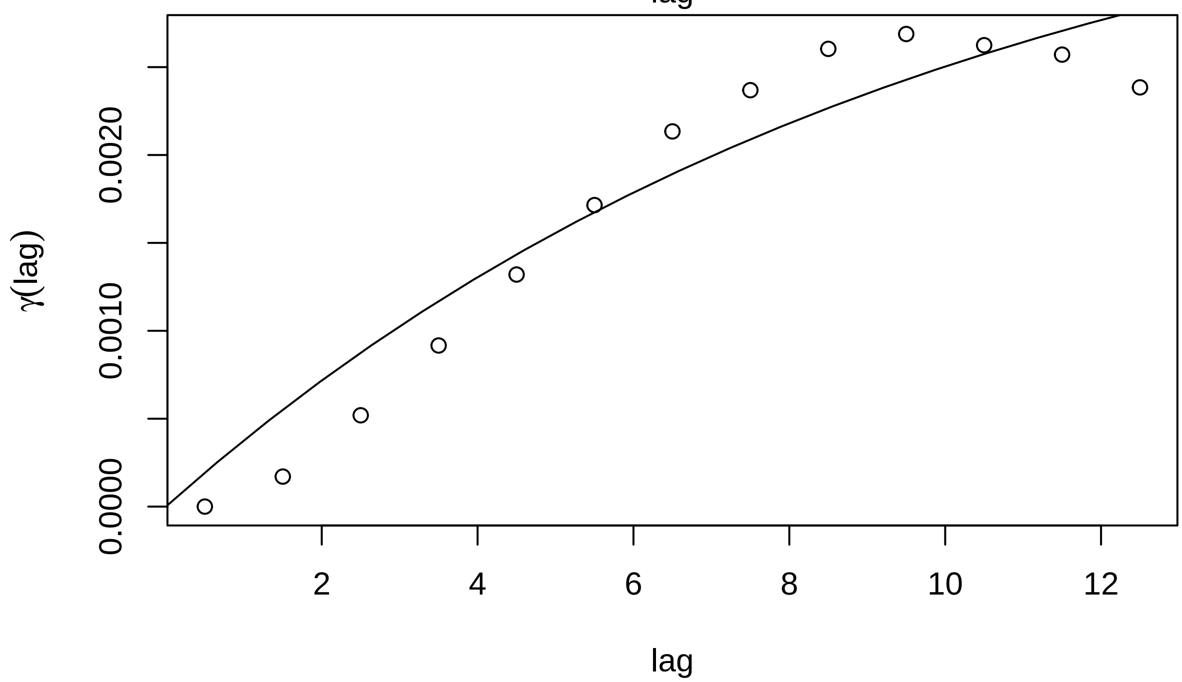
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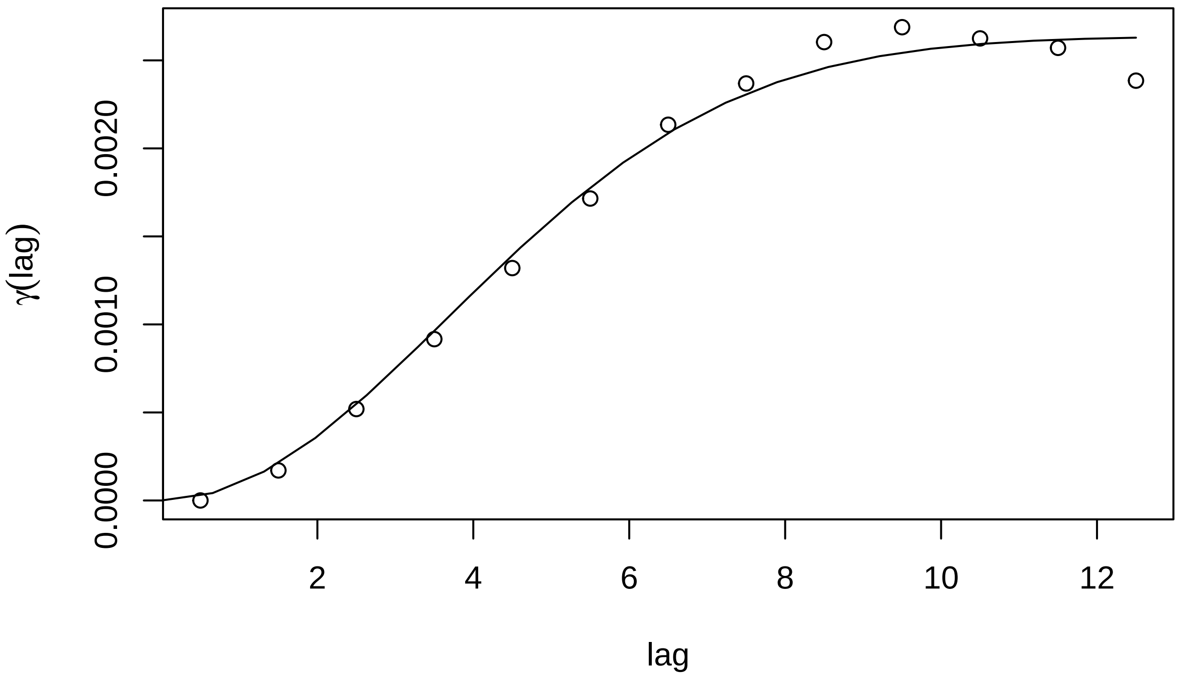

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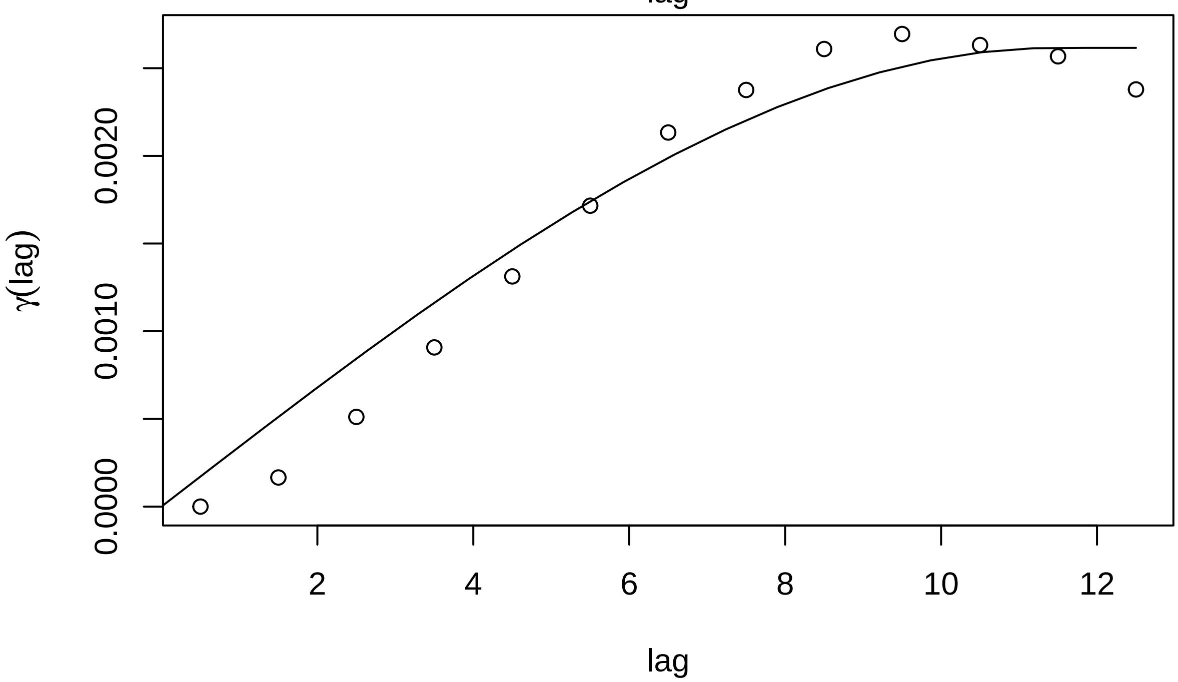

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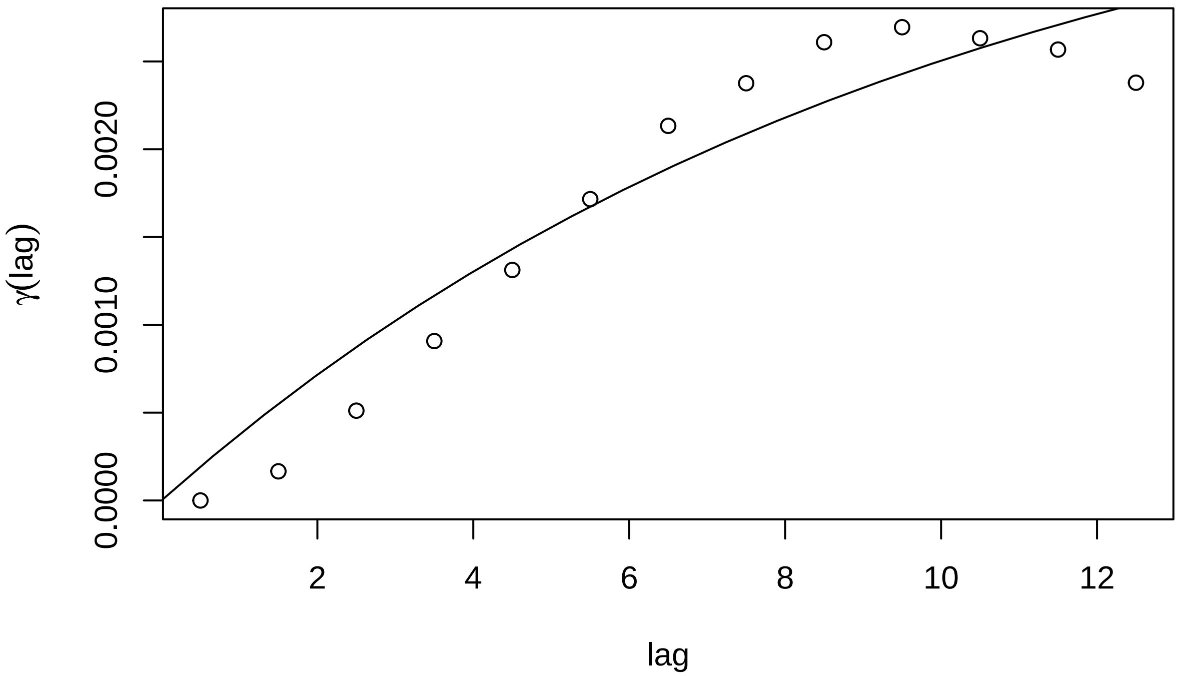

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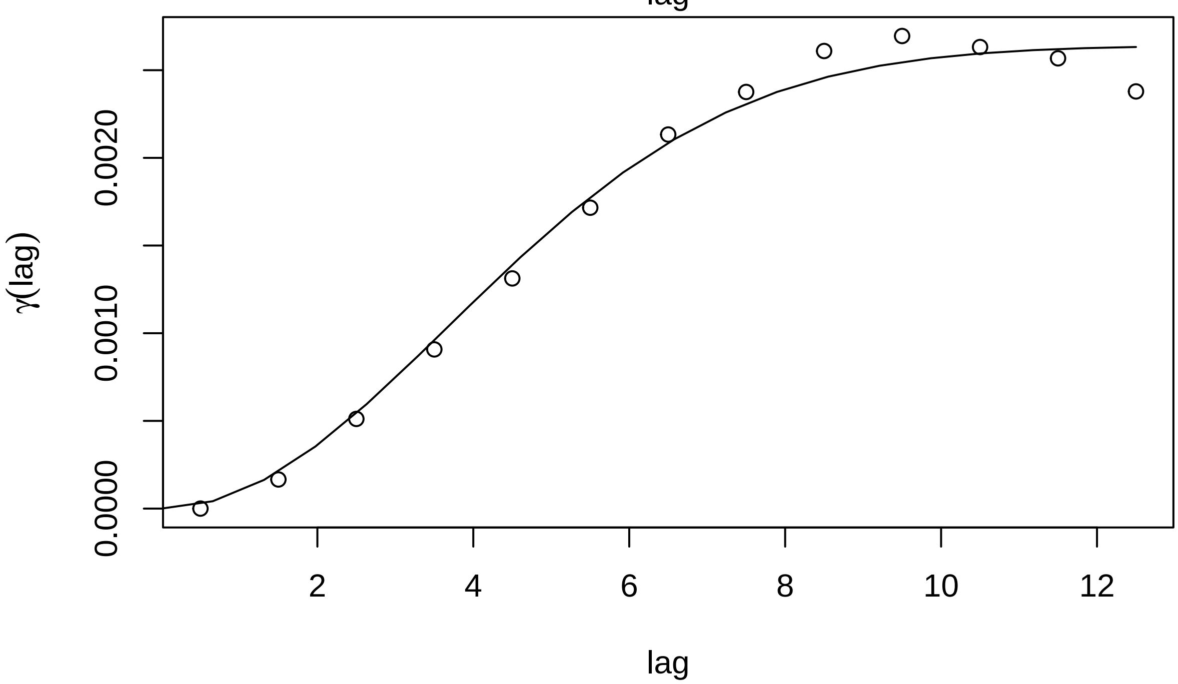

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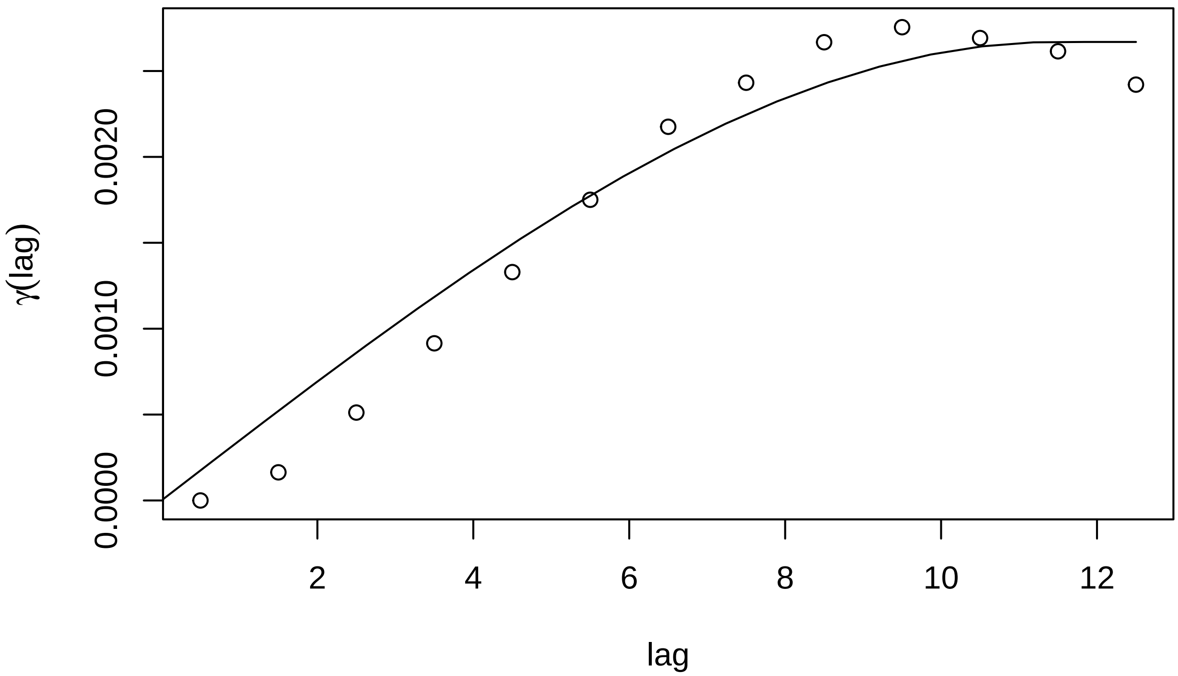
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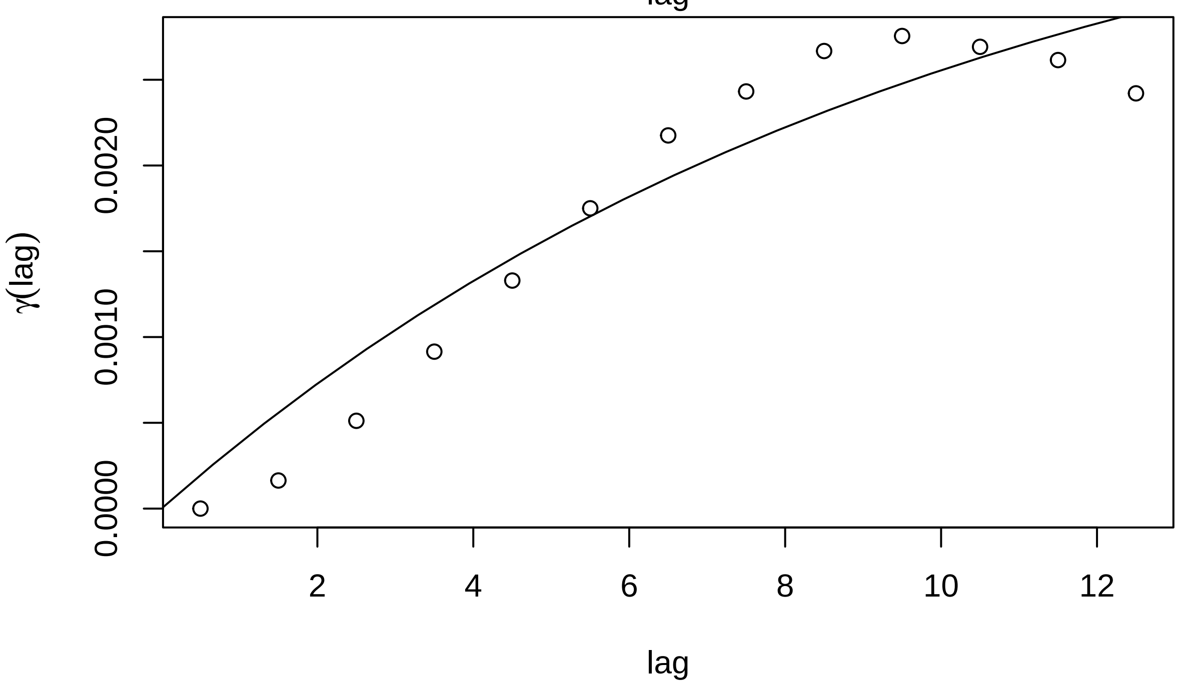
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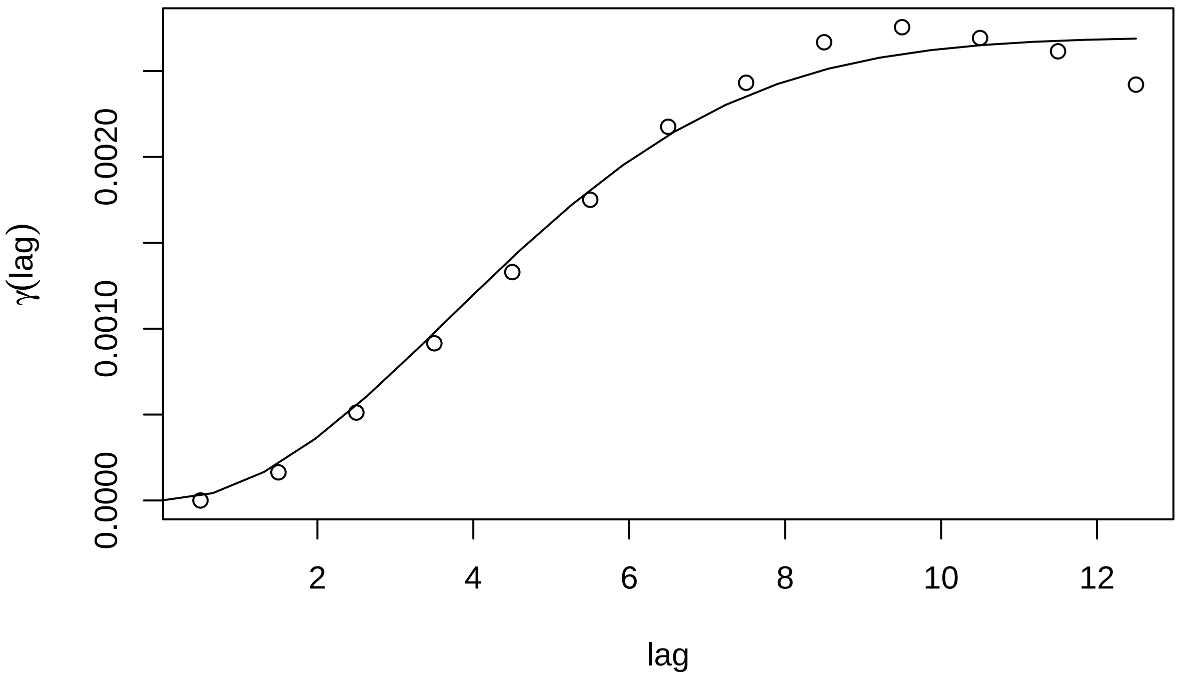

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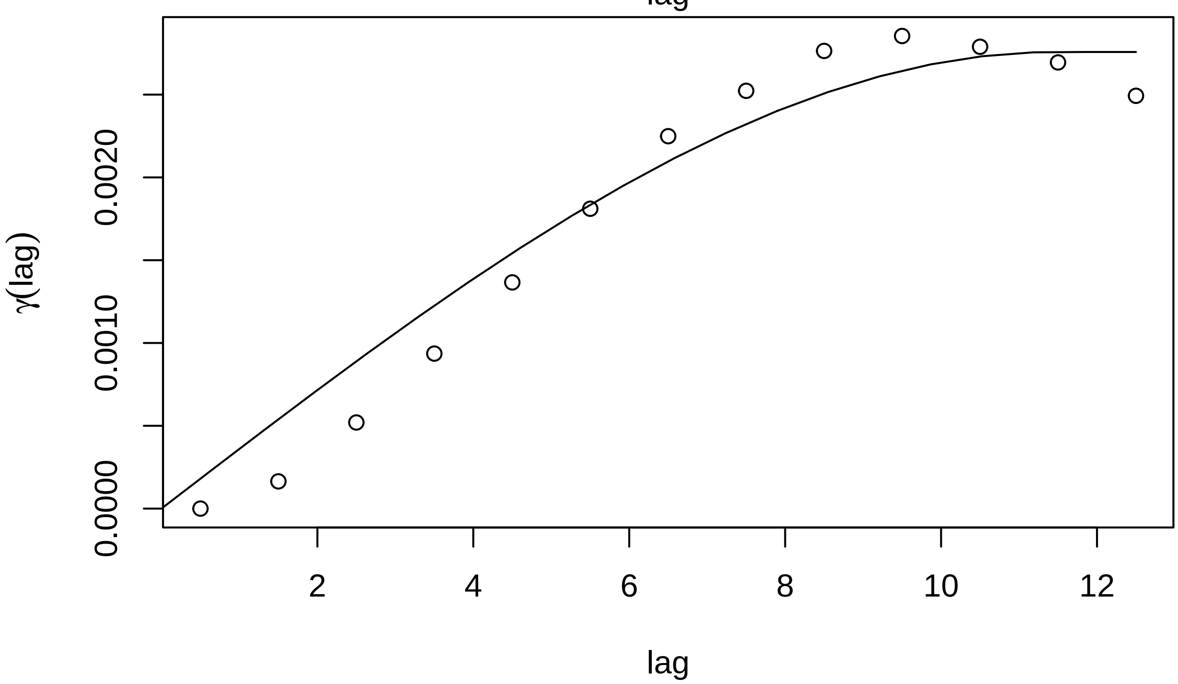

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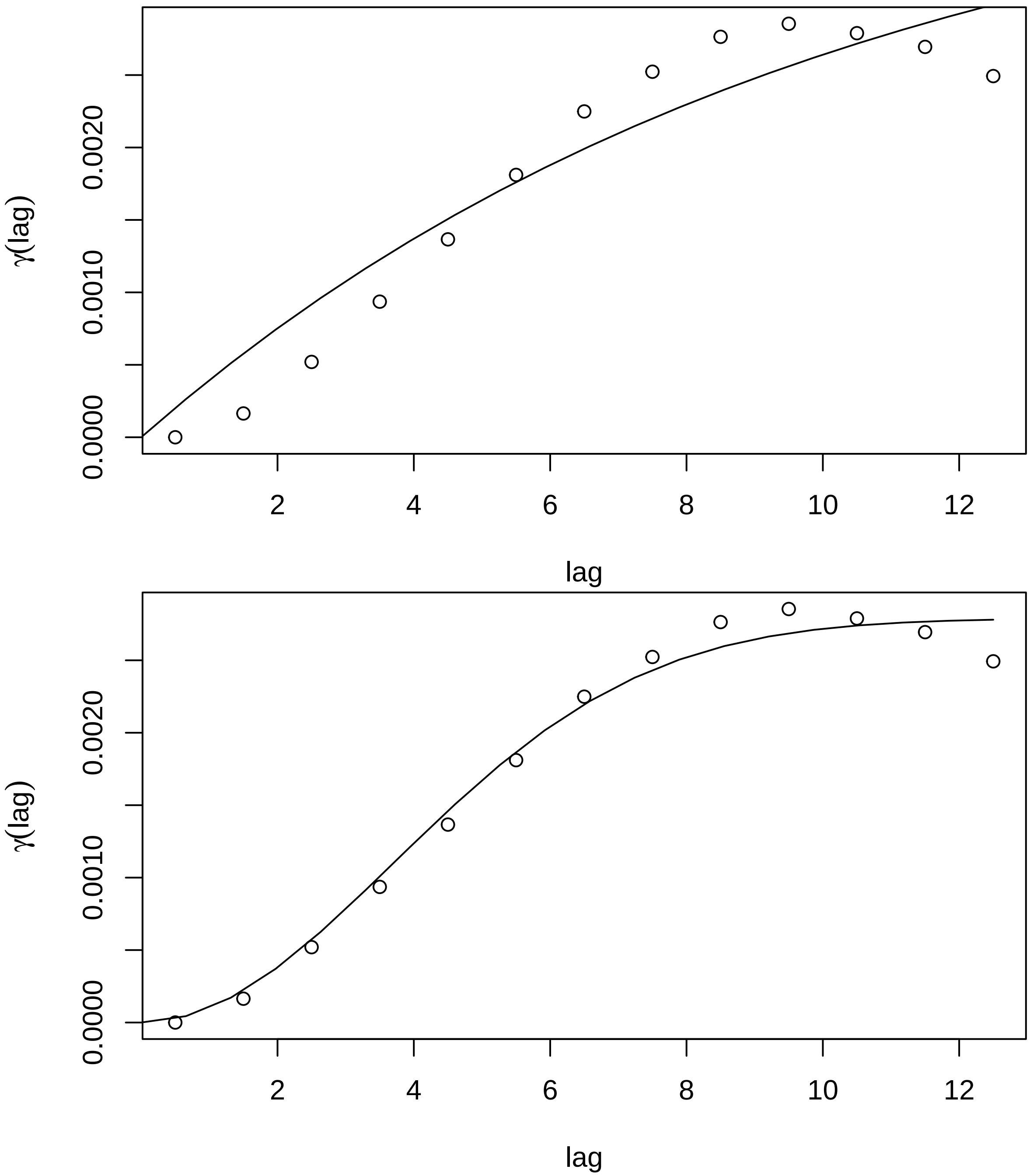
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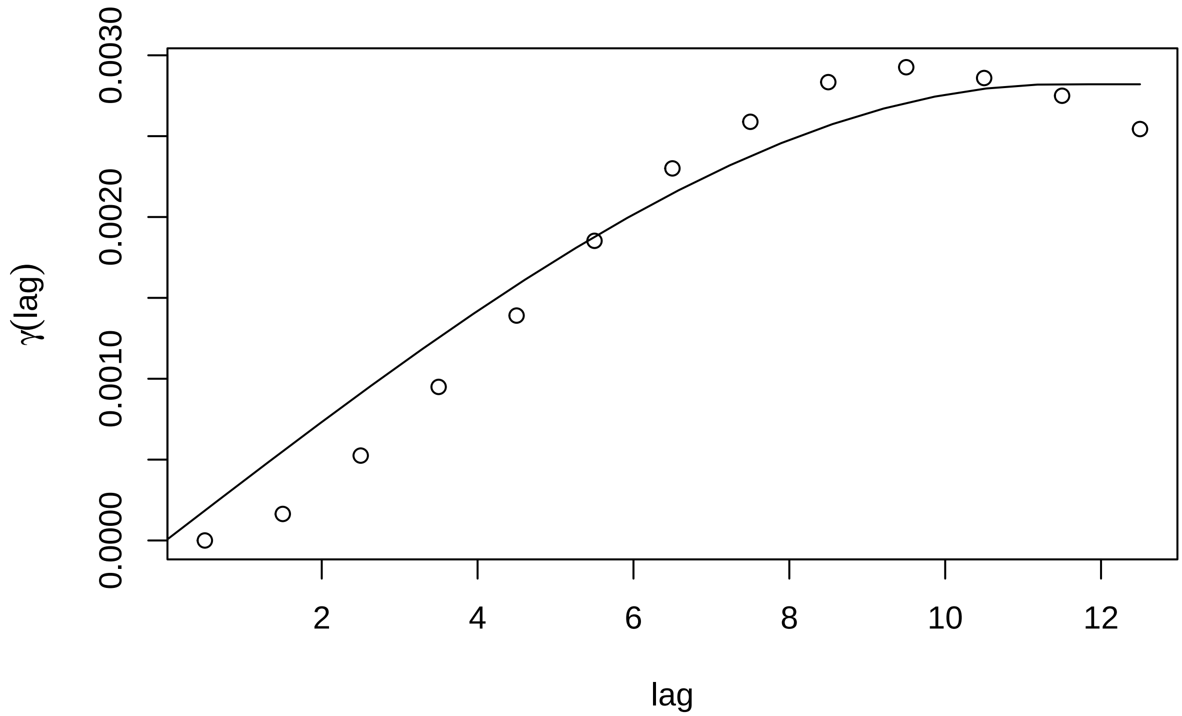
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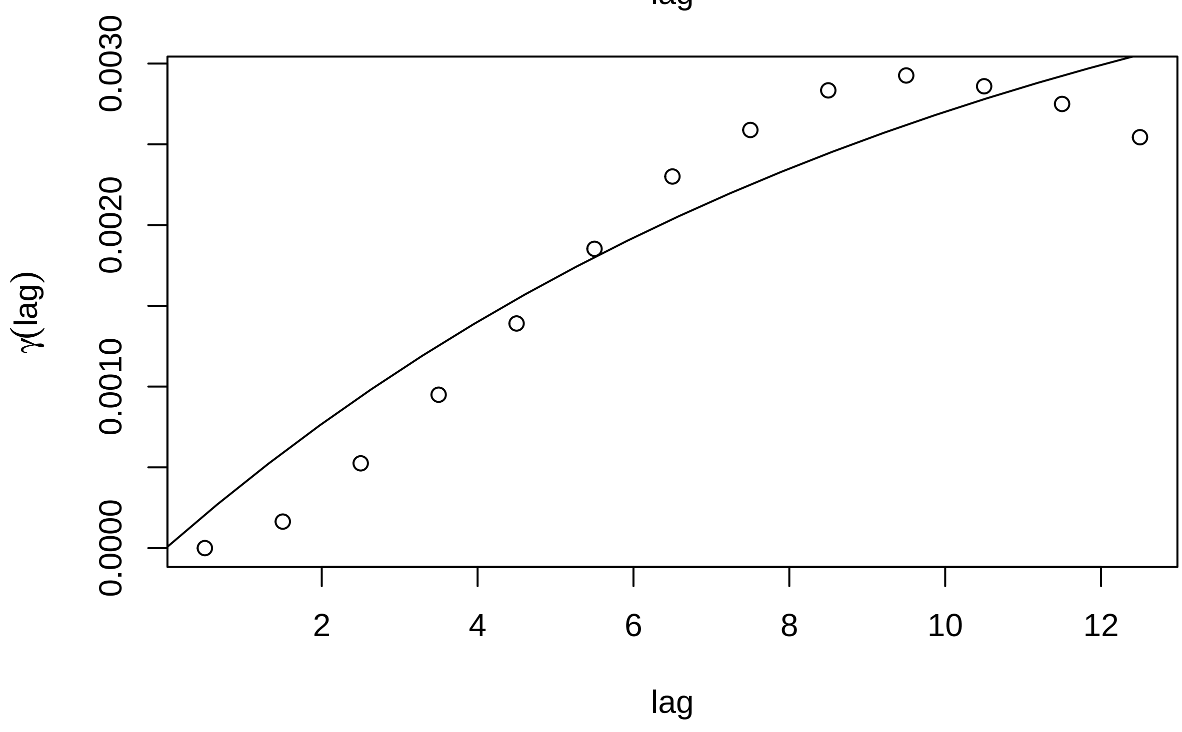
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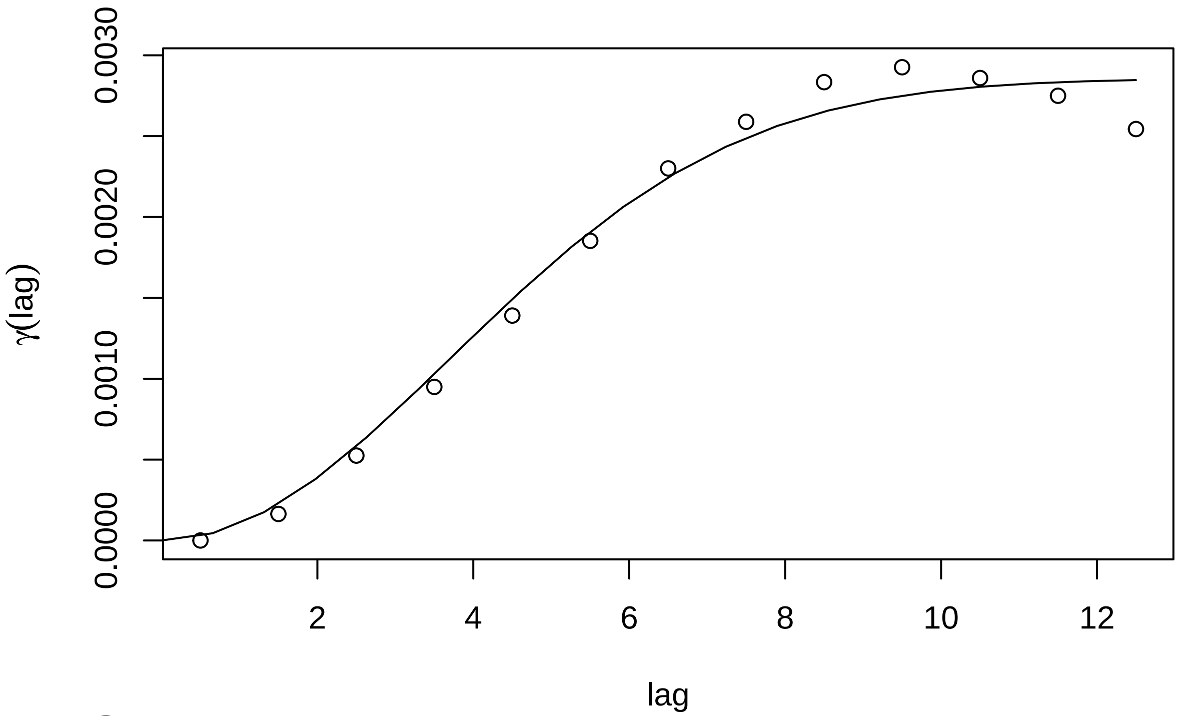

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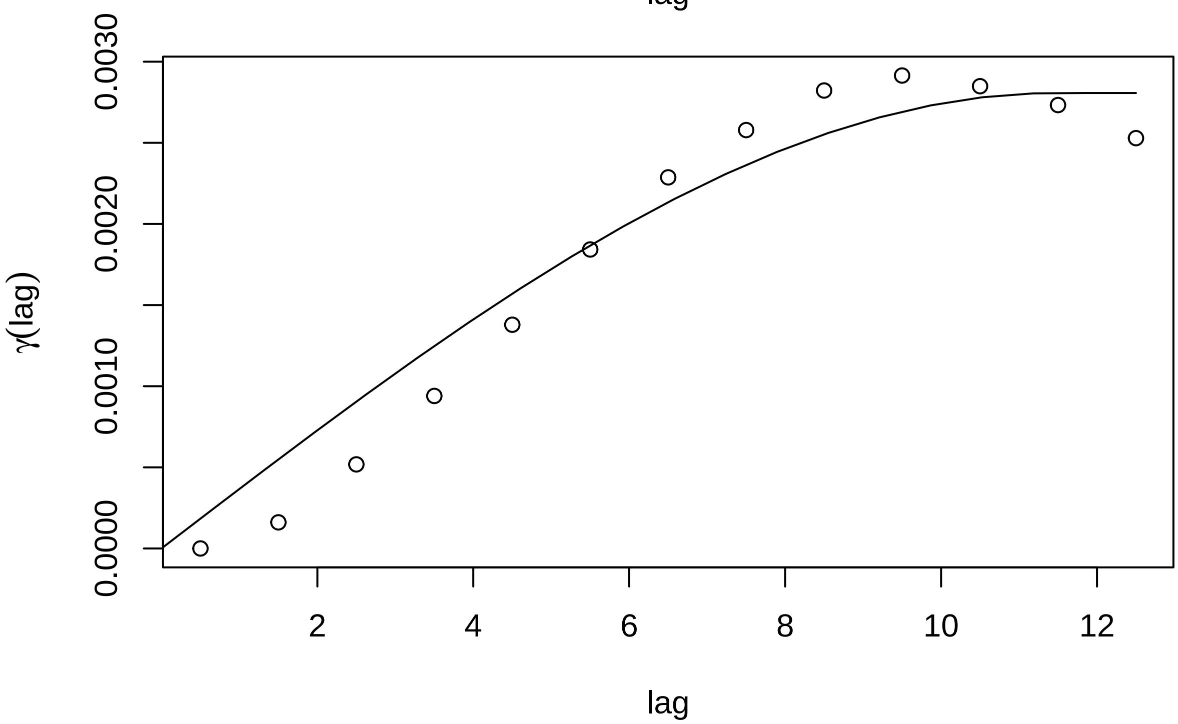

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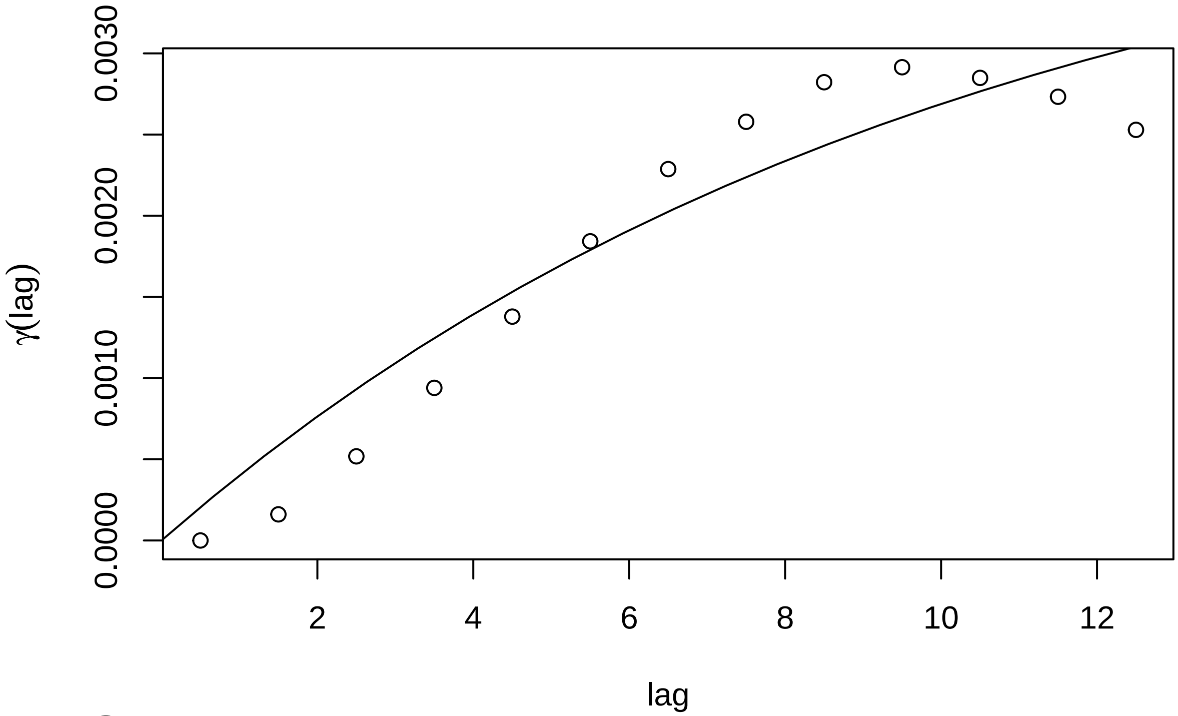
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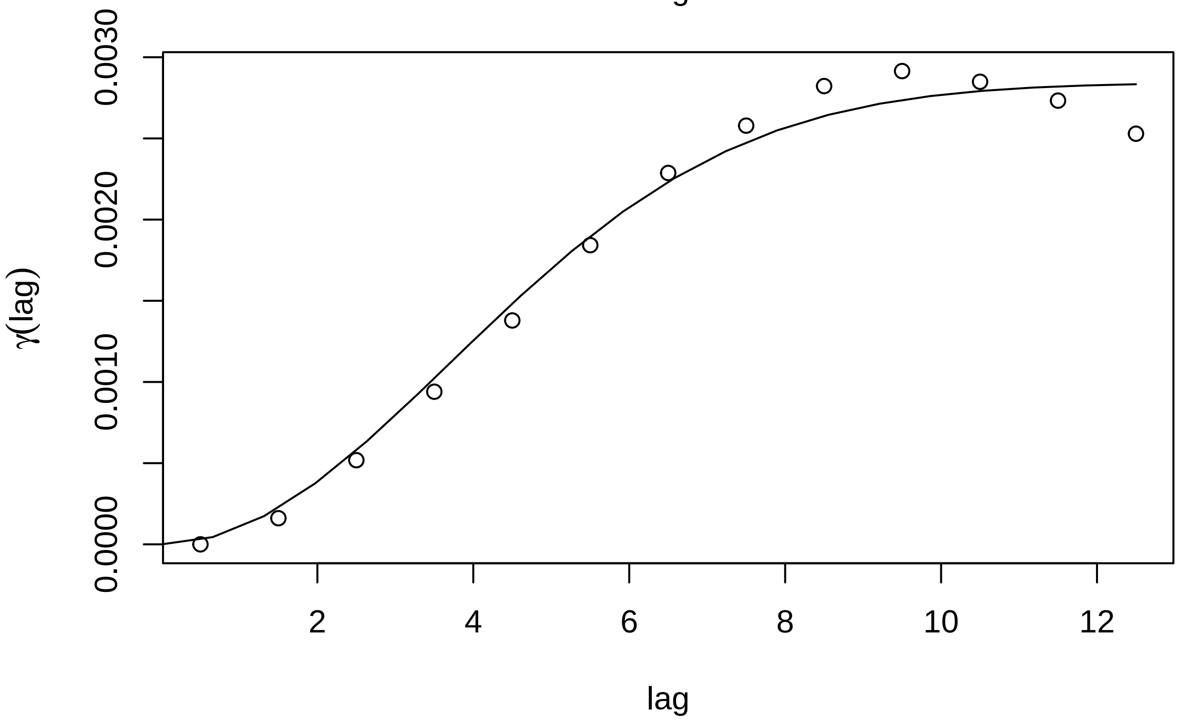
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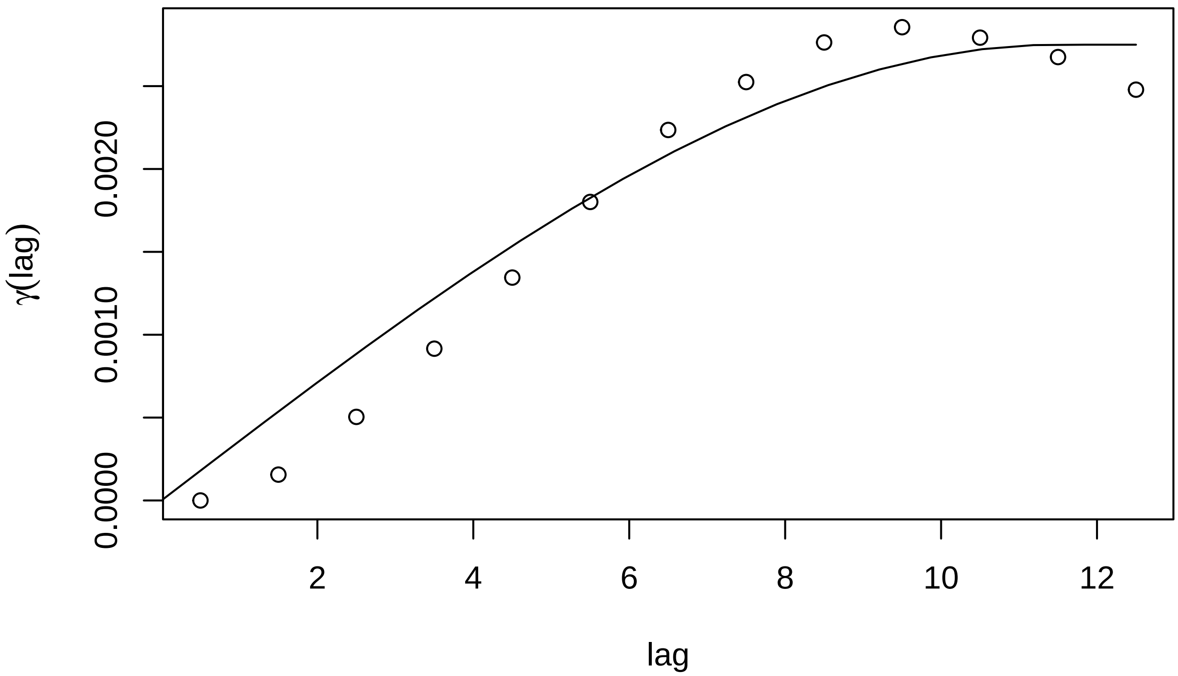
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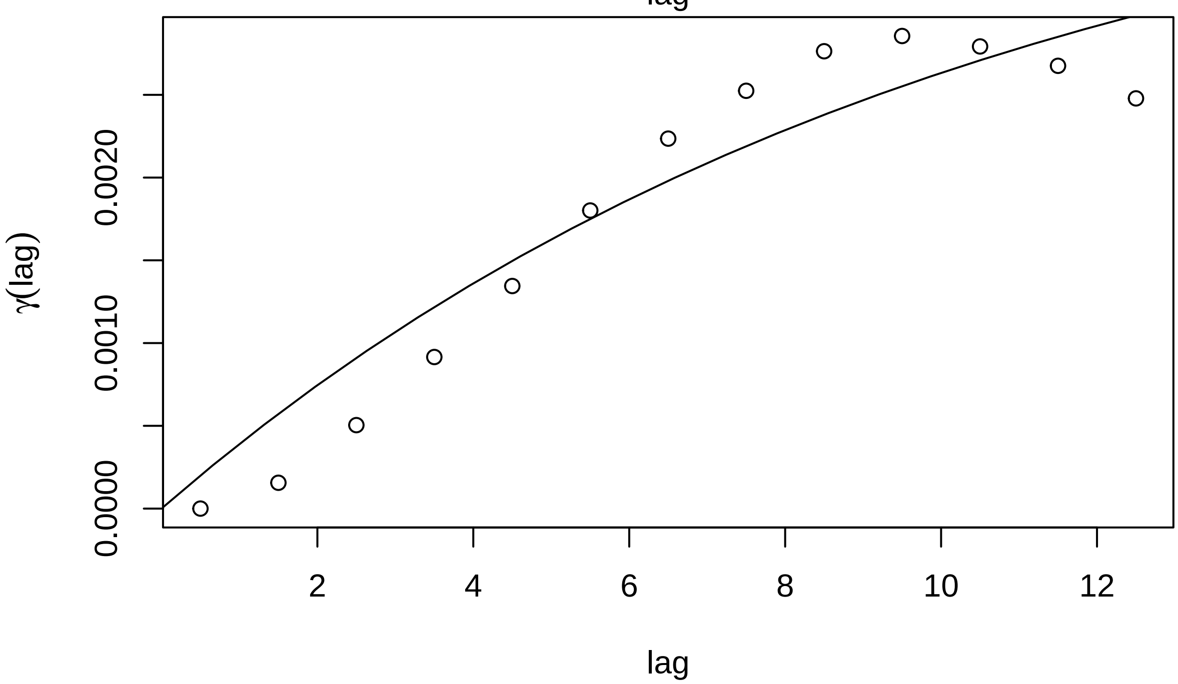
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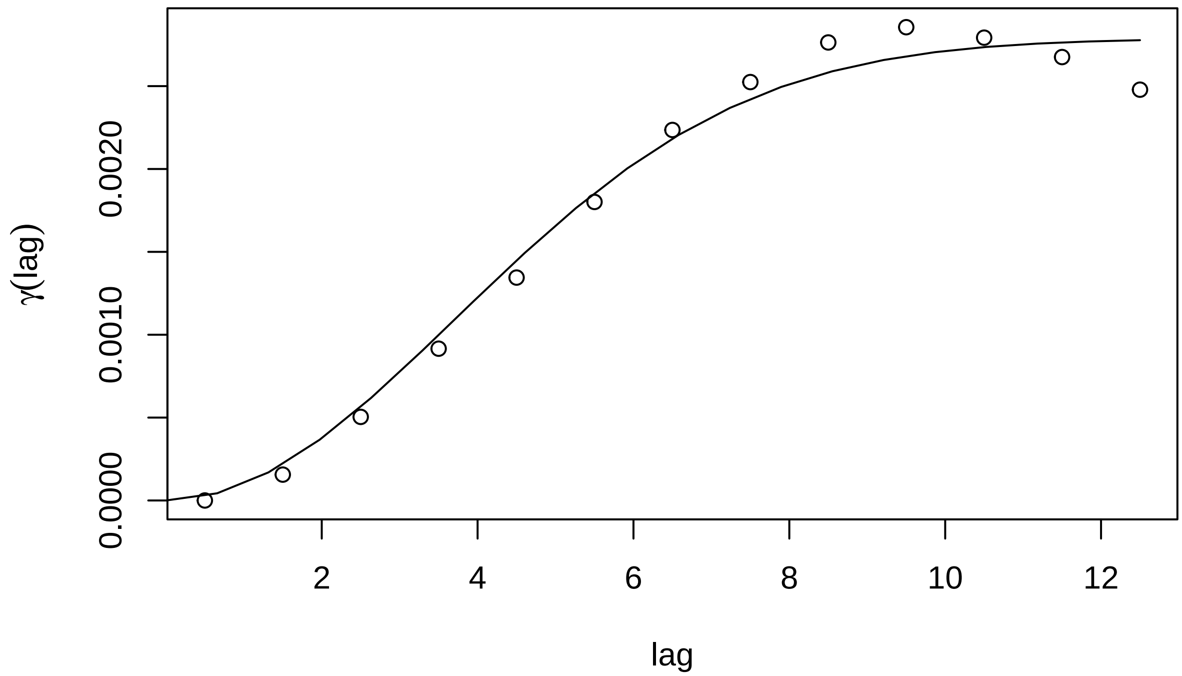

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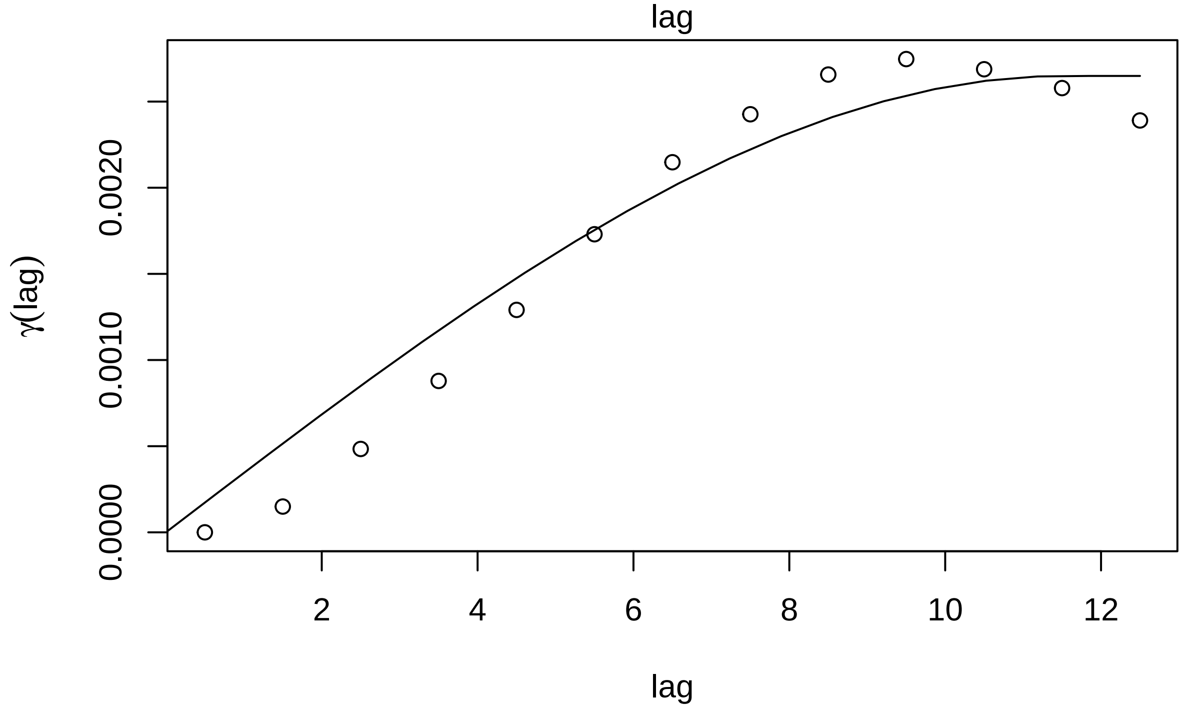

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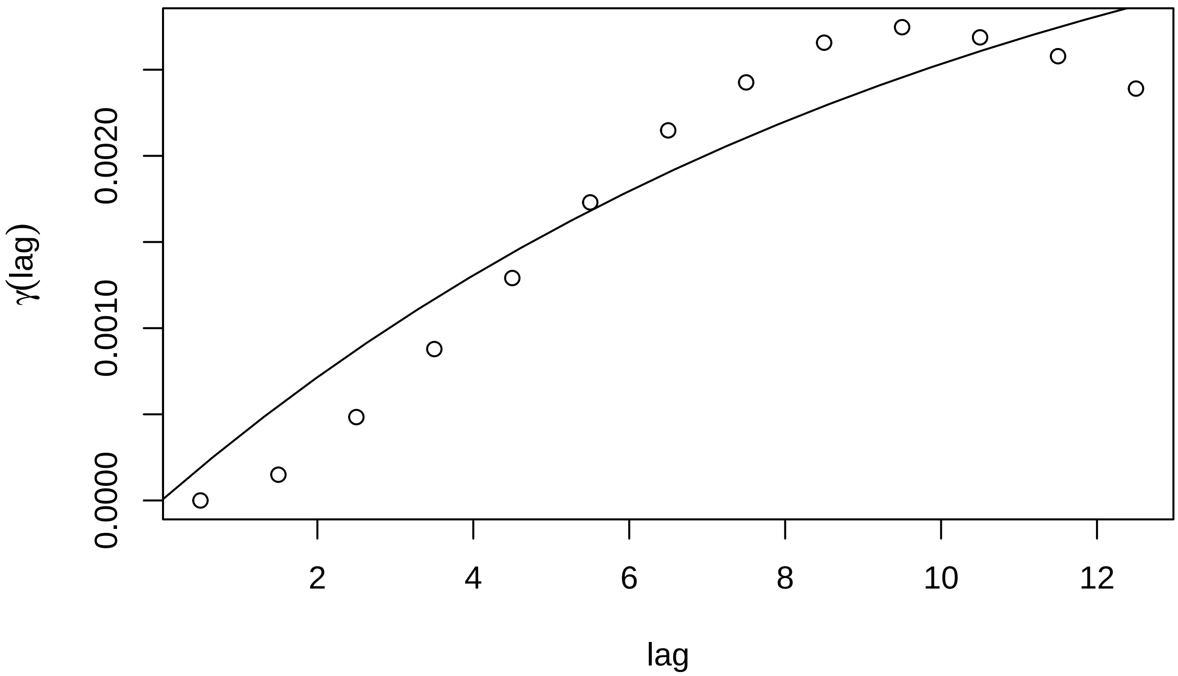
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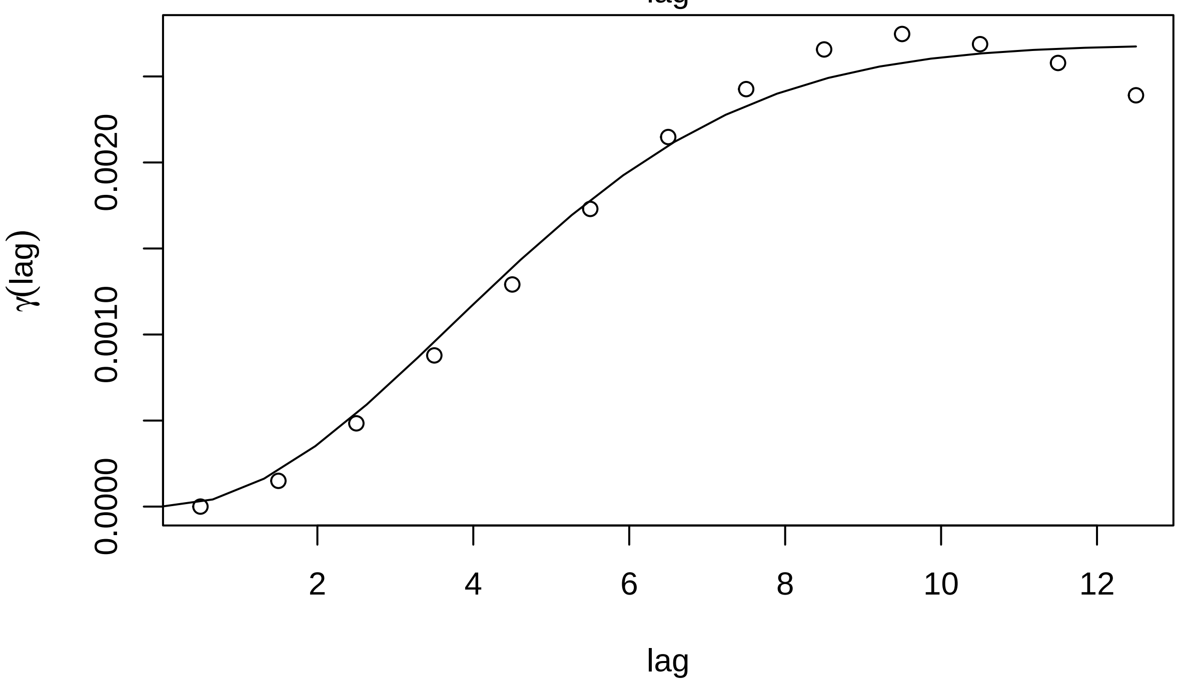
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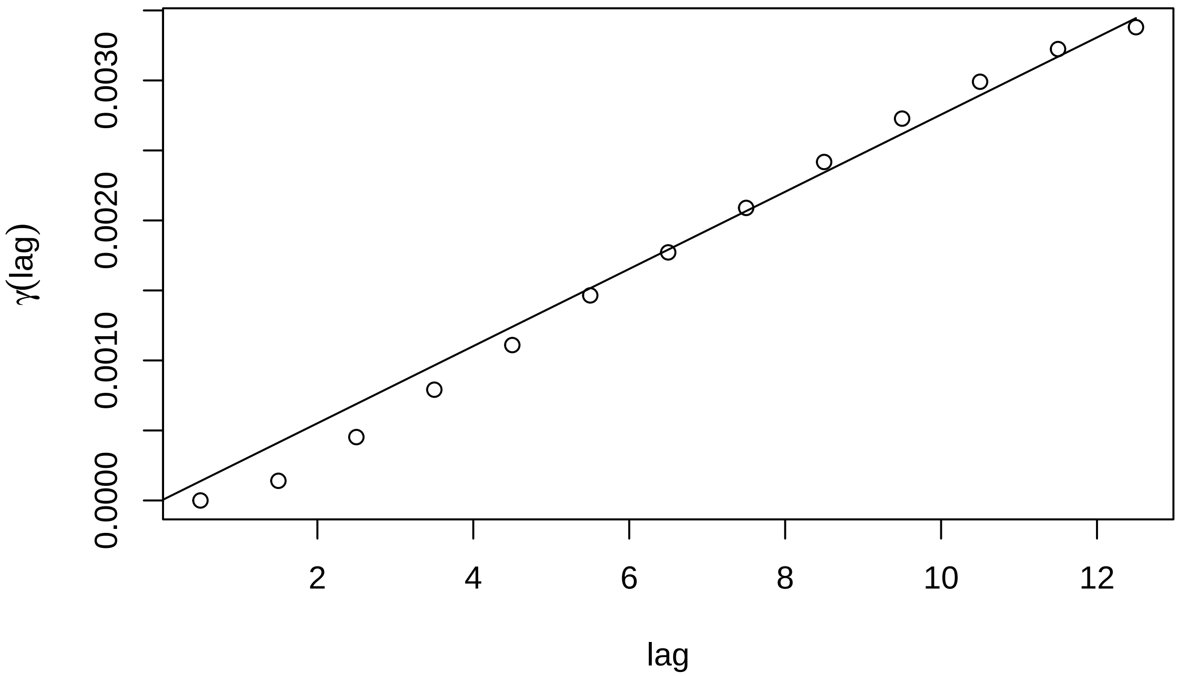
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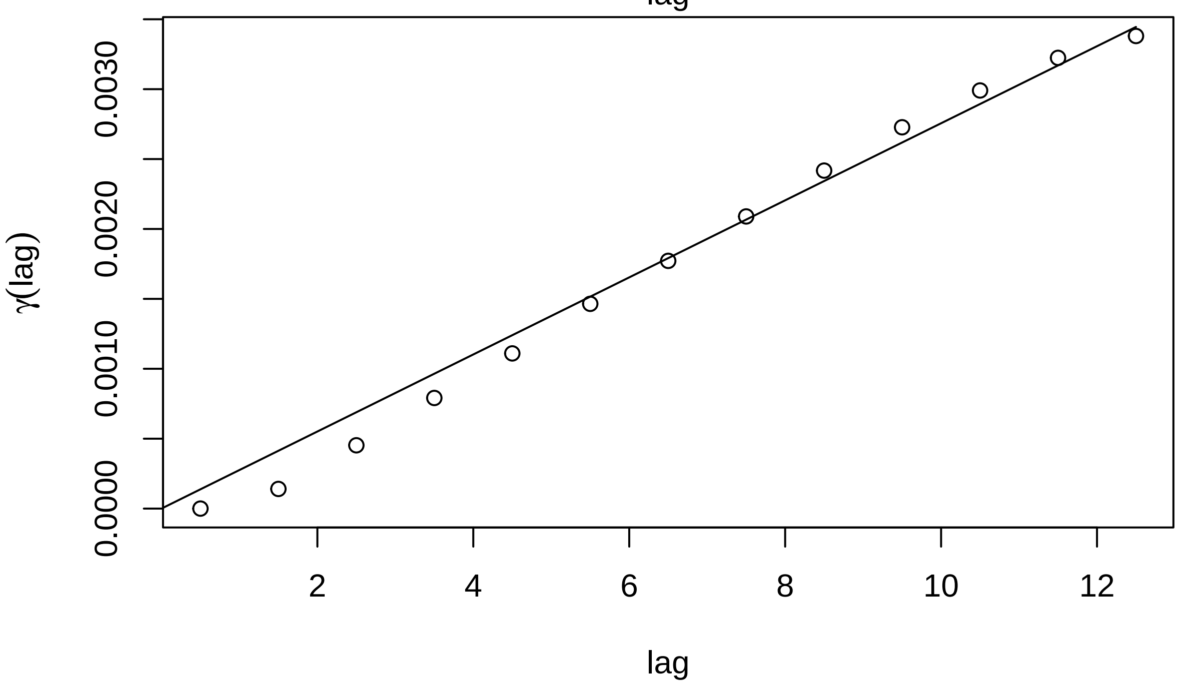
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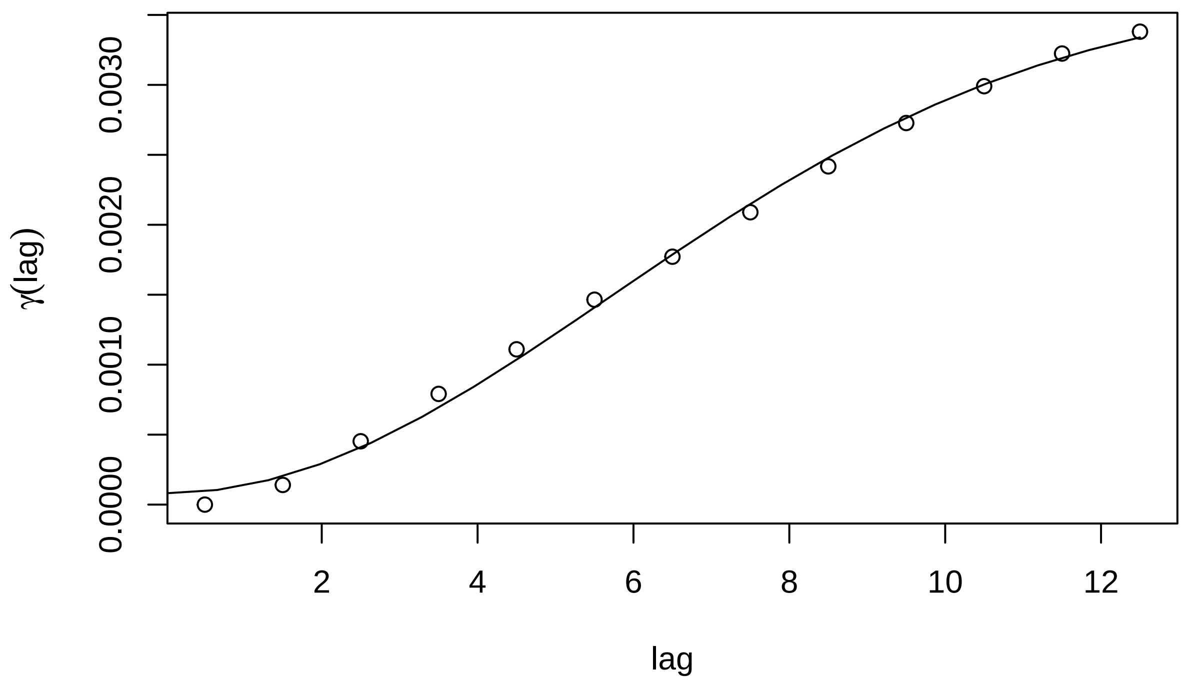
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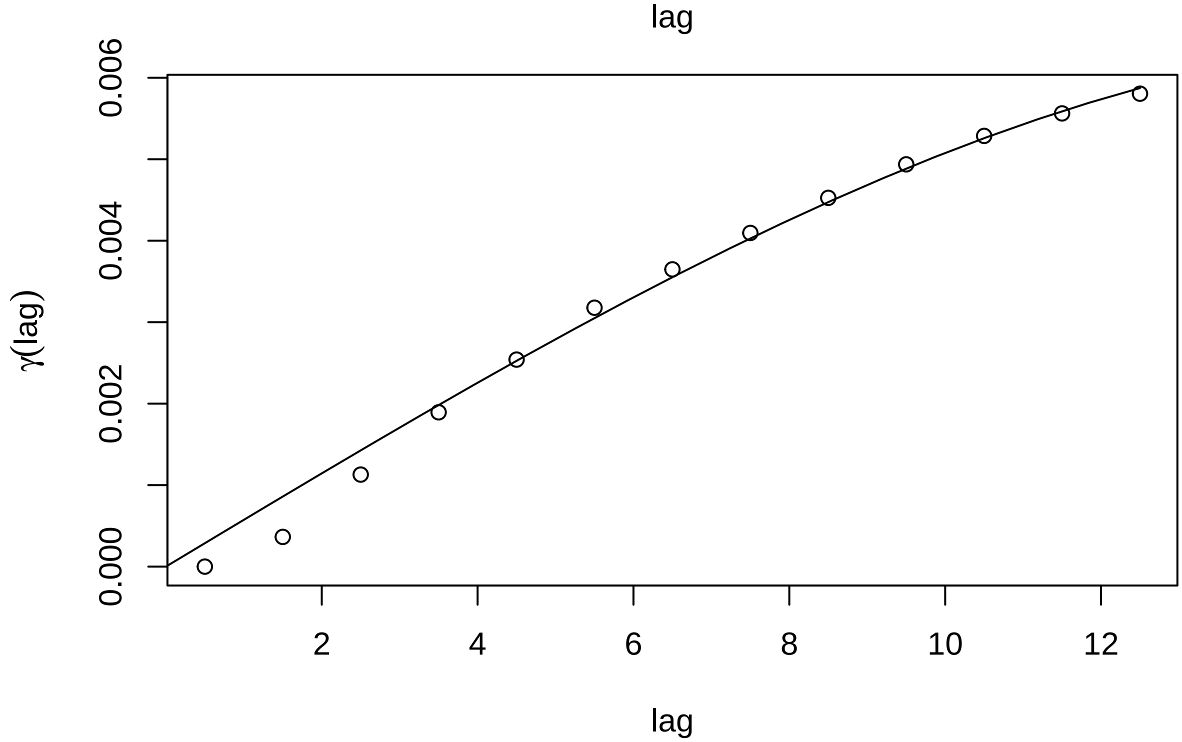
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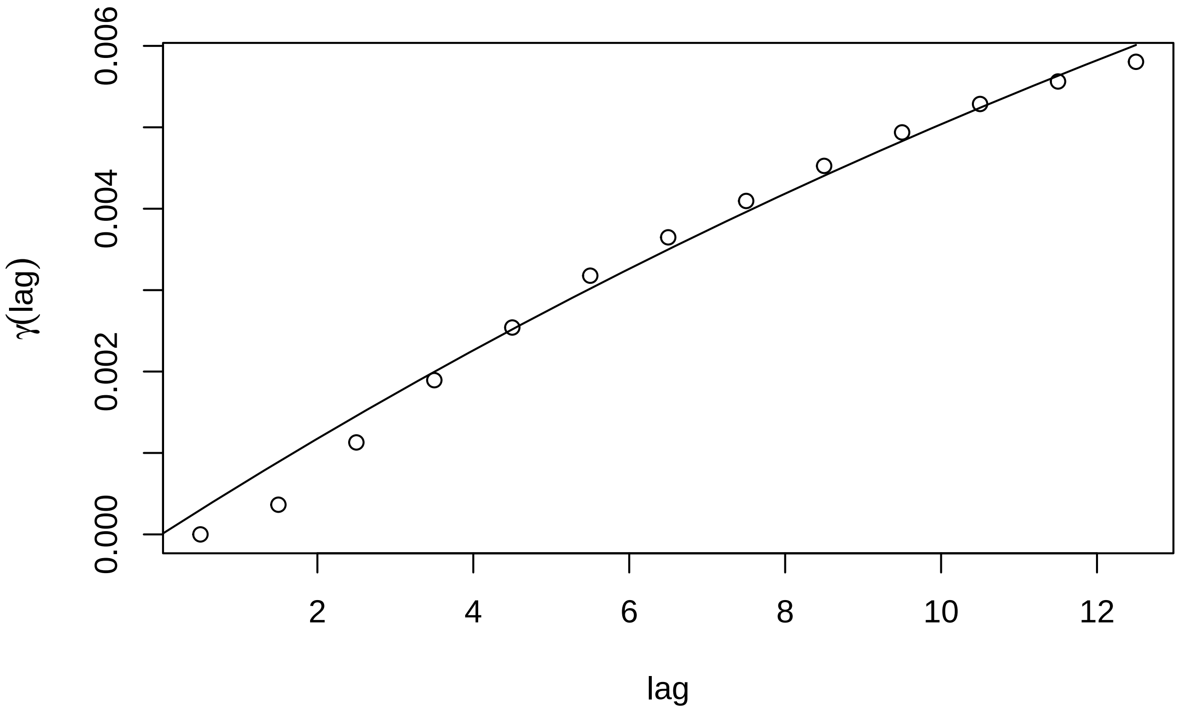
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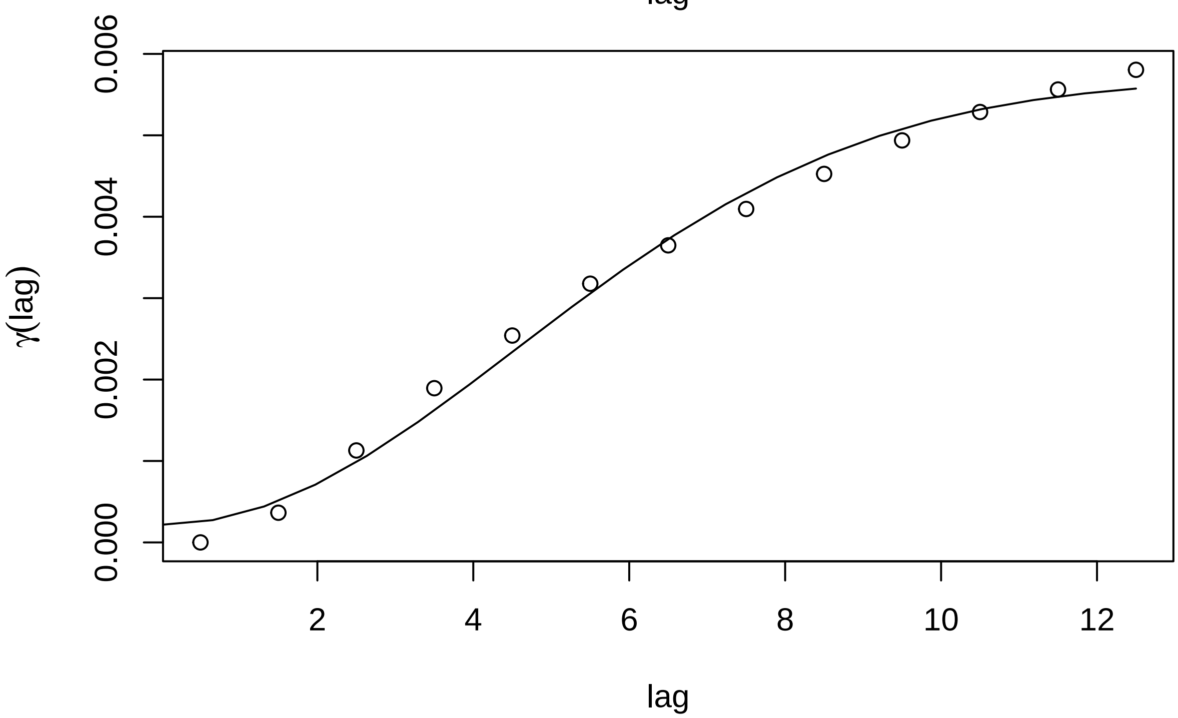
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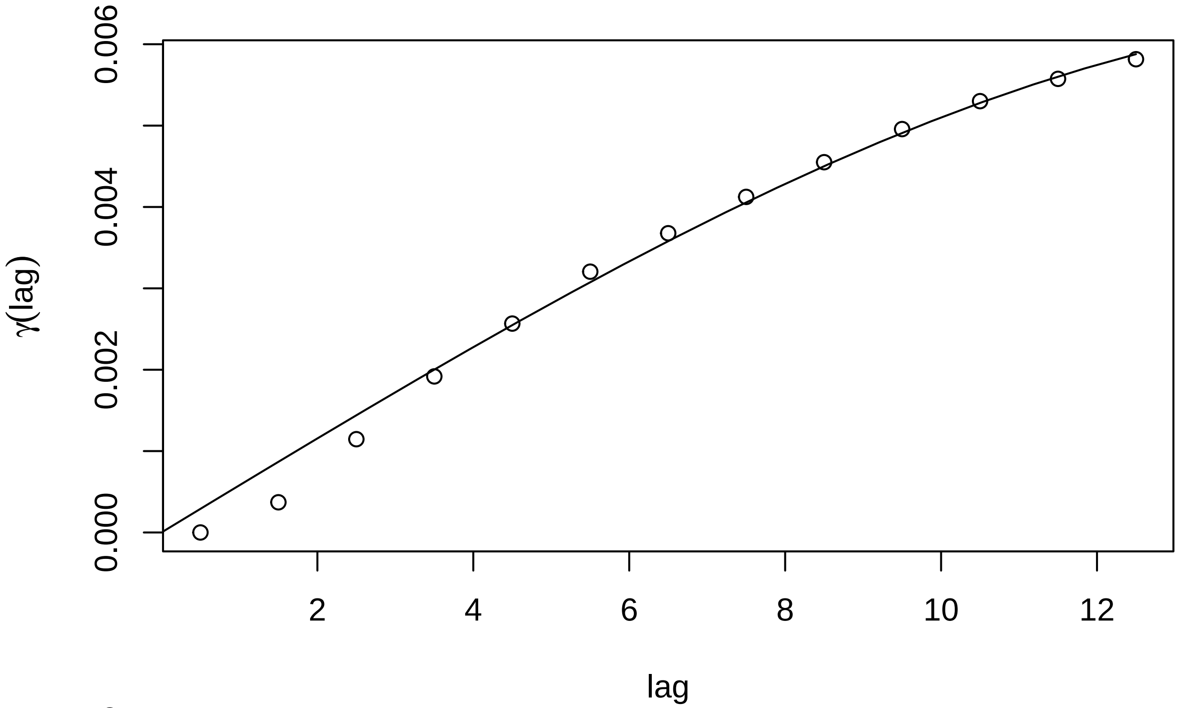

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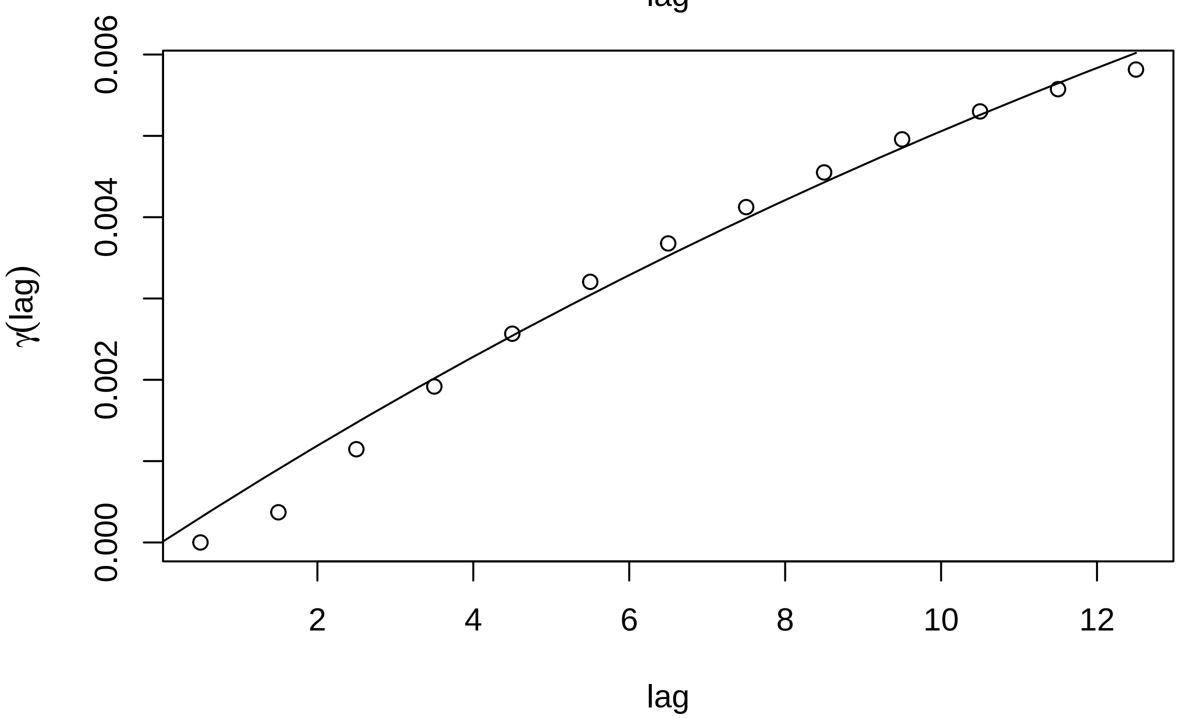

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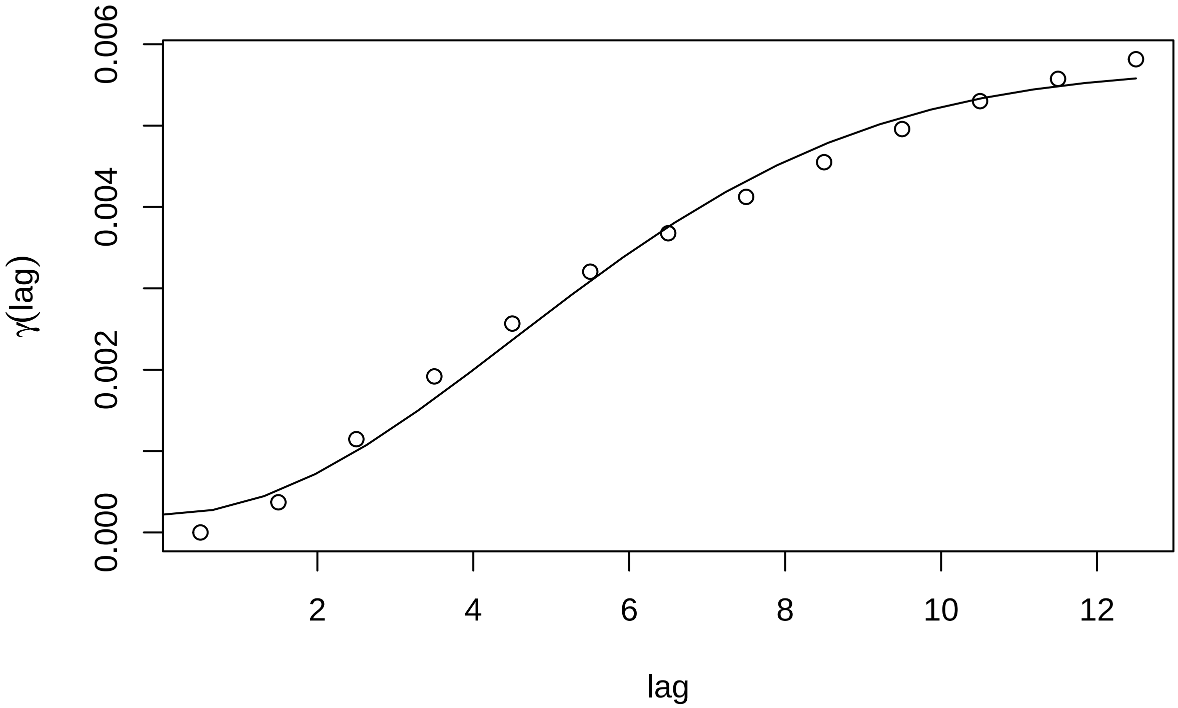
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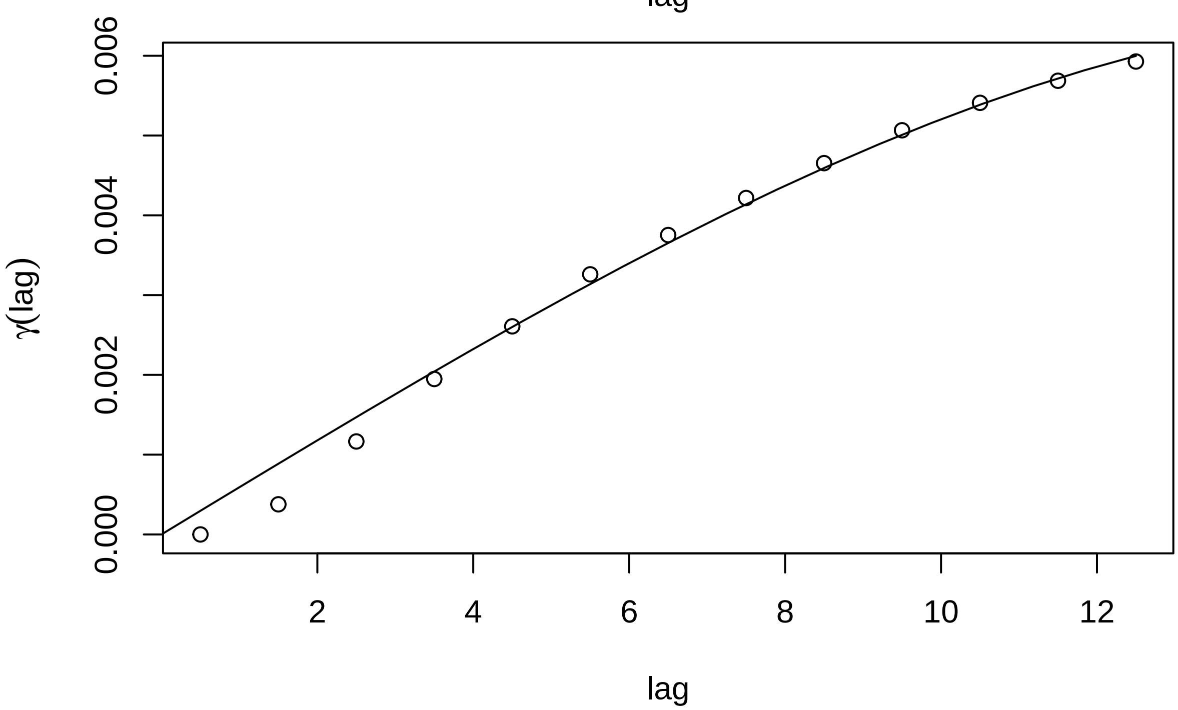
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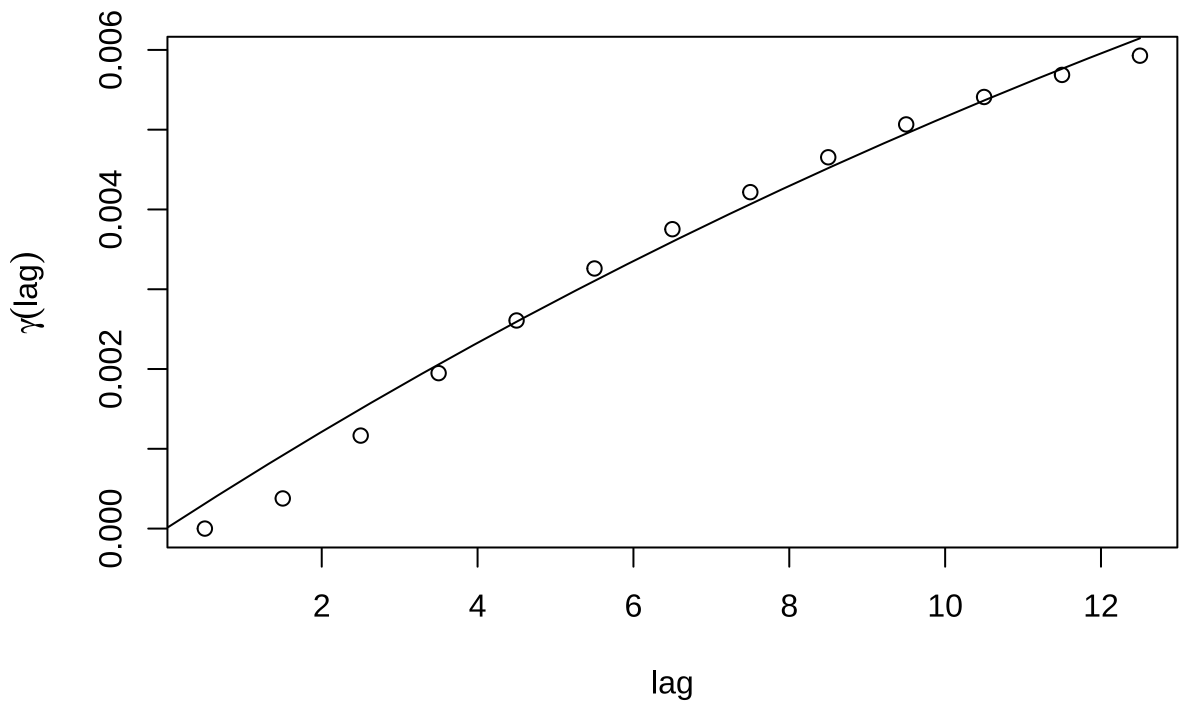
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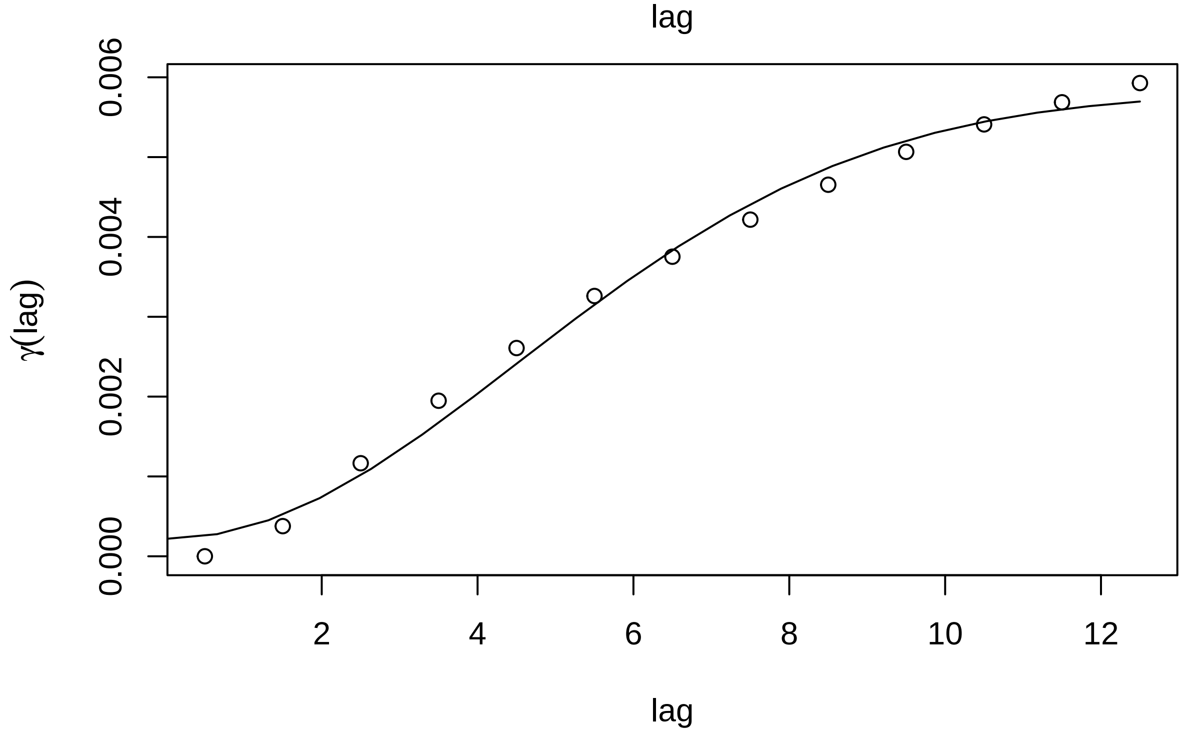
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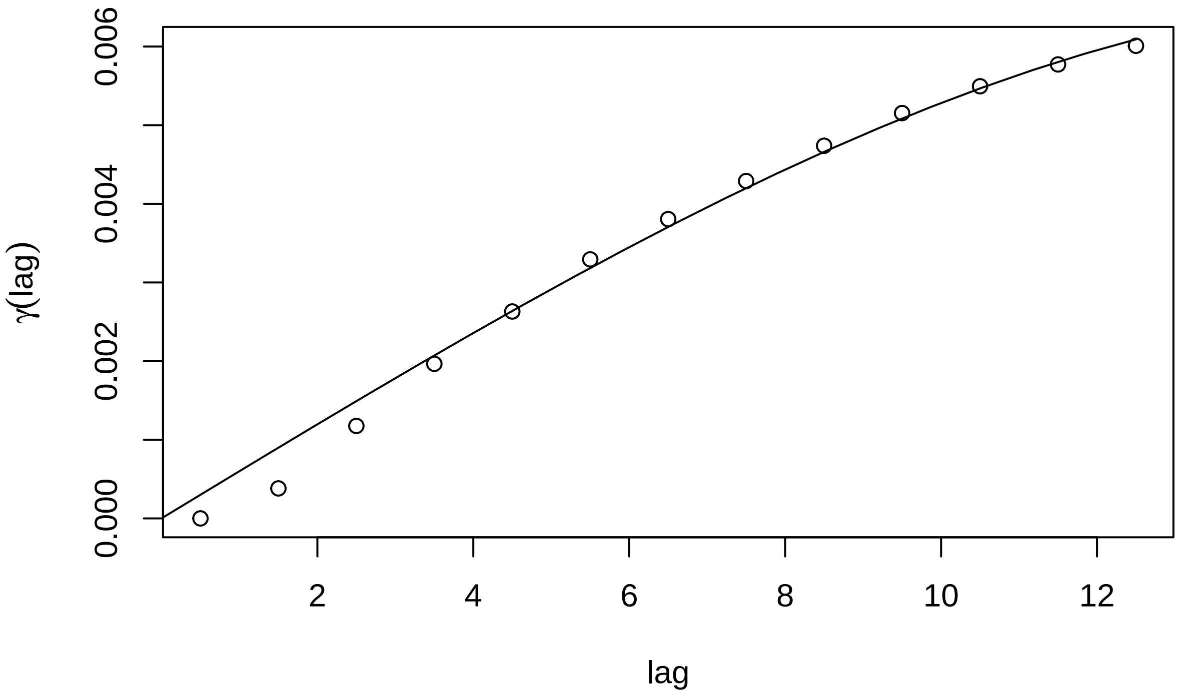
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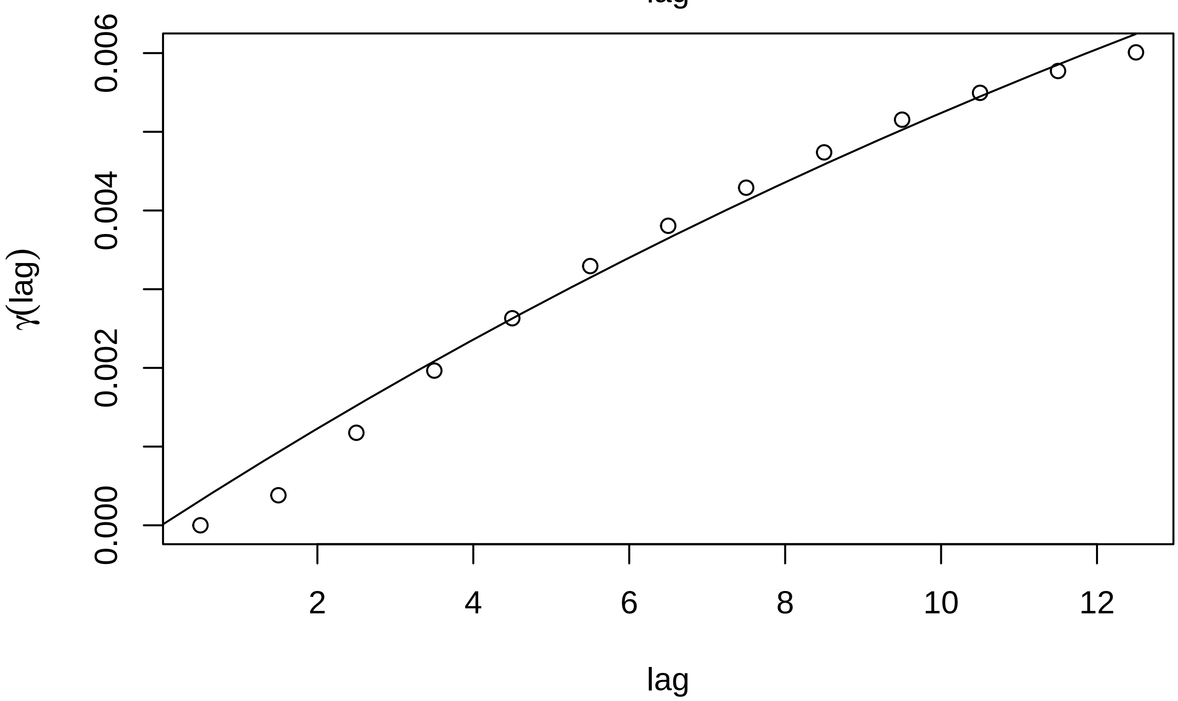
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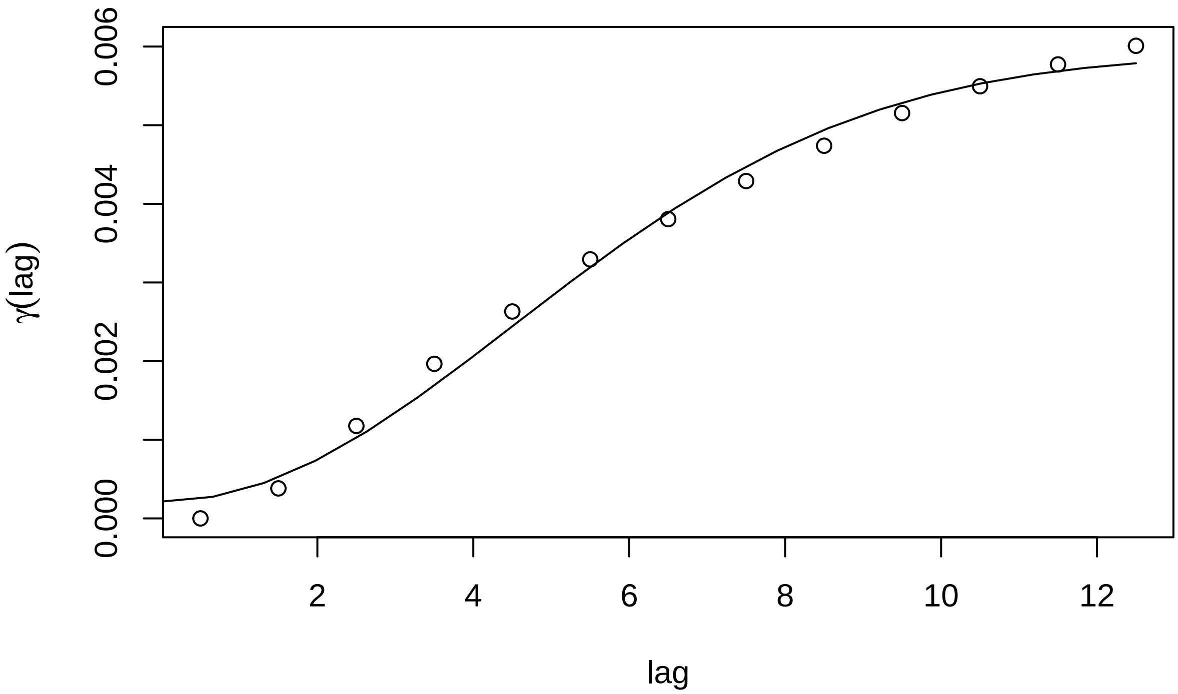

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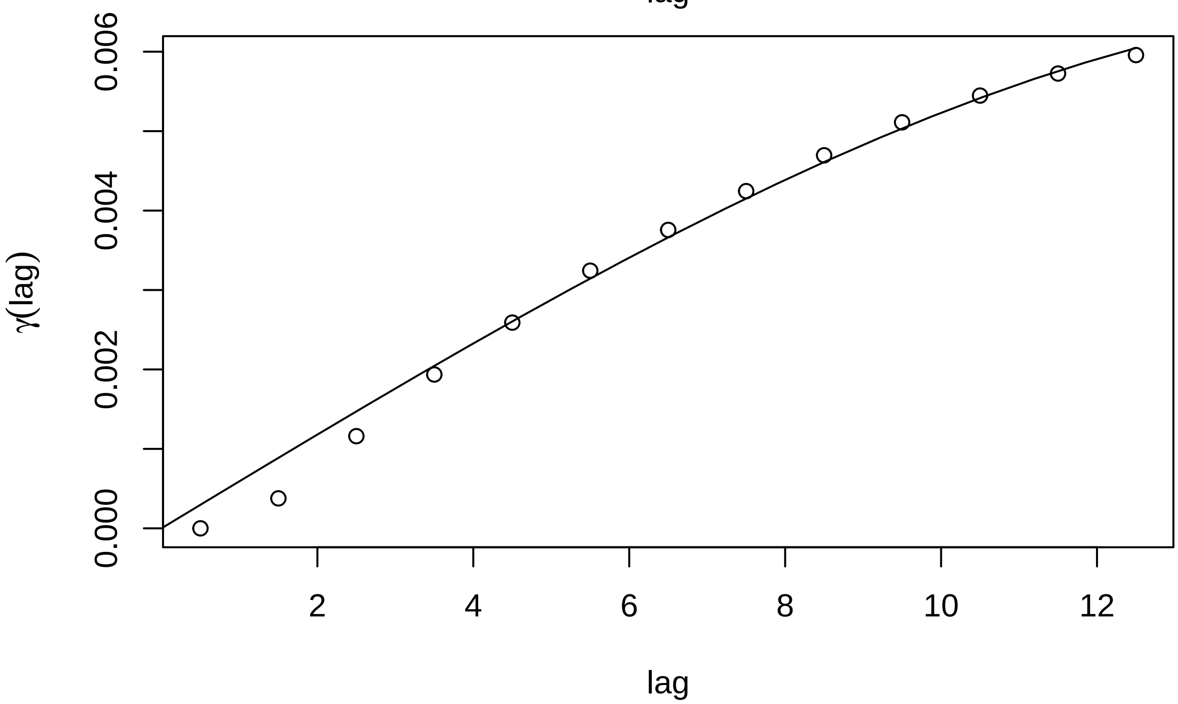

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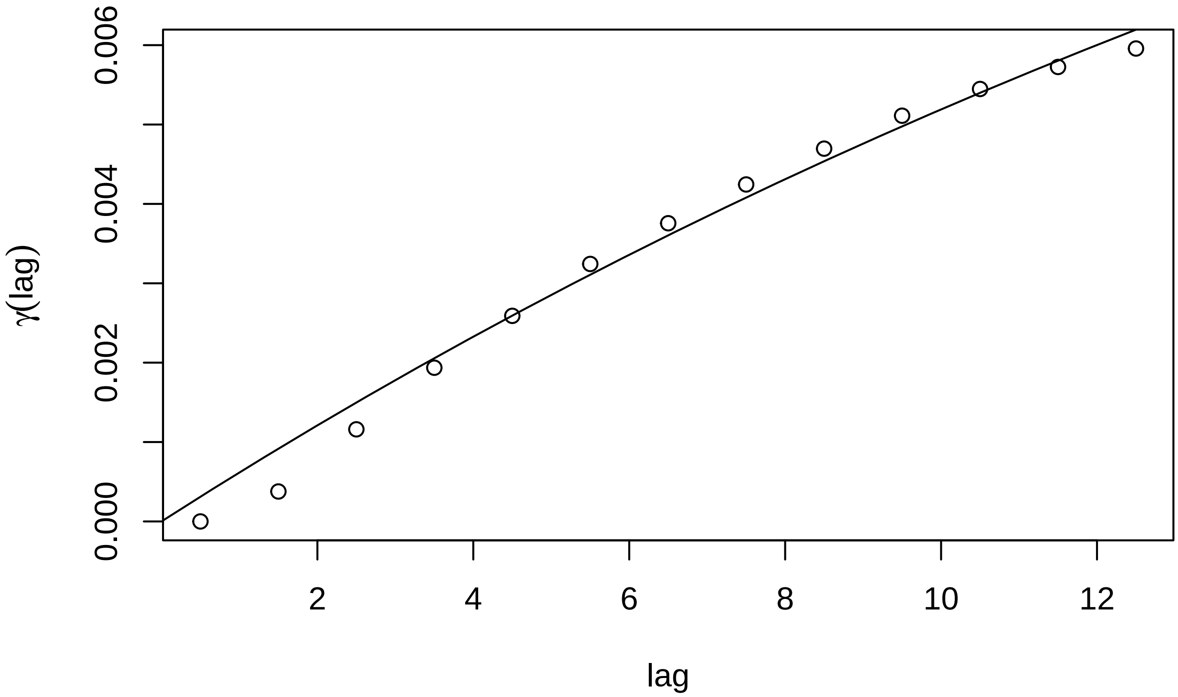

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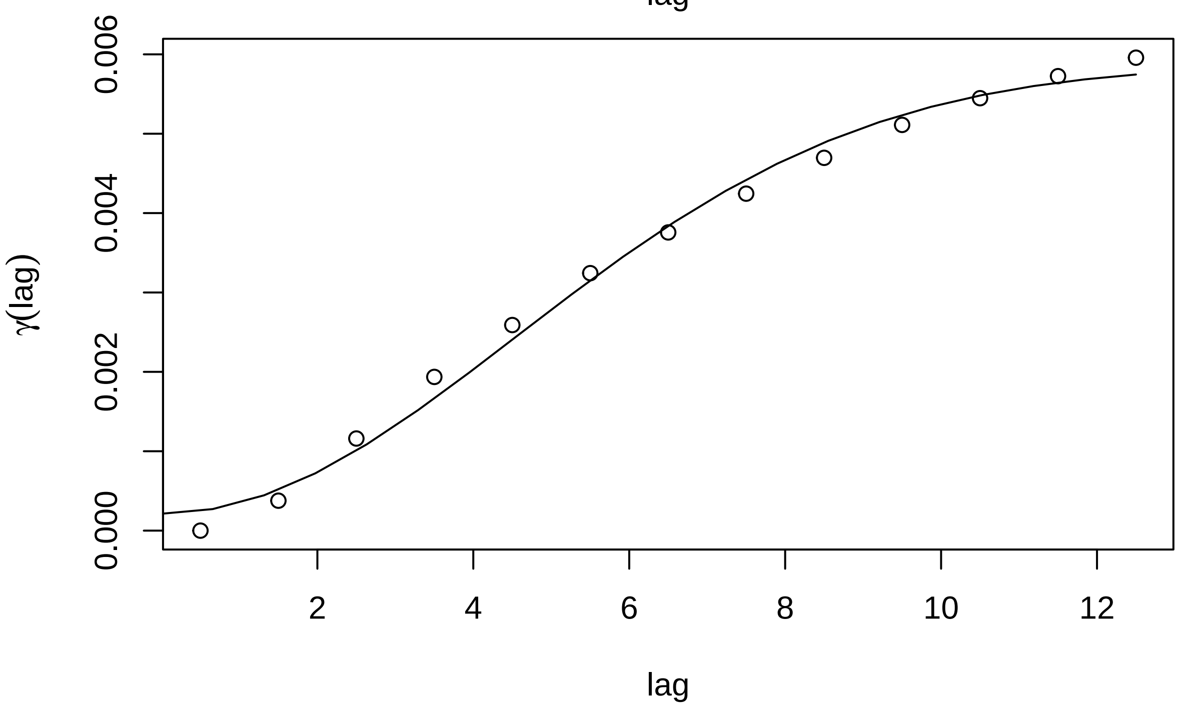

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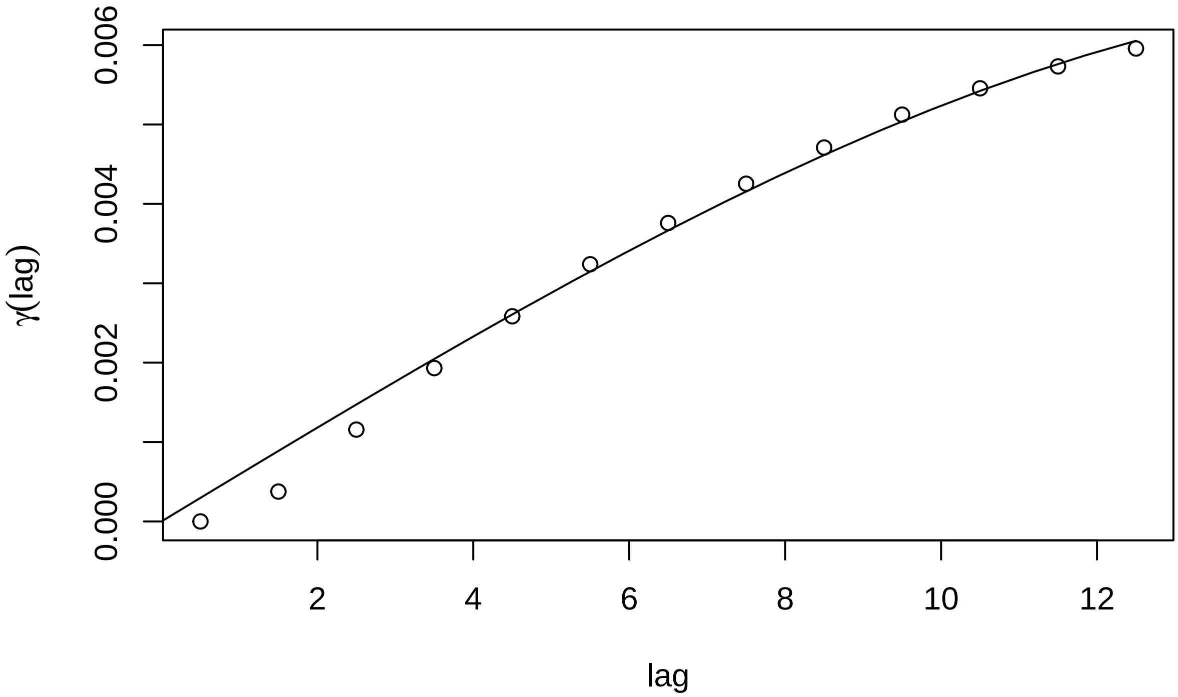
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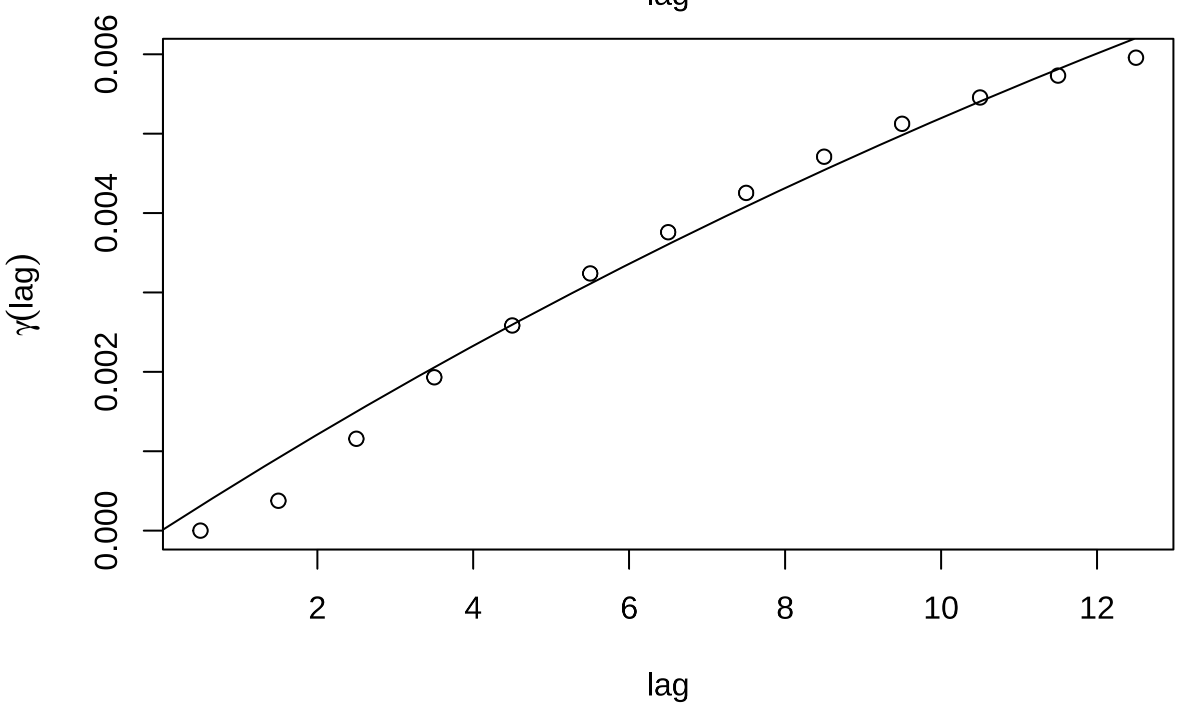
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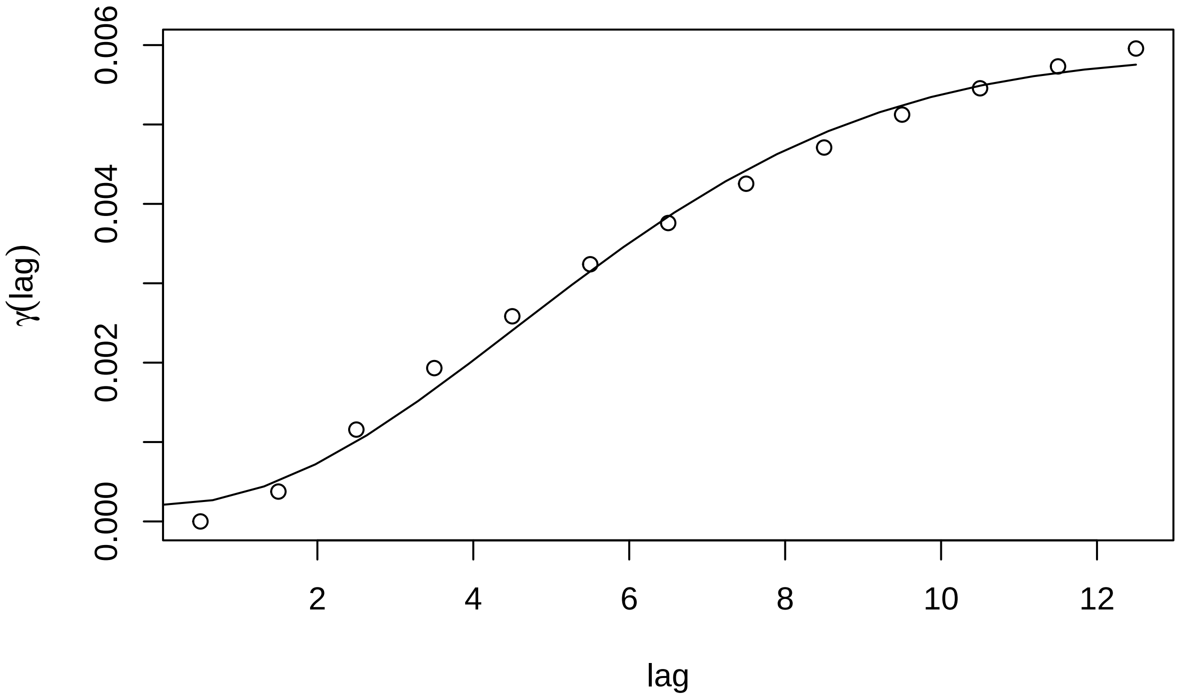
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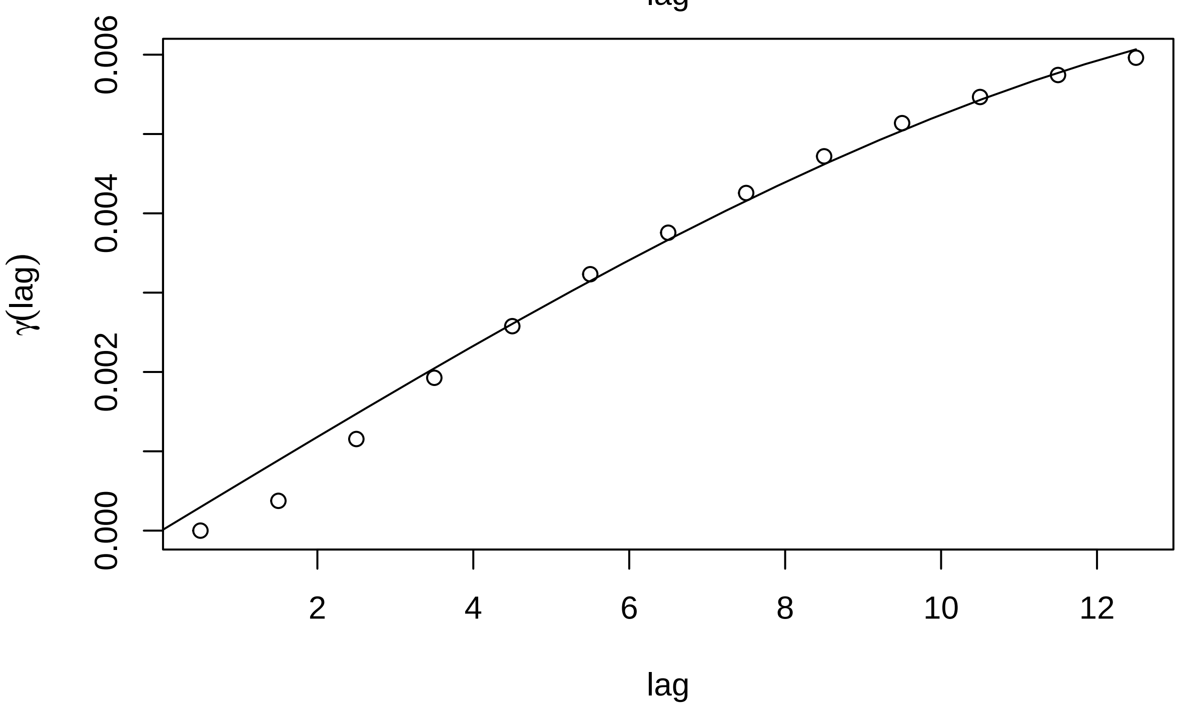
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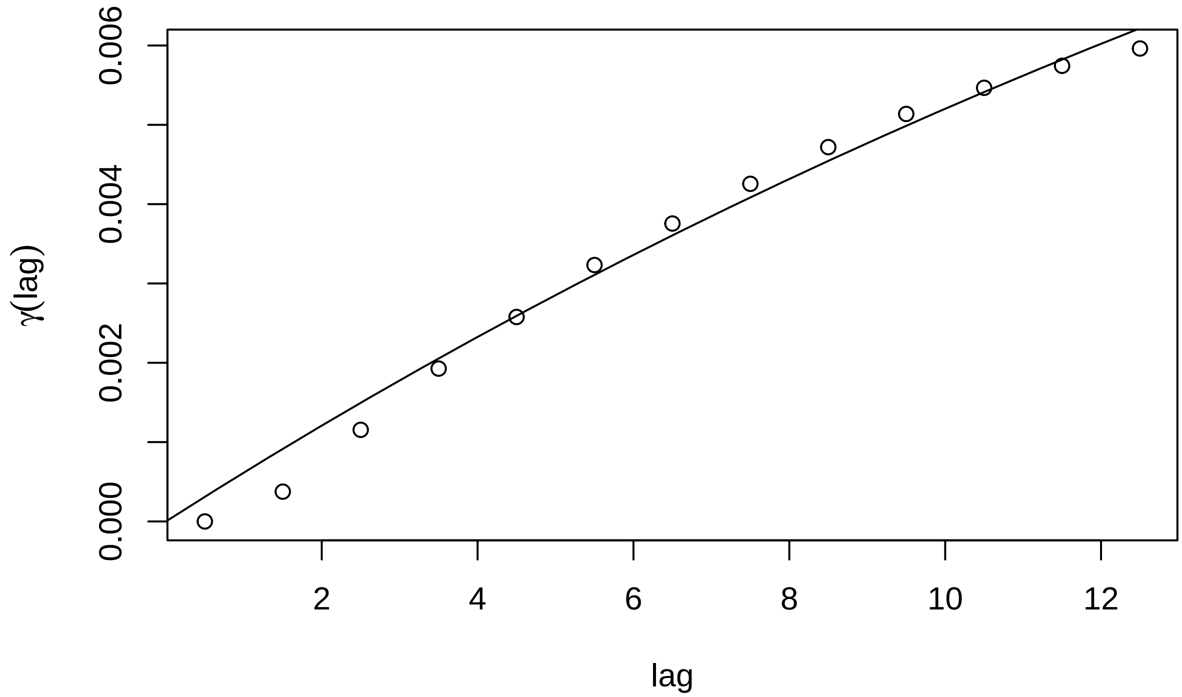
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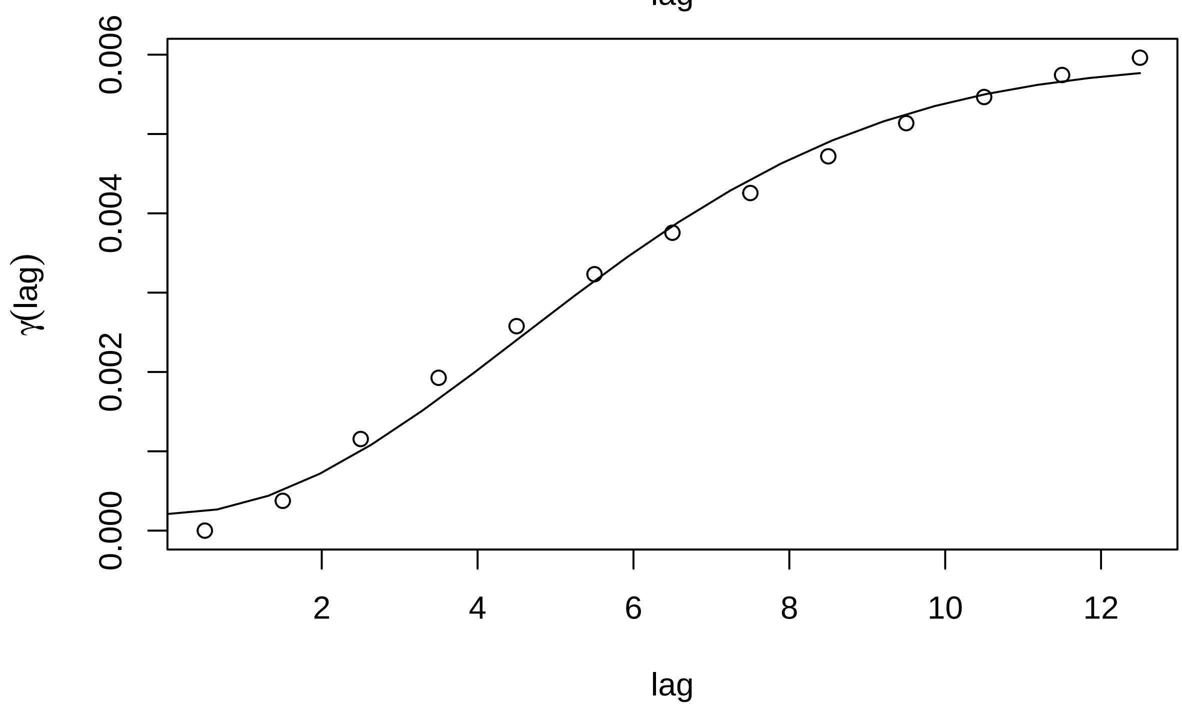
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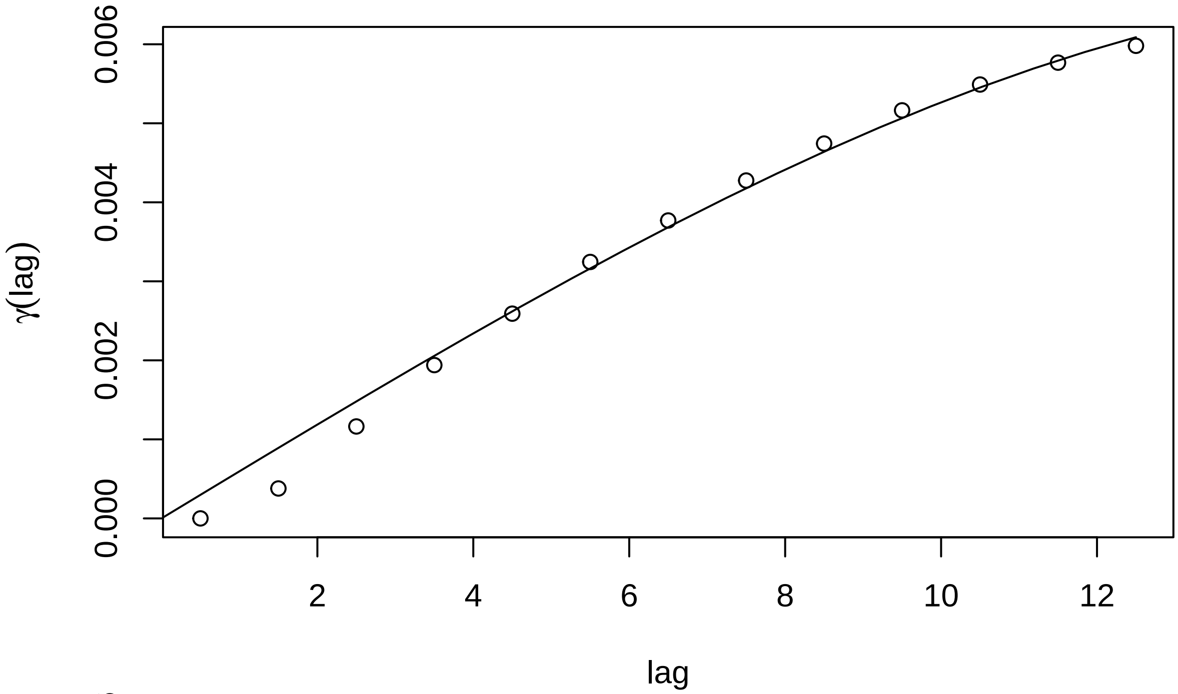

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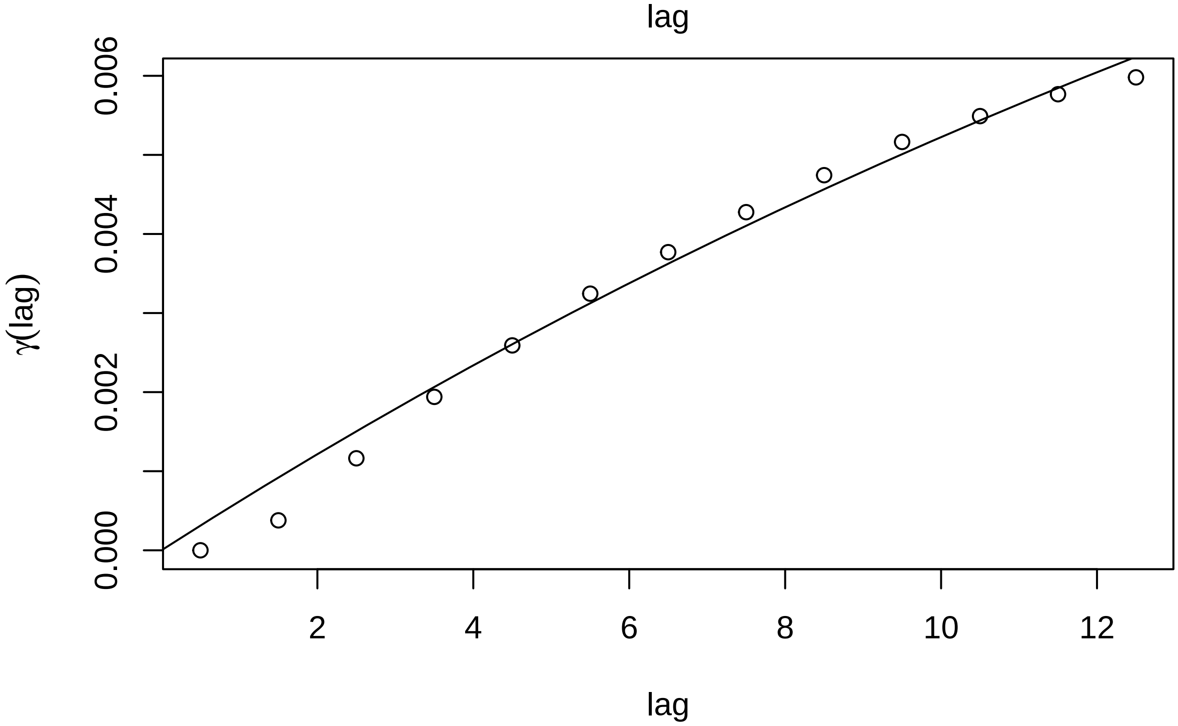

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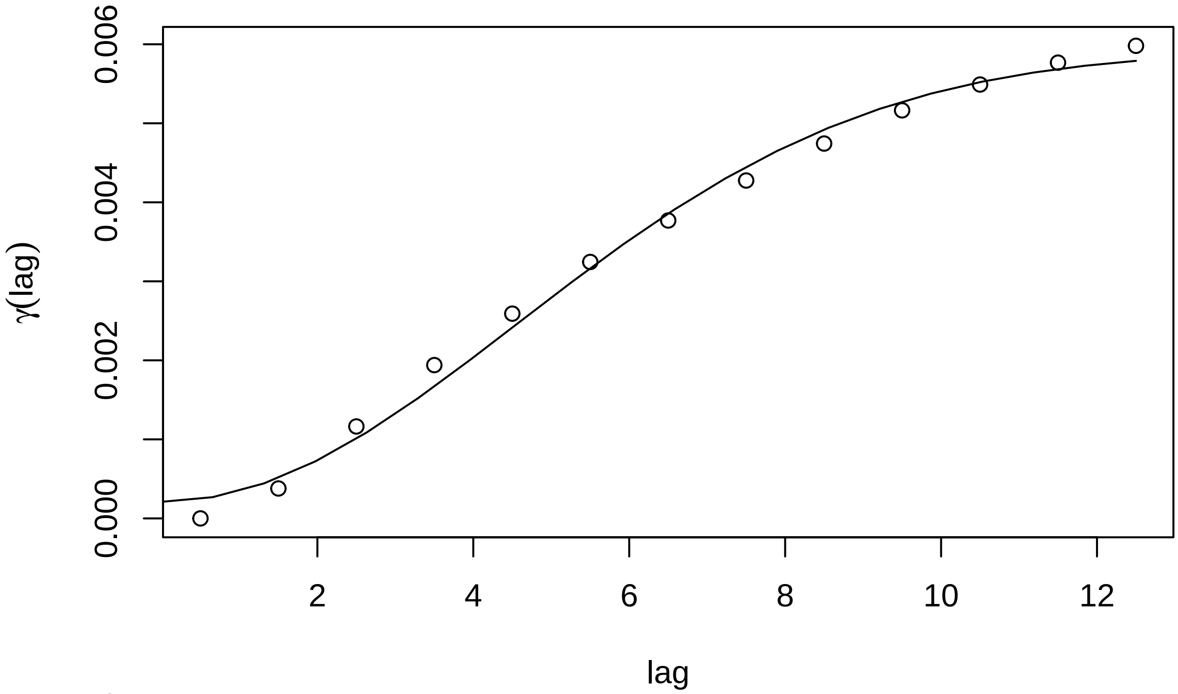

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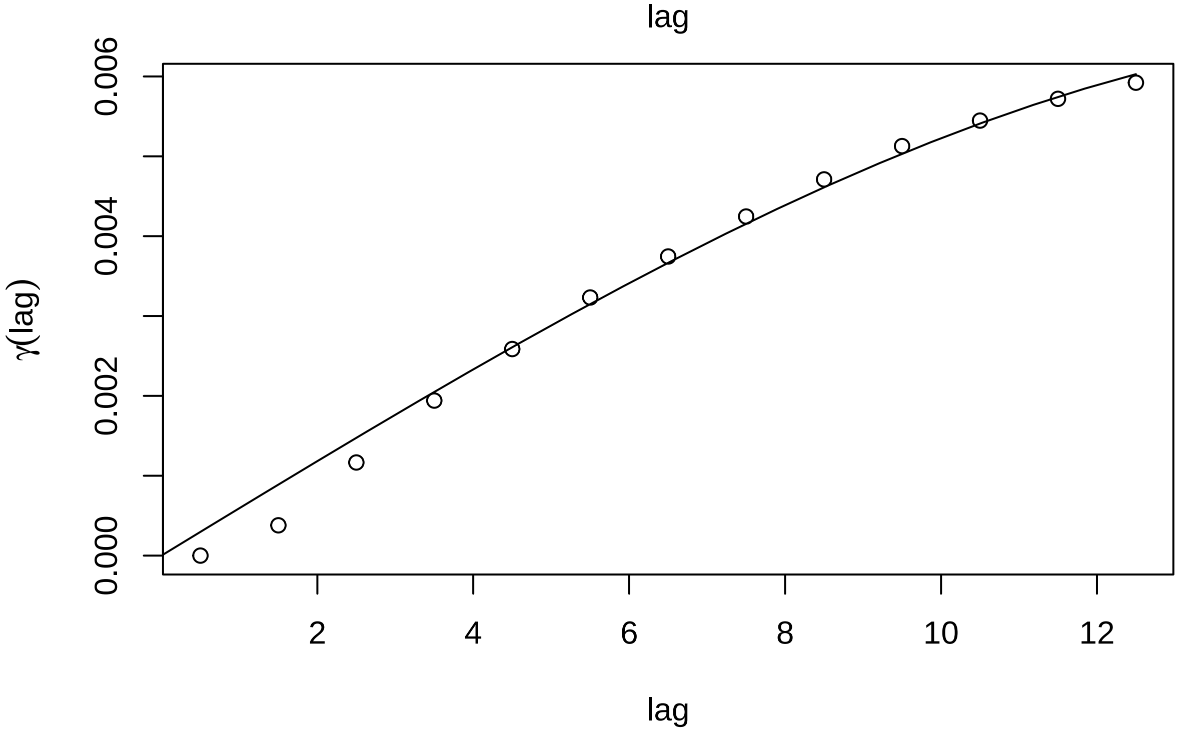

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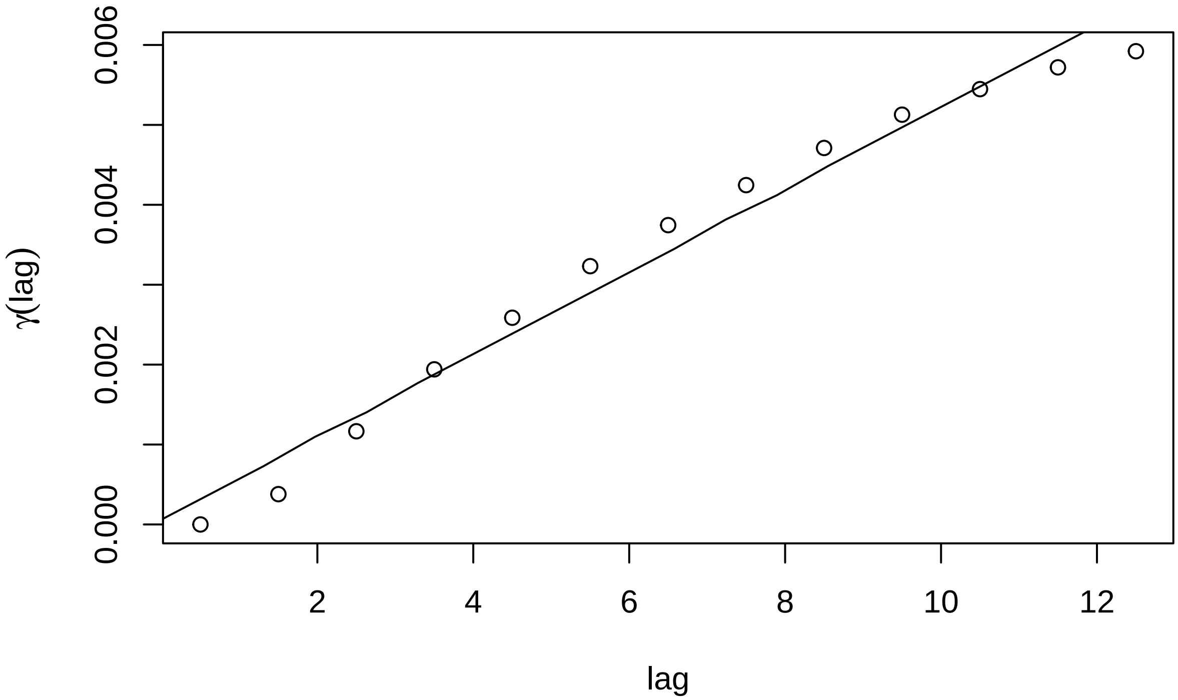
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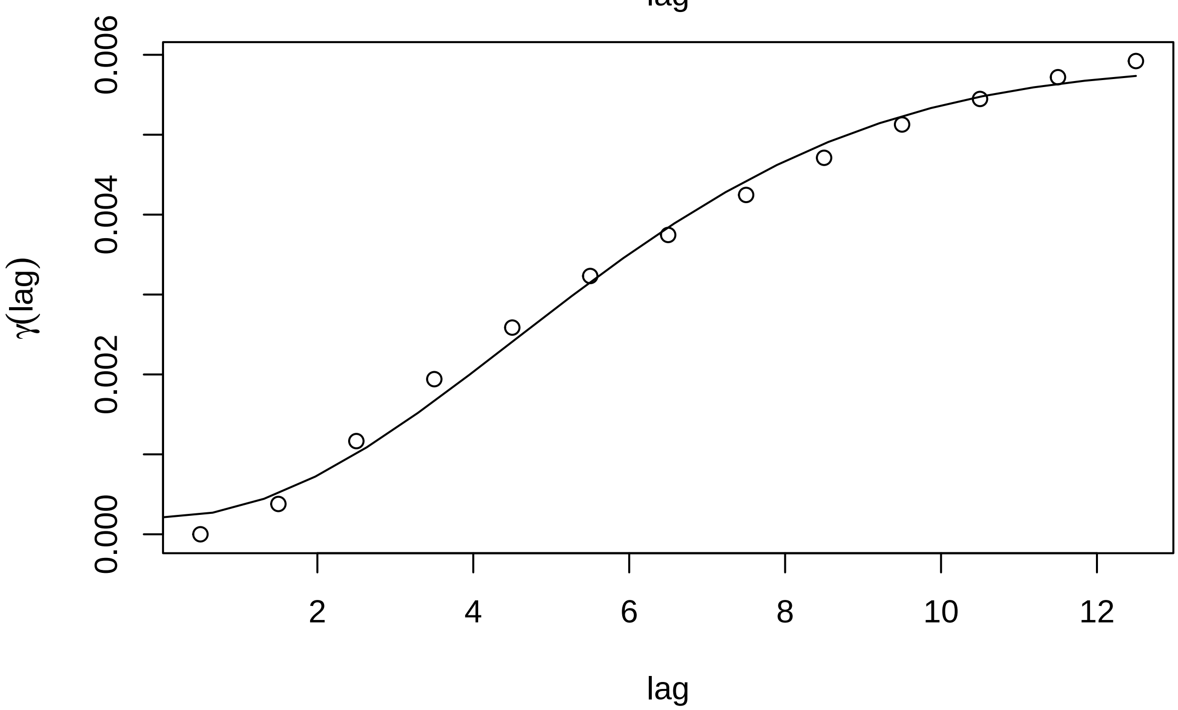
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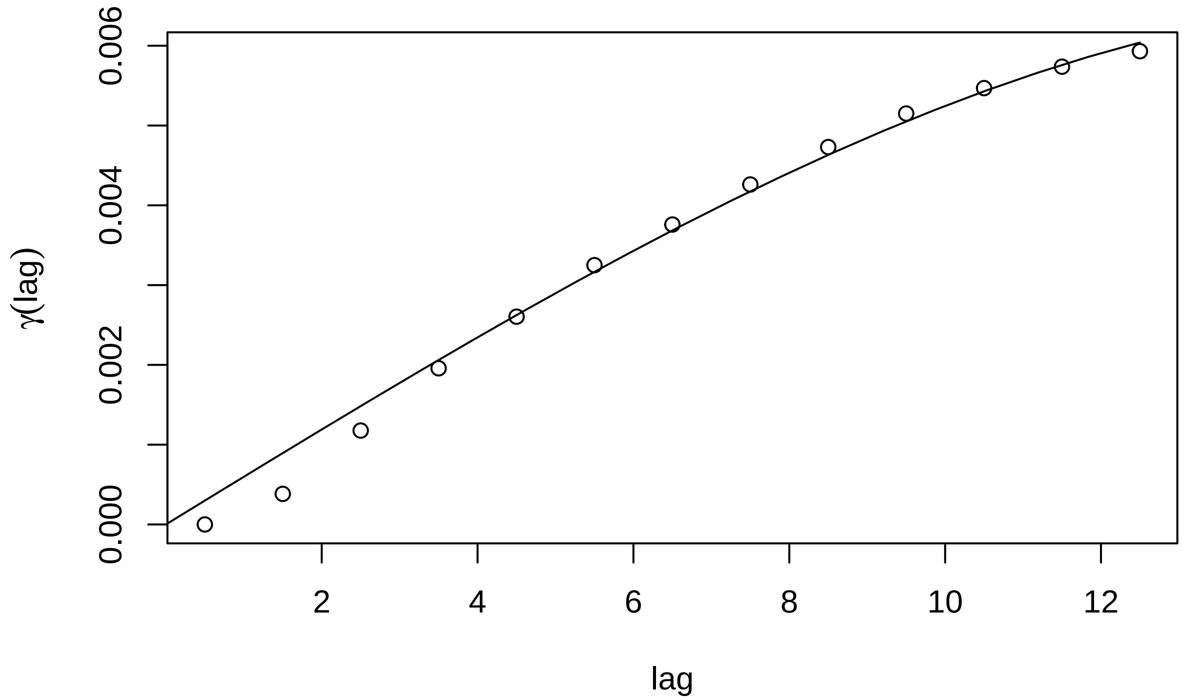

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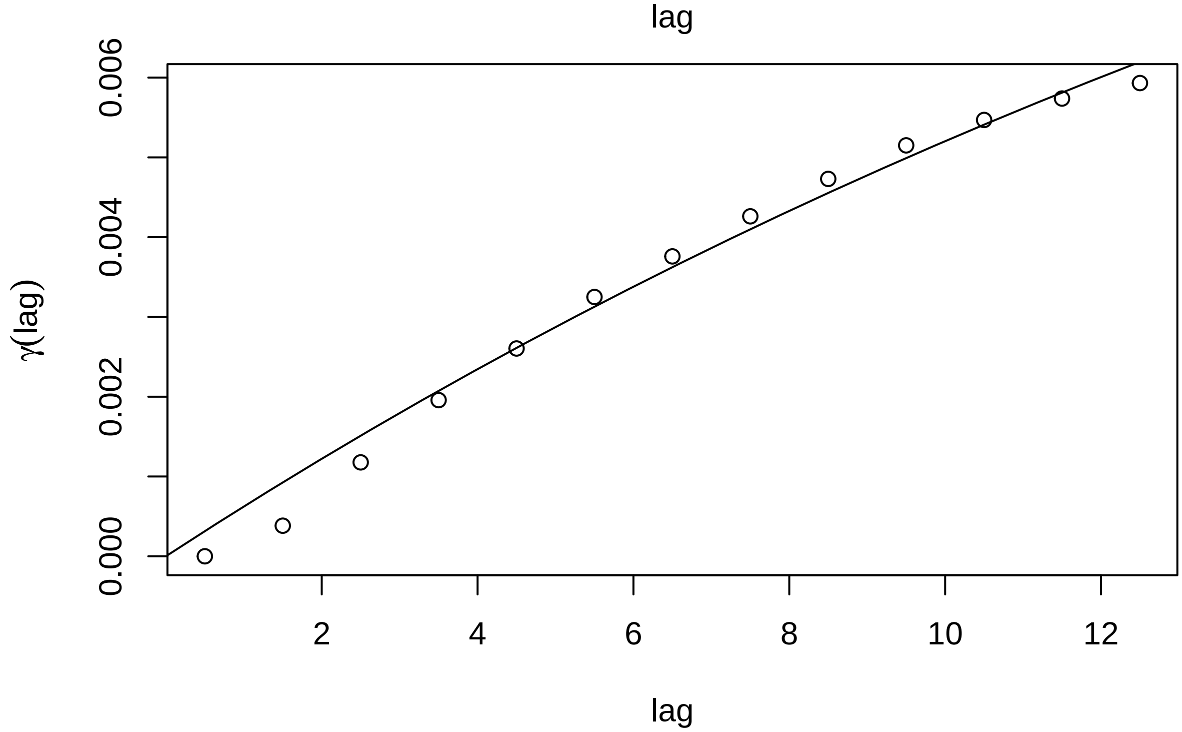

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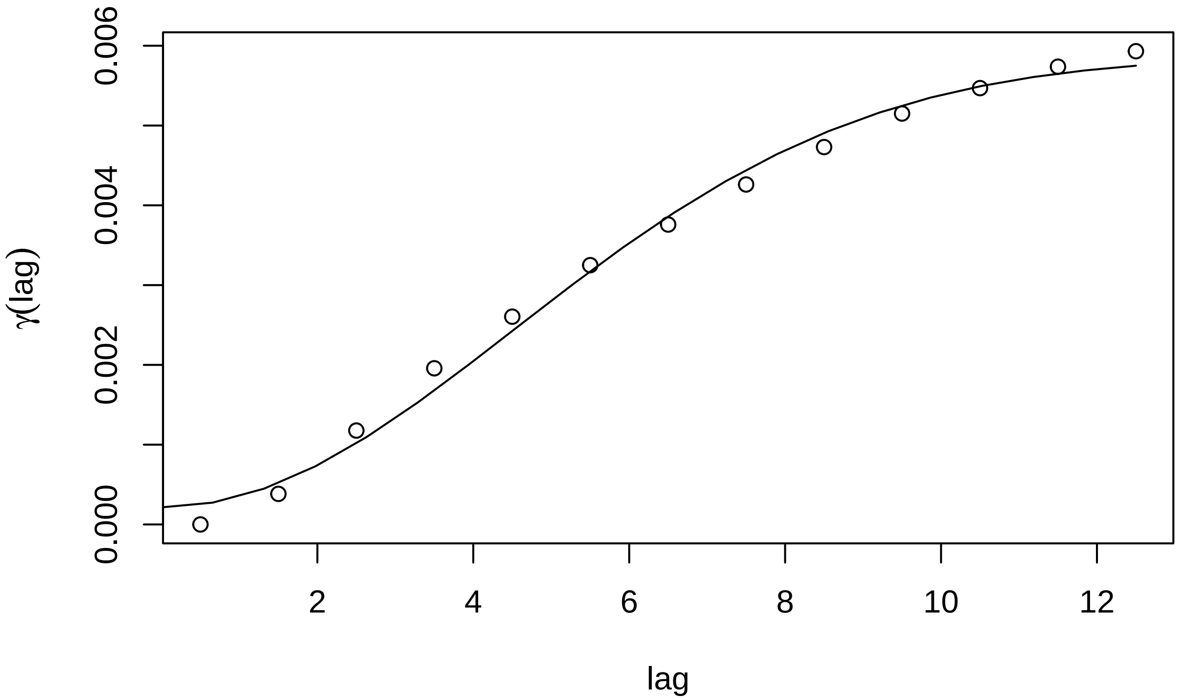
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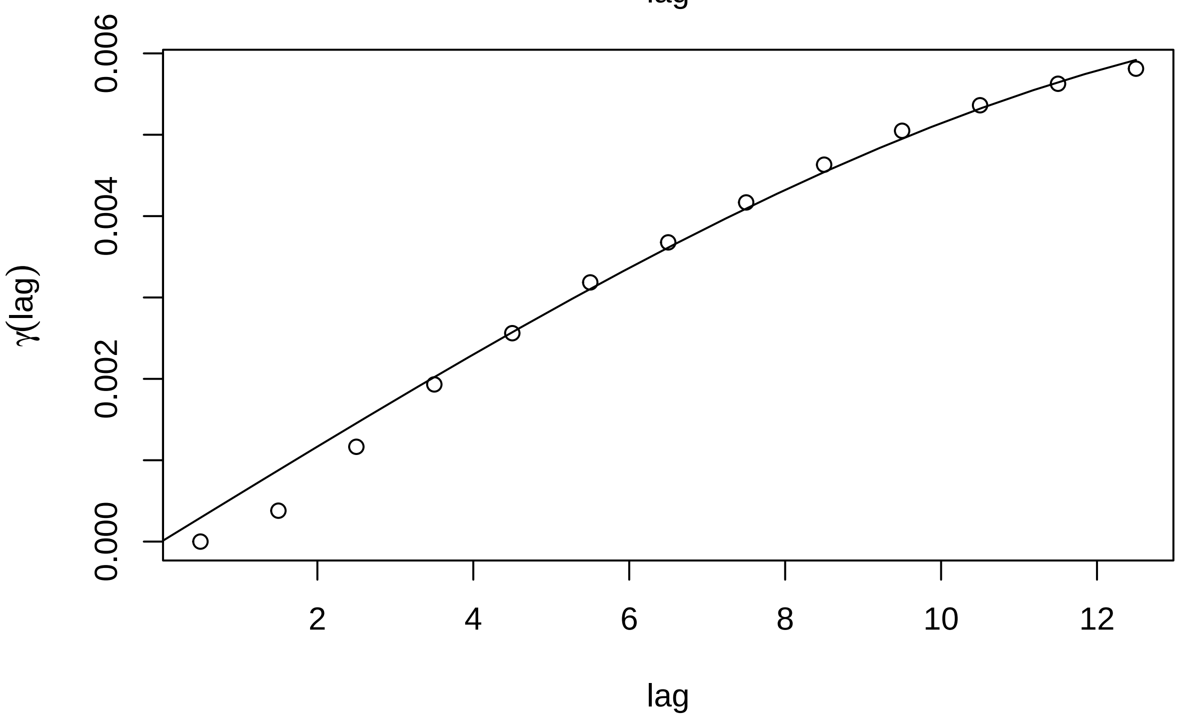
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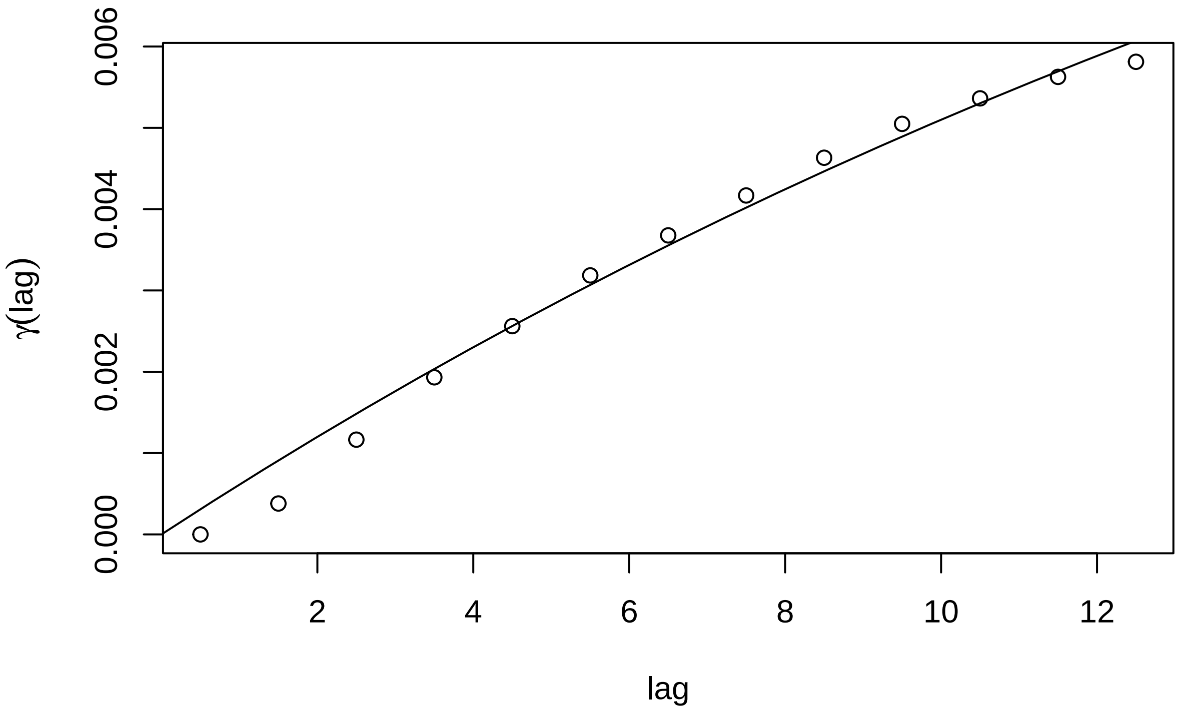
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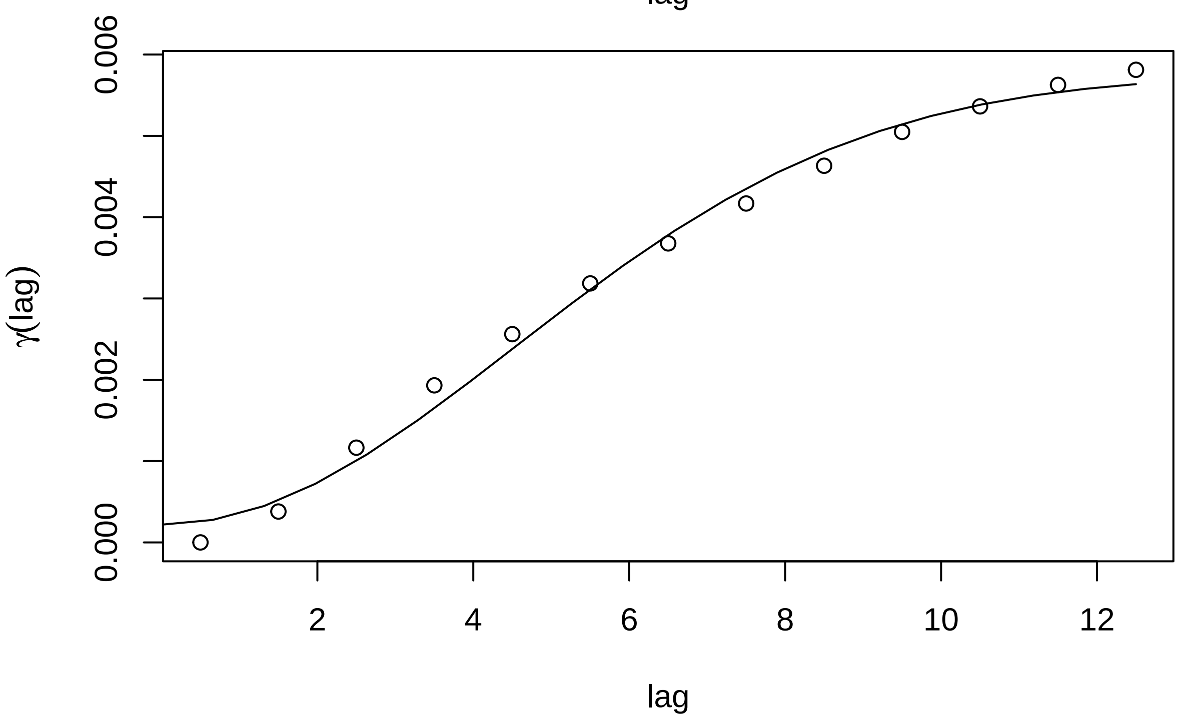
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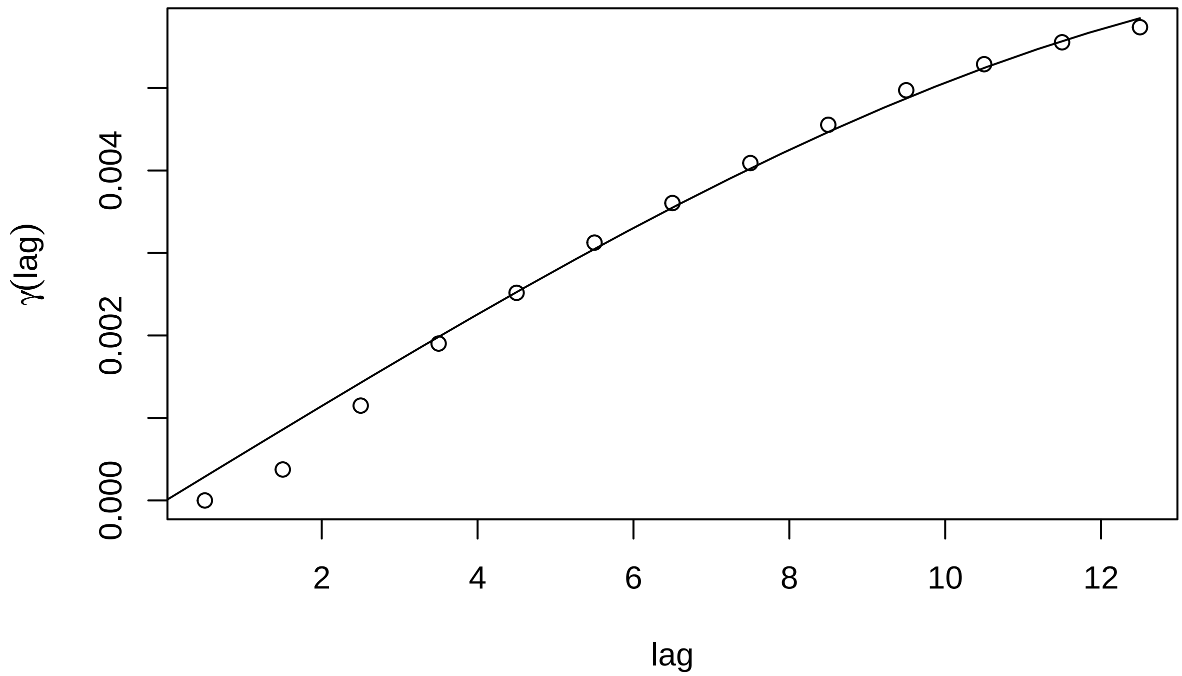
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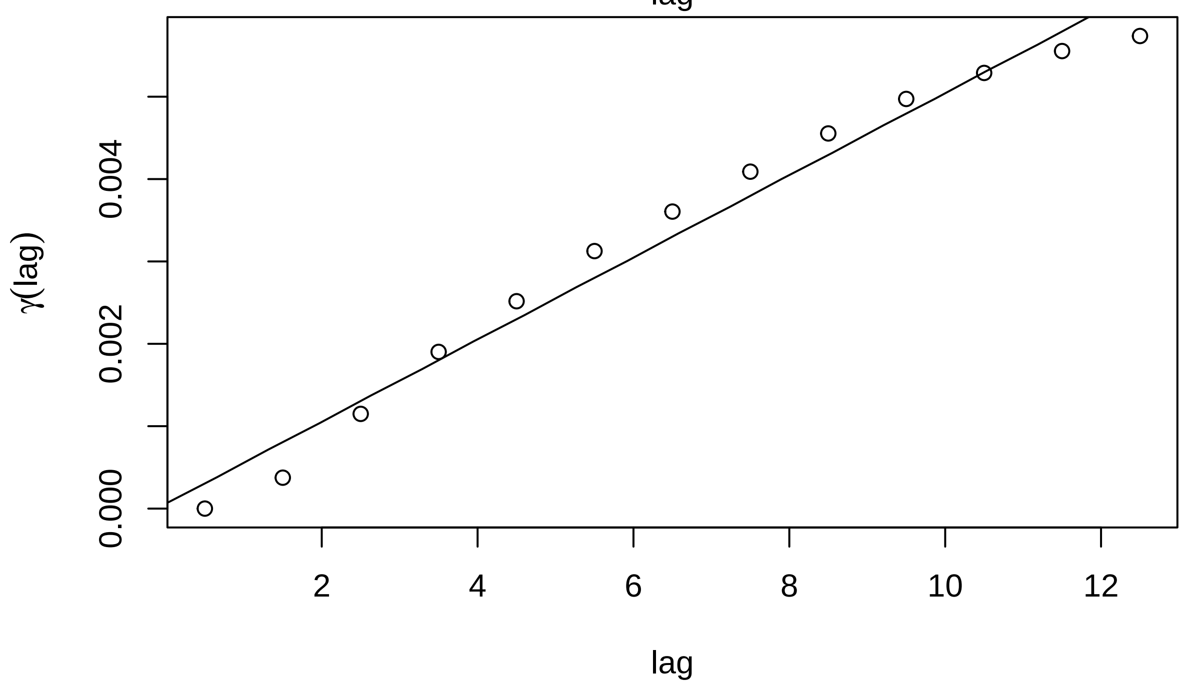
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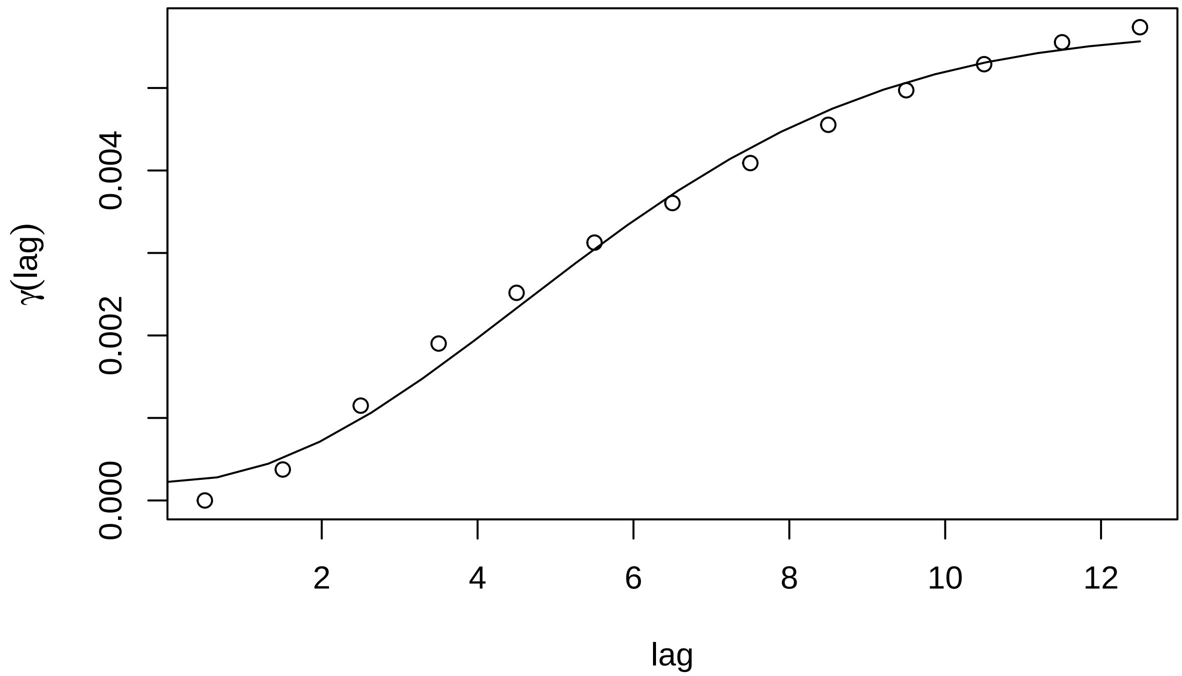
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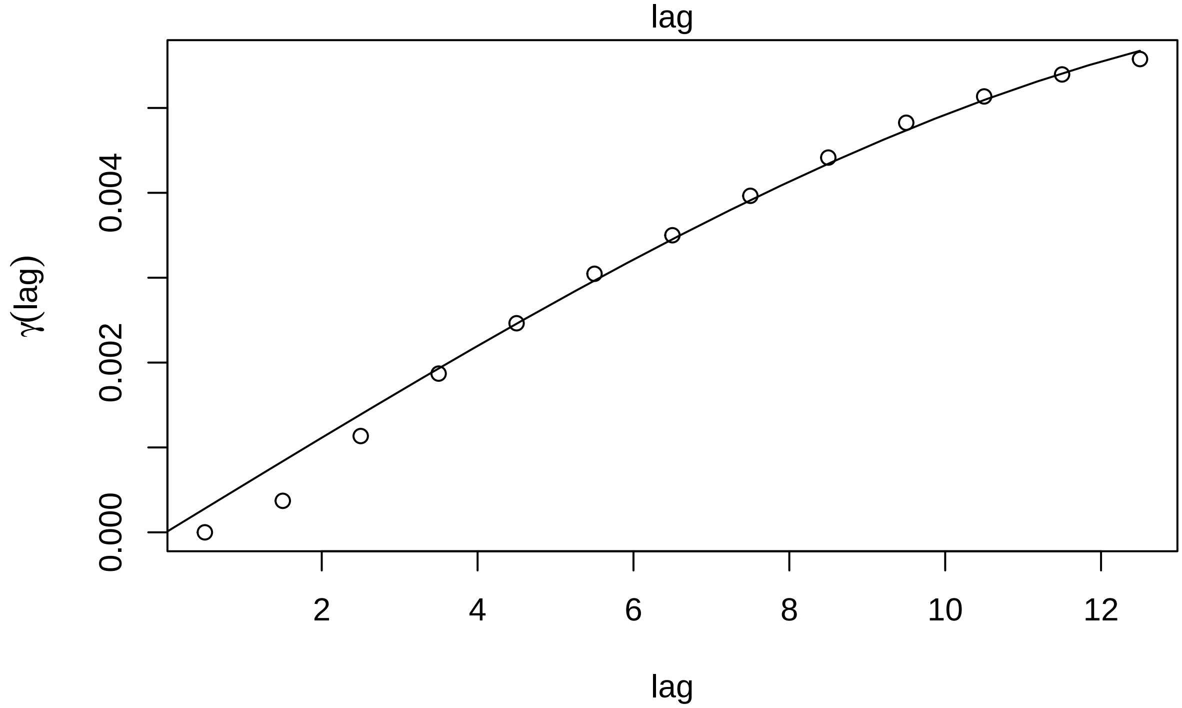
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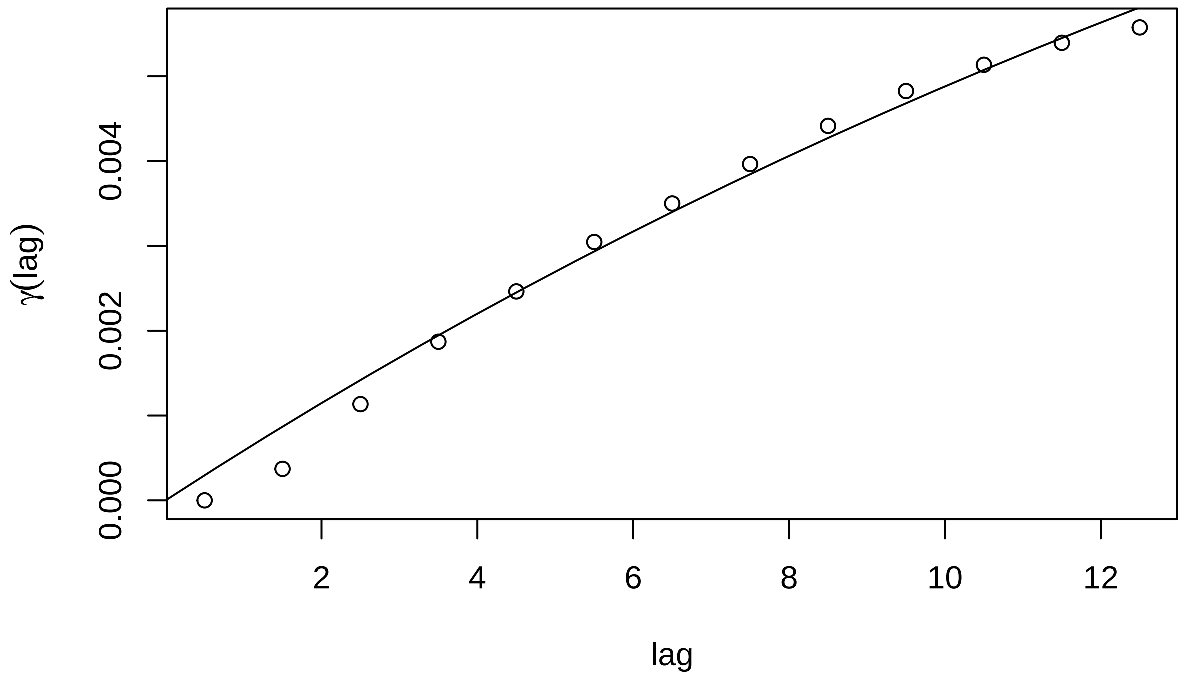
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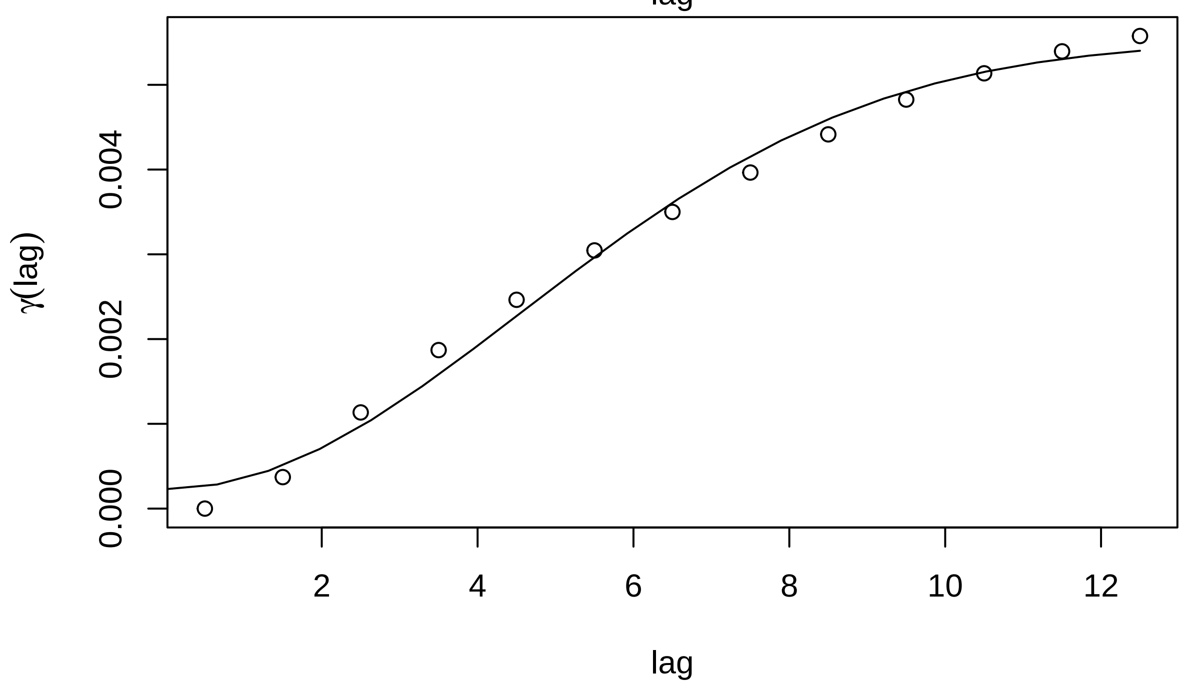
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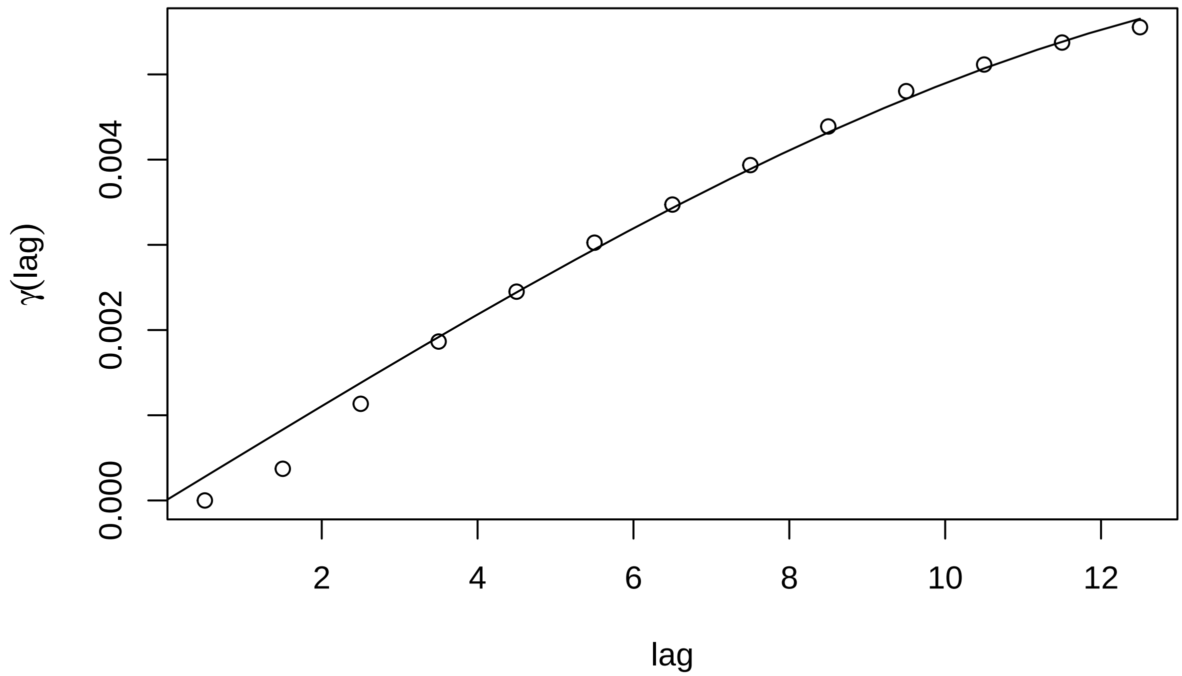
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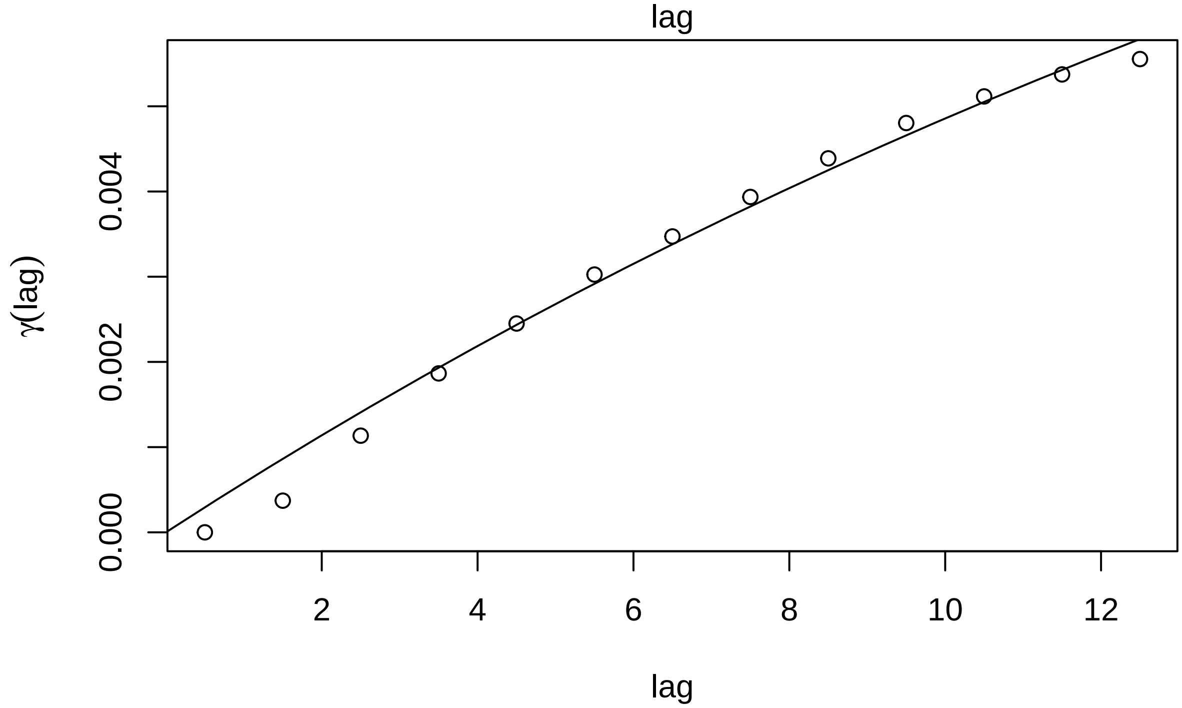
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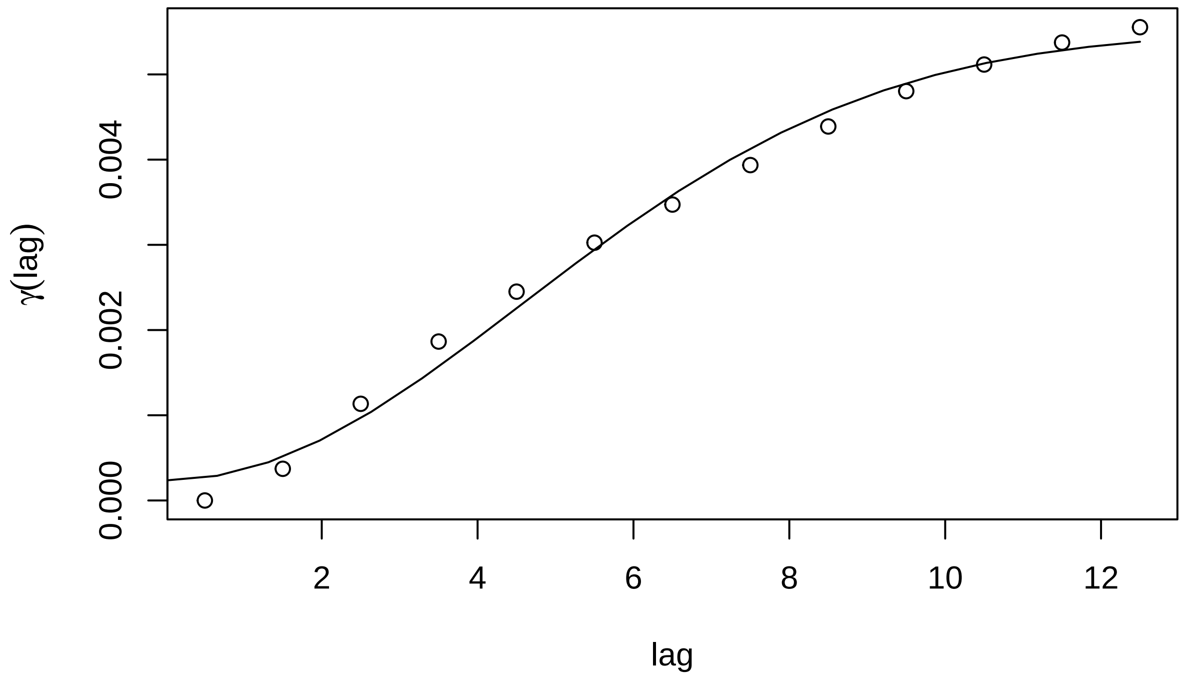
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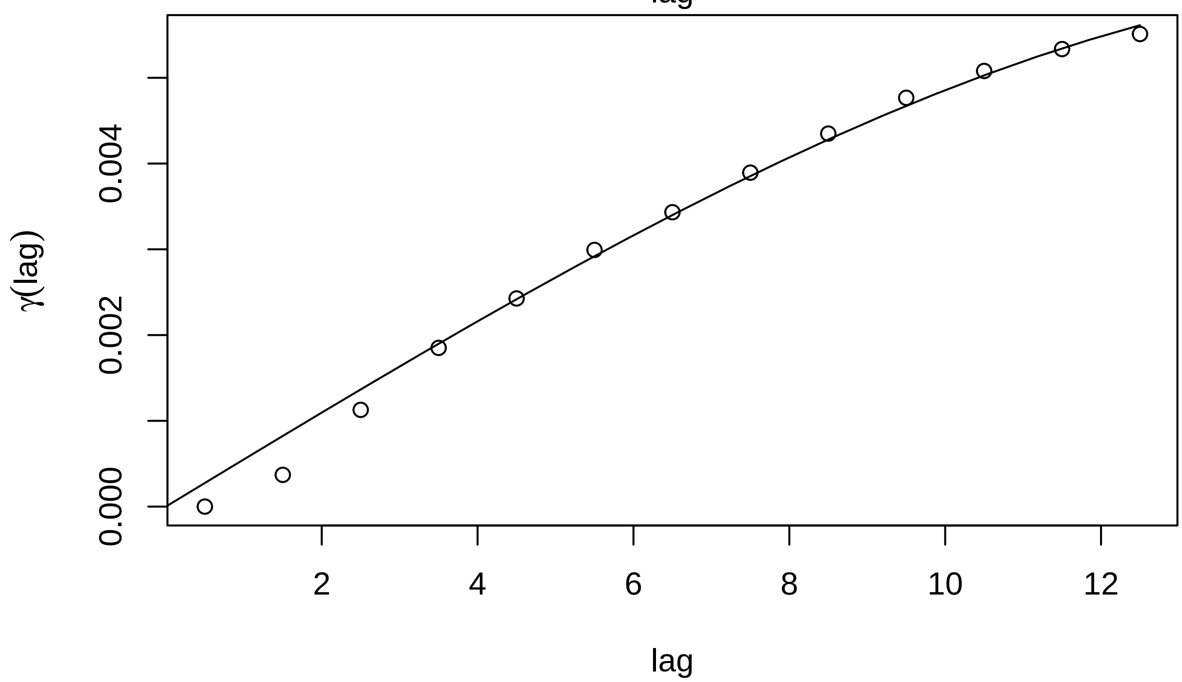
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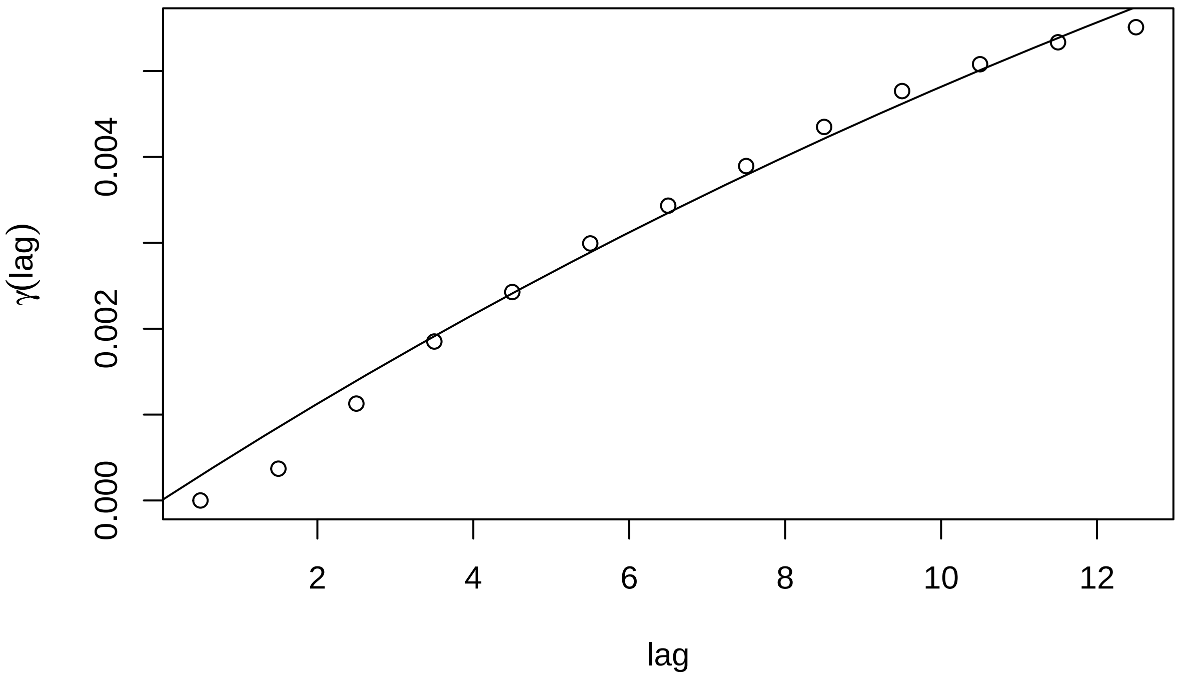
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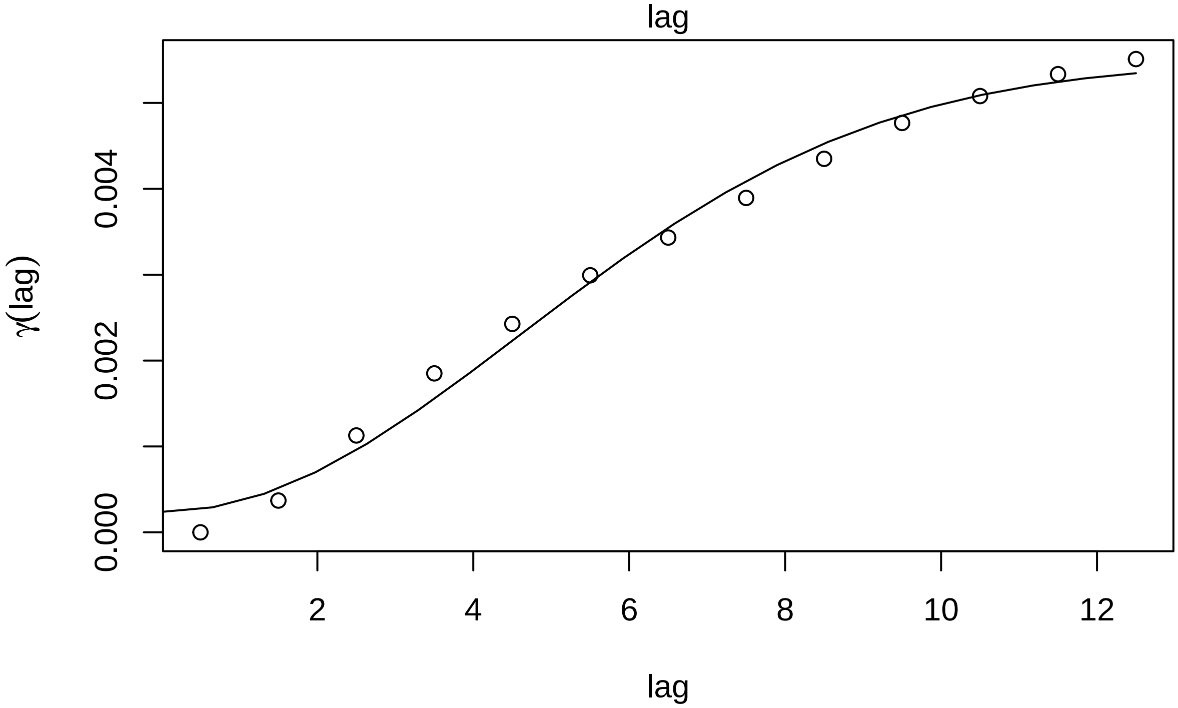
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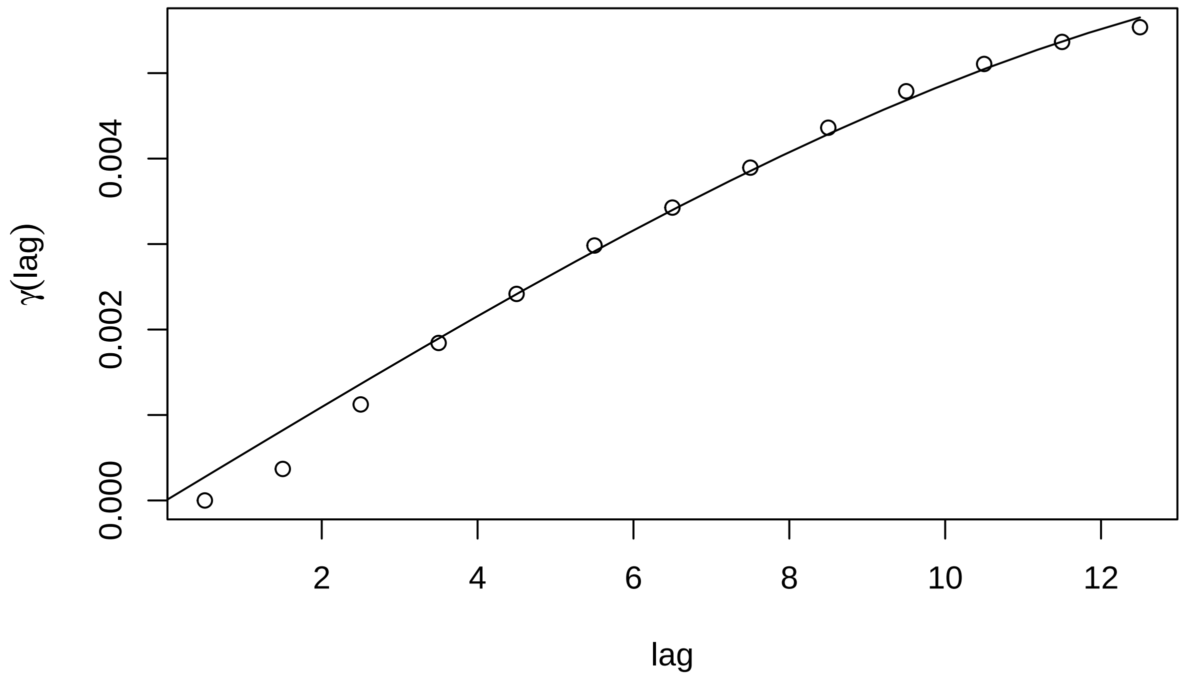
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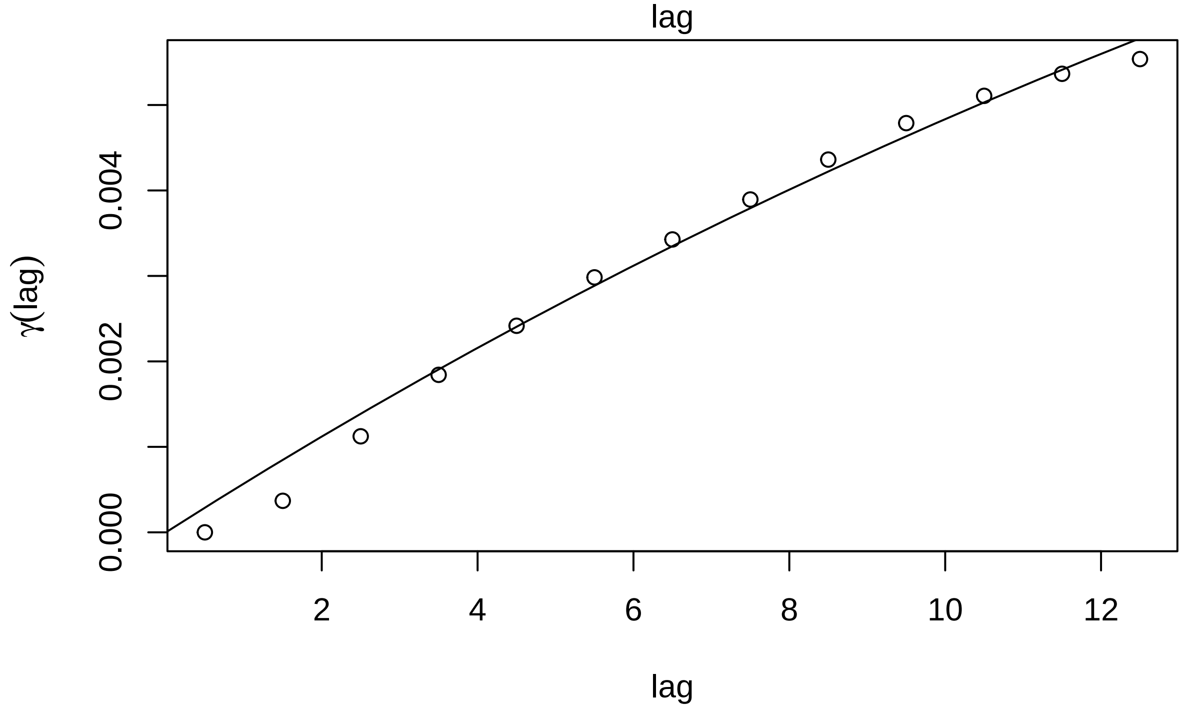
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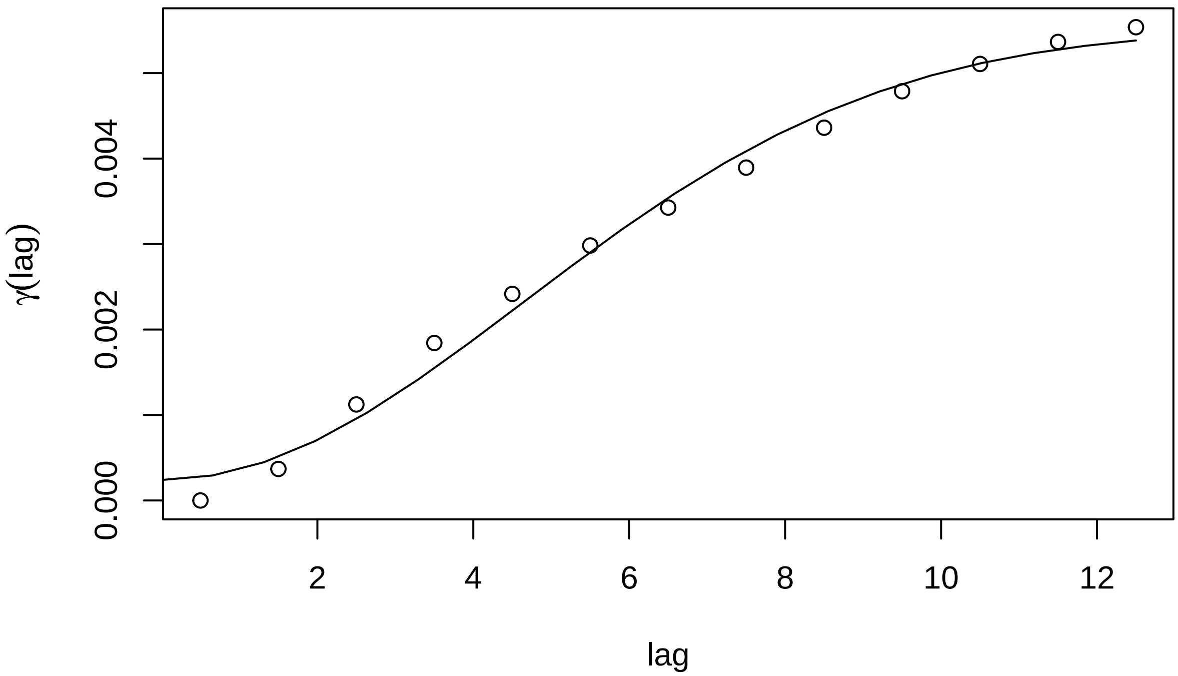
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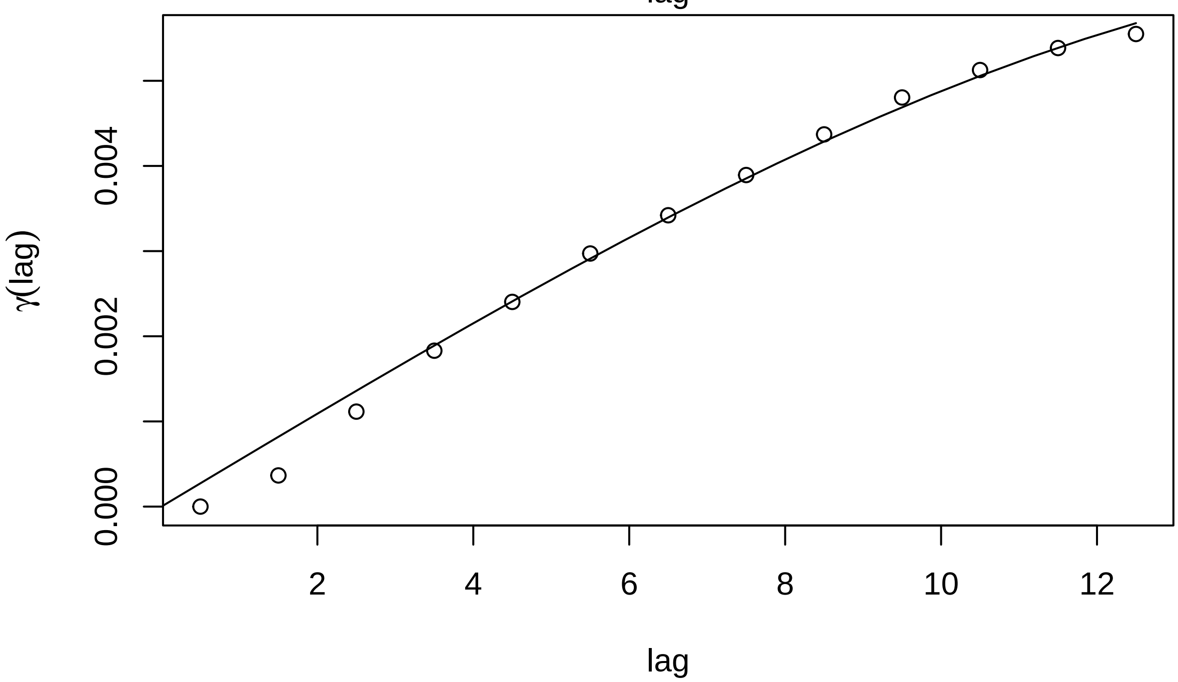
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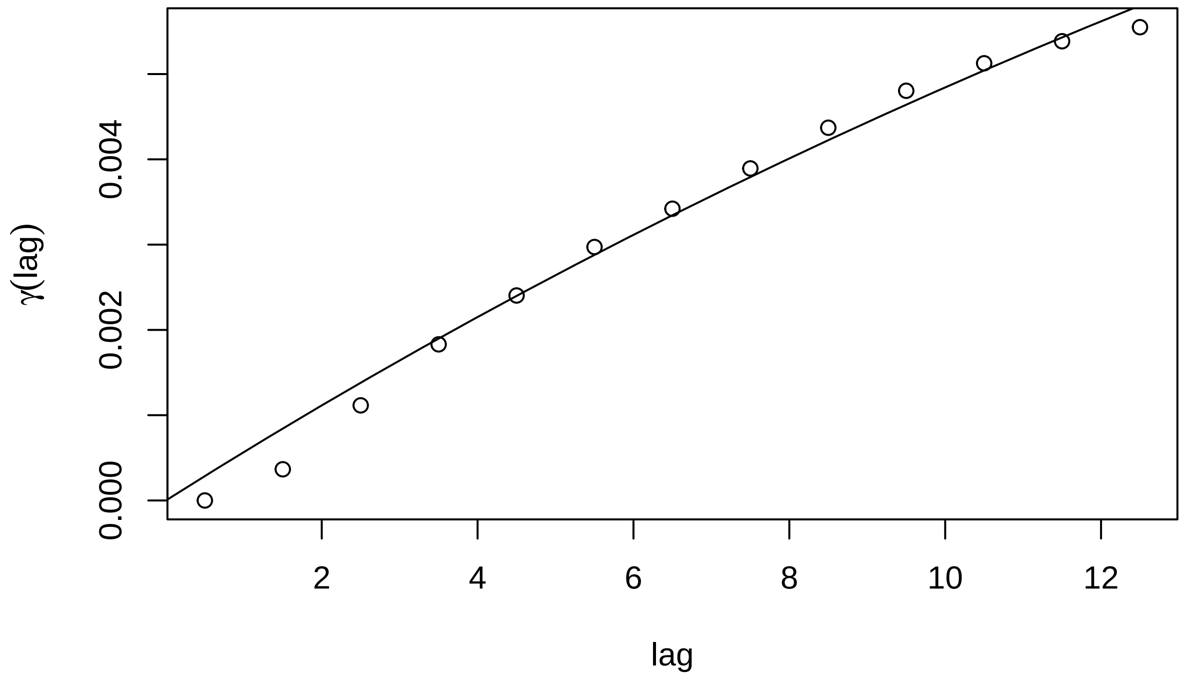
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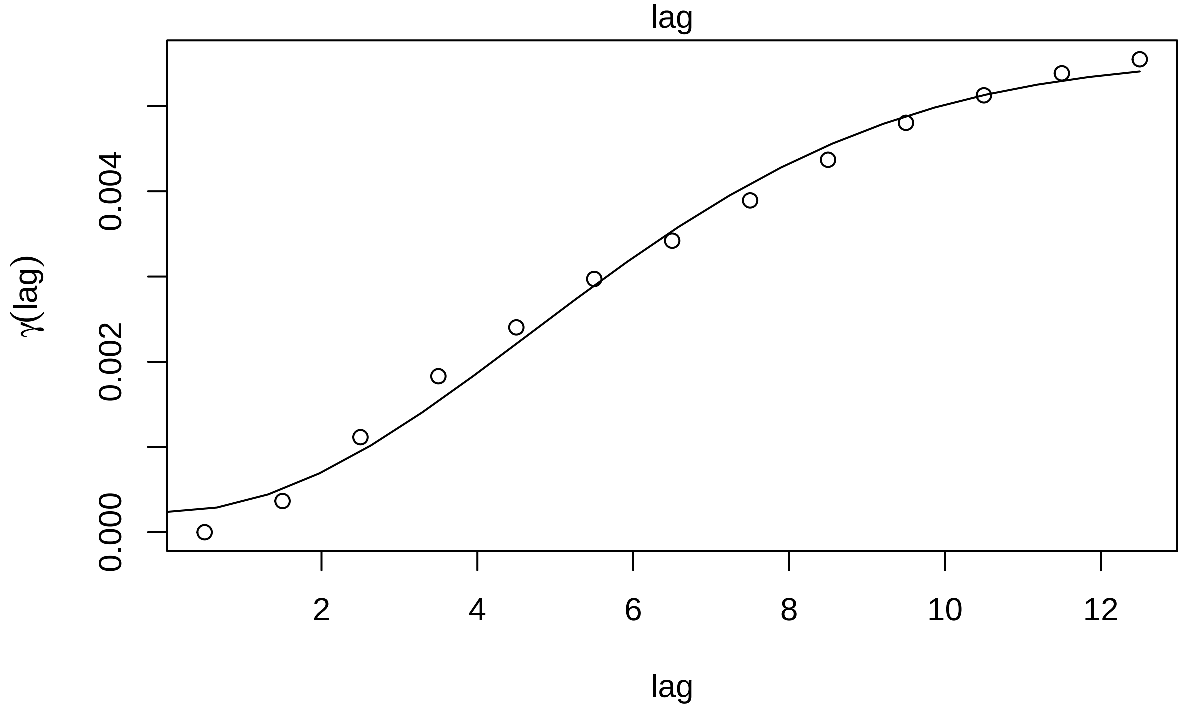
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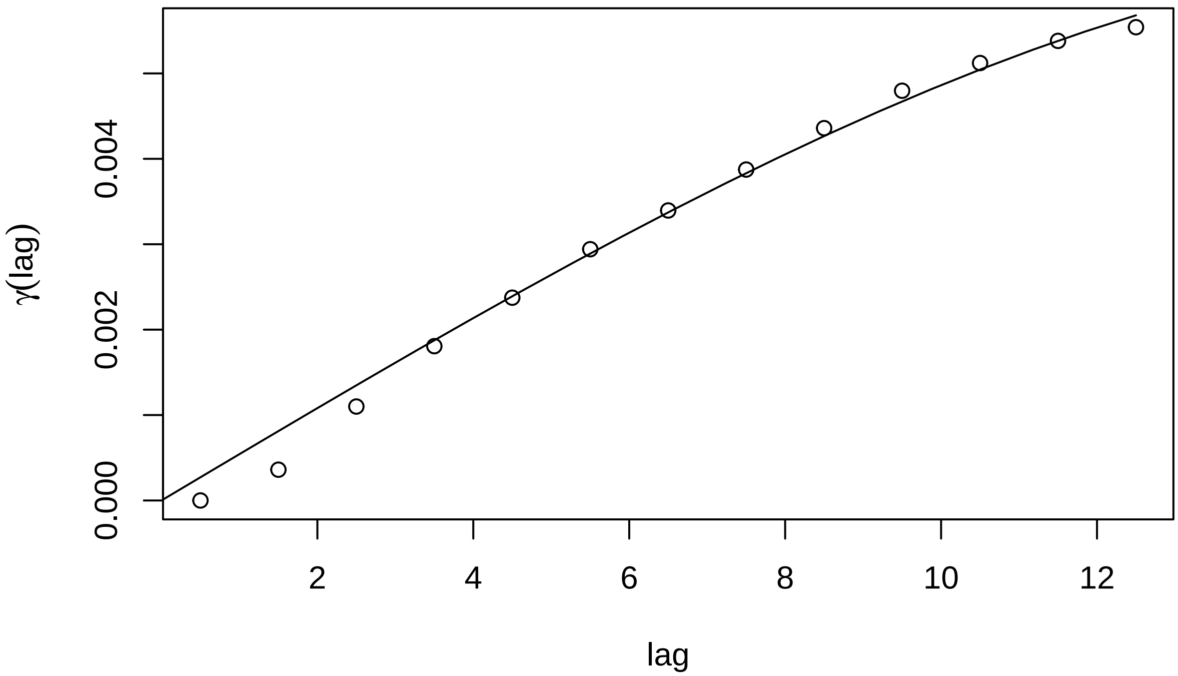
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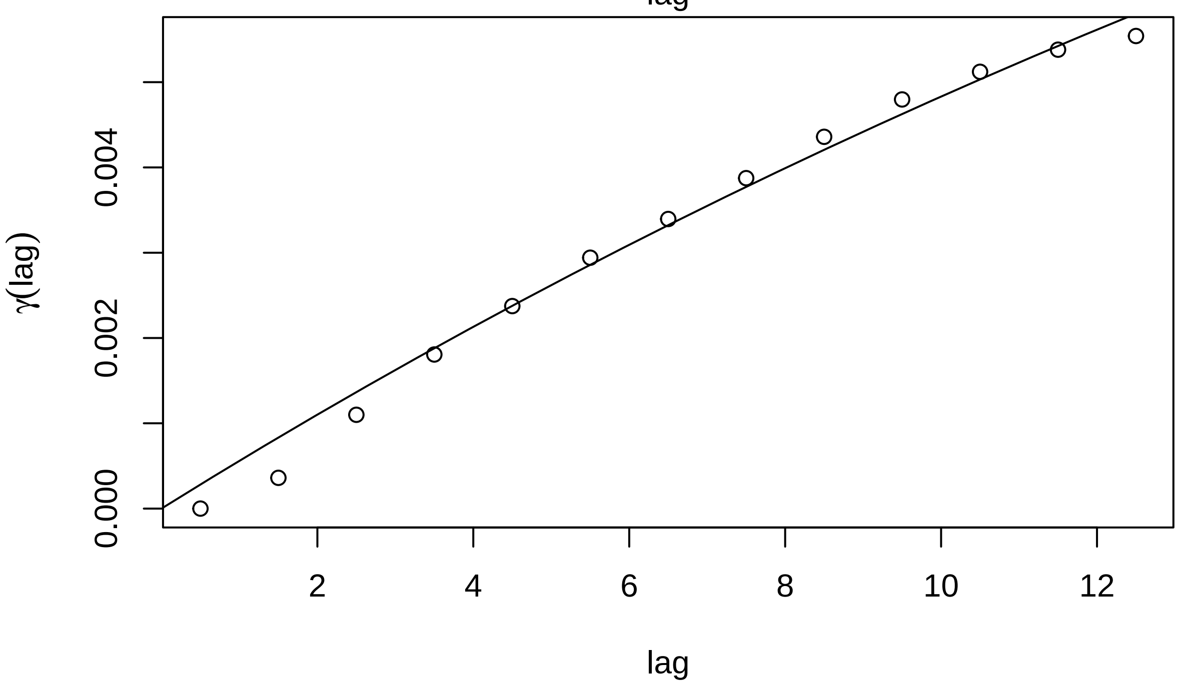
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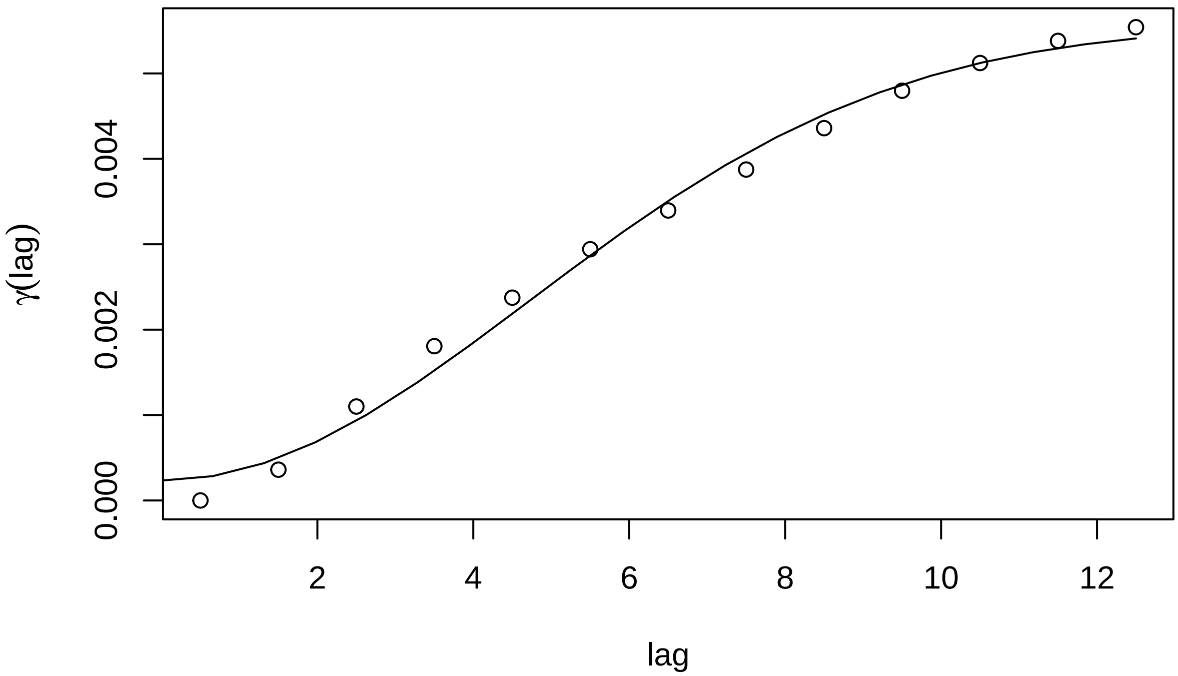

