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ECON 0150 | MiniExam 5 | Demo

This MiniExam will take 20 minutes with a quick break to follow. MiniExams are designed to both test your knowledge and challenge you to apply familiar concepts in new environments. Treat it as if you're trying to show me that you understand the material. Answer clearly, completely, and concisely.

Academic Conduct Code

The following academic conduct code is designed to protect the integrity of your work. Print your name/initials beside the three academic honesty agreements. I pledge to my fellow students, the university, and the instructor, that:

✓ I will complete this MiniExam solely using my own work.
✓ I will not use any digital resources unless explicitly allowed by the instructor.
✓ I will not communicate directly or indirectly with others during the MiniExam.

Q1. A researcher wants to examine how years of education affects hourly wages while controlling for years of work experience. x y z

a) Which regression model would answer this question? (circle one)

A) $wages = \beta_0 + \beta_1 \cdot education + \varepsilon$

B) $wages = \beta_0 + \beta_1 \cdot education + \beta_2 \cdot experience + \varepsilon$

C) $wages = \beta_0 + \beta_1 \cdot education + \beta_2 \cdot (education \times experience) + \varepsilon$

D) $wages = \beta_0 + \beta_1 \cdot experience + \varepsilon$

b) In the correct model, what does the coefficient on `education` represent?

The extra earnings (wages) associated with one more year of education.

c) Why might controlling for `experience` change the estimated effect of `education` on wages?

Now we compare two people with the same work experience, where before we compared everyone.

Q2. An economist is studying how coffee shop revenue differs between urban and rural locations. The variable `urban` is coded as 1 for urban locations and 0 for rural locations.

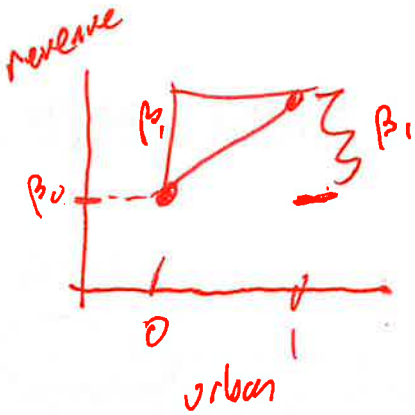
a) Which regression model correctly tests whether urban locations have different revenue than rural locations? (circle one)

A) revenue = $\beta_0 + \beta_1 \cdot \text{urban} + \beta_2 \cdot \text{rural} + \varepsilon$

B) revenue = $\beta_0 + \beta_1 \cdot \text{urban} + \varepsilon$

C) revenue = $\beta_0 + \beta_1 \cdot (\text{urban} \times \text{rural}) + \varepsilon$

D) revenue = $\beta_0 + \beta_1 \cdot \text{location} + \varepsilon$



b) In the correct model, what does the intercept (β_0) represent?

The average revenue in rural.

c) In the correct model, what does β_1 represent?

The additional revenue for those in urban locations.

d) If β_1 equals 450, interpret this in context:

Urban shops on average have $450 extra in revenue over rural shops.

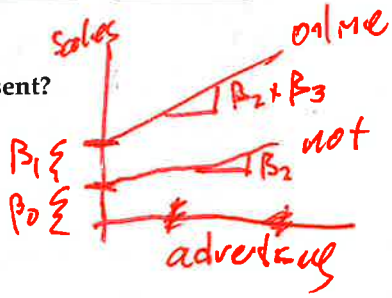
Q3. A study examines whether the effect of advertising spending on sales differs between online and brick-and-mortar stores. The variable online is coded as 1 for online stores and 0 for brick-and-mortar stores.

a) Write a regression model that allows the effect of `advertising` on `sales` to differ by store type (include an interaction term):

$$\underset{\varepsilon}{\text{sales}} = \beta_0 + \beta_1 \times \text{online} + \beta_2 \times \text{ad} + \beta_3 \times \text{ad} \cdot \text{online} +$$

b) In this model, what does the coefficient on `advertising` (without the interaction) represent?

How much sales increase for every dollar of ads for brick and mortar stores.



c) What does the coefficient on the interaction term (`advertising` × `online`) represent?

The extra returns to advertising for online stores.

~~**d) If $\beta_1 = 2.5$ and $\beta_3 = 1.2$, what is the effect of a $1,000 increase in advertising on sales for online stores?**~~

Q4. A researcher collected data on 200 houses and wants to understand how square footage and neighborhood affect housing prices. The regression output shows:

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	85.400	12.300	6.943	0.000	61.117	109.683
sqft	a) → 0.125	0.018	6.944	0.000	0.090	0.160
Suburb	b) → 25.600	8.200	3.122	0.002	9.417	41.783
Rural	-18.300	9.100	-2.011	0.046	-36.262	-0.338

Note: Urban is the reference category for neighborhood; price is in thousands of dollars; sqft is in square feet.

a) Interpret the coefficient on sqft (0.125) in context:

Every additional square foot is associated with 0.125k $ extra in the price, holding every else constant.

b) Interpret the coefficient on Suburb (25.600) in context:

A house in the suburbs is $25k more expensive than in an urban area.

c) What is the predicted price for a 2,000 sqft house in an Urban neighborhood?

Show your work:

price = 85.4 + 0.125 · 2000 + 25.6 · 0 + -18.3 · 0 =

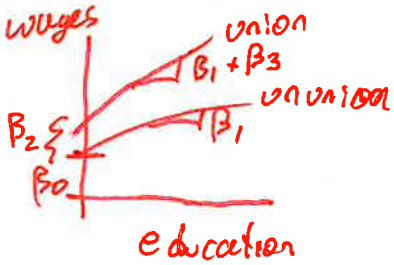
d) What is the predicted price for a 2,000 sqft house in a Rural neighborhood?

Show your work:

price = 85.4 + 0.125 · 2000 + -18.3 · 1 =

Q5. A labor economist wants to test whether the return to education differs for union vs. non-union workers.

a) Which of the following models would test this hypothesis? (circle one)



A) wages = $\beta_0 + \beta_1 \cdot$education + $\beta_2 \cdot$union + ε

B) wages = $\beta_0 + \beta_1 \cdot$education + $\beta_2 \cdot$union + $\beta_3 \cdot$(education × union) + ε

C) wages = $\beta_0 + \beta_1 \cdot$education + $\beta_2 \cdot$experience + $\beta_3 \cdot$union + ε

D) wages = $\beta_0 + \beta_1 \cdot$(education × union) + ε

b) In the correct model, which coefficient would you examine to determine if the return to education differs by union status?

β_3

c) If that coefficient is positive, what would that tell us about the relationship?

It would tell us that the returns to education are higher for unionized workers.

Q6. Consider the following regression output examining how temperature affects ice cream sales, with month fixed effects:

	coef	std err	t	P>|t|
Intercept	120.500	15.200	7.928	0.000
temperature	8.250	1.100	7.500	0.000
February	-5.200	8.400	-0.619	0.537
March	12.300	8.100	1.519	0.131
April	28.400	7.900	3.595	0.000
May	45.600	7.800	5.846	0.000
June	62.100	8.200	7.573	0.000
...				

Note: January is the reference category for months; sales is in dollars.

a) Why might we include month fixed effects when studying the effect of temperature on sales?

We want to control for the factors that differ between months like January and December that aren't related to temperature.

b) The coefficient on `temperature` is 8.250. What does this represent in this model?

Every increase in the temp by 1° is assiated with an increase in sales of $8.25, holding month constant.

c) The coefficient on `April` is 28.400. Interpret this in context:

April has sales that are $28.4 higher, holding temperature constant.