```
                                                              ___  ____  ____  ____  ____(R)
                                                             /__    /   ____/   /   ____/
                                                            ___/   /   /___/   /   /___/
                                                              Statistics/Data analysis

                                                                User: ALGhomework8_results
```


```
  ___  ____  ____  ____  ____ (R)
 /__    /   ____/   /   ____/
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```
Notes:
      1. Unicode is supported; see help unicode_advice.

. ** Q1

.
. * a) Every unit increase in IQ results in an increase of $500 in annual earnings.

. * b) A one unit increase in IQ results in exponential growth in annual earnings.

. * c) If we increase IQ by one percent, we expect annual earnings semi-elasticity to increase by 500 (B1=50,000/100) un

.
. * d) IQ only effects annual earnings if IQ is greater than 100 and results in a $10,000 increase in earnings.

.
. * e) “if we increase IQ by 1, we’d expect earnings to change by 100*(0.010 = β1) percent which is also its semi-elast

.
. * f) The effect of IQ is equal to elasticity and a 1% change in IQ is expected to result in earnings to change by 0.9(

. * g) MEM = 50,000 / 110 = 454.545

. **************

. use "C:\Users\antho\Documents\UCI Spring 2021\Econ 129\Data\ADVERTISING.DTA"

. ** Q2

.
. * a)

.
. reg sales tv

      Source |       SS           df       MS      Number of obs   =       200
-------------+----------------------------------   F(1, 198)       =    312.14
       Model |  3.3146e+09         1  3.3146e+09   Prob > F        =    0.0000
    Residual |  2.1025e+09       198  10618841.6   R-squared       =    0.6119
-------------+----------------------------------   Adj R-squared   =    0.6099
       Total |  5.4171e+09       199    27221853   Root MSE        =    3258.7

------------------------------------------------------------------------------
       sales |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          tv |   47.53664   2.690607    17.67   0.000     42.23072    52.84256
       _cons |   7032.594   457.8429    15.36   0.000     6129.719    7935.468
------------------------------------------------------------------------------
```

```
20 .
21 . estimates store MODEL1

22 .
23 . reg sales lntv

      Source |       SS           df       MS      Number of obs   =       200
-------------+----------------------------------   F(1, 198)       =    257.22
       Model |  3.0609e+09         1  3.0609e+09   Prob > F        =    0.0000
    Residual |  2.3562e+09       198  11900116.9   R-squared       =    0.5650
-------------+----------------------------------   Adj R-squared   =    0.5628
       Total |  5.4171e+09       199    27221853   Root MSE        =    3449.7

------------------------------------------------------------------------------
       sales |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lntv |   3900.875   243.2267    16.04   0.000     3421.227    4380.522
       _cons |  -4202.587   1162.253    -3.62   0.000     -6494.57   -1910.604
------------------------------------------------------------------------------

24 .
25 . estimates store MODEL2

26 .
27 . reg lnsales tv

      Source |       SS           df       MS      Number of obs   =       200
-------------+----------------------------------   F(1, 198)       =    317.09
       Model |   21.032308         1   21.032308   Prob > F        =    0.0000
    Residual |  13.1333104       198  .066329851   R-squared       =    0.6156
-------------+----------------------------------   Adj R-squared   =    0.6137
       Total |  34.1656184       199  .171686525   Root MSE        =    .25755

------------------------------------------------------------------------------
     lnsales |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          tv |   .0037867   .0002127    17.81   0.000     .0033673     .004206
       _cons |   8.914947   .0361853   246.37   0.000     8.843589    8.986306
------------------------------------------------------------------------------

28 .
29 . estimates store MODEL3

30 .
31 . reg lnsales lntv

      Source |       SS           df       MS      Number of obs   =       200
-------------+----------------------------------   F(1, 198)       =    569.85
       Model |  25.3555468         1  25.3555468   Prob > F        =    0.0000
    Residual |  8.81007162       198  .044495311   R-squared       =    0.7421
-------------+----------------------------------   Adj R-squared   =    0.7408
       Total |  34.1656184       199  .171686525   Root MSE        =    .21094

------------------------------------------------------------------------------
     lnsales |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        lntv |   .3550358   .0148728    23.87   0.000     .3257063    .3843652
       _cons |   7.813001   .0710693   109.93   0.000     7.672851    7.953151
------------------------------------------------------------------------------
```

```
32 .
33 . estimates store MODEL4

34 .
35 . * b)

36 .
37 . estimates table MODEL*, b(%6.3g) t(%4.2f) p(%4.3f) stat(N r2)
```

