QUASAR -- A quasar is a distant celestial object (at least four billion light-years away) that provides a powerful source of radio energy. The Astronomical Journal (July 1995) reported on a study of 90 quasars detected by a deep space survey. The survey enabled astronomers to measure several different quantitative characteristics of each quasar, including:

Y1 - Rest frame Equivalent Width

Use R to perform a regression analysis on the QUASAR dataset

Evaluation of Explanatory Variables:

X1 - Redshift

```
lm(formula = RFEWIDTH ~ REDSHIFT, data = QUASAR)

Residuals:
    Min      1Q  Median      3Q     Max
-54.922 -36.077  -8.504  24.590 166.590

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  112.115     70.151   1.598    0.124
REDSHIFT      -7.013     20.477  -0.342    0.735
```

Residual standard error: 48.29 on 23 degrees of freedom
Multiple R-squared: 0.005073, Adjusted R-squared: -0.03818
F-statistic: 0.1173 on 1 and 23 DF, p-value: 0.7351

T-Test –> Negative value, so that means that the sample mean is less than the hypothesis

P value –> High P-Value (not less than .05)

R Squared -> .005073(.5%) of variability in Y1 (Rest Frame Equivalent width) is explained by our model. This is very low.

X2 - Line Flux

```
Call:
lm(formula = RFEWIDTH ~ LINEFLUX, data = QUASAR)

Residuals:
    Min      1Q  Median      3Q     Max
-59.053 -32.667  -9.432  25.137 157.947

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   665.77     563.70   1.181    0.250
LINEFLUX       41.83      40.83   1.025    0.316

Residual standard error: 47.35 on 23 degrees of freedom
Multiple R-squared:  0.04365,      Adjusted R-squared:  0.002066
F-statistic:  1.05 on 1 and 23 DF,  p-value: 0.3162
```

T-Test –> Fairly low value, tells us that the result have a low probability of being repeated

P value –> High P-Value (not less than .05)

R Squared -> .04 (4%) of variability in Y1 (Rest Frame Equivalent width) is explained by our model. This is low.

X3 - Line Luminosity

```
Call:
lm(formula = RFEWIDTH ~ LUMINOSITY, data = QUASAR)

Residuals:
    Min      1Q  Median      3Q     Max 
-53.800 -30.427  -5.716  21.960 164.875 

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -1978.21    2226.43  -0.889    0.383
LUMINOSITY     45.78      49.32   0.928    0.363

Residual standard error: 47.53 on 23 degrees of freedom
Multiple R-squared:  0.03611,	Adjusted R-squared:  -0.005803 
F-statistic: 0.8615 on 1 and 23 DF,  p-value: 0.3629
```

T-Test –> Fairly low value, tells us that the result have a low probability of being repeated

P value –> High P-Value (not less than .05)

R Squared -> .03611 (3.611%) of variability in Y1 (Rest Frame Equivalent width) is explained by our model. This is very low.

X4 - AB1450 Magnitude

```
Call:
lm(formula = RFEWIDTH ~ AB1450, data = QUASAR)

Residuals:
    Min      1Q  Median      3Q     Max 
-50.630 -24.405  -3.409   7.946 144.479 

Coefficients:
            Estimate Std. Error t value Pr(>|t|)   
(Intercept)  -667.31     239.42  -2.787   0.0105 * 
AB1450         38.31      12.13   3.158   0.0044 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 40.44 on 23 degrees of freedom
Multiple R-squared:  0.3024,	Adjusted R-squared:  0.2721 
F-statistic: 9.972 on 1 and 23 DF,  p-value: 0.004399
```

T-Test –> High T Value, tells us that the result have a good probability of being repeated

P value –> Low P-Value (under .05). This builds a strong case to reject the null hp

R Squared -> .3024 (30.24%) of variability in Y1 (Rest Frame Equivalent width) is explained by our model. This a relatively good for single variable, and should be looked at further.

X5 - Absolute Magnitude

```
Call:
lm(formula = RFEWIDTH ~ ABSMAG, data = QUASAR)

Residuals:
    Min      1Q  Median      3Q     Max 
-56.281 -22.287  -7.592  18.770 127.261 

Coefficients:
            Estimate Std. Error t value Pr(>|t|)    
(Intercept)  1263.64     318.22   3.971 0.000605 ***
ABSMAG         44.63      12.08   3.695 0.001197 ** 
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 38.36 on 23 degrees of freedom
Multiple R-squared:  0.3724,	Adjusted R-squared:  0.3451 
F-statistic: 13.65 on 1 and 23 DF,  p-value: 0.001197
```

T-Test –> High T Value, tells us that the result has a good probability
of being repeated

P value –> Low P-Value (under .05). This builds a strong case to reject the null hp

Adjusted R Squared -> .3724 (37.24%) of variability in Y1 (Rest Frame Equivalent width) is explained by our mod el. This a relatively good for single variable, and should be looked at further.

Identifying the best model

The best model is for X5 – Absolute magnitude since it has the lowest p-value and the highest adjusted R squared. The low p value gives us the reasoning to reject the null hypothesis and accept the alternative. Since we are looking at one variable at a time we will be looking at R squared. The high R squared tells us that 37.24% of variability in Y is explained by the absolute magnitude.