ECO 307: Practice Exam 1

R Code and Output

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```
glimpse(data)
```

```
## Observations: 88
## Variables: 6
## $ price    <dbl> 300000, 370000, 191000, 195000, 373000, 466275, 33250...
## $ assess   <dbl> 349.1, 351.5, 217.7, 231.8, 319.1, 414.5, 367.8, 300....
## $ bdrms    <int> 4, 3, 3, 3, 4, 5, 3, 3, 3, 3, 4, 5, 3, 3, 3, 4, 4, 3,...
## $ lotsize  <dbl> 6126, 9903, 5200, 4600, 6095, 8566, 9000, 6210, 6000,...
## $ sqrft    <int> 2438, 2076, 1374, 1448, 2514, 2754, 2067, 1731, 1767,...
## $ colonial <int> 1, 1, 0, 1, 1, 1, 1, 1, 0, 0, 1, 1, 1, 0, 1, 1, 0, 1,...
```

Real estate home prices regression

```
lmhouse <- lm(log(price) ~ lotsize + sqrft + bdrms + colonial +
                colonial:sqrft + colonial:lotsize, data=data)
summary(lmhouse)
```

```
##
## Call:
## lm(formula = log(price) ~ lotsize + sqrft + bdrms + colonial +
##     colonial:sqrft + colonial:lotsize, data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.73822 -0.10032 -0.01789  0.10860  0.68684
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)       1.172e+01  1.245e-01  94.098  < 2e-16 ***
## lotsize           1.587e-05  6.113e-06   2.595   0.0112 *
## sqrft             2.897e-04  6.285e-05   4.609 1.49e-05 ***
## bdrms             1.118e-02  2.949e-02   0.379   0.7057
## colonial         -4.420e-02  1.471e-01  -0.301   0.7646
## sqrft:colonial    1.135e-04  7.402e-05   1.534   0.1289
## lotsize:colonial -1.139e-05  6.472e-06  -1.759   0.0823 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1851 on 81 degrees of freedom
## Multiple R-squared:  0.6539, Adjusted R-squared:  0.6283
## F-statistic: 25.51 on 6 and 81 DF,  p-value: < 2.2e-16
```

```r
confint(lmhouse)
```

```
##                          2.5 %       97.5 %
## (Intercept)       1.146893e+01 1.196443e+01
## lotsize           3.702696e-06 2.803002e-05
## sqrft             1.646435e-04 4.147618e-04
## bdrms            -4.750107e-02 6.985701e-02
## colonial         -3.368825e-01 2.484747e-01
## sqrft:colonial   -3.373399e-05 2.608332e-04
## lotsize:colonial -2.426341e-05 1.490763e-06
```

Restricted regression 1

```
lmhouse_res1 <- lm(log(price) ~ lotsize + sqrft + bdrms, data=data)
summary(lmhouse_res1)
```

```
##
## Call:
## lm(formula = log(price) ~ lotsize + sqrft + bdrms, data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.73389 -0.10792 -0.01595  0.11181  0.63914
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 1.167e+01  9.354e-02 124.734  < 2e-16 ***
## lotsize     5.602e-06  2.038e-06   2.749  0.00732 **
## sqrft       3.641e-04  4.201e-05   8.668 2.77e-13 ***
## bdrms       2.524e-02  2.859e-02   0.883  0.37992
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1899 on 84 degrees of freedom
## Multiple R-squared:  0.6223, Adjusted R-squared:  0.6088
## F-statistic: 46.13 on 3 and 84 DF,  p-value: < 2.2e-16
```

```
confint(lmhouse_res1)
```

```
##                     2.5 %       97.5 %
## (Intercept)  1.148112e+01 1.185314e+01
## lotsize      1.549550e-06 9.654020e-06
## sqrft        2.805807e-04 4.476541e-04
## bdrms       -3.162111e-02 8.209873e-02
```

