Finance 30210
Solutions to Midterm #1 Practice Questions

1) Suppose that you have estimated the following regression (standard errors associated with each are below in parentheses):

$$Q_d = 300 - 4P + \varepsilon$$
$$\quad (6.5) \quad (1.2) \quad (60.5)$$

a) Calculate your forecast at the sample average of $50.

$$Q_d = 300 - 4(50) + 0 = 100$$

b) Calculate the 95% confidence interval for your forecast.

A 95% confidence is equal to your estimate +/- 2 standard errors where the error is calculated as:

$$StdDev = \sqrt{Var(a) + X^2 Var(b) - 2X\overline{X}Var(b) + Var(error)}$$
$$StdDev = \sqrt{(6.5)^2 + (50)^2(1.2)^2 - 2(50)^2(1.2)^2 + (60.5)^2}$$
$$StdDev = 10.12$$

c) Calculate your estimated demand elasticity at the sample average of $50.

$$\varepsilon = \frac{\%\Delta Q}{\%\Delta P} = \left(\frac{\Delta Q}{\Delta P}\right)\left(\frac{P}{Q}\right) = -4\left(\frac{50}{100}\right) = -2$$

d) Why might you be worried about calculating an estimate of demand at a price of $70?

You are starting to stray quite a ways from the sample mean. The estimates get worse!!

2) Suppose that you have the following data on heating oil usage:

Heating Oil Usage (in Thousands of Barrels)			
1995Q1	22,500	**1997Q1**	25,200
1995Q2	21,750	**1997Q2**	23,275
1995Q3	24,000	**1997Q3**	22,500
1995Q4	25,100	**1997Q4**	20,750
1996Q1	21,300	**1998Q1**	24,350

1996Q2	22,150	**1998Q2**	21,125
1996Q3	23,250	**1998Q3**	26.200
1996Q4	20,680	**1998Q4**	25,225

a) Calculate a forecast for usage in the first quarter of 1999 using a moving average with a length of 4.

Your forecast would be equal to the average of the previous 4 quarters:

$$MA(4) = \frac{24{,}350 + 21{,}125 + 26{,}200 + 25{,}225}{4} = 24{,}225$$

b) Repeat (a) using an exponential smoothing model with a smoothing parameter of .4 (assume that your forecast for 1998Q4 was 24,500).

$$1999Q1 = .4(25{,}225) + .6(24{,}500) = 24{,}790$$

c) How would you compare the performance of the methods in (a) and (b)?

For various methods, you could compare root mean squared errors. The smaller the RMSE, the better the forecast.

d) Why should you be careful to check for the presence of a trend or seasonality before using the methods in (a) and (b)?

If there is seasonality or a trend in the data, there are better methods for forecasting.

3) Suppose that you have the following data:

Gasoline Sales (in Thousands of Barrels)			
1995Q1	22,434	**1997Q1**	22,776
1995Q2	23,766	**1997Q2**	24,491
1995Q3	23,860	**1997Q3**	24,751
1995Q4	23,391	**1997Q4**	24,170
1996Q1	22,662	**1998Q1**	23,302
1996Q2	24,032	**1998Q2**	24,045
1996Q3	24,171	**1998Q3**	25,437
1996Q4	23,803	**1998Q4**	25,272

You have already estimated a linear trend as follows:

$$Q_d = 23{,}000 + 120t + \varepsilon$$

Where t = 1 refers to 1995Q1.

a) Calculate your forecast for 1999Q1 (t = 17).

Date	**Actual**	**Predicted**	**Ratio**	**Date**	**Actual**	**Predicted**	**Ratio**
1995Q1	22,434	23120	0.970329	**1997Q1**	22,776	24080	0.945847
1995Q2	23,766	23240	1.022633	**1997Q2**	24,491	24200	1.012025
1995Q3	23,860	23360	1.021404	**1997Q3**	24,751	24320	1.017722
1995Q4	23,391	23480	0.99621	**1997Q4**	24,170	24440	0.988953
1996Q1	22,662	23600	0.960254	**1998Q1**	23,302	24560	0.948779
1996Q2	24,032	23720	1.013153	**1998Q2**	24,045	24680	0.974271
1996Q3	24,171	23840	1.013884	**1998Q3**	25,437	24800	1.025685
1996Q4	23,803	23960	0.993447	**1998Q4**	25,272	24920	1.014125

For t = 17 (1999Q1)

$$Q_d = 23,000 + 120(17) = 25,040$$

b) Using the ratio to trend method. Revise your estimate in (a) for seasonality.

