

SUMMARY In this installment 4 you will fit a time series regression model. Use the lab on Time Series Regression and Chapter 5 as reference. Follow these steps.

TO DO

- (a) Start a new session in your paper, right after the VAR section. This will be Section V. Time Series Regression. Separate parts of your analysis for this section using subsections. V.1, V.2, etc... All the analysis in this installment is done with the Variance stationary original time series.
- (b) First, fit a linear regression model with your target variable (pre-transformed to stabilize the variance if necessary) as the dependent variable, the variable you want to forecast, and the other variables in your project as independent variables. Check the residuals for autocorrelation and check the other assumptions. For autocorrelation use an ACF, as in the labs.

If the residuals are autocorrelated, as indicated by the ACF, then look at the PACF and identify an arma model. Fit the arma model to the residuals and check that the ACF of the residuals of the arma model fitted to the residuals is white noise. Modify the model as needed. Once happy with the ARMA model, use that with the glm command with corarma to fit the model accounting for the correlation of the residuals. Check the residuals of the newly fit model (see regression lab 1, as you need to do some extra work to see the actual residuals because with gls residuals command of the fitted model is not enough.) If there is more structure to the residuals of the gls model, then modify the model of the residuals accordingly. Justify what you do each time. Explain in your paper what you do.
- (c) It could very well be that you could take care of autocorrelated residuals using dummy variables for the months and polynomials for the trend. So another option you should consider to address autocorrelation is to add seasonal dummies and or polynomial trend variables to your model and fit again. Perhaps that takes care of the residuals and you do not need to fit gls with the arma model. Investigate this possibility and mention in your paper what you get. Compare the results of the gls-corarma option and this other option of the dummies and trend. Check residuals after the second option. Are you done? Are they finally white noise?
- (d) Provide your final regression model, written in equation form, with standard error of the model coefficients and p-values. If you ended up fitting an arma model to the residuals, and used it to fit the regression model, report also the arma model.
- (e) When you think you have found the right model, create a data frame with the future values of your independent variables. Add the trends and dummies if a model containing them is the chosen one. See the labs. Then obtain forecasts for the next twelve month using the final model. Put those forecasts in the table where are writing your forecasts. Calculate the root mean square error. So far, which model is winning? Write the root mean square error at the bottom of the table.
- (f) Upload the .pdf version of the whole paper, with all the sections, including corrections to the VAR and previous sections. YOURLASTNAME-ID.pdf
- (g) Upload the R script file for the paper (including the one you uploaded for sections 1 and 2, 3). The name of the file should have YOURLASTNAME-ID.R. Separate the code by sections. This time I will have no mercy. IF your code is not separated by sections, and has comments indicating what you are doing and your name and ID are not in it, you will get lots of points off. Your code should run without errors when I run it with the data you uploaded. If I have to spend hours trying to figure out what each part of your code is doing, where everything is, you will lose a lot of points. Be organized, put headings such as

Section 4.1 This is the code to take the log of the interest rate series, for example..