02417: Time Series Analysis
Rune Grønborg Junker
Spring 2022

DTU Compute
Technical University of Denmark

Assignment 4: Multivariate Processes

In financial markets you can improve your return and/or reduce your risk if you have better predictions than the market. The focus is on predicting monthly returns for five industries. The data file contains the following columns:

Name	Description
yyyymm	The year and month for the observation
Cnsmr	Consumer industry
Manuf	Manufacturing industry
HiTec	High tech industry
Hlth	Healthcare industry
Other	Other industries
b.m	Book to market ratio (To be used as predictor)
ntis	Net equity expansion (To be used as predictor)
infl	Inflation (To be used as predictor)

You should not use the last four observations for estimating a model but save them for showing the performance of your model.
It is the intention that you use the R-package marima for questions 4.3 to 4.6 - other software packages may have similar functionality that you can use.
This assignment is inspired by the PhD thesis by Thomas Trier Bjerring.

Question 4.1: Presenting the data Present the data. Comment on the behaviour including considerations on stationarity. Consider transformations of the individual series already at this point.

Question 4.2: ACF, PACF and CCF Estimate the autocorrelation function, the partial autocorrelation function and the cross correlation function of the returns from the five industries.

Comment on the structures you find.

Question 4.3: MARIMA model Estimate a suitable MARIMA model to the returns from the five industries and reduce it. Validate the model.

Argue for the choices you make. Remember that the model building process is an iterative process and you should always consider stepping back and consider your choices again.

Question 4.4: Predictions with MARIMA model Use the model you have developed for predicting the returns for the remaining four observations and include prediction limits.

Compare with the actual data and comment on the results

Question 4.5: MARIMA model with regression variables Estimate a suitable MARIMA model to the returns from the five industries. In this model you are allowed to include the last three columns as regression variables. Validate the model.

Question 4.6: Predictions with MARIMA model with regression variables Use the model you have developed for predicting the returns for the remaining four observations and include prediction limits.

Compare with the actual data and comment on the results

You are allowed to use the observed values for the regression variables when predicting - but you are also welcome to predict them as well.

Question 4.7: Compare predictions Compare the predictions from the two models you developed.