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# First homework assignment

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PhD in Business Economics

**Professor:** Hedibert Freitas Lopes

You can work individually or in pairs.

Course: Econometrics III

Due date: February 7th, 2019.

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**Problem 1:** The following is taken from Ender's (1995) page 66<sup>1</sup>:

To illustrate a typical moving average process, supposed you win \$1 if a fair coin shows a head and lose \$1 if it shows a tail. Denote the outcome of the toss  $t$  by  $\epsilon_t$  (i.e., for toss  $t$ ,  $\epsilon_t$  is either +\$1 or -\$1). If you wish to keep track of your "hot streaks", you might want to calculate your average winnings on the last four tosses. For each coin toss  $t$ , your average winnings of the last four tosses are  $x_t = 1/4\epsilon_t + 1/4\epsilon_{t-1} + 1/4\epsilon_{t-2} + 1/4\epsilon_{t-3}$ . Although the  $\{\epsilon_t\}$  sequence is a white-noise process, the construct  $\{x_t\}$  sequence will not be a white-noise noise.

A. Find the expected value of  $x_t$ . Find the expected value given that  $\epsilon_{t-3} = \epsilon_{t-2} = 0$ .

B. Find  $var(x_t)$ . Find  $var(x_t)$  conditional on  $\epsilon_{t-3} = \epsilon_{t-2} = 1$ .

C. Find

i.  $cov(x_t, x_{t-1})$

ii.  $cov(x_t, x_{t-2})$

iii.  $cov(x_t, x_{t-5})$

**Problems 2-6:** Exercises 1.1 to 1.5 (pages 25 to 28) of Tsay (2010)

**Problem 7-10:** Exercises 2.1 to 2.4 (pages 104 to 105) of Tsay (2010)

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<sup>1</sup>Enders (1995) *Applied Econometric Time Series*, Wiley.