**Question 1**

A researcher studying a sample of 500 firms has estimated two alternative regression models for their access to bank loans:

Model 1

Loans = 45.50 - 0.55\*(X1) + 0.92\*(X2) + 0.47\*(X3) - 0.80\*(X4)

R-squared 0.85

Model 2

Loans = 35.80 -0.41\*(X1) + 0.70\*(X2) + 0.39\*(X3)

R-squared 0.44

Where

Loans: is the ratio of the value of loans a firm has been granted to its total assets

X1: is a variable attaining the value of one if the firm was a single proprietorship and zero otherwise

X2: is the ratio of the value of profits a firm has to its total assets

X3: is the logarithm of its total assets

X4: is a variable attaining the value of one if the firm does not use external auditors, and zero otherwise.

1. Which of the two model specifications should the research adopt, and why?
2. Discuss the qualitative and quantitative impact of external auditing on firms’ access to bank loans. Suppose you were told that the standard error of the X1 variable in the preferred specification was 0.07, is there any evidence for ownership-type effects on the bank loan market?
3. Based on the estimated parameters, what do you conclude about the loan distribution across firms, depending on whether they use or not external auditors and the type of ownership (assume that both factors enter significantly in the model)?

**Question 2**

The finance department of a multinational shipping company has constructed a model for the company’s revenues. The research team collected quarterly sales (in millions of dollars) for 12 years and estimated the following two models:

ΔS = 15.54 + 0.3 (Q1) + 0.4 (Q2) + 0.9 (Q4) + 0.45 Δ(X1) – 0.35 Δ(X2) + 0.25 Δ(X3)

R-squared 0.67

ΔS = 11.53 + 0.12 Δ(X1) – 0.45 Δ(X2) + 0.18 Δ(X3)

R-squared 0.35

Where

S: is dollar value of the company’s sales

Q1, Q2, Q4: are dummy variables identifying the corresponding quarter of the year

X1: is the dollar amount of the company’s promotion expenditure

X2: is the dollar price of Brent

X3: is the dollar value of the company’s investment expenditure

1. Explain why a dummy variable for the third quarter of the year is not included in the model
2. Would you say that the demand the company faces is characterized as seasonal?
3. Based on the information provided, can you tell anything about the company’s change of sales across quarters in a typical year?
4. Based on the information you are provided, are the variables involved: (a) stationary?, (b) are their levels cointegrated? explain your answers.

**Question 3**

1. Discuss the theoretical as well as the observed sample differences between a stationary and a non-stationary times series.
2. Describe a formal method used to test for the stationarity or not of a time series.
3. What is the DW statistic, when and how is it used? Discuss its shortcoming and alternative ways to test autocorrelation.
4. Explain the notion of cointegration between two time series and provide a formal method to test for its presence.