```
anova(lmhouse, lmhouse_res1)
```

```
## Analysis of Variance Table
##
## Model 1: log(price) ~ lotsize + sqrft + bdrms + colonial + colonial:sqrft +
##     colonial:lotsize
## Model 2: log(price) ~ lotsize + sqrft + bdrms
##   Res.Df    RSS Df Sum of Sq      F  Pr(>F)
## 1     81 2.7746
## 2     84 3.0284 -3  -0.25381 2.4699 0.06777 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Restricted regression 2

```
lmhouse_res2 <- lm(log(price) ~ sqrft + bdrms + colonial + colonial:sqrft, data=data)
summary(lmhouse_res2)
```

```
##
## Call:
## lm(formula = log(price) ~ sqrft + bdrms + colonial + colonial:sqrft,
##     data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.75341 -0.09898 -0.00433  0.10387  0.66124
##
## Coefficients:
##                   Estimate Std. Error t value Pr(>|t|)
## (Intercept)     1.174e+01  1.306e-01  89.907  < 2e-16 ***
## sqrft           3.476e-04  6.145e-05   5.657 2.13e-07 ***
## bdrms           1.169e-02  3.099e-02   0.377    0.707
## colonial       -5.610e-02  1.547e-01  -0.363    0.718
## sqrft:colonial  6.842e-05  7.413e-05   0.923    0.359
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1952 on 83 degrees of freedom
## Multiple R-squared:  0.6056, Adjusted R-squared:  0.5866
## F-statistic: 31.86 on 4 and 83 DF,  p-value: 4.446e-16
```

```
confint(lmhouse_res2)
```

```
##                        2.5 %       97.5 %
## (Intercept)     1.148165e+01 1.200114e+01
## sqrft           2.254060e-04 4.698623e-04
## bdrms          -4.994880e-02 7.332604e-02
## colonial       -3.637796e-01 2.515886e-01
## sqrft:colonial -7.901701e-05 2.158563e-04
```

```
anova(lmhouse, lmhouse_res2)
```

```
## Analysis of Variance Table
##
## Model 1: log(price) ~ lotsize + sqrft + bdrms + colonial + colonial:sqrft +
##     colonial:lotsize
## Model 2: log(price) ~ sqrft + bdrms + colonial + colonial:sqrft
##   Res.Df    RSS Df Sum of Sq      F   Pr(>F)
## 1     81 2.7746
## 2     83 3.1620 -2  -0.38742 5.6551 0.005024 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Scaled explanatory variables

```
lmhouse_scale <- lm(log(price) ~ scale(lotsize) + scale(sqrft) + scale(bdrms) + colonial +
                colonial:scale(sqrft) + colonial:scale(lotsize), data=data)
summary(lmhouse_scale)
```

```
##
## Call:
## lm(formula = log(price) ~ scale(lotsize) + scale(sqrft) + scale(bdrms) +
##     colonial + colonial:scale(sqrft) + colonial:scale(lotsize),
##     data = data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.73822 -0.10032 -0.01789  0.10860  0.68684
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)              12.483048   0.037151 336.004  < 2e-16 ***
## scale(lotsize)            0.161427   0.062198   2.595   0.0112 *
## scale(sqrft)              0.167214   0.036279   4.609 1.49e-05 ***
## scale(bdrms)              0.009405   0.024814   0.379   0.7057
## colonial                  0.081747   0.045301   1.805   0.0749 .
## scale(sqrft):colonial     0.065540   0.042726   1.534   0.1289
## scale(lotsize):colonial -0.115846   0.065846  -1.759   0.0823 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1851 on 81 degrees of freedom
## Multiple R-squared:  0.6539, Adjusted R-squared:  0.6283
## F-statistic: 25.51 on 6 and 81 DF,  p-value: < 2.2e-16
```

```
confint(lmhouse_scale)
```

```
##                                2.5 %      97.5 %
## (Intercept)              12.409128524 12.55696810
## scale(lotsize)            0.037671782  0.28518166
## scale(sqrft)              0.095030871  0.23939702
## scale(bdrms)             -0.039967047  0.05877717
## colonial                 -0.008386736  0.17188093
## scale(sqrft):colonial    -0.019470977  0.15055073
## scale(lotsize):colonial -0.246859629  0.01516725
```