Variable	MODEL1	MODEL2	MODEL3	MODEL4
tv	47.5		.0038	
	17.67		17.81	
	0.000		0.000	
lntv		3901		.355
		16.04		23.87
		0.000		0.000
_cons	7033	-4203	8.91	7.81
	15.36	-3.62	246.37	109.93
	0.000	0.000	0.000	0.000
N	200	200	200	200
r2	.612	.565	.616	.742

legend: b/t/p

```
38 .
39 . ** My preferred model is Model 4 because it has the highest R^2 which measures the fit of the data and will have bette

40 .
41 . * c)

42 .
43 . reg sales lntv
```

Source	SS	df	MS
Model	3.0609e+09	1	3.0609e+09
Residual	2.3562e+09	198	11900116.9
Total	5.4171e+09	199	27221853

Number of obs	=	200
F(1, 198)	=	257.22
Prob > F	=	0.0000
R-squared	=	0.5650
Adj R-squared	=	0.5628
Root MSE	=	3449.7

sales	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lntv	3900.875	243.2267	16.04	0.000	3421.227	4380.522
_cons	-4202.587	1162.253	-3.62	0.000	-6494.57	-1910.604

```
44 .
45 . sum lntv
```

Variable	Obs	Mean	Std. Dev.	Min	Max
lntv	200	4.672052	1.005398	-.356675	5.69171

```
46 .
47 . display "MEM = " _b[lntv]/r(mean)
   MEM = 834.93825

48 .
49 . gen AME = _b[lntv]/lntv

50 .
51 . sum AME

      Variable |        Obs        Mean    Std. Dev.       Min        Max
   ------------+---------------------------------------------------------
           AME |        200    826.2057    886.1645  -10936.78   2764.643

52 .
53 . display "AME = " r(mean)
   AME = 826.20566

54 .
55 . * d)

56 .
57 . reg sales tv

        Source |       SS           df       MS      Number of obs   =       200
   ------------+----------------------------------   F(1, 198)       =    312.14
         Model |  3.3146e+09         1  3.3146e+09   Prob > F        =    0.0000
      Residual |  2.1025e+09       198  10618841.6   R-squared       =    0.6119
   ------------+----------------------------------   Adj R-squared   =    0.6099
         Total |  5.4171e+09       199    27221853   Root MSE        =    3258.7

   ------------------------------------------------------------------------------
         sales |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
   ------------+----------------------------------------------------------------
            tv |   47.53664   2.690607    17.67   0.000     42.23072    52.84256
         _cons |   7032.594   457.8429    15.36   0.000     6129.719    7935.468
   ------------------------------------------------------------------------------

58 .
59 . predict psales
   (option xb assumed; fitted values)

60 .
61 . sum sales psales

      Variable |        Obs        Mean    Std. Dev.       Min        Max
   ------------+---------------------------------------------------------
         sales |        200     14022.5    5217.457       1600      27000
        psales |        200     14022.5    4081.222   7065.869   21122.45

62 .
63 . ** Yes, the prediction on average equals sales on average.

64 .
65 . * e)
```

```
66 .
67 . reg lnsales tv

      Source |       SS           df       MS      Number of obs   =       200
-------------+----------------------------------   F(1, 198)       =    317.09
       Model |   21.032308         1   21.032308   Prob > F        =    0.0000
    Residual |  13.1333104       198  .066329851   R-squared       =    0.6156
-------------+----------------------------------   Adj R-squared   =    0.6137
       Total |  34.1656184       199  .171686525   Root MSE        =    .25755

------------------------------------------------------------------------------
     lnsales |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          tv |   .0037867   .0002127    17.81   0.000     .0033673     .004206
       _cons |   8.914947   .0361853   246.37   0.000     8.843589    8.986306
------------------------------------------------------------------------------

68 .
69 . predict plnsales, xb

70 .
71 . generate p_sales=exp(plnsales)

72 .
73 . sum sales p_sales

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       sales |        200     14022.5    5217.457       1600      27000
     p_sales |        200    13675.95    4350.734   7462.142   22863.81

74 .
75 . ** No, the prediction on average does not equal sales on average.

76 .
77 . * f)

78 .
79 . gen p_sales1 = exp(plnsales) * exp((.25755^2)/2)

80 .
81 . sum sales p_sales1

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
       sales |        200     14022.5    5217.457       1600      27000
    p_sales1 |        200    14137.13     4497.45   7713.781   23634.83

82 .
83 . ** Yes it does, without the correction there is an underestimate of the mean and the inclusion of exp(SE^2/2) corrects

84 .
85 . * g)

86 .
```

```
 87 . sort tv

 88 .
 89 . scatter psales tv, c(I) || scatter plnsales tv, c(I) || scatter p_sales1 tv, c(I)
    (note:  named style I not found in class connectstyle, default attributes used)