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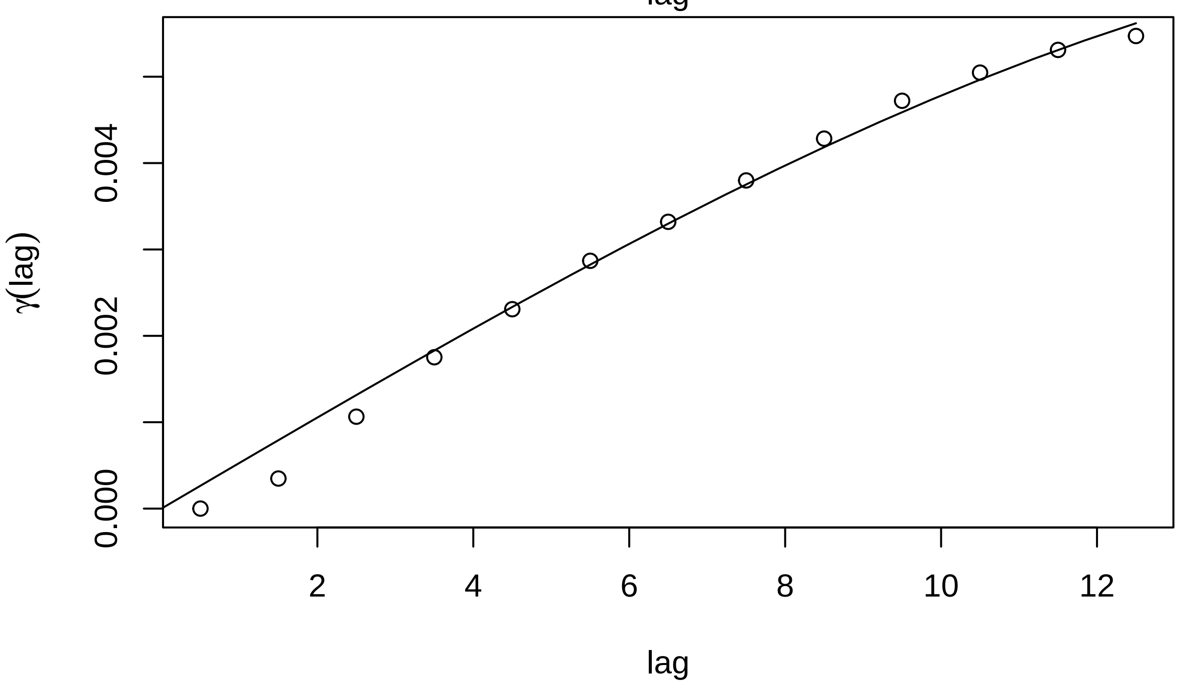

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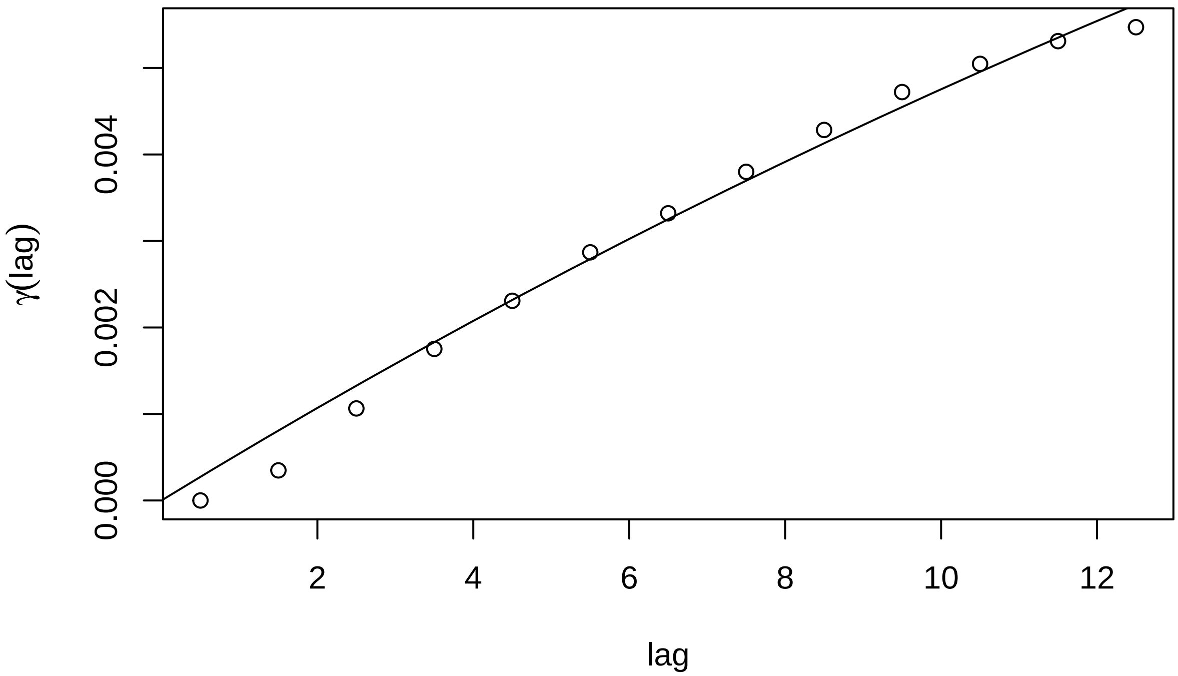

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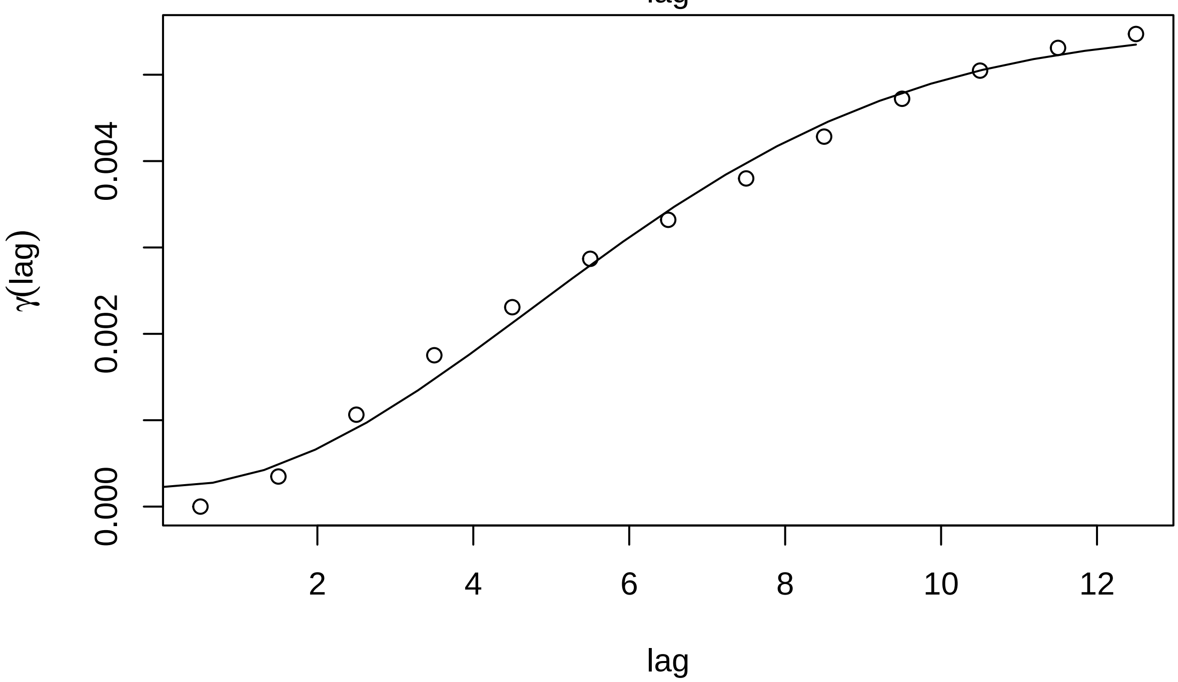

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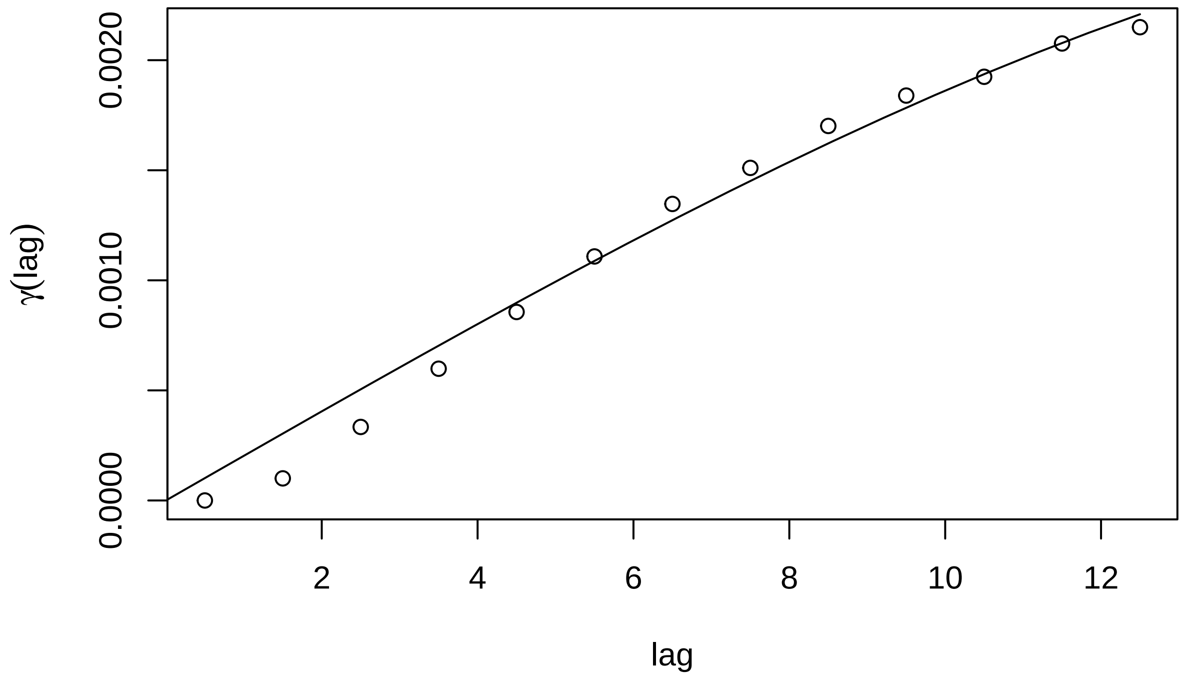

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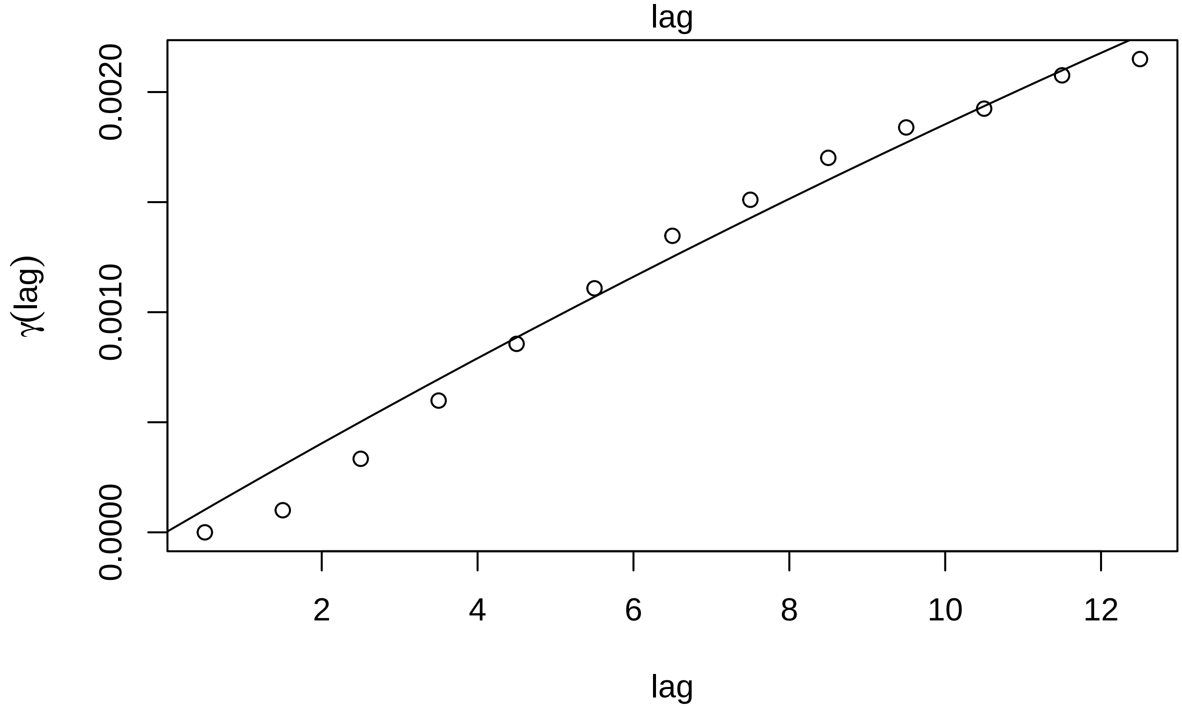

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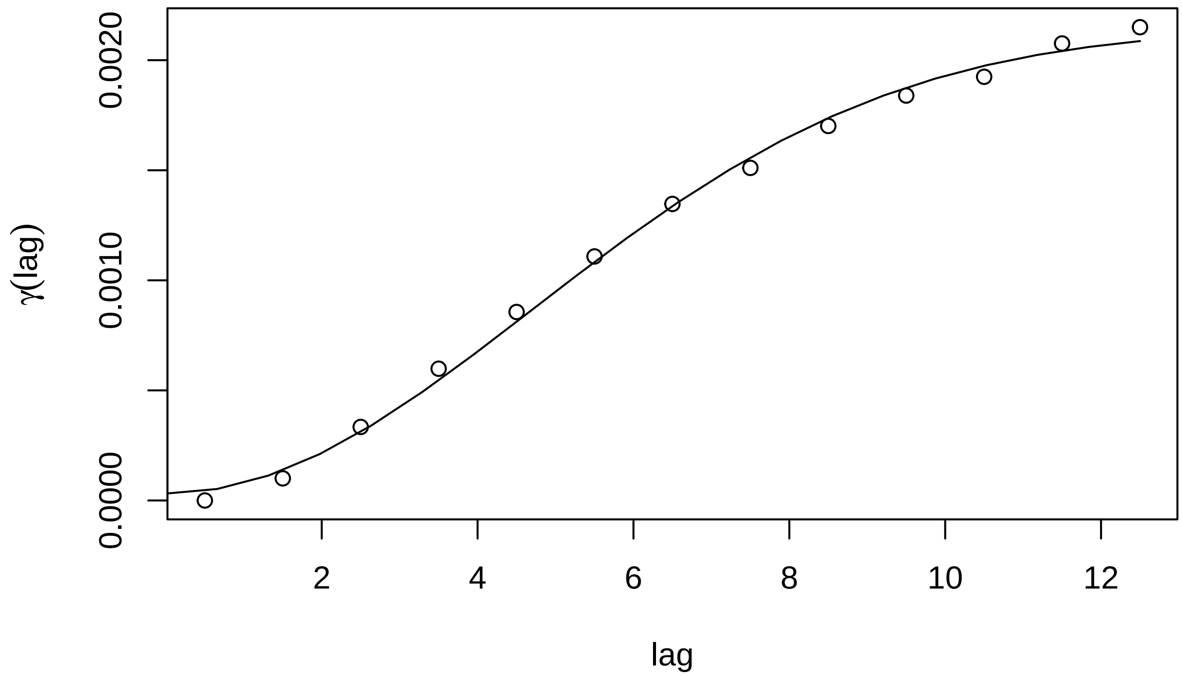

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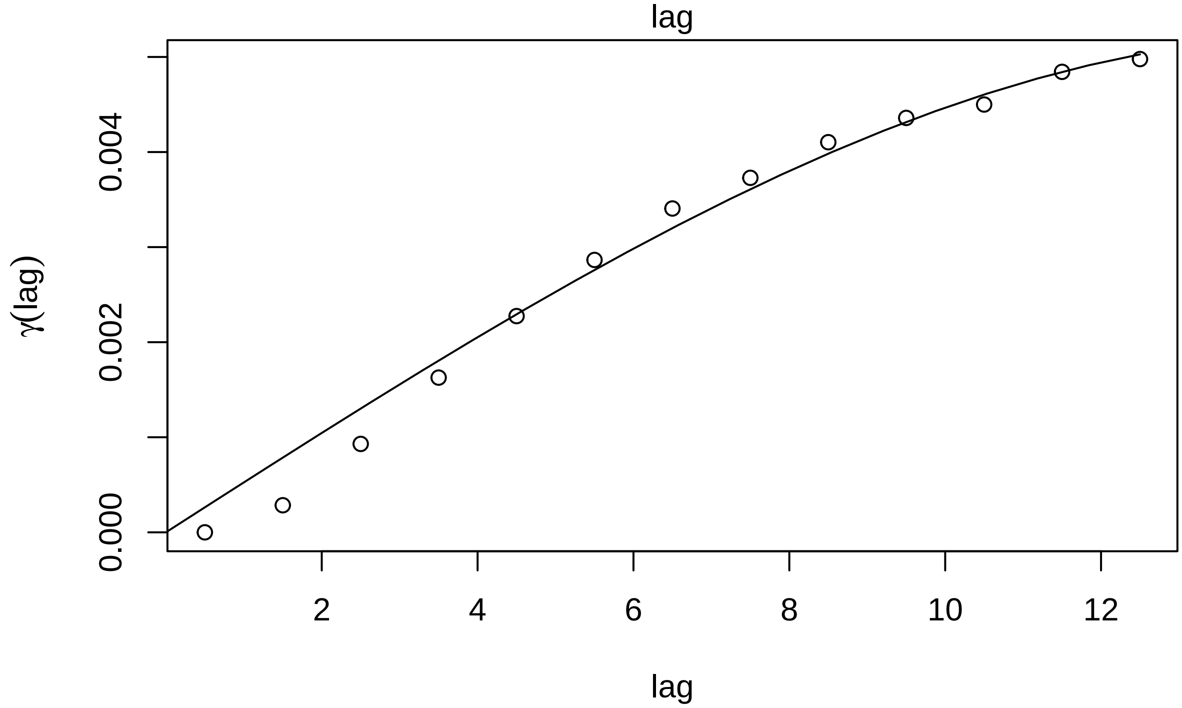

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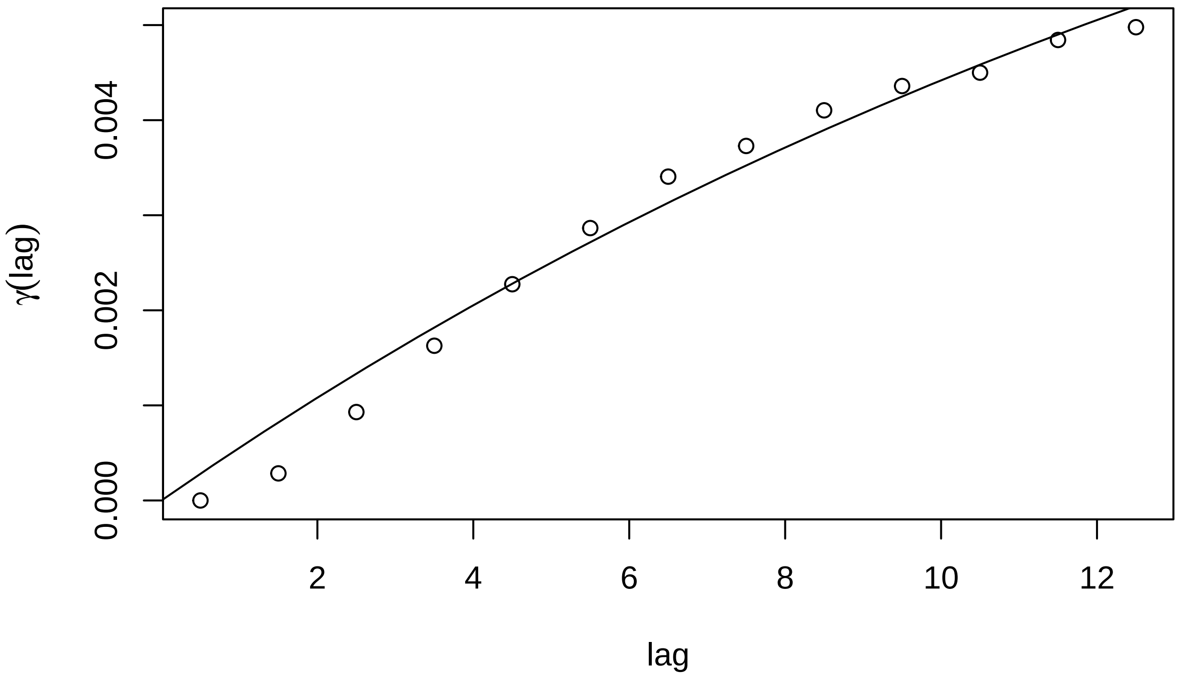
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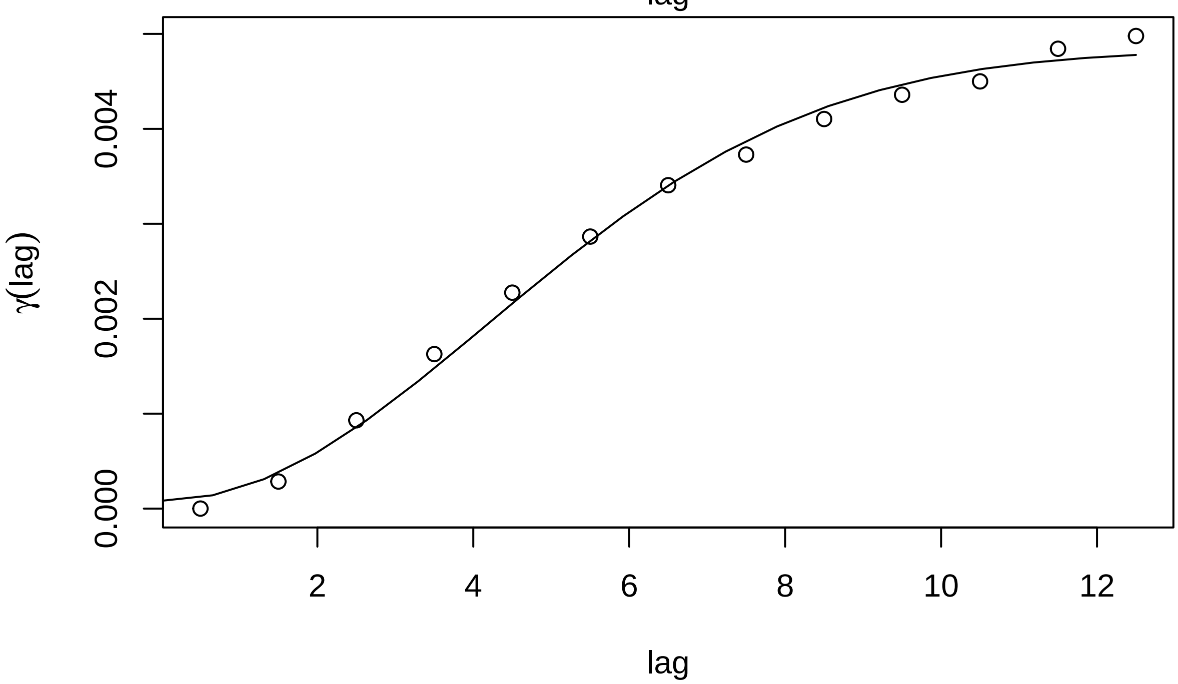
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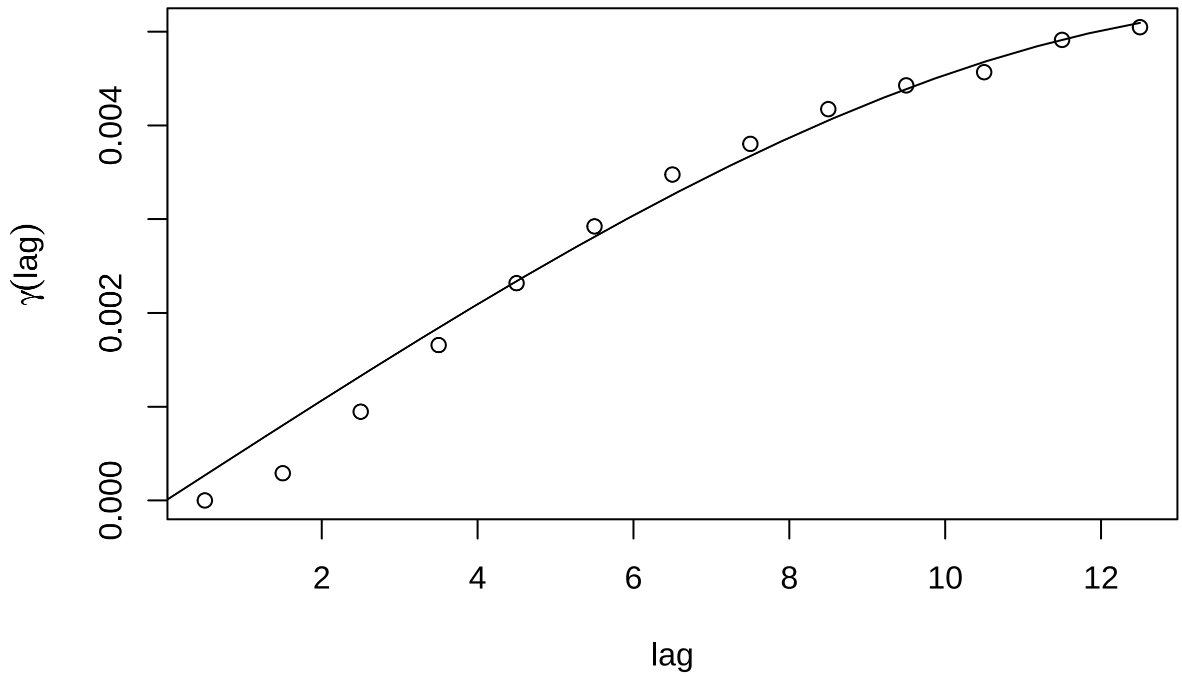
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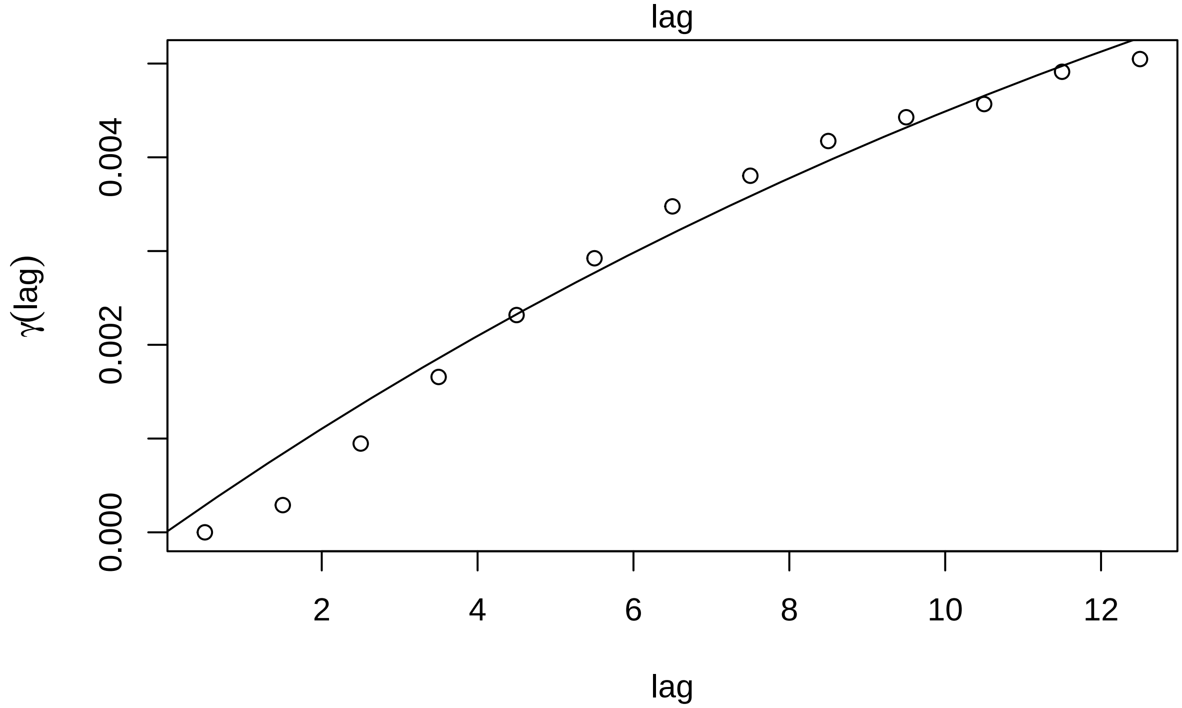
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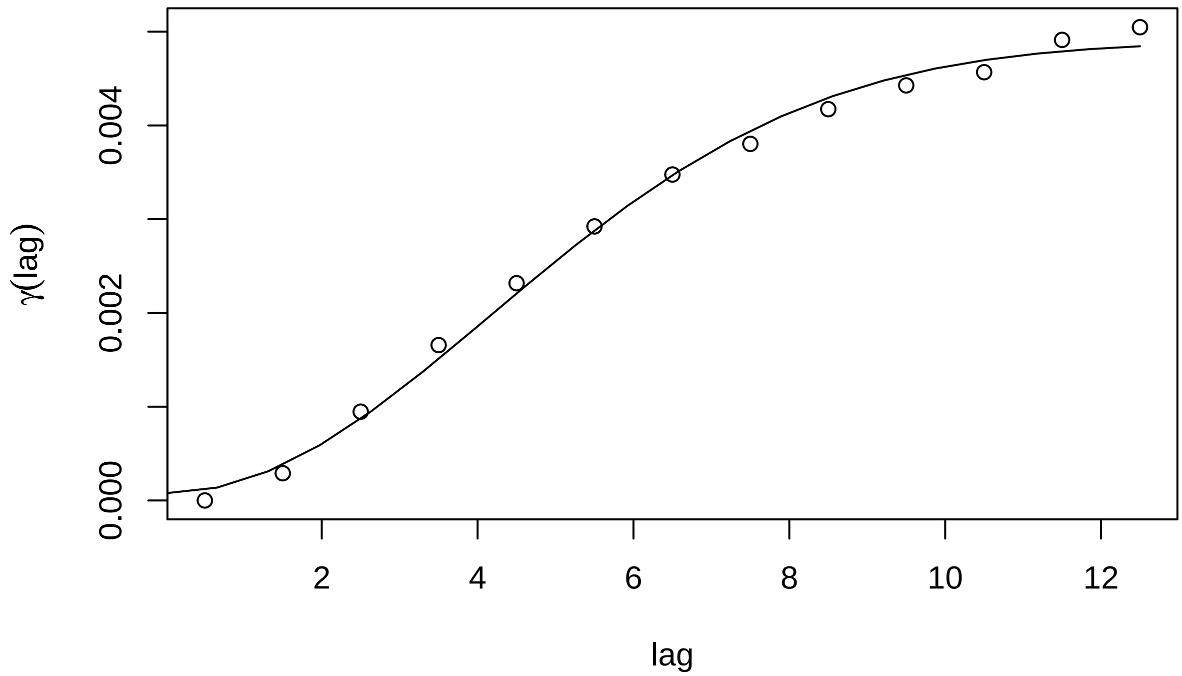

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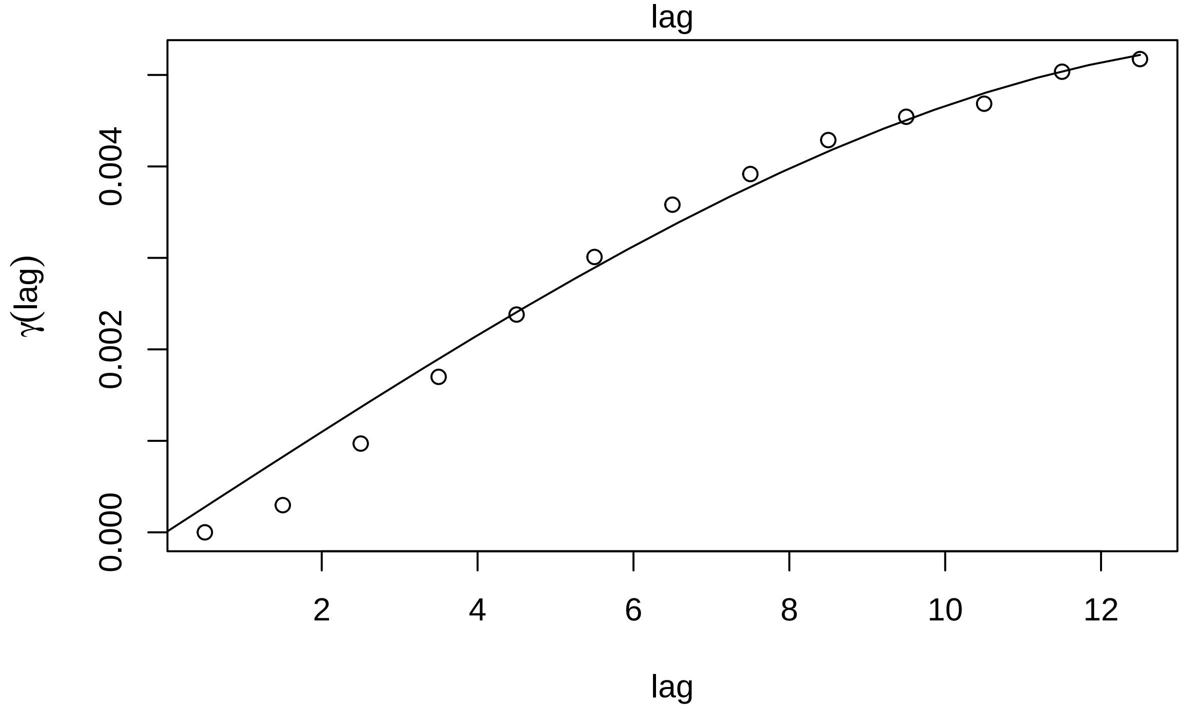

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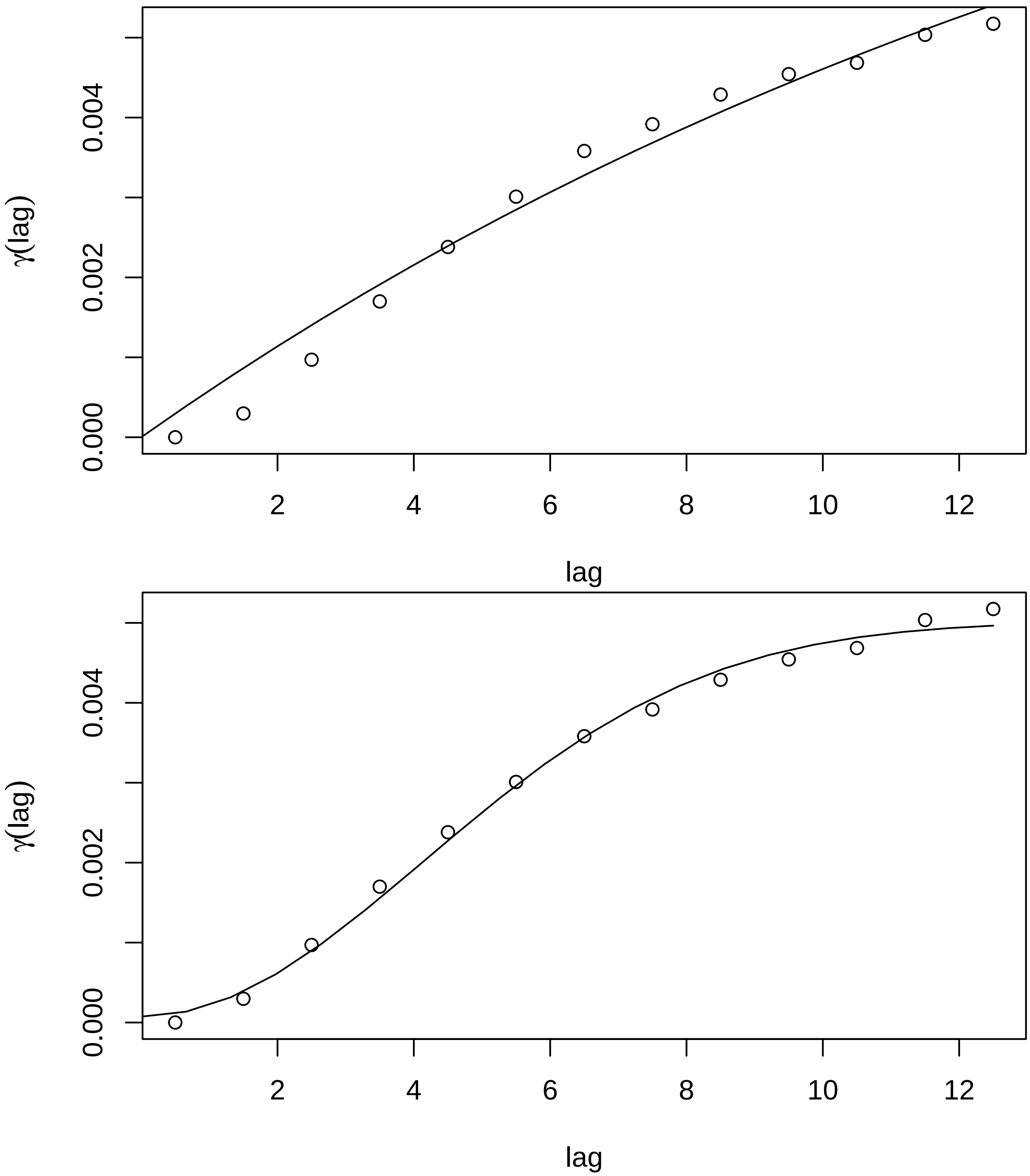
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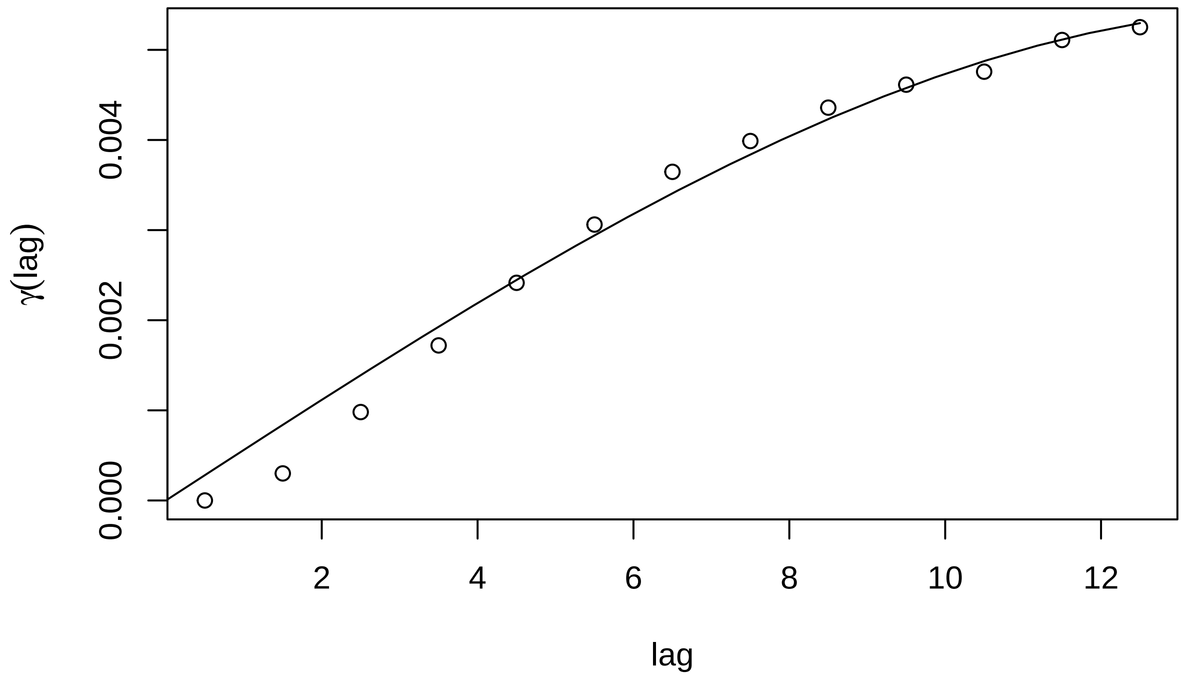
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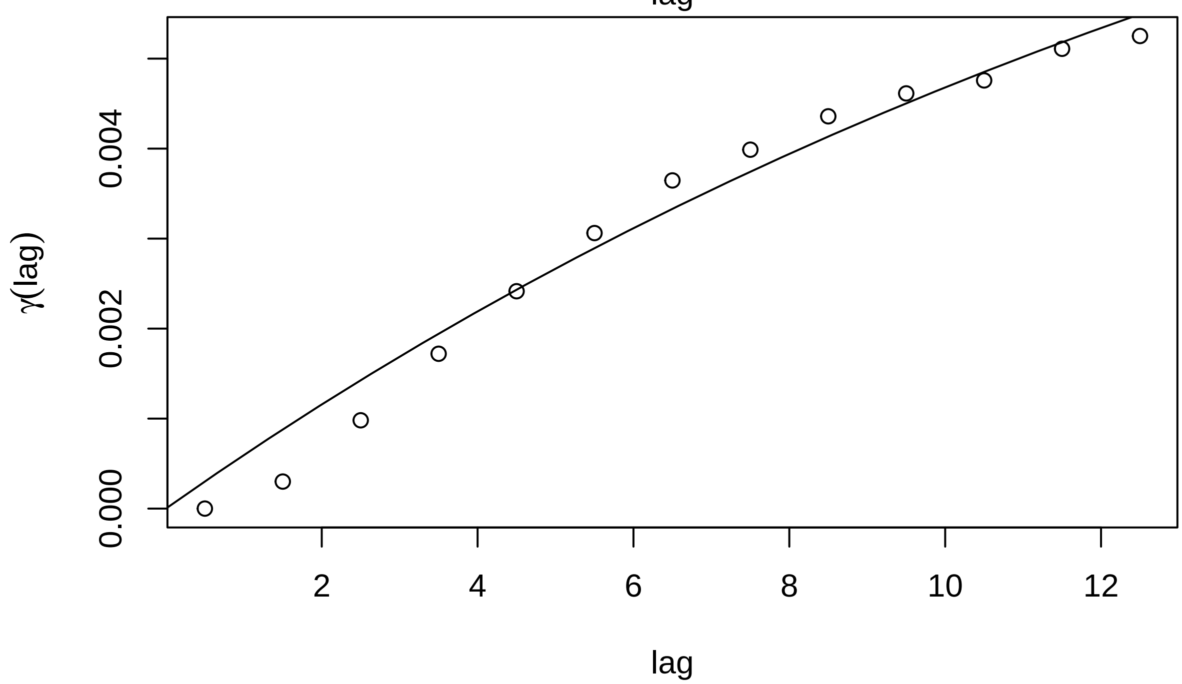
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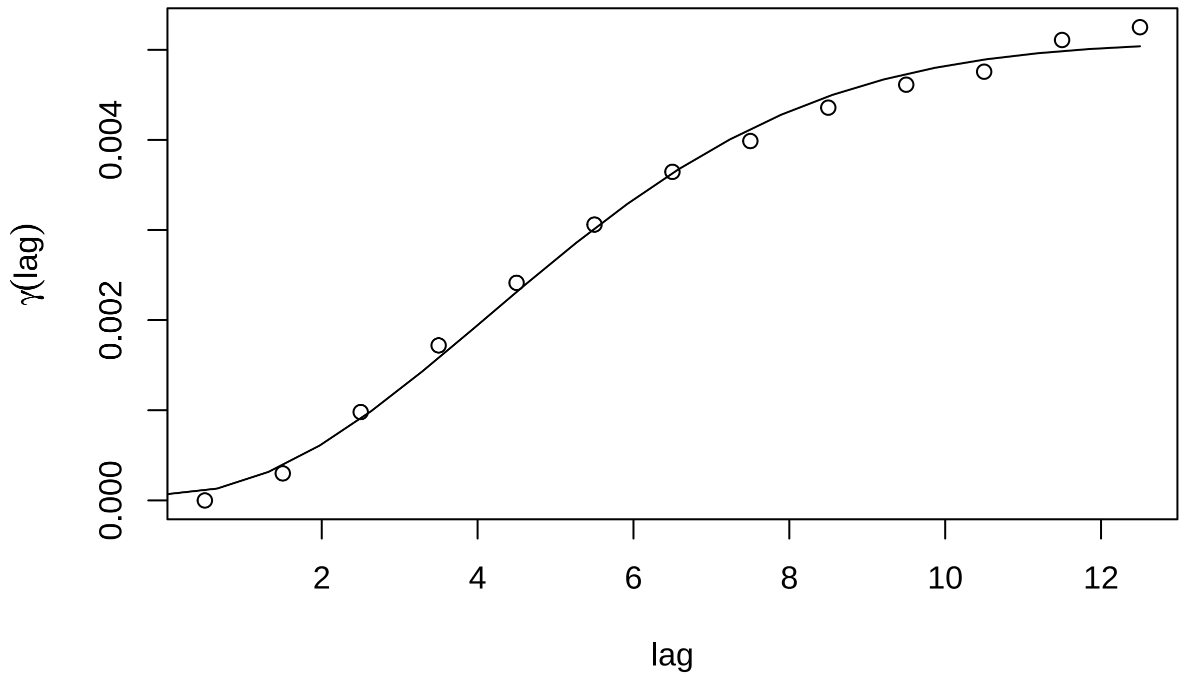

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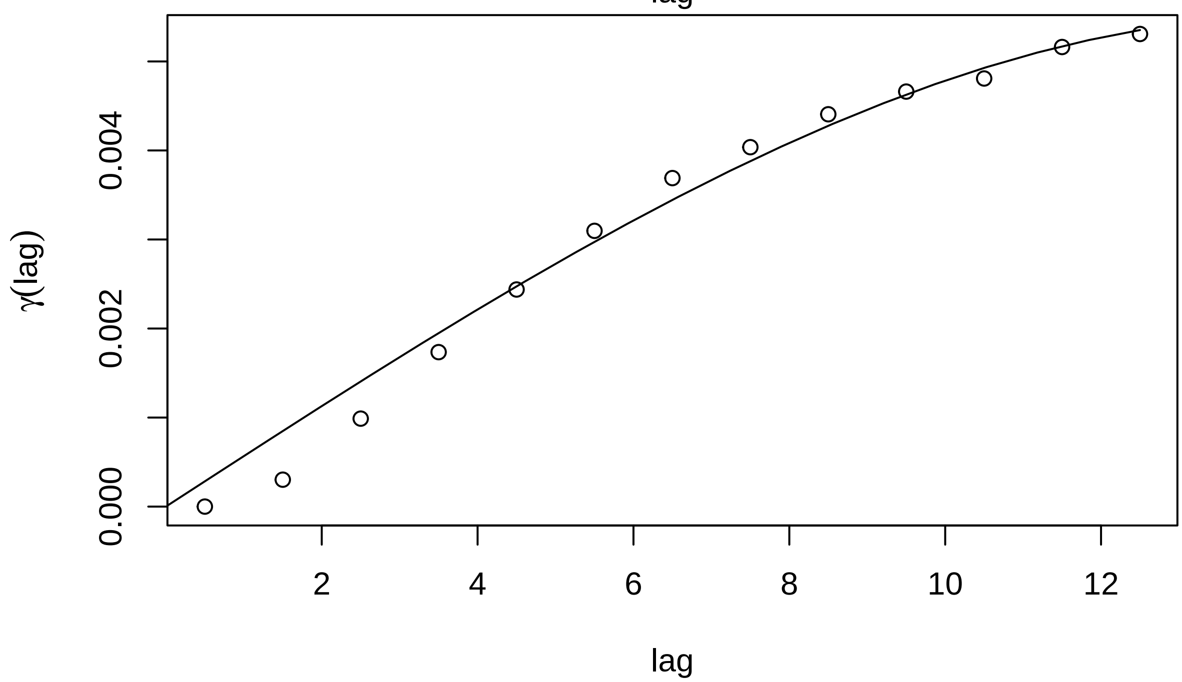

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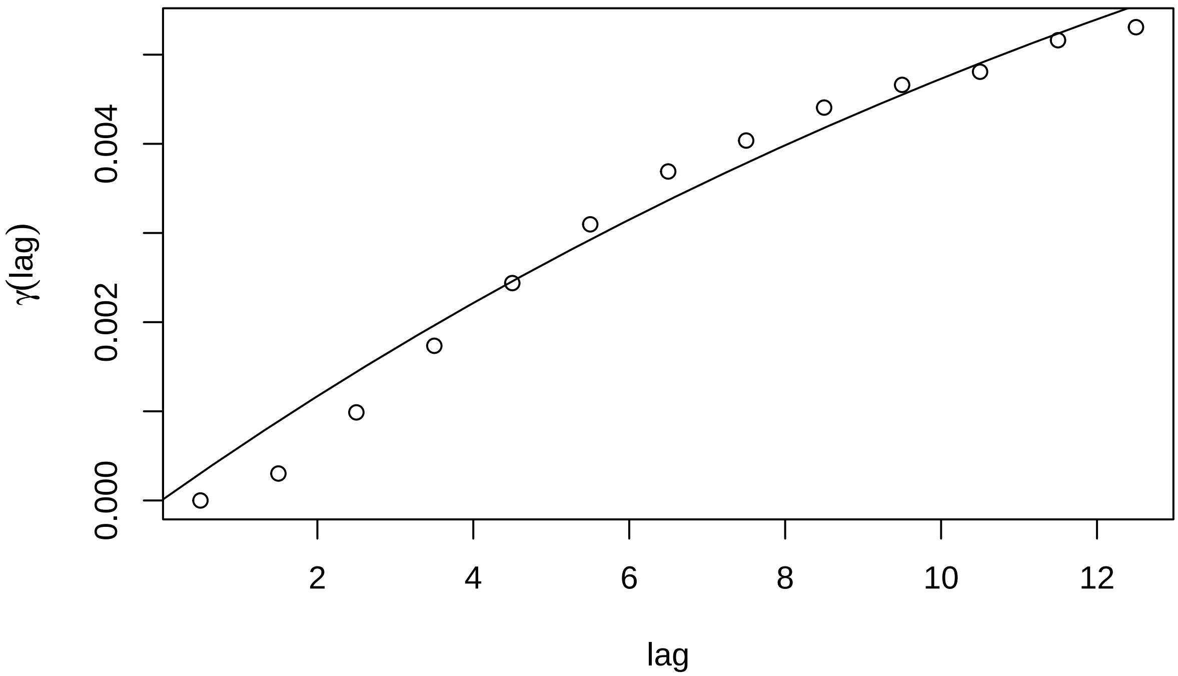

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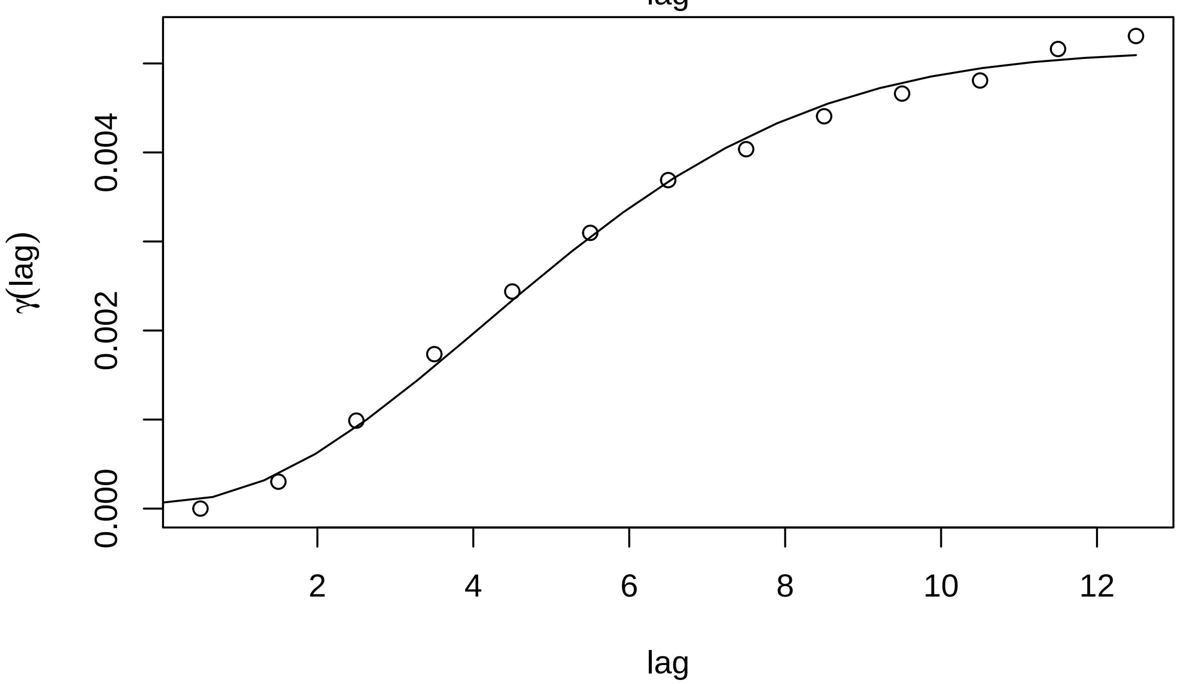

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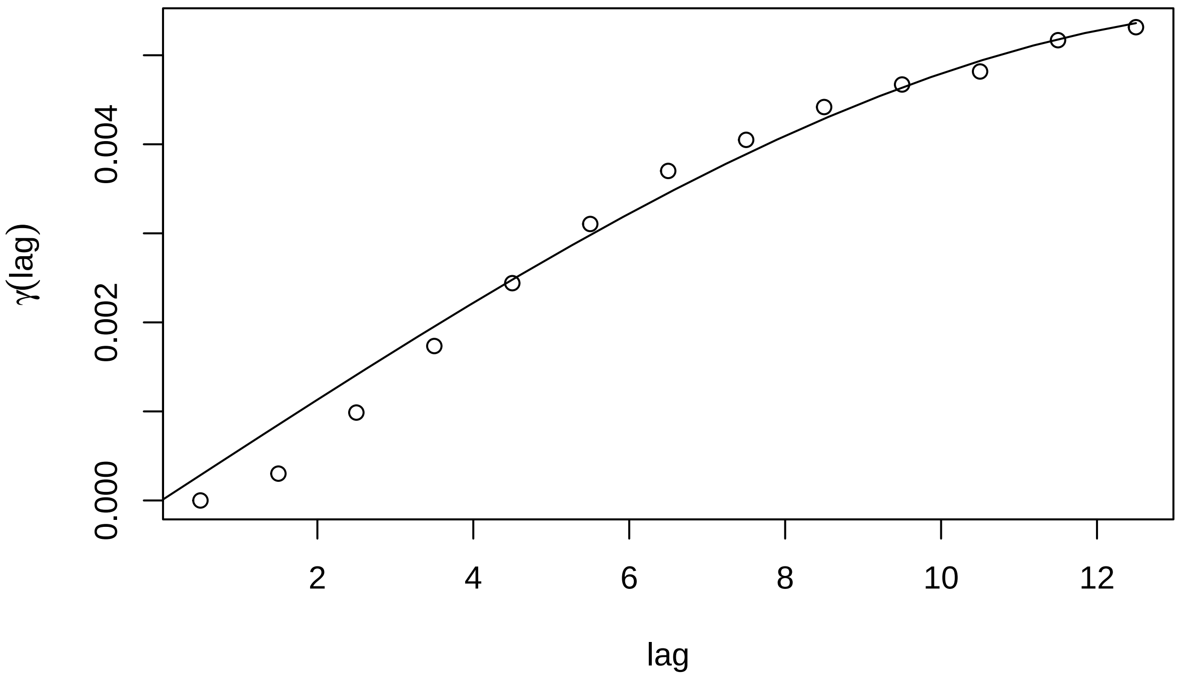

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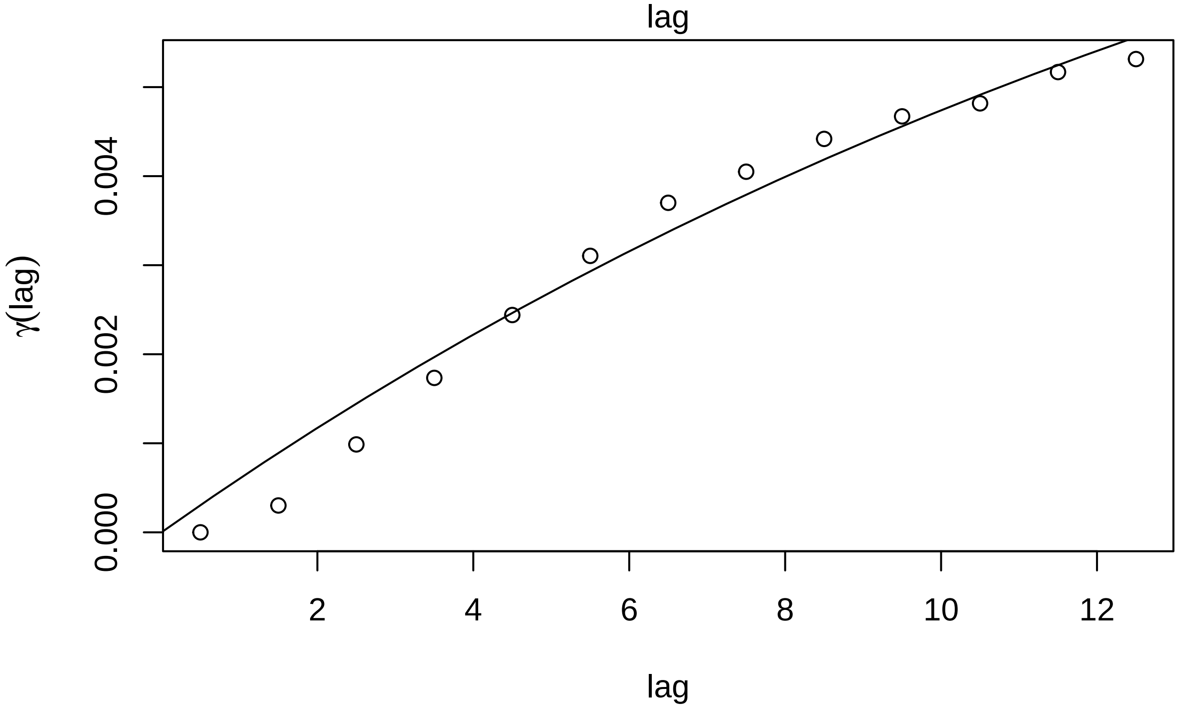

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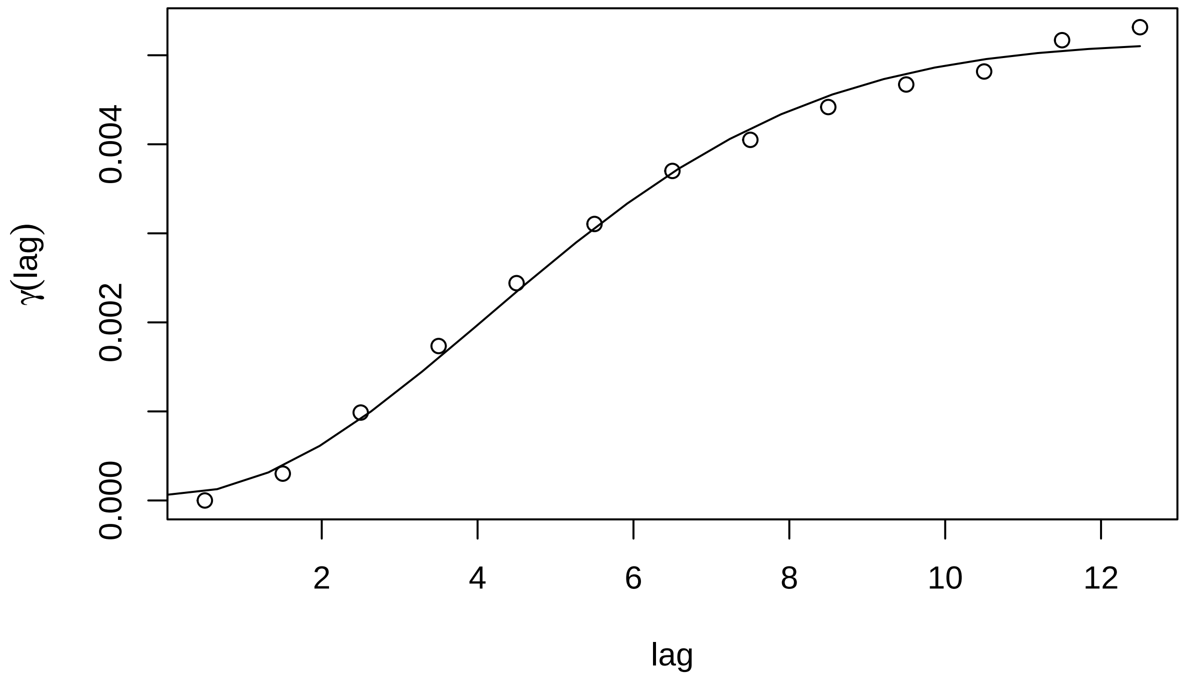

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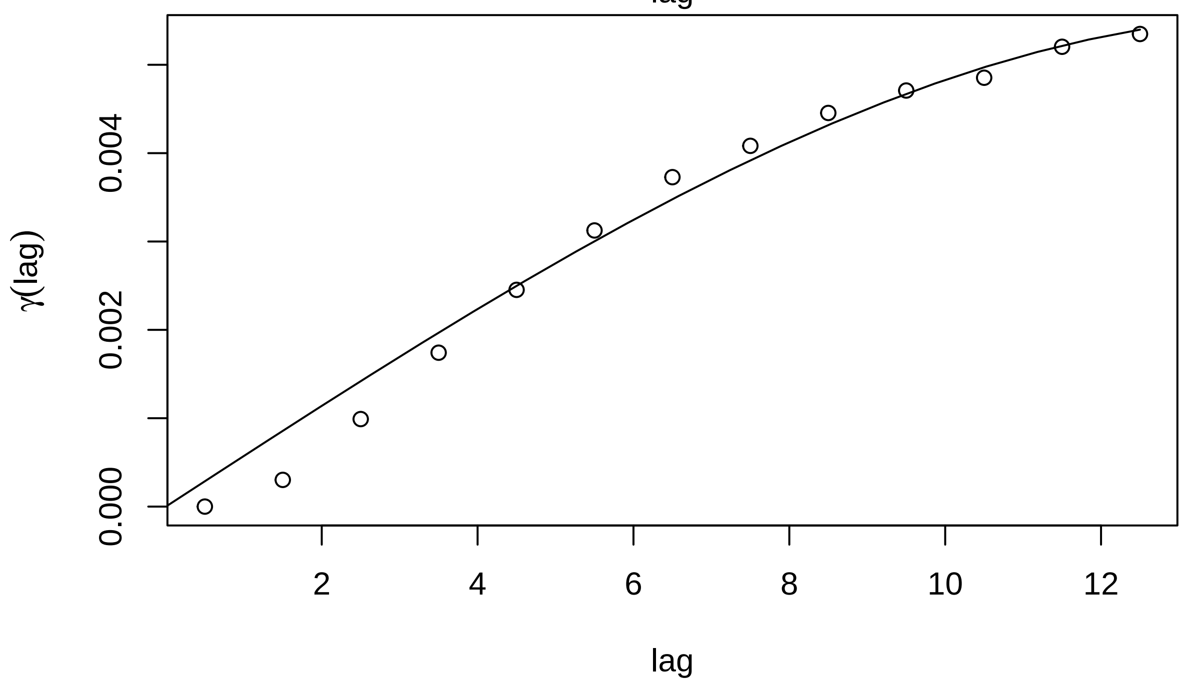

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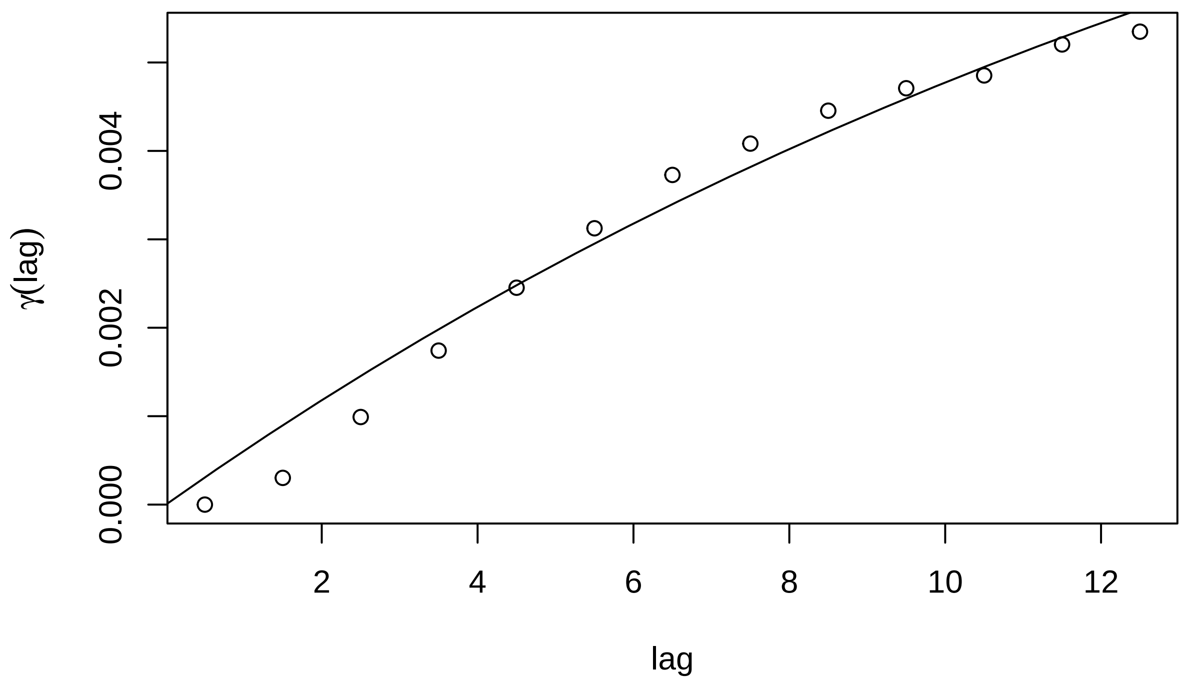

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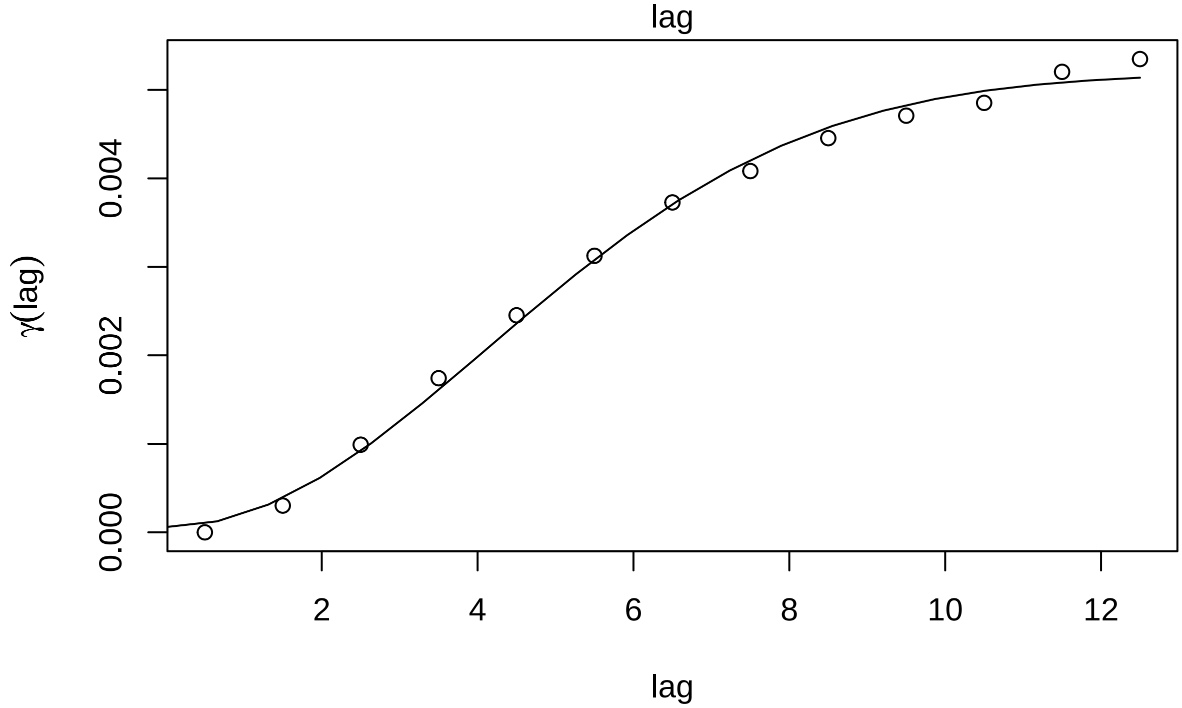

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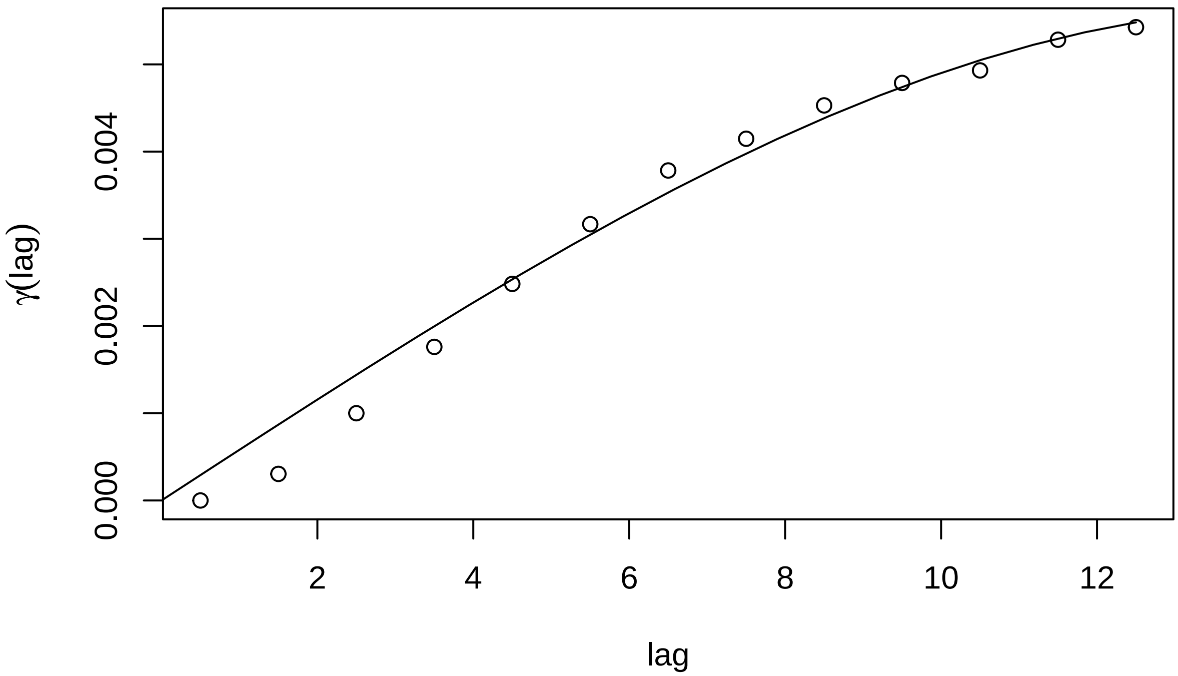

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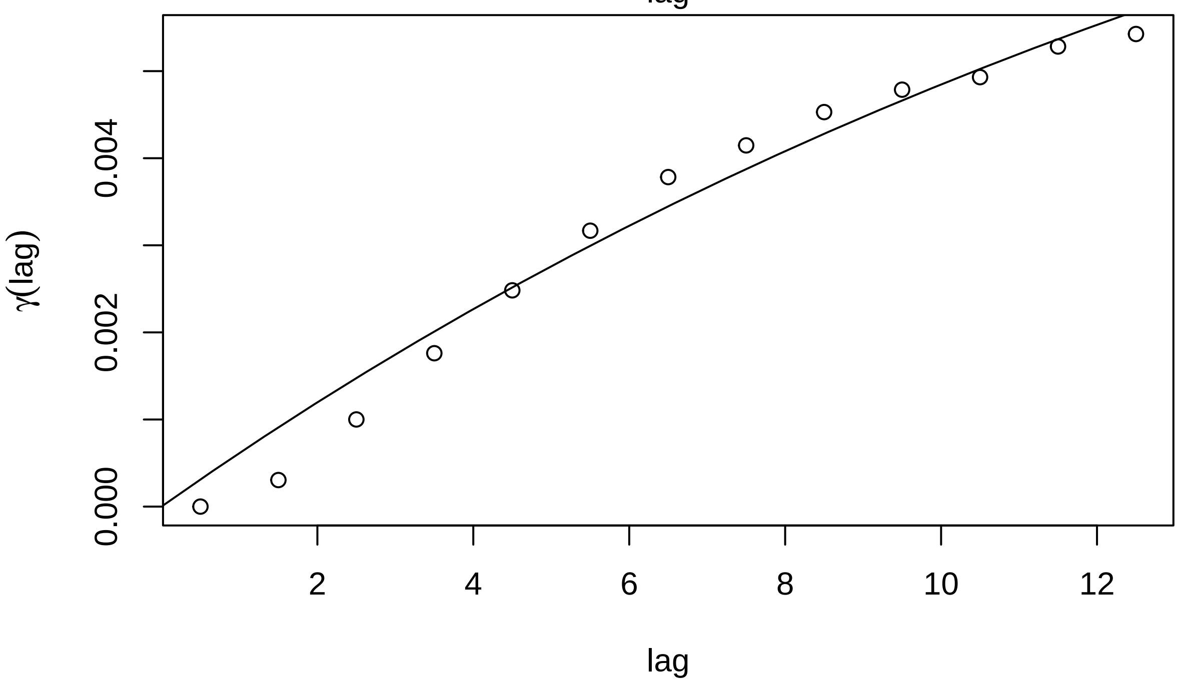

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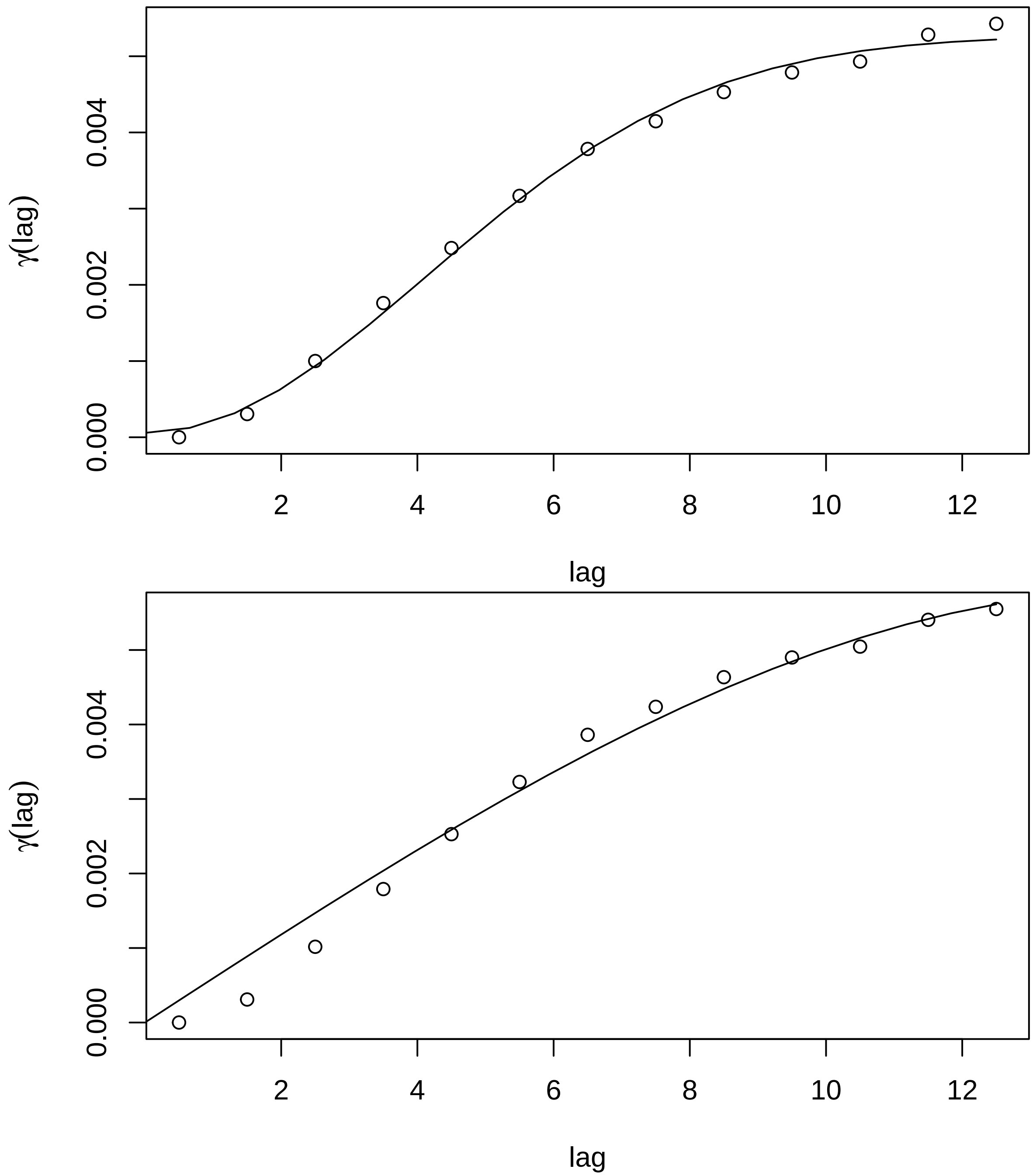

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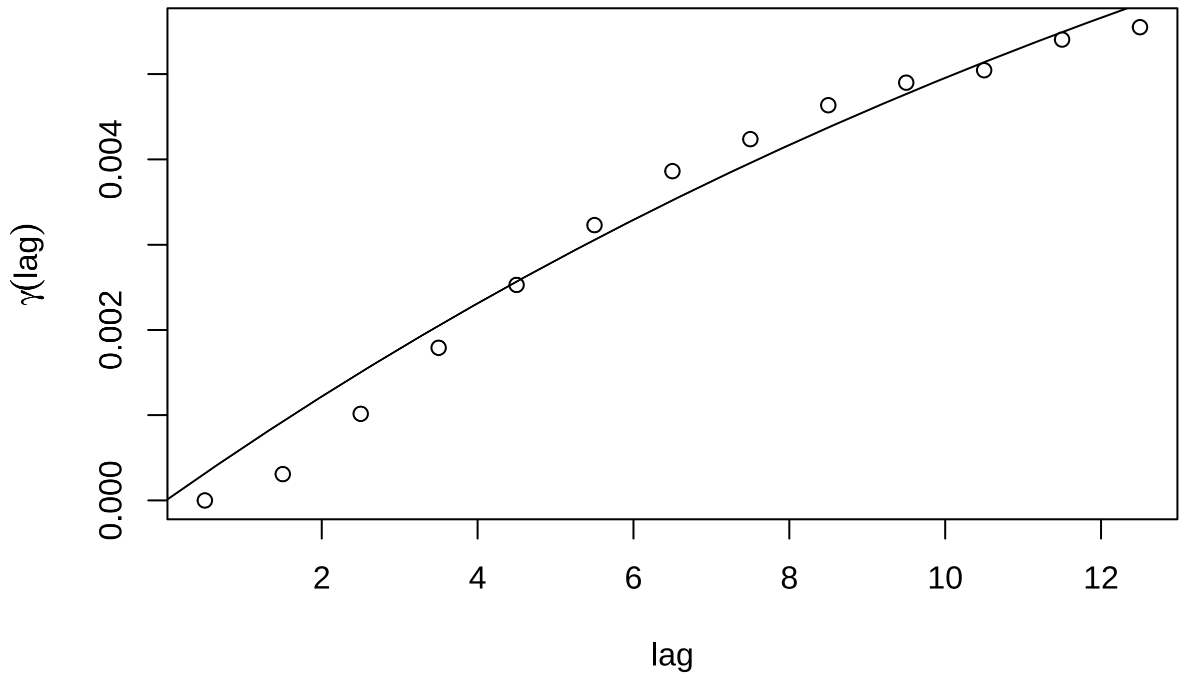
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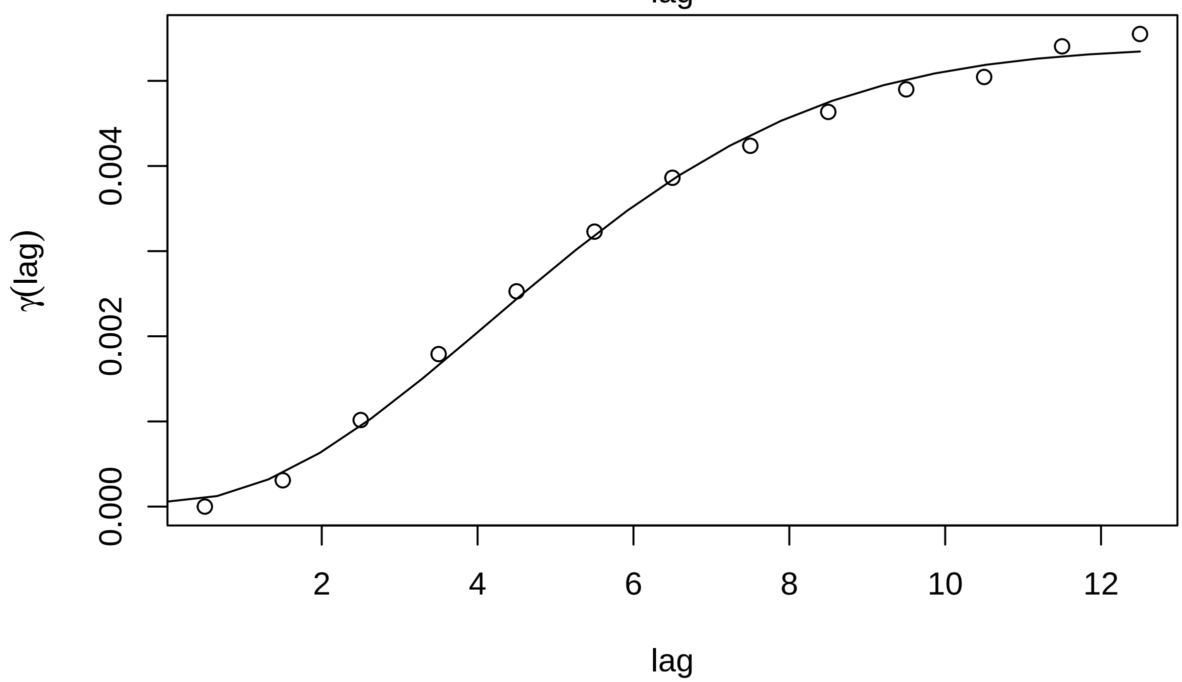
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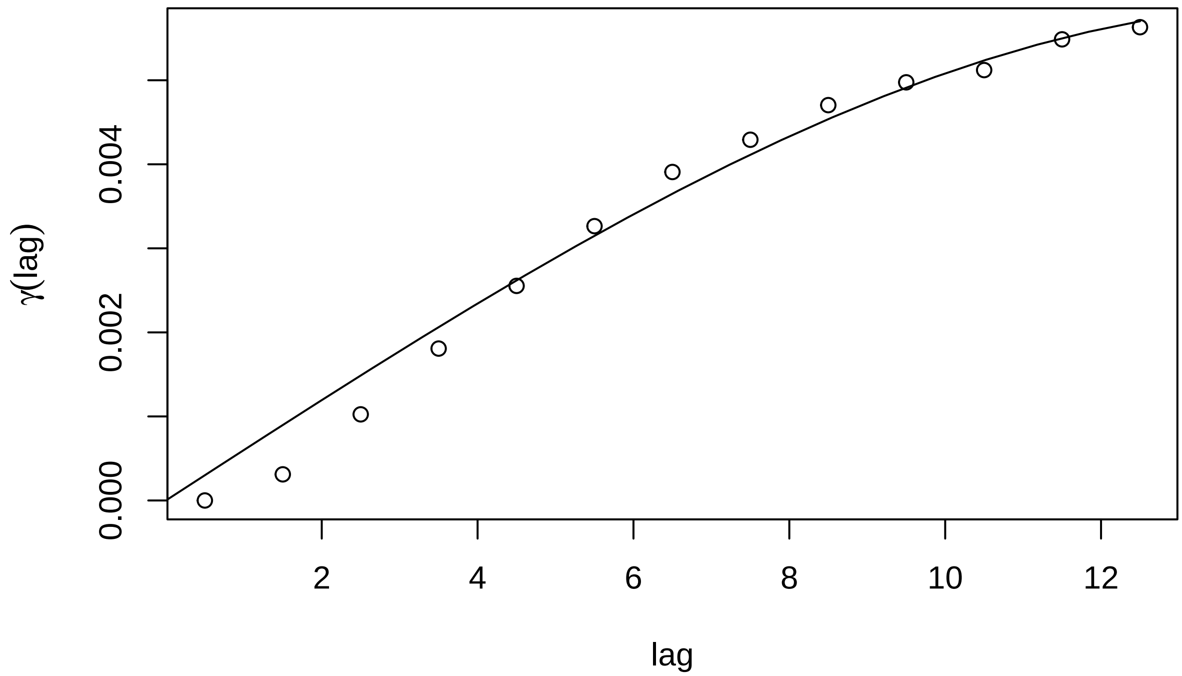
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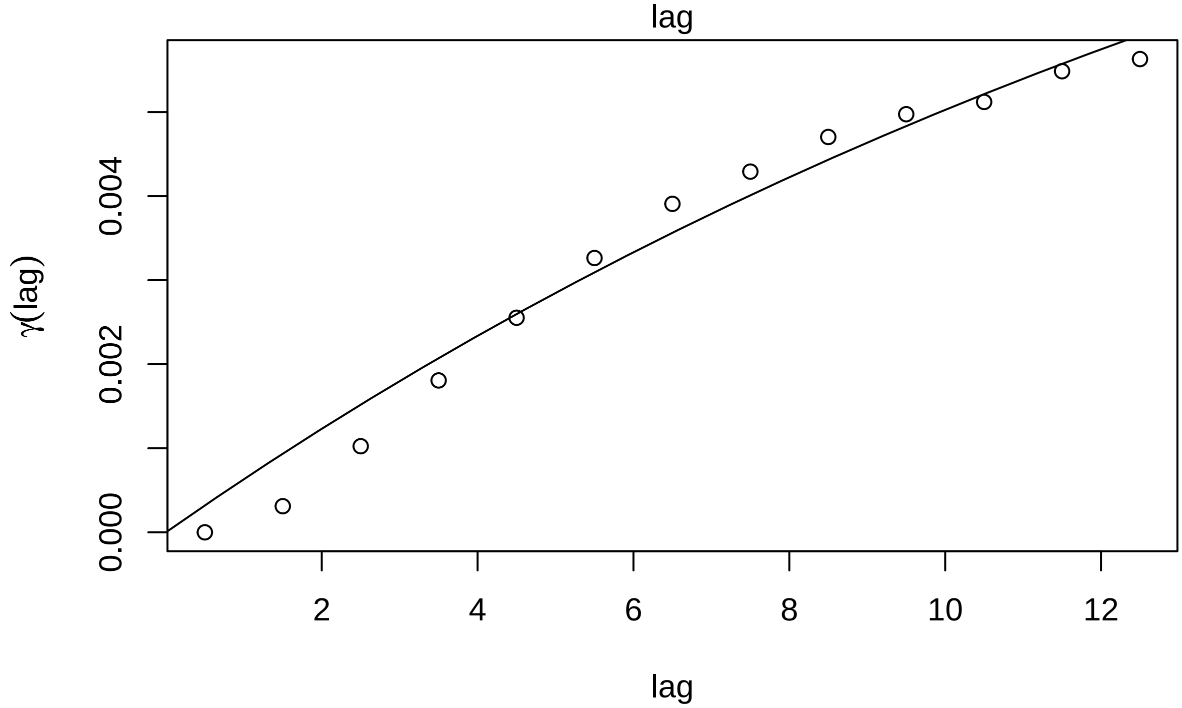
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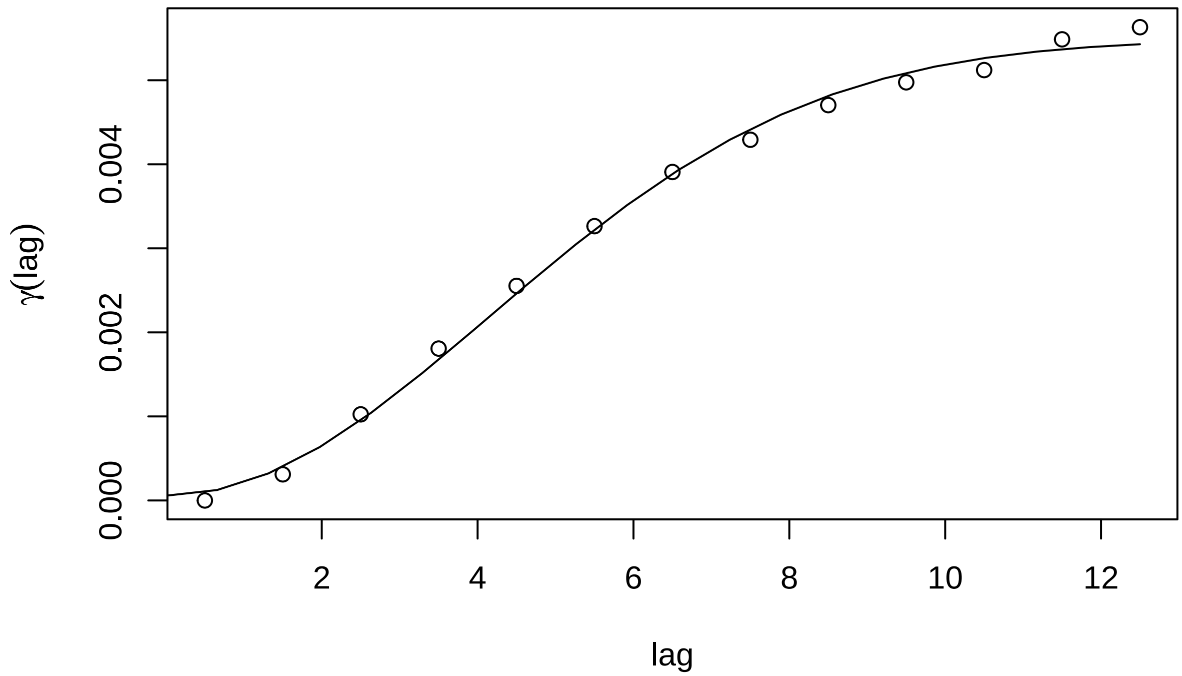

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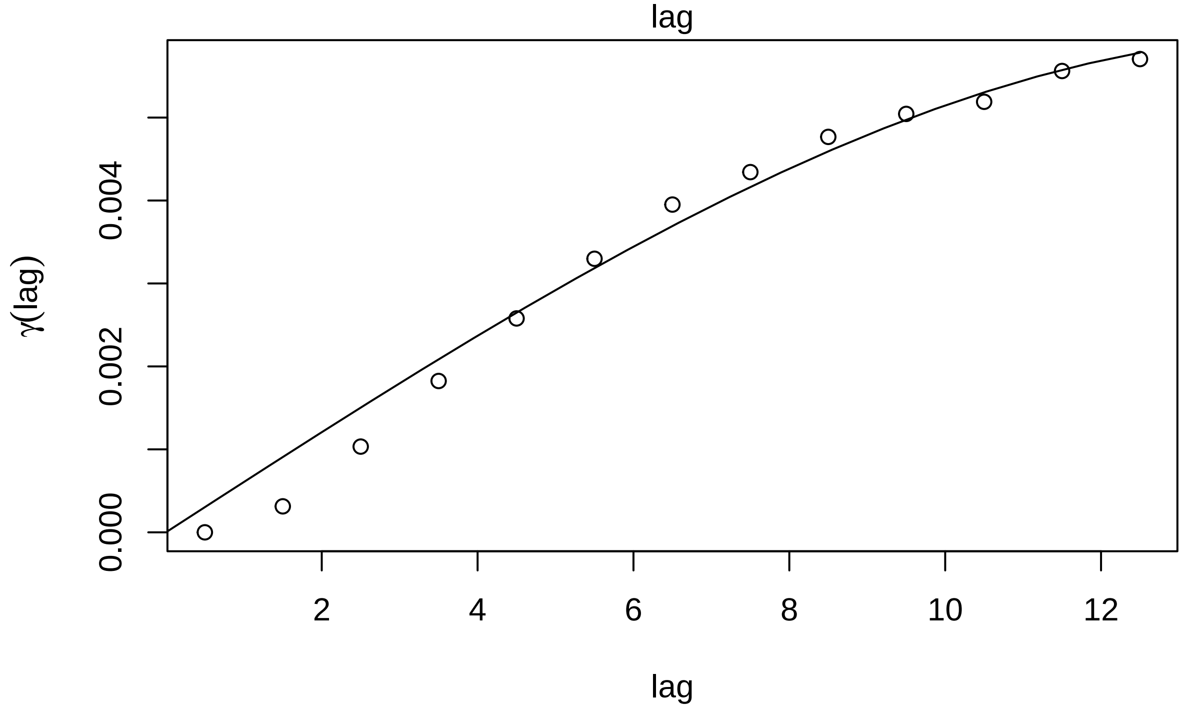

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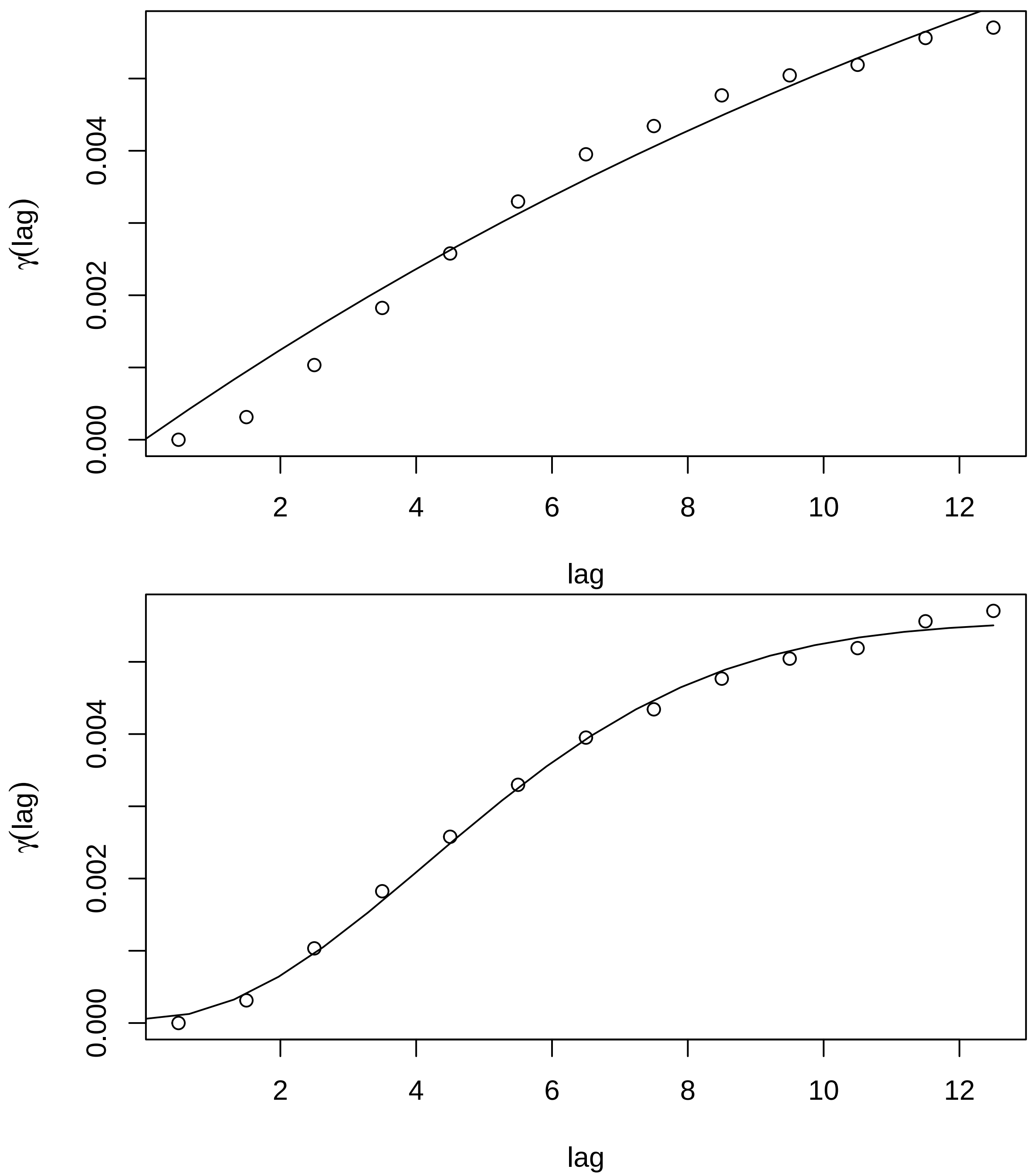
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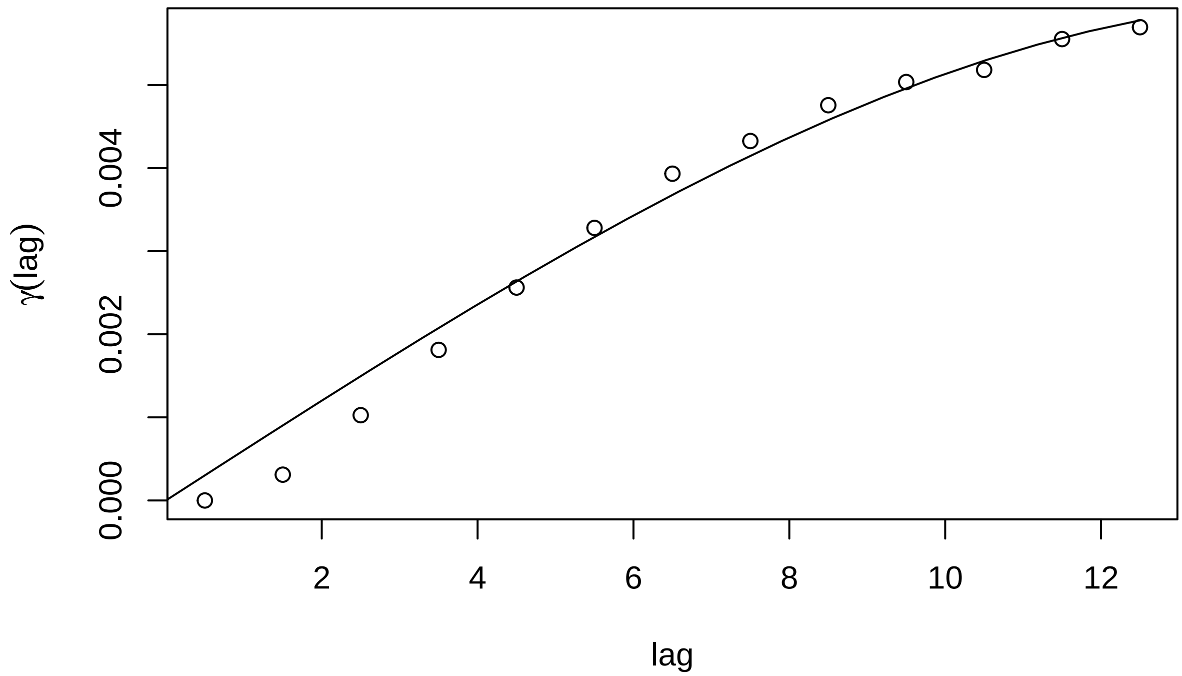
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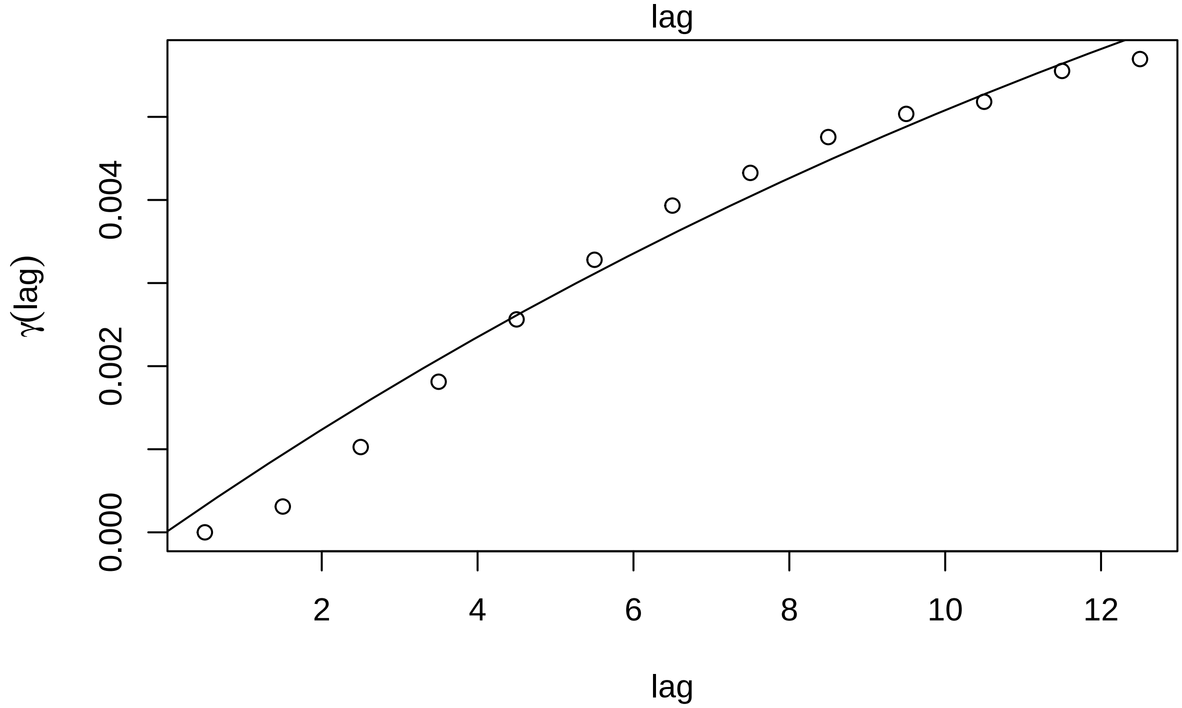
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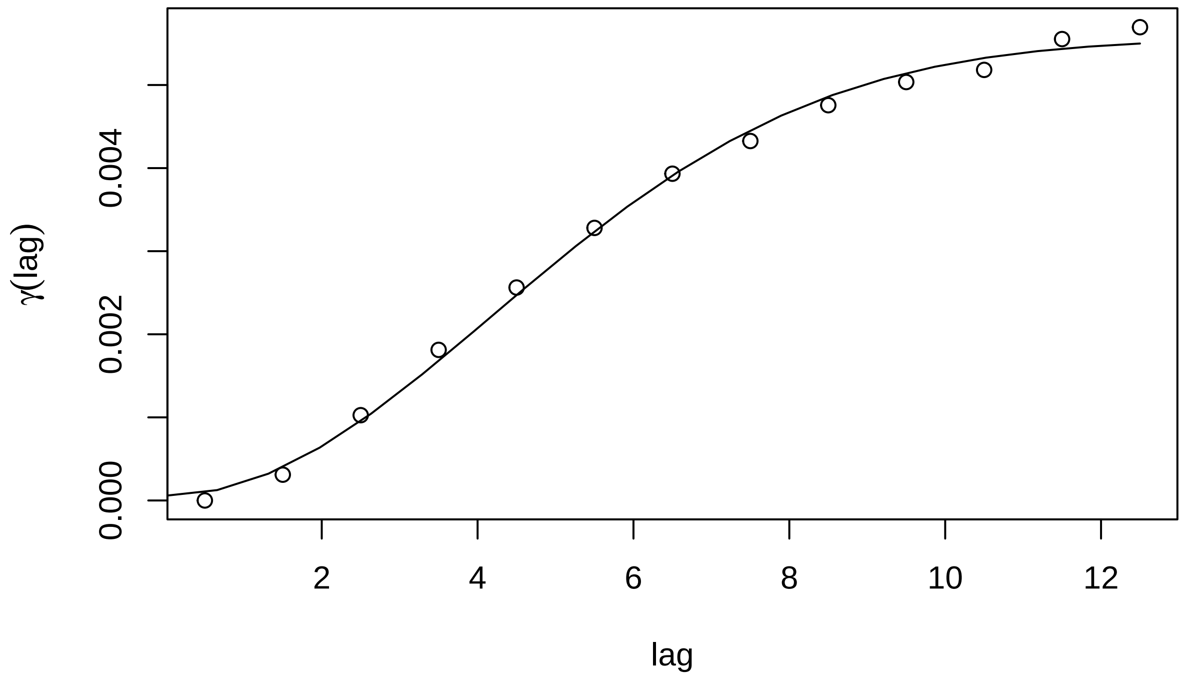
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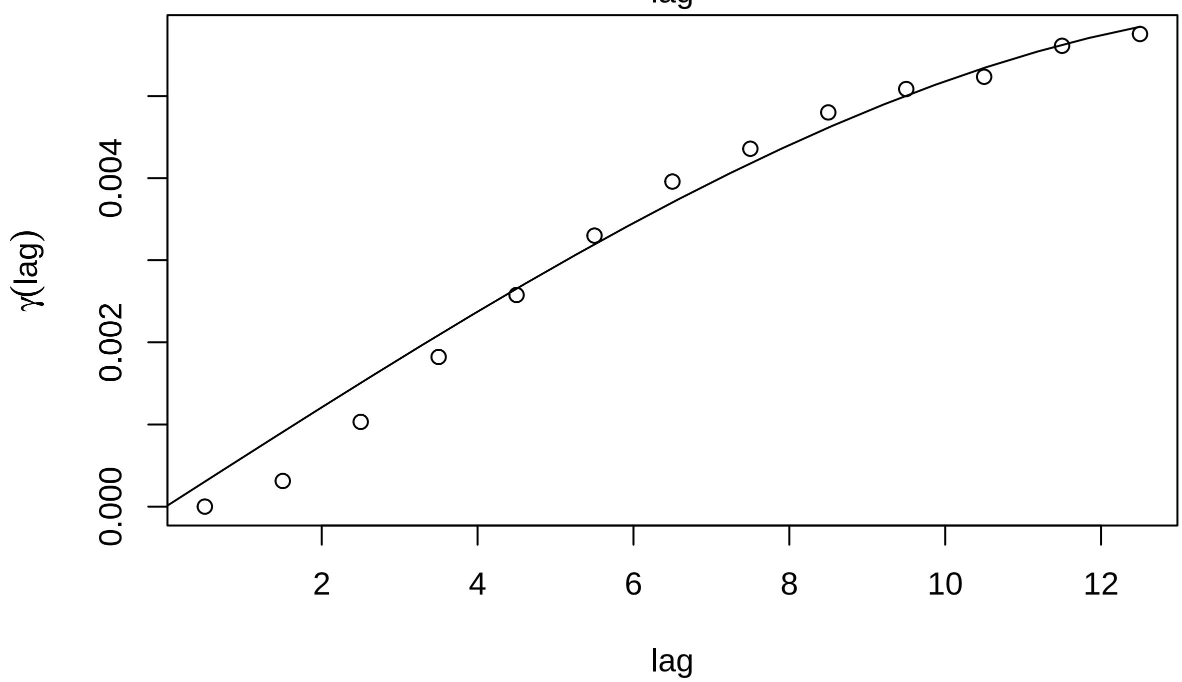
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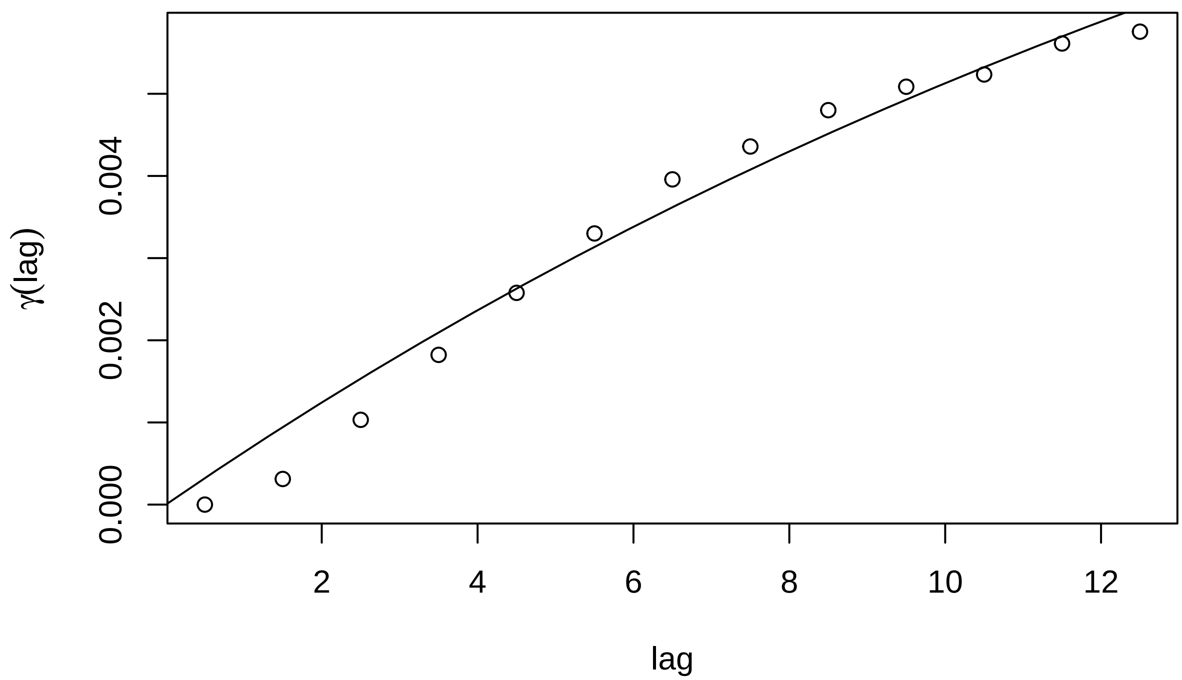
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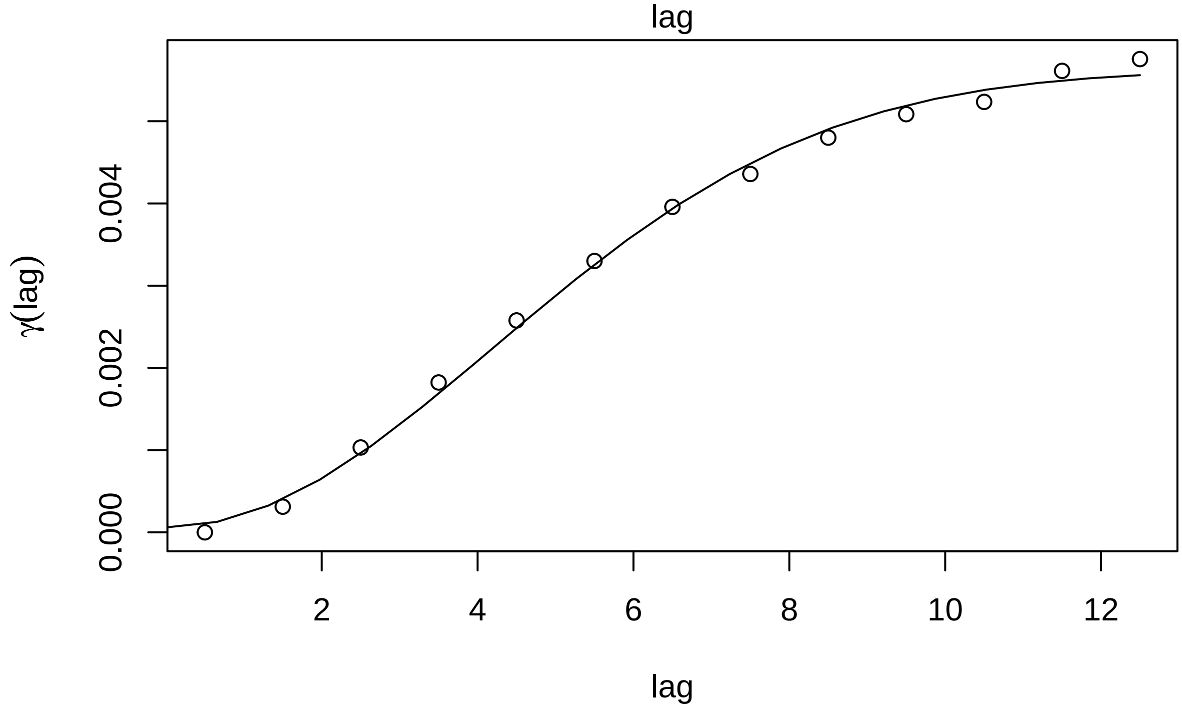
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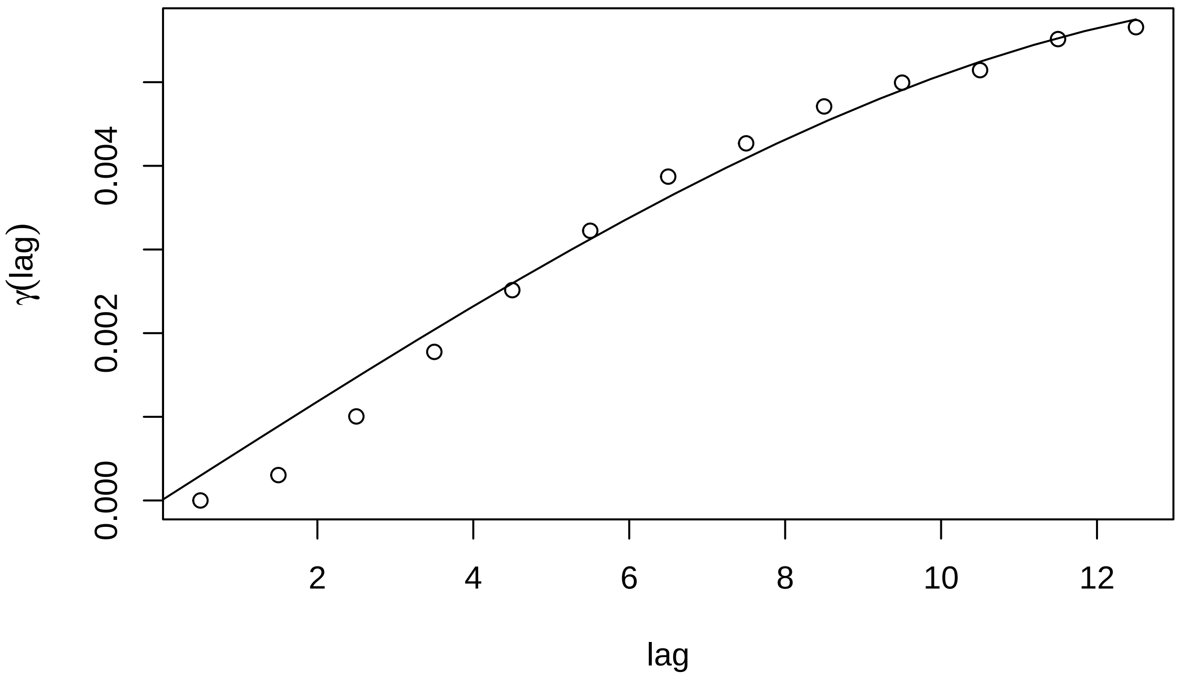

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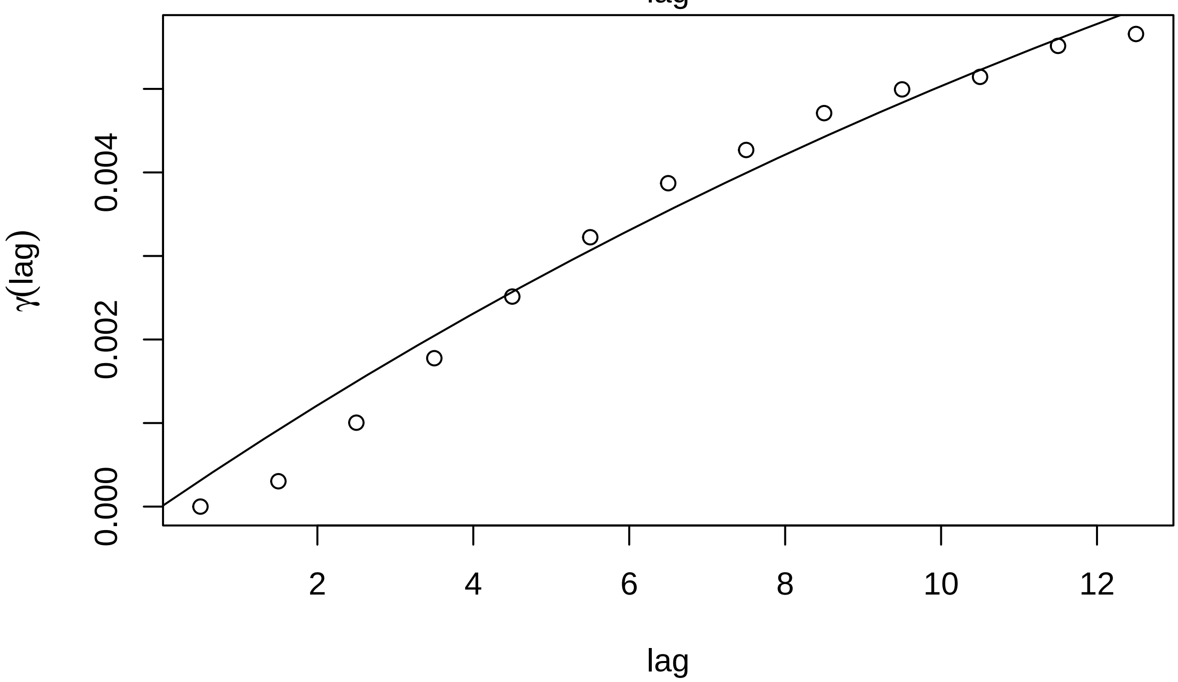

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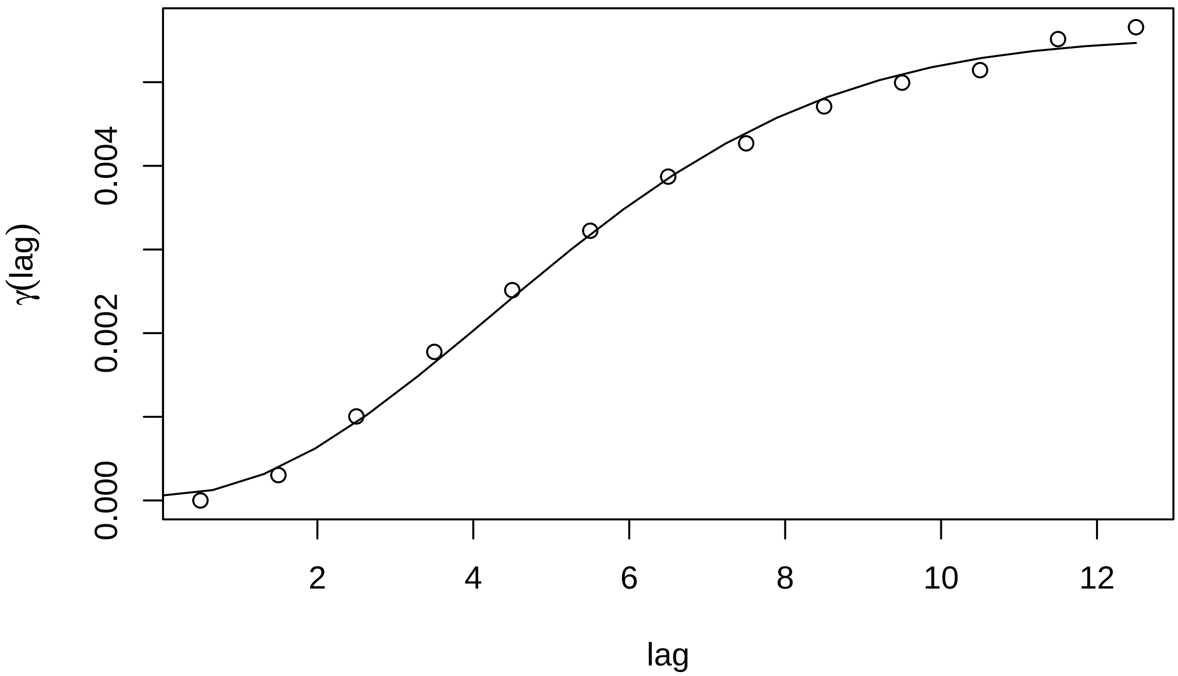

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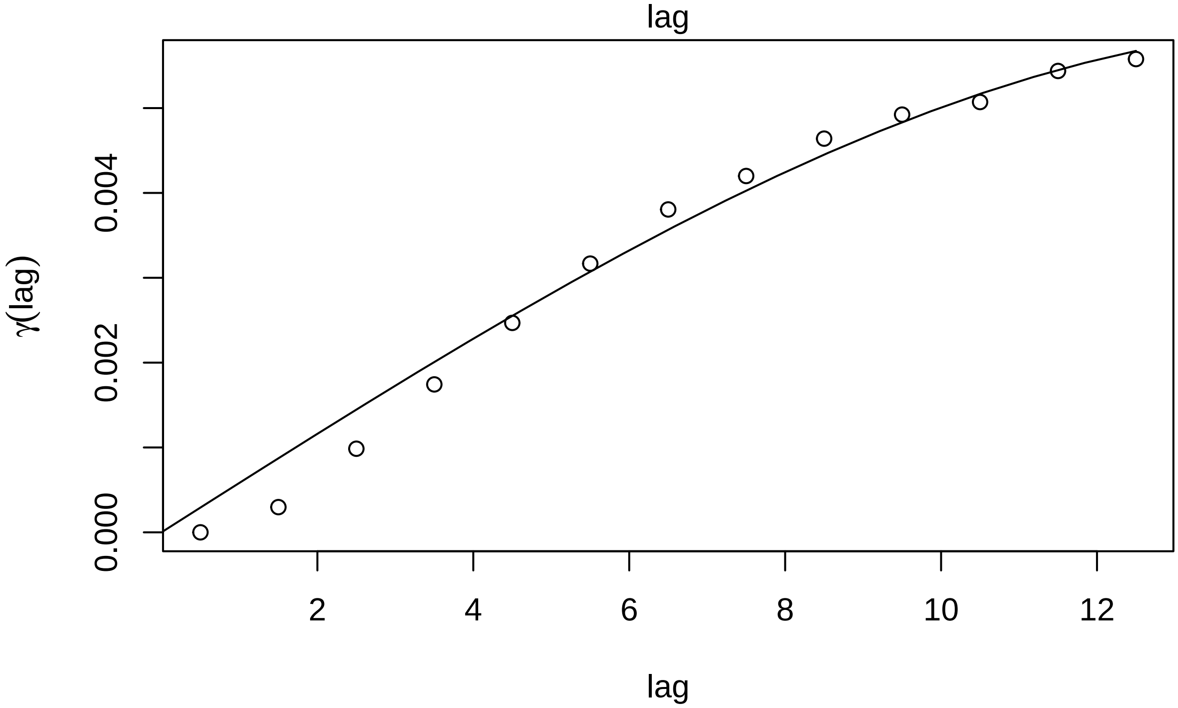

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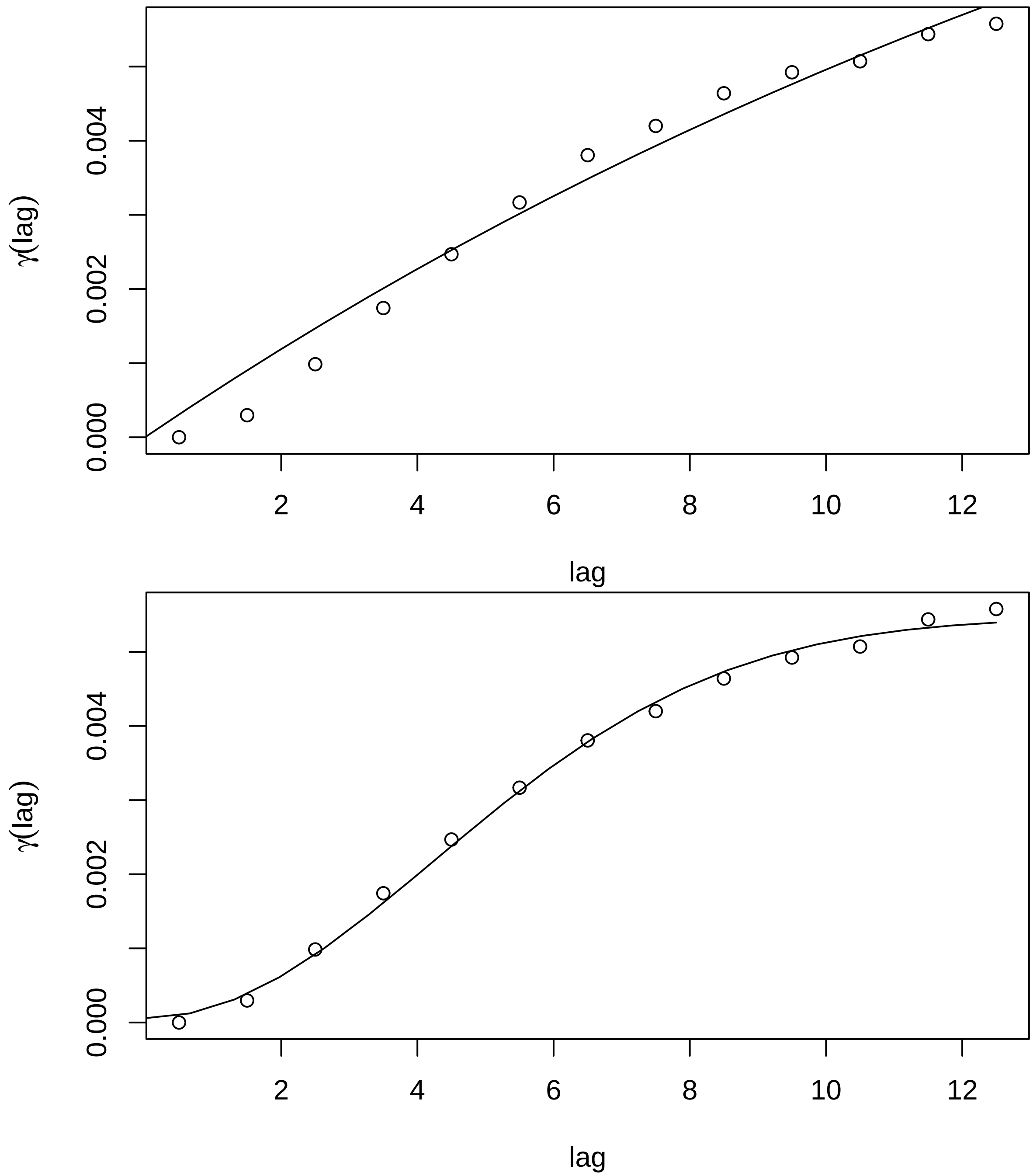

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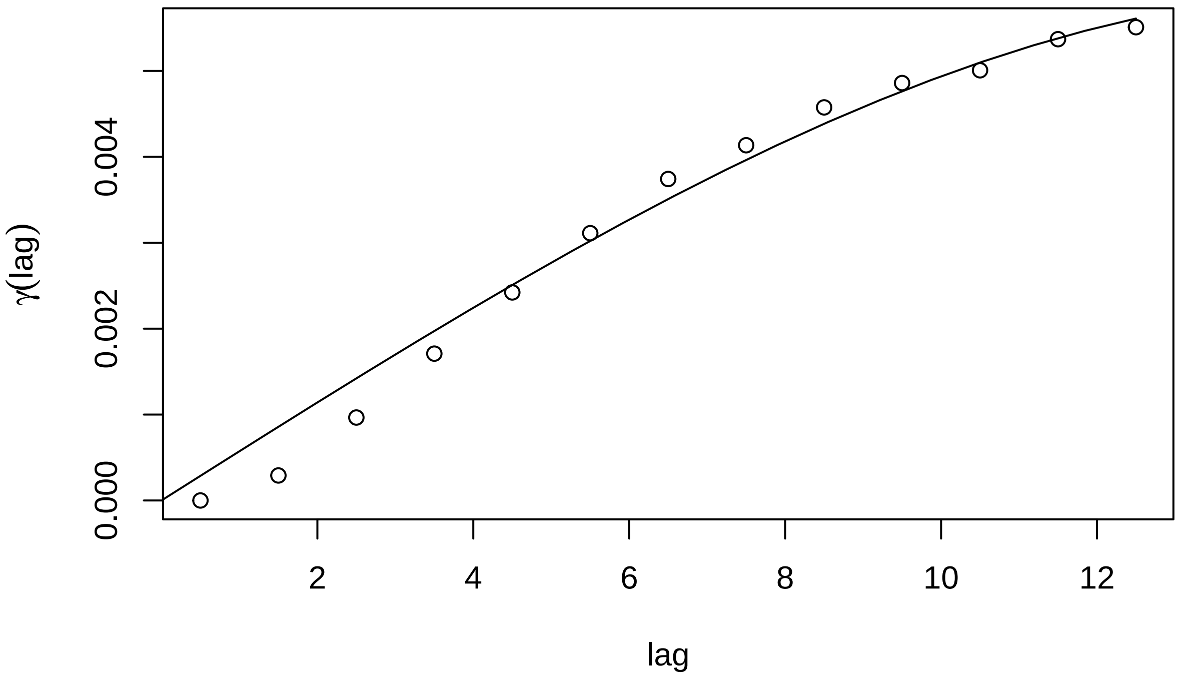

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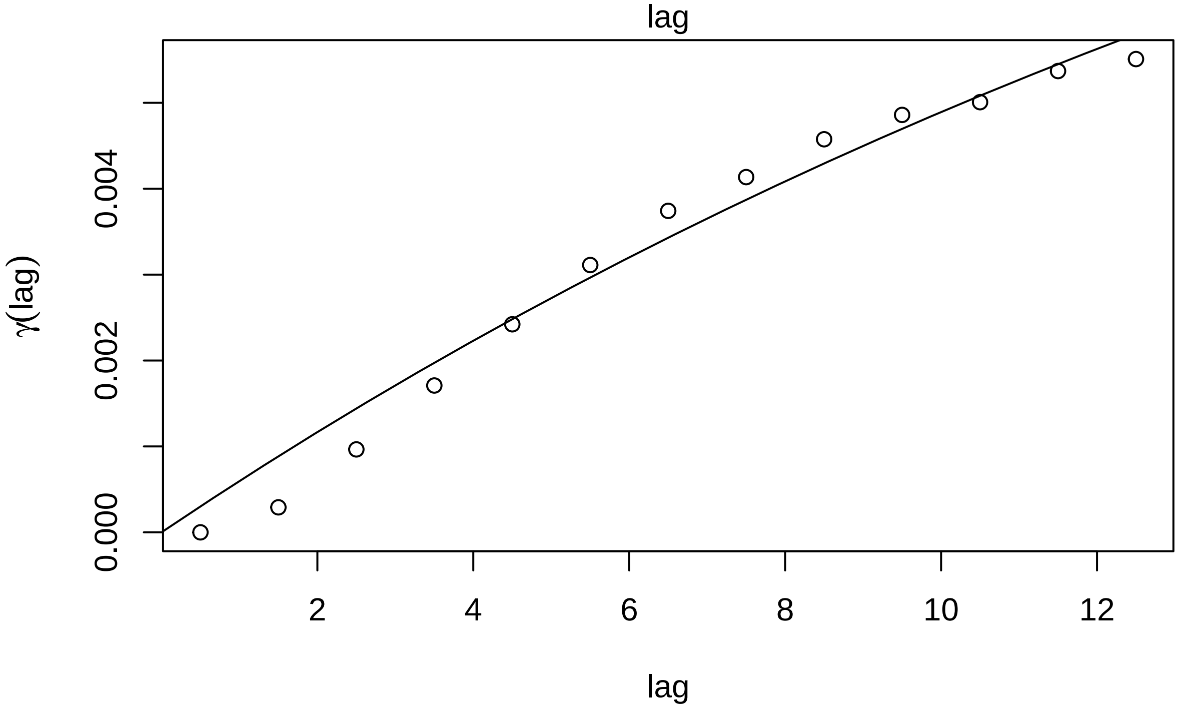

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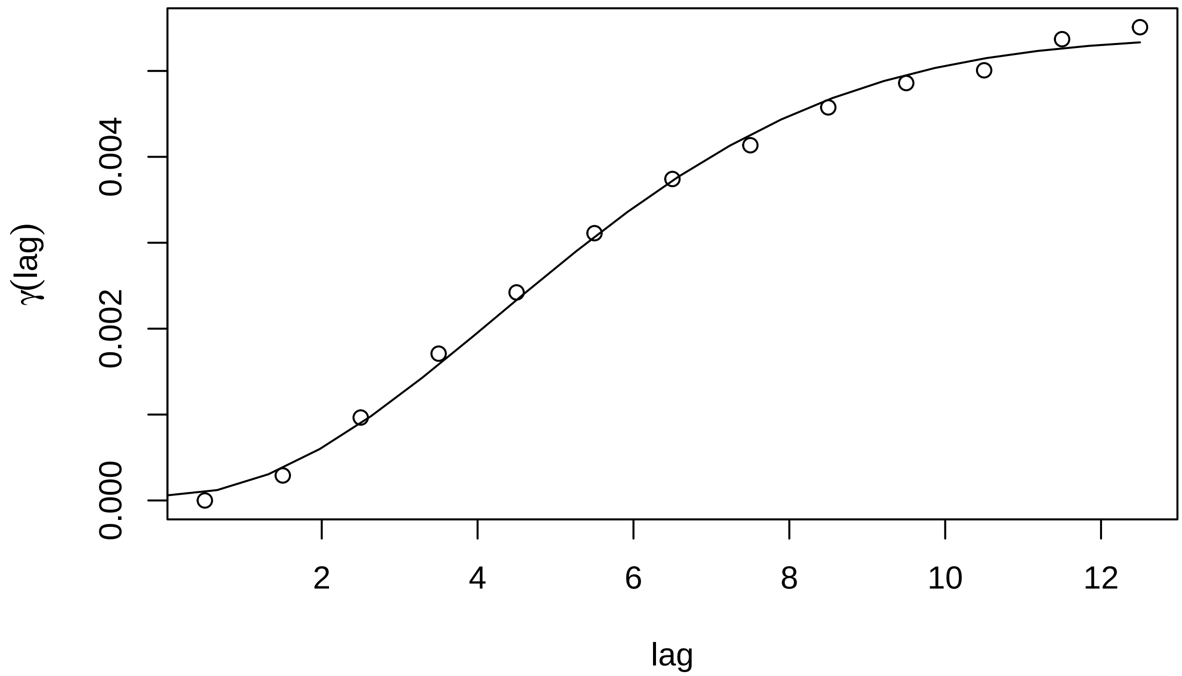

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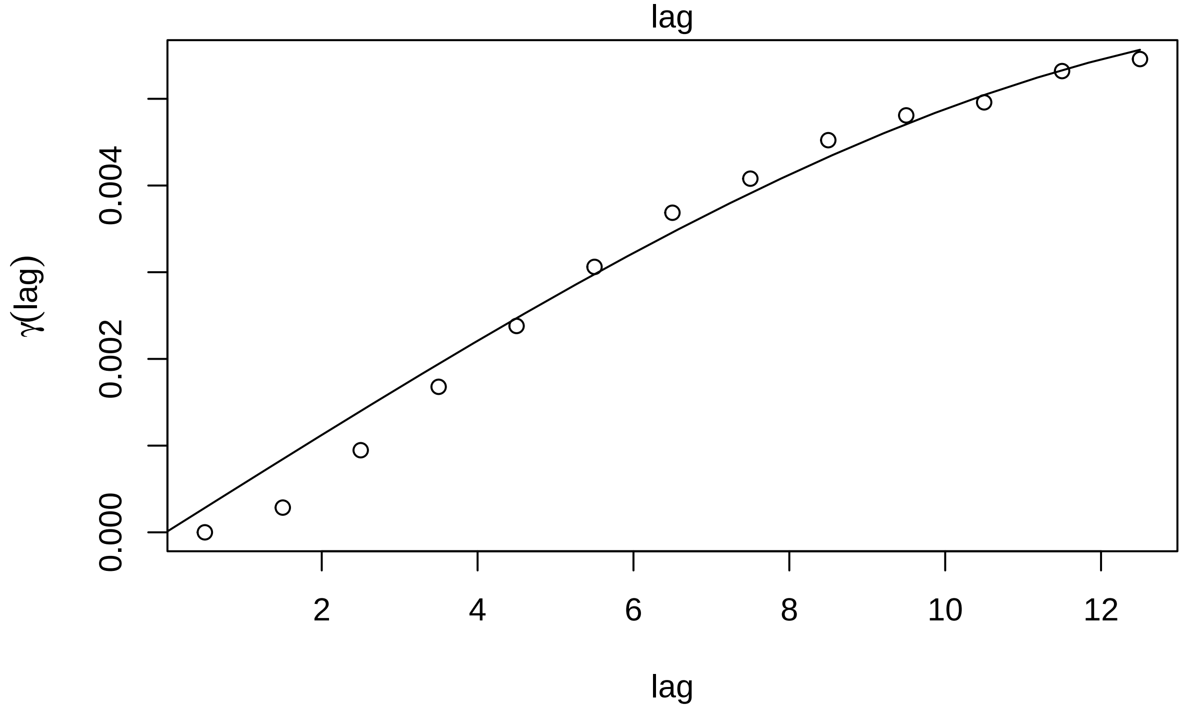

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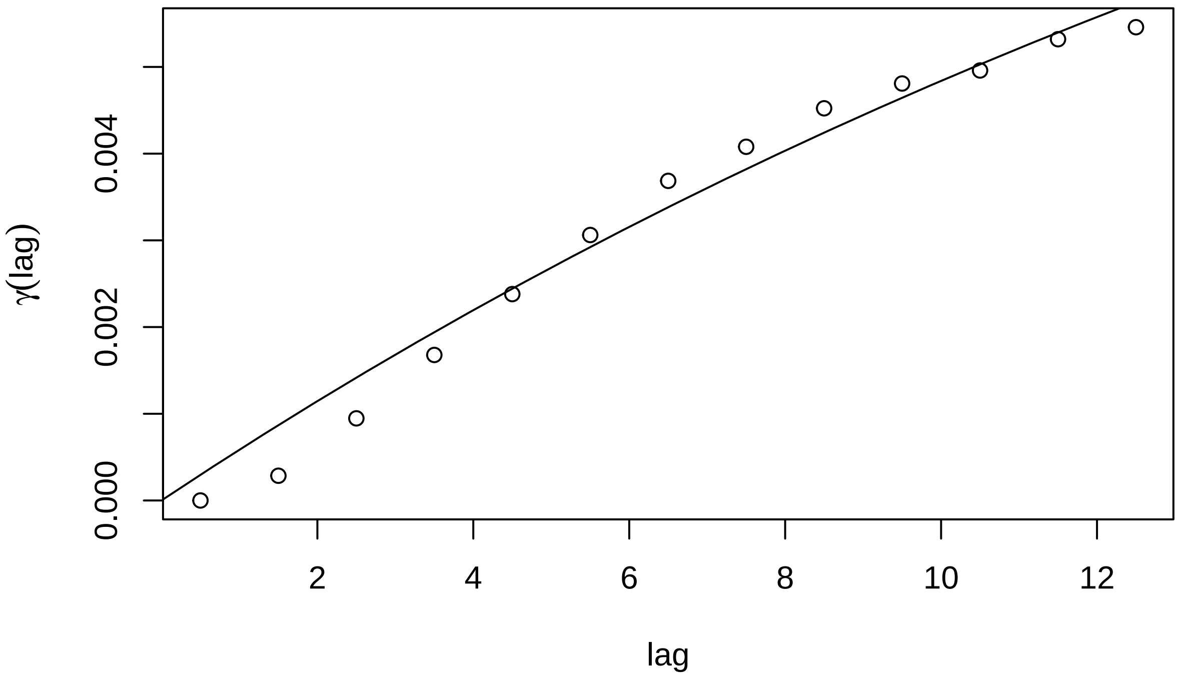

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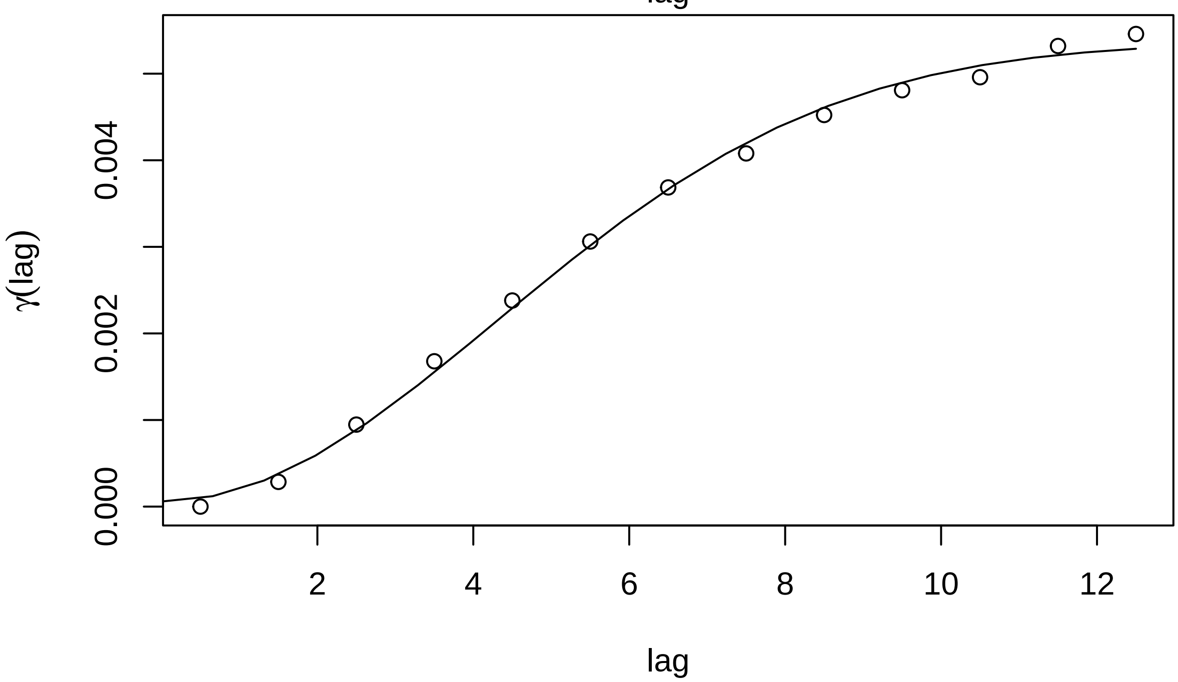

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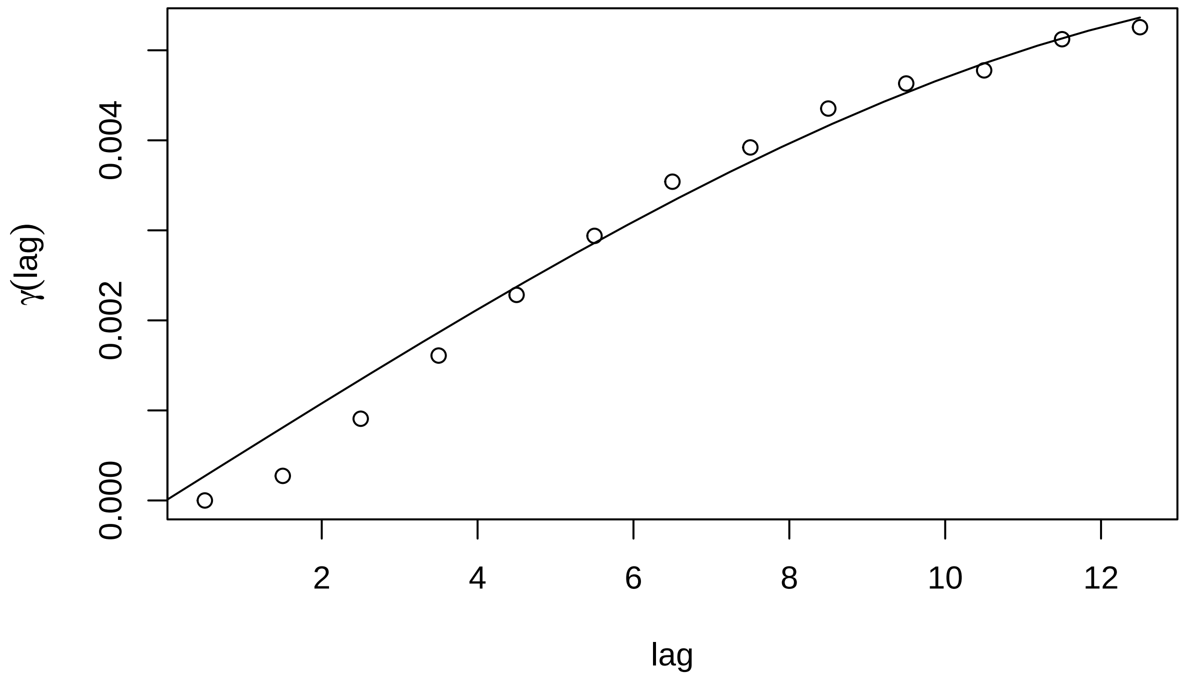
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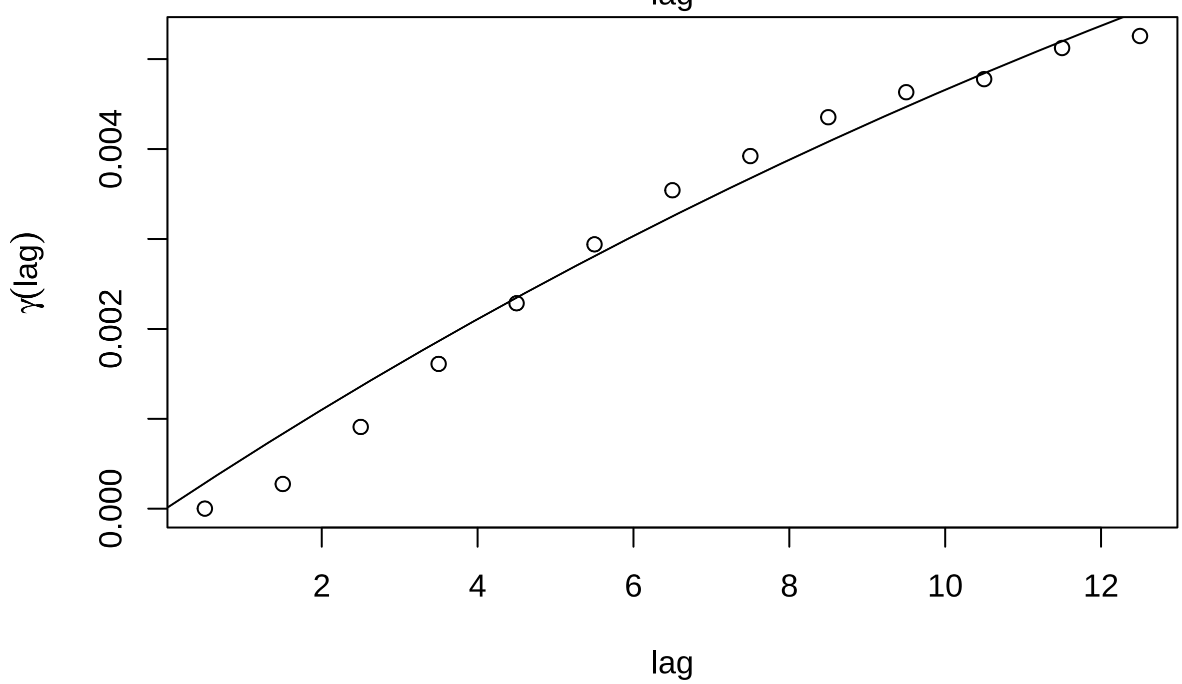
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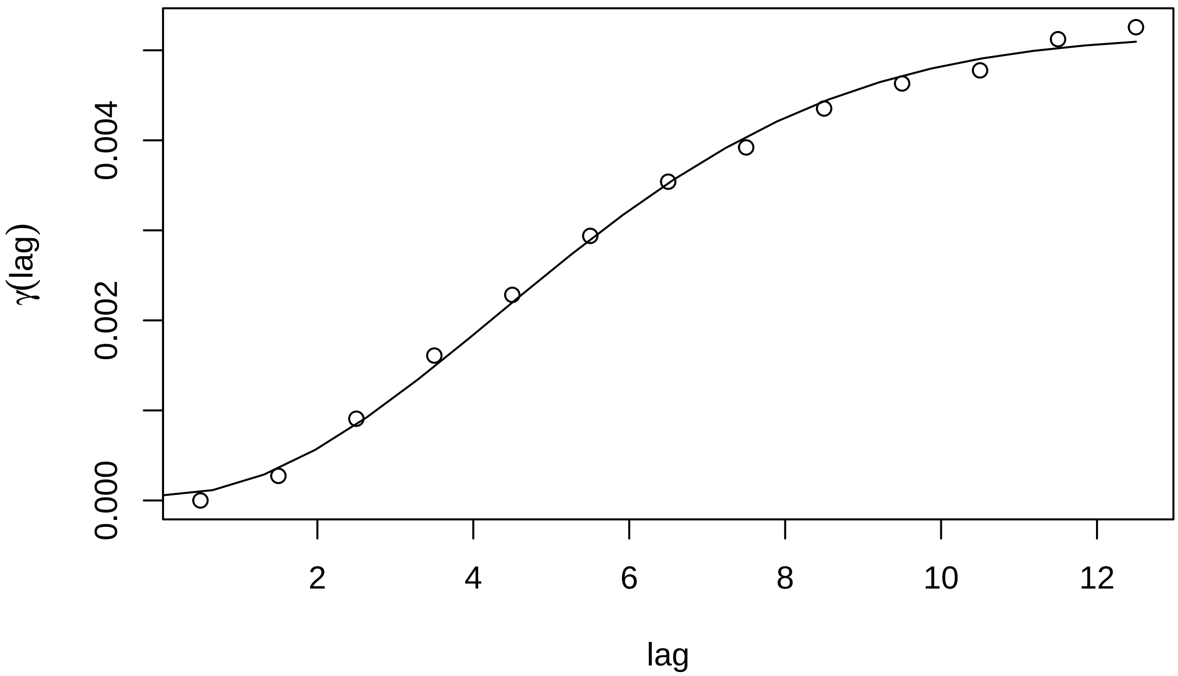
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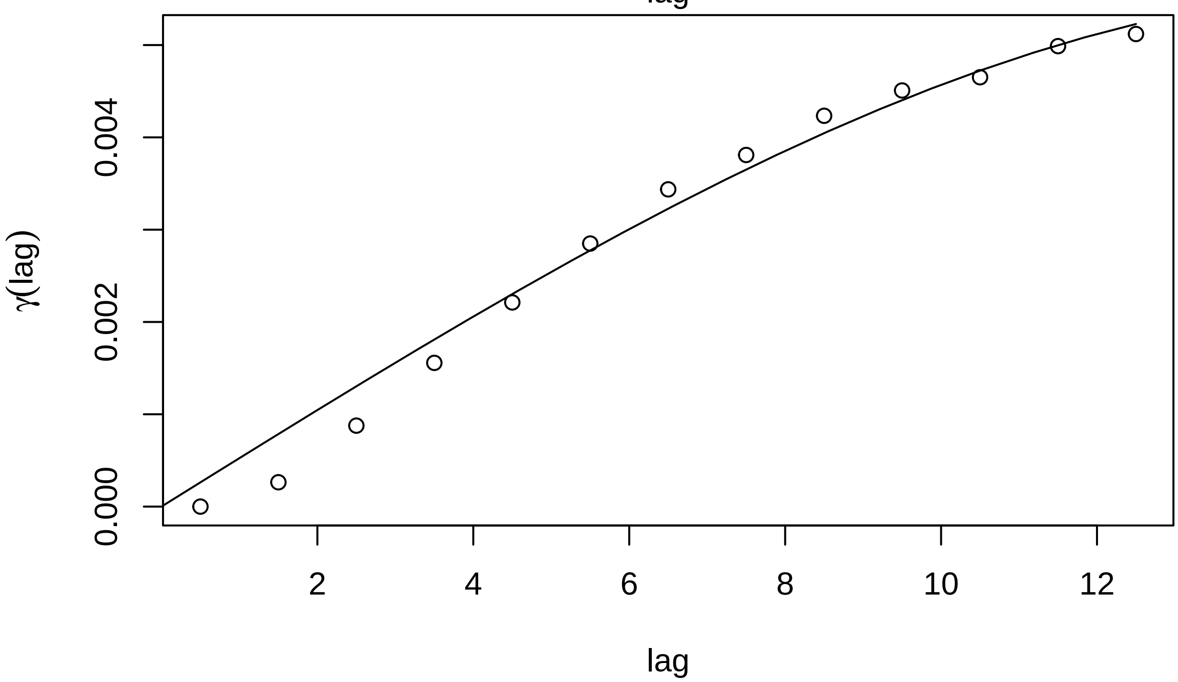
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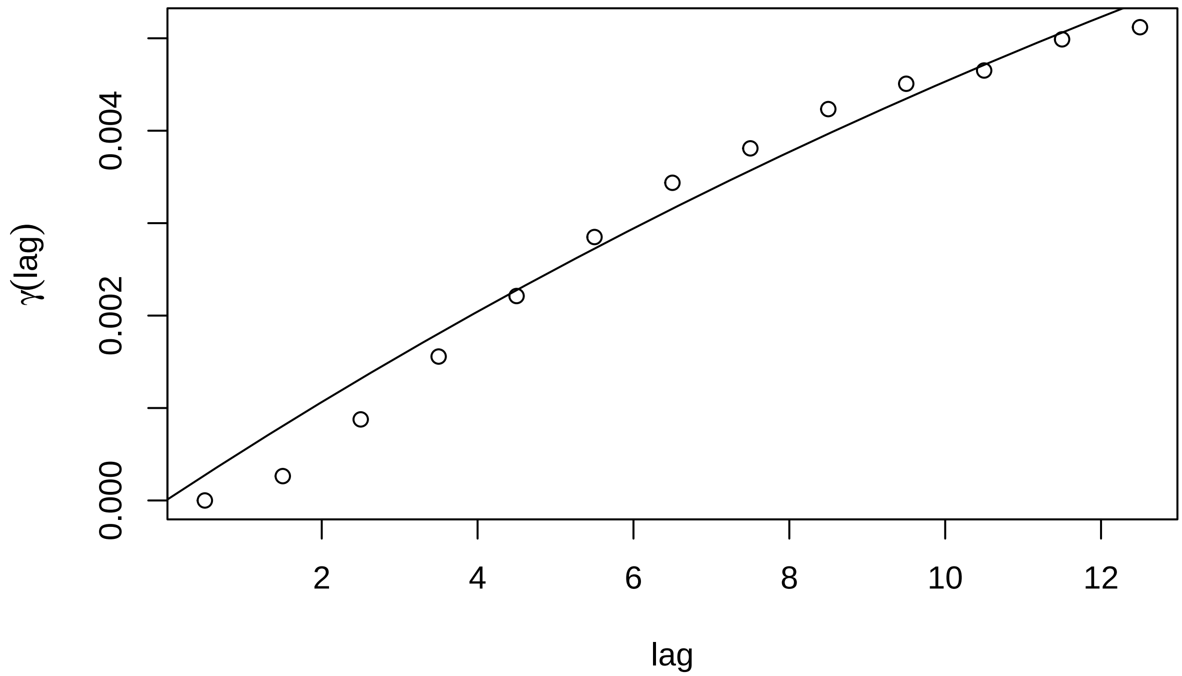
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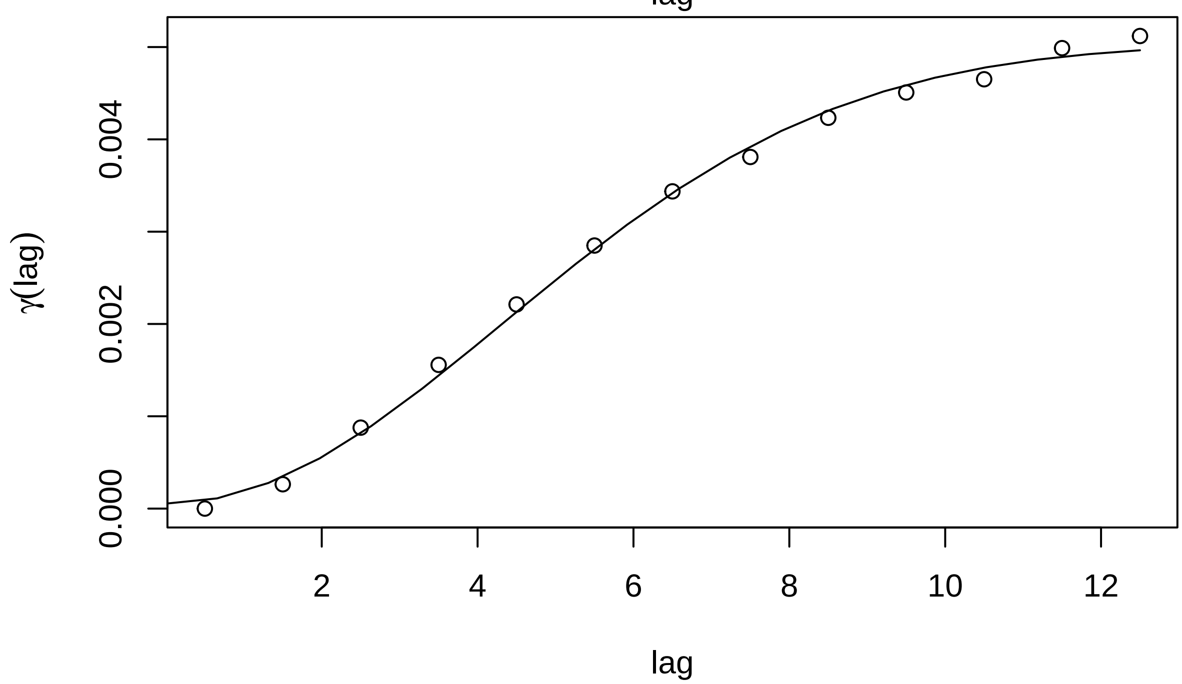
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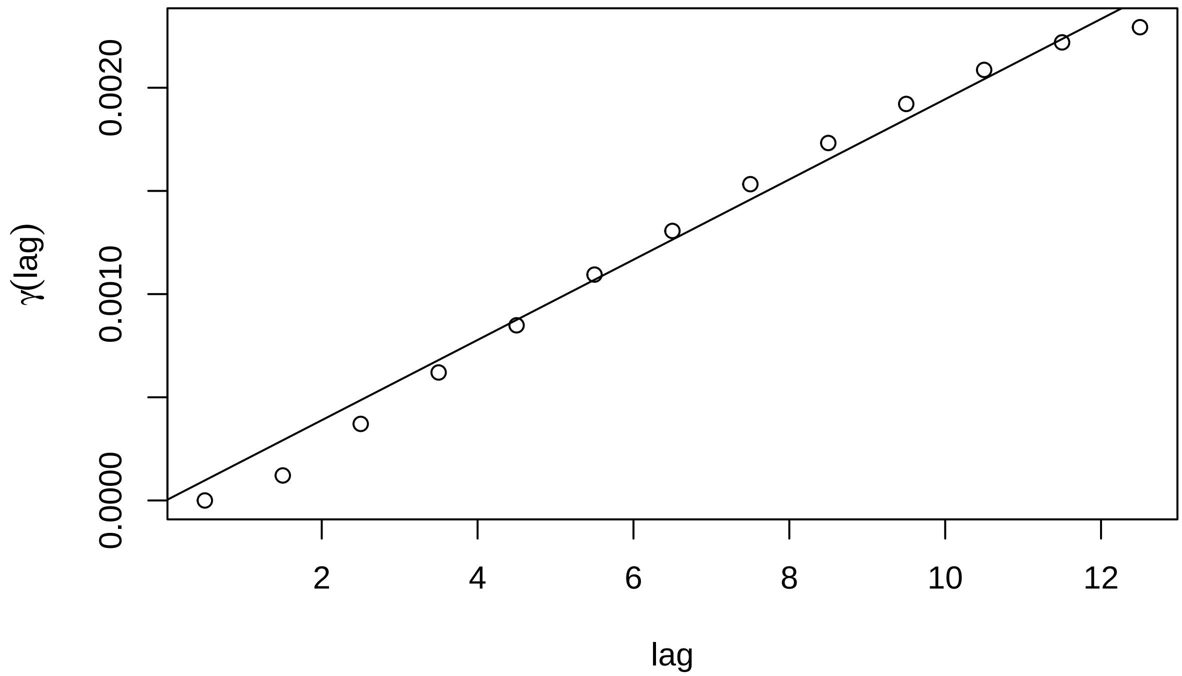
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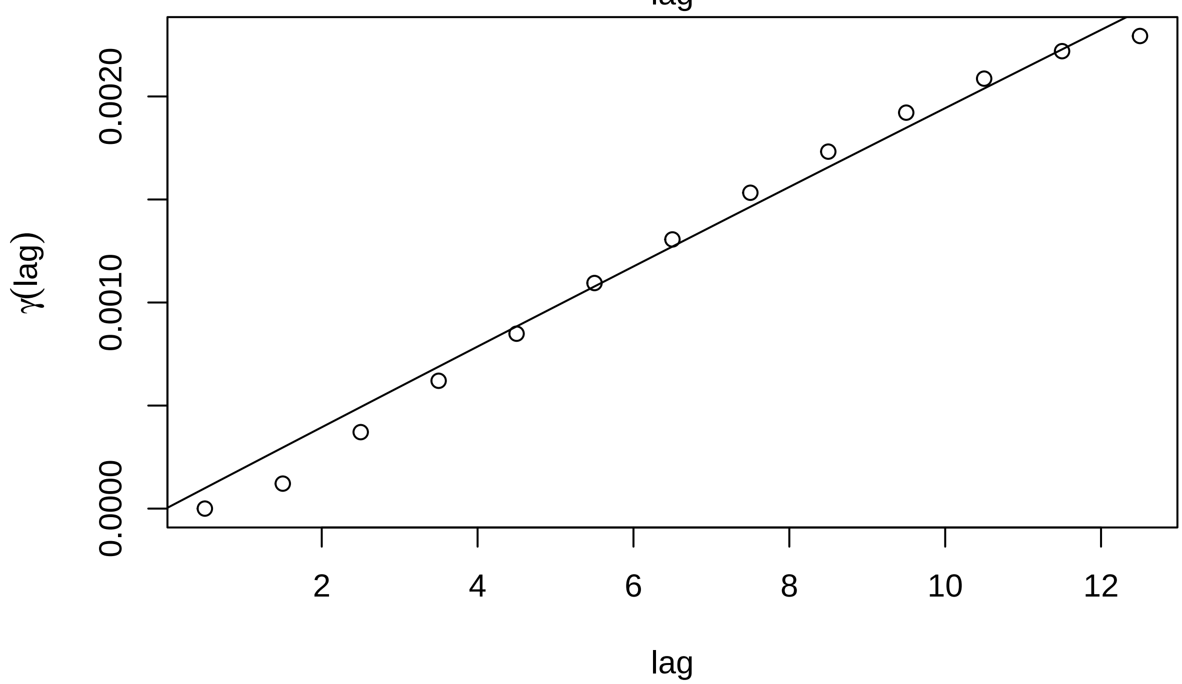
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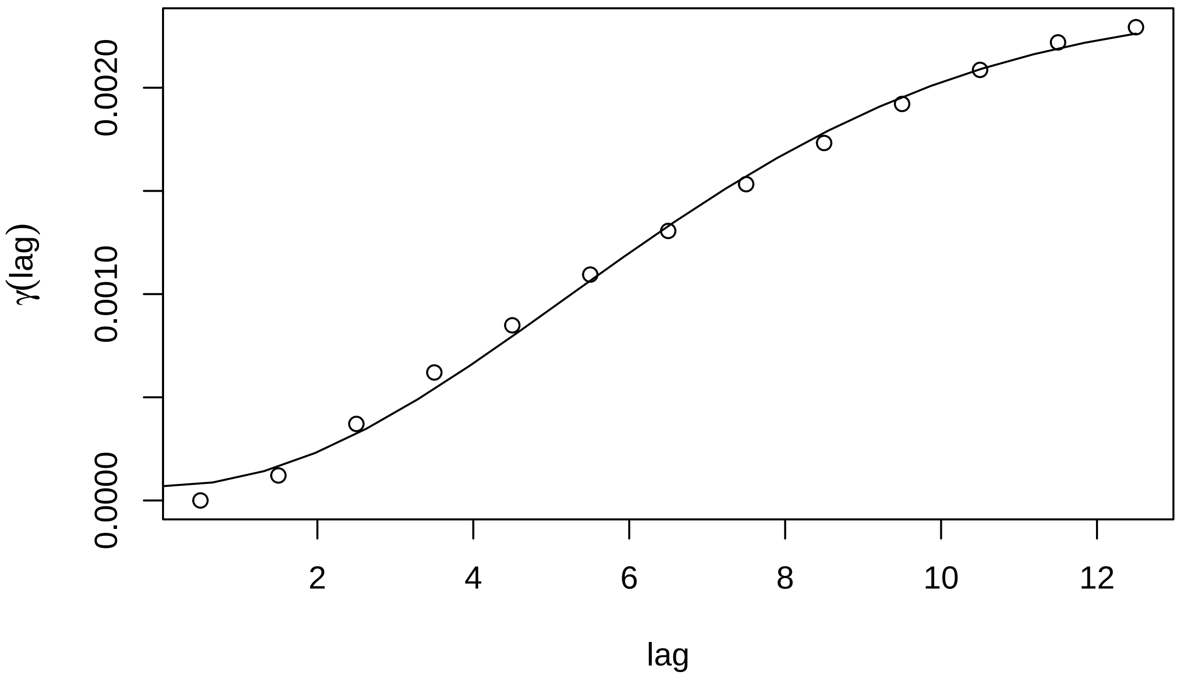

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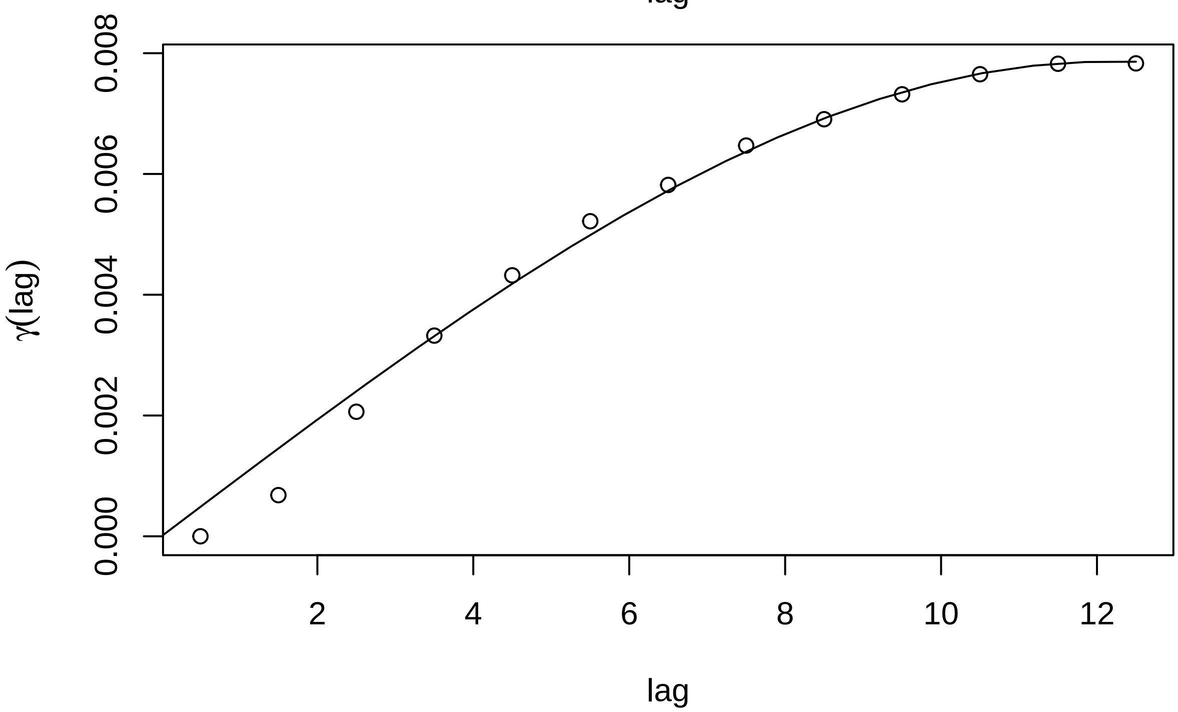

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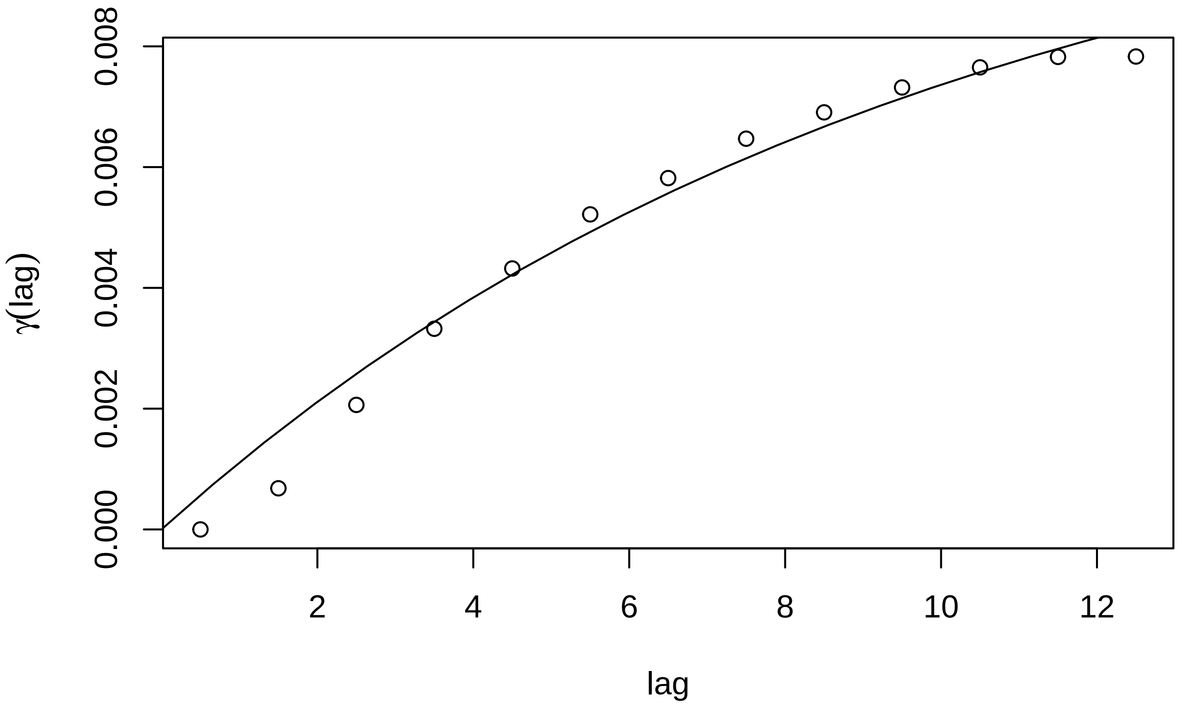
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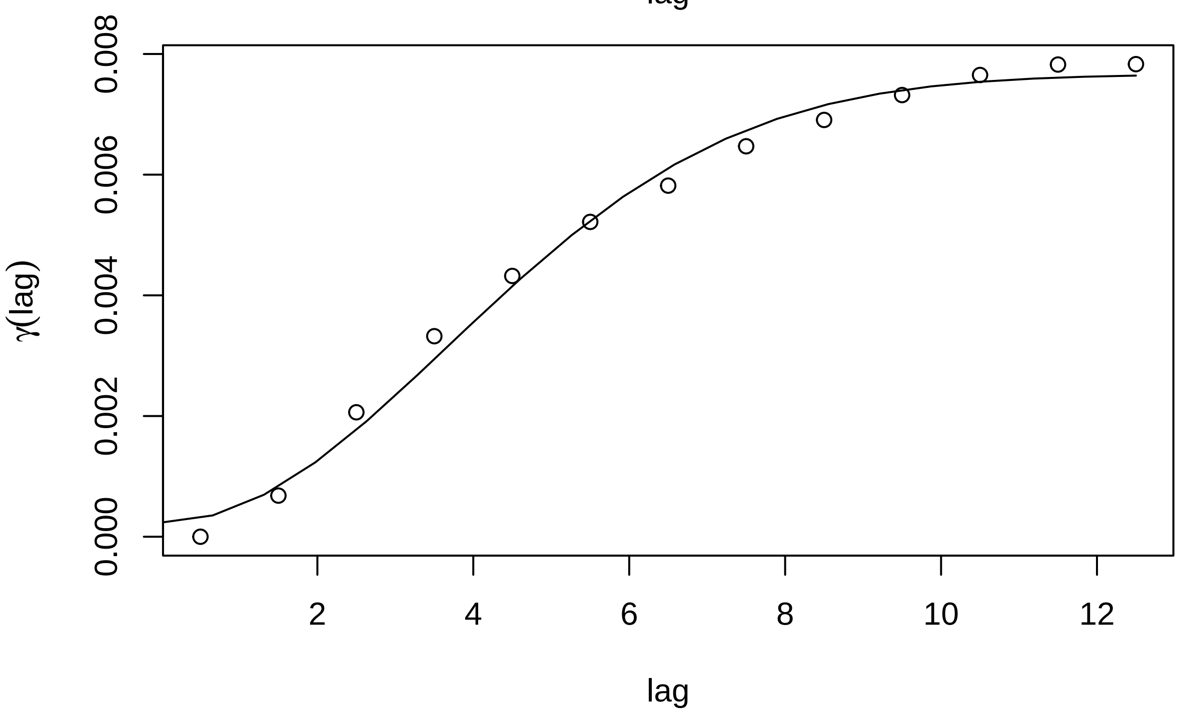
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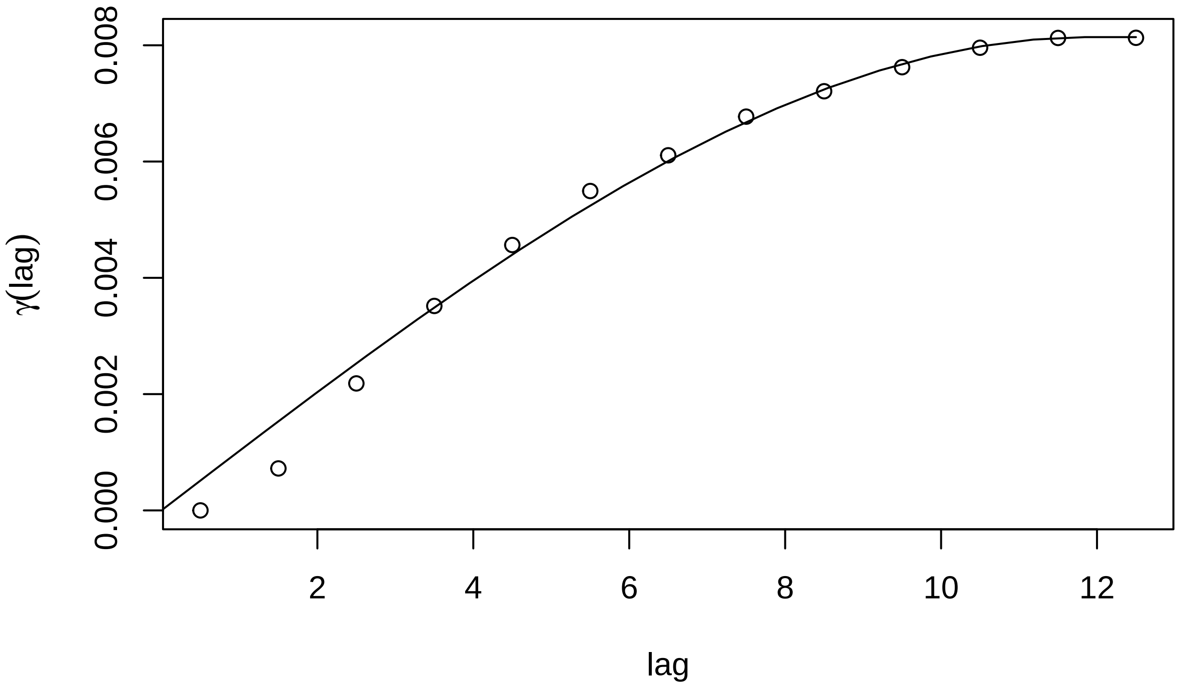

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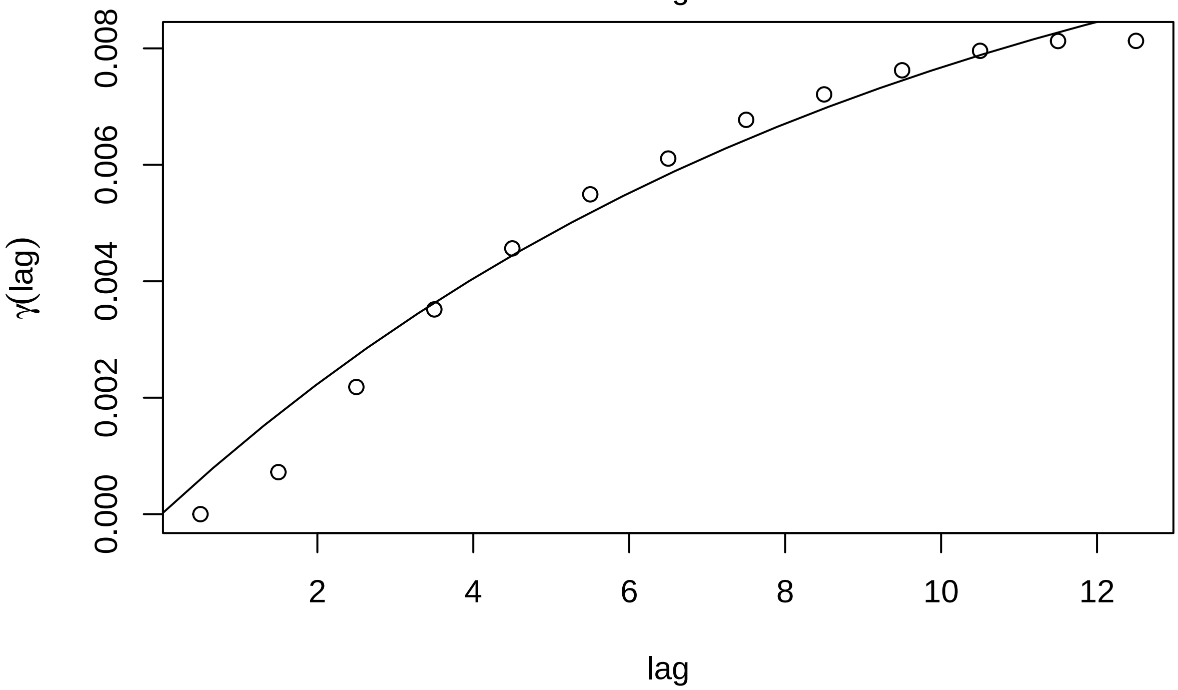

