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The aim of this project to use dummies variable to answer a lot of questions by using R packages.so, I have sample of 300 from dataset named car which is talking about used cars of general motors in 2005. To explain how qualities of cars effect on price.

Model 1:

$Y=\beta_0+\beta_1 D_{1i}+\beta_2 D_{2i}+\beta_3 D_{3i}+\beta_4 D_{4i}+\beta_5 D_{5i}+u_i$

$Y = 7.0626-2.0346D_{1i}+1.1339D_{2i}+0.3141D_{3i}-1.2103D_{4i}+1.4917D_{5i}$

H_0: $\beta_1=\beta_2=\beta_3=\beta_4=\beta_5=0$

H_1: at least one of them not equal zero

```
> model1<-lm(sample_car$price ~ sample_car$Make, data= sample_car)
> model1

Call:
lm(formula = sample_car$price ~ sample_car$Make, data = sample_car)

Coefficients:
          (Intercept)  sample_car$MakeCadillac  sample_car$MakeChevrolet    sample_car$MakePontiac
               7.0626                  -2.0346                    1.1339                    0.3141
     sample_car$MakeSAAB    sample_car$MakeSaturn
              -1.2103                   1.4917
```

```
> summary(model1)

Call:
lm(formula = sample_car$price ~ sample_car$Make, data = sample_car)

Residuals:
    Min      1Q  Median      3Q     Max 
-3.5870 -0.4141 -0.0306  0.4783  2.5625 

Coefficients:
                         Estimate Std. Error t value Pr(>|t|)    
(Intercept)                7.0626     0.1556  45.392  < 2e-16 ***
sample_car$MakeCadillac   -2.0346     0.2200  -9.247  < 2e-16 ***
sample_car$MakeChevrolet   1.1339     0.1762   6.437 4.95e-10 ***
sample_car$MakePontiac     0.3141     0.1916   1.639    0.102    
sample_car$MakeSAAB       -1.2103     0.2041  -5.929 8.51e-09 ***
sample_car$MakeSaturn      1.4917     0.2329   6.406 5.92e-10 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.8663 on 294 degrees of freedom
Multiple R-squared:  0.6326,	Adjusted R-squared:  0.6263 
F-statistic: 101.2 on 5 and 294 DF,  p-value: < 2.2e-16
```

Assume alpha = 0.05, Estimators are significant so, they effect on price of cars except beta 3 which is equal 0.102 and it is greater than alpha, we also know model as all is significant, now I interpret each beta

Beta 1: the expected price in make Cadillac is less than the expected price of make Buick by 2.0346 , Beta 2: the expected price in make Chevrolet is more than the expected price of make Buick by 1.1339, Beta 3: no difference significant between expected price in make Pontiac and make Buick, Beta 4: the expected price in make saap is less than the expected price of make Buick by 1.2103 and Beta5: the expected price in make Saturn is more than the expected price of make Buick by 1.4917

Model2:

$Y=\beta_0+\beta_1 D_{1i}+\beta_2 D_{2i}+\beta_3 D_{3i}+\beta_4 D_{4i}+\beta_5 D_{5i}+\beta_6 D_{6i}+\beta_7 D_{7i}+\beta_8 D_{8i}+\beta_9 D_{9i}+\beta_{10} D_{10i}+\beta_{11} D_{11i}+u_i$

$Y = 5.247-1.2181D_{1i}+0.275D_{2i}+0.1582D_{3i}-2.3992D_{4i}+0.1819D_{5i}+0.5553D_{6i}+1.2936D_{7i}+0.77D_{8i}+0.3027D_{9i}+2.544D_{10i}+1.0456D_{11i}$

H_0: $\beta_1=\beta_2=\beta_3=\beta_4=\beta_5=\beta_6=\beta_7=\beta_8=\beta_9=\beta_{10}=\beta_{11}=$zero

