

## Part 1 - Mell Computers

Mell Computers is developing and testing a new computer workstation, Count103, which it will introduce to the market in the next six months. Count103 will be sold under a three- year warranty covering parts and labour. The company has decided to subcontract the service support for the warranty and has entered negotiations about the support contract with Sortit. Sortit has proposed two different pricing schemes for the subcontract. The first involves the payment of a fixed fee of £1.2million and the second a variable fee of £250 per workstation sold, subject to a minimum fee of £400,000. Under both schemes, the payment will be made one year after the introduction of the workstation to the market at which point the product will be replaced by newer models not covered by the warranty service subcontract. At the moment, there is uncertainty about the sales potential of the new workstation. Sales of Mount101 are expected to come from two sources: (i) the successful closure by senior management of a major purchase of 1,000 units by a long-standing customer; (ii) the efforts of regional sales offices. Given the state of the negotiations with the long-standing customer, the current estimate of the probability of a successful closure of the major purchase is 70%. Regional sales of Mount101 would be boosted by the successful closure, and the Fell management has estimated the regional sales potential (in addition to the major purchase), as shown in the table below.

If Major purchase		If no major purchase	
Sales	Probability	Sales	Probability
2500	20%	1000	25%
3500	30%	2000	25%
4500	30%	3000	25%
5500	20%	4000	25%

- (a) Use a decision tree to establish which pricing scheme is preferable for Fell?
- (b) By how much would the variable fee (currently £250) and the minimum fee (currently £400,000) have to change before your answer to (a) changes?
- (c) What is the most that Fell should pay for information regarding whether they will achieve the successful closure of the major purchase? (Assume the variable fee is £250 and the minimum fee is £400,000.)

## Part 2 – Tour de Bayes

The organisers of the Tour de Bayes cycling race for professional cyclists applies drug testing to the race participants. The test, however, is not perfectly reliable. That is, a drug user will test positive for drugs with probability 97%, and a nonuser will test negative with probability 99%. A cyclist in the race is selected at random and tested. The result is positive.

- (a) What is the probability that this individual is a drug user if it is estimated that 1 in 10 professional cyclists are drug takers?

(b) What is the probability that this individual is a drug user if it is estimated that 1 in 1,000 professional cyclists are drug users?

(c) Comment on the intuition for the different answers to (a) and (b).

### Part 3 – The Bank Job

The Rude Bank is facing a gender discrimination lawsuit. The suggestion is that the organisation's female employees receive substantially smaller salaries than its male employees. The employee database is listed in the file Rude.xls. For each of its 208 employees, the dataset includes the following variables:

**EducLev** : Education level, a categorical variable with categories 1 (finished secondary school), 2 (finished some college courses), 3 (obtained a bachelor's degree), 4 (took some graduate courses), 5 (obtained a graduate degree)

**JobGrade** : A categorical variable indicating the current job level, the possible levels being 1 through 6 (6 is highest)

**Years** : Years since the employee was hired

**Age** : Age of the employee was hired

**Gender** : A categorical variable with values "Female" and "Male"

**YrsPrior** : Number of years of relevant work experience prior to working at the bank

**Salary** : Current annual salary in thousands of pounds

Your task is to investigate the accusation of discrimination. Start with a simple regression for salary with only gender as an explanatory variable. Next, build a multiple regression model in order to try to gain a fuller understanding of the factors affecting salary. In your report, make sure to describe your modelling process (30 marks) and to provide an interpretation of your final model (10 marks).