ECON20003 Quantitative Methods 2

Tutorial 11 (Week 6 - Tuesday)

Zheng Fan

The University of Melbourne

Introduction

Zheng Fan

- Ph.D candidate in Economics at Unimelb
- know more about me: zhengfan.site

If you need help,

- Consultation & Ed discussion board (your first priority)
- Email Dr. Xuan Vu for all subject matters
- Consult Stop 1 for special consideration
- Email: fan.z@unimelb.edu.au (last resort!)

Before posting any questions, make sure you have reviewed the materials on Canvas and questions on Ed discussion board!

Tutorial Overview

In this tutorial we study statistical inference for

- Dummy dependent variable regression models
- Logit and probit models
- Interpretation of probabilities and marginal effects

From LPM to Logit and Probit

In the previous tutorial, we studied the linear probability model

- Simple to estimate and interpret
- Can produce predicted probabilities below zero or above one
- Imposes constant marginal effects

Logit and probit models address these limitations.

Logit and Probit Models

Logit and probit models

- Are designed for binary dependent variables
- Ensure predicted probabilities lie between zero and one
- Allow marginal effects to vary with covariates
- Are estimated using maximum likelihood methods

Estimation and Inference

For logit and probit models

- Coefficients are not directly interpreted as marginal effects
- Statistical significance is assessed using z statistics
- Overall model significance is tested using **likelihood ratio tests**

Model Fit and Evaluation

Model fit is assessed using

- Deviance and changes in deviance
  - ⋆ Think about residual sum of square $\sum_{i=1}^{n}(y_i - \hat{y}_i)$
- Pseudo R squared measures such as McFadden R squared
  - ⋆ McFadden R squared: percentage of deviance improvement
- Classification accuracy and predicted probabilities
  - ⋆ Number of correct classification over total number of observations

Predicted Probabilities

Using estimated models, we can

- Compute predicted probabilities for given scenarios
- Compare probabilities across different values of covariates
- Interpret results in a meaningful economic context

Marginal Effects

Marginal effects

- Measure how a small change in a covariate affects the probability of success, and Are usually evaluated at specific scenarios or sample means

Given $Z = \beta_0 + \beta_1 X$,

$$P = F(Z) = \frac{1}{1 + e^{-Z}}$$

The marginal effect of the independent variable on the probability of success

$$\frac{dP}{dX} = F'(Z) \times \beta_1 = \frac{e^Z}{(1 + e^Z)^2} \times \beta_1$$

where F' is the derivative of F.