H_1: at least one of them not equal zero

```
> model2<-lm(sample_car$price ~ sample_car$Make+sample_car$Type+sample_car$Cylinder, data= sample_car)
> model2

Call:
lm(formula = sample_car$price ~ sample_car$Make + sample_car$Type +
    sample_car$Cylinder, data = sample_car)

Coefficients:
              (Intercept)      sample_car$MakeCadillac     sample_car$MakeChevrolet       sample_car$MakePontiac
                   5.2470                      -1.2181                       0.2750                       0.1582
        sample_car$MakeSAAB        sample_car$MakeSaturn         sample_car$TypeCoupe     sample_car$TypeHatchback
                  -2.3992                       0.1819                       0.5553                       1.2936
       sample_car$TypeSedan          sample_car$TypeWagon        sample_car$Cylinderlow  sample_car$Cylindermoderate
                   0.7700                       0.3027                       2.5440                       1.0456
```

```
> summary(model2)

Call:
lm(formula = sample_car$price ~ sample_car$Make + sample_car$Type +
    sample_car$Cylinder, data = sample_car)

Residuals:
     Min       1Q   Median       3Q      Max
-1.05940 -0.36604 -0.04014  0.33037  1.92298

Coefficients:
                           Estimate Std. Error t value Pr(>|t|)
(Intercept)                  5.2470     0.1990  26.368  < 2e-16 ***
sample_car$MakeCadillac     -1.2181     0.1559  -7.814 1.05e-13 ***
sample_car$MakeChevrolet     0.2750     0.1228   2.240  0.02584 *
sample_car$MakePontiac       0.1582     0.1191   1.329  0.18506
sample_car$MakeSAAB         -2.3992     0.1509 -15.897  < 2e-16 ***
sample_car$MakeSaturn        0.1819     0.1612   1.129  0.25996
sample_car$TypeCoupe         0.5553     0.1699   3.268  0.00121 **
sample_car$TypeHatchback     1.2936     0.1929   6.707 1.05e-10 ***
sample_car$TypeSedan         0.7700     0.1506   5.114 5.77e-07 ***
sample_car$TypeWagon         0.3027     0.1789   1.692  0.09181 .
sample_car$Cylinderlow       2.5440     0.1350  18.847  < 2e-16 ***
sample_car$Cylindermoderate  1.0456     0.1242   8.420 1.80e-15 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.5102 on 288 degrees of freedom
Multiple R-squared:  0.8751,	Adjusted R-squared:  0.8704
F-statistic: 183.5 on 11 and 288 DF,  p-value: < 2.2e-16
```

Assume alpha equal 0.05, estimators are significant so they effect on price of car except beta 3, beta 5 and beta 9. Model as all is significant by p-value. Now, I interpret each beta

Beta 1: the expected price of make Cadillac is less than the expected price of make Buick by 1.2181, holding cylinder and type constant, Beta 2: the expected price of make Chevrolet is more than the expected price of make Buick by 0.2750, holding cylinder and type constant, Beta 3: no difference significant between expected price in make Pontiac and make Buick, holding cylinder and type constant, Beta 4: the expected price of make saap is less than the expected price of make Buick by 2.3992, holding cylinder and type constant, Beta 5: no difference significant between expected price in make Saturn and make Buick, holding cylinder and type constant, Beta 6: the expected price of type coupe is more than expected price of type Convertible by 0.5553, holding make and cylinder constant, Beta 7: the expected price of type hatchback is more than expected price of type Convertible by 1.2936, holding make and cylinder constant, Beta 8: the expected price of type sedan is more than expected price of type Convertible by 0.7700, holding make and cylinder constant, Beta 9: no difference significant between expected price in type wagon and type convertible, holding cylinder and make constant, Beta 10: the expected price of cylinder low is more than expected price of cylinder high by 2.544, holding make and type constant, and Beta 11: the expected price of cylinder moderate is more than expected price of cylinder high by 1.0456, holding make and type constant.

Model 3:

$Y=\beta_0+\beta_1D_{1i}+\beta_2D_{2i}+$
$\beta_3D_{3i}+\beta_4D_{4i}+\beta_5D_{5i}+\beta_6D_{6i}+\beta_7D_{7i}+\beta_8D_{1i}D_{6i}+\beta_9D_{2i}D_{6i}+\beta_{10}D_{3i}D_{6i}+\beta_{11}D_{4i}D_{6i}+\beta_{12}D_{5i}D_{6i}$
$+\beta_{13}D_{1i}D_{7i}+\beta_{14}D_{2i}D_{7i}+\beta_{15}D_{3i}D_{7i}+\beta_{16}D_{4i}D_{7i}+\beta_{17}D_{5i}D_{7i}$

$Y= 5.99755 -1.13485D_{1i}-0.82638D_{2i}+ 0.23339D_{3i}-$
$2.03775D_{4i}+0.73044D_{5i}+1.8925D_{6i}+1.06502D_{7i}+1.90533D_{2i}D_{6i}-0.04142D_{3i}D_{6i}-$
$0.49586D_{1i}D_{7i}+1.19614\ D_{2i}D_{7i}$

