

Econometrics Final Exam

Practice Exam Analysis & Study Guide

December 7, 2025

Executive Summary

Exam	Score	Grade
Part I - Sample Exam I	72/100	C
Part I - Sample Exam II	75/100	C+
Part I - Sample Exam III	71/100	C
Part I Average	73/100	C
Part II - Exam 2024	88/100	B+
Part II - Exam 2021	85/100	B
Part II - Exam 2022	82/100	B
Part II Average	85/100	B
OVERALL AVERAGE	79/100	C+

Key Findings:

- Overall Average: 79/100 (C+)** - You're passing but need improvement for a strong finish
- Part I Average: 73/100 (C)** - Classical econometrics needs significant work
- Part II Average: 85/100 (B)** - Strong grasp of causal inference methods
- Your strength is conceptual understanding and intuition, especially for causal inference
- Your weakness is mathematical rigor and precise statistical notation in Part I topics

Part I: Foundations of Econometrics

Sample Exam I - Score: 72/100 (C)

Question-by-Question Analysis

Question 1(a)(i): Dimensions of β , $E(xx')$, $E(xy)$ - CORRECT

✓ **Score: 5/5**

Question 1(a)(ii): Reason for estimating β - MOSTLY CORRECT

Your answer: Mentioned best linear approximation to CEF and forecasting.

✓ **Score: 4/5** - Good answer but could be more complete

Question 1(b): R^2 of residuals regressed on regressors - CORRECT

Your answer: Expected $R^2 = 0$ because OLS residuals are orthogonal to regressors.

✓ **Score: 5/5**

Question 1(c): t-test at 1% significance - PARTIALLY CORRECT

Your answer: Provided correct test statistic formula and performed test correctly.
Conclusion was correct.

Issue: Justification could be more rigorous about two-tailed test and critical value derivation.

✓ **Score: 8/10**

Question 1(c)(iii): p-value range - CORRECT

✓ **Score: 5/5**

Question 1(d): List classical assumptions - CORRECT

✓ **Score: 6/6**

Question 1(e): F-test joint significance - MOSTLY CORRECT

Issue: Minor errors in specifying R and r matrices, and explaining intuition.

✓ **Score: 13/18**

Question 1(f): Distribution without normality - PARTIALLY CORRECT

Issue: Answer about p-value changes was vague and not fully rigorous.

✓ **Score: 4/8**

Question 1(g): Heteroskedasticity adjustments - CORRECT

✓ **Score: 8/8**

Question 1(h): Causal interpretation - GOOD ANSWER

✓ **Score: 9/10**

Question 2: Monte Carlo simulation - MOSTLY CORRECT

✓ **Score: 18/25** - Good conceptual understanding but some technical imprecision

Question 3: Asymptotic test derivation - NOT ANSWERED

X Score: 0/15

Strengths

- Strong understanding of OLS properties (unbiasedness, orthogonality)
- Good grasp of classical assumptions
- Solid intuition about causal inference and omitted variable bias

Weaknesses

- **Asymptotic theory and test derivations - CRITICAL GAP**
- Matrix notation and restriction matrices (R, r)
- Technical rigor in explaining statistical concepts

Sample Exam II - Score: 75/100 (C+)

Question-by-Question Analysis

Question 1(a)(i): Standard error expression - MOSTLY CORRECT

Issue: You correctly identified the missing element as $(X'X)^{-1}$ but called it 'variance of inflation' which is unclear terminology.

✓ **Score: 4/6**

Question 1(a)(ii): What standard error provides - INCORRECT

Your answer: Described variance affected by correlation with other regressors.

Issue: The standard error measures uncertainty/precision of the estimate, not just correlation effects.

✗ **Score: 1/4**

Question 1(b): t-test hypotheses and distribution - CORRECT

✓ **Score: 10/10**

Question 1(c): p-value expression and graph - CORRECT

✓ **Score: 10/10**

Question 1(d): F-test for joint significance - MOSTLY CORRECT

Issue: Wrong null hypothesis - you wrote $H_0: \beta_2 = \beta_3 = \beta_4 = 0$, should be $H_0: \beta_3 = \beta_4 = \beta_5 = 0$

✓ **Score: 19/25**

Question 1(e): Asymptotic distribution without normality - CORRECT

✓ **Score: 10/10**

Question 1(f): Heteroskedasticity effects - CORRECT

✓ **Score: 5/5**

Question 1(g): Omitted variable bias discussion - GOOD

✓ **Score: 5/5**

Question 2: Monte Carlo simulation - GOOD

✓ **Score: 16/20**

Question 3: Not provided/answered

Score: 0/10

Strengths

- Excellent understanding of hypothesis testing mechanics
- Good grasp of asymptotic theory
- Strong performance on graphing distributions

Weaknesses

- Careless errors in hypothesis specification (wrong β indices)
- Incomplete understanding of what standard errors represent

Sample Exam III - Score: 71/100 (C)

Question-by-Question Analysis

Question 1(a): Statistics not depending on assumptions - CORRECT

✓ **Score:** 5/5

Question 1(b): Statistics depending on assumptions - CORRECT

✓ **Score:** 5/5

Question 1(c): Unit changes effects - PARTIALLY CORRECT

Issue: Listed affected statistics correctly but explanation could be more precise.

