EDS241: Assignment 4

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For Assignment 4, we will estimate the price elasticity of demand for fresh sardines across 56 ports located in 4 European countries with monthly data from 2013 to 2019. The data are contained in the file `EU_sardines.csv`.

We are using the following variables: `year`, `month`, `country`, `port` (port where sardines are landed and sold), `price_euro_kg` (price per kg in €), and `volume_sold_kg` (quantity of sardines sold in kg). In the questions below, I use `log()` to denote the natural logarithm.

Load Data

```
sardines_data <- read_csv(here::here("assignments/data/EU_sardines.csv"))
```

Question A

```
# log of volume sold and price
sardines_log <- sardines_data %>%
  mutate(price_euro_kg_log = log(price_euro_kg),
         volume_sold_kg_log = log(volume_sold_kg))

# bivariate regression
model_1 <- lm_robust(data = sardines_log,
                     volume_sold_kg_log ~ price_euro_kg_log)
huxreg(model_1)
```

```
# test null hypothesis that price elasticity = -1
linearHypothesis(model_1, c("price_euro_kg_log = -1"), white.adjust = "hc2")
```

Answer: The price elasticity of demand for sardines -1.55. And we reject the null hypothesis that price elasticity is equal to -1 because the p-value is statistically significant.

	(1)
(Intercept)	7.759 ***
	(0.043)
price_euro_kg_log	-1.545 ***
	(0.078)
N	3988
R2	0.104

*** p < 0.001; ** p < 0.01; * p < 0.05.

Res.Df	Df	Chisq	Pr(>Chisq)
3.99e+03			
3.99e+03	1	48.7	2.95e-12

Question B

```
# first stage regression
model_2 <- lm_robust(data = sardines_log, price_euro_kg_log ~ wind_m_s)
huxreg(model_2)
```

	(1)
(Intercept)	-0.305 ***
	(0.027)
wind_m_s	0.067 ***
	(0.006)
N	3988
R2	0.038

*** p < 0.001; ** p < 0.01; * p < 0.05.

Answer: The estimated coefficient β_1 on `wind_m_s` tells us that for each 1 m/s of wind speed the price of sardines in euros increases by 0.067. This is the expected sign because fishing conditions are worse when it is windy, meaning supply will likely go down causing prices to increase.

```
# instrument relevance and non--weak test
# want f-statistic to be greater than 10
hypo_1 <- linearHypothesis(model_2, # first stage regression model
                c("wind_m_s = 0"), # null hypothesis
                white.adjust = "hc2") # robust heteroskedastic errors
```

Answer: The F-statistic is 144.65 and is greater than 10 and is therefore not a weak instrument.

Question C

```
tsls1 <- ivreg(volume_sold_kg_log ~ price_euro_kg_log | wind_m_s, data = sardines_log)
huxreg(tsls1)
```

	(1)
(Intercept)	7.755 ***
	(0.043)
price_euro_kg_log	-1.088 **
	(0.370)
N	3988
R2	0.095

*** p < 0.001; ** p < 0.01; * p < 0.05.

Answer: The estimated price elasticity of demand for sardines is -1.09.

Question D

```
# tsls with fixed effects
tsls_fixed <- ivreg(volume_sold_kg_log ~ price_euro_kg_log +
                      as.factor(country) + as.factor(year) + as.factor(month) |
                      wind_m_s +
                      as.factor(country) + as.factor(year) + as.factor(month),
                    data = sardines_log)
```

```
# need to use the regression from the first stage with the fixed effects
model_fixed <- lm_robust(data = sardines_log, price_euro_kg_log ~ wind_m_s +
                           as.factor(country) + as.factor(year) + as.factor(month))

hypo_fixed <- linearHypothesis(model_fixed, c("wind_m_s=0"), white.adjust = "hc2")
```

Answer: The estimated price elasticity of demand is -1.25. And the F-statistic testing for wind as a relevant and non-weak instrument is 77.66.