POLS 6481, Spring 2021

Professor Scott Basinger

Reading Assignment Week 11

Distributed Wednesday, April 7

Due Thursday, April 15

Required reading: Wooldridge 6.2b + 9.1

Kam and Franzese, *Mod.and.Int.Int.Hyp.in.Reg.Analy.*, 33–34, 57–58, 69–71, 85–87

1. What are two practical limitations on using polynomial (e.g., quadratic, cubic) regression models?

2A. What is the equation for the turning point (or vertex) of a quadratic regression function?

2B. Suppose you estimate the model in Wooldridge’s Example 6.5 (equation [6.32]) for which predicted college GPA = 1.493 + .00149\*(SAT score) − .01386\*(%ile in HS class) − .06088\*(*hsize*) + .00546\*(*hsize2*), where *hsize* is size of high school class in hundreds (i.e., *hsize* = 5 means 500 students). At what value of *hsize* does an increase in its value change from having a negative effect to having a positive effect?

3A. What is the equation for the marginal effect of Δ*x* on Δ*y* in a quadratic regression model?

3B. Solve the equation for the marginal effect of Δ*hsize* on Δ college GPA, and then graph the marginal effect function (the horizontal axis is *hsize*, the vertical axis is *colgpa*). (Note: because you are graphing marginal effects, you do not need to know SAT score or %ile in HS class!)

4A. What is the equation for the standard error of the marginal effect of Δ*x* on Δ*y* in a quadratic regression model?

4B. Suppose the ***variance-covariance matrix of the estimator*** for the example in 2B and 3B yields: var() = .0002723; var() = .0000052; and covar (,) = −.0000357. Using the equation in 4A, calculate the standard error of the marginal effect of Δ*hsize* on Δ college GPA.

5A. Kam and Franzese never quite finish deriving the variance of , where . (Instead they jump to a solution for one value of PS.) Fill in that missing equation, first in the abstract and next numerically, using the variances and covariances of the estimators shown on page 58.

5B. Using algebra, calculus, or a drawing, show why the equation that you filled in for 5A. attains its lowest value near *PS* = 61.