Midterm Review

EC 320: Introduction to Econometrics

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Prologue

PBS3 Q3

Second proof:

Supporting Proof

$$\sum_{i=1}^{n} X_i \hat{u}_i = \sum_{i=1}^{n} X_i (Y_i - \hat{\beta}_1 - \hat{\beta}_2 X_i) = \sum_{i=1}^{n} X_i Y_i - \hat{\beta}_1 \sum_{i=1}^{n} X_i - \hat{\beta}_2 \sum_{i=1}^{n} X_i^2 = 0$$

Main Proof

$$\begin{aligned}
\operatorname{cov}(X, u) =& E[(X_i - \bar{X})(\hat{u}_i - \bar{\hat{u}}_i)] \\
=& \frac{1}{n} \sum_{i=1}^{n} (X_i - \bar{X})(\hat{u}_i - \bar{\hat{u}}_i) = \frac{1}{n} \sum_{i=1}^{n} (X_i - \bar{X}) \hat{u}_i \\
=& \frac{1}{n} \sum_{i=1}^{n} (X_i \hat{u}_i) - \frac{1}{n} \sum_{i=1}^{n} (\bar{X} \hat{u}_i) = 0 + \bar{X} \frac{1}{n} \sum_{i=1}^{n} \hat{u}_i = 0
\end{aligned}$$

PBS3 Q3

Why does $\sum_{i=1}^{n} X_i Y_i - \hat{\beta}_1 \sum_{i=1}^{n} X_i - \hat{\beta}_2 \sum_{i=1}^{n} X_i^2 = 0$ hold?

Dougherty (5th ed), p.93

The partial differentials of *RSS* with respect to b_1 and b_2 are:

$$\frac{\partial RSS}{\partial b_1} = 2nb_1 - 2\sum_{i=1}^{n} Y_i + 2b_2 \sum_{i=1}^{n} X_i \qquad (1.24)$$

$$\frac{\partial RSS}{\partial b_2} = 2b_2 \sum_{i=1}^{n} X_i^2 - 2\sum_{i=1}^{n} X_i Y_i + 2b_1 \sum_{i=1}^{n} X_i \qquad (1.25)$$

As in the four-observation example, $\hat{\beta}_1$ and $\hat{\beta}_2$, the values of b_1 and b_2 that minimize *RSS*, must satisfy the first-order conditions

$$\frac{\partial RSS}{\partial b_1} = 0 \text{ and } \frac{\partial RSS}{\partial b_2} = 0 \qquad (1.26)$$

Hence

$$2n\hat{\beta}_1 - 2\sum_{i=1}^{n} Y_i + 2\hat{\beta}_2 \sum_{i=1}^{n} X_i = 0 \qquad (1.27)$$

$$2\hat{\beta}_2 \sum_{i=1}^{n} X_i^2 - 2\sum_{i=1}^{n} X_i Y_i + 2\hat{\beta}_1 \sum_{i=1}^{n} X_i = 0 \qquad (1.28)$$

Exam Structure

Section 1: Multiple Choice Qs (20)

- 10 questions, each worth 2pts
- No negative grading, no attempt marks

Section 2: Short Answer Qs (20)

- 3 questions with multiple parts

Section 3: Long Answer Qs (30 each)

- 3 questions with multiple parts
- Attempt 2 of the choices, each devoted to a particular topic

