

# Exercise12

February 21, 2025

## 1 Exercise 12

### 1.1 Import notebook funcs

```
[1]: from notebookfuncs import *
```

### 1.2 12. This problem involves simple linear regression without an intercept.

1.2.1 (a) Recall that the coefficient estimate  $\hat{\beta}$  for the linear regression of Y onto X without an intercept is given by (3.38). Under what circumstance is the coefficient estimate for the regression of X onto Y the same as the coefficient estimate for the regression of Y onto X?

1.2.2 (b) Generate an example in Python with  $n = 100$  observations in which the coefficient estimate for the regression of X onto Y is different from the coefficient estimate for the regression of Y onto X.

1.2.3 (c) Generate an example in Python with  $n = 100$  observations in which the coefficient estimate for the regression of X onto Y is the same as the coefficient estimate for the regression of Y onto X.

- This has already been proved and shown in my answer to Exercise 11 where the coefficients are calculated as  $\rho * \frac{SD(y)}{SD(x)}$  and its inverse.
- The ratios of the standard deviations are inversed when the regressions are inversed.
- When the two variables are standardized and have unit variance or SD, then their coefficient estimate  $\hat{\beta}$  are the same as the Pearson correlation coefficient  $\rho$ .

Examples have been generated for the same in Exercise 11.

```
[2]: allDone();
```

<IPython.lib.display.Audio object>