

DEPARTMENT OF MATHEMATICS AND STATISTICS  
TIME SERIES ANALYSIS II -COURSE 2020

EXAM, Tuesday the 3rd of March, 2020

1. Define a stationary VAR( $p$ ) -process and define the stationarity condition using the model parameters. Explain all the details on the model, for example, what are unknown constants and what are random variables.
2. Derive the log-likelihood function for a stationary VAR( $p$ ) model with normal errors, and explain how to obtain the MLE for the model parameters. No detailed derivations are needed, but the general explanation of the required stages is.
3. Explain what methods are available for choosing the lag order  $p$  in the VAR( $p$ ) models and describe them shortly.
4. Derive prediction error impulse responses and orthogonal impulse responses for a stationary VAR( $p$ ) model with normal errors. Explain why impulse responses are useful in analyzing a multivariate model and what are their shortcomings in the analysis.

Recall that if  $Y_i \sim N(\mu, \sigma^2)$ , then  $f_{Y_i}(y_i) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\{-\frac{1}{2\sigma^2}(y_i - \mu)^2\}$ ,  $y_i \in \mathbb{R}$ .