    (note:  named style I not found in class connectstyle, default attributes used)
    (note:  named style I not found in class connectstyle, default attributes used)

 90 .
 91 . scatter psales tv, c(I) || scatter p_sales tv, c(I) || scatter p_sales1 tv, c(I)
    (note:  named style I not found in class connectstyle, default attributes used)
    (note:  named style I not found in class connectstyle, default attributes used)
    (note:  named style I not found in class connectstyle, default attributes used)

 92 .
 93 . ** The linear prediction is very similar to the log-linear model with the correction showing that these are good uses

 94 . **************

 95 . ** Q3

 96 . * a)

 97 . describe sales tv radio newspaper

                  storage   display    value
    variable name   type    format     label      variable label
    --------------------------------------------------------------------------------------------------------------------

    sales           float   %9.0g                 Number of units sold
    tv              float   %9.0g                 TV advertising in $ thousands
    radio           float   %9.0g                 Radio advertising in $ thousands
    newspaper       float   %9.0g                 Newspaper advertising in $ thousands

 98 . sum sales tv radio newspaper

        Variable |        Obs        Mean    Std. Dev.       Min        Max
    -------------+---------------------------------------------------------
           sales |        200     14022.5    5217.457       1600      27000
              tv |        200    147.0425    85.85424         .7      296.4
           radio |        200      23.264    14.84681          0       49.6
       newspaper |        200      30.554    21.77862         .3        114

 99 . * b)

100 . ttest sales=13000

    One-sample t test
    ------------------------------------------------------------------------------
    Variable |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
    ---------+--------------------------------------------------------------------
       sales |     200     14022.5    368.9299    5217.457    13294.99    14750.01
    ------------------------------------------------------------------------------
        mean = mean(sales)                                            t =   2.7715
    Ho: mean = 13000                                 degrees of freedom =      199

      Ha: mean < 13000            Ha: mean != 13000             Ha: mean > 13000
     Pr(T < t) = 0.9969         Pr(|T| > |t|) = 0.0061          Pr(T > t) = 0.0031
```

```
101 . * c)

102 . graph matrix sales tv radio newspaper, half

103 . ** The variables that are important indicators for sales is tv and radio advertising.

104 . * d)

105 . correlated sales tv radio newspaper
    command correlated is unrecognized
    r(199);

106 . correlate sales tv radio newspaper
    (obs=200)

                 |    sales       tv    radio newspa~r
    -------------+------------------------------------
           sales |   1.0000
              tv |   0.7822   1.0000
           radio |   0.5762   0.0548   1.0000
       newspaper |   0.2283   0.0566   0.3541   1.0000


107 . ** The variables with the most correlation to sales is tv and radio which is not a surprise from the matrix.

108 . * e)

109 . reg sales tv radio newspaper

          Source |       SS           df       MS      Number of obs   =       200
    -------------+----------------------------------   F(3, 196)       =    570.27
           Model |  4.8603e+09         3  1.6201e+09   Prob > F        =    0.0000
        Residual |   556825286       196  2840945.34   R-squared       =    0.8972
    -------------+----------------------------------   Adj R-squared   =    0.8956
           Total |  5.4171e+09       199    27221853   Root MSE        =    1685.5

    ------------------------------------------------------------------------------
           sales |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
    -------------+----------------------------------------------------------------
              tv |   45.76465   1.394897    32.81   0.000     43.01371    48.51558
           radio |     188.53   8.611234    21.89   0.000     171.5474    205.5126
       newspaper |  -1.037494    5.87101    -0.18   0.860    -12.61595    10.54097
           _cons |   2938.889   311.9082     9.42   0.000     2323.762    3554.017
    ------------------------------------------------------------------------------

110 . ** The variables that are statistically significant are, again, tv and radio because of their p-value being less than

111 . * f)

112 . ** The only regressor that I didn't expect to be negative was the newspaper regressor and whowed that money put into i

113 .
```