

Old Exam 3, Econ 311

Total points are 100. But it counts 20% toward your final grade. So the effective total points are 20

Note: (i) show me your work in details in order to get partial credits; (ii) round your answer to 2 decimal spaces

Last Name

First Name

You may use the following facts to answer some questions. Let $Z \sim N(0, 1)$ then

$$P(Z < 1.96) = 0.975 \quad P(Z < 1.645) = 0.950 \quad P(Z < 1.28) = 0.900$$

Q1, 2, 3, 4, 5 are based on the following simple regression applied to Wage data

```
> summary(lm(wage~married))$coef
              Estimate Std. Error  t value    Pr(>|t|)
(Intercept) ?          0.2518651  19.281974 5.224669e-63
married      1.730106   0.3229133    ?          1.263821e-07
```

Q1 (5 points) Please find interpret, and intercept it.

Q2 (5 points). Please interpret 1.730106, the coefficient of married

Q3 (5 points) Find the t test for the null hypothesis $H_0 : \beta_1 = 2$ and draw a conclusion.

Q4 (5 points). Please find the two-sample t test for the null hypothesis that there is no difference in average wage between married and unmarried persons, and draw a conclusion

Q5 (5 points). Can you guess whether the confidence interval for β_1 includes 0? Why?

Q6 (10 points). Please describe in detail how to test the null hypothesis that the effect of exper on wage does not depend on marital status. You need to specify the unrestricted and restricted models. How to draw conclusion?

Q7 (10 points). Suppose there is a race variable that equals one for black people, two for white people, and three for other people. Please explain how to use race variable to run a regression that estimate its effect on wage

Q8 (5 points). What is dummy variable trap, and how to avoid it?

Q9 (5 points). Explain the common trend assumption of the difference-in-difference estimator

Q10 (10 points). Consider the regression results

```
> inta = female*married
> summary(lm(wage~married+female+inta))$coef
```

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	5.181395	?	?	?
married	2.818605	?	?	?
female	-0.557812	?	?	?
inta	-2.868703	?	?	?

please interpret 2.818605 and -0.557812

Q11 (5 points). Continue Q10. Find the average wage for married male

Q12 (5 points). Please explain in details how the authors of Gun paper apply the difference-in-difference (DID) technique to show the effect of Gun Buyback on crimes.

Q13 (5 points). What is heteroskedasticity? How to define heteroskedasticity mathematically?

Q14 (10 points). What is the null hypothesis of the Breusch-Pagan (BP) test? Please discuss fully how to proceed if we reject the null hypothesis of the BP test.

Q15 (5 points). Suppose a sample contains two independent observations (X_1, X_2) with $E(X_1) = 8$, $\text{var}(X_1) = 4$, $E(X_2) = 8$, $\text{var}(X_2) = 1$, $\text{cov}(X_1, X_2) = 0$. Consider the weighted mean that uses unequal weights $\tilde{X} = \frac{1}{3}X_1 + \frac{2}{3}X_2$. Please find $E(\tilde{X})$ and $\text{var}(\tilde{X})$

Q16 (5 points) (True or False, Why). The coefficient estimate reported by R function `lm` will change after heteroskedasticity robust standard error and t value are reported