# ASSIGNMENT 3

Question 1 (20 points): Prove that this time deterministic process is not stationary:

$$Y_t = \beta_0 + Y_{t-1} + \varepsilon_t$$

Question 1 (30 points): There are four time series plots and ACF plots for four variables: $y_{1t}, \ y_{2t}, \ y_{3t}, \ y_{4t}$. Identify which ACF plot corresponds to each time series variable. Information about each time series:

- y_1: Number of minks trapped in northern Canada, 1848–1911.

- y_{2t}: Number of airline passengers, 1949–1960.

- y_{3t}: Number of deaths from accidents in the U.S., 1973–1982.

- y_{4t}: Morning temperature of a cow over a period of 75 days.

Time plots:
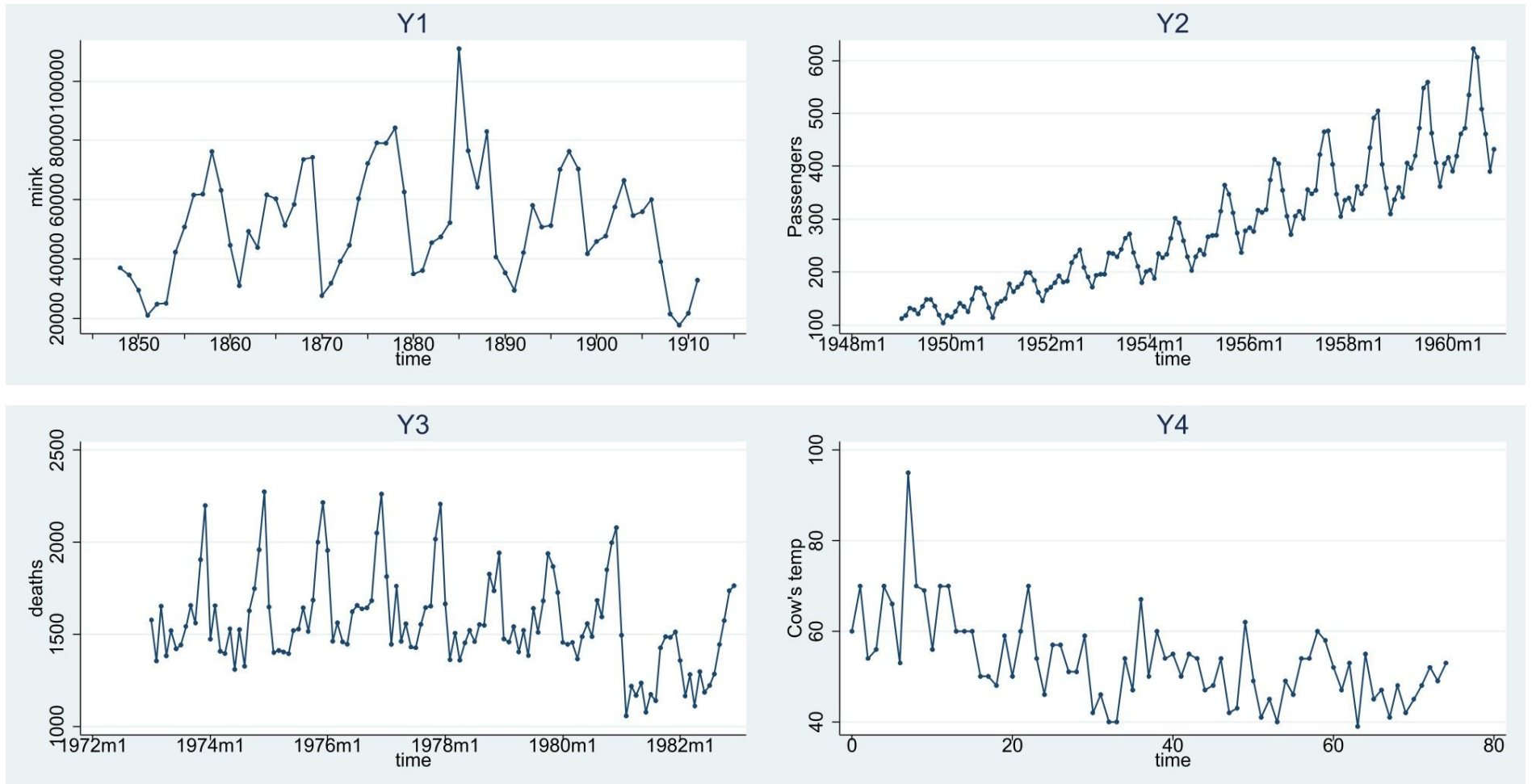
ACF plots:
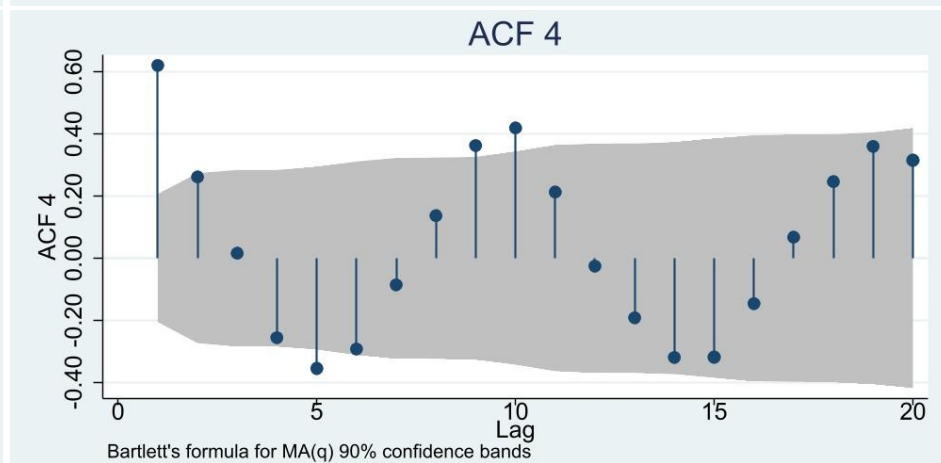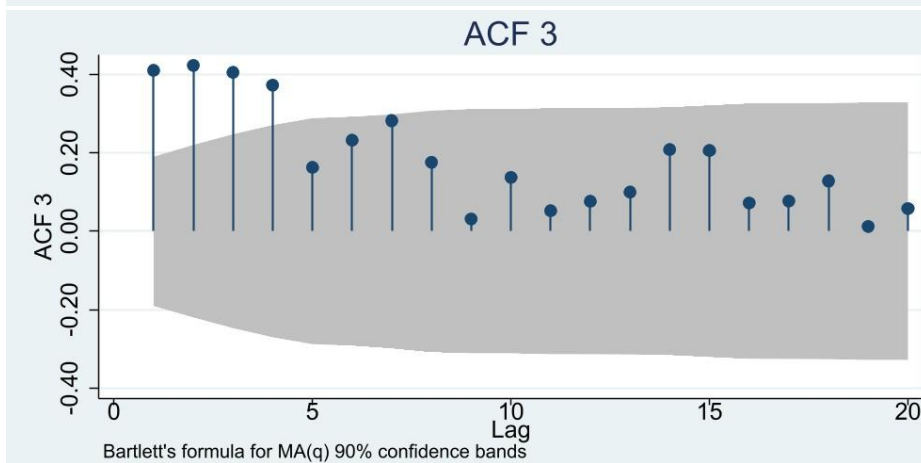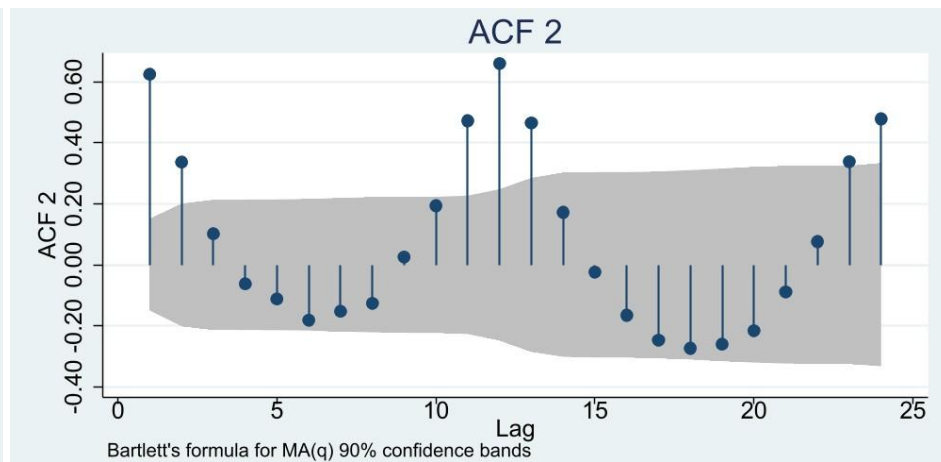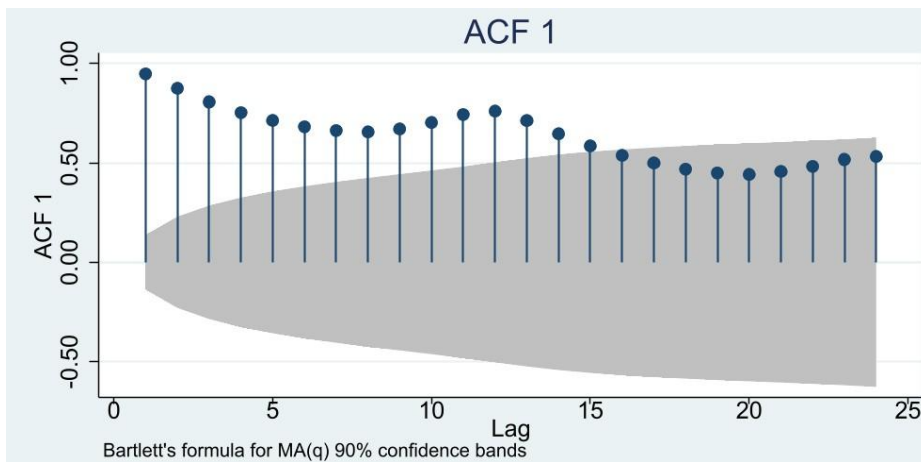
Questions 3 (50 points): Import these four variables (from the specified sheets):

1. Stock prices of Vinamilk — sheet *VNM*.
2. Seasonally adjusted US CPI — sheet *PC*.
3. Seasonally adjusted US unemployment rate — sheet *PC*.
4. Non-seasonally adjusted US CPI — sheet *PC*.

Then perform these tasks:

i.   Provide the appropriate data format for each variable.
ii.   Plot each time series and its sample autocorrelation function (ACF).
iii.   Conduct unit-root tests to determine whether each variable is stationary at level (I(0)) or requires first differencing (I(1)). You may apply transformations to achieve stationarity where appropriate (examples: first differences, log differences, or seasonal differences). For each variable:

- Report which tests you used (e.g., Augmented Dickey–Fuller (ADF), Phillips–Perron, KPSS) and the test specification (trend/constant/no constant and lag selection method).
- Present test results in a concise table showing: test name, test statistic, p-value (or critical values), and your stationarity decision at conventional significance levels (e.g., 1%, 5%, 10%).
- A short interpretation (3–5 sentences) summarizing final results and how you transformed each variable for stationarity.