

APPLIED ECONOMETRICS SKILLS ASSESSMENT (AESAS)

LEARNING GOALS

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AESAS tests all of the below goals while AESAS, Core Skills (AESAS-Core) focuses exclusively on linear regression models and evaluates the learning goals 2 through 10.

Bivariate Models

1. Interpret differences in average outcomes across groups appropriately in terms of average treatment effects, selection bias, treatment-on-the-treated, and intent-to-treat effects.
2. Write down the appropriate bivariate linear regression model given a real-world situation.
 - a. Choose dependent and independent variables.
 - b. Explain what the error term represents.
 - c. Explain the assumptions of the model.
 - d. Derive best linear predictor.
3. Interpret regression coefficients (intercept and slope) and standard errors.
4. Estimate and interpret measures of goodness-of-fit including R^2 and Mean Squared Error.
5. Pose, implement, and interpret hypothesis tests concerning regression coefficients. Create and interpret confidence intervals around regression coefficients.
6. Use estimates of regression models to compute point predictions and prediction intervals given values of the independent variables.

Multivariate Linear Regression Models

7. Specify the appropriate multivariate linear regression model given a real-world situation
 - a. Represent non-linear relationships with logs, polynomials, and indicators.

- b. Incorporate categorical independent variables as sets of indicators.
 - c. Use interactions to allow effects to depend on other variables.
- 8. Estimate and interpret regression coefficients and standard errors of multivariate regression models.
- 9. Recognize and address common pitfalls including: omitted variable bias, multicollinearity, heteroscedasticity, endogeneity.
 - a. Understand the consequences of these pitfalls.
 - b. Differentiate between exogenous and endogenous variables.
- 10. Pose, implement and interpret joint hypothesis tests concerning regression coefficients.

Binary Dependent Variables

- 11. Estimate and interpret linear probability models, logit models, and probit models.

Instrumental Variables

- 12. Judge situations where Instrumental Variables (IV) can and cannot be applied to obtain an unbiased coefficient estimate.
 - a. Explain why IV estimation (using two stage least squares) yields unbiased estimates.
 - b. Evaluate whether the instrumental variable is correlated with the endogenous variable and assess its strength.
 - c. Evaluate whether the instrumental variable is correlated with the error term.
- 13. Interpret IV estimates as Local Average Treatment Effects (LATE).

Difference-in-Differences (DD) and Fixed Effects

14. Judge situations where DD can and cannot be applied.
 - a. Evaluate the data requirements.
 - i. two groups and two time periods
 - ii. Either aggregate, repeated cross-section, or panel data
 - b. Evaluate the parallel trends assumption by appealing to theory and using additional pre-treatment time periods
15. Estimate DD causal effects using aggregate level data.
16. Estimate DD causal effects using a multiple regression model with and without controls.
17. Apply fixed effect models to estimate causal effects in situations with time-invariant unobserved heterogeneity.
 - a. Estimate fixed effects models using first differences
 - b. Estimate fixed effects models using within transformations.