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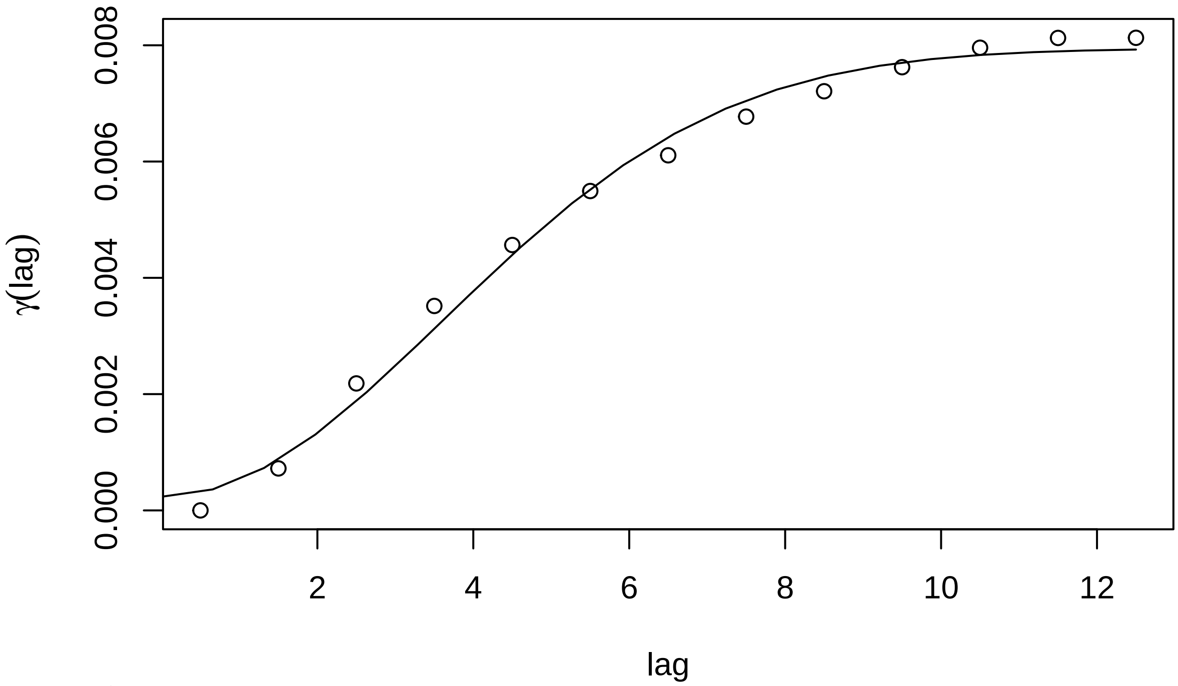
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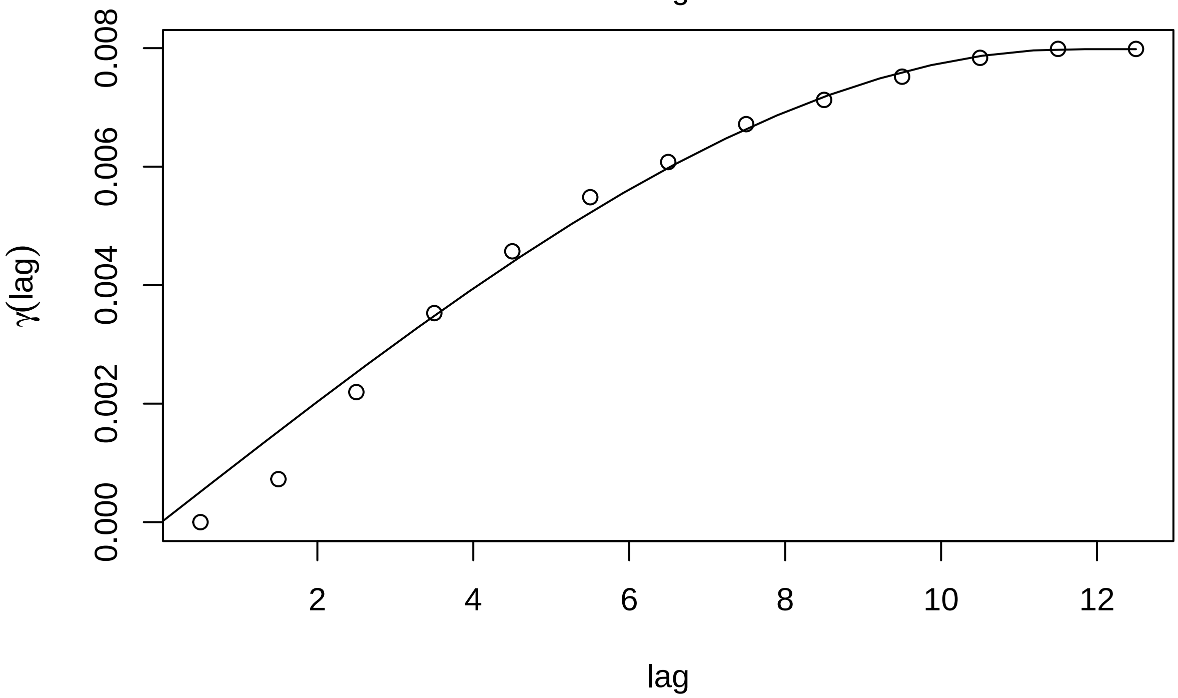
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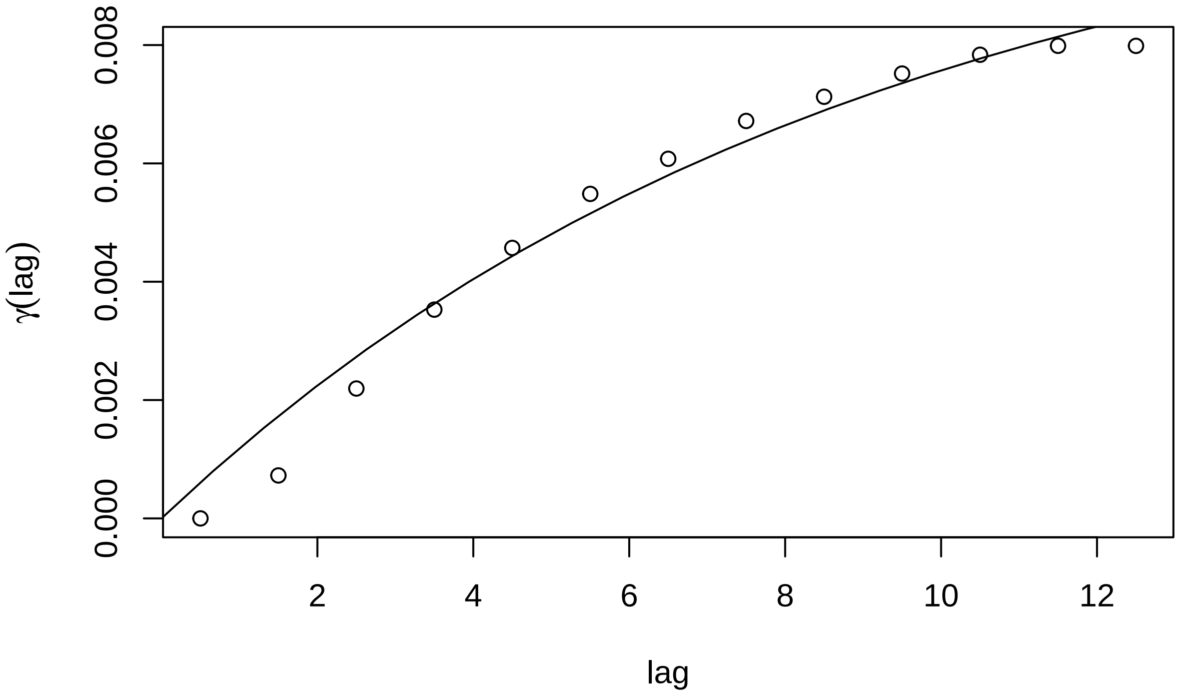
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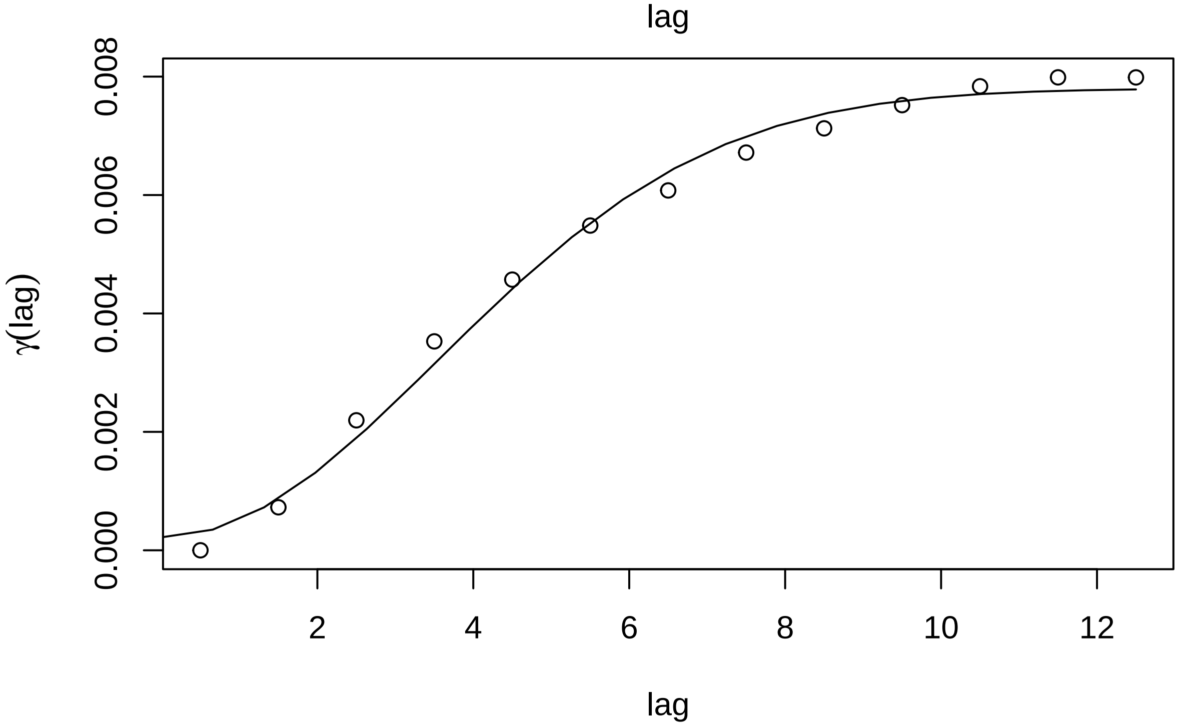
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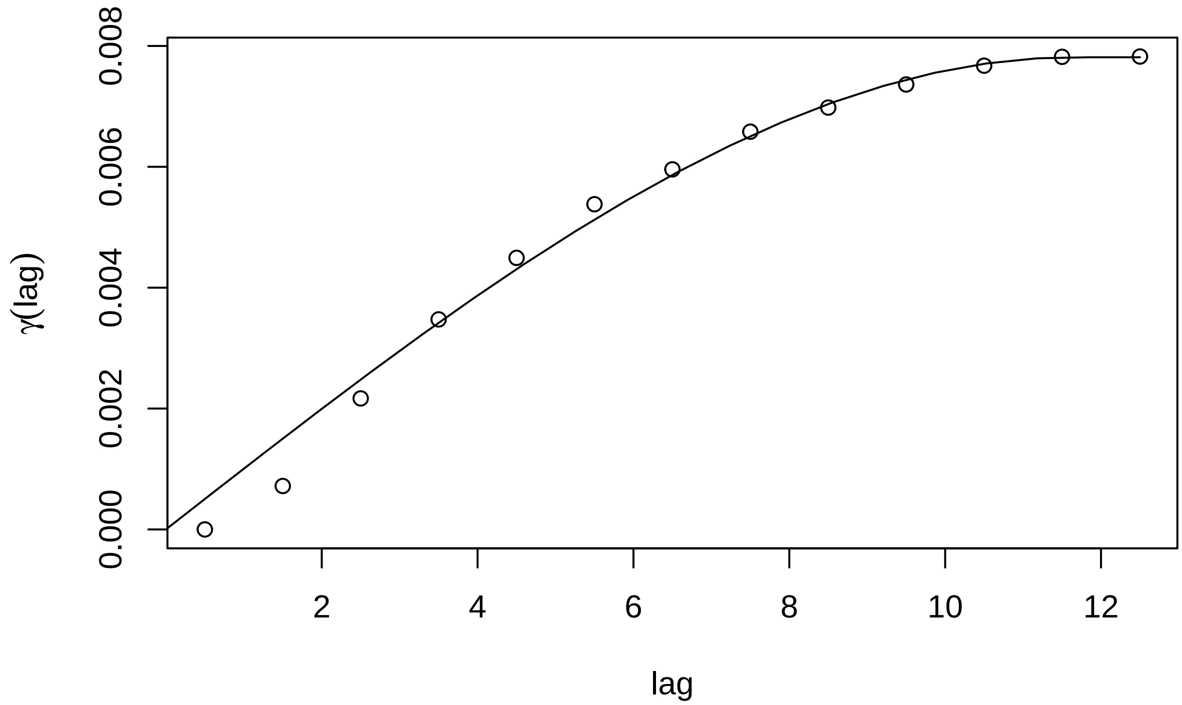

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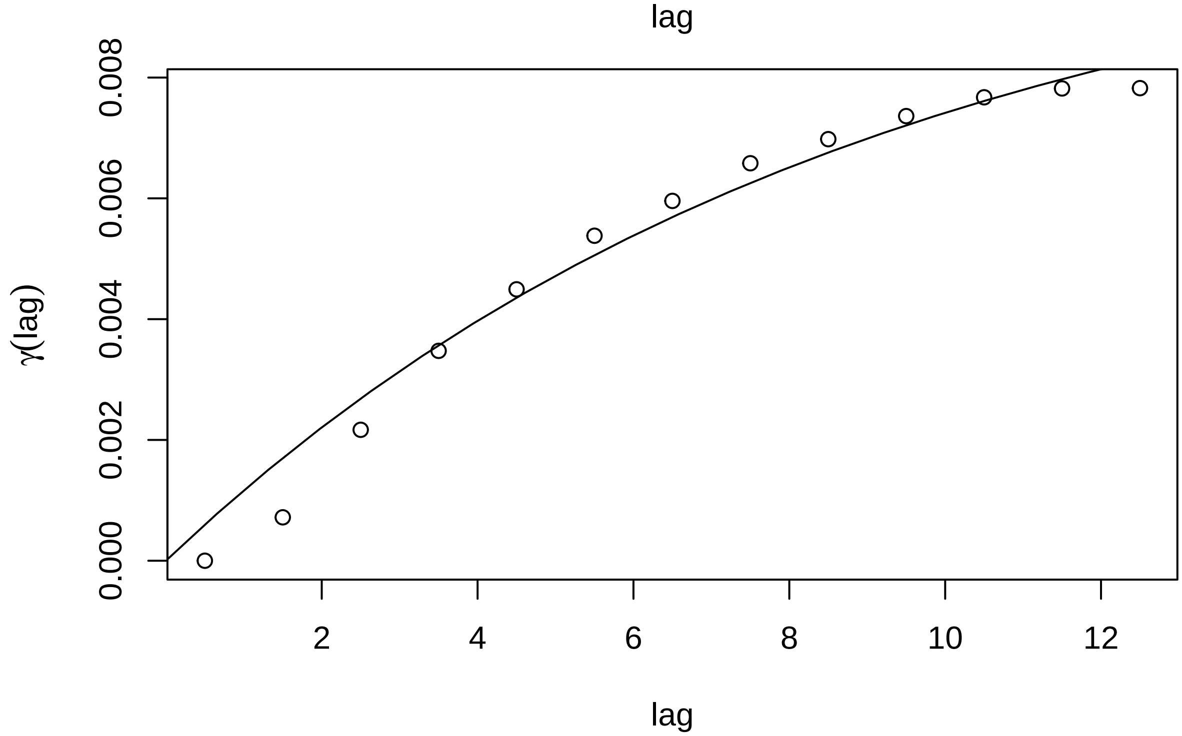

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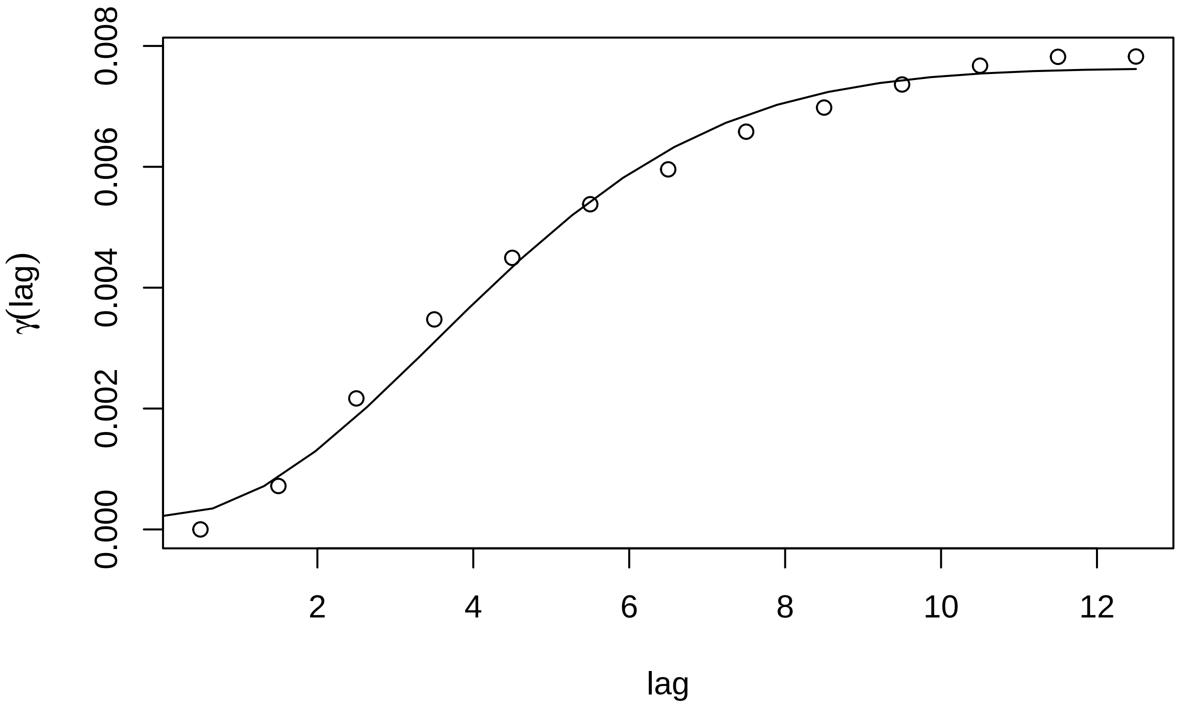

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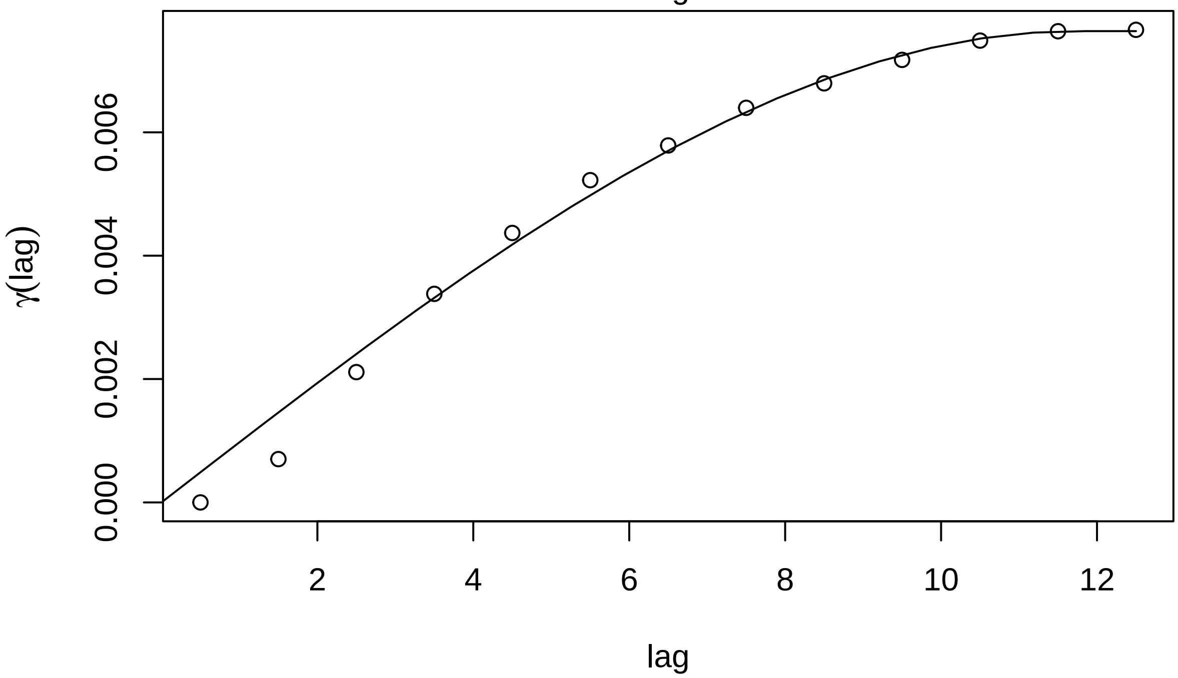

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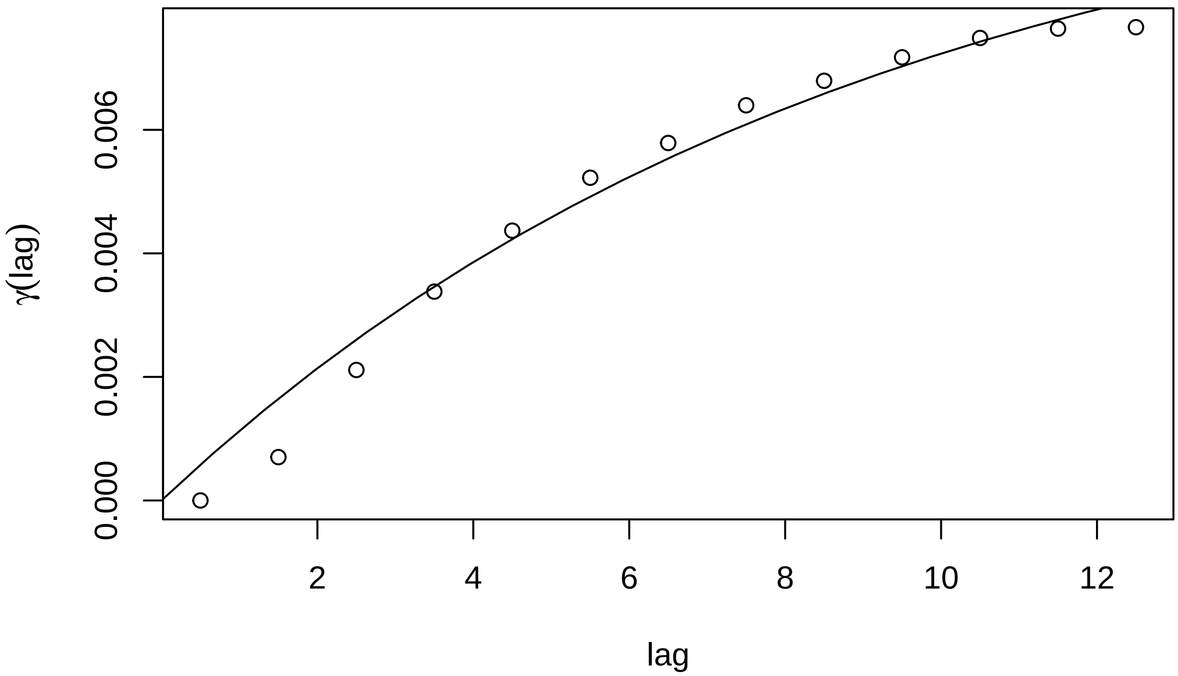
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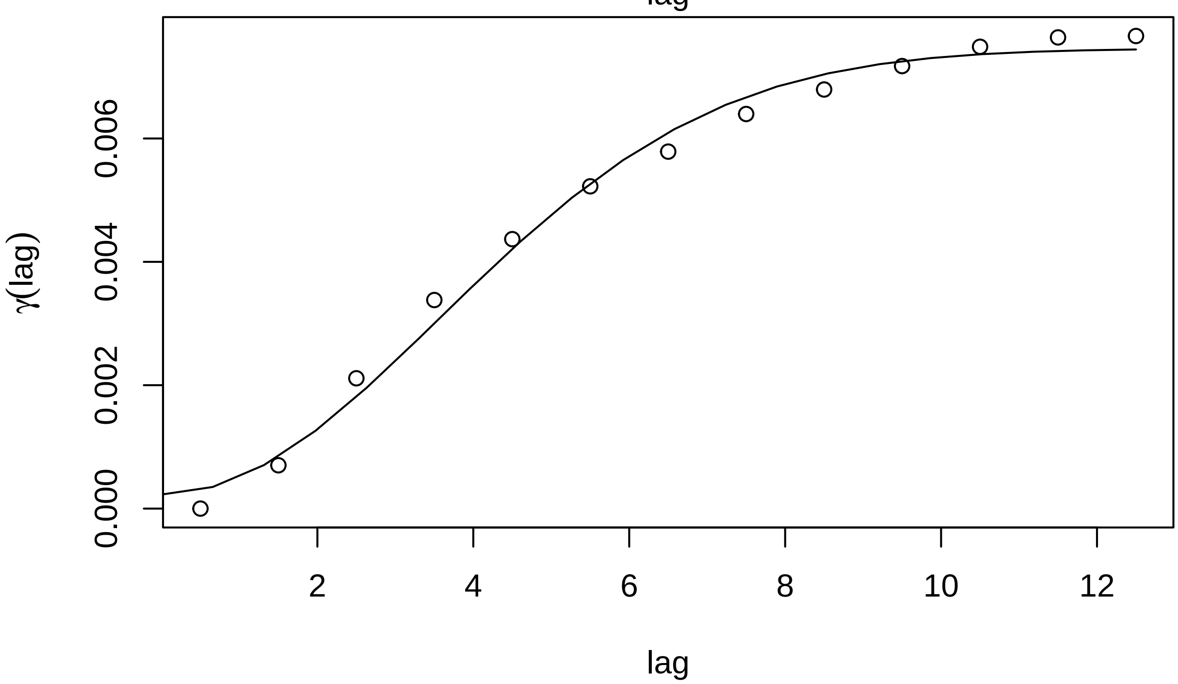
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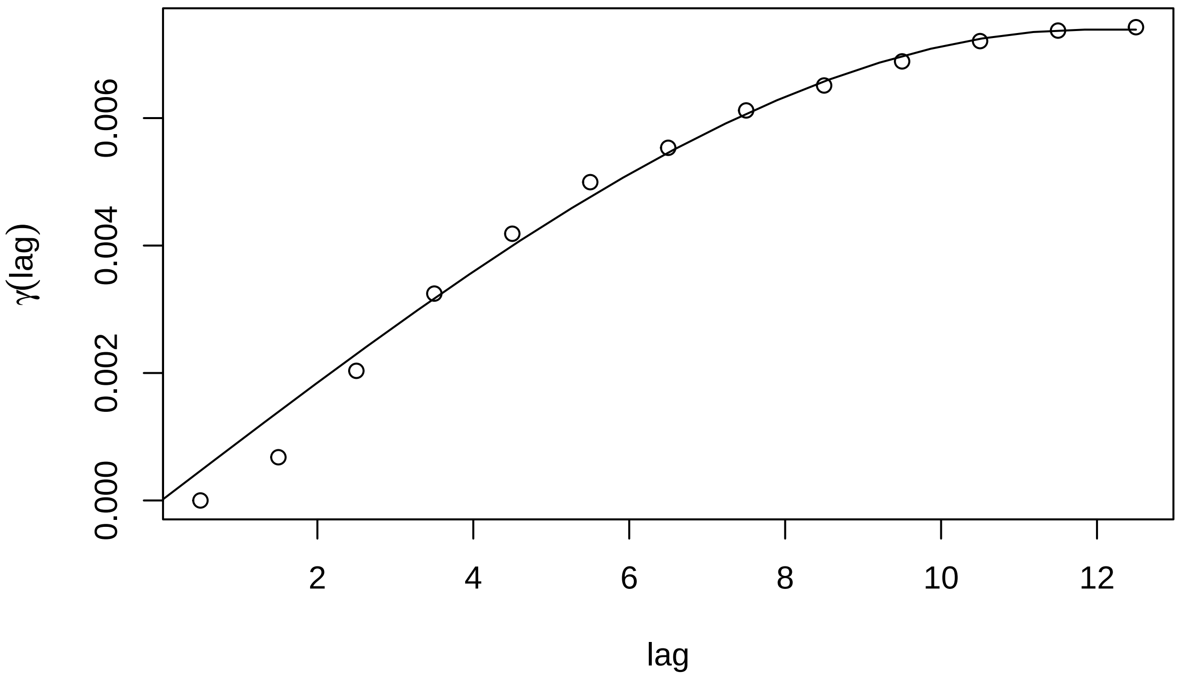

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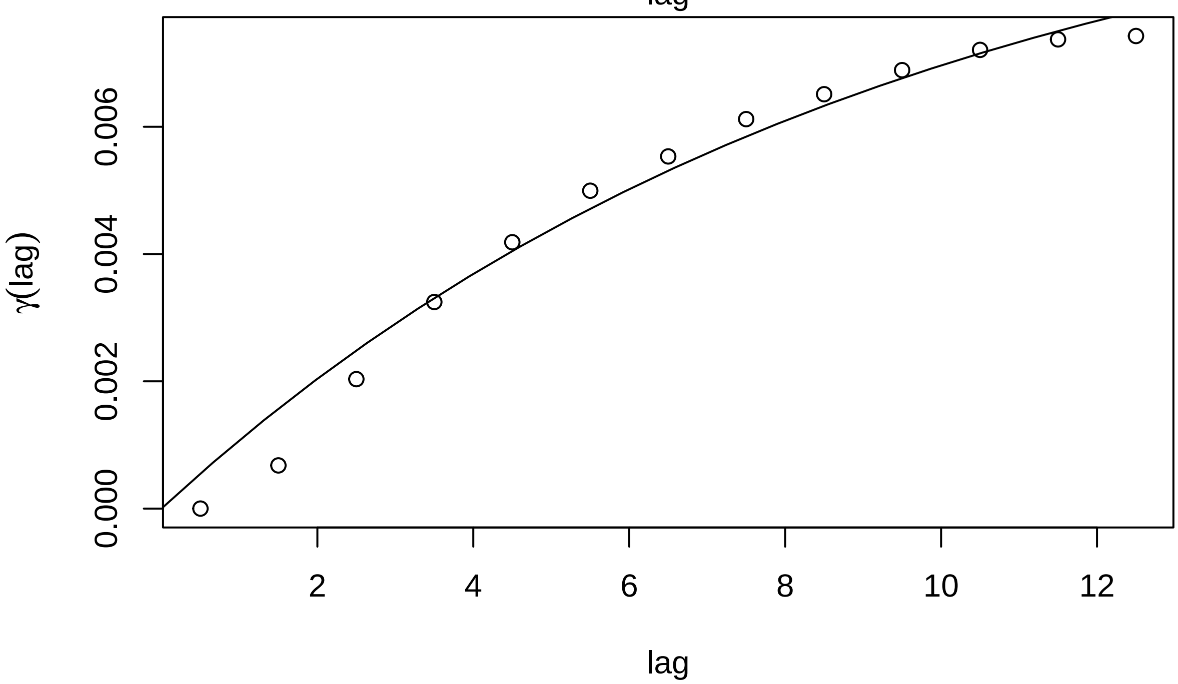

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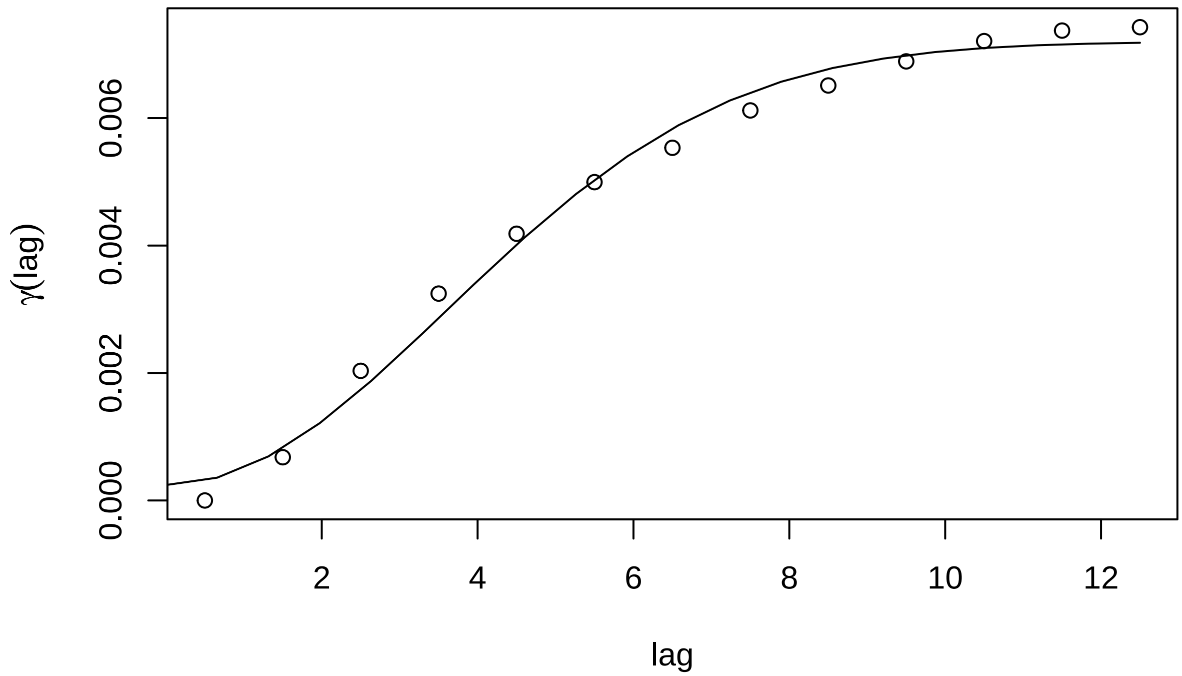
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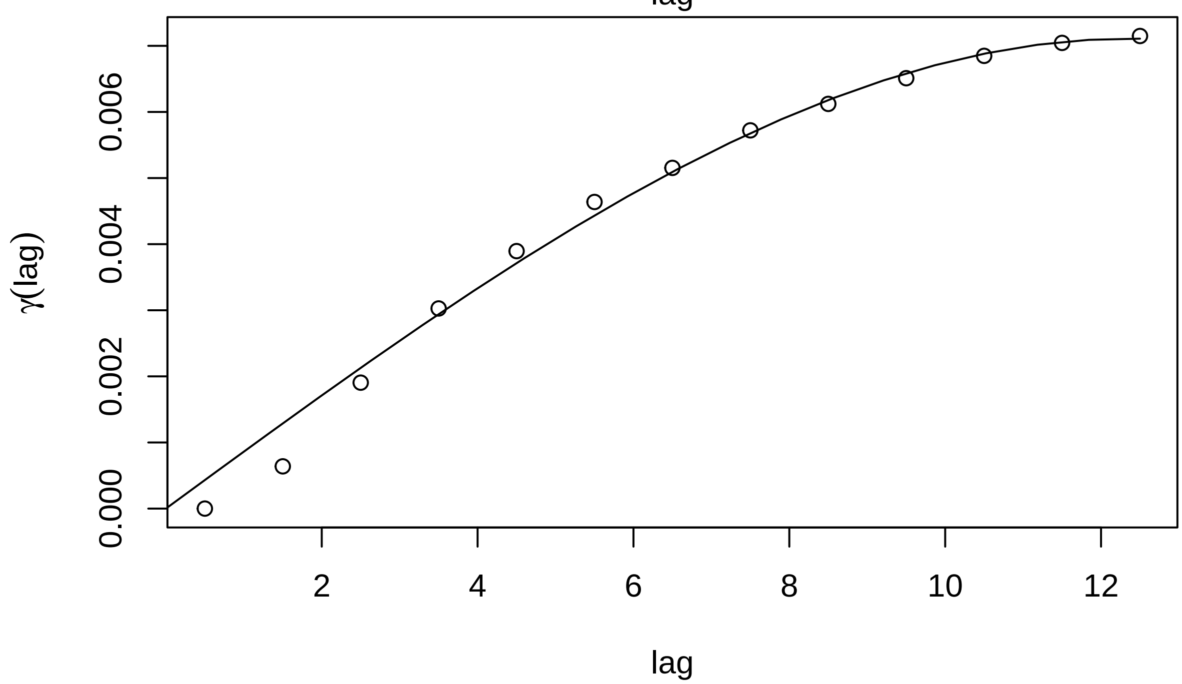
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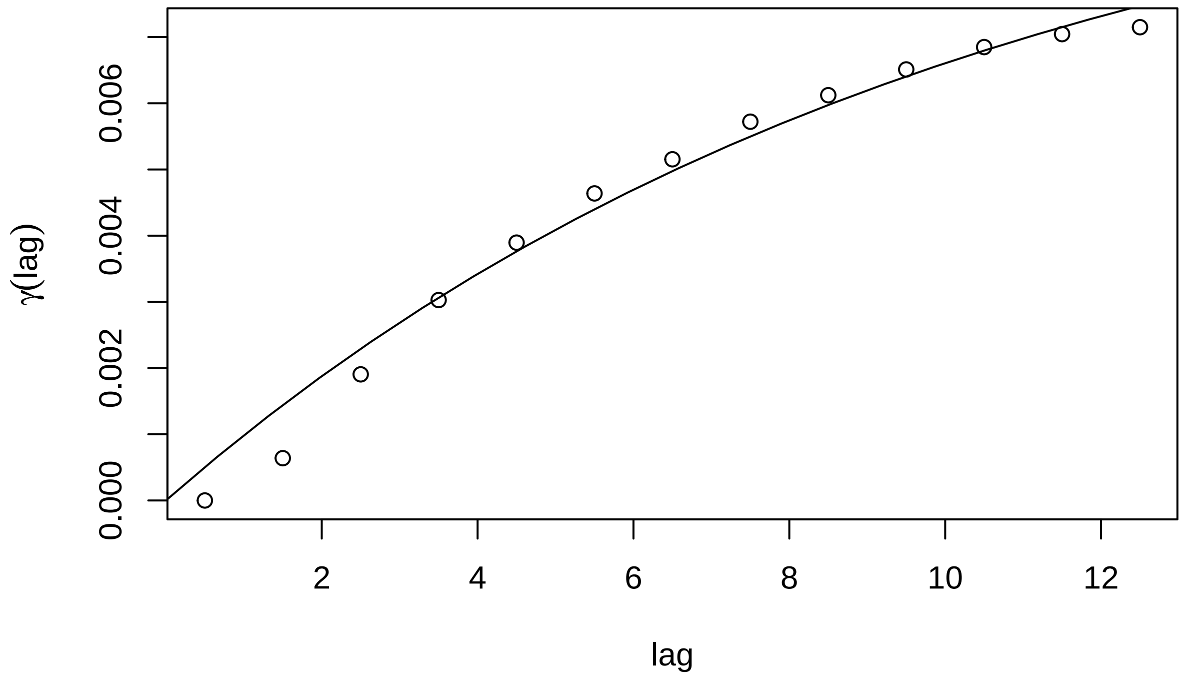
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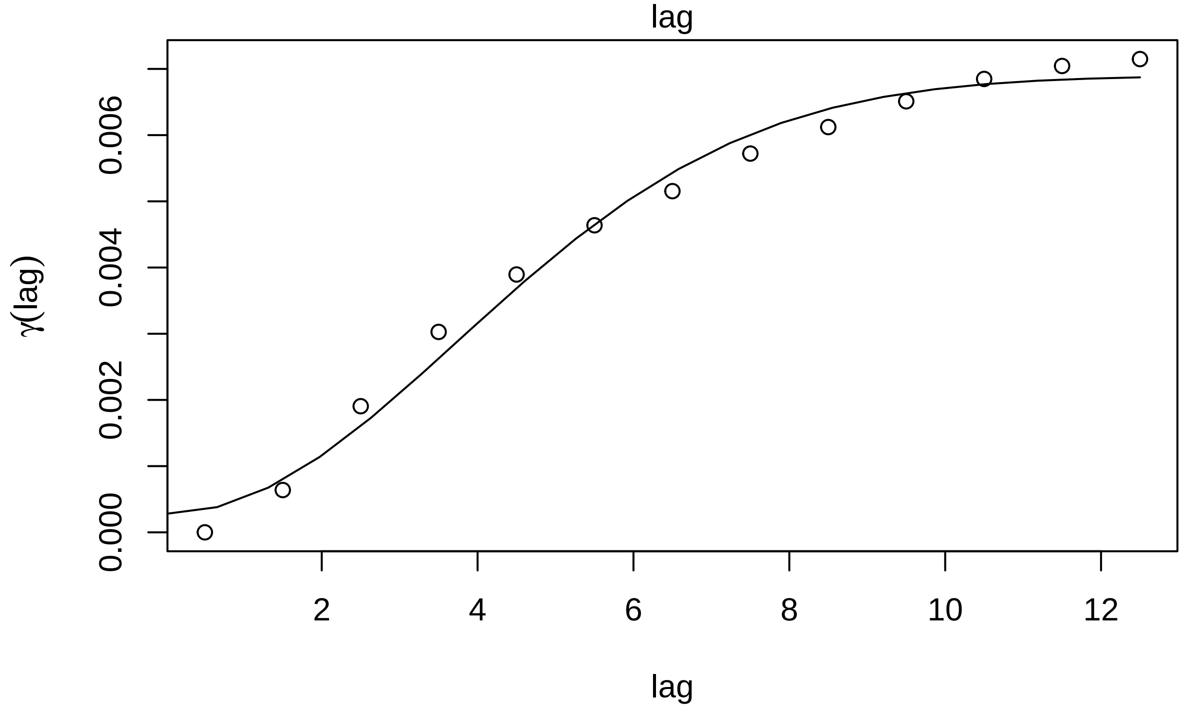
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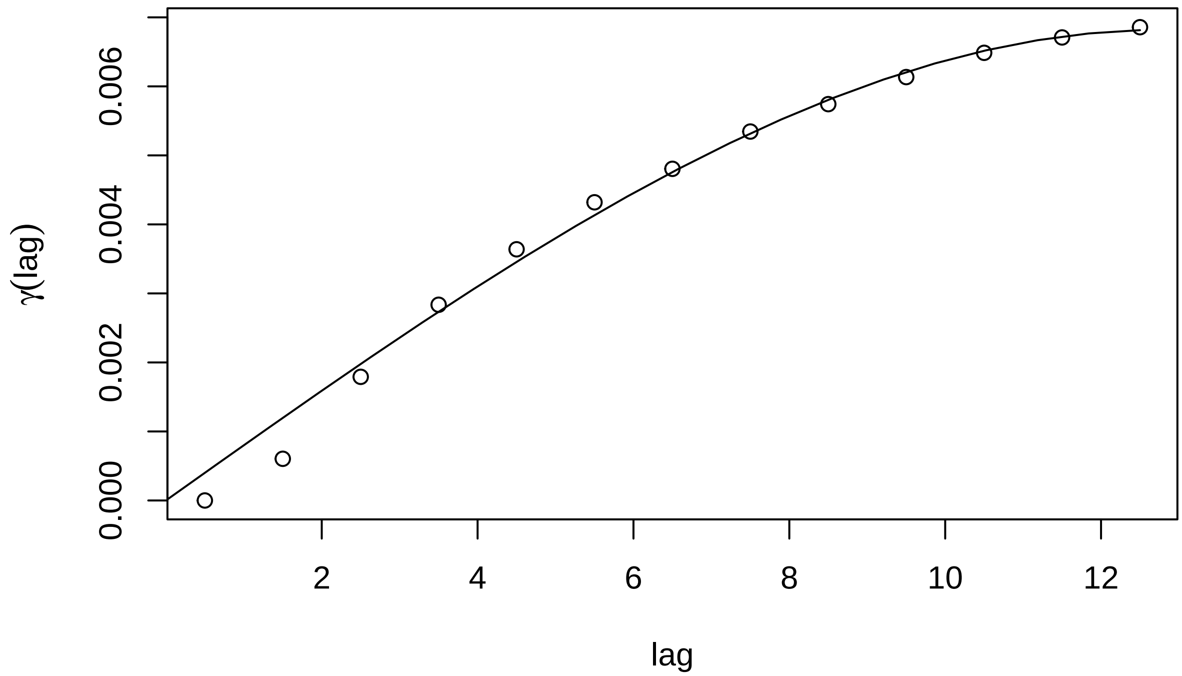

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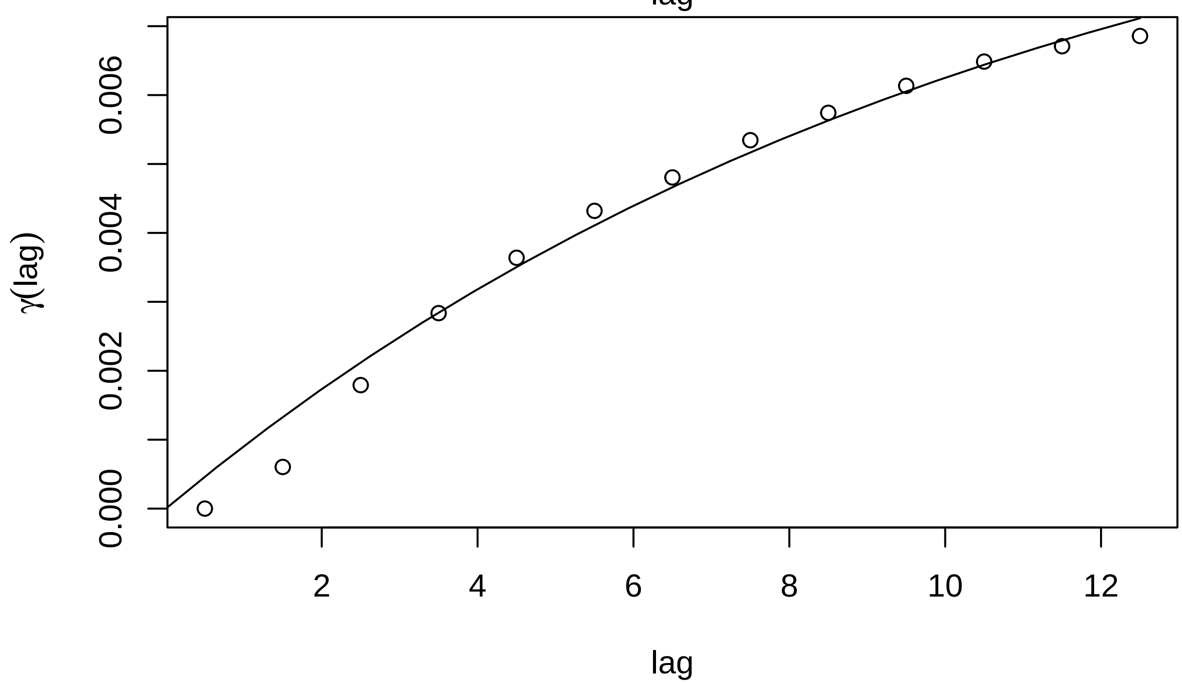

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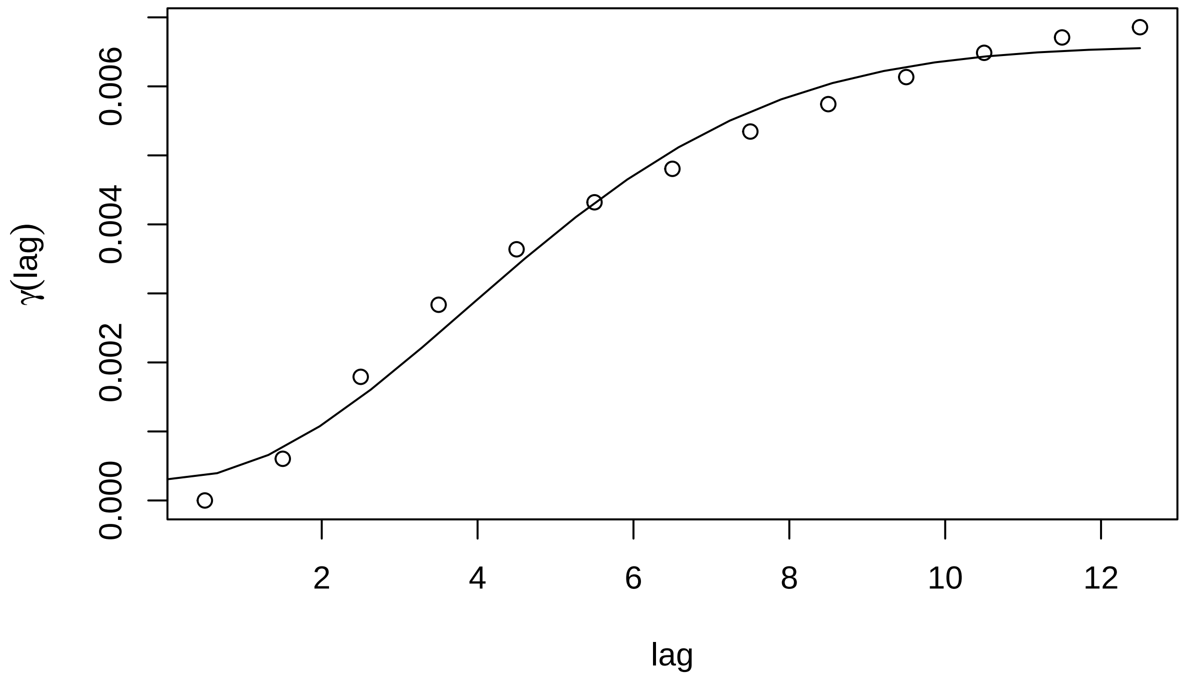

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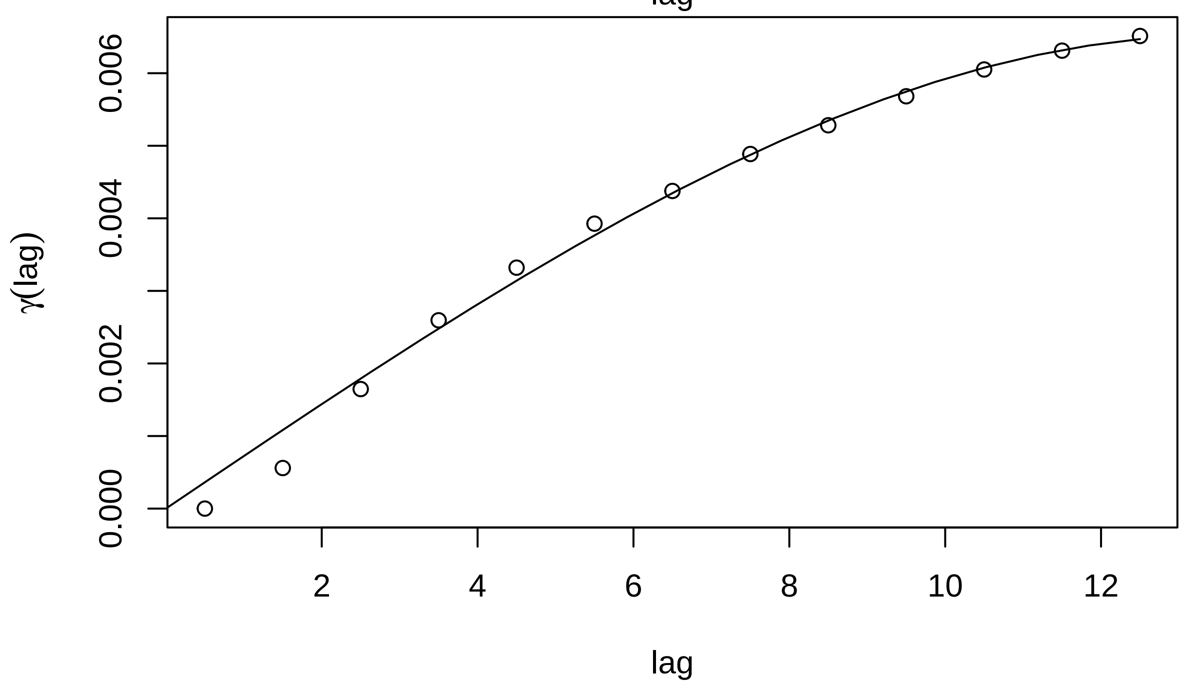

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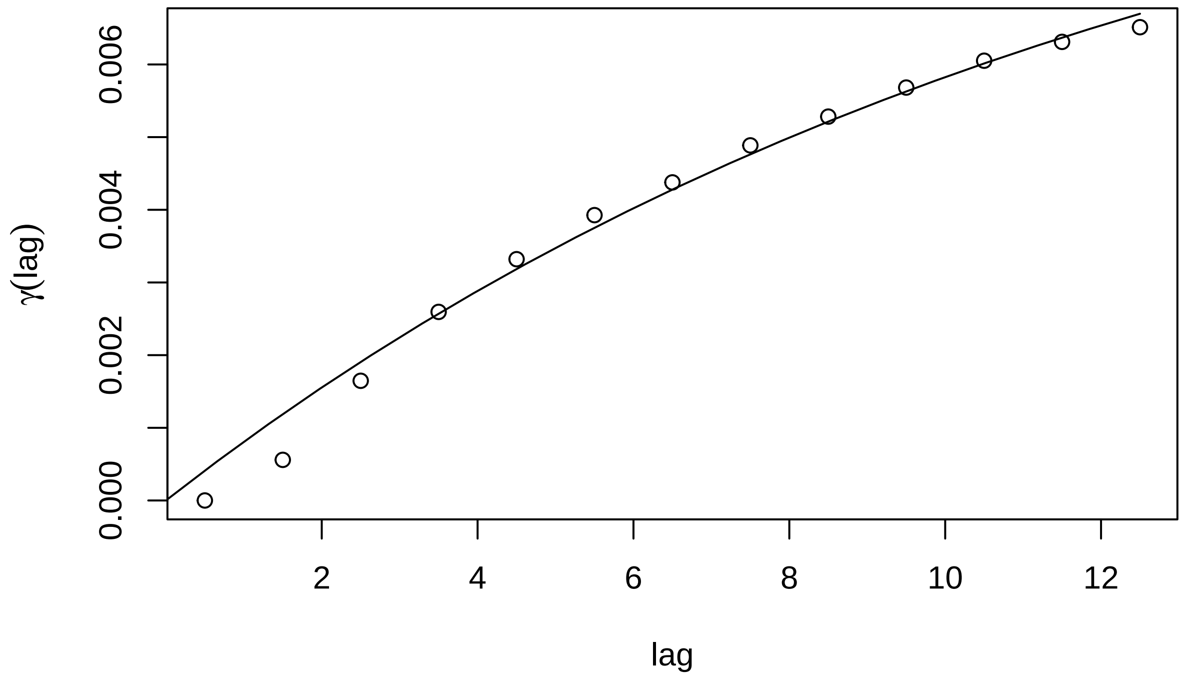
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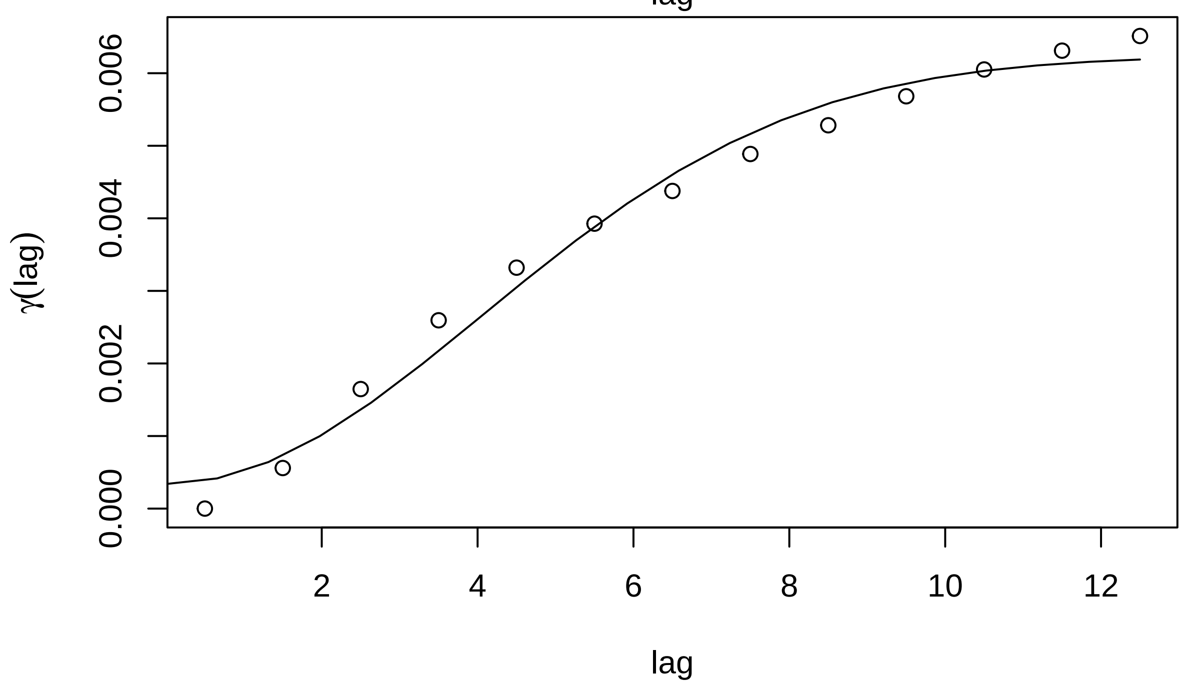
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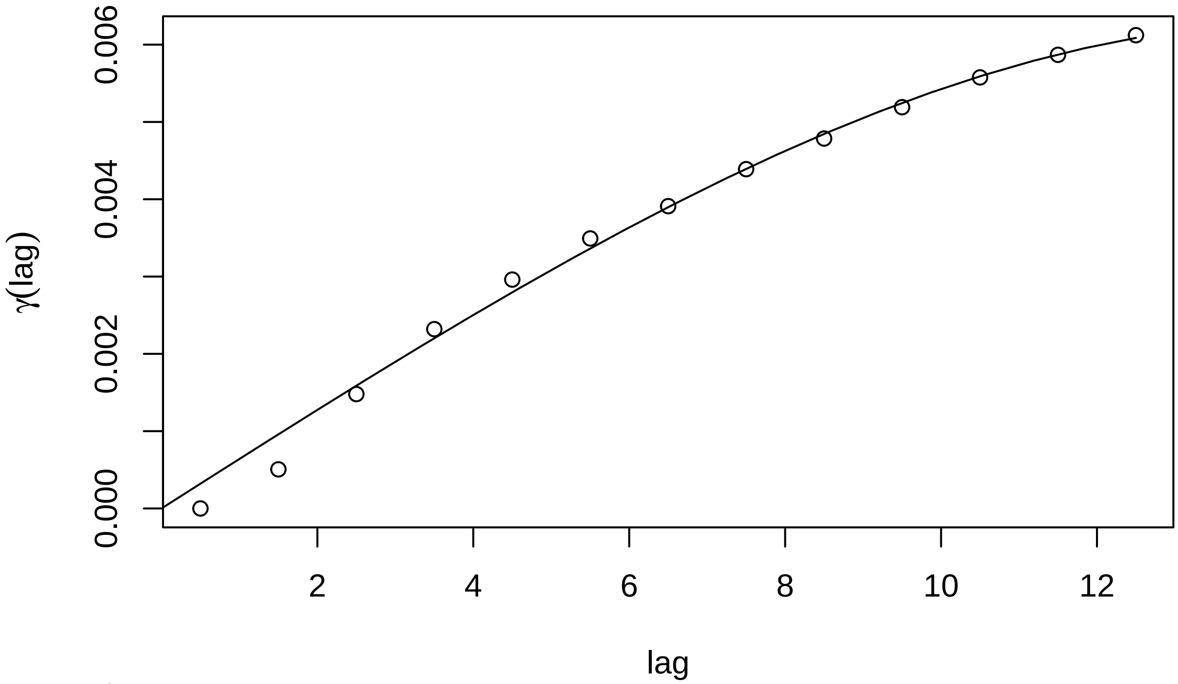

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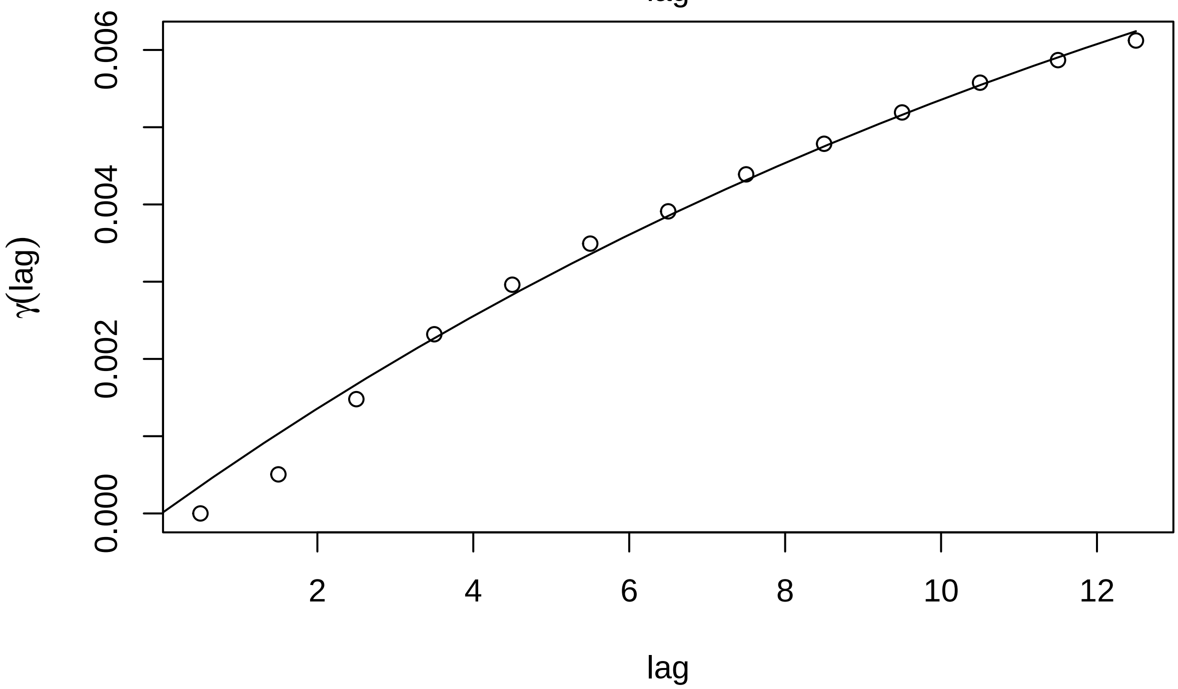

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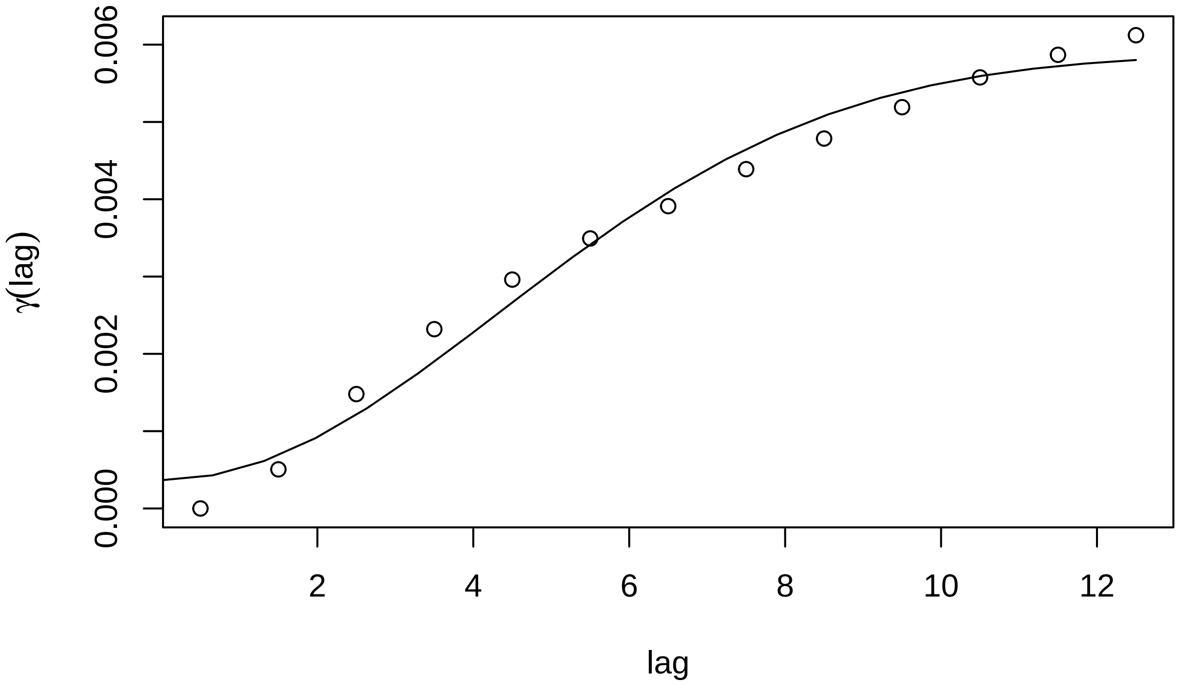

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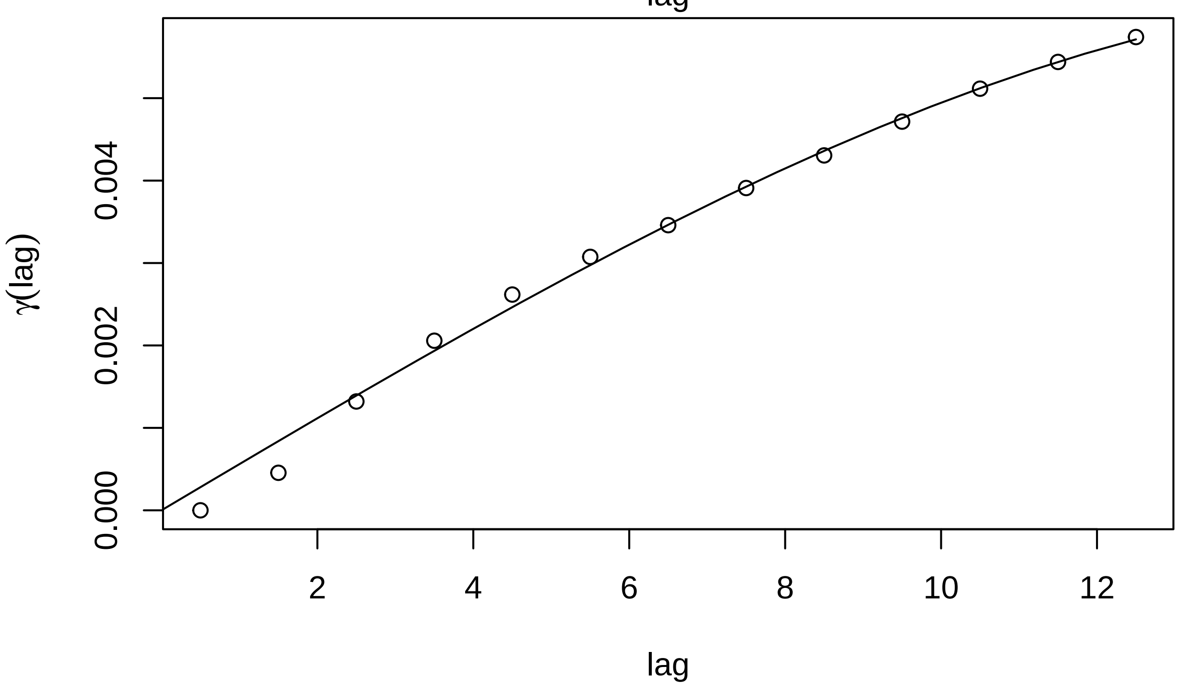

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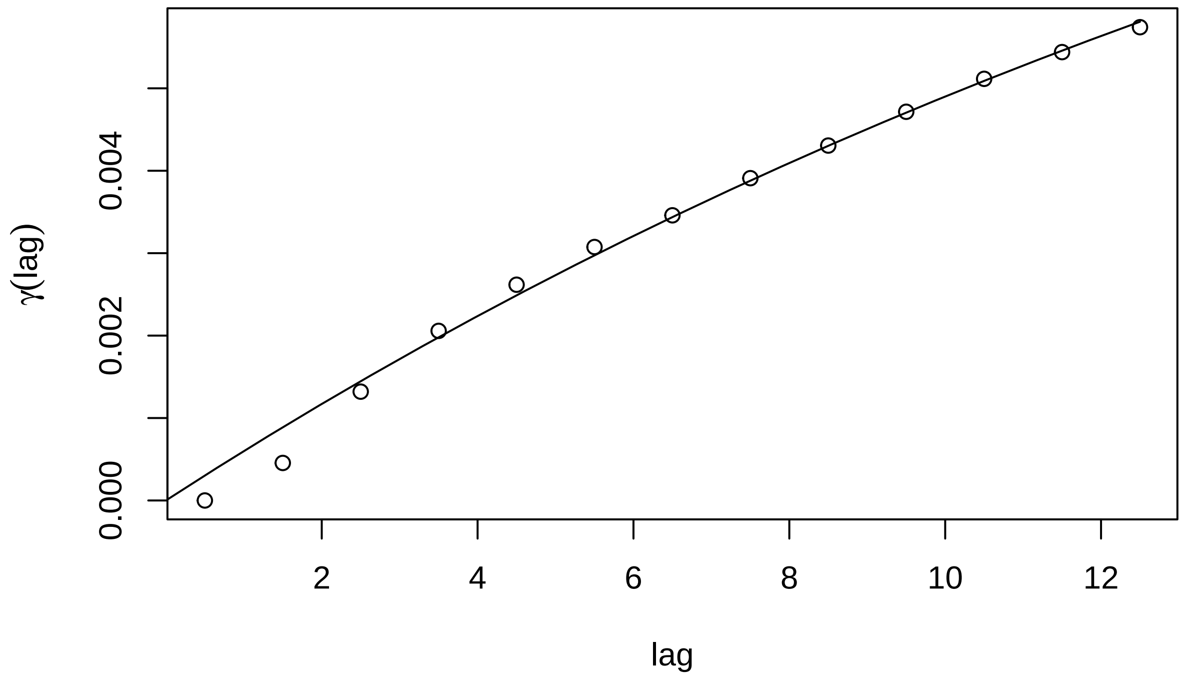

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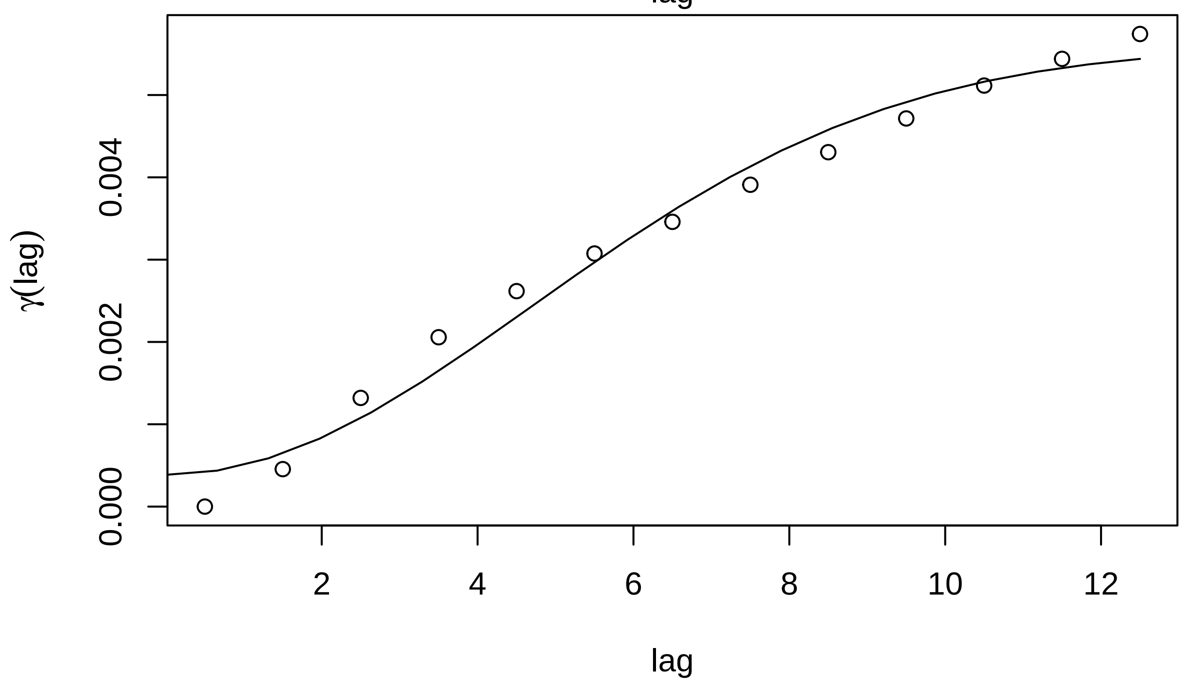

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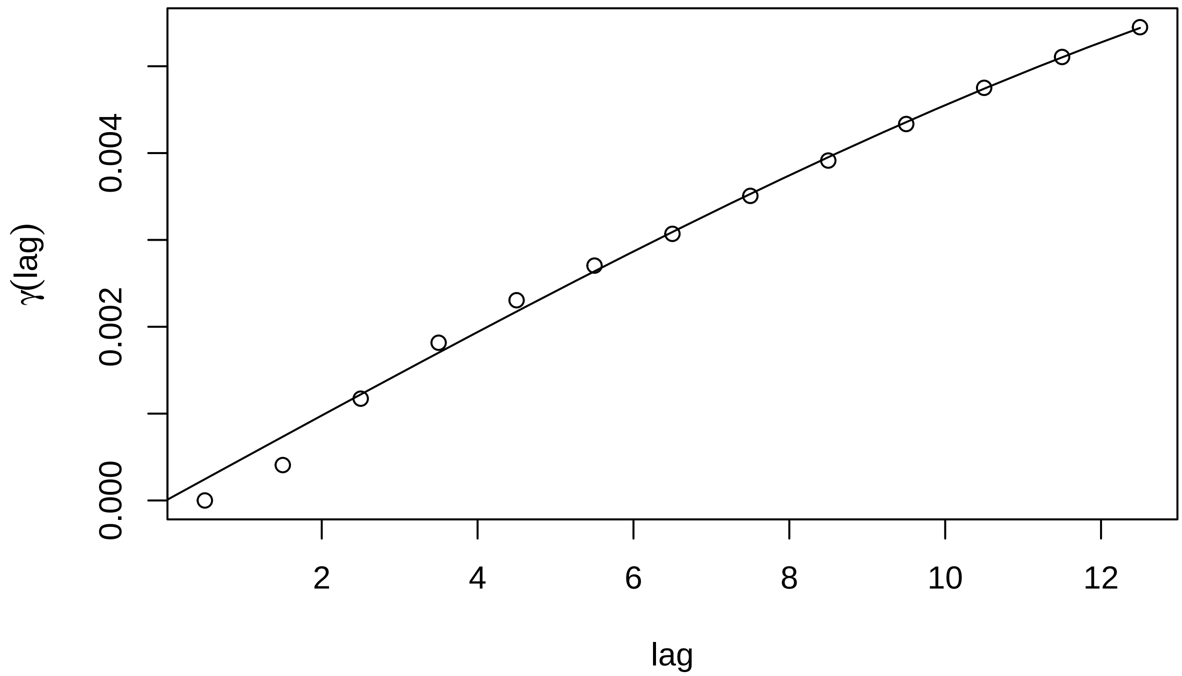

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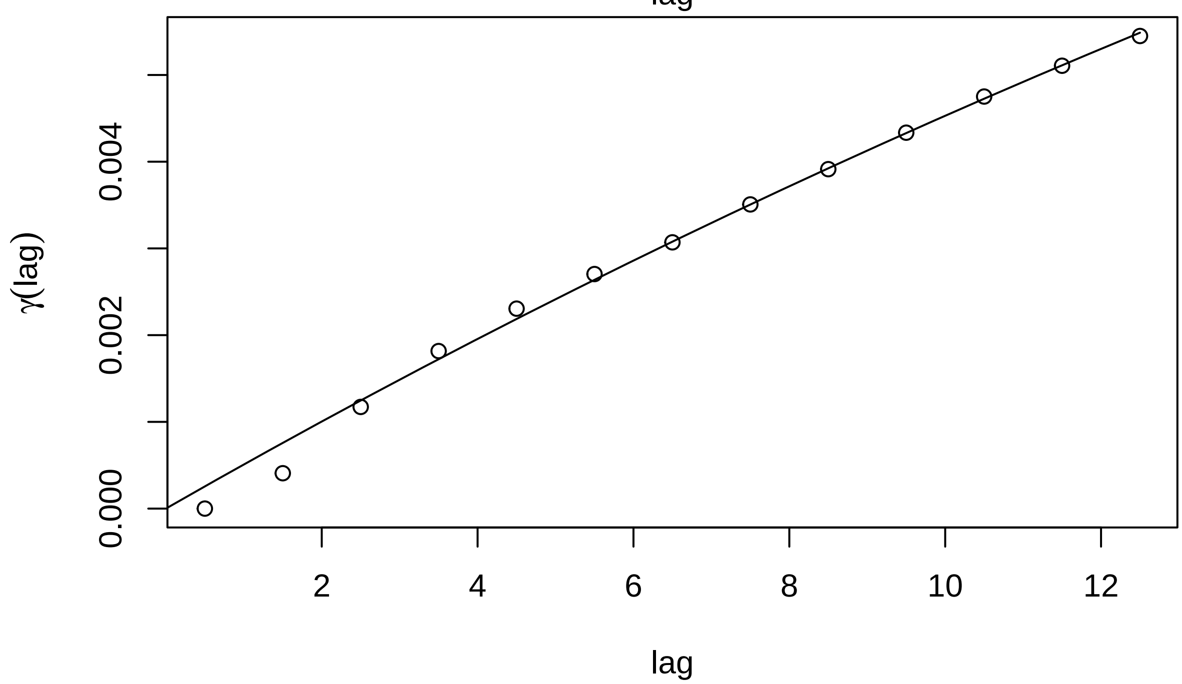

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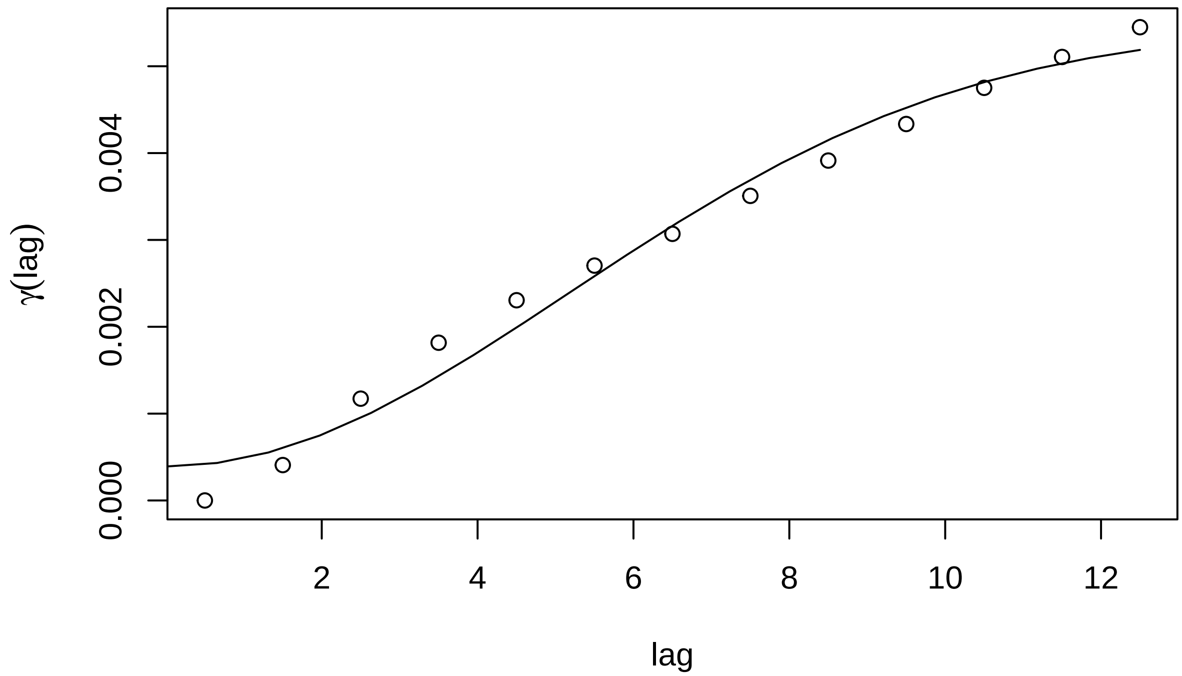
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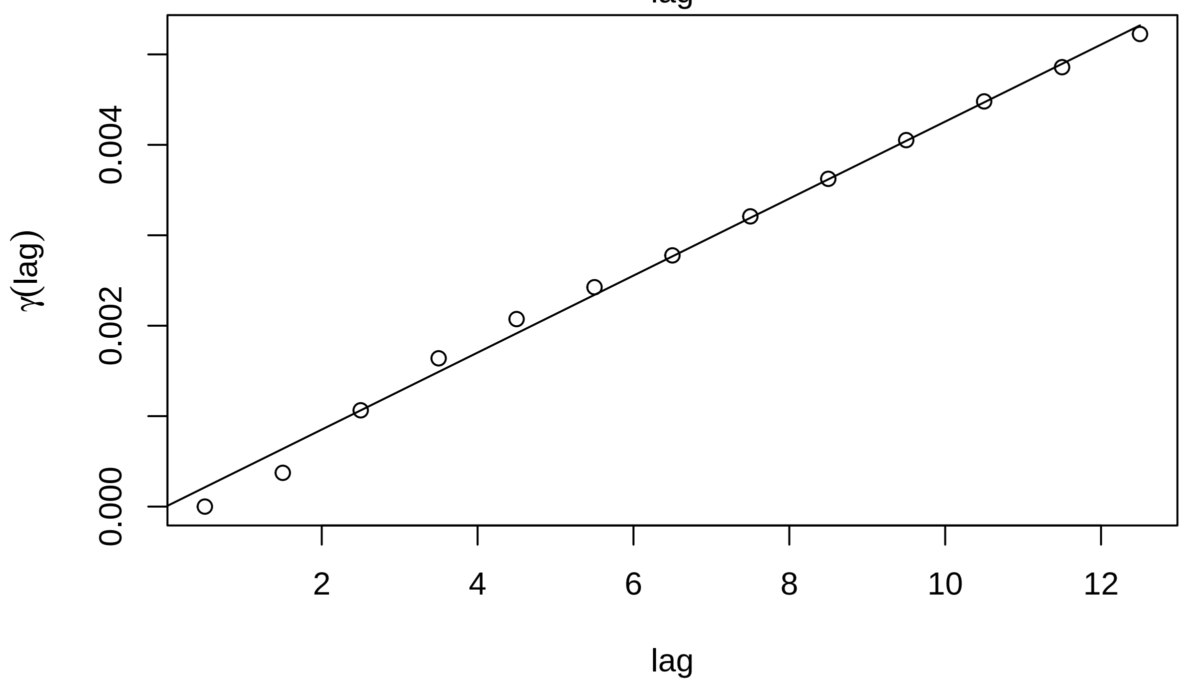
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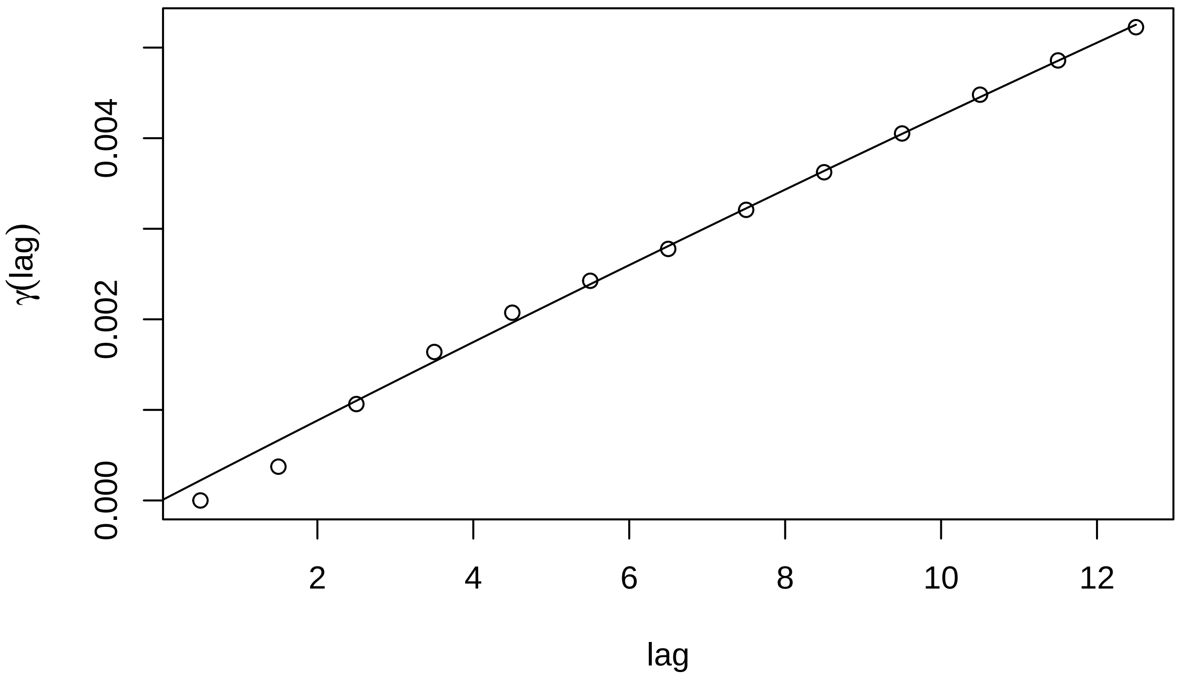
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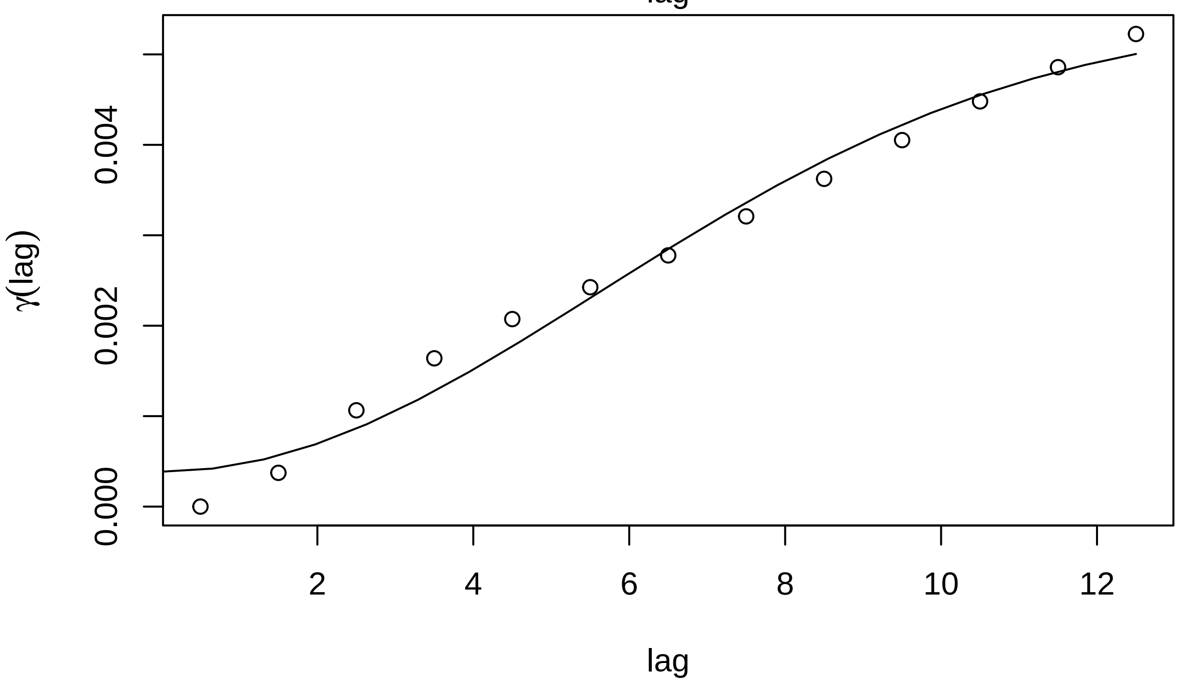
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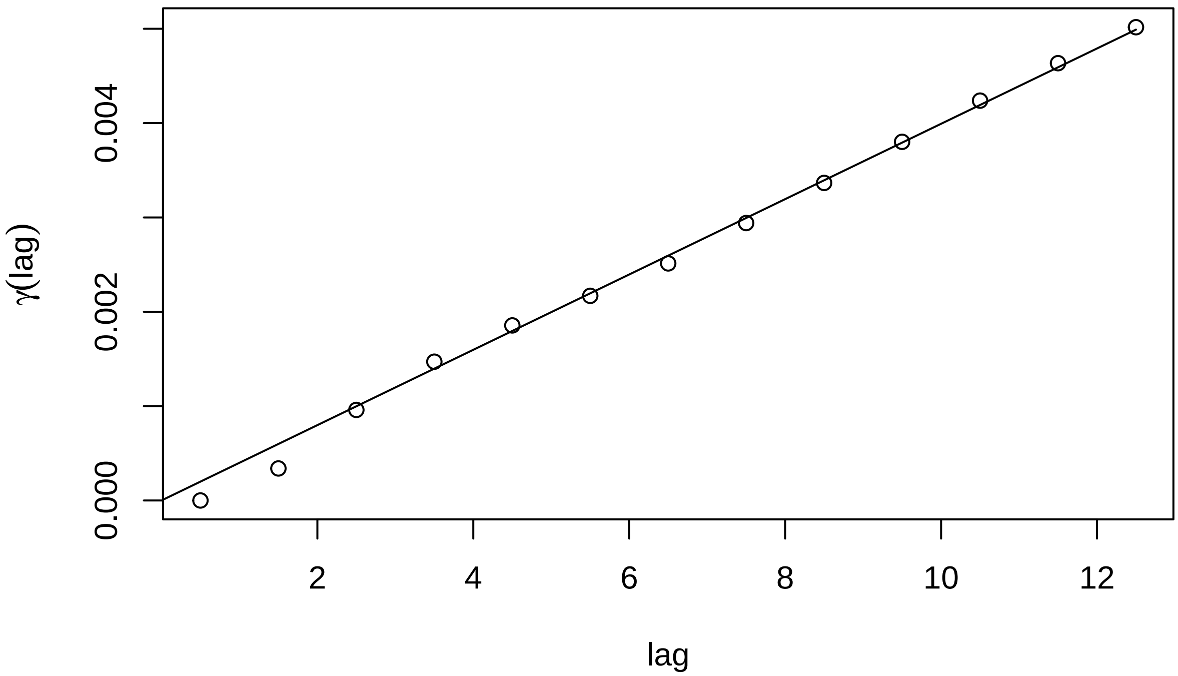
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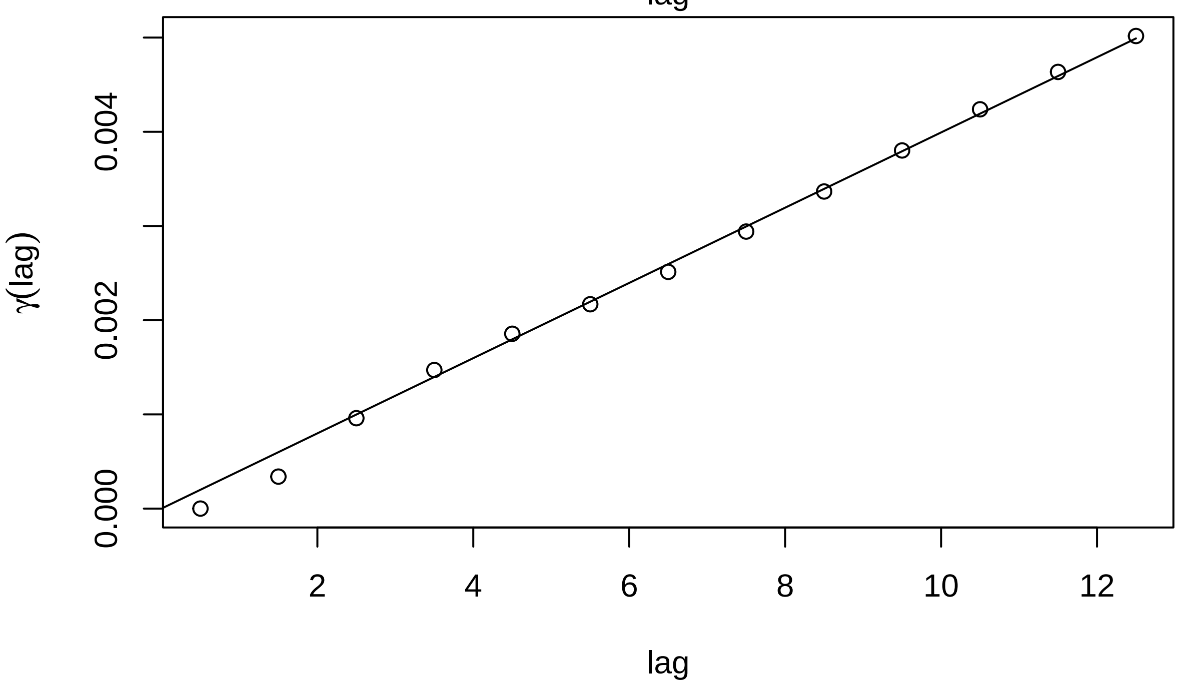
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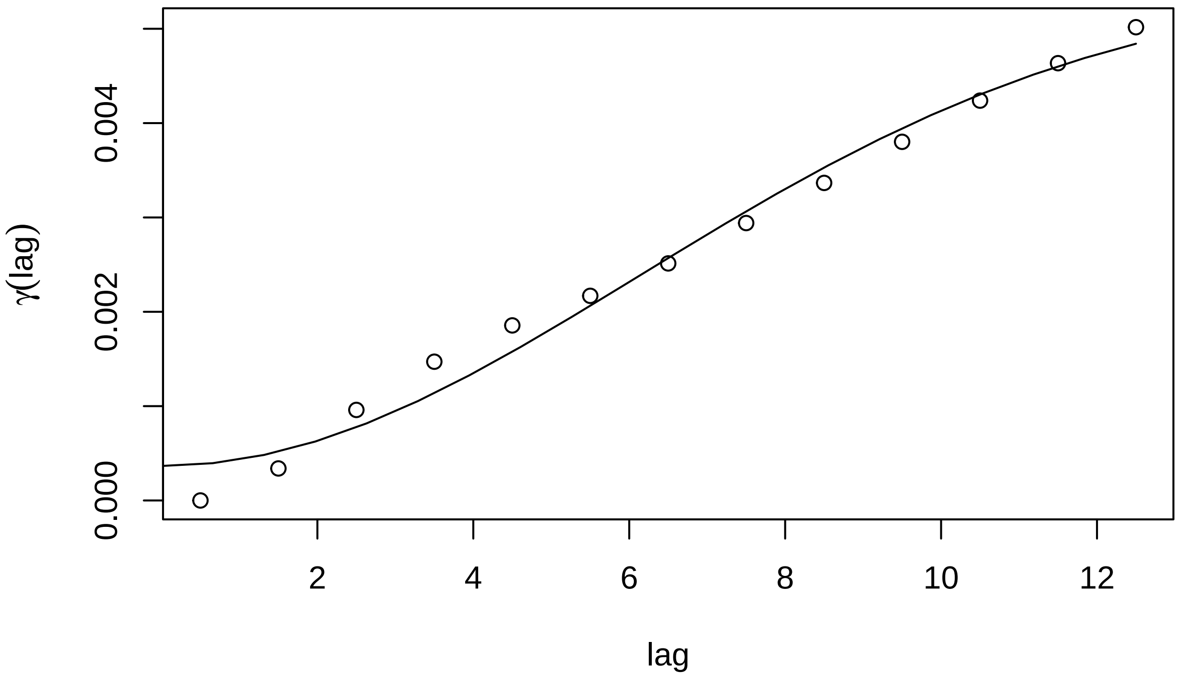
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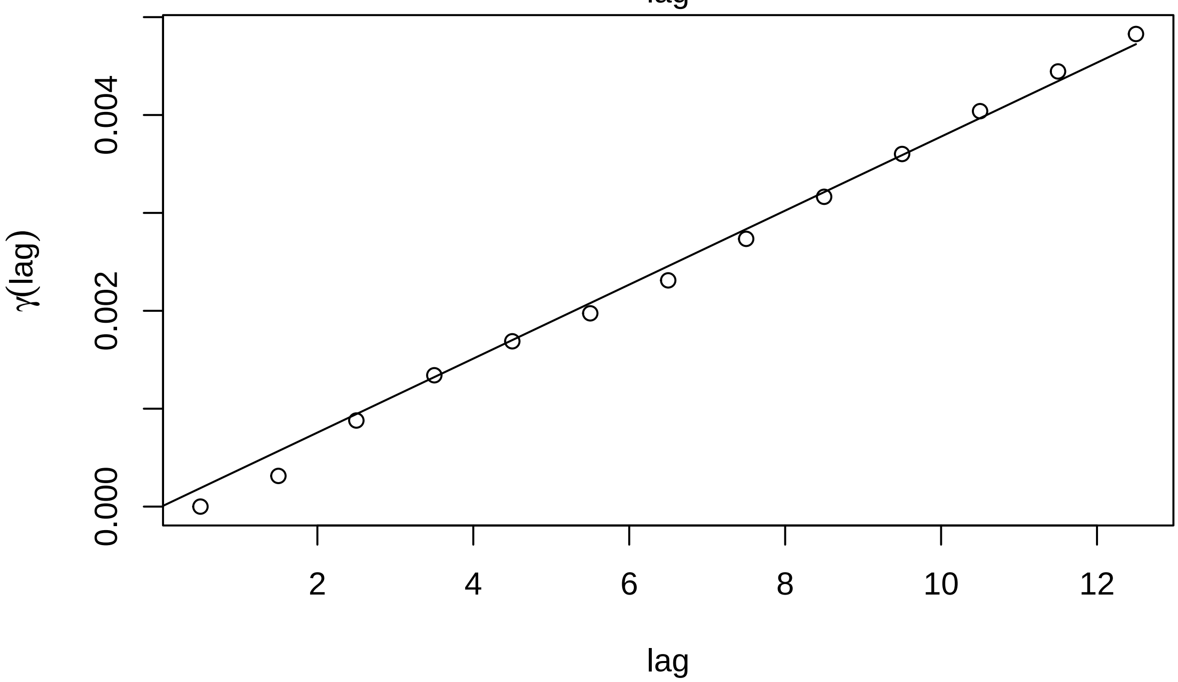
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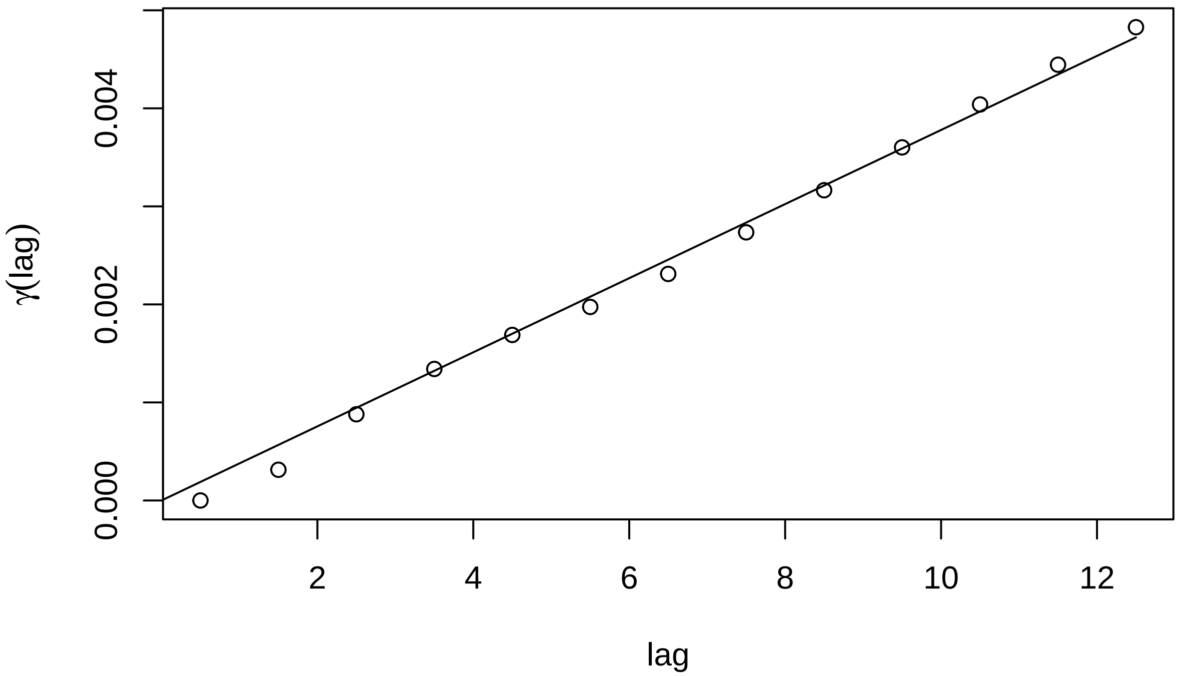
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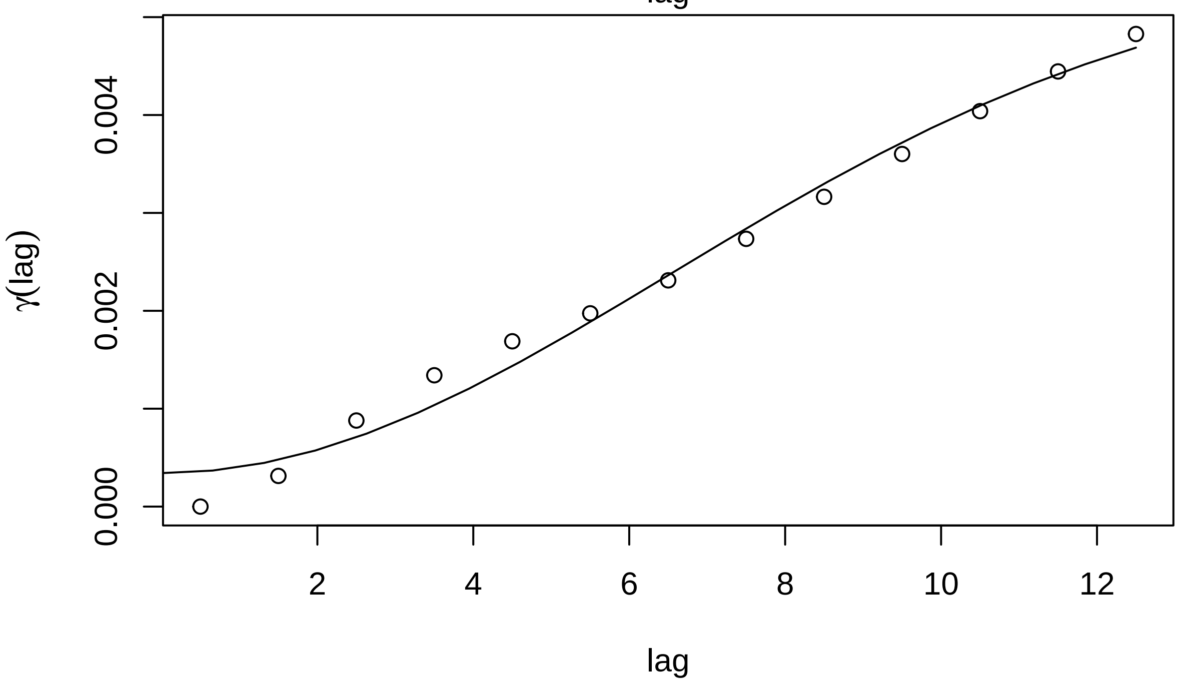
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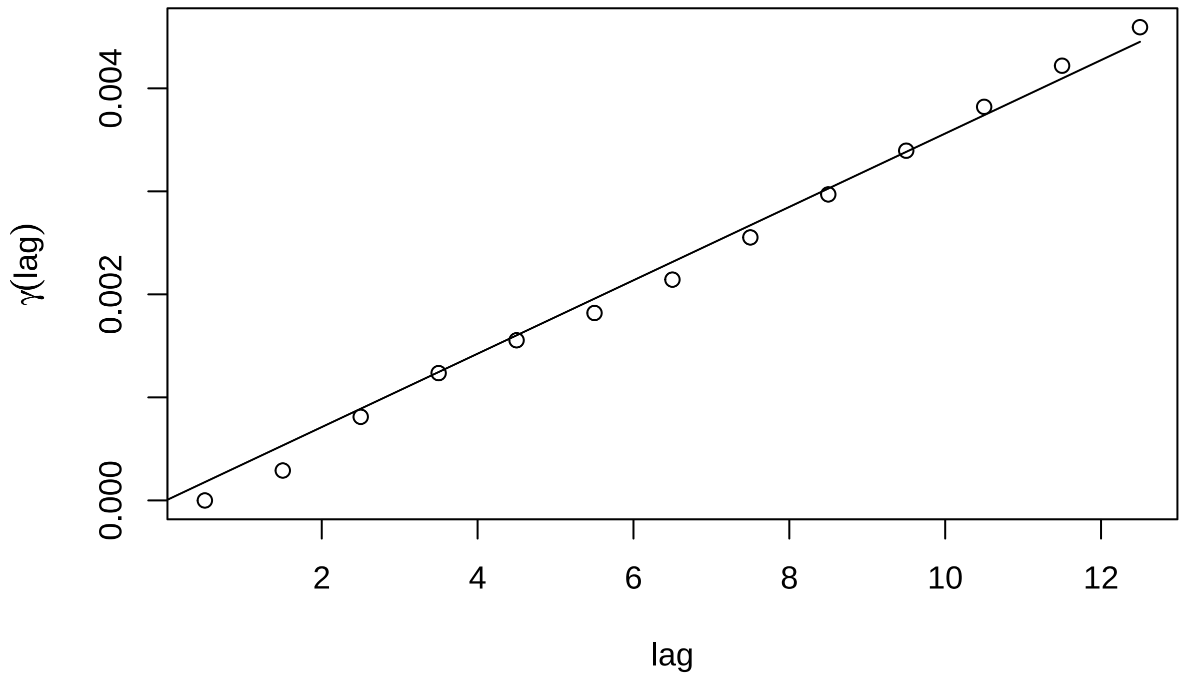
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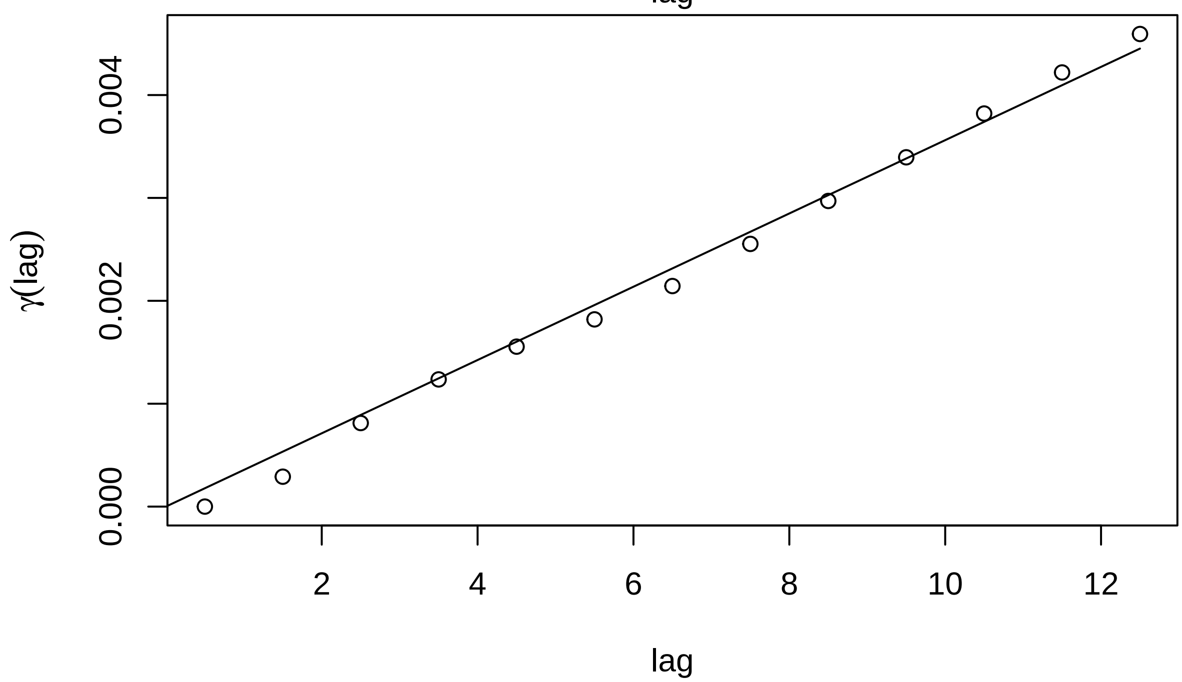
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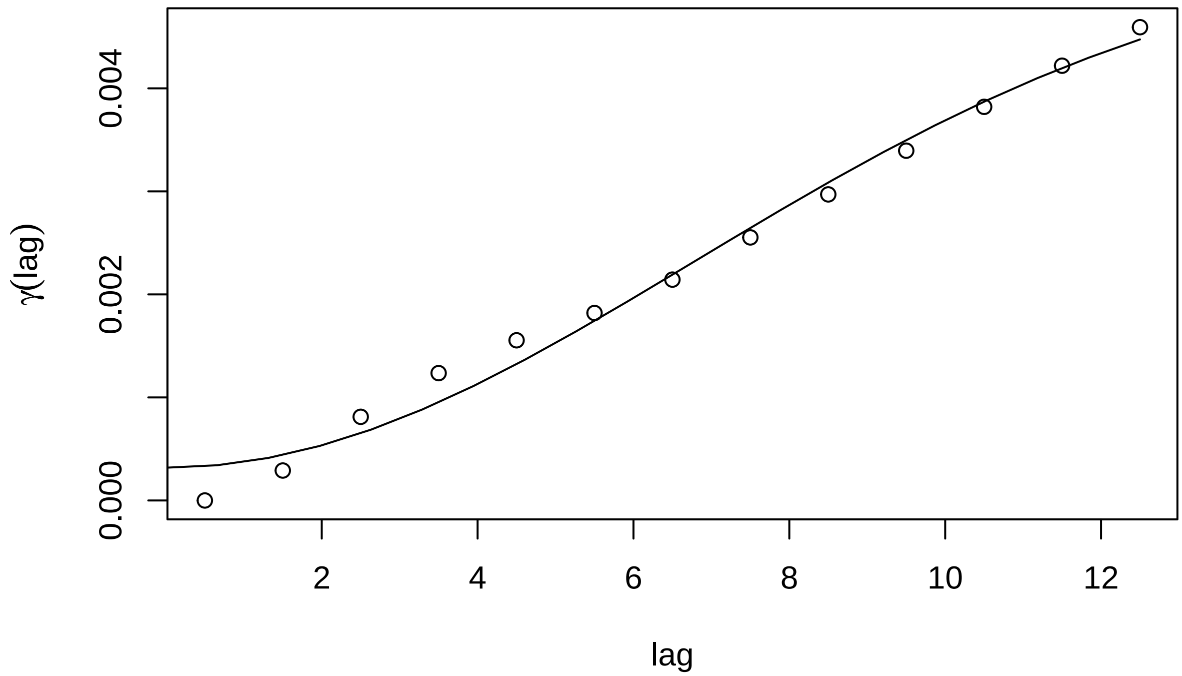
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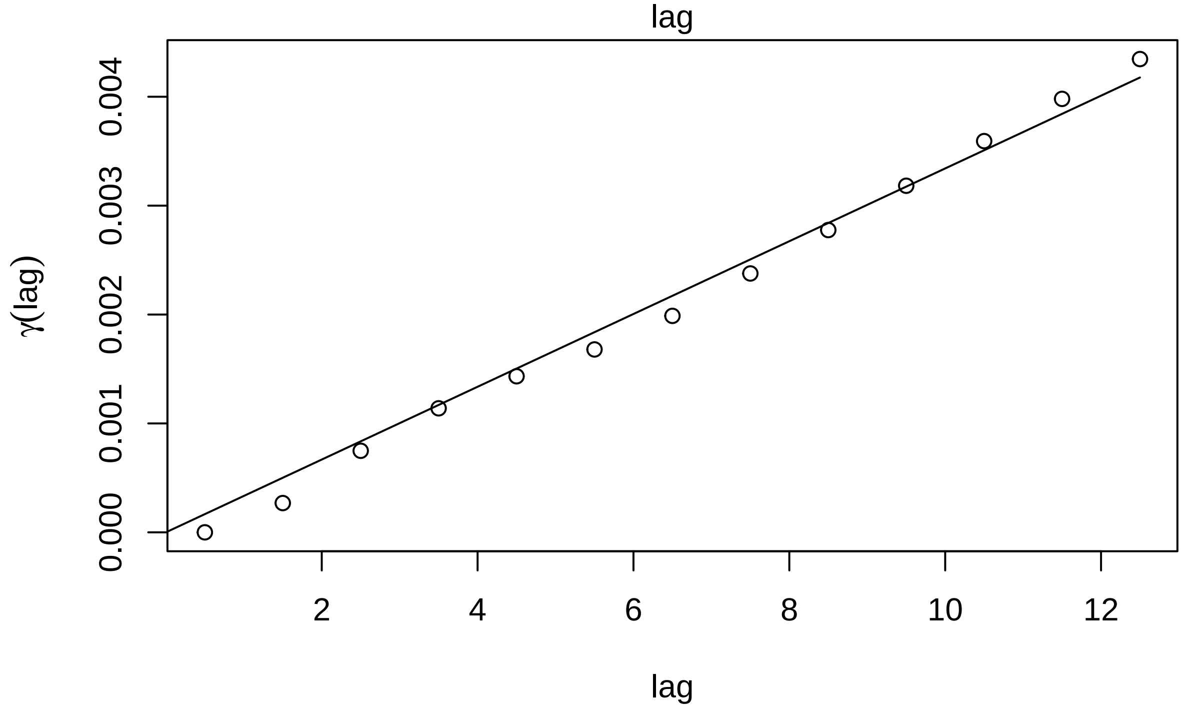
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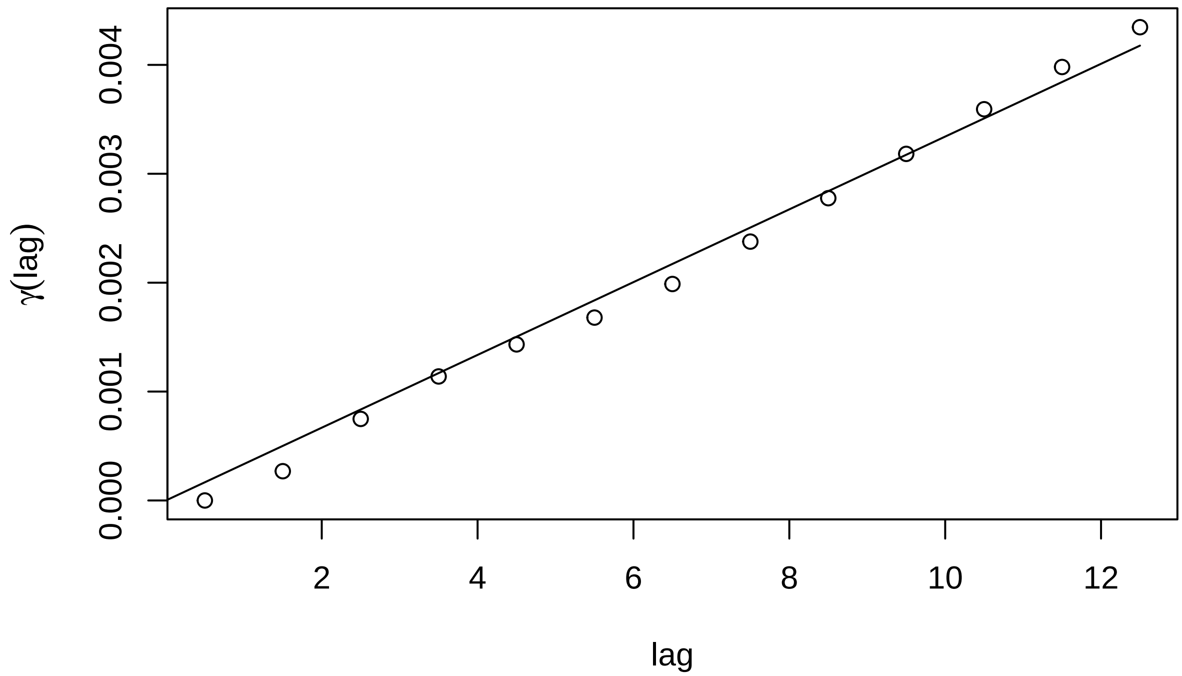

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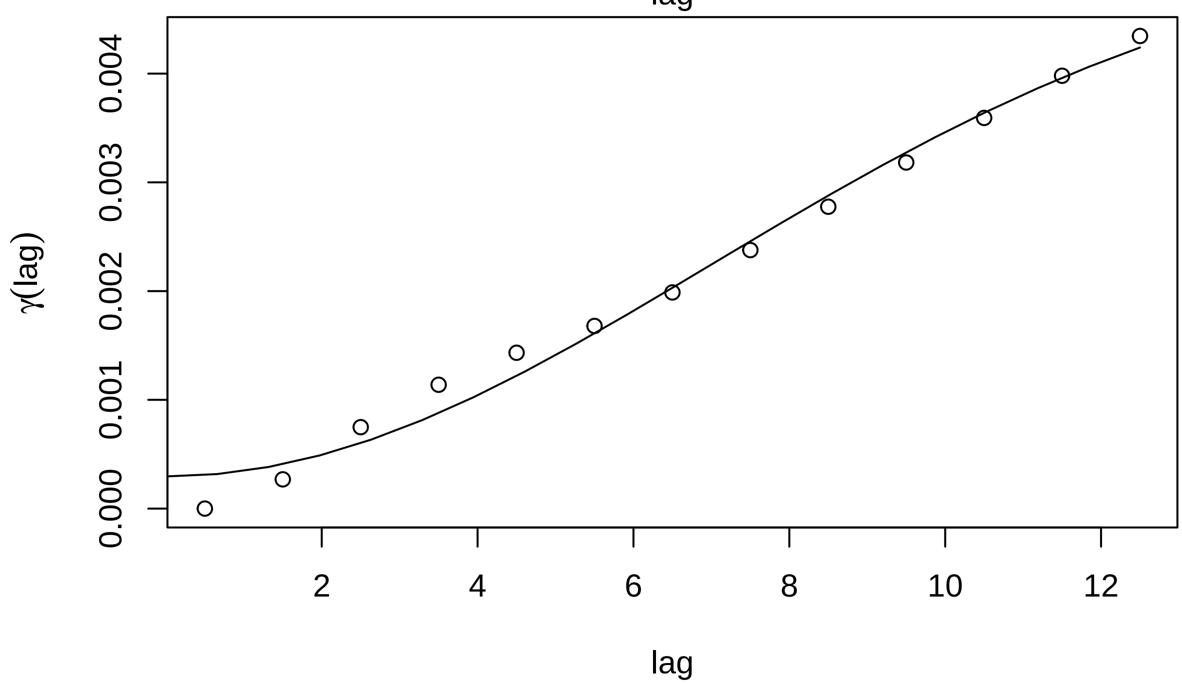

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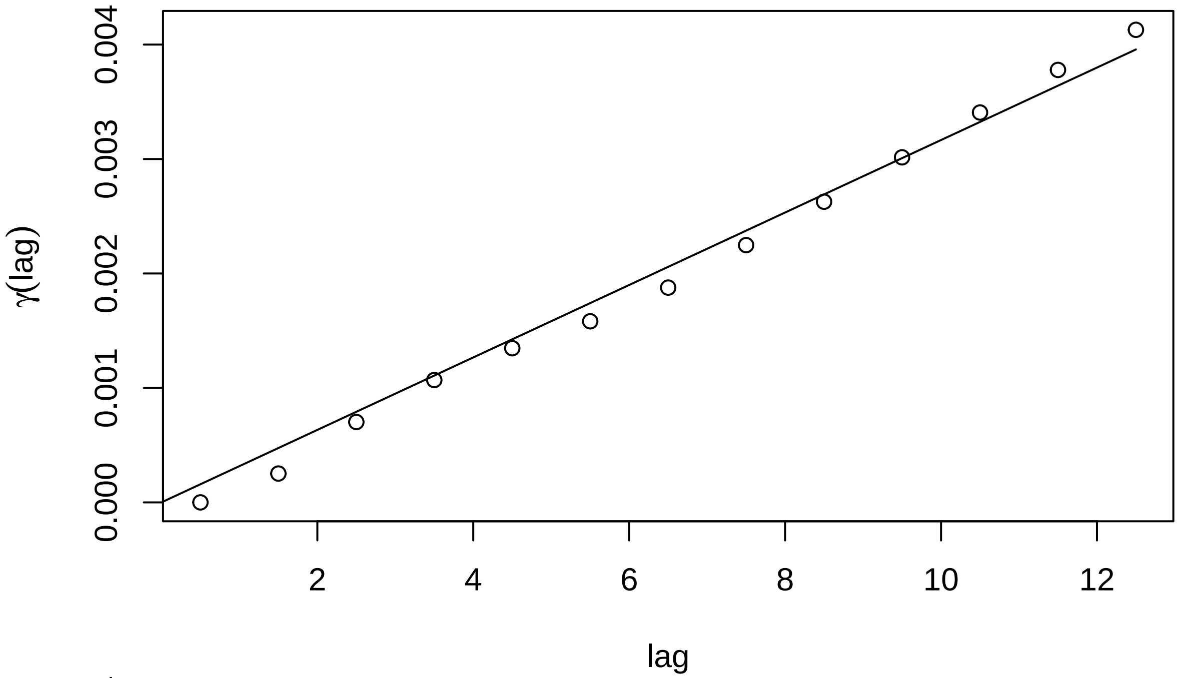
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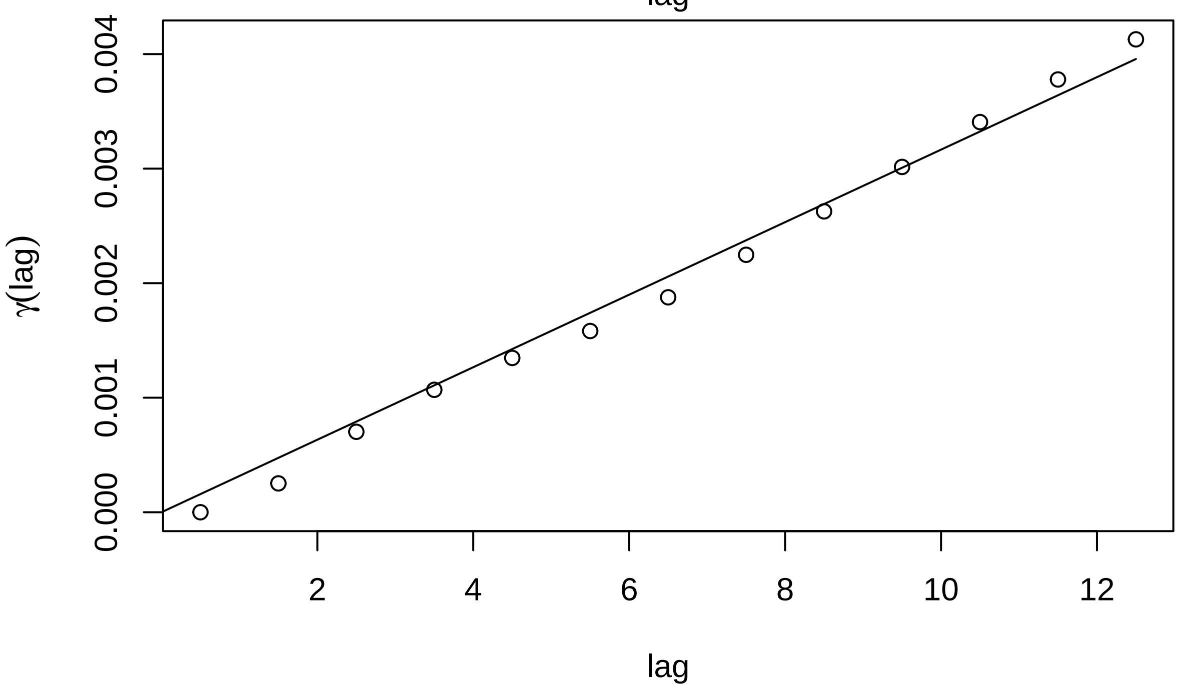
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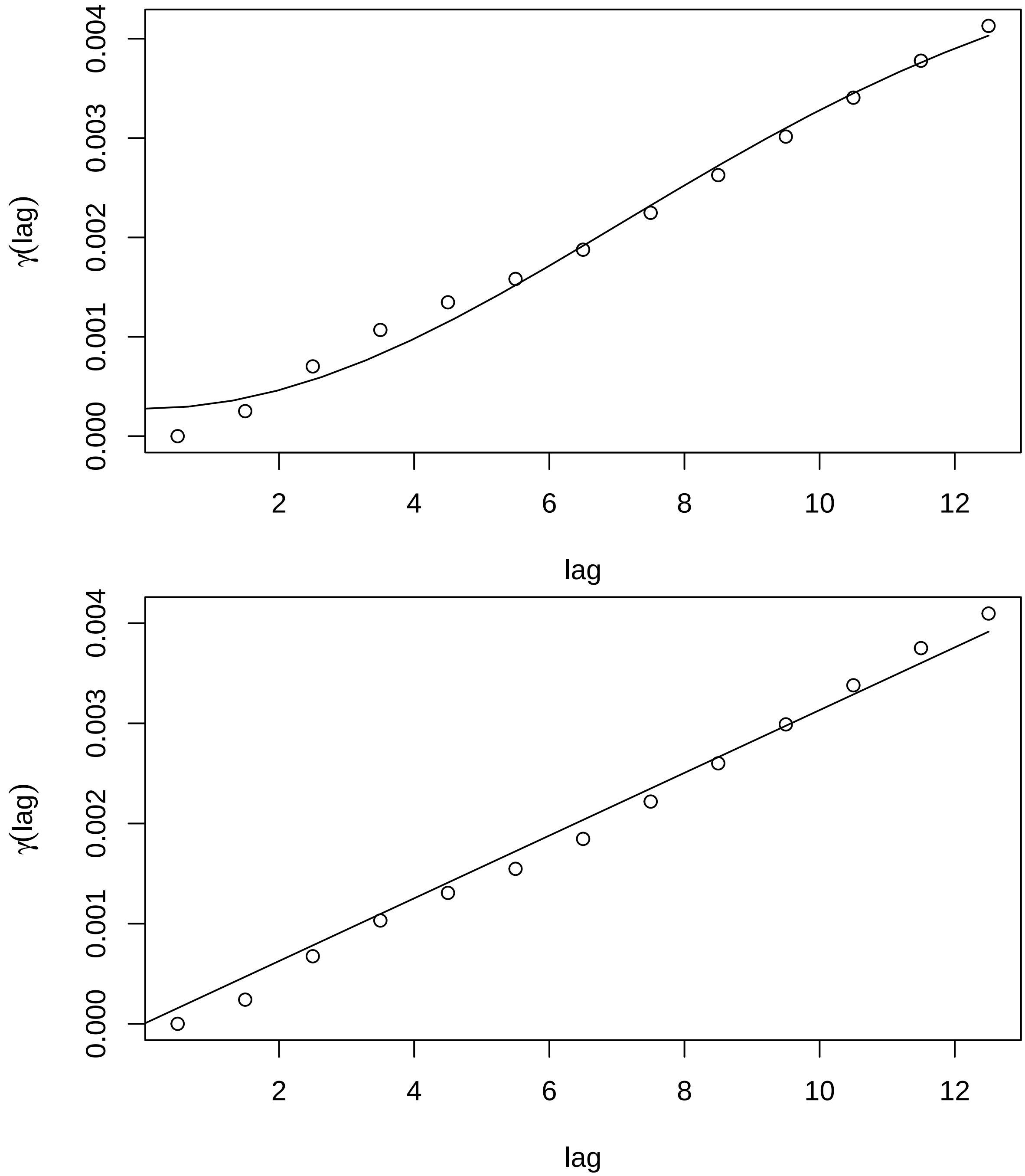

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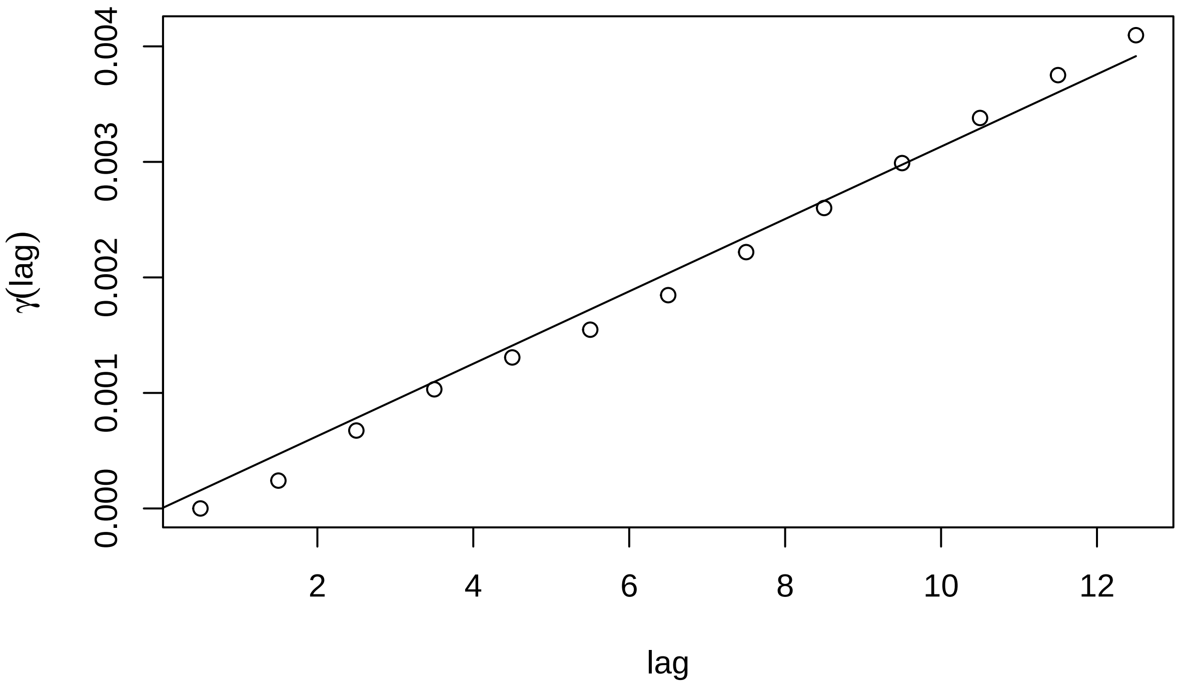

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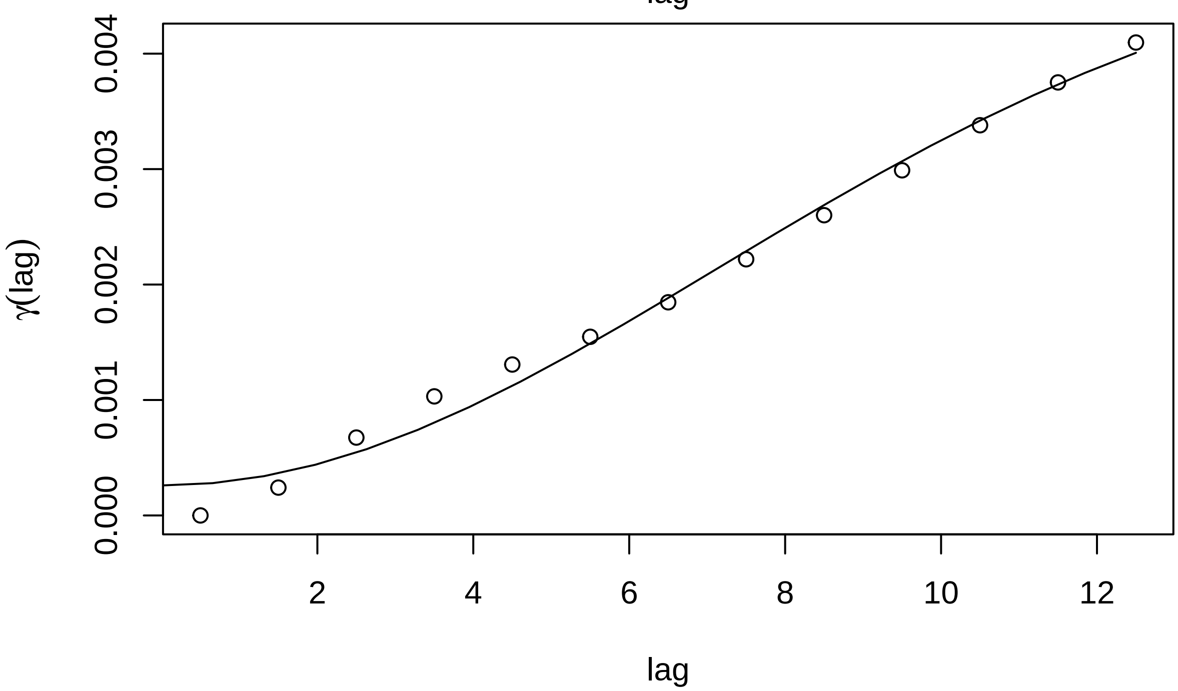

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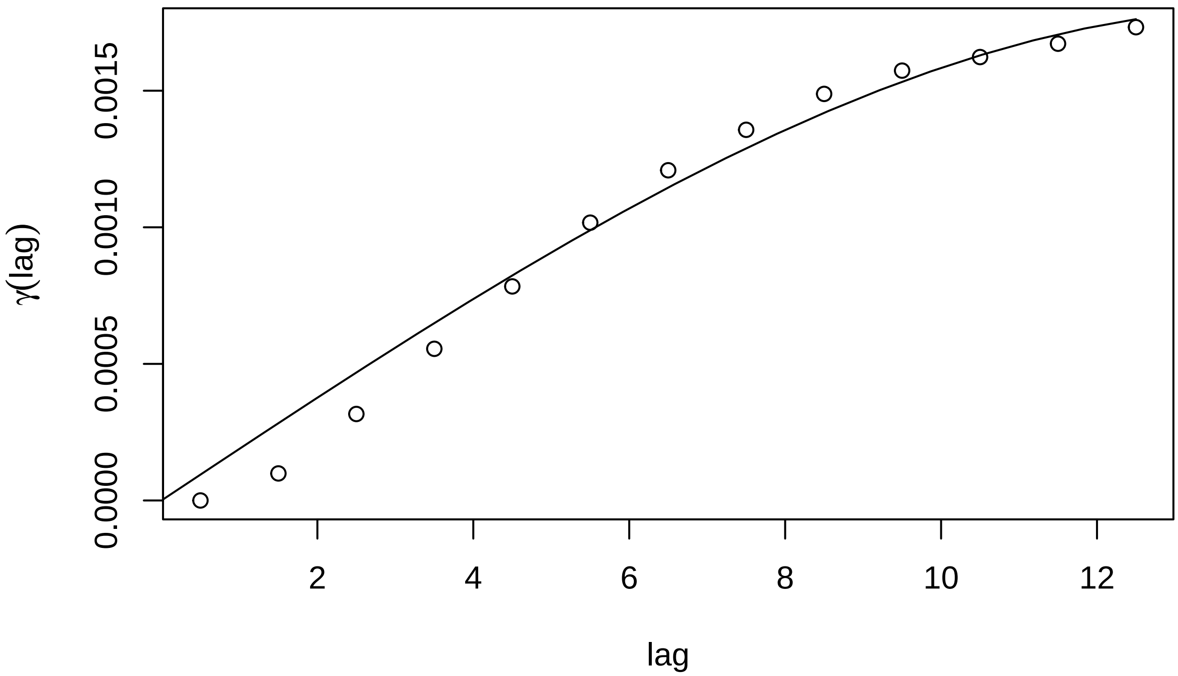
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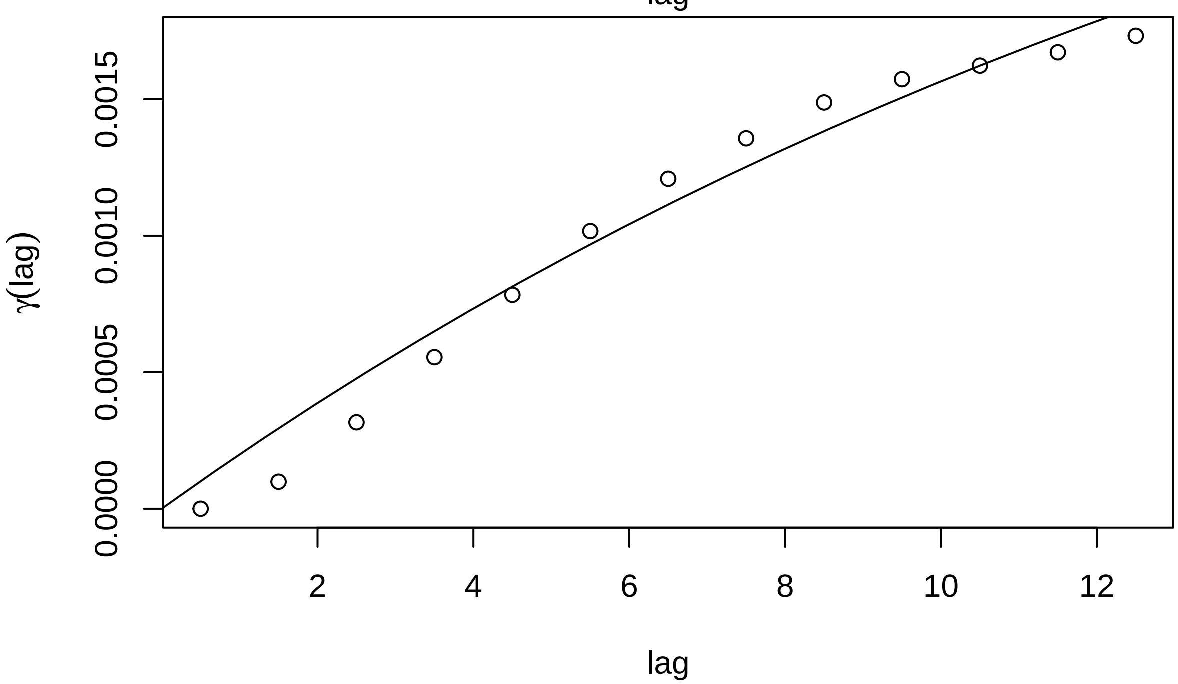
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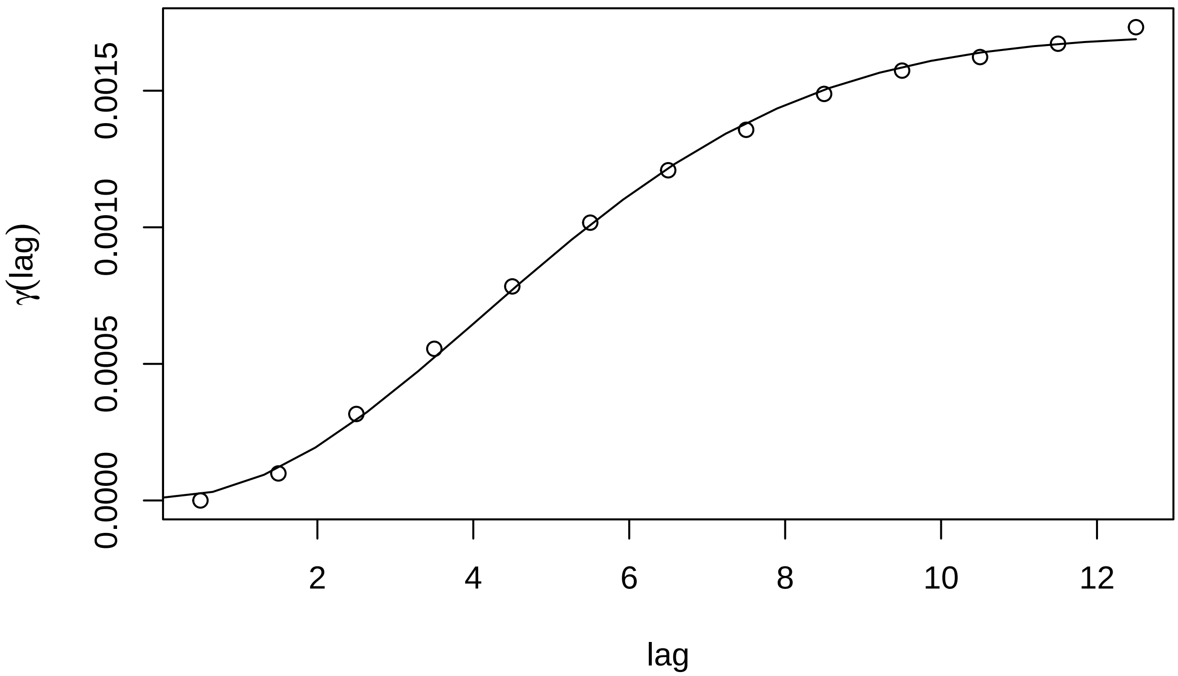
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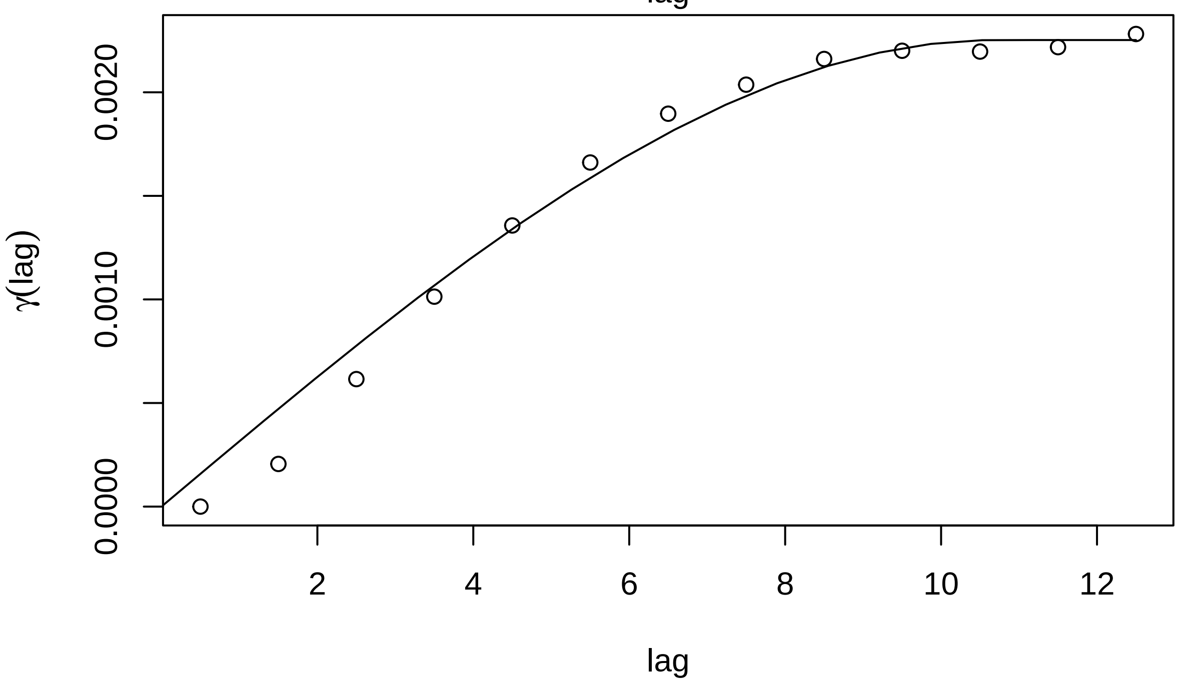
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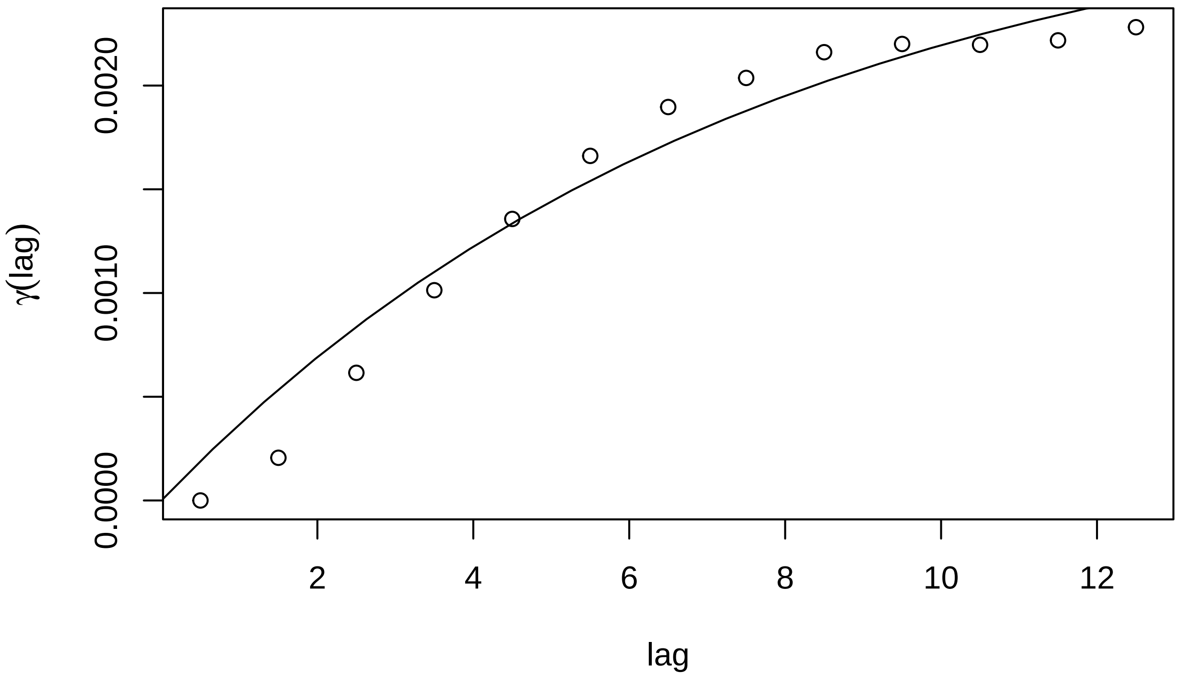
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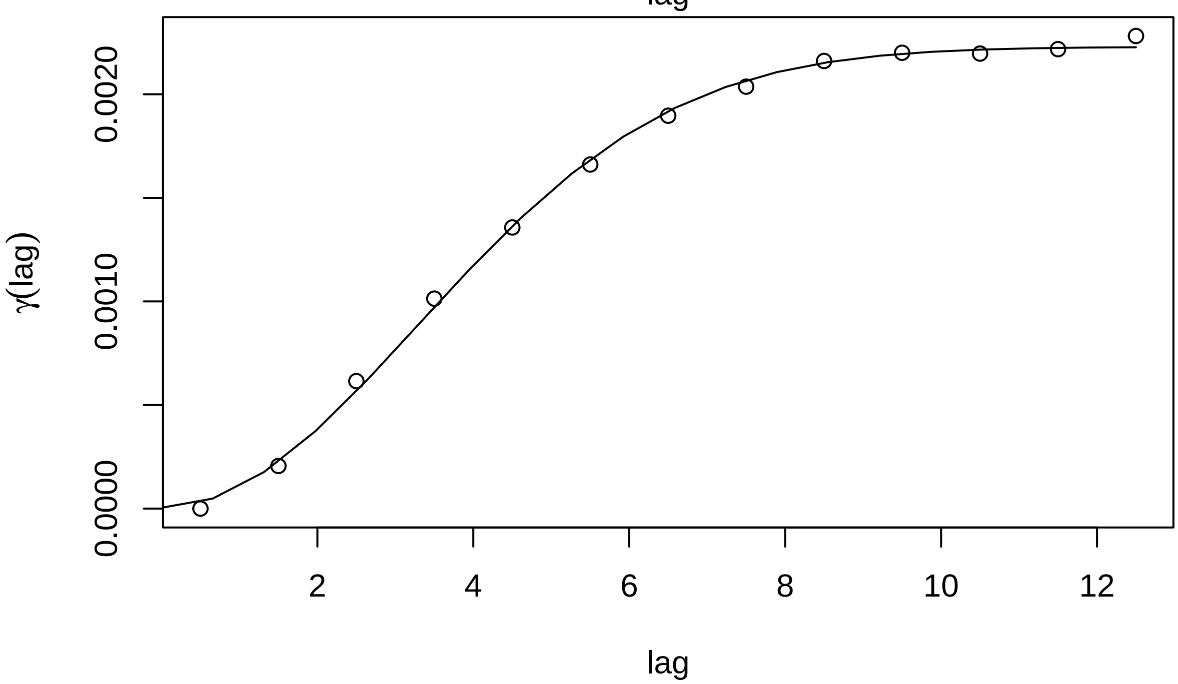
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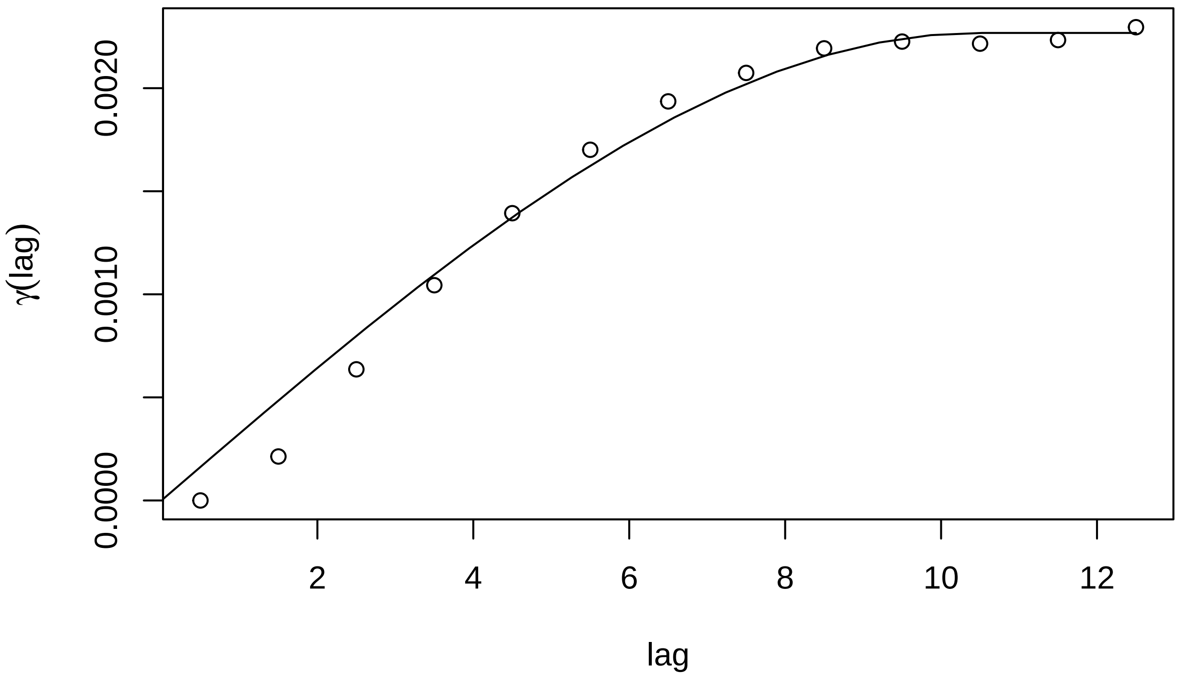
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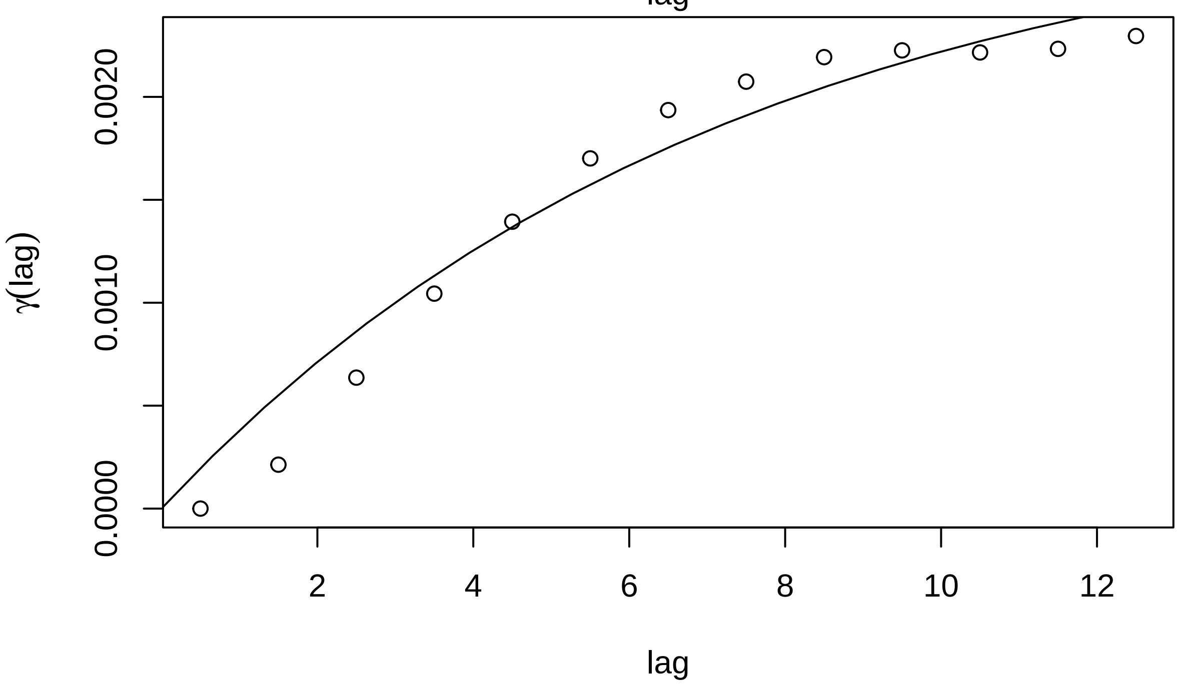
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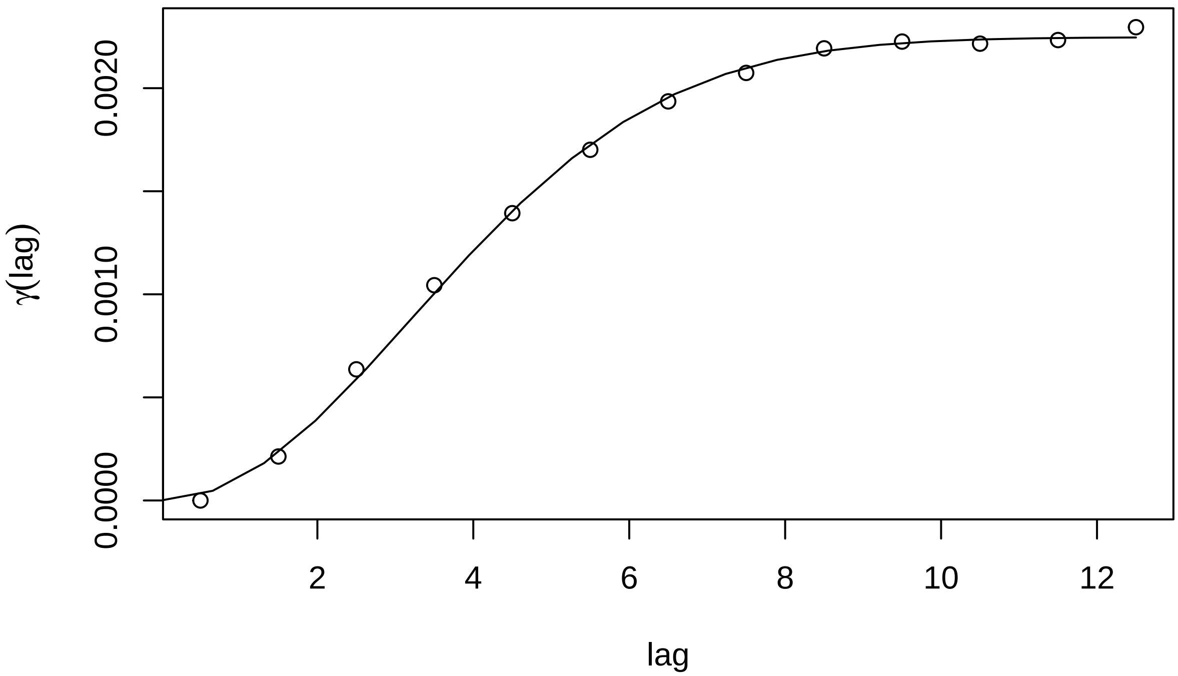
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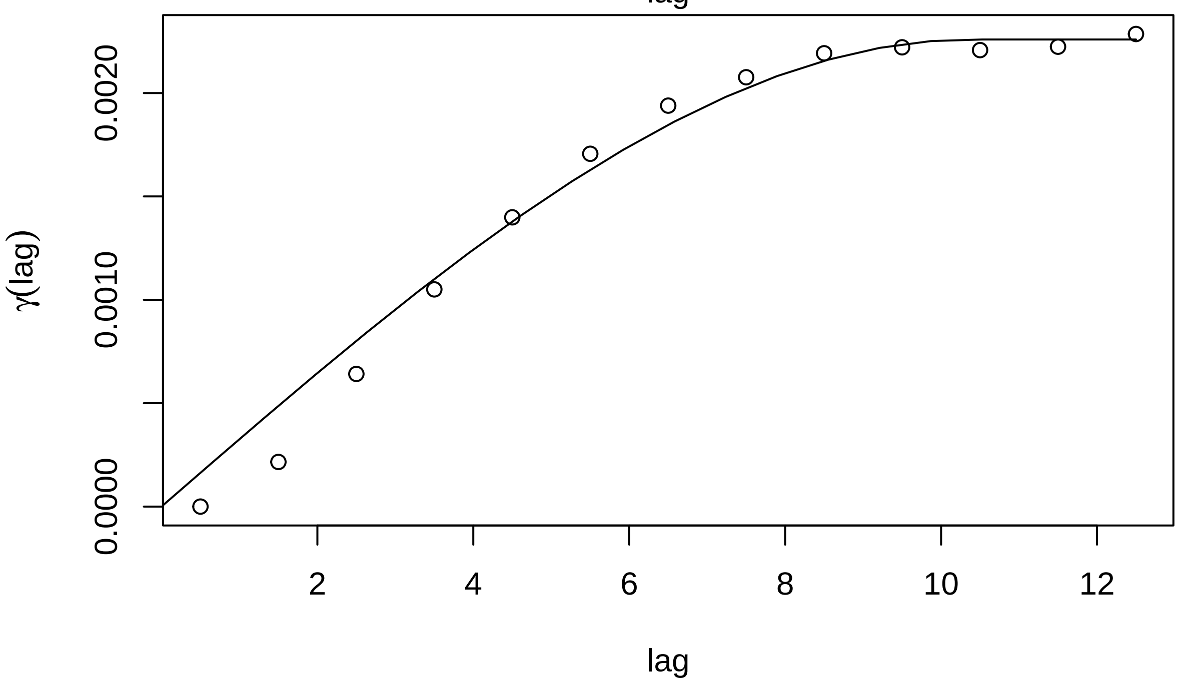
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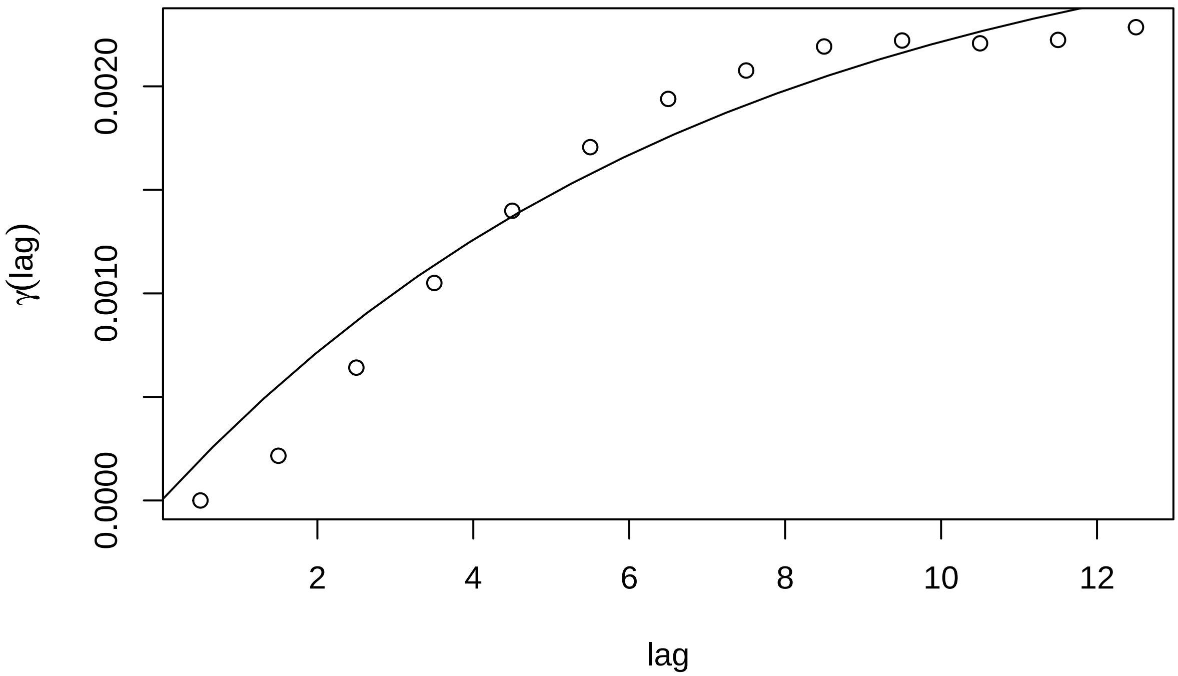

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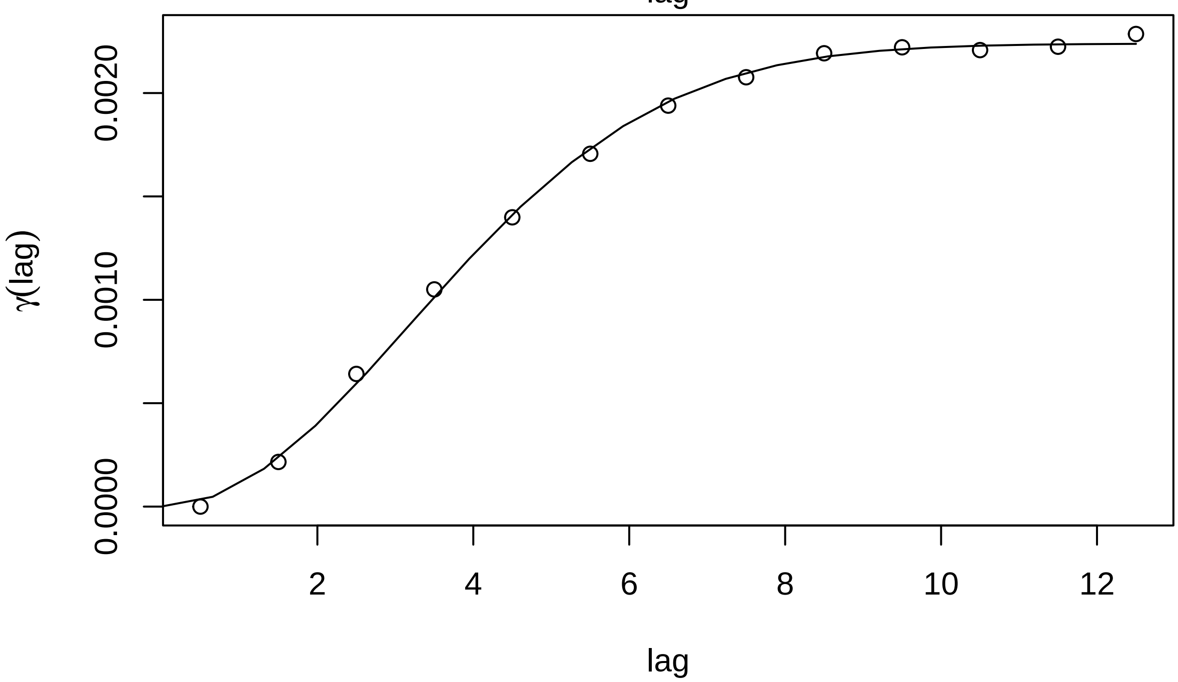

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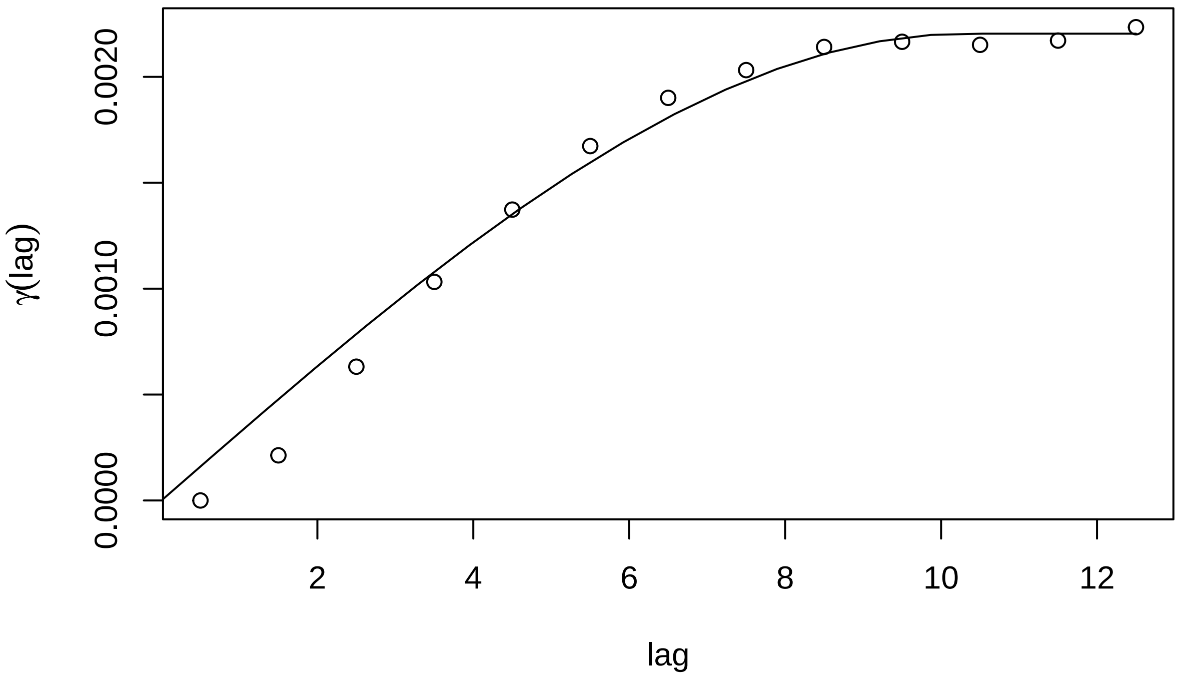
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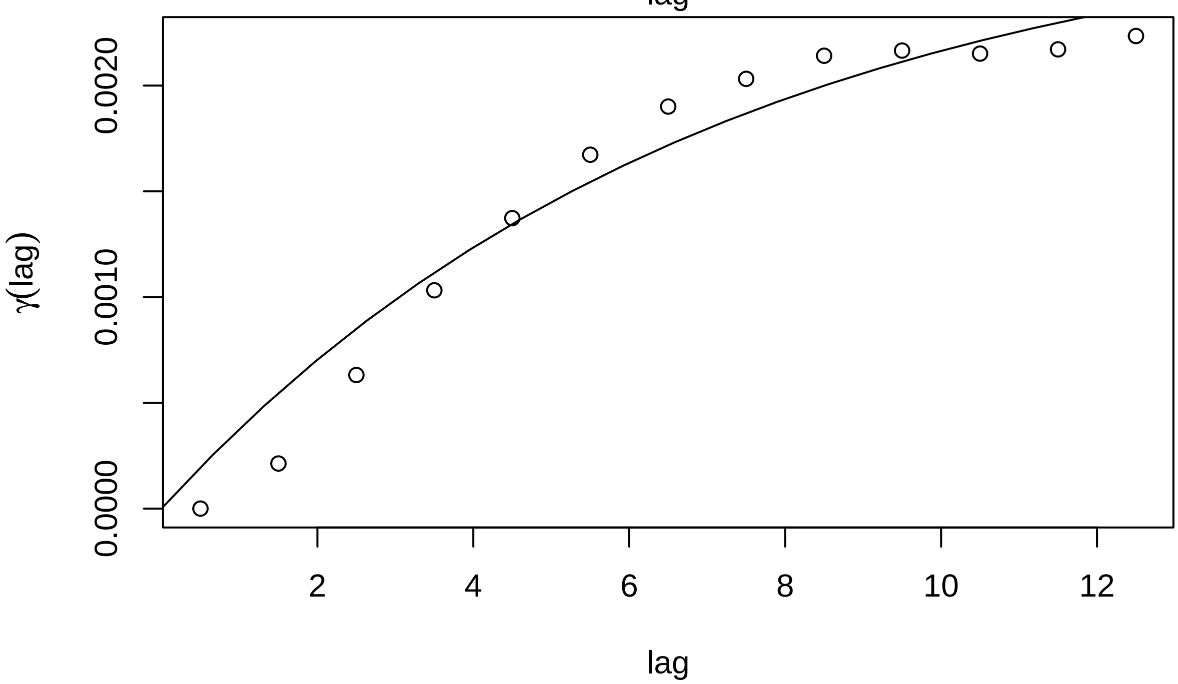
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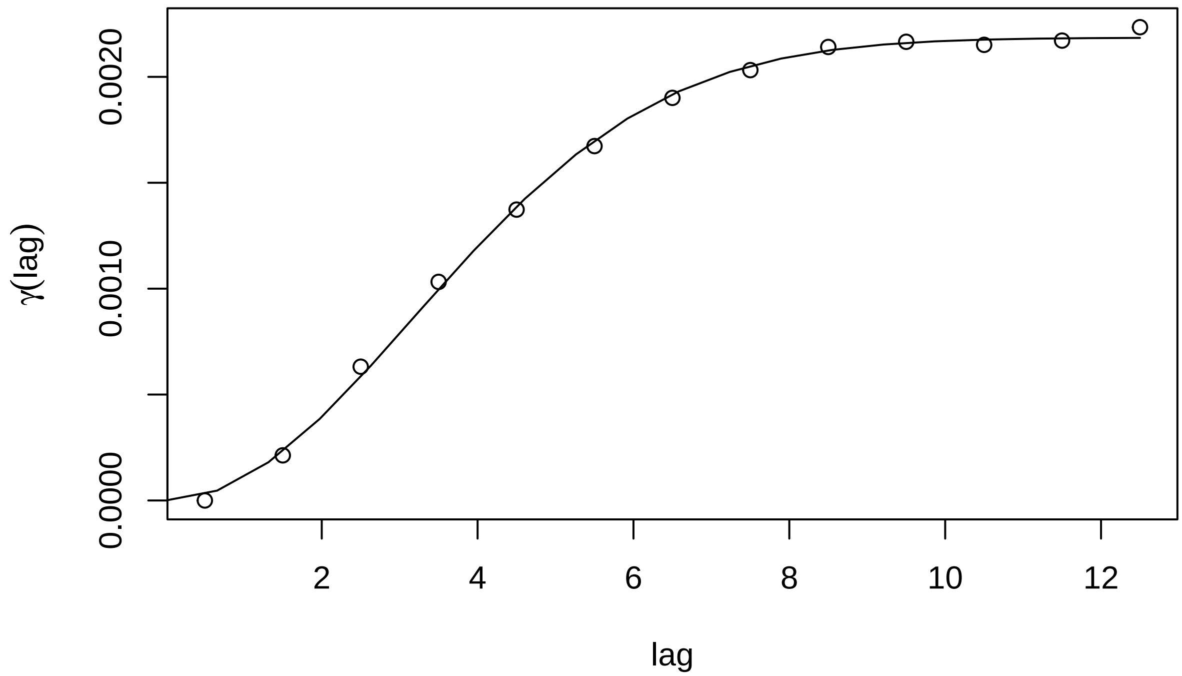
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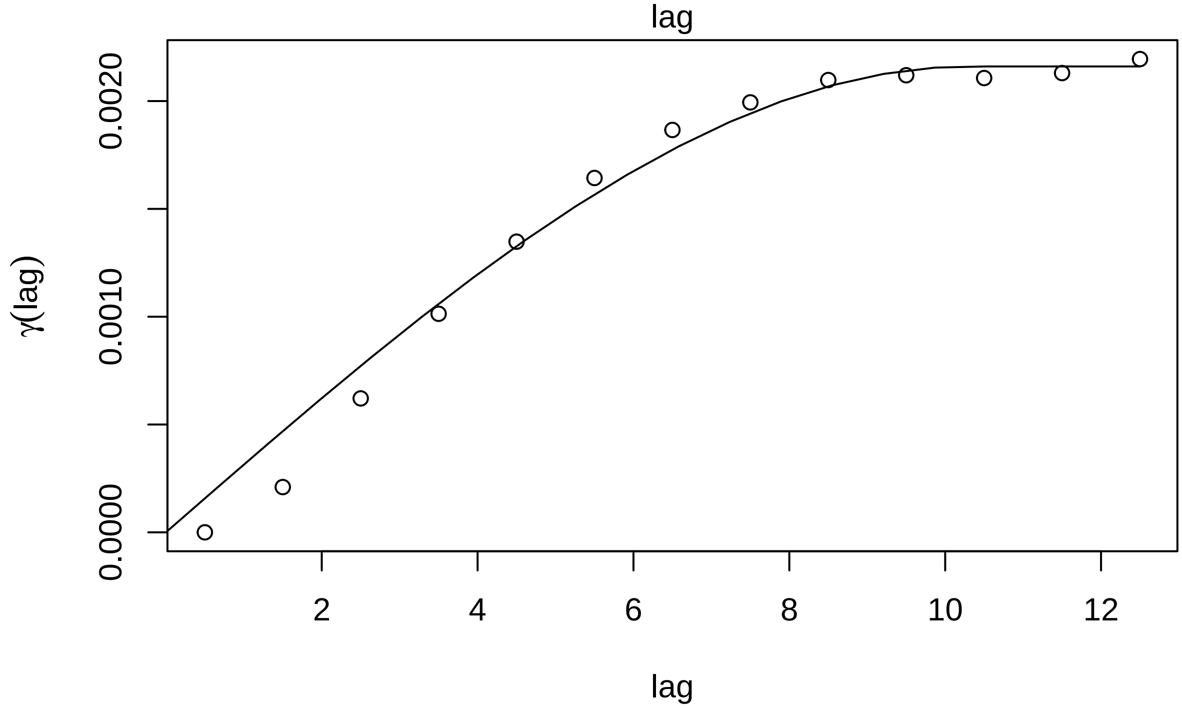
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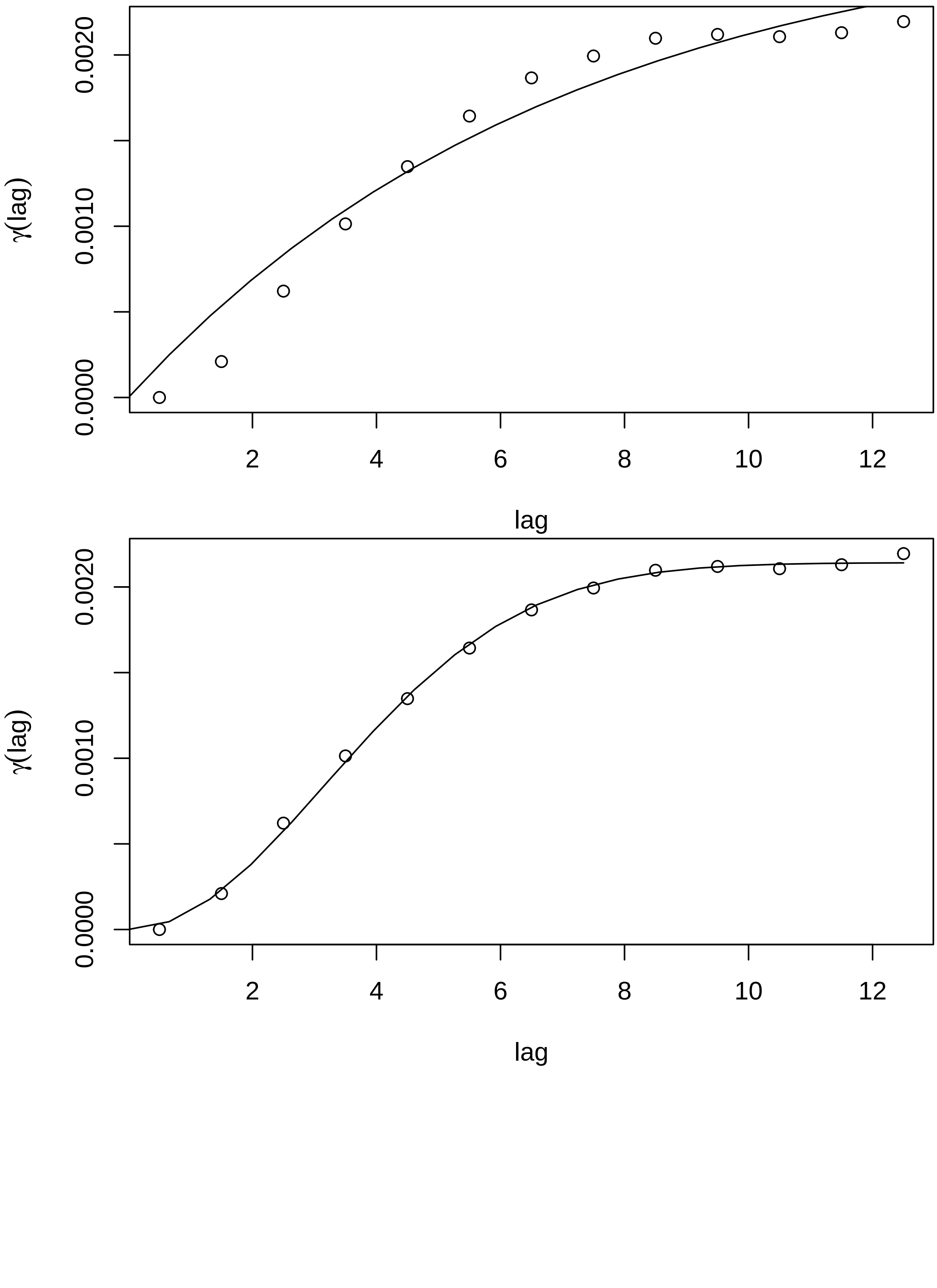
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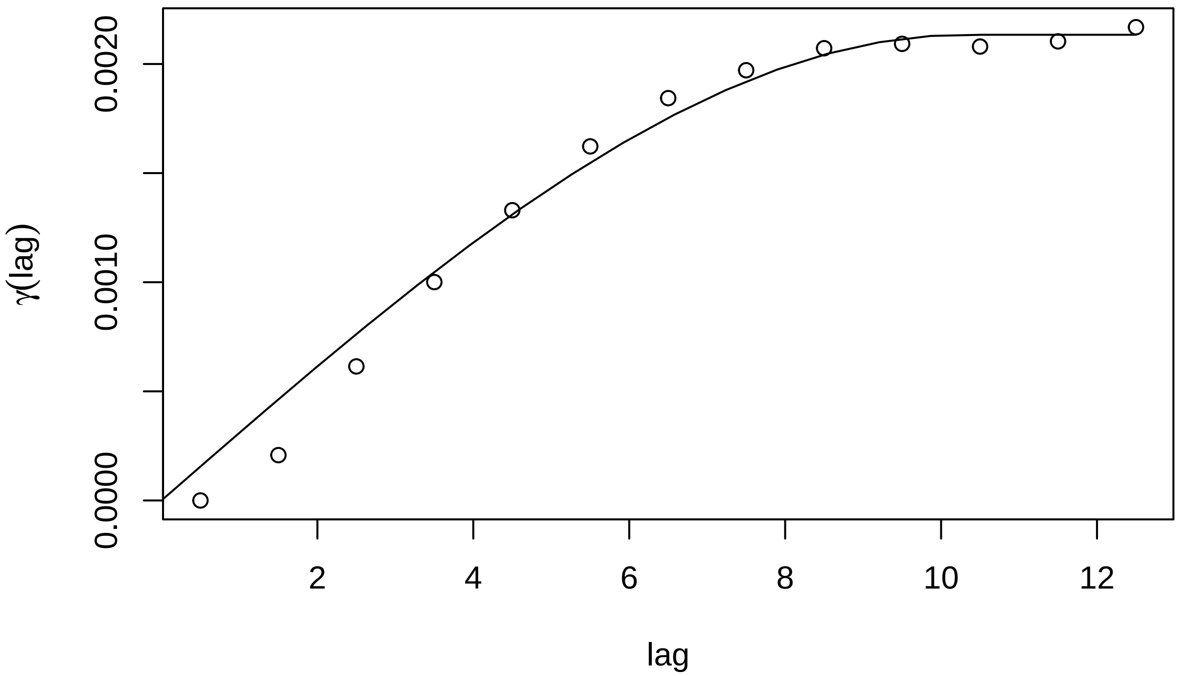
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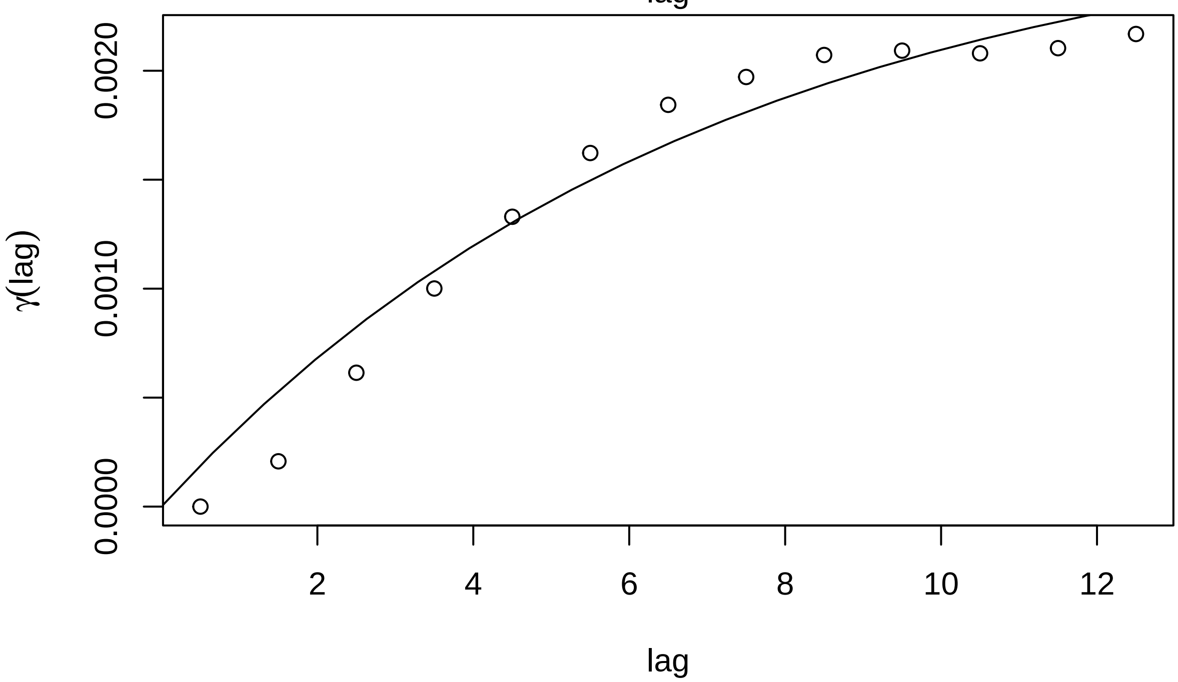
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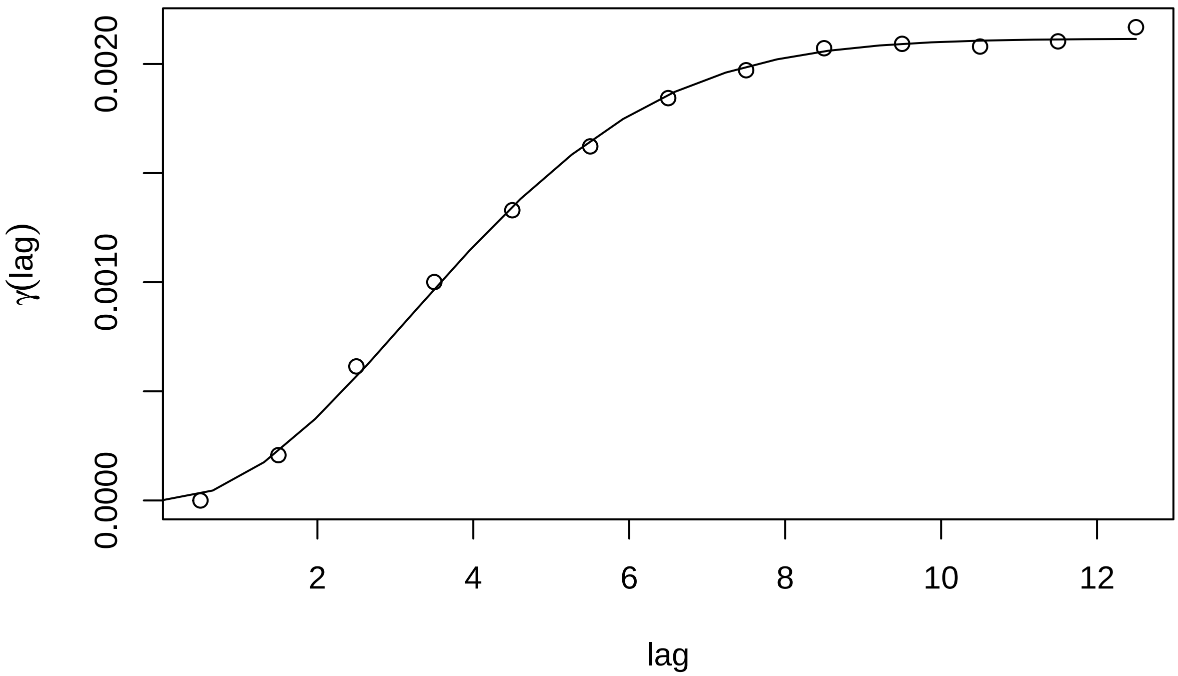

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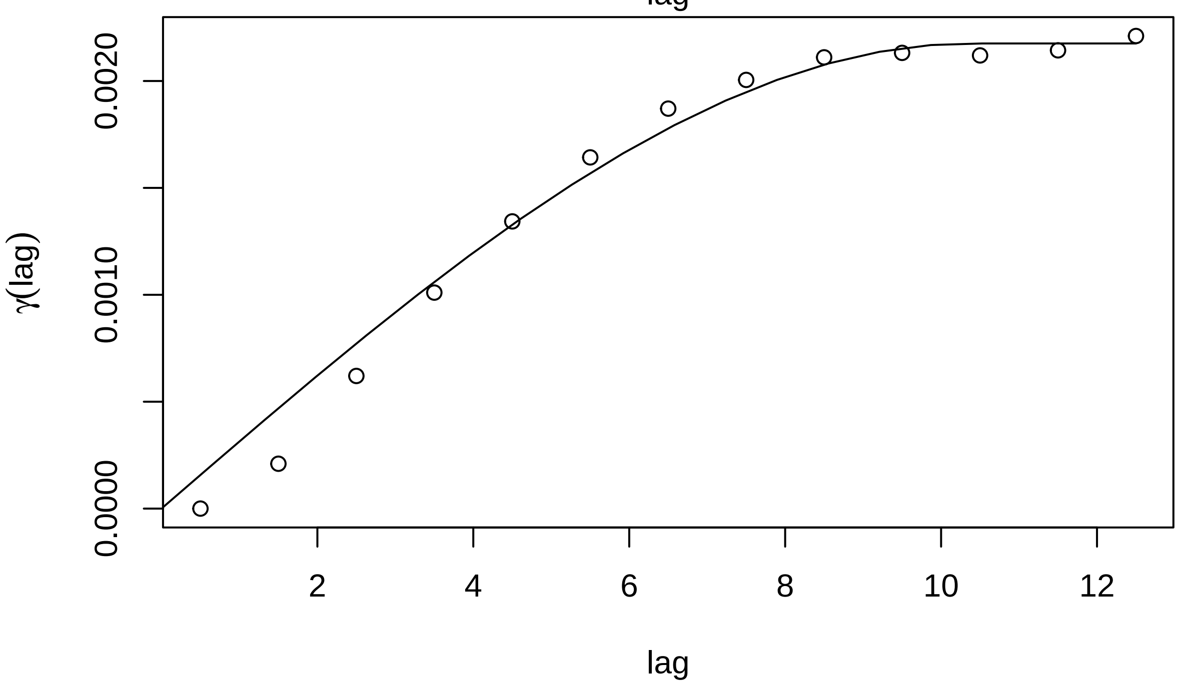

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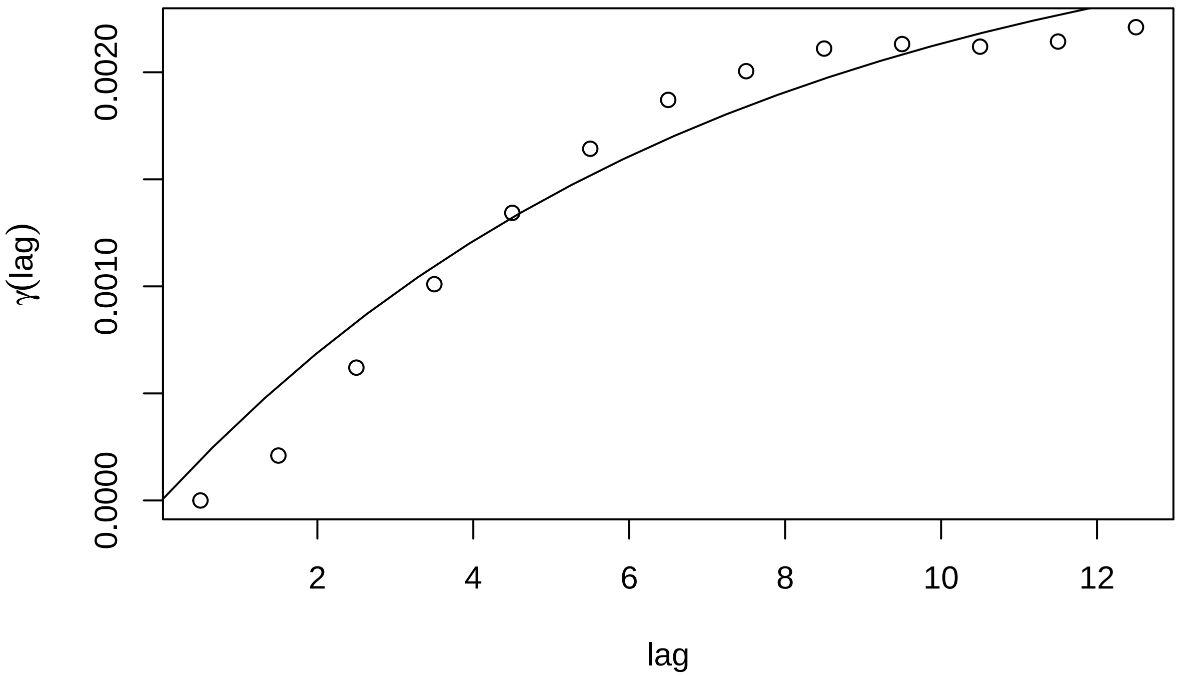
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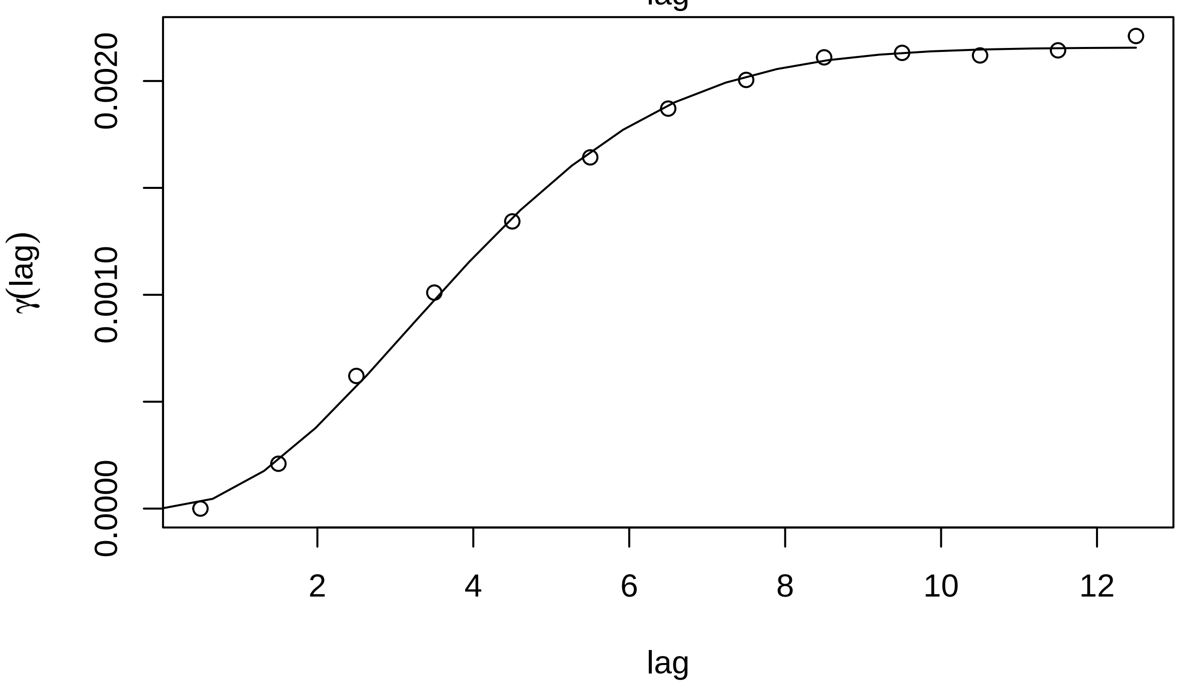
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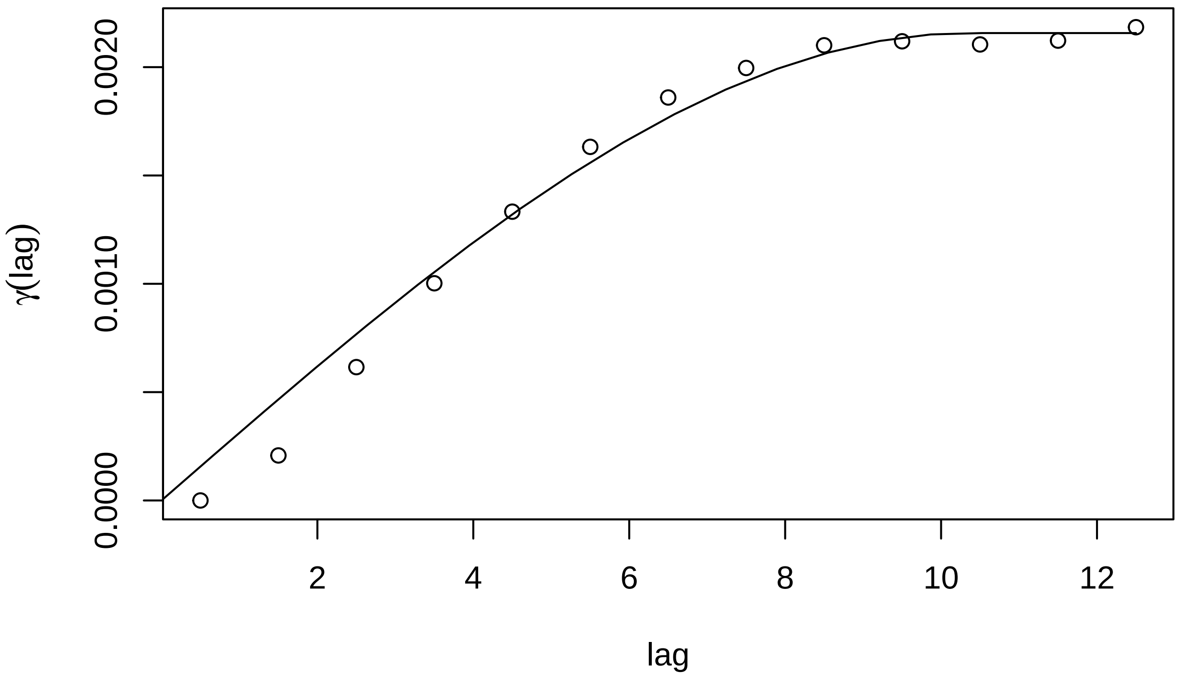
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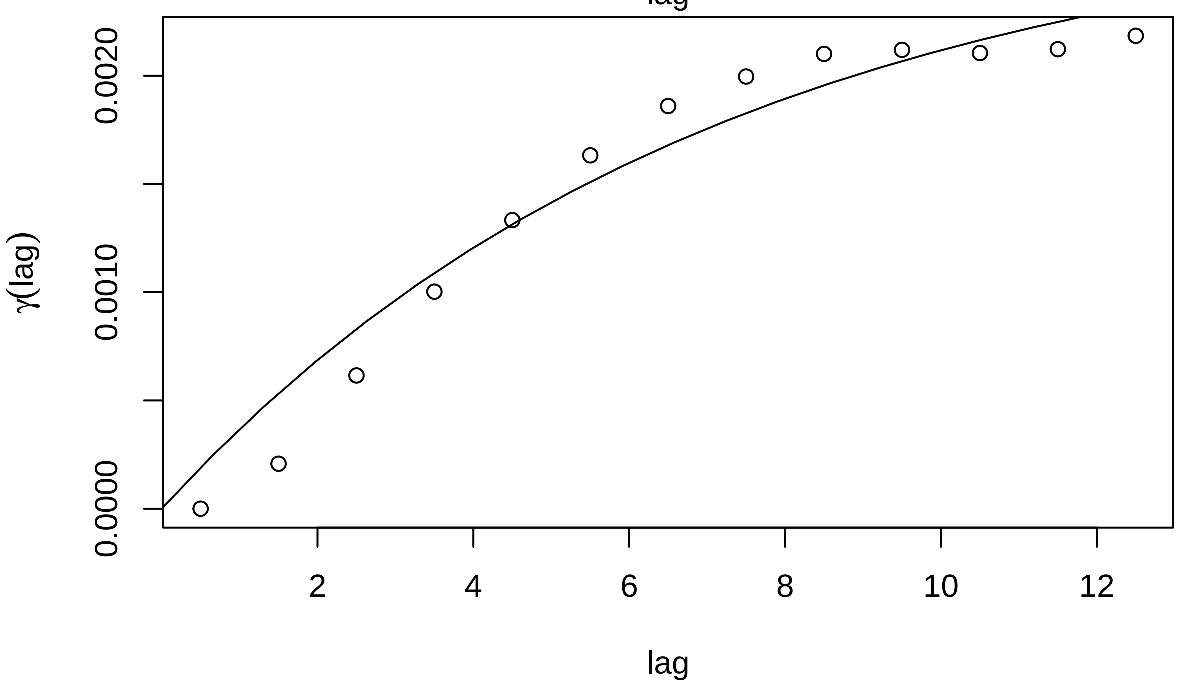
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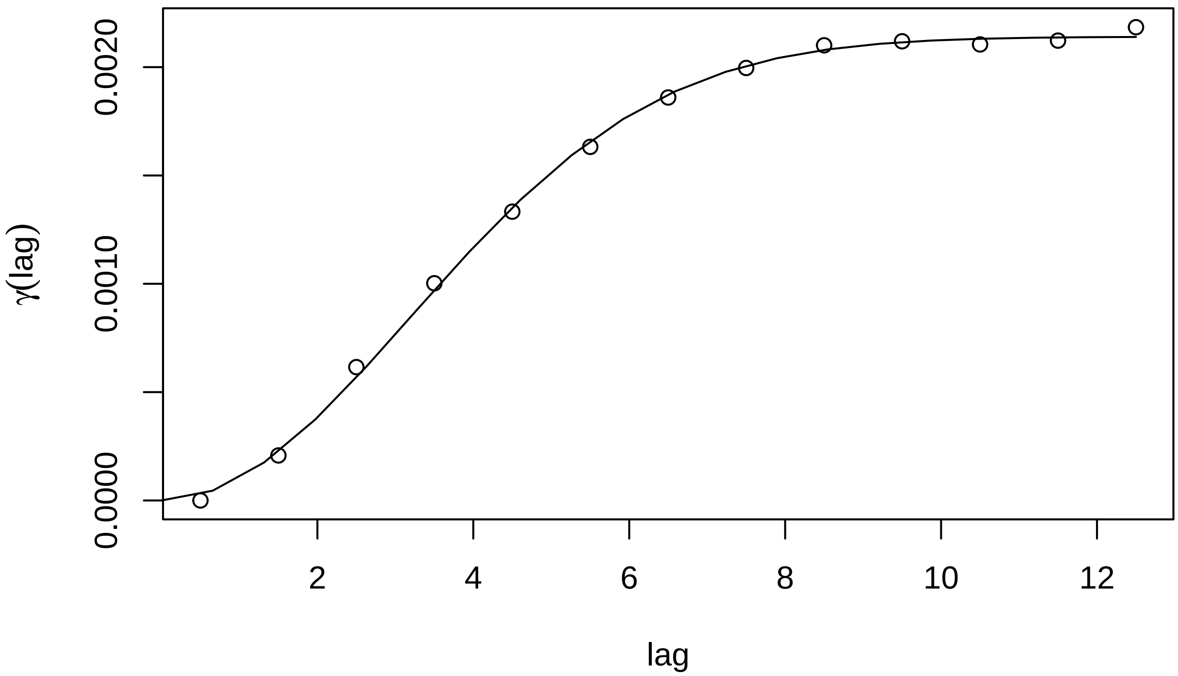
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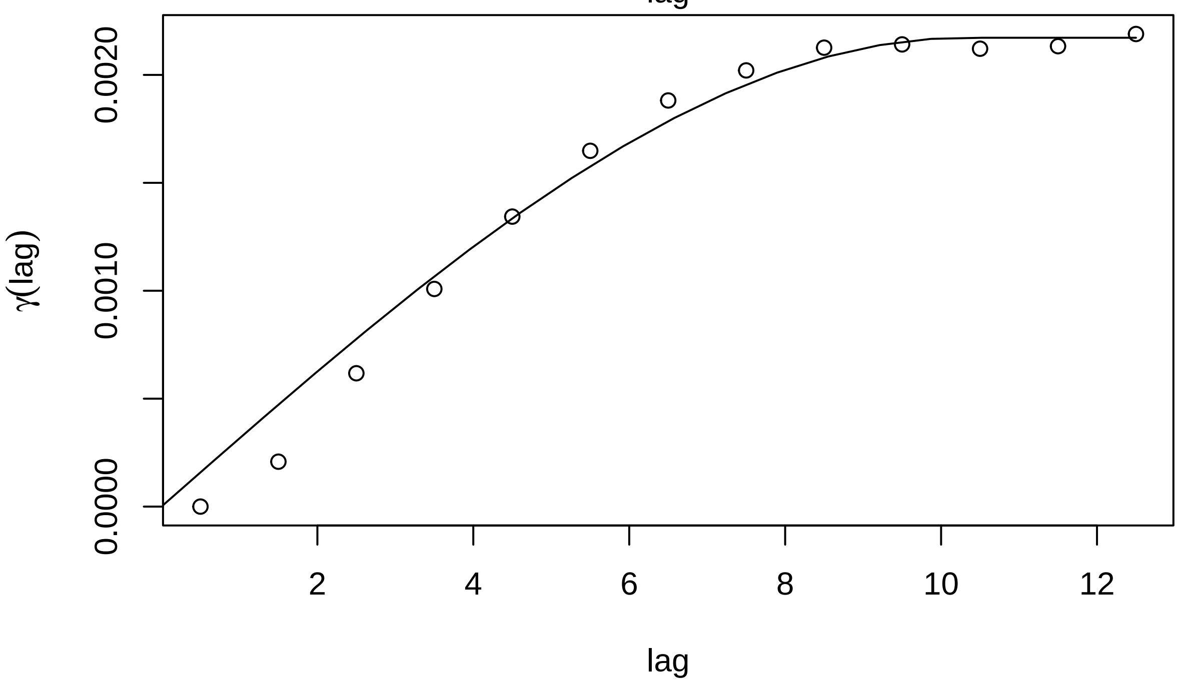
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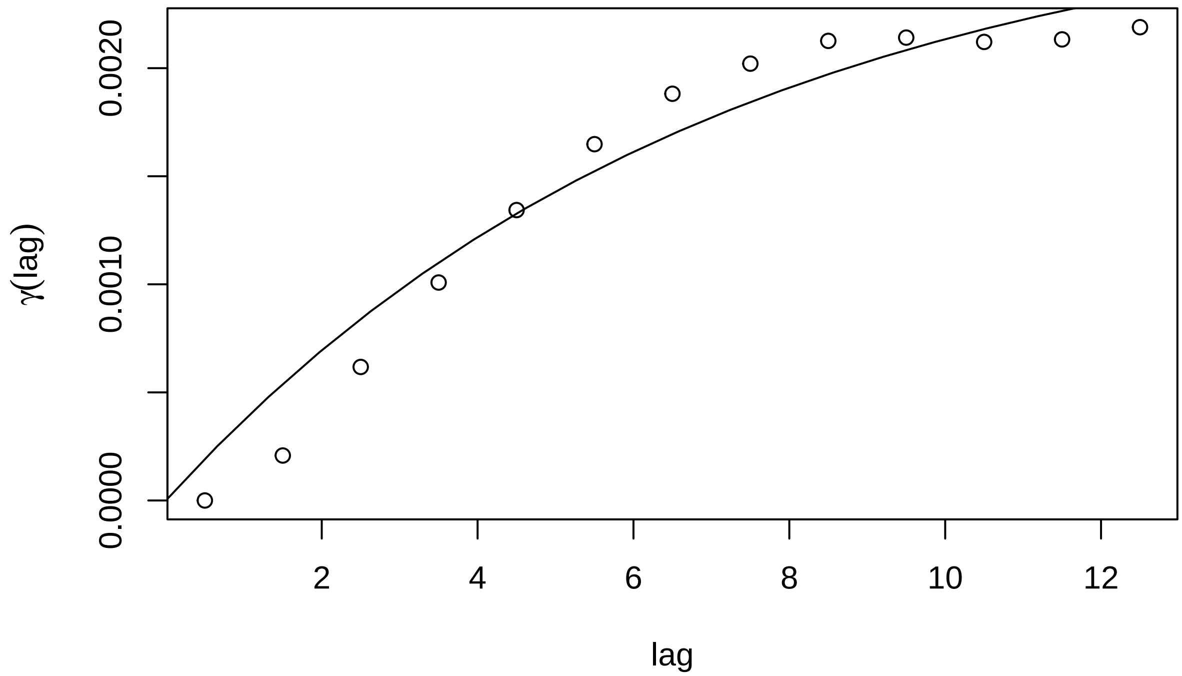
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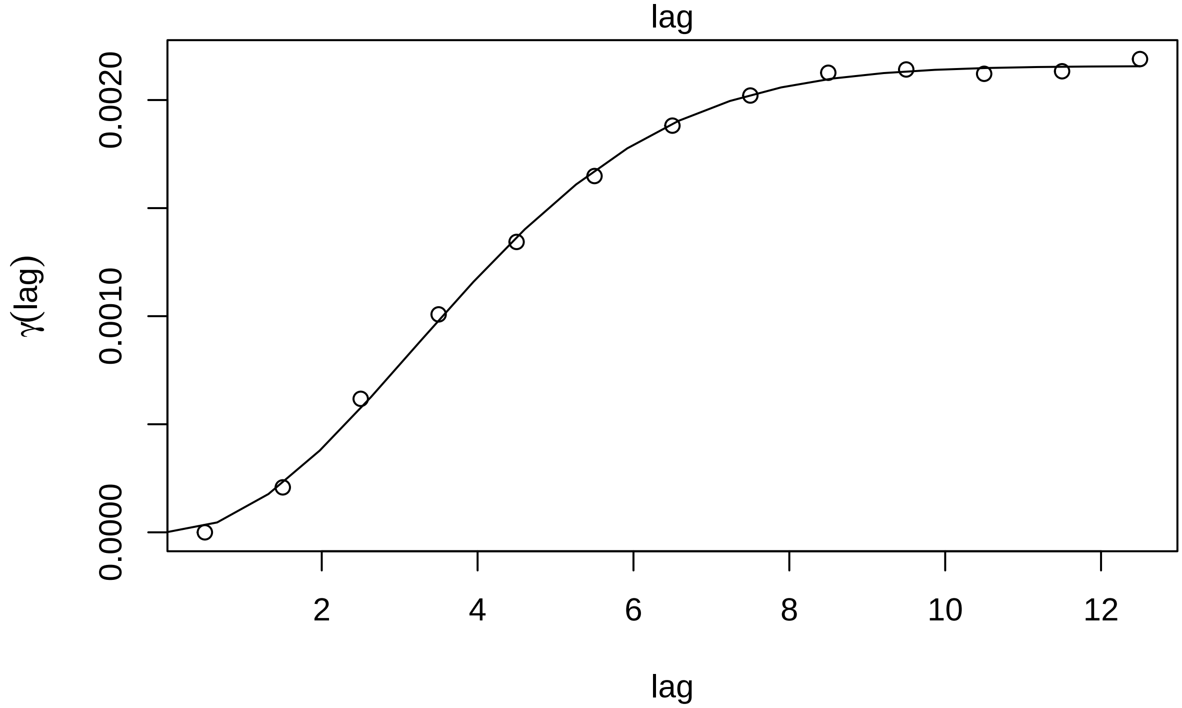
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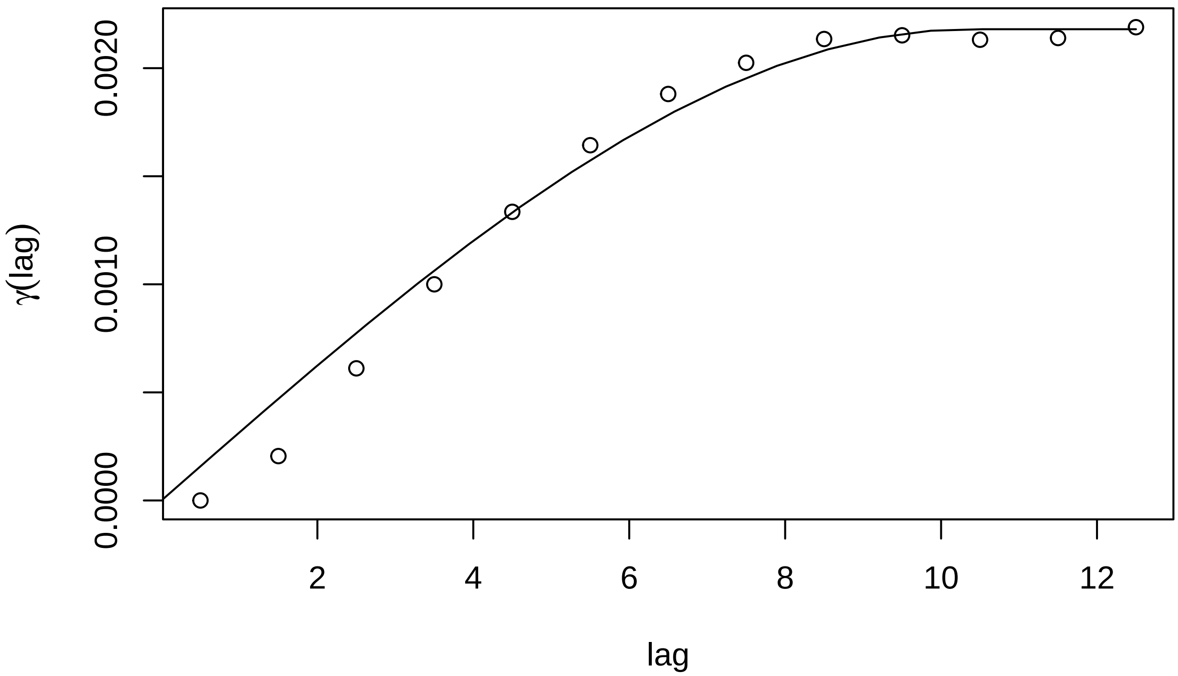