H_0: $\beta_8=\beta_9=\beta_{10}=\beta_{11}=\beta_{12}=\beta_{13}=\beta_{14}=\beta_{15}=\beta_{16}=\beta_{17}$=zero

H_1: at least one of them not equal zero

```
> model3<-lm(sample_car$price ~ sample_car$Make*sample_car$Cylinder,data=sample_car)
> model3

Call:
lm(formula = sample_car$price ~ sample_car$Make * sample_car$Cylinder,
    data = sample_car)

Coefficients:
                              (Intercept)                                  sample_car$MakeCadillac
                                  5.99755                                                 -1.13485
                ample_car$MakeChevrolet                                   sample_car$MakePontiac
                                 -0.82638                                                  0.23339
                    sample_car$MakeSAAB                                     sample_car$MakeSaturn
                                 -2.03775                                                  0.73044
                  sample_car$Cylinderlow                               sample_car$Cylindermoderate
                                  1.89250                                                  1.06502
    sample_car$MakeCadillac:sample_car$Cylinderlow      sample_car$MakeChevrolet:sample_car$Cylinderlow
                                       NA                                                  1.90533
     sample_car$MakePontiac:sample_car$Cylinderlow          sample_car$MakeSAAB:sample_car$Cylinderlow
                                 -0.04142                                                       NA
      sample_car$MakeSaturn:sample_car$Cylinderlow   sample_car$MakeCadillac:sample_car$Cylindermoderate
                                       NA                                                 -0.49586
sample_car$MakeChevrolet:sample_car$Cylindermoderate   sample_car$MakePontiac:sample_car$Cylindermoderate
                                  1.19614                                                       NA
    sample_car$MakeSAAB:sample_car$Cylindermoderate     sample_car$MakeSaturn:sample_car$Cylindermoderate
                                       NA                                                       NA
```

```
> summary(model3)

Call:
lm(formula = sample_car$price ~ sample_car$Make * sample_car$Cylinder,
    data = sample_car)

Residuals:
     Min       1Q   Median       3Q      Max
-1.12007 -0.33382 -0.04743  0.34197  1.78995

Coefficients: (6 not defined because of singularities)
                                                      Estimate Std. Error t value Pr(>|t|)
(Intercept)                                            5.99755    0.21714  27.621  < 2e-16 ***
sample_car$MakeCadillac                               -1.13485    0.24225  -4.685 4.33e-06 ***
sample_car$MakeChevrolet                              -0.82638    0.28878  -2.862  0.00452 **
sample_car$MakePontiac                                 0.23339    0.12423   1.879  0.06130 .
sample_car$MakeSAAB                                   -2.03775    0.38985  -5.227 3.31e-07 ***
sample_car$MakeSaturn                                  0.73044    0.36749   1.988  0.04780 *
sample_car$Cylinderlow                                 1.89250    0.42055   4.500 9.87e-06 ***
sample_car$Cylindermoderate                            1.06502    0.19740   5.395 1.43e-07 ***
sample_car$MakeCadillac:sample_car$Cylinderlow              NA         NA      NA       NA
sample_car$MakeChevrolet:sample_car$Cylinderlow        1.90533    0.46584   4.090 5.60e-05 ***
sample_car$MakePontiac:sample_car$Cylinderlow         -0.04142    0.40009  -0.104  0.91762
sample_car$MakeSAAB:sample_car$Cylinderlow                  NA         NA      NA       NA
sample_car$MakeSaturn:sample_car$Cylinderlow                NA         NA      NA       NA
sample_car$MakeCadillac:sample_car$Cylindermoderate   -0.49586    0.28052  -1.768  0.07818 .
sample_car$MakeChevrolet:sample_car$Cylindermoderate   1.19614    0.28616   4.180 3.87e-05 ***
sample_car$MakePontiac:sample_car$Cylindermoderate          NA         NA      NA       NA
sample_car$MakeSAAB:sample_car$Cylindermoderate             NA         NA      NA       NA
sample_car$MakeSaturn:sample_car$Cylindermoderate           NA         NA      NA       NA
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.5037 on 288 degrees of freedom
Multiple R-squared:  0.8783,    Adjusted R-squared:  0.8737
F-statistic:   189 on 11 and 288 DF,  p-value: < 2.2e-16
```

Beta 10 is insignificant so, no interaction between pontiac and cylinder low and beta 13 is also insignificant so, no interaction between Cadillac and cylinder moderate. Beta 9 is significant so, interaction between Chevrolet and cylinder low is exist. Beta 14 is significant so, interaction between Chevrolet and cylinder moderate is exist.