Quarter	**Average ratio**
Q1	0.956302
Q2	1.005521
Q3	1.019674
Q4	0.998184

Therefore, we have 25,040(.956) = 23,938.

4) Suppose that you have the following demand and supply curve for rental cars:

$$Q_d = 400 - 3P$$
$$Q_s = 200 + 2P$$

a. Solve for the equilibrium price and quantity.

Set demand equal to supply

$$400 - 3P = 200 + 2P$$
$$200 = 5P$$
$$P = 40$$
$$Q = 280$$

b. Calculate consumer expenditures on rental cars

Expenditures = Price(Quantity) = \$40(280) = \$11,200

c. The elasticity of demand is given by

$$\varepsilon = \frac{dQ}{dP}\frac{P}{Q} = -3\left(\frac{40}{280}\right) = -.42$$

d. With an elasticity less than one, an increase in price would raise expenditures.

5) Consider the following productivities:

	United States	**England**
Services	6 Units/hr	3 Units/hr
Manufacturing	2 Units/hr	6 Units/hr

a) Calculate the opportunity cost of services in the US and England

US: $\frac{2}{6} = .33$ Units of manufacturing per unit of services

England: $\frac{6}{3} = 2$ Units of manufacturing per unit of services

b) Calculate the opportunity cost of manufacturing in the US and England. Who has the comparative advantage in services?

US: $\frac{6}{2} = 3$ Units of Services per unit of manufacturing

England: $\frac{3}{6} = .5$ Units of Services per unit of manufacturing

The US has a comparative advantage in services while England has a comparative advantage in manufacturing.

c) Between what prices will trade occur?

The relative price of services should lie between .33 and 2.

d) Suppose that the relative price of services was one. What trading pattern would emerge?

At a relative price of one, the US would produce all the services and England would produce all the manufacturing. The US would import manufacturing while England imports services.

e) Why do we only concern ourselves with relative prices in economics?

In economics, we are concerned about the flow of resources between various sectors of the economy. Generally speaking, resources flow to the areas where they are the ost valuable. This relative value is reflected by relative prices. That is, if all prices doubled, relative values (and, hence, the flow of resources) is unaffected.

6) Suppose that you have estimated the following demand curve:

$$Q = 120 - 4P + .001I$$

You know that the current market price is \$10 and average income is \$40,000.

a) Calculate the markets total willingness to pay.
b) Calculate the market's consumer surplus.

First, solve for the price where Q = 0.

$$P = \frac{120 + .001(\$40{,}000)}{4} = \$40$$

Consumer Surplus = (1/2)(40 – 10)(120) = \$1800
Total Actually Paid = (120)(10) = \$1200
Total Willingness to Pay = \$1200 + \$1800 = \$3000

7) Suppose that you estimated the following demand curve.

$$Q = 400 - 6P + .005I$$

Q Represents quantity demanded, P represents price and I represents average income.

You know that the current market price is \$20 and average income is \$20,000

a) Calculate current demand.

At a price of \$20, we have Q = 400 – 6(\$20) +.005(\$20,000) = 380

b) Calculate the price elasticity of demand.

$$\varepsilon = \frac{dQ}{dP}\frac{P}{Q} = -6\left(\frac{20}{380}\right) = -.31$$

c) Calculate the income elasticity of demand

$$\varepsilon = \frac{dQ}{dI}\frac{I}{Q} = -.005\left(\frac{20{,}000}{380}\right) = .26$$

How would your answers change if you estimated this demand curve in log form?

$$\ln(Q) = 45 - 1.6\ln(P) + 2.56\ln(I)$$

With a log-linear demand, we can read the elasticity from the coefficients: income elasticity equals 2.56 while price elasticity is 1.6

8) Suppose that you observed the following set of data:

Average Business School tuition: $30,000
Average Salary for non-MBA's: $50,000 per year
Average MBA salary: $90,000 per year.

The length of an MBA program is 2 years and is assumed that and MBA will have a working career of 20 years after graduation. The interest rate is 5% and is expected to stay at 5%.

a) Is this set of data consistent with market equilibrium?

The present value of $40,000 per year for 20 years is $498,488. Note that you don't get this money for two years, so we need to discount it another two years. This comes to $452,143.

Two year of tuition equals $60,000 plus lost salary of $100,000 totals $160,000 opportunity cost. You could add other expenses, but it looks pretty clear that MBAs are overvalued.

b) If your answer to (a) is no, how will markets adjust?

Demand for MBA degrees should rise, pushing up tuition. Further, as the number of MBAs increases, their salaries should drop.