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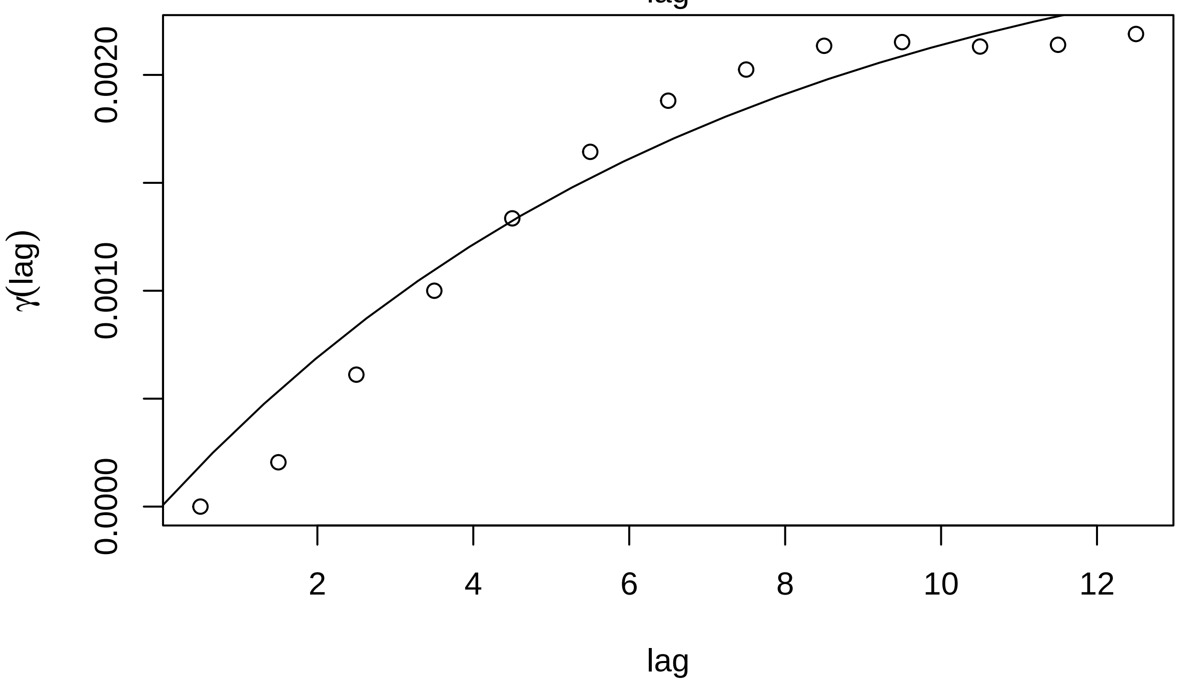

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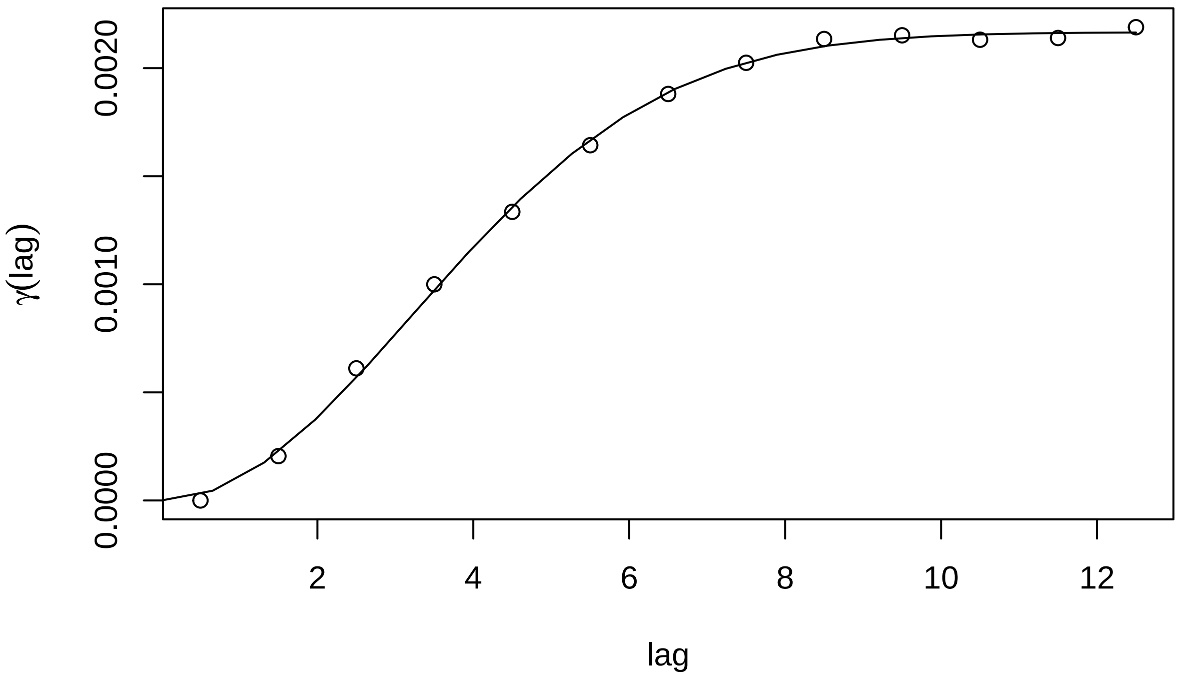
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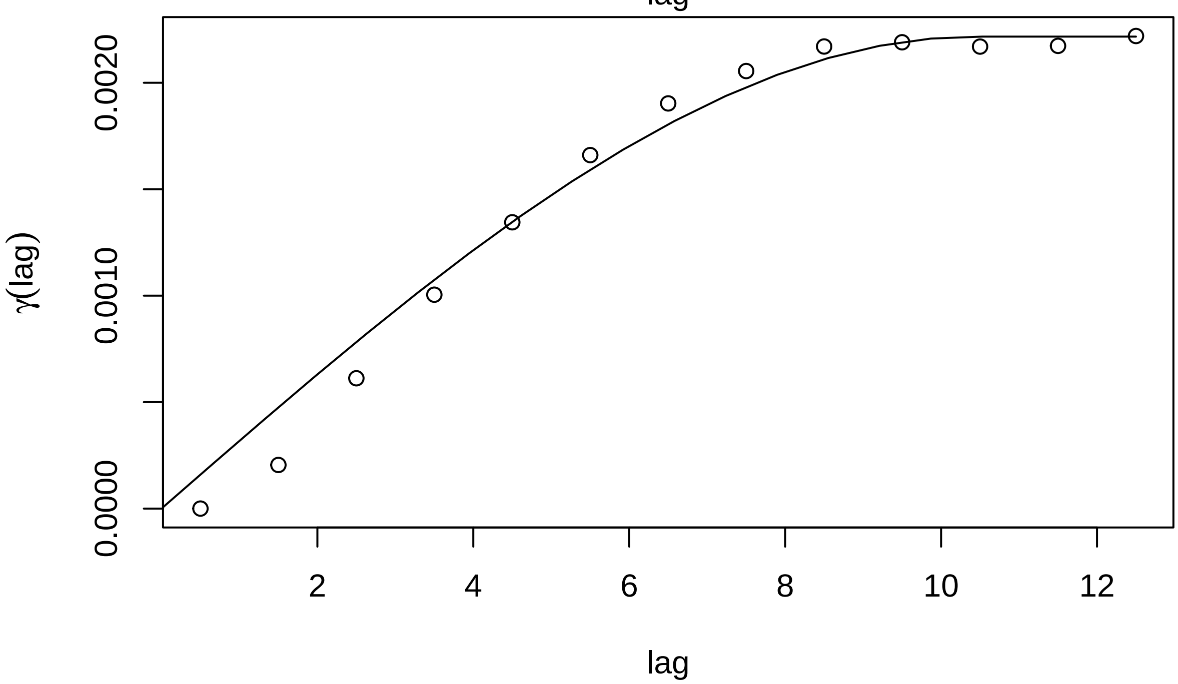
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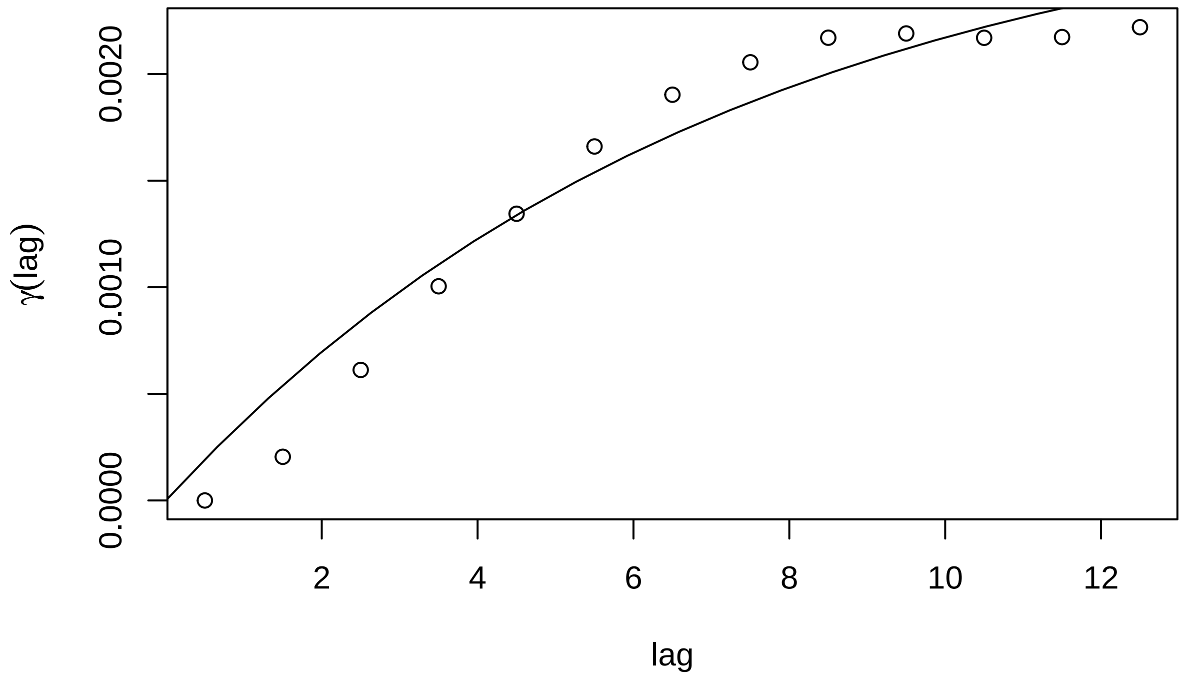
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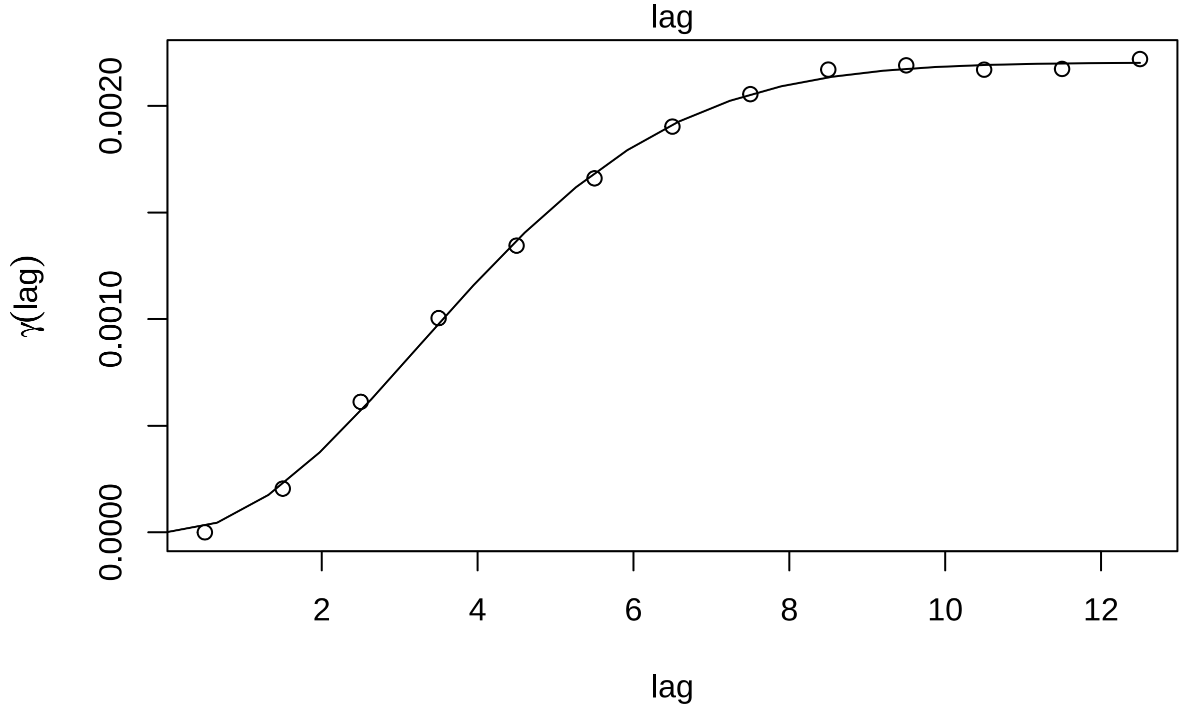
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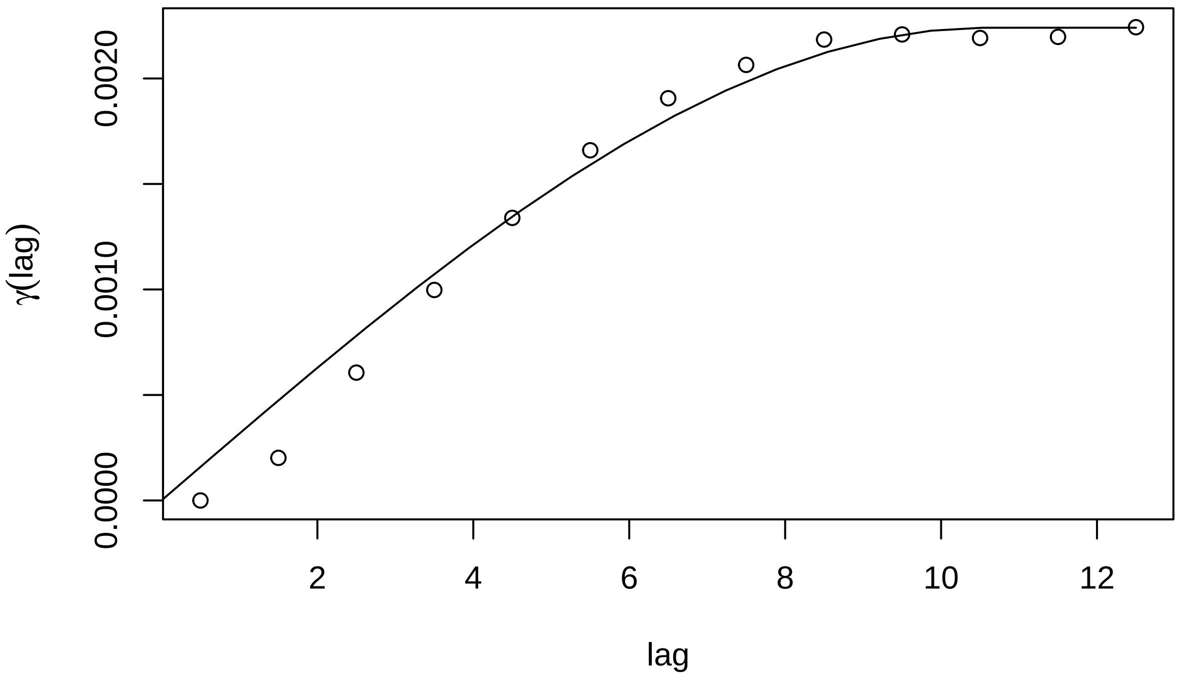

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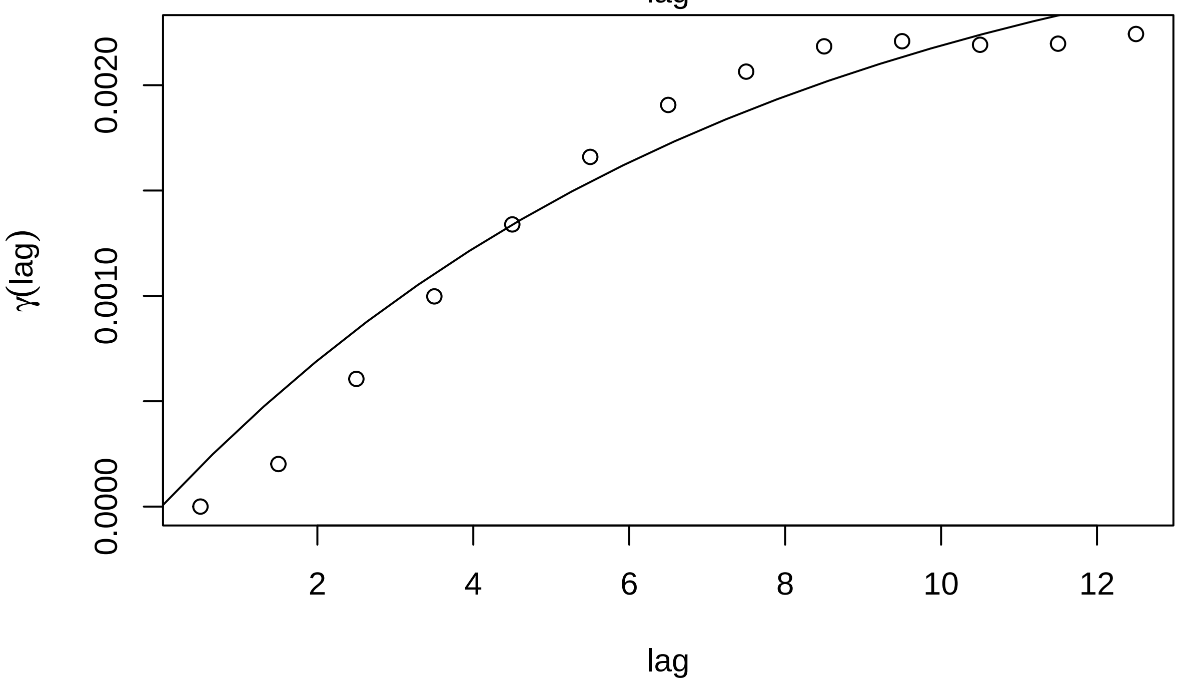

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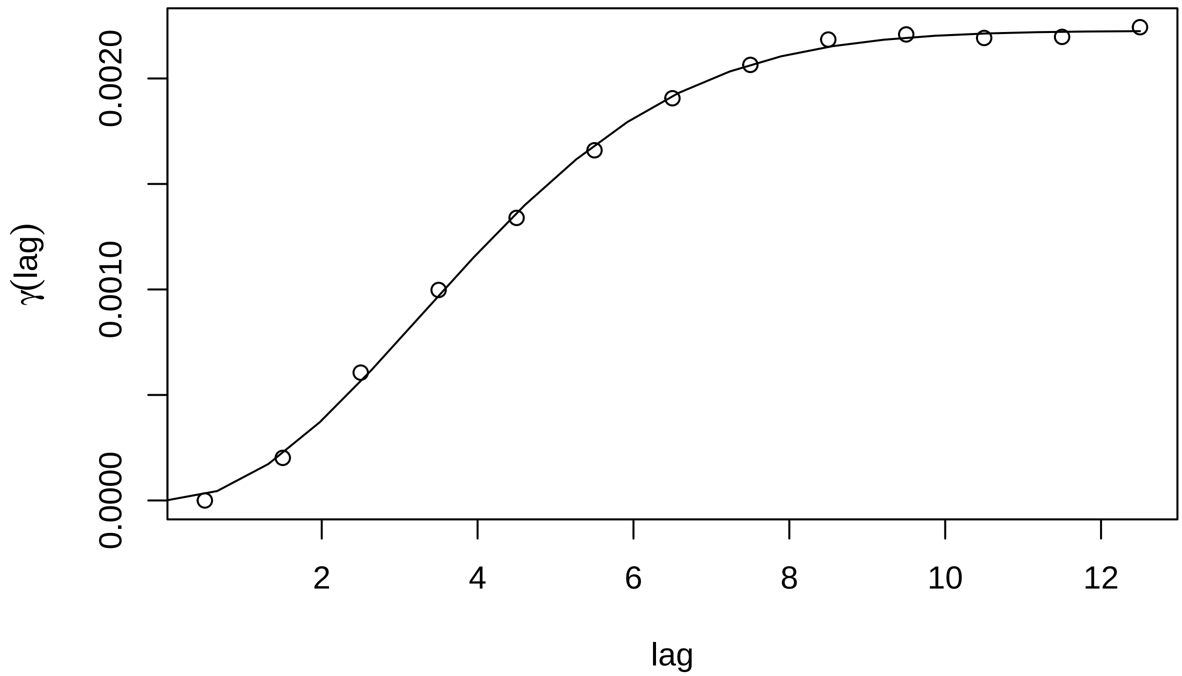
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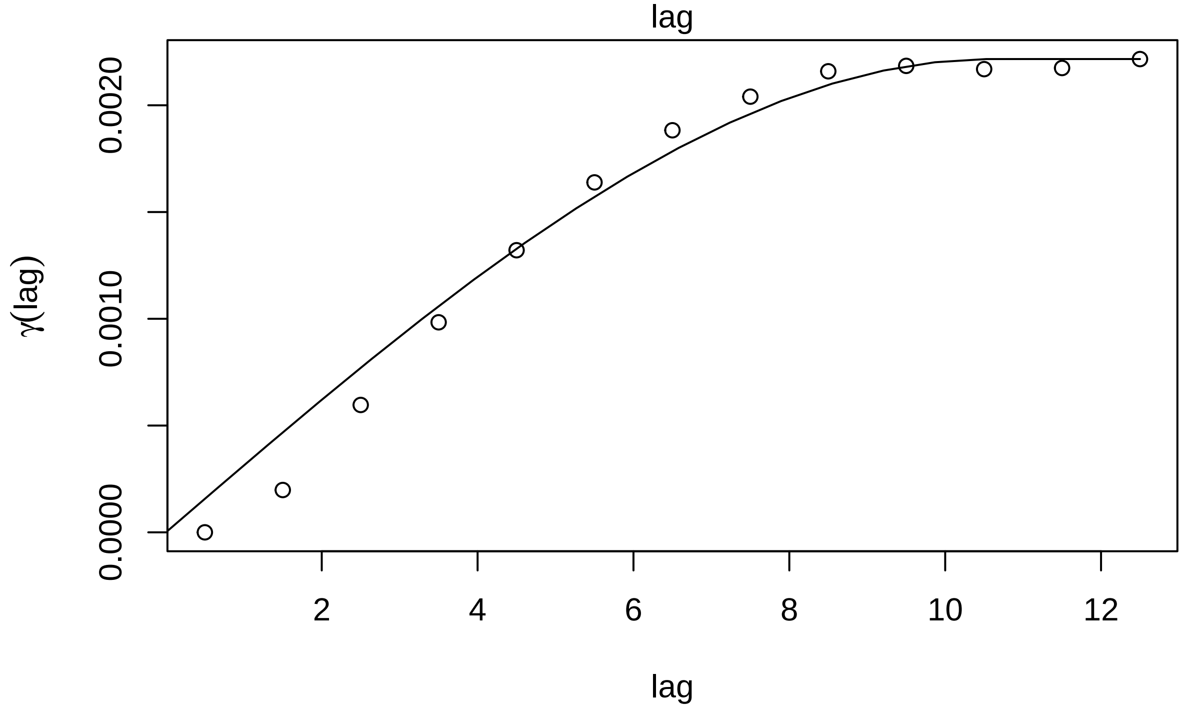
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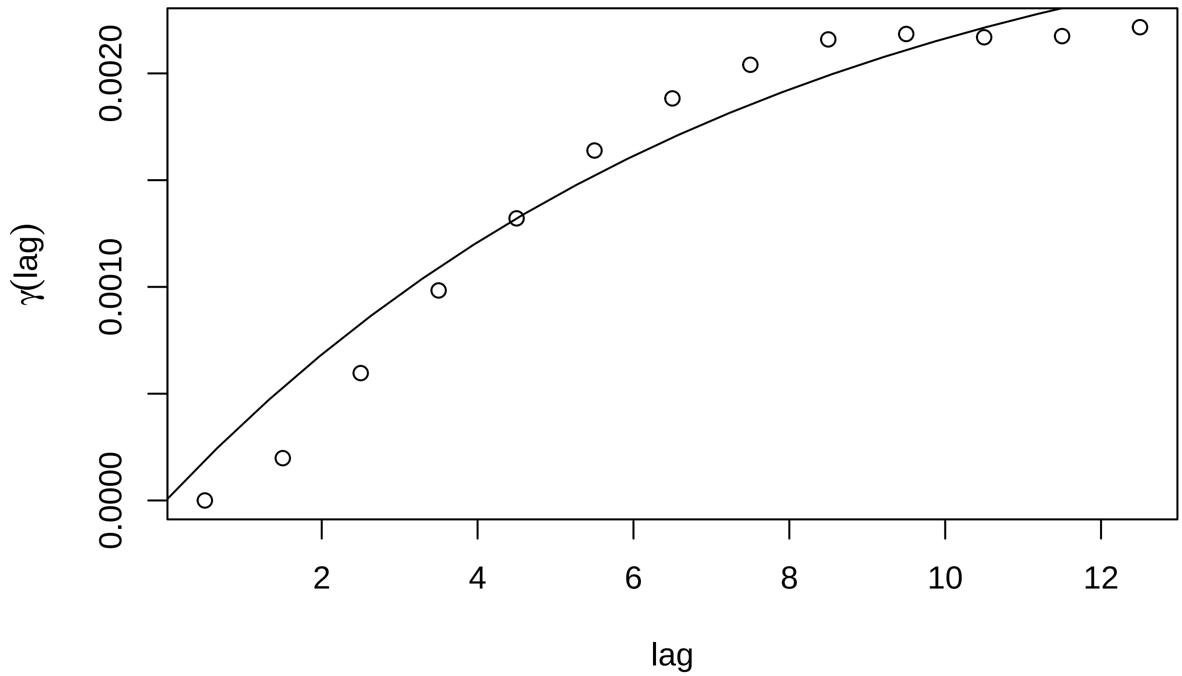
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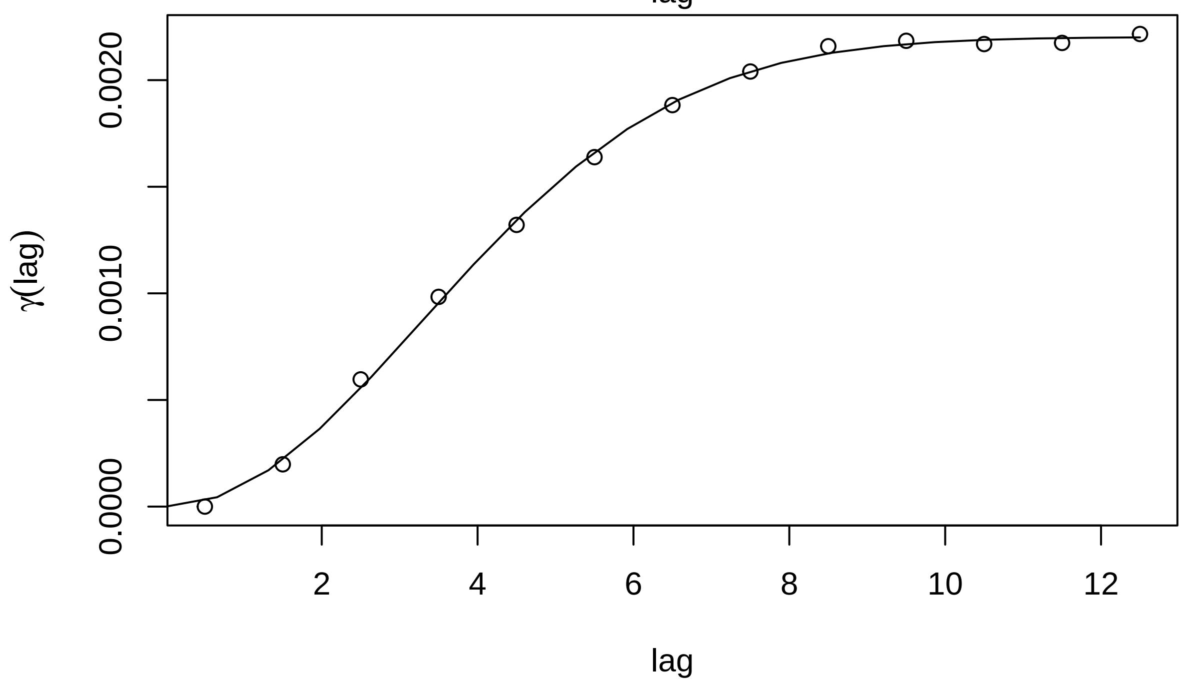
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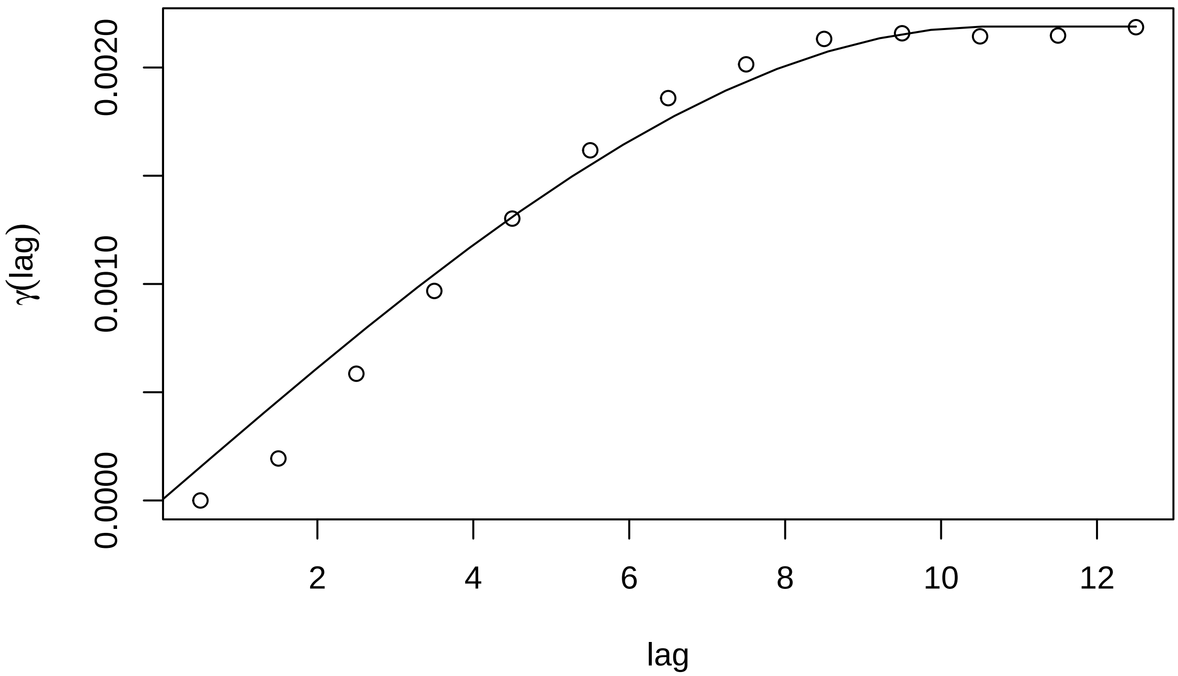

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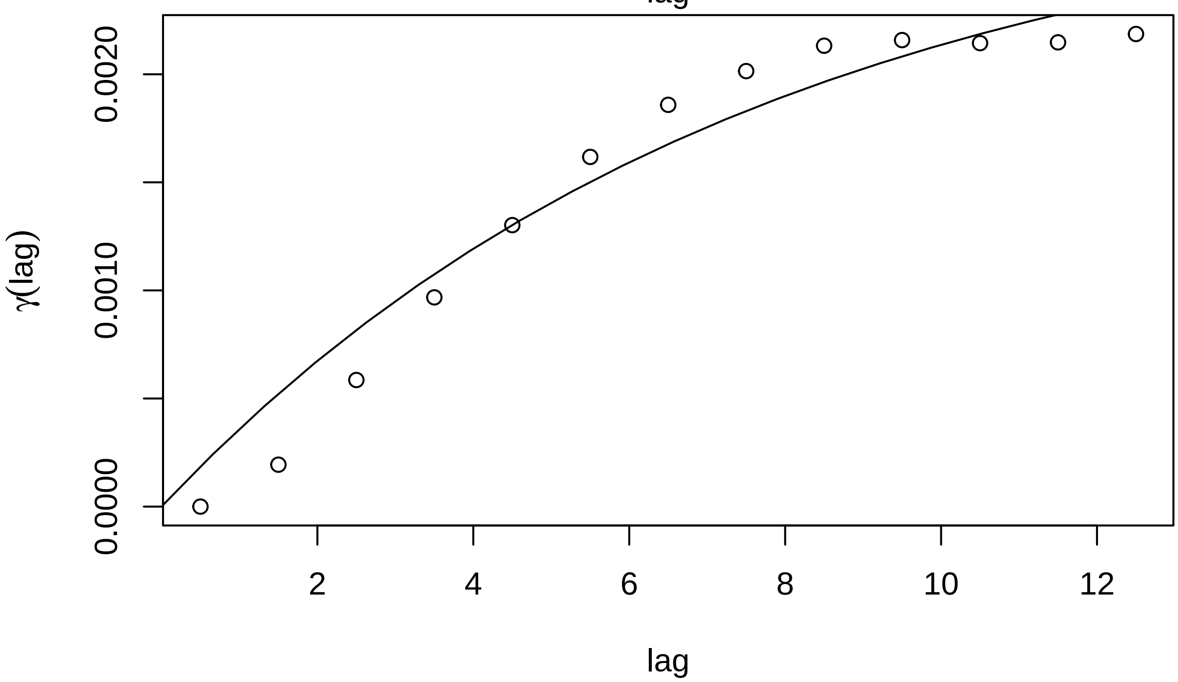

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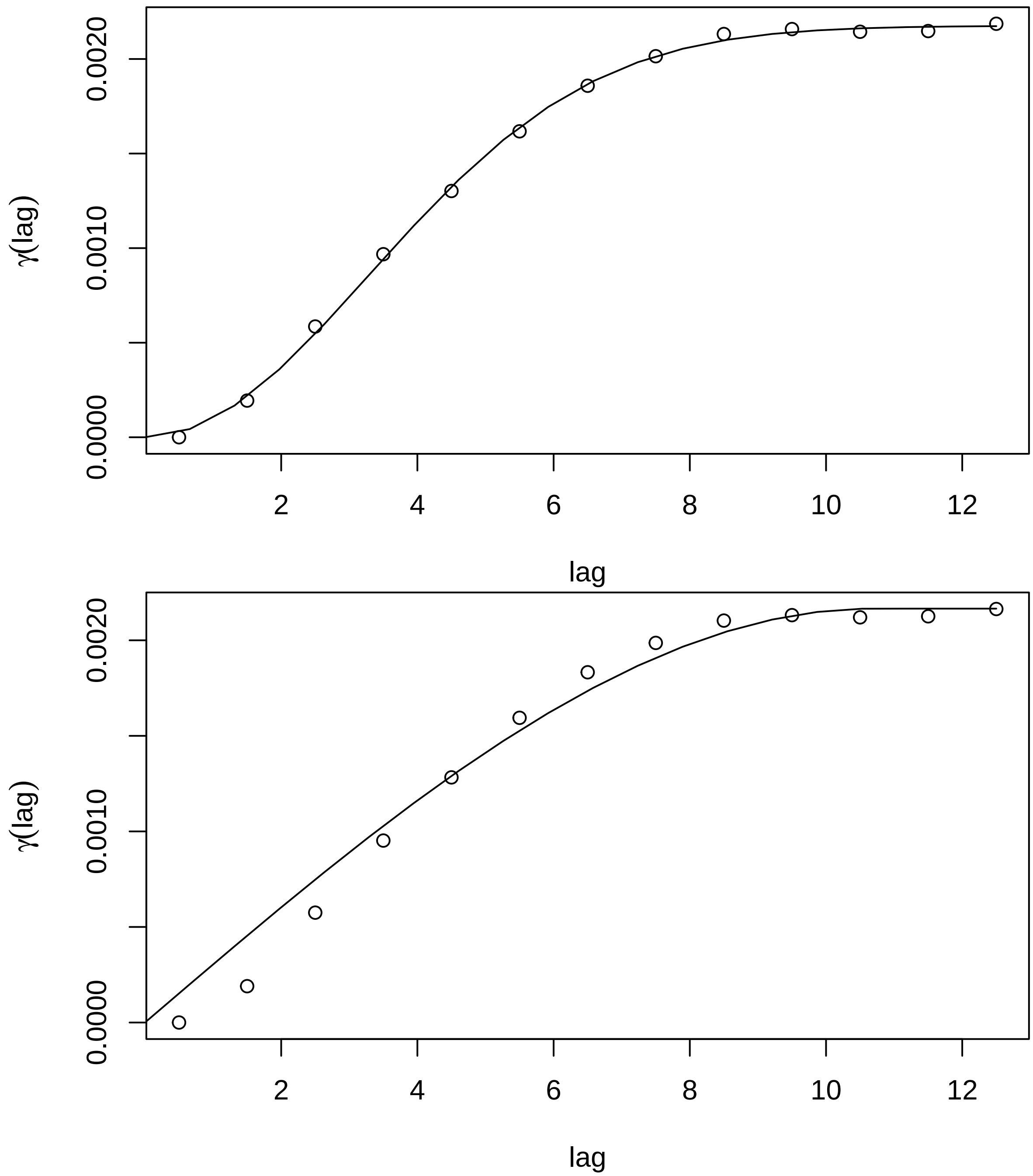

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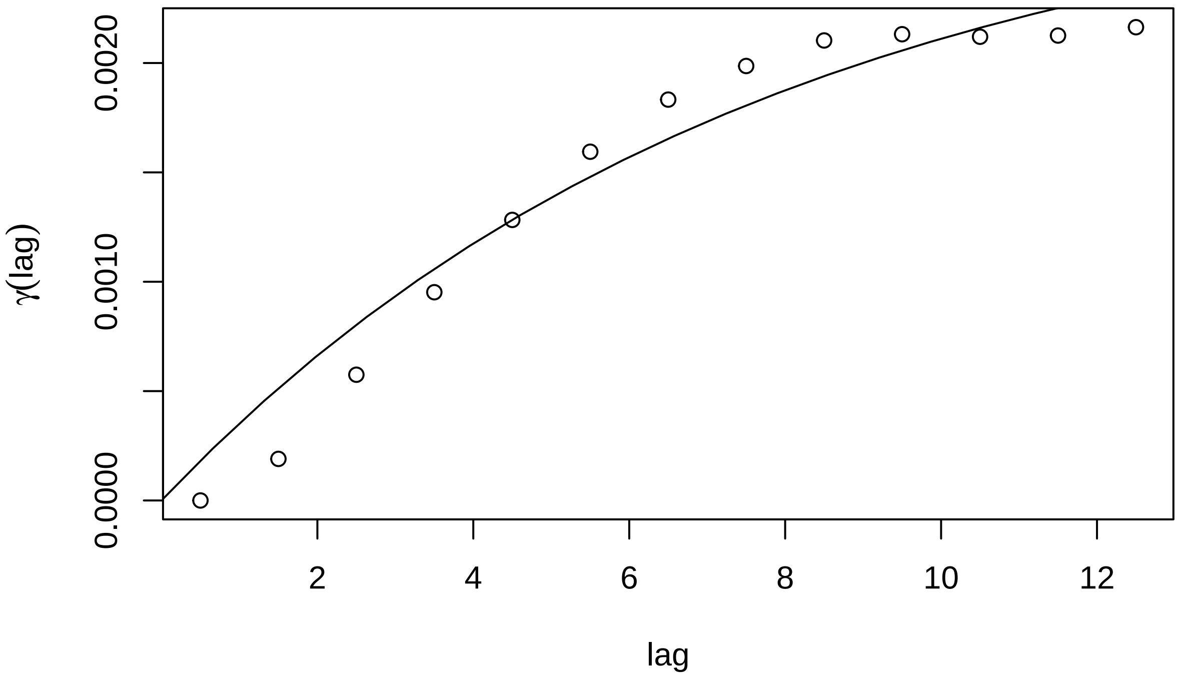
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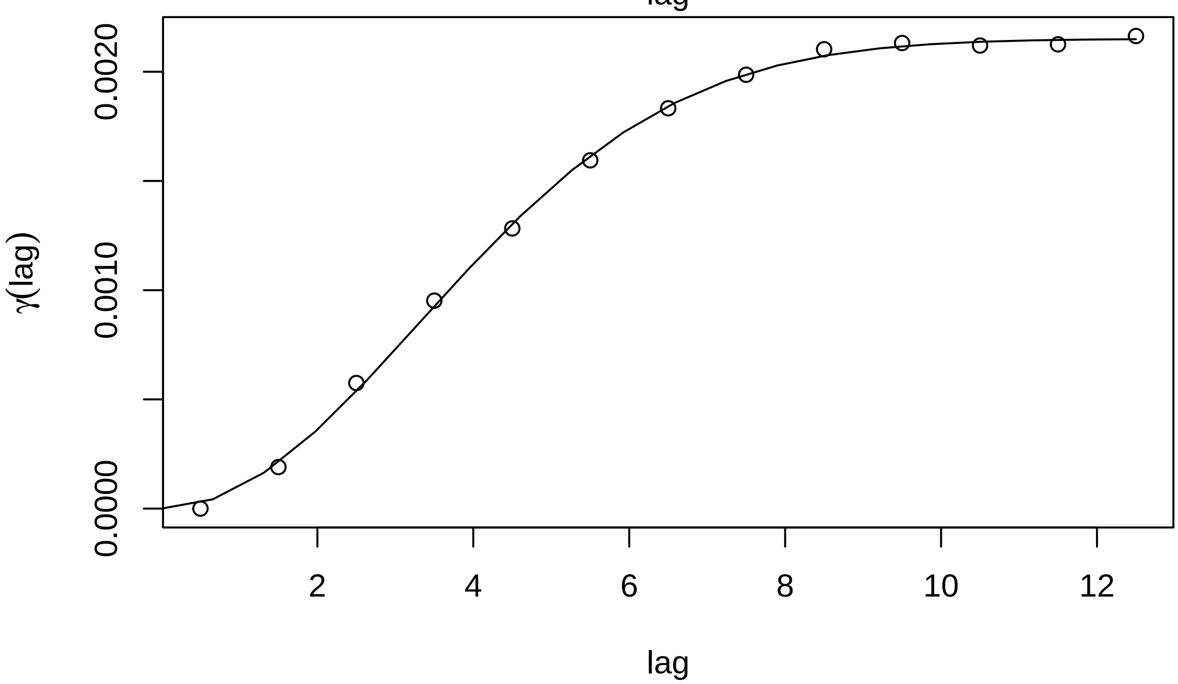
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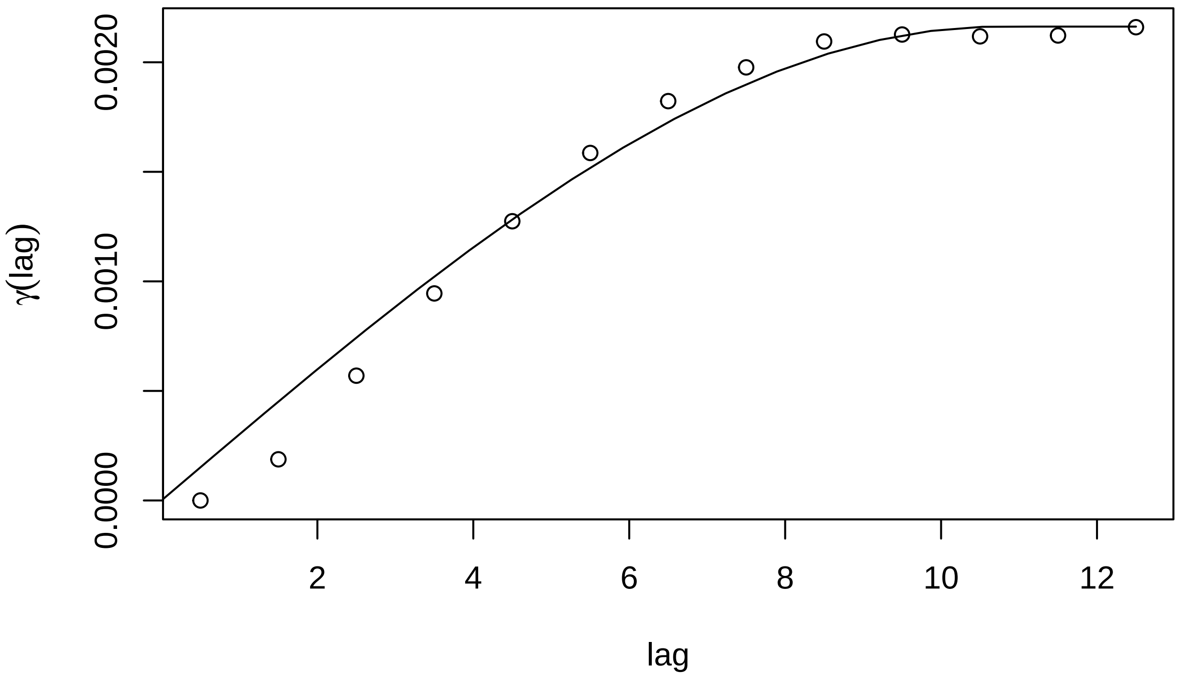
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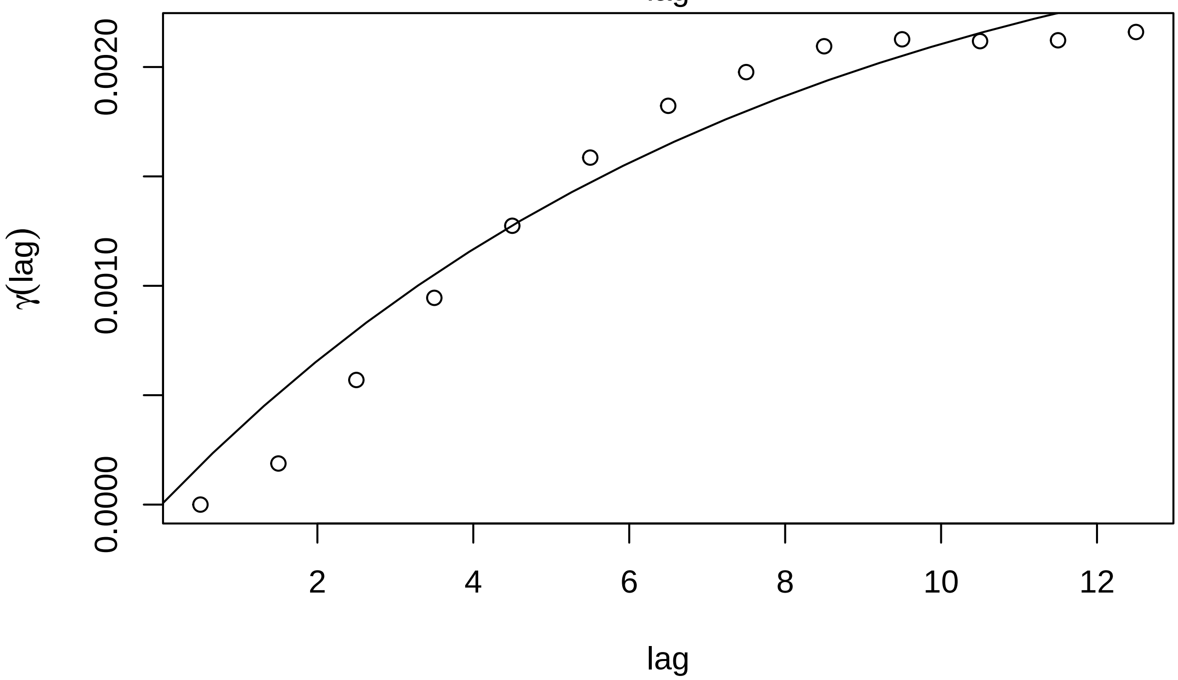
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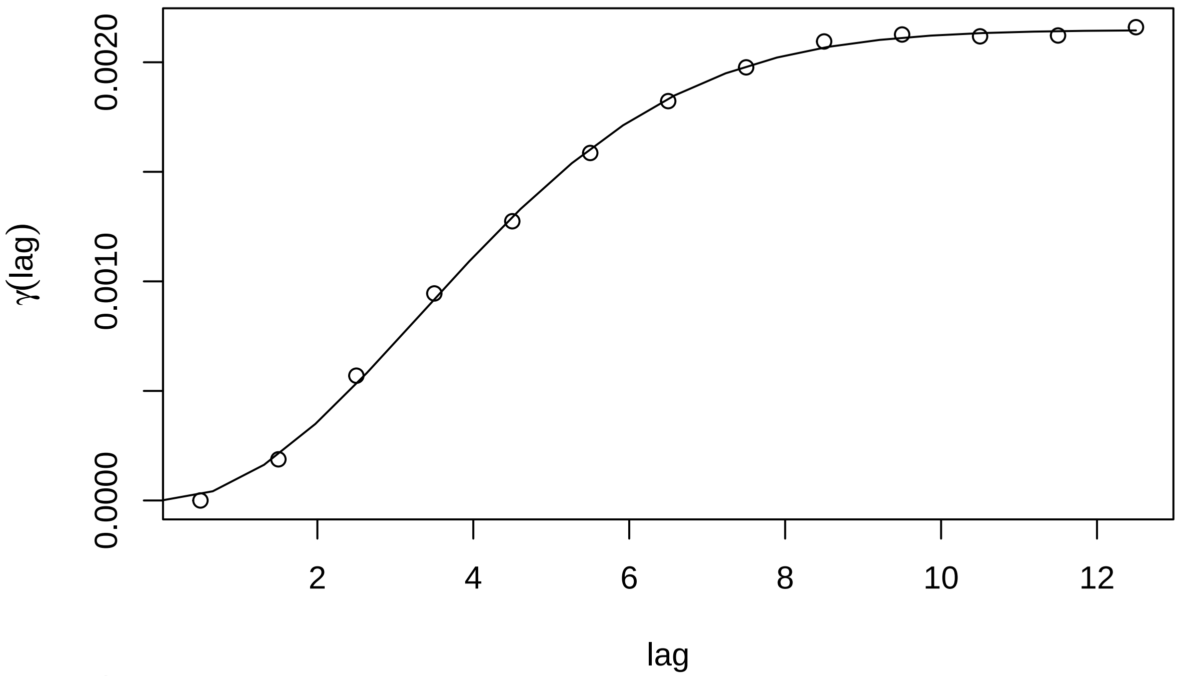

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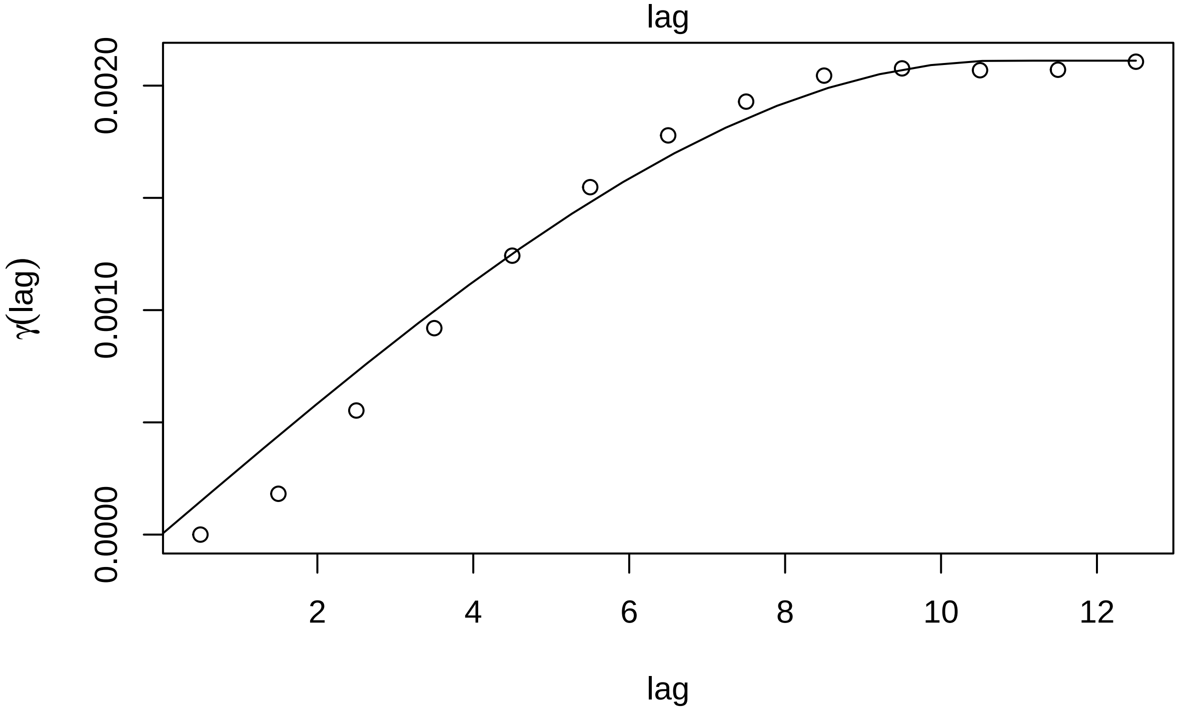

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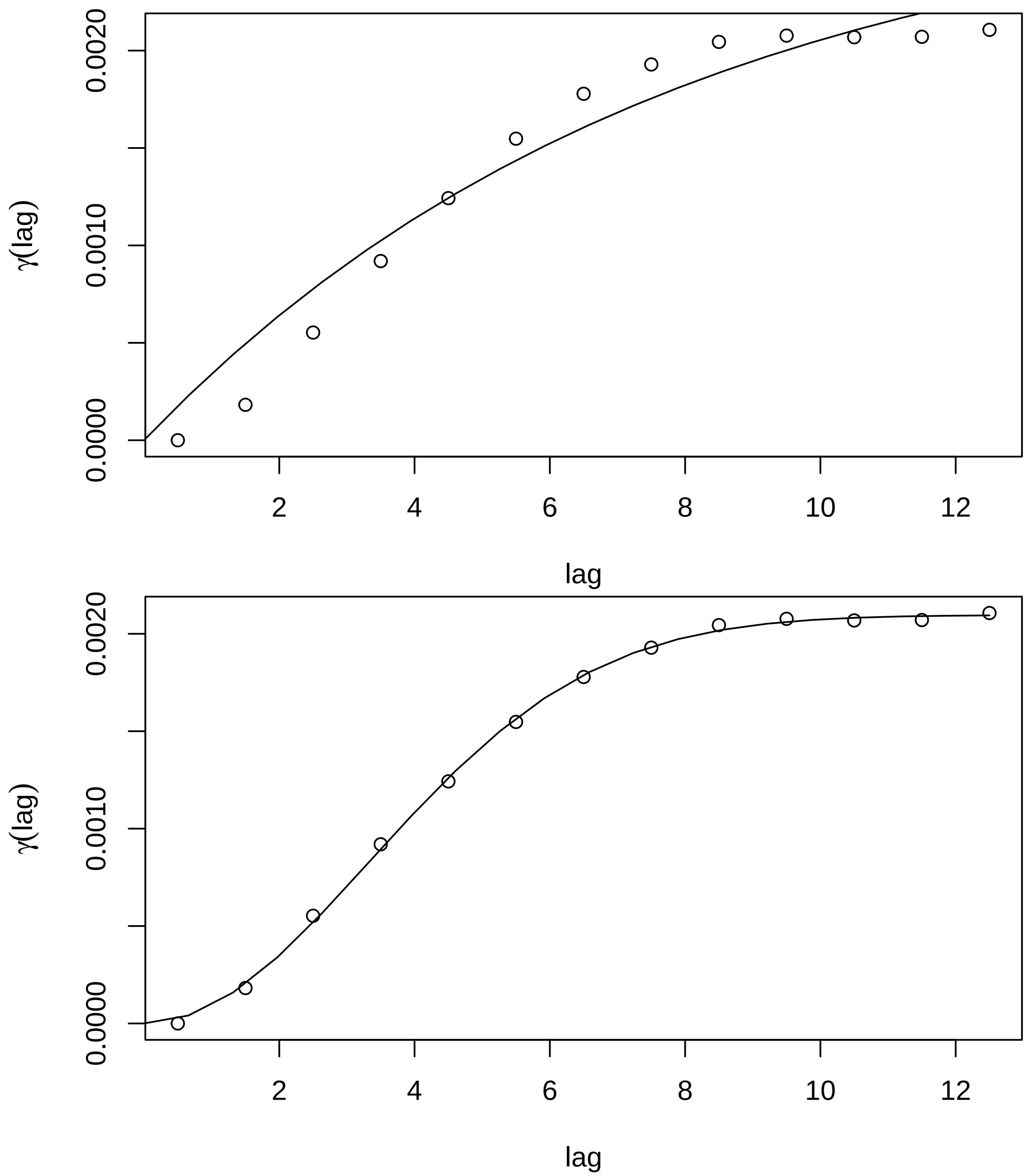
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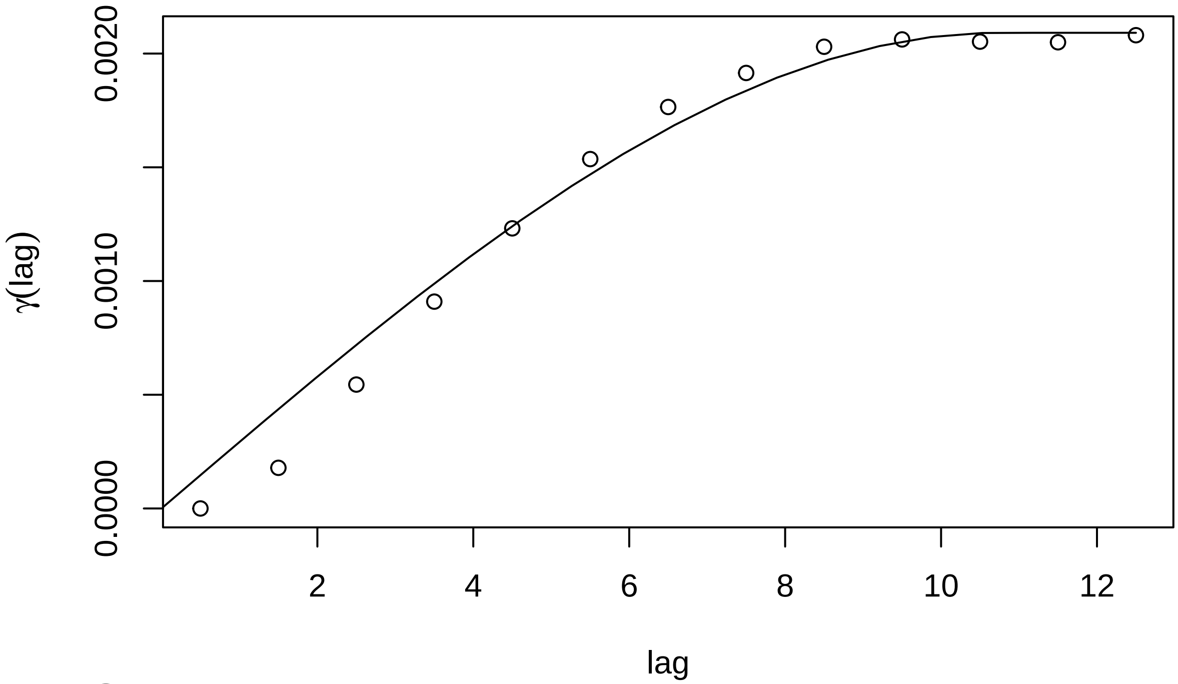

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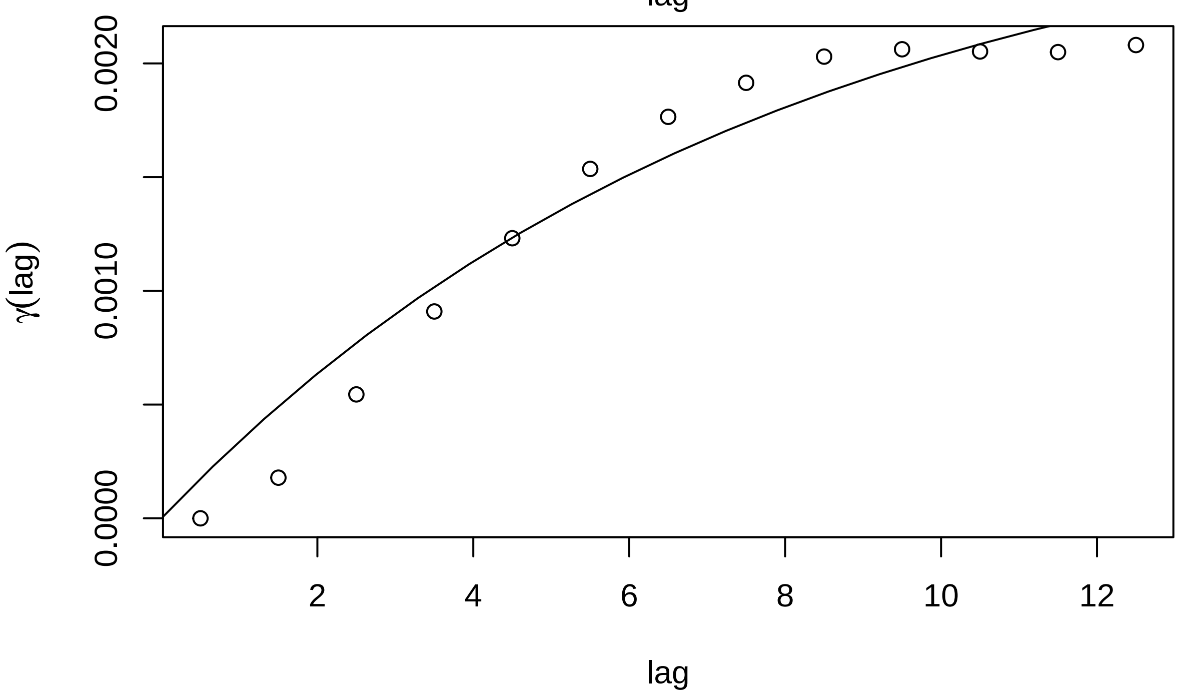

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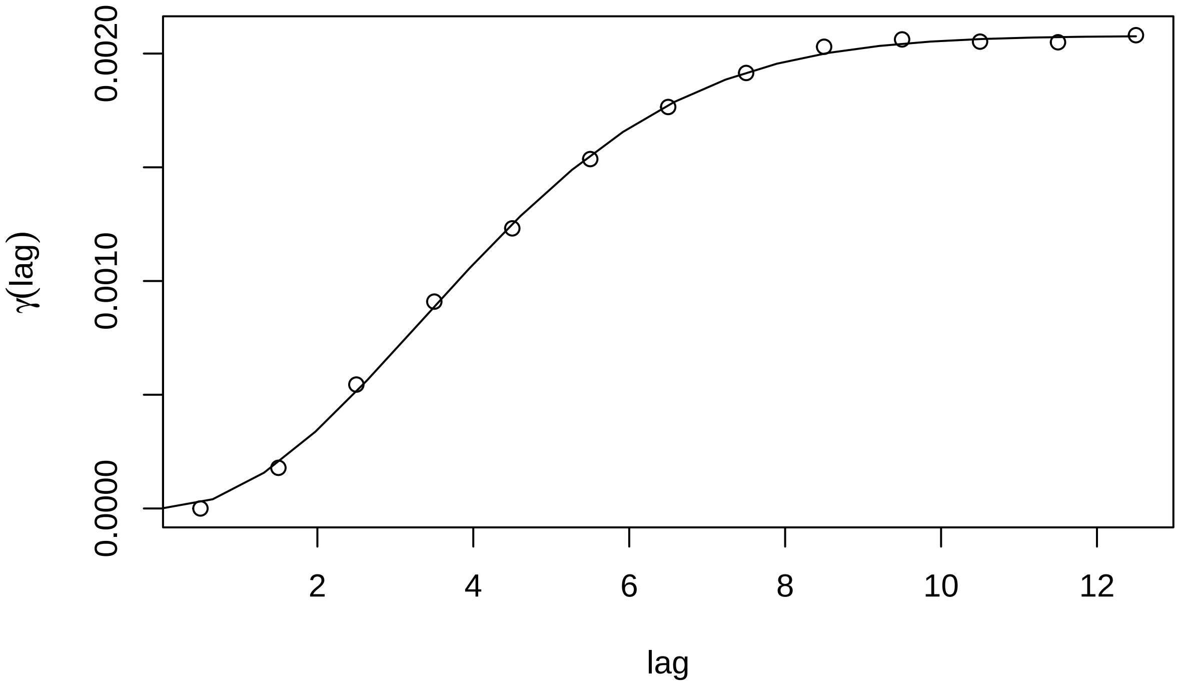
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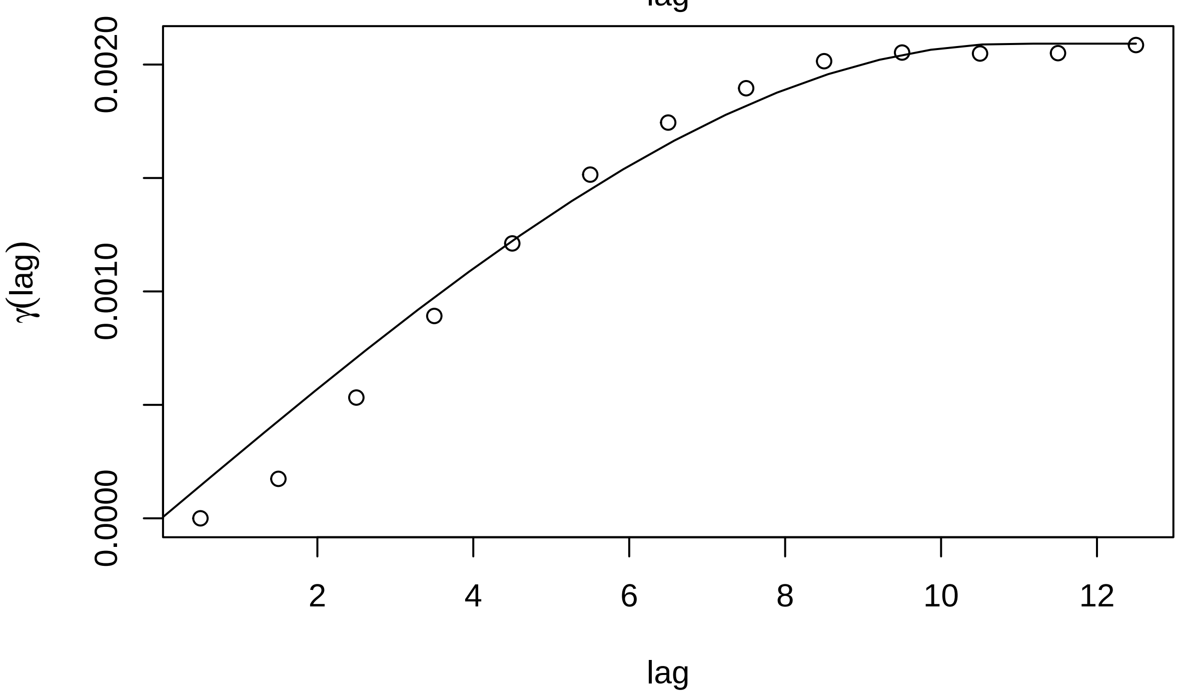
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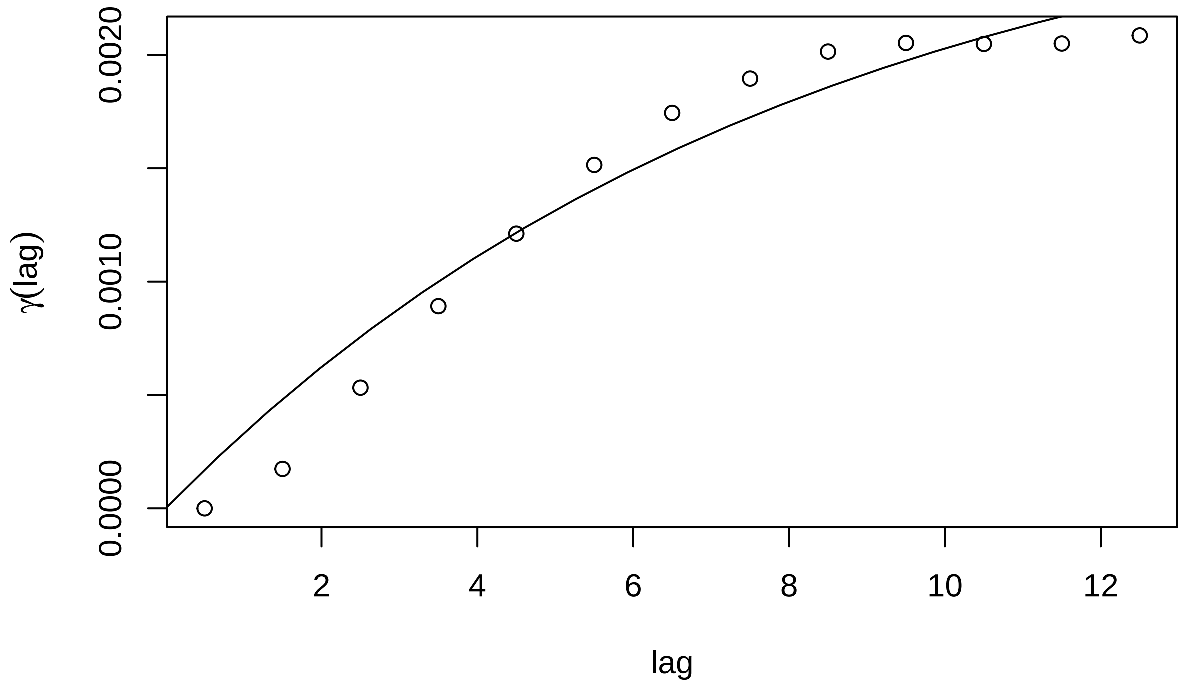
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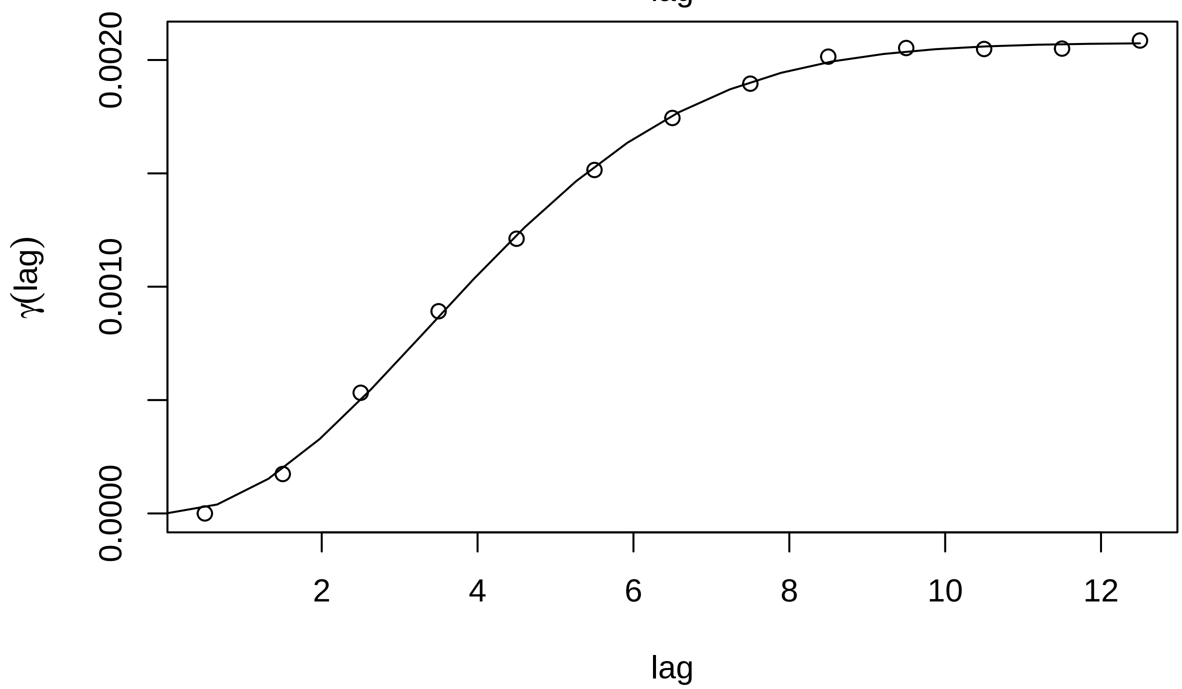
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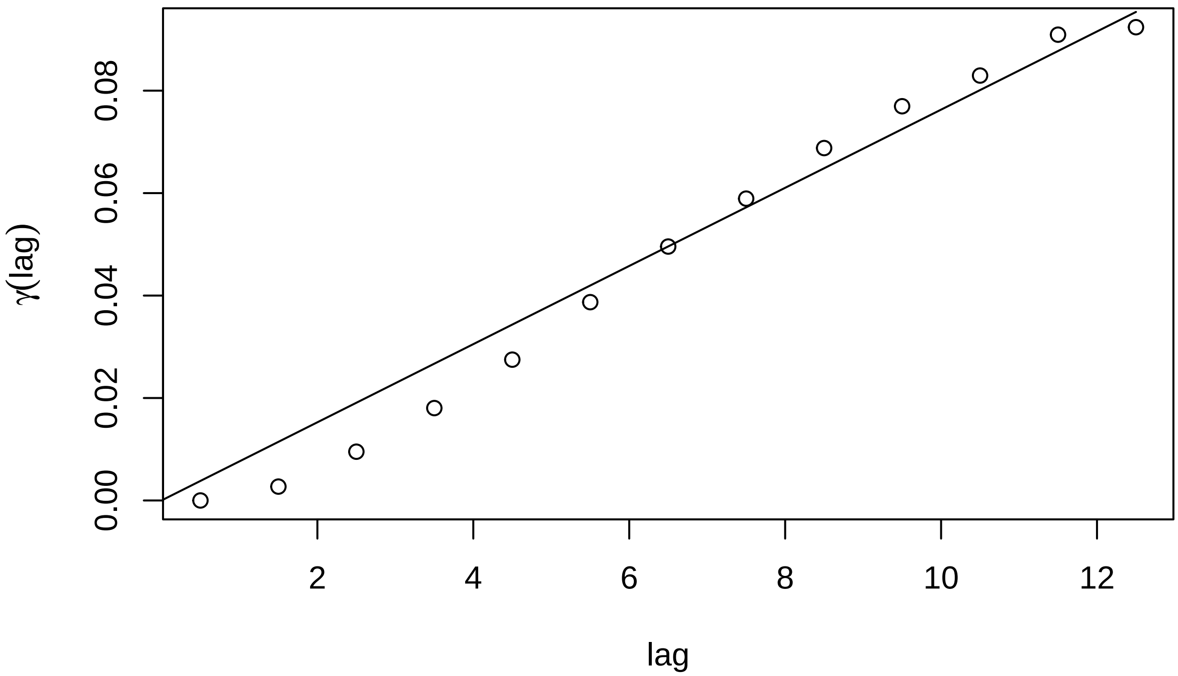
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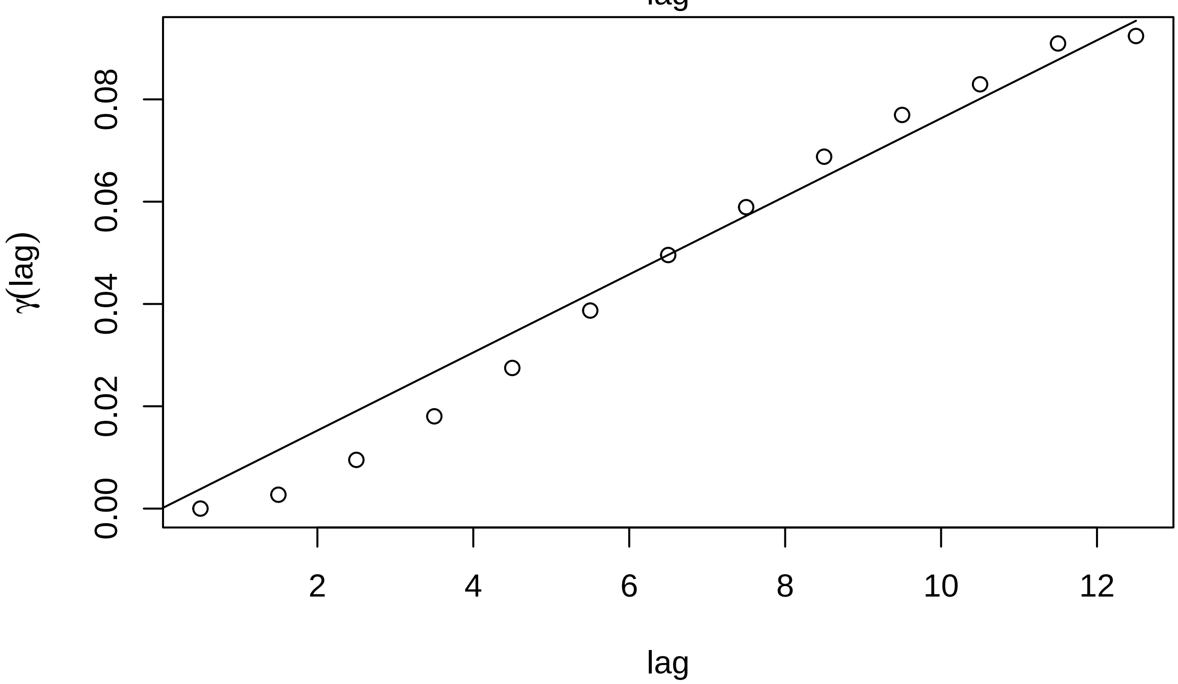
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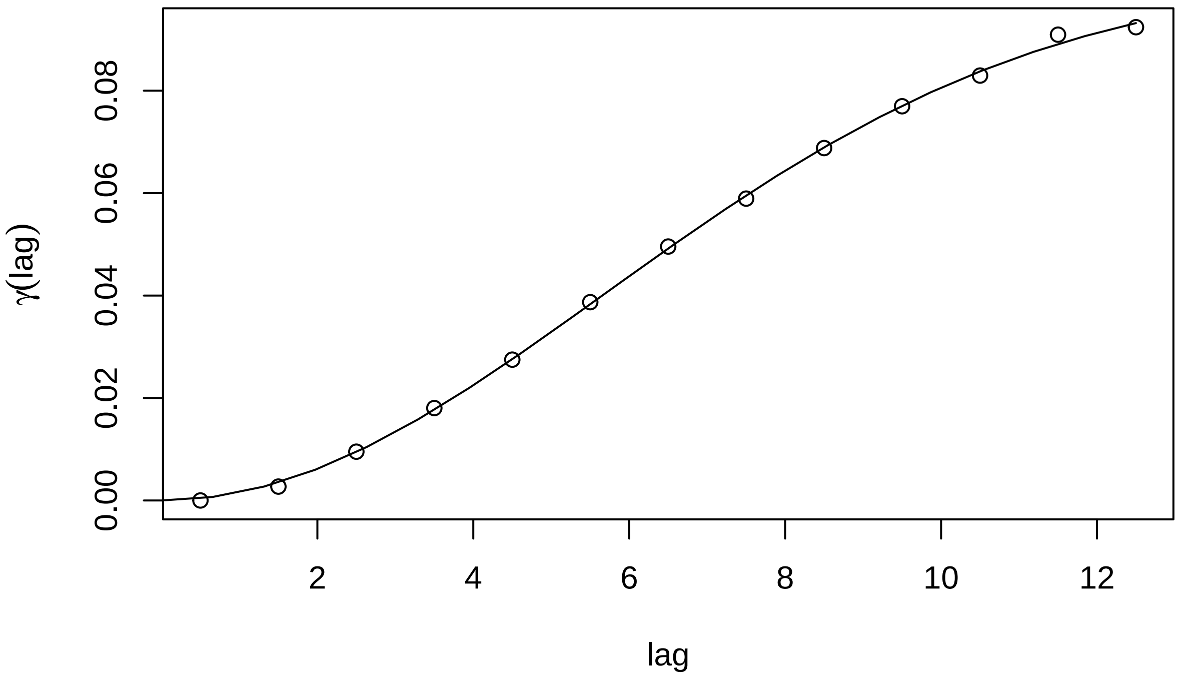

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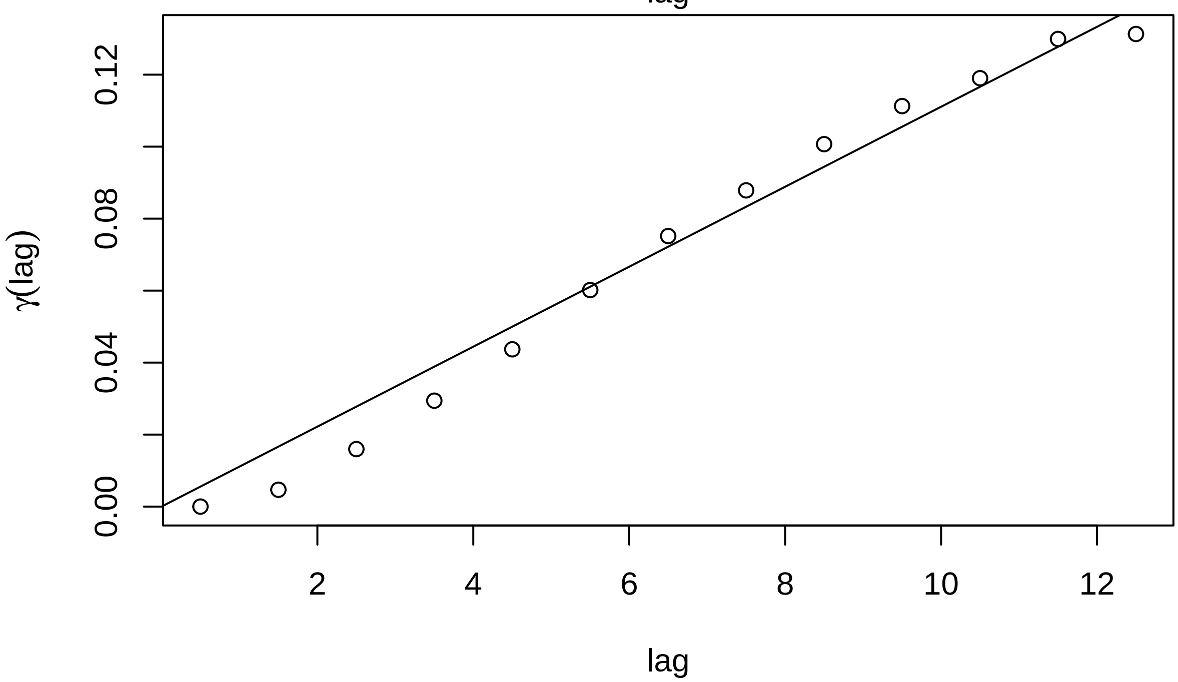

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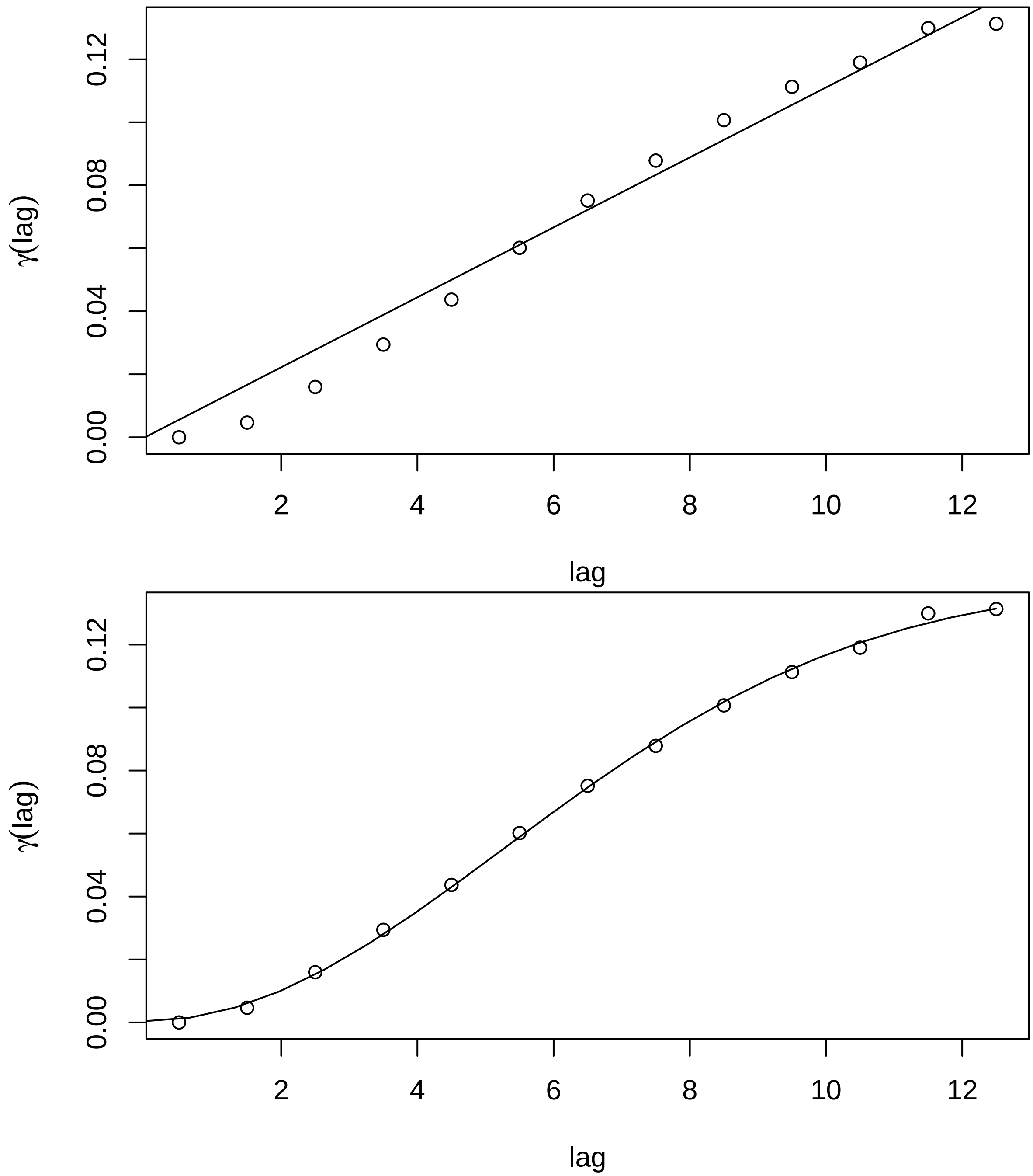

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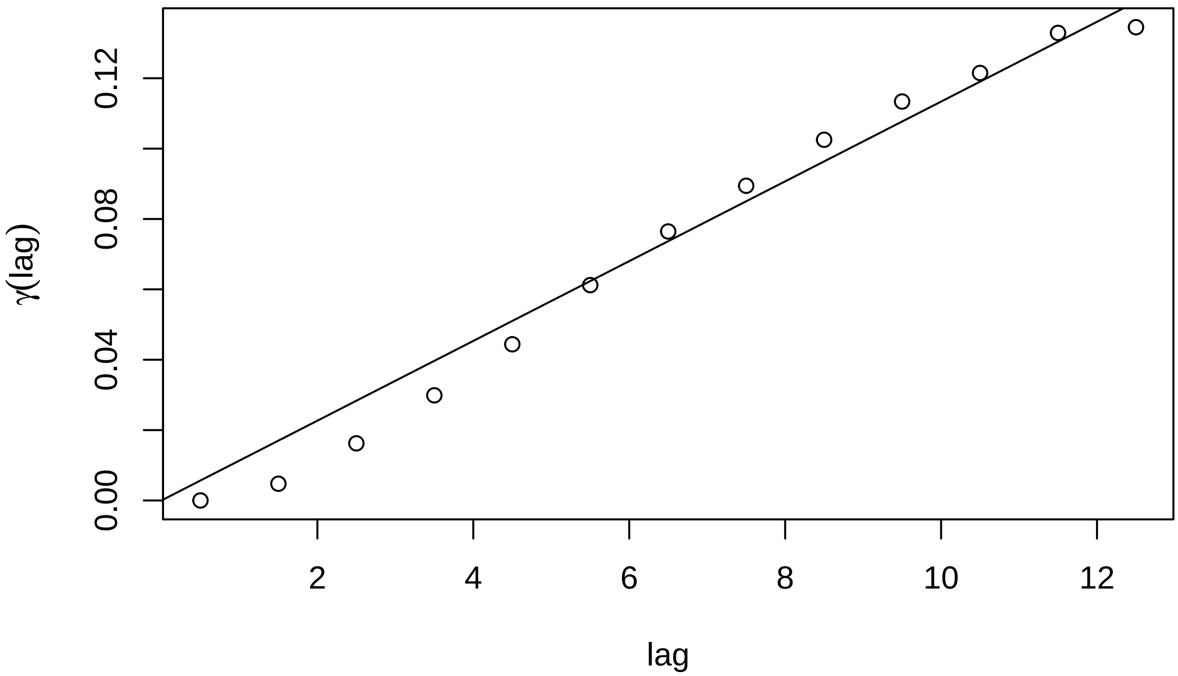
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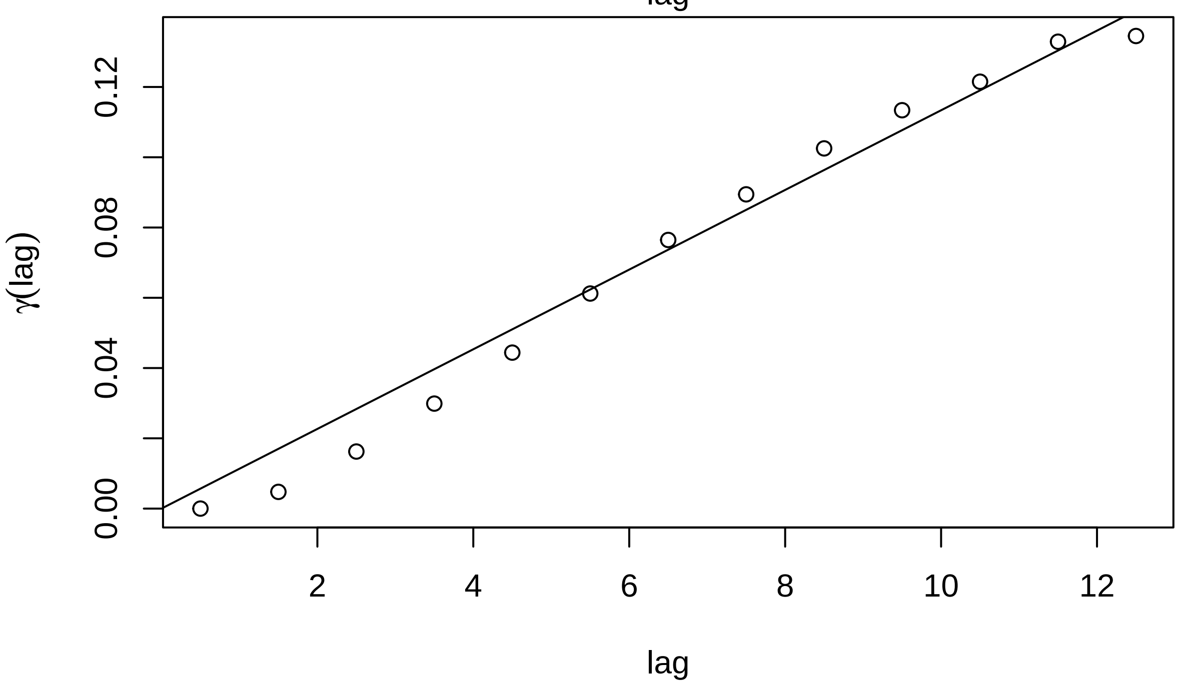
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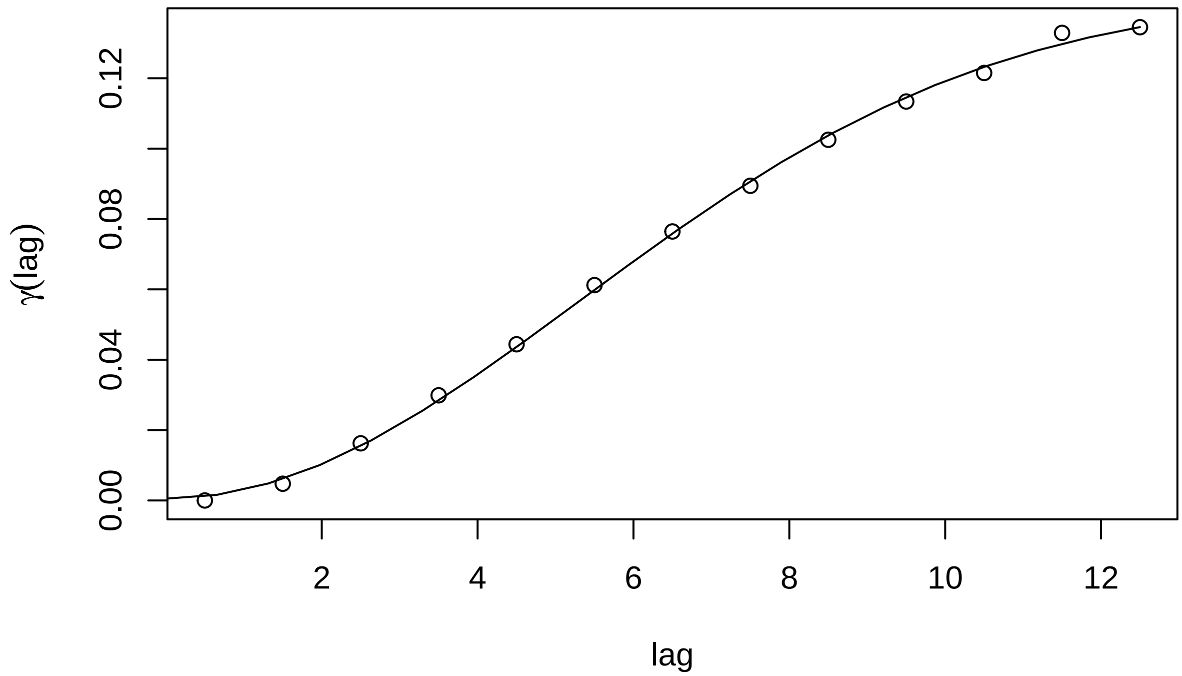
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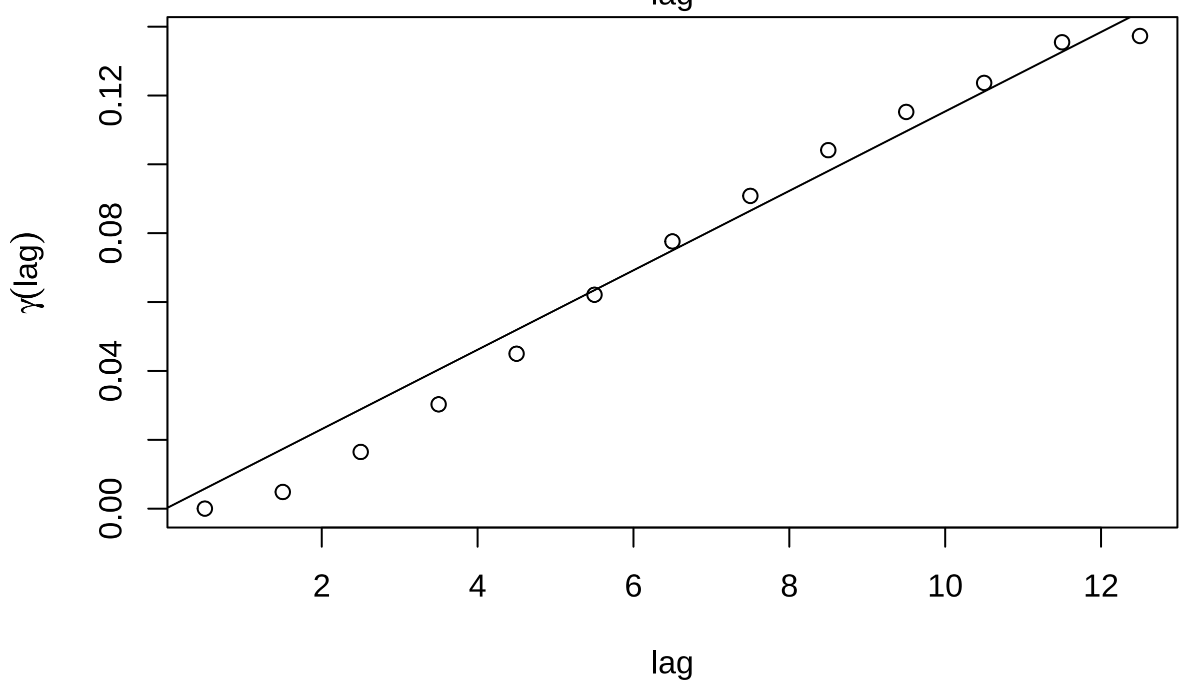
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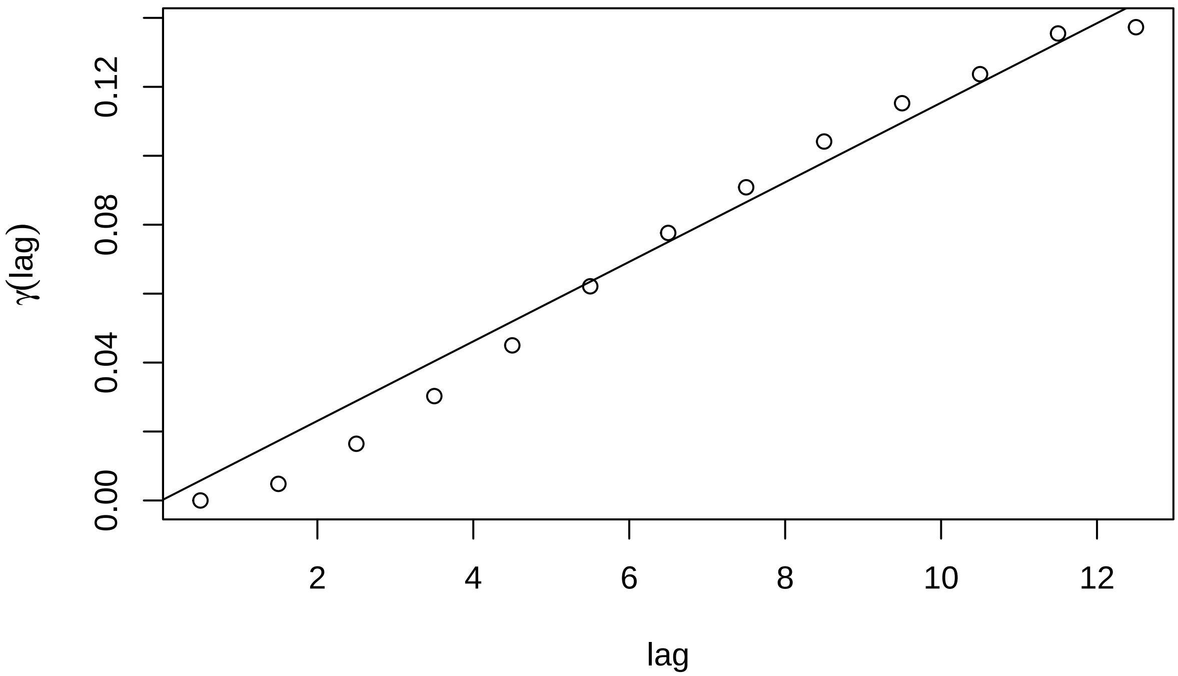
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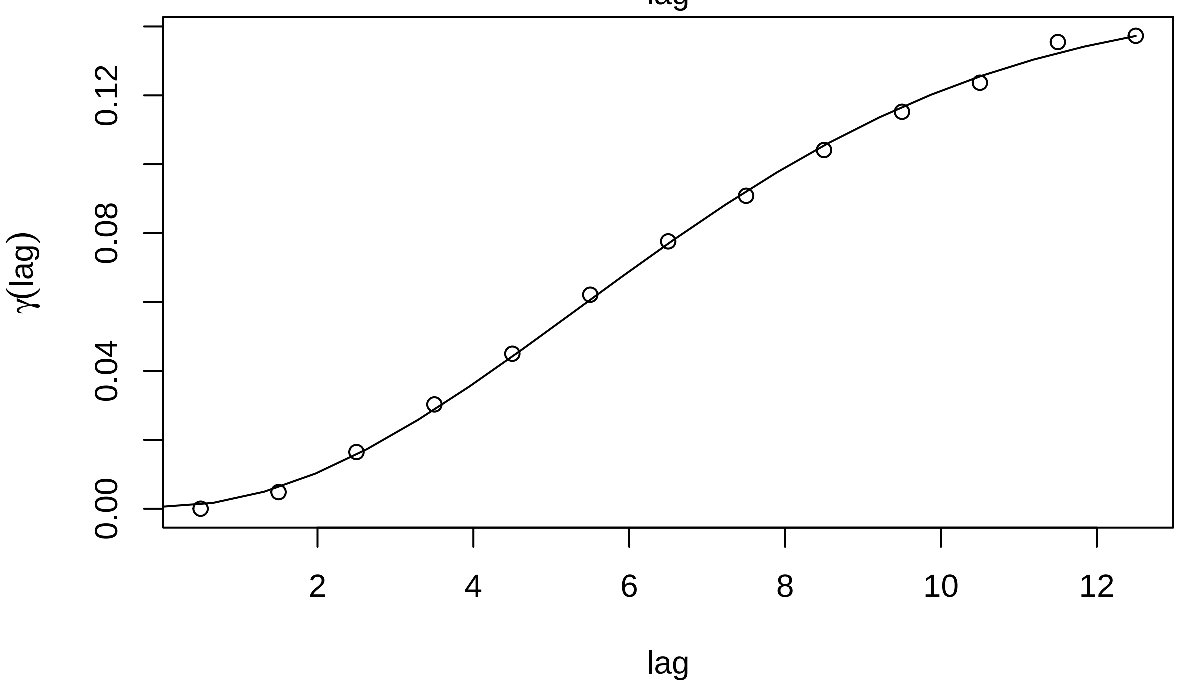
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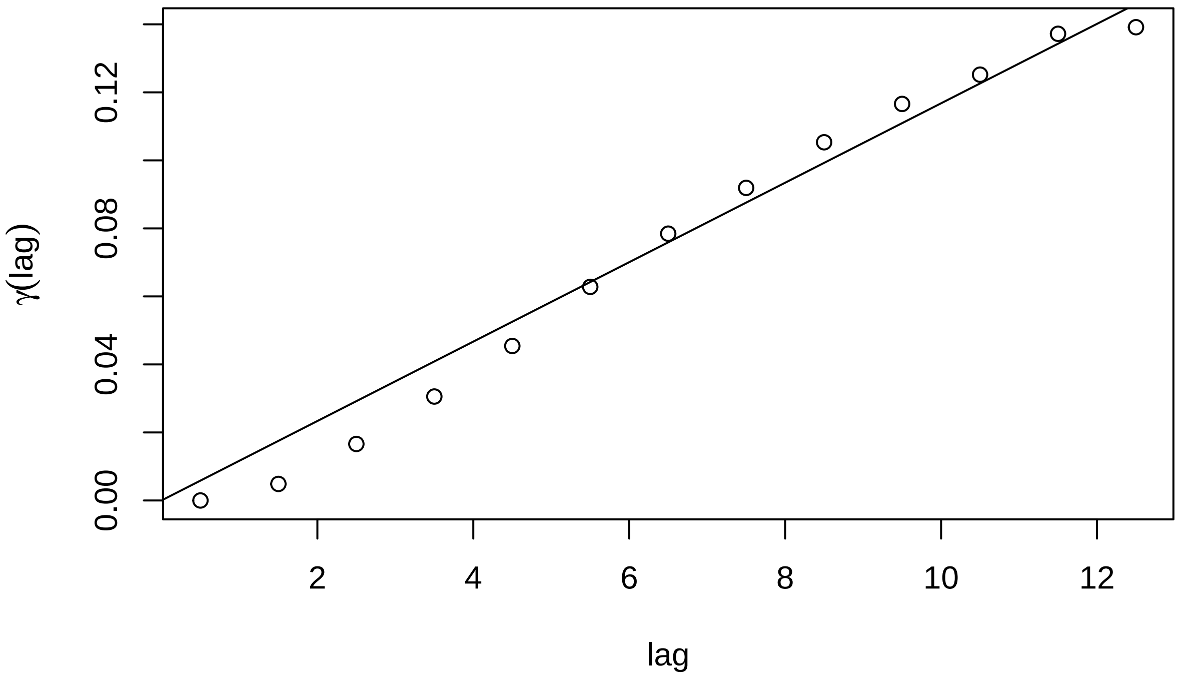
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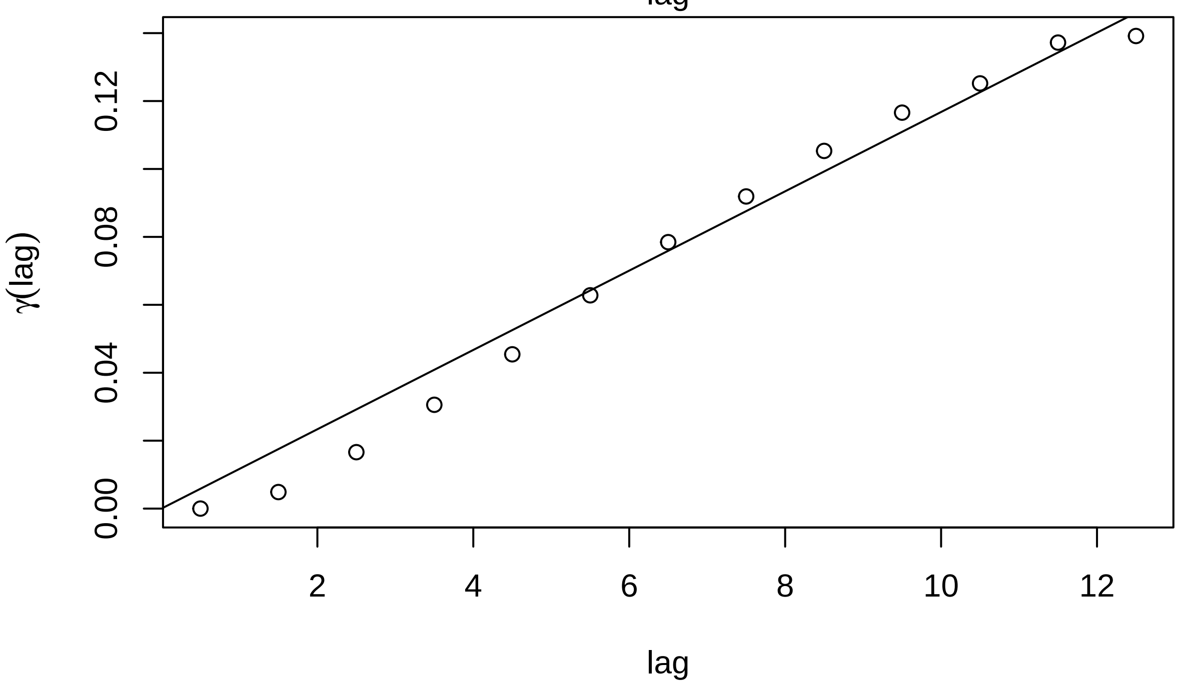
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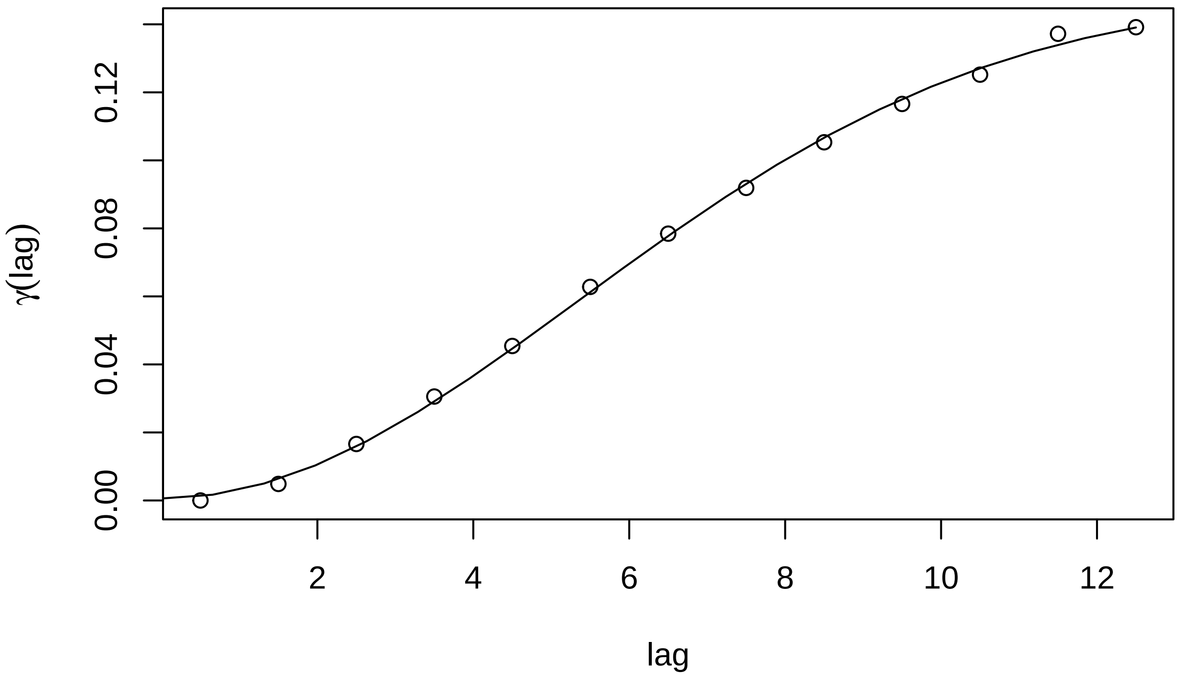
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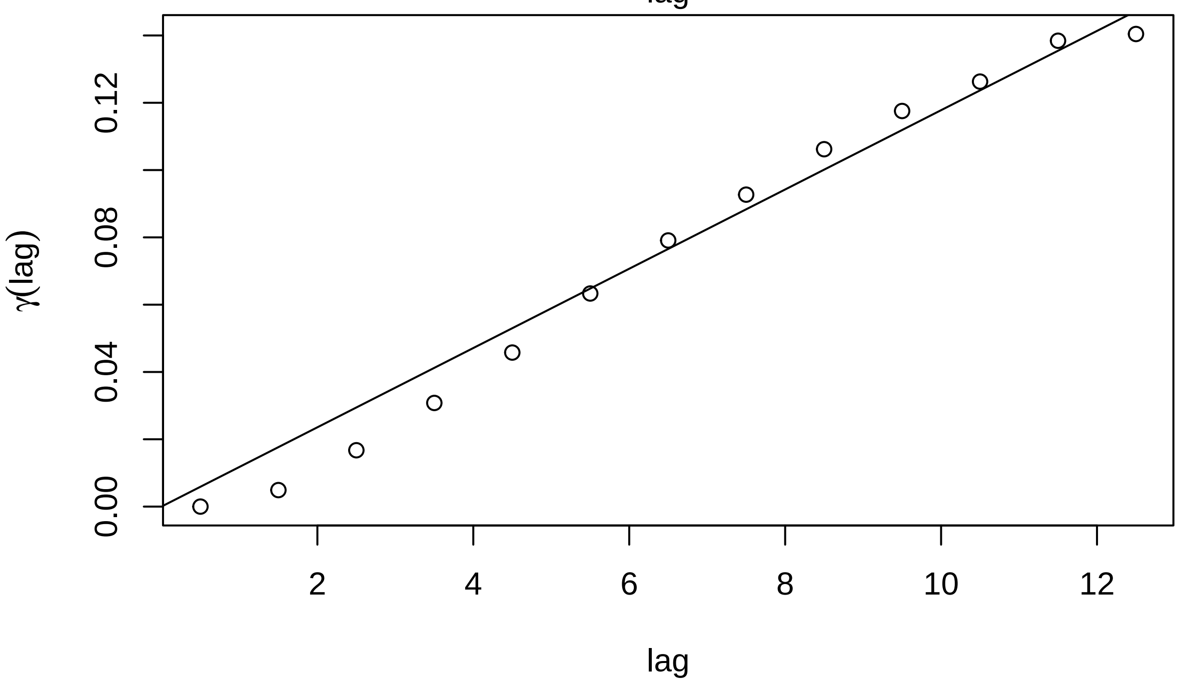
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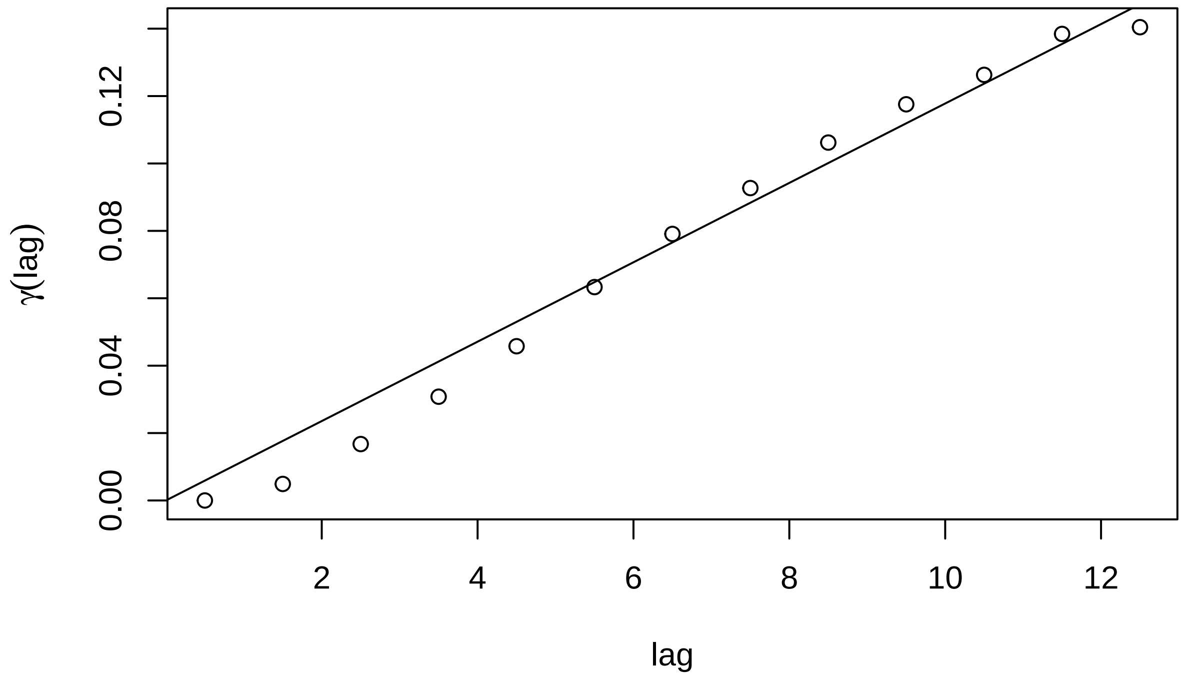
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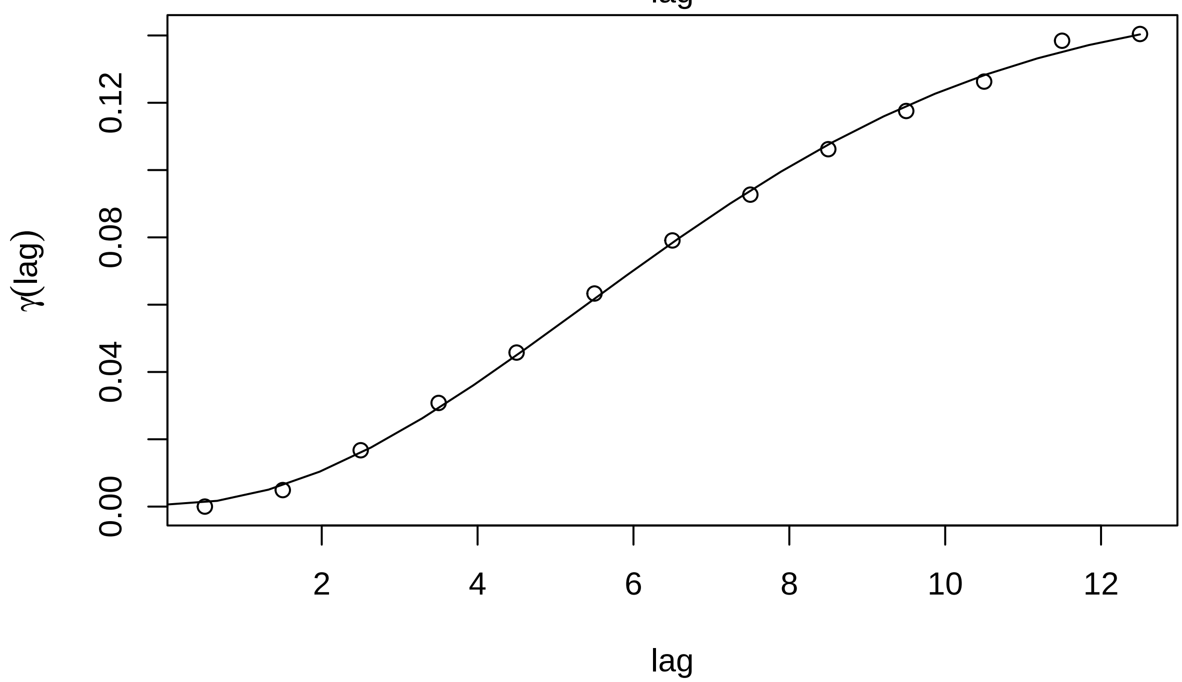
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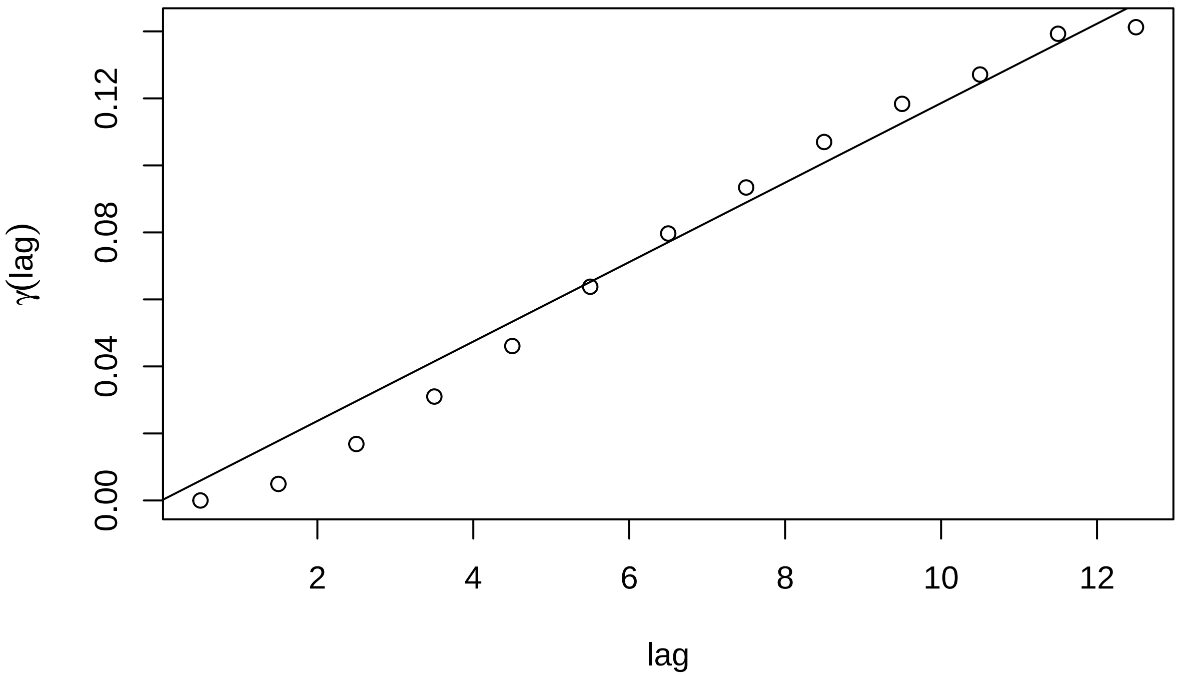
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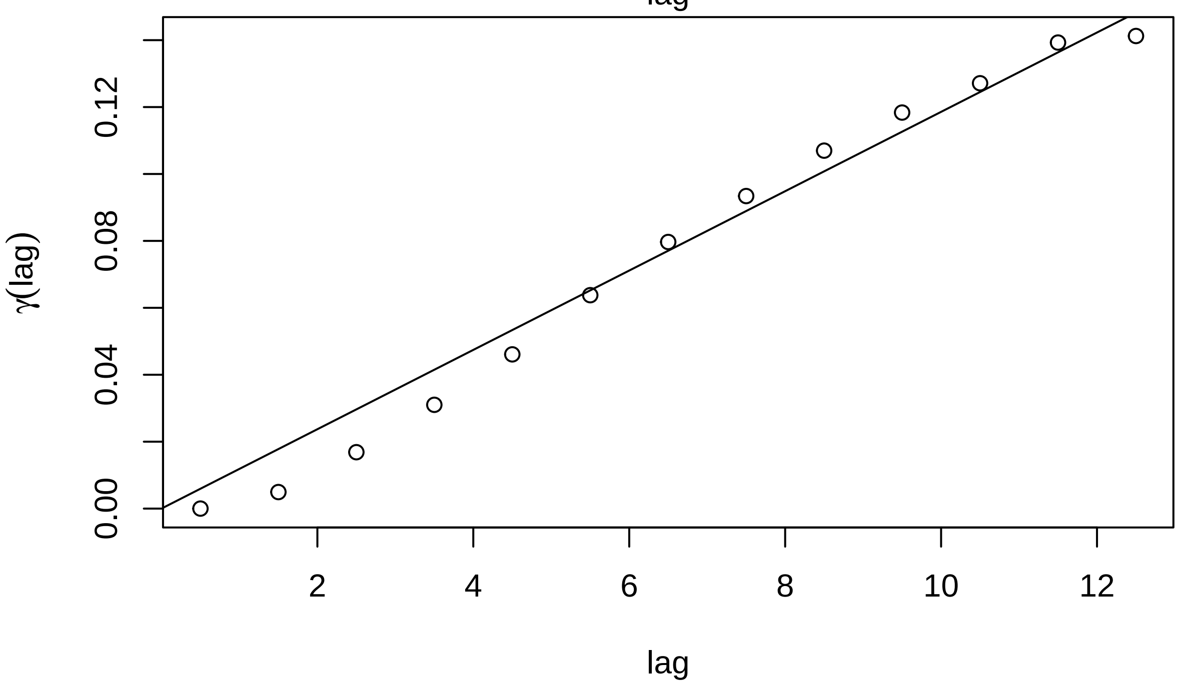
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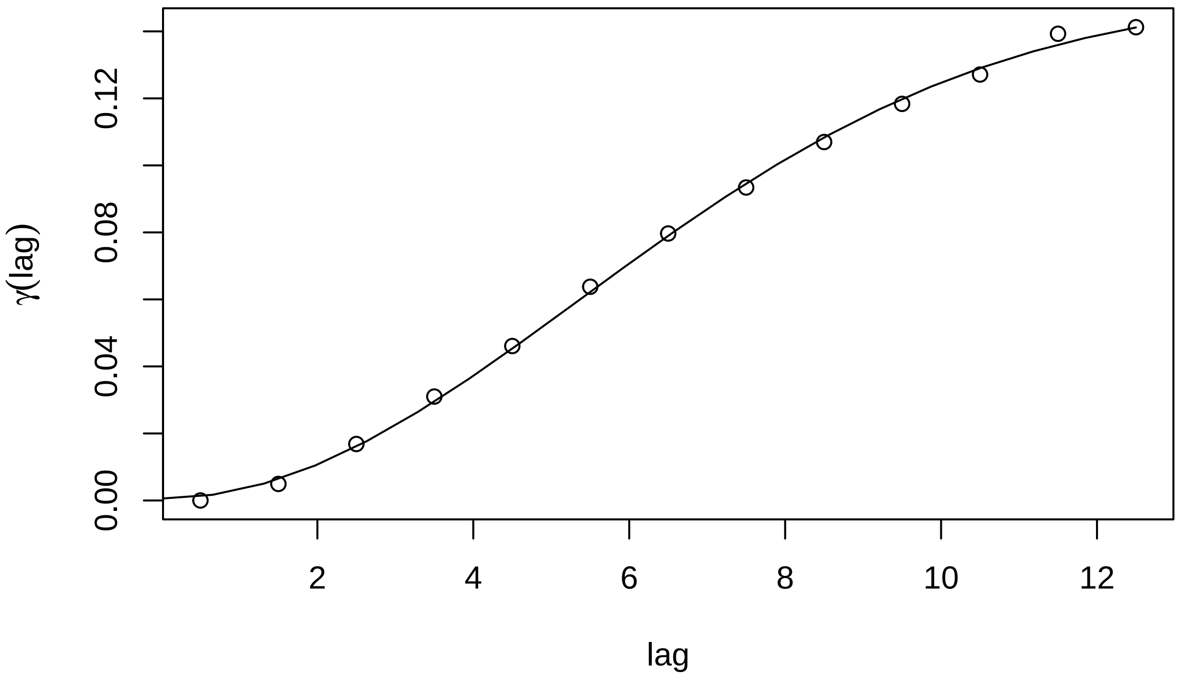
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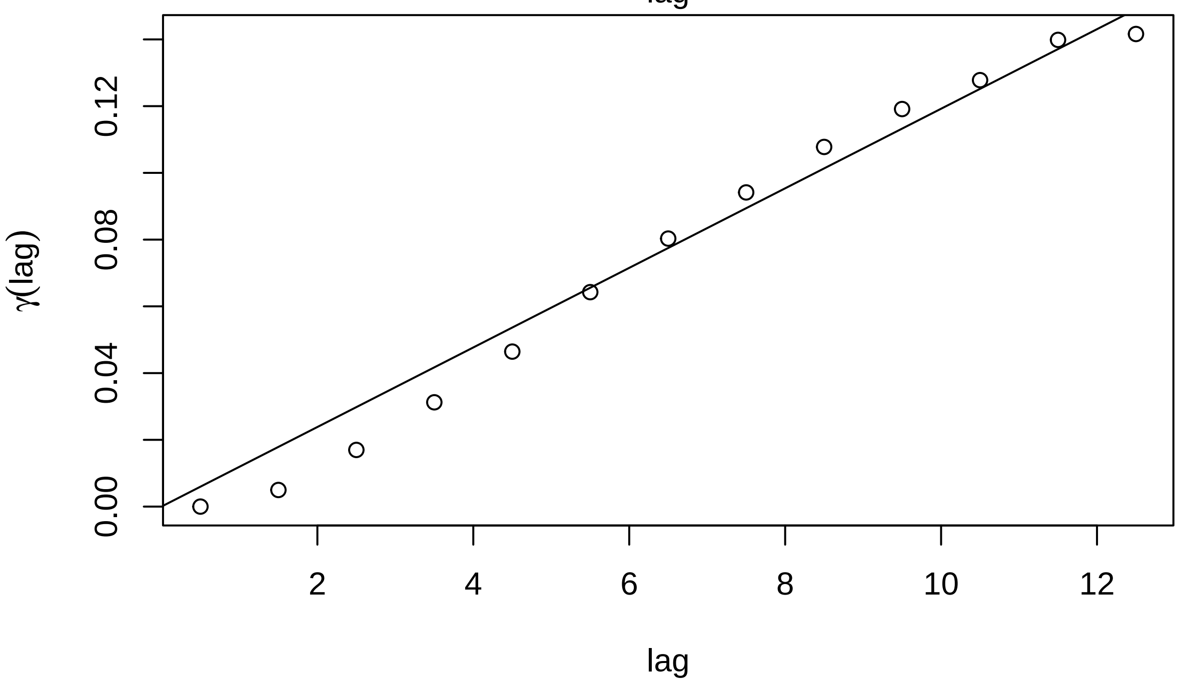
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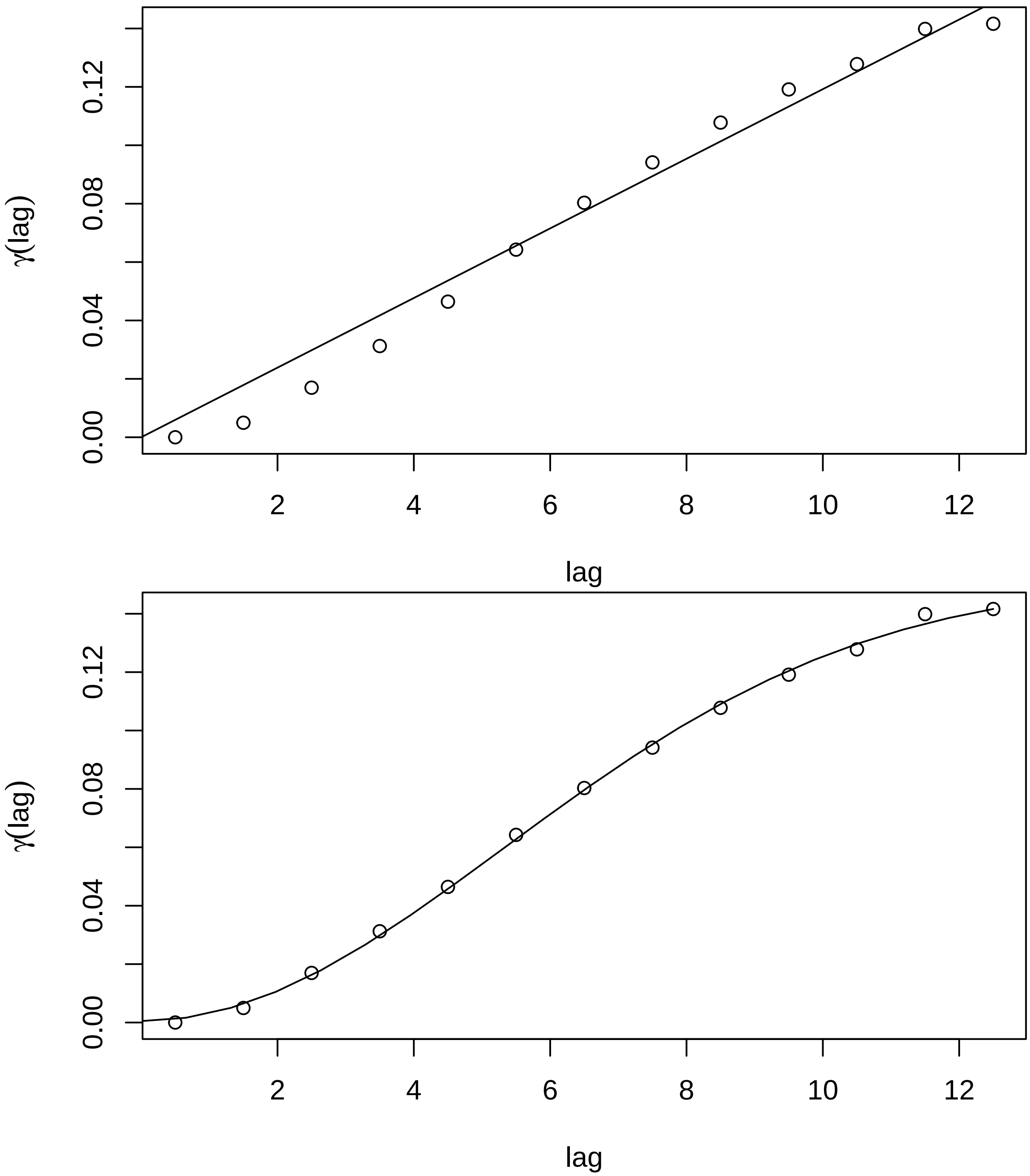
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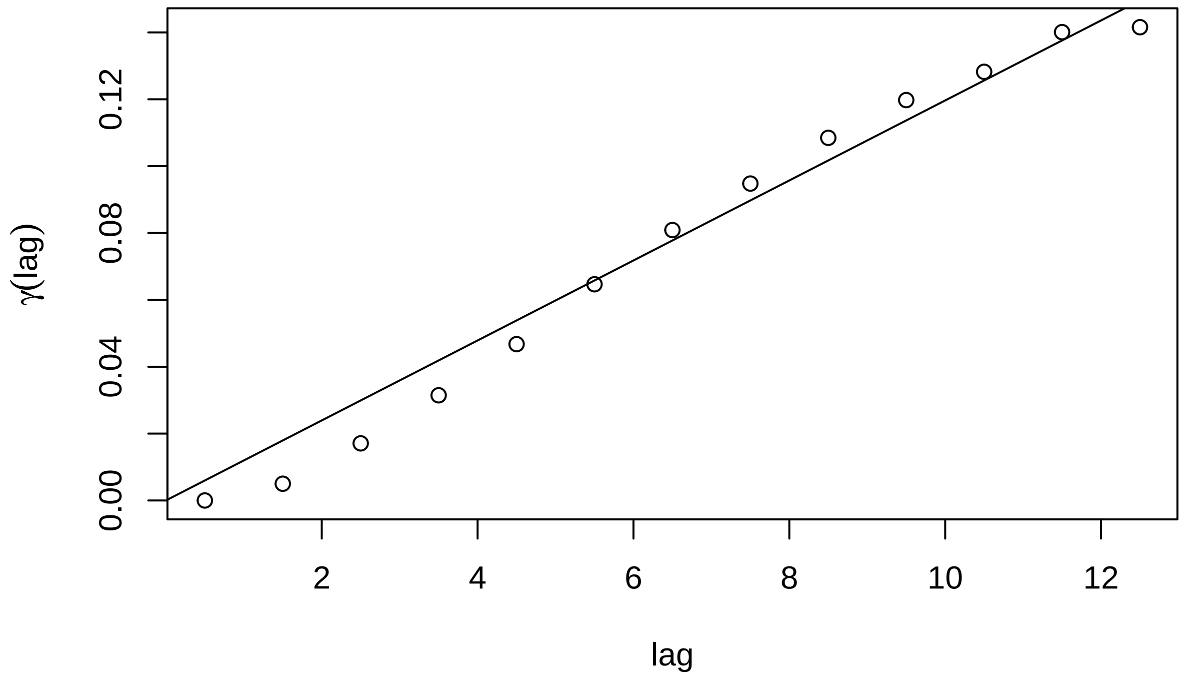
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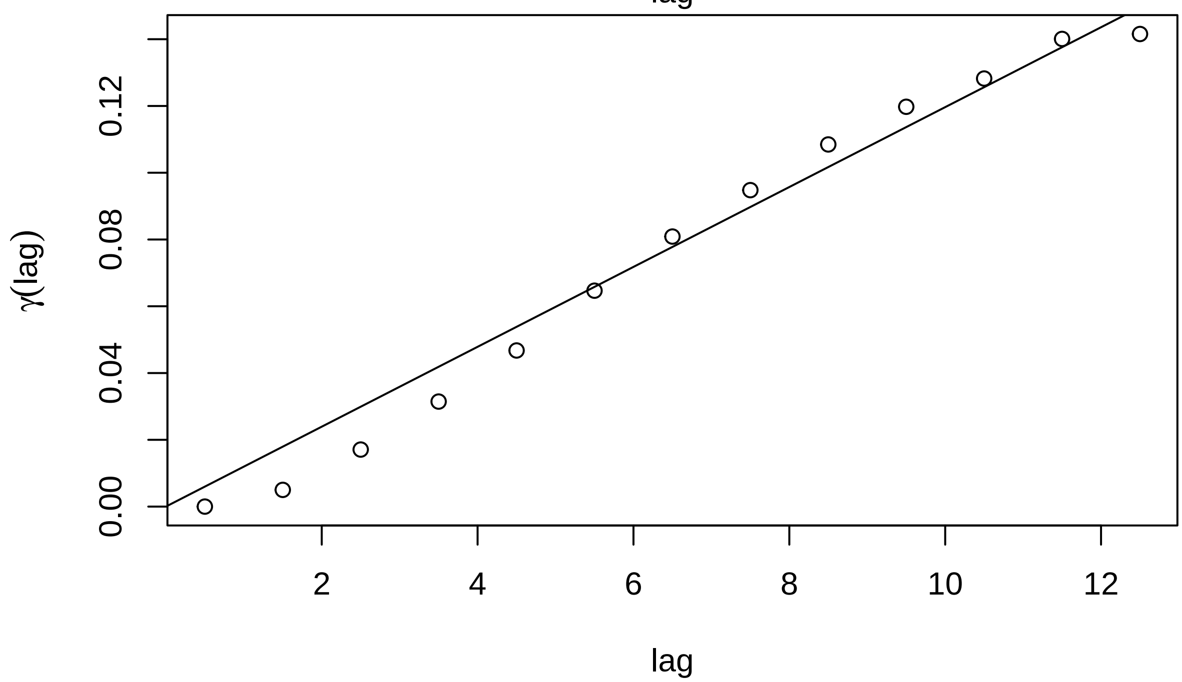
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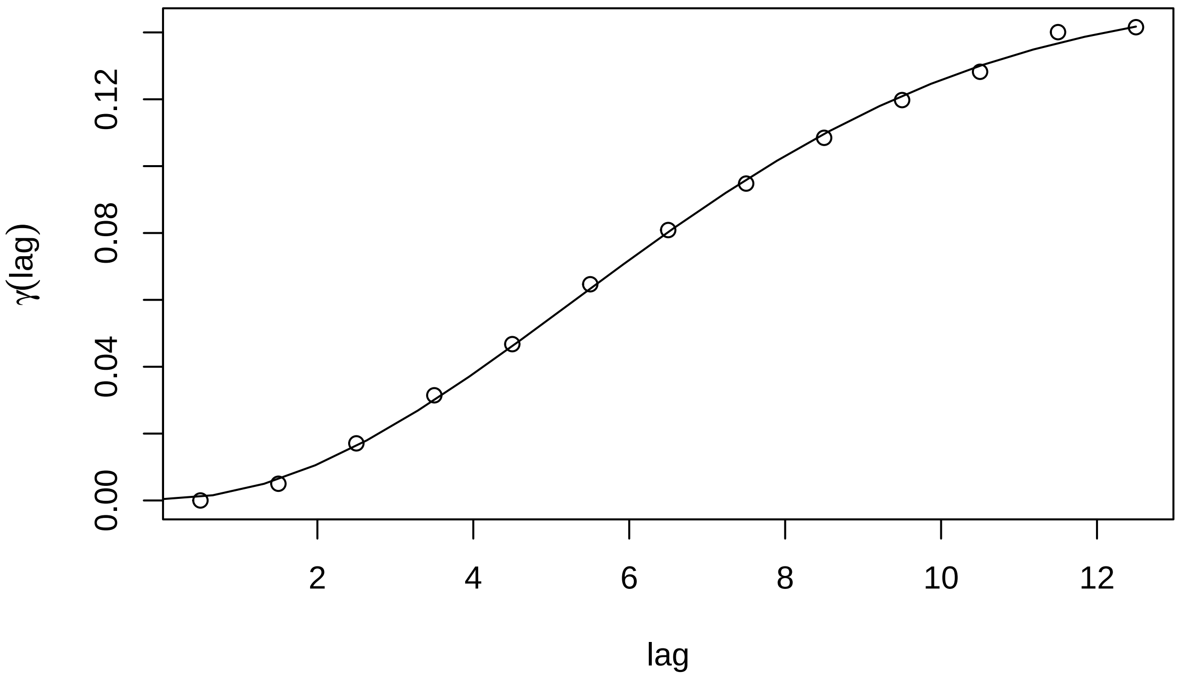
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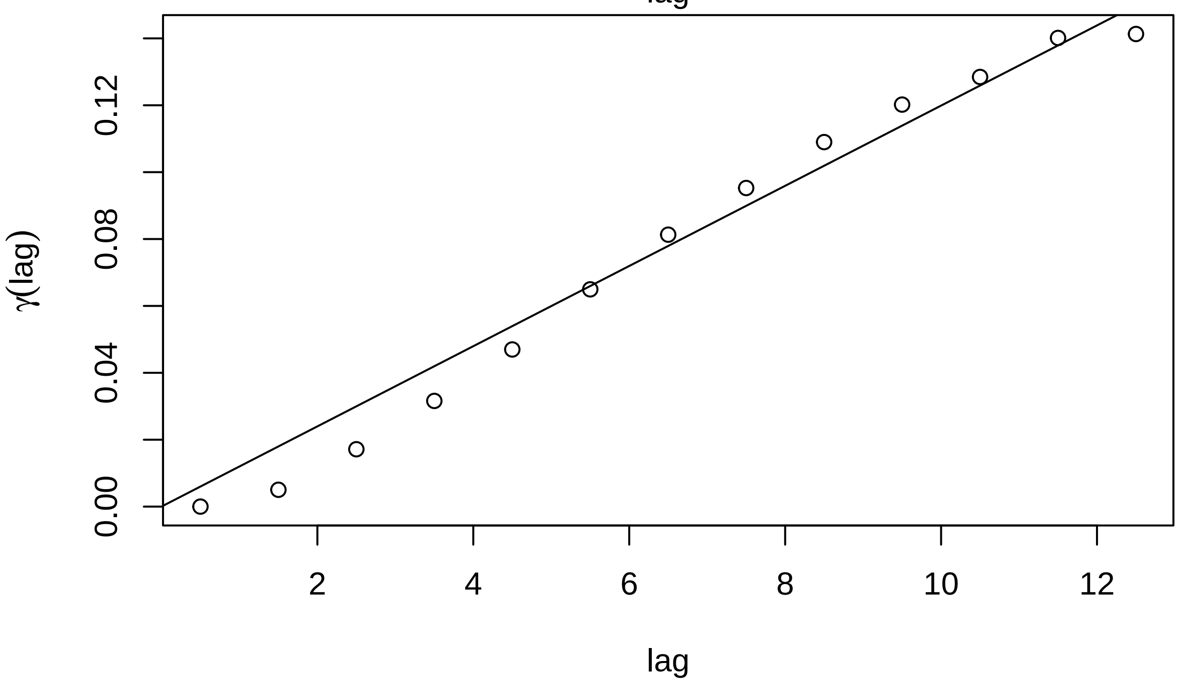
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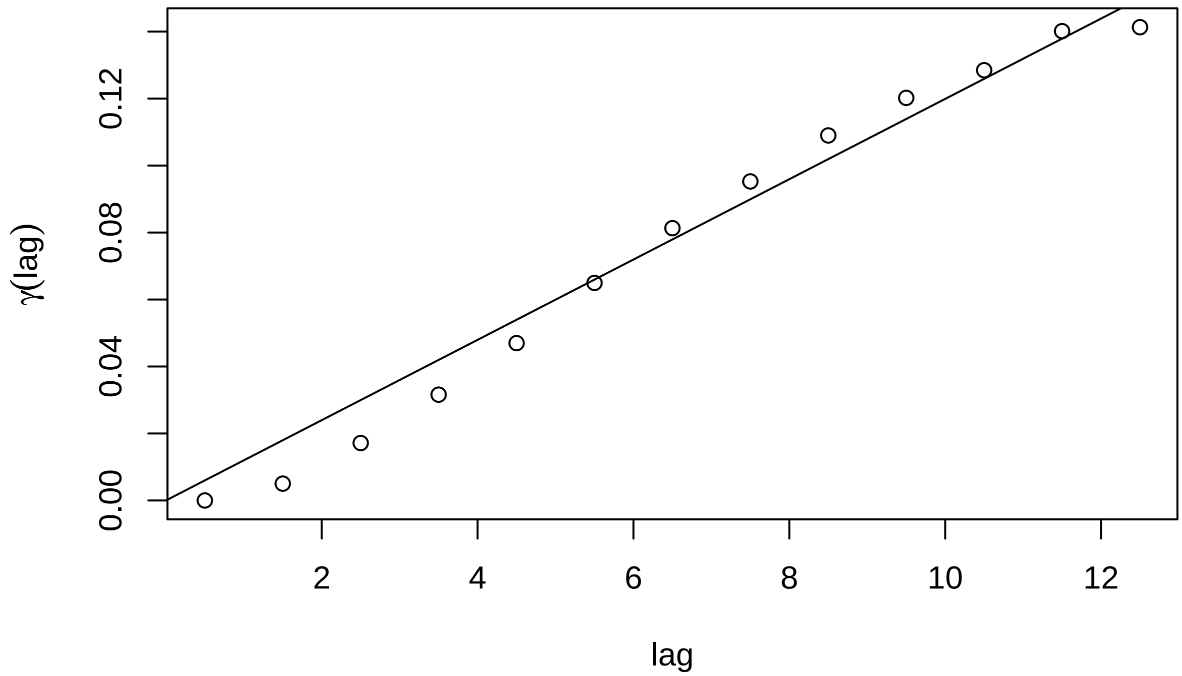
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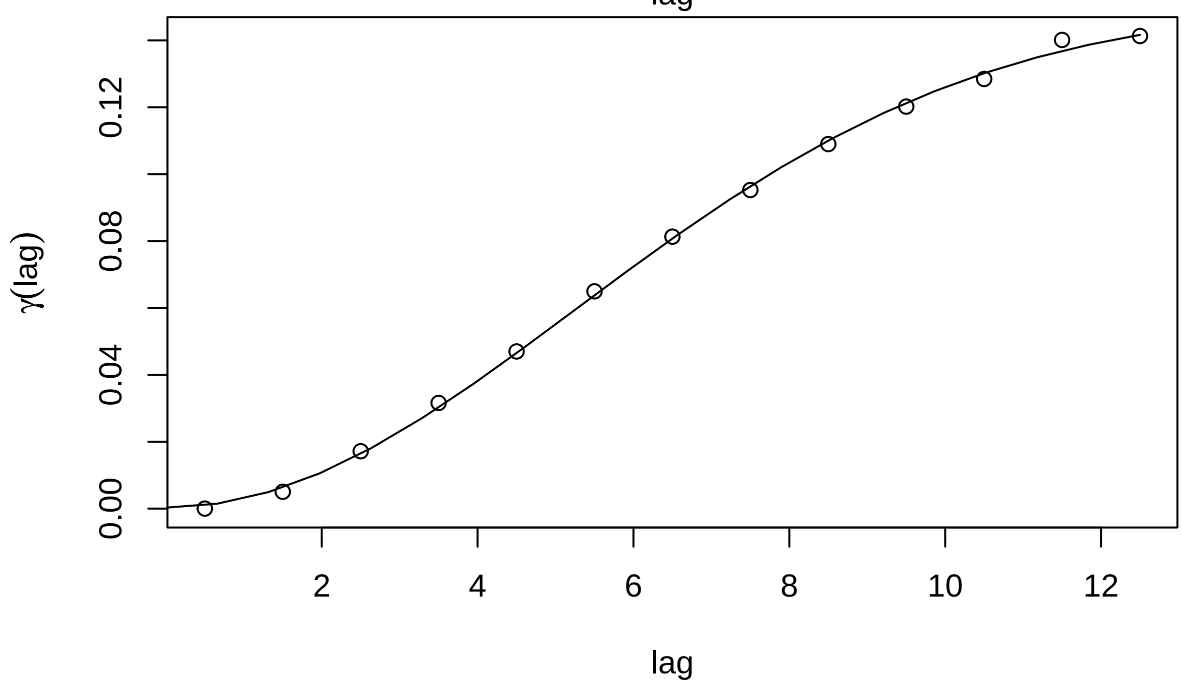
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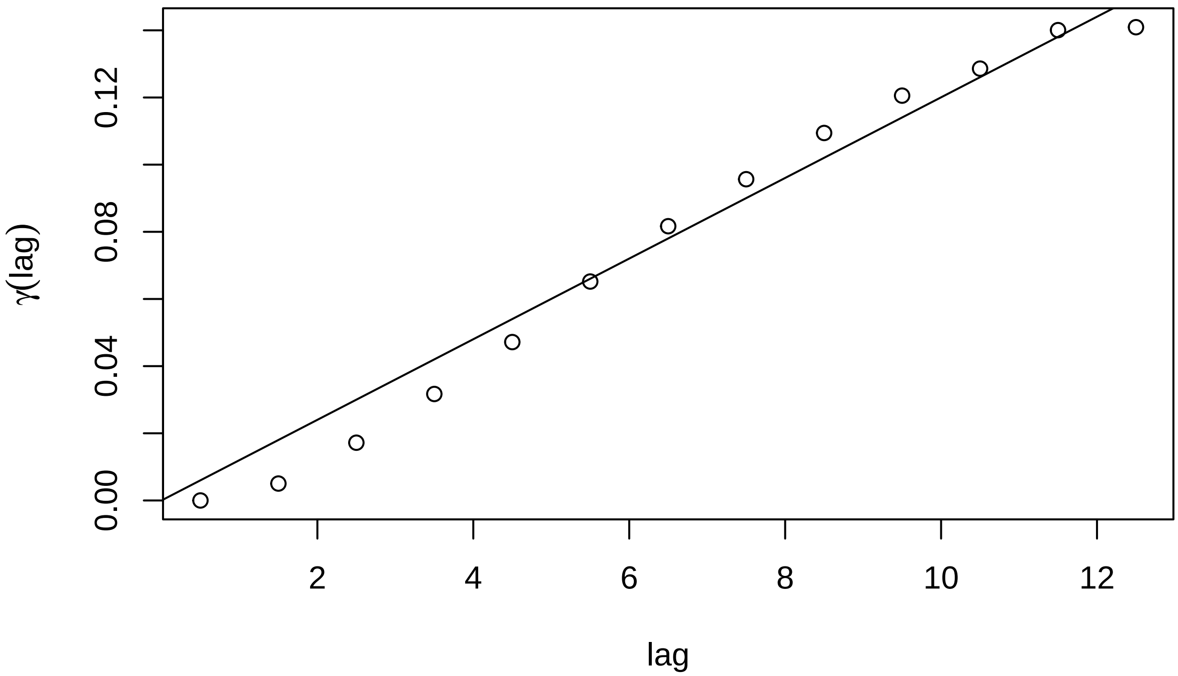
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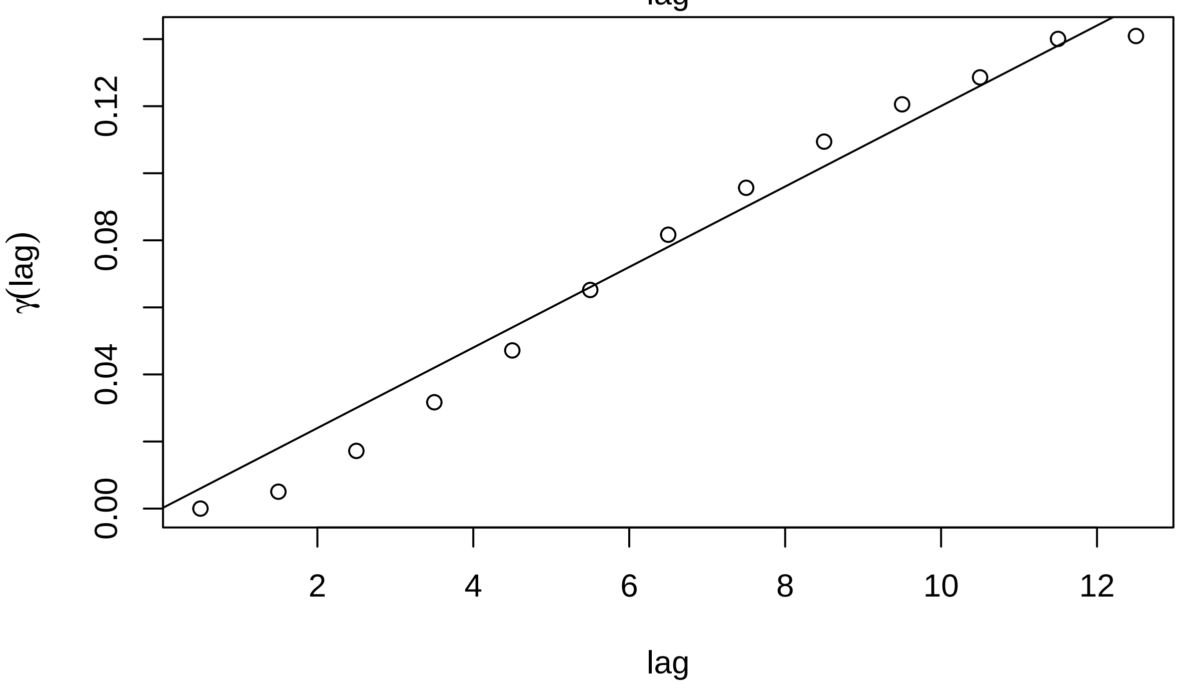
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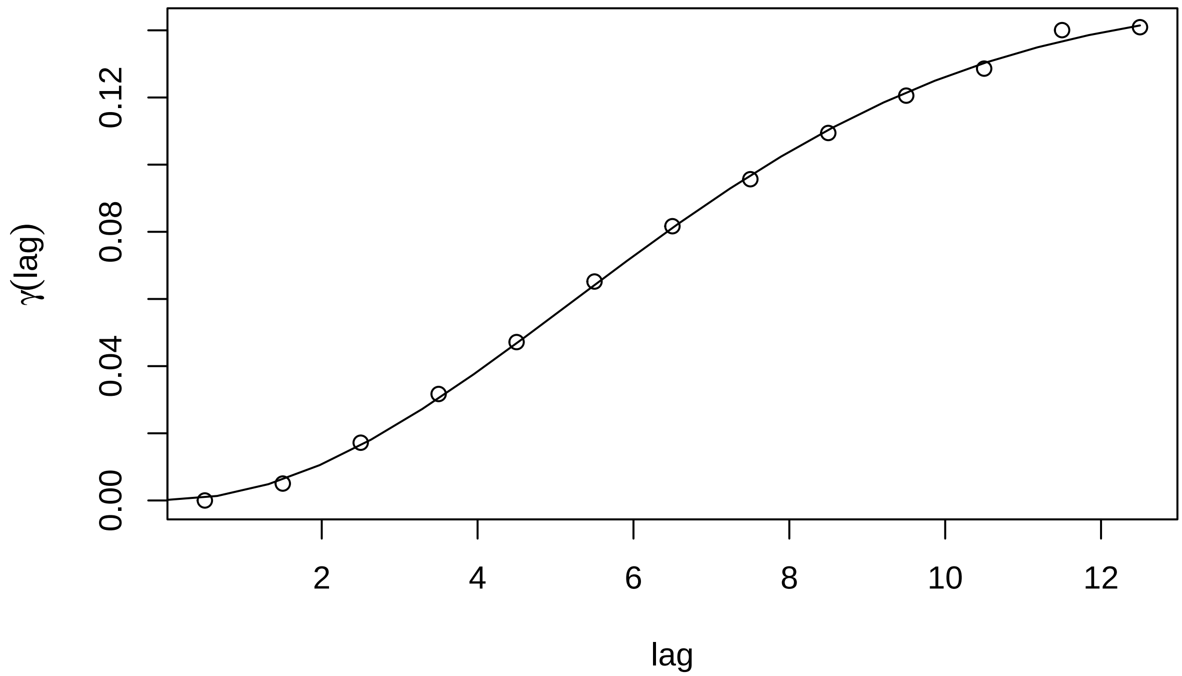
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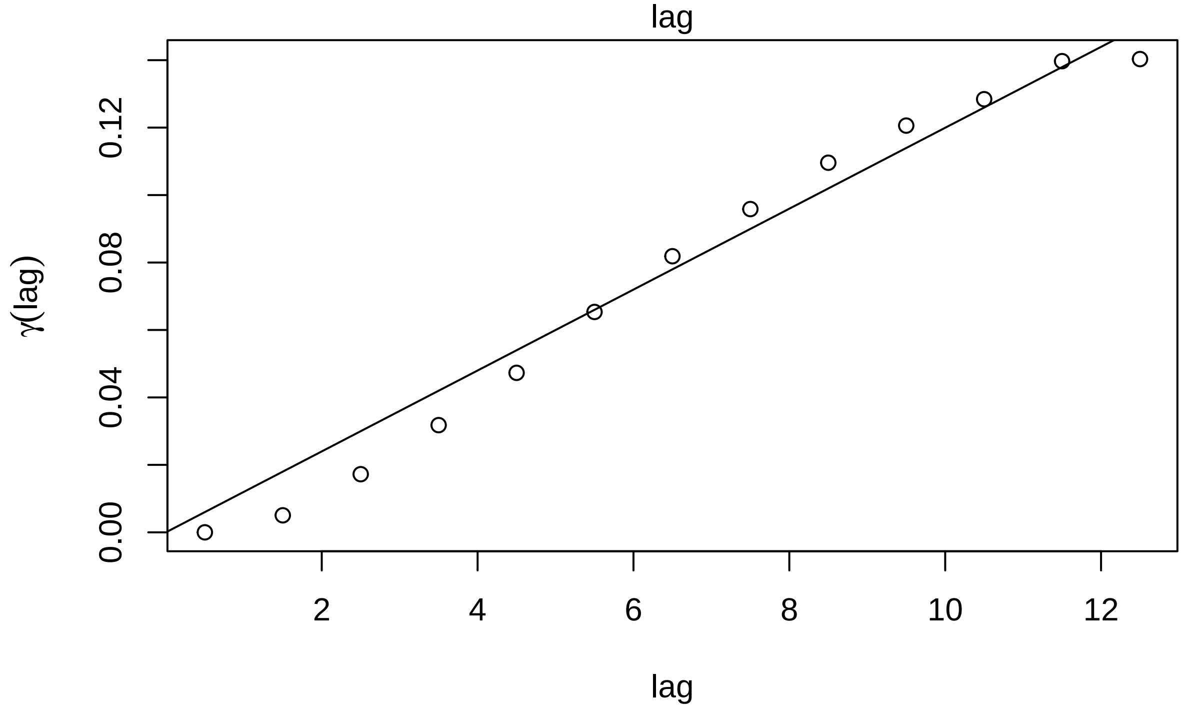
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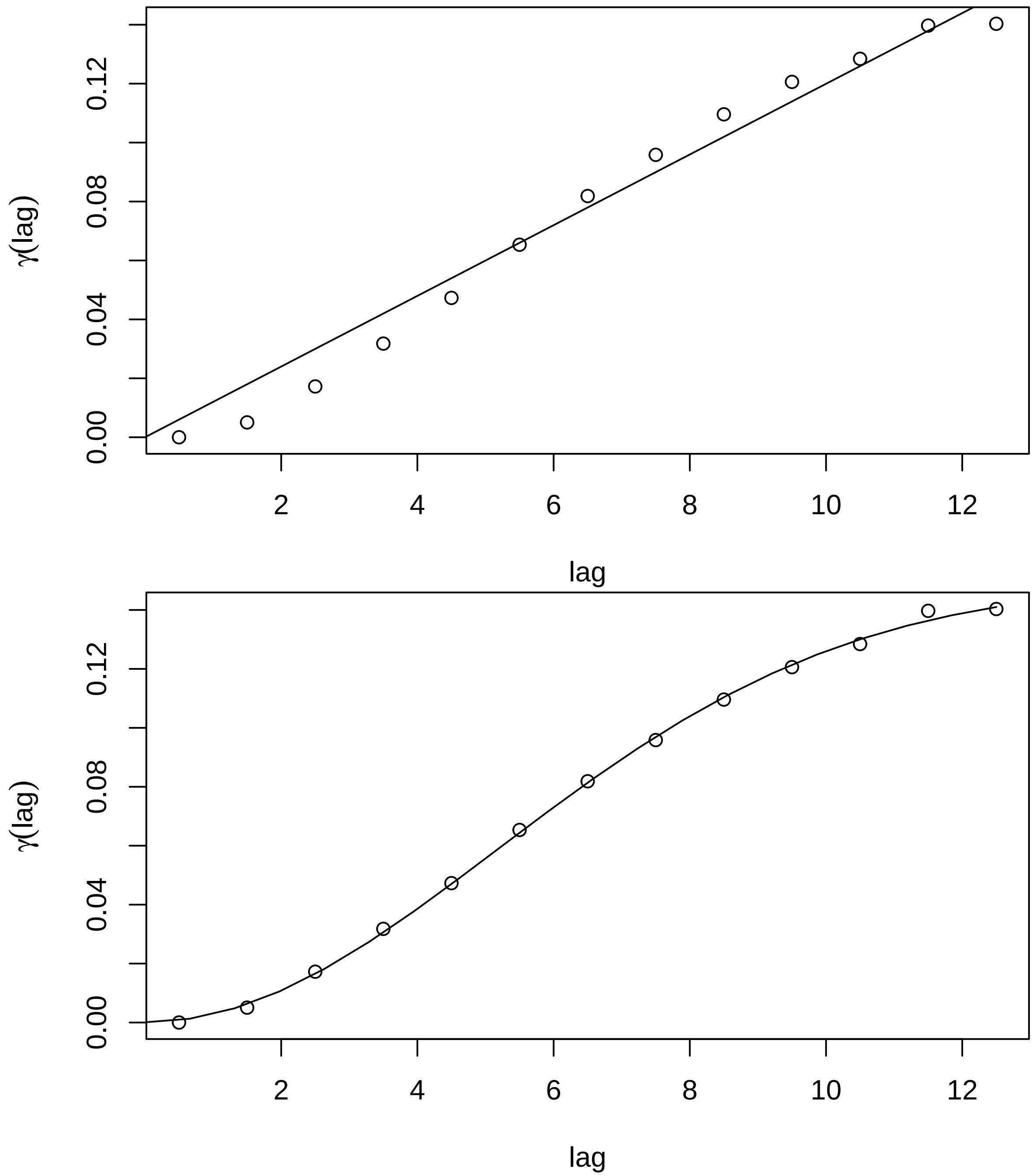
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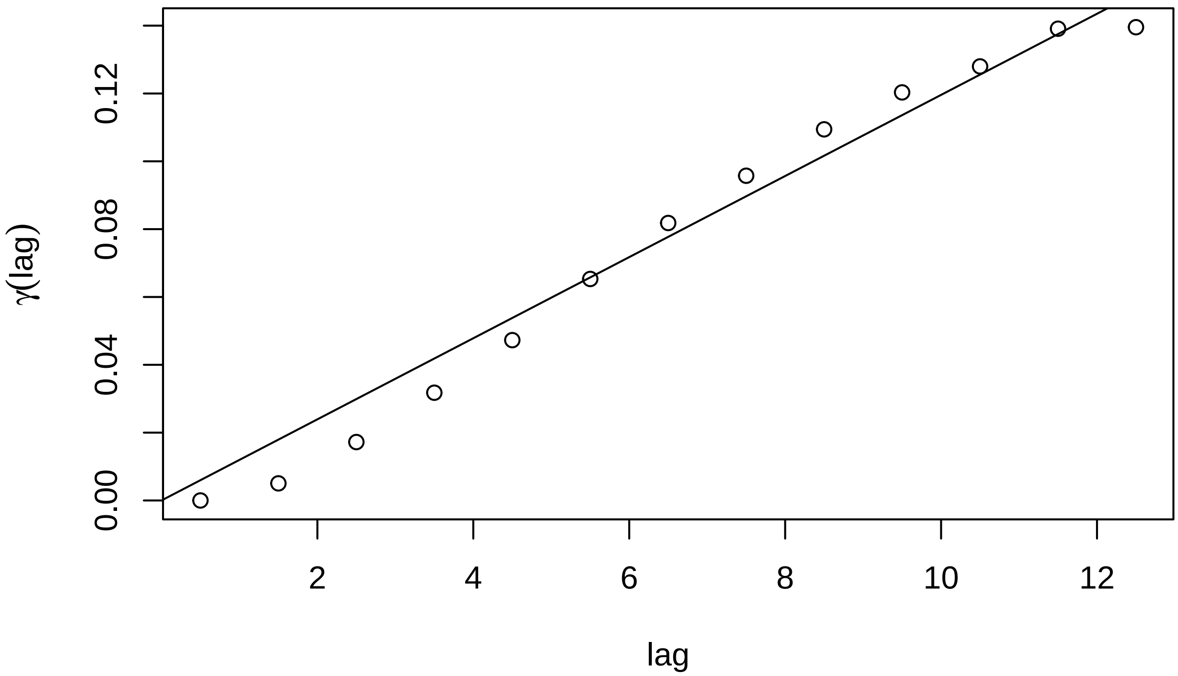
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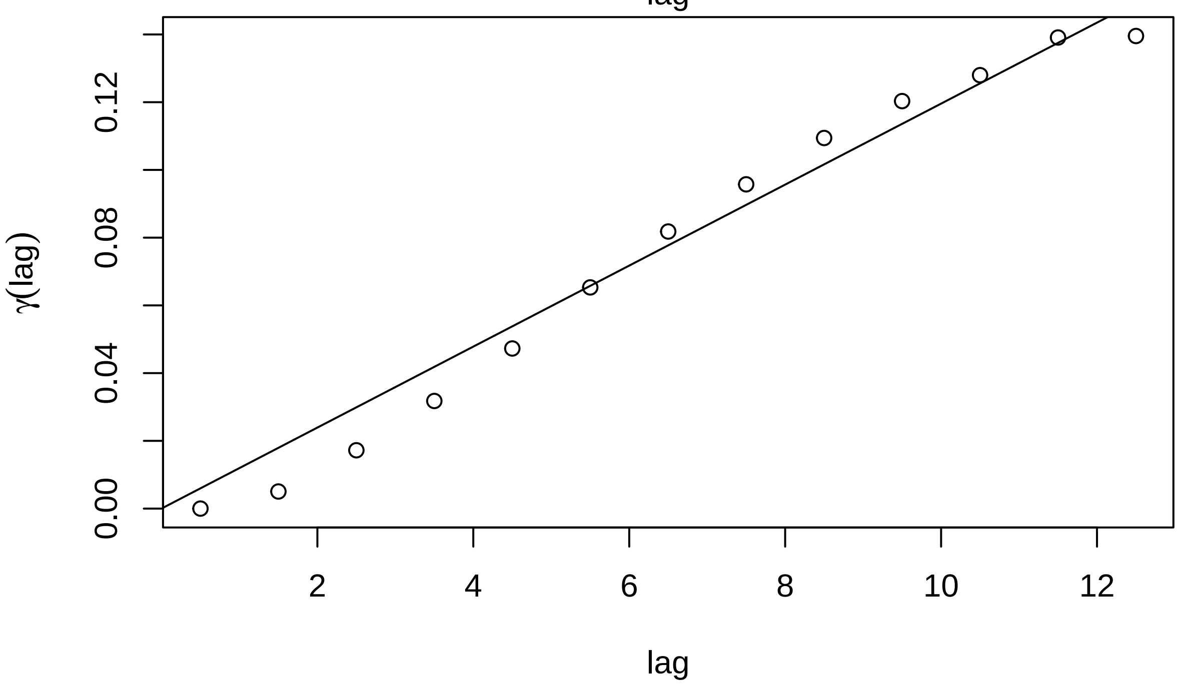
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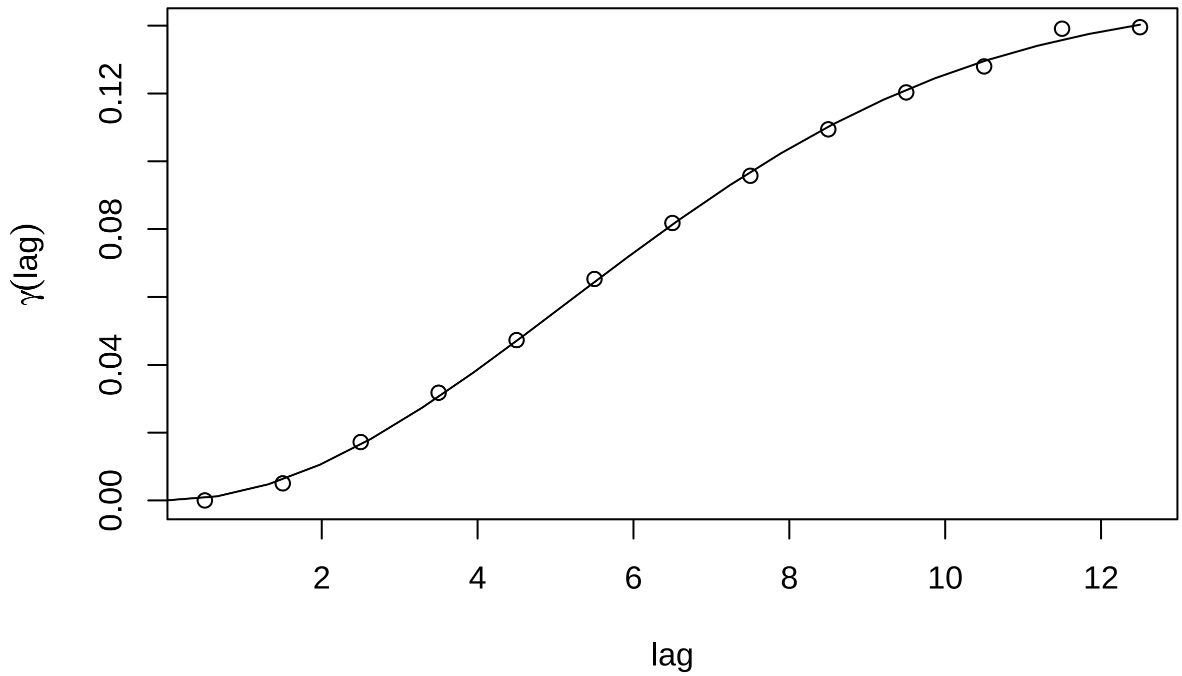
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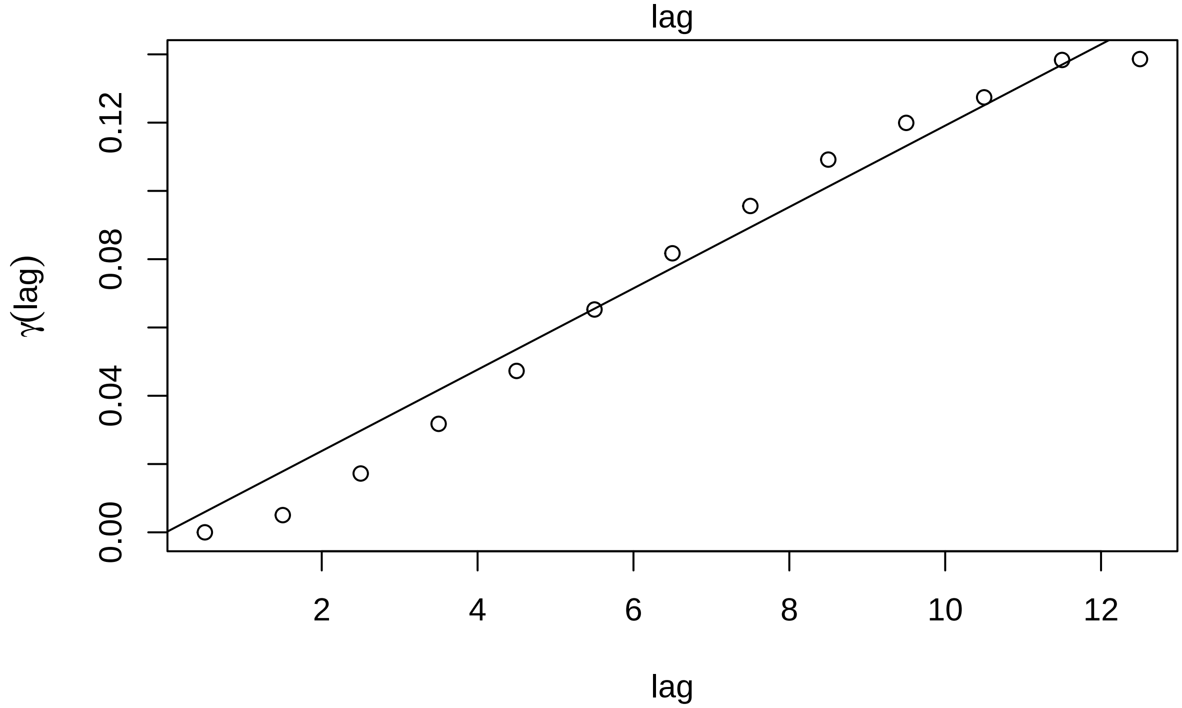
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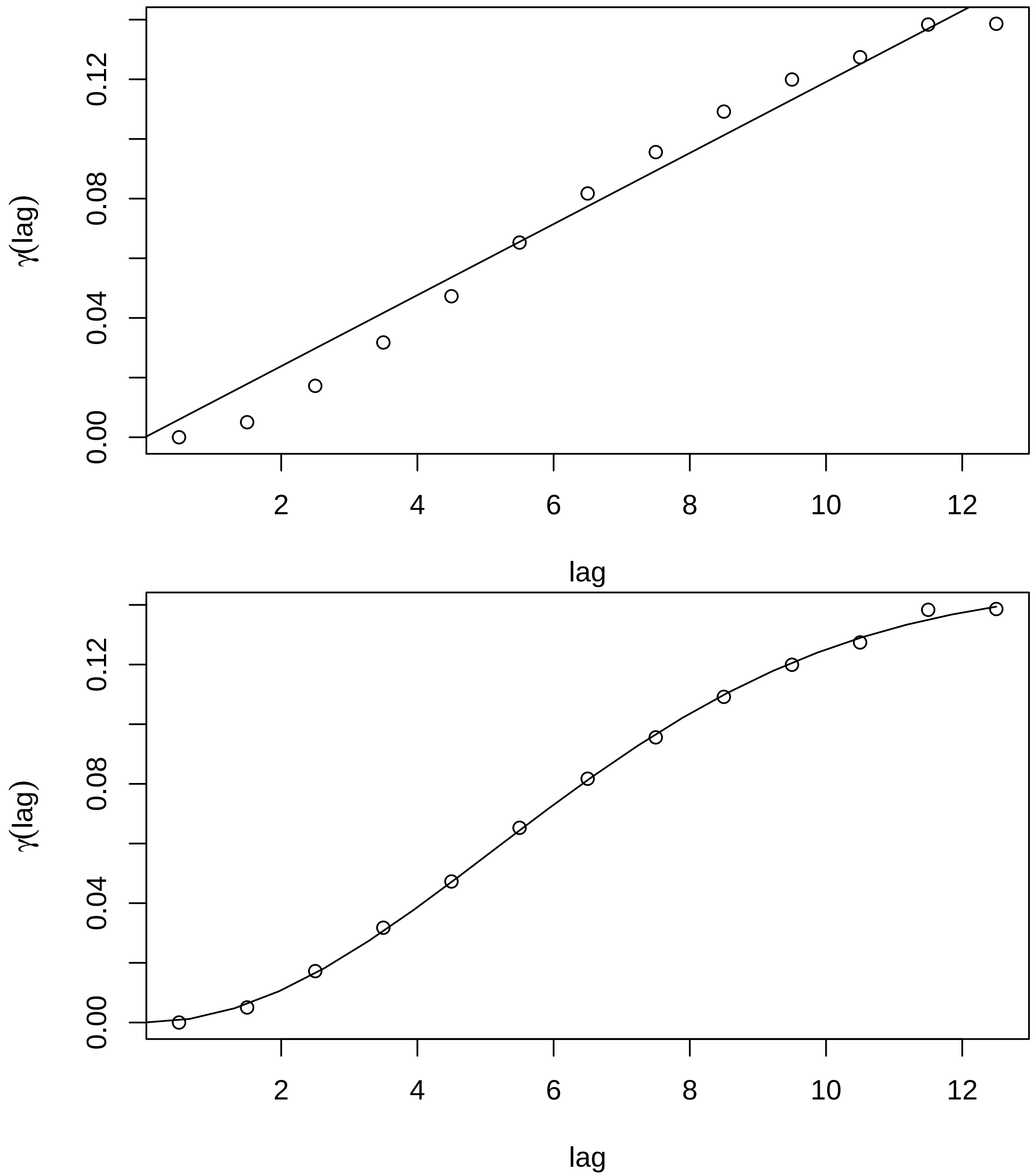
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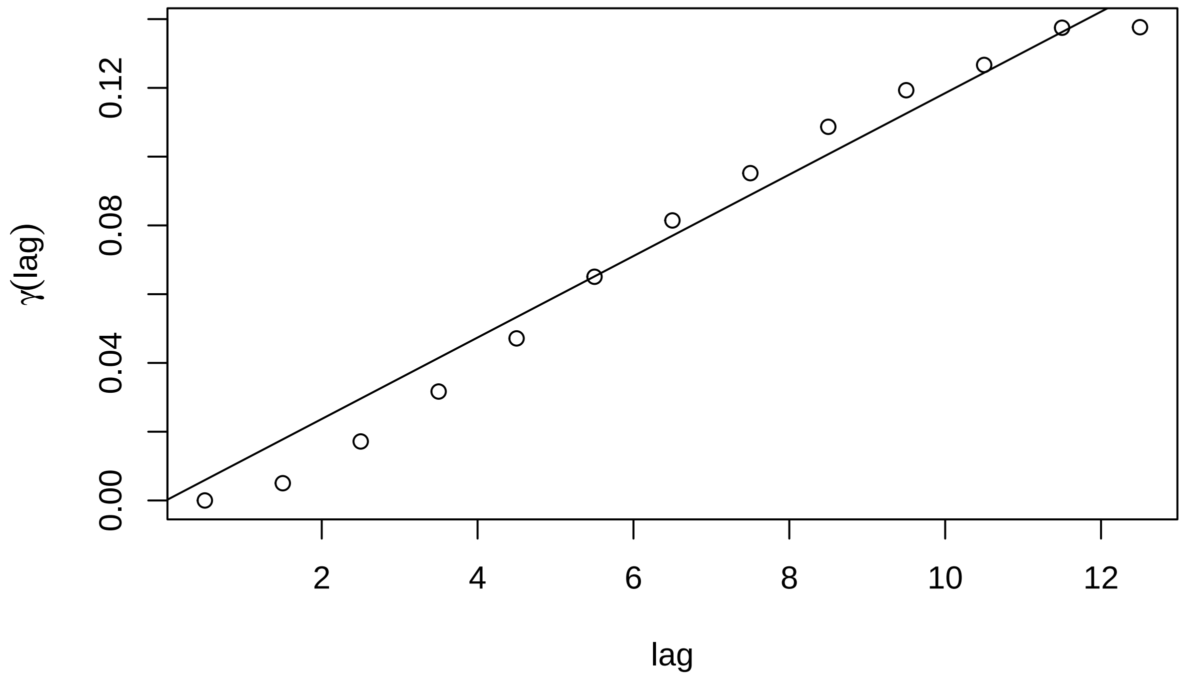
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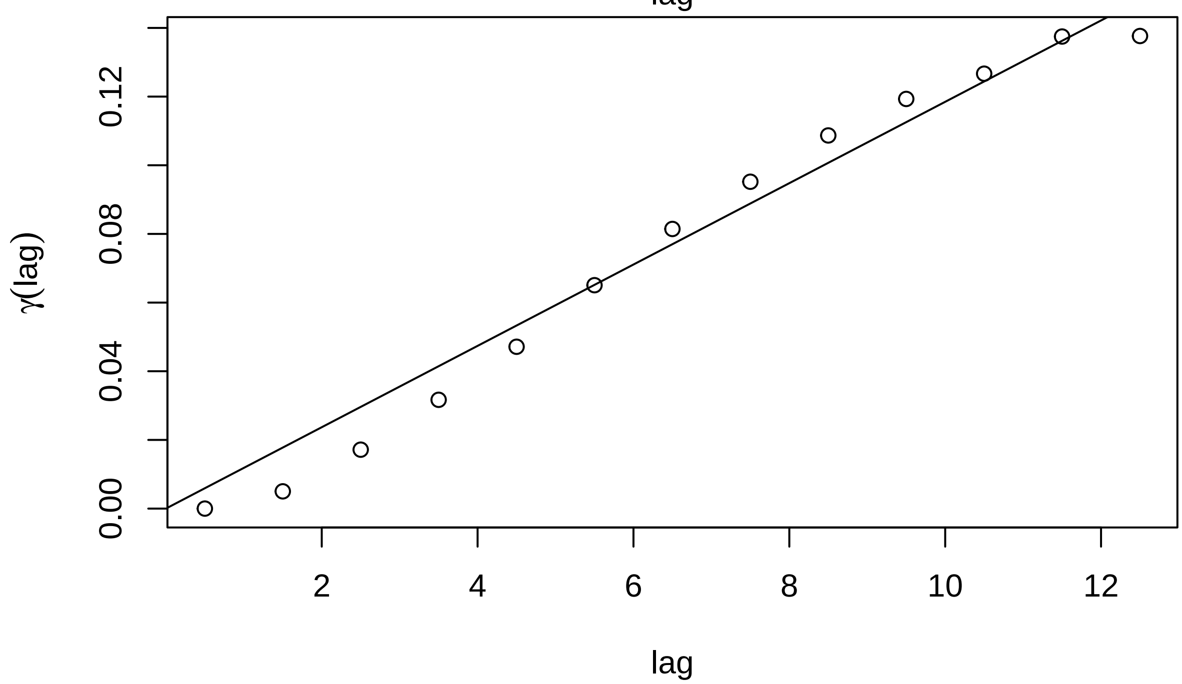
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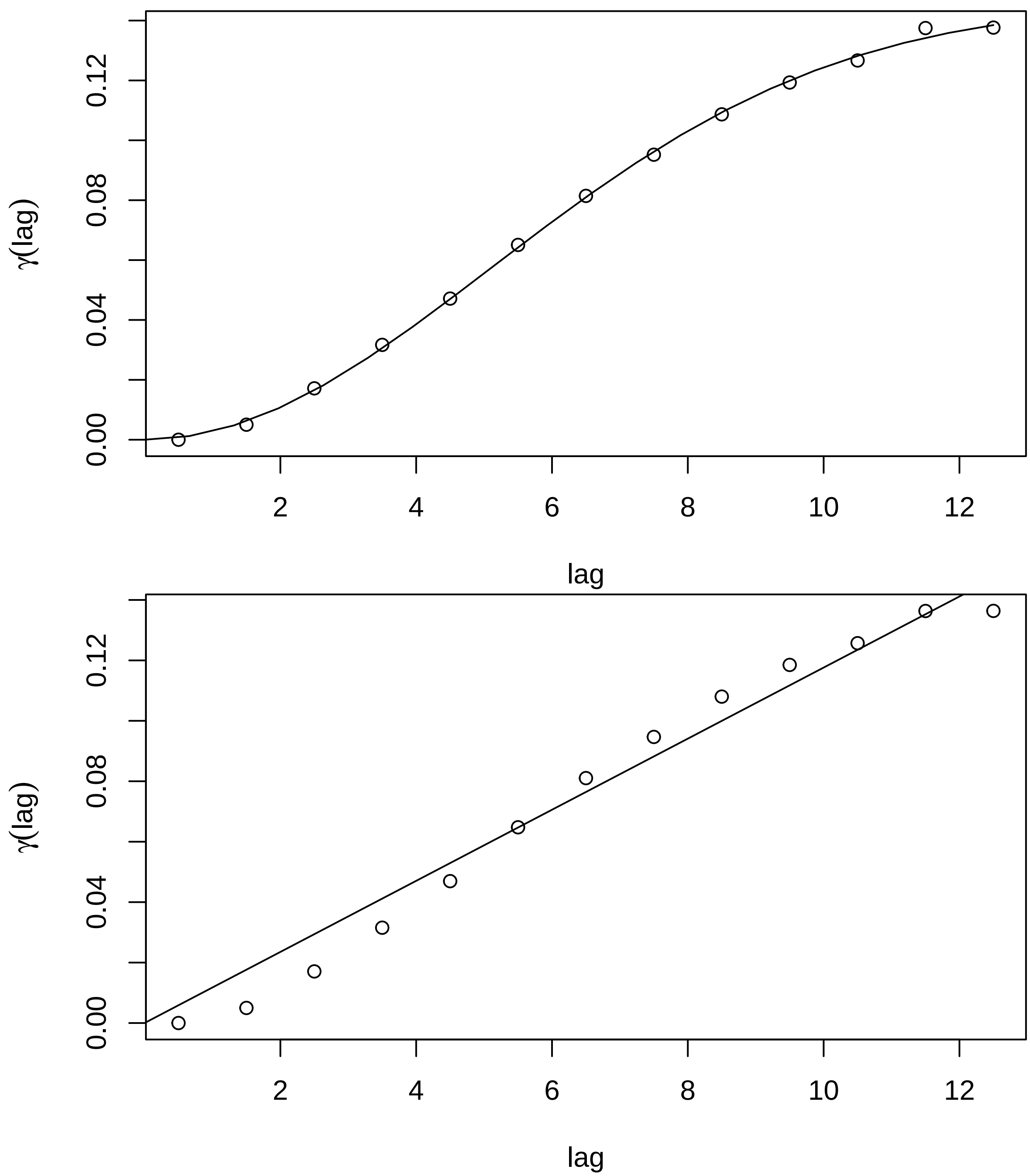
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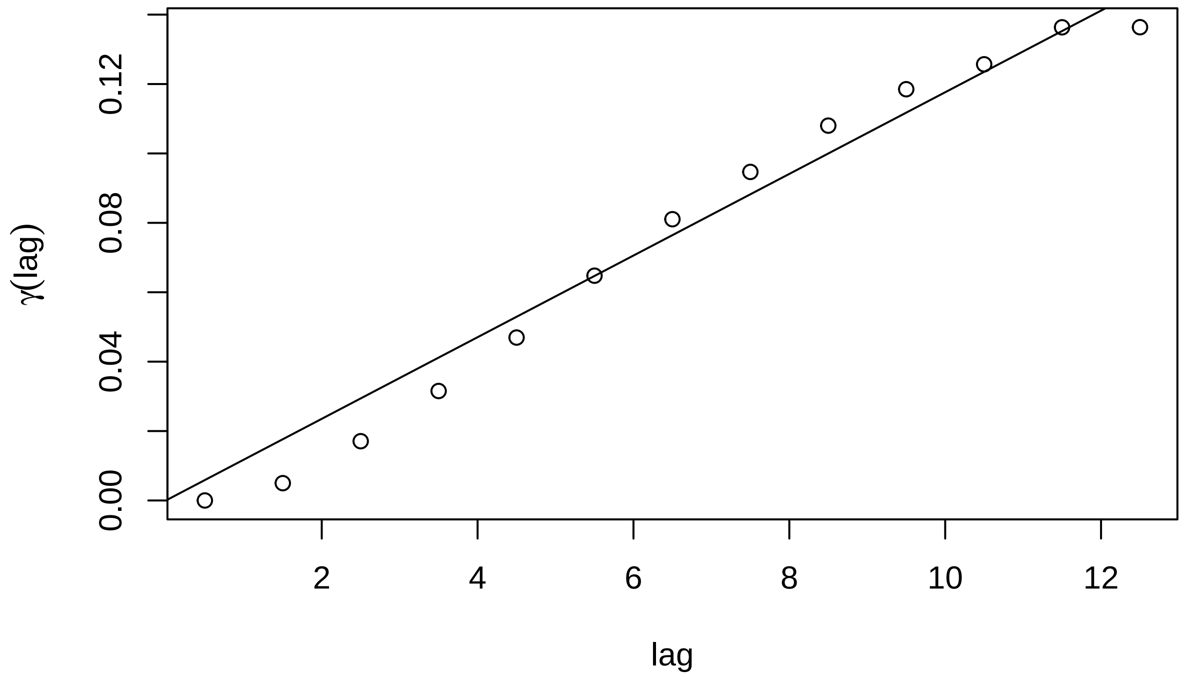

