

Econometrics A (Econ 210)

Problem Set 6

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Due: Nov 19, 2015; TA Session

Note: The references to Wooldridge are according the second edition. Check the scanned pages if you are using a different version.

1. Wooldridge 3.3
2. Wooldridge 3.4
3. Wooldridge 3.9
4. Using data on 2,380 home mortgage applications in Massachusetts, two linear probability models are estimated to explain what factors influence whether banks deny loan requests for home buyers. The dependent variable, *Deny*, is binary, with a value of 1 when an application is denied and 0 otherwise. The explanatory variables used are *MP/Inc*, the ratio of the proposed (monthly) mortgage payment to household (monthly) income; *Loan/Val*, the ratio of the loan amount to the appraised value of the home; and *Black*, a binary variable taking on a value of 1 if the applicant is black and 0 if the applicant is white. Summary statistics and regression results are summarized in Table 1.

(a) Of the 339 loan applications submitted by black home buyers, 28% were denied.

Comparing this number to the summary statistic for *Deny* on the entire sample,

Table 1: Home Loan Applications

Summary Statistics				
Variable	Mean	St. Dev.	Min	Max
<i>Deny</i>	0.12	0.32	0	1
<i>Black</i>	0.14	0.35	0	1
<i>MP/Inc</i>	0.33	0.11	0	3
<i>Loan/Val</i>	0.74	0.18	0.02	1.95

Regression Results				
	Model 1		Model 2	
	Estimated Coefficient	Standard Error	Estimated Coefficient	Standard Error
<i>MP/Inc</i>	2.47	0.52	2.60	0.46
<i>Loan/Val</i>	1.41	0.28	1.33	0.25
<i>Black</i>	.71	.66	0.63	0.08
<i>MP/Inc</i> \times <i>Black</i>	.68	1.06	—	—
<i>Loan/Val</i> \times <i>Black</i>	-0.39	0.63	—	—
Constant	-3.24	0.28	-3.22	0.25

does this tell us anything about racial discrimination in loan evaluation practices? Briefly explain why or why not.

- (b) Using the regression results, construct a test statistic to evaluate the hypothesis that race plays no role in Model 1. State the null hypothesis and the distribution of the test statistic, including degrees of freedom.
 - (c) Using the statistical tables provided, give the 5% critical value for the test. Would you reject the hypothesis that race does not change evaluation of financial characteristics at the 5% level?
 - (d) What is the average change in loan denial probability associated with being black, holding all other factors constant.
 - (e) Comment on whether the discrimination effect in the previous part is statistically and/or economically significant.
5. Using data on 66 houses that were sold in a single metropolitan area, three models are estimated to explain house prices. The dependent variable, *Price*, is the sale price of the house, measured in thousands of US dollars (*i.e.*, 100 means \$100,000). The explanatory variables are *Lot Size*, the size of the house's lot in acres; *Sq. Footage*, the size of the house, as measured in standard square feet; and *# of Bedrooms*, the number of bedrooms in the house. The results are summarized in Table 1.
- (a) Explain in common terms what the coefficient for "*# of Bedrooms*" means, using the value from Model 1.
 - (b) Using Model 1, construct a 95% confidence interval to evaluate the hypothesis that the number of bedrooms has no effect on price against the alternative hypothesis that it does matter in some way (*i.e.*, a two-sided alternative).

Table 2: House Price Regression Results

	Model 1		Model 2		Model 3	
	Estimated Coefficient	Standard Error	Estimated Coefficient	Standard Error	Estimated Coefficient	Standard Error
<i>Lot Size</i>	498.66	87.42	809.24	90.81	90.069	27.97
$(Lot\ Size)^2$	-204.55	41.47	-348.14	43.63	—	—
<i># of Bedrooms</i>	20.19	7.96	48.75	8.33	13.85	9.01
<i>Sq. Footage</i>	0.18	0.06	—	—	0.12	0.013
$(Sq. Footage)^2$	0.00015	0.00013	—	—	—	—
<i>Constant</i>	36.28	74.59	-14.27	31.59	-21.77	29.48
R²	0.7581		0.6228		0.6724	
SSR	222,020		346,220		300,720	

(c) Note that Model 1 includes non-linear effects of both “*Lot Size*” and “*Sq. Footage*”.

Using information in Table 1, construct a test statistic to evaluate the hypothesis that the linear version of the model (Model 3) adequately captures the effects of house size and lot size (in other words, test the hypothesis that we can ignore the squared terms). State the distribution of your test statistic (including its degrees of freedom), and use the provided statistical tables to tell whether the null hypothesis is rejected at the 5% level.