

## Exercise 12

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## Import notebook funcs

```
from notebookfuncs import *
```

**12. This problem involves simple linear regression without an intercept.**

(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?

(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.

(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.**

```
allDone();
```

```
<IPython.lib.display.Audio object>
```