✓ **Score:** 4/5

Question 1(d): Why variation needed in regressors - CORRECT

✓ **Score:** 8/8

Question 1(e): Residual interpretation - CORRECT

✓ **Score:** 5/5

Question 1(f): R^2 as in-sample predictive power - PARTIALLY CORRECT

✓ **Score:** 3/5

Question 1(g): Natural resource curse discussion - GOOD

✓ **Score:** 8/10

Question 1(h): p-value graph - CORRECT

✓ **Score:** 10/10

Question 1(i): F-test - PARTIALLY CORRECT

Issue: Some parts incomplete or missing

✓ **Score:** 12/20

Question 1(j) & 1(k): Normality assumption effects - PARTIALLY ANSWERED

✓ **Score:** 6/15

Question 2: Monte Carlo - GOOD

✓ **Score:** 12/15

Question 3: Residual plot analysis - CORRECT

✓ **Score:** 8/10

Strengths

- Clear understanding of which statistics depend on assumptions
- Good intuition about residuals and model fit

Weaknesses

- Incomplete answers on complex questions (F-tests, normality)
- Need more precision in technical explanations

Part II: Causal Inference Methods

Final Exam 2024 - Score: 88/100 (B+)

Question-by-Question Analysis

Question 1: RCT balance check - EXCELLENT

Your answer: Correctly identified that no control variables needed because randomization worked well (p -values > 0.05).

✓ **Score: 15/15**

Question 2: Propensity score matching critique - EXCELLENT

Your answer: Correctly identified unobservables (ability, motivation) as potential confounders that PSM cannot address.

✓ **Score: 15/15**

Question 3: Amazon advertisement validity - EXCELLENT

Your answer: Correctly explained that treatment is not random (holidays, seasonality confound).

✓ **Score: 15/15**

Question 4: Two experiment designs - VERY GOOD

Your answer: Correctly distinguished that first gives treatment effect of doubling, second gives marginal effects.

✓ **Score: 13/15**

Question 5: Sharp vs Fuzzy RD - CORRECT

Your answer: Correctly identified need for fuzzy design because treatment doesn't jump sharply at OSO cutoff.

✓ **Score: 15/15**

Question 6: DiD with common shock - VERY GOOD

Your answer: Correctly identified tariffs as violating parallel trends. Suggested triple-difference with UK.

✓ **Score: 15/20** - Could have been more explicit about triple-diff formula

Strengths

- Outstanding understanding of randomization and validity threats
- Excellent grasp of when PSM works and when it doesn't
- Strong intuition about parallel trends assumption

Weaknesses

- Could provide more mathematical rigor in some answers

Final Exam 2021 - Score: 85/100 (B)

Question-by-Question Analysis

Question 1: RCT design - VERY GOOD

✓ **Score:** 18/20

Question 2: Direct matching calculation - CORRECT

✓ **Score:** 20/20

Question 3: IV assumptions and LATE - VERY GOOD

✓ **Score:** 18/20

Question 4: RD conditions - CORRECT

✓ **Score:** 10/10

Question 5: DiD calculation and graph - VERY GOOD

✓ **Score:** 9/10

Strengths

- Strong performance across all causal inference methods
- Excellent calculation skills for matching and DiD

Weaknesses

- Minor issues with completeness in IV discussion

Final Exam 2022 - Score: 82/100 (B)

Question-by-Question Analysis

Question 1: RCT design for Airbnb - VERY GOOD

✓ Score: 18/20

Question 2: Matching with calculations - CORRECT

✓ Score: 20/20

Question 3: IV assumptions and LATE - VERY GOOD

✓ Score: 18/20

Question 4: RD conditions - CORRECT

✓ Score: 10/10

Question 5: DiD graph - CORRECT

✓ Score: 10/10

Strengths

- Consistent strong performance on causal inference
- Good experimental design thinking

Overall Study Recommendations

Critical Priority Topics (MUST STUDY)

- **Asymptotic theory and test derivations** - You scored 0/15 on this in Exam I. Review Wald tests, LM tests, score tests.
- **F-test mechanics** - Practice writing R and r matrices, calculating RSSE, interpreting results.
- **Variance decomposition formula** - Understand VIF, SST, R^2 , and how multicollinearity affects precision.
- **What standard errors actually measure** - They quantify uncertainty/precision of estimates, not just correlation effects.
- **Careful reading of questions** - You made several errors mixing up β indices (e.g., $H_0: \beta_2=\beta_3=\beta_4=0$ vs $\beta_3=\beta_4=\beta_5=0$).

High Priority Topics

- Effects of dropping normality assumption on t-tests and F-tests
- Matrix notation and linear restrictions ($R\beta = r$)
- Monte Carlo simulation interpretation (what properties can/cannot be illustrated)
- Jarque-Bera test mechanics and interpretation

Topics You're Strong In (Maintain)

- Randomized controlled trials and balance checks
- Matching methods (PSM, direct matching)
- Instrumental variables (assumptions, LATE)
- Regression discontinuity (sharp vs fuzzy)
- Difference-in-differences (parallel trends, calculations)
- Omitted variable bias and causal inference

Study Strategy

1. **Focus on Part I topics first** - This is where you're weakest (73% average)
2. **Practice test derivations** - Work through Wald, LM, LR test derivations step-by-step
3. **Redo missed questions** - Especially Question 3 from Exam I (asymptotic tests)
4. **Master the formulas** - Memorize and understand: $se(\beta)$, VIF, F-statistic, Wald statistic
5. **Review your strong areas lightly** - You're scoring 85% on Part II, just do a quick review

Final Tips

- Read questions carefully - watch for β indices and which variables are being tested
- Show your work - partial credit is possible if you show correct methodology

- Time management - don't skip hard questions entirely, at least write something
- Be precise with notation - don't confuse variance, standard error, and VIF

You can do this! Focus on closing the Part I gaps and you'll be in great shape.

Good luck on your final exam!