AGEC622 - Agribusiness Analysis and Forecasting
07_Exercises

- Complete the exercises in the provided notebook "07_exercises.xlsx". a

- If there is more than one question, note that each will have its own tab in the workbook.

- Work vertically down the sheet within your notebook. Separate the individual parts of the question(s) (a, b, c, ...) using dividing rows like the blue example dividers in the file.

- Submit your completed .xlsx file via Canvas.

Question 1. The overall objective of this question is to characterize the probabilities of various financial outcomes for a crop production enterprise over a five-year planning horizon.

a) **Build a model for the crop price.** You will generate stochastic forecasts for the crop price using an AR time series model. Determine an appropriate number of differences for the price data. Determine the optimal number of lags for the AR model using the SAC approach. Set up *stochastic* forecasts for the crop price for the five years following the historical period. Test for normality and determine a probability distribution that you believe is appropriate for drawing stochastic errors/innovations.

b) **Build a model for the crop yield.** Use a simple linear trend to model the crop yield. Again set up *stochastic* forecasts for 2022 through 2026. Sample stochastic errors for the forecasts from a probability distribution that you deem appropriate.

c) **Set up stochastic simulation for the gasoline price.** Assume that a logarithmic transformation of the gasoline price is a good idea. Check if the log transformation make data stationary, that is check if $\ln(P_{gas})$ is stationary. If not, take the first difference, $\Delta \ln(P_{gas})$, and use an empirical distribution for 2022 through 2026 to simulate P_{gas} for each year.

d) **Build a model for variable cost (VC).** Assume that VC is a function of the gasoline price (*not* the natural logarithm of P_{gas}). Set up a simple linear regression model, and generate stochastic forecasts for VC (using stochastic draws for P_{gas} that you generate in part c) using any distribution you deem appropriate for the stochastic errors.

e) **Calculate financial variables for the enterprise.** Assume that net returns (NR) are

$$NR \equiv Acres \times P_{crop} \times Yield - Acres \times VC - FC$$

Assume the following:

- The farm plants 1,000 acres in all years.
- Beginning cash for 2022 is $50,000.
- Total fixed costs (FC) are $200,000 for 2022, and this increases by 5% per year.

f) **Simulate 2026 ending cash.** Determine the following values:

- Expected ending (2026) cash
- The probability ending (2026) cash is less than $0
- The probability ending (2026) cash is less than $100,000