Homework 2

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October 26, 2011

1. The conversion factor from capabilities to requirements is 1/0.077059 or 12.9702 as demonstrated by the following model:

```
> fit1 <- lm(capabilities ~ requirements, data=dataFile1)
> summary(fit1)

Call:
lm(formula = capabilities ~ requirements, data = dataFile1)

Residuals:
    Min      1Q  Median      3Q     Max
-2.5803 -1.3406 -0.6886  1.0469  4.2185

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)  0.916200   0.957642   0.957    0.351
requirements 0.077059   0.005099  15.112 1.14e-11 ***
---
Signif. codes:  0 *** 0.001 ** 0.01 * 0.05 . 0.1   1

Residual standard error: 2.089 on 18 degrees of freedom
Multiple R-squared: 0.9269,Adjusted R-squared: 0.9229
F-statistic: 228.4 on 1 and 18 DF,  p-value: 1.138e-11
```

   Using the CER given to derive an 80% confidence interval estimate of effort for 22 capabilities with my conversion factor:

$$\begin{aligned}\text{effort(person months)} &= 38.55 \times (12.902 \times 22)^{1.06} \\ &= 38.55 \times 285.3840^{1.06} \\ &= 38.55 \times 400.6410 \\ &= 15444.71\end{aligned}$$

2. The covariance matrix and model parameters for the three CER's are:

```
> vcov(fit2)
             (Intercept)      Weight     DataRate
(Intercept) 14125099.33 -94781.4510 -13233.38143
Weight        -94781.45   1745.7161   -105.60854
DataRate      -13233.38   -105.6085     55.13398

> vcov(fit2a)
             (Intercept)     Weight
(Intercept)  73320342.0 -804468.66
Weight        -804468.7   10335.79

> vcov(fit2b)
             (Intercept)     DataRate
(Intercept) 12281183.22 -25942.62991
DataRate      -25942.63     66.67152
```

The ANOVA table for the three models is given as:

```
> anova(fit2, fit2a, fit2b)
Analysis of Variance Table

Model 1: Cost ~ Weight + DataRate
Model 2: Cost ~ Weight
Model 3: Cost ~ DataRate
  Res.Df        RSS Df   Sum of Sq      F    Pr(>F)
1     15  431645574
2     16 3083288942 -1 -2651643368 92.147 8.535e-08 ***
3     16  629745888  0  2453543054
---
Signif. codes:  0 *** 0.001 ** 0.01 * 0.05 . 0.1   1
```

Based on my analysis I would say that Data Rate is a much better predictor for Cost than Weight.