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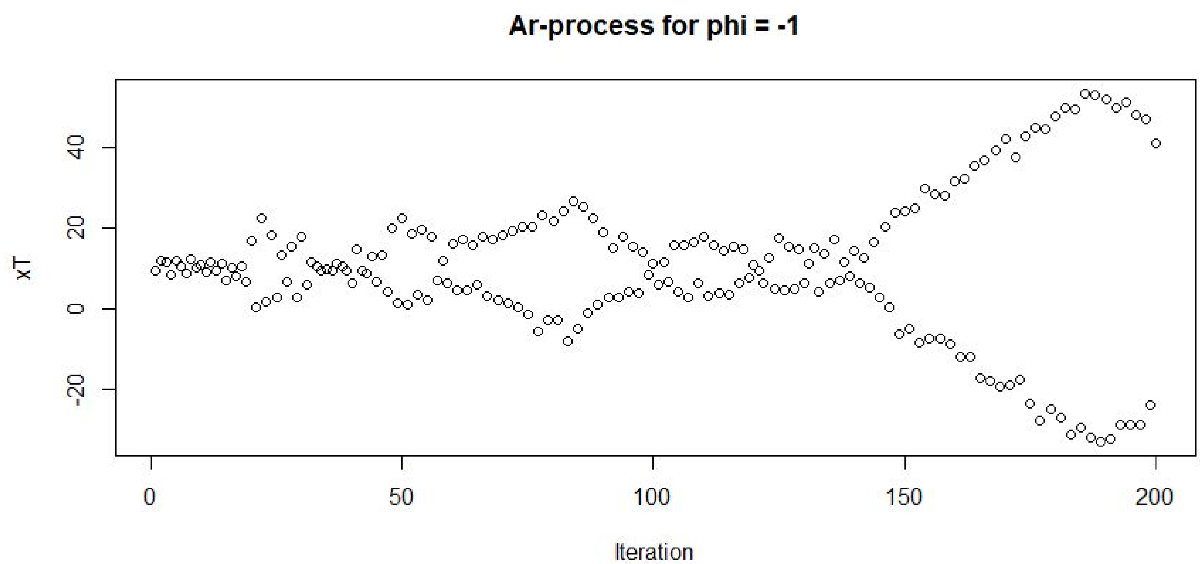
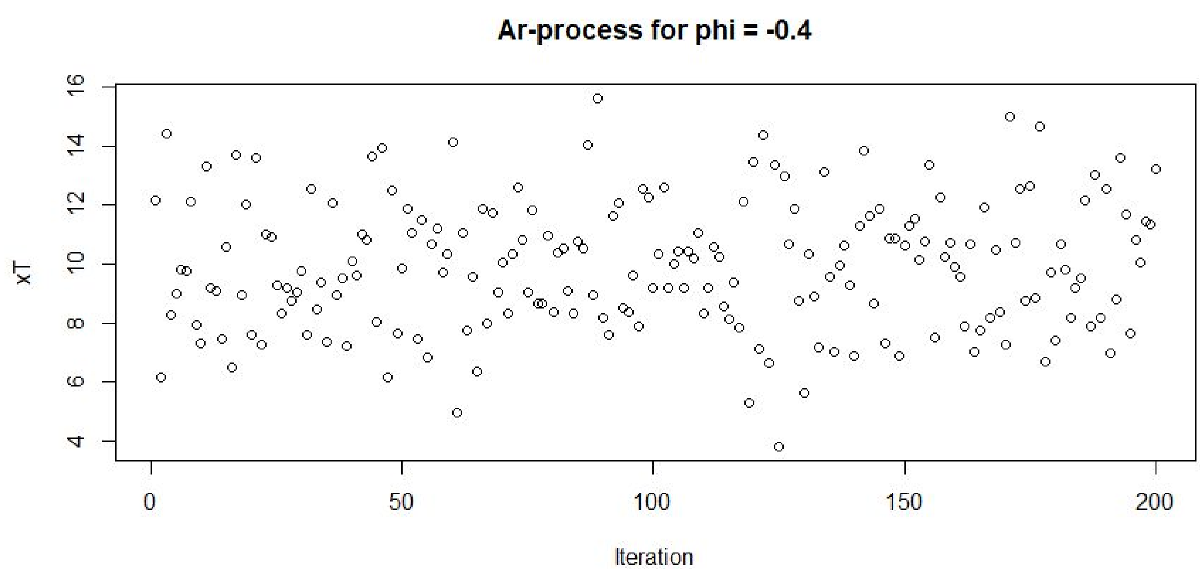
Lab 4

