L07 SAS for simple linear regression

1. SAS output

The following is a SAS output

Source		DF	\mathbf{SS}	MS	F	Pı	r > F	
Model		1	67.63	67.63	11.2	20 0.	0.0074	
Error		10	60.37	6.04				
Corrected Total		11	128.00					
	Root	MSE		2.46	R-Sq	uare	0.53	
	Depei	ndent	Mean	16.00	Adj I	R-Sq	0.48	
	Coeff	Var		15.36				
Vari	iable	Estin	nate	Stand.	Error	t	Pr 2	> t
Inte	rcept	2	1.52	1.8	30	11.99	<.0	0001
x		-	0.69	0.2	21	-3.35	0.0	074

(1) Model

DF of SSM = 1 implies that the model has one predictor. In the first column and last row of ANOVA table **Corrected Total** indicates this model does have intercept. So the model is

$$y = \beta_0 + \beta_1 x + \epsilon, \ \epsilon \sim N(0, \ \sigma^2).$$

This conclusion can also be reached from Parameter Table where Intercept and x are listed.

(2) Test for significance of regression

ANOVA table gives the information about F-test on H_0 : $\beta_1 = 0$. This H_0 is rejected with *p*-value= 0.0074

The same conclusion can be reached from Parameter Table where $t = \frac{\hat{\beta}_i}{S_{\hat{\beta}_i}}$ and $2P(t(n-2) > |t_{ob}|)$ for testing on H_0 : $\beta_i = 0$, i = 0, 1, are listed. By t-test H_0 : $\beta_1 = 0$ is also rejected with the same p-value = 0.0074.

(3) t-intervals and t-tests

With $\hat{\beta}_i$ and $S_{\hat{\beta}_i}$, i = 0, 1 given in Parameter Table, one can do t-tests and construct t-intervals.

(4) Coefficient of determination

Among 5 statistics in between the two tables the coefficient of determination $R^2 = \frac{SSM}{SSTO}$. With this R^2 once can calculate F in ANOVA table

$$F = \frac{MSM}{MSE} = \frac{SSM}{SSE} \cdot (n-2) = \frac{SSM}{SSTO - SSM} \cdot (n-2) = \frac{R^2}{1 - R^2} \cdot (n-2).$$

- 2. SAS program
 - (1) Enter data

<pre>data try1; input x y;</pre>	data try2;		
datalines; 1 2	datalines;	data try3;	
05	12052	infile "D:\mydata.txt";	
2 3	3 -1 4	input x y ee,	
-1 4	;		
;			

(2) SAS for $y = \beta_0 + \beta_1 x + \epsilon$

3. SAS for $y = \beta x + \epsilon$

(1) SAS program

```
data a;
    infile "D:\mydata.txt";
    input x y @@;
proc reg;
    model y=x/noint;
    run
```

(2) Model

Uncorrected Total in ANOVA table indicates that the model does not have intercept. This is also reflected in Parameter table where there is no β_0 .