Model 4:

$Y = \beta_0 + \beta_1 D_{1i} + \beta_2 D_{2i} + \beta_3 D_{3i} + \beta_4 D_{4i} + \beta_5 D_{5i} + \beta_6 x_{1i} + \beta_7 x_{2i} + u_i$

$Y = 4.869 - 1.0819 D_{1i} + 1.361 D_{2i} + 0.4891 D_{3i} - 0.9539 D_{4i} + 1.811 D_{5i} + 0.00003246 x_{1i} + 0.3753 x_{2i}$

H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$

H_1: at least one of them not equal zero

```
> model4<-lm(sample_car$price ~ sample_car$Make+sample_car$Mileage+sample_car$Doors, data= sample_car)
> model4

Call:
lm(formula = sample_car$price ~ sample_car$Make + sample_car$Mileage +
    sample_car$Doors, data = sample_car)

Coefficients:
            (Intercept)   sample_car$MakeCadillac  sample_car$MakeChevrolet    sample_car$MakePontiac
              4.869e+00                -1.819e+00                 1.361e+00                 4.891e-01
     sample_car$MakeSAAB     sample_car$MakeSaturn        sample_car$Mileage          sample_car$Doors
             -9.539e-01                 1.811e+00                 3.246e-05                 3.753e-01
```

```
> summary(model4)

Call:
lm(formula = sample_car$price ~ sample_car$Make + sample_car$Mileage +
    sample_car$Doors, data = sample_car)

Residuals:
     Min       1Q   Median       3Q      Max
-2.84278 -0.42279 -0.01095  0.35171  2.20856

Coefficients:
                           Estimate Std. Error t value Pr(>|t|)
(Intercept)               4.869e+00  3.102e-01  15.696  < 2e-16 ***
sample_car$MakeCadillac  -1.819e+00  2.017e-01  -9.016  < 2e-16 ***
sample_car$MakeChevrolet  1.361e+00  1.628e-01   8.362 2.55e-15 ***
sample_car$MakePontiac    4.891e-01  1.752e-01   2.791   0.0056 **
sample_car$MakeSAAB      -9.539e-01  1.879e-01  -5.076 6.88e-07 ***
sample_car$MakeSaturn     1.811e+00  2.153e-01   8.413 1.81e-15 ***
sample_car$Mileage        3.246e-05  5.909e-06   5.494 8.57e-08 ***
sample_car$Doors          3.753e-01  5.877e-02   6.385 6.74e-10 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.7858 on 292 degrees of freedom
Multiple R-squared:  0.6998,    Adjusted R-squared:  0.6926
F-statistic: 97.22 on 7 and 292 DF,  p-value: < 2.2e-16
```

Assume alpha = 0.05, Model as all is significant and Estimators also are significant so, I show how make of cars, mileage and doors effect on price of the cars.

Beta 1: the expected price of make Cadillac is less than expected price of make Buick by 1.0819, holding mileage and doors constant, Beta 2: the expected price of make Chevrolet is more than expected price of make Buick by 1.361, holding mileage and doors constant, Beta 3: the expected price of make Pontiac is more than expected price of make Buick by 0.4891, holding mileage and doors constant, Beta 4: the expected price of make saap is more than expected price of make Buick by 0.9539, holding mileage and doors constant, Beta 5: the expected price of make Saturn is less than expected price of make Buick by 1.811, holding mileage and doors constant, Beta 6: when mileage increase by one unit, the expected price will increase by 0.0000324 ,and Beta 7: when doors increase by one unit, the expected price will increase by 0.3753.

Model 5:

$Y = \beta_0 + \beta_1 D_{1i} + \beta_2 D_{2i} + \beta_3 D_{3i} + \beta_4 D_{4i} + \beta_5 x_i + \beta_6 D_{1i} x_i + \beta_7 D_{1i} x_i + \beta_8 D_{1i} x_i + \beta_9 D_{1i} x_i + u_i$

$Y = 4.545 + 2.469 D_{1i} + 2.498 D_{2i} + 1.656 D_{3i} + 2.641 D_{4i} + 0.00002761 x_i + 0.000003625 D_{1i} x_i + 0.00005525 D_{1i} x_i + 0.00002686 D_{1i} x_i - 0.00003841 D_{1i} x_i$

