

MS course: TIME SERIES ANALYSIS WITH APPLICATIONS IN FINANCE

Final exam topics

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November 24, 2020

1. Time domain: Definition of multivariate stationary time series, properties of the autocovariance function.
2. Frequency domain: Spectral distribution and spectral density function of multivariate, weakly stationary processes. Condition for the existence of the spectral density matrix.
3. Relation between the autocovariance function and spectral representation of weakly stationary processes.
4. Estimating parameters of stationary time series, ergodicity for the mean and autocovariances.
5. Estimates of the spectral density. One- and multi-dimensional periodogram.
6. Time invariant linear filters, one-dimensional $MA(\infty)$ and $MA(q)$ processes.
7. One-dimensional $AR(p)$ process, stability, Youle–Walker equations.
8. One-dimensional $AR(p)$ and $ARMA(p, q)$ processes, causality, rational spectral density.
9. Wold decomposition in one dimension, and its consequences.
10. Classification of one-dimensional, weakly stationary processes, types of singular processes.
11. Multivariate stationary time series of constant rank. Factorization of their spectral density.
12. Multivariate Wold decomposition, innovation subspaces.
13. Multivariate ARMA processes and Yule–Walker equations.
14. Low-rank approximation of constant rank and regular processes.
15. One- and h -step ahead prediction of one-dimensional, weakly stationary processes based on n past observations and on the infinite past. Prediction error, relation to the Wold decomposition.
16. One-step ahead prediction of multi-dimensional, weakly stationary processes based on n past observations and on the infinite past. Rank of the error covariance matrix, relation to the transfer function.
17. Kálmán’s filtering.
18. Dynamic principal component and factor analysis.
19. Non-stationary processes, stochastic volatility, ARCH and GARCH models.
20. You may be asked to explain some figures in the illustrations.