Exercise (a)





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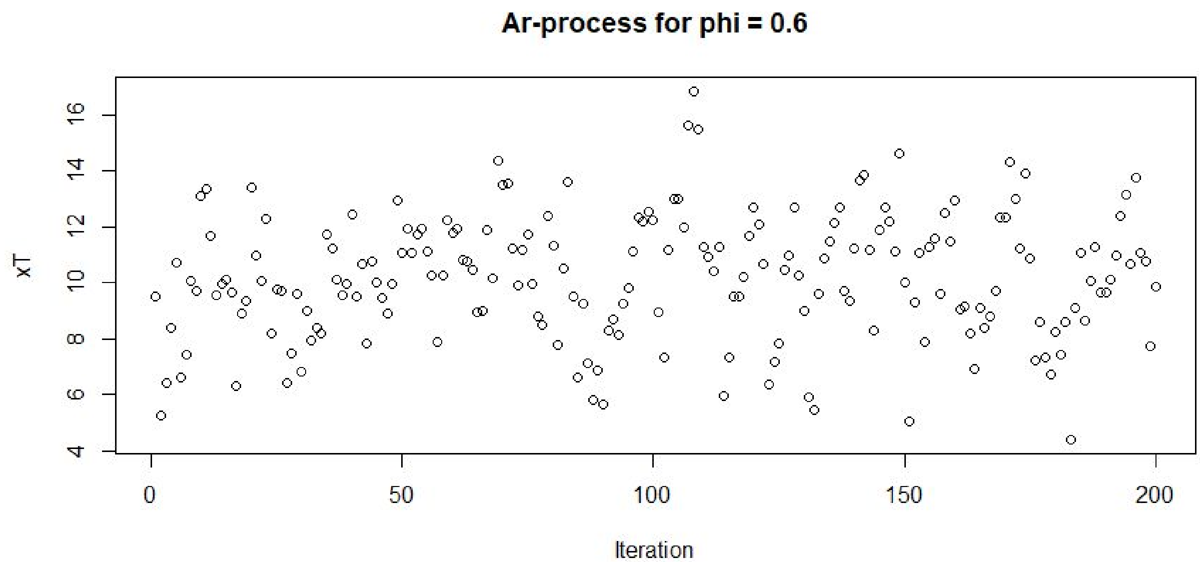