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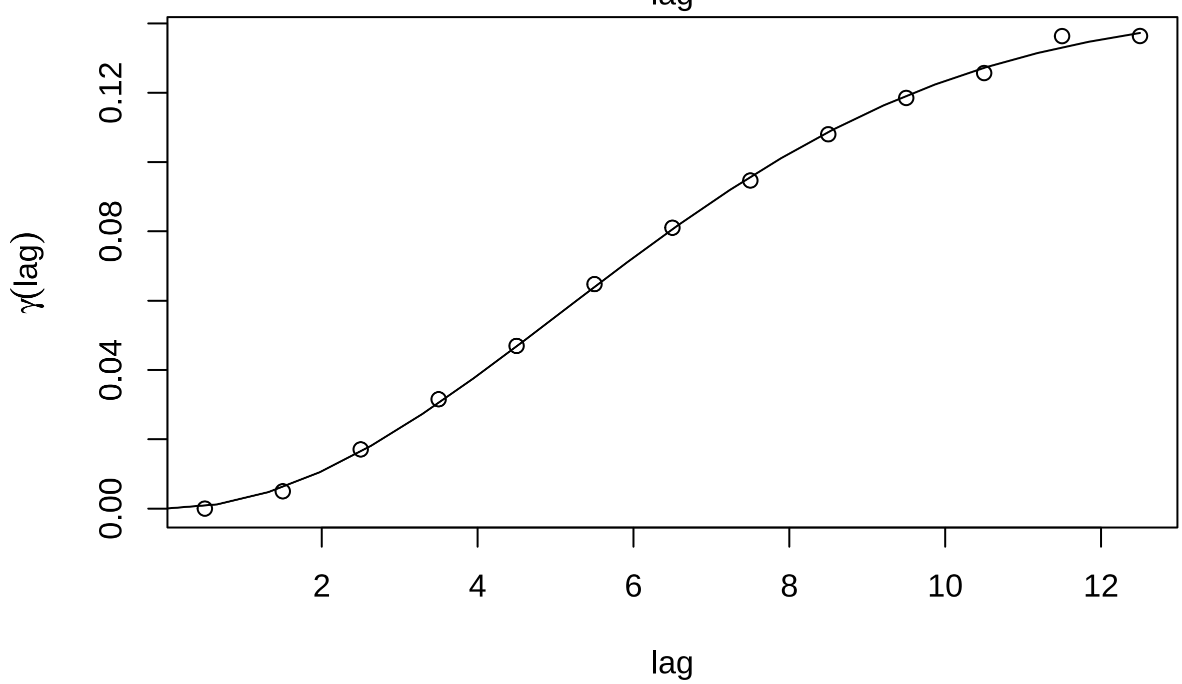

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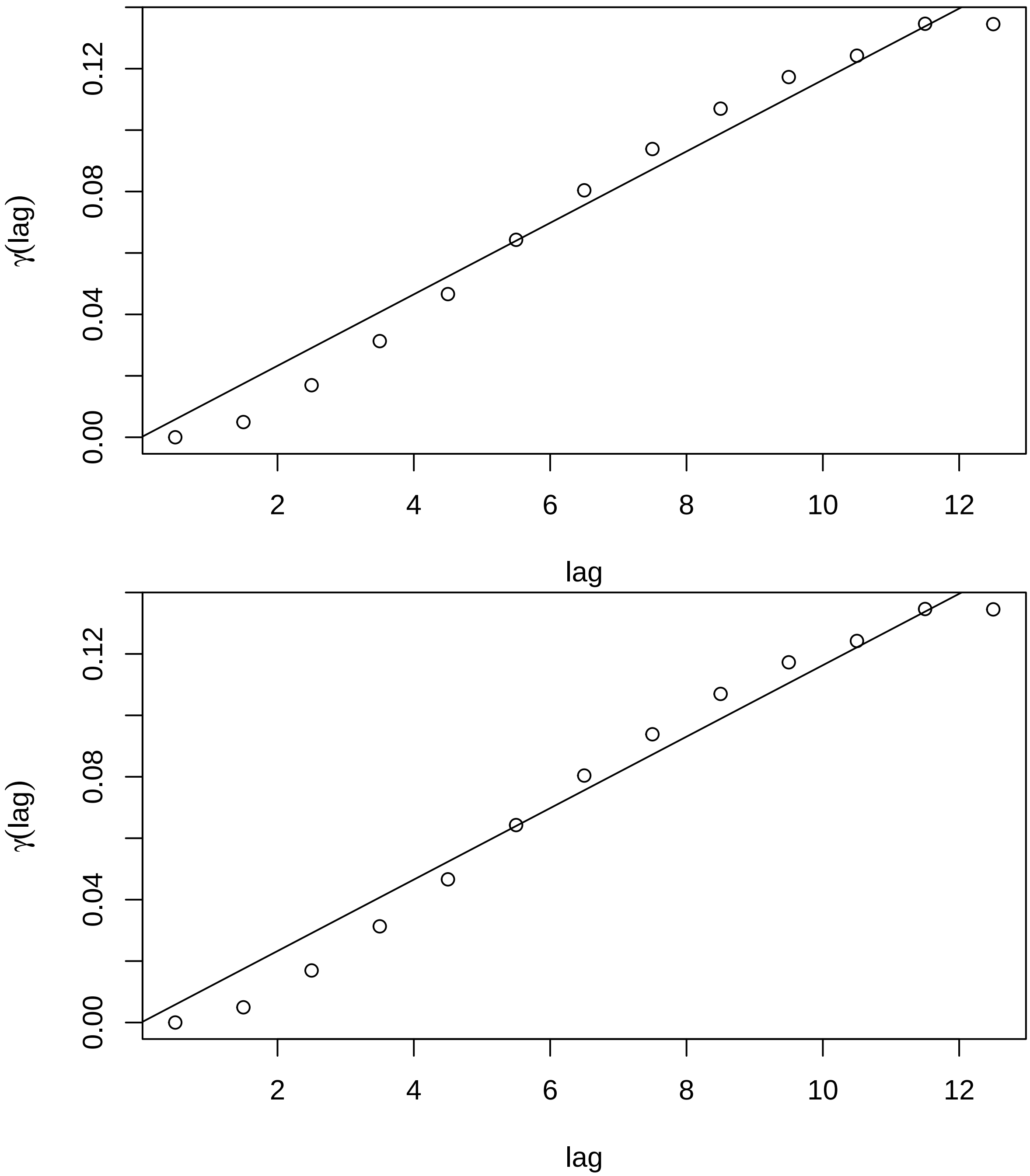
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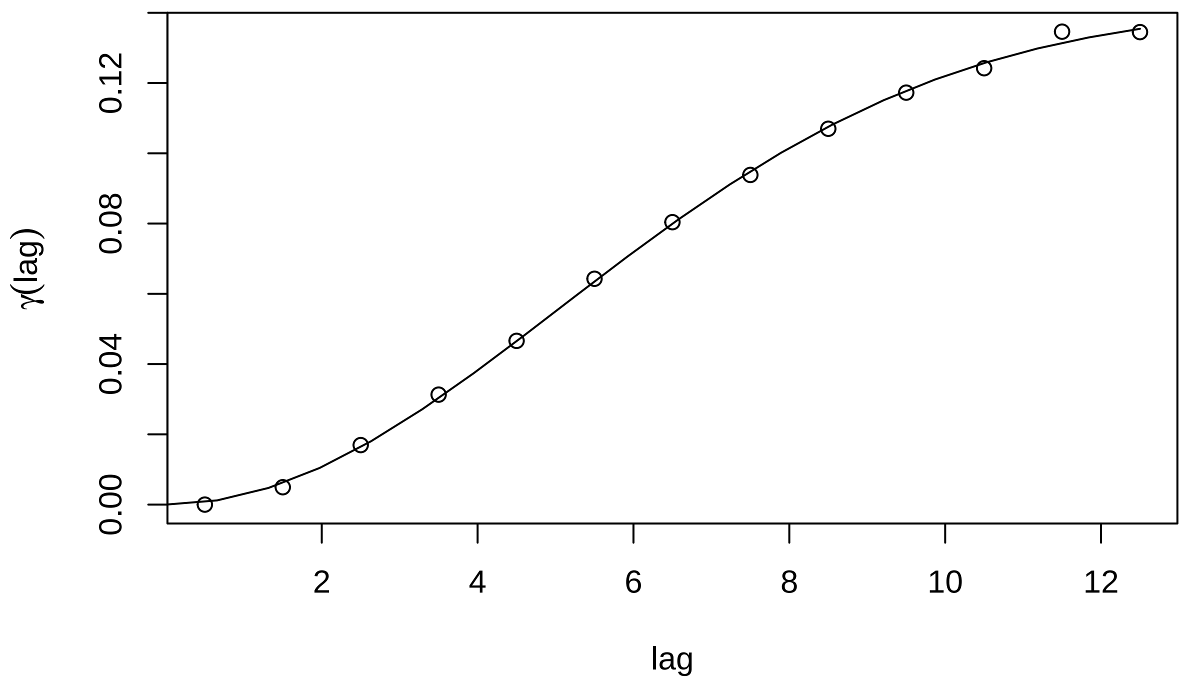
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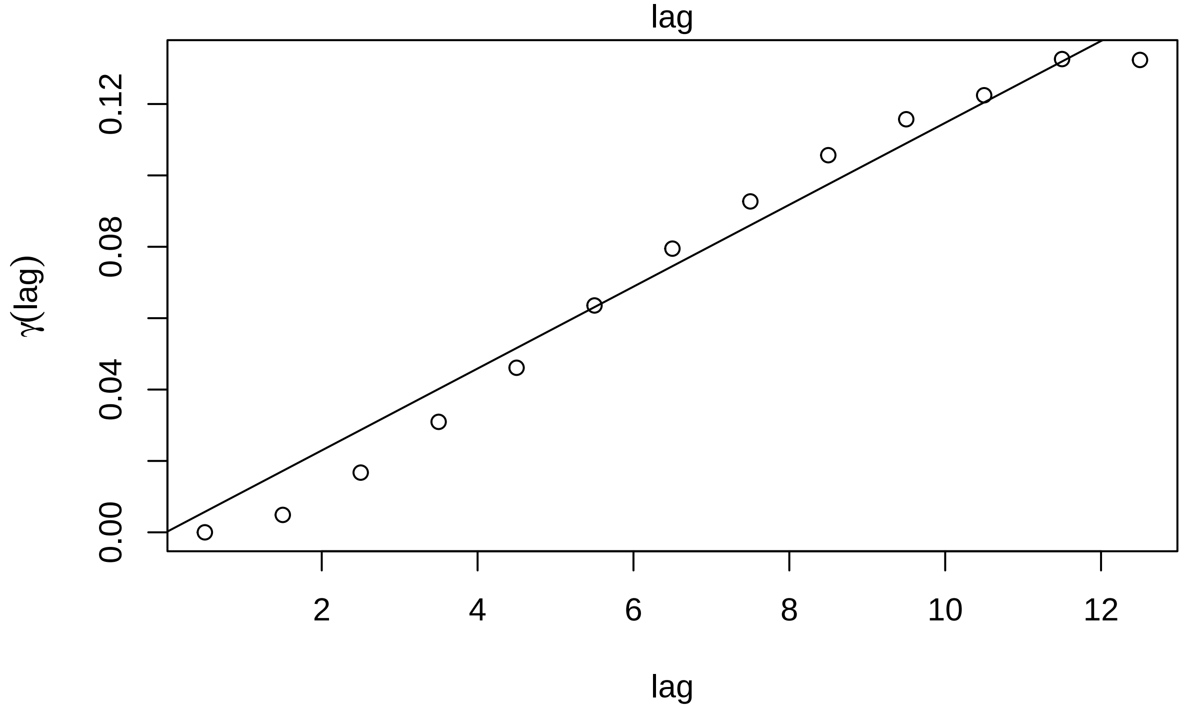
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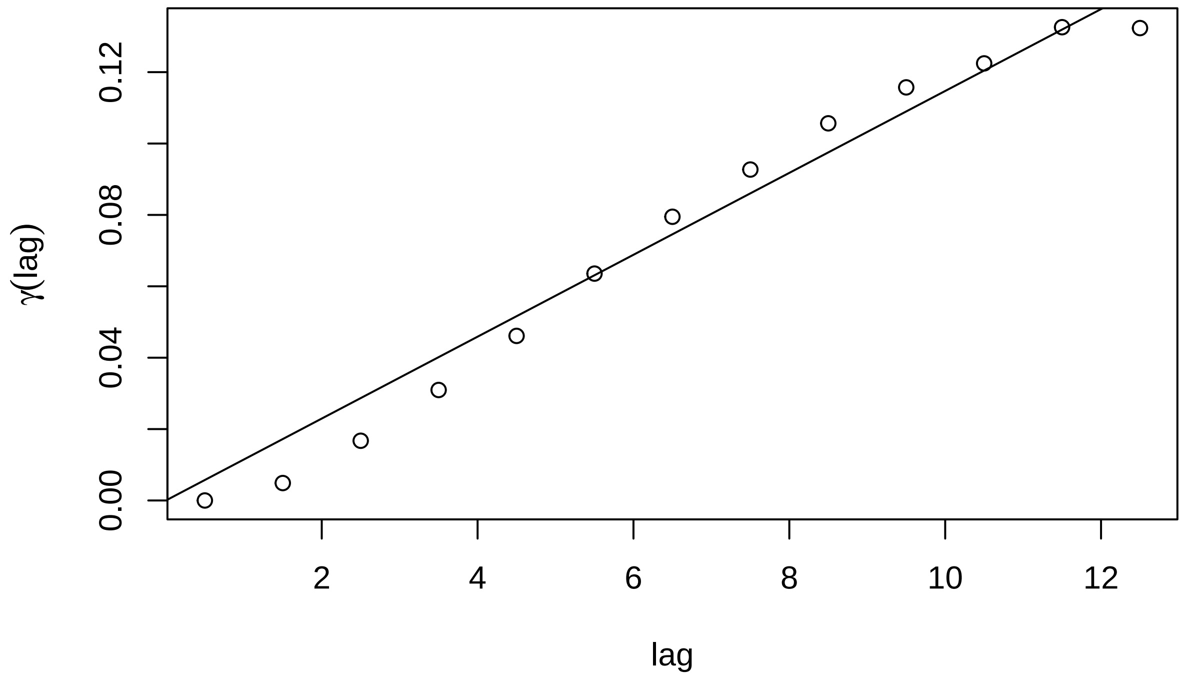
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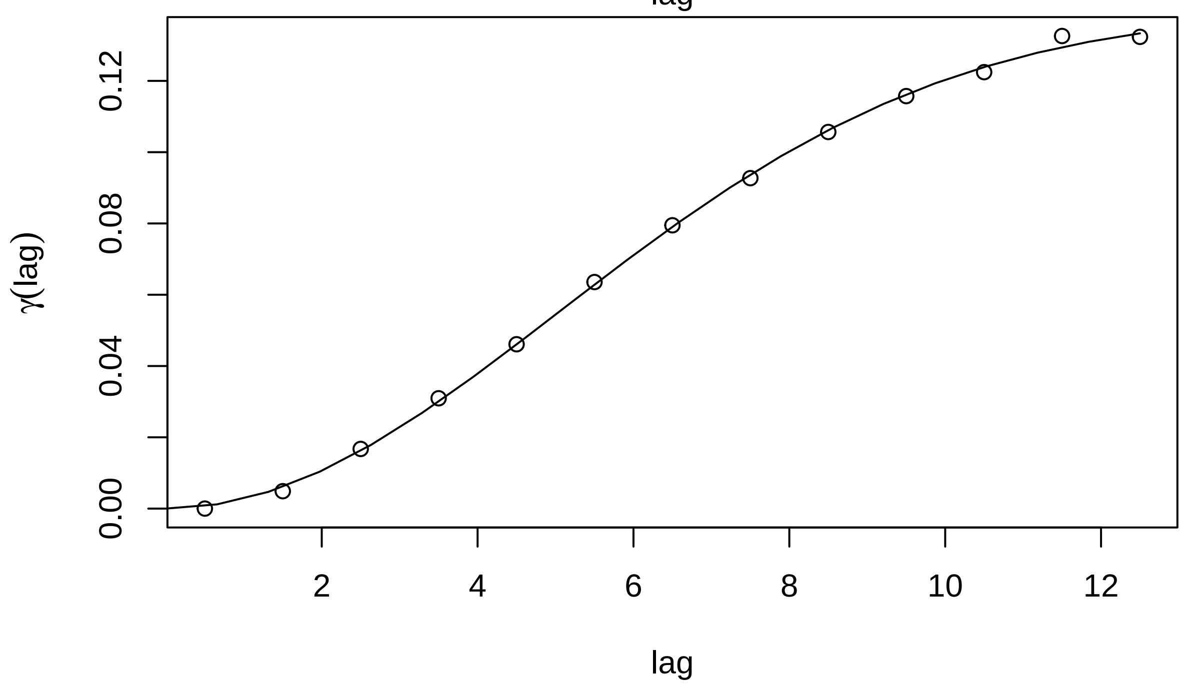
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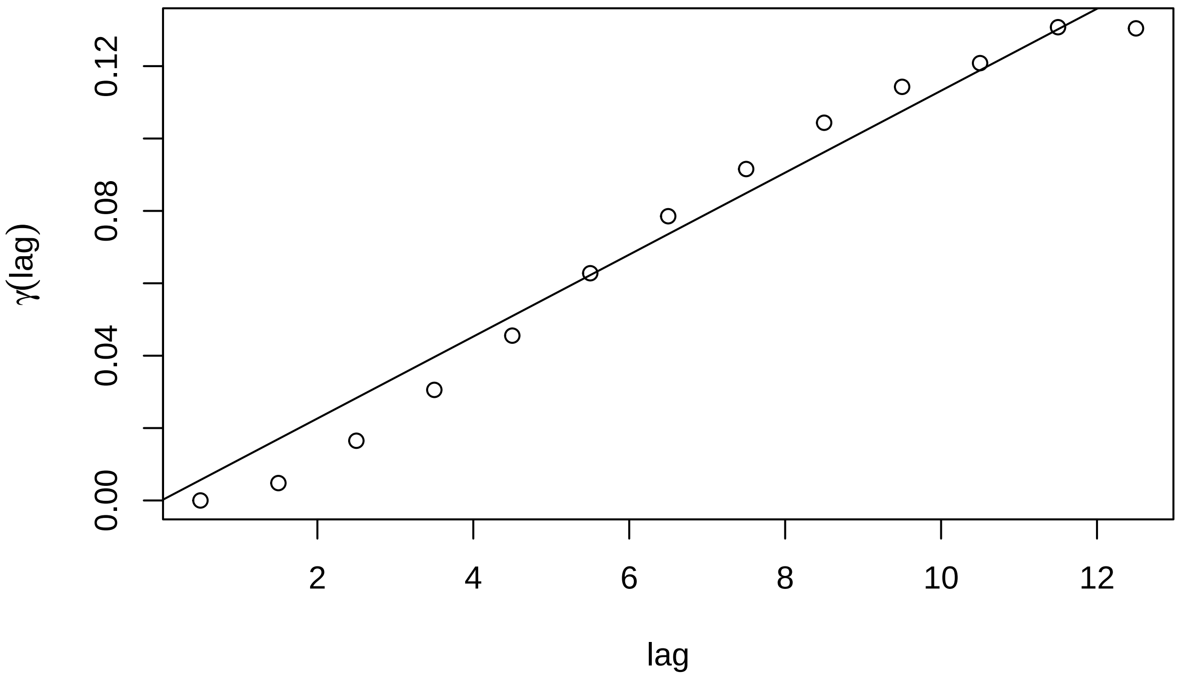
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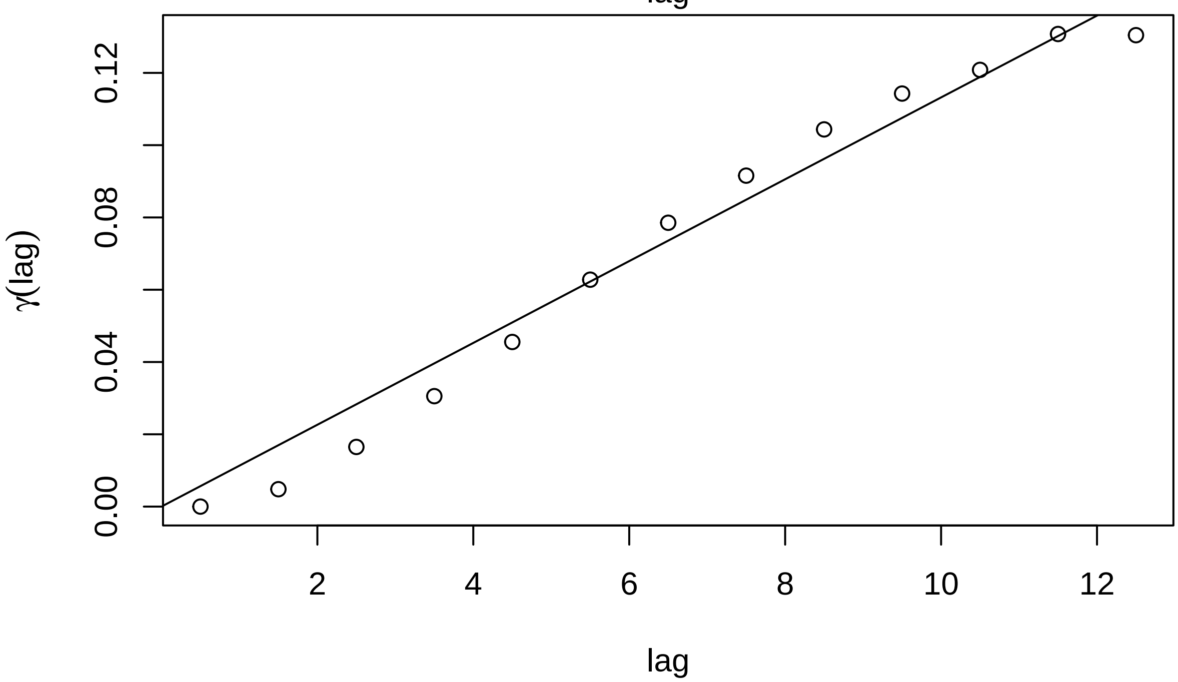
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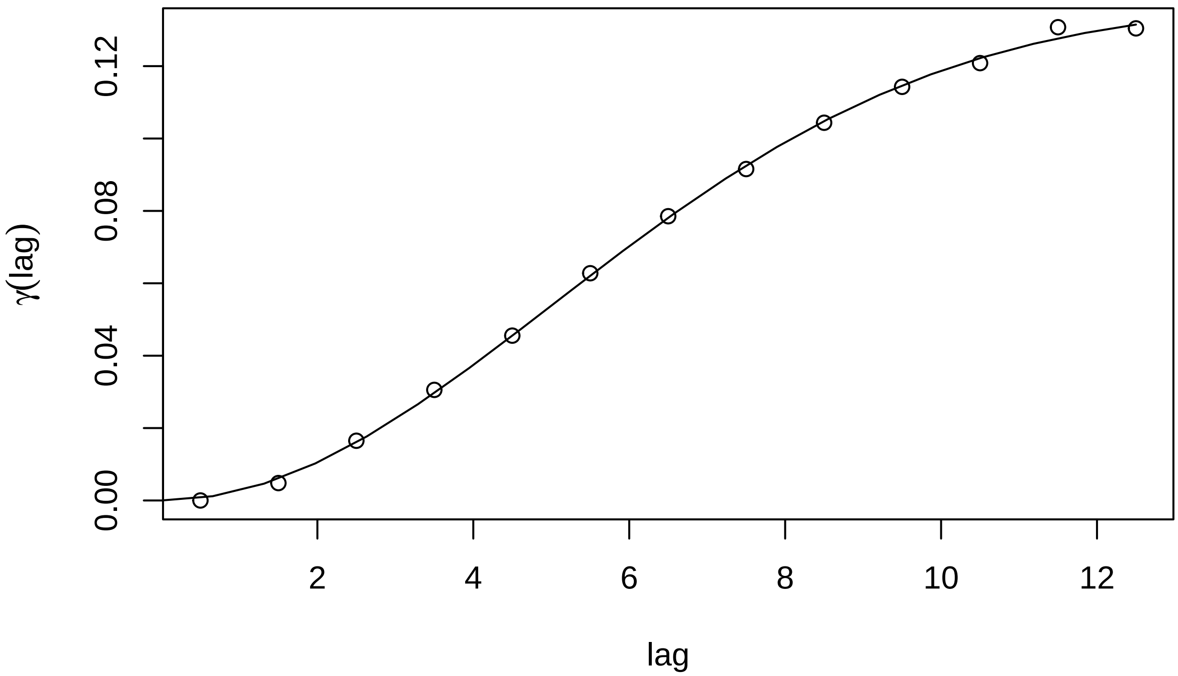
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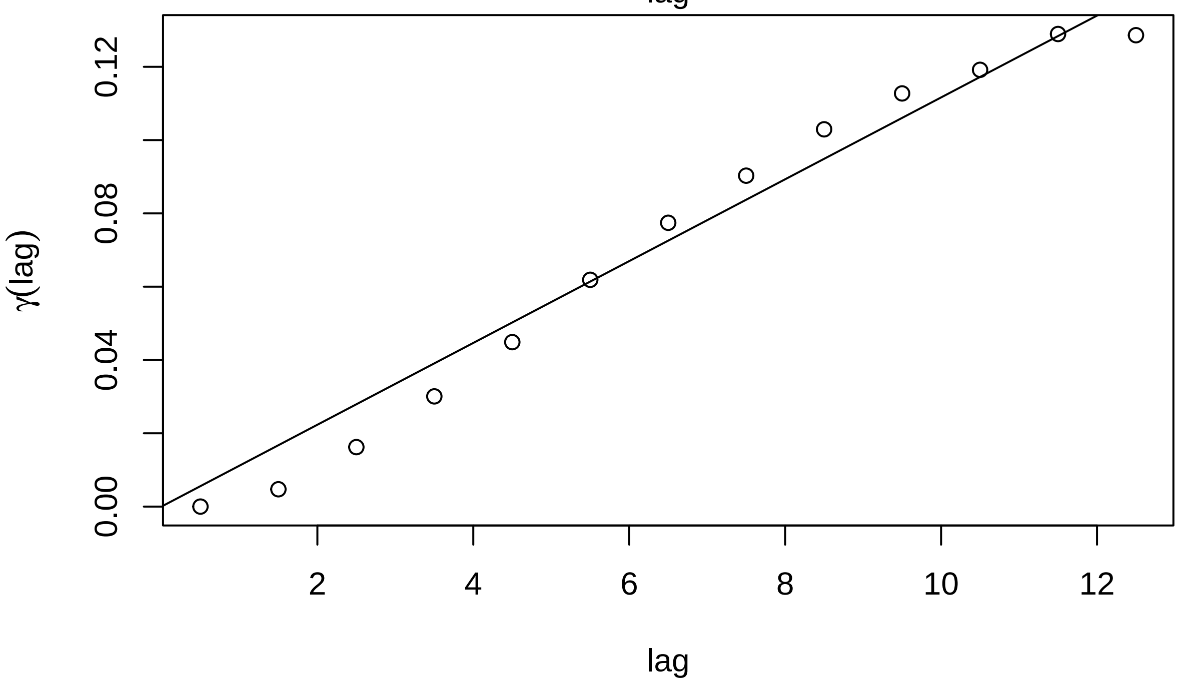
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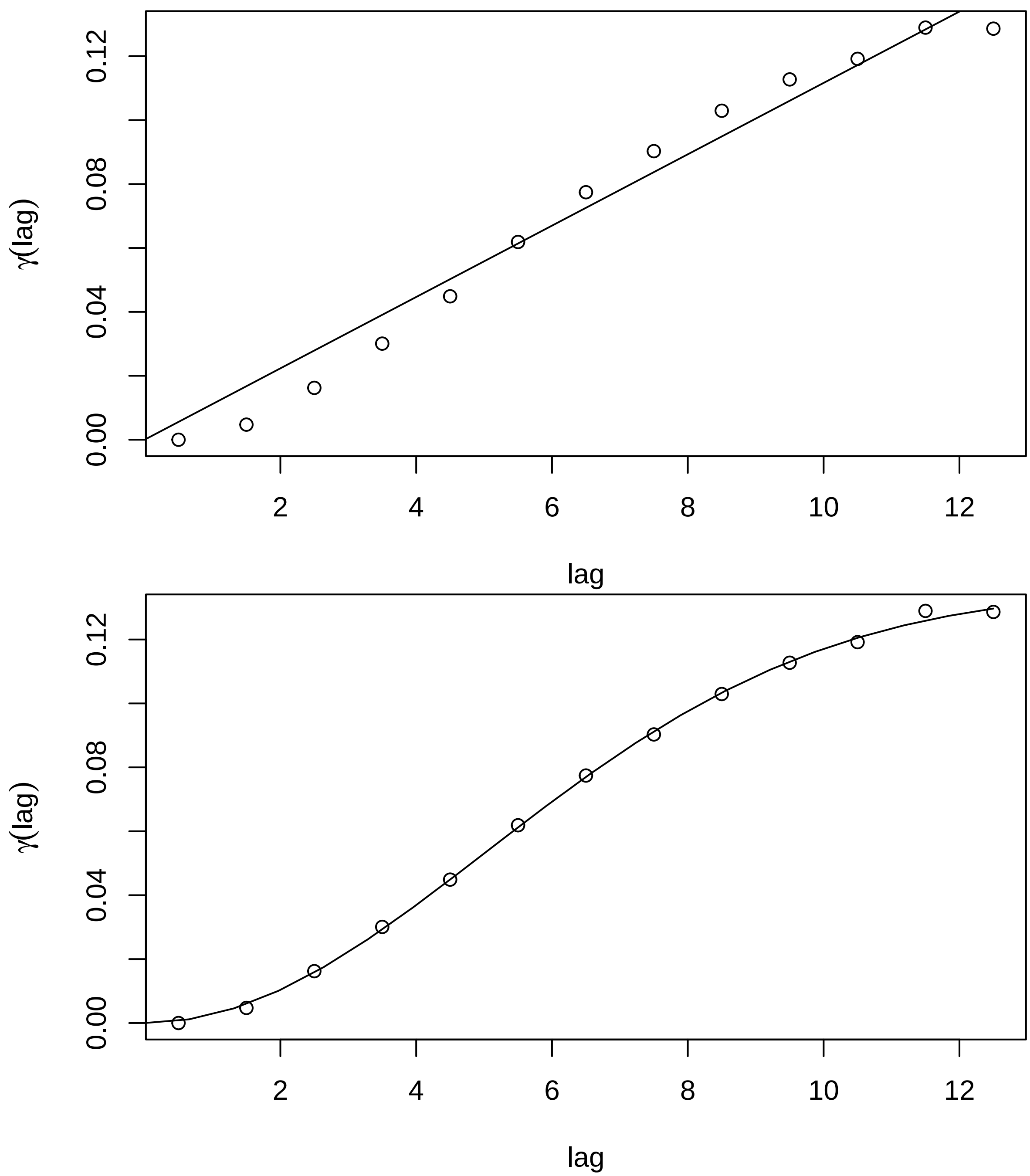
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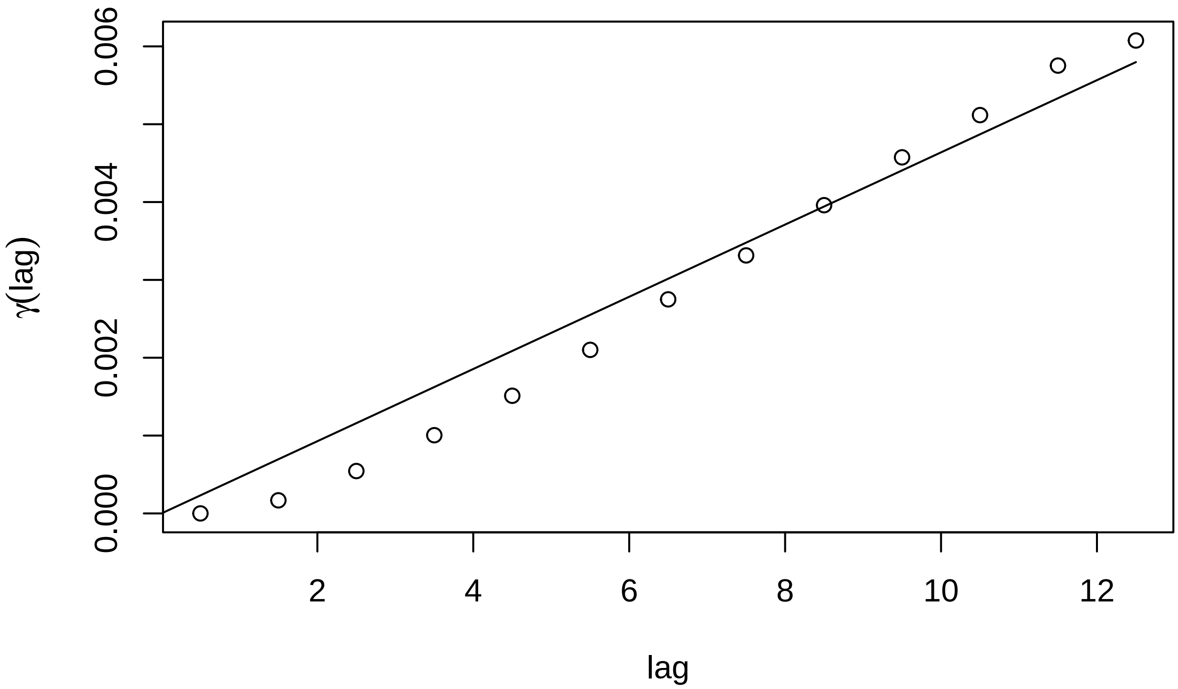

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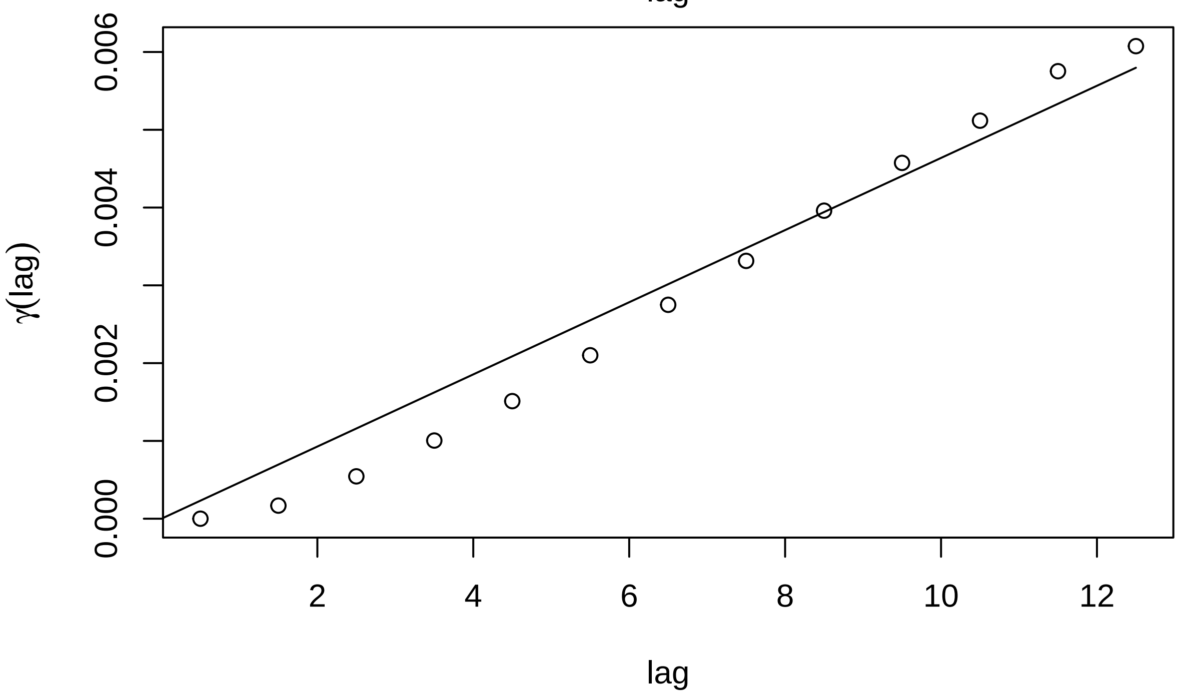

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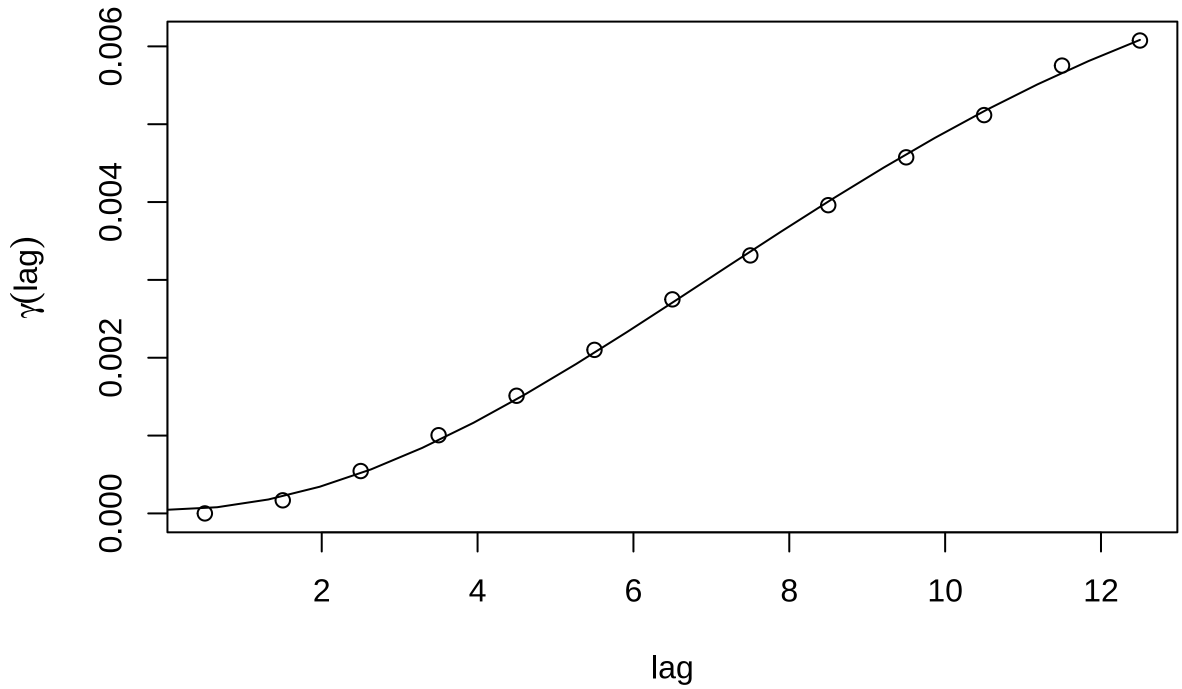
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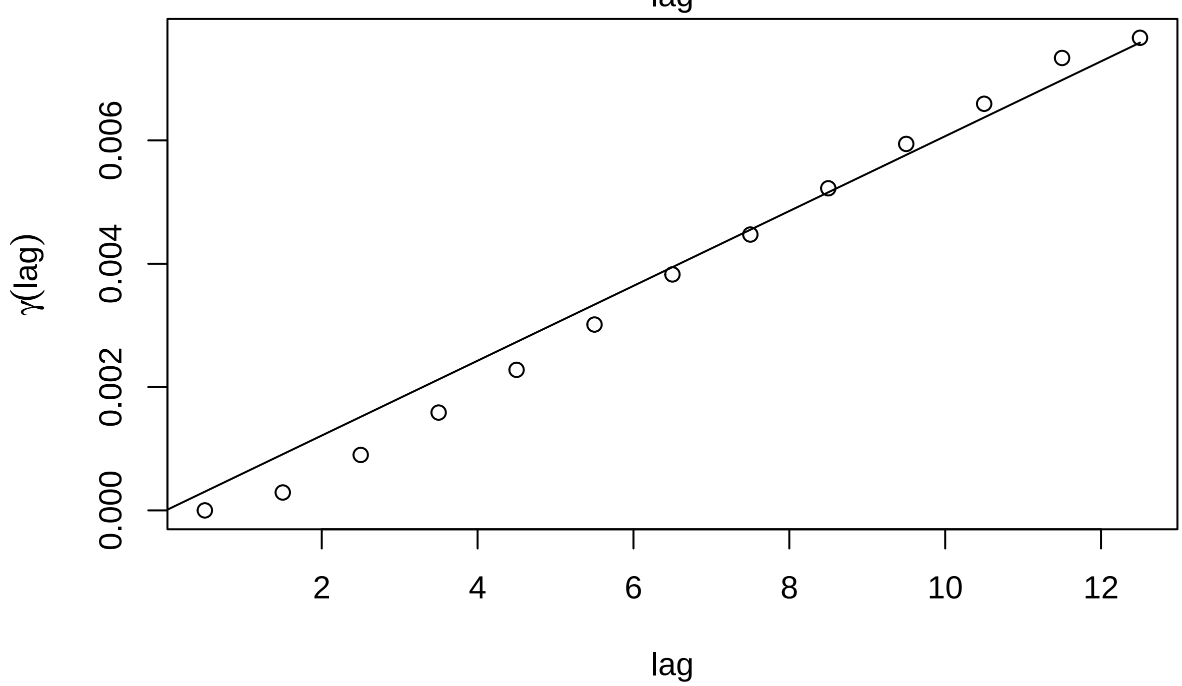
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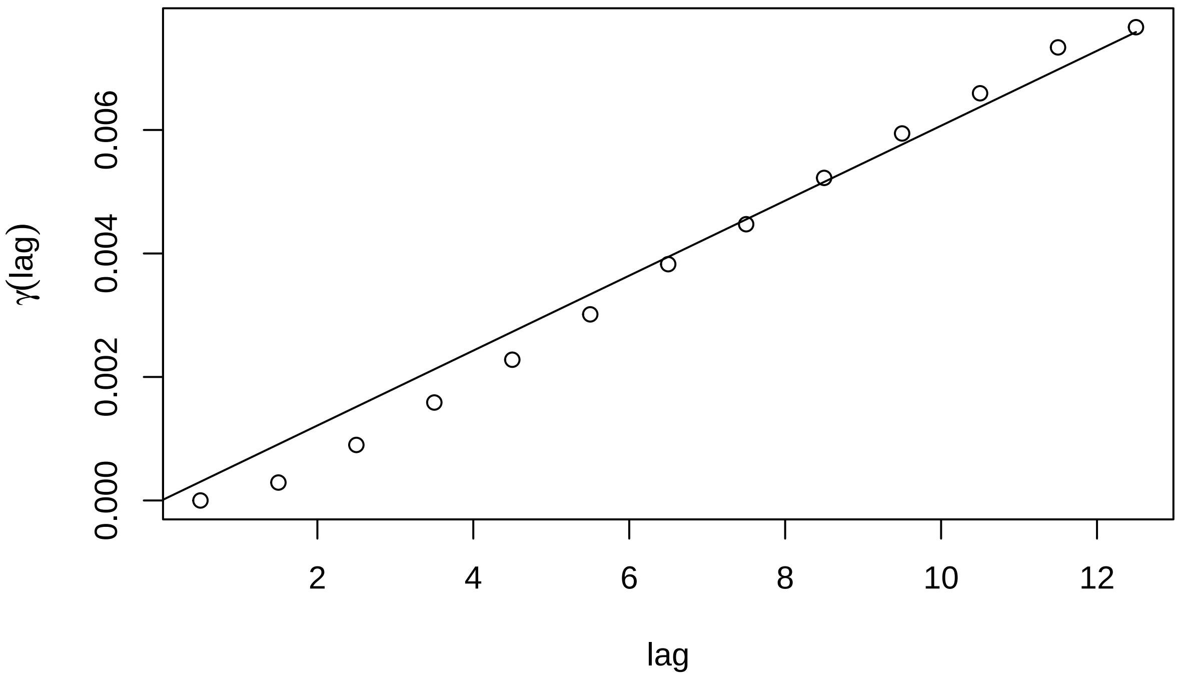

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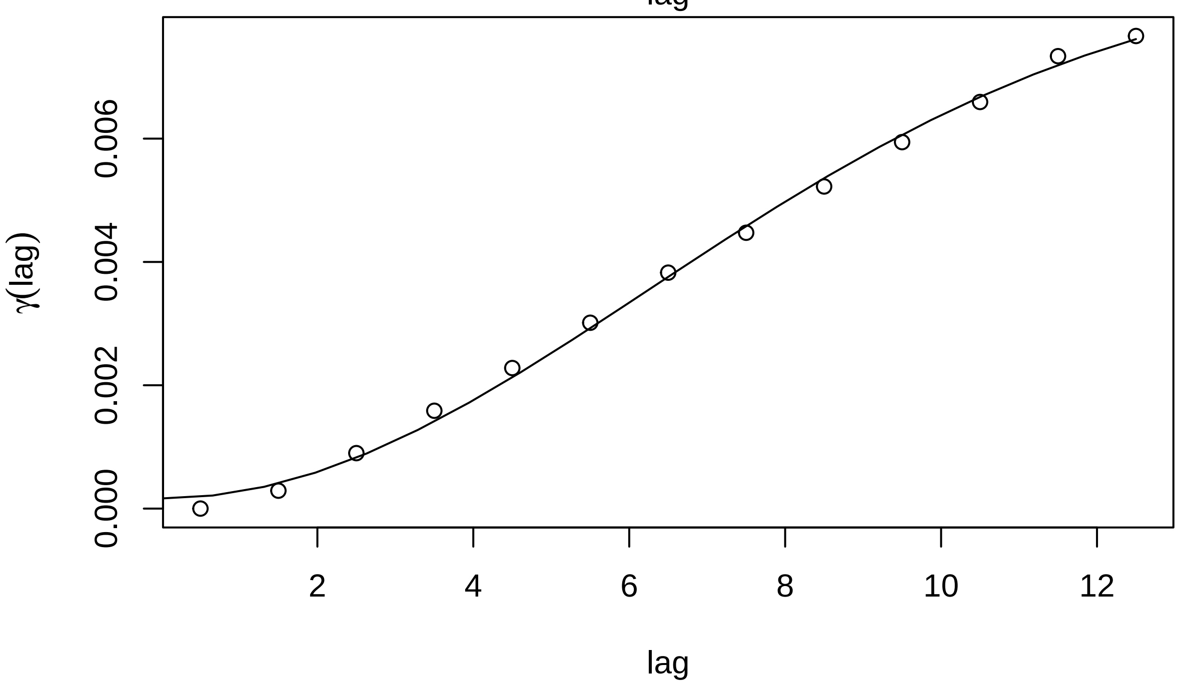

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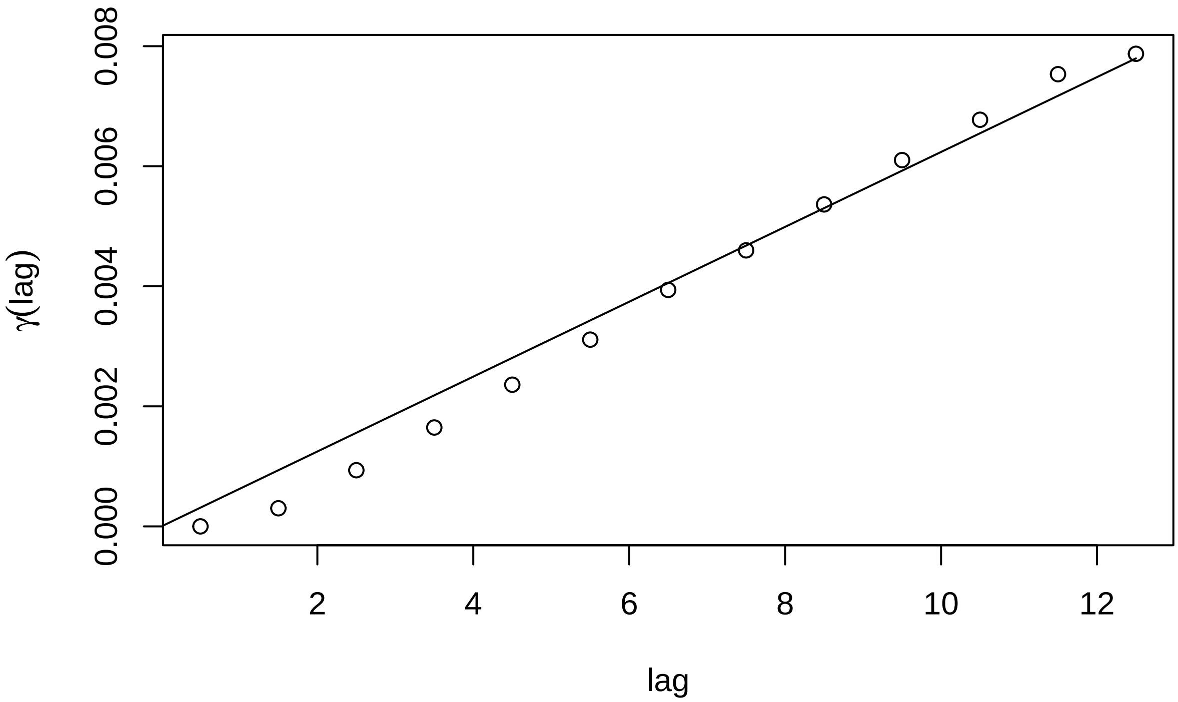
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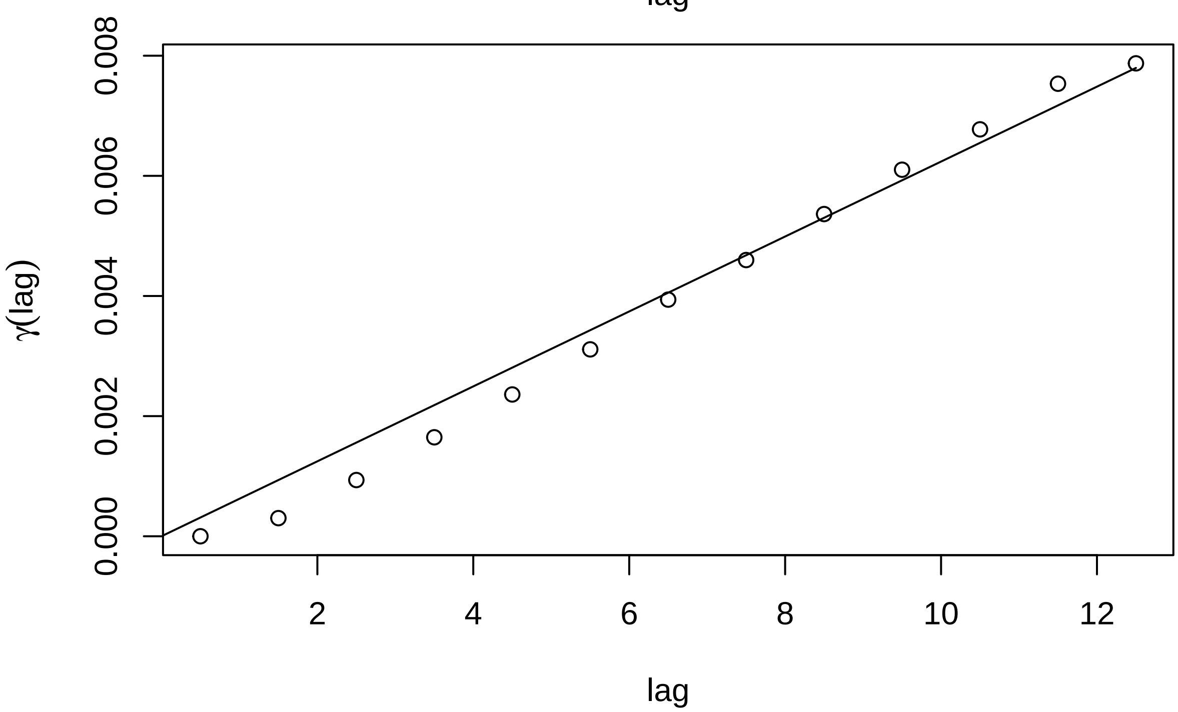
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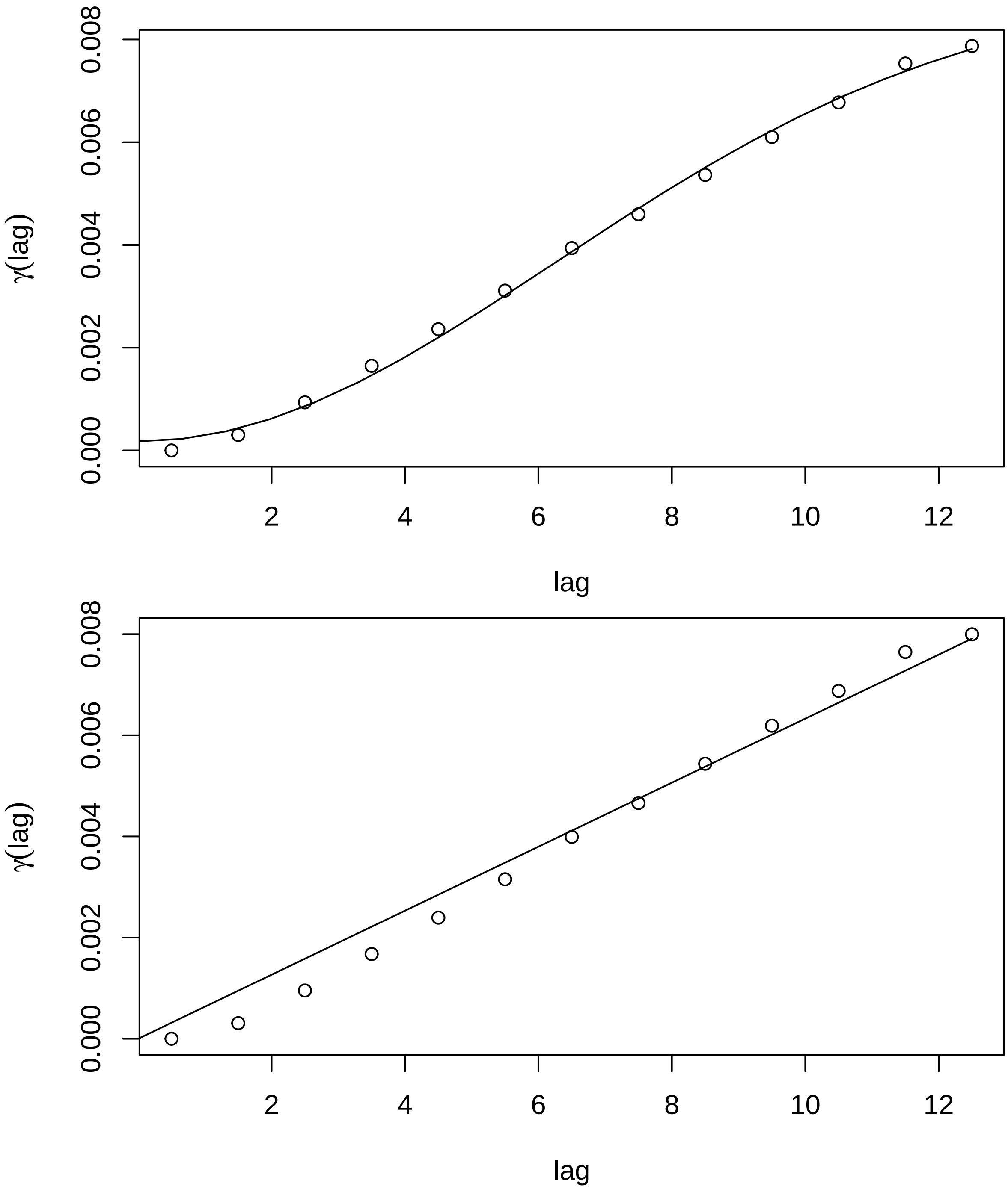
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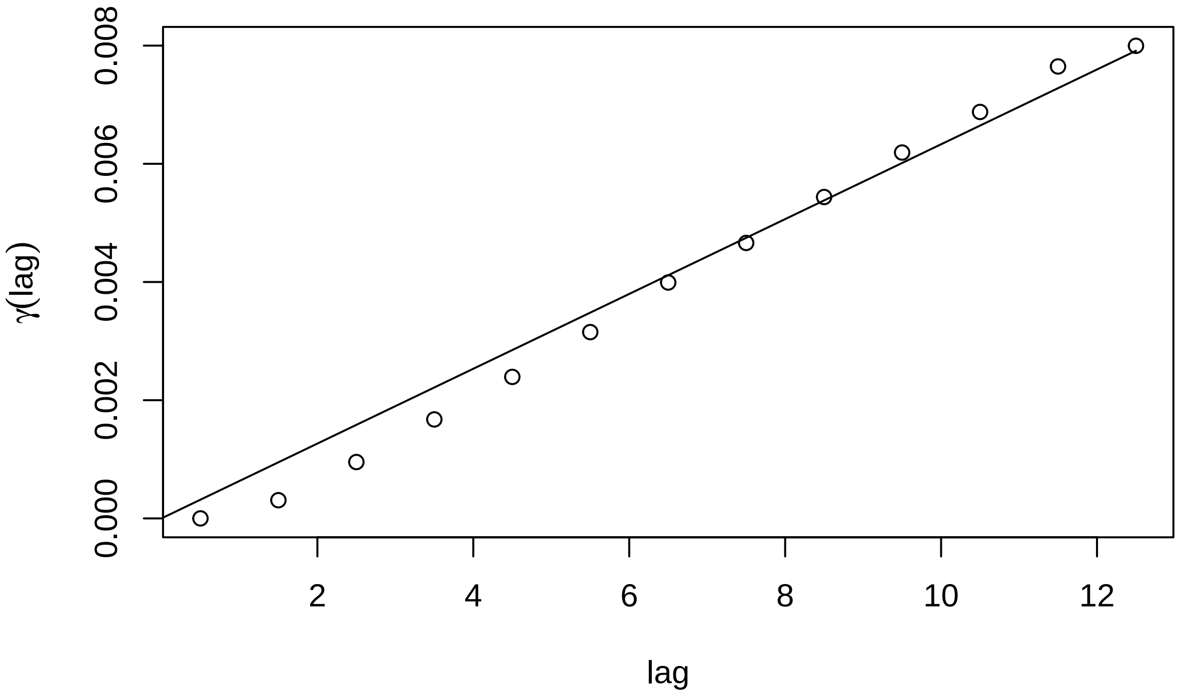
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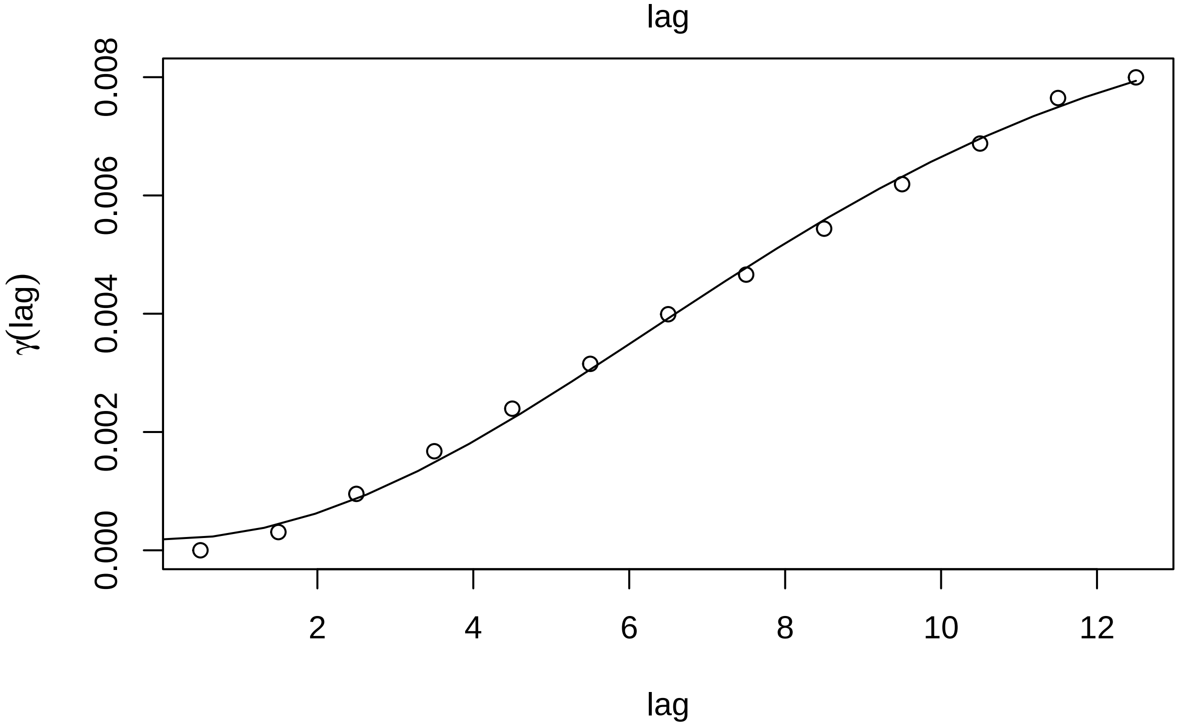
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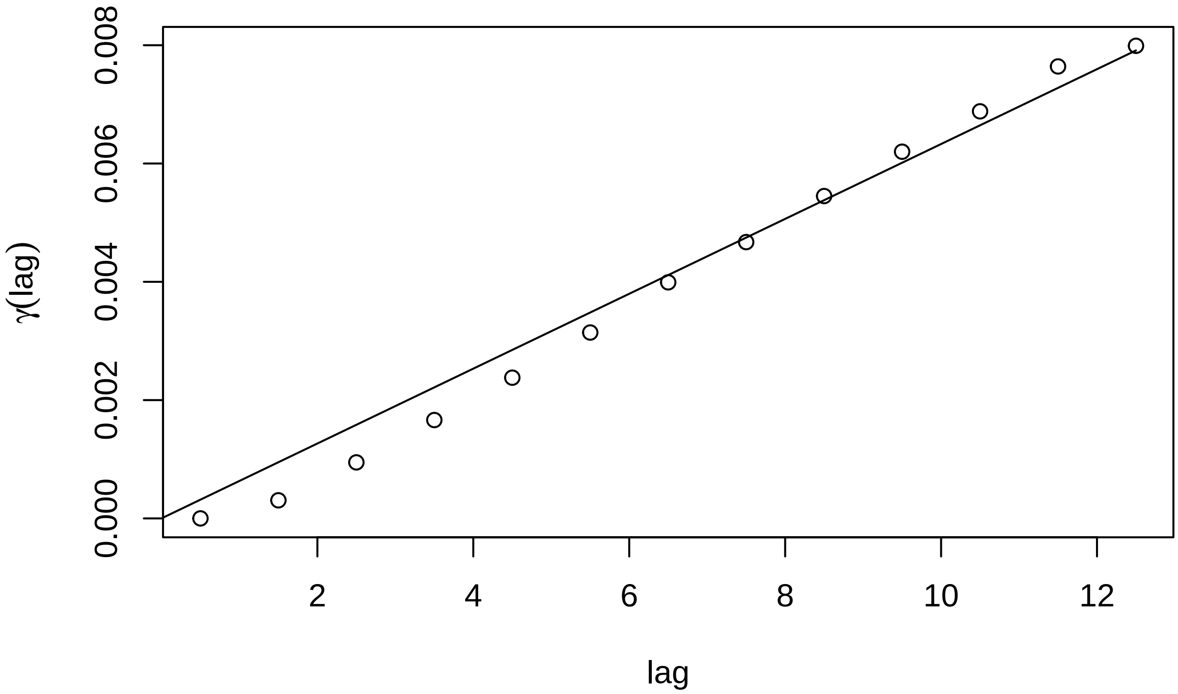

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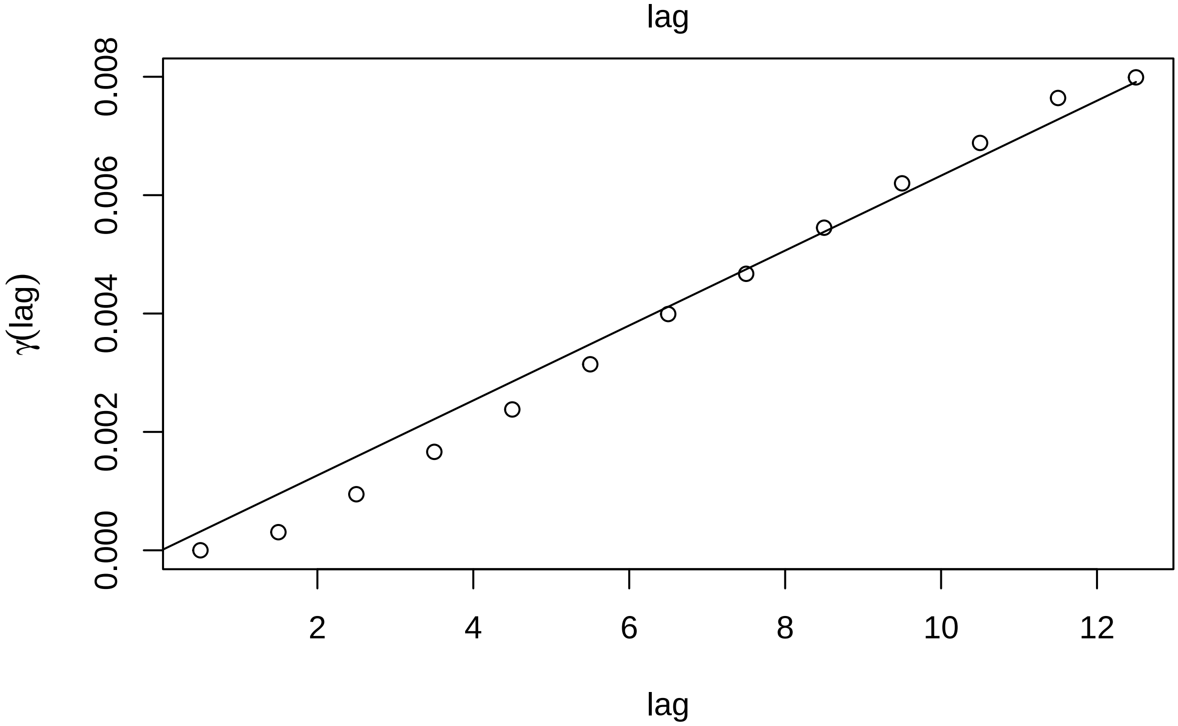

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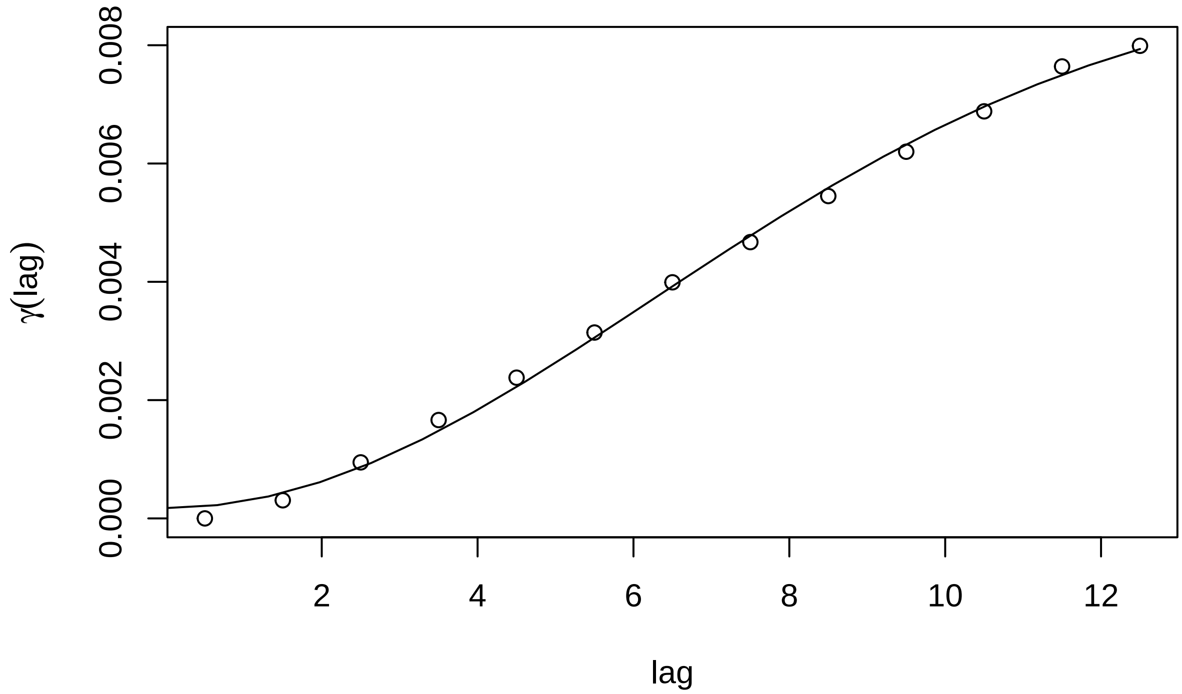
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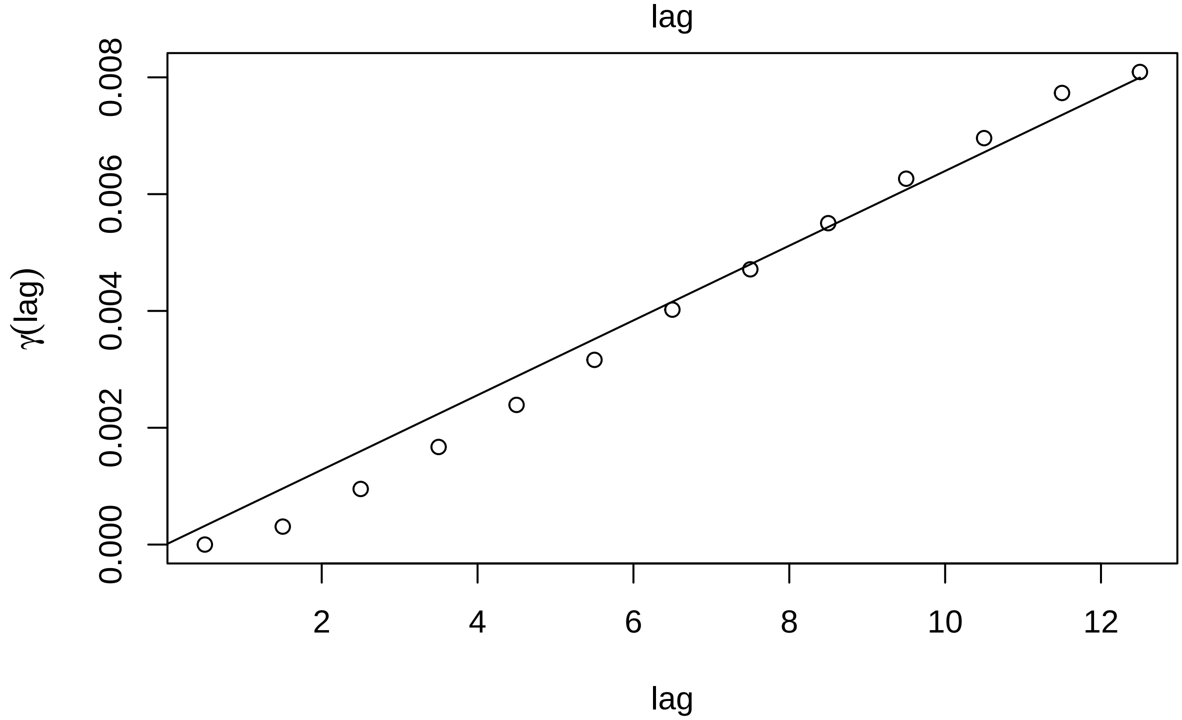
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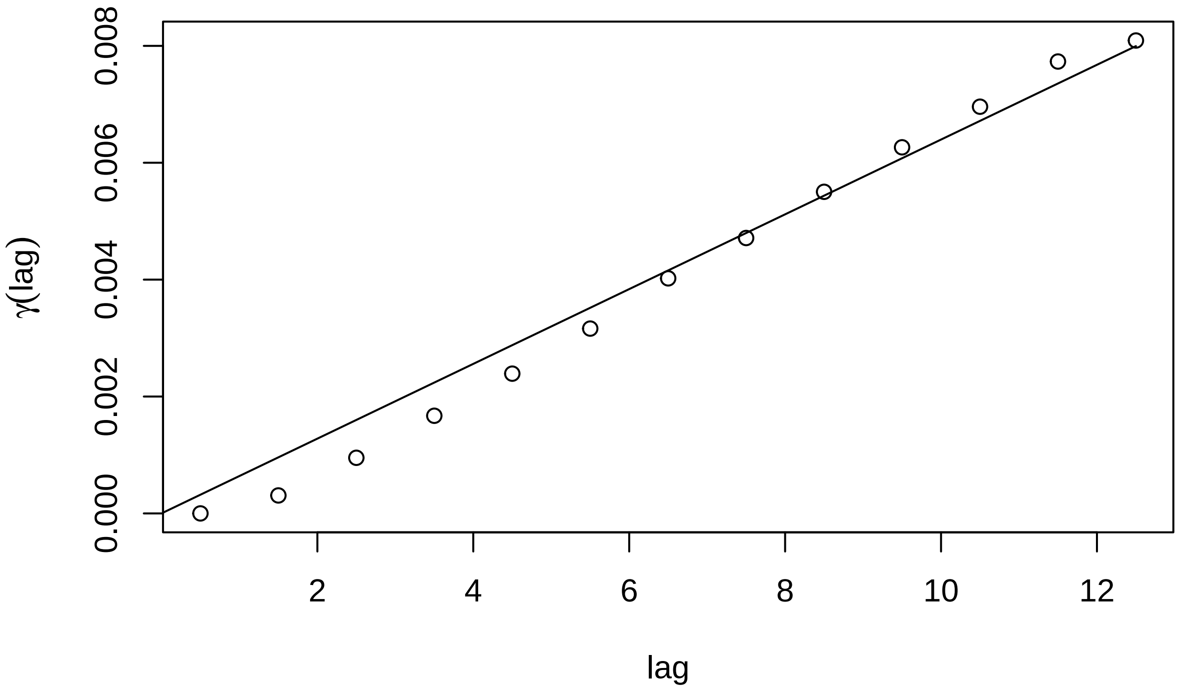
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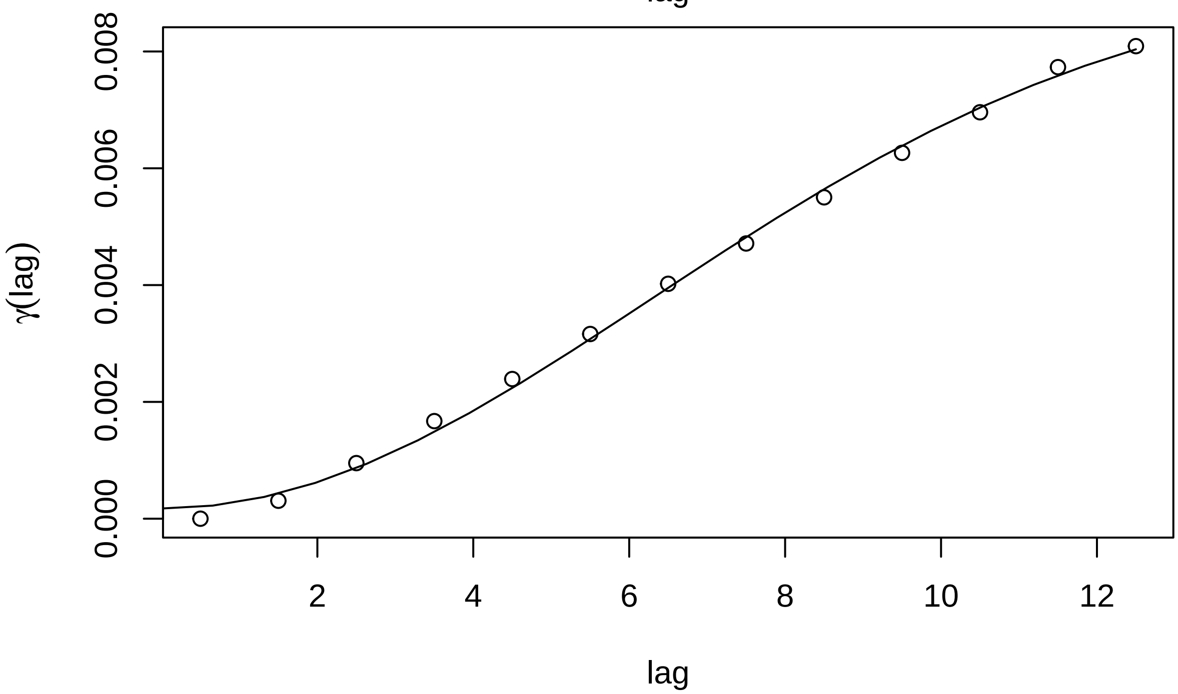
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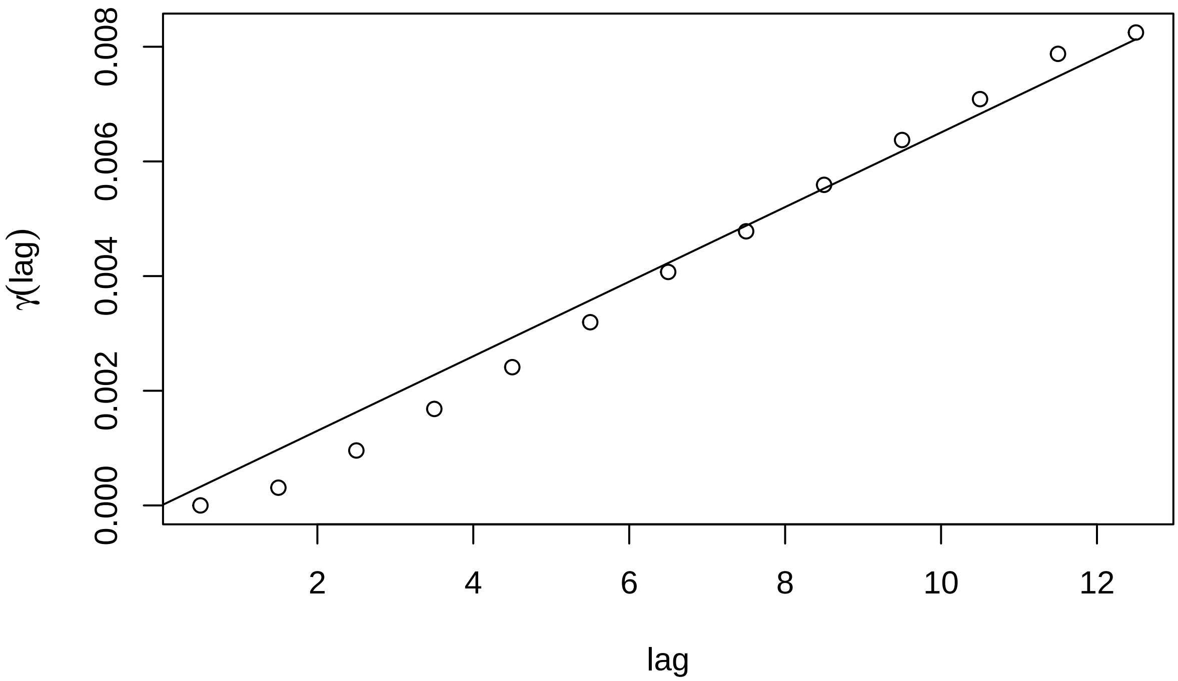
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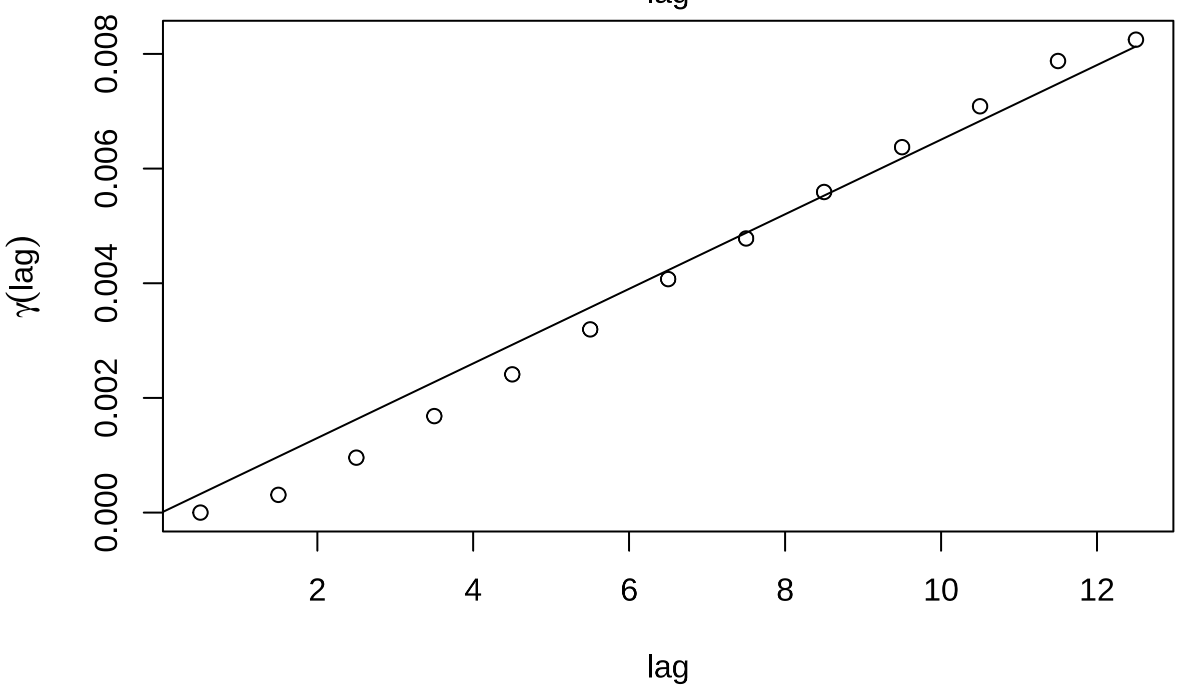
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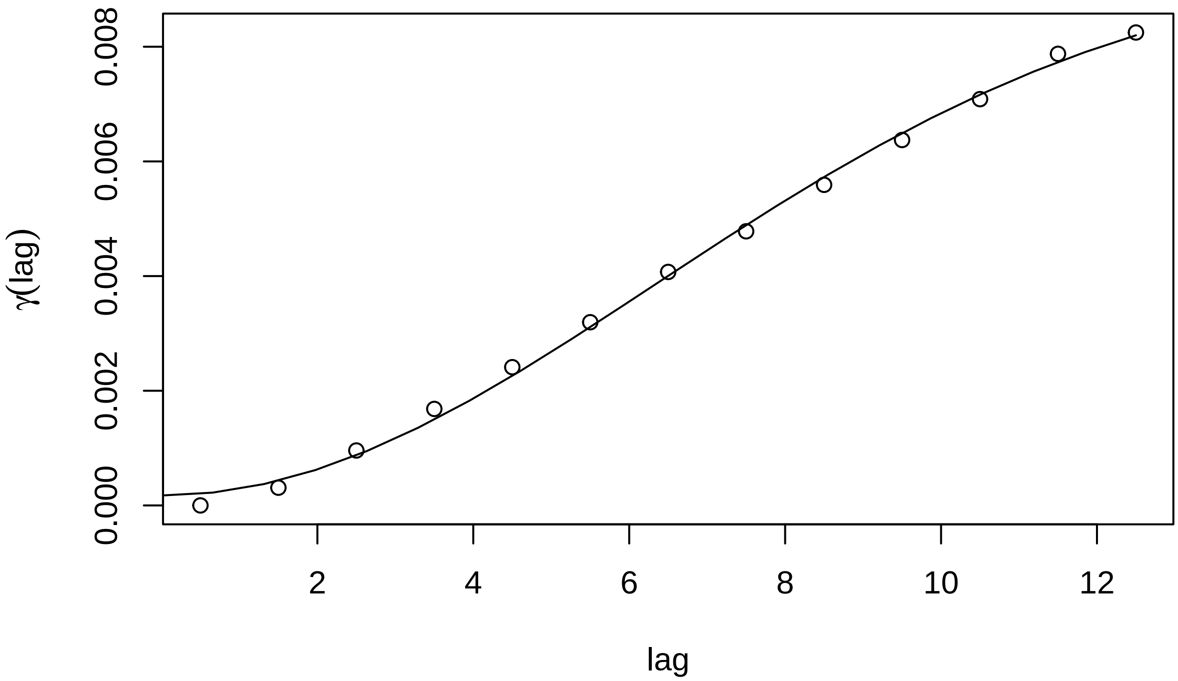
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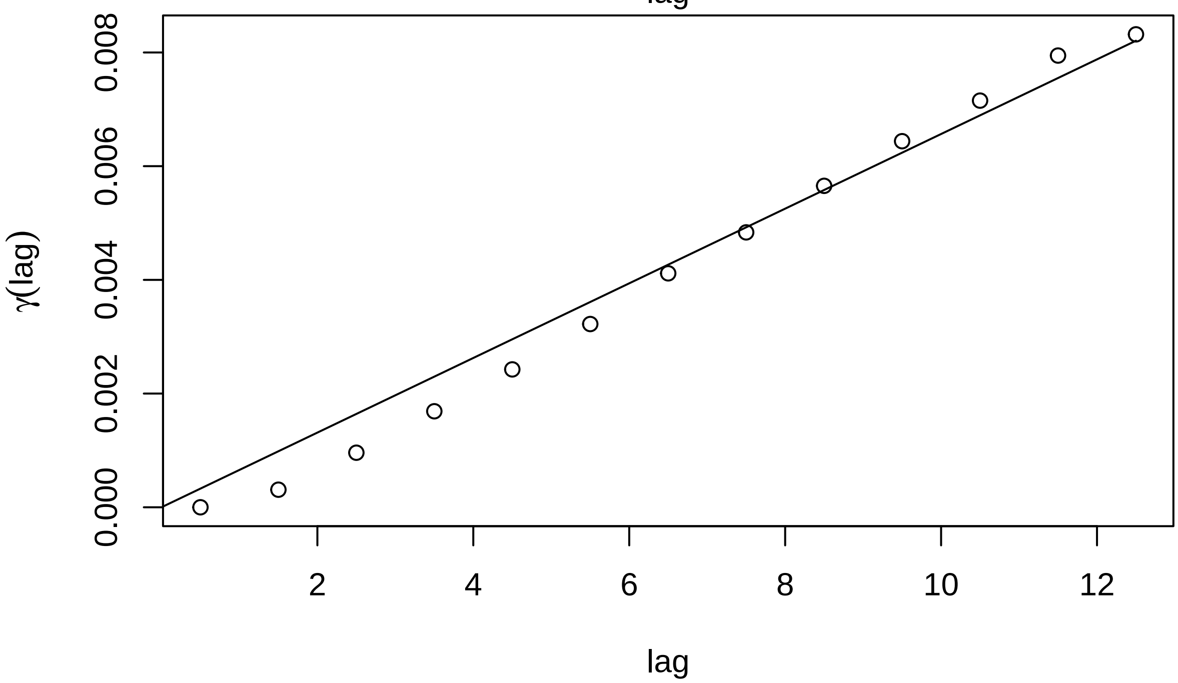
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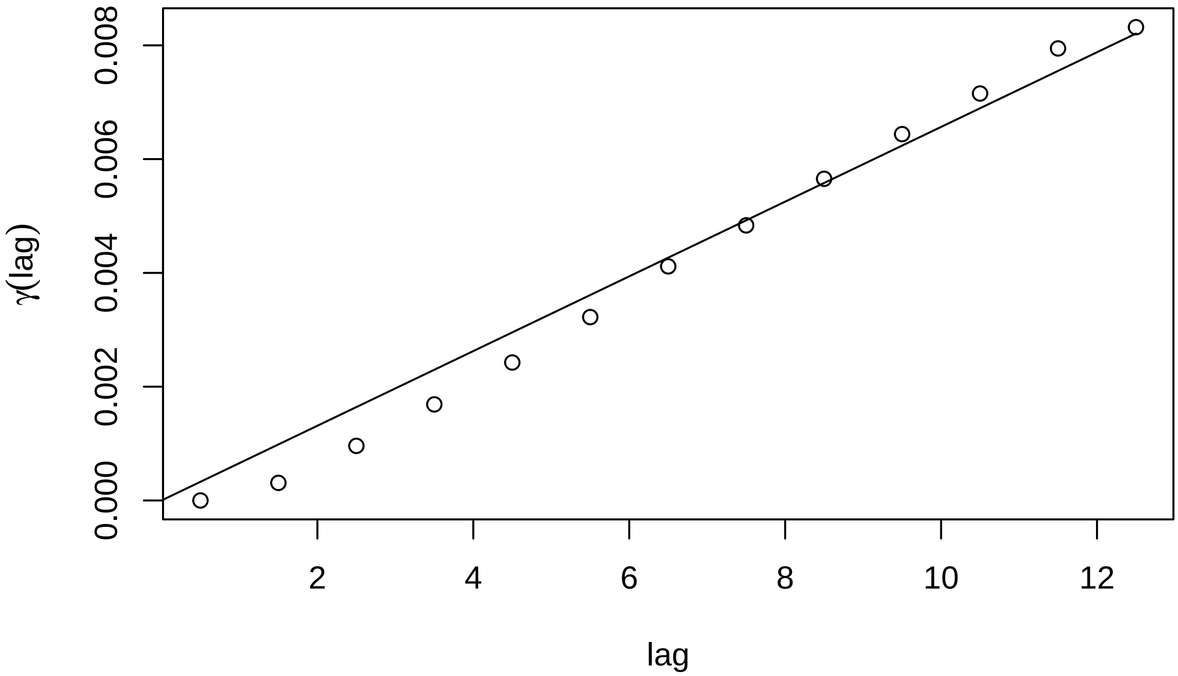
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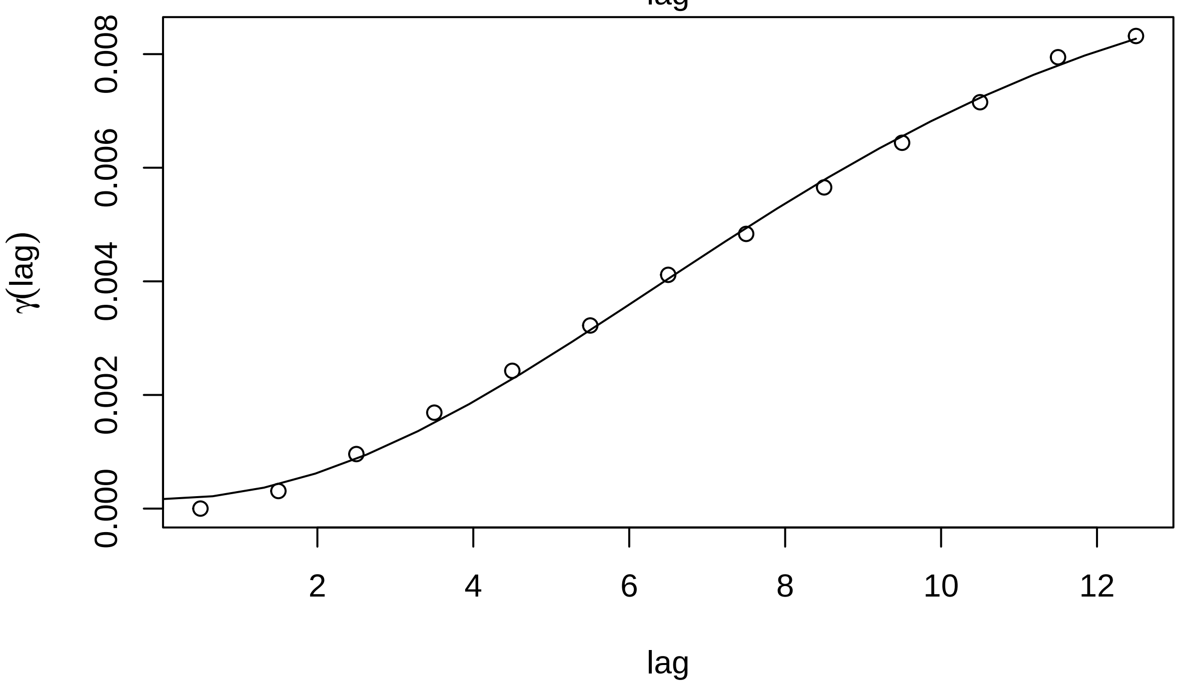
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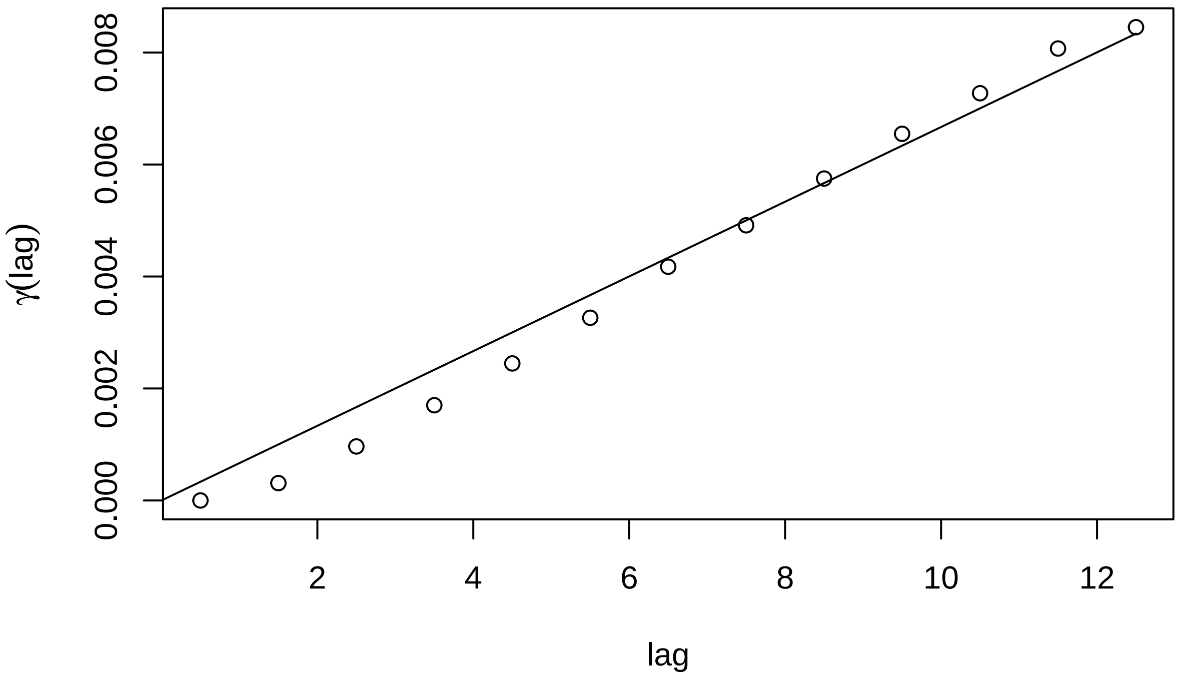
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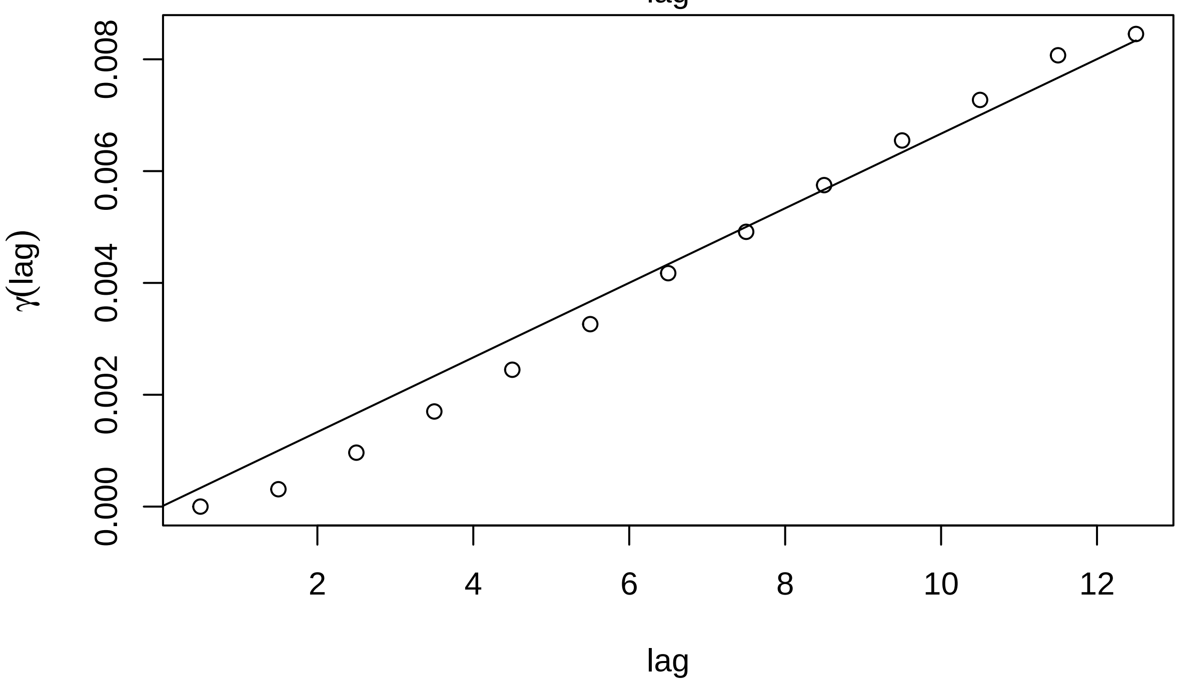
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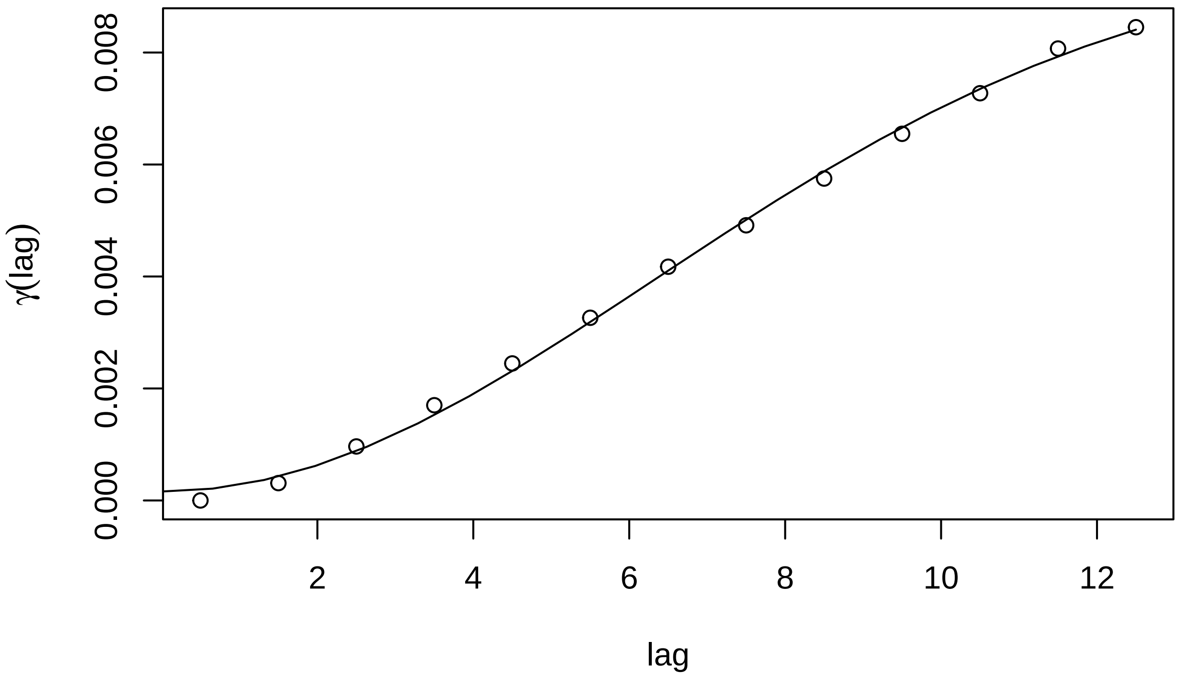
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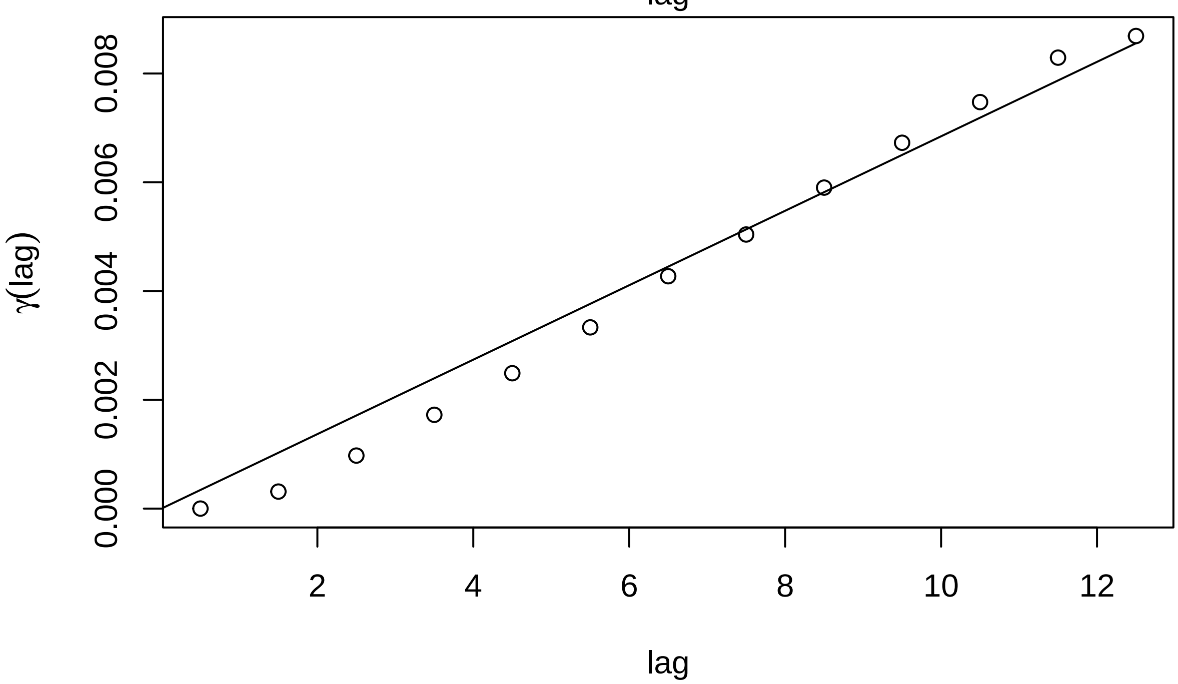
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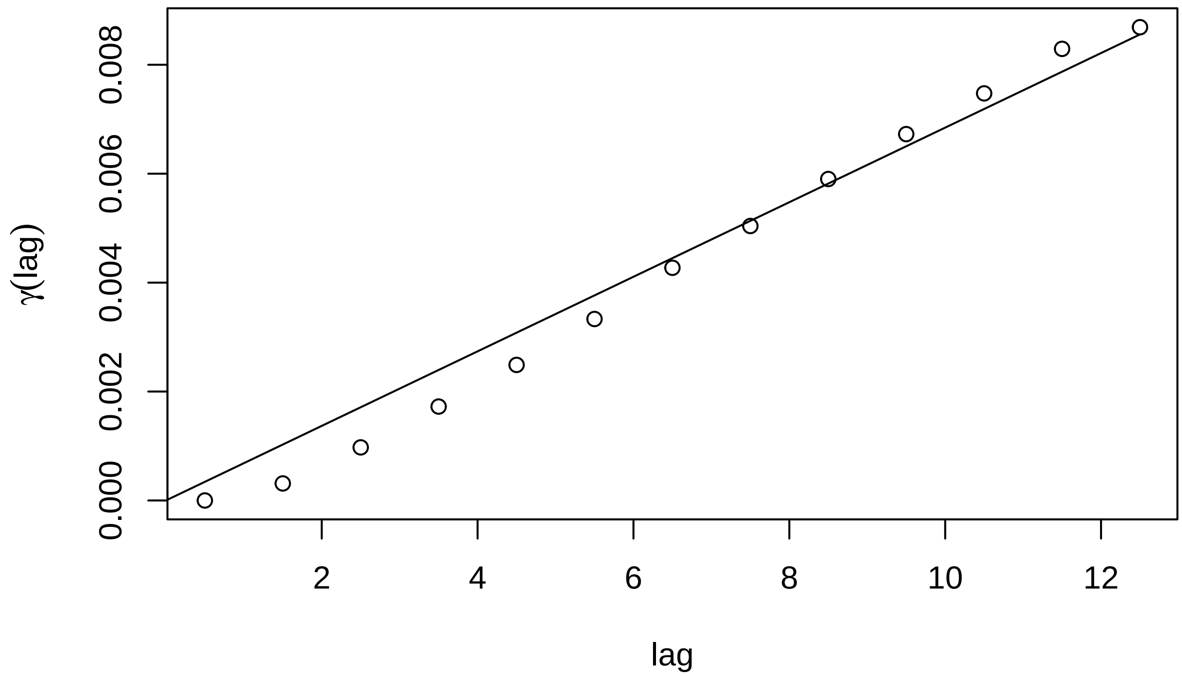
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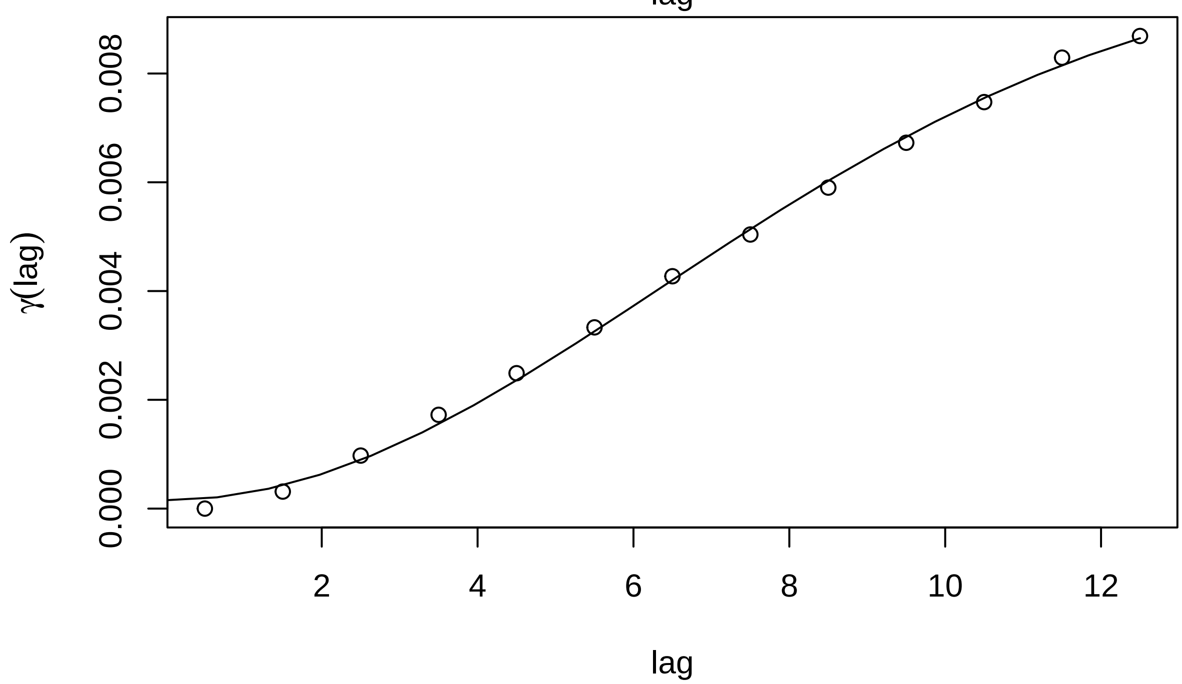
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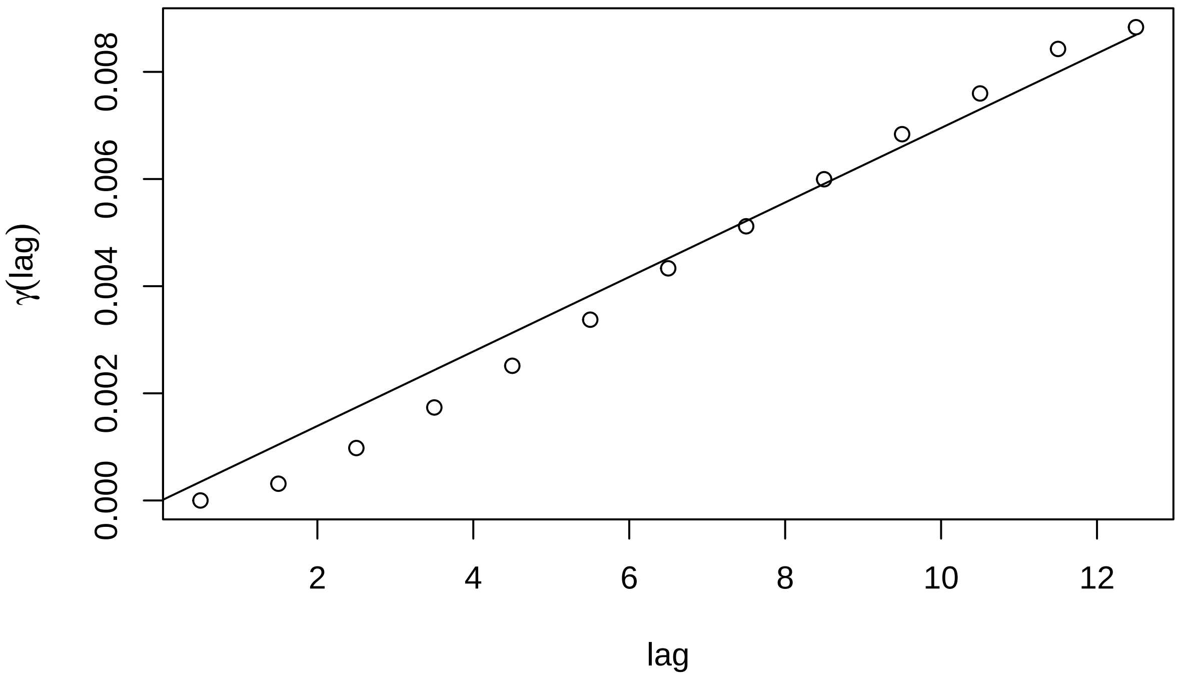

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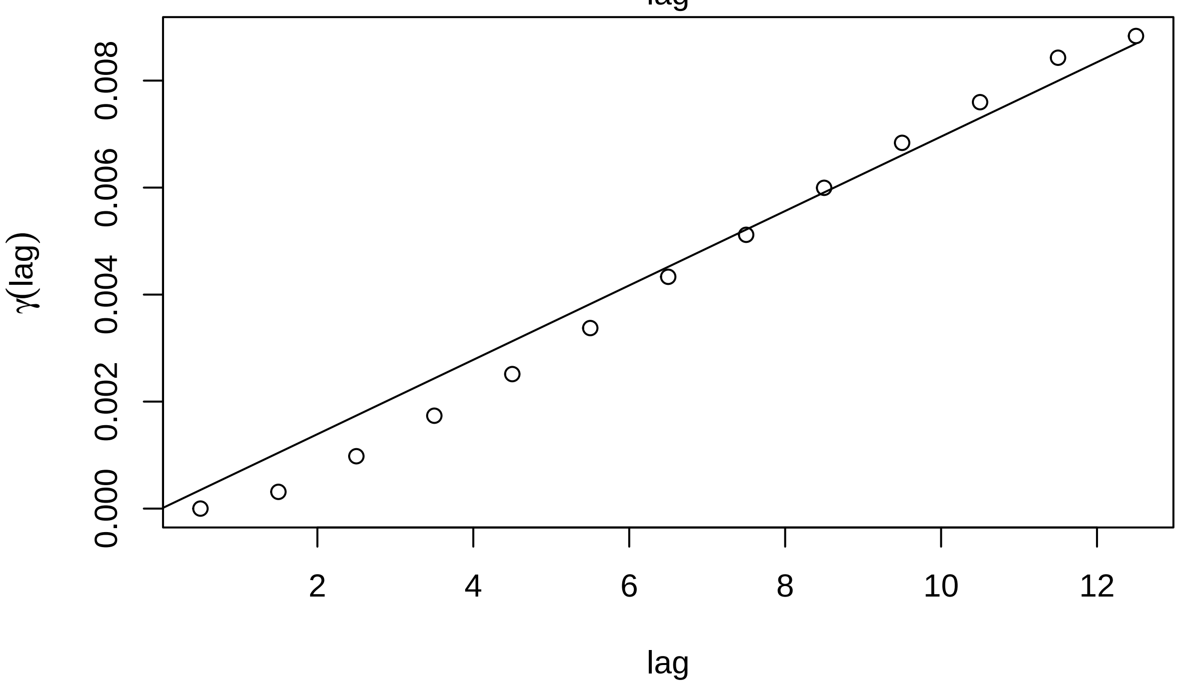

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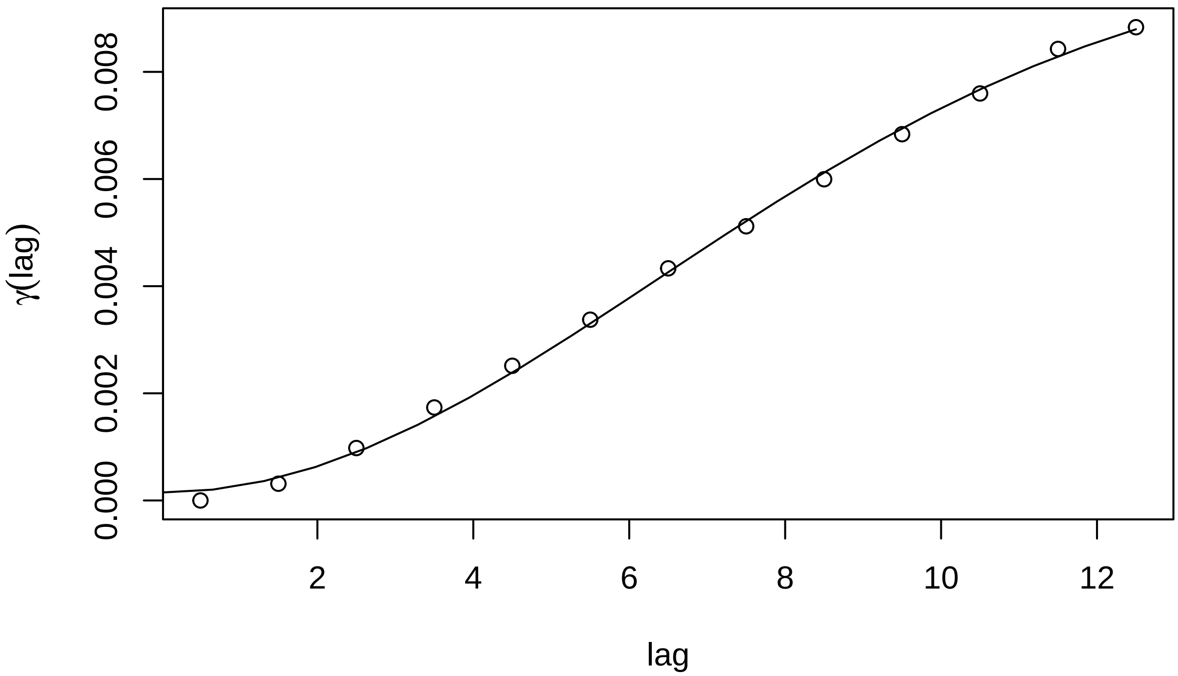
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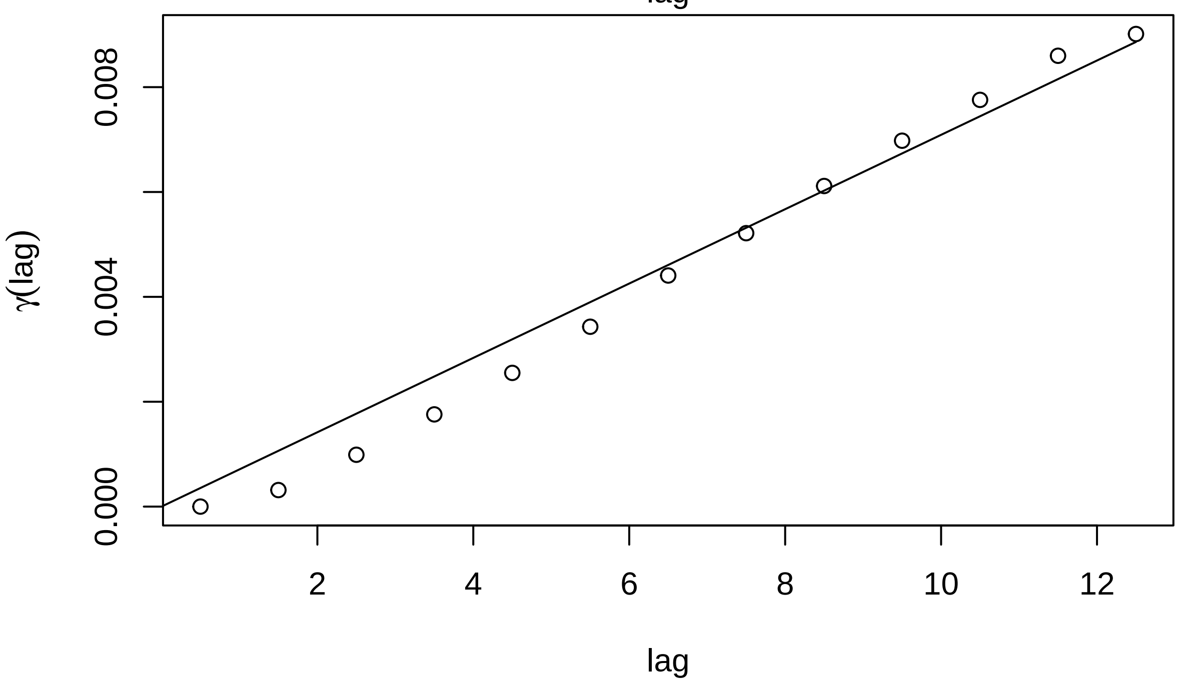
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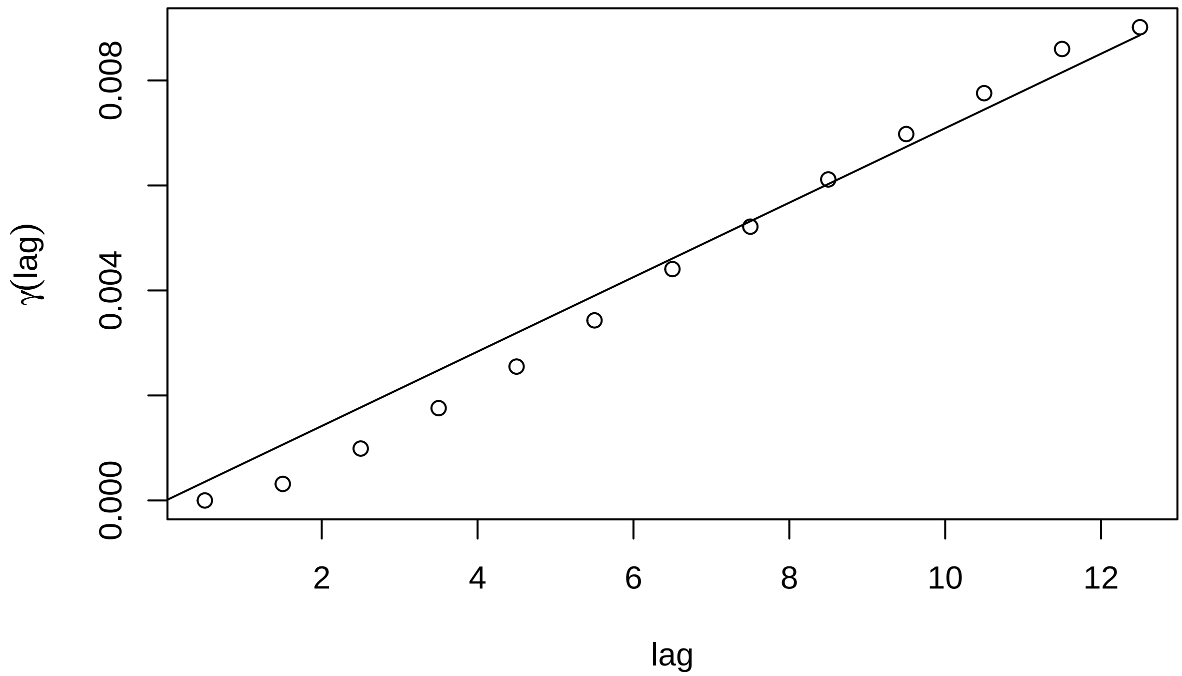

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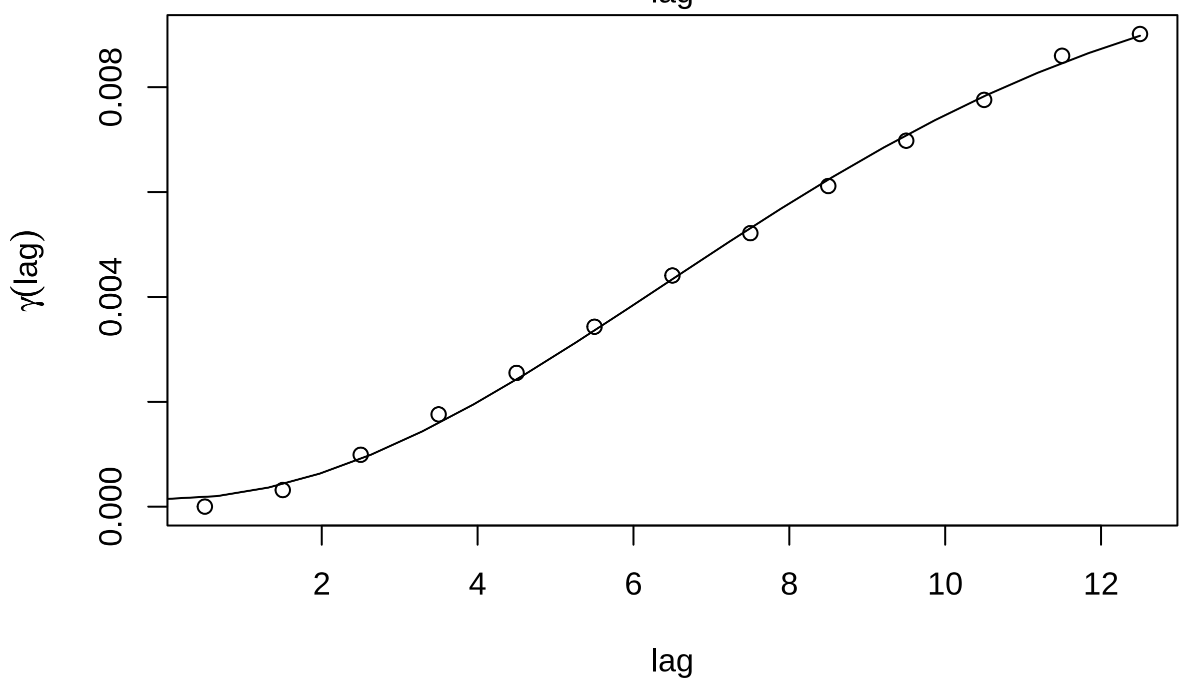

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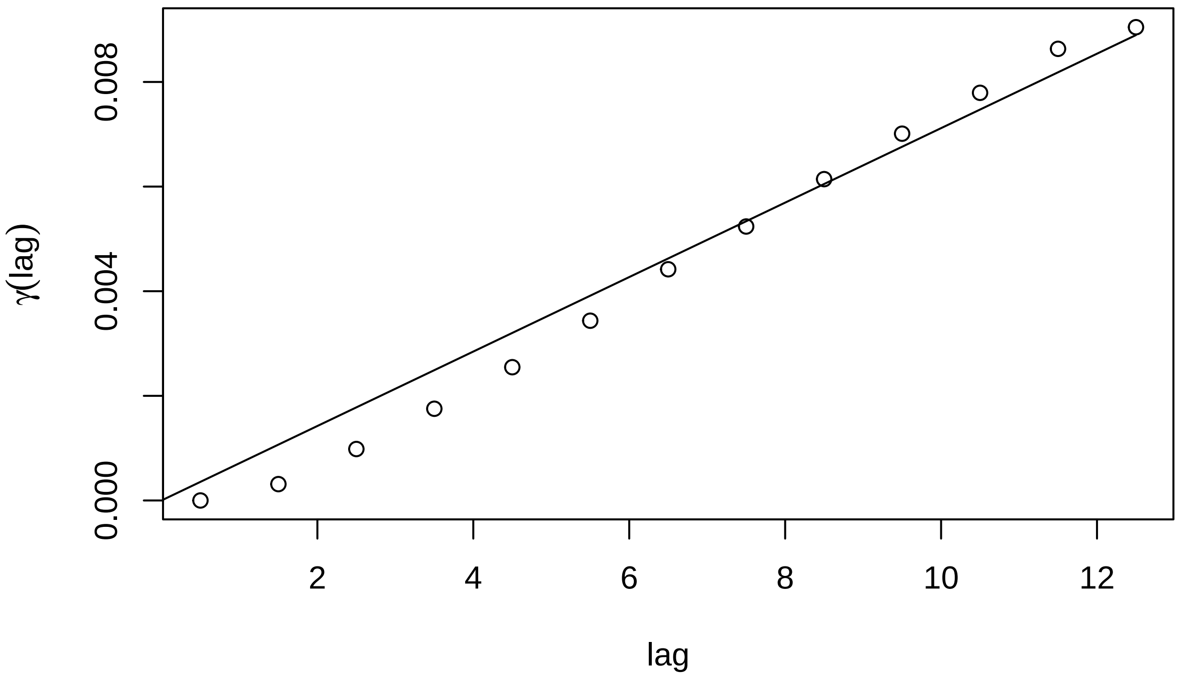

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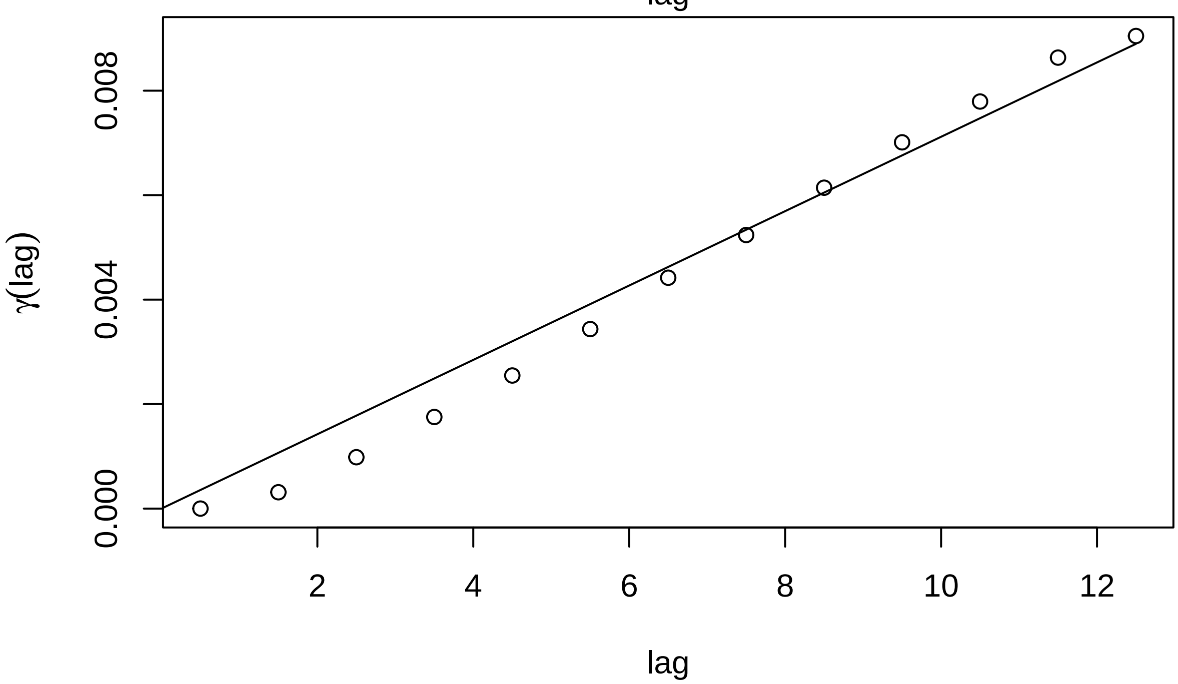

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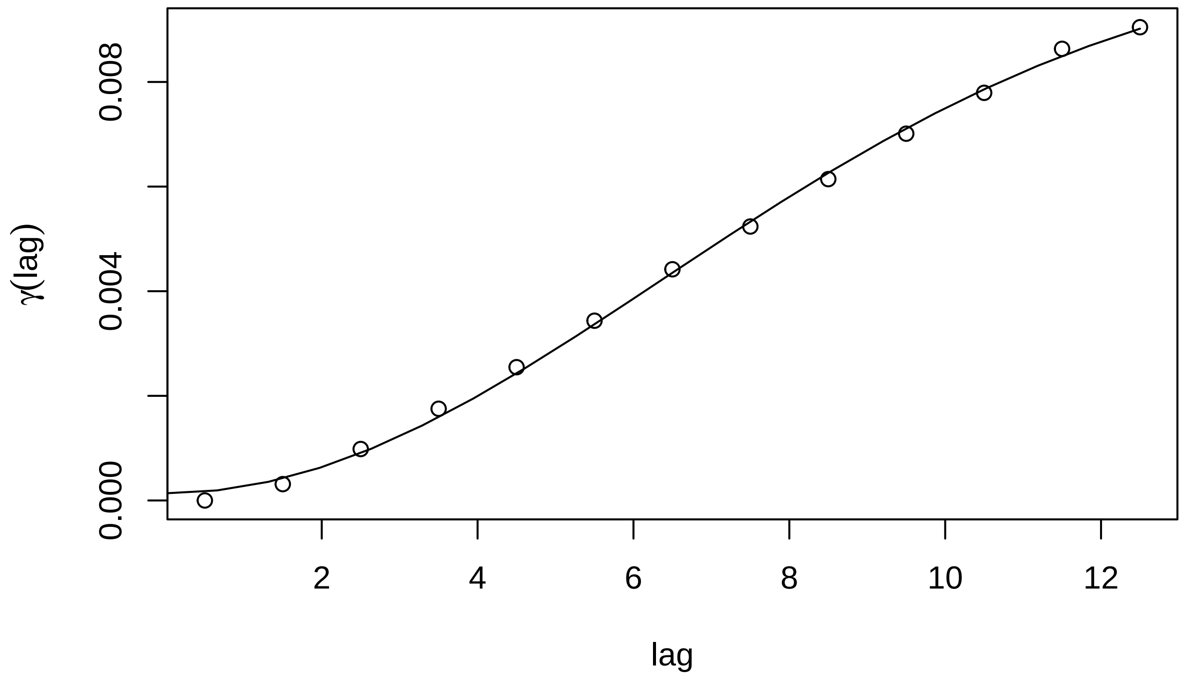

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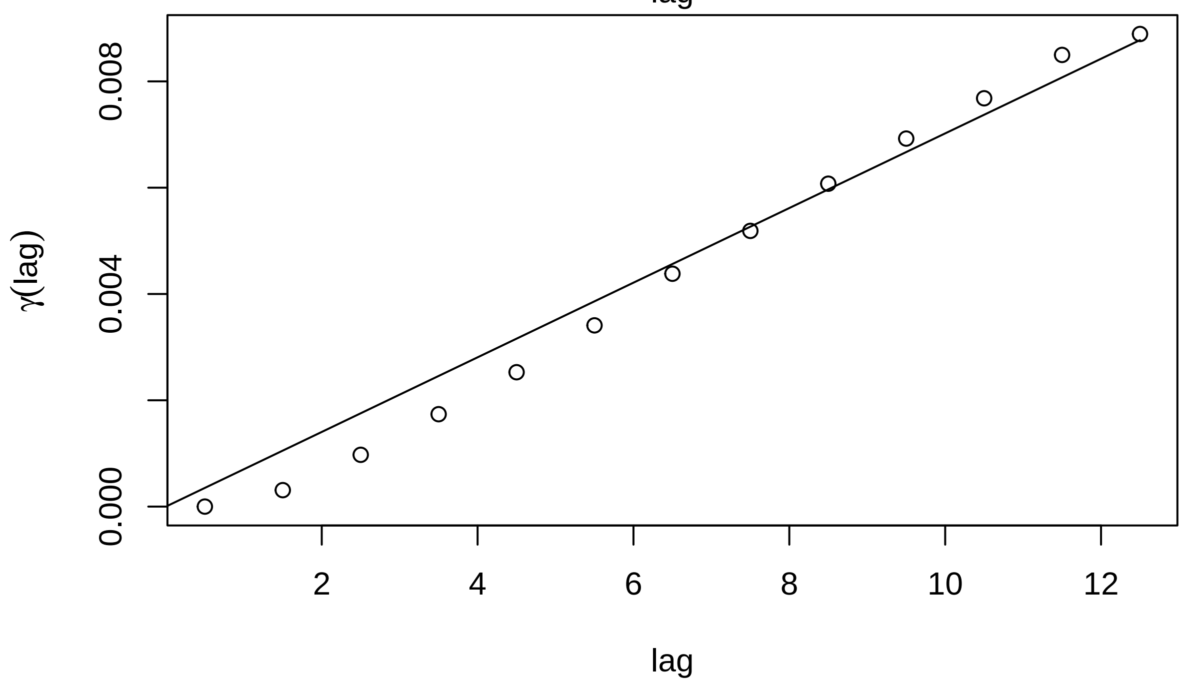

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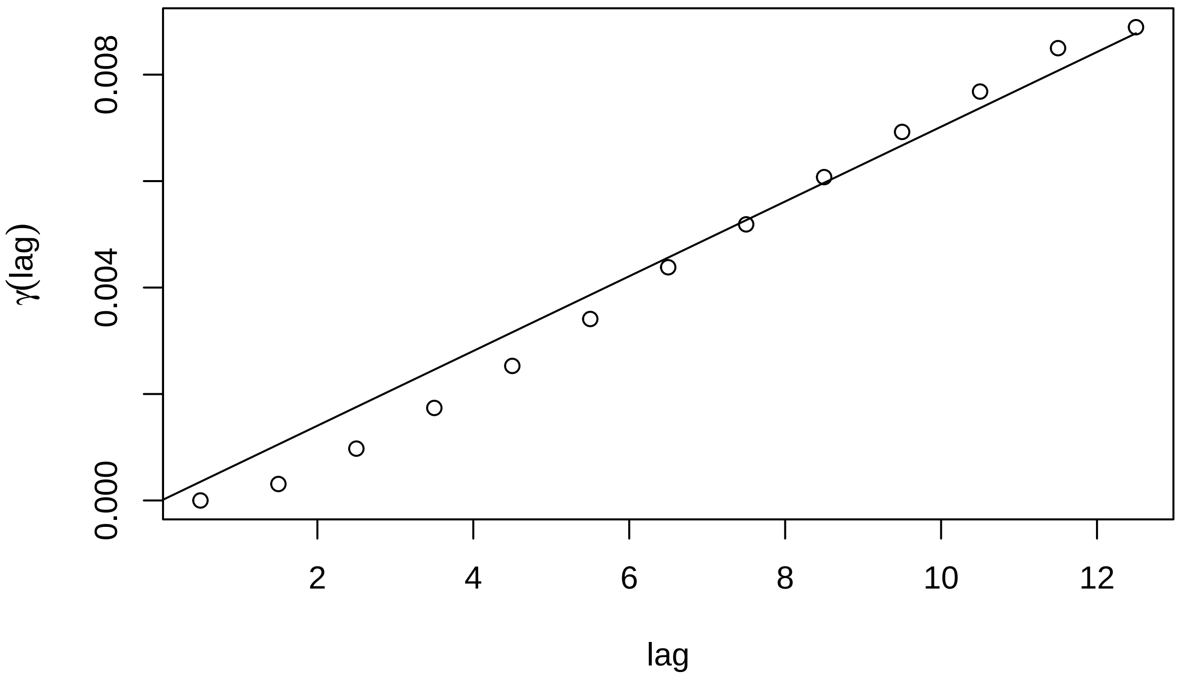

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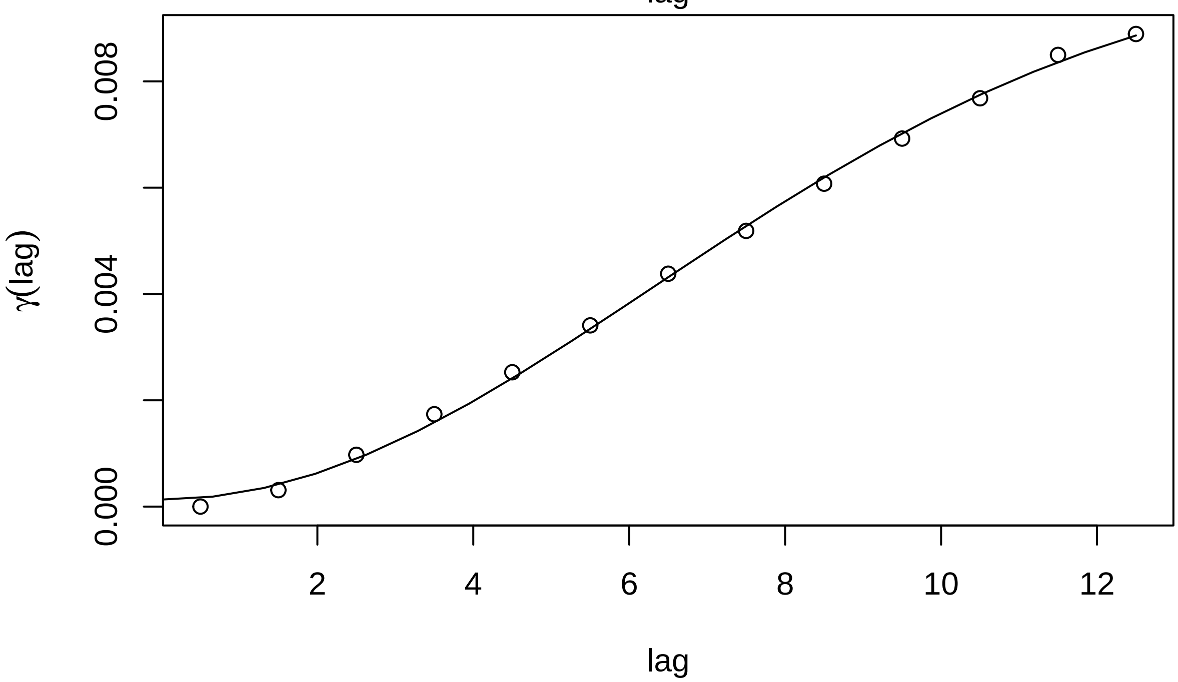

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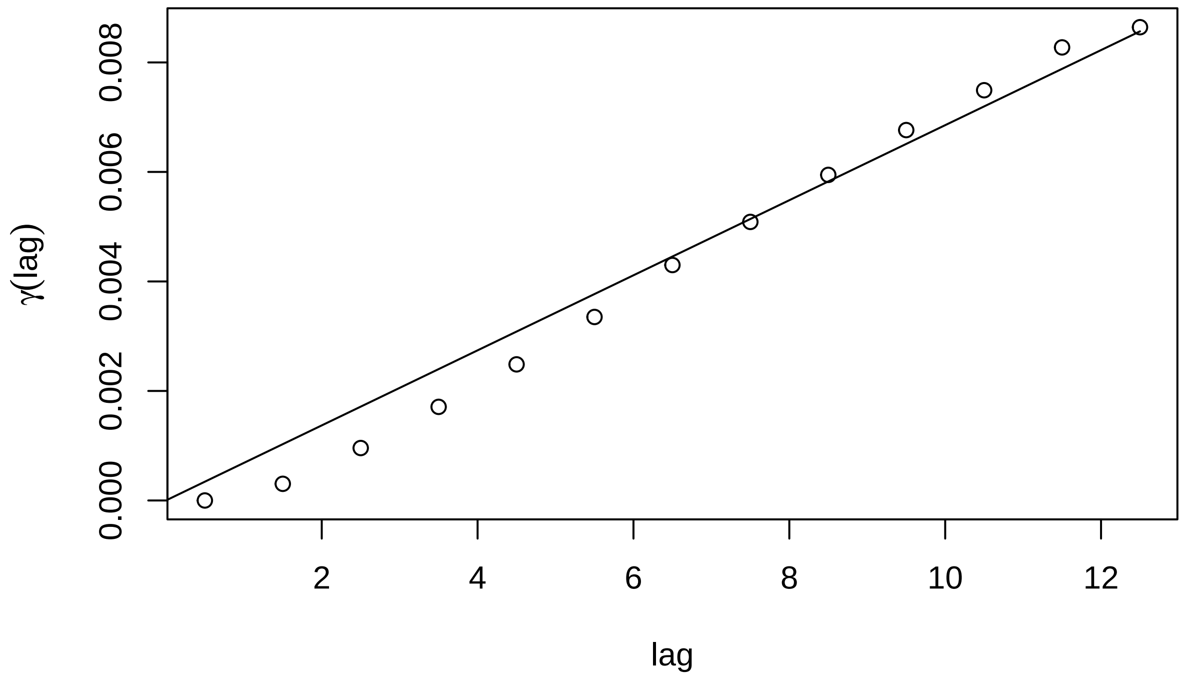
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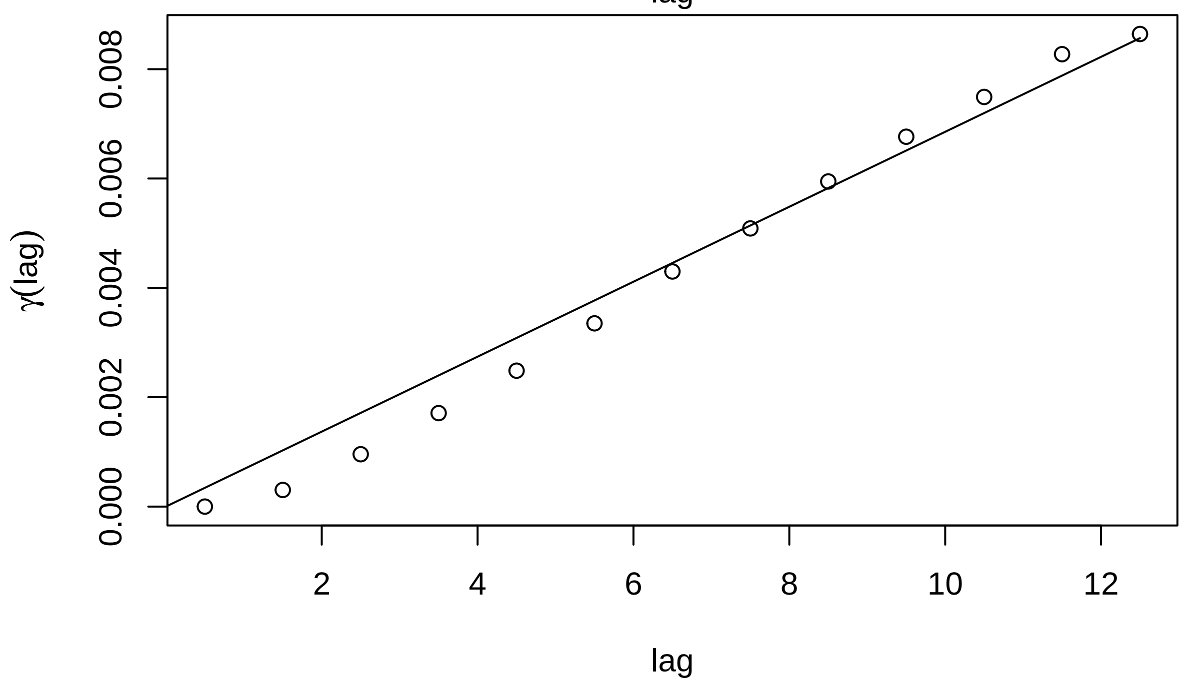
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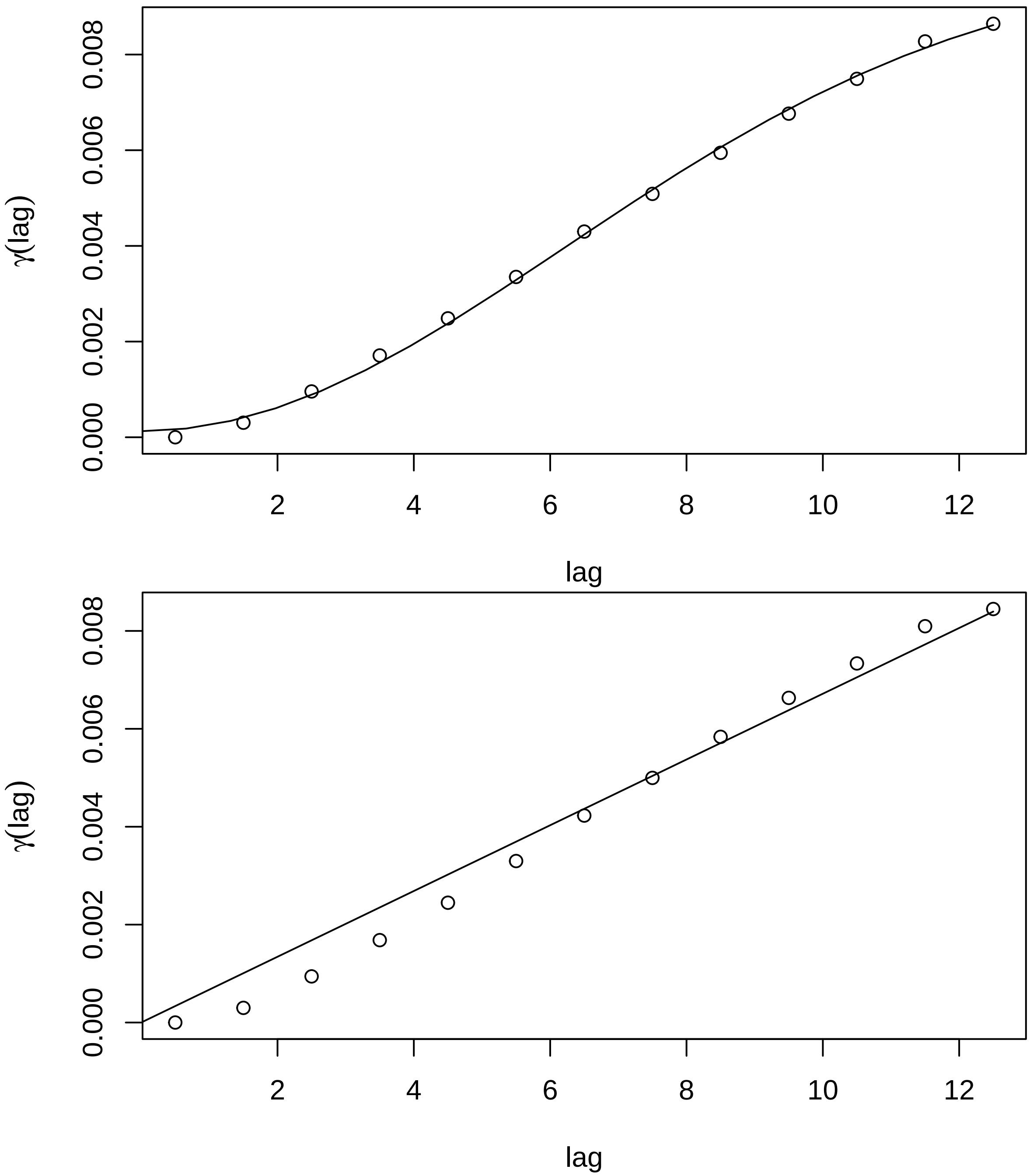
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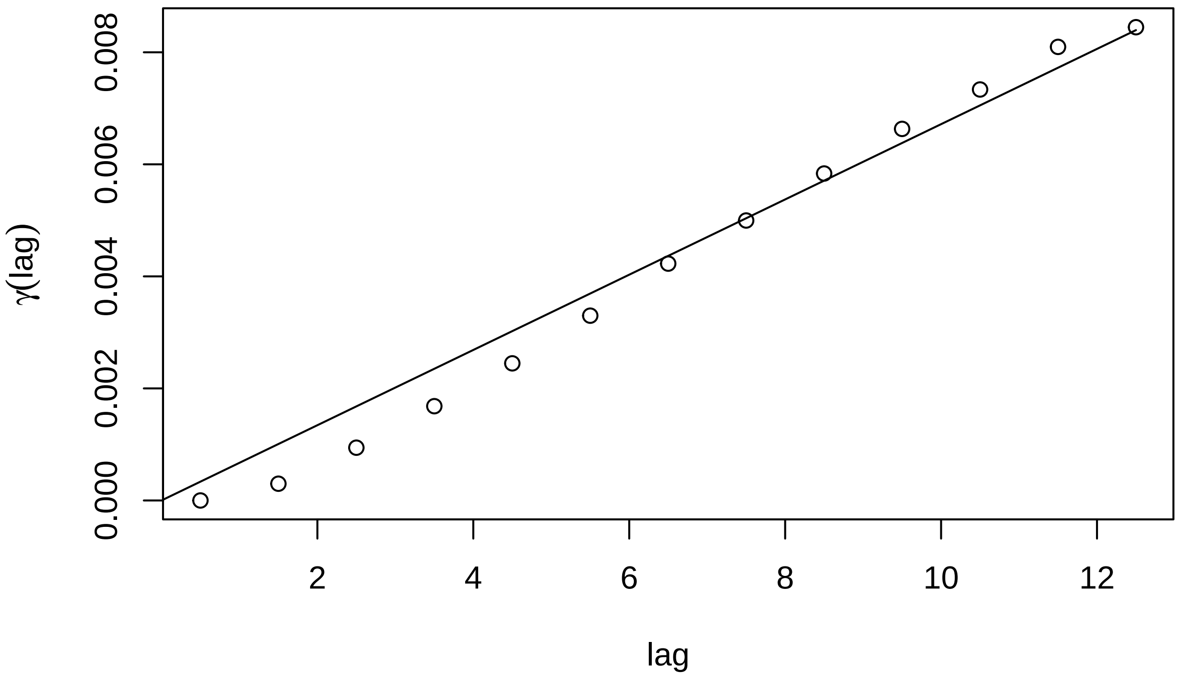

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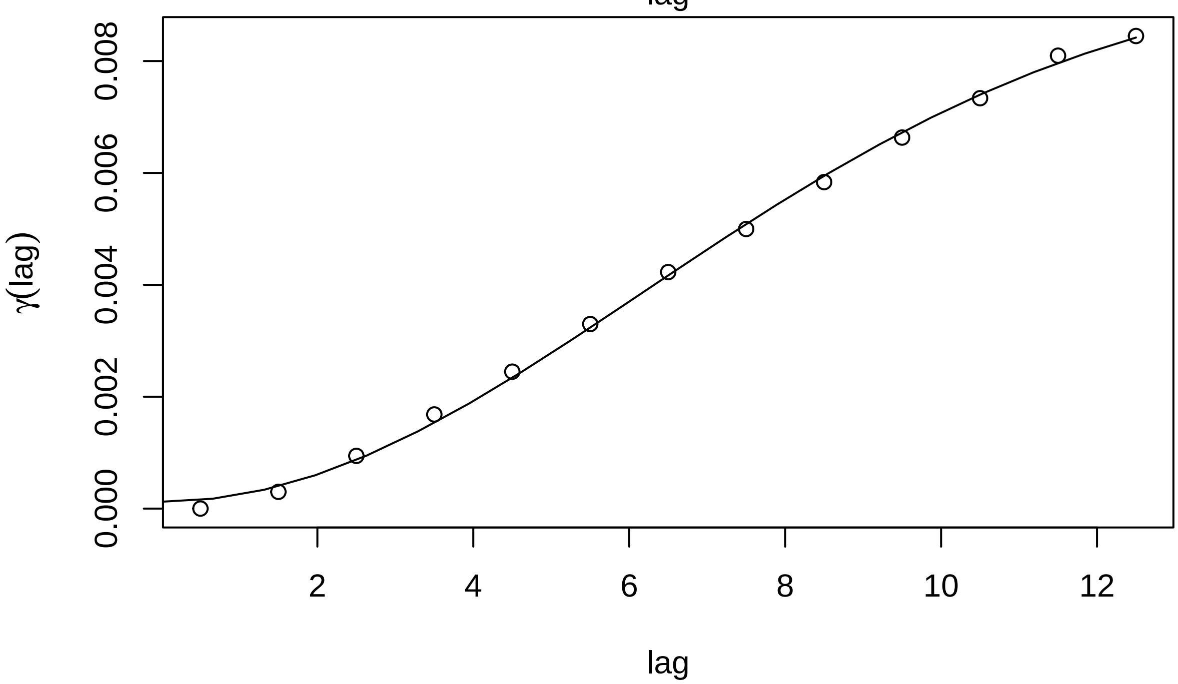

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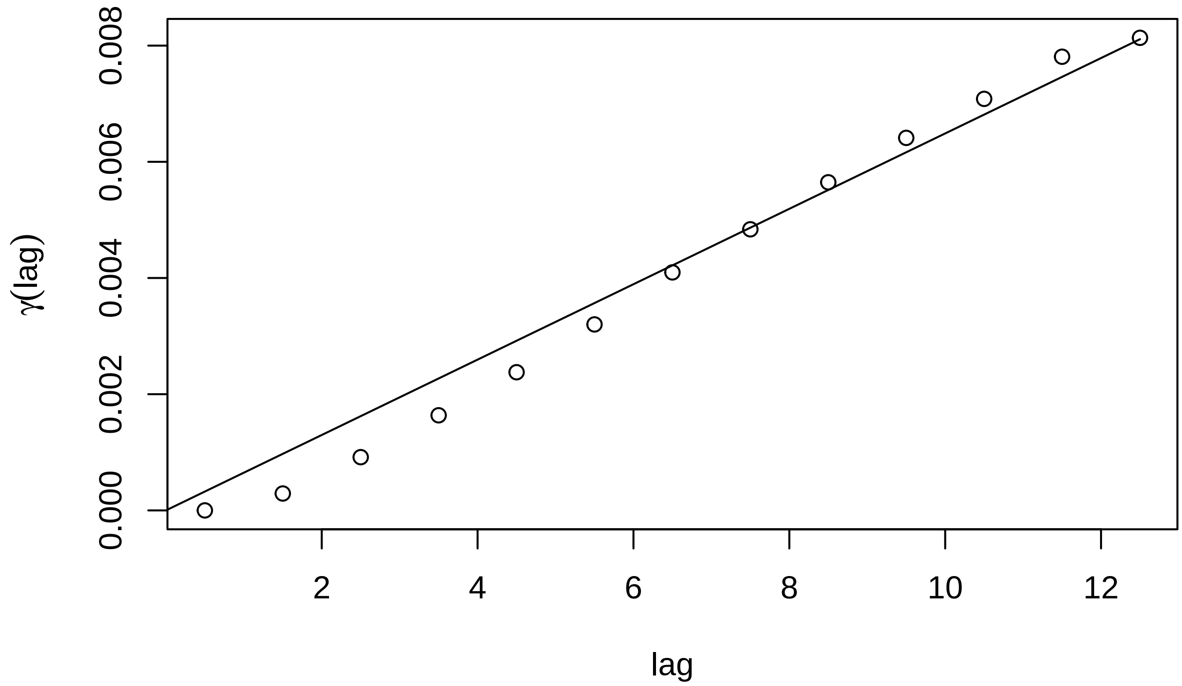
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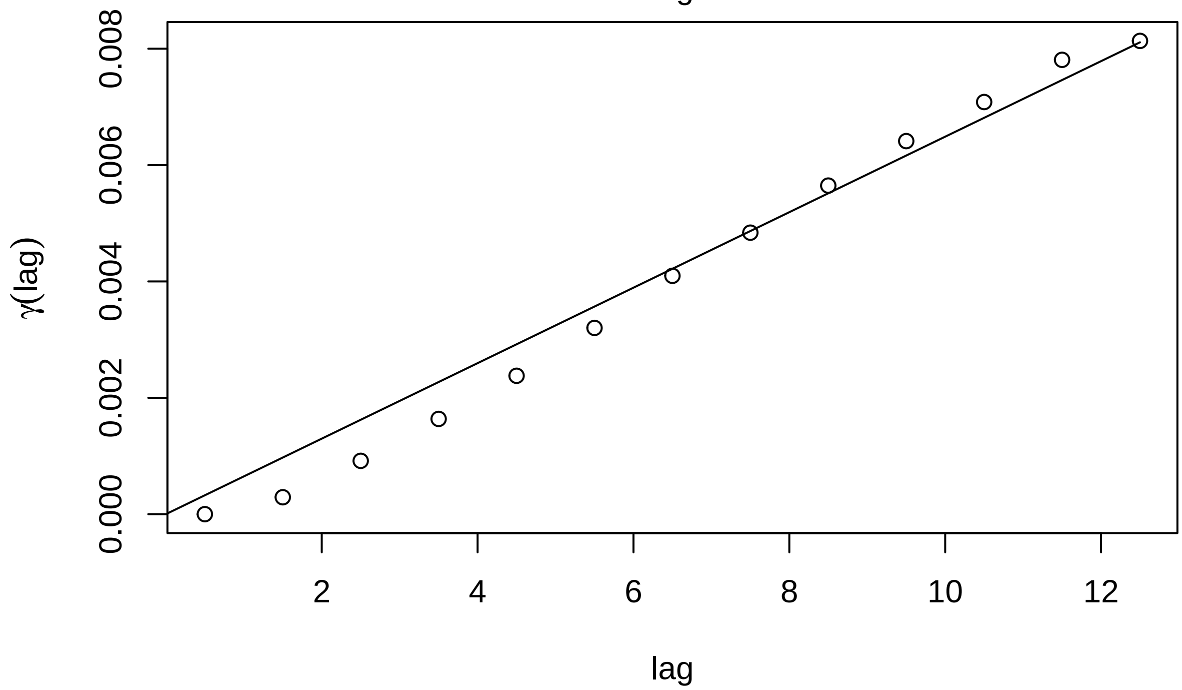
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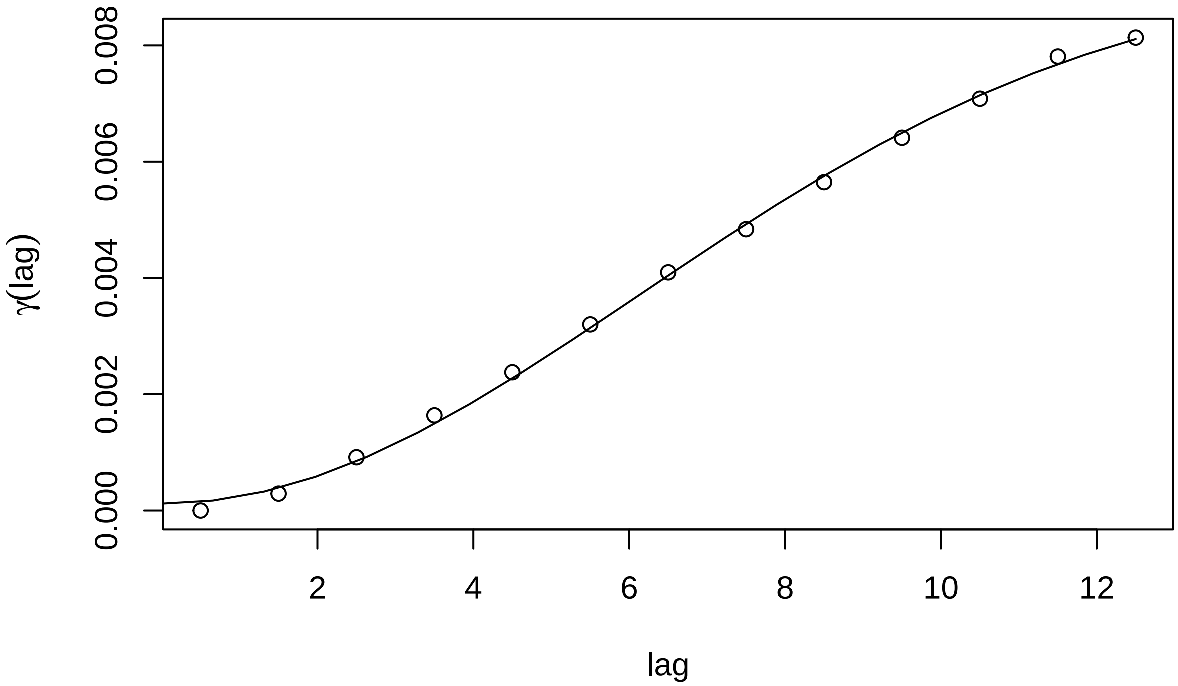
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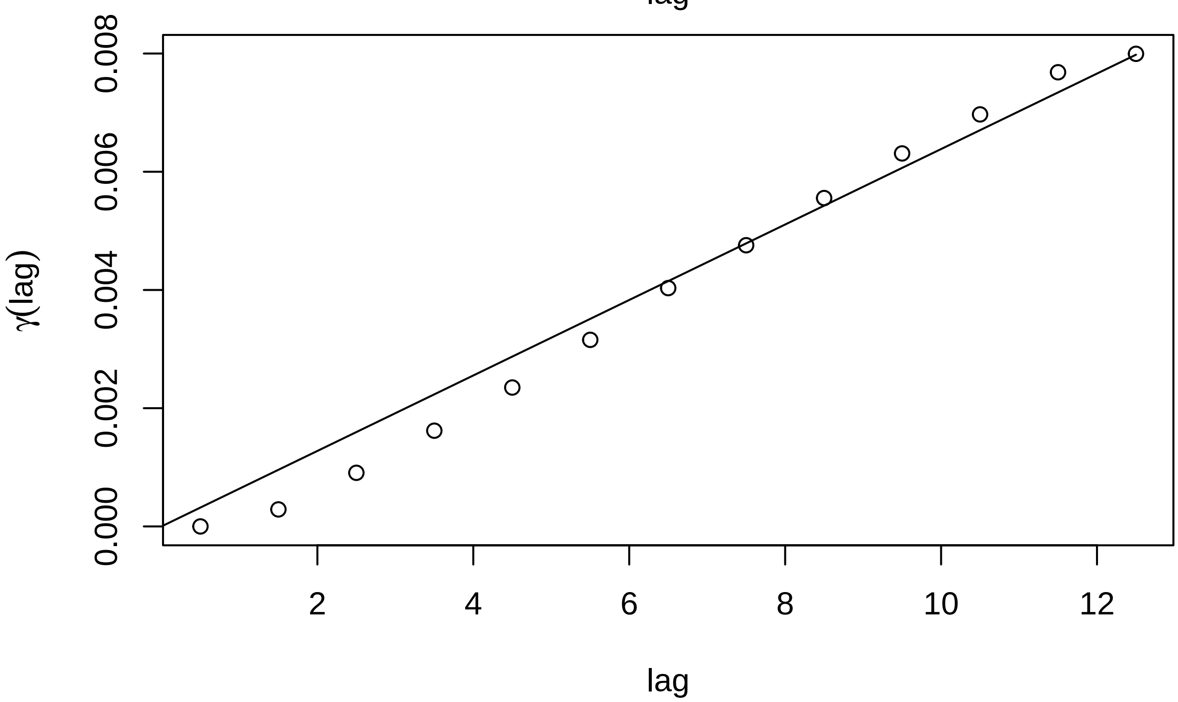
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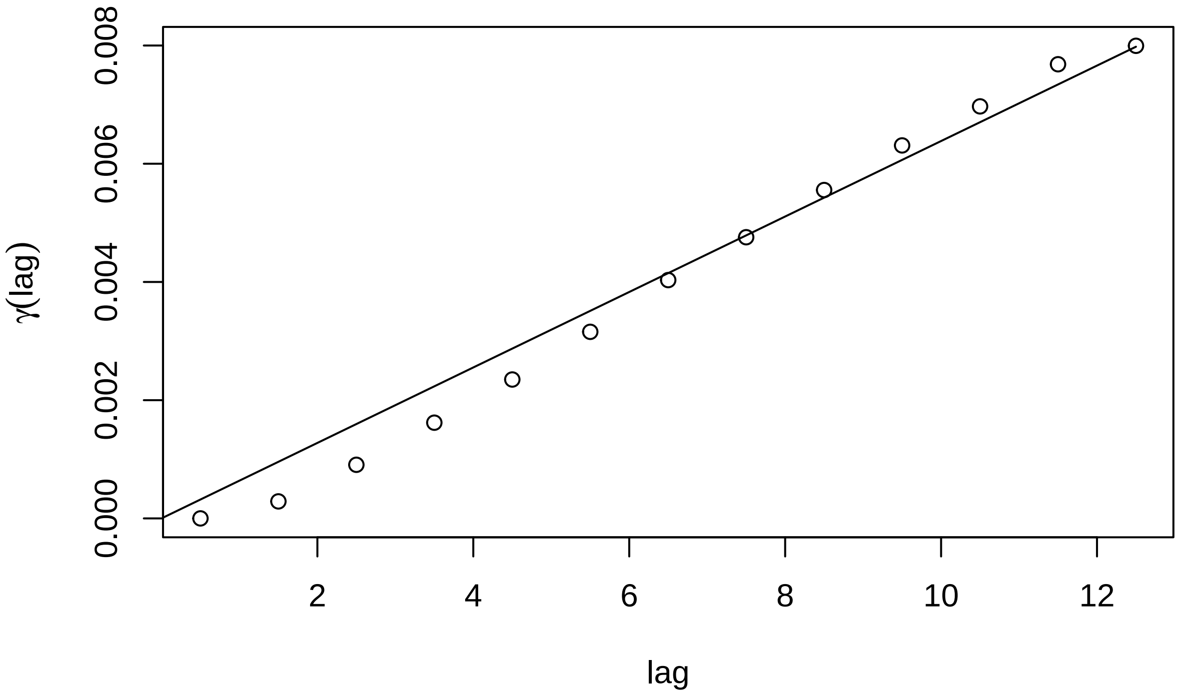

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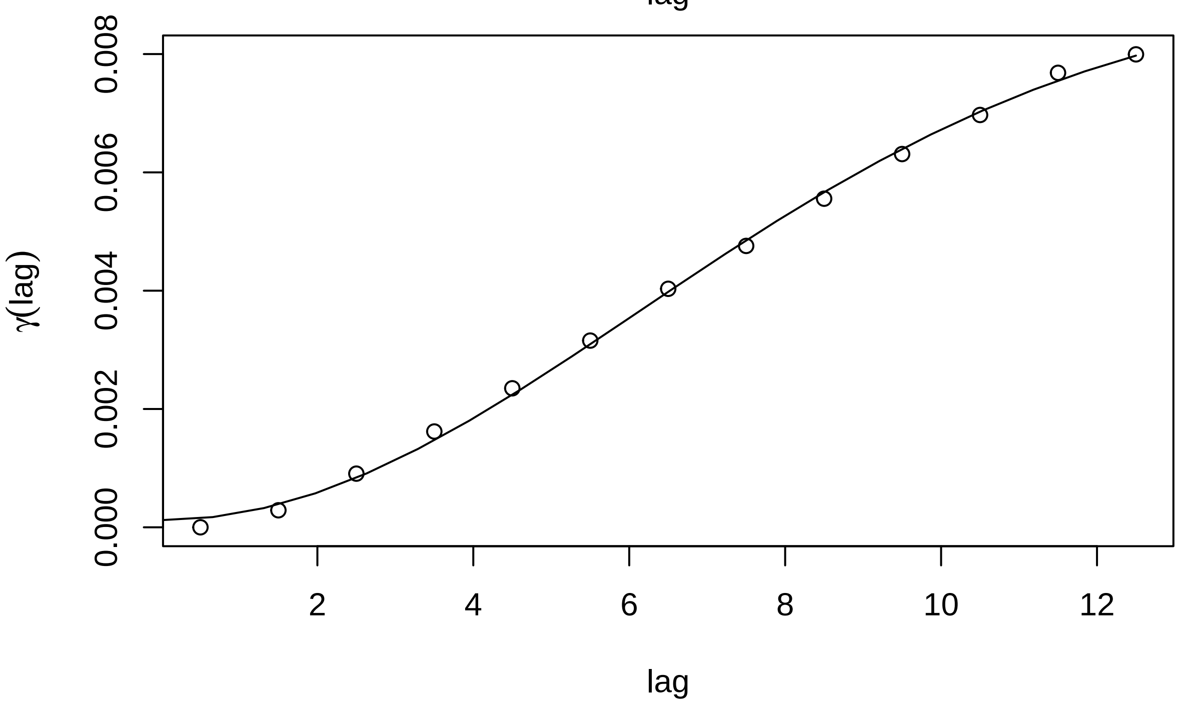

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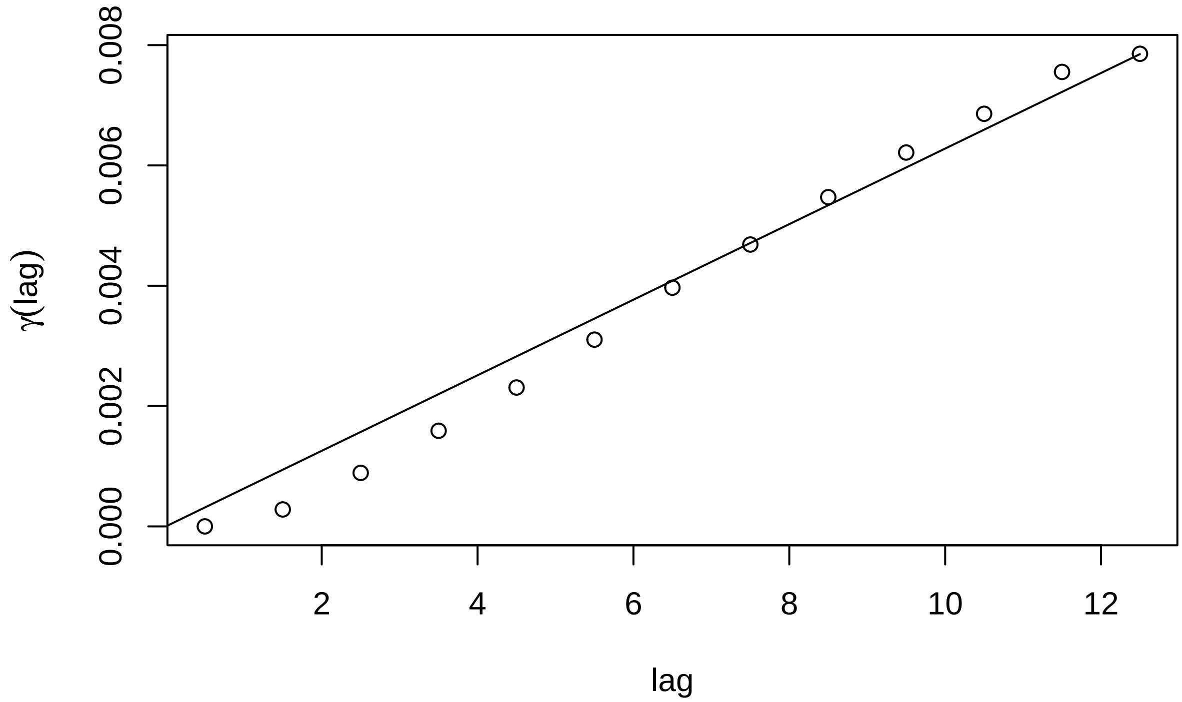

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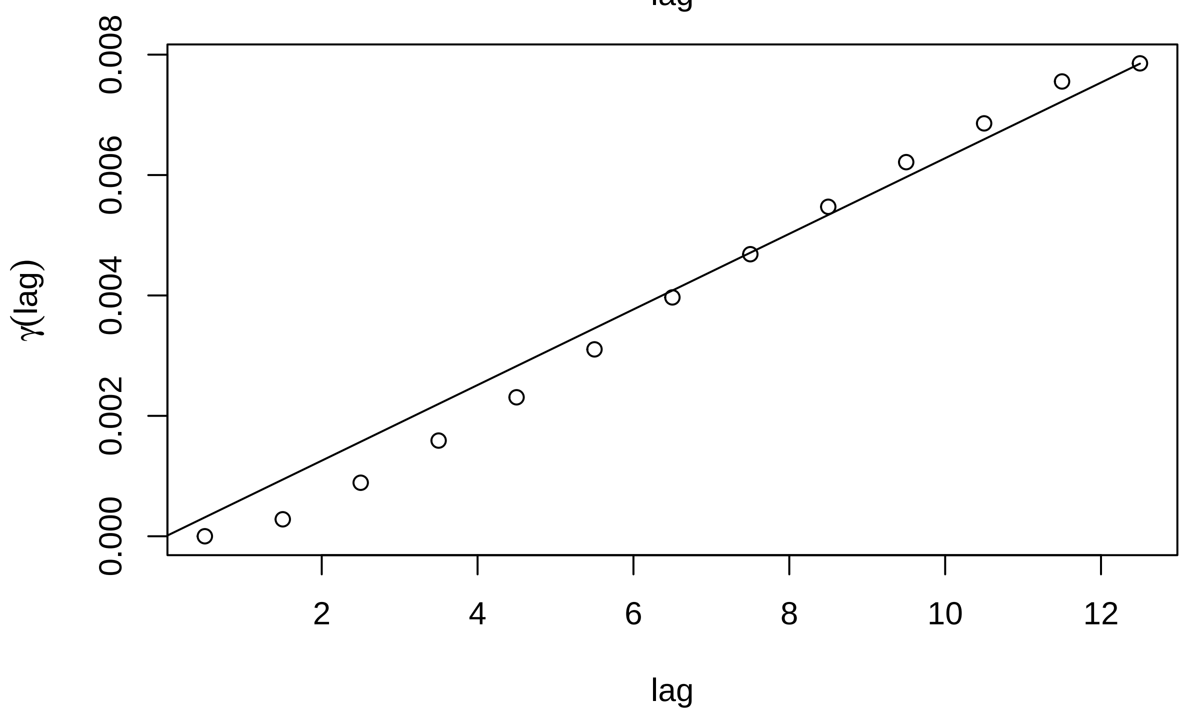

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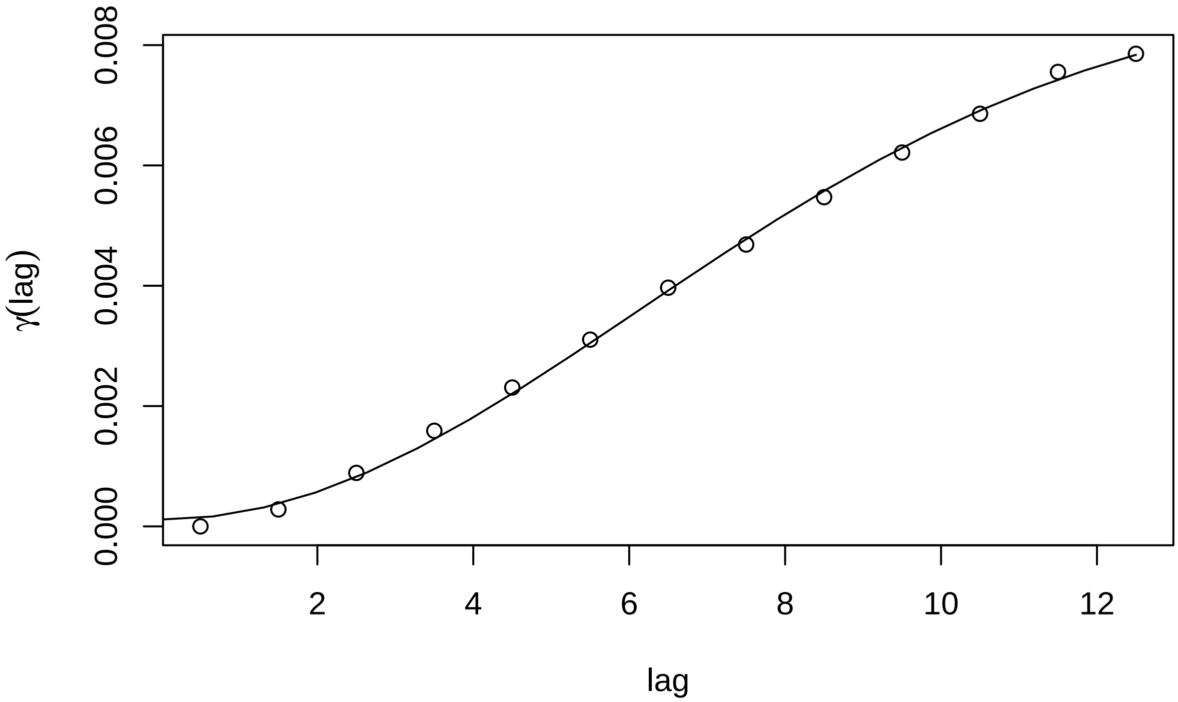

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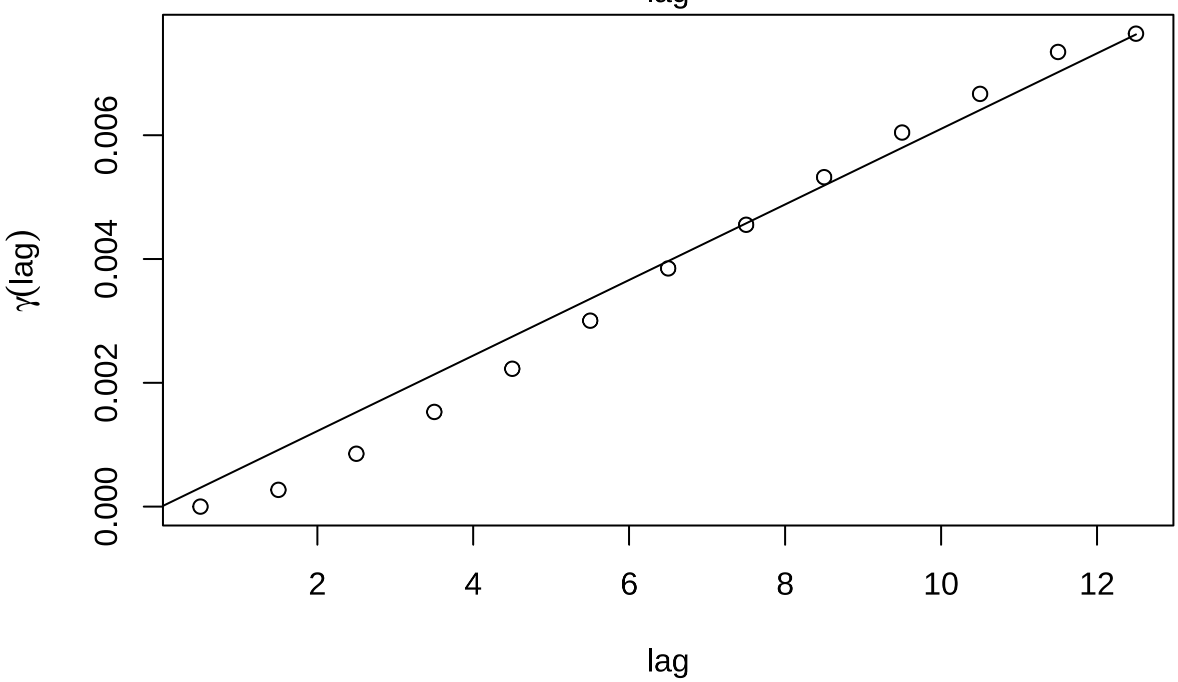

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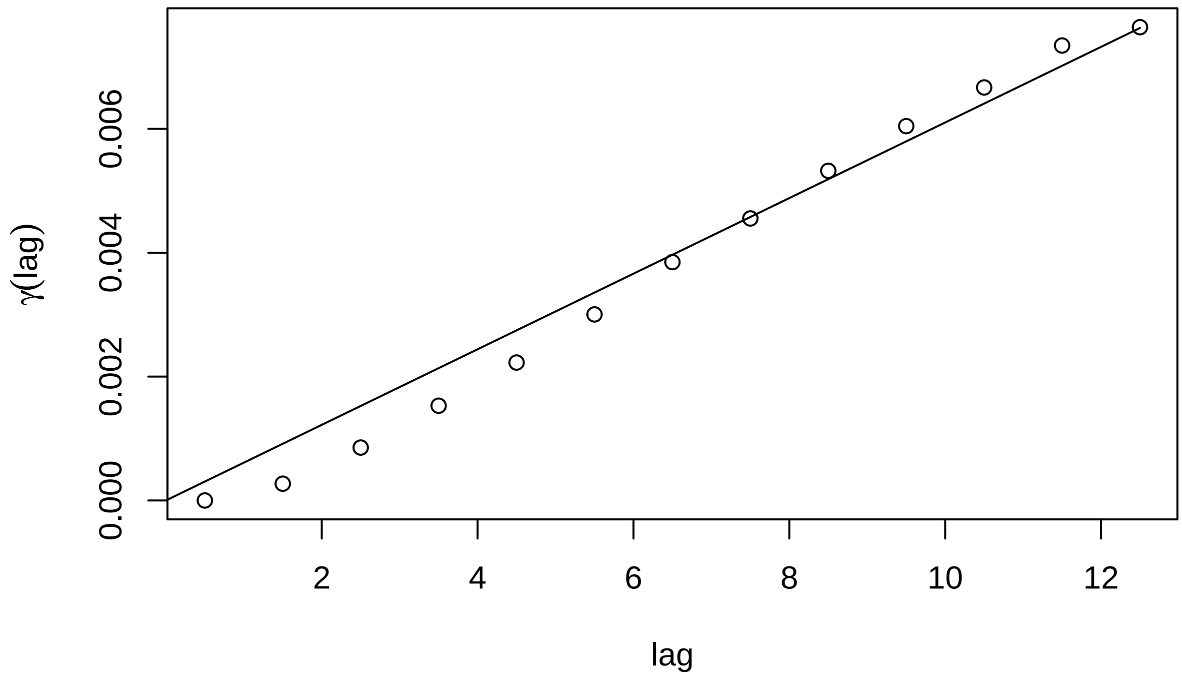
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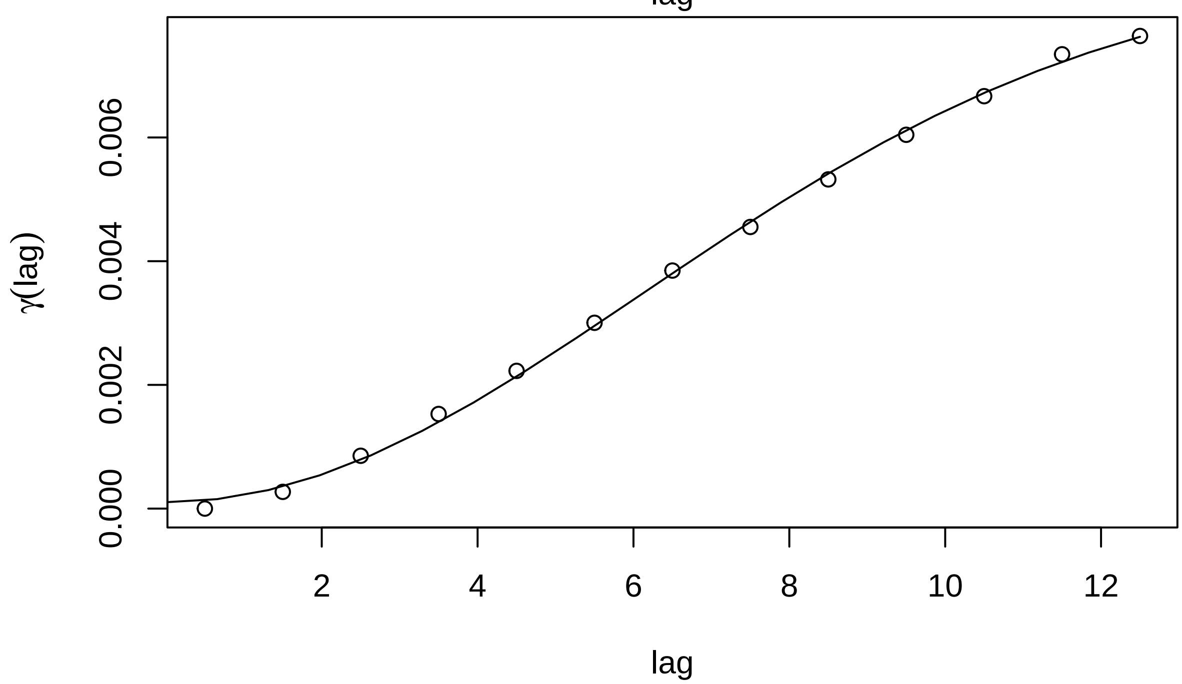
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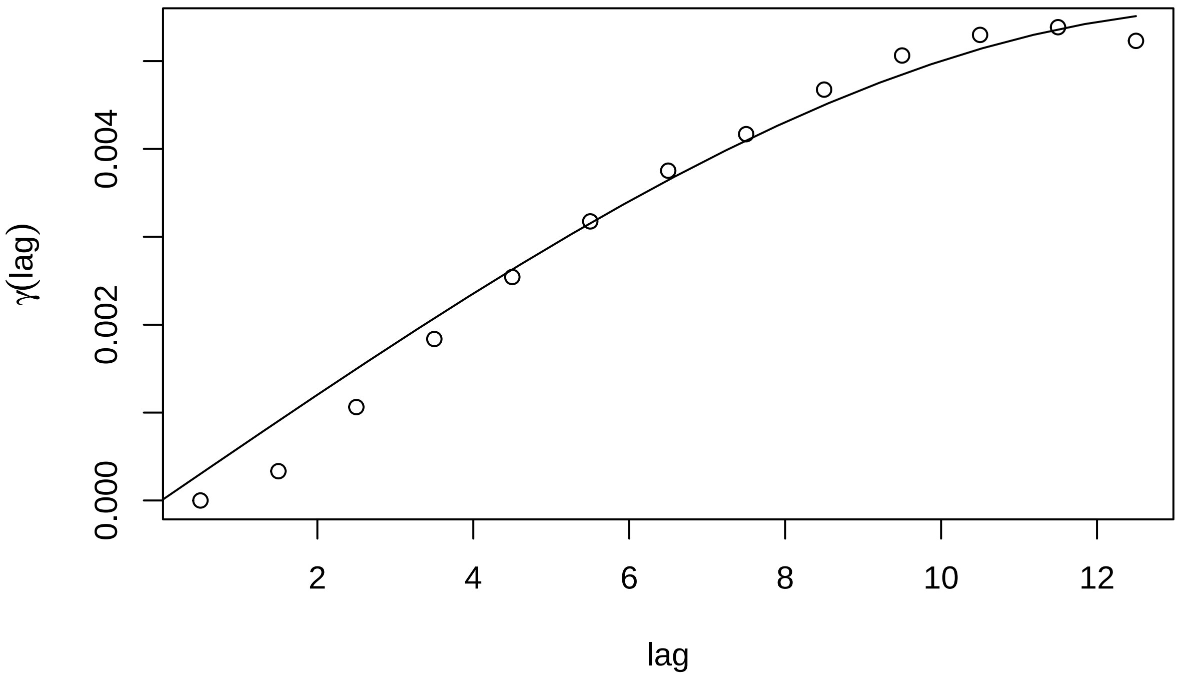

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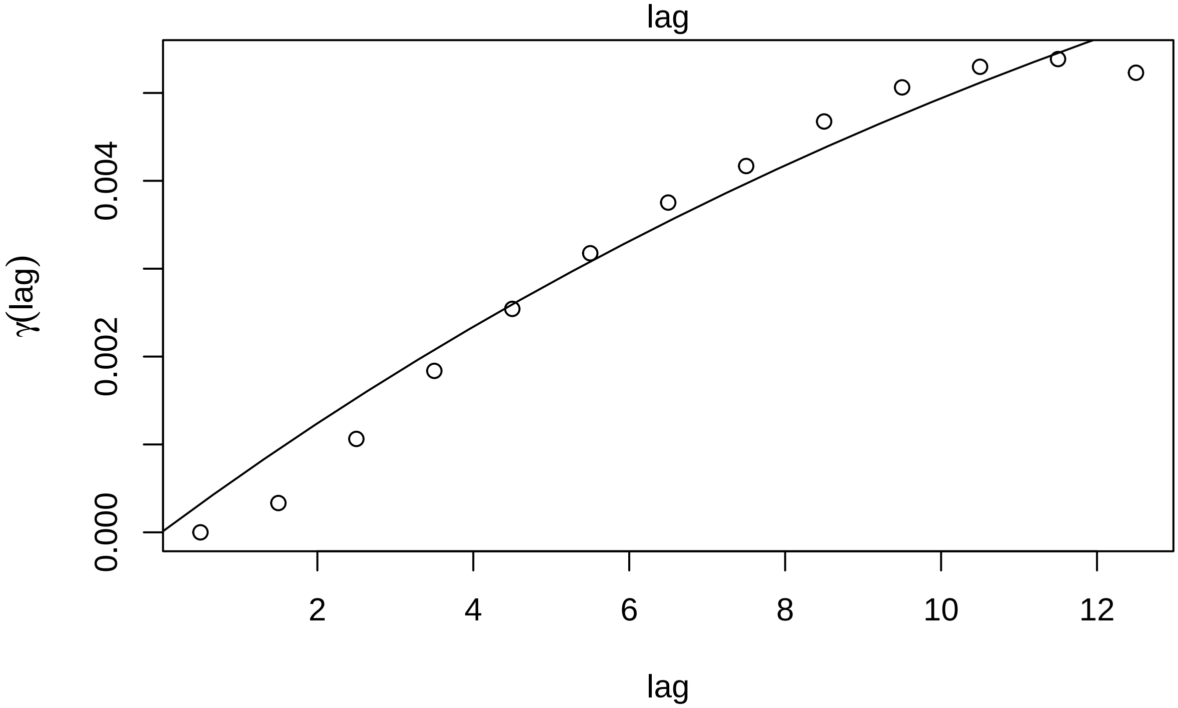