H_0: $\beta_6 = \beta_7 = \beta_8 = \beta_9 =$zero

H_1: at least one of them not equal zero

```
> model5<-lm(sample_car$price ~ sample_car$Type*sample_car$Mileage, data=sample_car)
> model5

Call:
lm(formula = sample_car$price ~ sample_car$Type * sample_car$Mileage,
    data = sample_car)

Coefficients:
                           (Intercept)                         sample_car$TypeCoupe
                             4.545e+00                                    2.469e+00
                 sample_car$TypeHatchback                           sample_car$TypeSedan
                             2.498e+00                                    1.656e+00
                   sample_car$TypeWagon                           sample_car$Mileage
                             2.641e+00                                    2.761e-05
    sample_car$TypeCoupe:sample_car$Mileage  sample_car$TypeHatchback:sample_car$Mileage
                             3.625e-06                                    5.525e-05
    sample_car$TypeSedan:sample_car$Mileage      sample_car$TypeWagon:sample_car$Mileage
                             2.686e-05                                   -3.841e-05
```

```
                              2.686e-05                                             -3.841e-05

> summary(model5)

Call:
lm(formula = sample_car$price ~ sample_car$Type * sample_car$Mileage,
    data = sample_car)

Residuals:
    Min      1Q  Median      3Q     Max
-2.6660 -0.9651  0.0693  1.0030  3.1848

Coefficients:
                                           Estimate Std. Error t value Pr(>|t|)
(Intercept)                               4.545e+00  8.964e-01   5.070 7.11e-07 ***
sample_car$TypeCoupe                      2.469e+00  1.063e+00   2.323   0.0209 *
sample_car$TypeHatchback                  2.498e+00  1.306e+00   1.912   0.0568 .
sample_car$TypeSedan                      1.656e+00  9.244e-01   1.791   0.0743 .
sample_car$TypeWagon                      2.641e+00  1.152e+00   2.292   0.0226 *
sample_car$Mileage                        2.761e-05  3.911e-05   0.706   0.4807
sample_car$TypeCoupe:sample_car$Mileage   3.625e-06  4.701e-05   0.077   0.9386
sample_car$TypeHatchback:sample_car$Mileage  5.525e-05  6.213e-05   0.889   0.3746
sample_car$TypeSedan:sample_car$Mileage   2.686e-05  4.057e-05   0.662   0.5085
sample_car$TypeWagon:sample_car$Mileage  -3.841e-05  5.219e-05  -0.736   0.4623
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1.229 on 290 degrees of freedom
Multiple R-squared:  0.2708,    Adjusted R-squared:  0.2481
F-statistic: 11.96 on 9 and 290 DF,  p-value: 4.803e-16
```

Assume the alpha= 0.05, beta 6 beta 7 beta 8 and beta 9 are insignificant so, no interaction between type of cars and mileage.

Beta1 is significant, so expected price of car of type coupe is higher than expected price of type convertible by 2.469 holding mileage constant, beta 3 and beta 2 is insignificant, no difference between type sedan(hatchback) and convertible, beta 4 (significant) the expected price of type wagon is higher than expected price of type convertible by 2.641 holding mileage constant.

Model 6:

$$Y = \beta_0 + \beta_1 D_{1i} + \beta_2 D_{2i} + \beta_3 D_{3i} + \beta_4 D_{1i}D_{2i} + \beta_5 D_{1i}D_{3i} + \beta_6 D_{2i}D_{3i} + \beta_7 D_{1i}D_{3i}D_{2i} + u_i$$

$$Y = 9.01966 - 1.70432\, D_{1i} - 0.34788\, D_{2i} + 0.04138 D_{3i} - 0.86119 D_{1i}D_{2i} - 0.37682 D_{1i}D_{3i} - 0.30259 D_{2i}D_{3i} + 1.40748 D_{1i}D_{3i}D_{2i}$$

