# Lab session 3

# Matching theoretical and sample ACFs

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## Question 1

- ▶ Simulate a series of $T = 500$ Gaussian white noise observations and compute the sample ACF, $\hat{\rho}(h)$, to lag 20.

- ▶ Compare the sample ACF you obtain to the actual ACF, $\rho(h)$.

- ▶ Repeat this using only $T = 50$. How does changing $T$ affect the results?

## Question 2

▶ Simulate a series of $T = 500$ moving average observations as $V_t = \frac{W_{t-1} + W_t + W_{t+1}}{3}$ and compute the sample ACF, $\hat{\rho}(h)$, to lag 20.

▶ Compare the sample ACF you obtain to the actual ACF, $\rho(h)$.

▶ Repeat this using only $T = 50$. How does changing $T$ affect the results?

# Question 3

▶ Suppose we consider $W_t$'s as input and calculate the output using the second-order equation

$$X_t = X_{t-1} - 0.9X_{t-2} + W_t$$

successively for $t = 1, 2, \ldots$. Assume $X_{-1} = 0, X_0 = 0$. Draw a realization of length $T = 500$ from the time series $X_t, t = 1, 2, \ldots$.

▶ Compute the sample ACF, $\hat{\rho}(h)$, to lag 20.

▶ Comment on the pattern you see from the sample ACF plot.

# Thank you!