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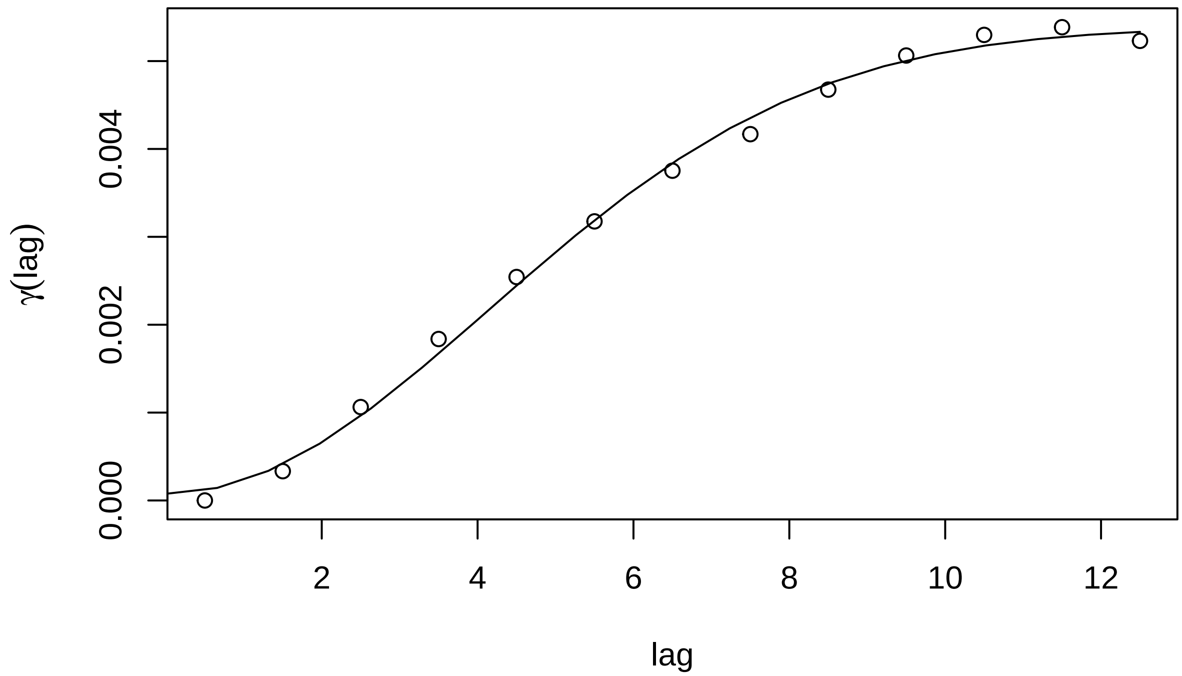
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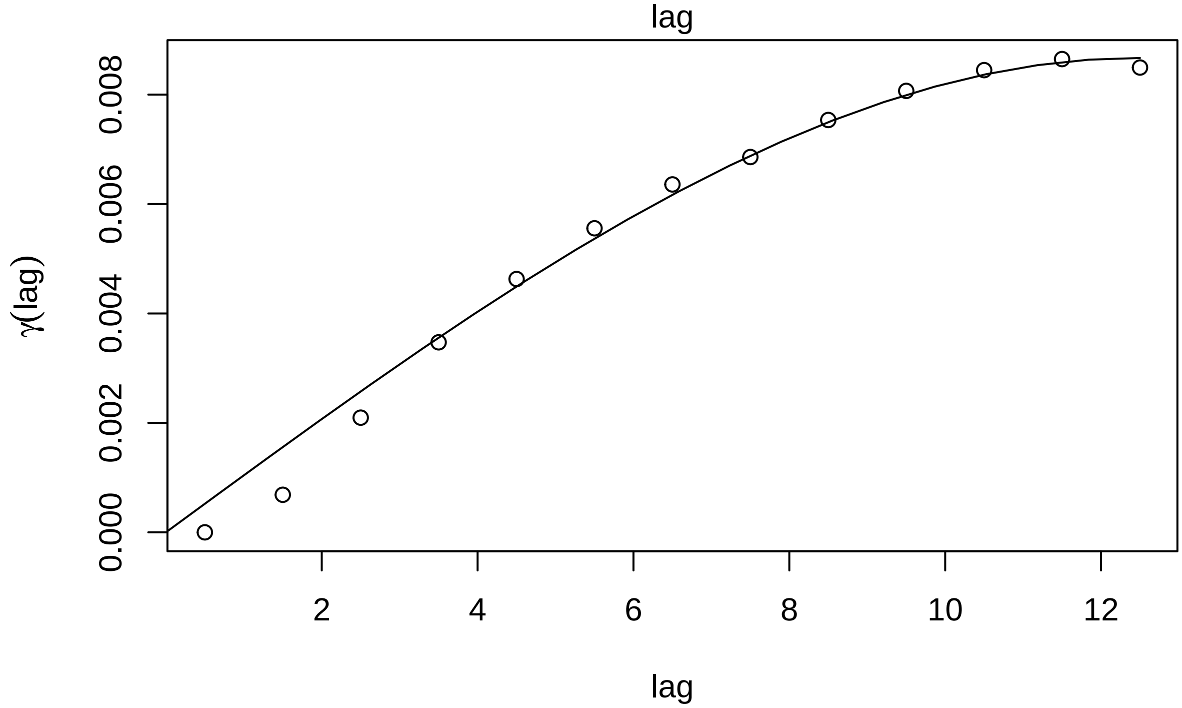
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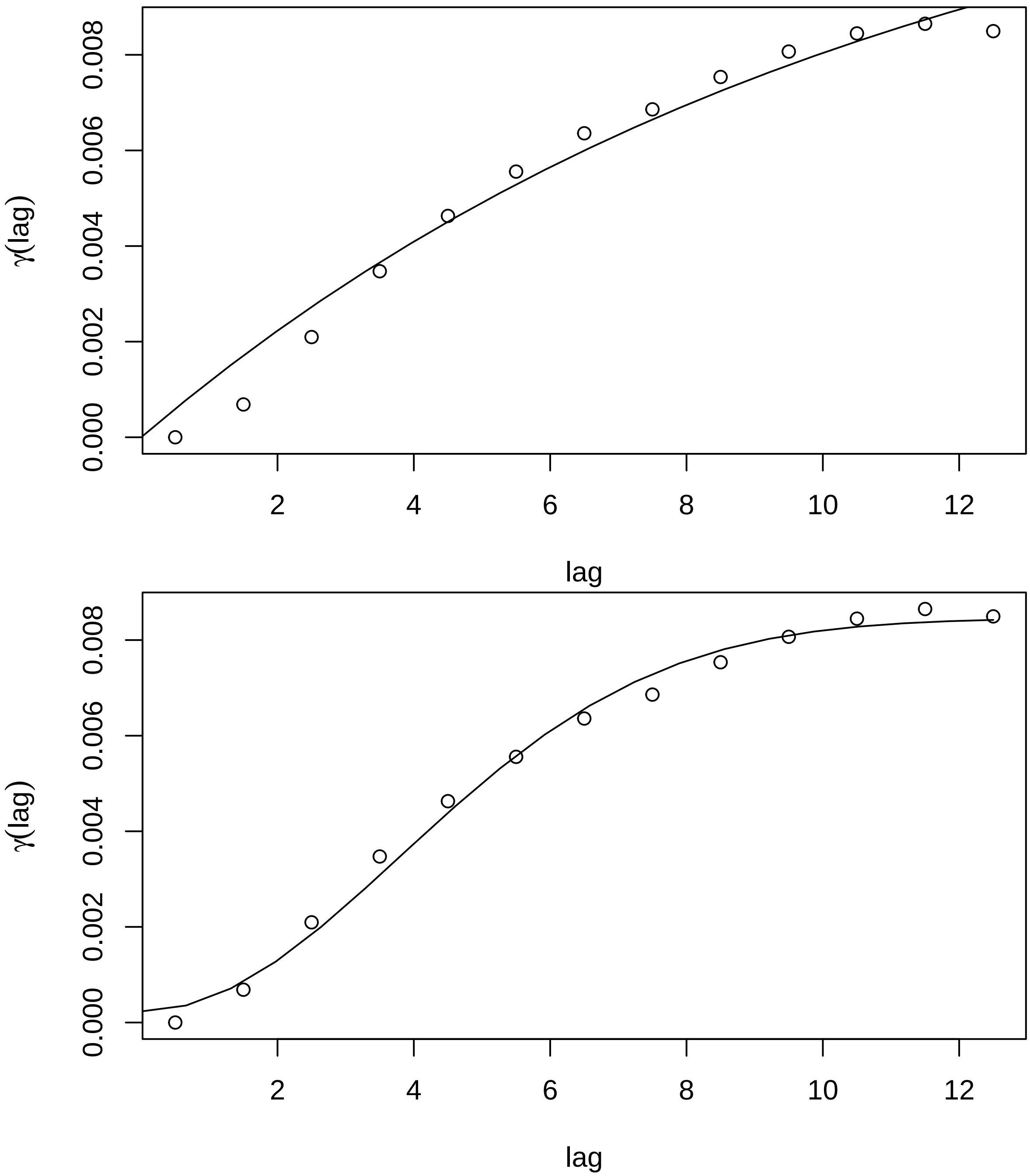
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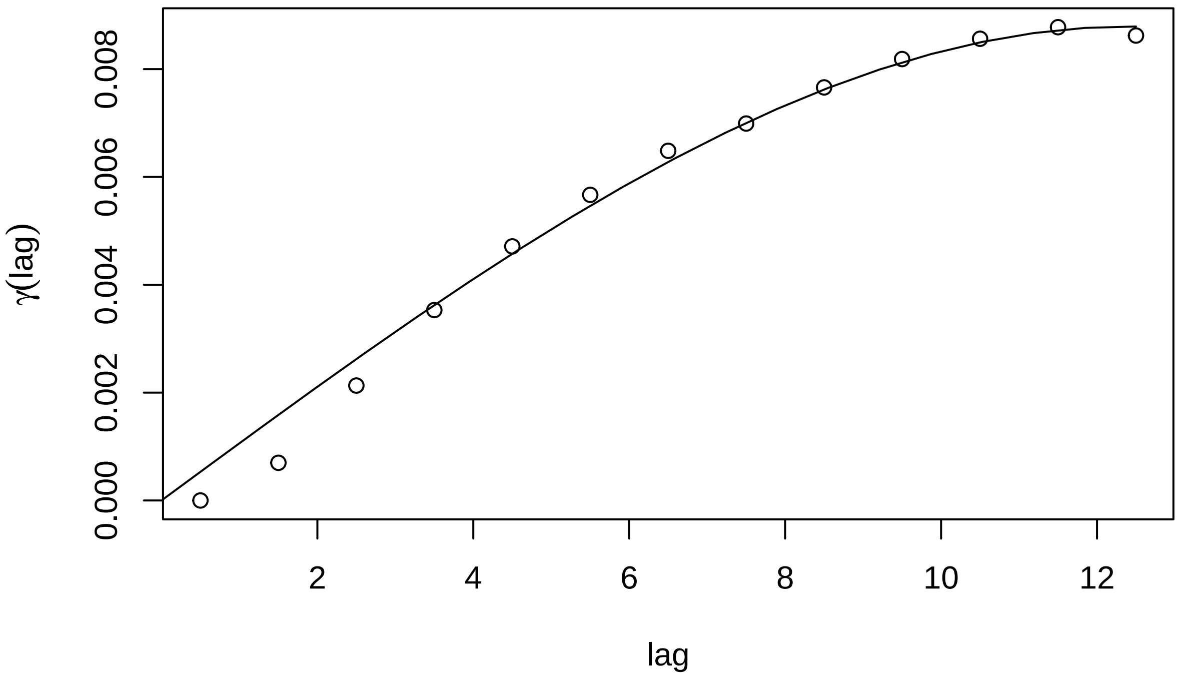
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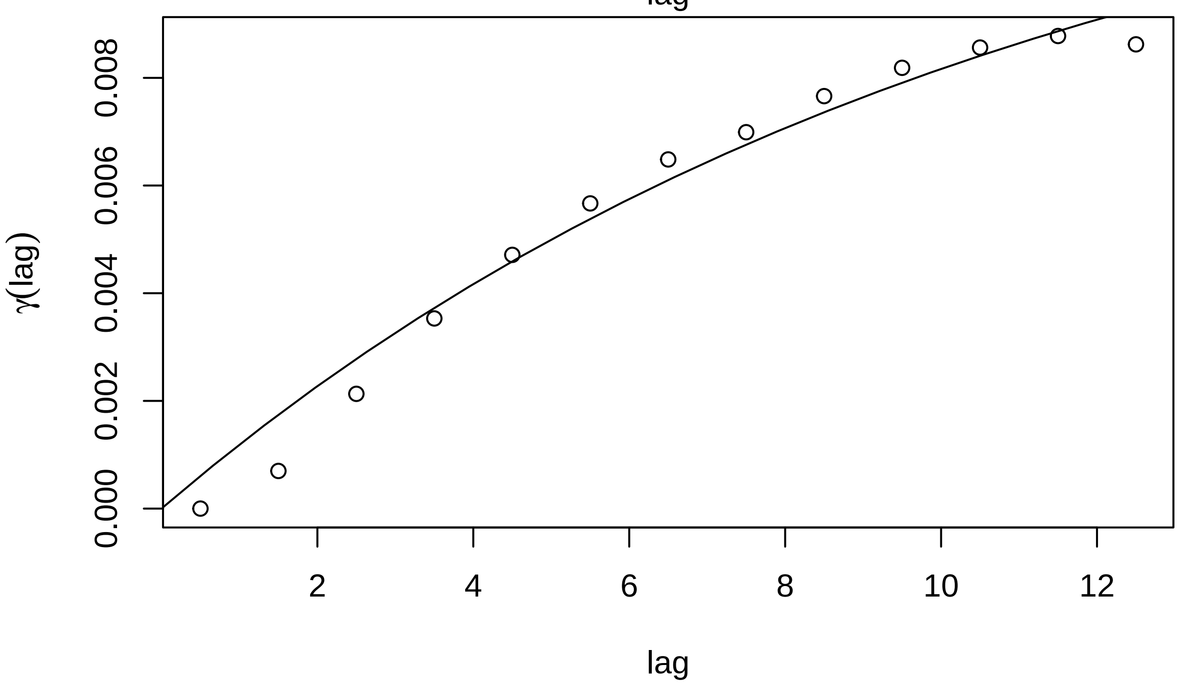
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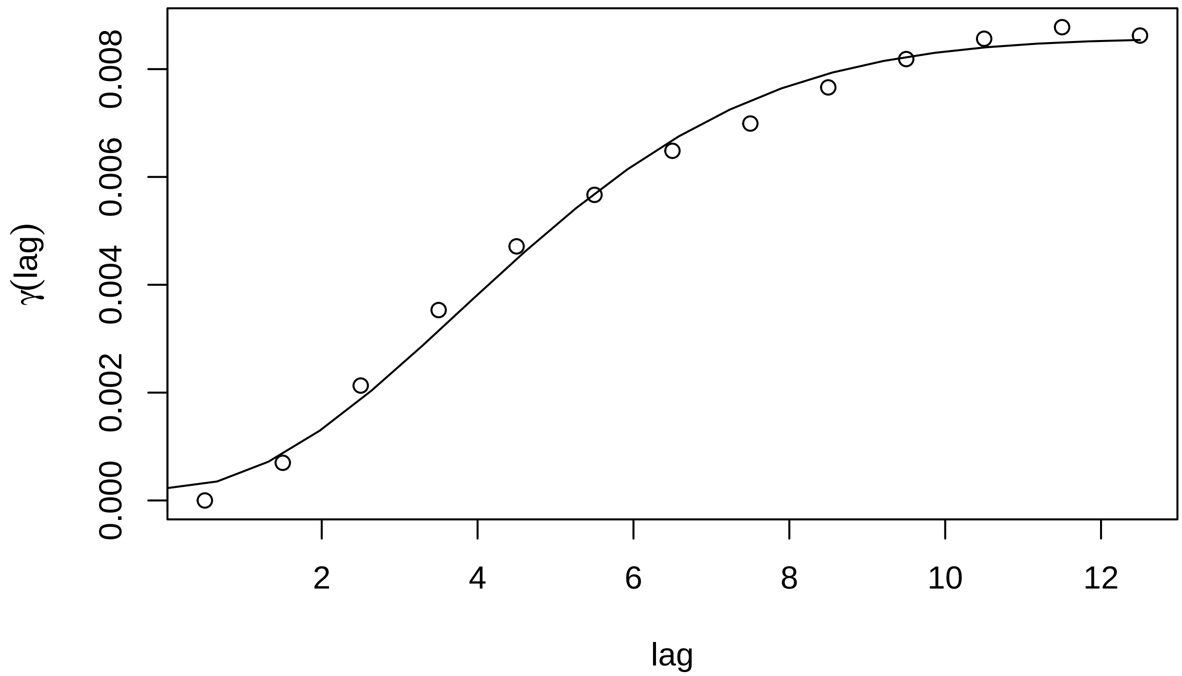
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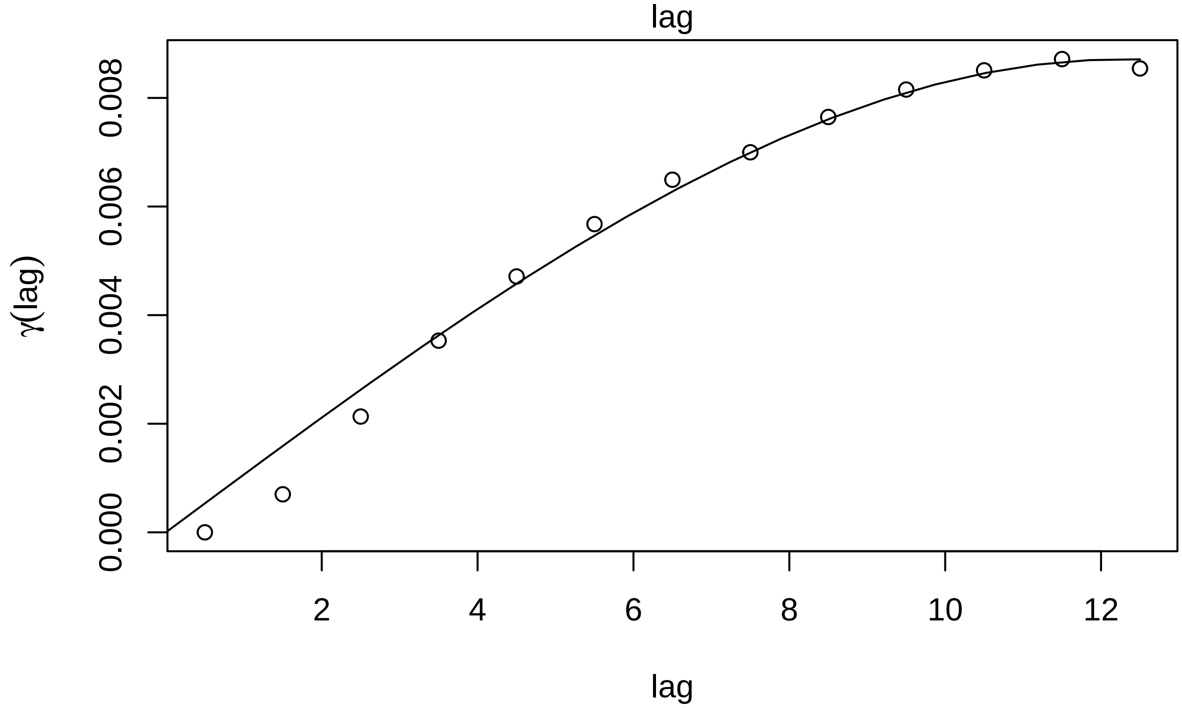
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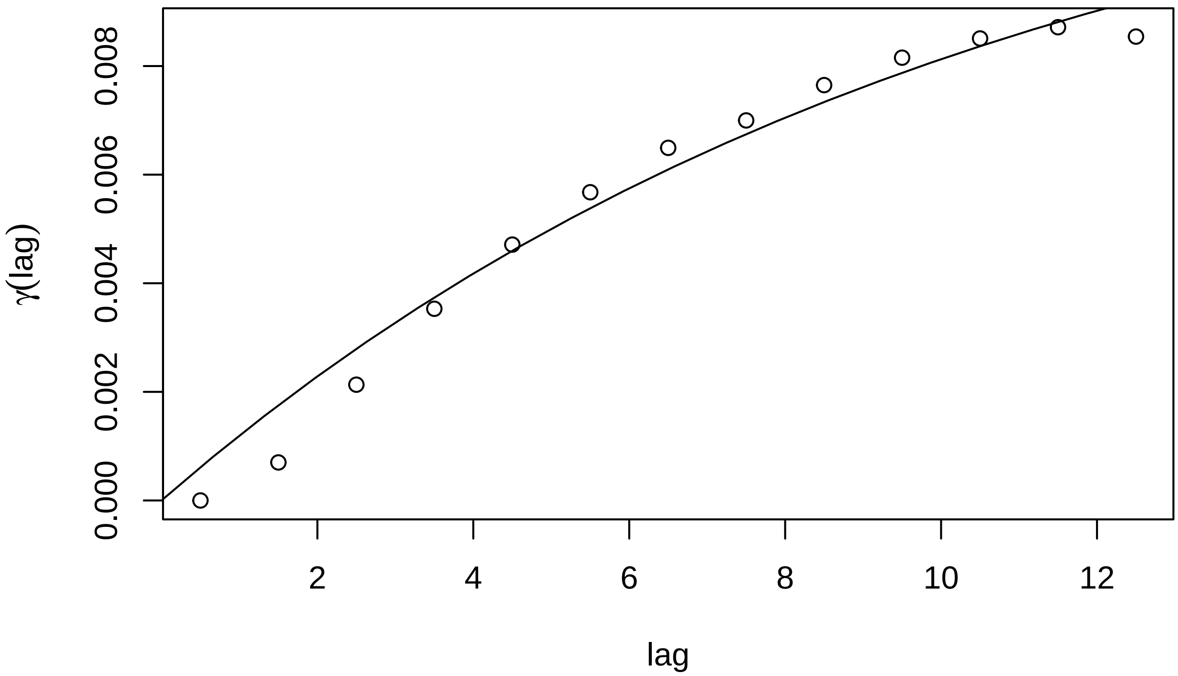
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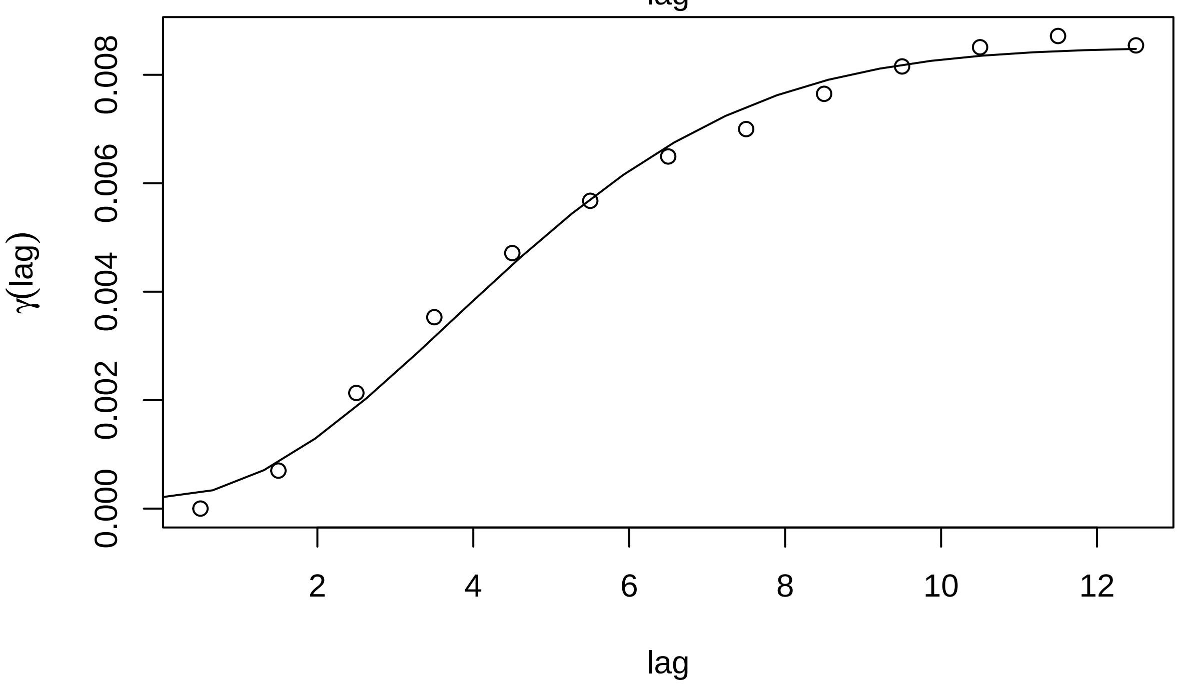
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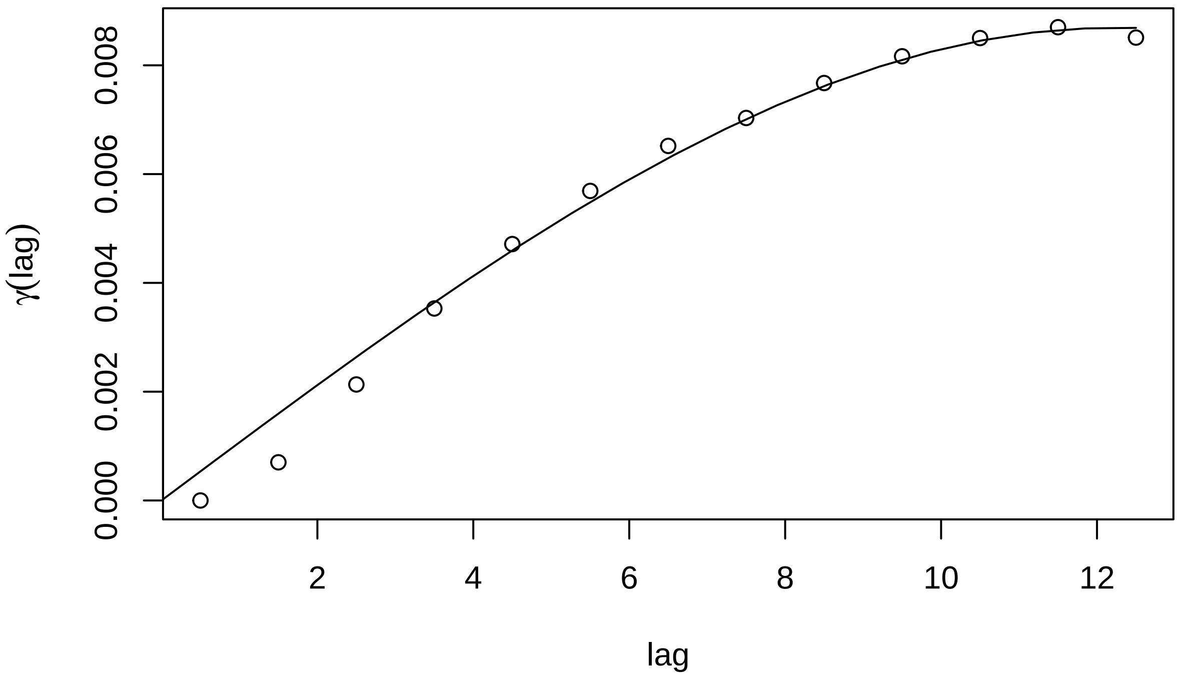
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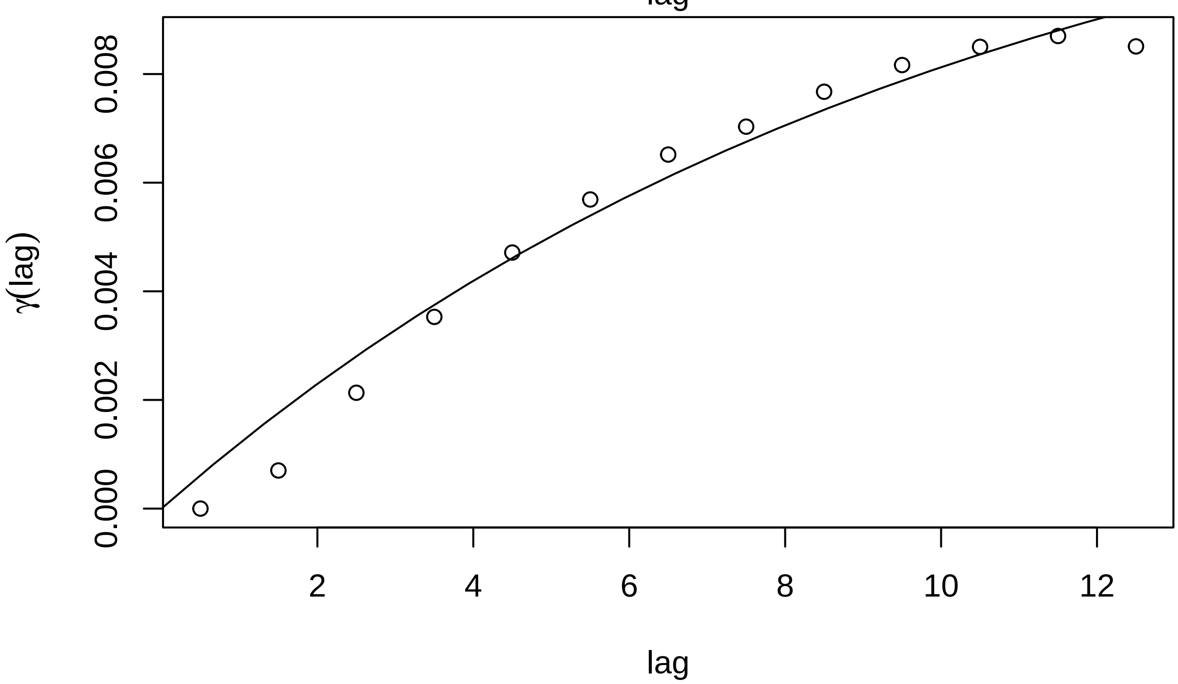
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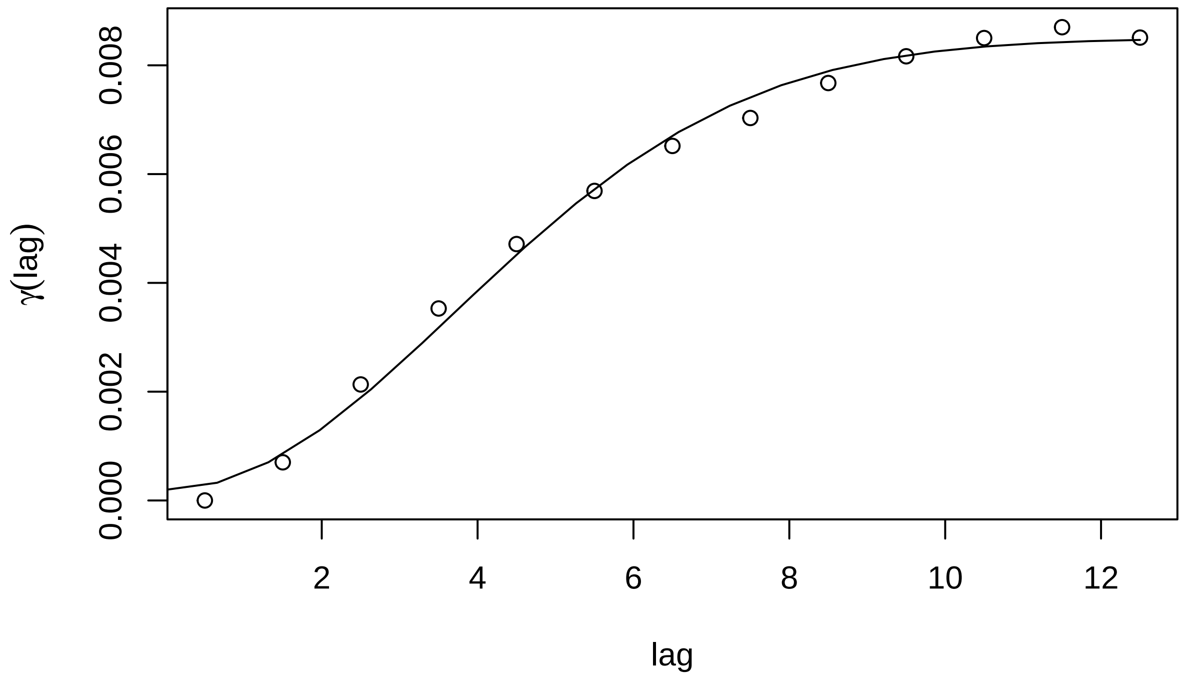
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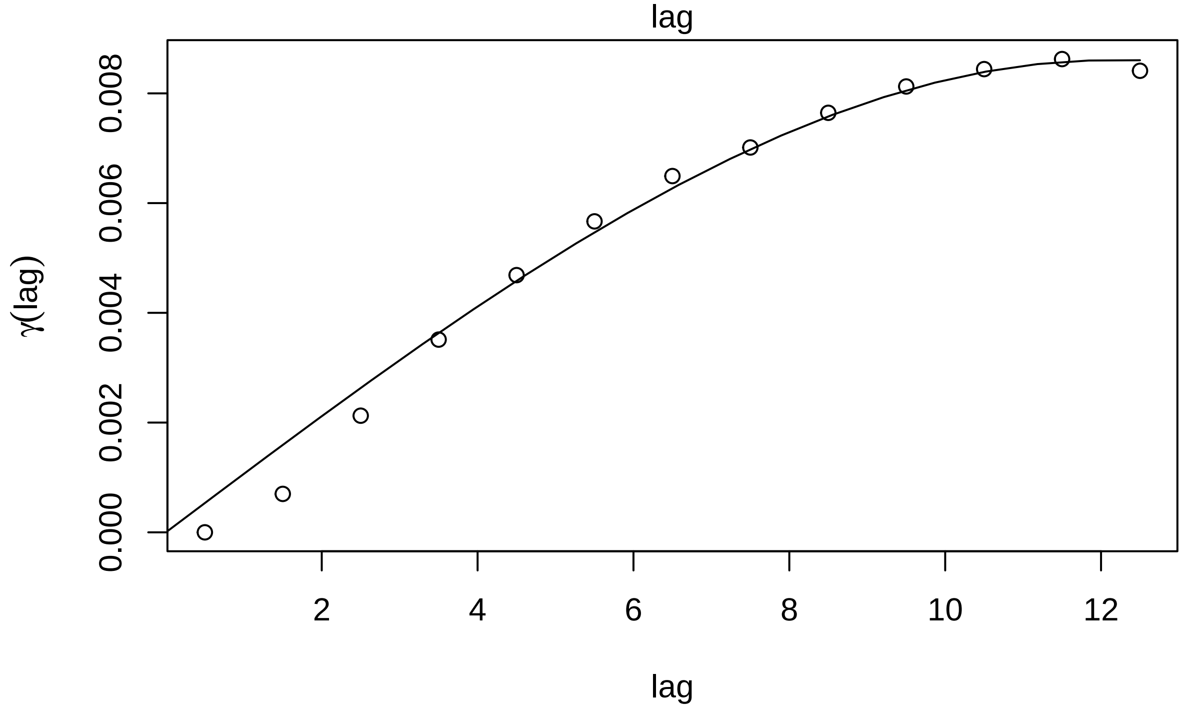
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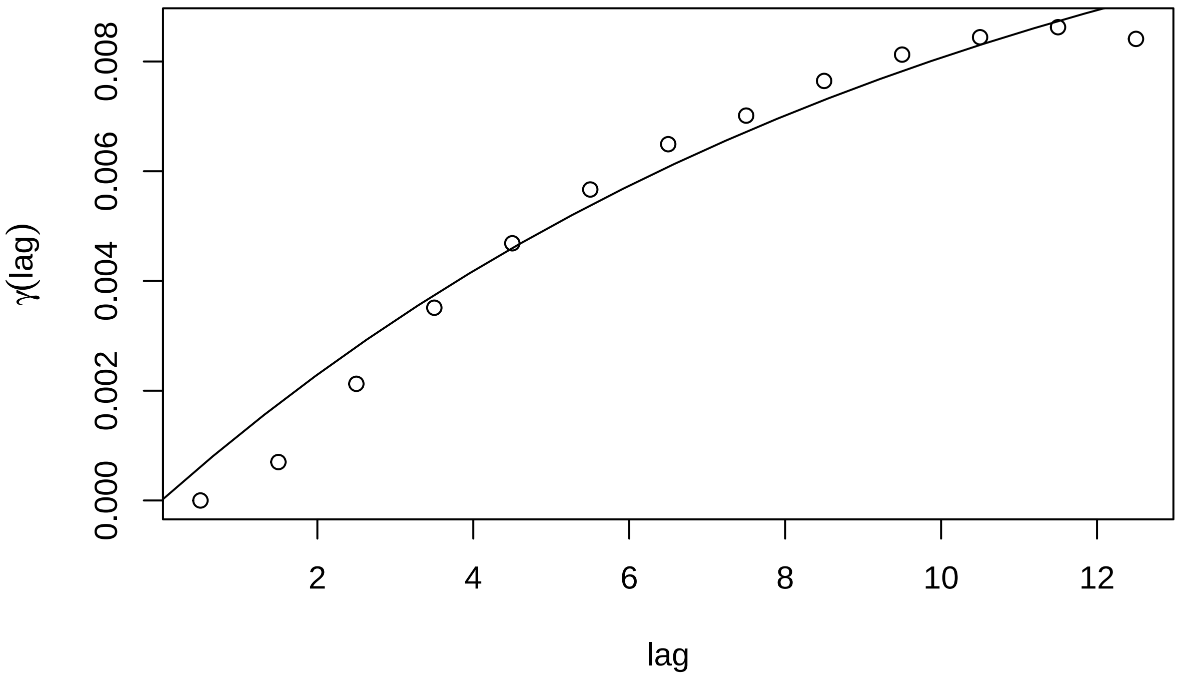
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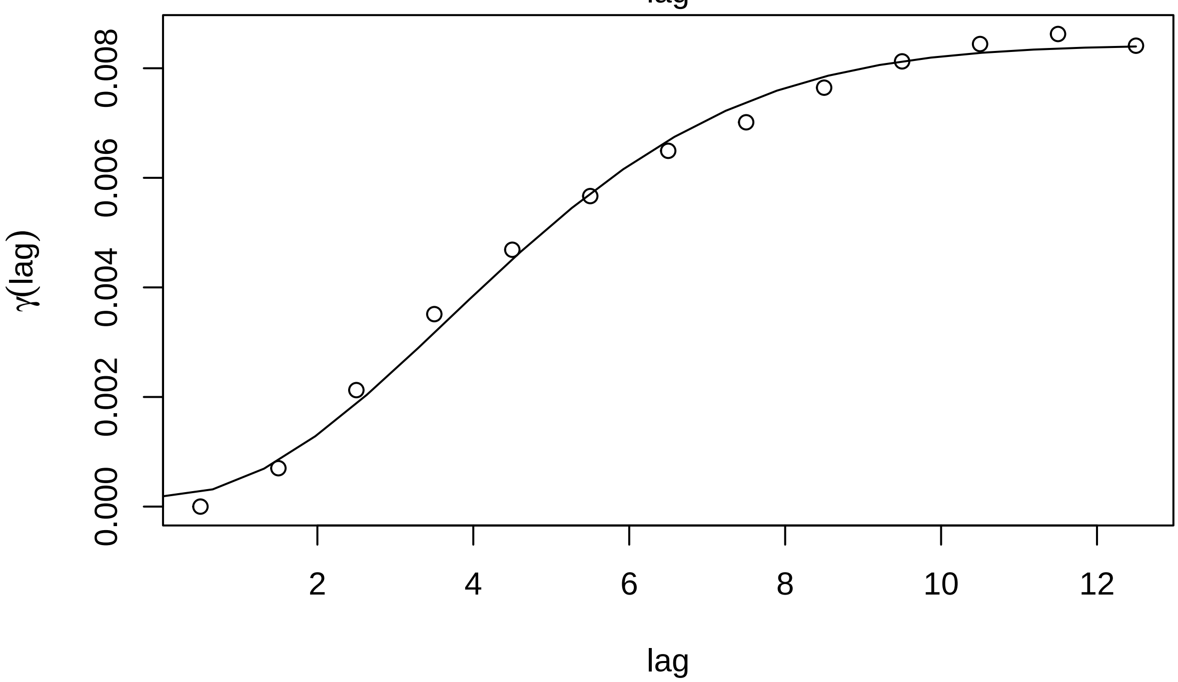
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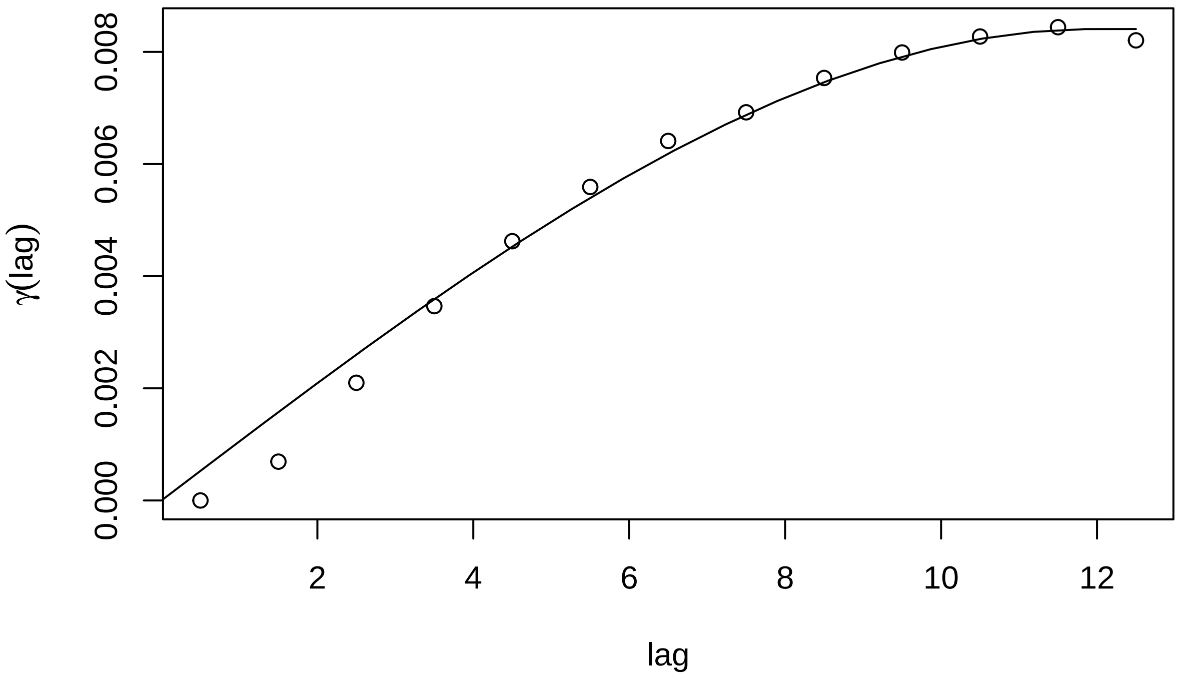
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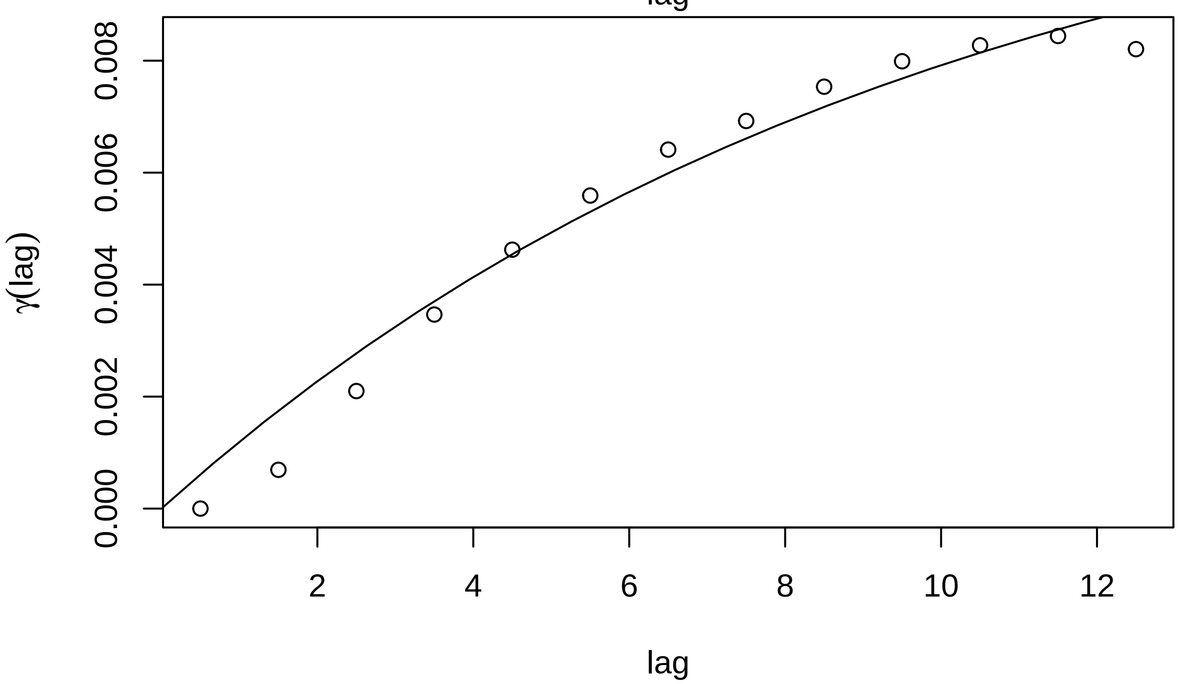
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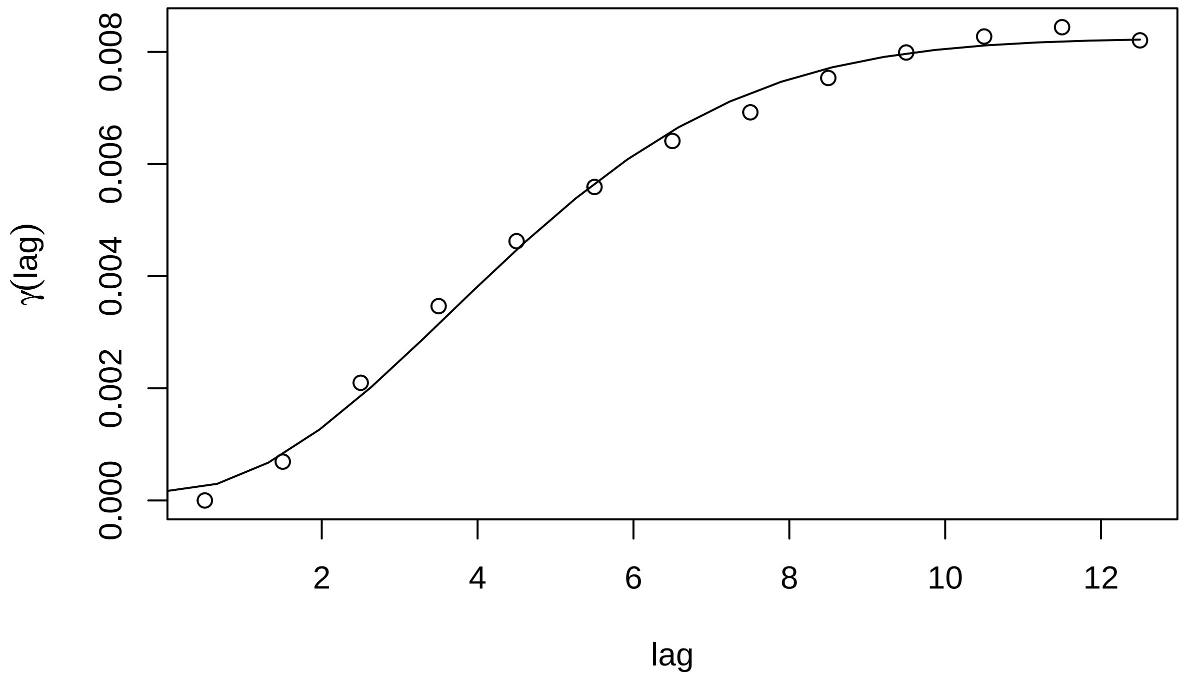
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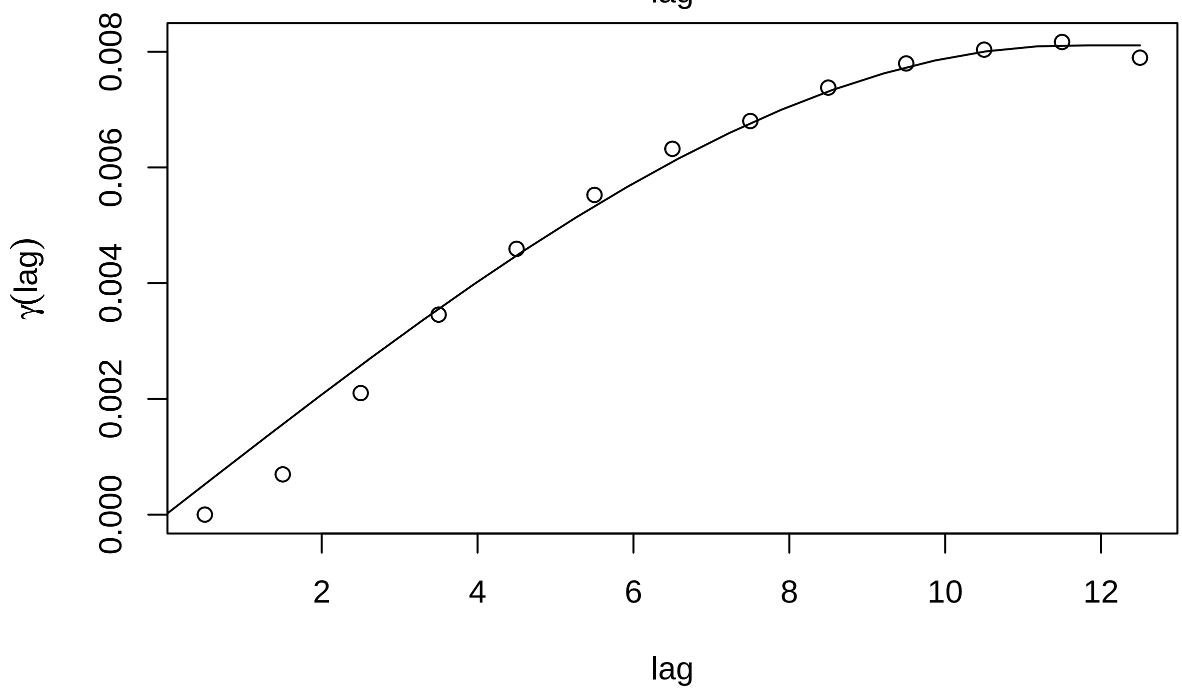
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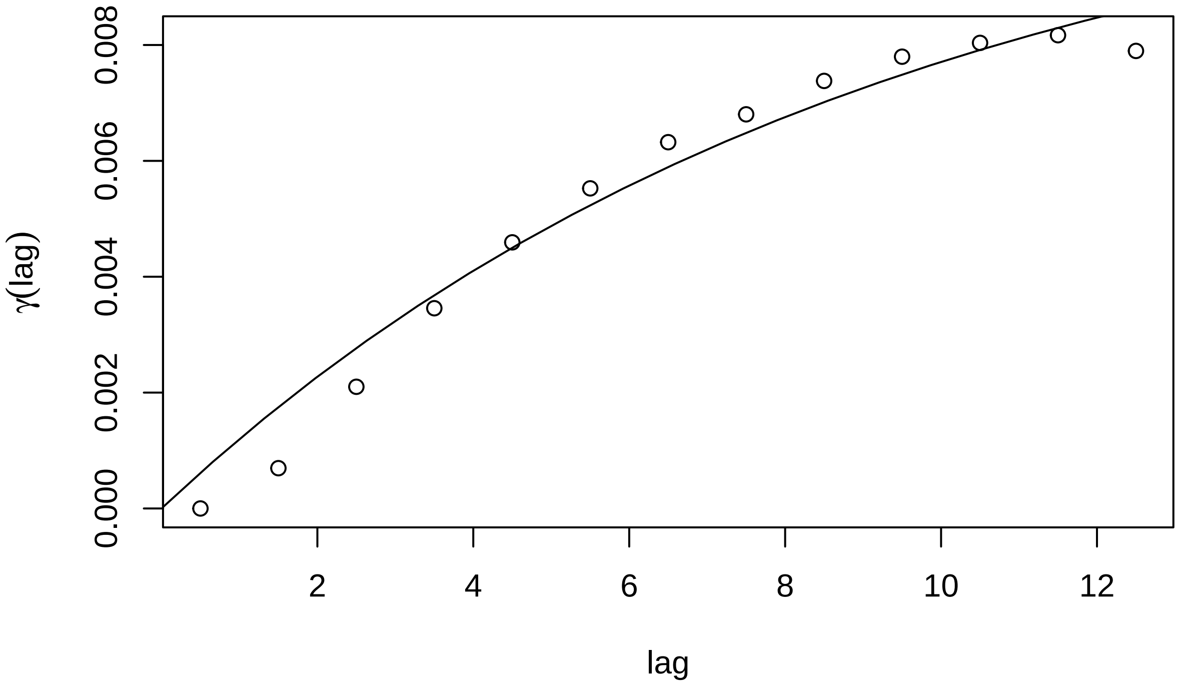

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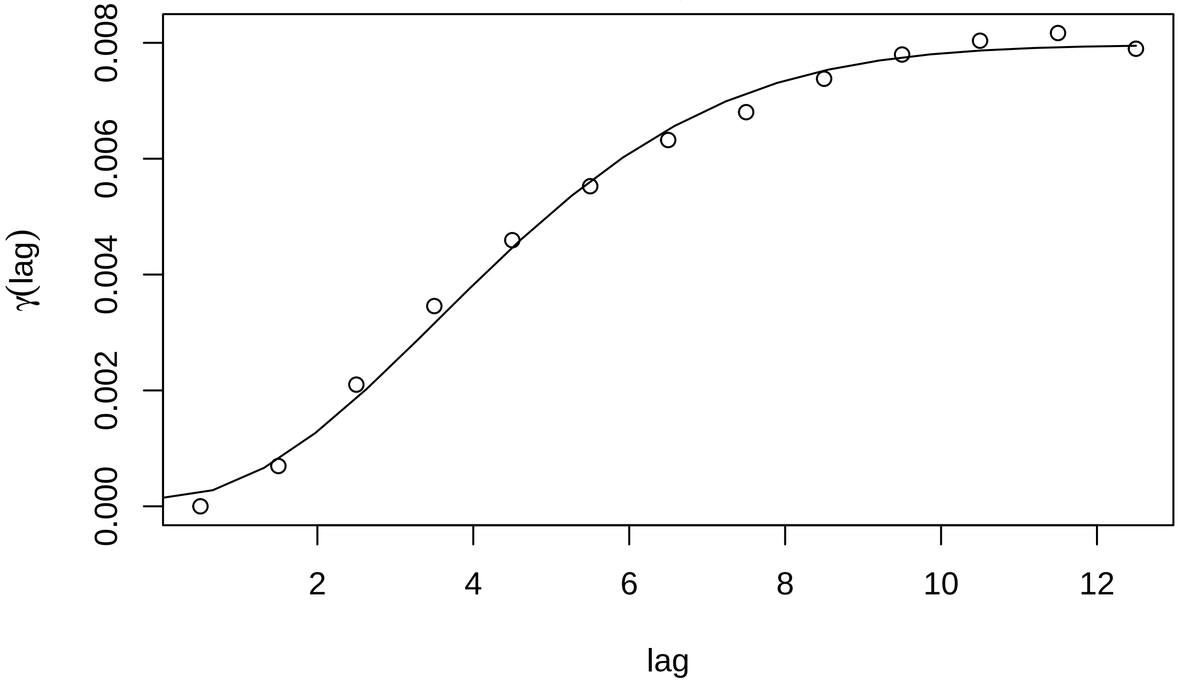

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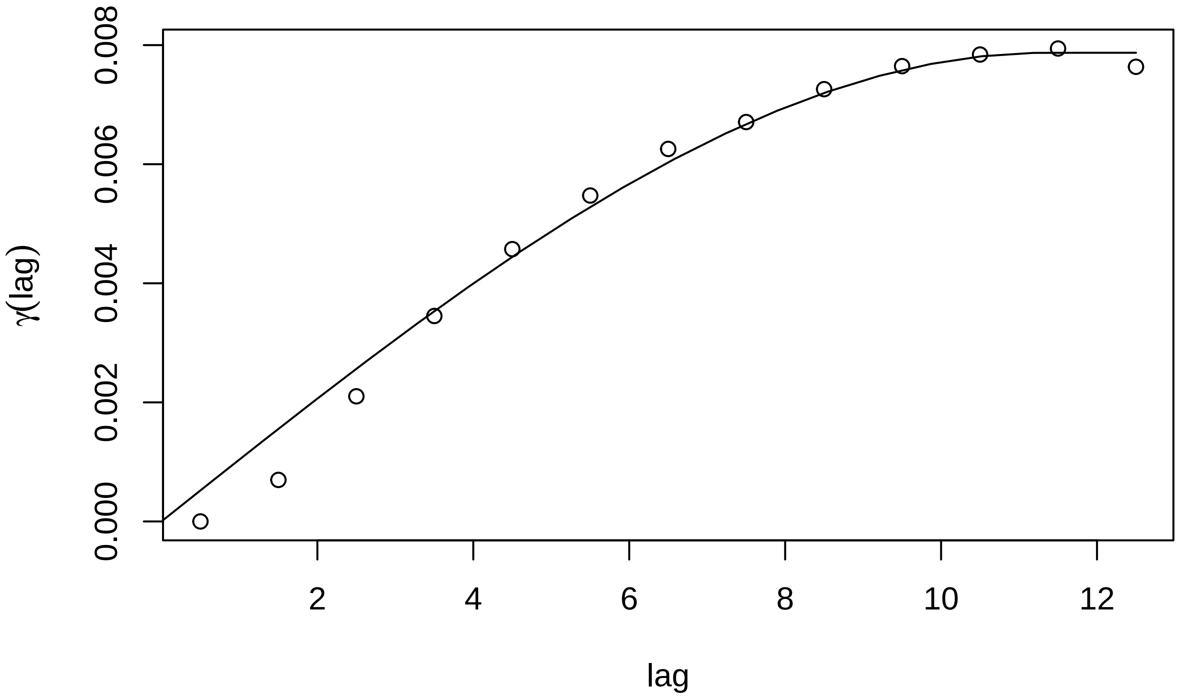
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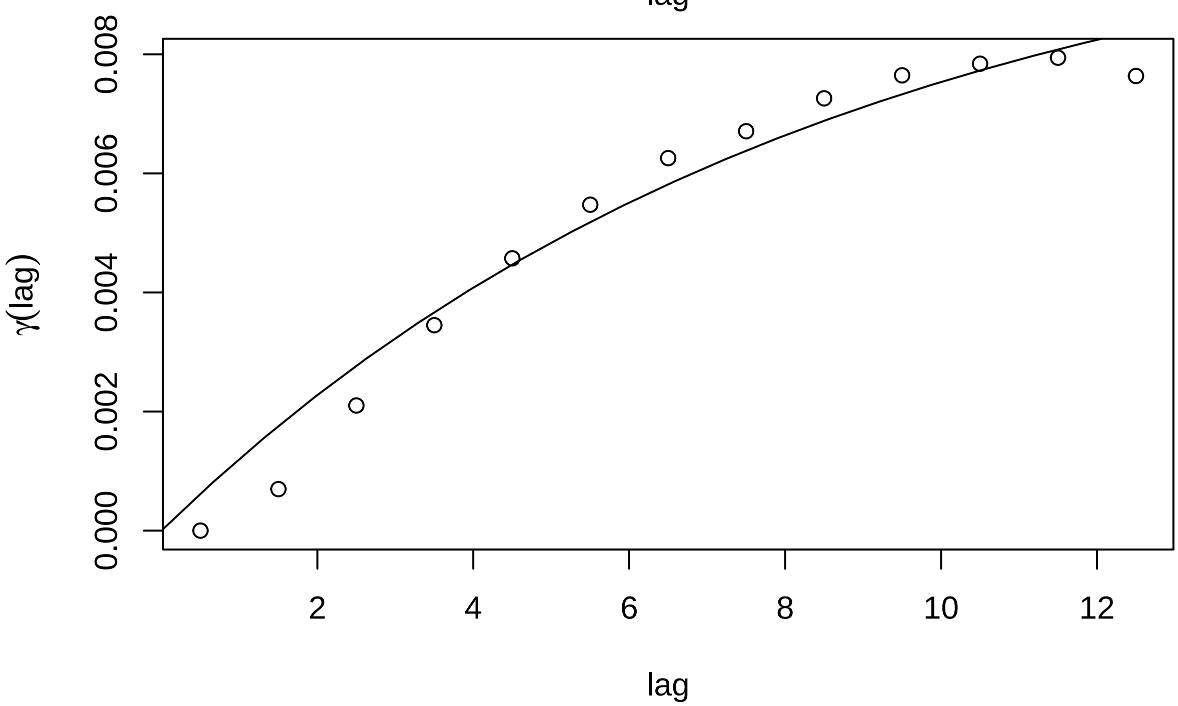
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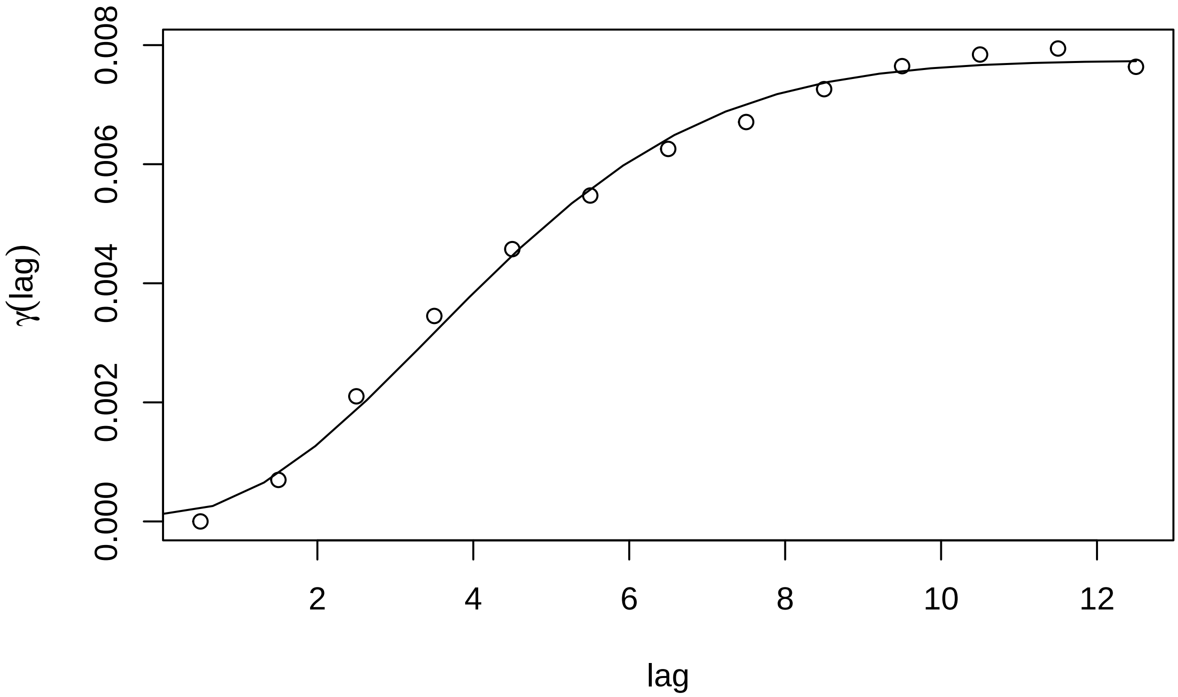
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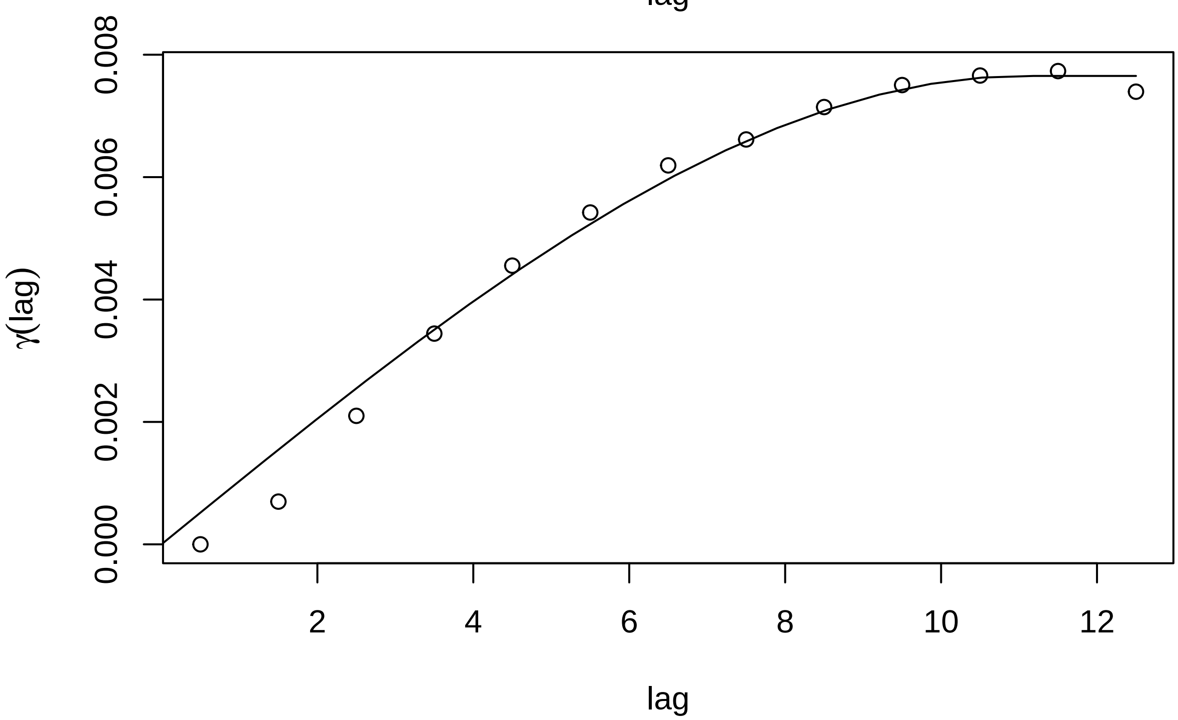
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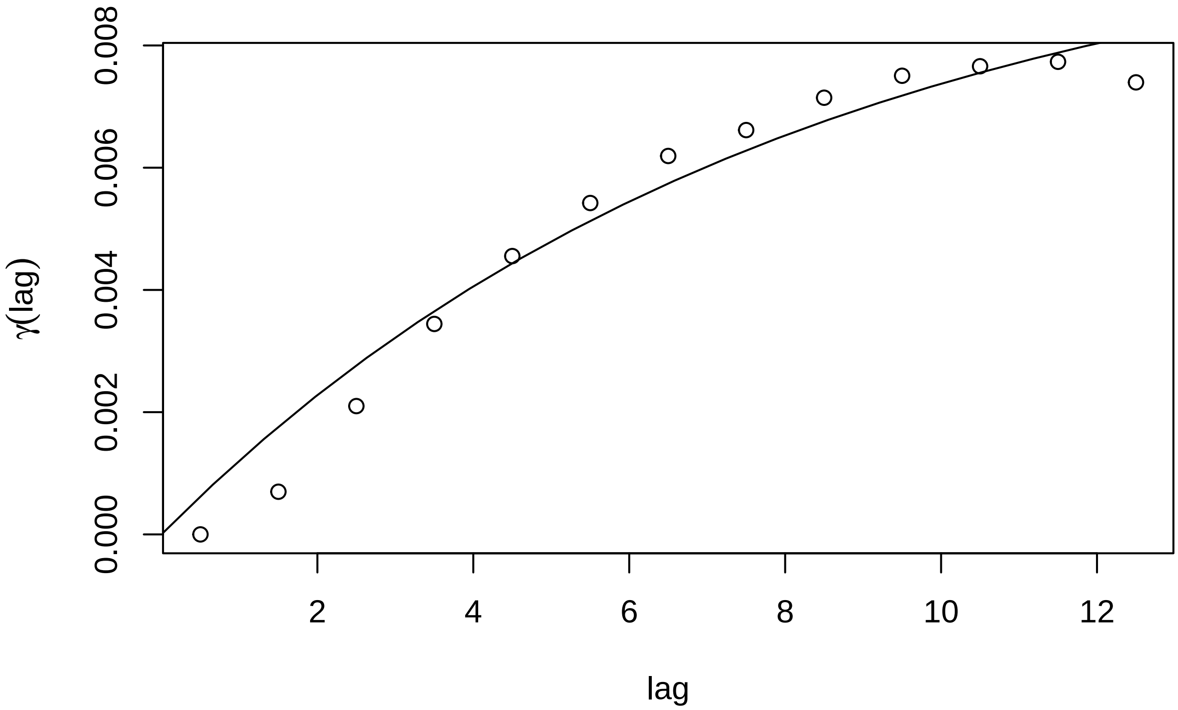
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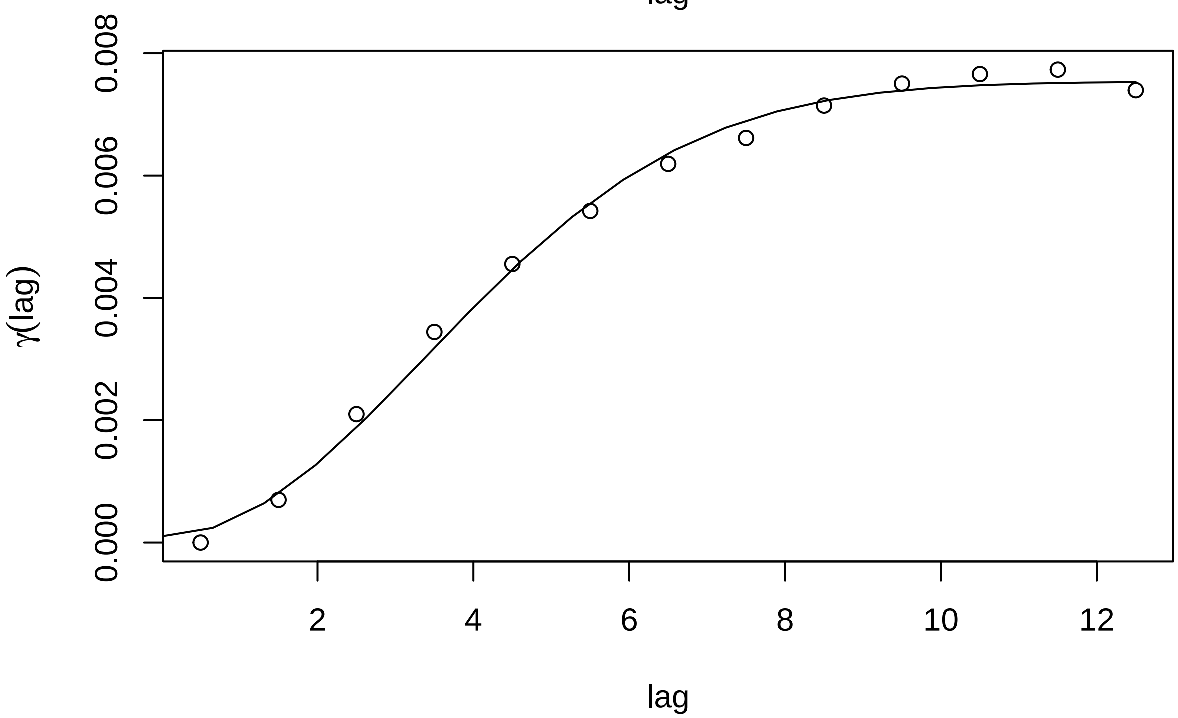
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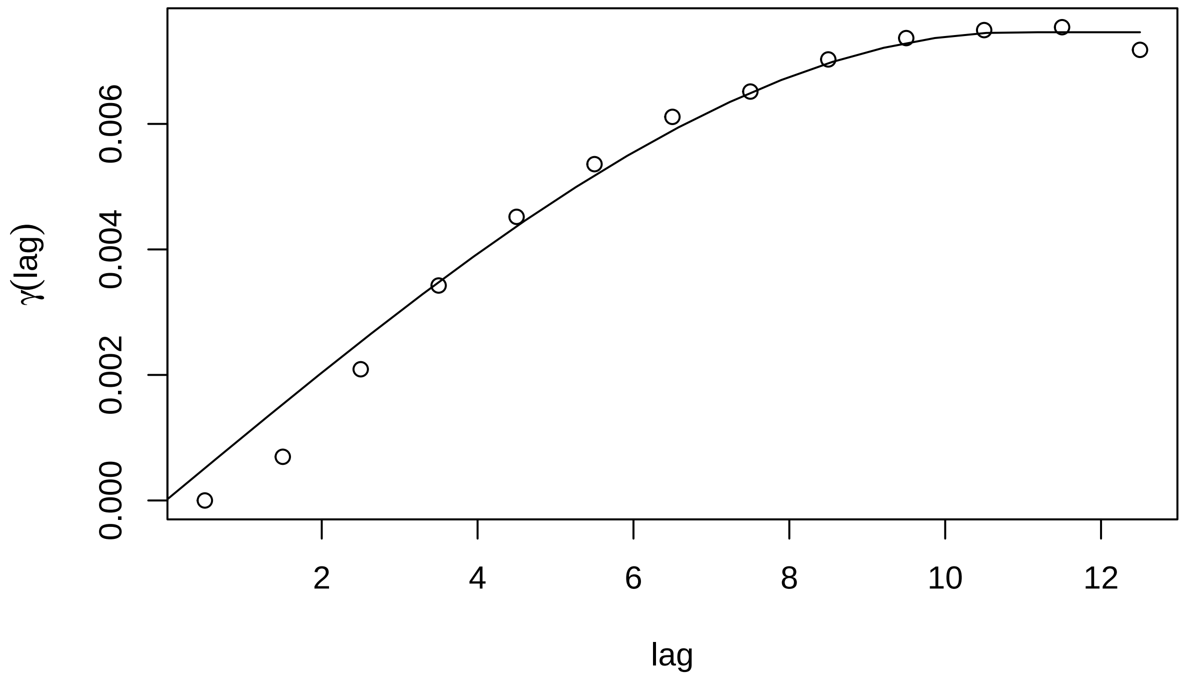
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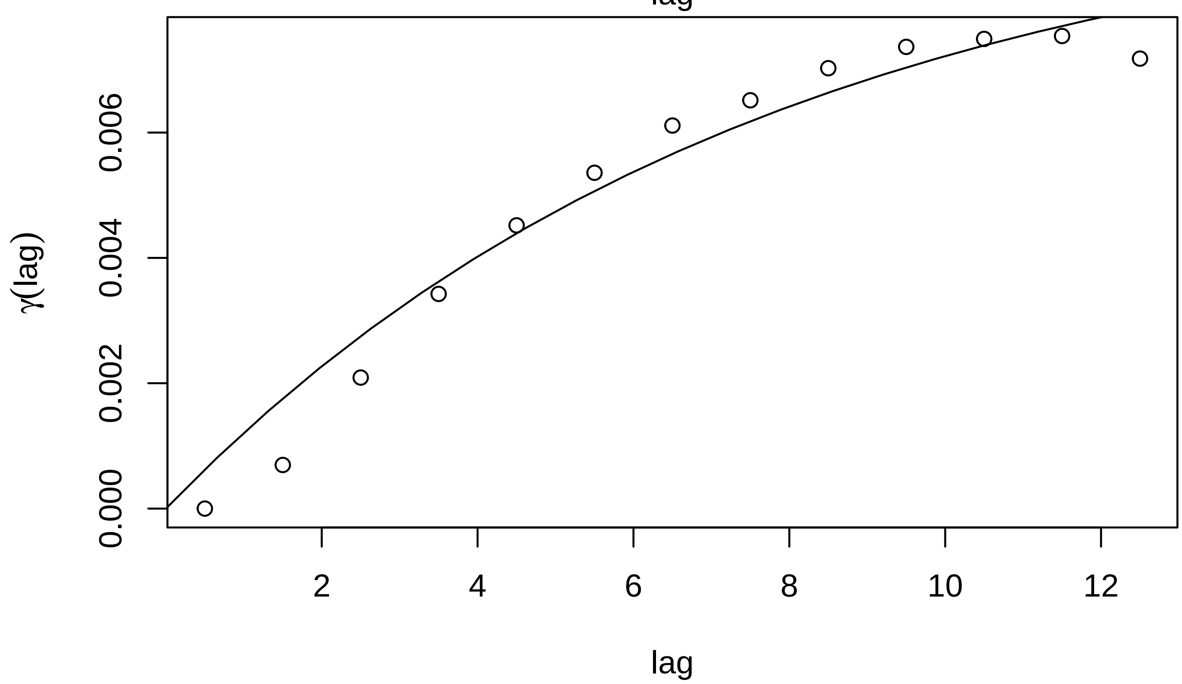
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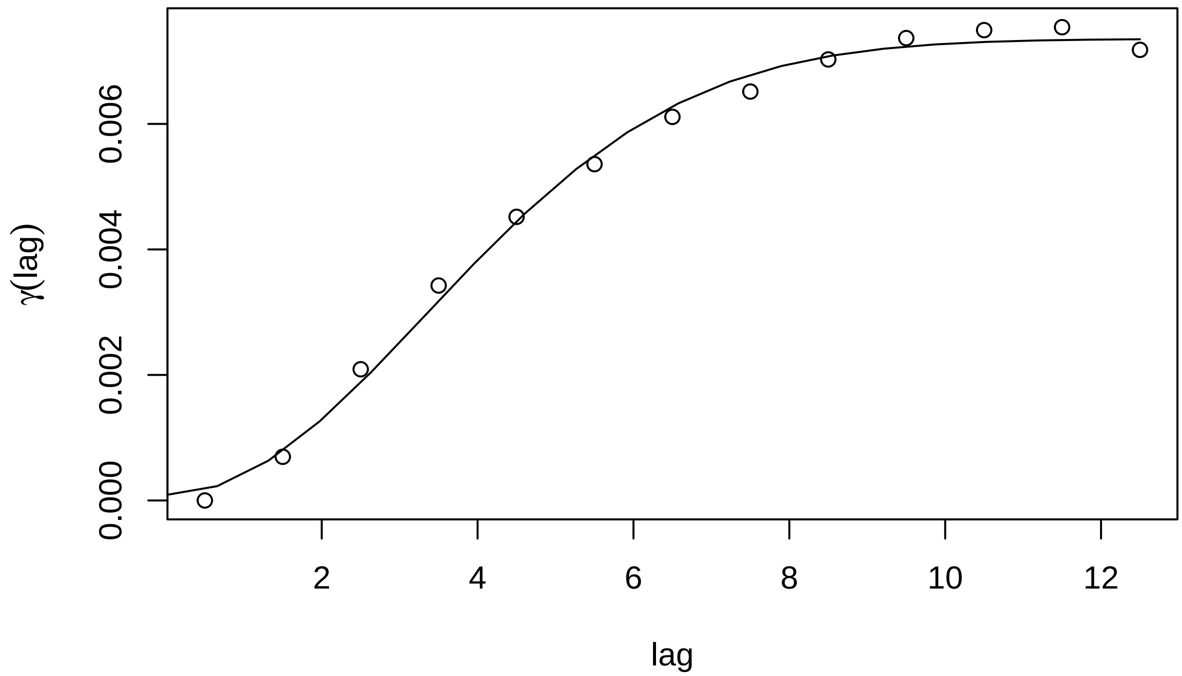
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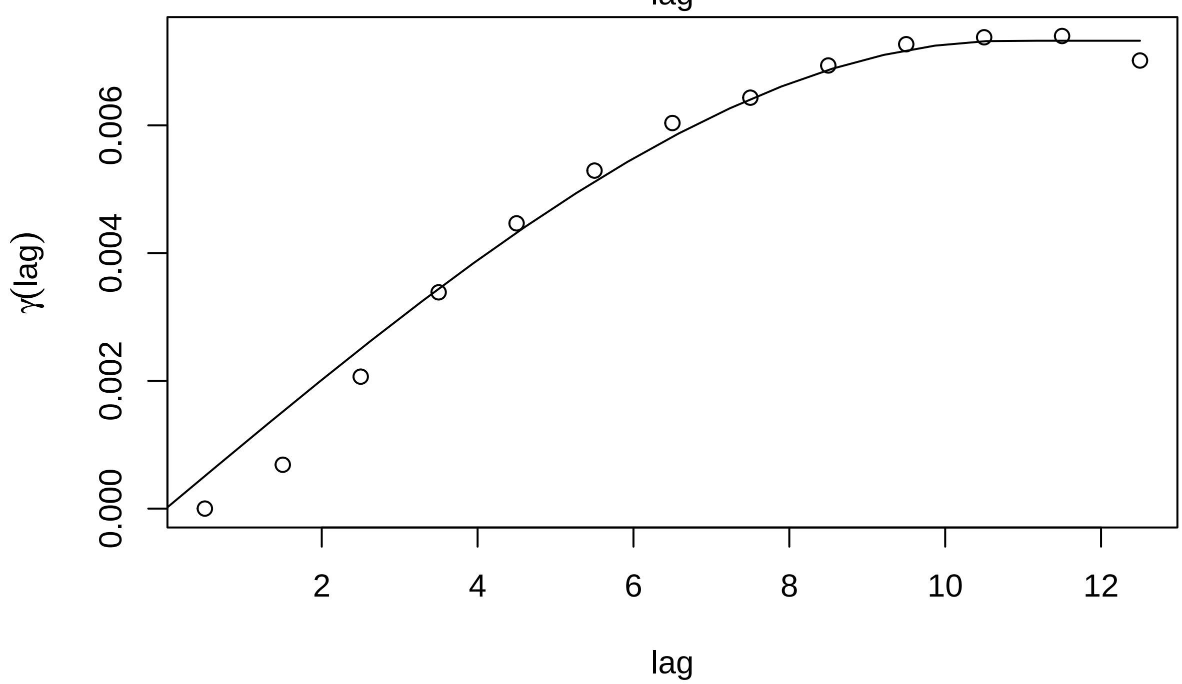
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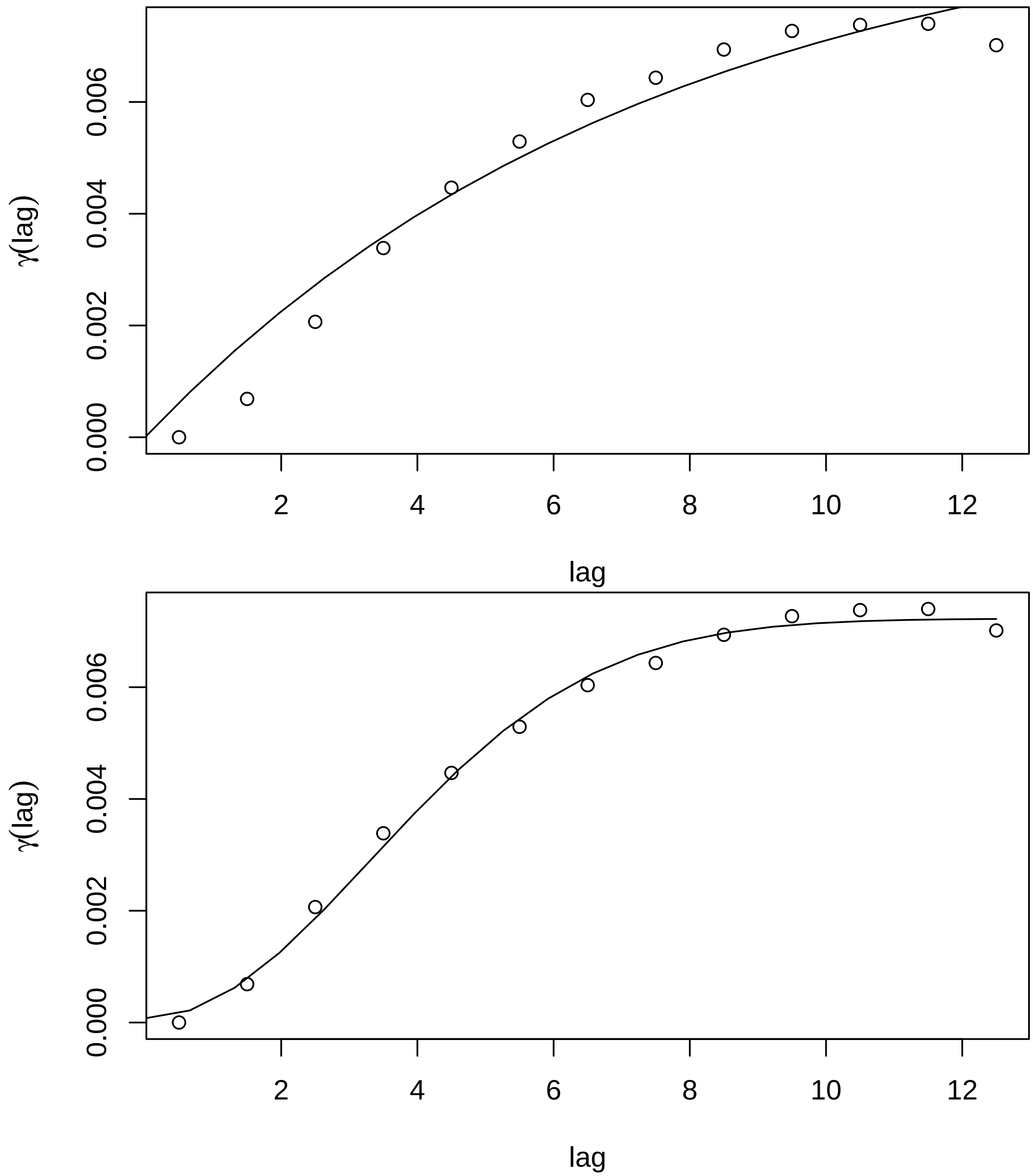

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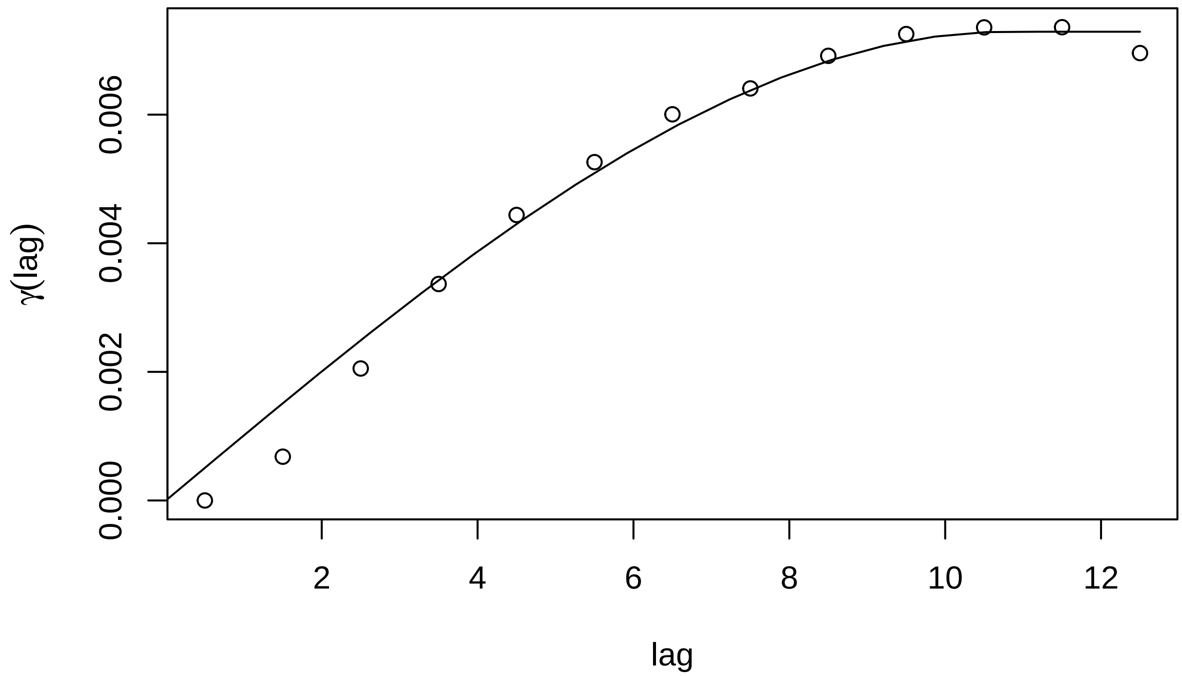

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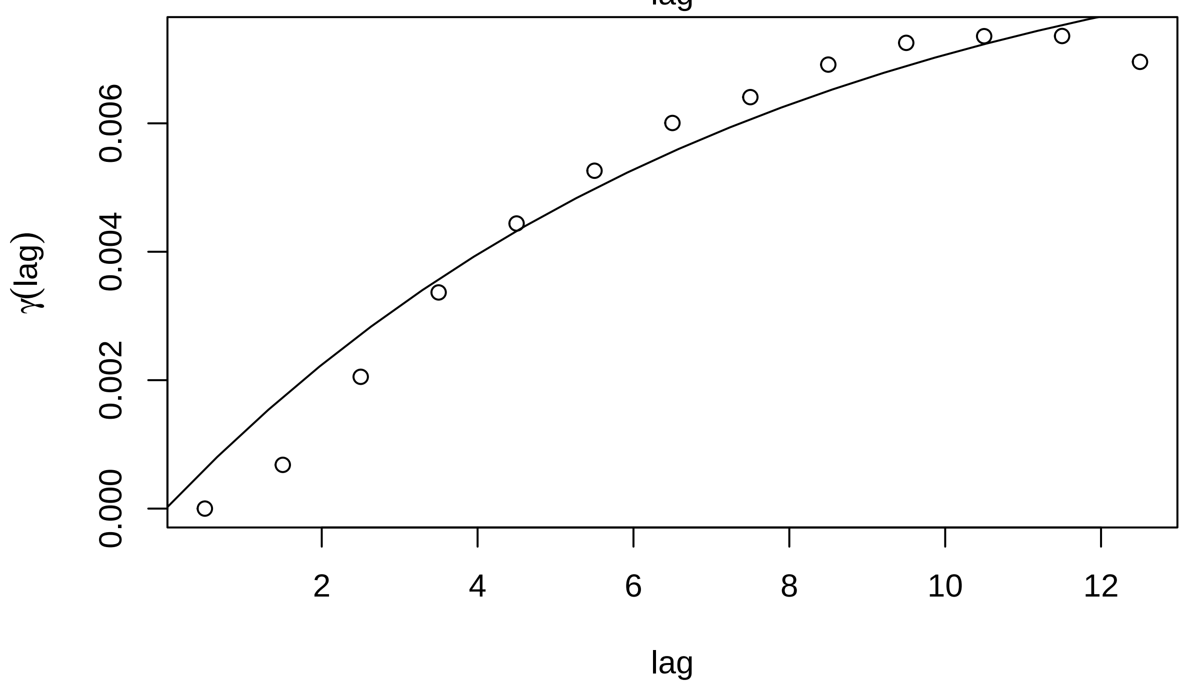

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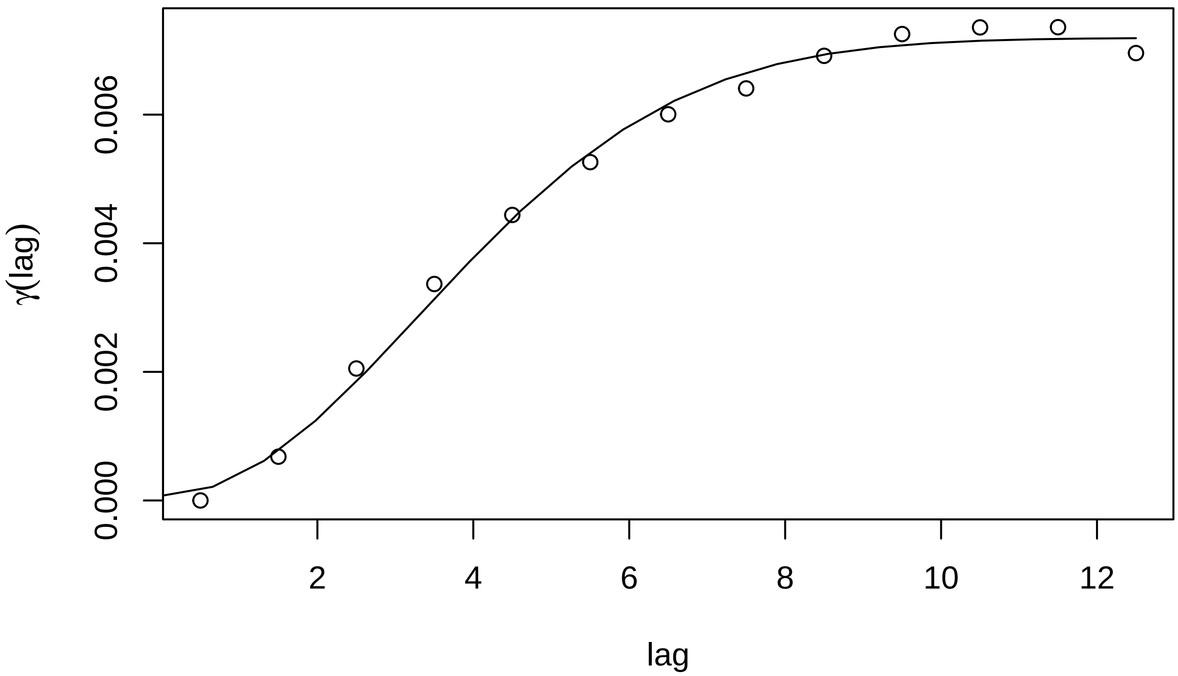

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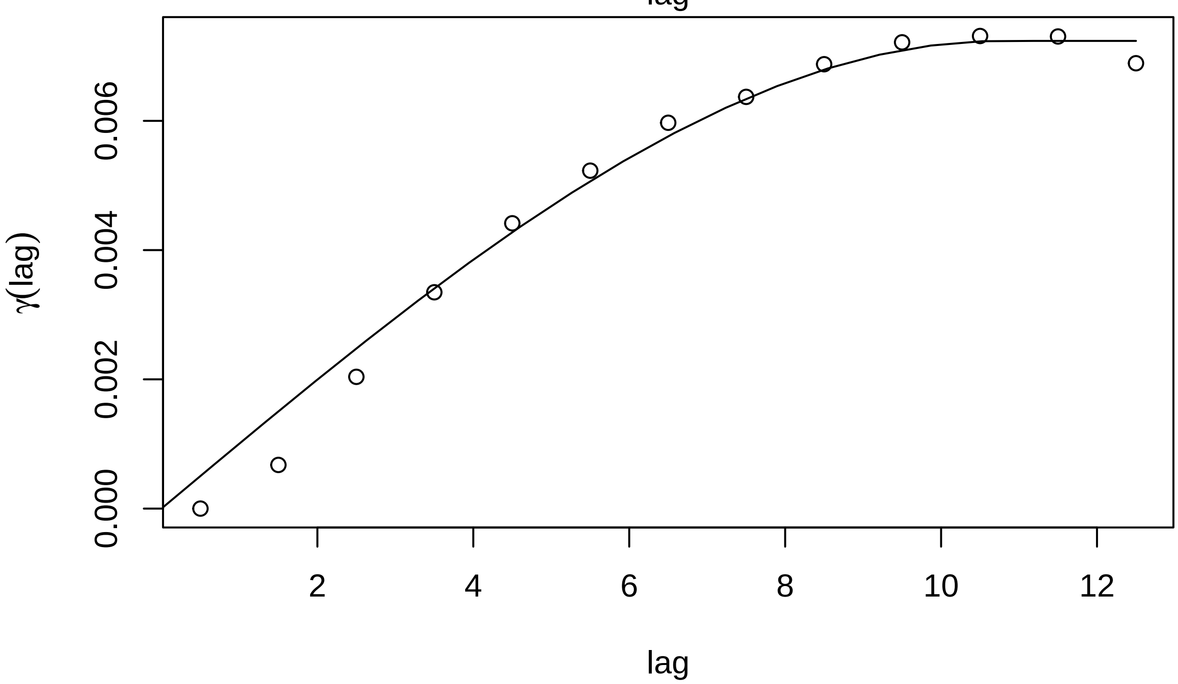

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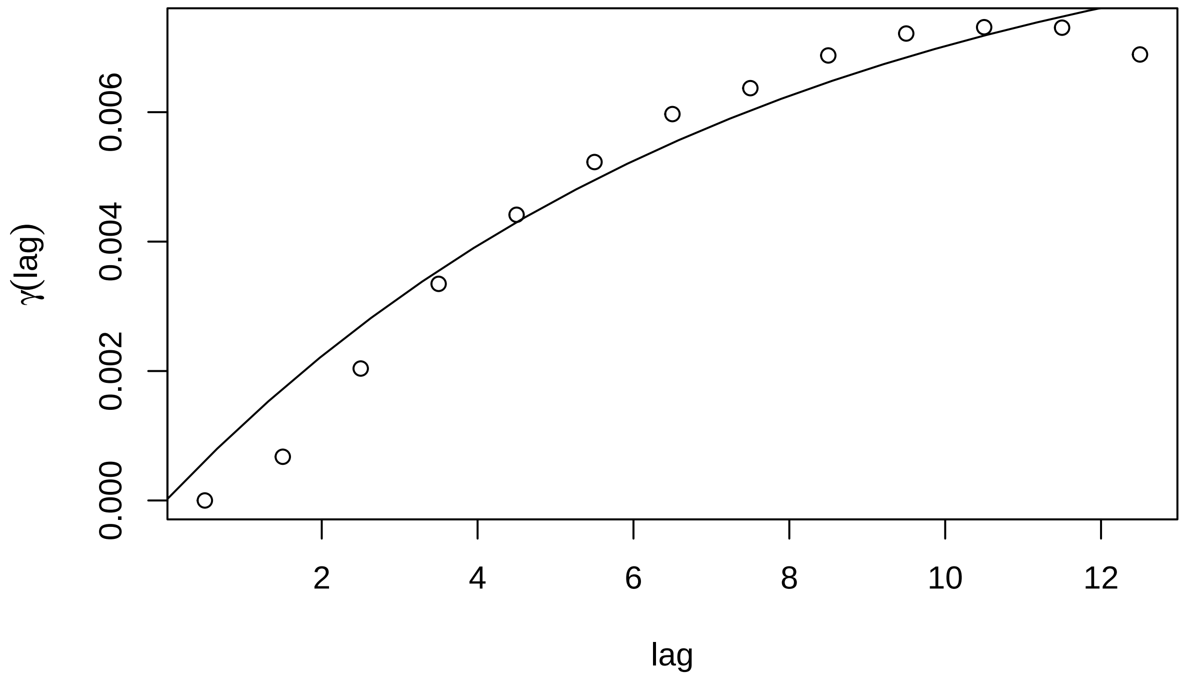
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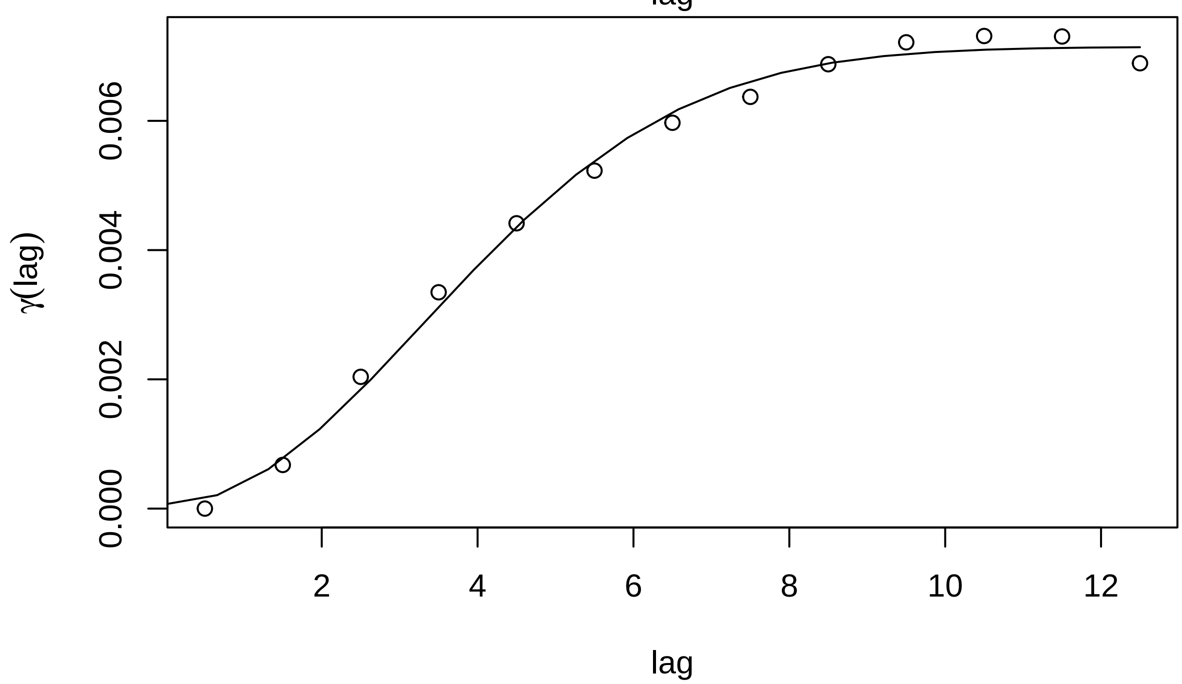
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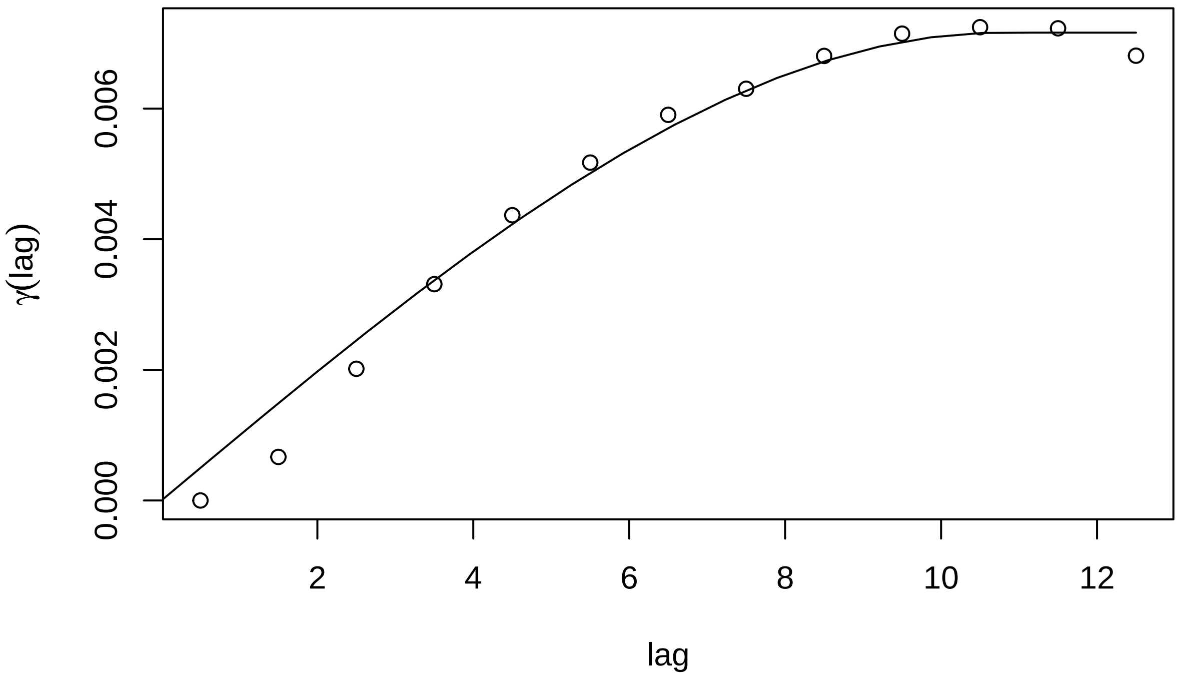
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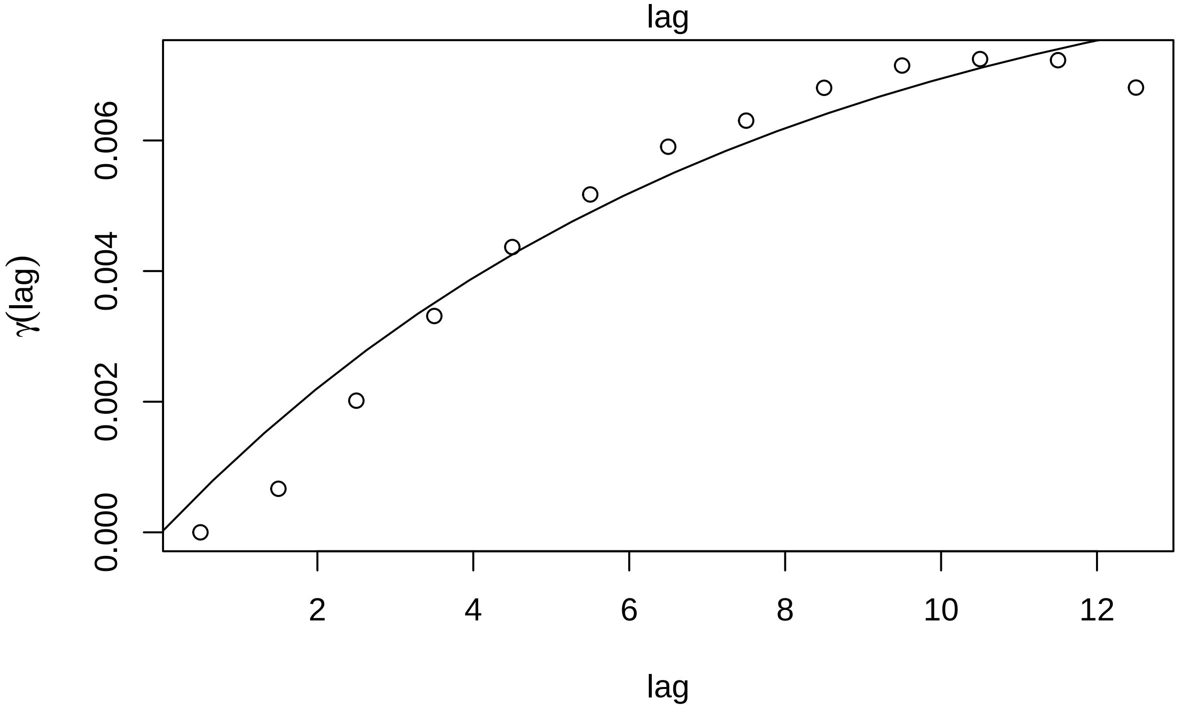
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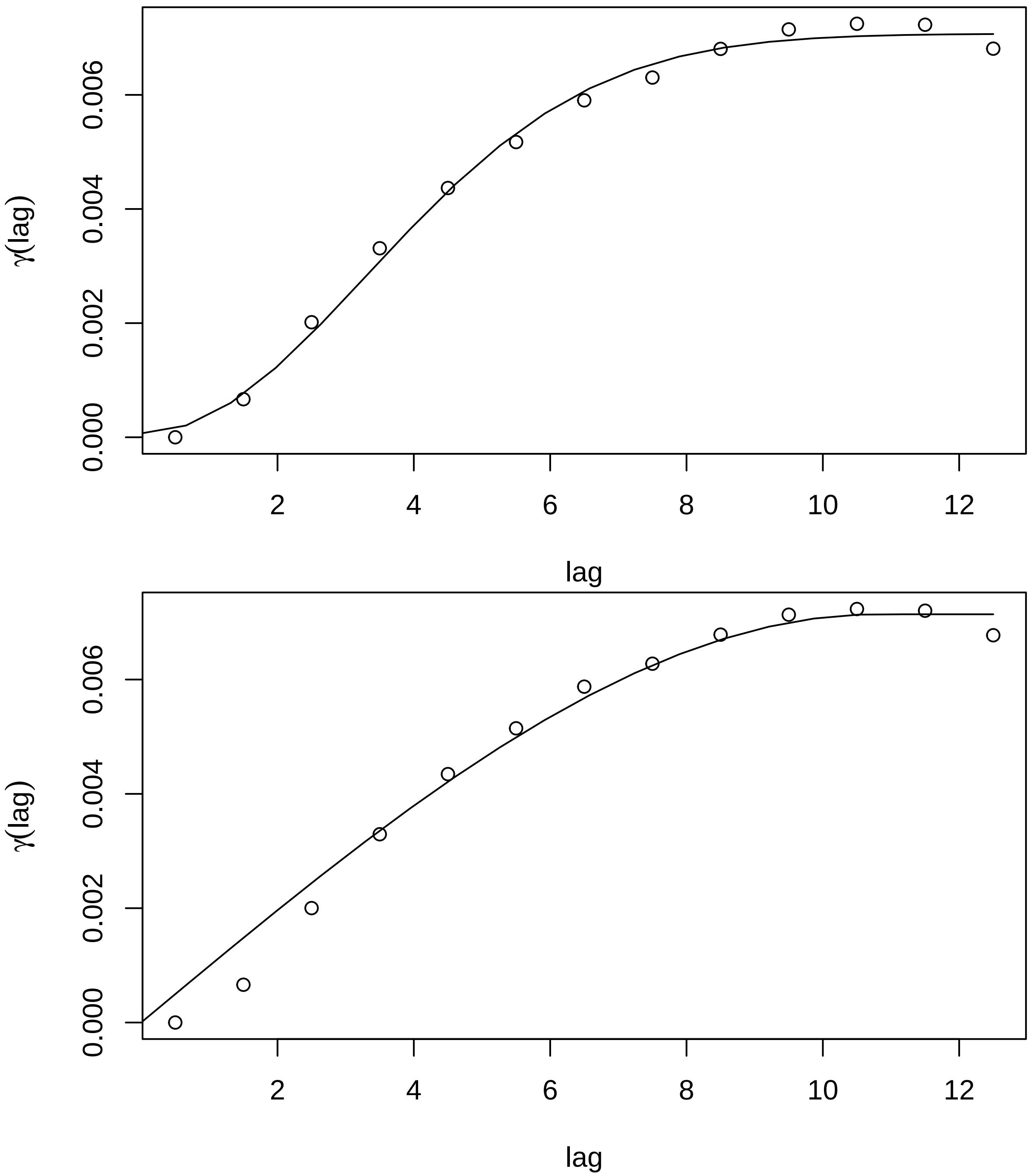
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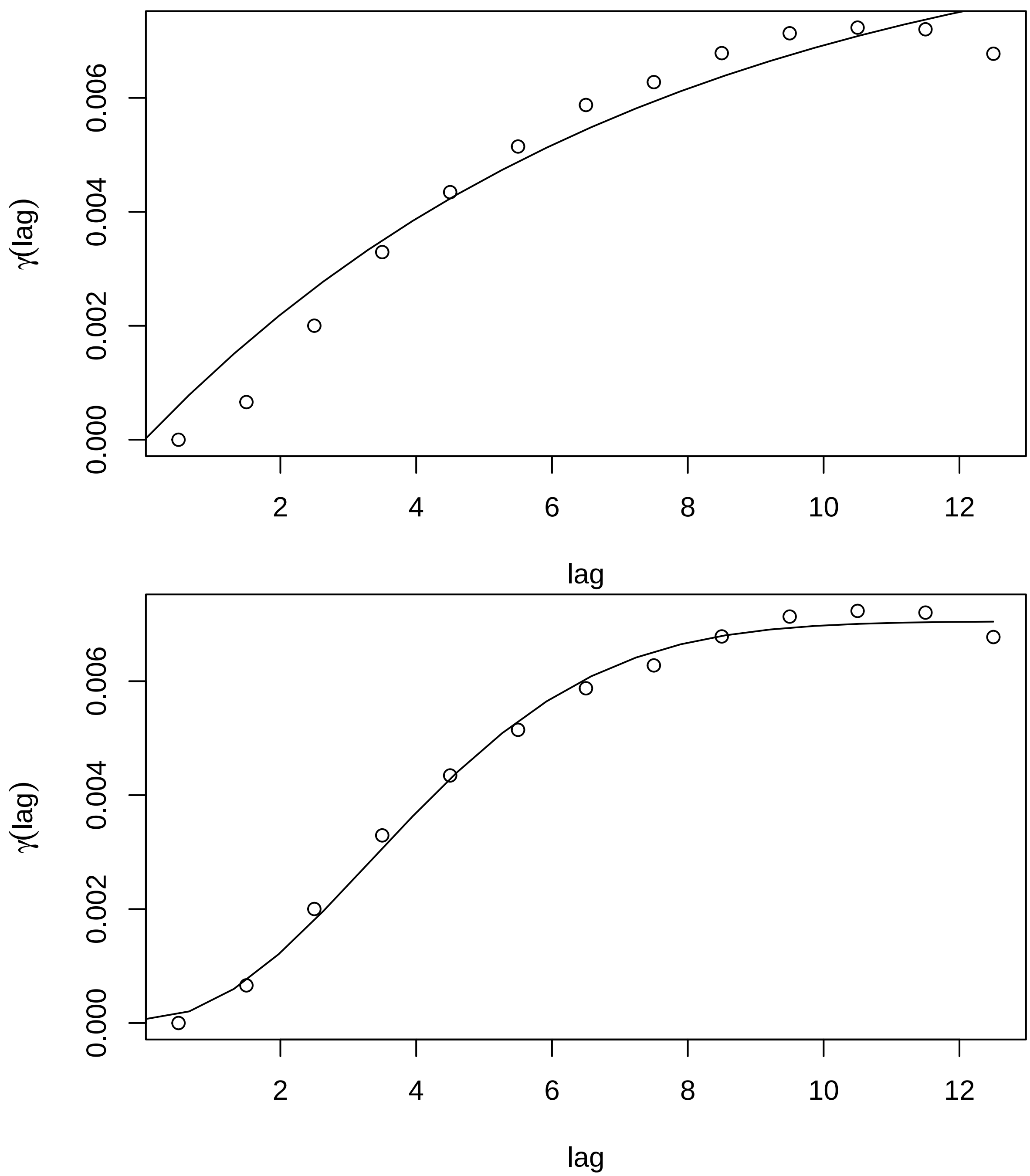
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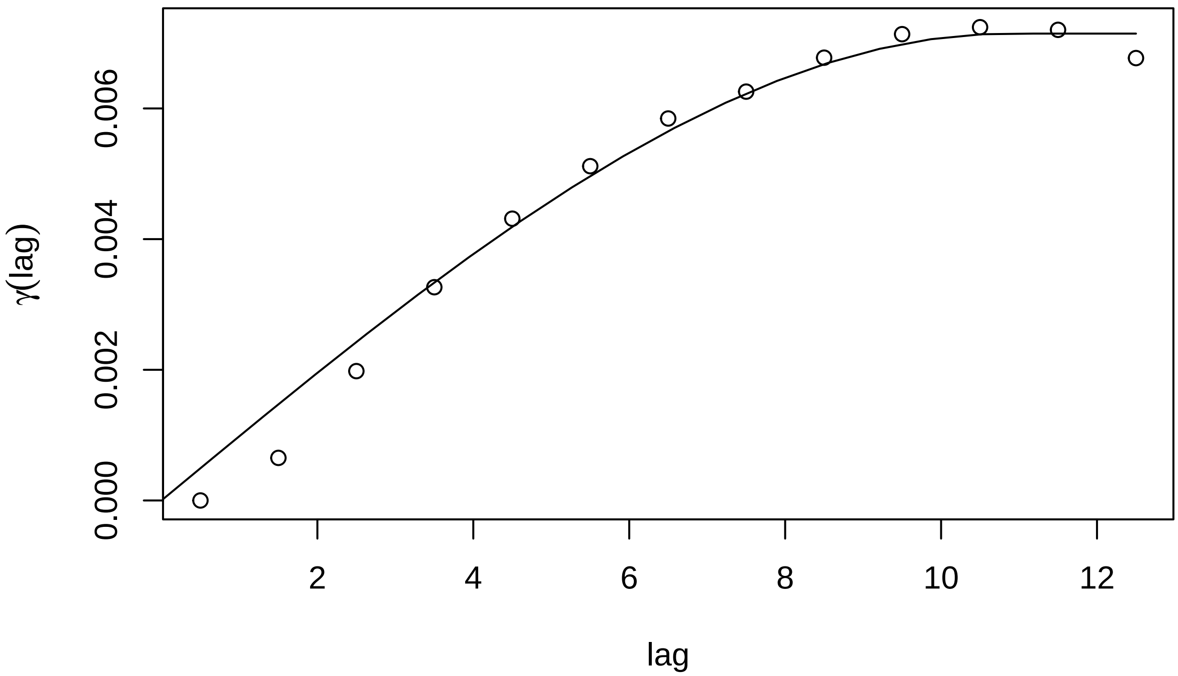
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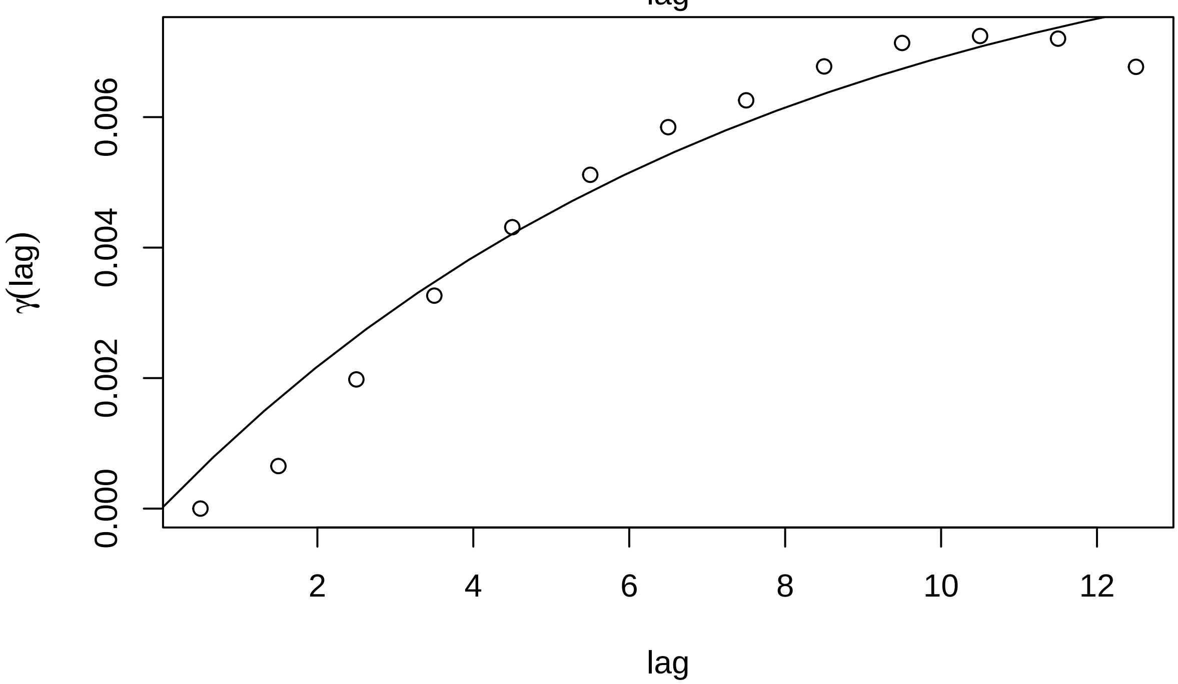
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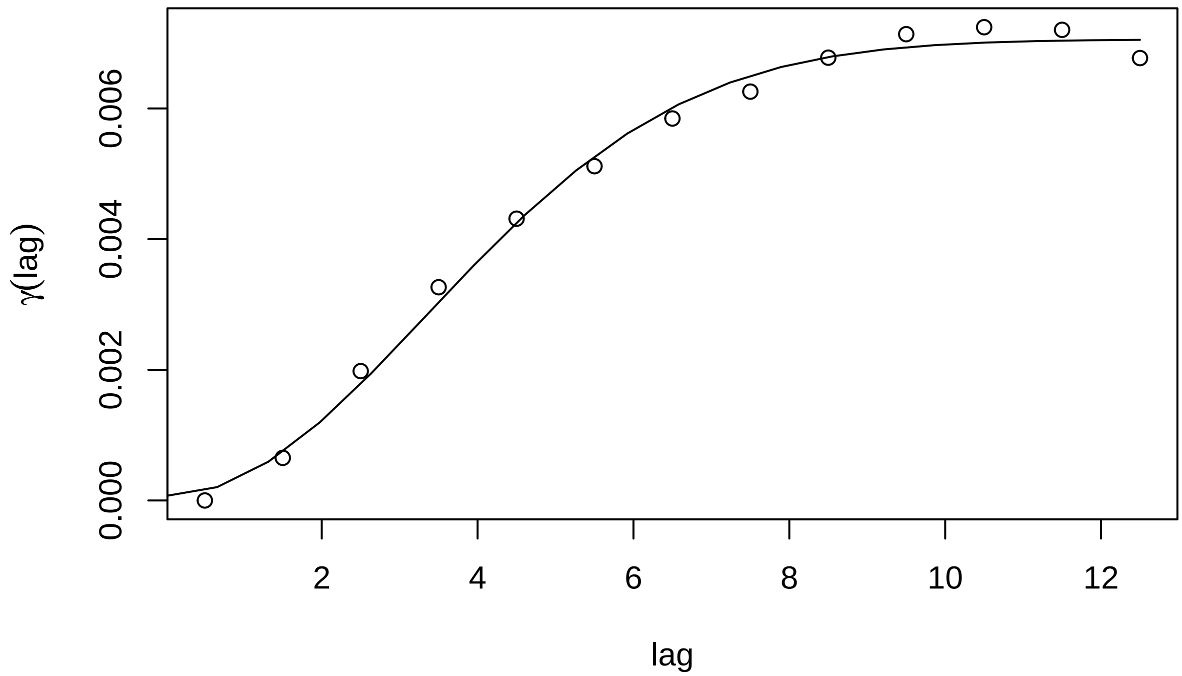
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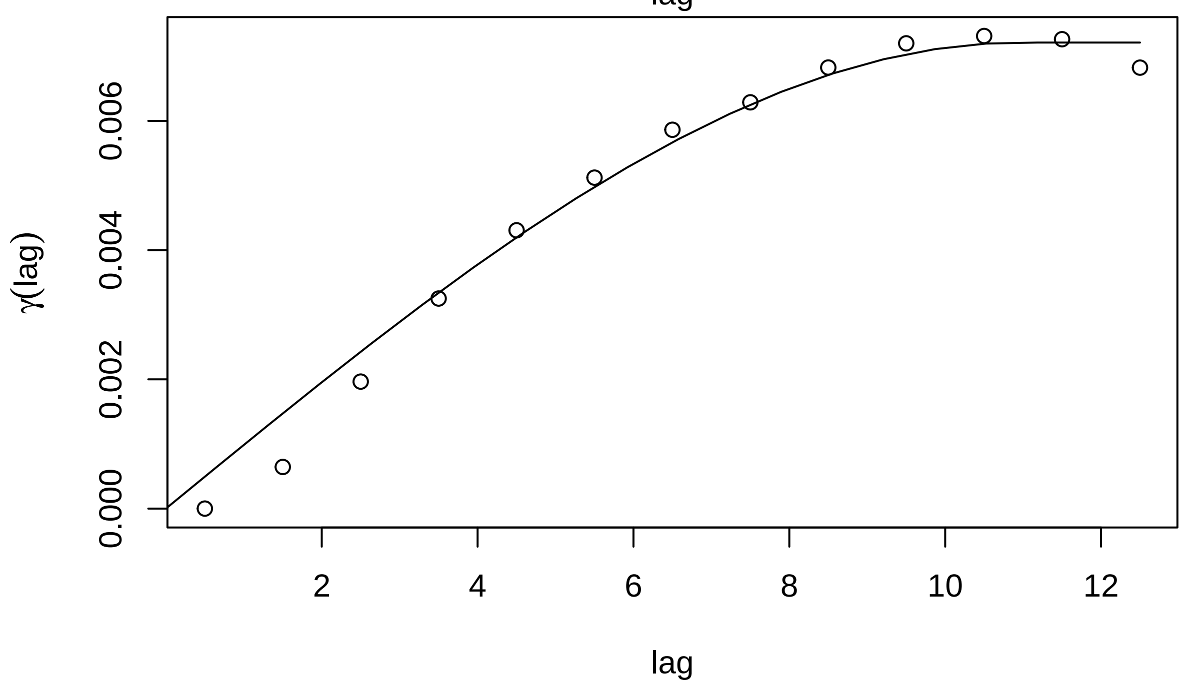
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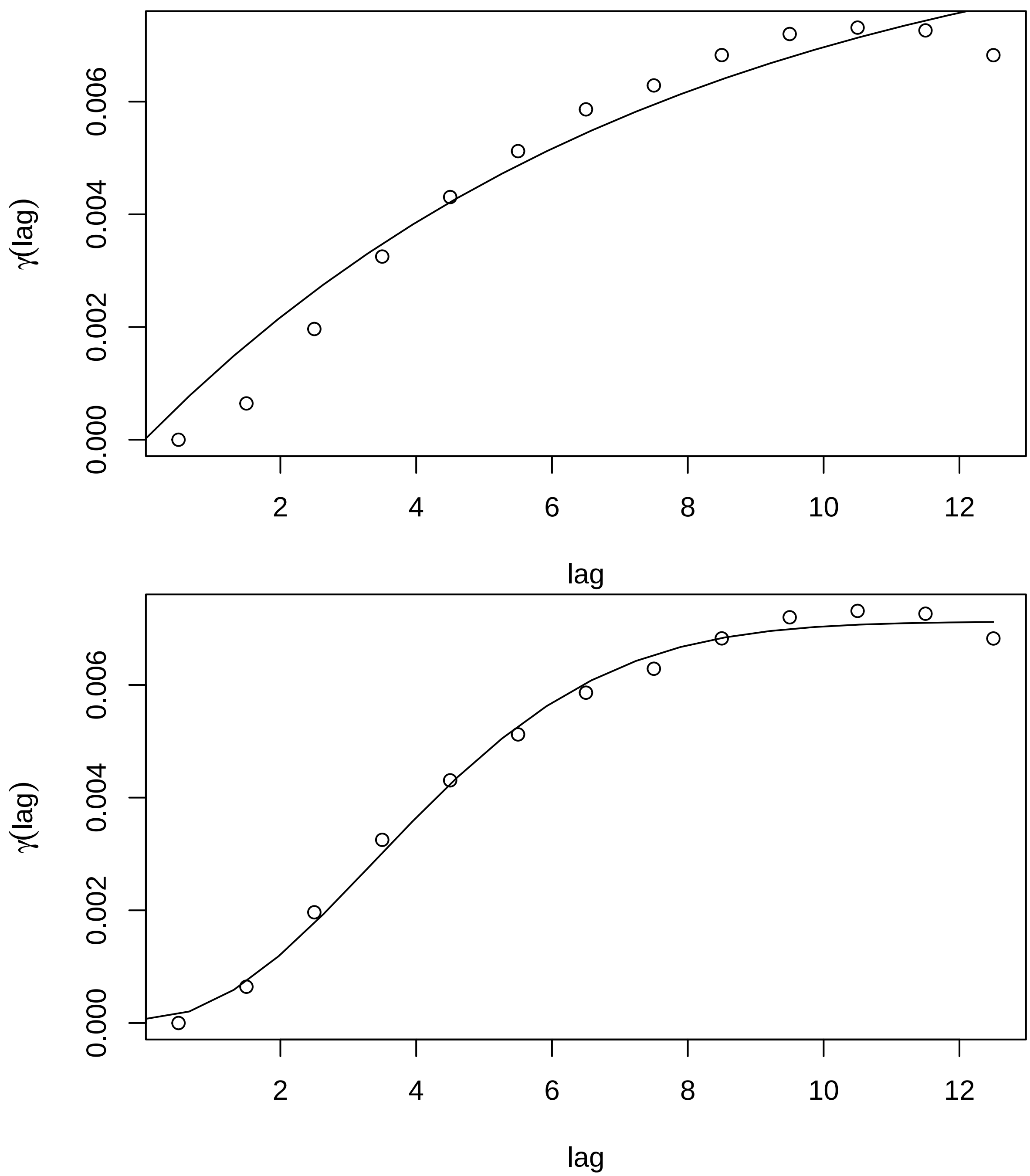
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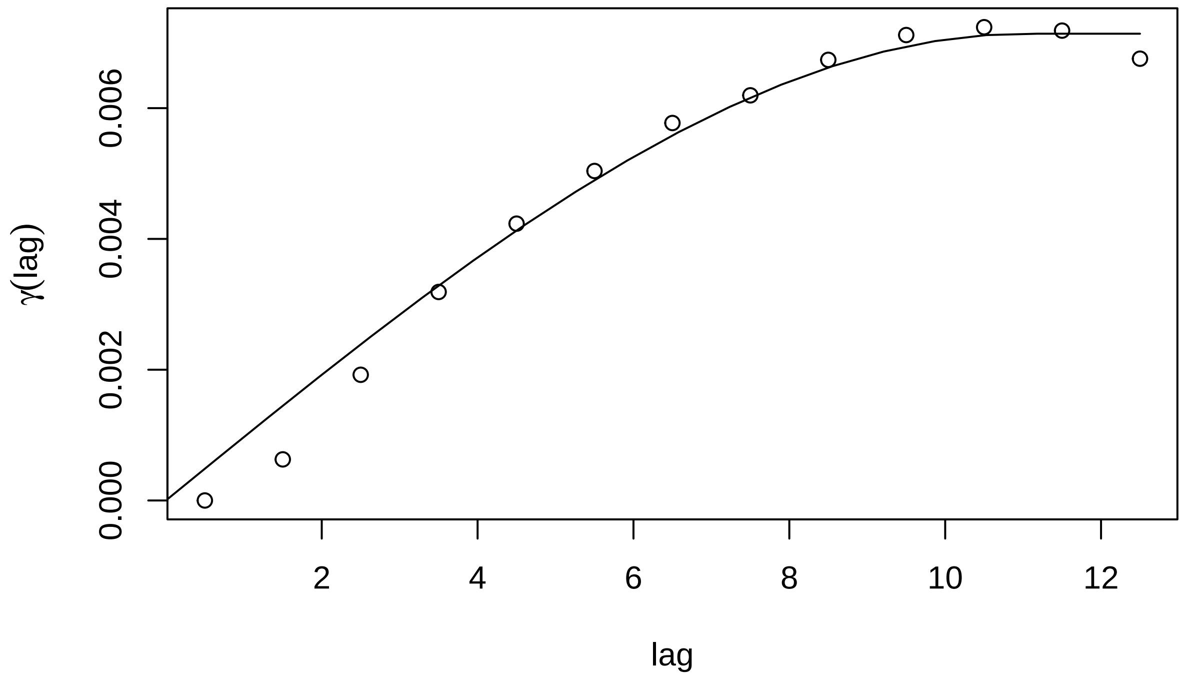

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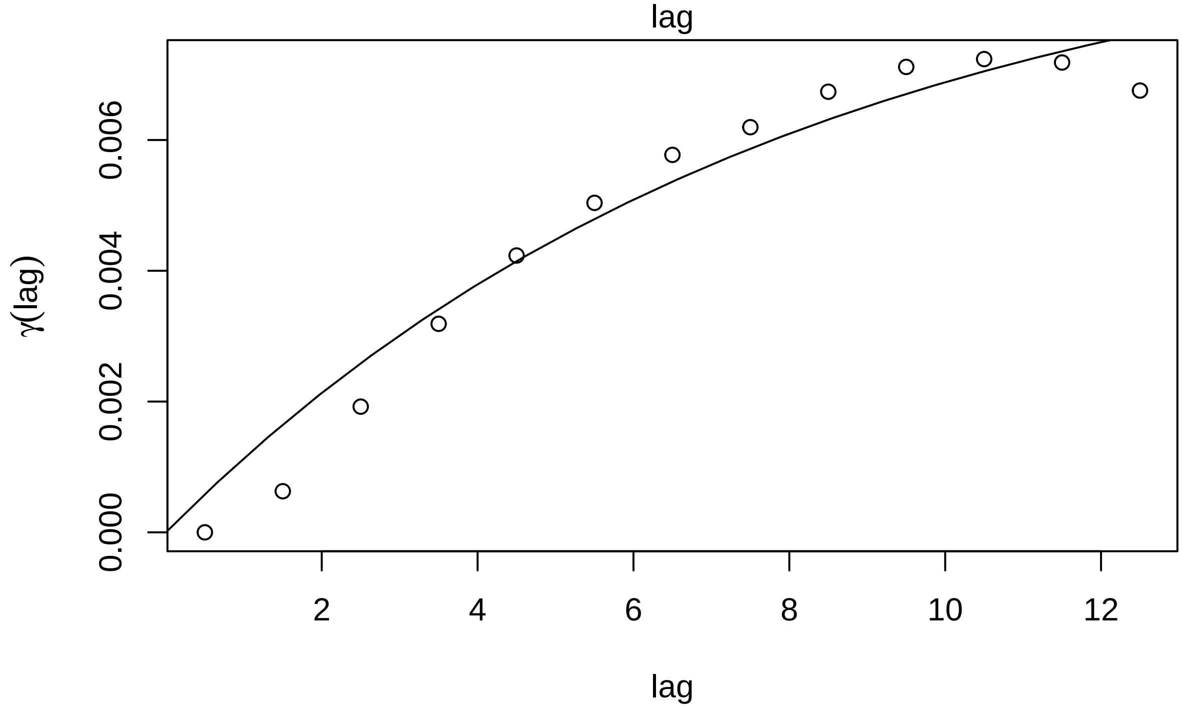

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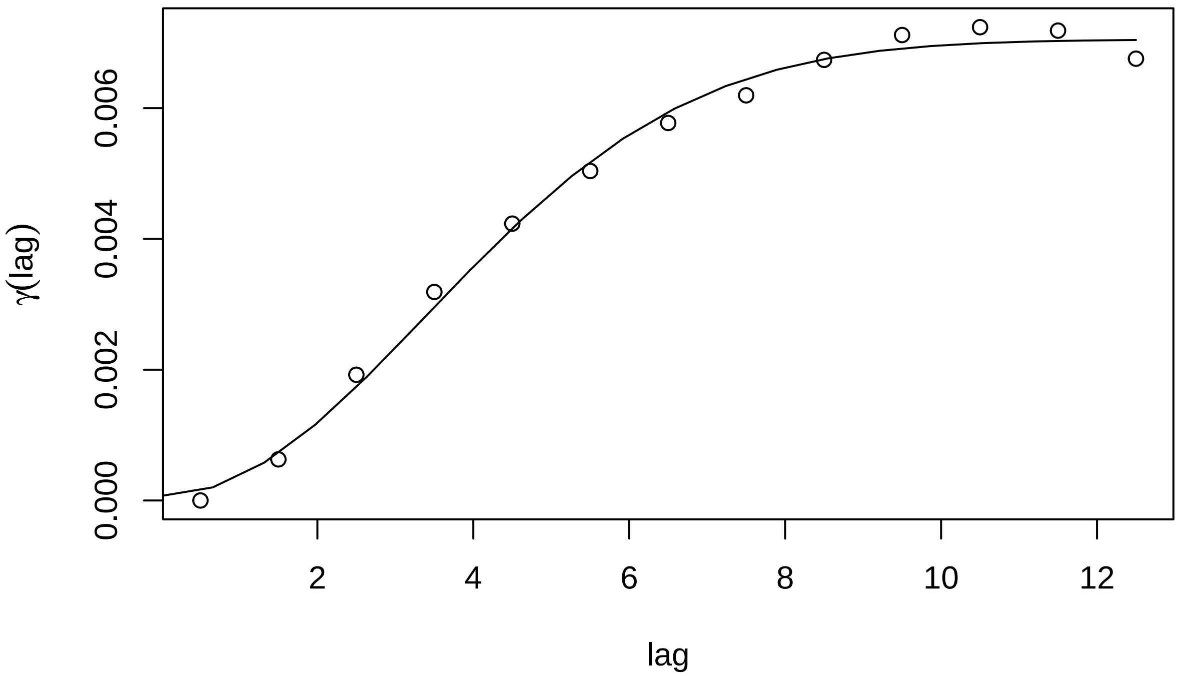
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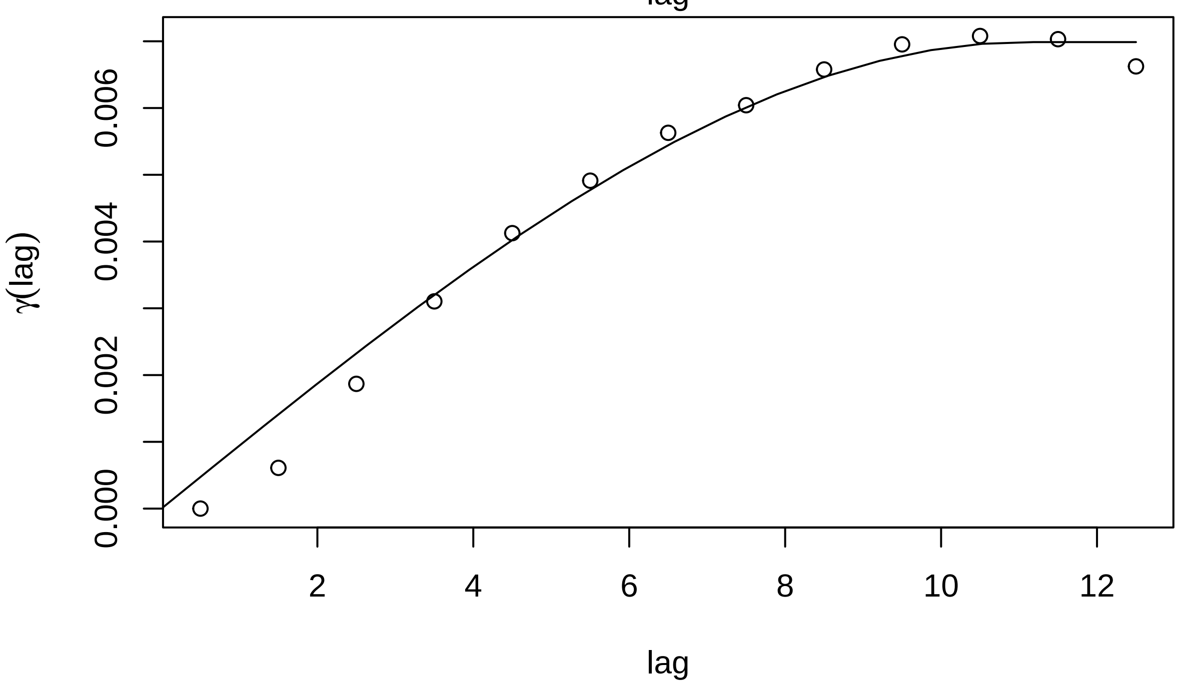
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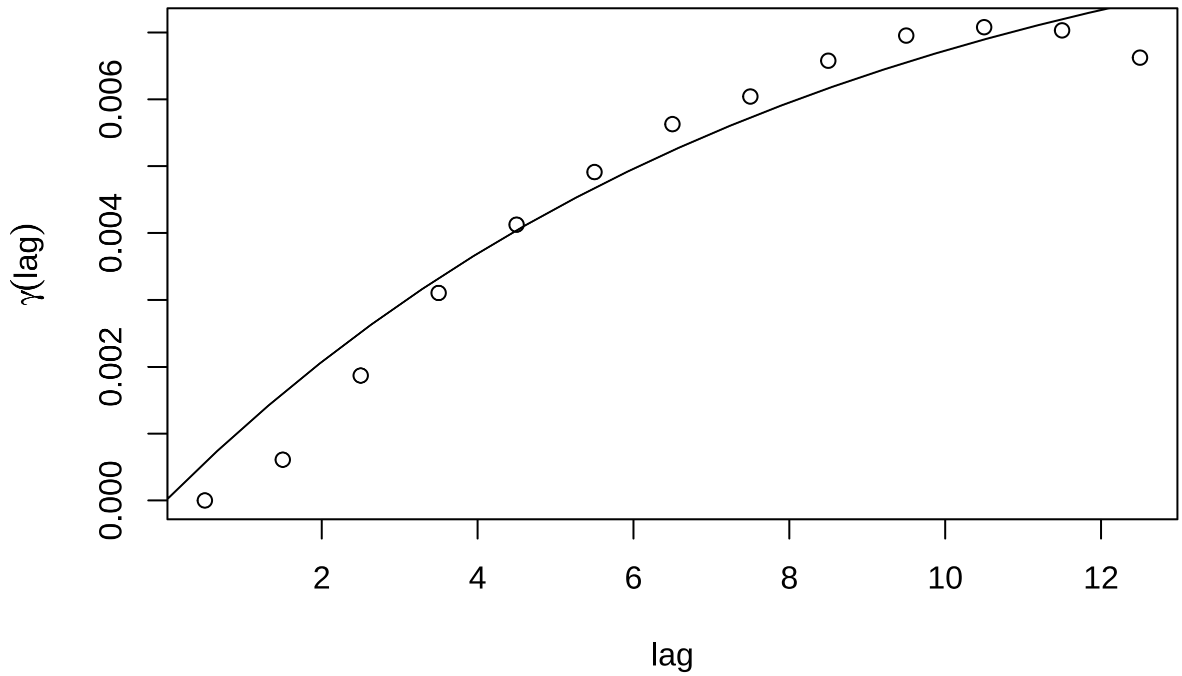

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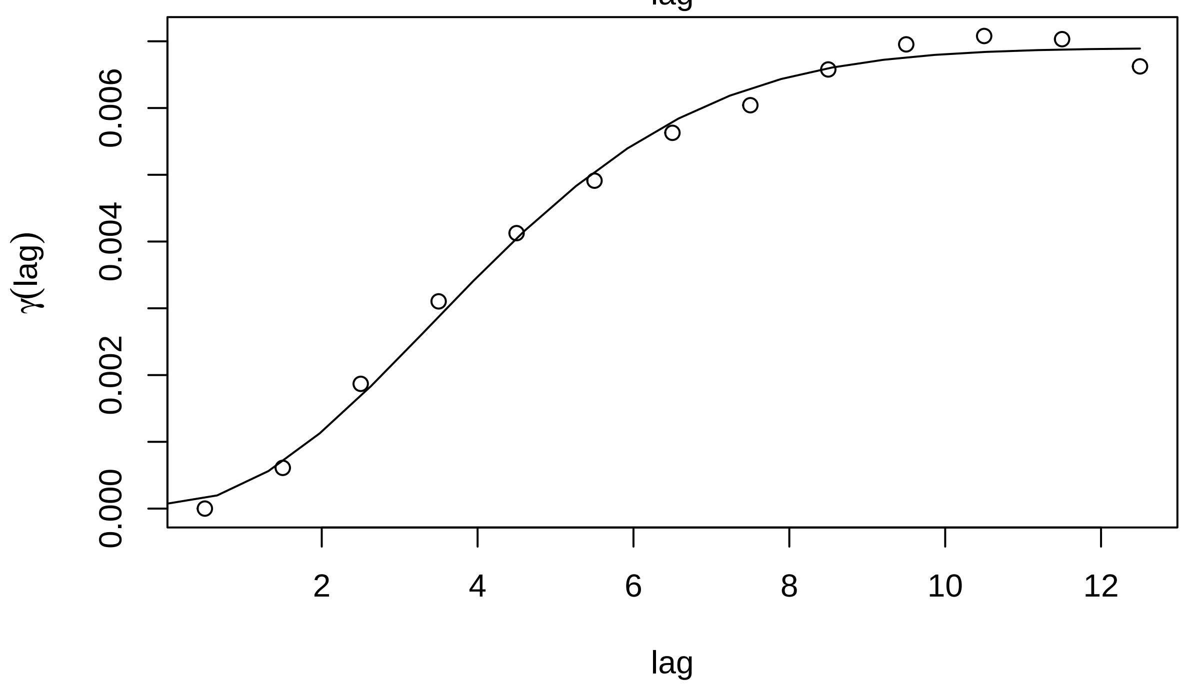

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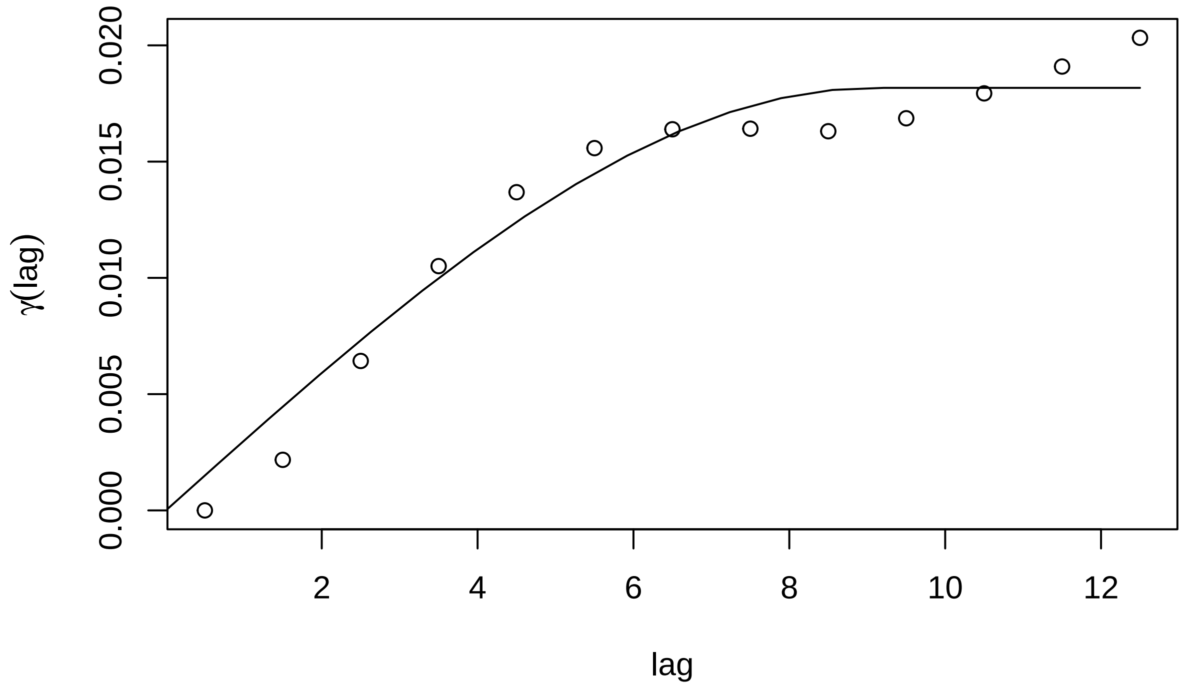
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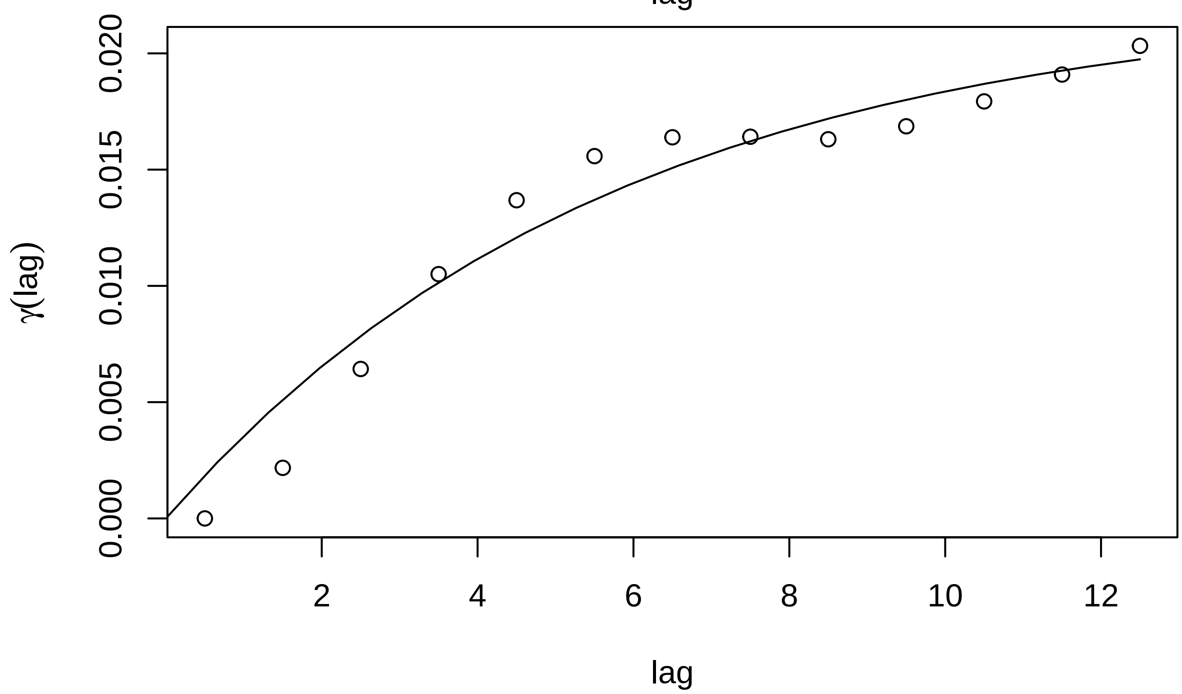
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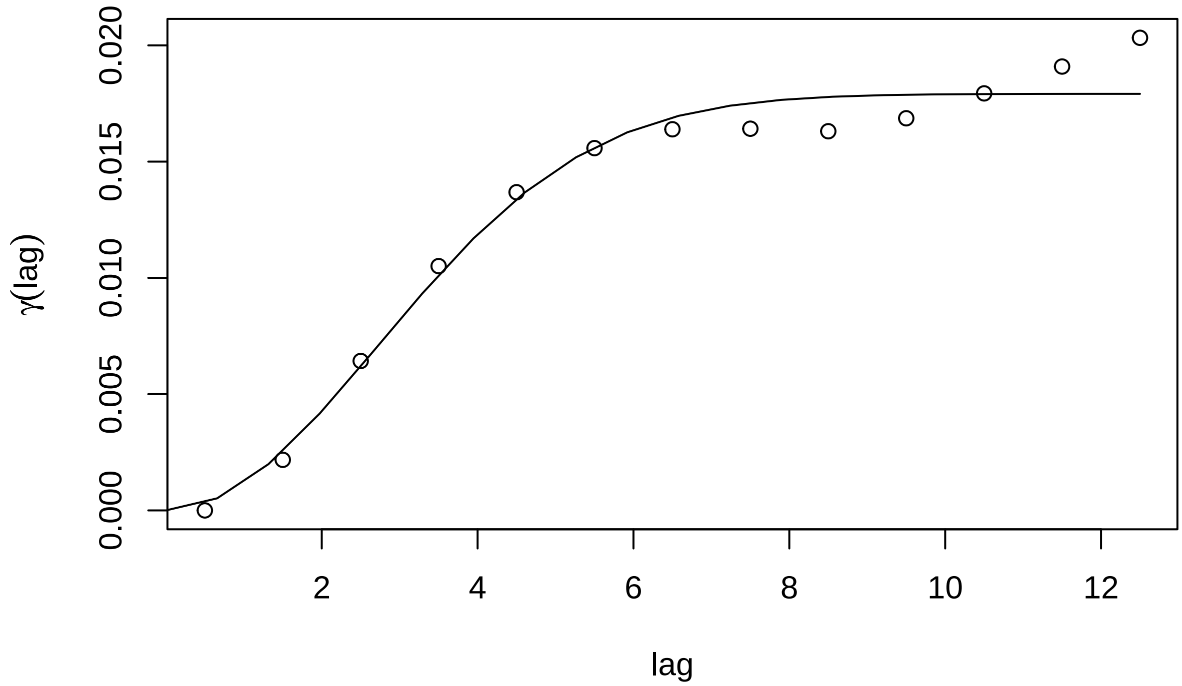
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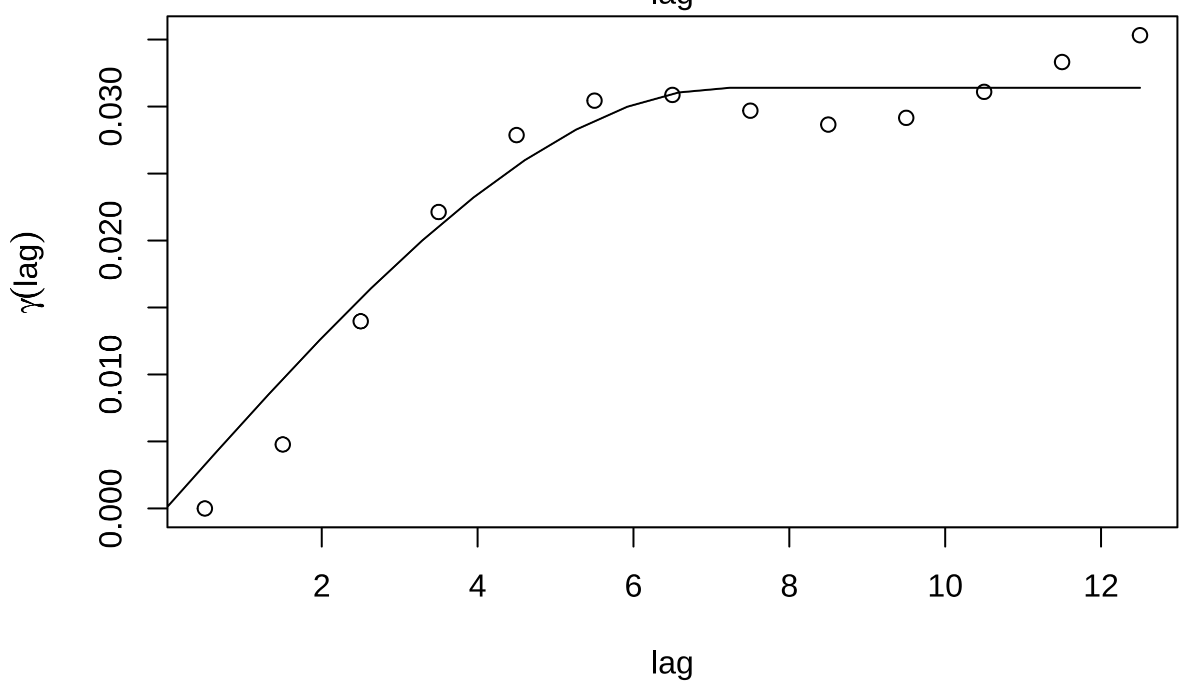
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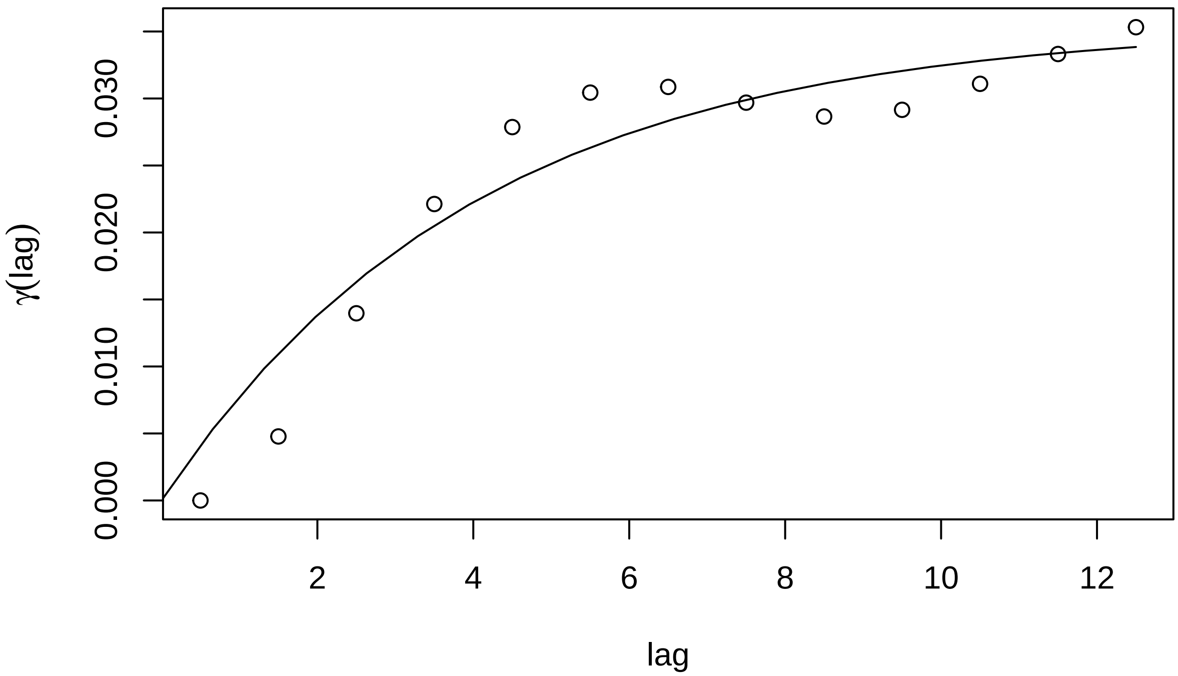

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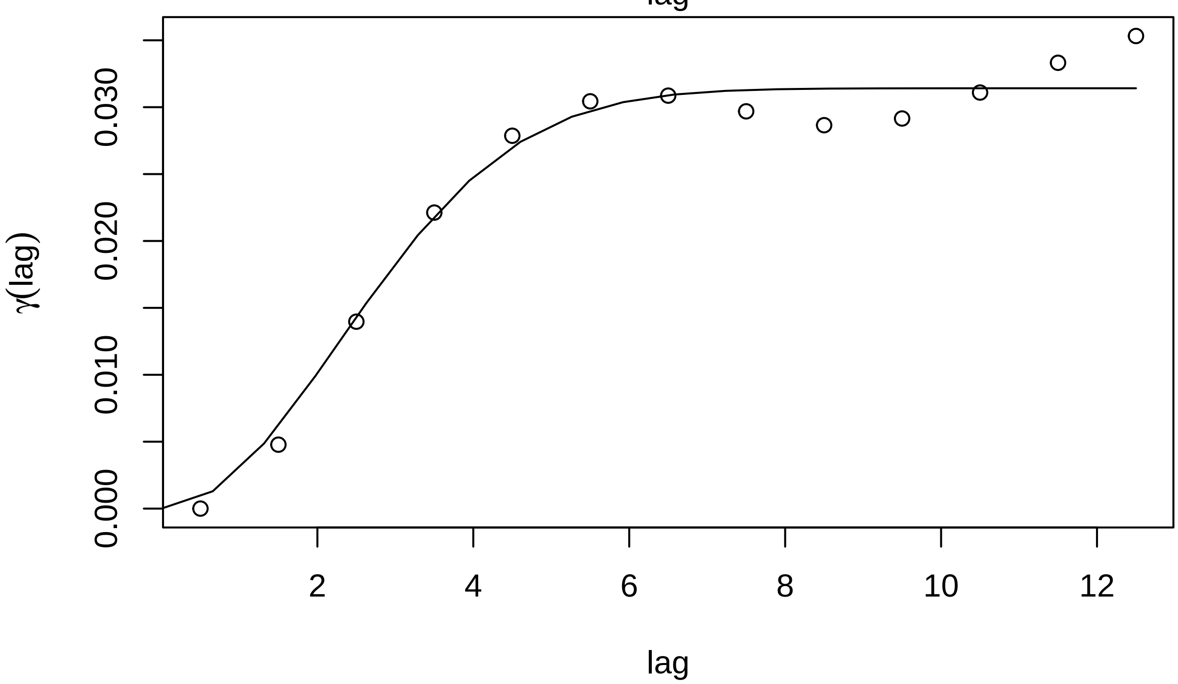

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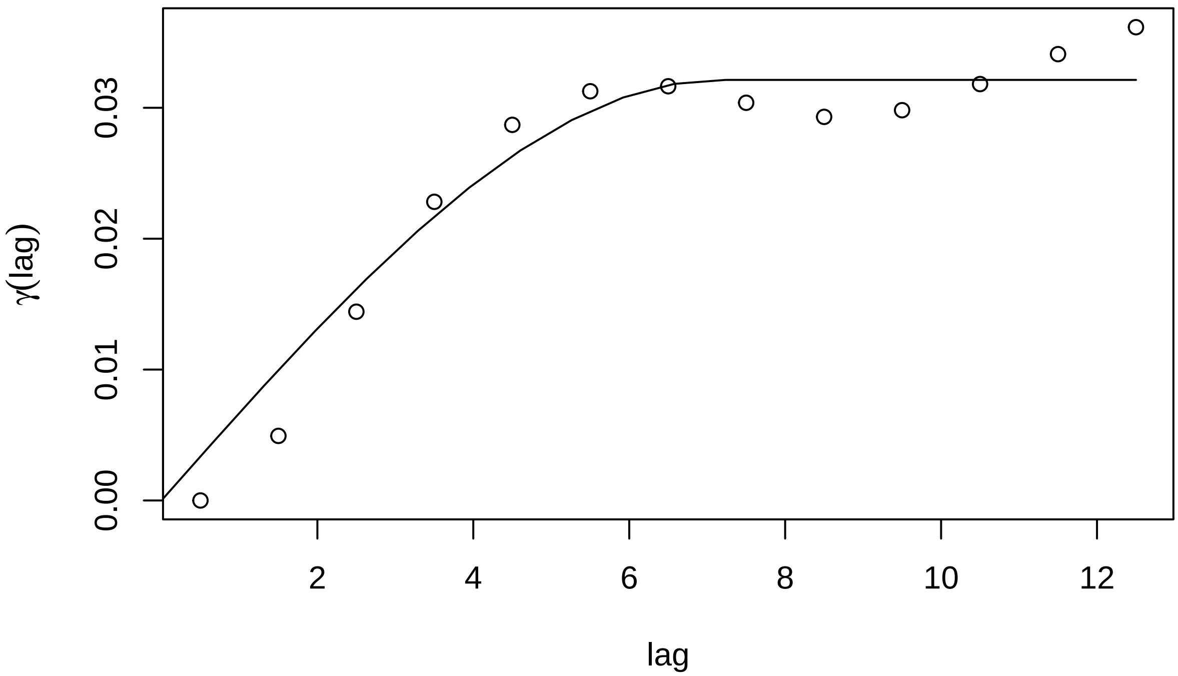
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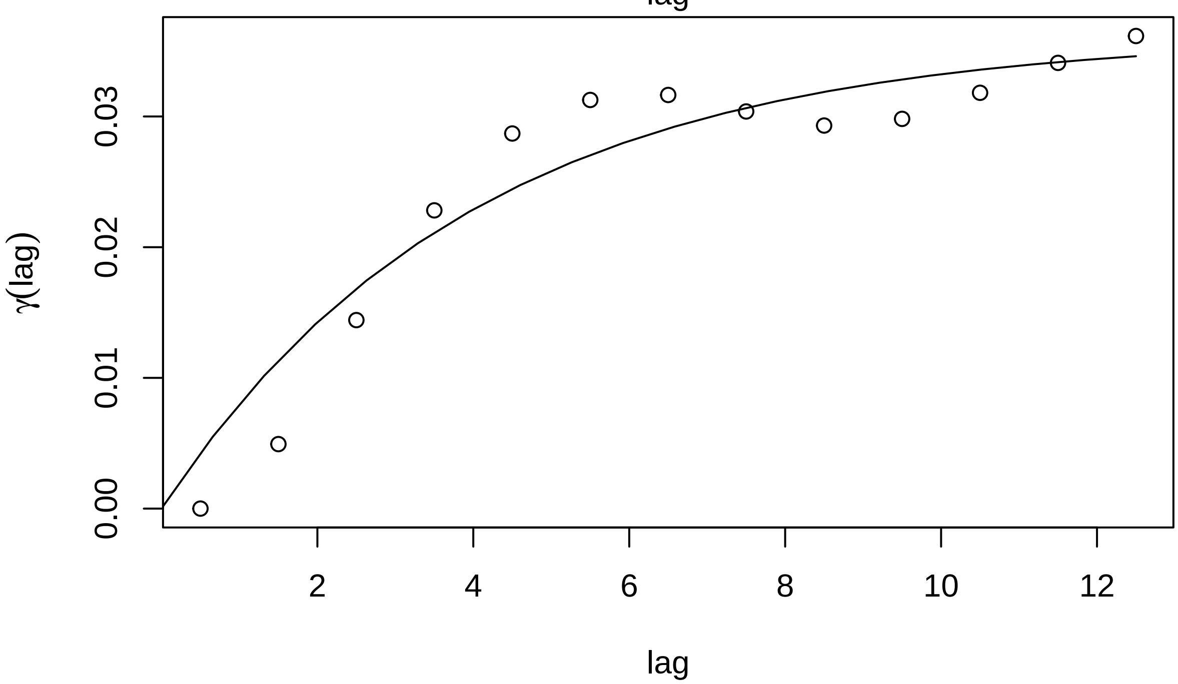
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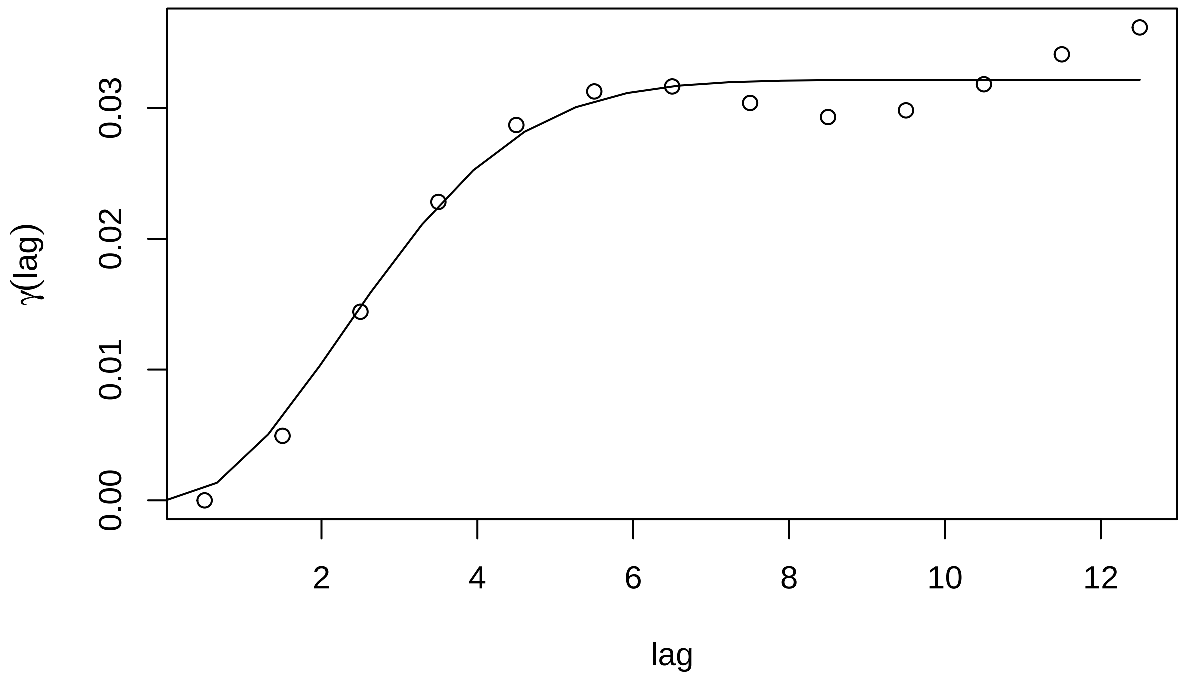
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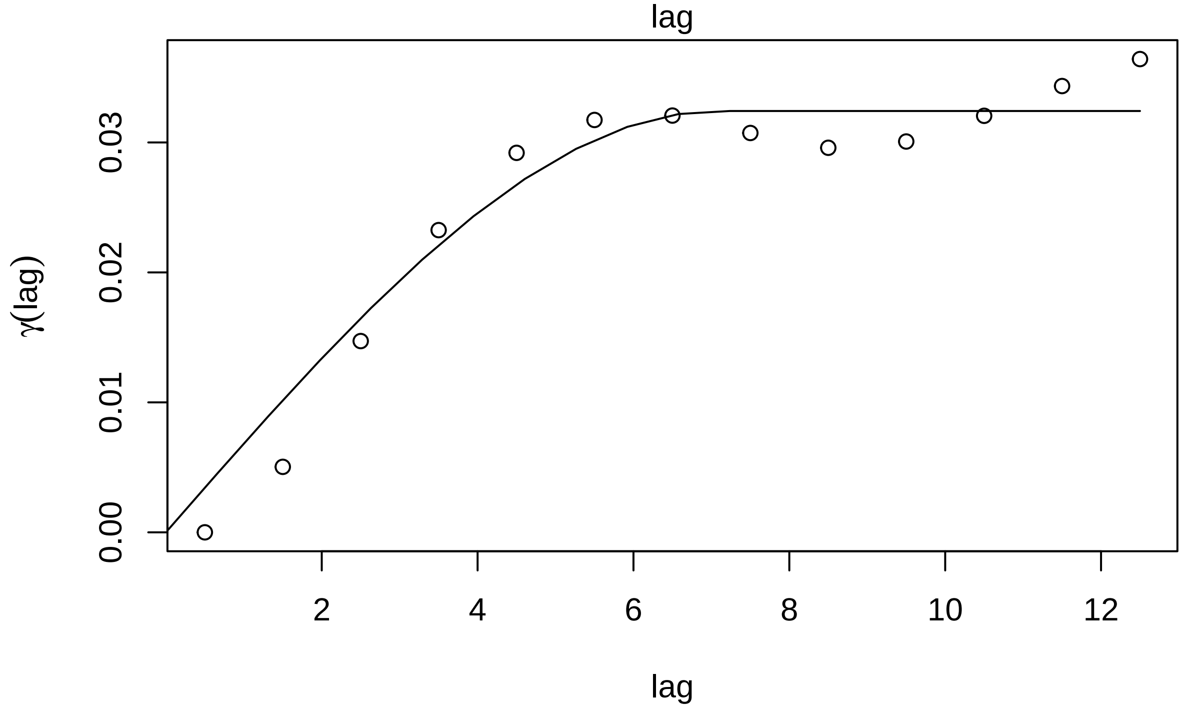
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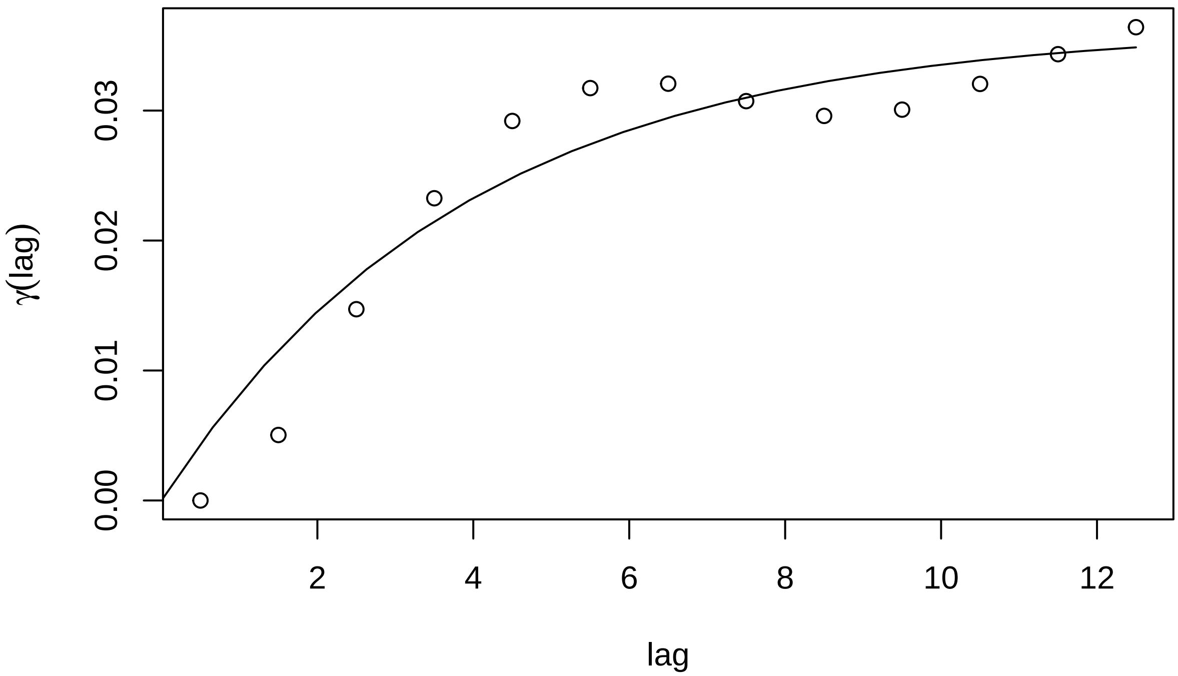
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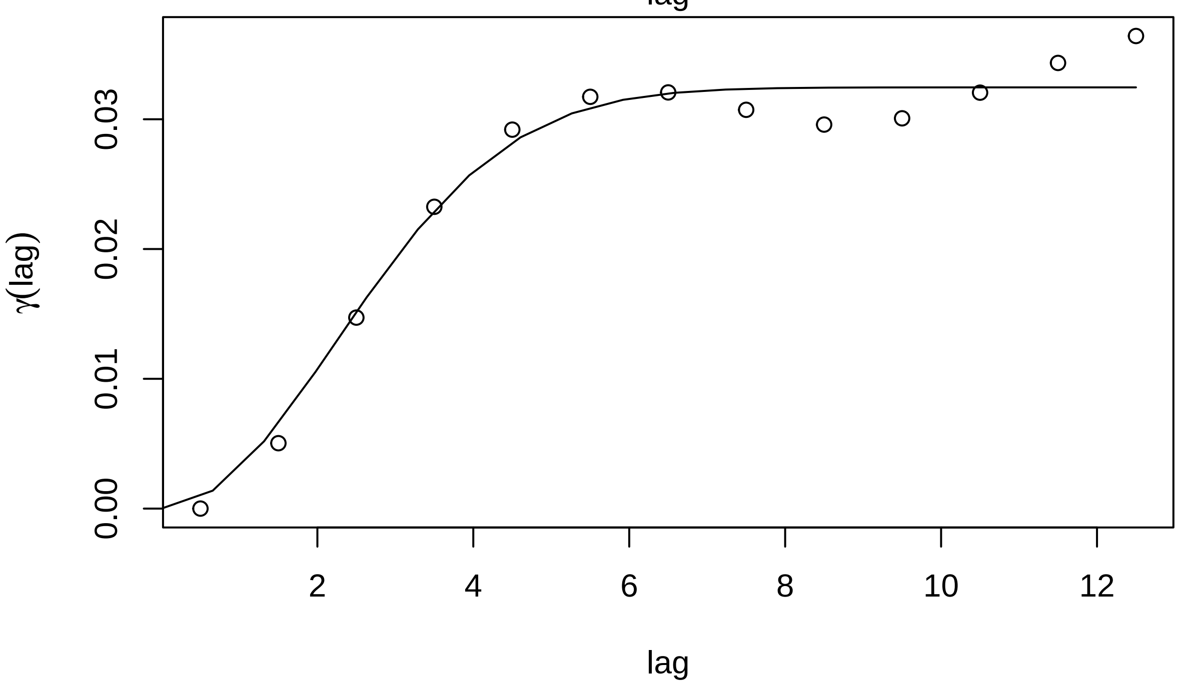
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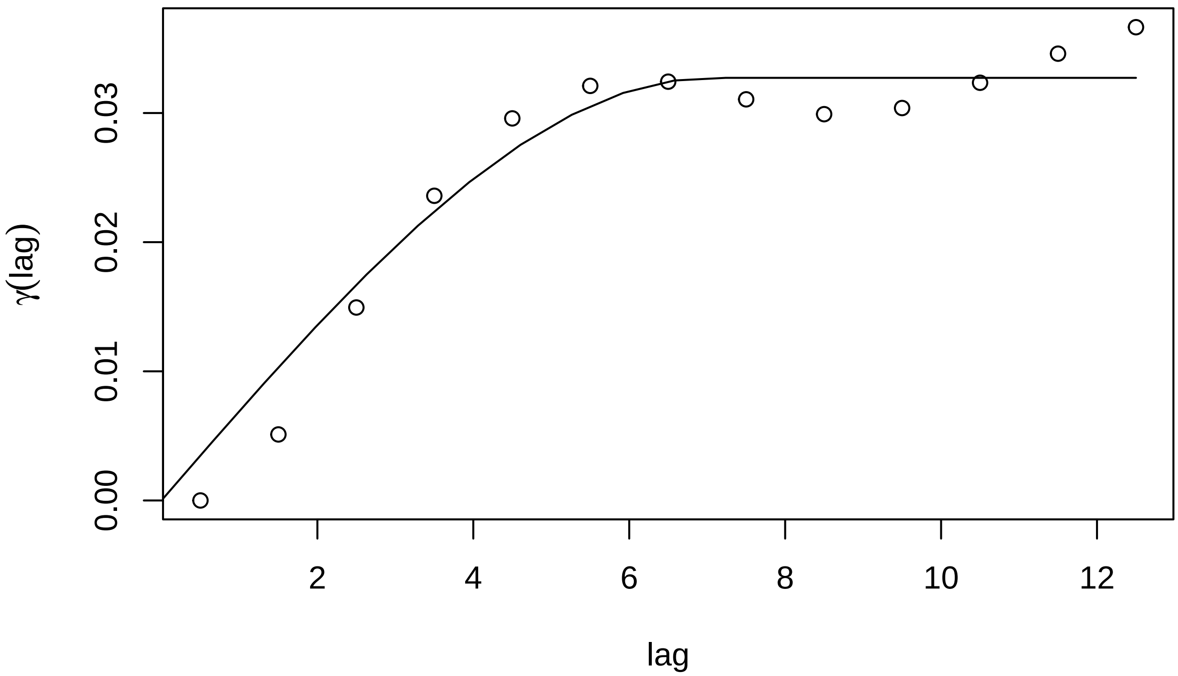
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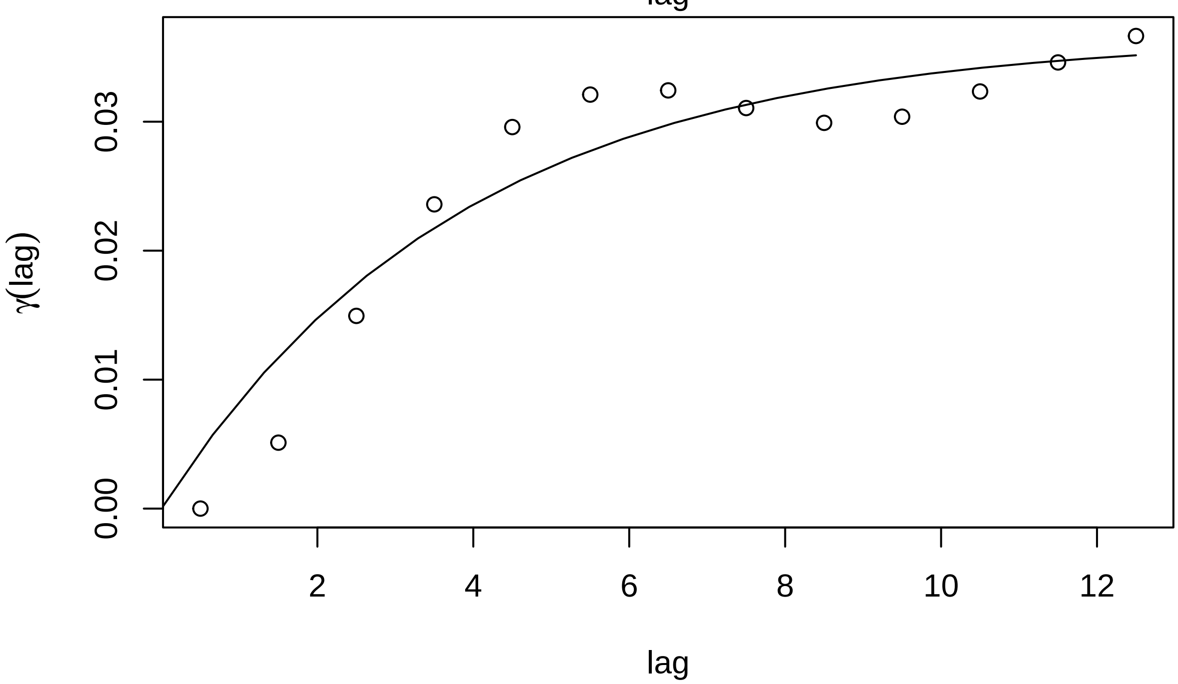
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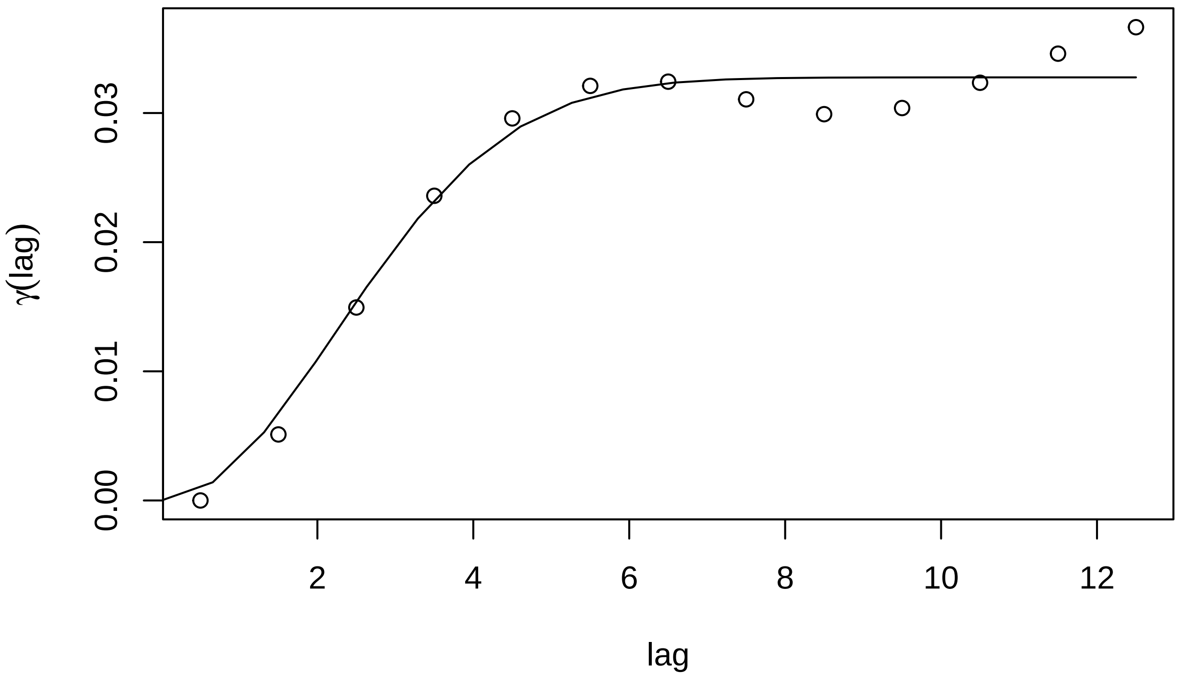

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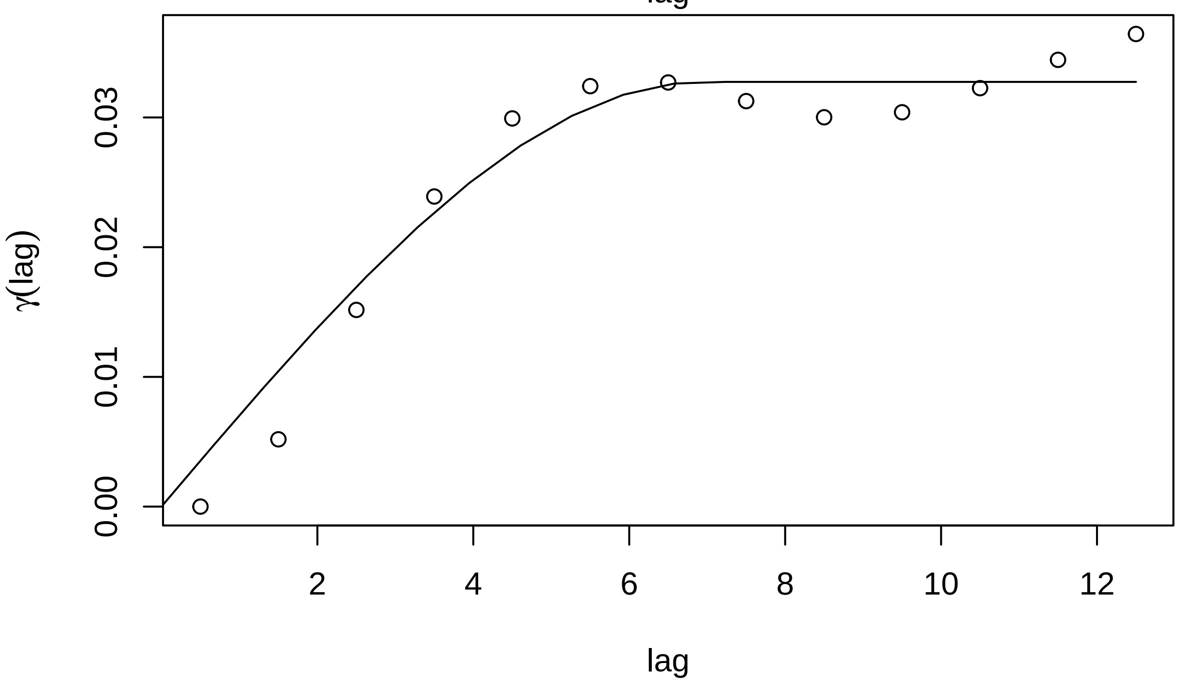

