Practical Econometrics for Finance and Economics

Exercises 3:

1. Using the calculation rules on page 2 of chapter 3, show that

$$E(XY) = E(X)E(Y) \quad \text{for} \quad \mathbb{C}\text{ov}(X, Y) = 0.$$

   Note: This is different from calculation rule (6), because $\mathbb{C}\text{ov}(X, Y) = 0$ does not necessarily imply that X and Y are independent.

2. Prove formulas (3.20)-(3.22) of the lecture notes.

3. Show that the process S_t is a martingale if and only if

   a) $E_t(S_u - S_t) = 0$ for all $u > t$,

   b) $E_t(S_u/S_t) = 1$ for all $u > t$ (we assume here that $S_t > 0$ for all t).

   Hint: S_t at the specific time point t is a random variable only at times $t' < t$, when we don't know yet what the value of S_t is. For $t' \geq t$ on the other hand, S_t is just a known constant, such that $E_{t'}(S_t) = S_t$.

4. Use data on the US consumer price index (CPI_U, quarterly observations, 1950.1 to 2000.4) given in Table F5.2 from Greene's data site.

   a) i) Plot the series.
   ii) Make the inflation series $\pi_t = 100 \log(p_t/p_{t-1})$, where p_t is the series in levels. Make a plot of the π_t series.

   b) Plot the autocorrelations and partial autocorrelations of the π_t series. What kind of ARMA model these suggest?

   c) Work out some alternatives and compute AIC and BIC. What do they suggest.

   d) Estimate your final model.

   e) Examine the residuals (autocorrelations, normality, histogram).