First-

H_0: $\beta_1 = \beta_2 = \beta_3 = 0$

H_1: at least one of them not equal zero

```
> model6<-lm(sample_car$price ~ sample_car$Cruise*sample_car$Leather*sample_car$Sound, data=sample_car)
> model6

Call:
lm(formula = sample_car$price ~ sample_car$Cruise * sample_car$Leather *
    sample_car$Sound, data = sample_car)

Coefficients:
                            (Intercept)                                   sample_car$Cruise
                                9.01966                                            -1.70432
                     sample_car$Leather                                    sample_car$Sound
                               -0.34788                                             0.04138
   sample_car$Cruise:sample_car$Leather                  sample_car$Cruise:sample_car$Sound
                               -0.86119                                            -0.37682
    sample_car$Leather:sample_car$Sound   sample_car$Cruise:sample_car$Leather:sample_car$Sound
                               -0.30259                                             1.40748
```

```
-0.30259
```

```
> summary(model6)

Call:
lm(formula = sample_car$price ~ sample_car$Cruise * sample_car$Leather *
    sample_car$Sound, data = sample_car)

Residuals:
    Min      1Q  Median      3Q     Max
-2.9942 -0.7646 -0.0215  0.6980  3.6374

Coefficients:
                                                      Estimate Std. Error t value Pr(>|t|)
(Intercept)                                            9.01966    0.29208  30.881  < 2e-16 ***
sample_car$Cruise                                     -1.70432    0.36480  -4.672 4.56e-06 ***
sample_car$Leather                                    -0.34788    0.45248  -0.769   0.4426
sample_car$Sound                                       0.04138    0.44032   0.094   0.9252
sample_car$Cruise:sample_car$Leather                  -0.86119    0.52445  -1.642   0.1016
sample_car$Cruise:sample_car$Sound                    -0.37682    0.51970  -0.725   0.4690
sample_car$Leather:sample_car$Sound                   -0.30259    0.58111  -0.521   0.6030
sample_car$Cruise:sample_car$Leather:sample_car$Sound  1.40748    0.66998   2.101   0.0365 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1.093 on 292 degrees of freedom
Multiple R-squared:  0.4193,	Adjusted R-squared:  0.4054
F-statistic: 30.12 on 7 and 292 DF,  p-value: < 2.2e-16
```

Assume alpha equal 0.05, beta 2 and beta 3 are no significant. Beta 1 is significant, for no leather and no sound difference between cruise or not equal -1.70432

<u>Second-</u>

H_0: $\beta_4 = \beta_5 = \beta_6 = \beta_7 = 0$

H_1: at least one of them not equal zero

Assume alpha equal 0.05. beta 4, beta 5 and beta 6 are insignificant so, there are no interaction between leather, cruise and sound but beta 7 is significant so, interaction between them with each other is exist.

Model 7:

$Y = \beta_0 + \beta_1 x_i + \beta_2 (x_i - 15) D_i + u_i$

$Y = 6.52 + \beta_1 x_i + 0.00003938 (x_i - 15) D_i$

H_0: β_2 =zero

H_1: β_2 not equal zero

```
> model7<-lm( sample_car$price~(sample_car$Mileage<15000)*sample_car$Mileage+(sample_car$Mileage>=15000)*sample_car$Mileage)
> model7

Call:
lm(formula = sample_car$price ~ (sample_car$Mileage < 15000) *
    sample_car$Mileage + (sample_car$Mileage >= 15000) * sample_car$Mileage)

Coefficients:
                            (Intercept)                     sample_car$Mileage < 15000TRUE
                              6.520e+00                                         -2.714e-01
                     sample_car$Mileage                    sample_car$Mileage >= 15000TRUE
                              3.938e-05                                                 NA
 sample_car$Mileage < 15000TRUE:sample_car$Mileage  sample_car$Mileage:sample_car$Mileage >= 15000TRUE
                              2.498e-05                                                 NA
```

```
> summary(model7)

Call:
lm(formula = sample_car$price ~ (sample_car$Mileage < 15000) *
    sample_car$Mileage + (sample_car$Mileage >= 15000) * sample_car$Mileage)

Residuals:
    Min      1Q  Median      3Q     Max
-3.4895 -1.1177  0.1275  1.1078  3.2459

Coefficients: (2 not defined because of singularities)
                                                     Estimate Std. Error t value Pr(>|t|)
(Intercept)                                         6.520e+00  4.372e-01  14.913   <2e-16 ***
sample_car$Mileage < 15000TRUE                     -2.714e-01  5.750e-01  -0.472   0.6373
sample_car$Mileage                                  3.938e-05  1.840e-05   2.140   0.0331 *
sample_car$Mileage >= 15000TRUE                            NA         NA      NA       NA
sample_car$Mileage < 15000TRUE:sample_car$Mileage   2.498e-05  4.049e-05   0.617   0.5378
sample_car$Mileage:sample_car$Mileage >= 15000TRUE         NA         NA      NA       NA
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 1.383 on 296 degrees of freedom
Multiple R-squared:  0.05734,   Adjusted R-squared:  0.04779
F-statistic: 6.002 on 3 and 296 DF,  p-value: 0.0005553
```

assume alpha equal 0.05, beta 2 is significant so, regression model of price and number of miles change after 15 thousands miles