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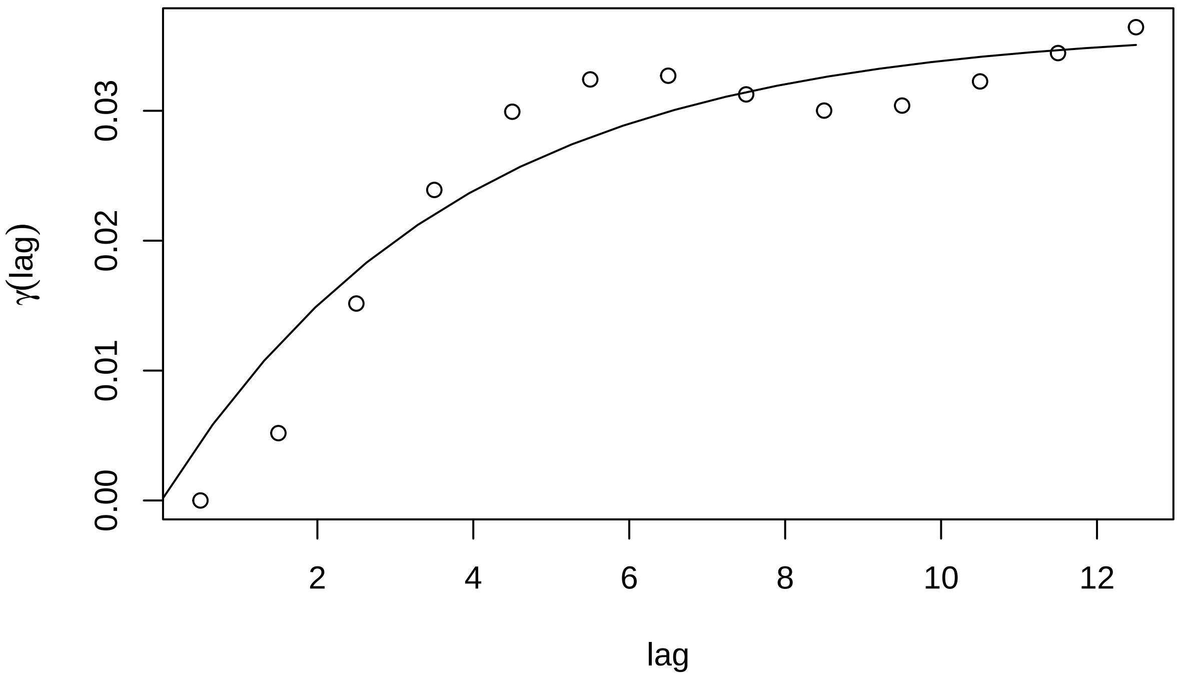
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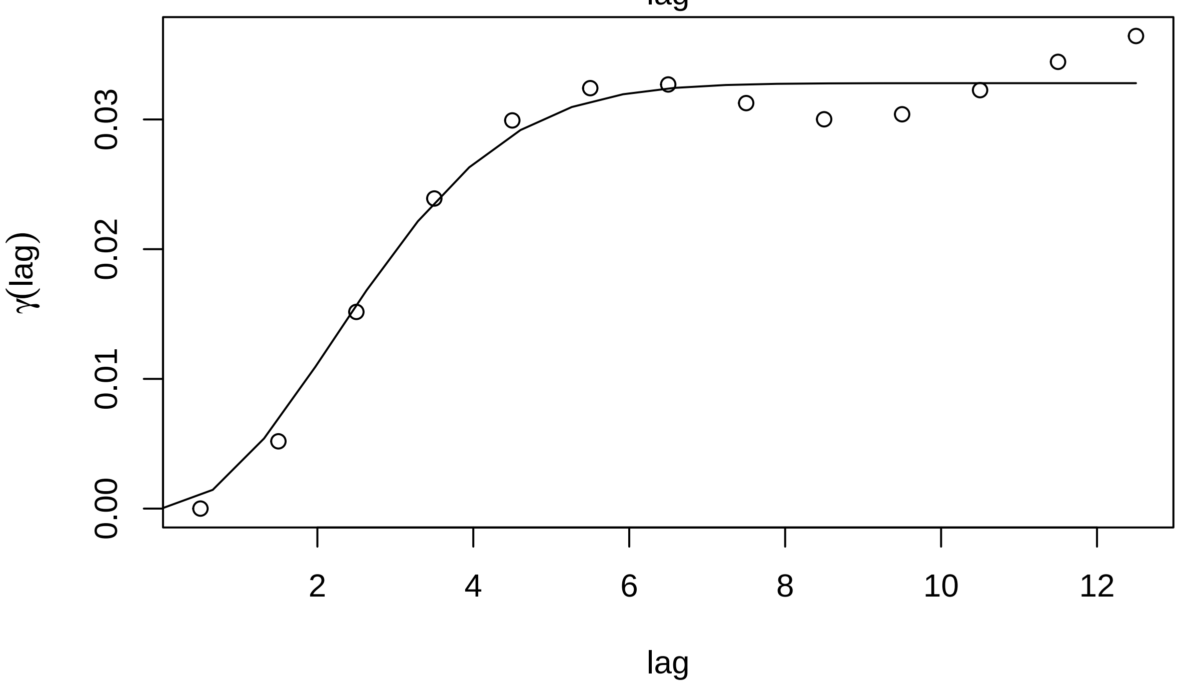
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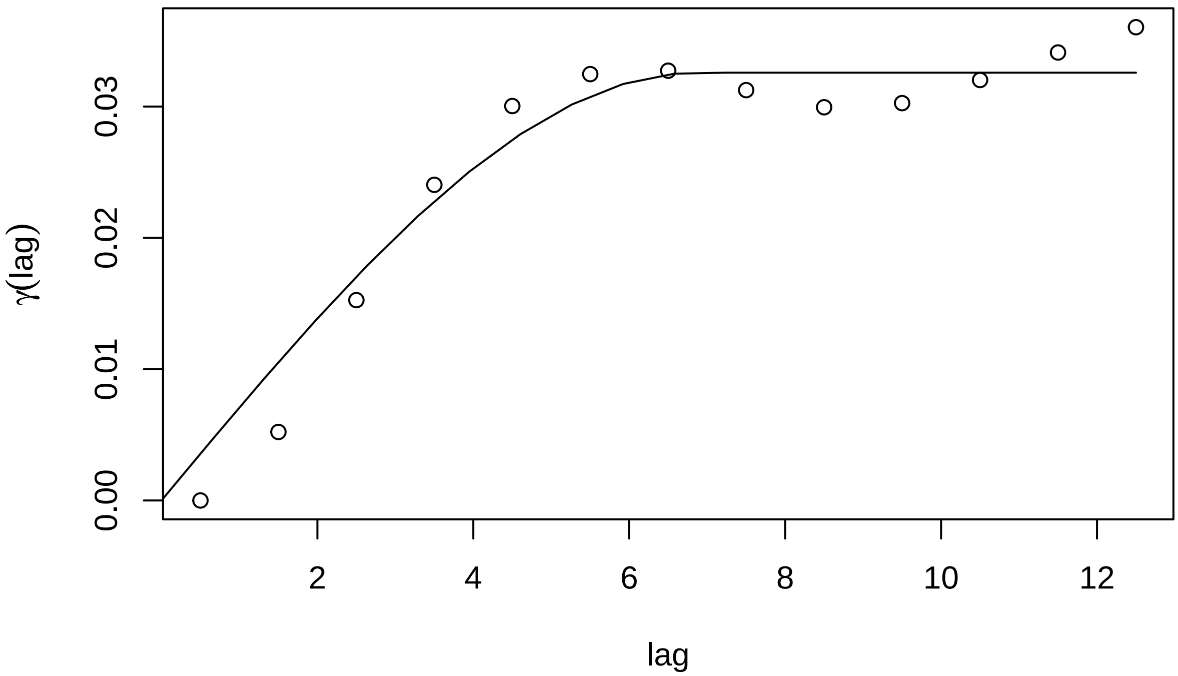
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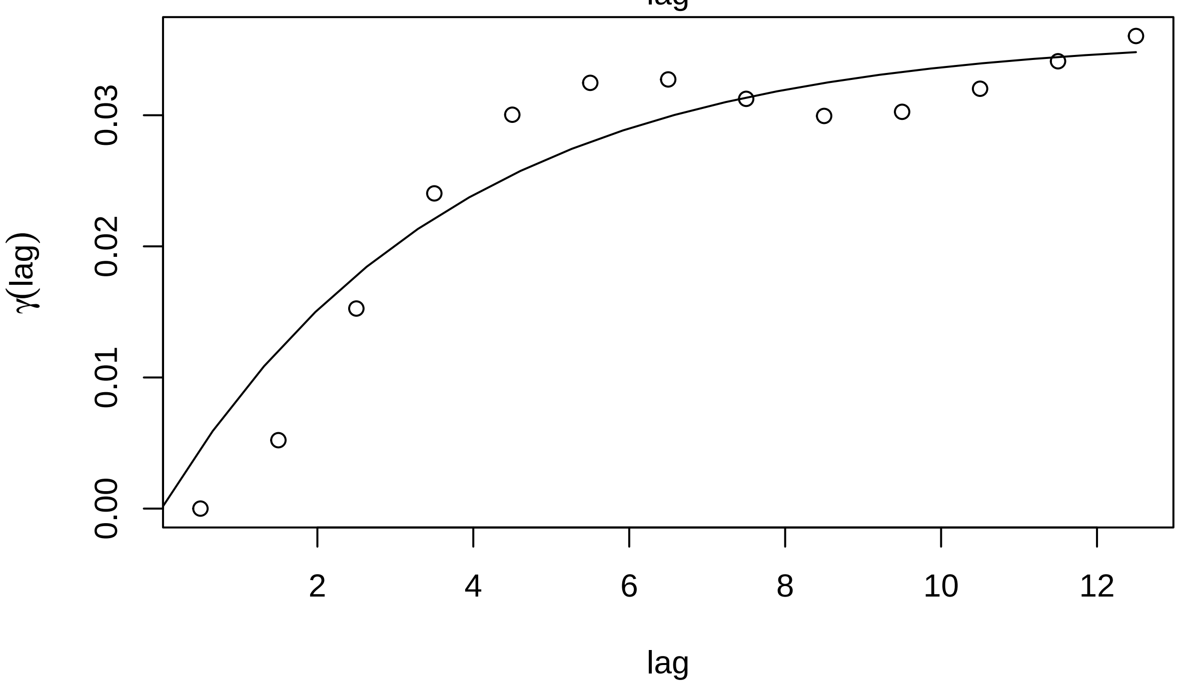
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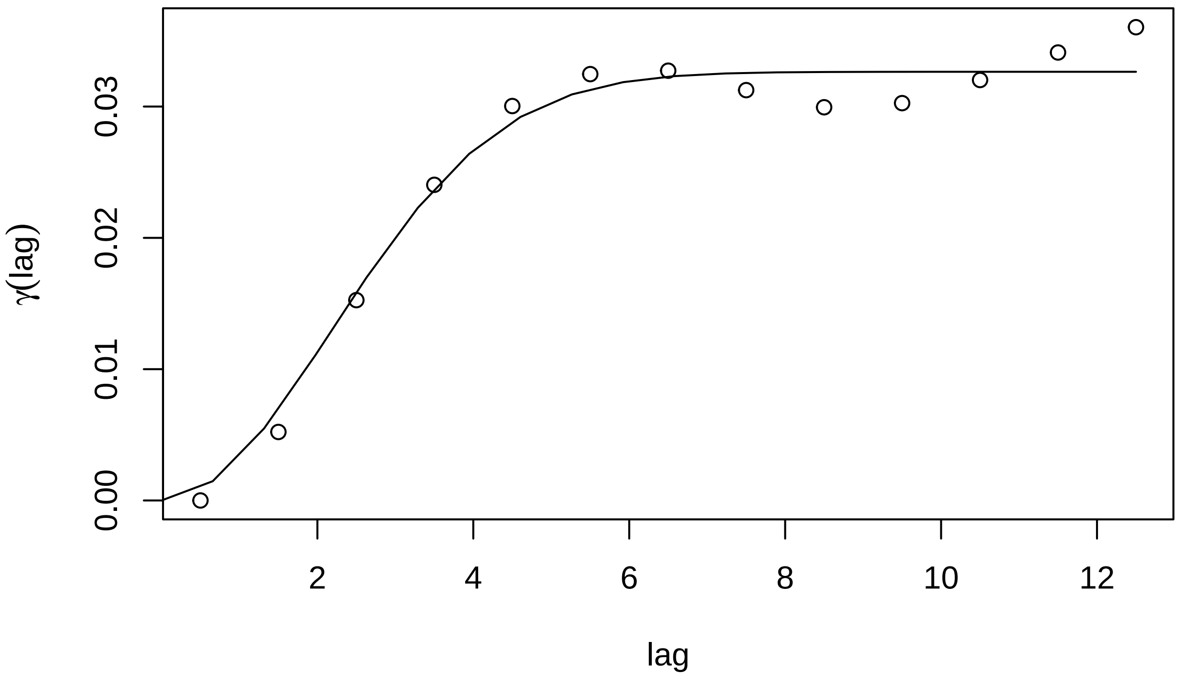
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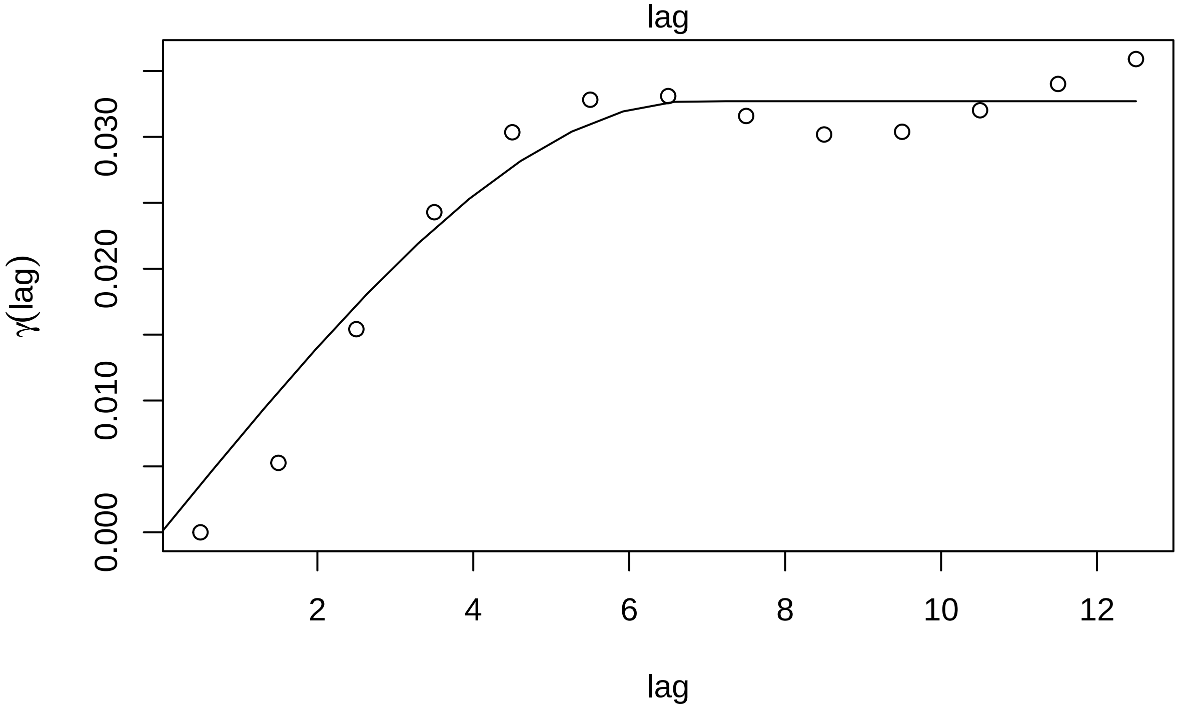
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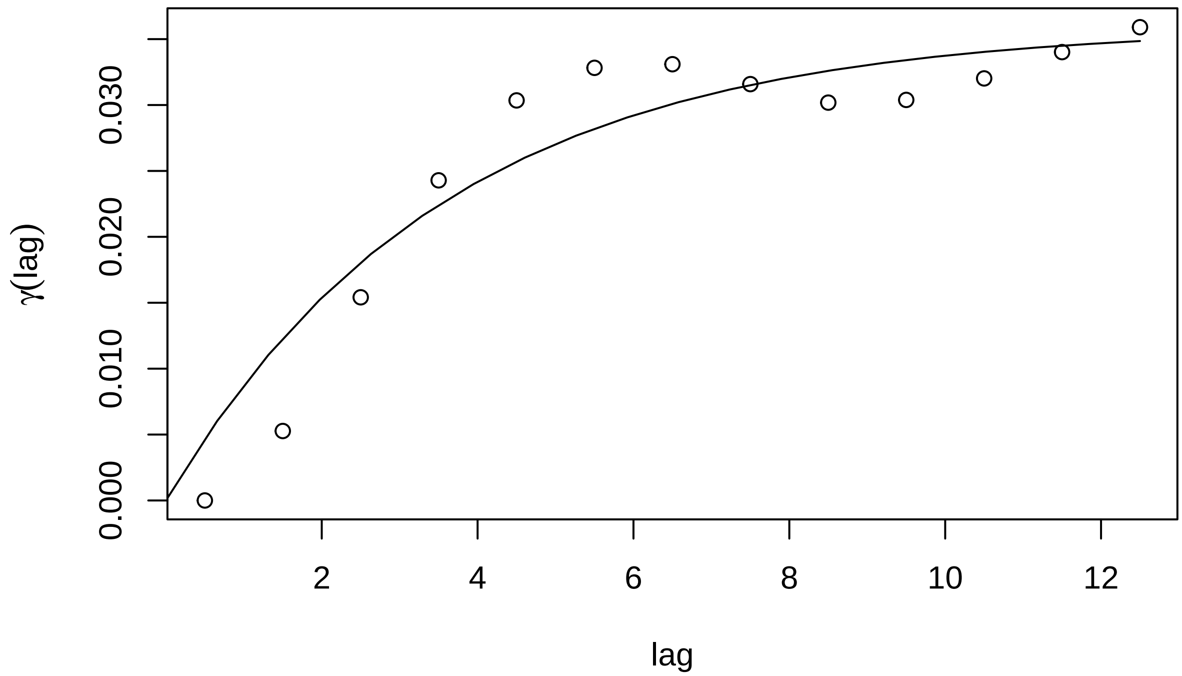
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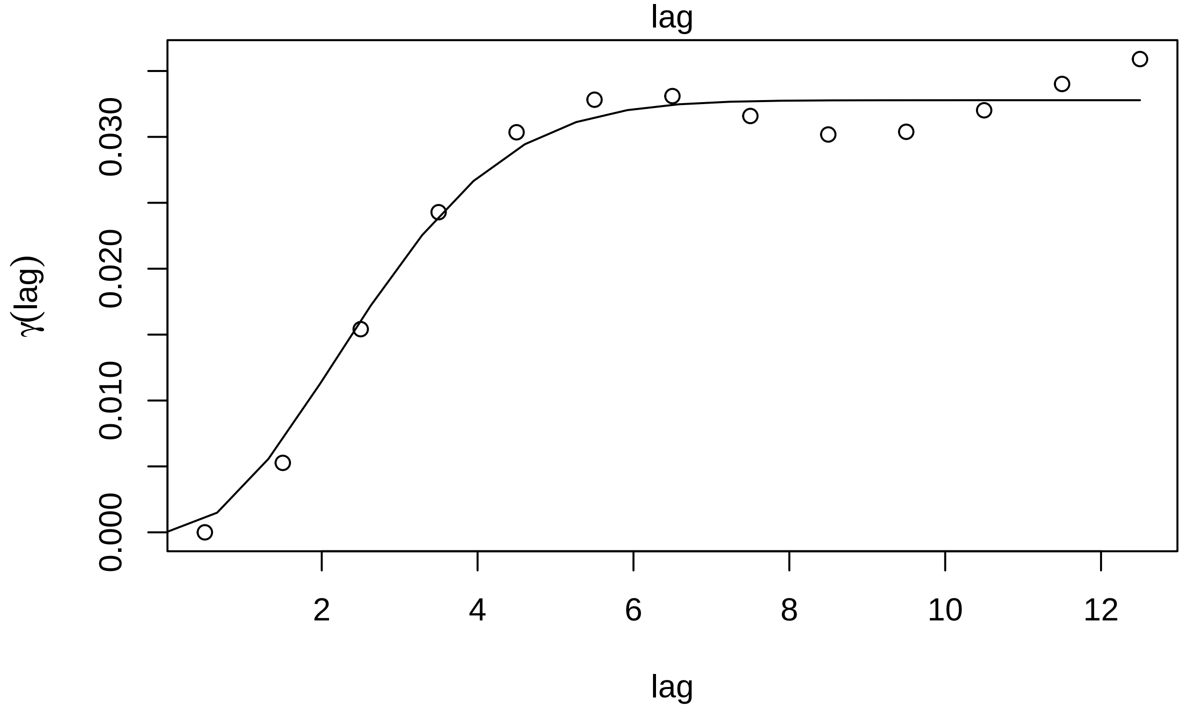
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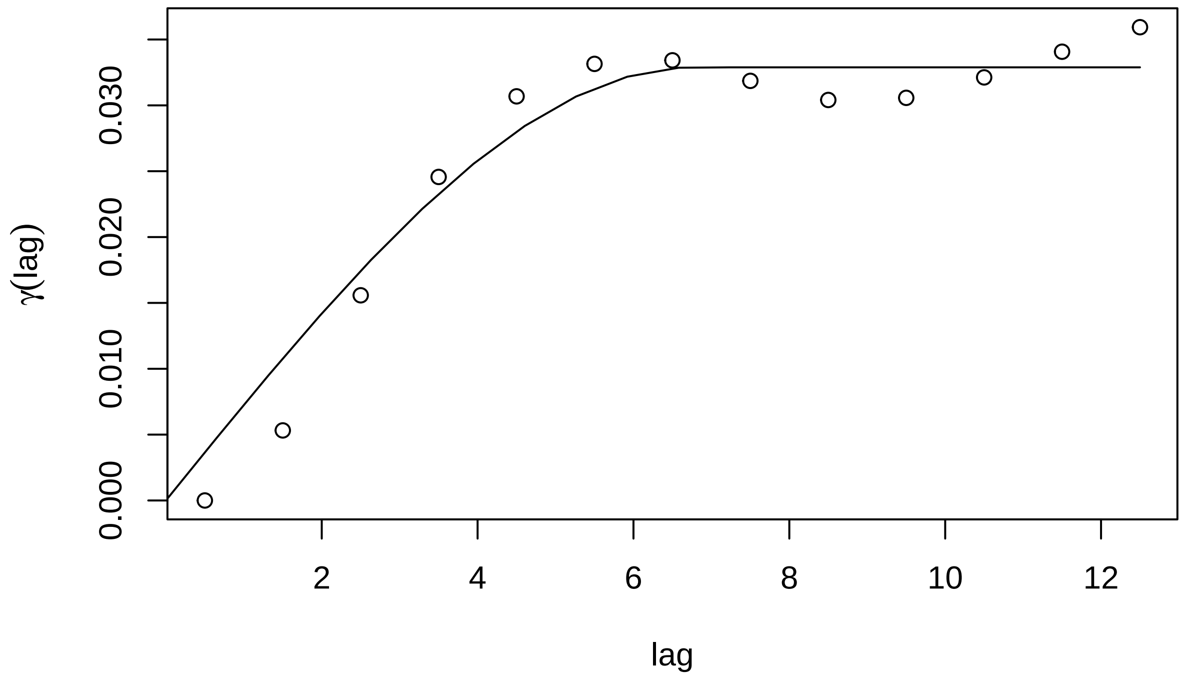
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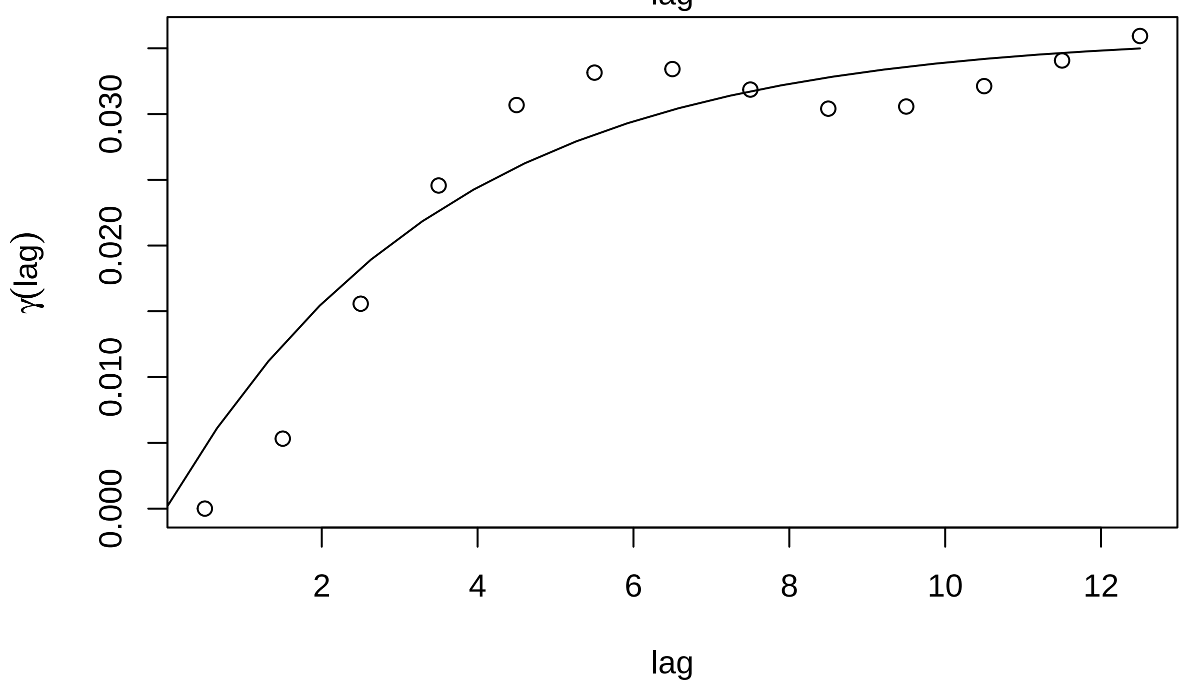
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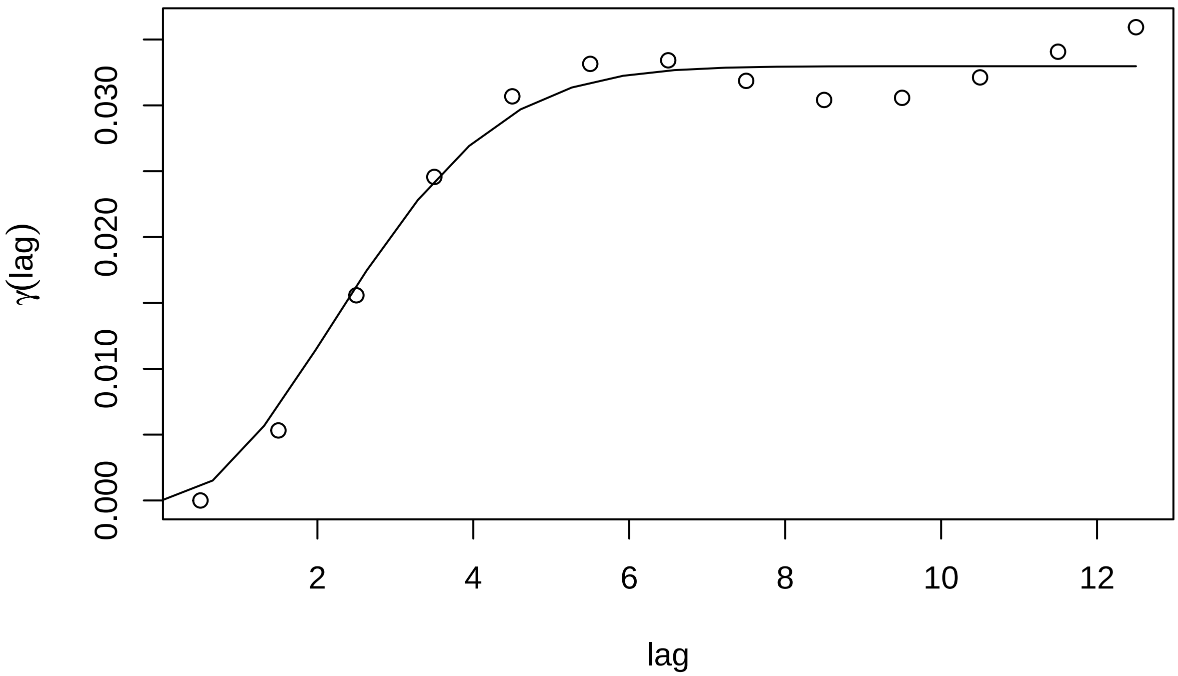
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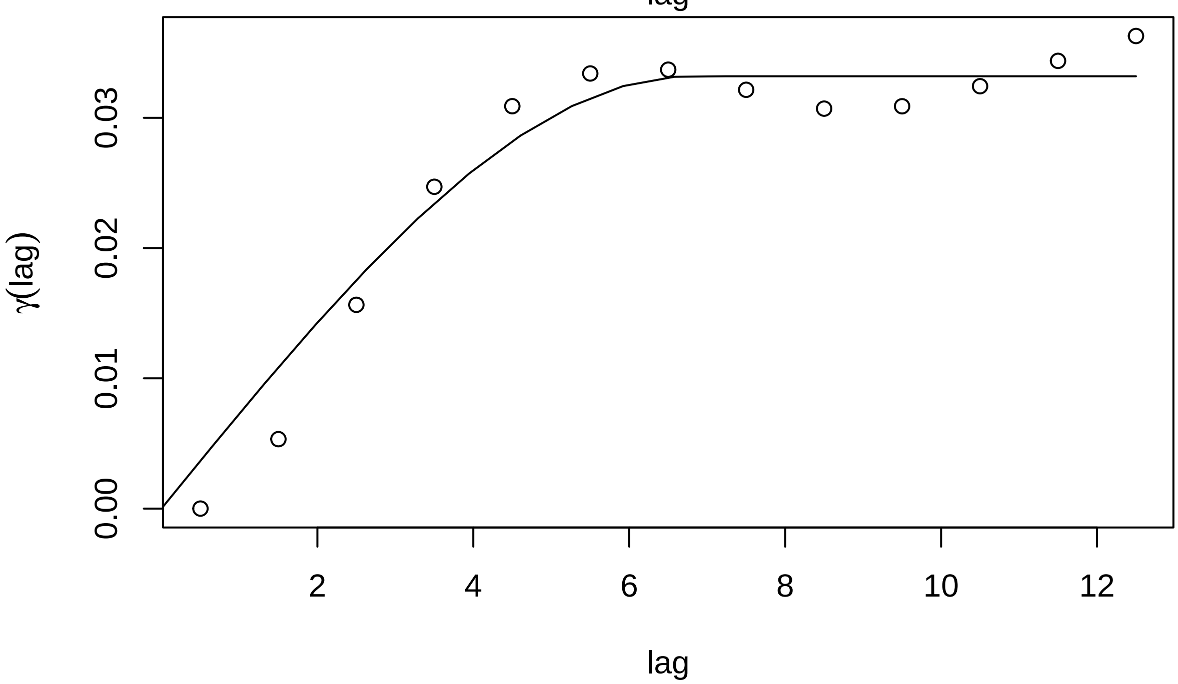
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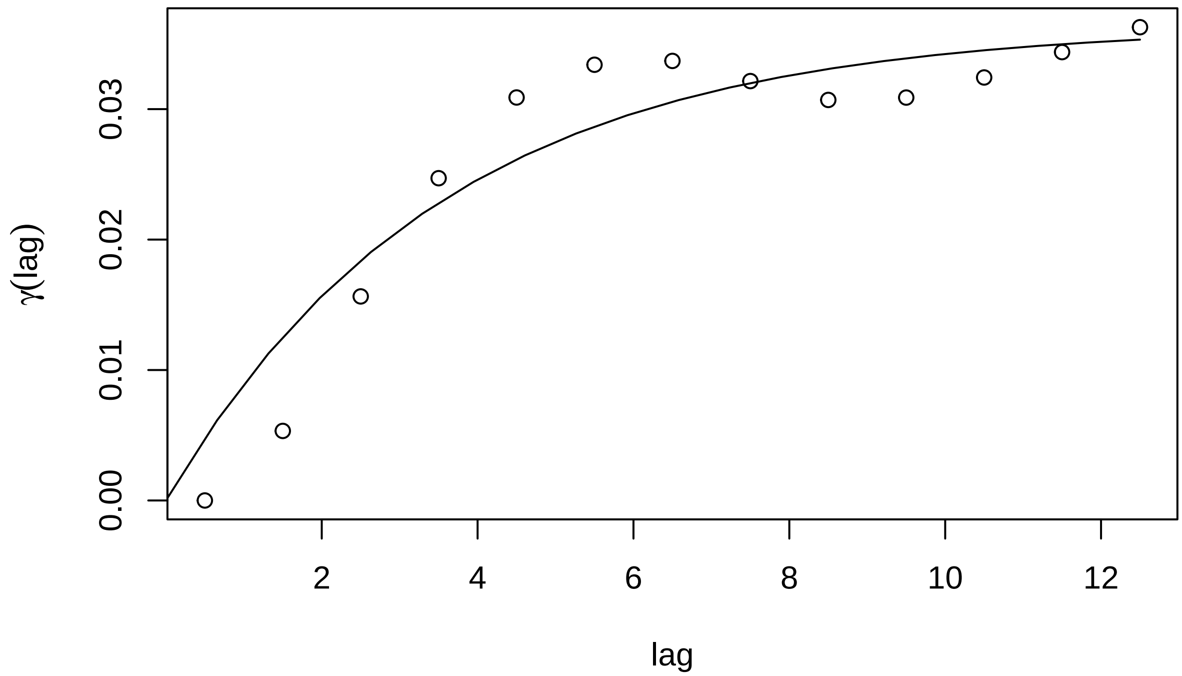
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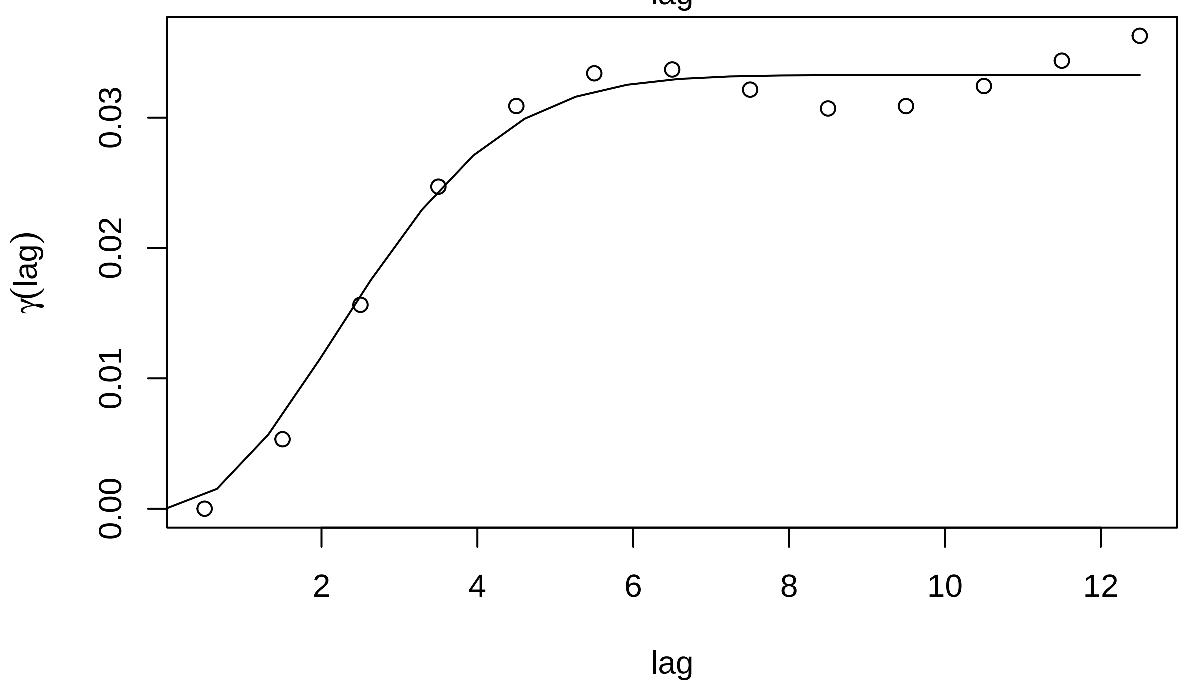
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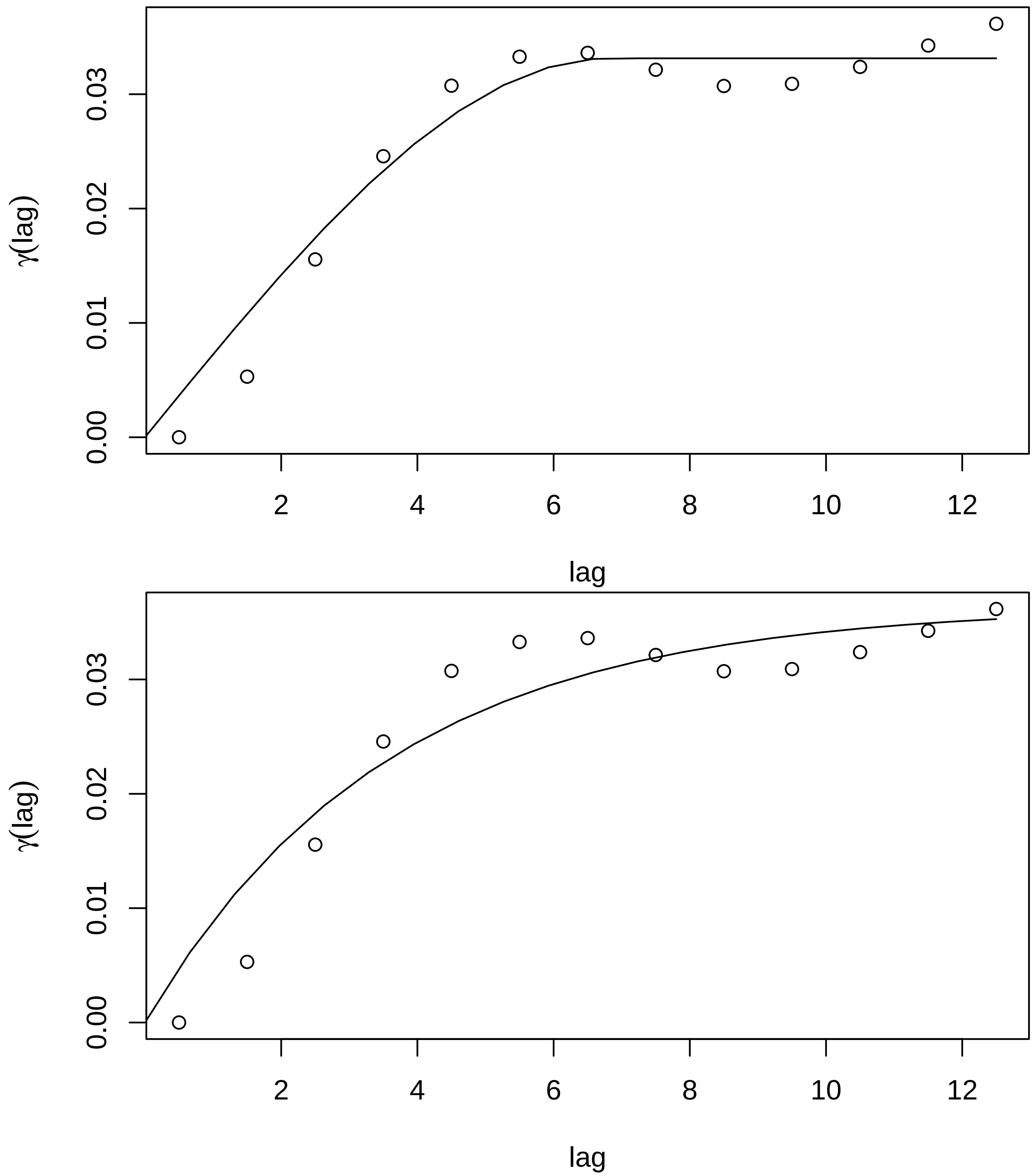
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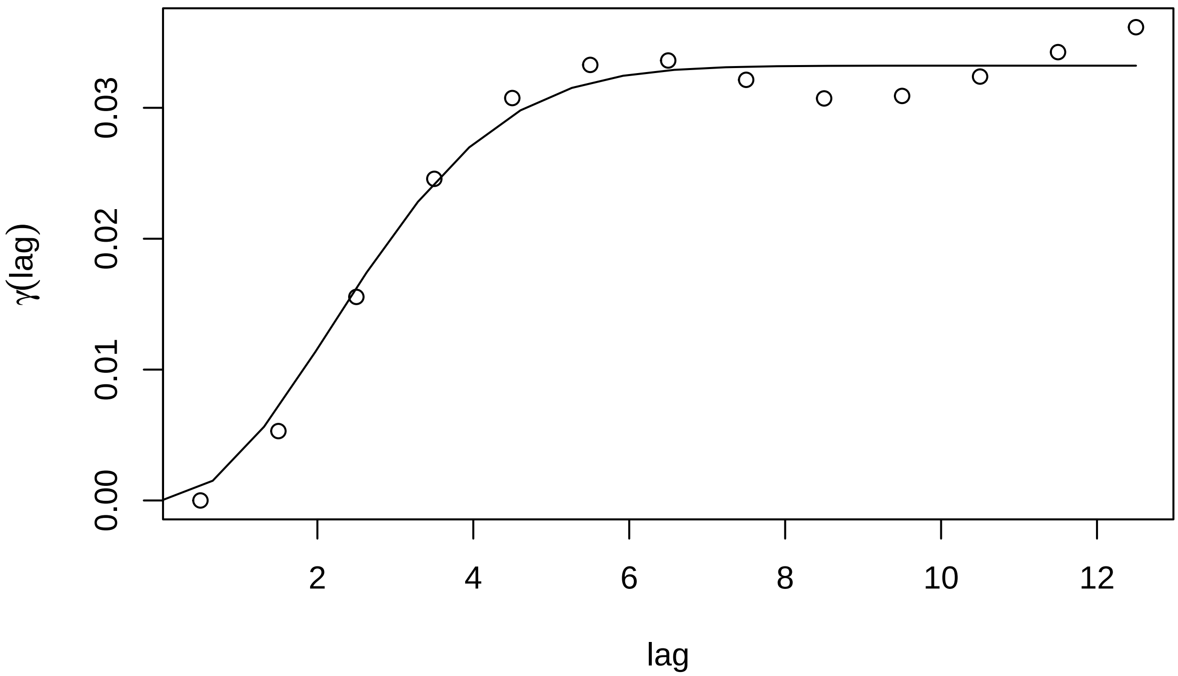

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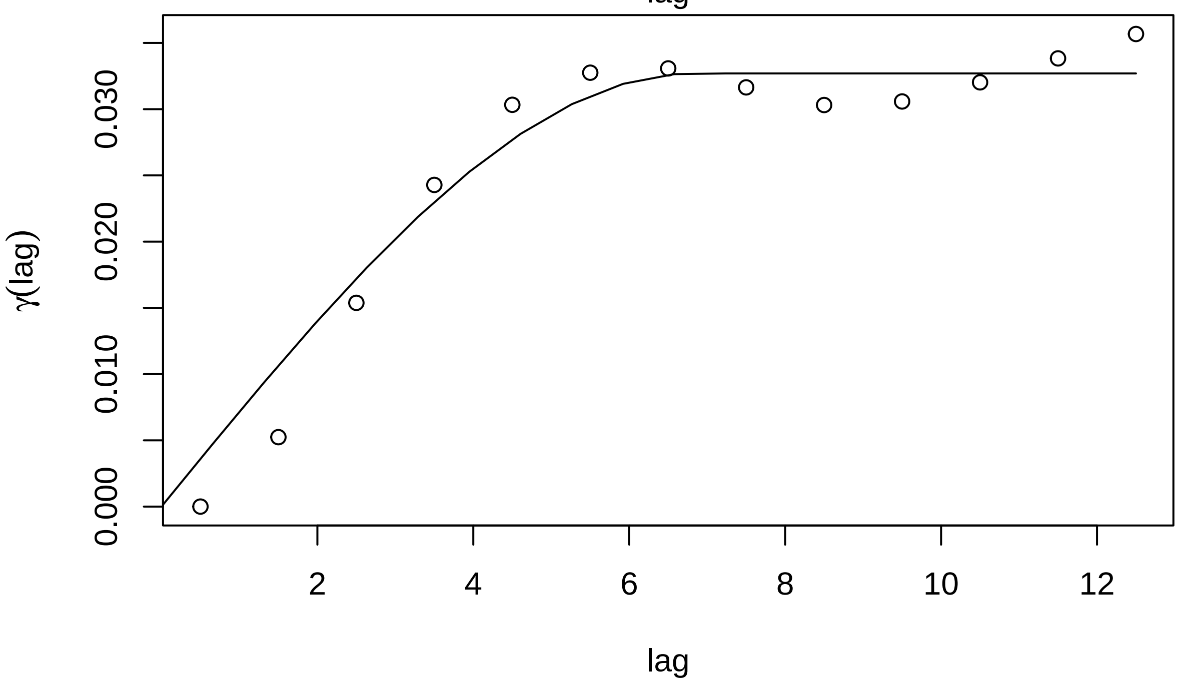

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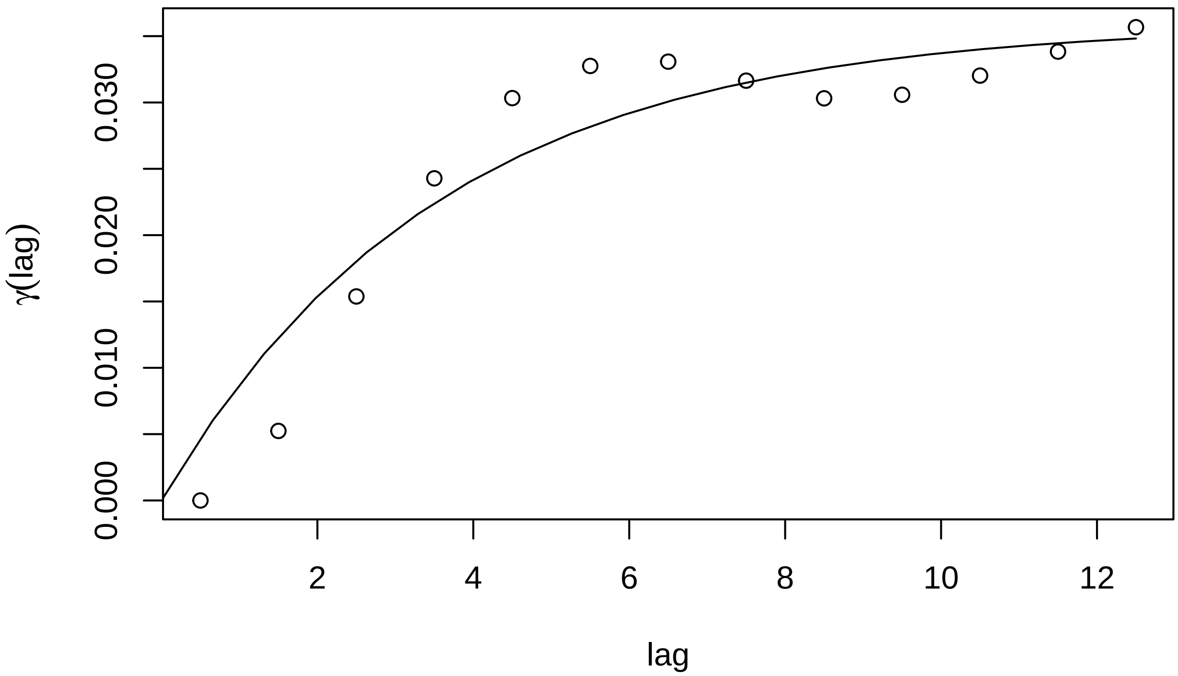

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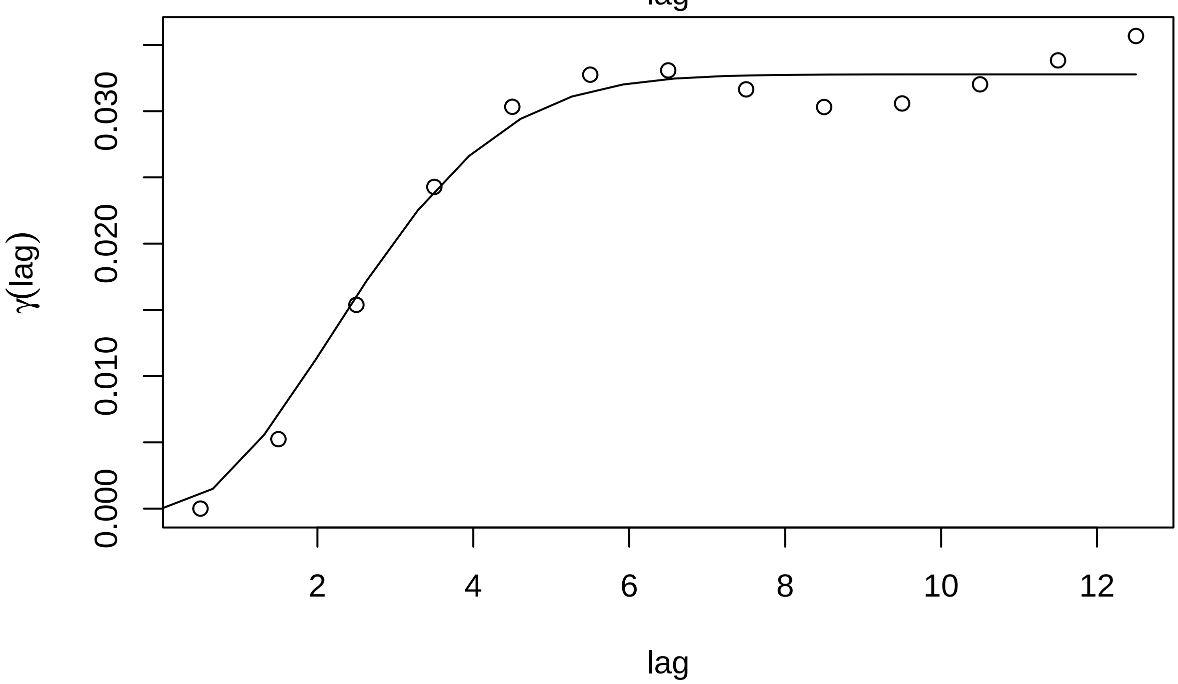

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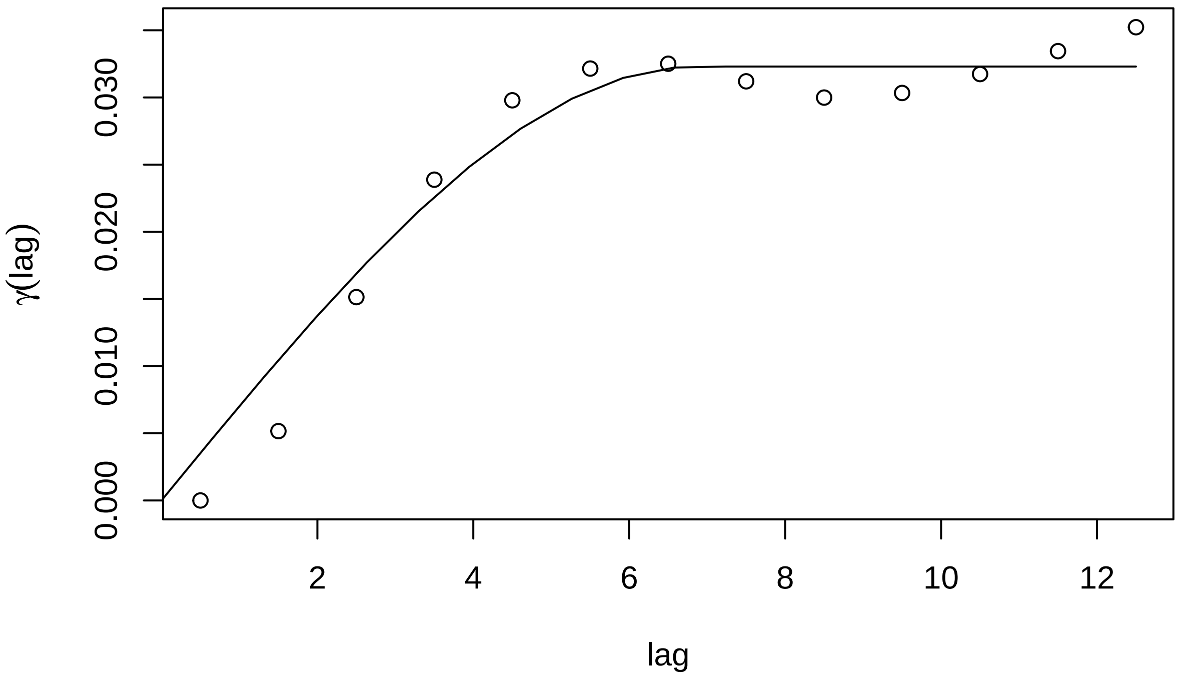

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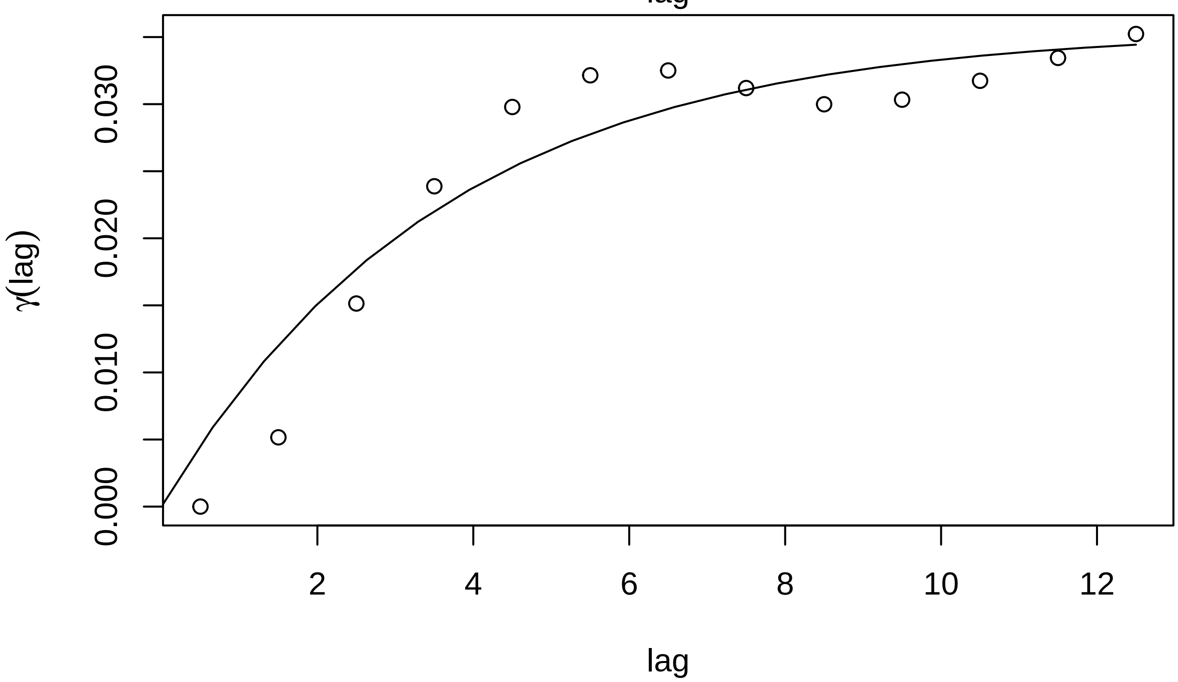

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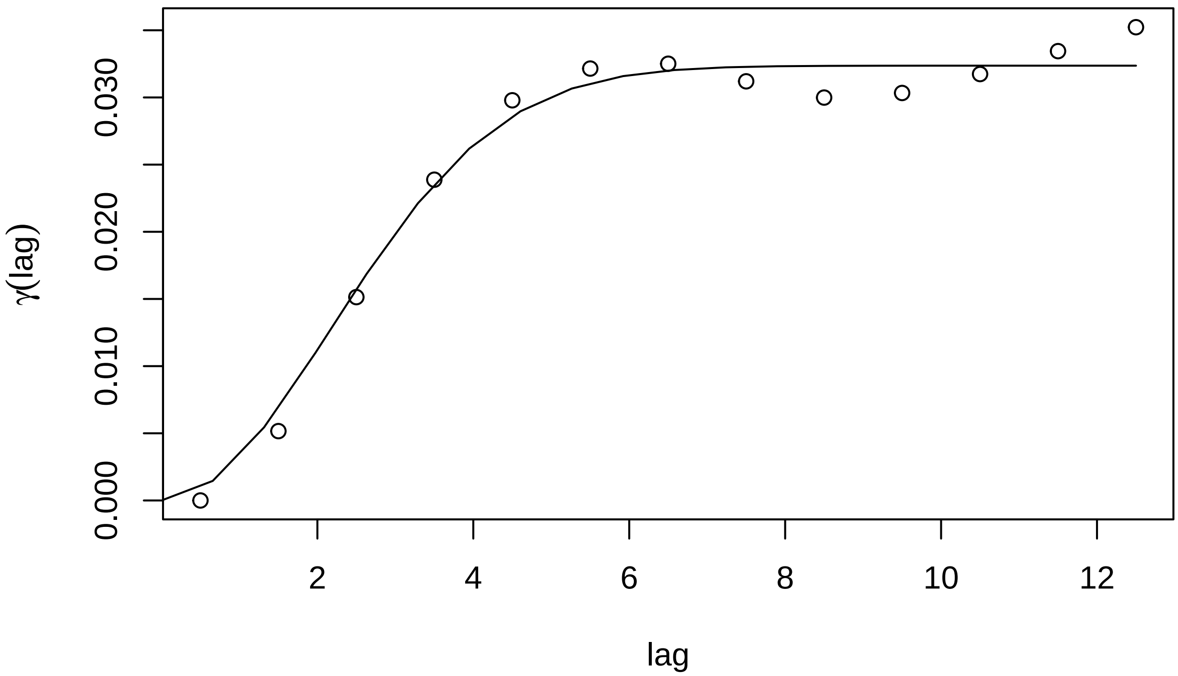

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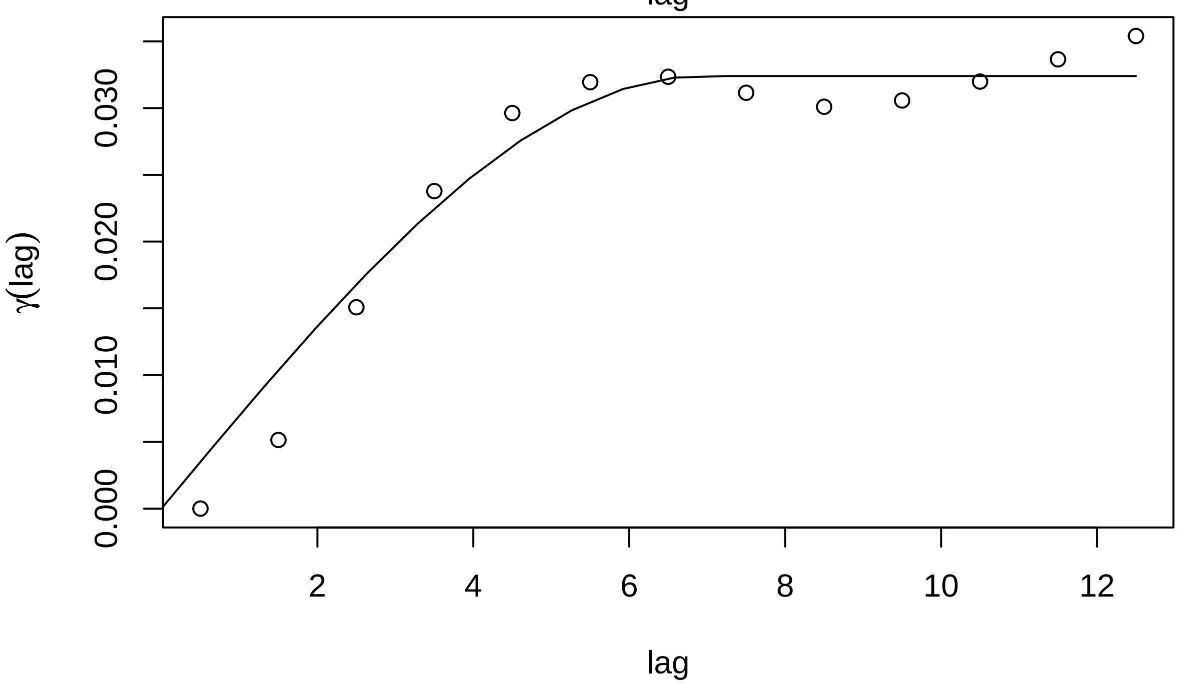

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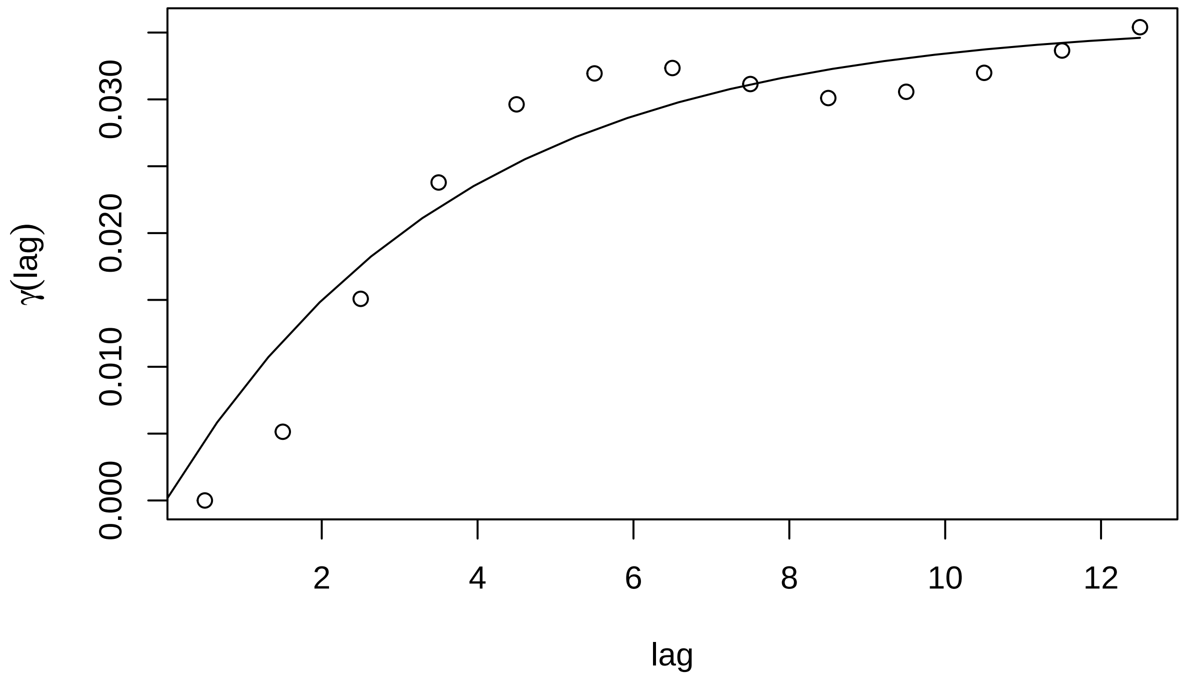
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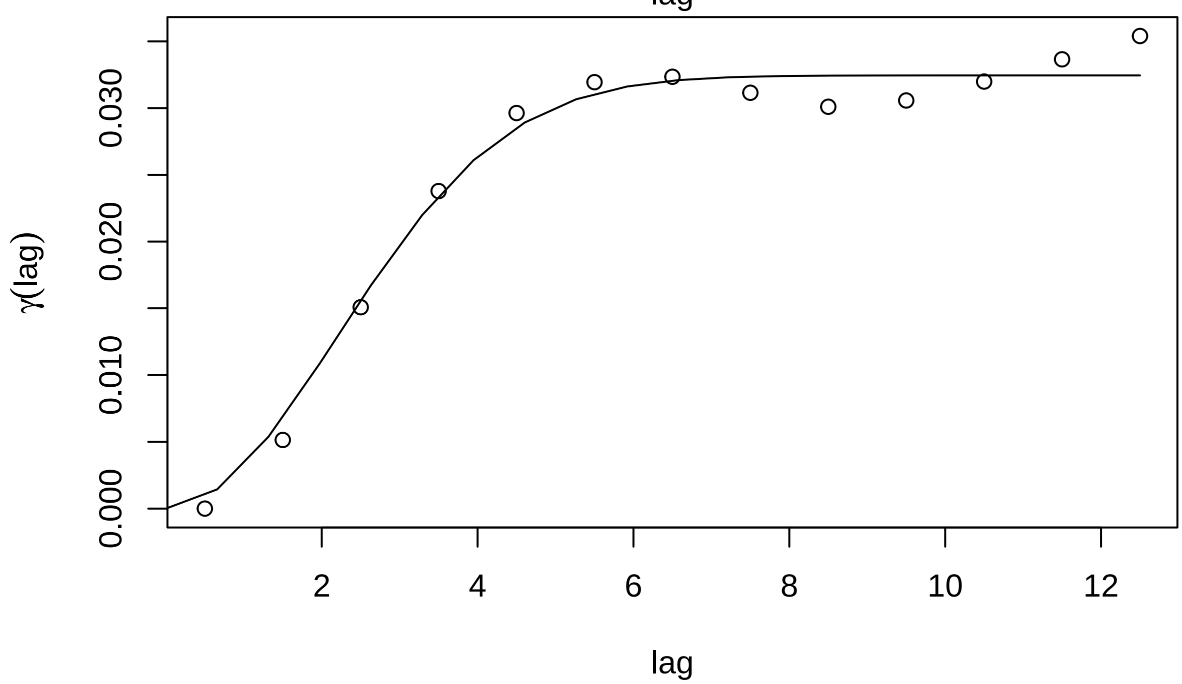
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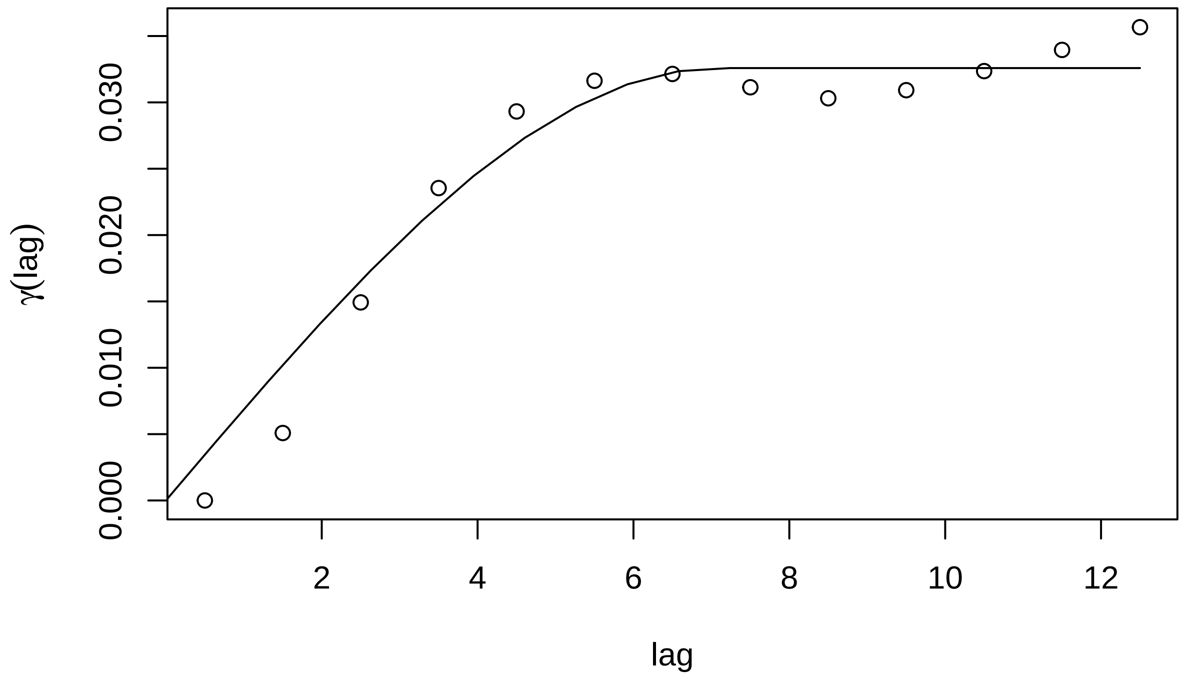
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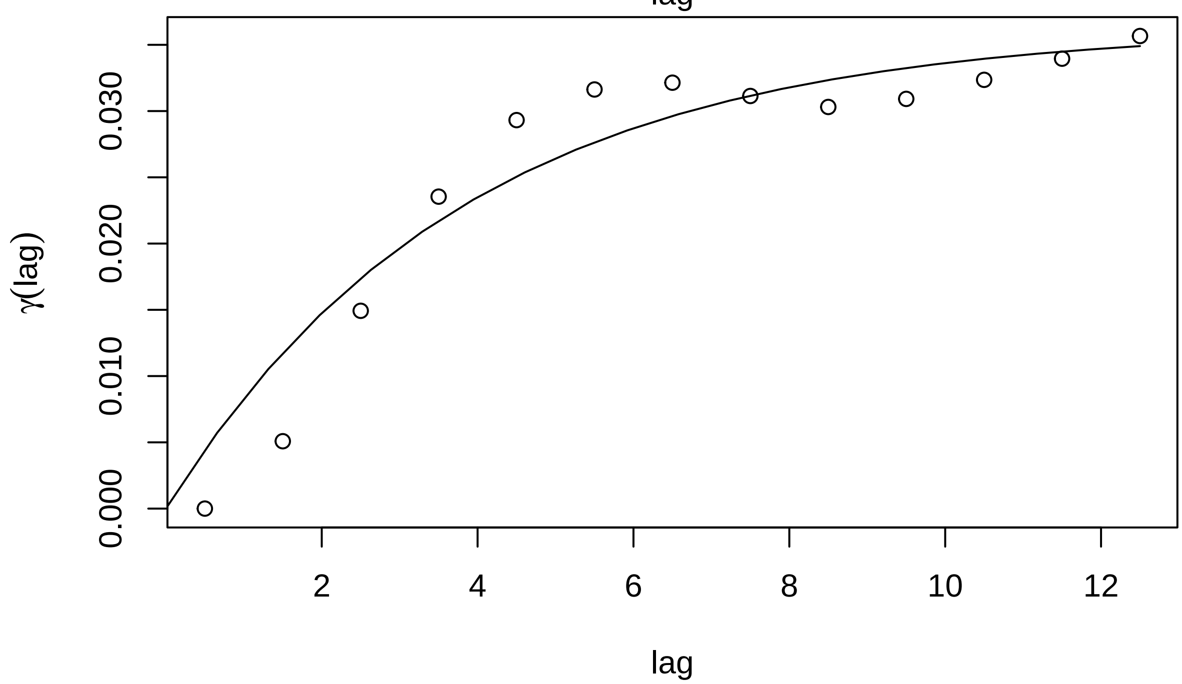
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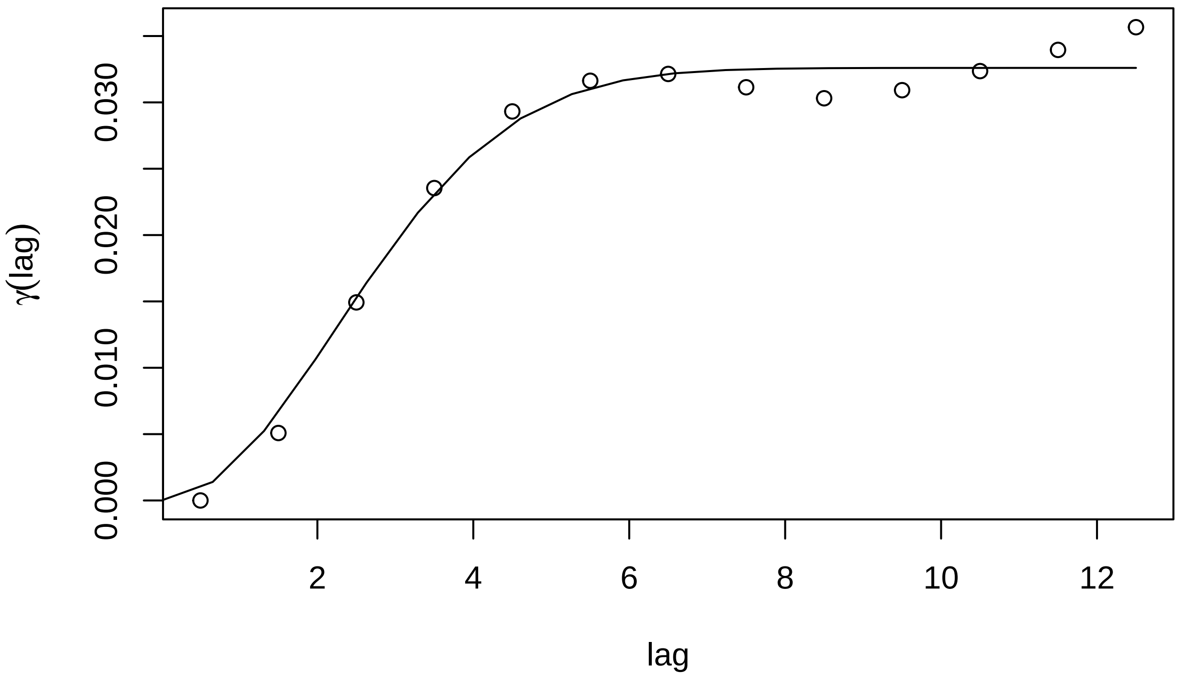
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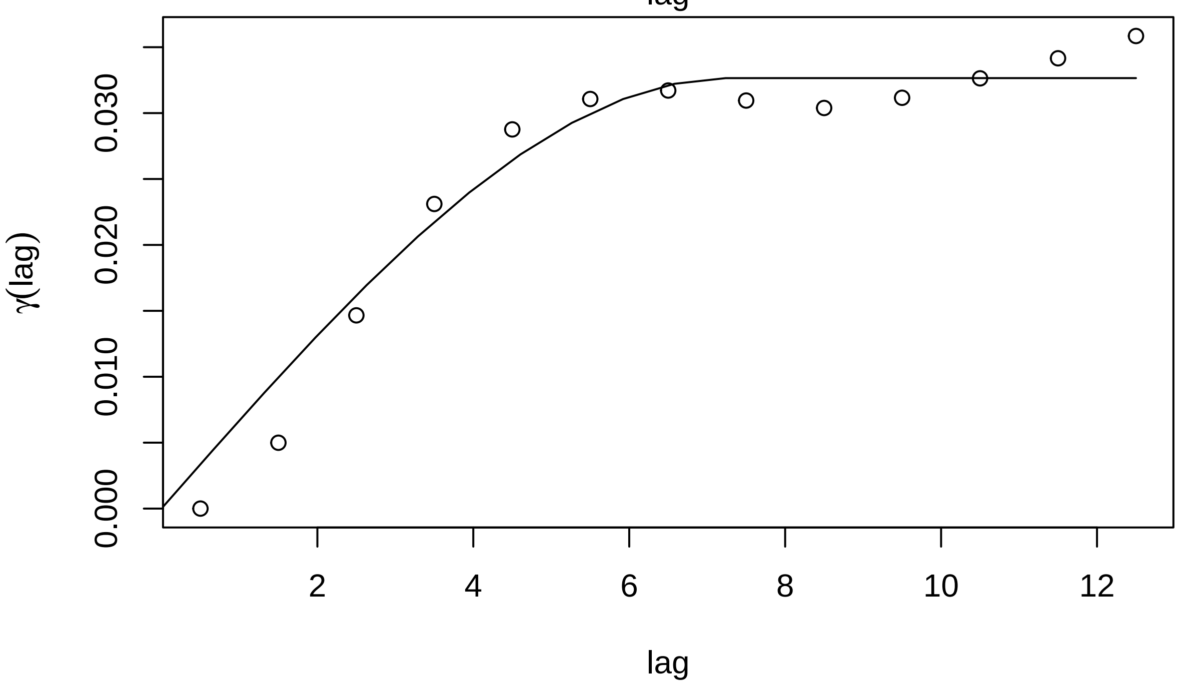
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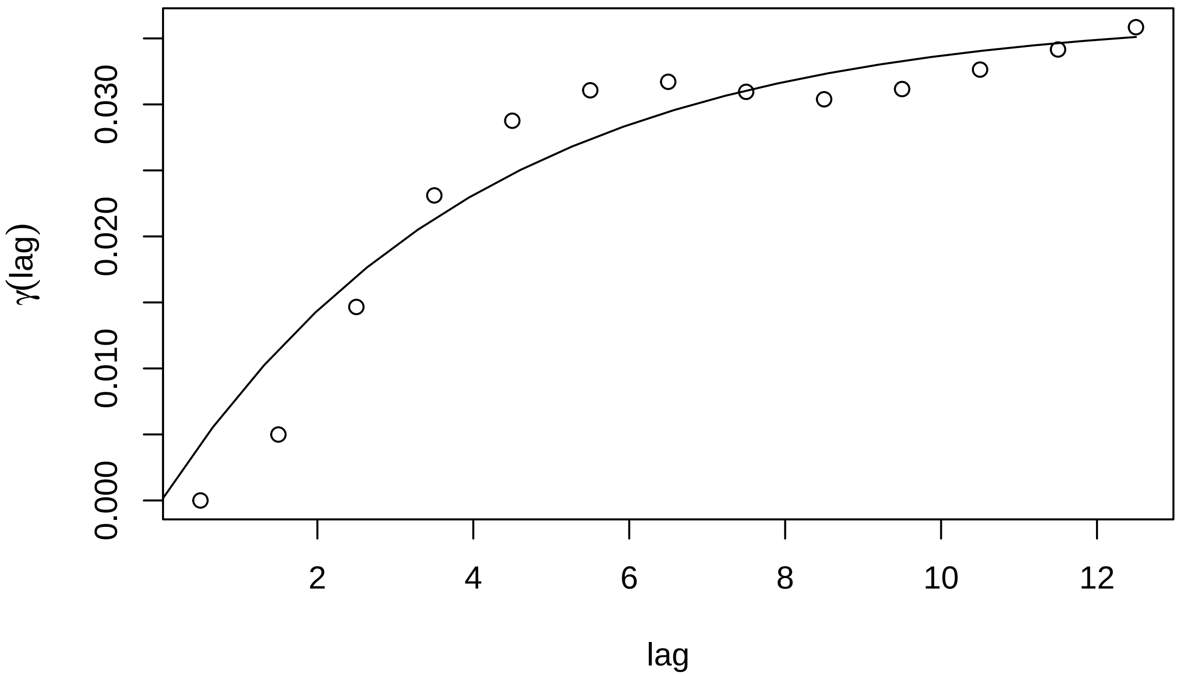

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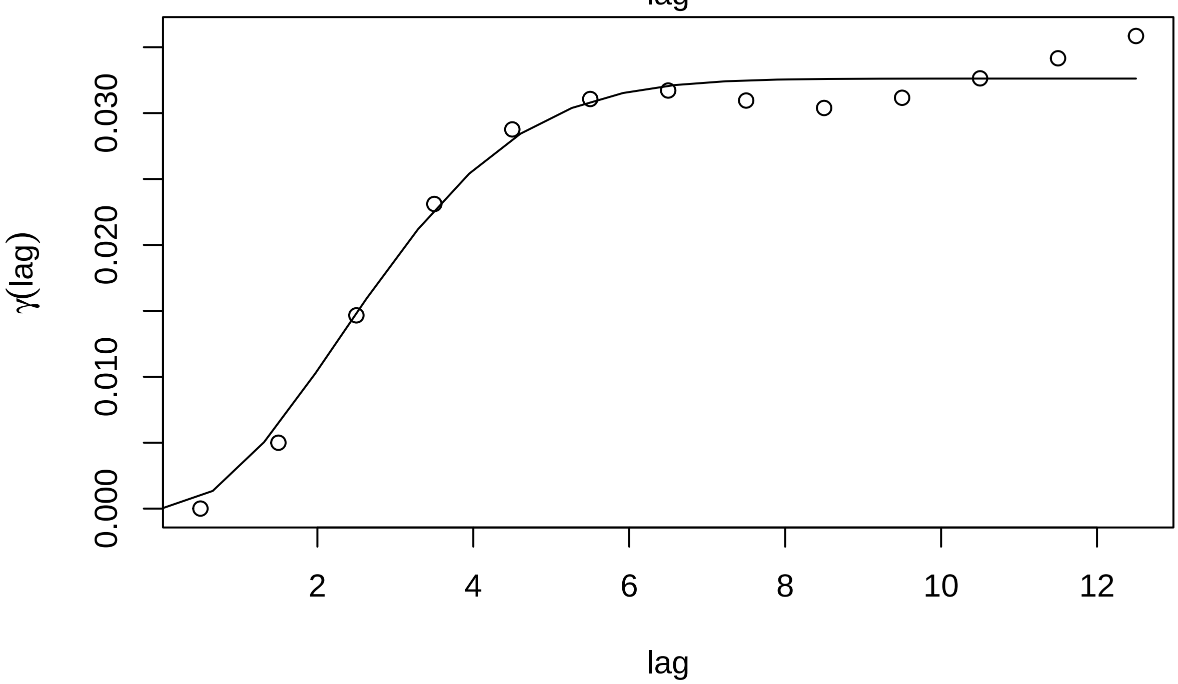

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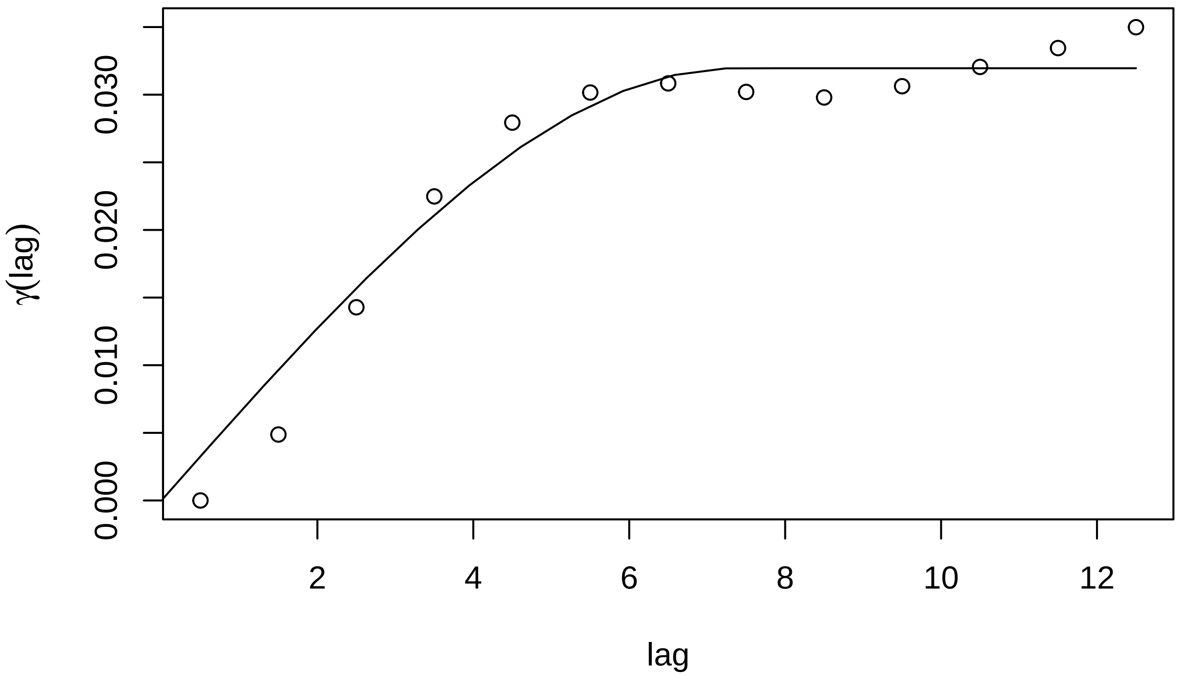
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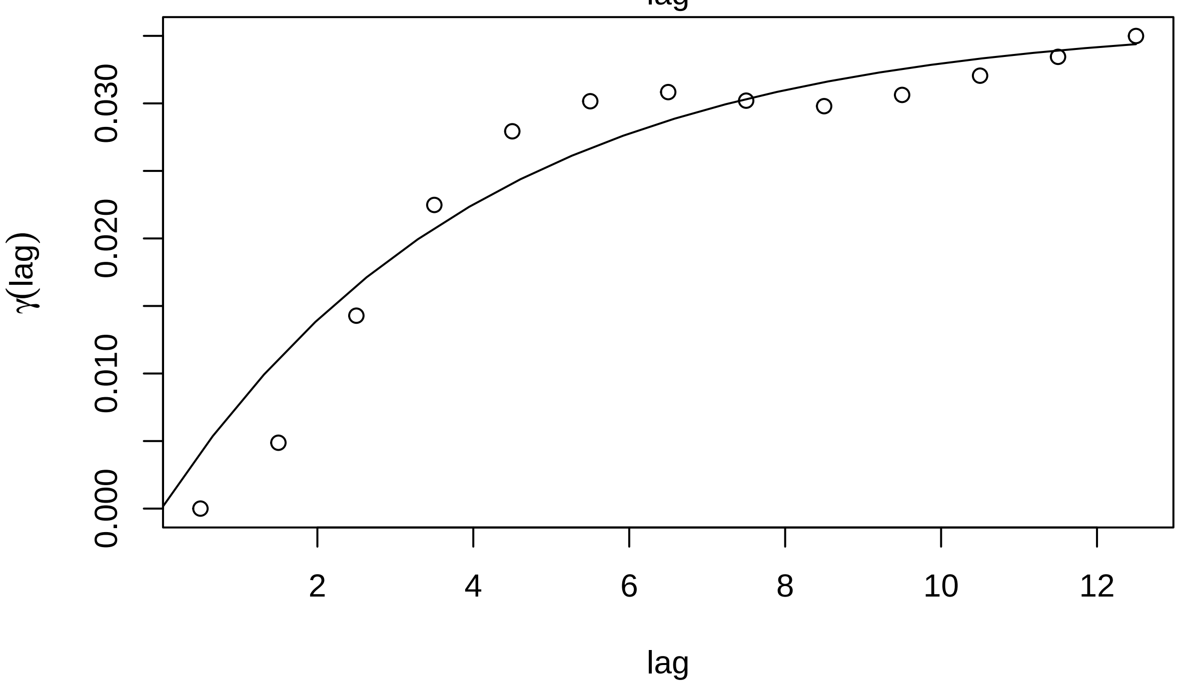
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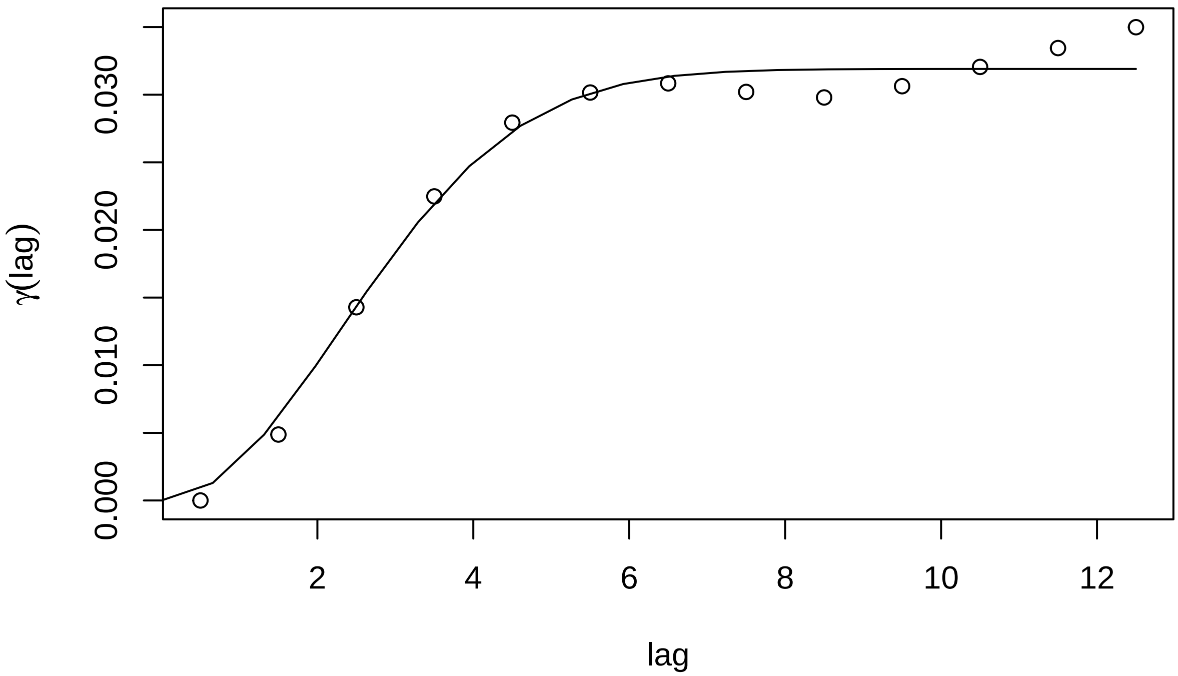
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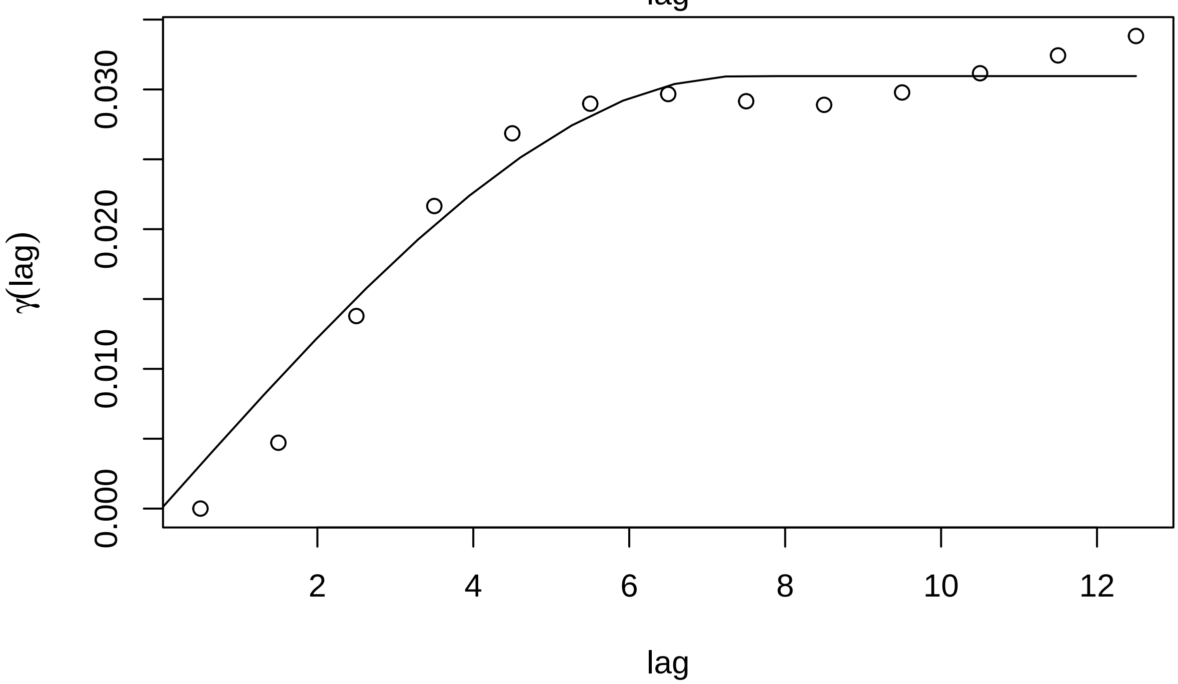
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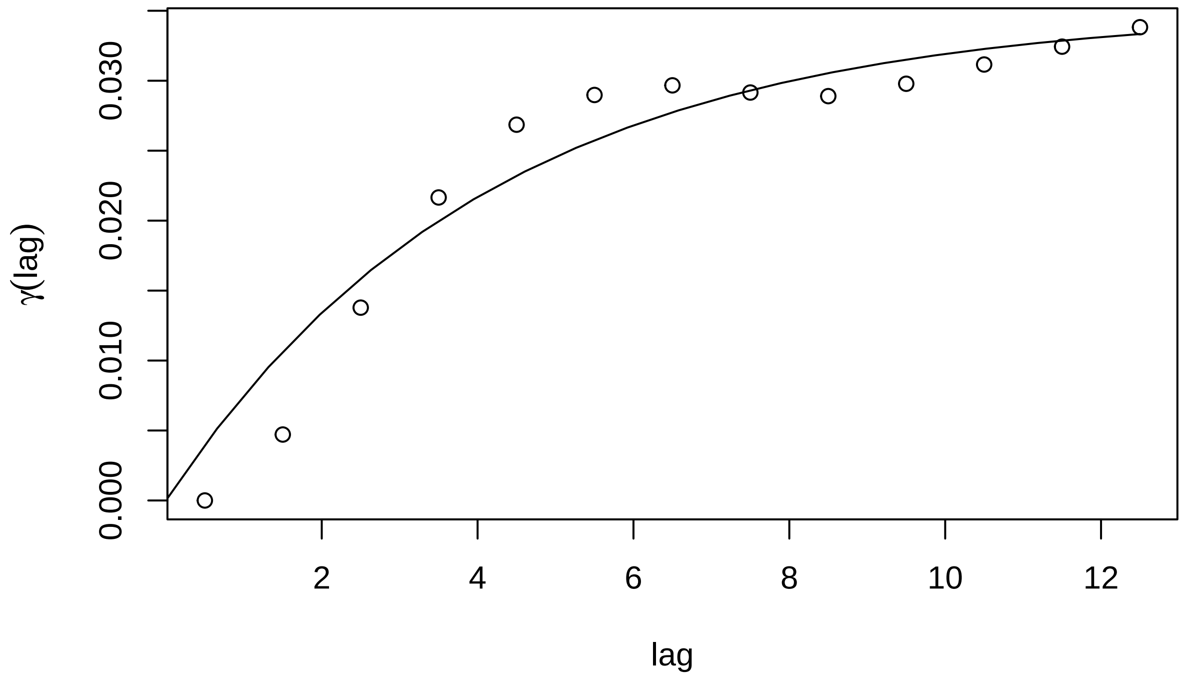

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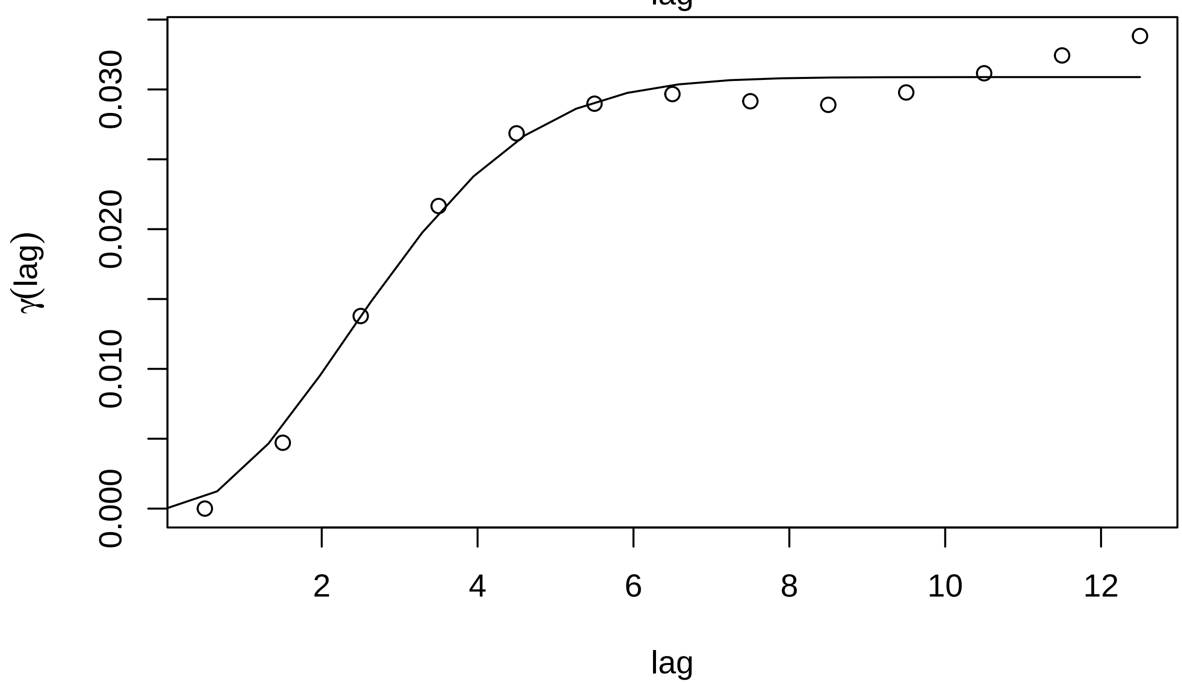

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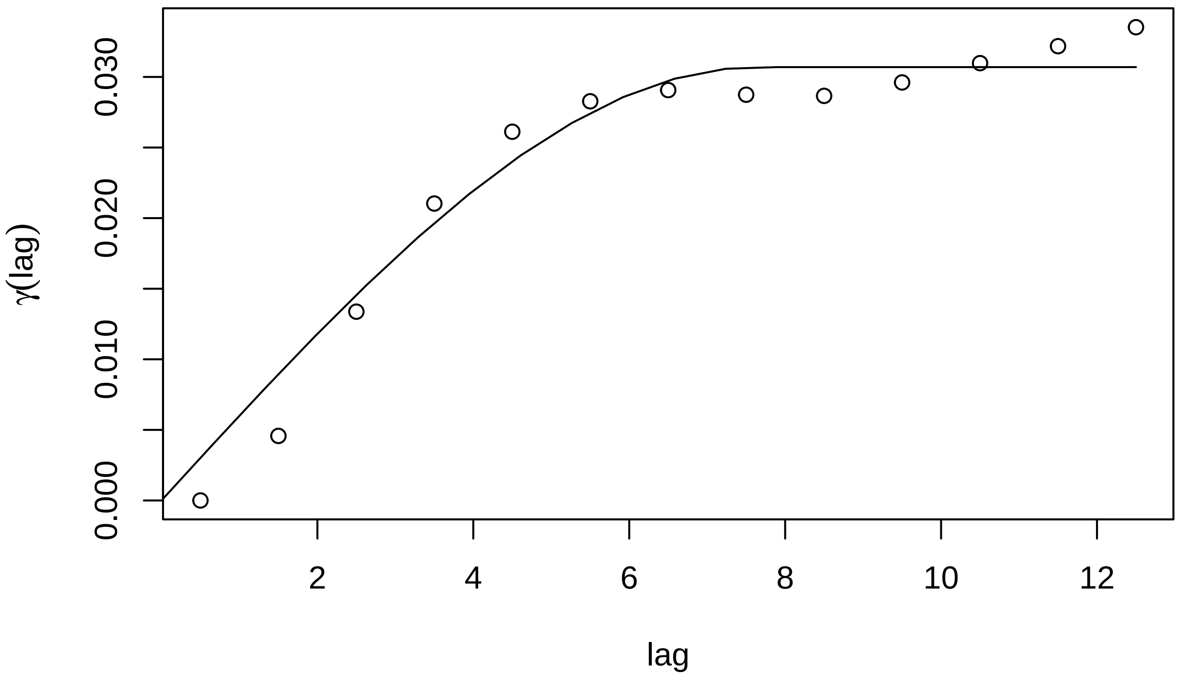
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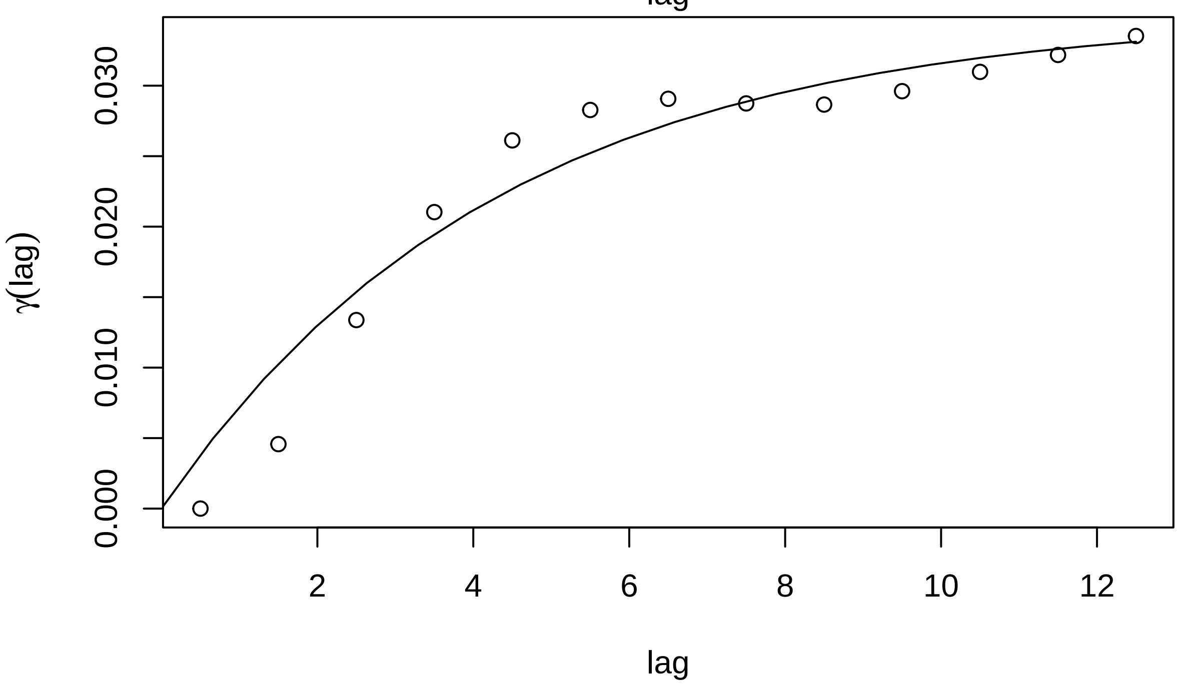
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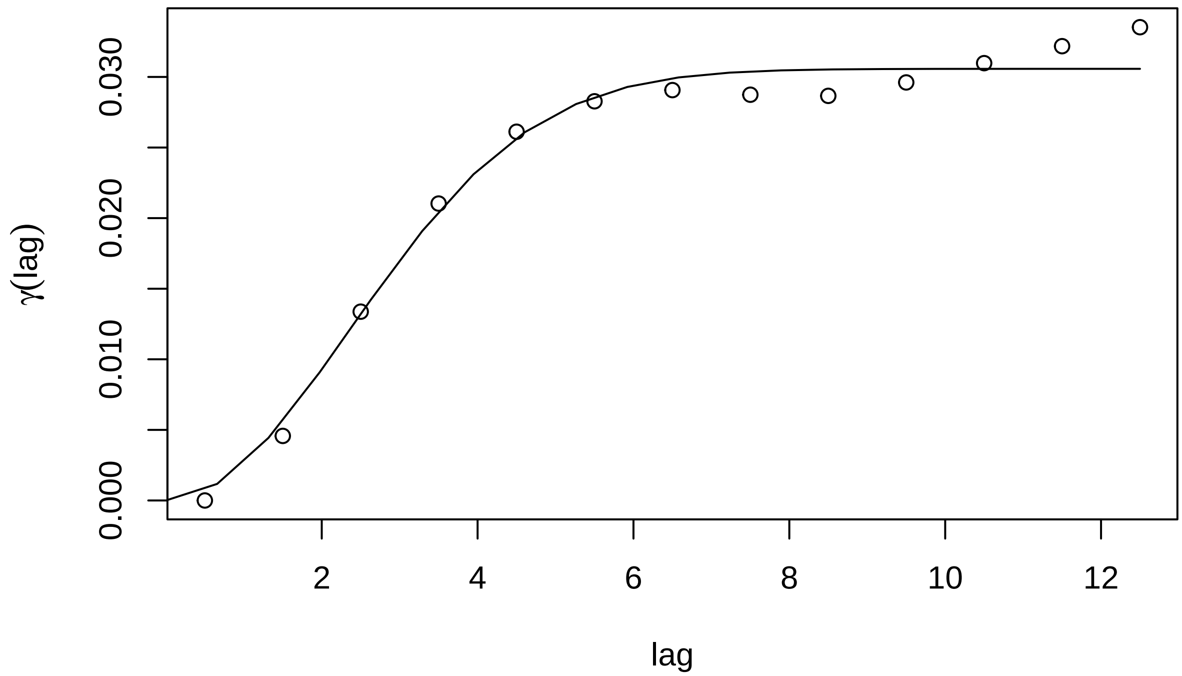

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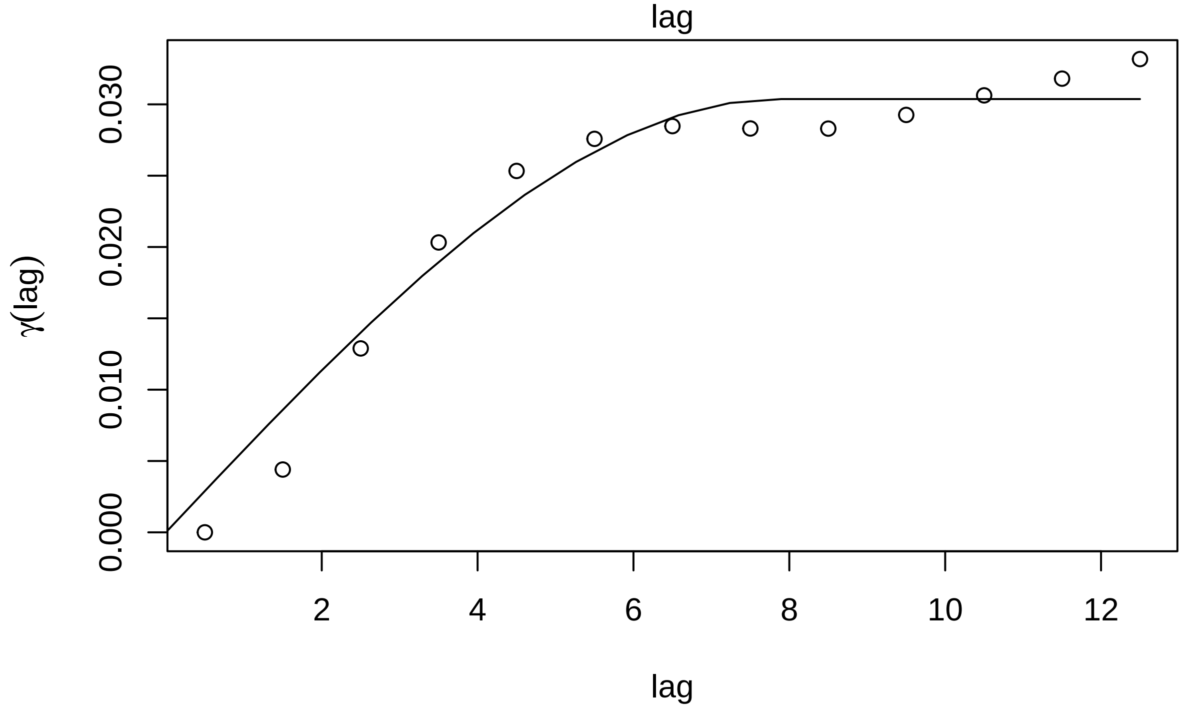

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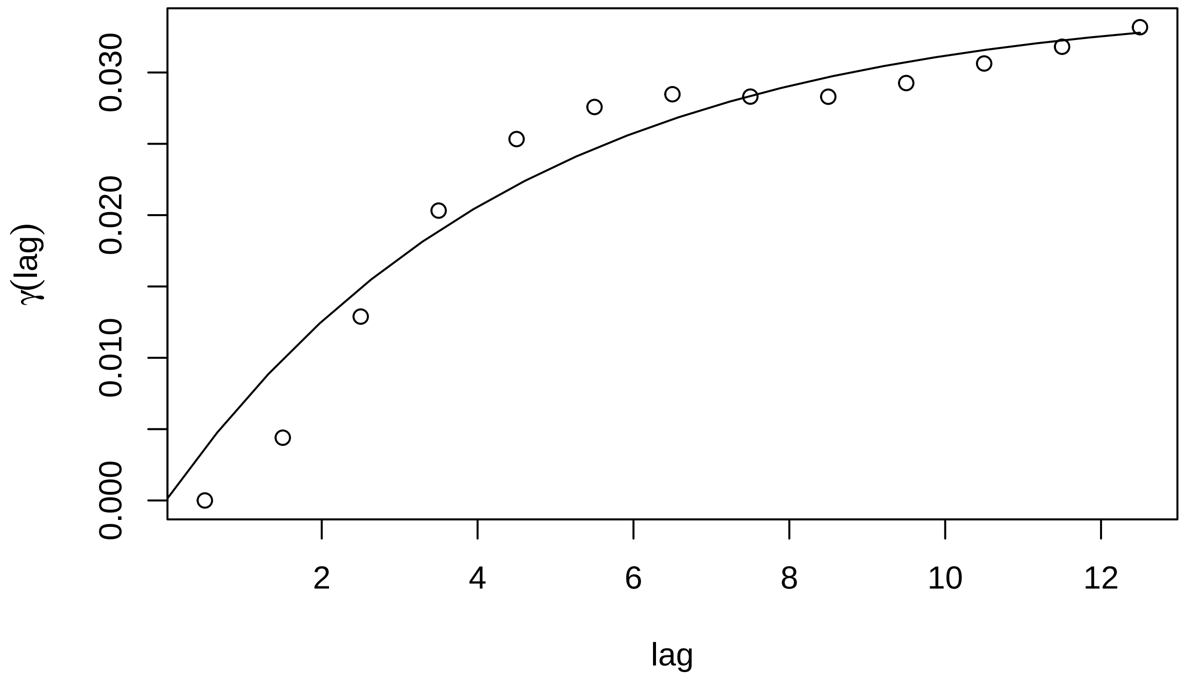
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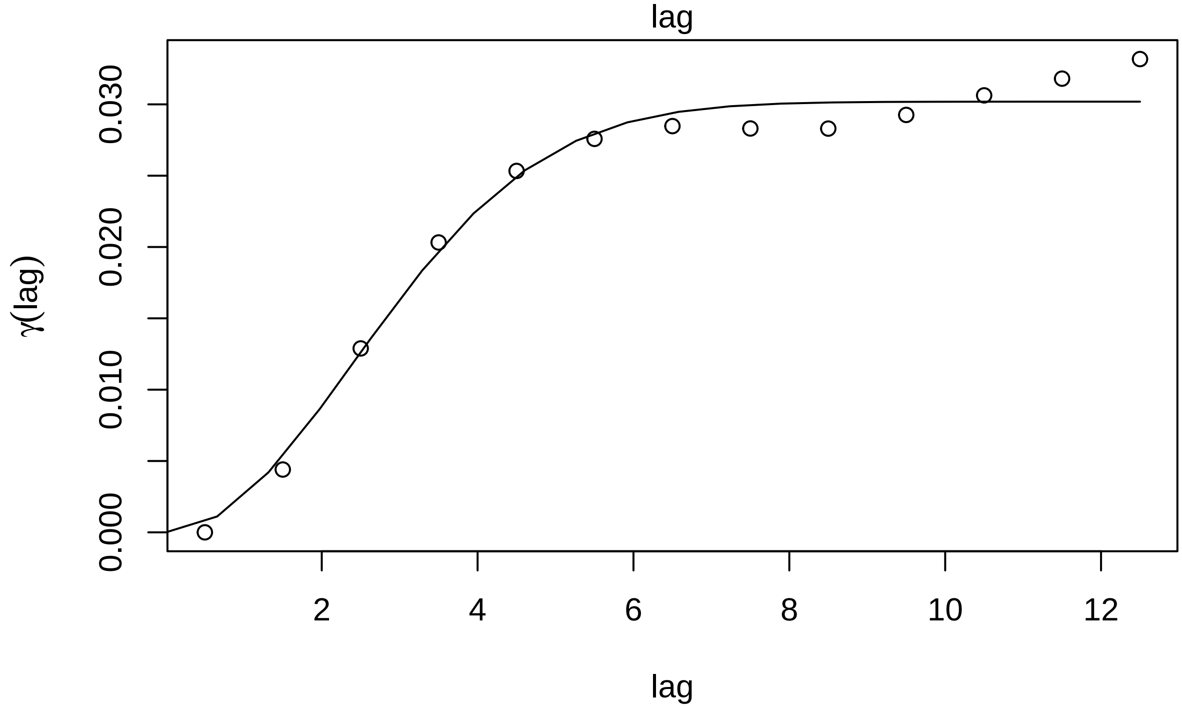
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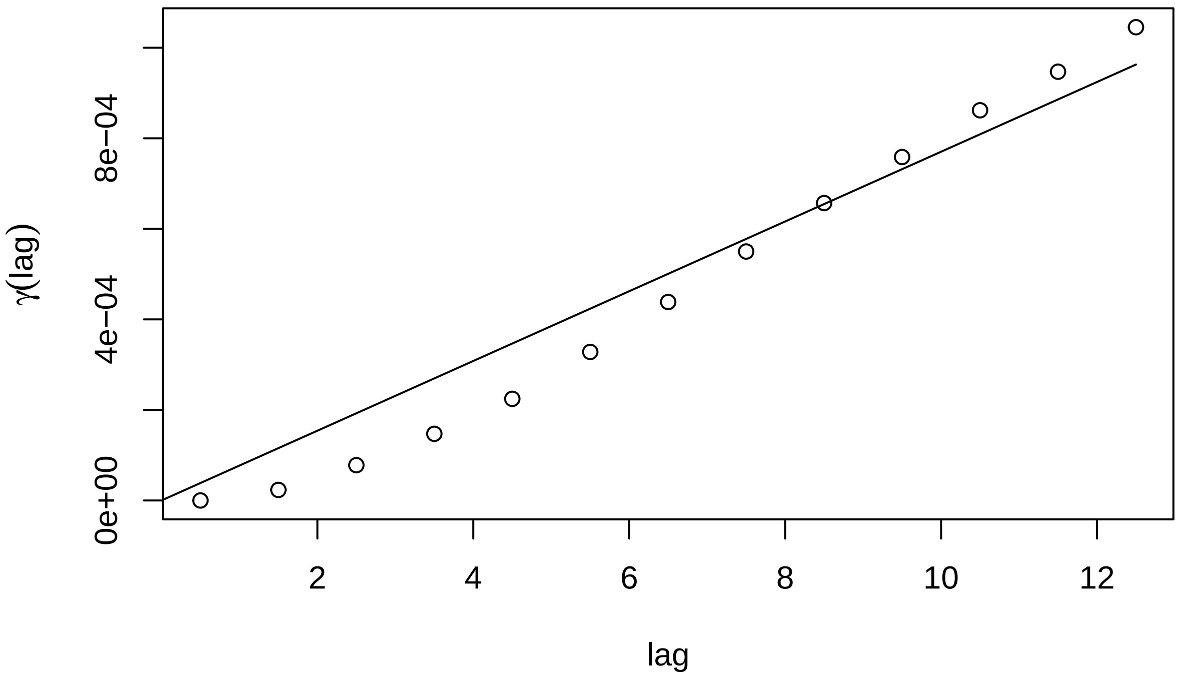

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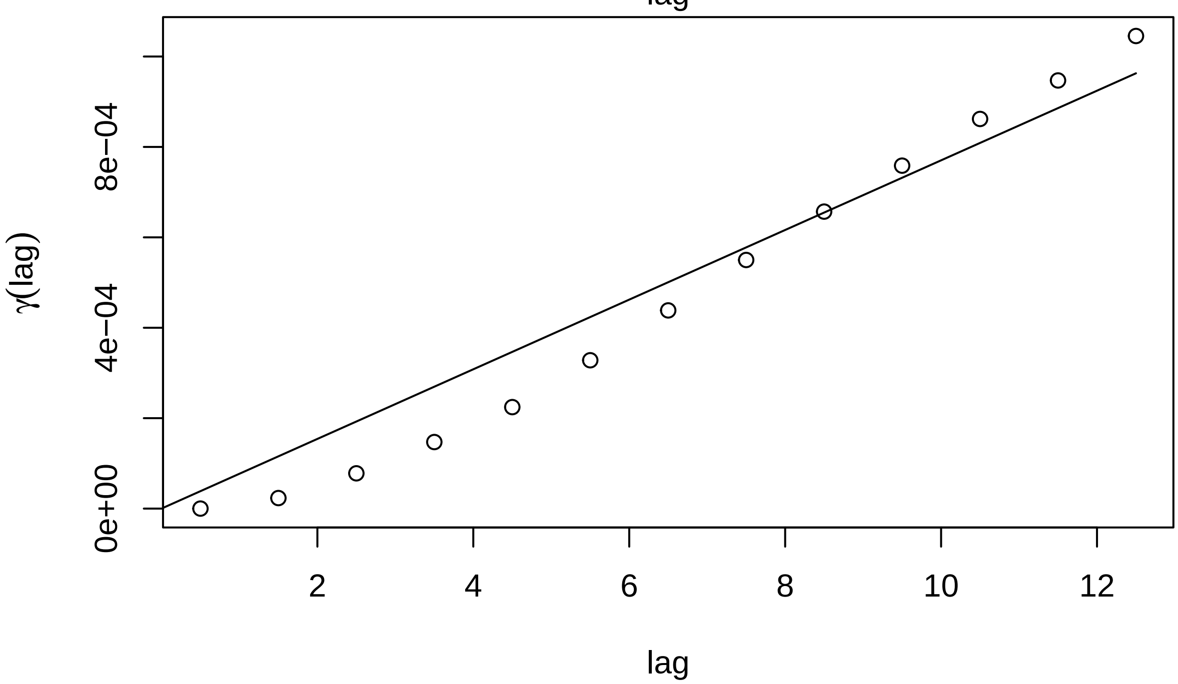

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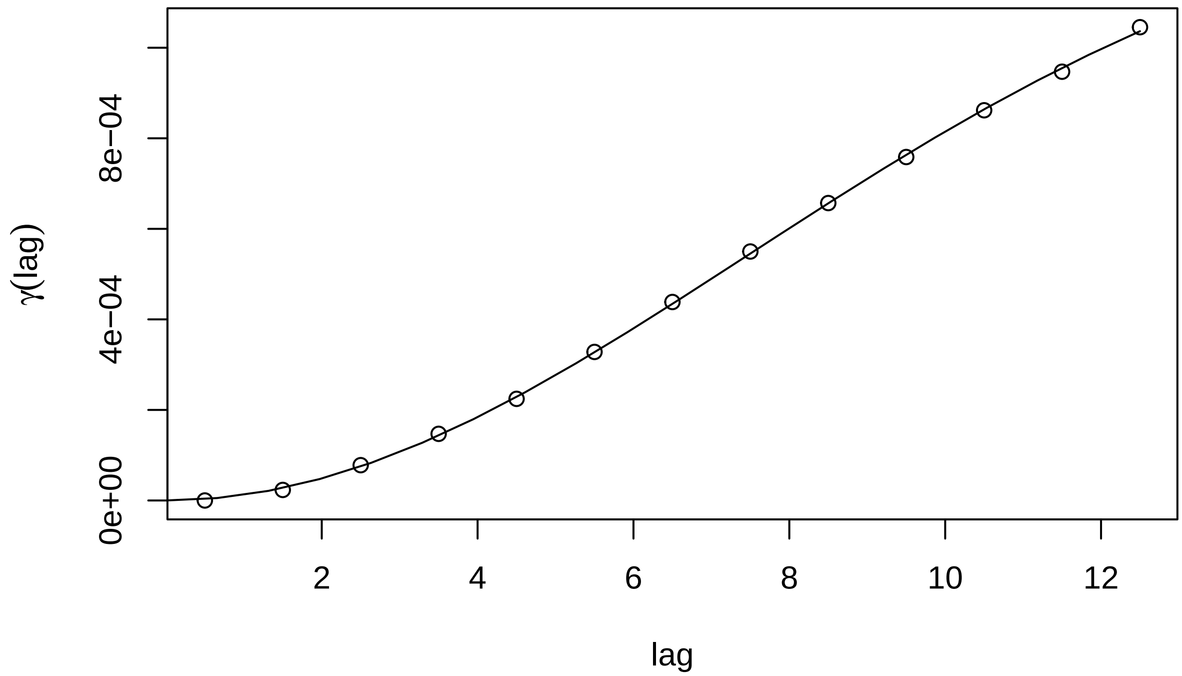
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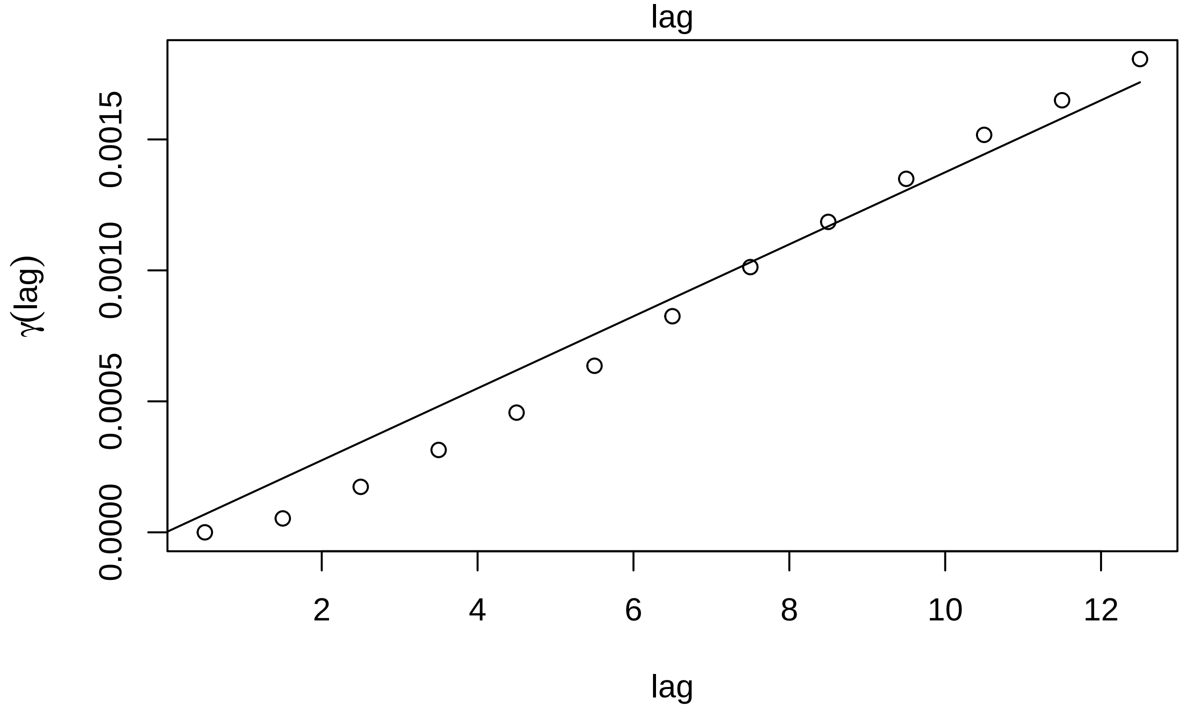
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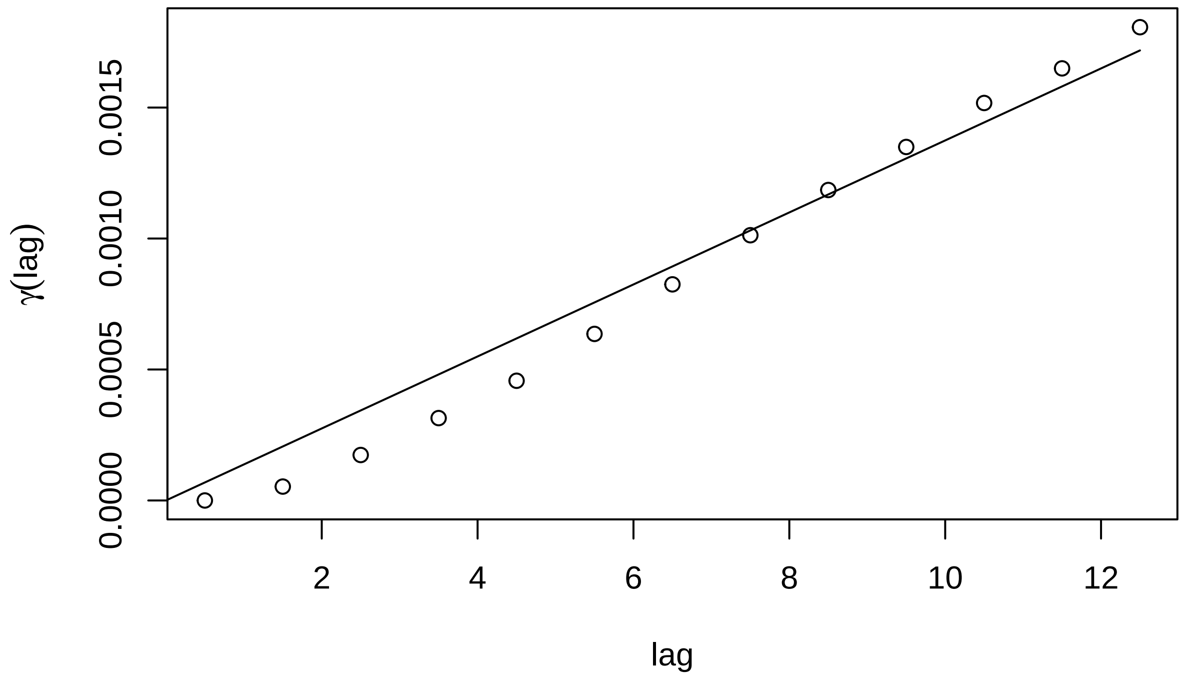

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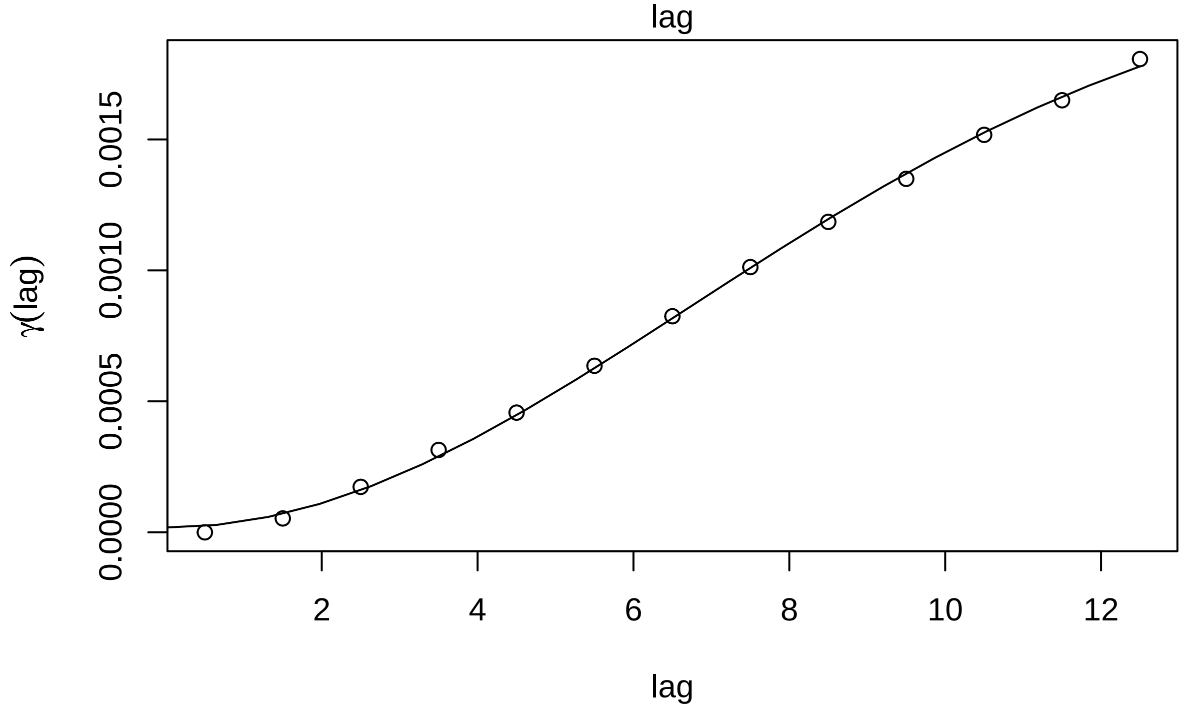

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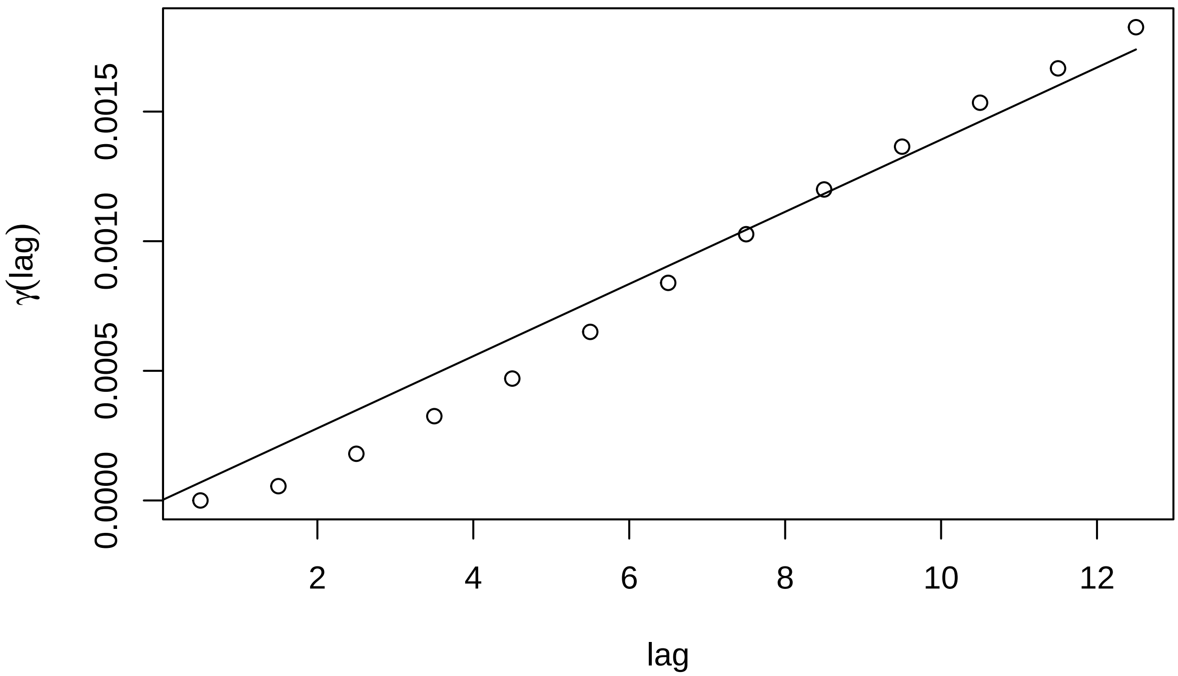

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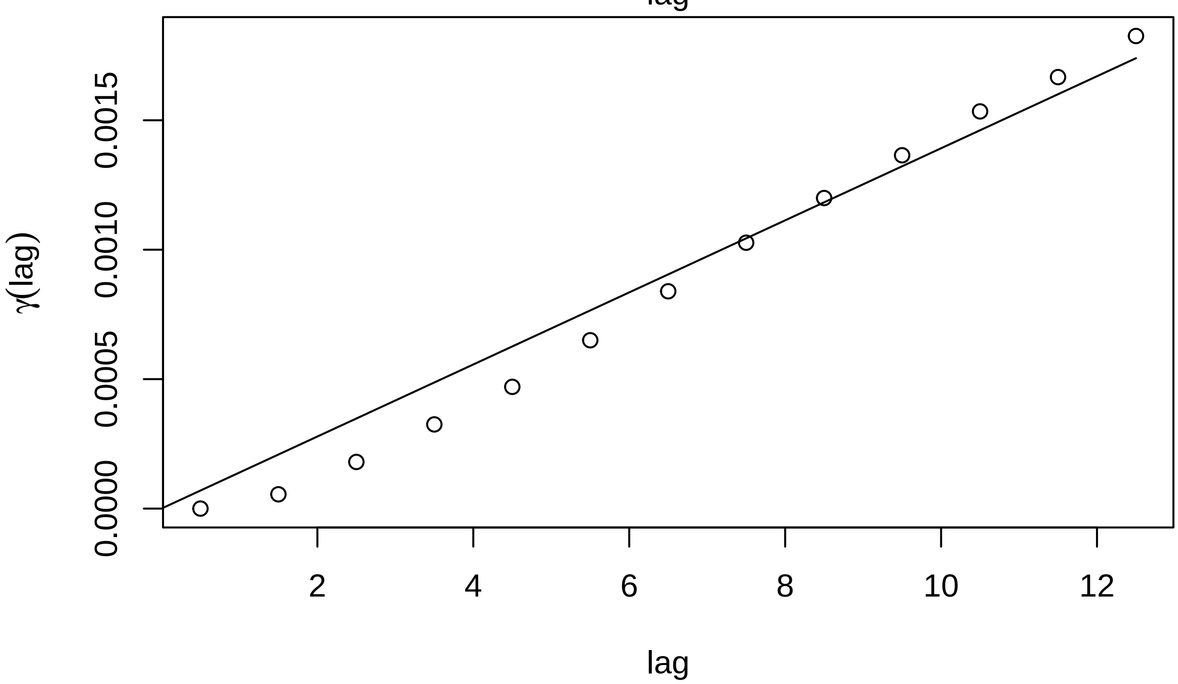

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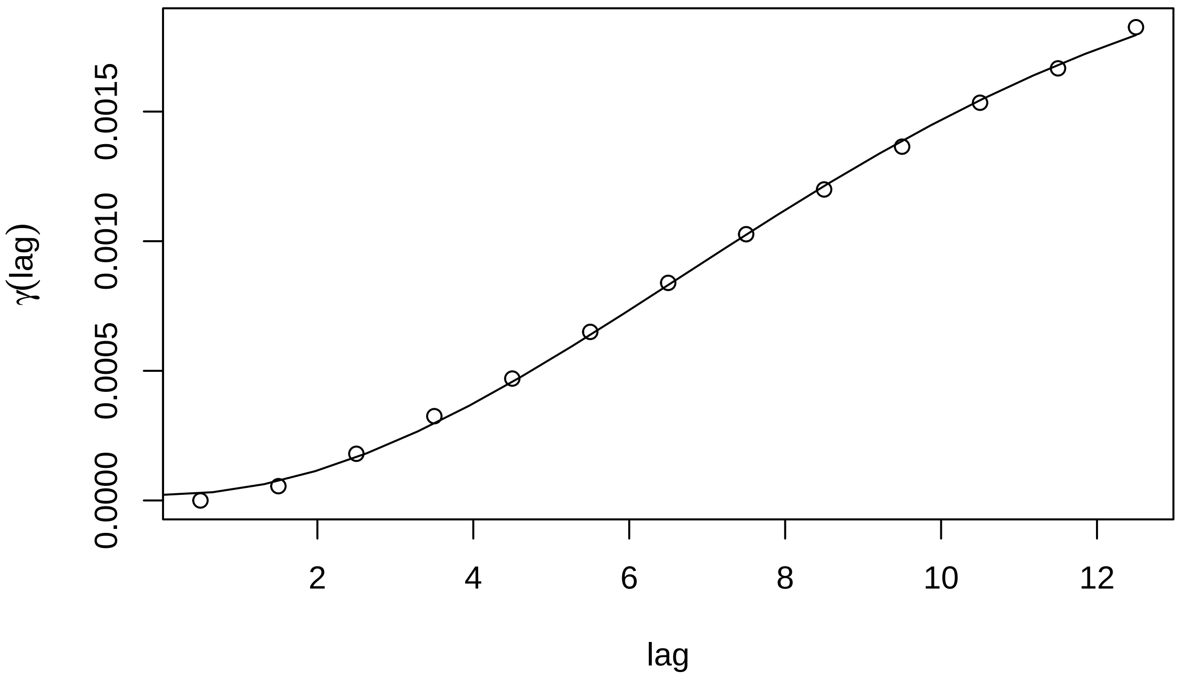

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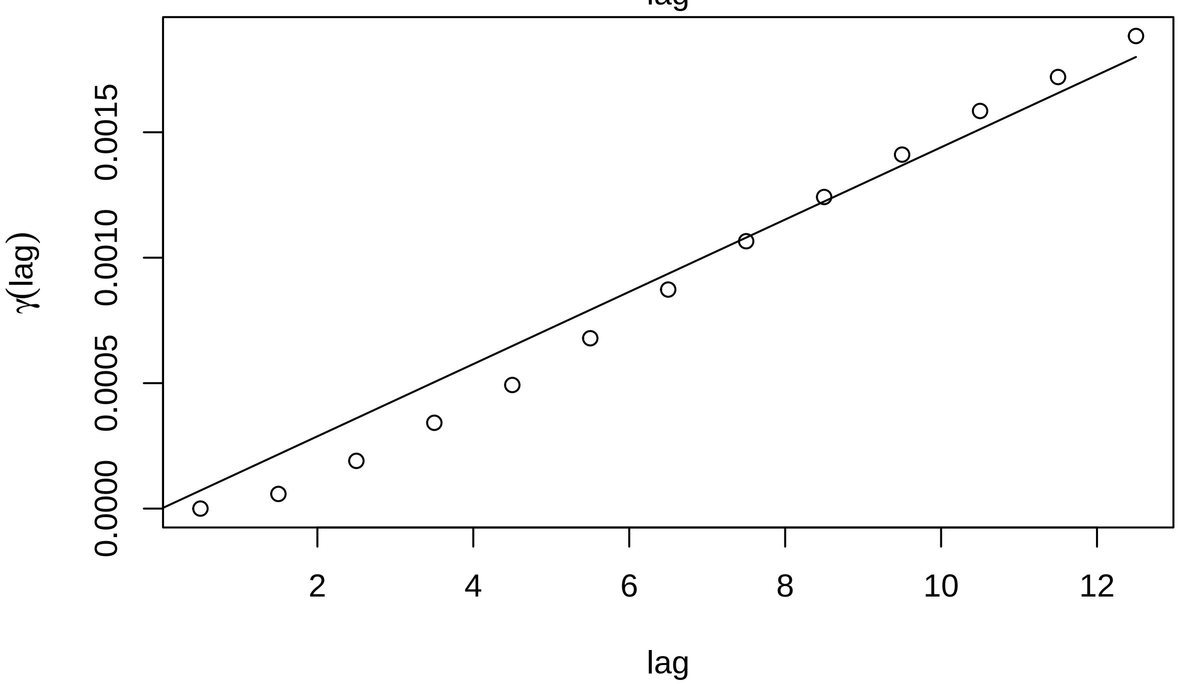

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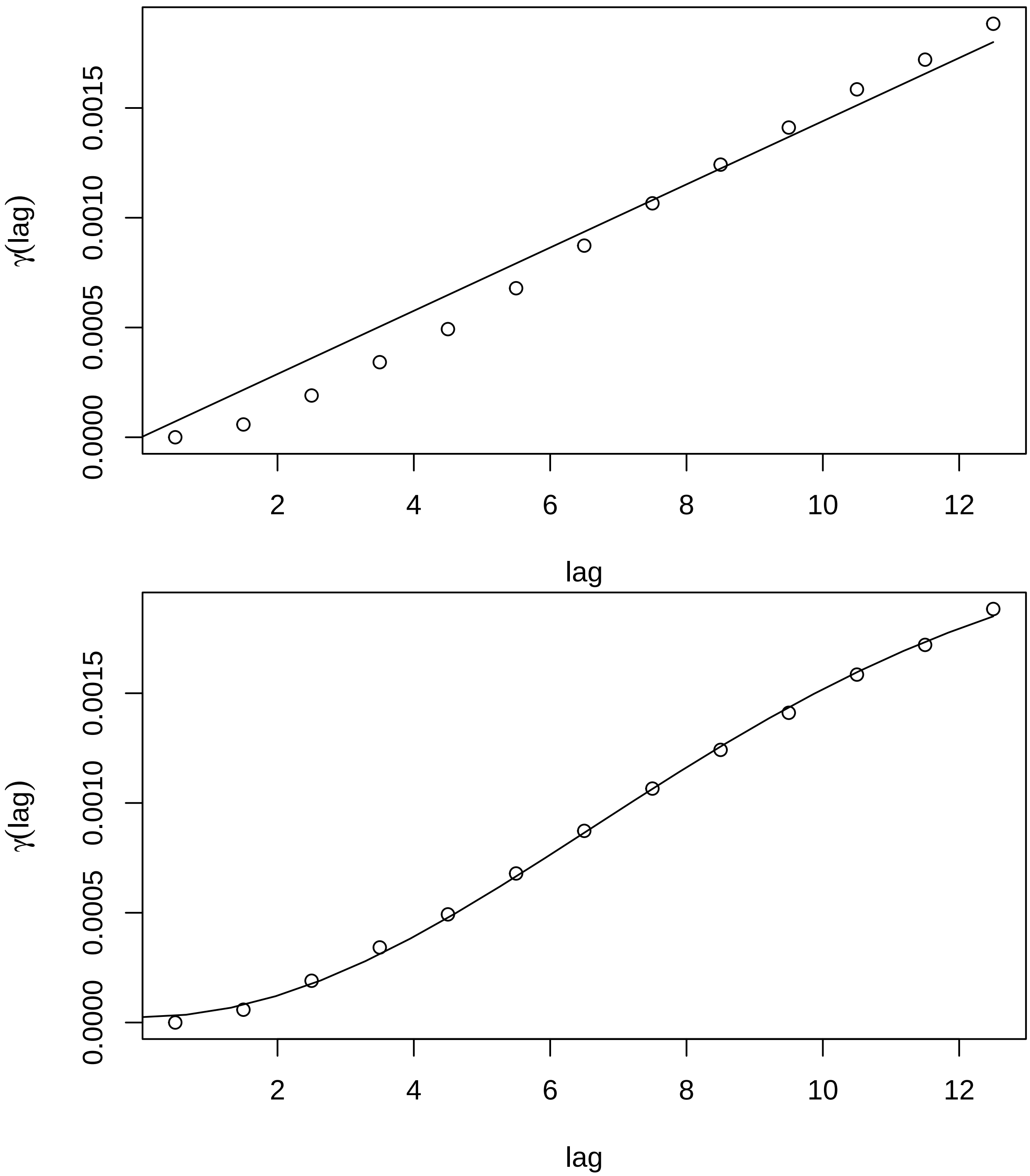
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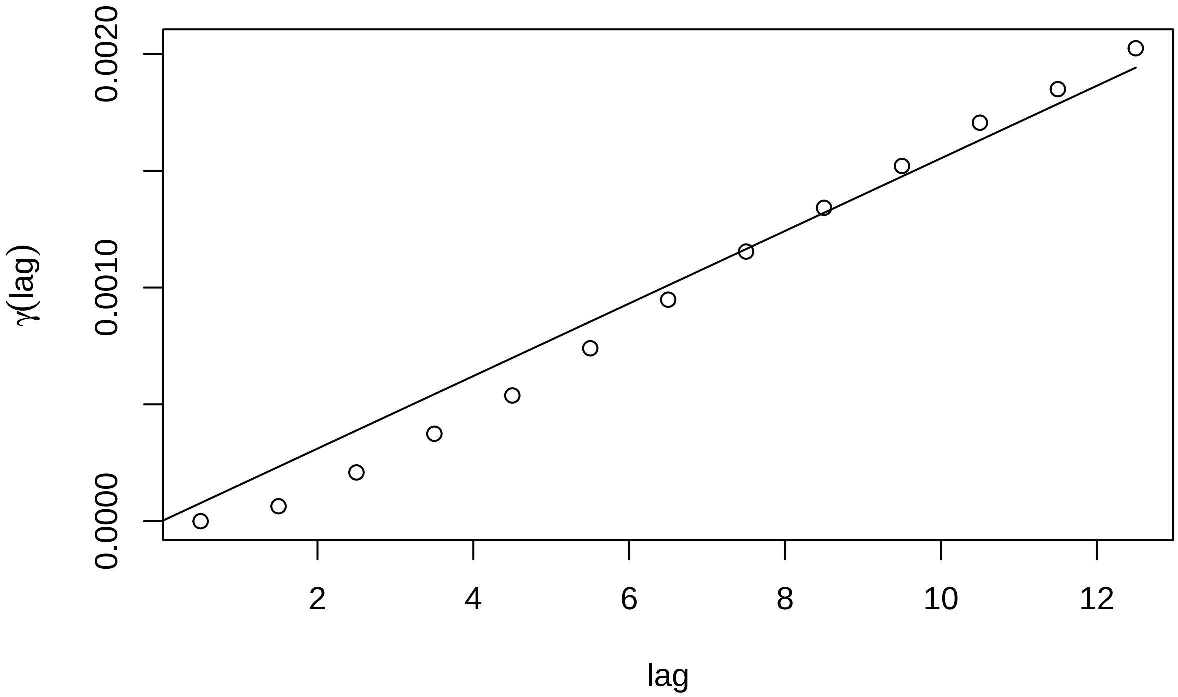

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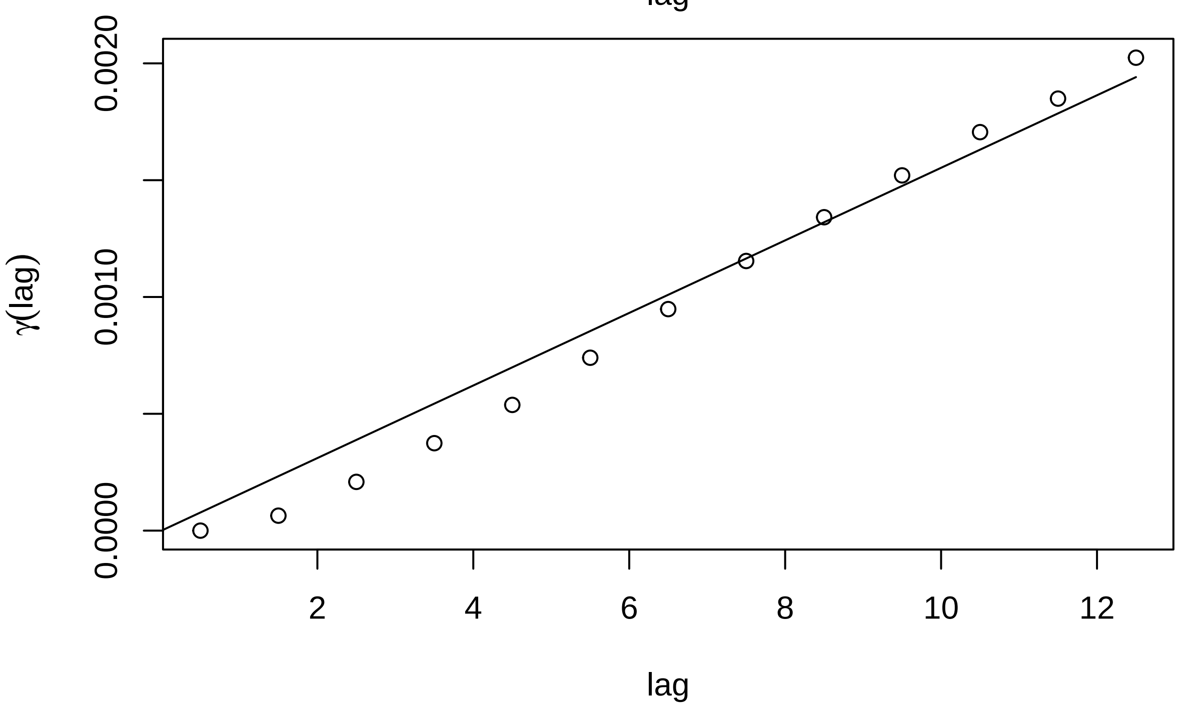

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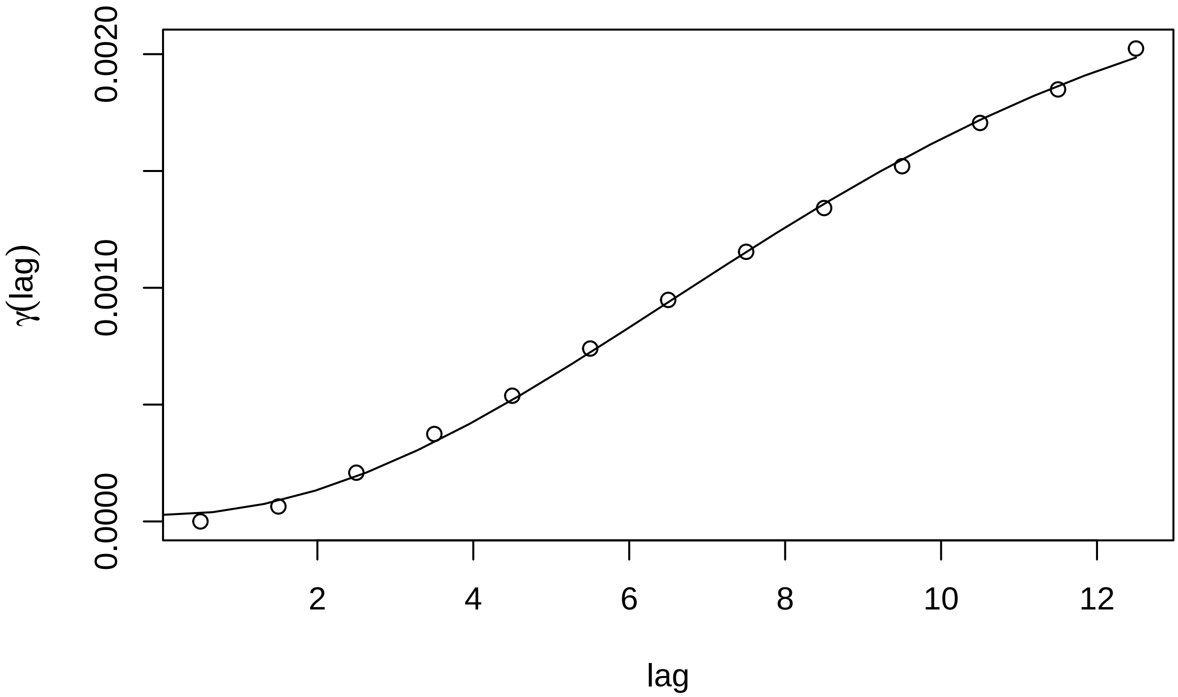
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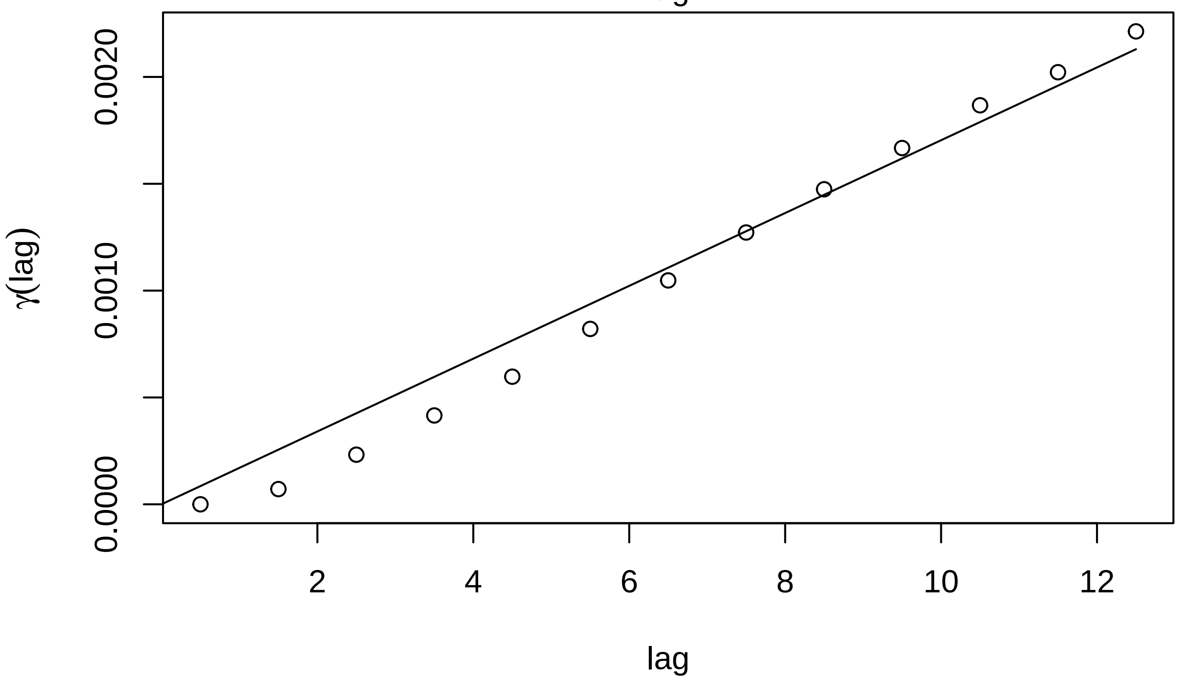
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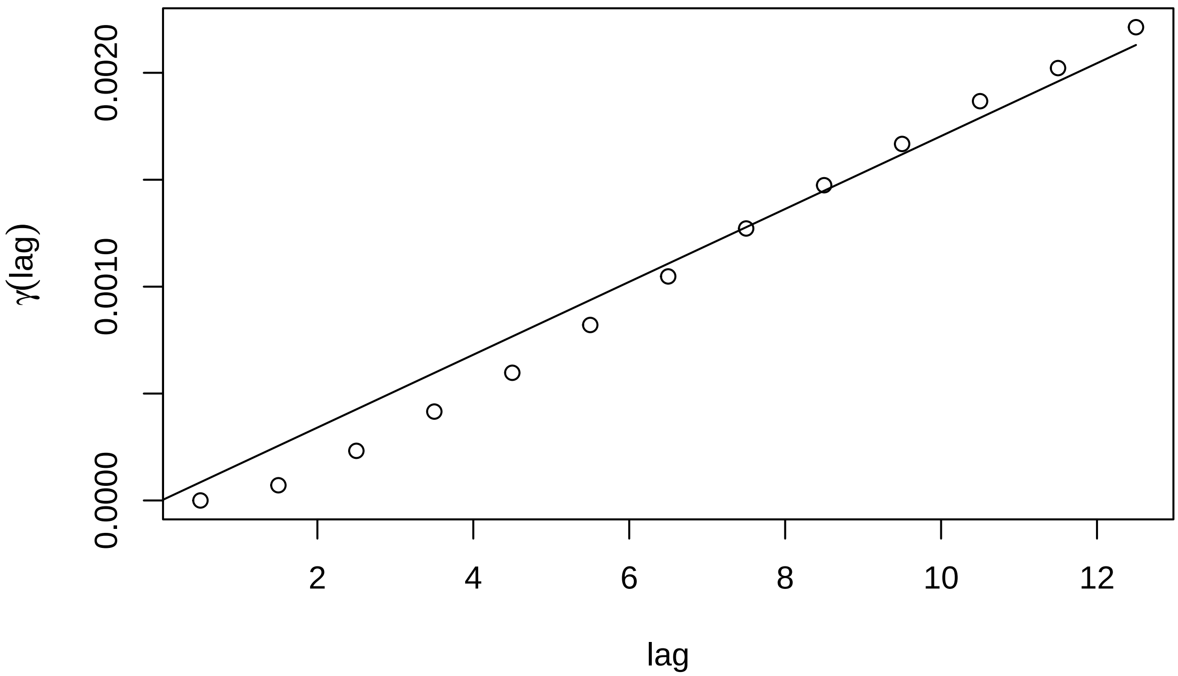
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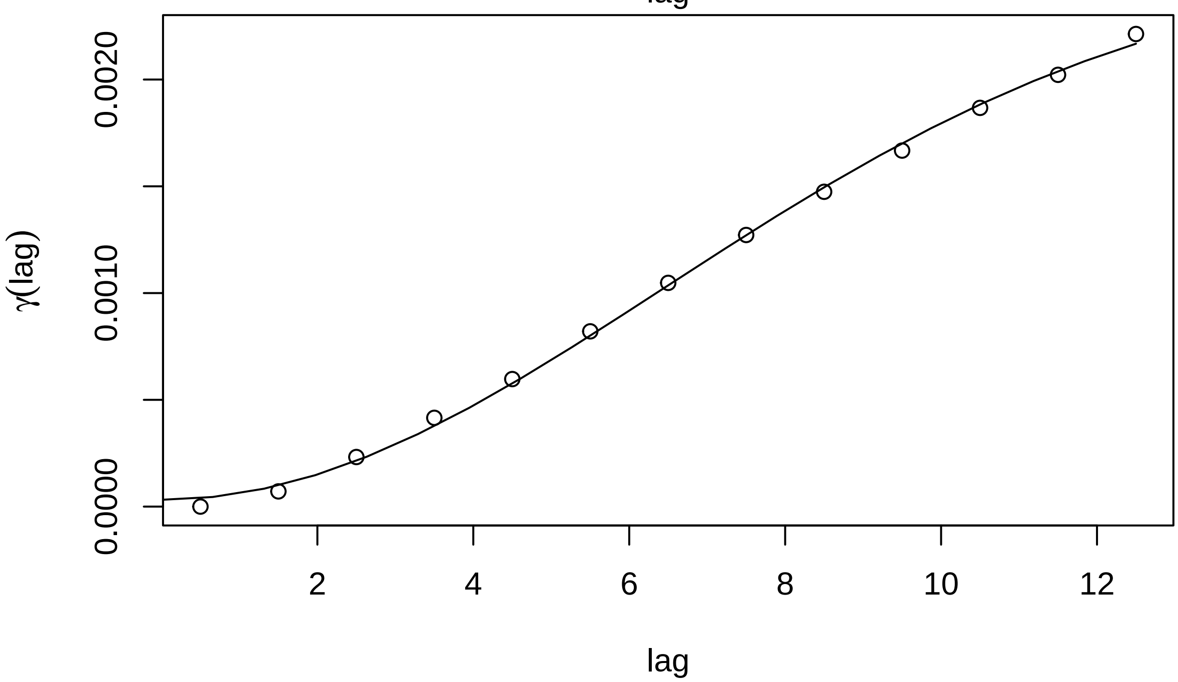
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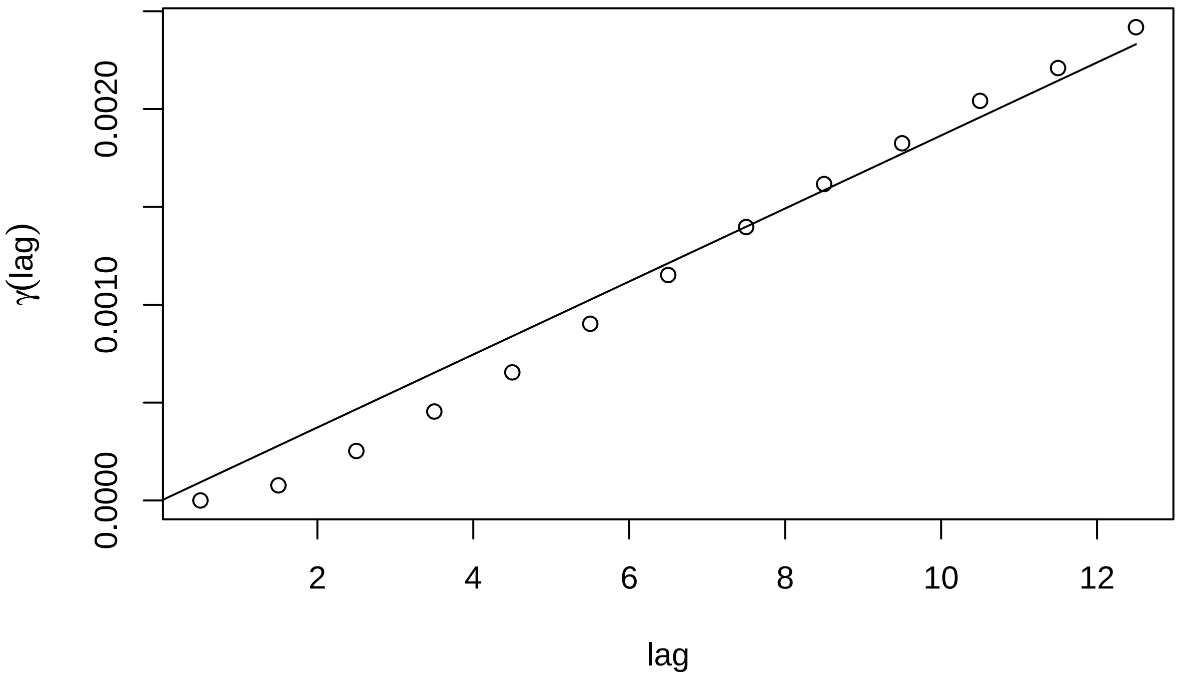

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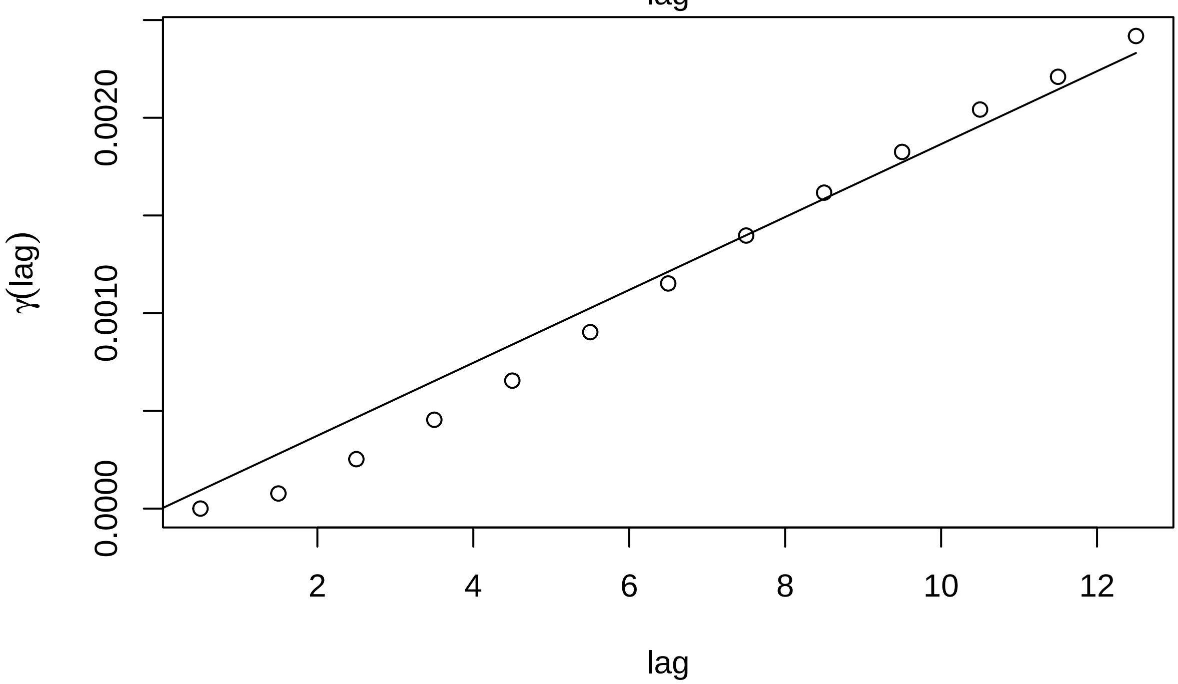

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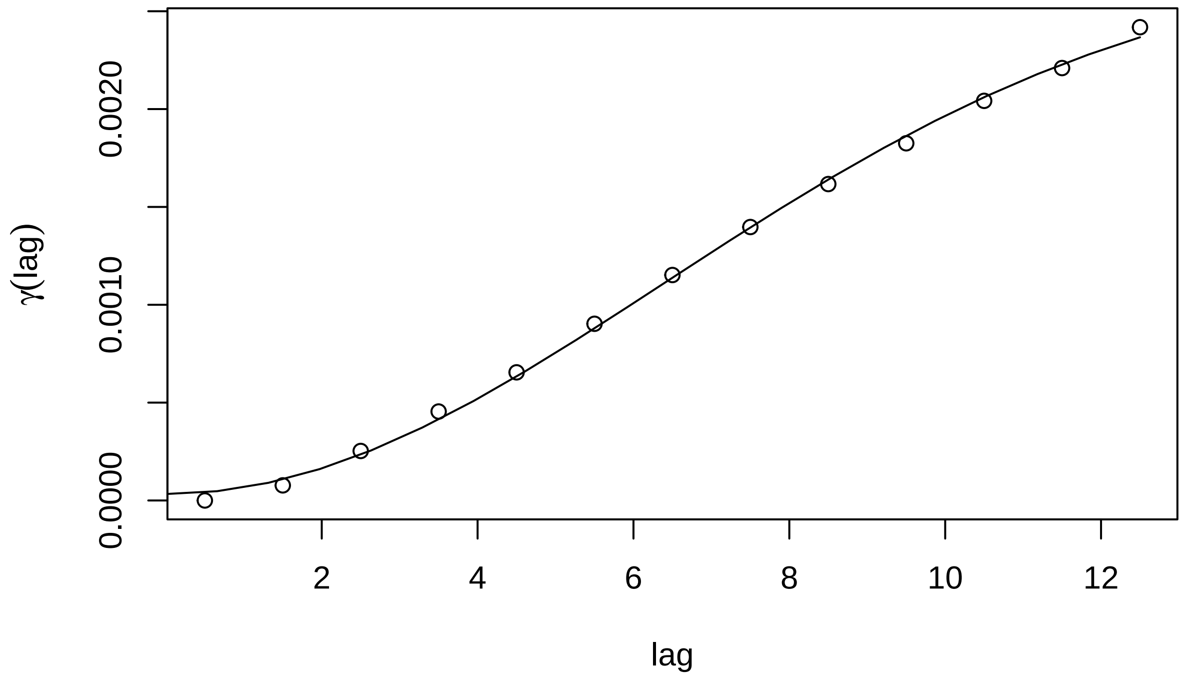
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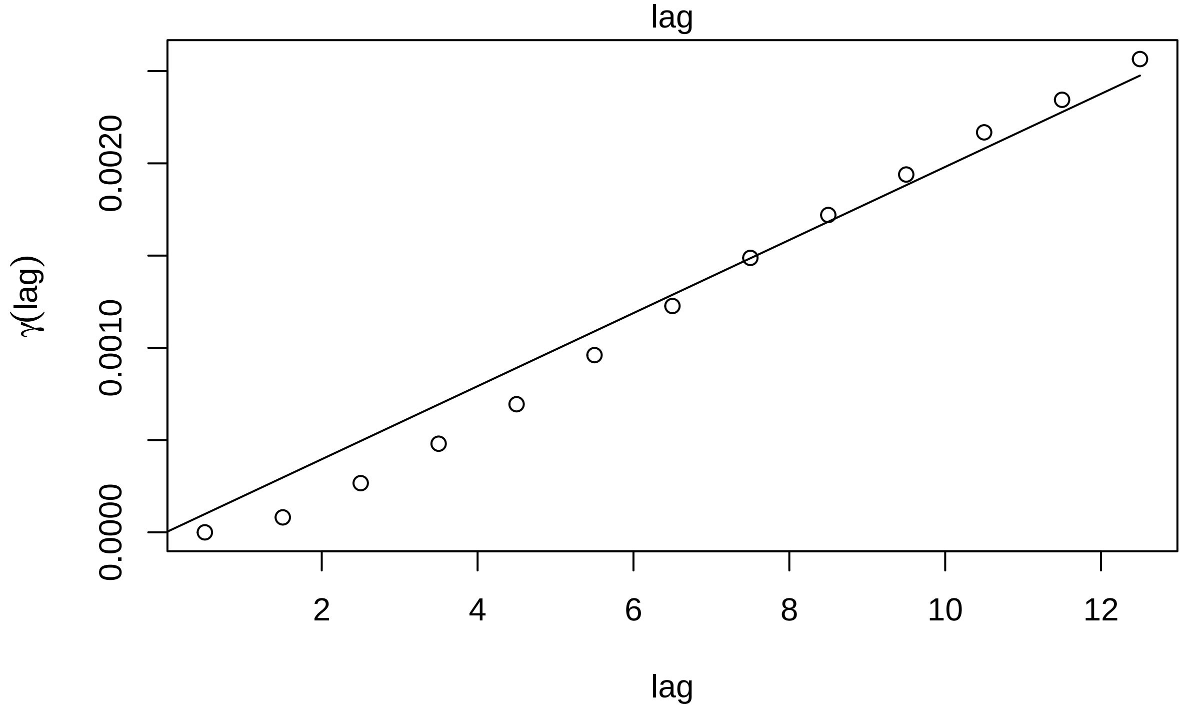
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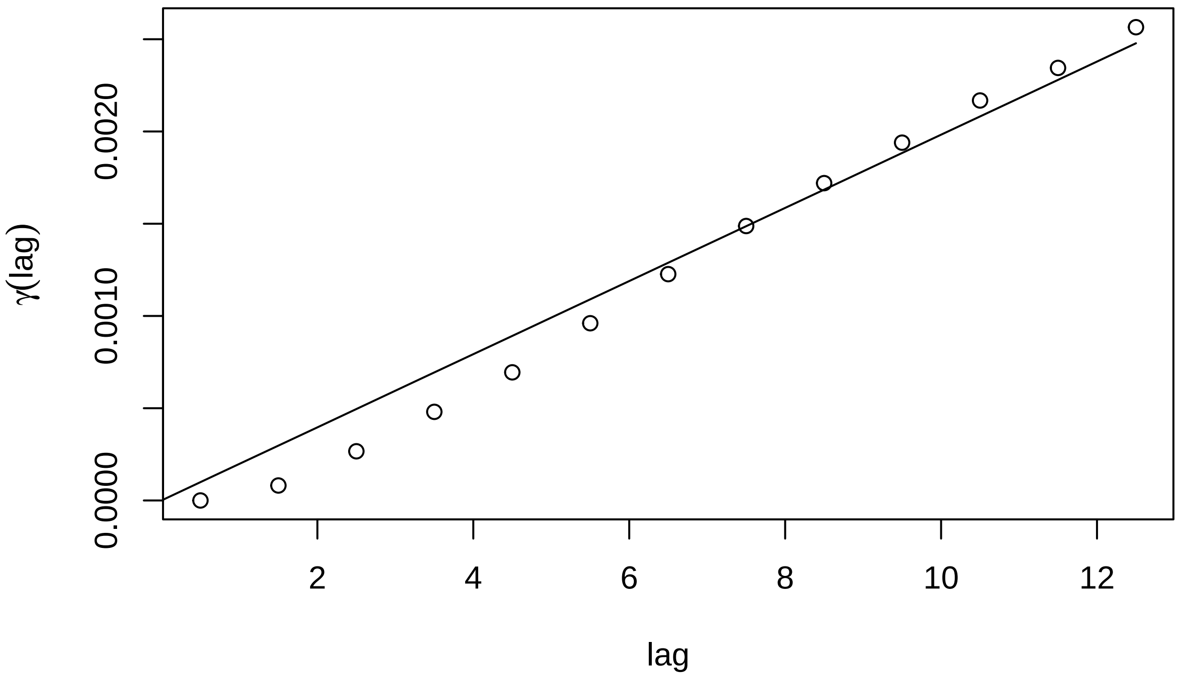

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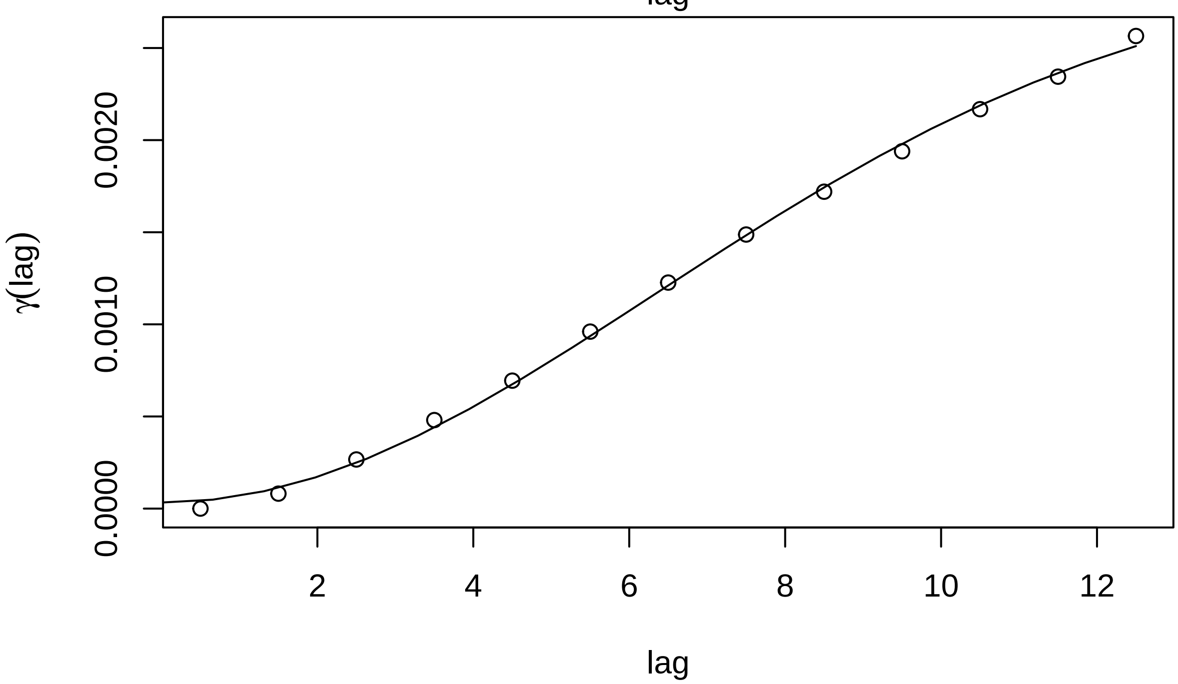

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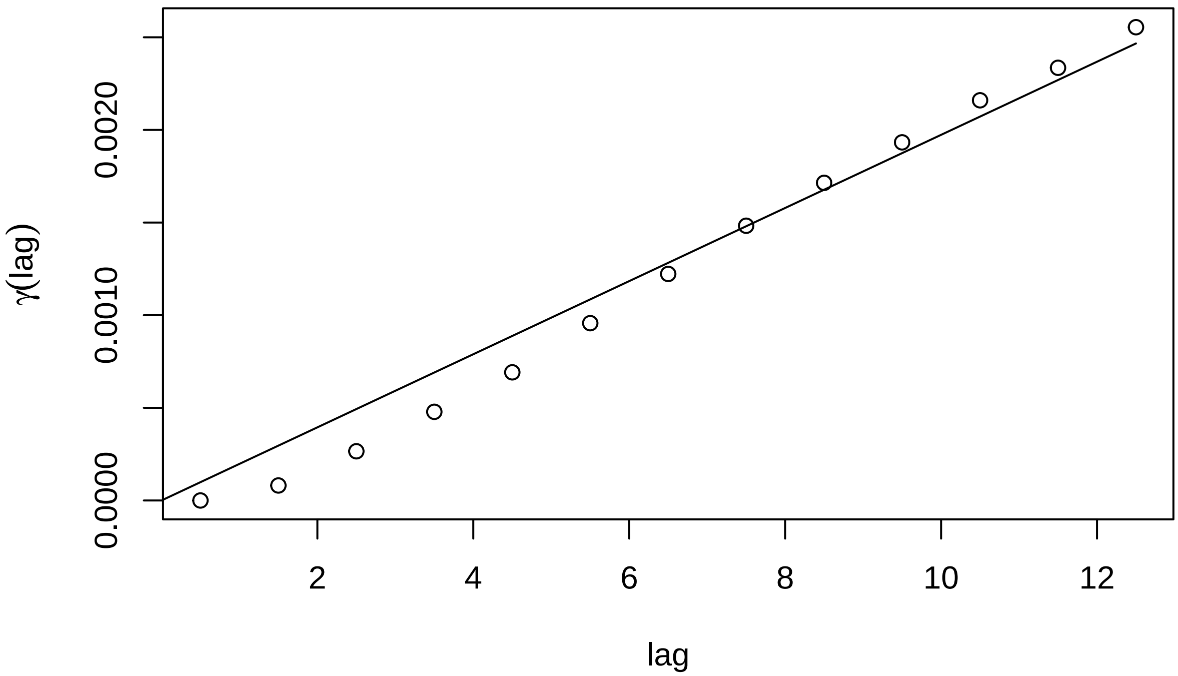
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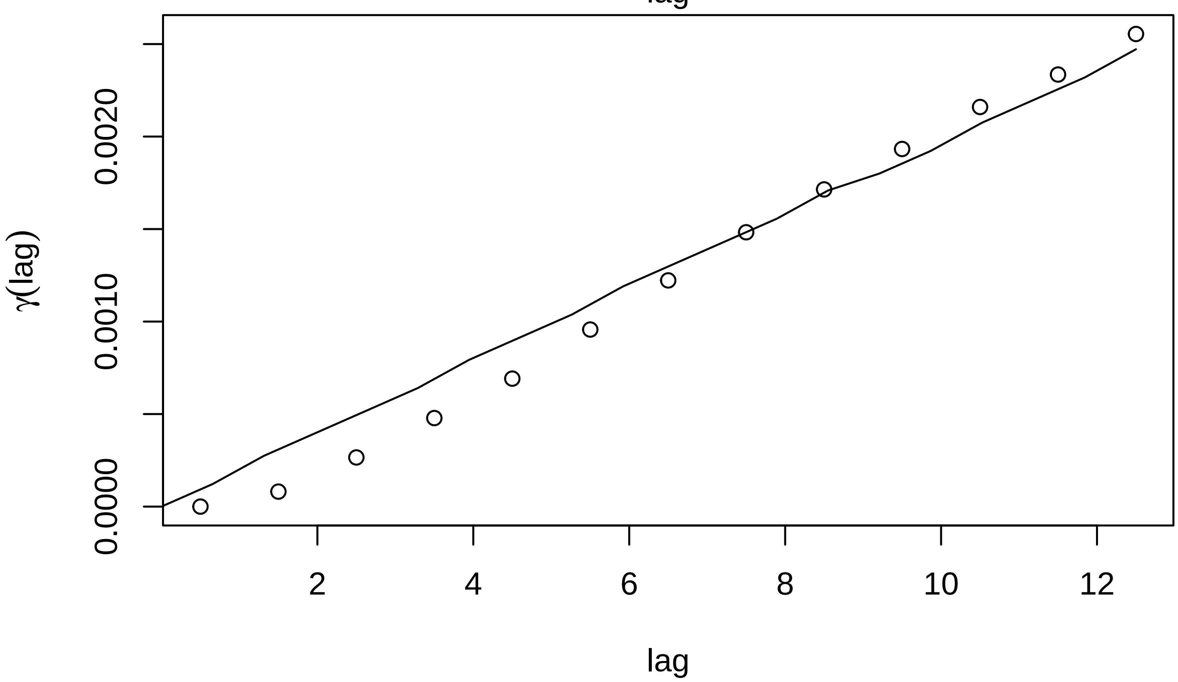
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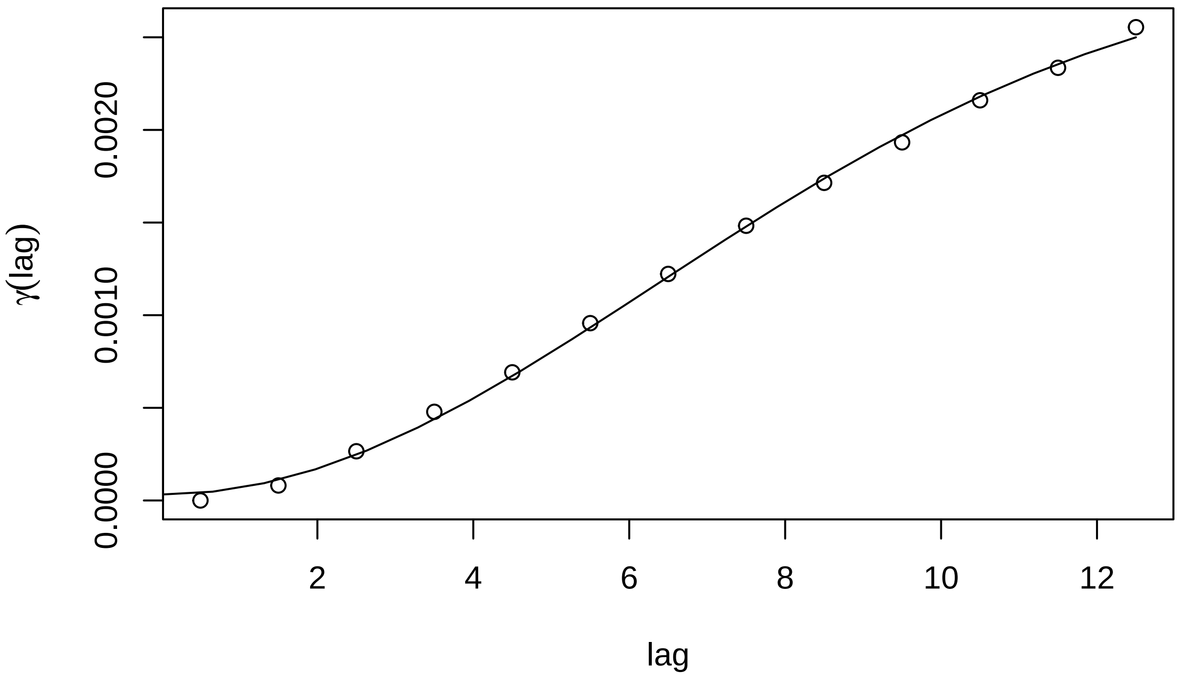
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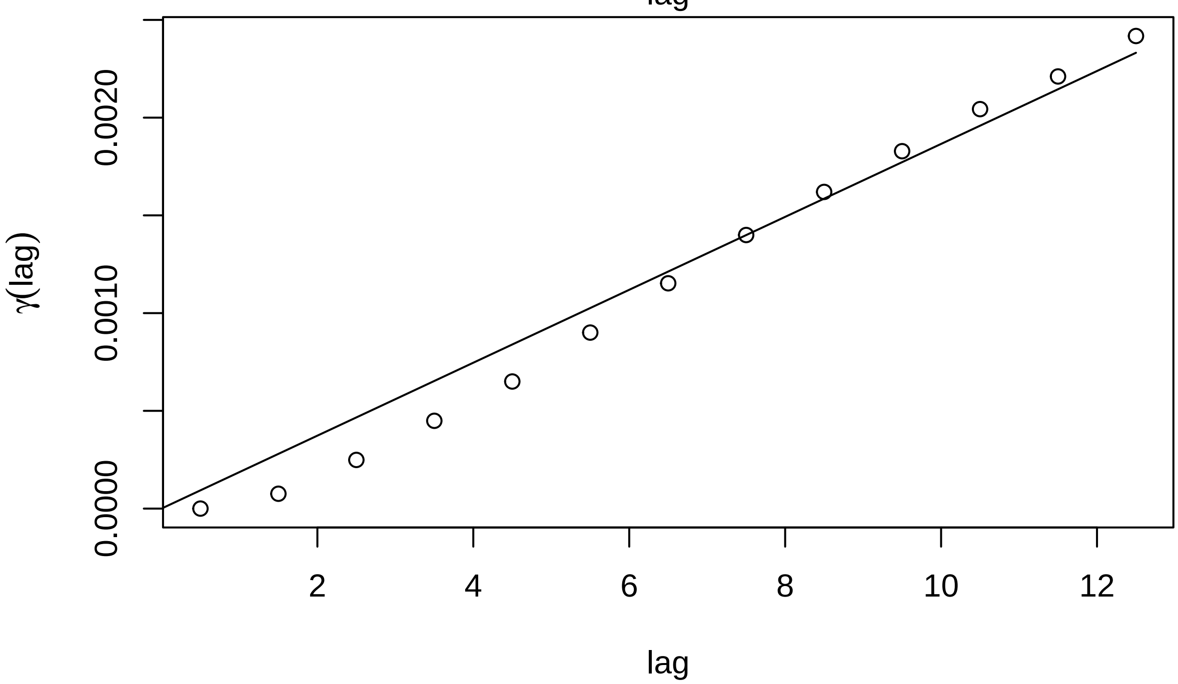
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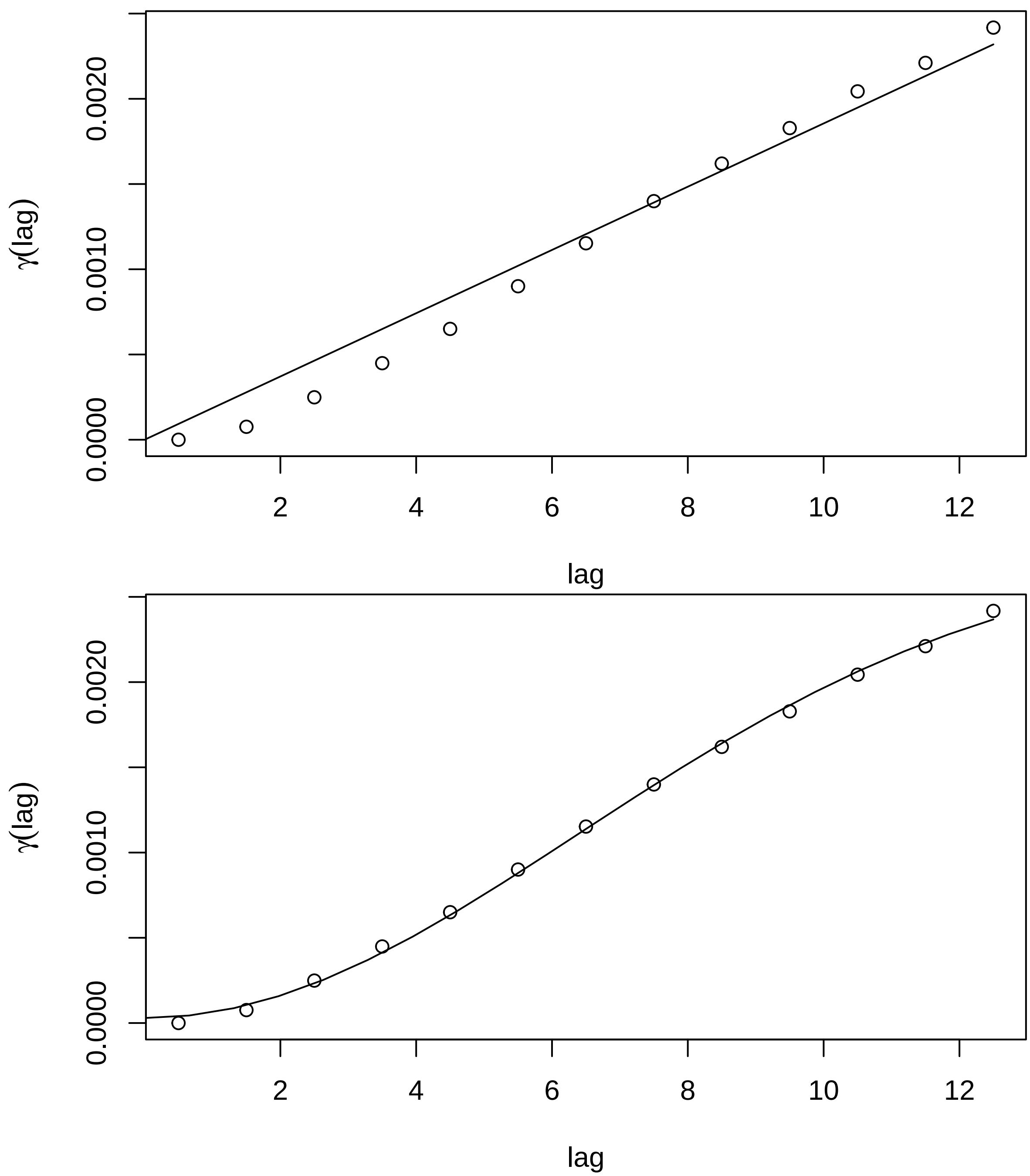
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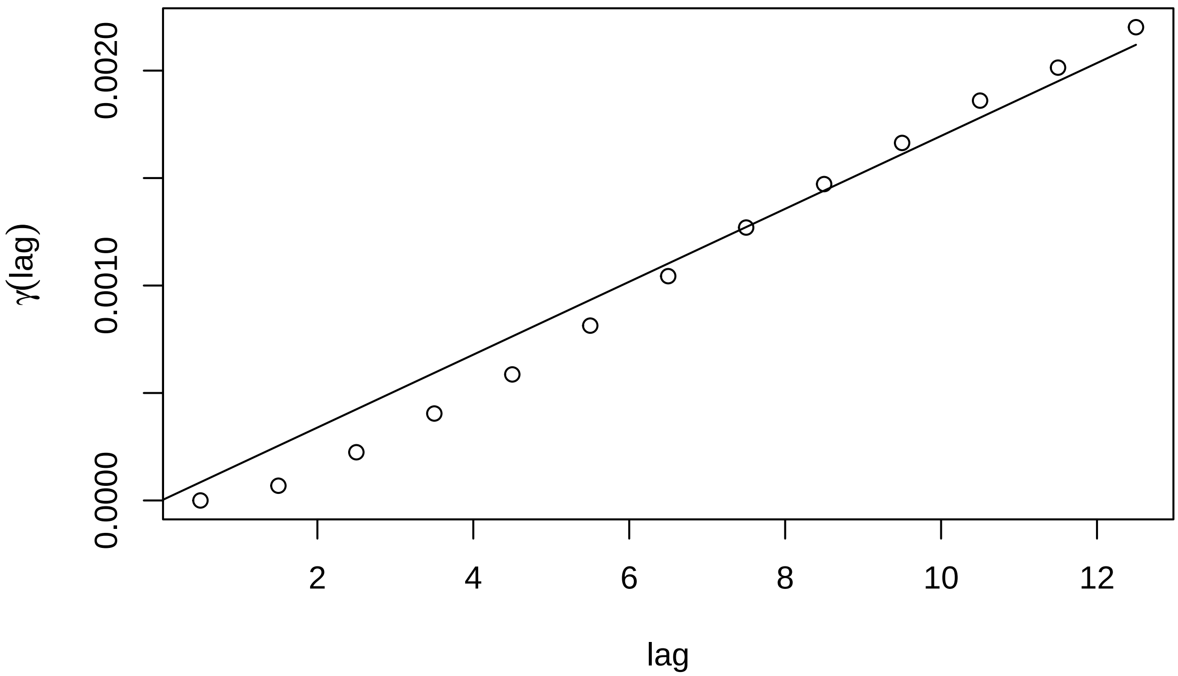
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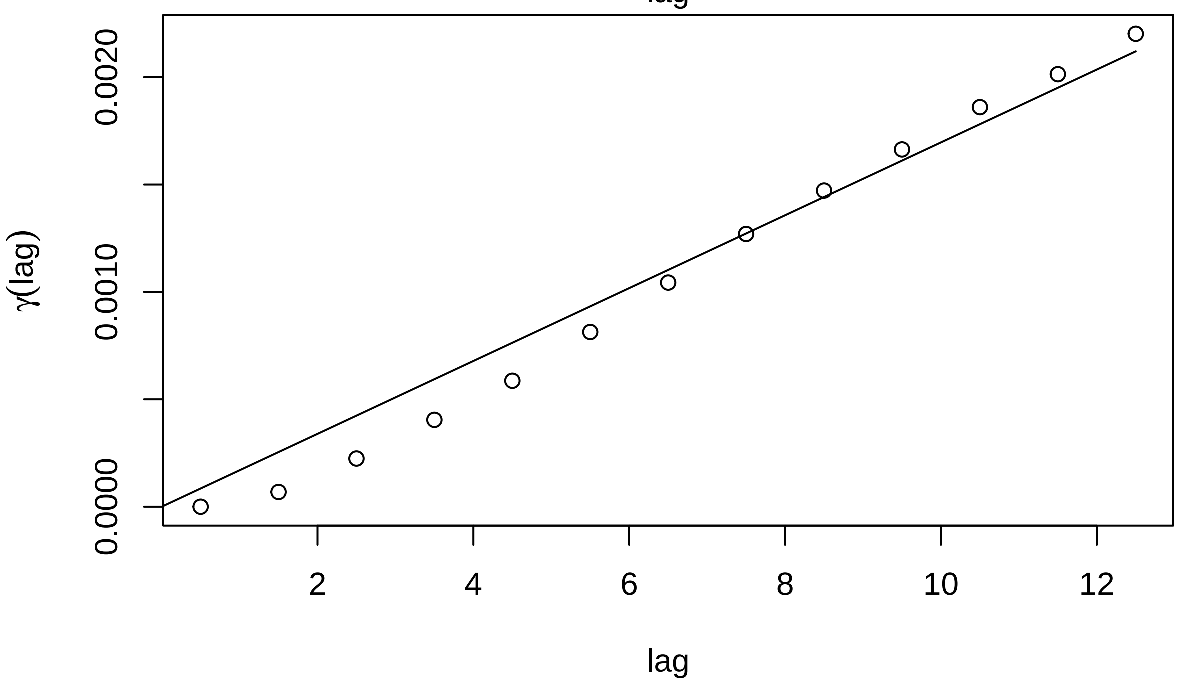
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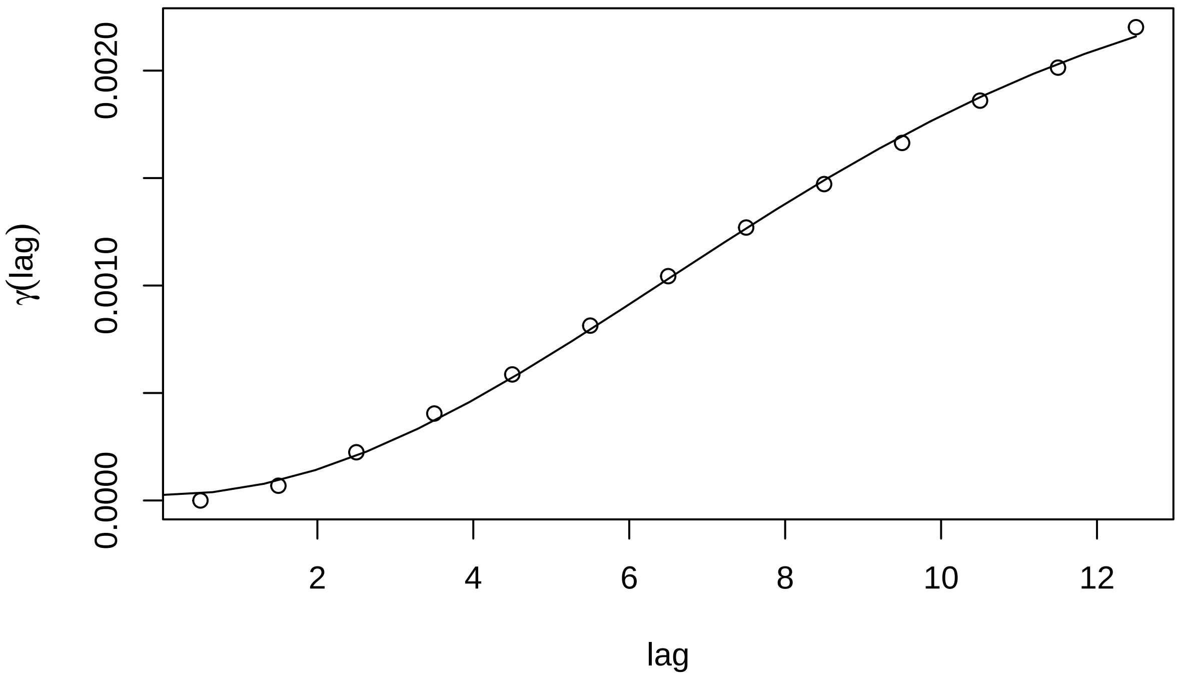
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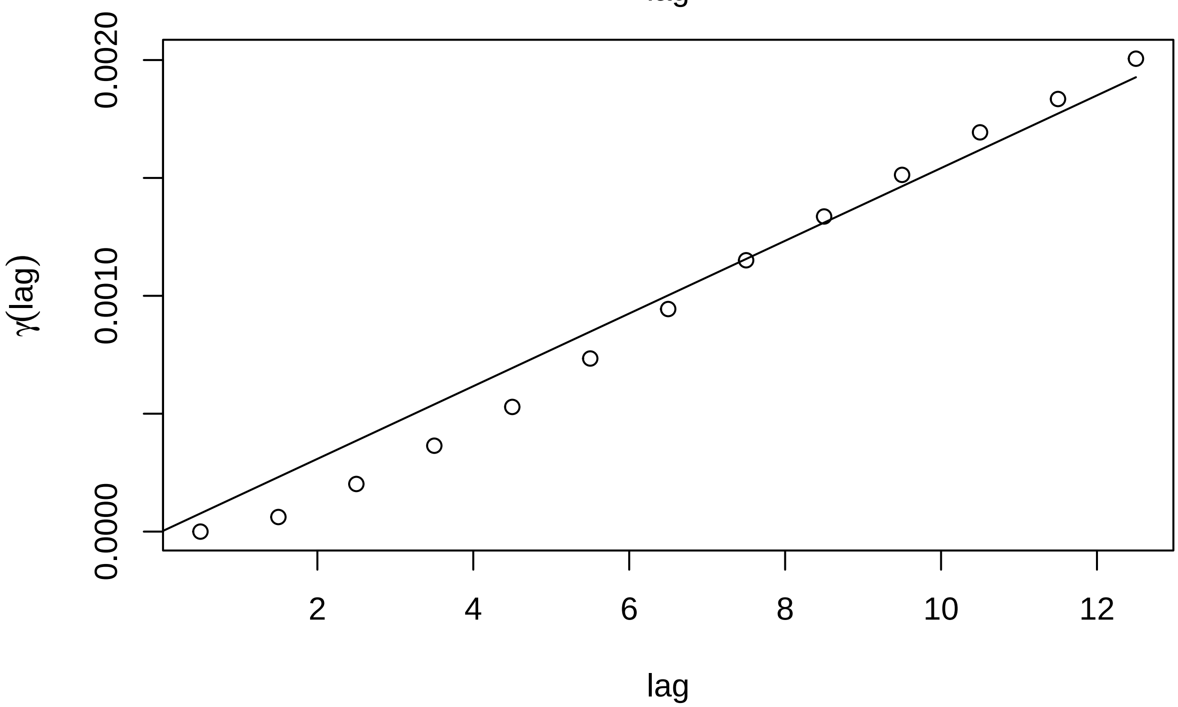
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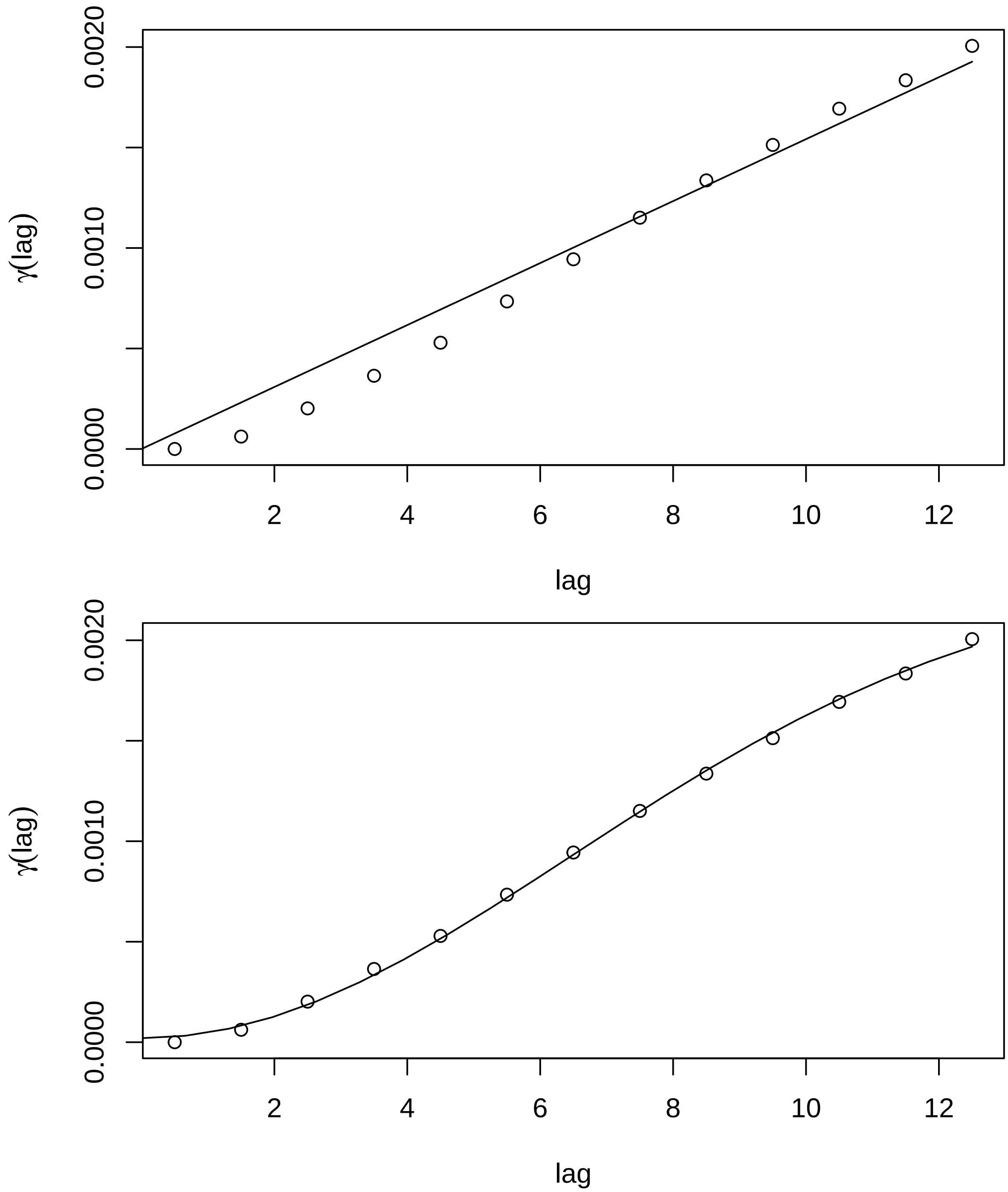

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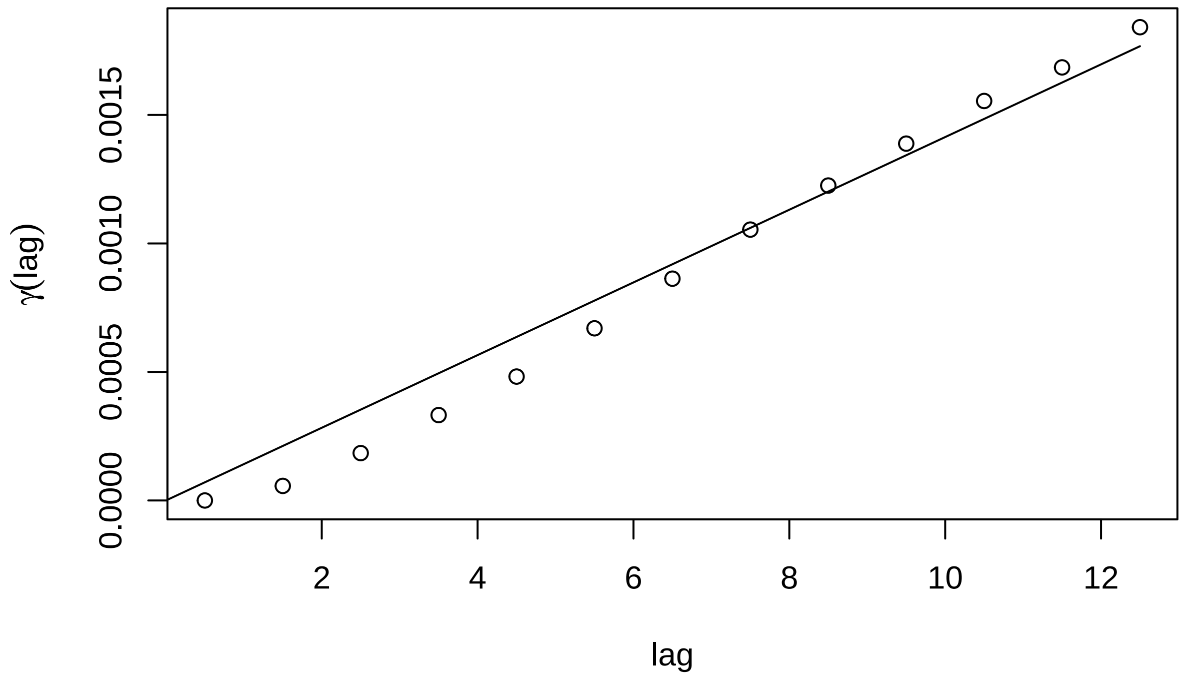

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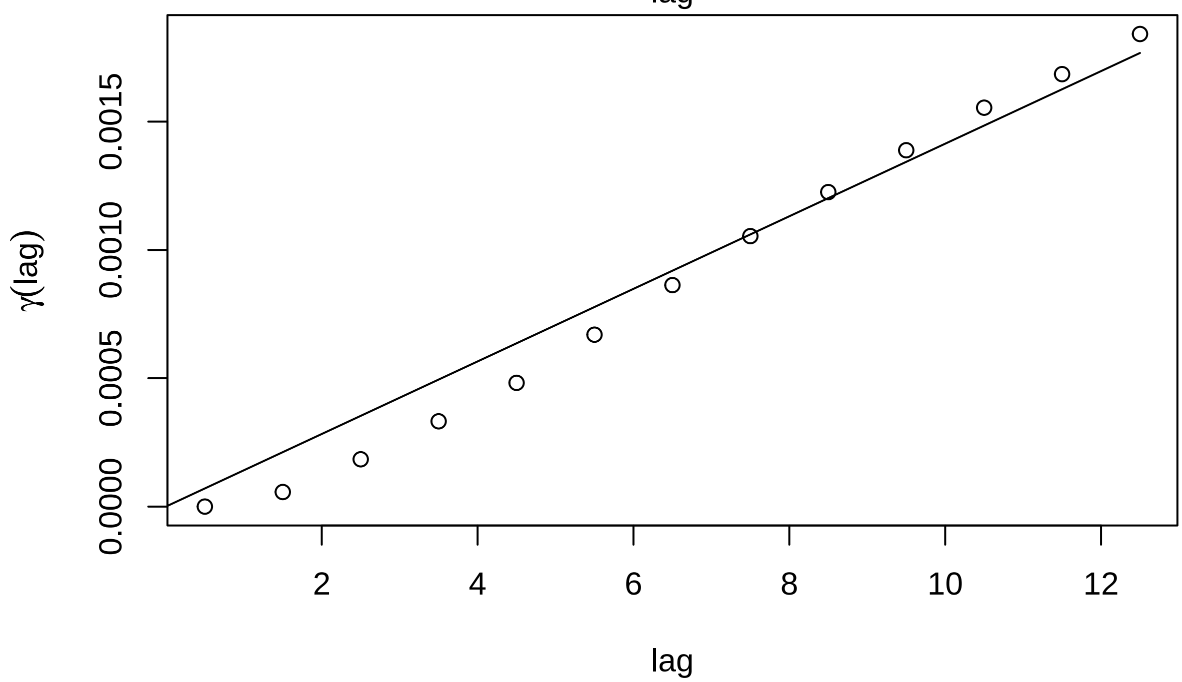

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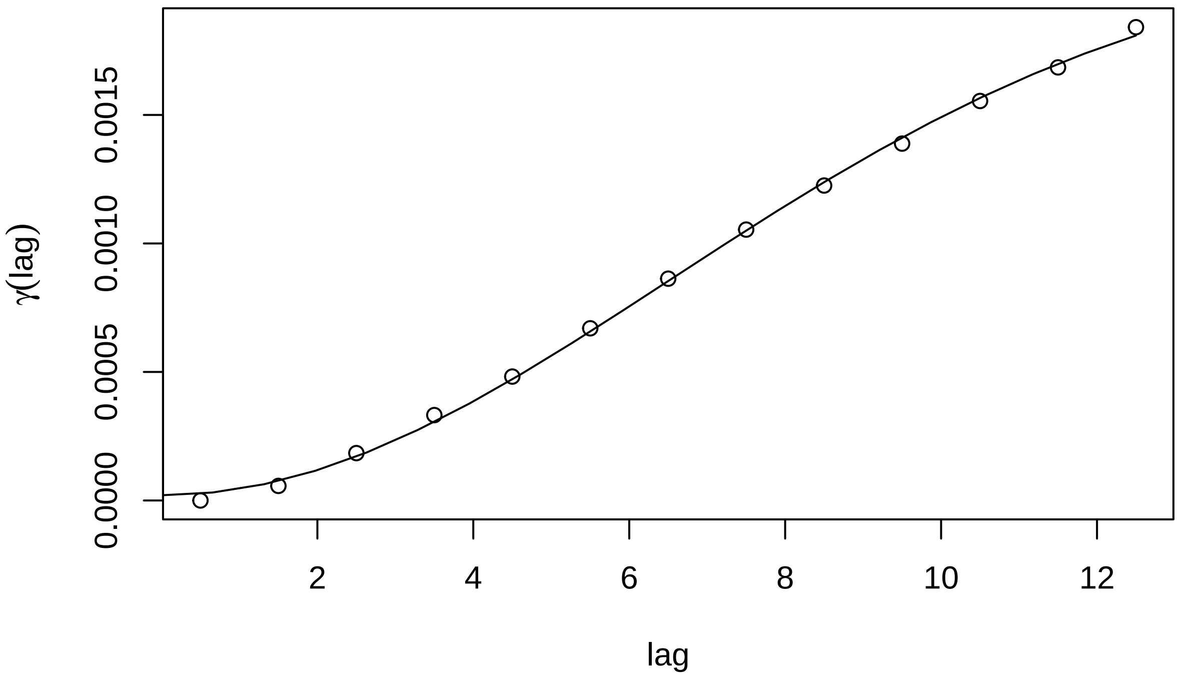
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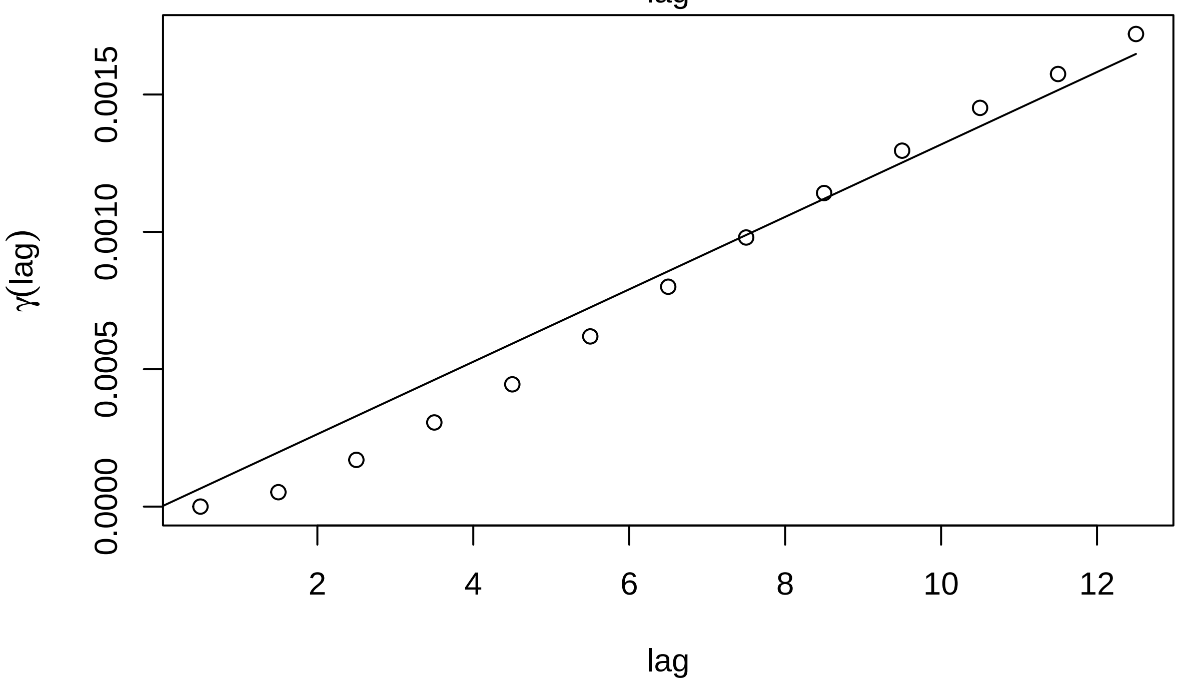
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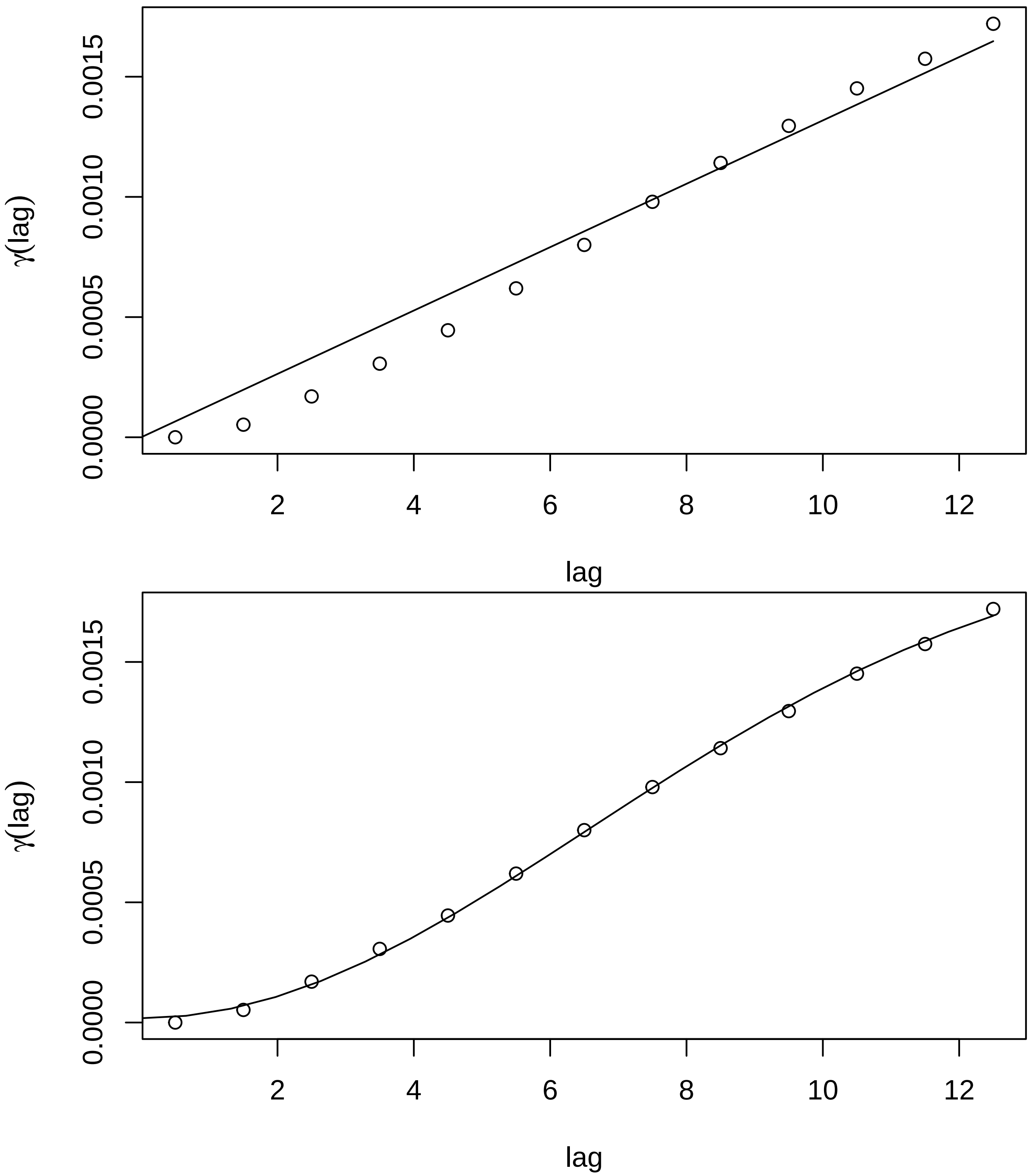

