UNIVERSITY OF BOLOGNA
Department of Statistics
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Advanced time series
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Homework assignment 4

Theory

Study Chapter 2 of the book by Durbin and Koopman (2012) *Time series analysis by state space methods*, with particular attention to the following sections: 2.1, 2.2, 2.5.1, 2.10, 2.11.

1. Prove that, under the Gaussian assumption, the Kalman filter provides the Minimum Variance Linear Unbiased Estimator for the predicted state (section 2.2.4).

In R

1. Download the Nile data, available in the R dataset:
   ```
   library(TSA)
   data()
   ```
   and fit a LLM to the data. Compare your results with Table 2.1.

2. Reproduce the Simulation example on Section 2.6.