

STAT 153 Project Checkpoint 4

Assigned: April 16, 2021

Due: April 21, 2021, by 11:59pm
(5% off per rounded-up hour late, like HW)

For the fourth project checkpoint, we will focus on wisely choosing ARMA or MSARMA models for the stationary processes that remain after your signal modeling. This is an opportunity to practice all of the skills we've built up over the last few weeks. I realize this is tighter-than-normal turnaround due to the midterm, so instead of finishing the whole project for this checkpoint, we'll just do the next main step.

Ideally, you should finish all of the modelling section of your report. You should have 2 signal models, and you should try 2 different (MS)ARMA specifications for each signal model, resulting in 4 total "signal+noise" models. You should provide both graphical motivation and graphical evidence of fit for each signal modeling step and each "noise"/ARMA modeling step. Specifically, the plot of the data in the EDA section and its discussion should motivate your signal models, and stationary-looking residual or differences plots are the evidence of fit. ACF/PACF plots of the residuals (or differences) provide the motivation for your ARMA models, and there are many ways to provide evidence of fit (Ljung-Box plot, or add theoretical ARMA model ACF/PACF values to original ACF/PACF plots in a different color, or all of `sarima()`'s plot if you have space, etc.). Of course, the text of your paper should describe why you made these modeling decisions and how the plots support these decision. Note that you can use `auto.arima()` for one of your ARMA specifications if desired or as a starting point, but you should explain why `auto.arima`'s choice makes sense. Please **review the project documents on bCourses** for further details!

(Aside: after finalizing your four models, you need to compare the models using cross-validation, and other methods like IC's if desired. Then you choose one of these models and use it to forecast. These steps aren't required for this checkpoint, but I wanted to lay out the big picture for you here.)

It would be great to do all of the above, but we will assume you have completed the previous checkpoints and specifically grade the following. Like the checkpoints before this, this checkpoint is worth **5 points** total, and it's simple to get full points because it is completion graded! The rubric/breakdown of these five points is:

1. Contains ACF and PACF of Signal Model 1's residuals (or differences).
2. Contains plot (visual evidence) that Signal Model 1's first (MS)ARMA model fits well.
3. Contains ACF and PACF of Signal Model 2's residuals (or differences).
4. Contains text describing choice of Signal Model 2's first (MS)ARMA model.
5. Clearly states the choice of p , q , and/or $p/q/P/Q/S$ for Signal Model 2's second (MS)ARMA model.

Of course, you'll want to do each of the above for each of your four (MS)ARMA choices, but we will only checking the above for this checkpoint. Note that by (MS)ARMA I mean that each of your chosen model may be standard (ARMA), seasonal (SARMA), or both/multiplicative (MSARMA).

If you have any questions, please ask!