Know your proofs from homework and detailed in slides

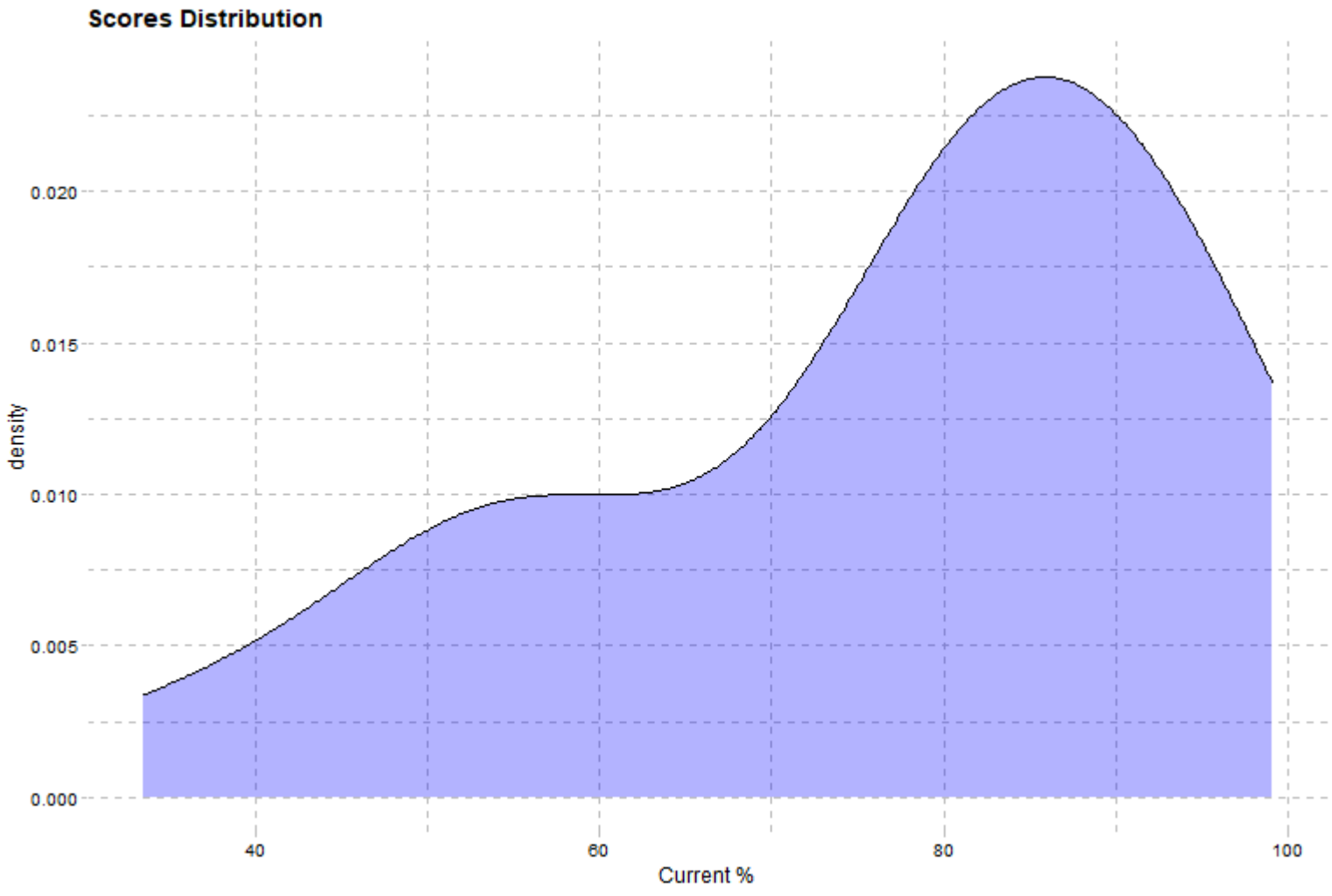
Exam Logistics

This Wednesday at **4pm SHARP**

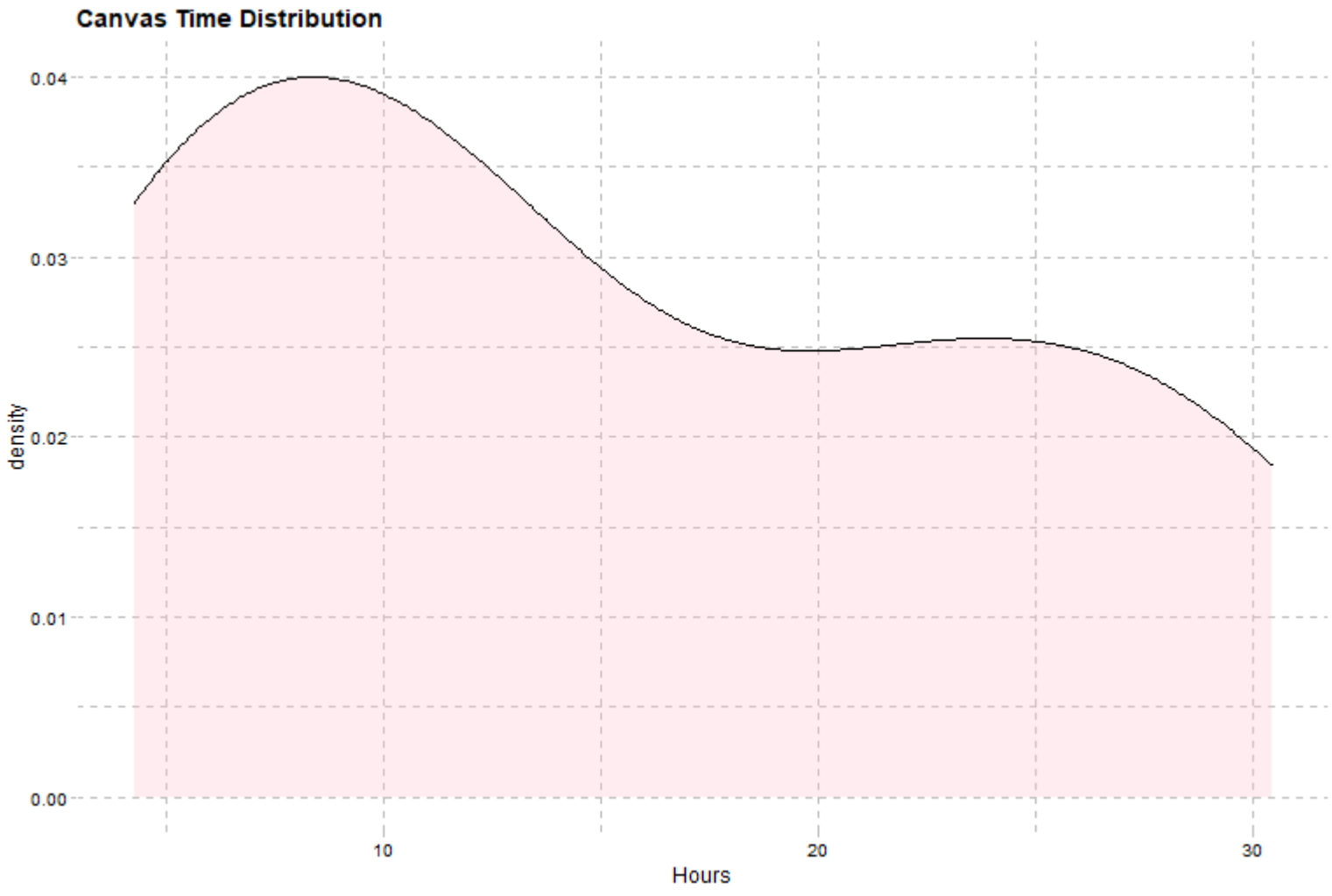
- Lectures up to and including **Classical Assumptions**
- **110 minutes** (1hr 50 minutes), **arrive early**
- Seat yourself distant from others
- Bring calculators and writing utensils
- I will provide scrap paper and calculators for those in need

Any questions?