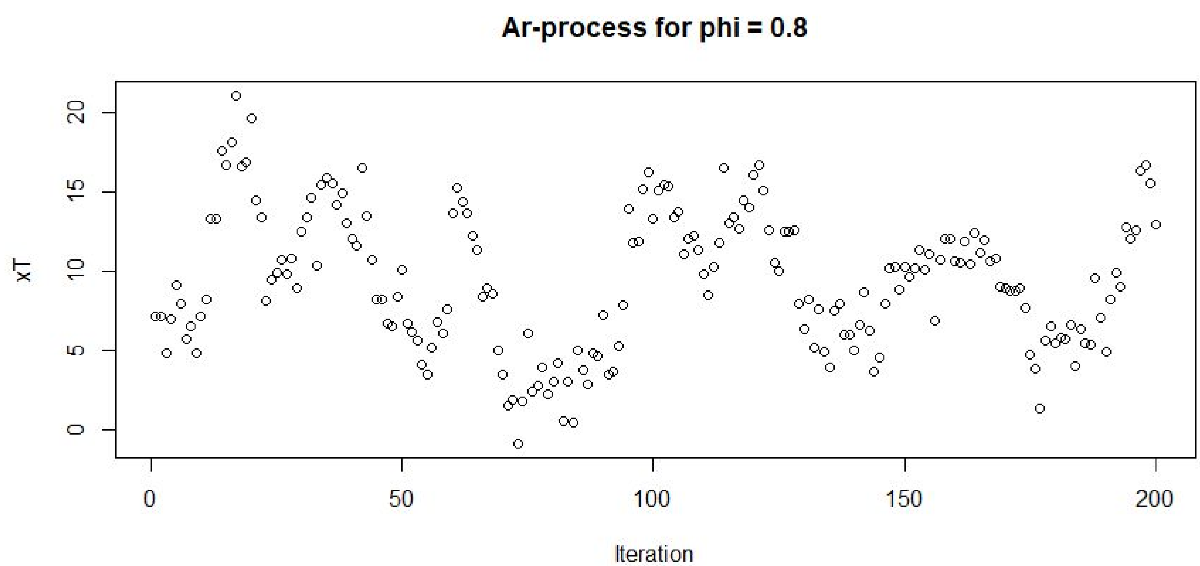

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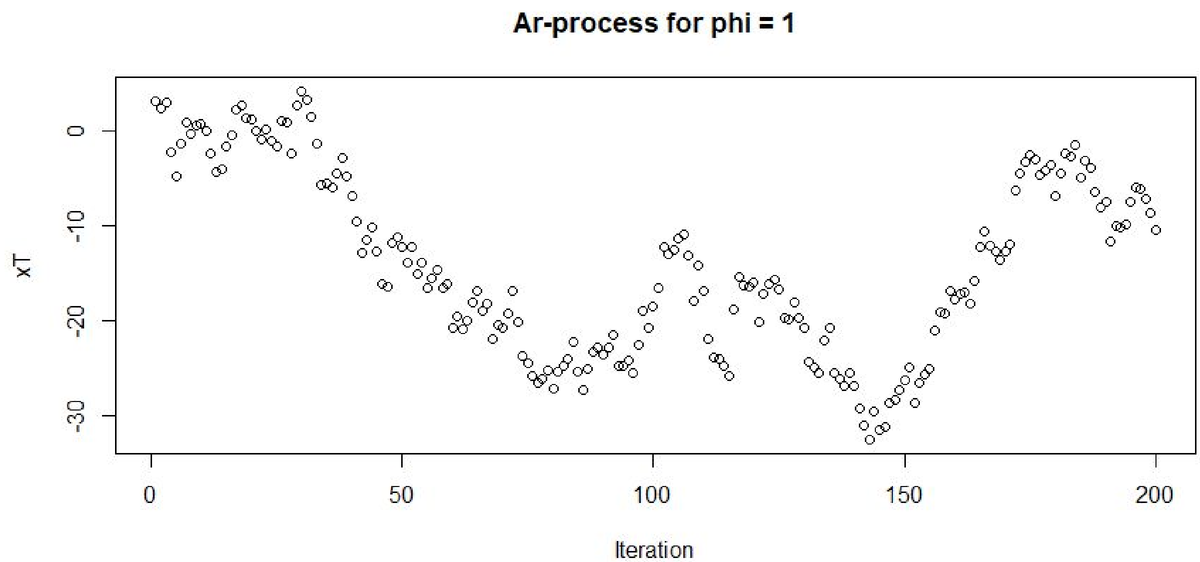

Phi effects the AR-process by influencing the next simulated value to different degrees. For Phi’s close to one the influence is large in the direction of the previous draw, as can be seen in the picture above. The influence of Phi when close to negative one is also large, however it will affect the next draw in an inverse way. This can be seen above clearly for phi = -1 where a “reflected” pattern is displayed. As Phi → 0 the draws simply become idd normally distributed with a mean of my and variance of sigma squared, not influenced by previous results.

Exercise (b)

i)

For phi = 0.95

	Mean	*Interval 95%*	*#Effective Samples*
Mu	*8.466*	*(-19.772;30,466)*	*428*
phi	*0.964*	*(0.917;0.999)*	*1527*
sigma	*1.877*	*(1.690;2.100)*	*2511*

