EC114 - INTRODUCTION TO QUANTITATIVE ECONOMICS

TEST: SOLUTIONS

23-11-2006

Question 1

1. *Pr(C or S)=Pr(C)+Pr(S)-Pr(C and S)=0.80+0.60-0.50=0.90*
2. *Pr(H and 3)=Pr(H)×Pr(3)=1/2*1/6=1/12*
3. Letting L=lemon, $Pr(L) = 0.10$; $Pr(sale|L) = 0.90$; $Pr(sale|non-L) = 0.05$. Bayes' rule gives:
   $Pr(L|sale) = \frac{Pr(L)\times Pr(sale|L)}{Pr(L)\times Pr(sale|L)+Pr(non-L)\times Pr(sale|non-L)} = \frac{0.10*0.90}{0.10*0.90+0.90*0.05} = 2/3$

Question 2

In each case, we calculate the hit probability P such that:

$$0 = \text{(profit if a hit)(P) + (profit if a dud)(1-P)}$$

which implies:

$$P = \frac{-\text{(profit if a dud)}}{\text{(profit if a hit)-(profit if a dud)}}$$

The answers are:

Dick Tracy	$£47/£158 = 0.297$
Die Hard II	$£69/£152 = 0.454$
Total Recall	$£16/£118 = 0.136$

Die Hard II has the highest requisite probability; Total Recall has the lowest requisite probability.

Question 3

1. $Pr(X < 1) = Pr(Z < \frac{1-3}{1}) = Pr(Z < -2) = 0.0228$
2. $Pr(X > 5) = Pr(Z > \frac{5-3}{1}) = Pr(Z > 2) = 0.0228$
3. The expected value of the cost per machine is 0.0228(£250)=£5.70, and Whirlaway would have to add this to the price of each machine to cover the cost of the guarantee.

Question 4

The mean of this sample of 24 observations is:

$$\frac{112+120+...+110}{24} = 111.875$$

The standard deviation of X is assumed to be 8, which implies a standard deviation for the sample mean of $\frac{8}{\sqrt{24}}$.

1. A 95% confidence interval is $111.875 \pm 1.96(8/\sqrt{24}) = 111.875 \pm 3.20$.
2. A 99% confidence interval is $111.875 \pm 2.58(8/\sqrt{24}) = 111.875 \pm 4.21$.
3. The 99% confidence interval is wider because we have to include more possibilities to be more certain that the interval will encompass the true value of μ.
4. Generally, the width of a 95% confidence interval $\bar{X} \pm 1.96\sigma/\sqrt{n}$ is $2(1.96)\sigma/\sqrt{n}$. To halve this interval, we must double the square root of n, which requires a quadrupling of n, the sample size.