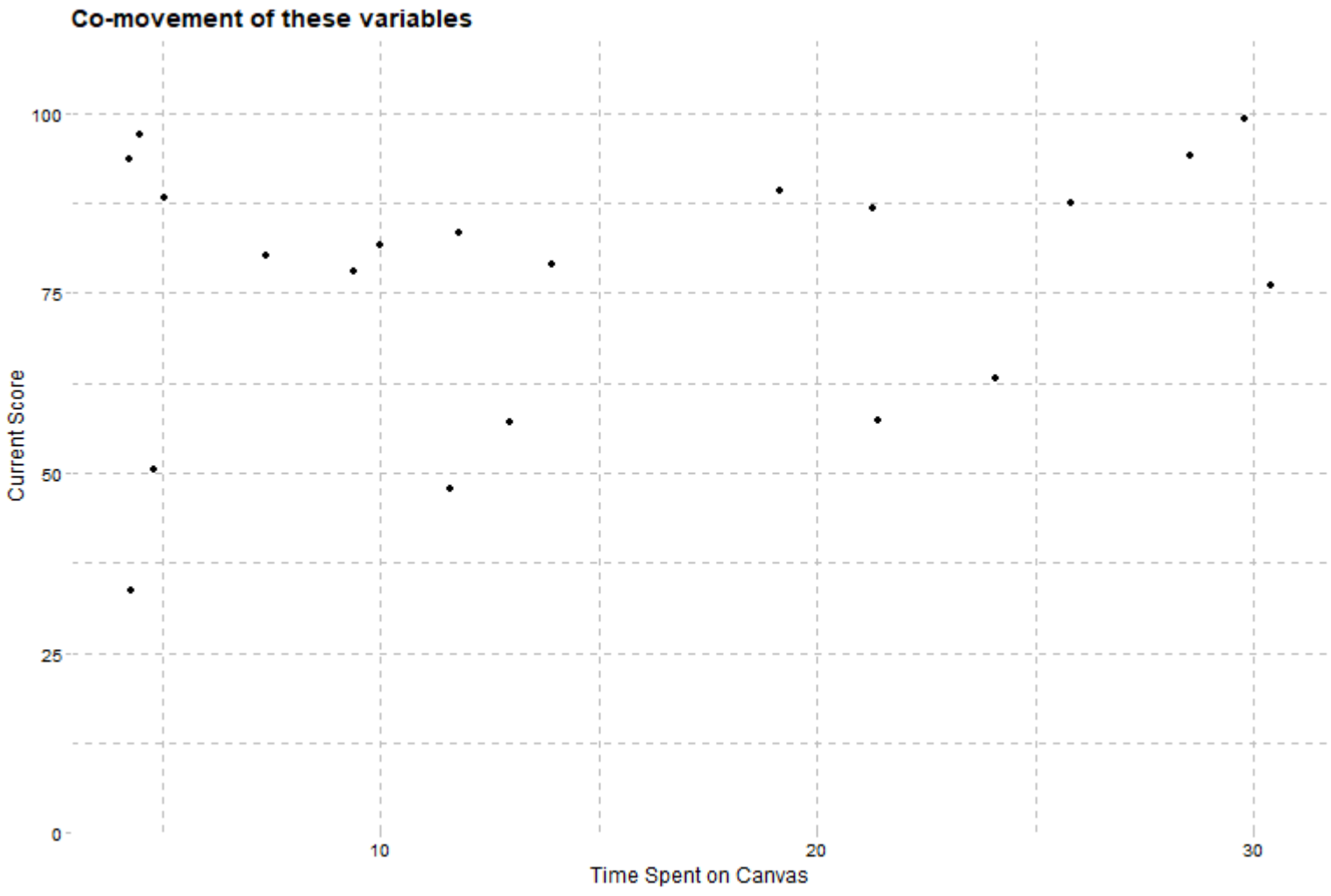
Current Performance



Current Performance



Current Performance



Current Performance

	score
canvas time	0.502
	(0.453)
n	20
R^2	0.064

Could there be bias in these results?

Yes: Not controlling for unobserved textbook time, unobserved R time, unobserved homework practice, office hours usage, emails or unobserved ability.