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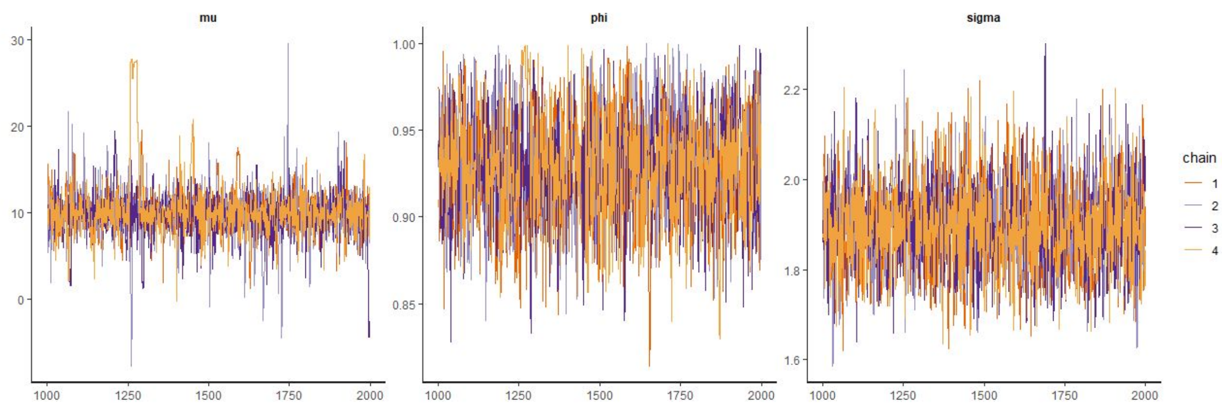
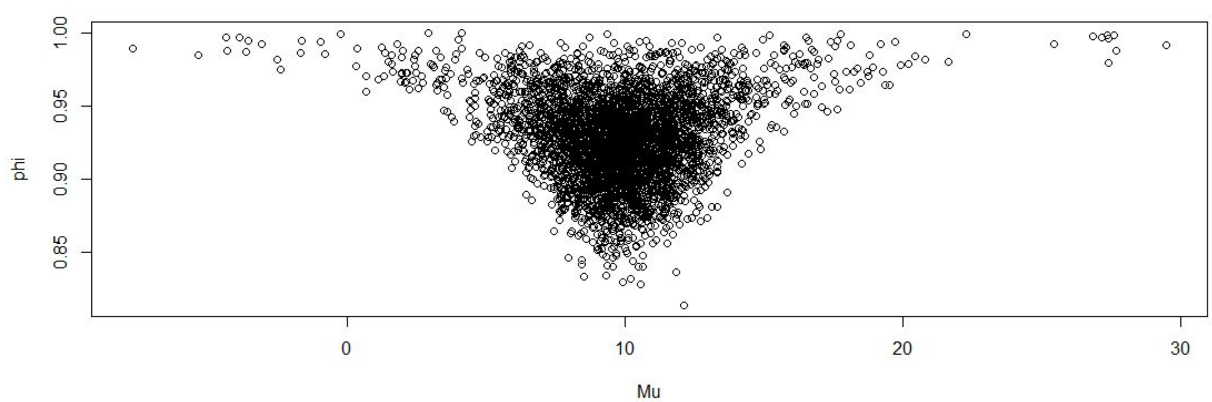
For phi = 0.3

	Mean	*Interval 95%*	*#Effective Samples*
Mu	*9.995*	*(9.607;10,381)*	*4135*
phi	*0.262*	*(0.125;0.403)*	*3366*
sigma	*1.964*	*(1.772;2.180)*	*3910*

ii)

For phi = 0.95





For phi = 0.3

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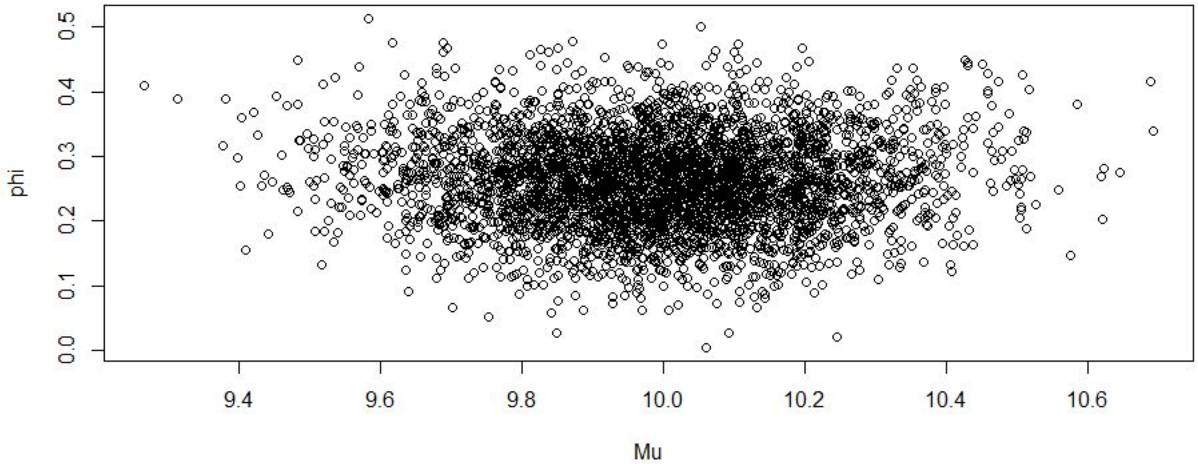

