

44-6873-00L- Econometrics for Business and Economics	Dr Amr Algarhi (Miro)
Exercise sheet 4. Multiple regression analysis Week 17	Department of Management Sheffield Hallam University

Question 1 (Stata). Suppose the following model of hamburger sales for Big Andy's Burger Barn, where sales depend on the price charged and the level of advertising.

$$SALES = \beta_1 + \beta_2 PRICE + \beta_3 ADVERT + u$$

where *SALES* is monthly sales in given city, and is measured in \$1,000 increments, *PRICE* is price of a hamburger measured in dollars, *ADVERT* is the advertising expenditure also measured in thousands of dollars.

Download the "**andy.dta**" file, which includes the data for the above sales model.

- (a) Open the file "**andy.dta**". Check the summary statistics of the data and list the first four observations.

Hint: summarize

Hint: list in 1/4

- (b) Estimate the sales model.

Hint: reg sales price advert

Hint: reg sales price advert, level(90)

- (c) Obtain the estimated variances for the regression coefficients.

Hint: estat vce

- (d) Suppose Big Andy wants to predict sales revenue for a price of \$5.50 and an advertising expenditure of \$1,200. What are the predicted sales for the given price and advertising expenditure?

Hint:

`di _b[_cons] + _b[price]*5.50 + _b[advert]*1.2`

OR

```
set obs 76
replace price = 5.50 in 76
replace advert = 1.2 in 76
predict yhat
list yhat in 76
```

- (e) Construct a 99% confidence interval for the partial slope parameter β_2 .

Hint:

- to calculate the critical value of t
`scalar tc995 = invttail(72,0.005)`
`di "t(72, 0.005) value = " tc995`

- to construct the confidence interval

```
scalar lb = _b[price] - tc995*_se[price]
scalar ub = _b[price] + tc995*_se[price]
```

```
di " beta_2 99% confidence interval is " lb " , " ub
OR
scalar list lb ub
```

- (f) Suppose Big Andy plans to increase advertising expenditure by \$800 and drop the price by 40 cents. What is the change in the expected sales?

Hint: `lincom (-0.4*price) + (0.8*advert)`

- (g) Test the null hypothesis that $\beta_2 \geq 0$ against the alternative $\beta_2 < 0$ at the 5% significance level.

Hint:

```
scalar t = (_b[price]-0)/_se[price]
scalar tcritical = -invttail(72,0.05)
scalar pvalue = 1 - ttail(72, t)

scalar list t tcritical pvalue
```

- (h) Test the null hypothesis that $\beta_3 \leq 1$ against the alternative $\beta_3 > 1$ at the 5% significance level (The test of advertising's effectiveness).

Hint:

```
scalar t1 = (_b[advert]-1)/_se[advert]
scalar tcritical = invttail(72,0.05)
scalar pvalue = ttail(72, t1)

scalar list t1 tcritical pvalue
```

- (i) Suppose Big Andy's marketing adviser claims that dropping the price by 20 cents will be more effective for increasing sales revenue than increasing advertising expenditure by \$500.

Hint:

```
lincom (-0.2*price) - (0.5*advert)

scalar pvalue = ttail(72, 1.62)
di pvalue
```

- (j) Test the joint significance of the regressors at the 5% significance level.

(END)