ECN 102, Spring 2020

Week 7 Section Regression Example Variables sales is how many sales (in units) a firm makes; variable newspaper is thousands of dollars a firm spends for newspaper advertising.

. regress sales newspaper

	Source	ss	df	MS		Number of obs F(1, 198) Prob > F R-squared Adj R-squared Root MSE		200
-	Model Residual	282344204 5.1348e+09	1 198	282344204 25933356.3	Prob > R-squa			10.89 0.0011 0.0521 0.0473
	Total	5.4171e+09	199	2722185				5092.5
	sales	Coef.	Std. Err.	t	P> t	[95% (conf.	Interval]
_	newspaper	54.6931	16.57572	3.30	0.001	22.00	548	87.38071

19.88

0.000

11125.96

13576.86

621.4202

t_198,.005 = 2.6008873 t_198,.01 = 2.3453283 t_198,.025 = 1.9720175 t_198,.05 = 1.6525858

_cons

t_198,.10 = 1.2858418

12351.41

How do sales change when newspaper advertising expenditure increases by one thousand dollars?

. regress sales newspaper

Source	SS	df	MS		er of obs	=	200
Model Residual	282344204 5.1348e+09	1 198	282344204 25933356.3	Prob R-sq	F(1, 198) Prob > F R-squared Adj R-squared		10.89 0.0011 0.0521 0.0473
Total	5.4171e+09	199	27221853		MSE	=	5092.5
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The slope coefficient is $b_2 = 54.6931$. An increase in variable newspaper by 1 unit (which is one thousand dollars) is associated with 54.6931 more units sold.

The claim is made that sales are not associated with newspaper advertising. Test this claim at significance level 0.05. State clearly the null and alternative hypothesis and your conclusion.

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_					- F(1, 198)	=	10.89
	Model	282344204	1	282344204	4 Prob > F	=	0.0011
	Residual	5.1348e+09	198	25933356.3	3 R-squared	=	0.0521
_					 Adj R-squared 	=	0.0473
	Total	5.4171e+09	199	27221853	Root MSE	=	5092.5
	'	1					
_		r					
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"Not associated with" is code for zero slope. The null hypothesis is $H_0: \beta_2 = 0$ against $H_a: \beta_2 \neq 0$. Stata tests this automatically. Notice the *p*-value for newspaper is 0.001 < 0.05, so we reject the null and conclude that the association between newspaper and sales is statistically significant at level 0.05.

The claim is made that saless change by more than 30 units when advertising expenditure increases by one thousand dollars. Test at level 0.05. State clearly the null and alternative hypotheses and your conclusion.

. regress sales newspaper

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 $t_198,.005 = 2.6008873$

 $t_198,.01 = 2.3453283$ $t_198,.025 = 1.9720175$

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The claim is H_a : $\beta_2 > 30$ and the null is H_0 : $\beta_2 \leq 30$. The *t*-statistic is

$$t = \frac{54.9631 - 30}{16.57572} = 1.506,$$

and the critical value is $t_{200-2,0.05} = 1.6525858$, so fail to reject the null.

Suppose \$100,000 is spent on newspaper advertising. What level of sales do we expect?

. regress sales newspaper

_cons

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SS

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MS

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Number of obs

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200

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The estimated regression line is $\hat{y}=12351.41+54.6931x$. Each unit of x is \$1000, so \$100,000 is equivalent to x=100. Plug this into the estimated regression line to get a predicted value of

$$\hat{y} = 12351.41 + 54.6931(100) = 17820.72$$
 units sold.