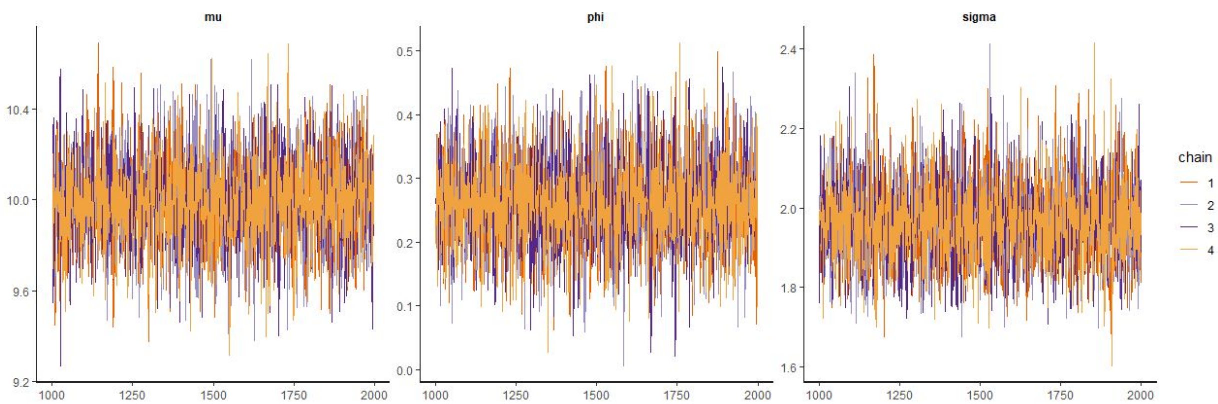

For phi 0.95, the credible interval for mu is larger which implies a higher uncertainty. This makes sense as for phis closer to 0, to distribution will be closer to a standard normal distribution with mean mu, which means that the value for mu will be more certain.

The inverse is true for the relationship between phi's certainty with the real phi. A lower phi gives low certainty for phi and higher phi gives higher certainty for phi (larger and lower range of CDI respectively). This makes intuitive sense as a larger phi value will result in larger observable dependence between data points and thus, a higher certainty for phi.

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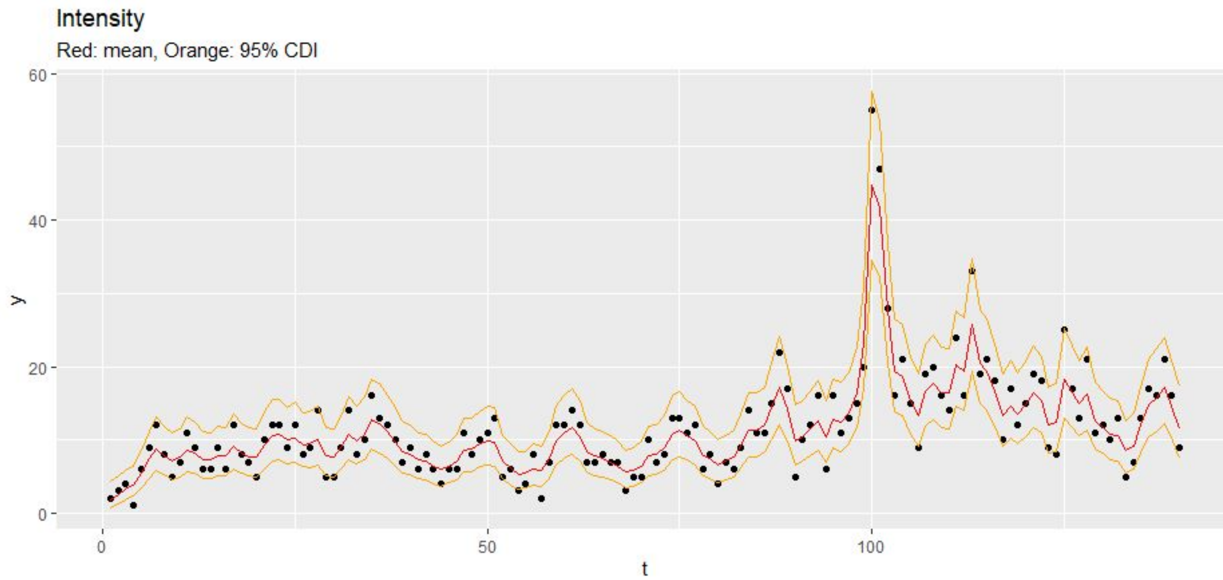
Exercise c)



Exercise d)

We added a prior for sigma in our stan model with a small s and freedom degrees equal to the amount of data points so that we rely on the prior. At first, when we set the priors smoothing value to ~1, there was no visible effect for the curve. But with our current value of 0.03, the prior clearly changed the curve to a more smooth variant than the one before. This because our prior tells our model to have a small variance, which means that our intensity cannot change much between points as the change is now at most as big as the previous difference from the mean time phi.

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