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ECON 257
EXERCISES 3

Data analysis
mtcars

Consider the data on *Motor Trend Car Road Tests* (mtcars) available in R. The data was extracted from the 1974 Motor Trend US magazine, and comprises fuel consumption and 10 aspects of automobile design and performance for 32 automobiles (1973–74 models).

A data frame with 32 observations on 11 (numeric) variables.

[, 1]	mpg	Miles/(US) gallon
[, 2]	cyl	Number of cylinders
[, 3]	disp	Displacement (cu.in.)
[, 4]	hp	Gross horsepower
[, 5]	drat	Rear axle ratio
[, 6]	wt	Weight (1000 lbs)
[, 7]	qsec	1/4 mile time
[, 8]	vs	Engine (0 = V-shaped, 1 = straight)
[, 9]	am	Transmission (0 = automatic, 1 = manual)
[,10]	gear	Number of forward gears
[,11]	carb	Number of carburetors

Further information on these data is available from the following sources:
https://stat.ethz.ch/R-manual/R-devel/library/datasets/html/00Index.html
https://www.rdocumentation.org/packages/datasets/versions/3.6.2/topics/mtcars
https://www.statology.org/mtcars-dataset-r/

We are interested in explaining mpg.

1. Perform the following regressions (including a constant in all cases):

   (a) mpg on cyl;

   (b) mpg on cyl and wt;

   (c) mpg on all the other variables.

2. Under the assumptions of the classical linear model, report for each one of the above three regressions:

(a) the least squares estimators of the regression coefficients and their standard errors;

(b) the estimated error variance and standard error;

(c) t statistics for testing whether each one of these coefficients is significant at level 0.05 ;

(d) confidence intervals (at level 0.95) for each regression coefficients;

(e) R^2 and $\bar{R}^2$.

3. Test whether a model which would include only cyl and wt (and a constant) as explanatory variables is appropriate.

4. Given the above evidence (and possibly other tests), propose a specification you would deem appropriate.