

DS-GA 3001.001 Special Topics in Data Science: Modeling Time Series
Homework 2

$$\Sigma_0 = \mathbb{E}[x_0, x_0^T] - mu_0 \mathbb{E}[x_0]^T - \mathbb{E}[x_0] mu_0^T + mu_0 mu_0^T$$

$$A = \left(\sum_{t=1}^{T-1} \mathbb{E}[x_t x_{t-1}^T] - b_{t-1} \mathbb{E}[x_{t-1}]^T \right) \left(\sum_{t=1}^{T-1} \mathbb{E}[x_{t-1} x_{t-1}^T] \right)^{-1}$$

$$Q = \frac{1}{T-1} \sum_{t=0}^{T-2} (\mathbb{E}[x_{t+1}] - A_t \mathbb{E}[x_t] - b_t) (\mathbb{E}[x_{t+1}] - A_t \mathbb{E}[x_t] - b_t)^T + A_t Var(x_t) A_t^T + Var(x_{t+1}) - Cov(x_{t+1}, x_t) A_t^T - A_t Cov(x_t, x_{t+1})$$

$$C = \left(\sum_{t=0}^{T-1} (z_t - d_t) \mathbb{E}[x_t]^T \right) \left(\sum_{t=0}^{T-1} \mathbb{E}[x_t x_t^T] \right)^{-1}$$

$$R = \frac{1}{T} \sum_{t=0}^{T-1} [z_t - C_t \mathbb{E}[x_t] - b_t] [z_t - C_t \mathbb{E}[x_t] - b_t]^T + C_t Var(x_t) C_t^T$$