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Winter 2008/2009
28.10.2008
Sheet 2

Time Series

(Due: Tu., 4.11.2008, 13:15 Uhr, in the exercise classes)

1. Let $(Y_t)_{t\in\mathbb{Z}}$ denote a stationary time series with mean zero. Define for $t \in \mathbb{Z}$ $X_t = a + bt + ct^2 + s_t + Y_t$, where s_t is a seasonal component with period 12, i.e. $s_t = s_{t-12}$. Moreover, let B denote the so called backward operator, i.e. $BX_t = X_{t-1}$. Show that

$$Z_t = (1 - B)(1 - B^{12})X_t$$

is a stationary time series.

(5 Credits)

2. Let $X_t = (-1)^t X, t \in \mathbb{Z}$ for some random variable X.

   (a) Find necessary and sufficient conditions so that X_t is stationary.

   (b) Assume X_t stationary. Find the spectral distribution function.

(2 + 4 Credits)

3. Let $(X_t, t \in \mathbb{Z})$ be a stochastic process with

$$X_t = \varepsilon_t + \theta\varepsilon_{t-1}.$$

   (a) Compute the spectral density of X_t and sketch it.

   (b) Simulate and plot the time series for $\theta \in \{-0.7, 0.7\}$.

(4 Credits)

http://www.uni-ulm.de/mawi/zawa/lehre/winter2008/ts20082009.html