

## **MOOC** Econometrics

## Training Exercise 4.2

## **Notes:**

- This exercise uses the datafile TrainExer42 and requires a computer.
- The dataset TrainExer42 is available on the website.

## Questions

In this exercise we reconsider the example from lecture 4.1 where an analyst models sales of ice cream over time as a function of price and where price is possibly endogenous due to strategic behavior of the salesperson. In this case the salesperson knows that when a particular event is organized, demand tends to be high. Therefore she may set a high price when there is such an event.

We consider the following data generating process

Sales = 
$$100 - 1 \times \text{Price} + \alpha \text{Event} + \varepsilon_1$$
  
Price =  $5 + \beta \text{Event} + \varepsilon_2$ ,

where Event is a 0/1 dummy variable indicating whether an event took place at a point in time. However, when trying to estimate the price coefficient the analyst does not have the Event dummy variable and simply regresses Sales on a constant and Price.

The dataset TrainExer42 contains sales and price data for different values of  $\alpha$  and  $\beta$ . For each scenario the same simulated values for  $\varepsilon_1$  and  $\varepsilon_2$  were used. Specifically, the data contains 4 price series and 16 sales series. Price variables "PriceB" give the price assuming that  $\beta = B$ , for B = 0, 1, 5, 10. Sales variables "SalesA\_B" give the sales for  $\alpha = A$  and  $\beta = B$ , where A also takes the values 0, 1, 5, 10.

- (a) First consider the case where the event only directly affects price ( $\alpha=0$ ). Estimate and report the price coefficients under all 4 scenarios for  $\beta$  and calculate the  $R^2$  for all these regressions. Do the estimated price coefficients signal any endogeneity problem for these values of  $\alpha$  and  $\beta$ ? Can you also explain the pattern you find for the  $R^2$ ?
- (b) Repeat the exercise above, but now consider the case where the event only directly affects sales, that is, set  $\beta = 0$  and check the results for the four different values of  $\alpha$ .
- (c) Finally consider the parameter estimates for the cases where the event affects price and sales, that is, look at  $\alpha = \beta = 0, 1, 5, 10$ . Can you see the impact of endogeneity in this case?

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