Hypothesis testing on regression parameters

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Residual

$$e_i = y_i - \hat{y}_i$$
$$= y_i - \hat{\beta}_0 - \hat{\beta}_1 x_i$$

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Sum of Squared Errors

$$SSE = \sum_{i=1}^{n} (y_i - \hat{y}_i)^2$$

$$= \sum_{i=1}^{n} e_i^2$$

Mean Squared Errors

$$MSE = \frac{SSE}{df}$$

Degrees of Freedom

$$= \frac{\sum_{i=1}^{n}(y_i - \hat{y}_i)^2}{n - p}$$

Number of observations

Number of estimated parameters

$\hat{\beta}_0, \hat{\beta}_1 \Rightarrow p = 2$

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Standard error of the model

$$SE_{model} = \sqrt{MSE}$$

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Standard error for regression parameter estimate

$$SE_{\hat{\beta}_x} = \frac{SE_{model}}{\sqrt{\sum_i (x_i - \bar{x})^2}}$$

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Statistical tests for regression parameters

- Computed estimates $\hat{\beta}_0$ and $\hat{\beta}_1$
- Computed $SE_{\hat{\beta}_0}$ and $SE_{\hat{\beta}_1}$
- We can then test

$$H_0 : \beta = \beta_{expected}$$

- Using the test statistic

$$t_{n-p} = \frac{\hat{\beta} - \beta_{expected}}{SE_{\hat{\beta}}}$$

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Statistical tests for regression parameters

- Test

$$H_0: \beta = 0 \text{ vs } H_A: \beta \neq 0$$

- Using the test statistic

$$t_{n-p} = \frac{\hat{\beta}}{SE_{\hat{\beta}}}$$

- P-value

$$P(|T_{n-p}| > |t_{n-p}|)$$

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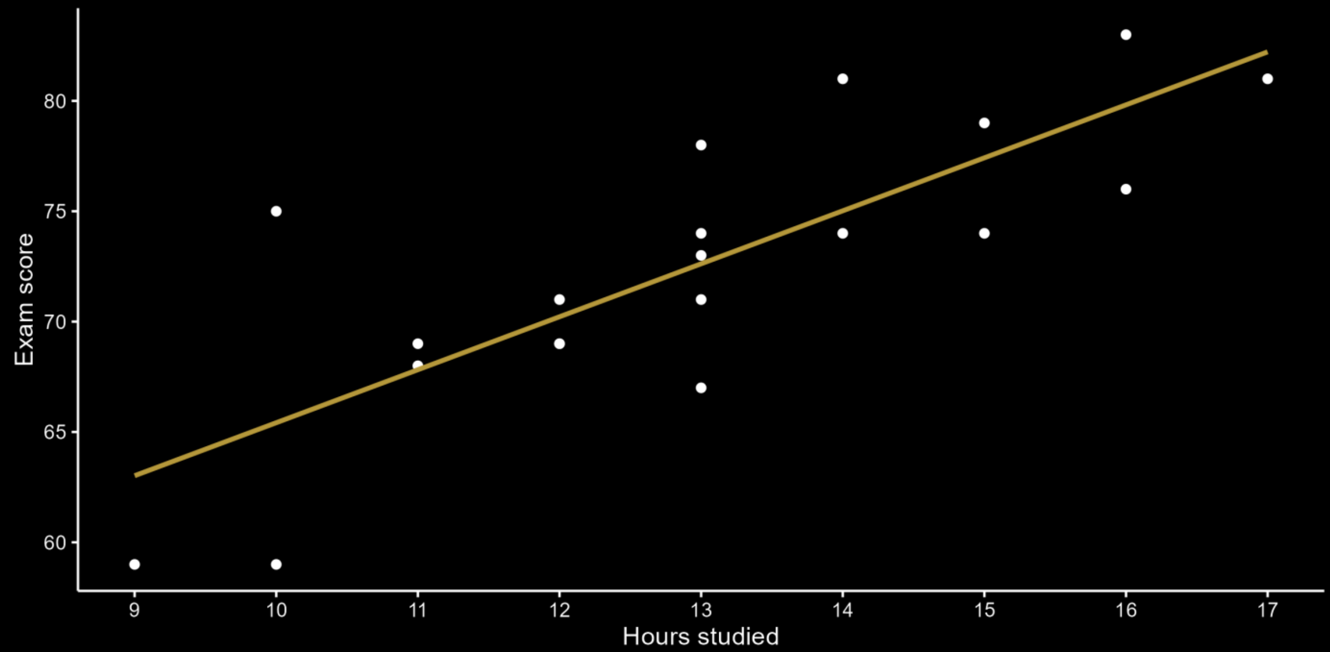
	$\hat{\beta}$	$SE_{\hat{\beta}}$	t_{n-p}	p-value
	coef	std err	t	P>|t|
β_0 Intercept	41.4171	5.647	7.335	0.000
β_1 hours_studied	2.4002	0.430	5.577	0.000



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