

## ISLR Exercise 3.7.11

In this problem, we will investigate the t-statistic for the null hypothesis  $H_0 : \beta = 0$  in simple linear regression without an intercept. To begin, we generate a predictor  $x$  and an response  $y$  as follows:

```
set.seed(1)
x <- rnorm(100) # picks 100 independent normally distributed samples with mean 0 and stdev 1
y <- 2*x+ rnorm(100)
```

a) Perform a simple linear regression of  $y$  onto  $x$  without an intercept. Report the coefficient estimate  $\hat{\beta}$ , the standard error of this coefficient estimate, and the t-statistic and p-value associated with the null hypothesis  $H_0 : \beta = 0$ .

```
fit1 <- lm(y ~ x + 0)
summary(fit1)
```

Call:

```
lm(formula = y ~ x + 0)
```

Residuals:

Min	1Q	Median	3Q	Max
-1.9154	-0.6472	-0.1771	0.5056	2.3109

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
x	1.9939	0.1065	18.73	<2e-16 ***

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.9586 on 99 degrees of freedom  
Multiple R-squared: 0.7798, Adjusted R-squared: 0.7776  
F-statistic: 350.7 on 1 and 99 DF, p-value:  $< 2.2e-16$

So the coefficient estimate is 1.9939, the std error is 0.1065, the t-statistic is 18.73, the p-value is very small ( $< 2e-16$ ) ### b) Report