Additional note ☺

Multiple regression

Oct 10, 2024

EE325

$$Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} \quad (1)$$

(2) $Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i}$

(3) $Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_5 X_{5i}$

Adjusted R-squared

An indicator of whether adding additional predictors improve a regression model or not

- The adjusted R-squared is a modified version of R-squared that **adjusts for predictors that are not significant in a regression model**.
- Compared to a model with additional input variables, **a lower adjusted R-squared indicates that the additional input variables are not adding value to the model**.
- Compared to a model with additional input variables, **a higher adjusted R-squared indicates that the additional input variables are adding value to the model**.

Source: https://corporatefinanceinstitute.com/resources/knowledge/other/adjusted-r-squared/

$$CM_i = \alpha_1 + \alpha_2 PGNP_i + u_i$$

Example

SS / df

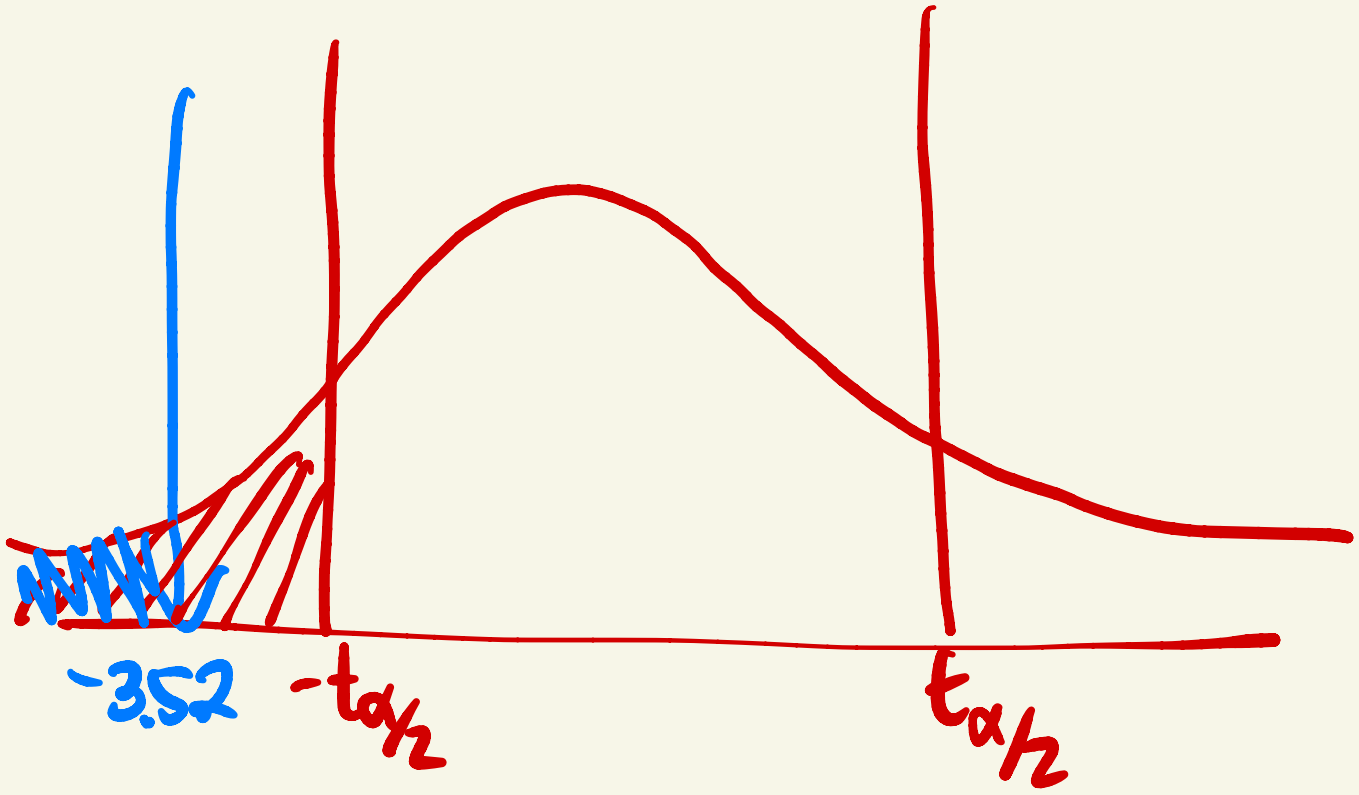
Source	SS	df	MS		
Model (ESS)	60449.4605	1	60449.4605	Number of obs	= 64
Residual (RSS)	303228.539	62	4890.78289	F(1, 62)	= 12.36
				Prob > F	= 0.0008
				R-squared	= 0.1662
				Adj R-squared	= 0.1528
Total (TSS)	363678	63	5772.66667	Root MSE	= 69.934

cm	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pgnp	-.0113645	.0032325	-3.52	0.001	-.0178262	-.0049027
_cons	157.4244	9.845583	15.99	0.000	137.7434	177.1055

α_2 α_1

$H_0: \alpha_i = 0$
$H_1: \alpha_i \neq 0$

$$t_{cal} = \frac{\hat{\alpha}_i - \alpha_i}{se(\hat{\alpha}_i)}$$


-3.52
$-t_{\alpha/2}$
$t_{\alpha/2}$

$$CM_i = \beta_1 + \beta_2 PGNP_i + \beta_3 FLR + u_i$$

Source	SS	df	MS		
Model	257362.373	2	128681.187	Number of obs	= 64
Residual	106315.627	61	1742.87913	F(2, 61)	= 73.83
				Prob > F	= 0.0000
				R-squared	= 0.7077
				Adj R-squared	= 0.6981
Total	363678	63	5772.66667	Root MSE	= 41.748

ESS → Model
RSS → Residual
TSS → Total

cm	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
pgnp	-.0056466	.0020033	-2.82	0.006	-.0096524	-.0016408
flr	-2.231586	.2099472	-10.63	0.000	-2.651401	-1.81177
_cons	263.6416	11.59318	22.74	0.000	240.4596	286.8236

$\hat{\beta}_2$ $\hat{\beta}_3$ $\hat{\beta}_1$

$H_0: \beta_i = 0$
$H_1: \beta_i \neq 0$

$$t_{cal} = \frac{\hat{\beta}_i - \beta_i}{se(\hat{\beta}_i)}$$

Henri Theil (1978) Introduction to Econometrics P. 135.

It is good practice to use adjusted R^2 rather than R^2 because R^2 tends to give an overly optimistic picture of the fit of the regression, particularly when the number of explanatory variables is not very small compared with the number of observations.