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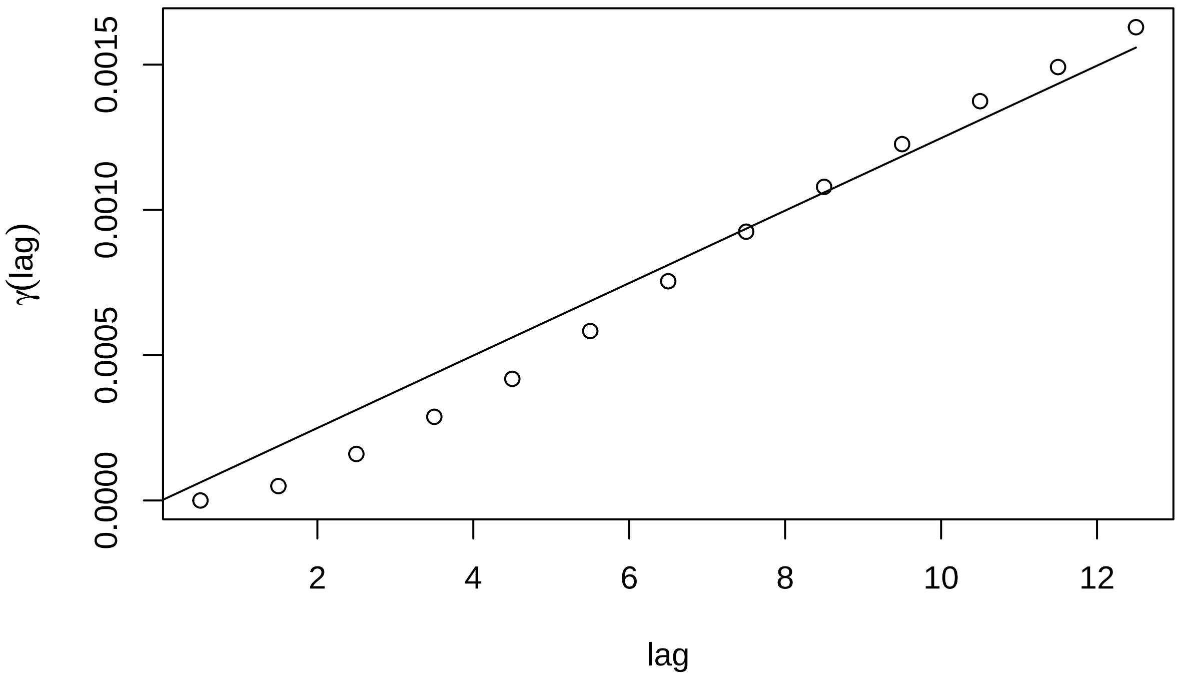
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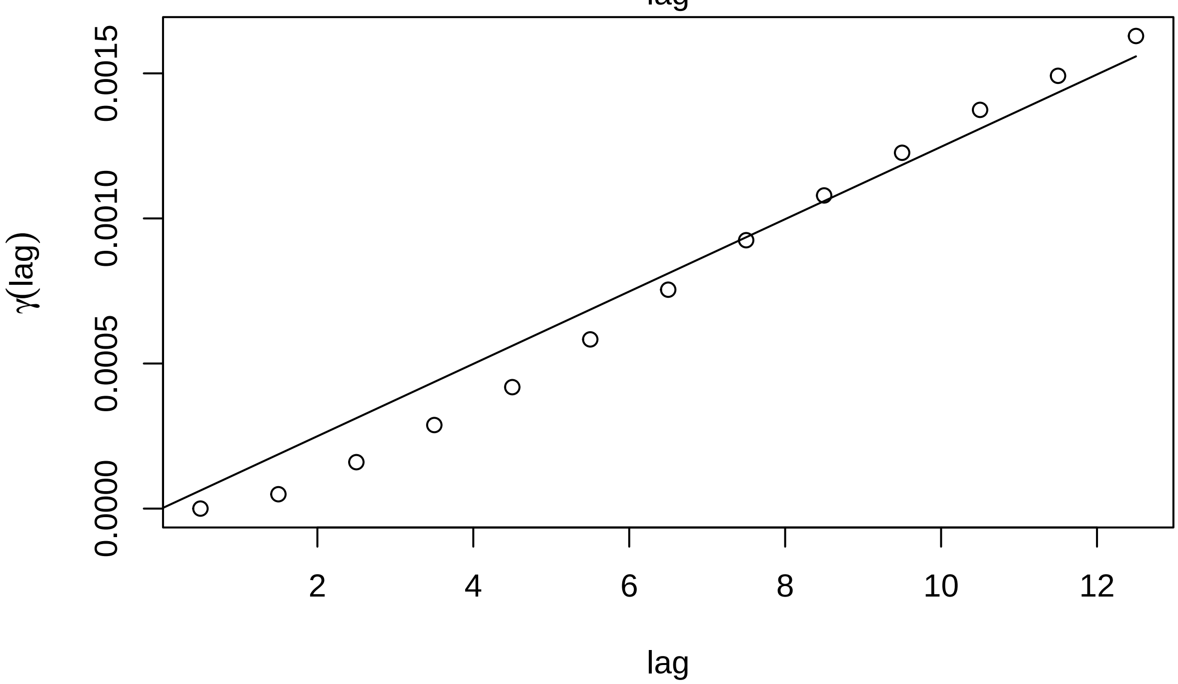
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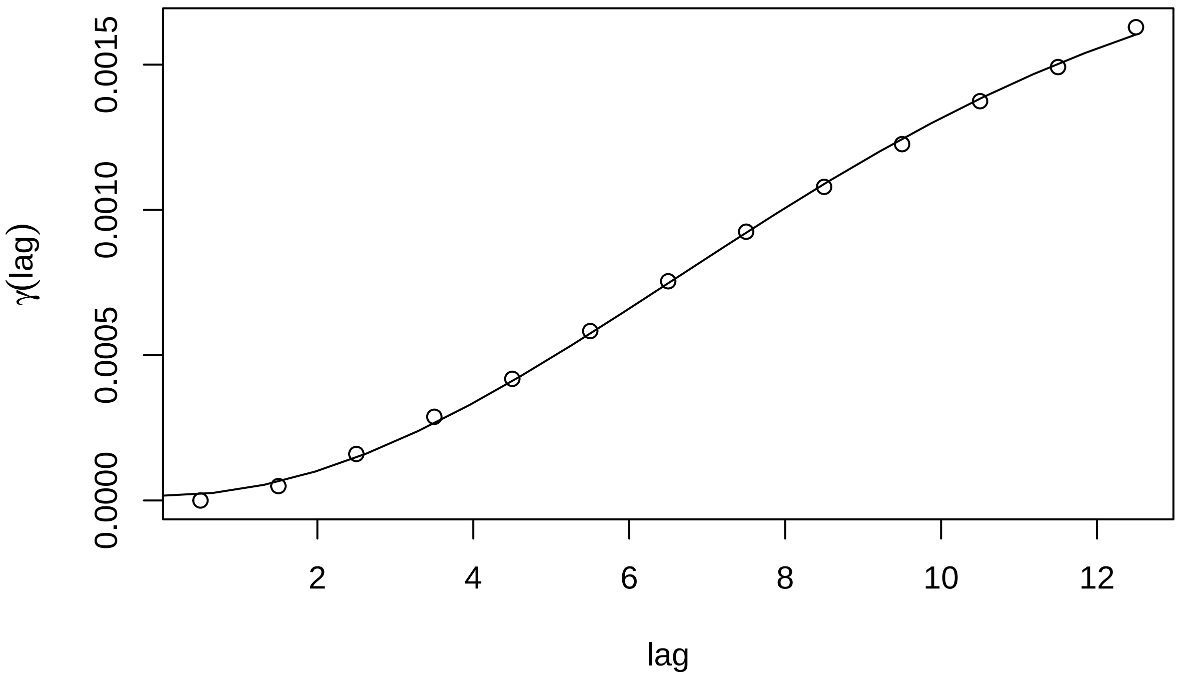

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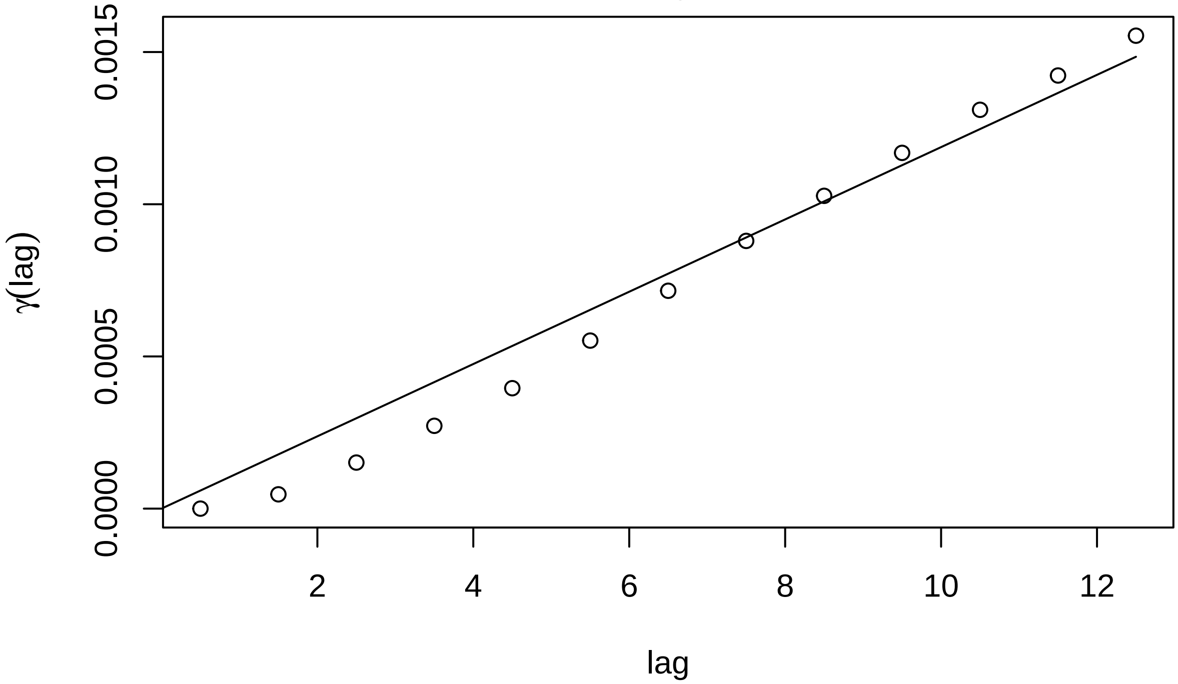

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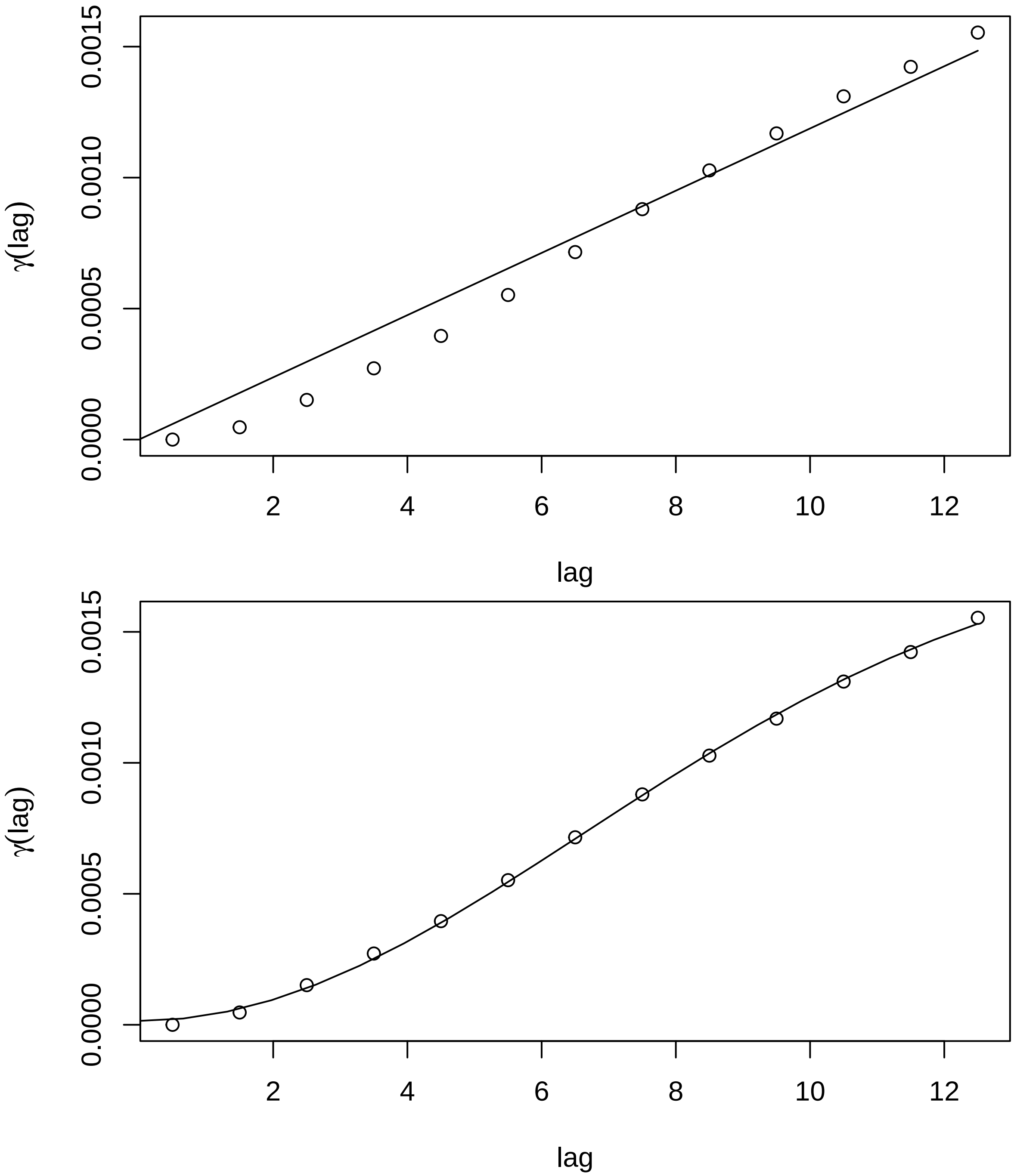
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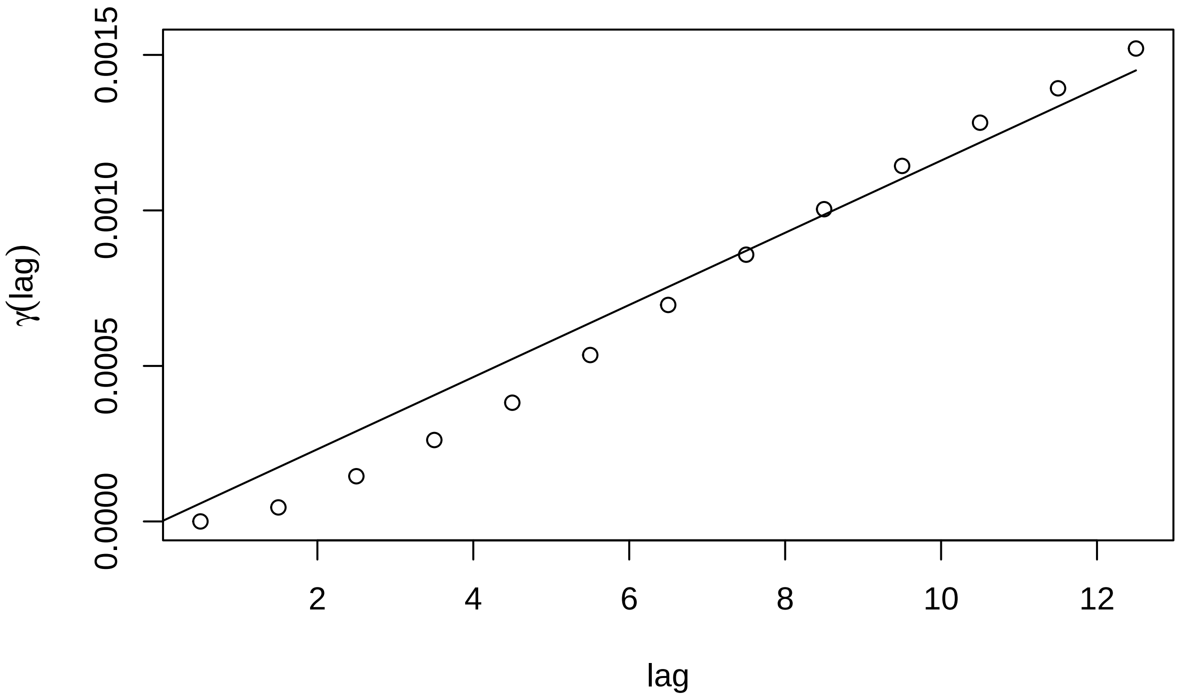

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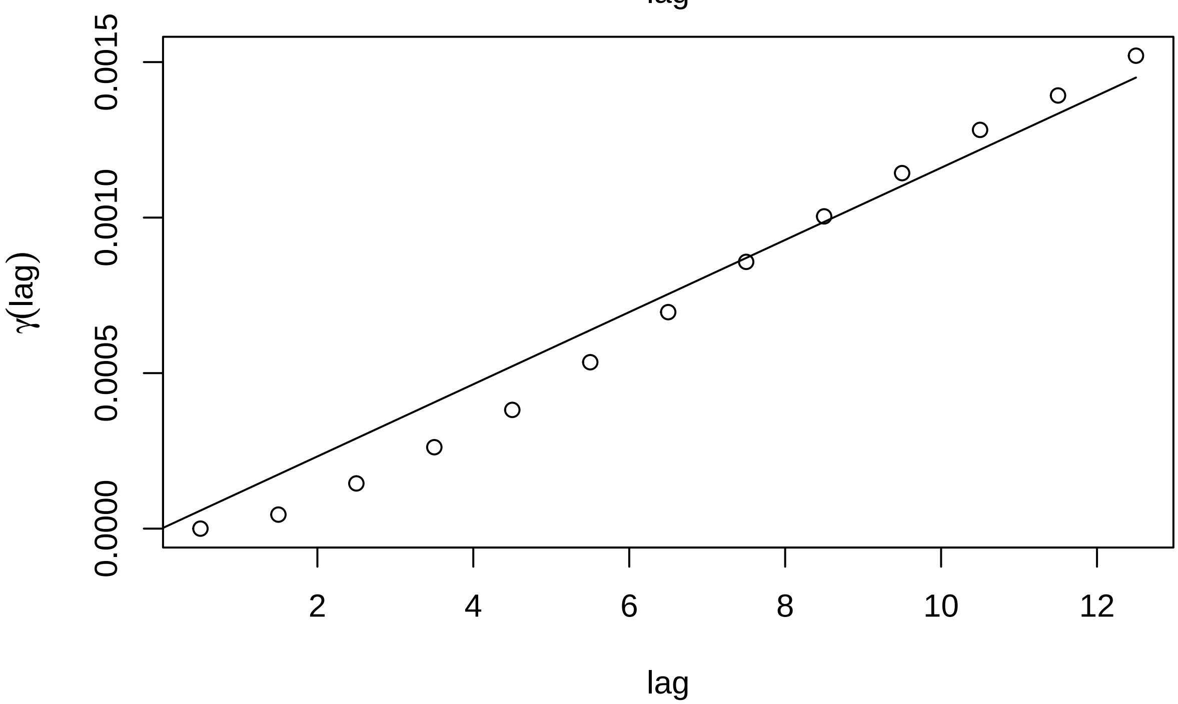

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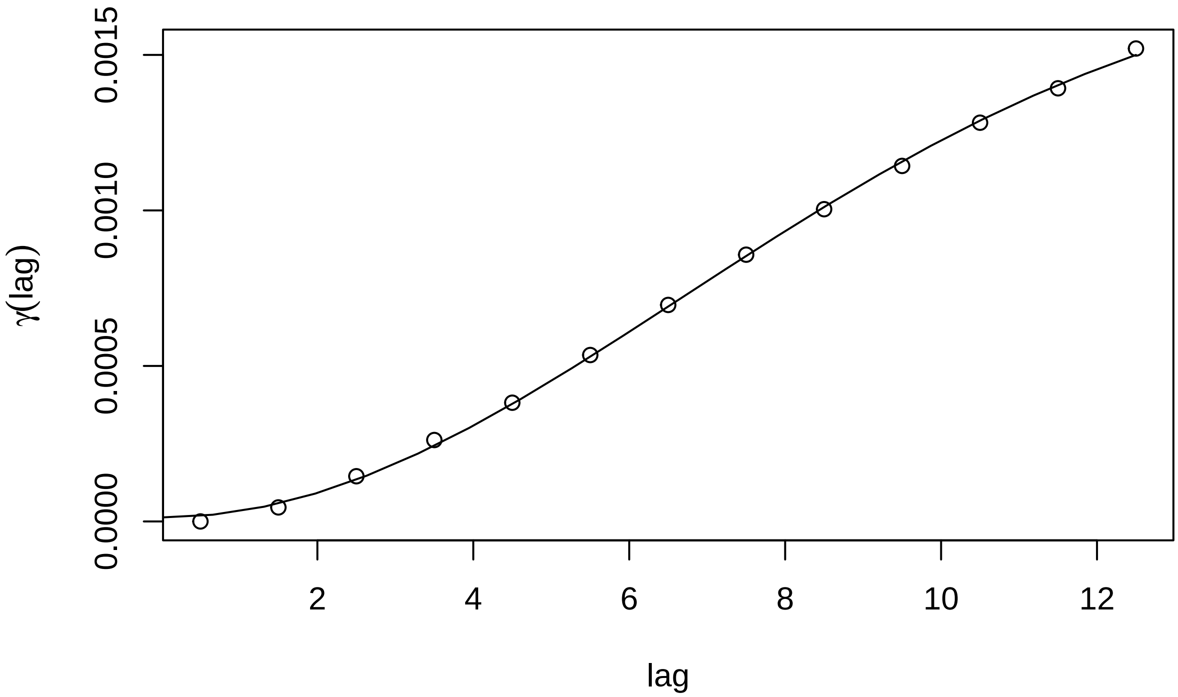
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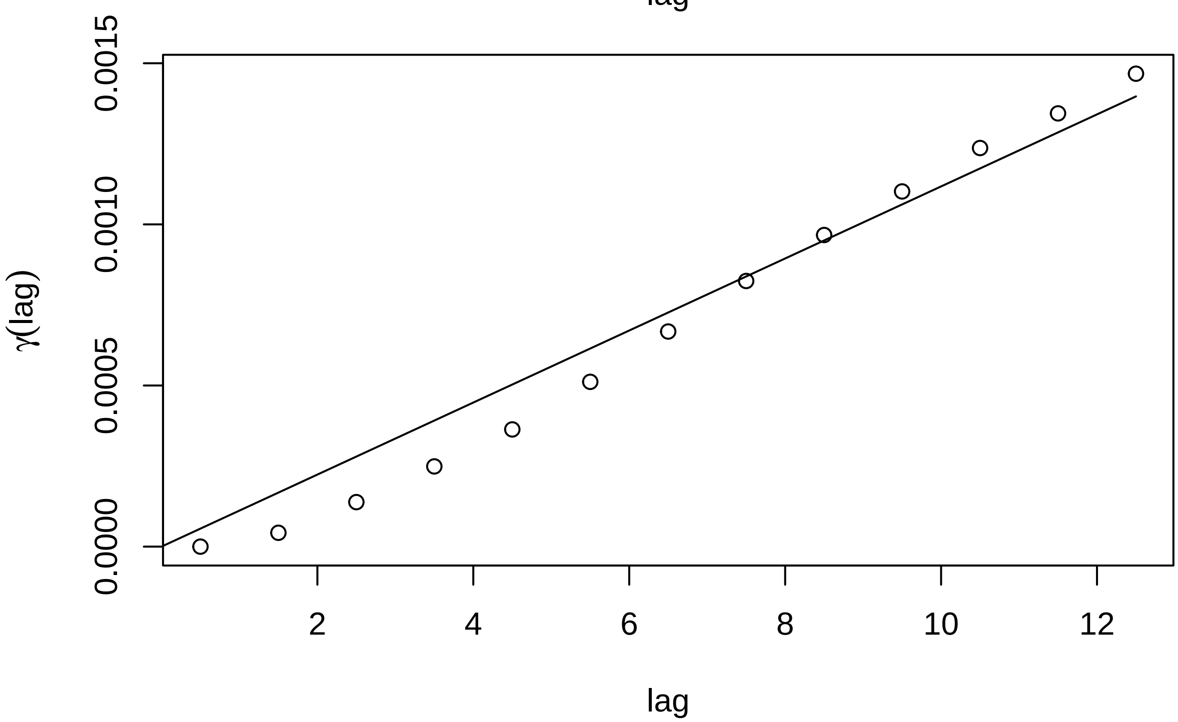
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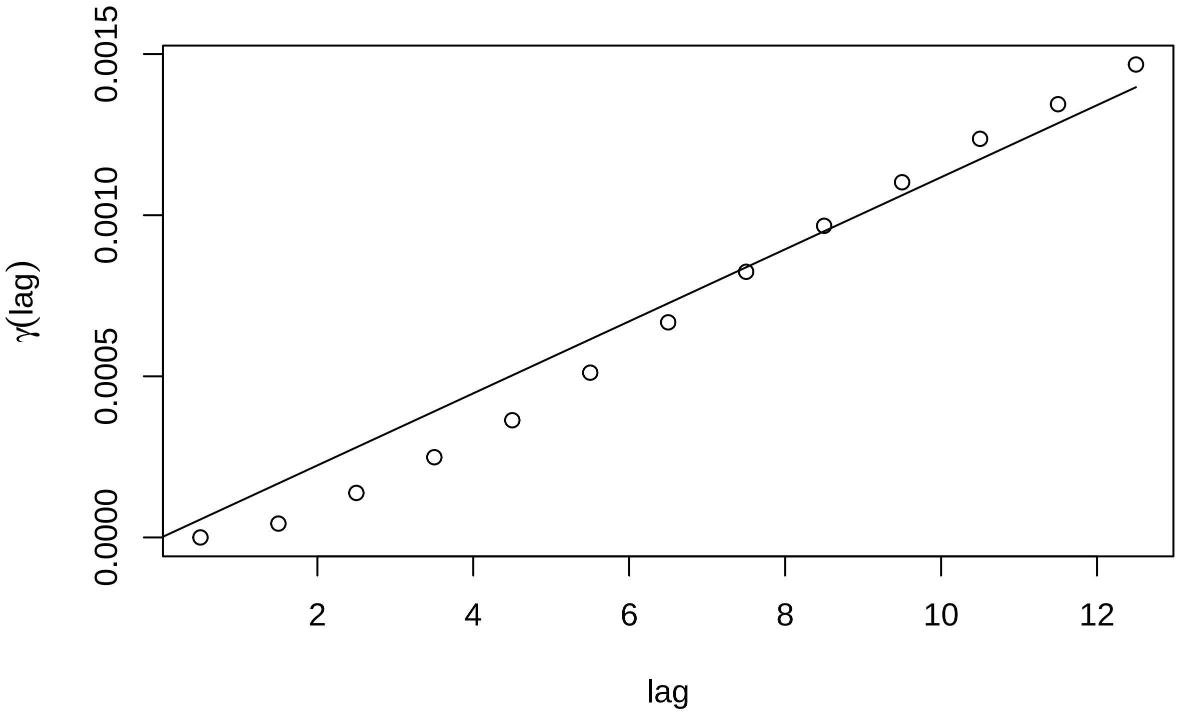

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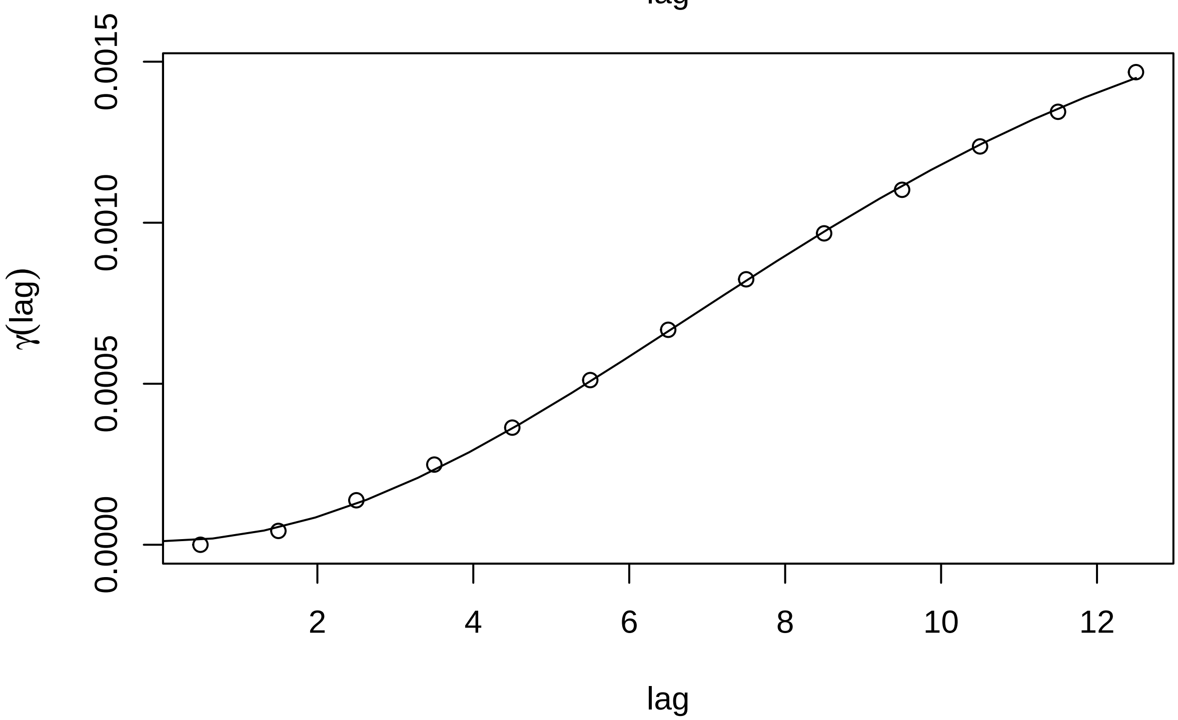

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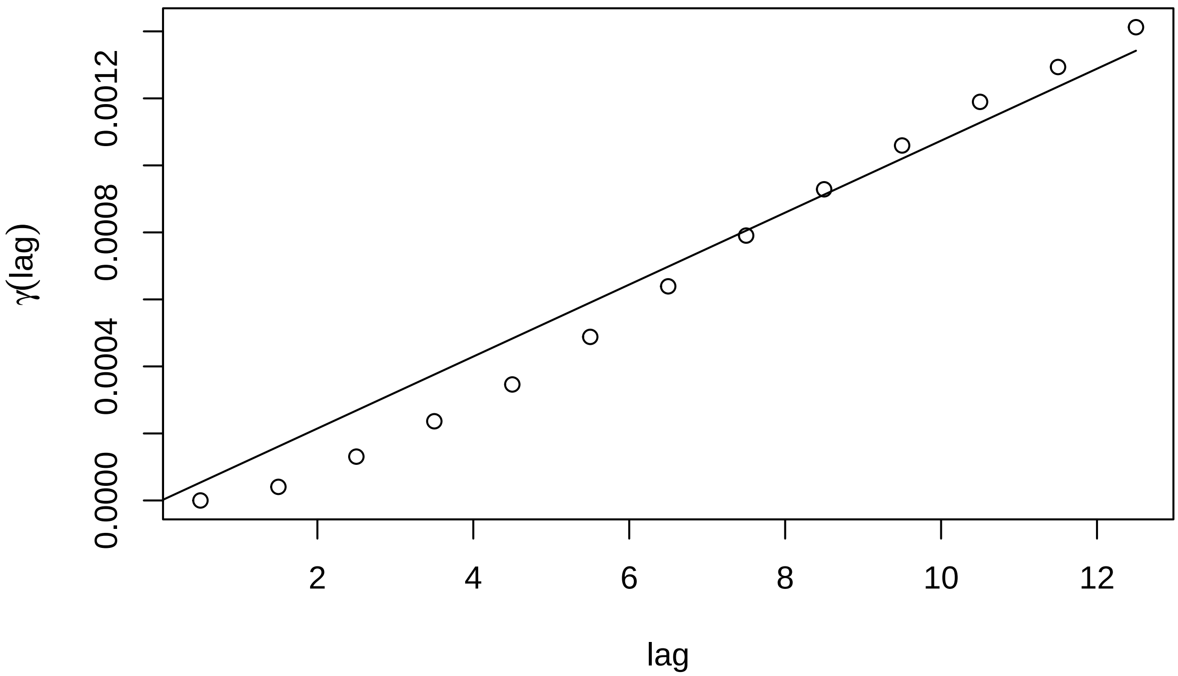
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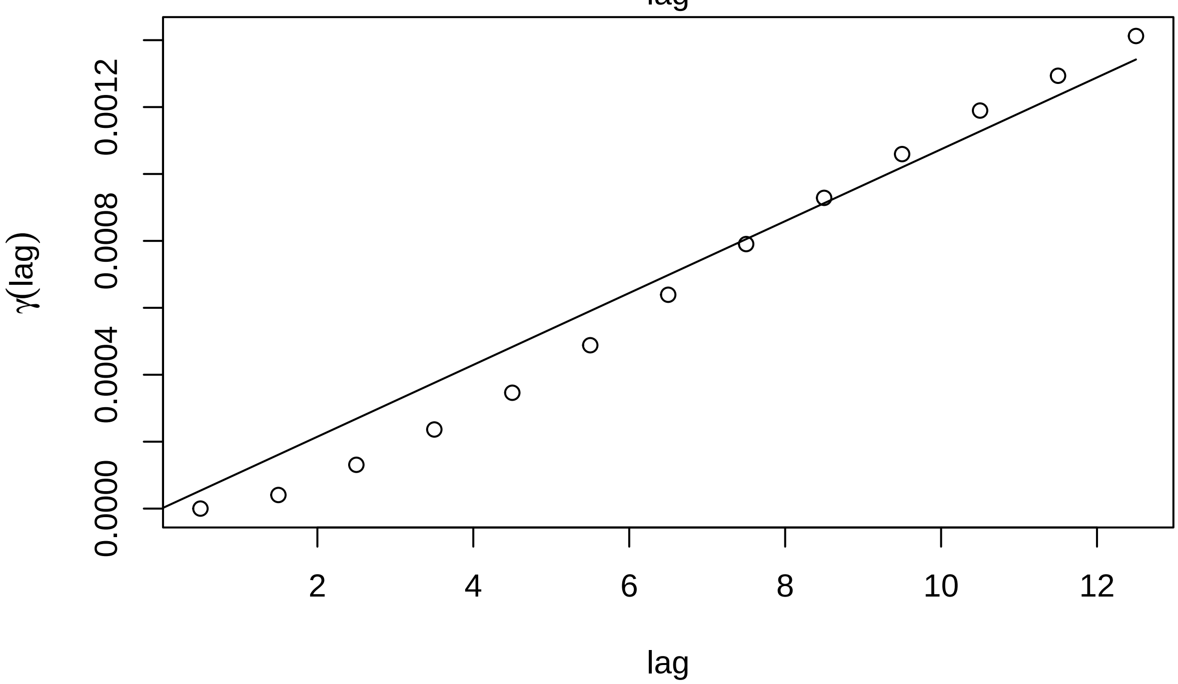
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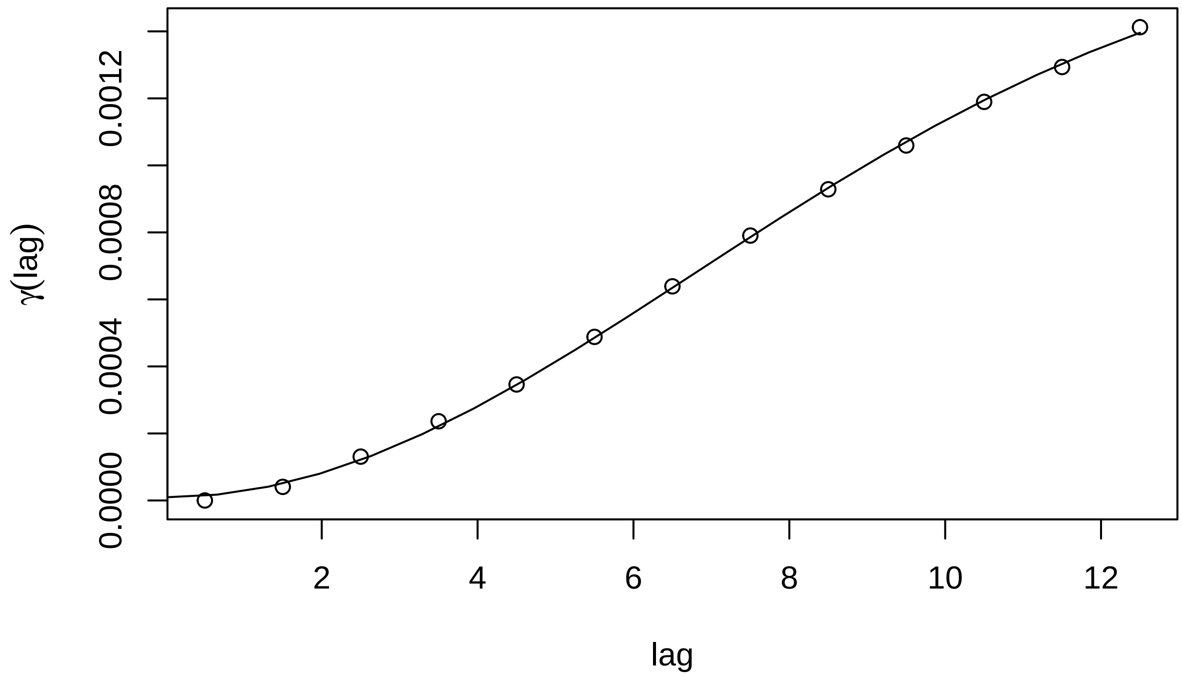

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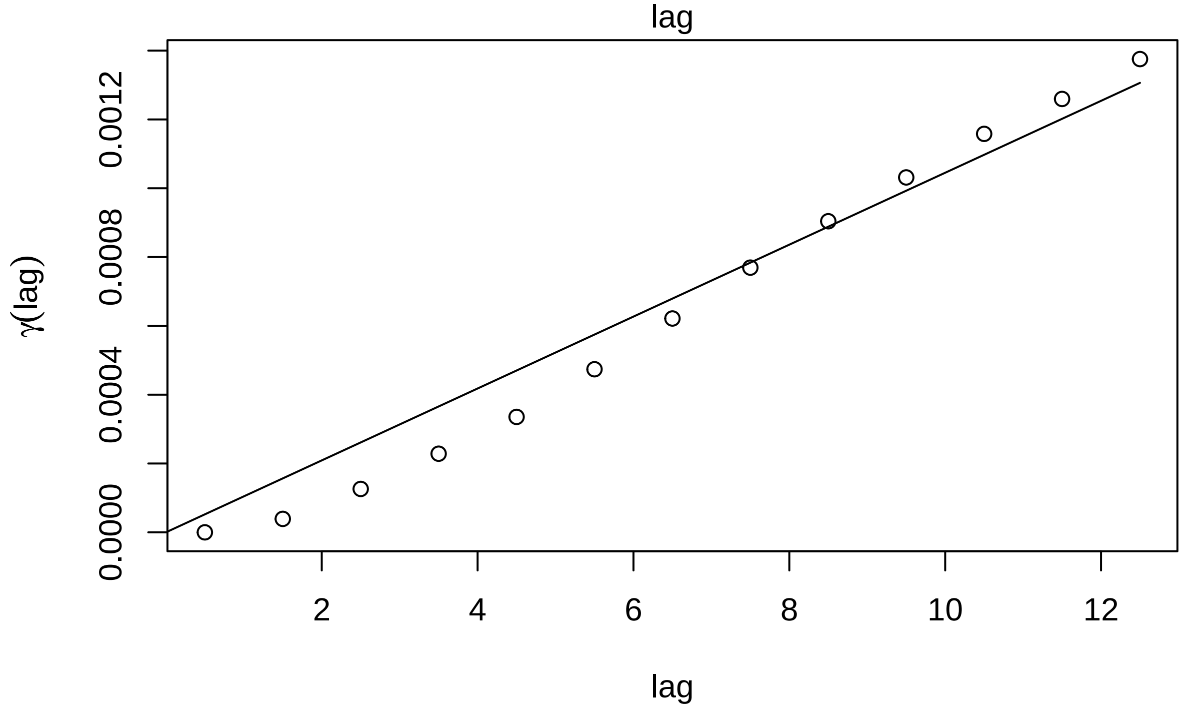

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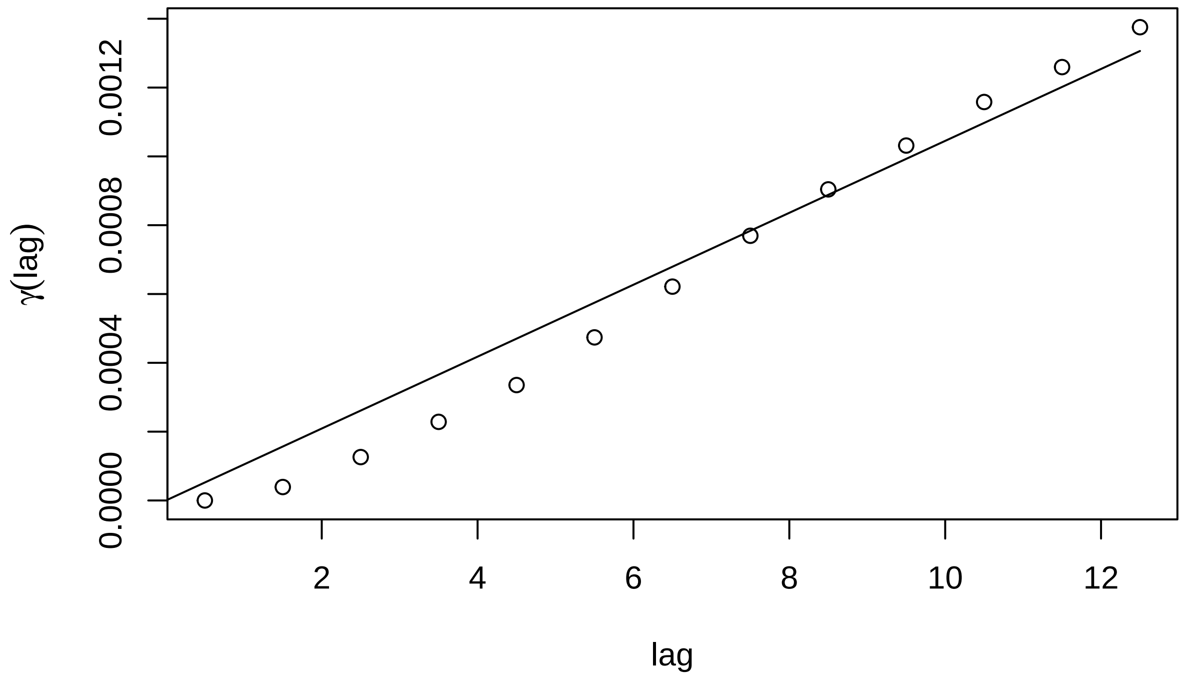

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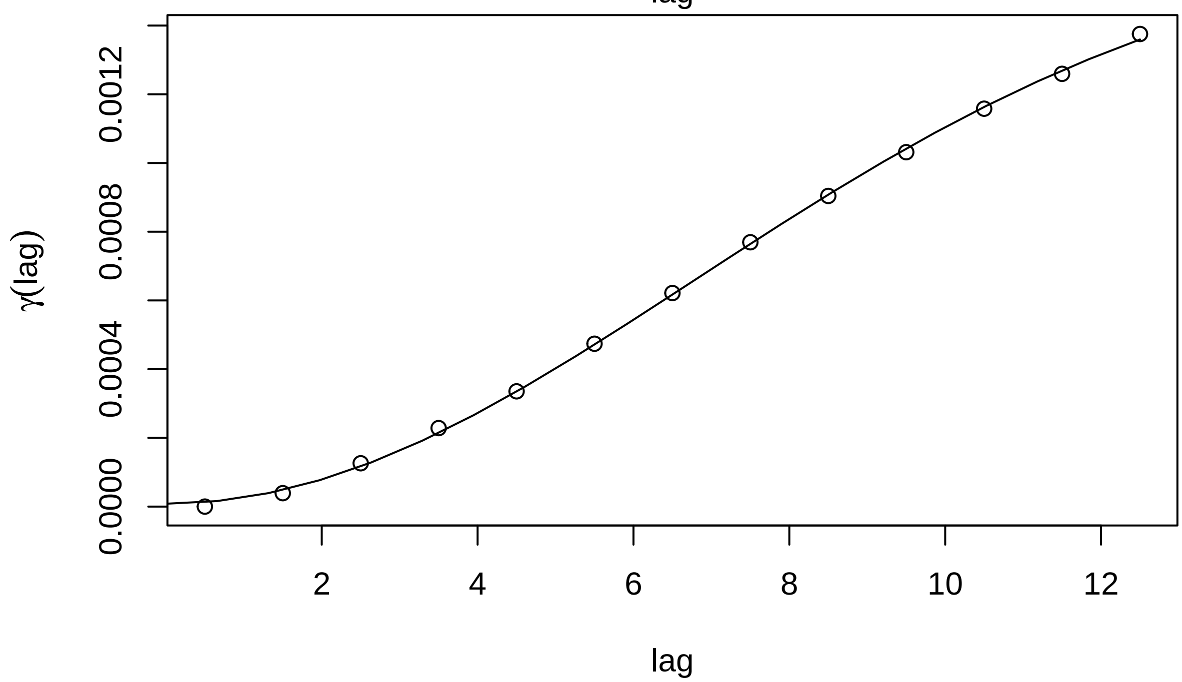

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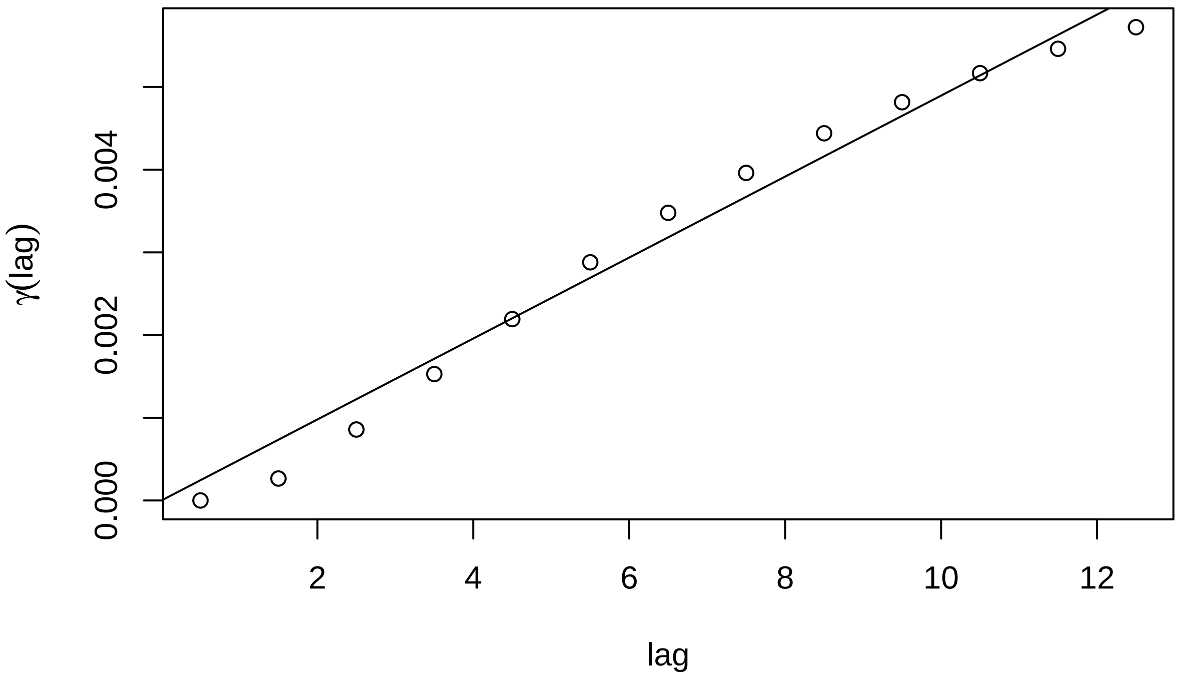
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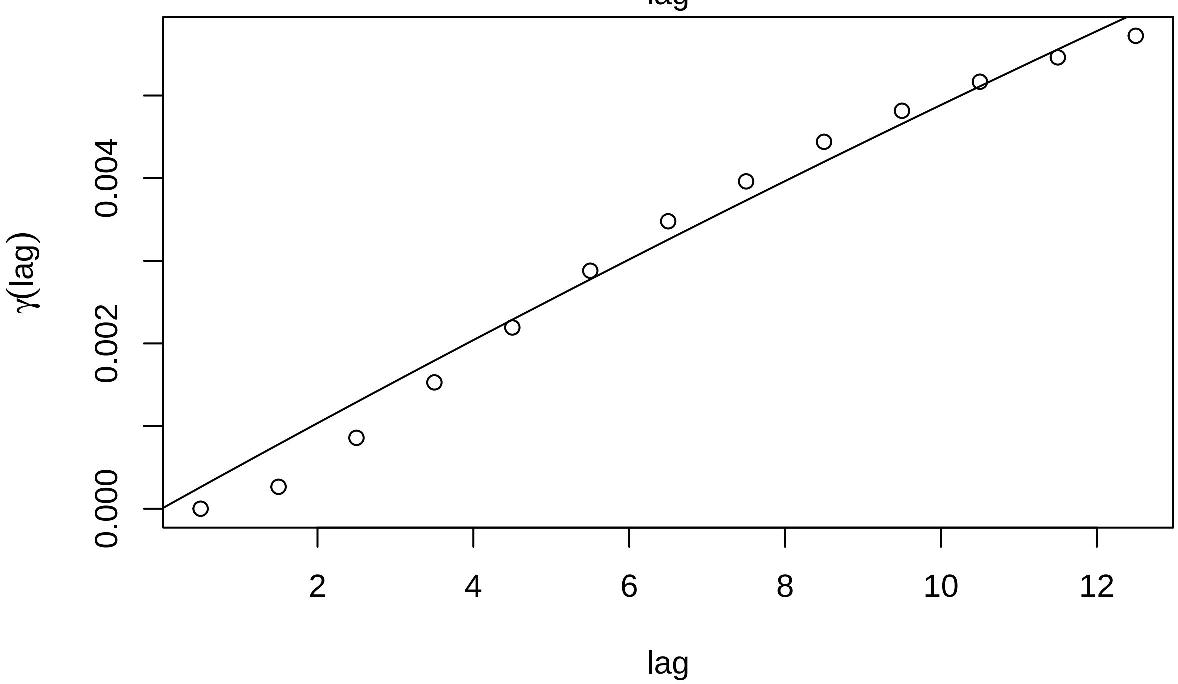
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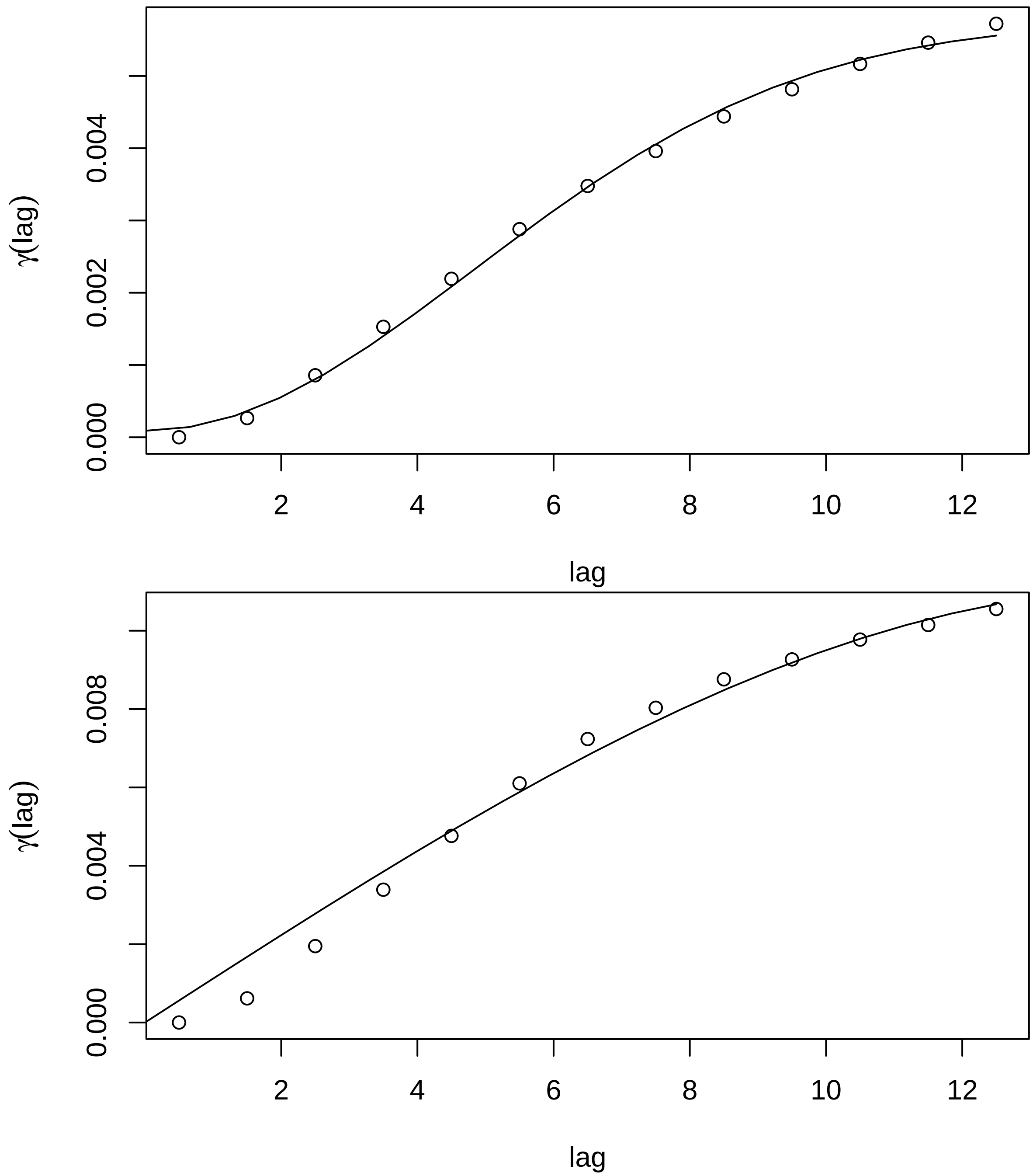
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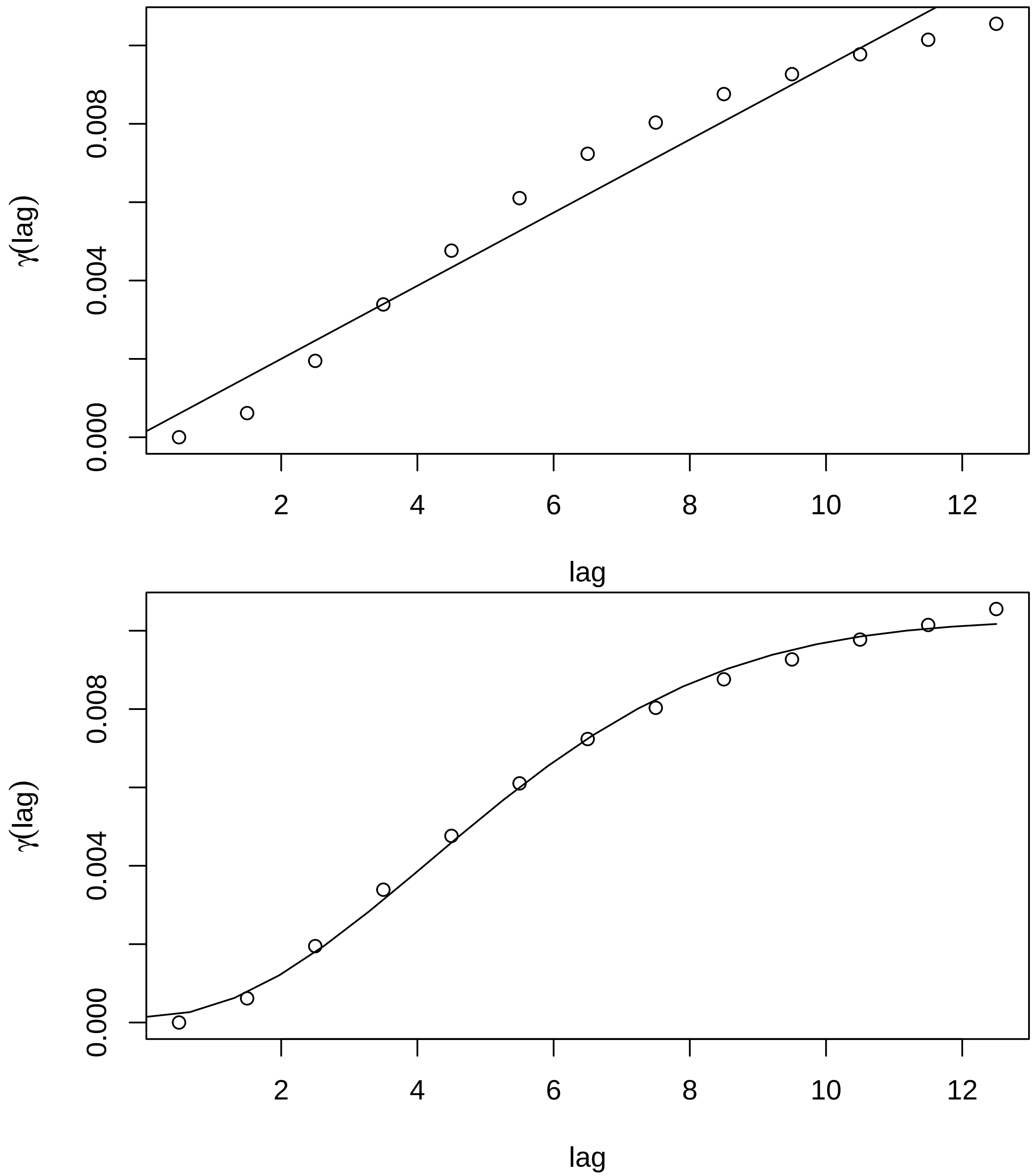

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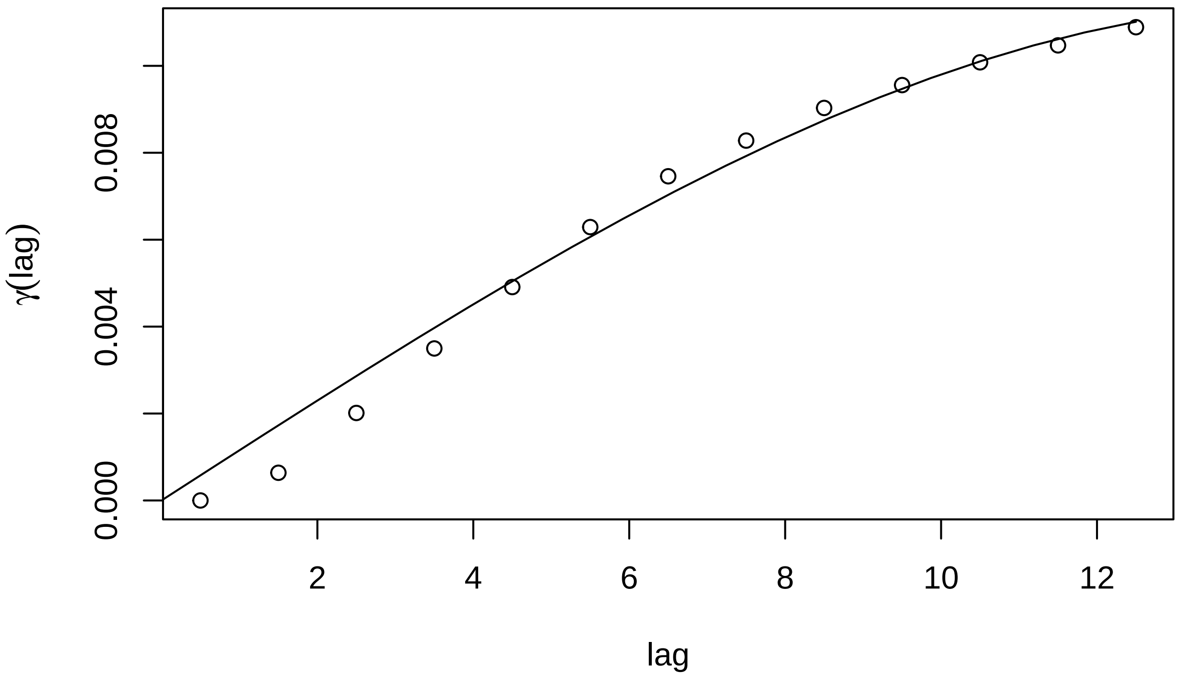
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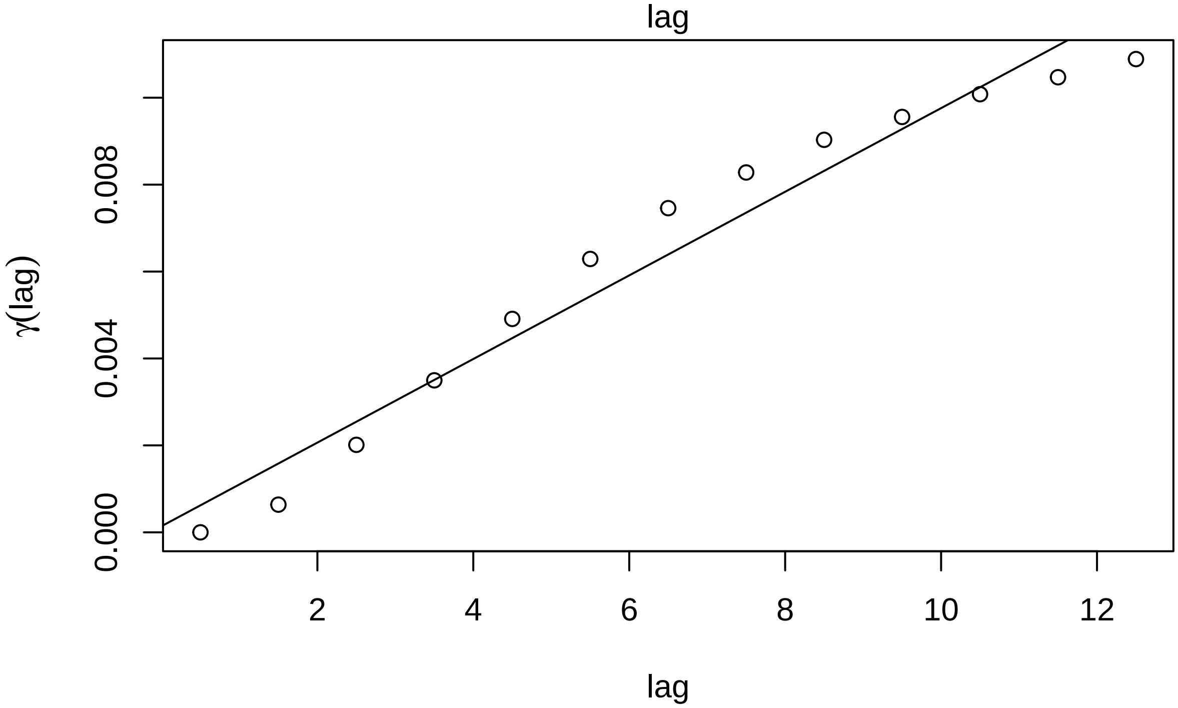
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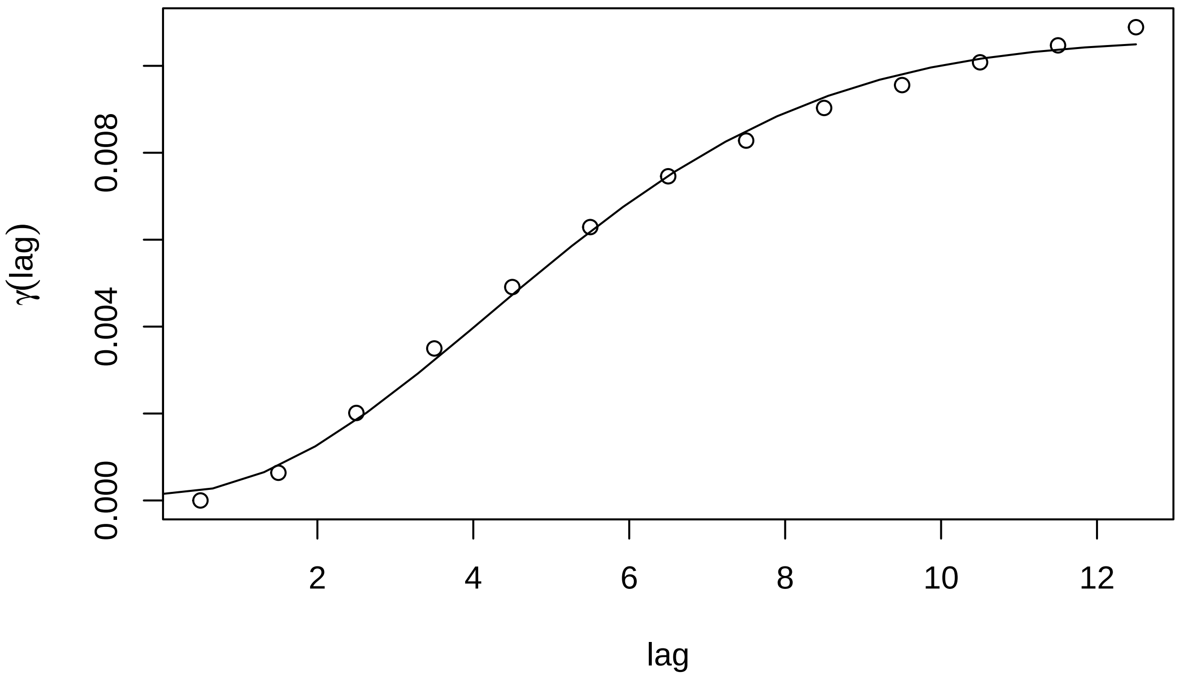

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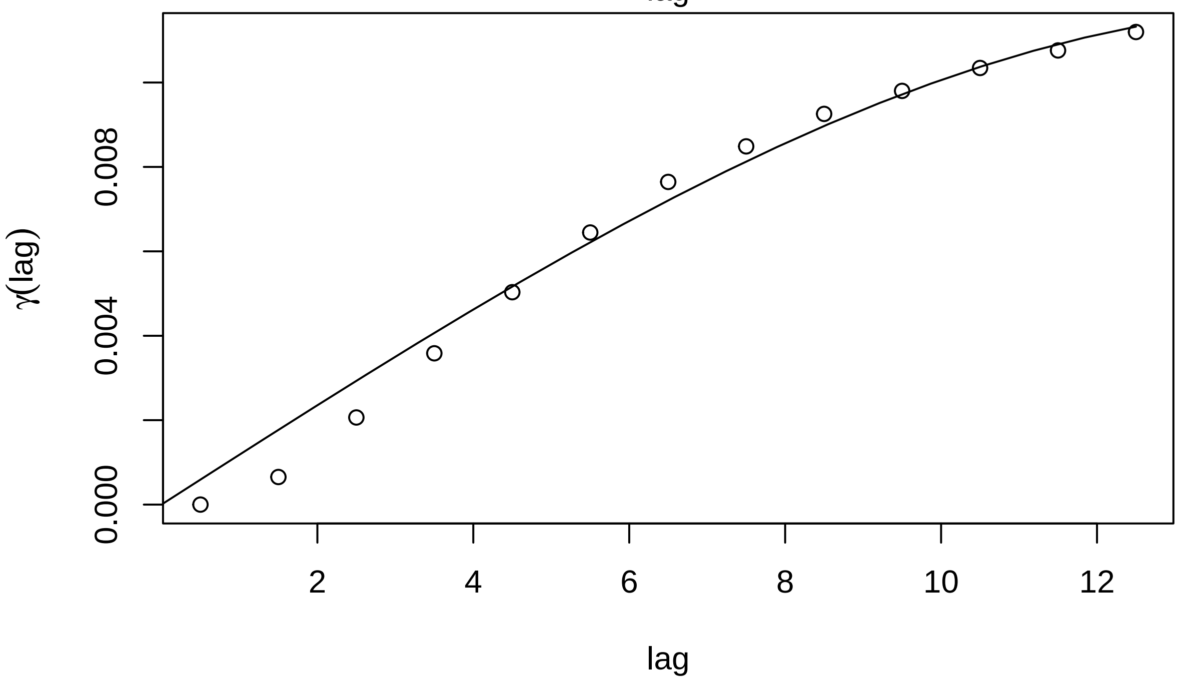

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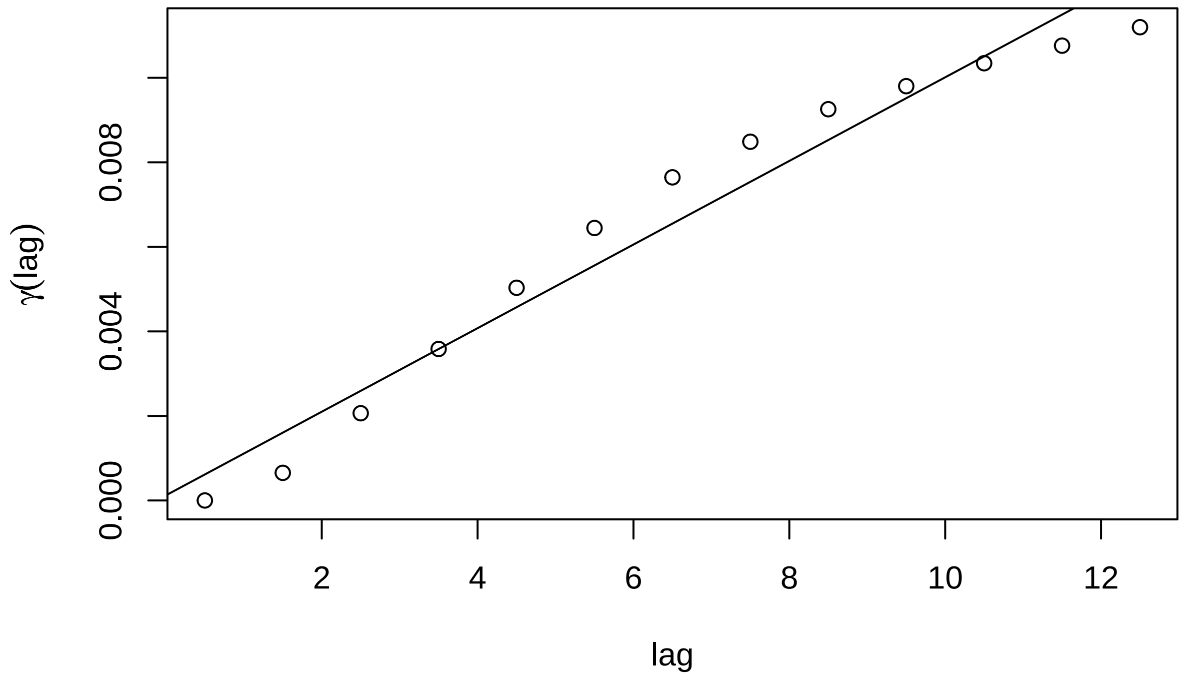

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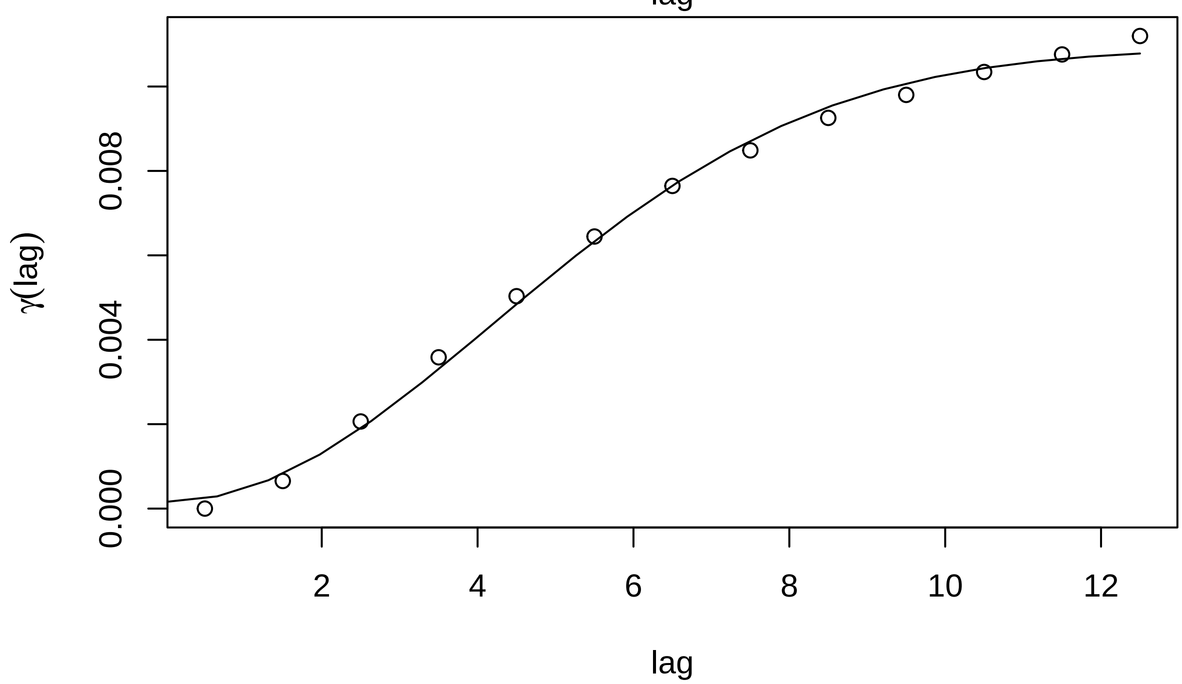

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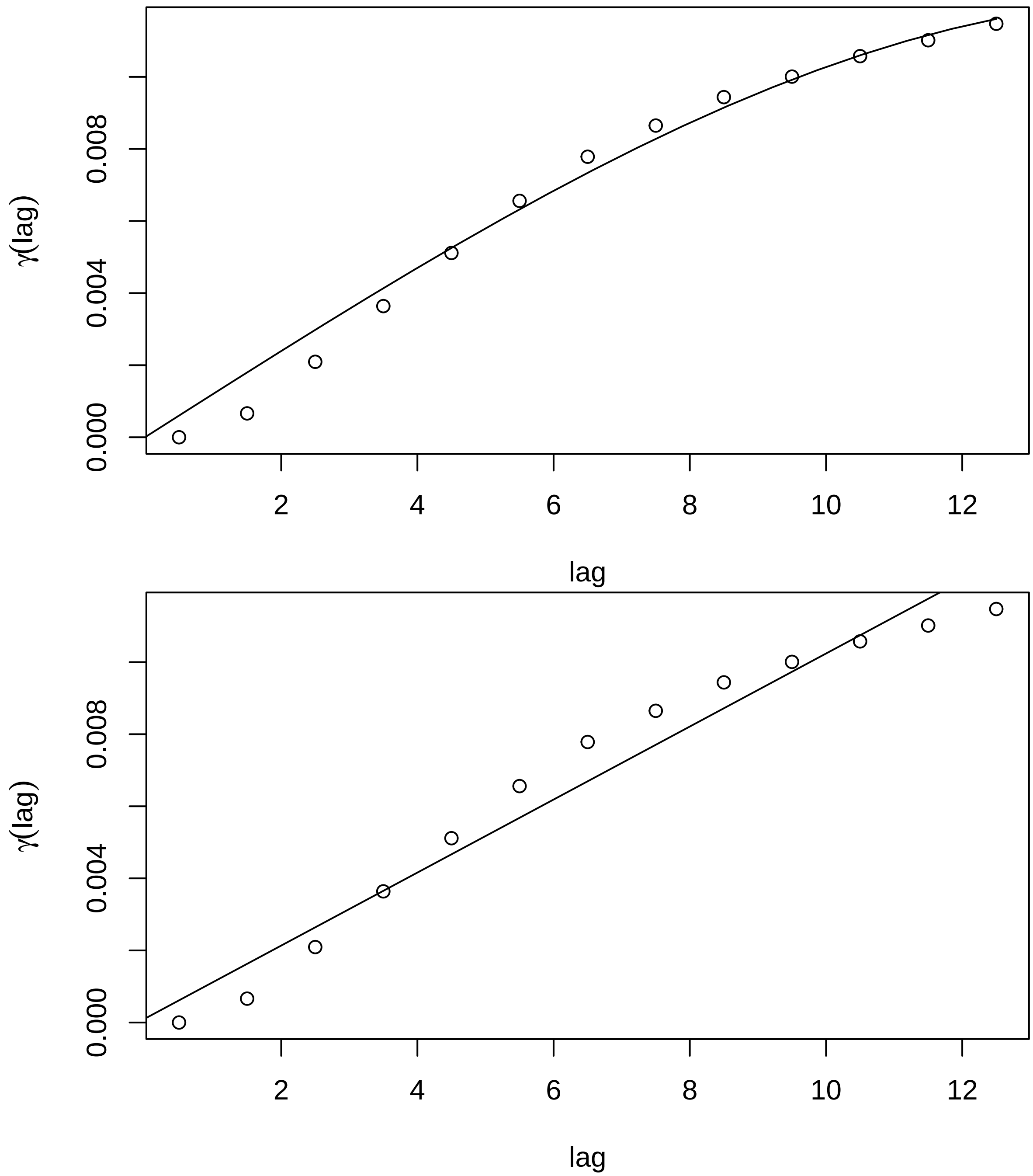
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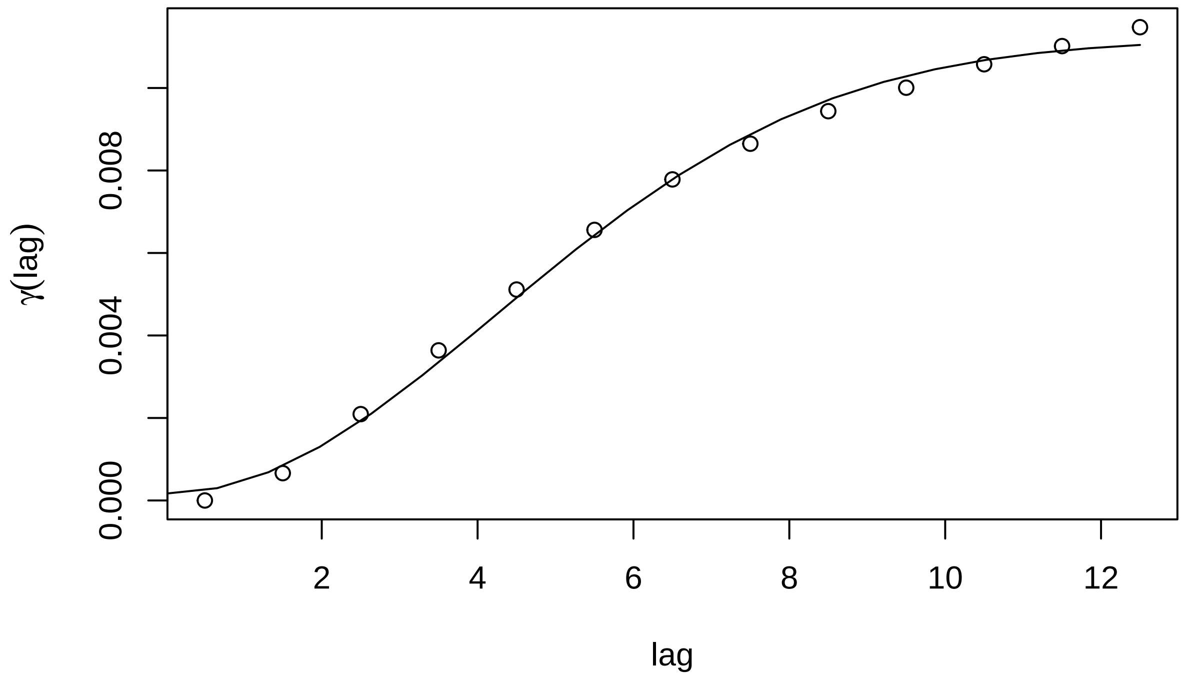
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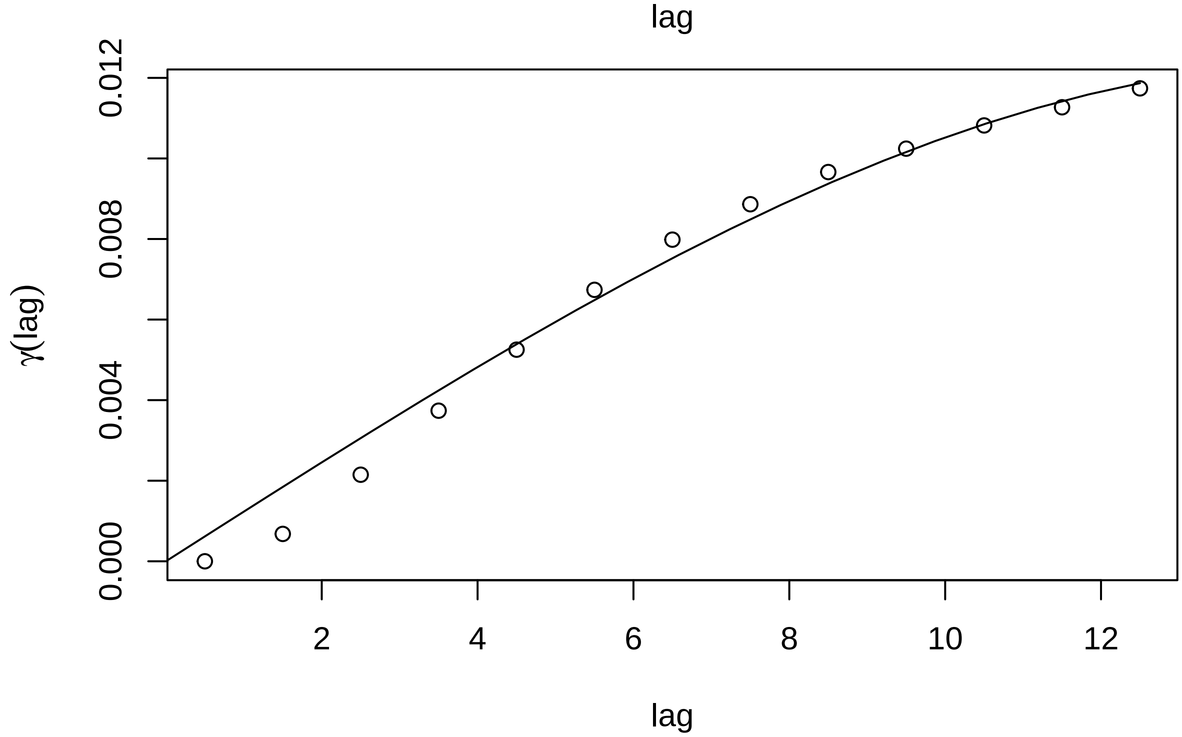
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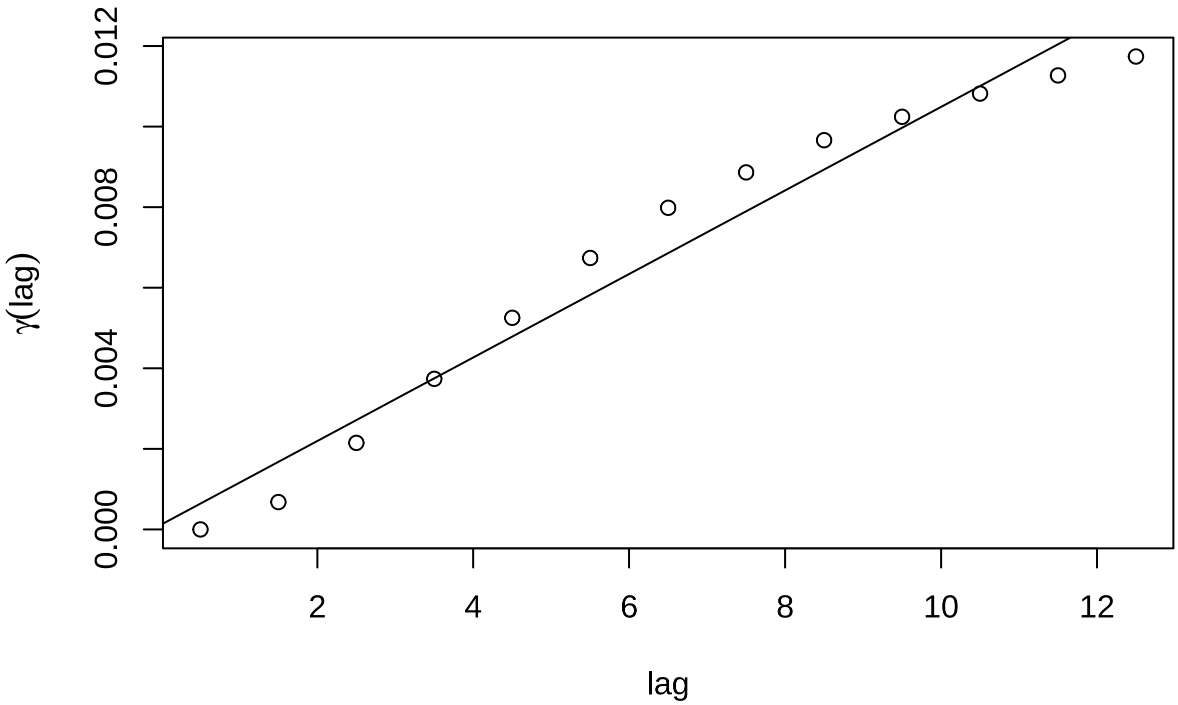

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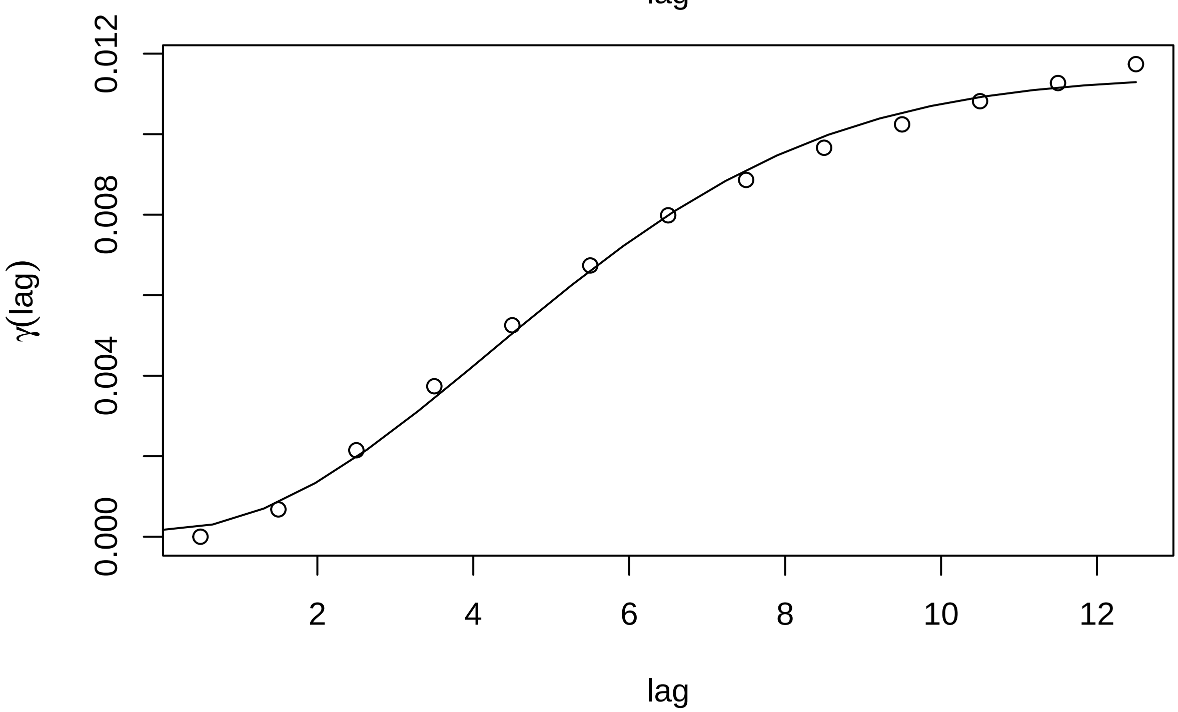

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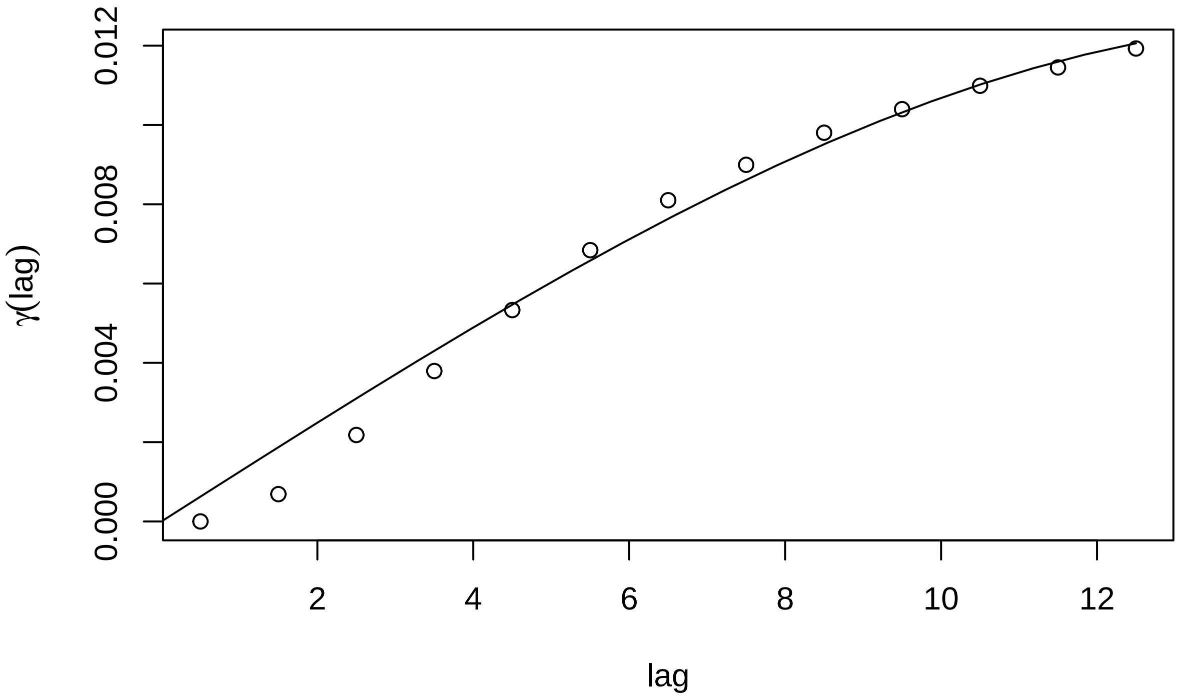
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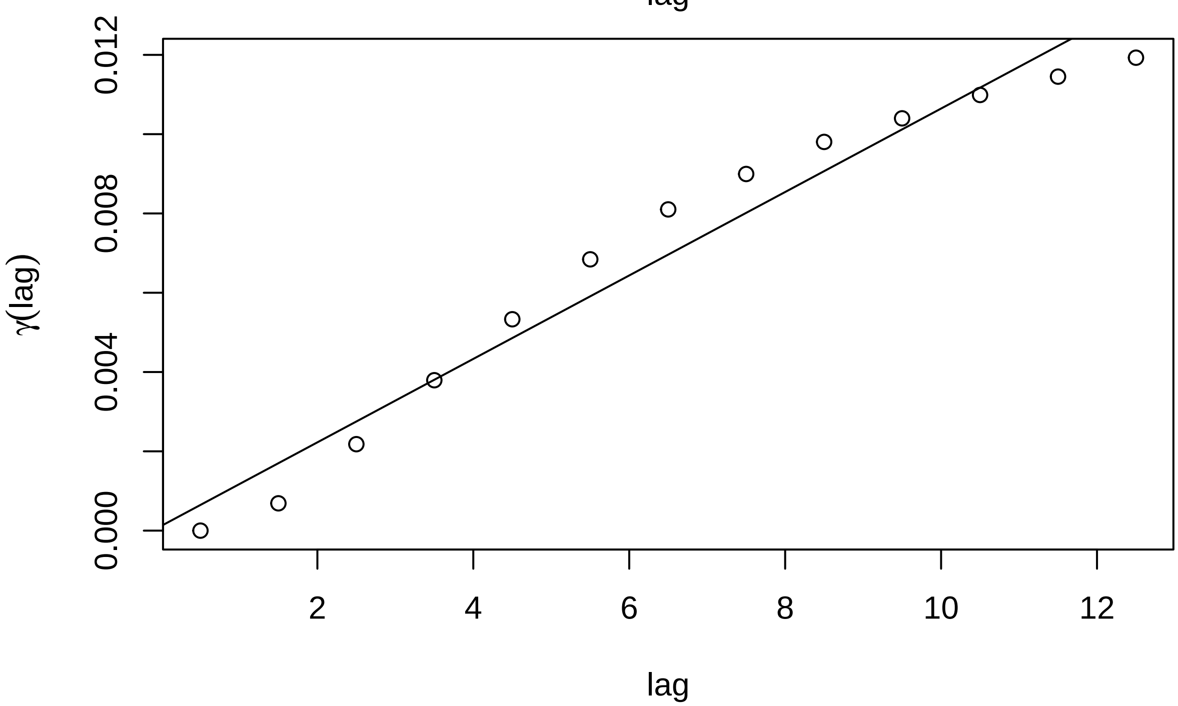
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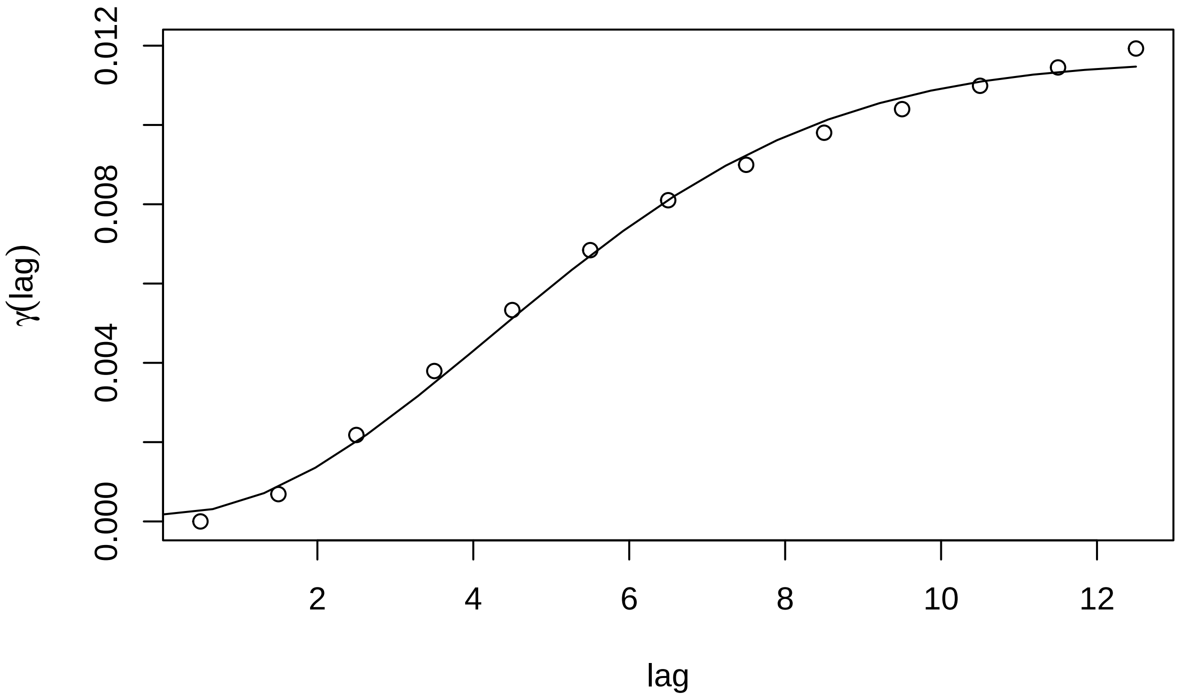

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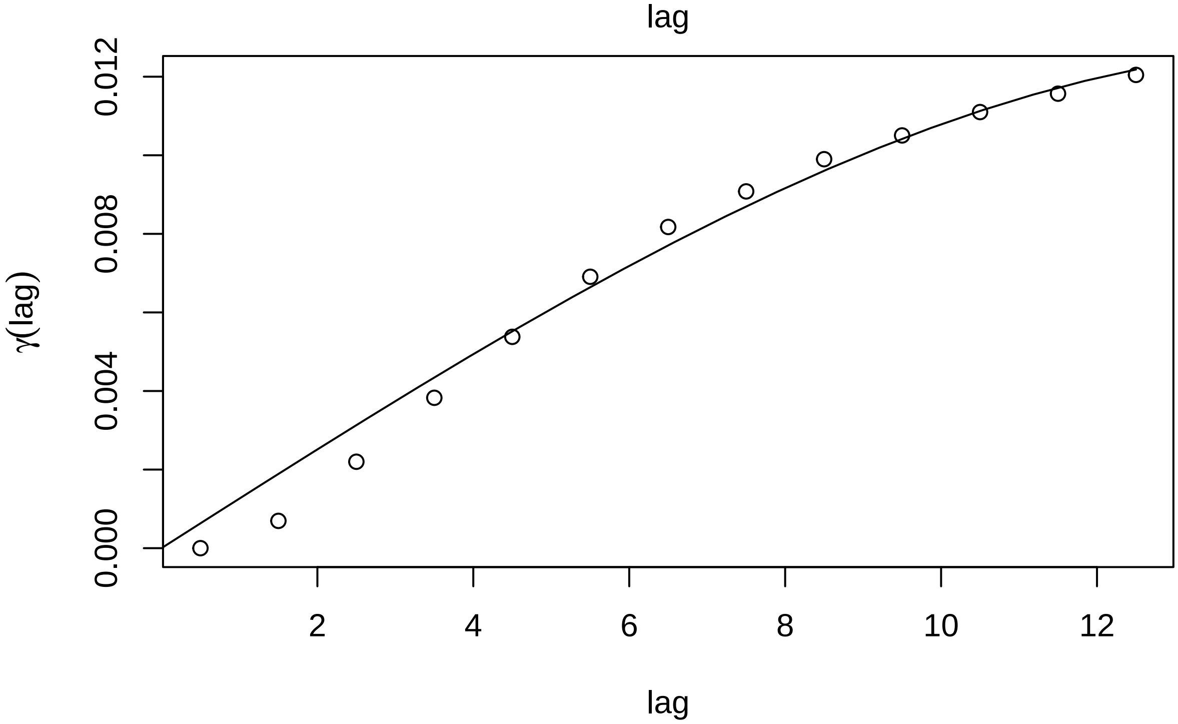

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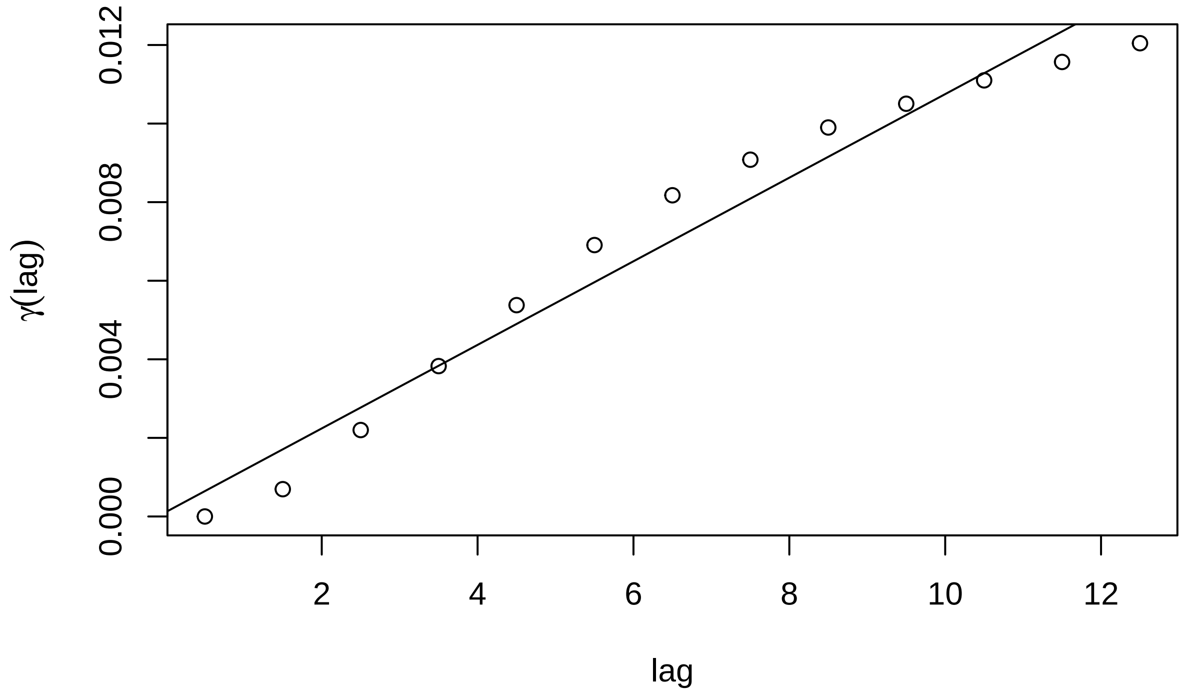
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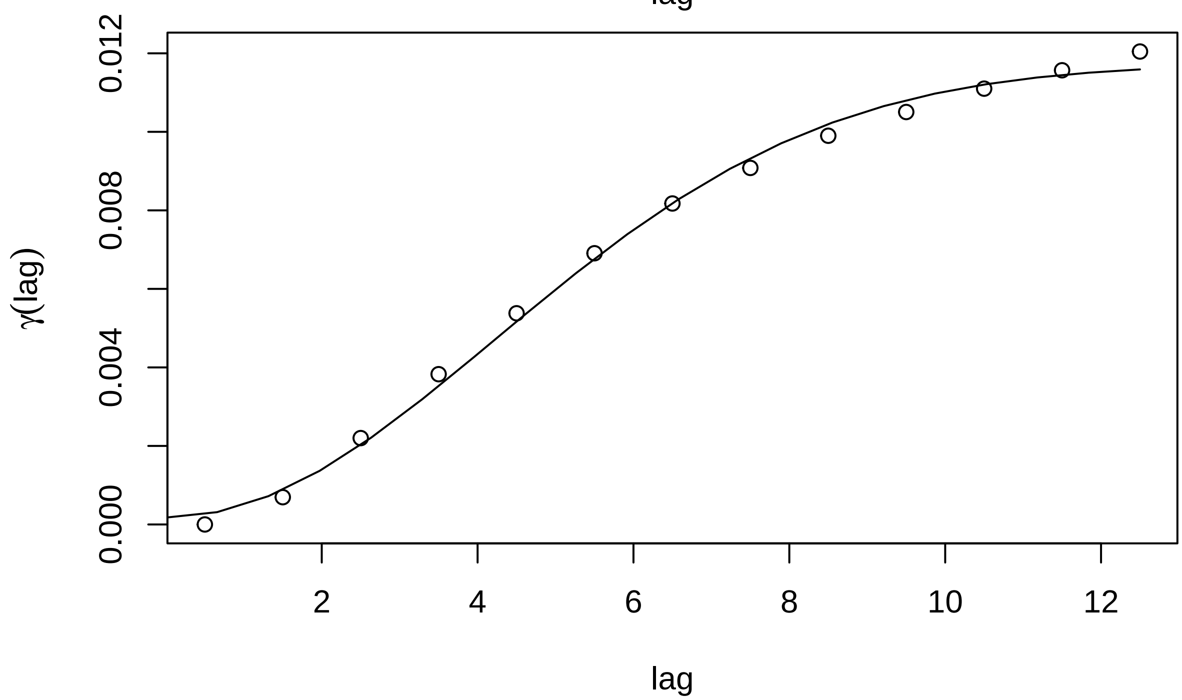
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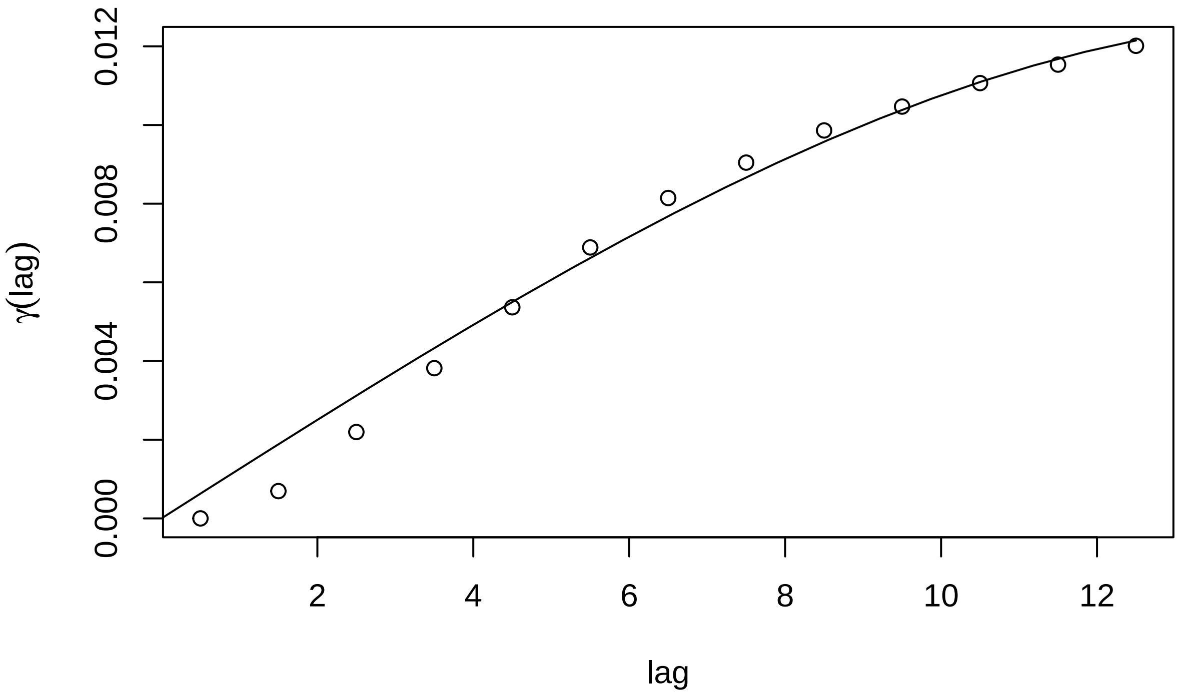

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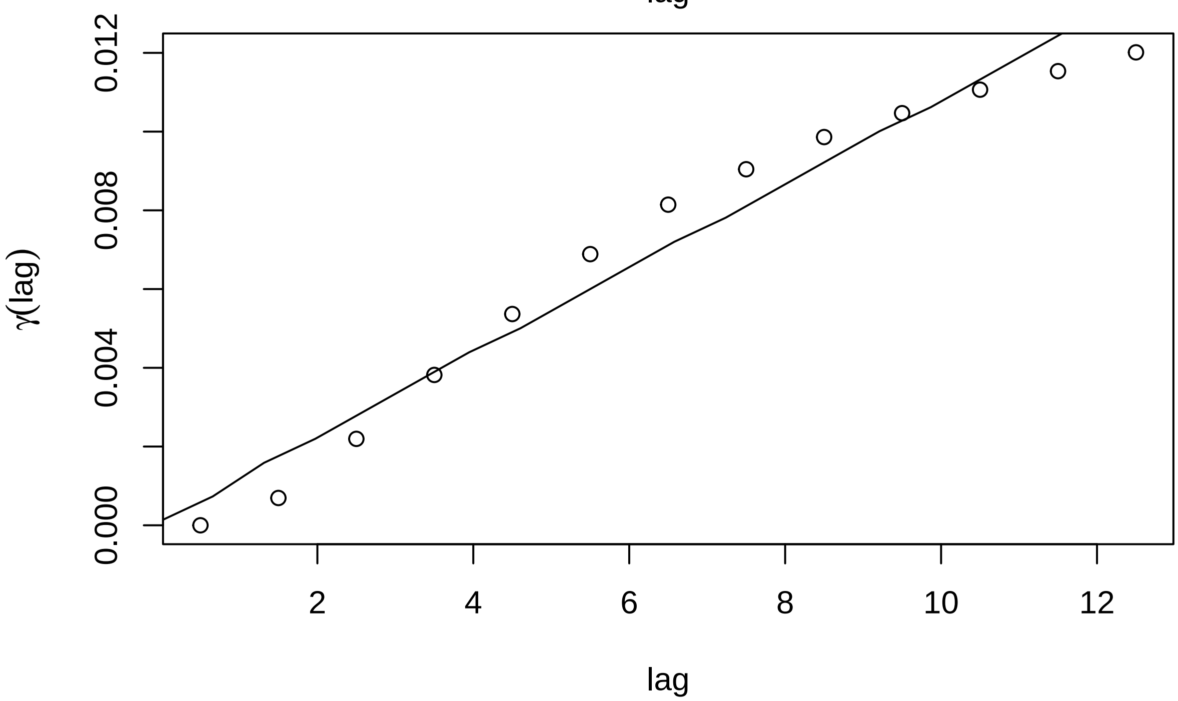

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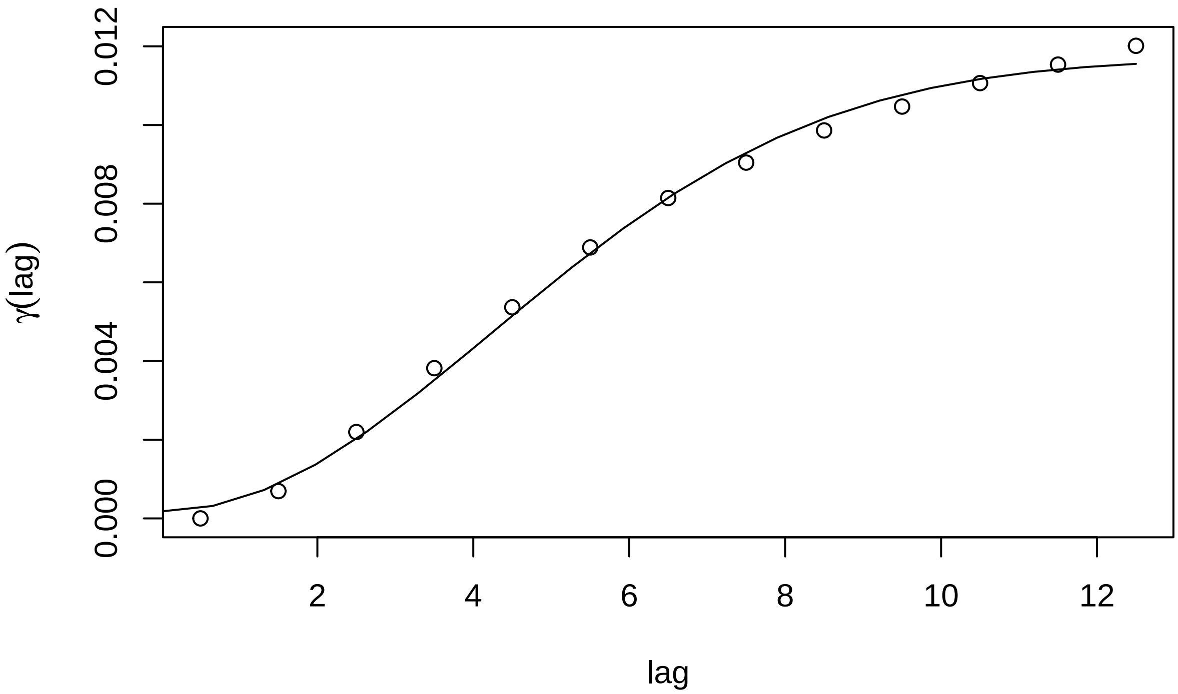

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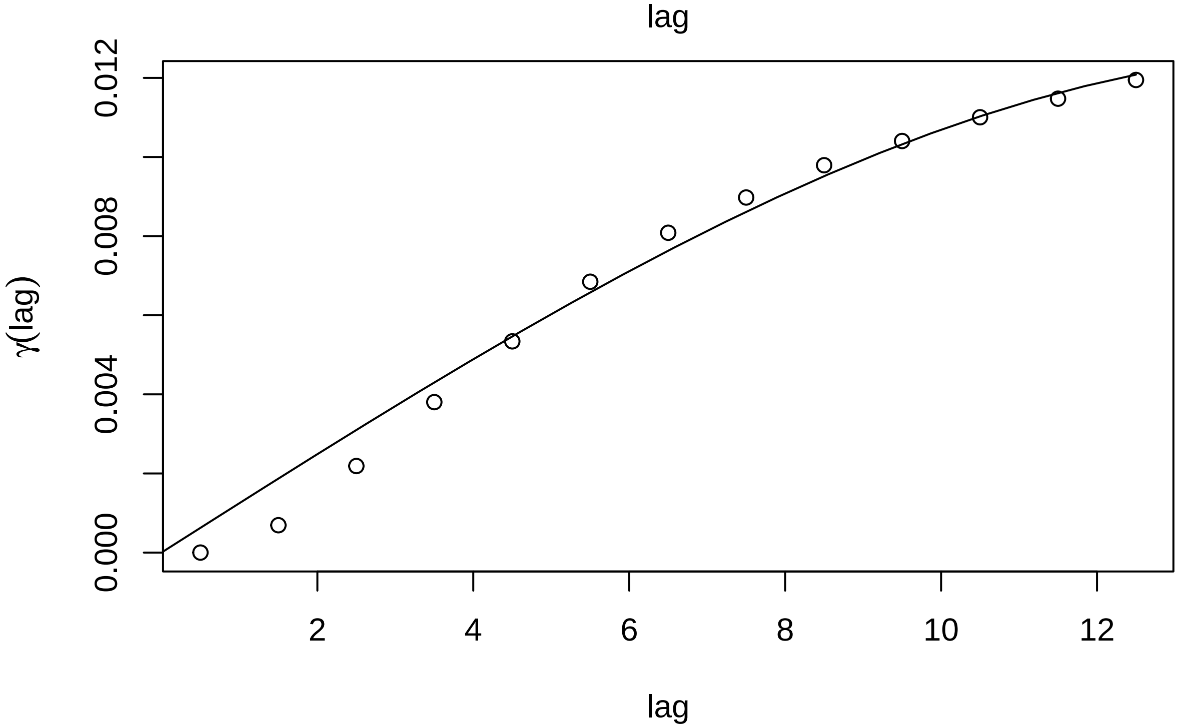

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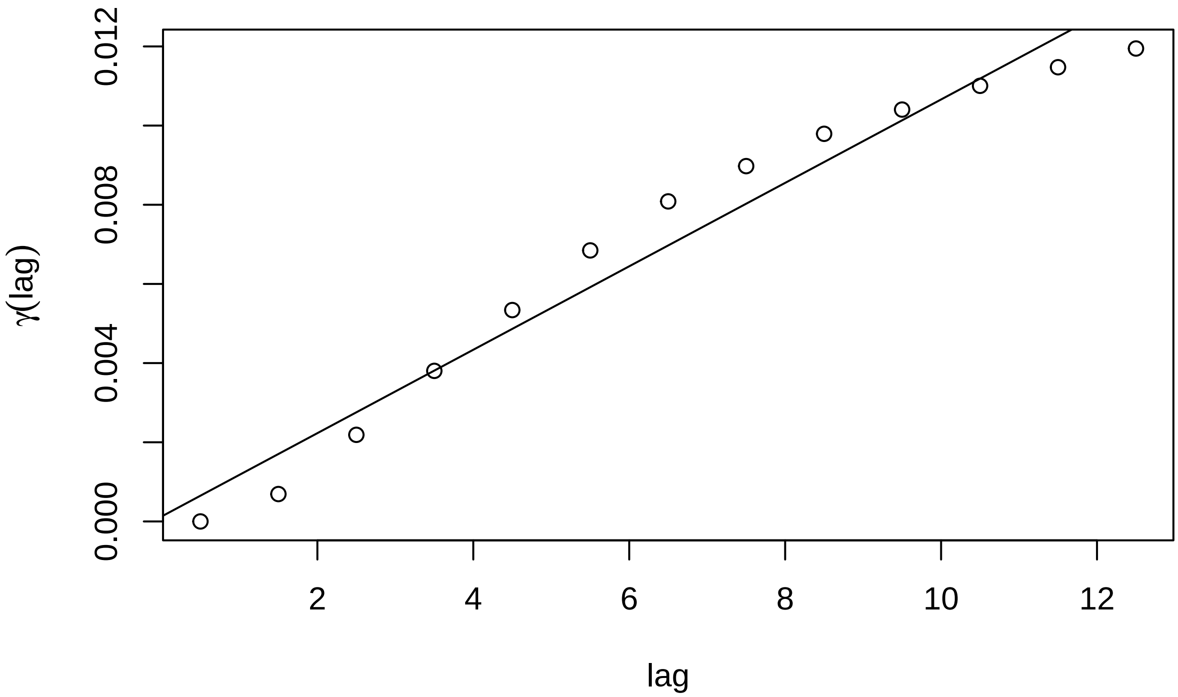
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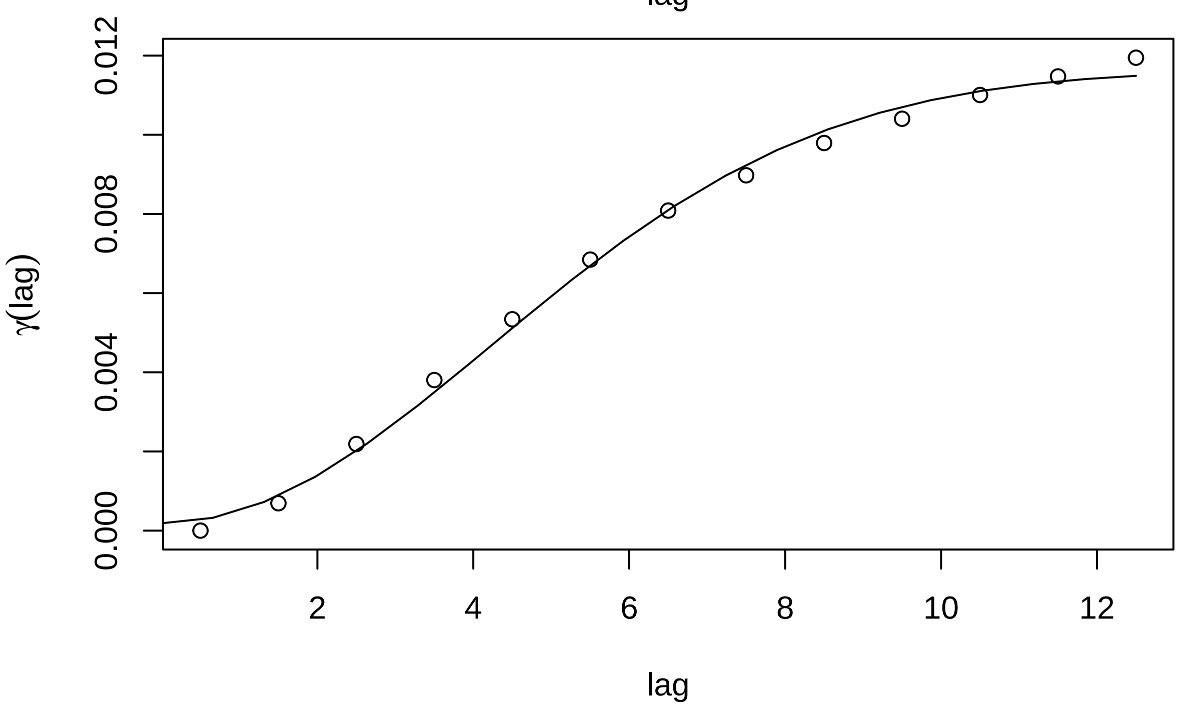
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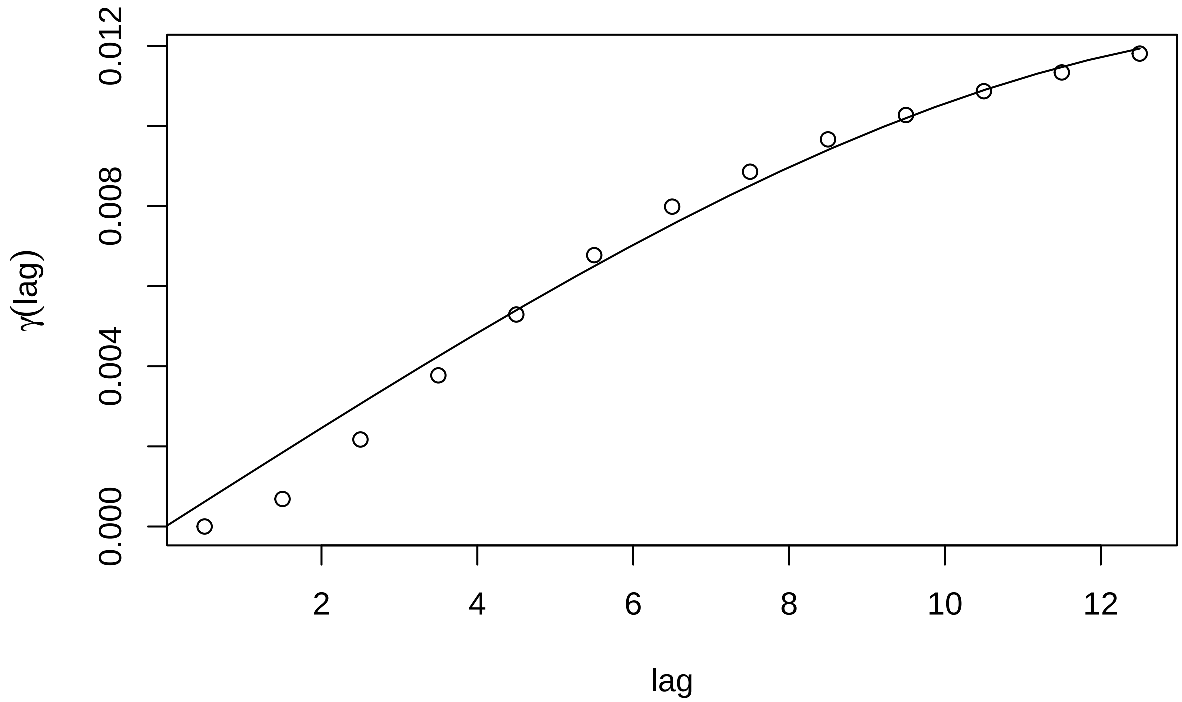
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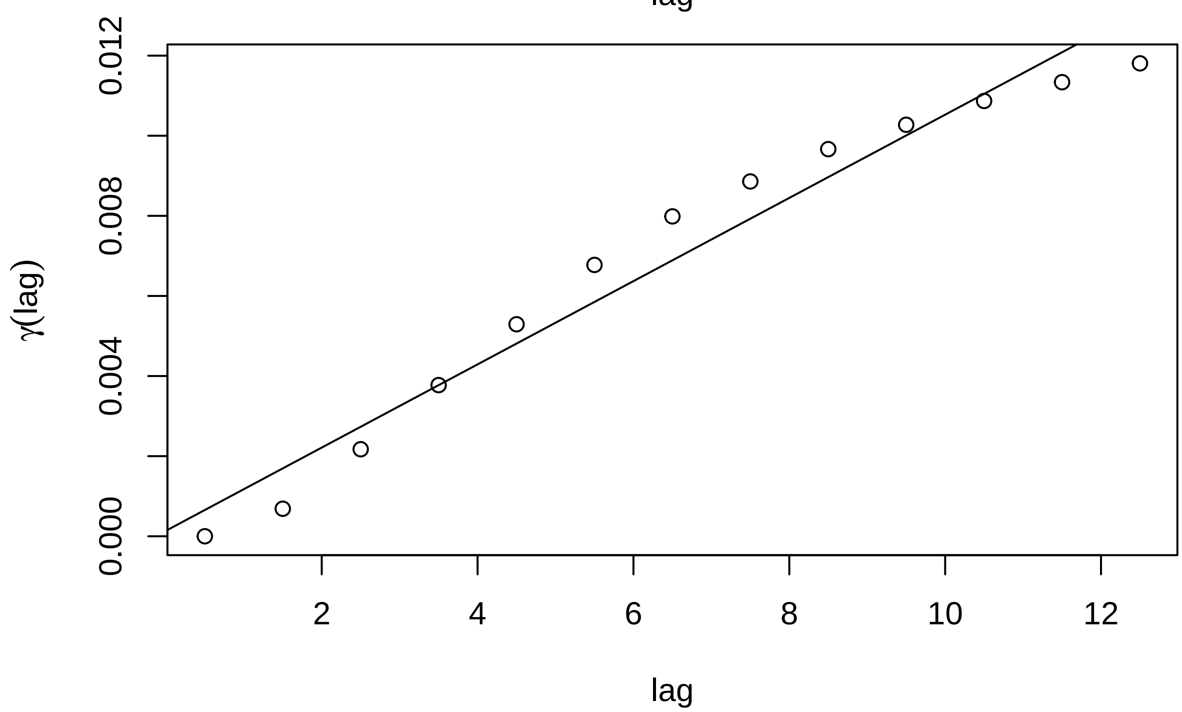
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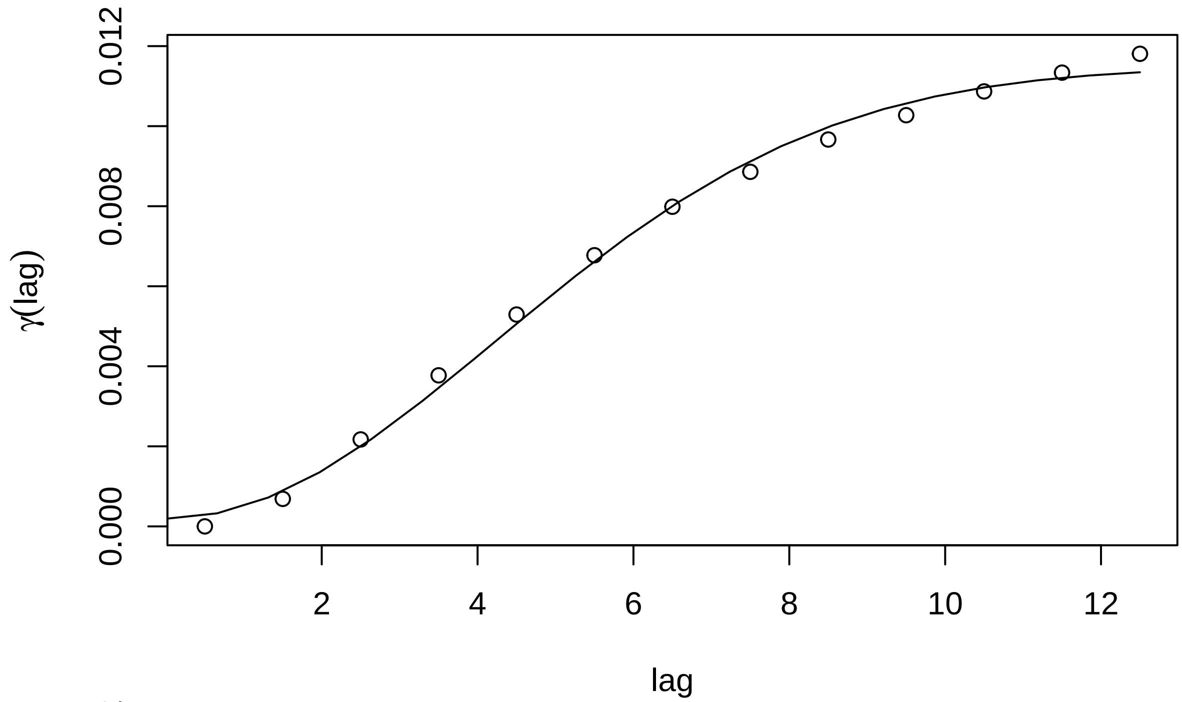

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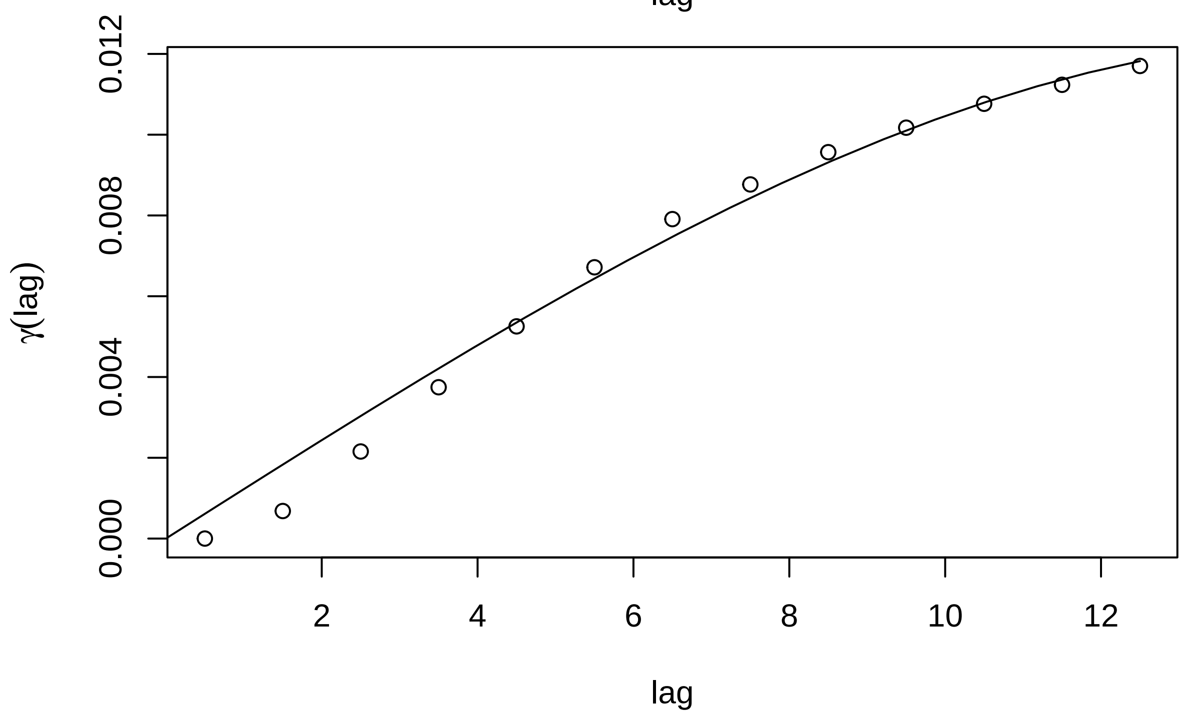

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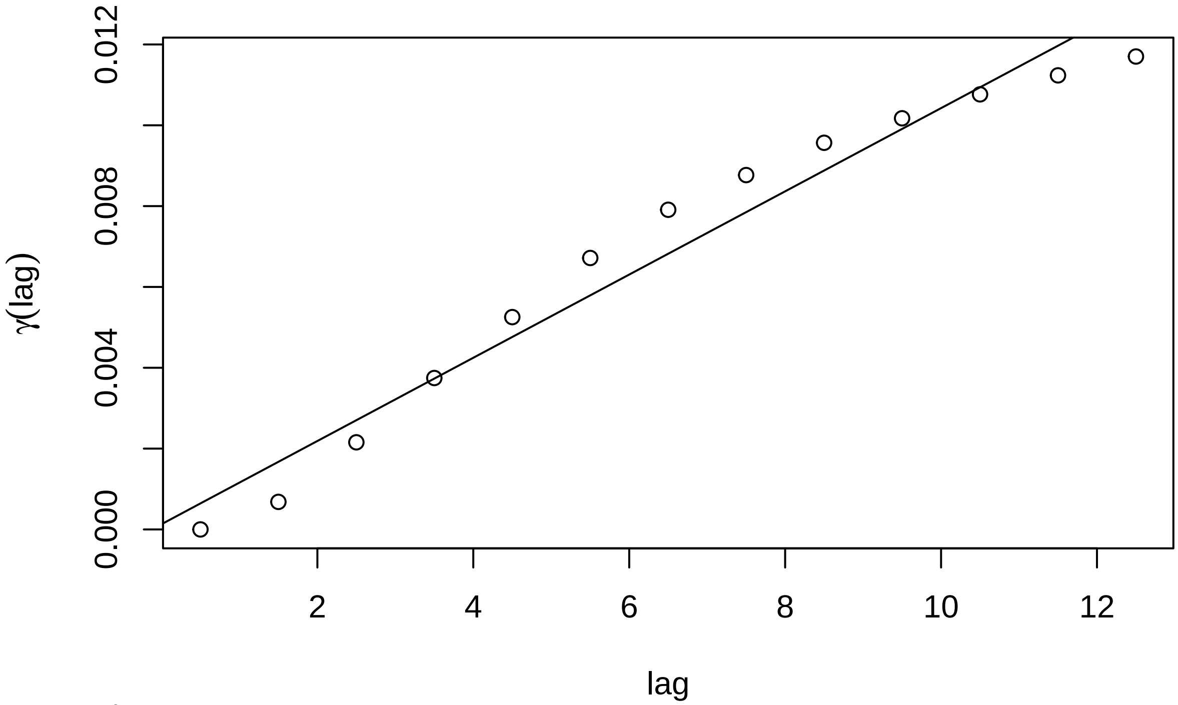
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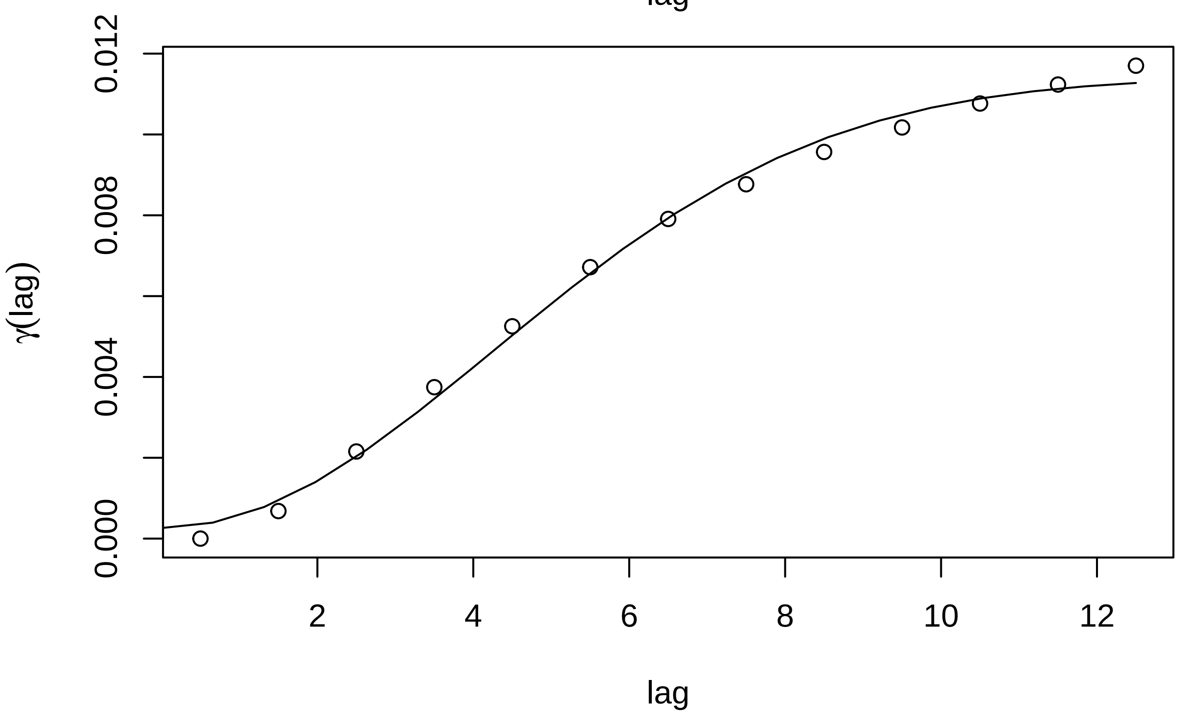
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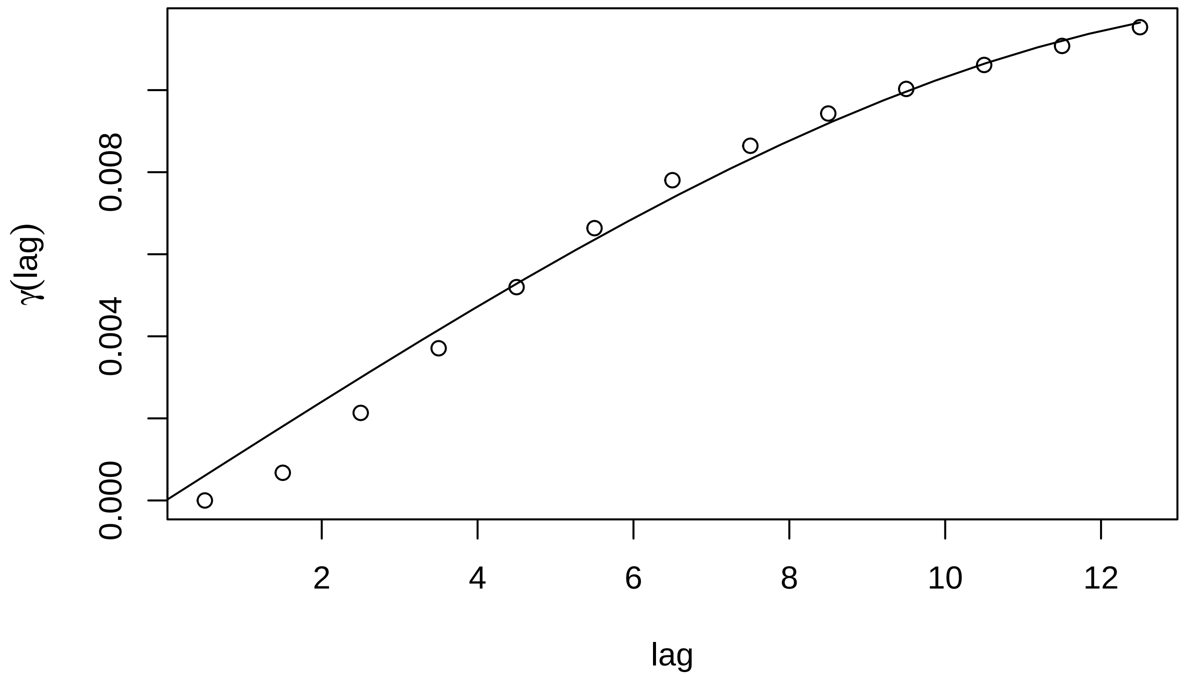

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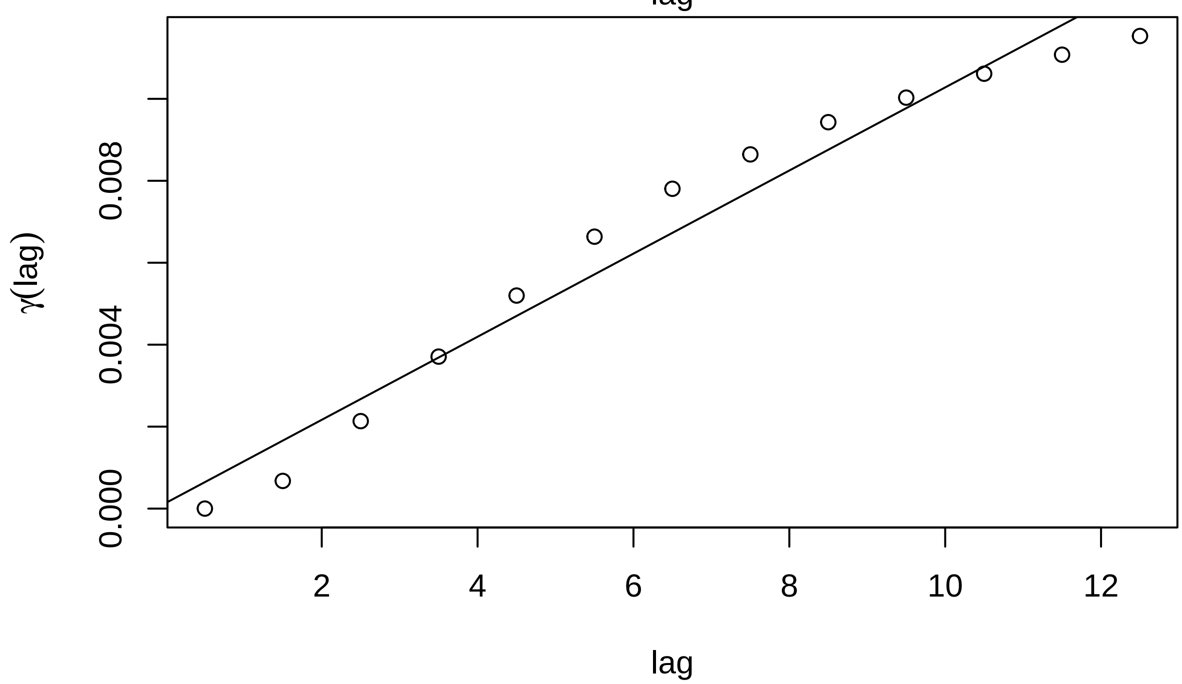

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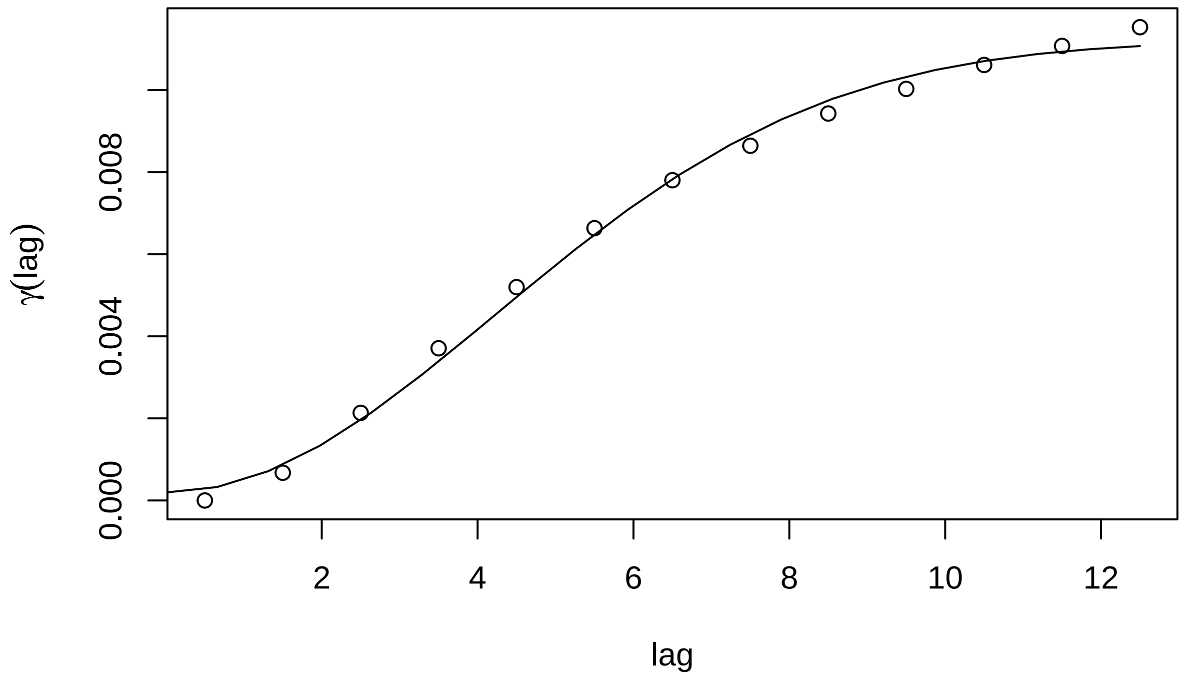
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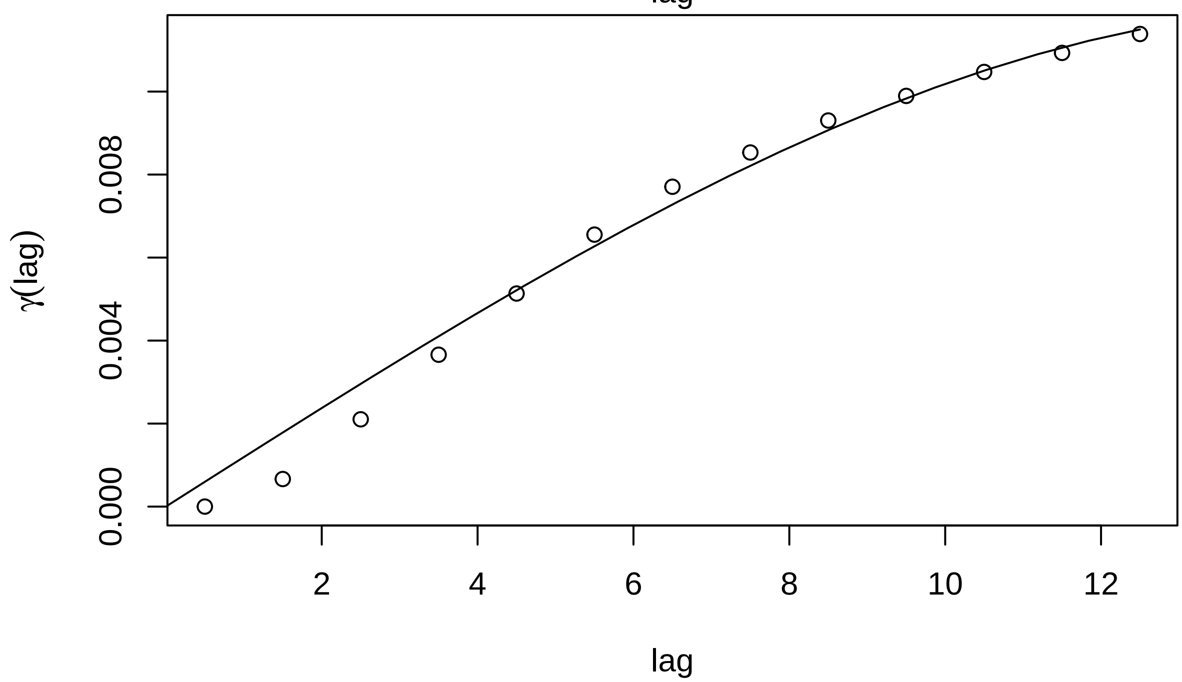
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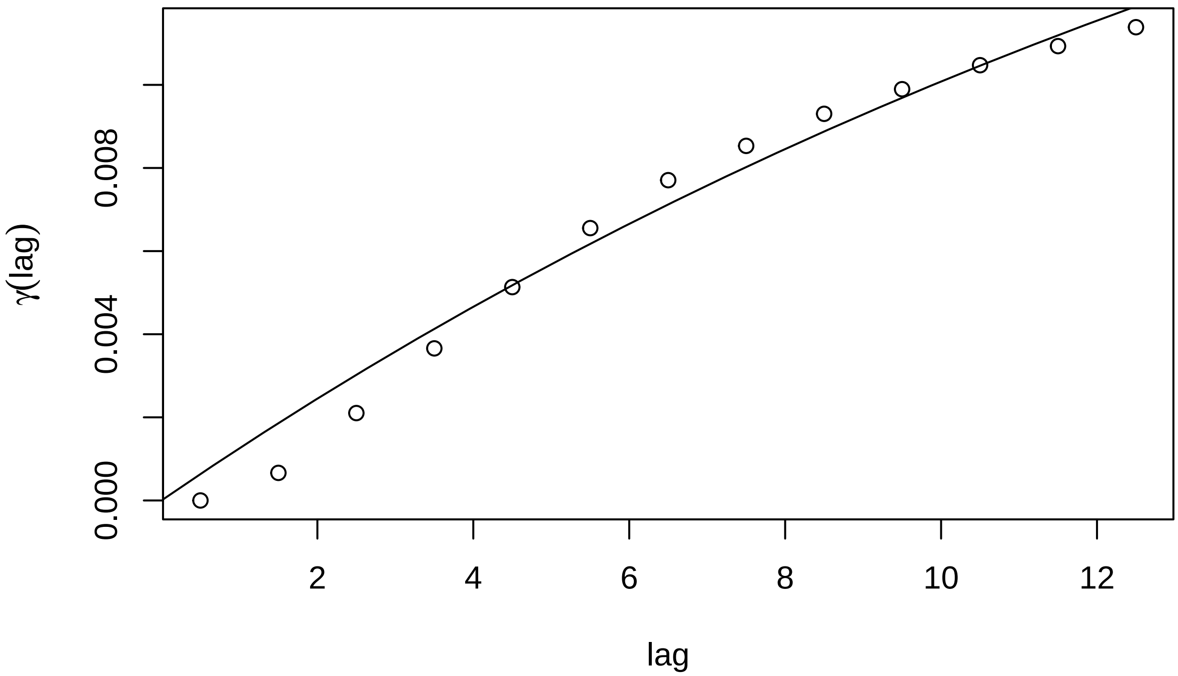
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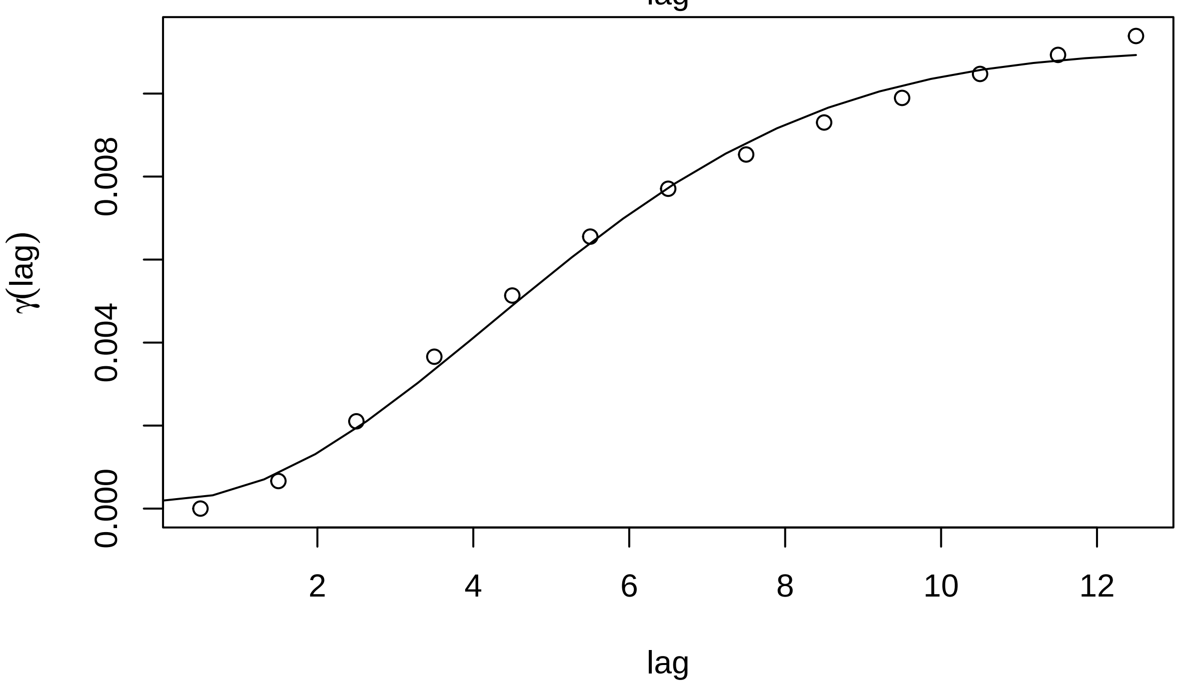
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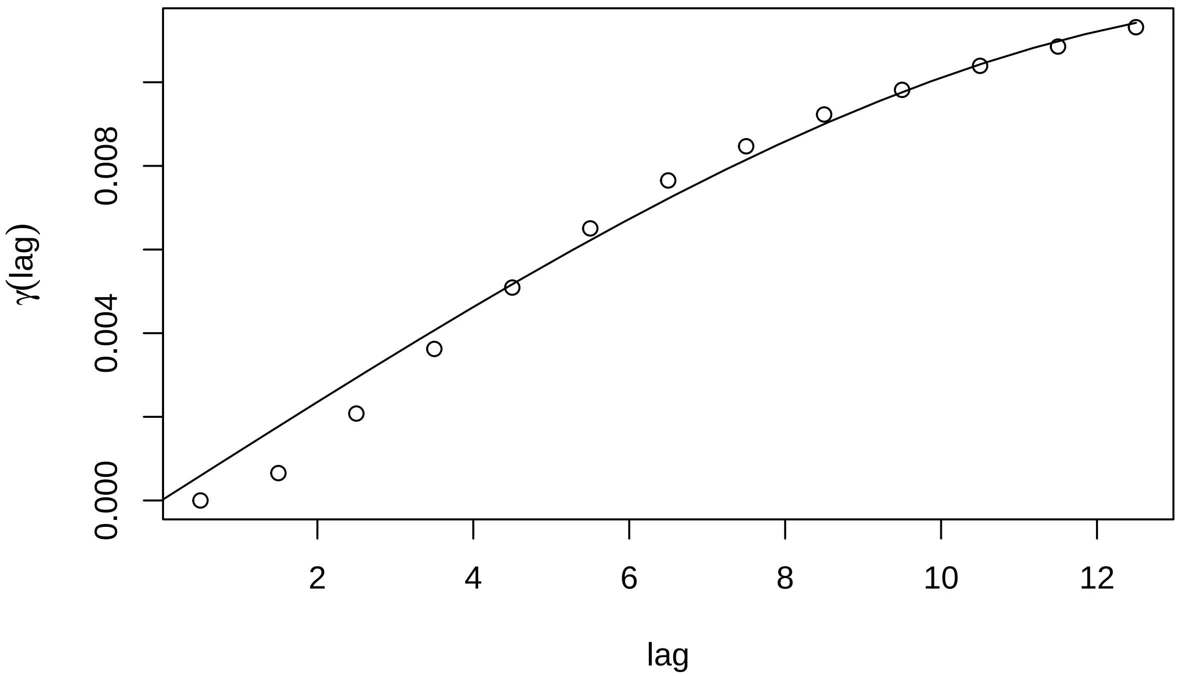
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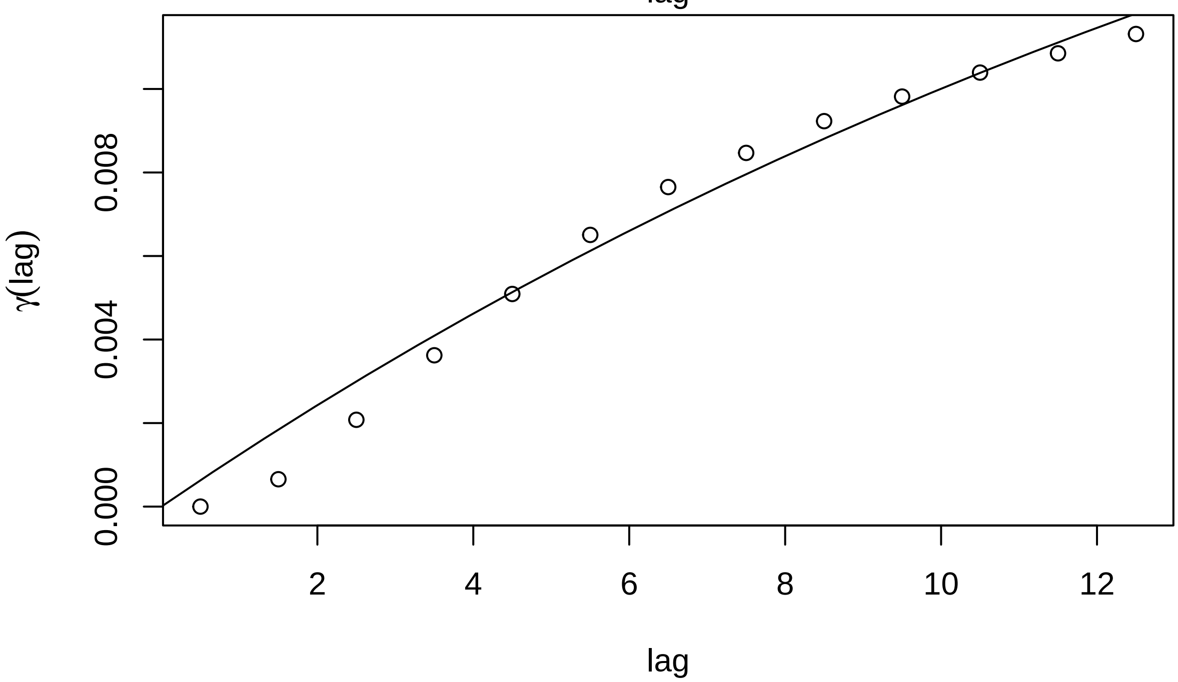
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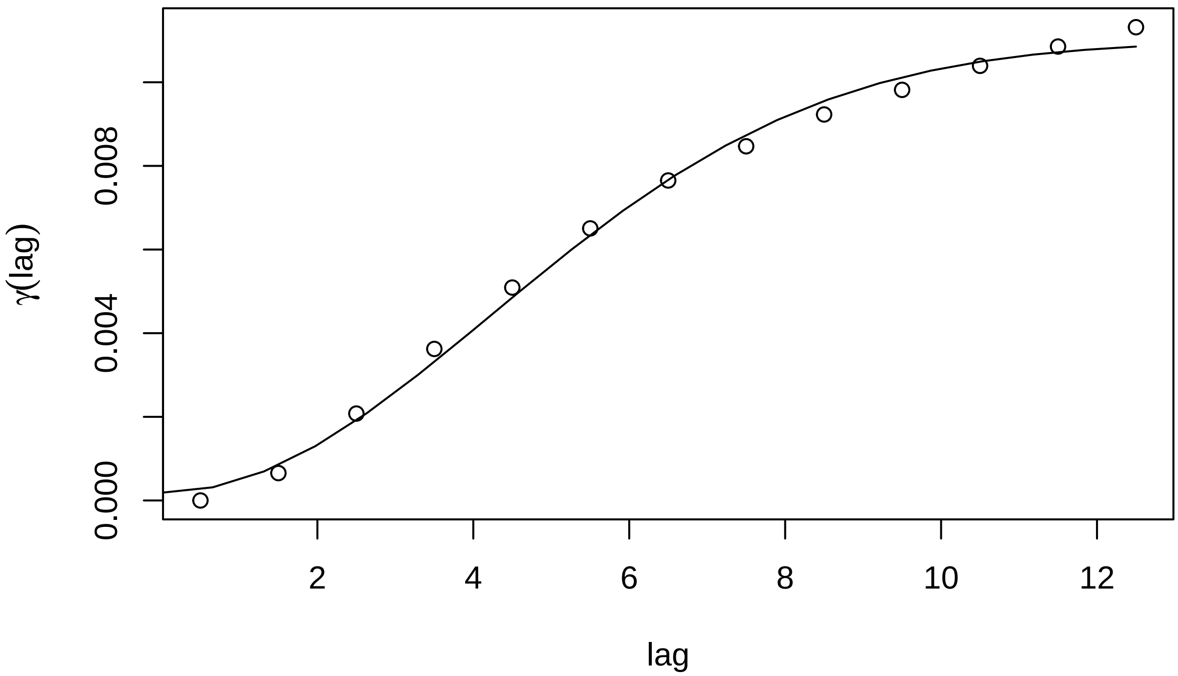

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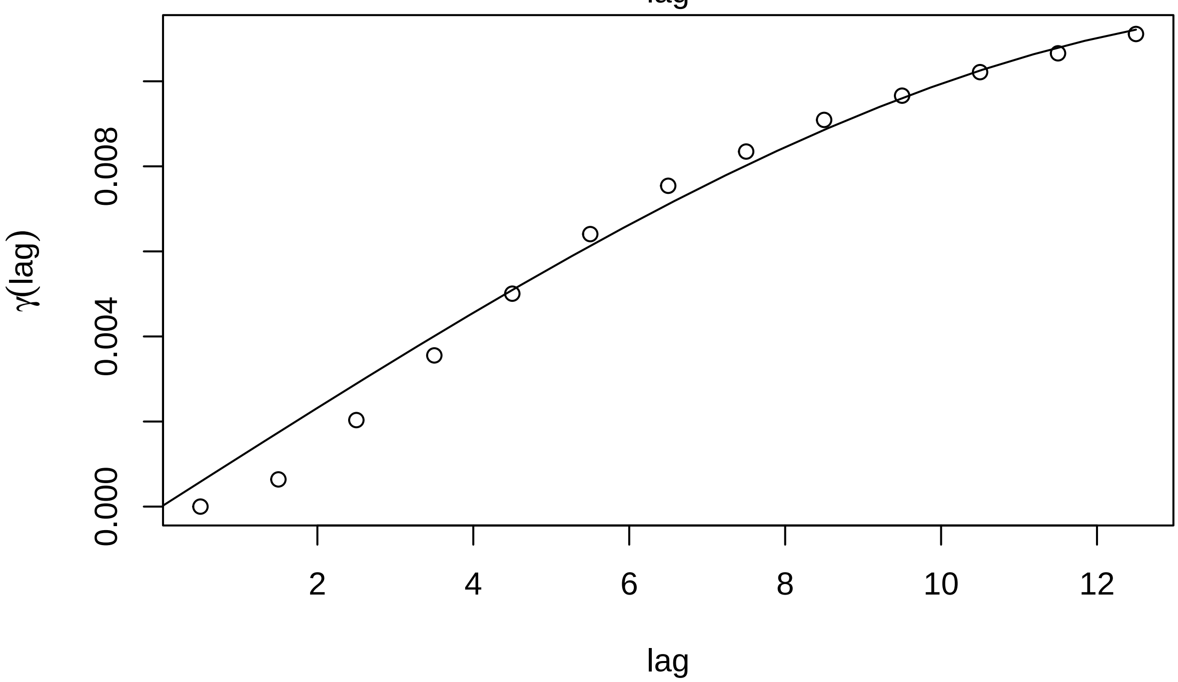

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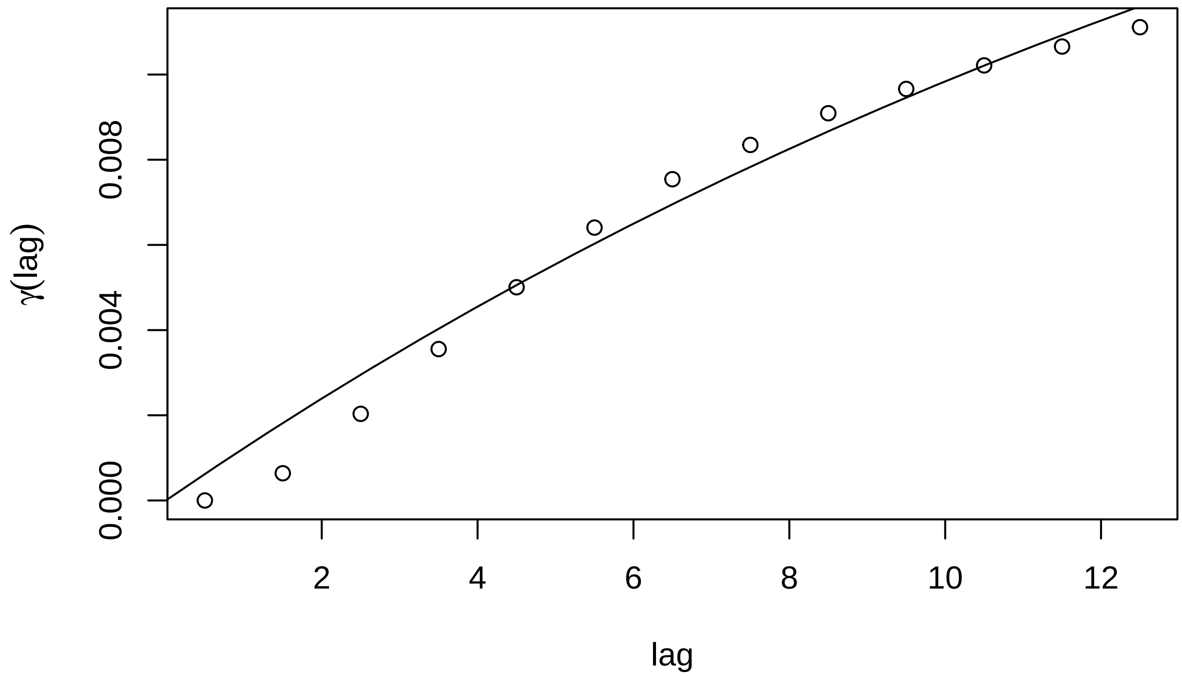

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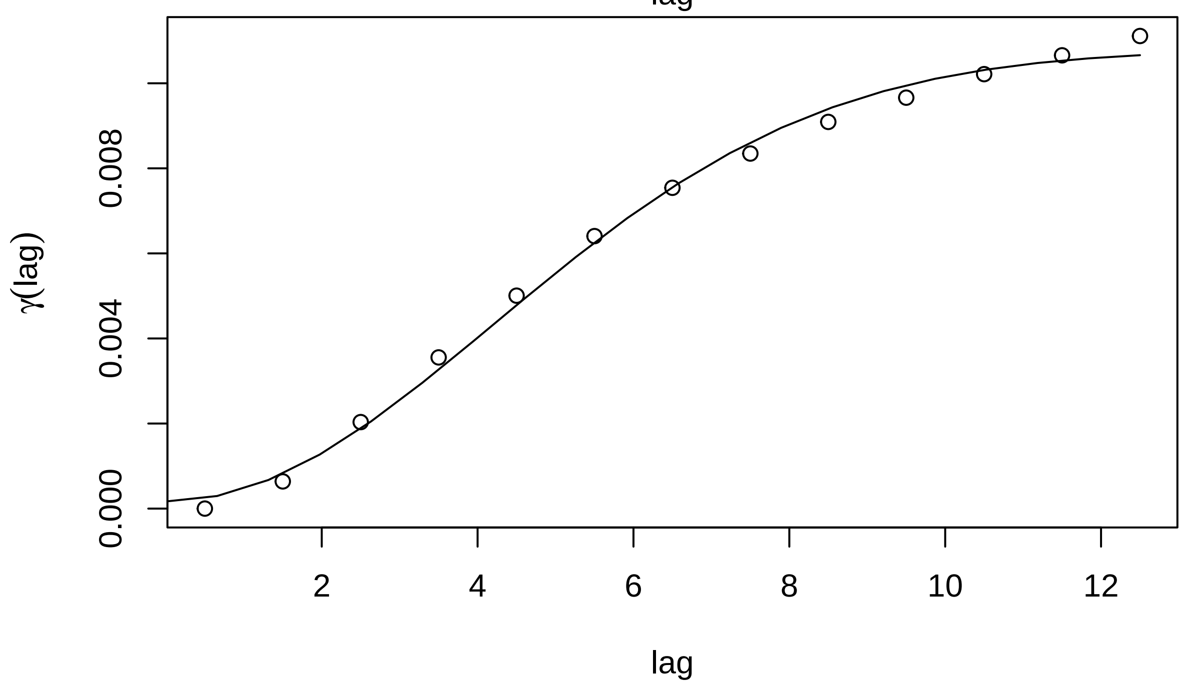

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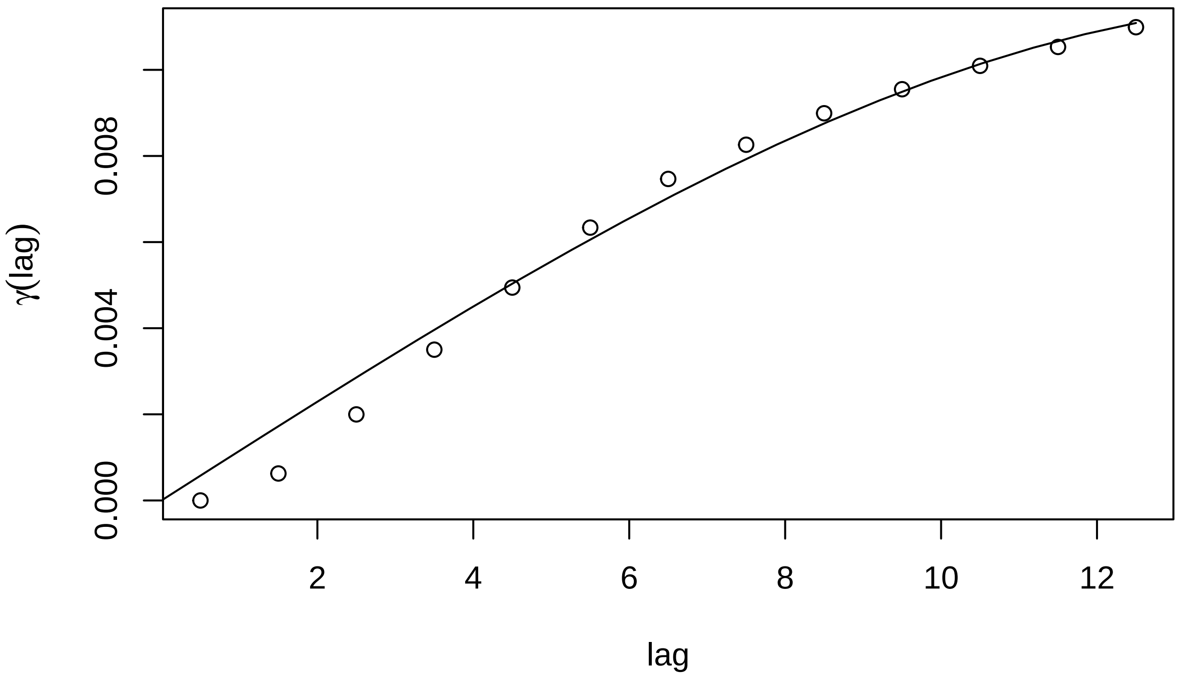

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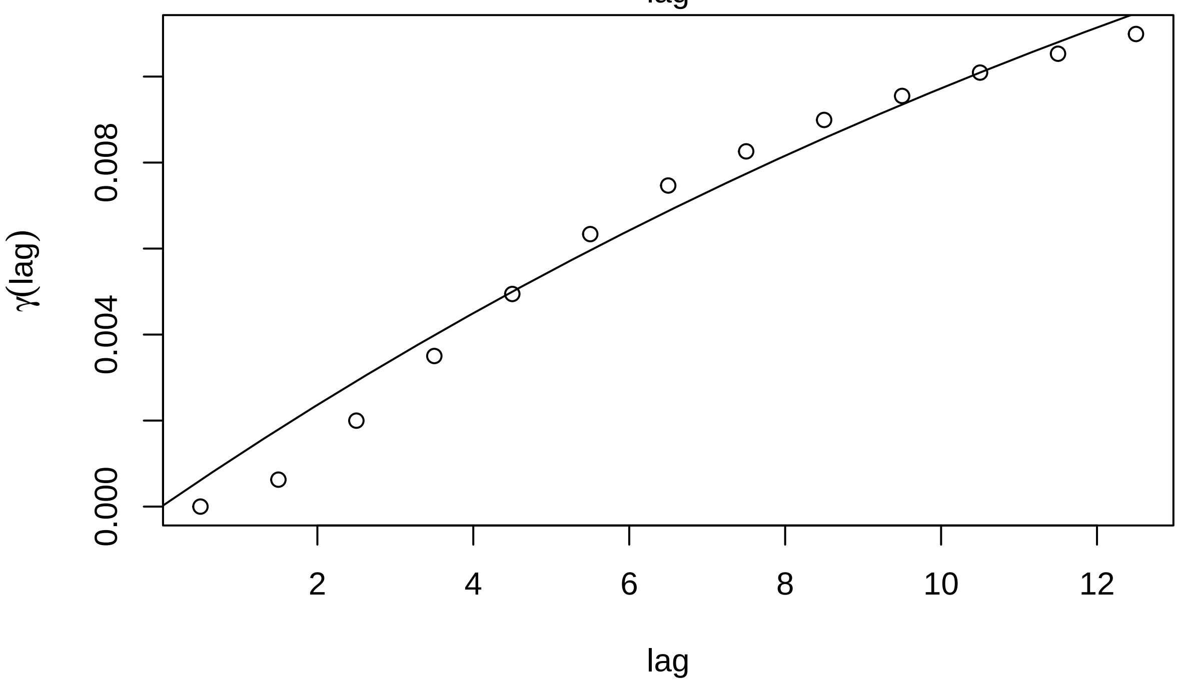

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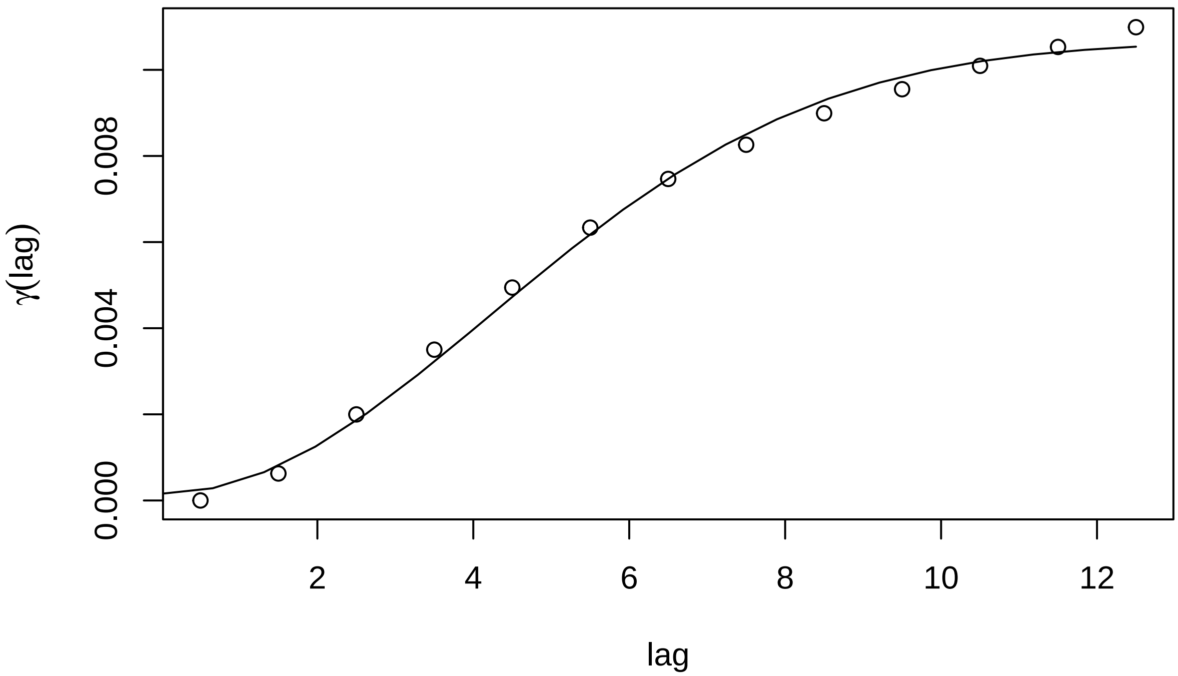

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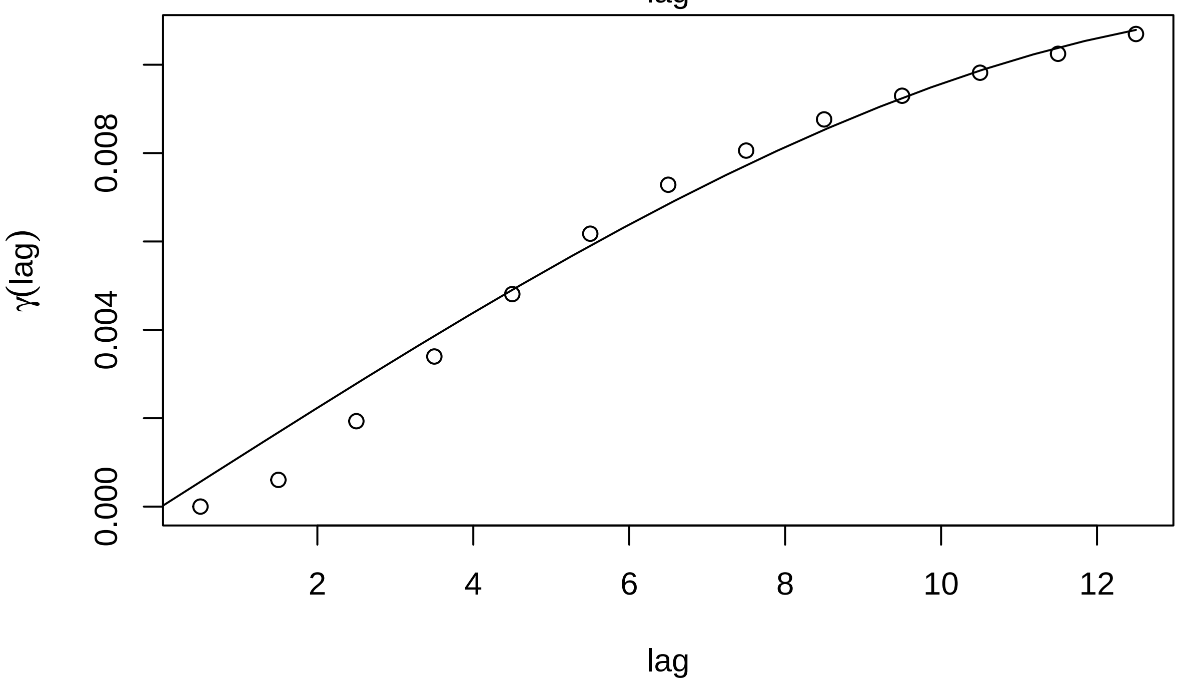

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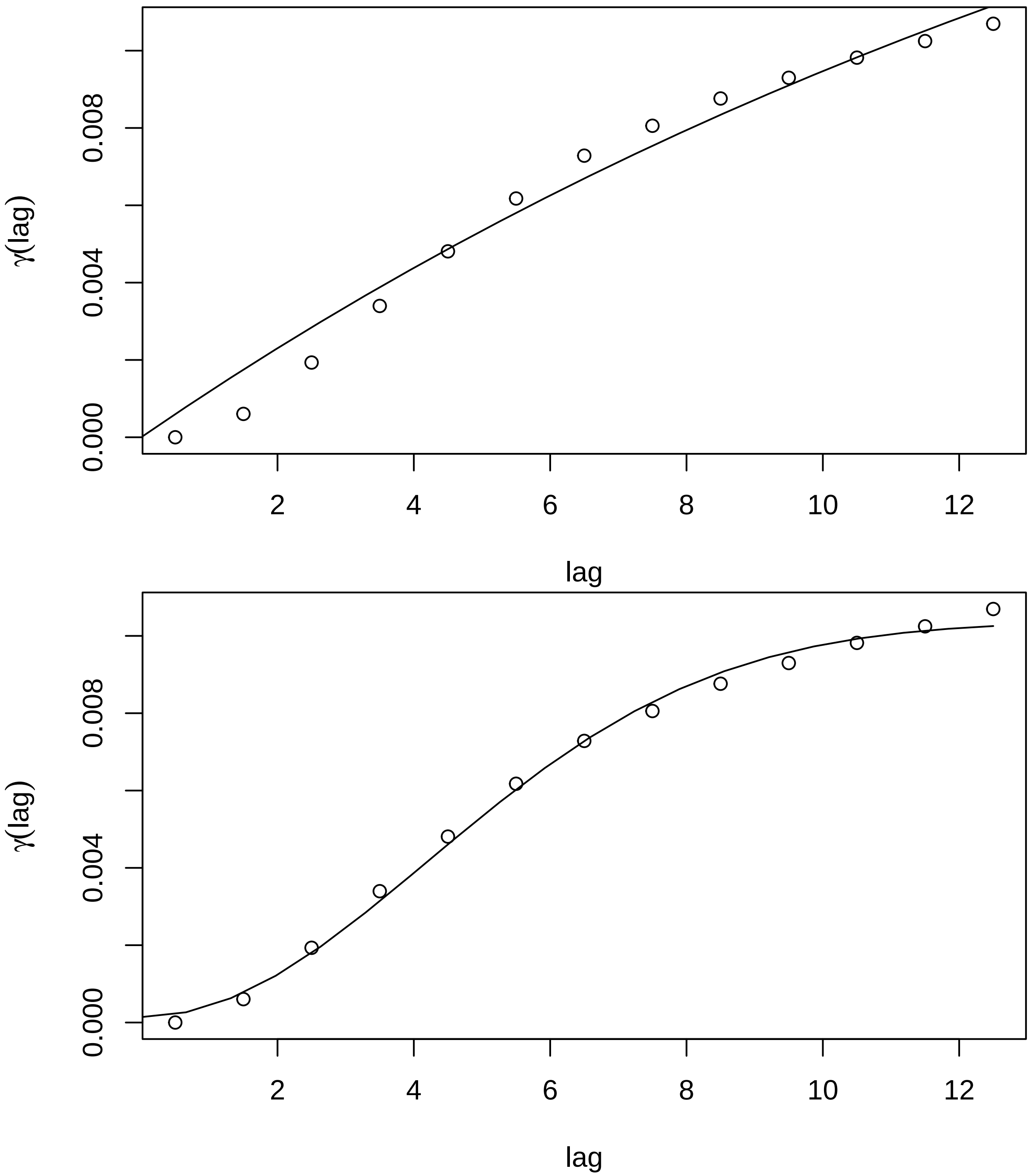

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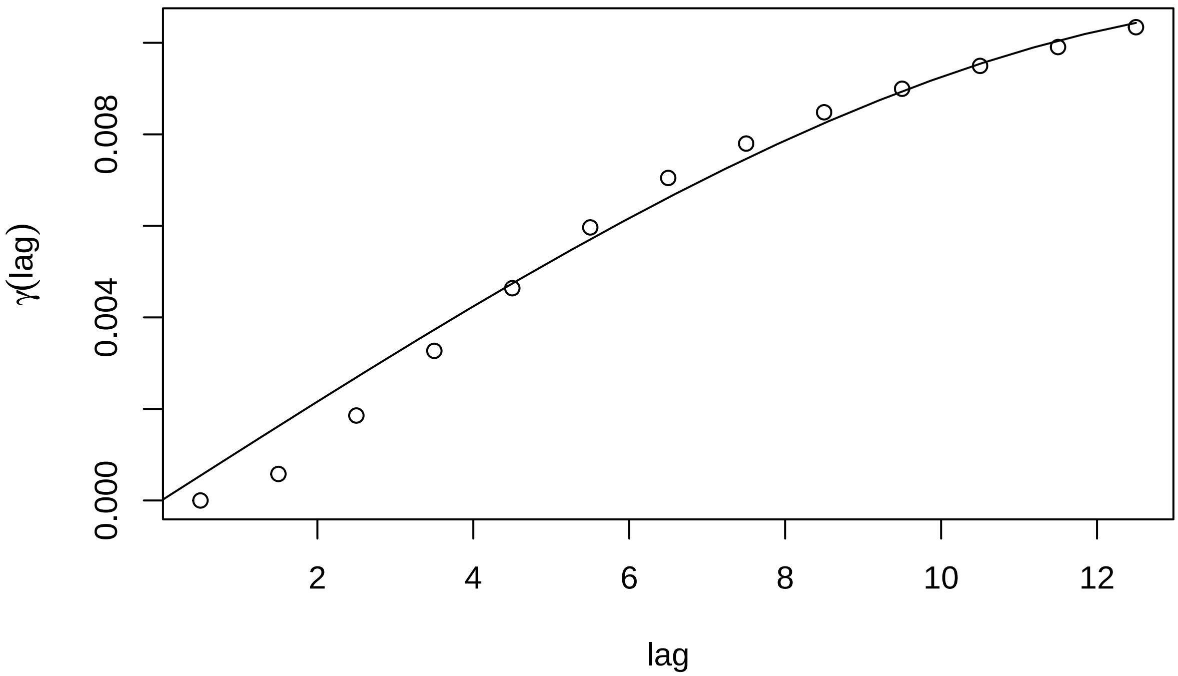
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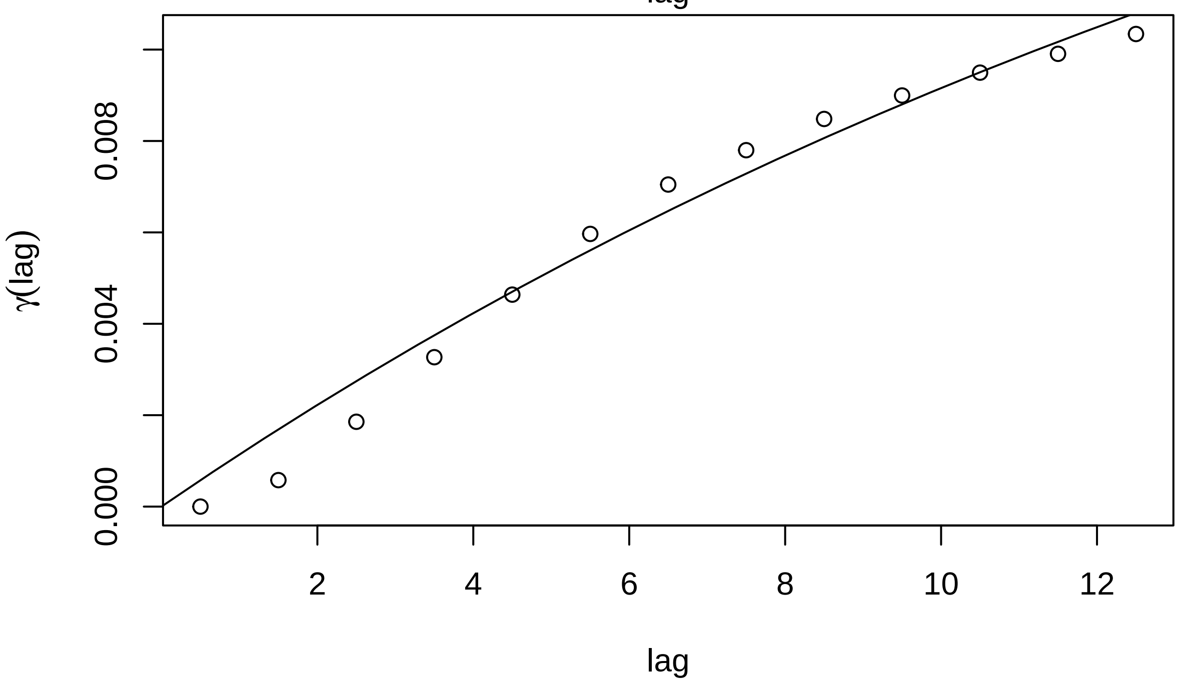
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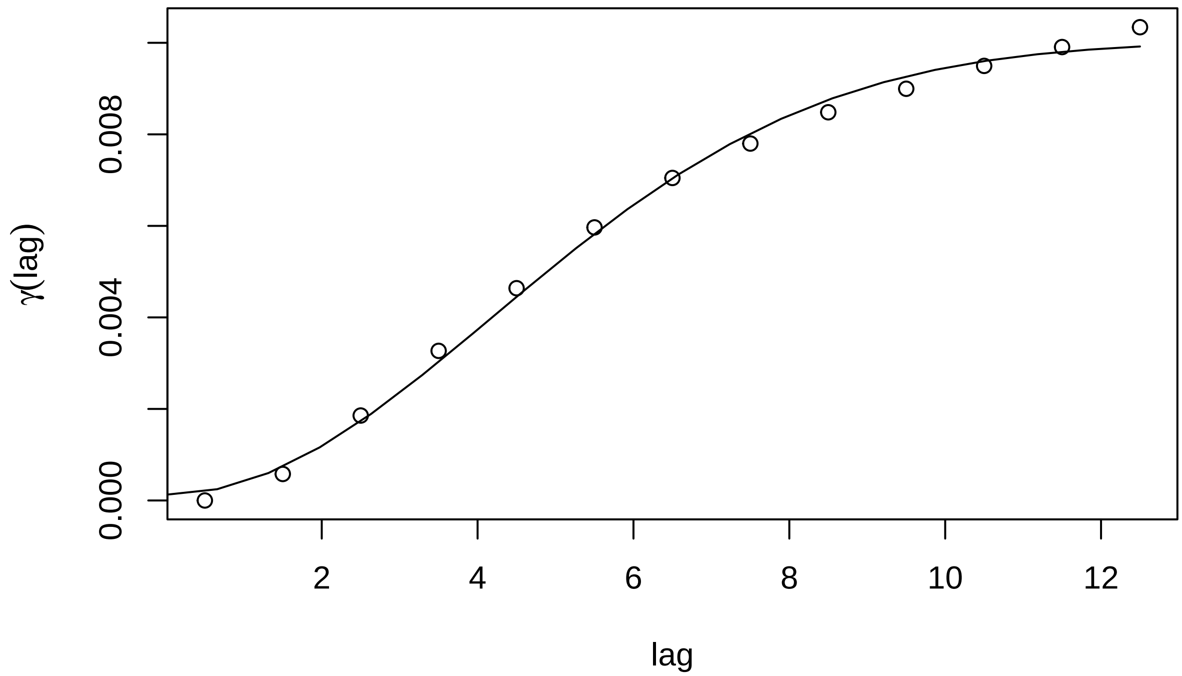

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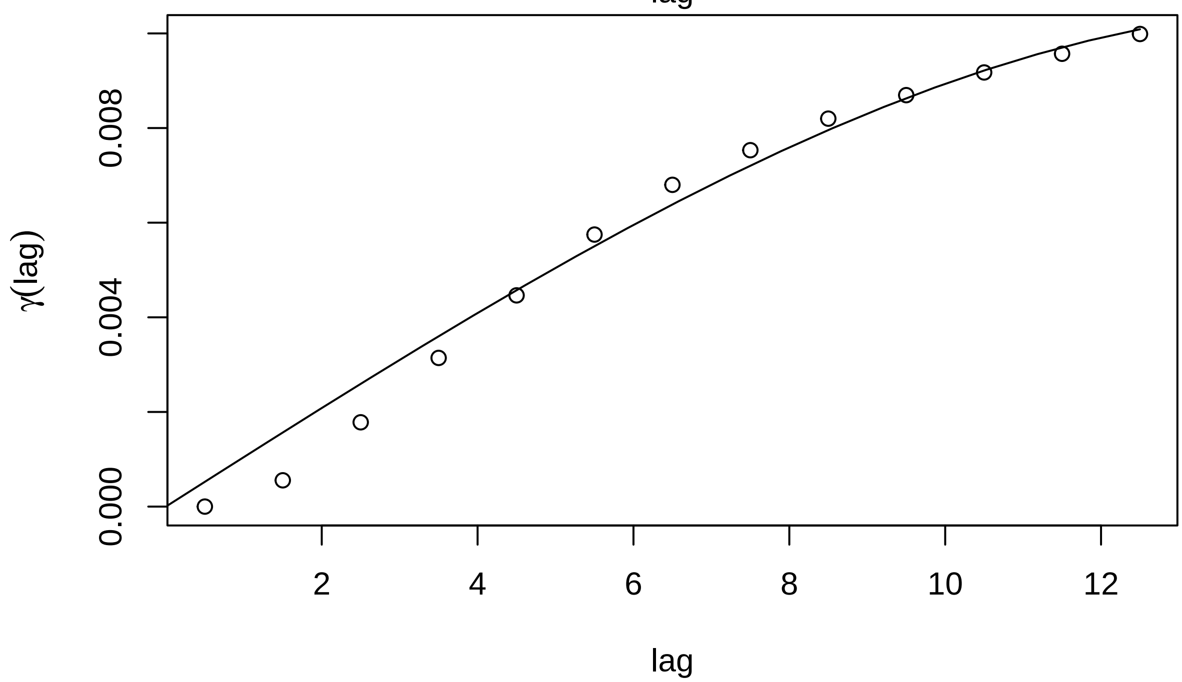

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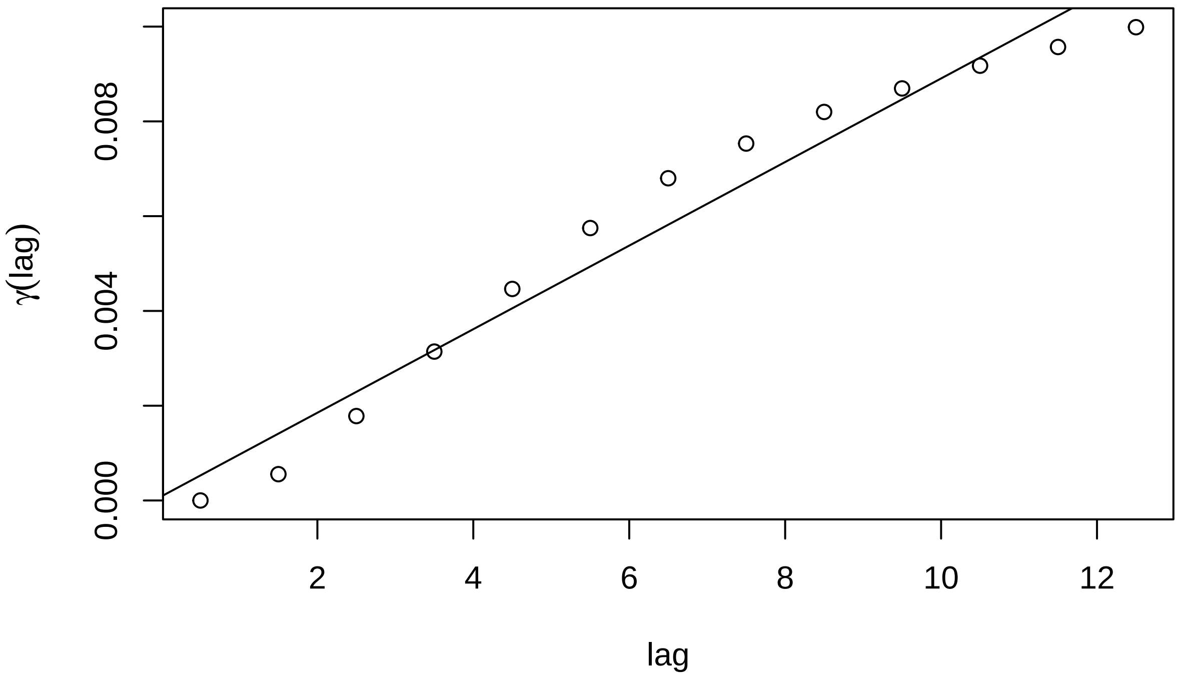

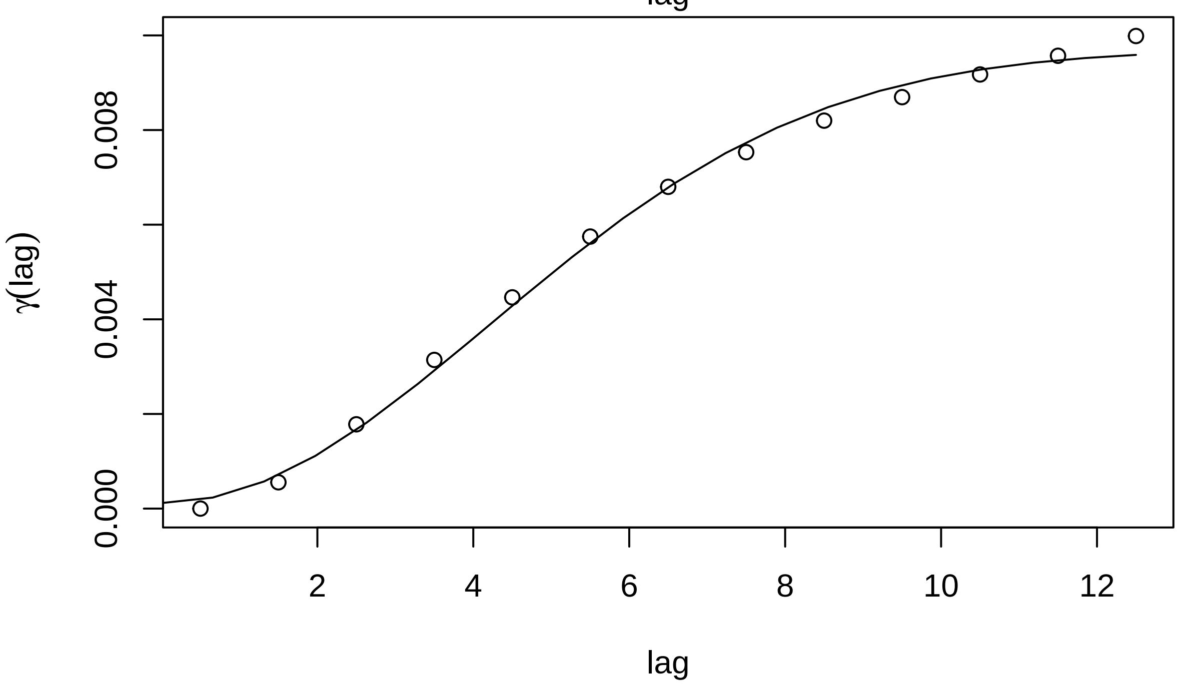

Based on visual assessment, the Gaussian model is the best fit to the relative abundance reconstructions. We can now use the parameters from this mdoel to make inference about the distance of spatial correlation and its strength.

Here are the distances after which grid cells are deemed independent (in number of grid cells, the "range" parameter):

|Taxon |Range (n. cells) | |:————|:—————-| |Ash |5.35352817075948 | |Beech |5.24993499783092 | |Birch |6.55520441471825 | |Elm |5.97101249033522 | |Hemlock |6.9855825624843 | |Maple |4.6476065817496 | |Oak |7.38899973865207 | |Other conifer |8.90685705597372 | |Other hardwood |4.96294809813878 | |Pine |3.18237895572842 | |Spruce |9.34620522357308 | |Tamarack |6.01398752765157 | # Omnidirection variogram

Next, I will compute the omnidirectional variogram for each taxon at each time step. I do these at each time step because I expect that the spatial correlation may change as a function of time.