

**Final Exam – Wednesday December 14, 2005**  
3 hours – 40 % of the final grade – scores add up to 40

## Instructions:

- Answer the question in the space provided in this exam.
- You may use your books and notes
- Show your work
- Be careful when you make calculations!
- Answer all the different parts of the questions
- Explain your answers
- Sign the below statement

I understand the Honor Code and pledge to abide by it.

Print Name: \_\_\_\_\_ Sign Name: \_\_\_\_\_

Date: \_\_\_\_\_

**A. Discrimination and (French) fries (20 points)**

Fast-food restaurants have been accused of many “bad” practices over the years. One of the accusations involved practices of price discrimination against African Americans. In order to analyze these accusations, a researcher collected information on the price of a small portion of French fries and the price of a medium soda from a random sample of fast-food restaurants in New Jersey (NJ) and Pennsylvania. He found a substantial price difference between the prices of fries in different restaurants and wanted to analyze whether there is evidence of higher prices in restaurants located in neighborhoods with a higher proportion of African Americans.

He collected data on 410 restaurants from 4 different chains: Burger King, Kentucky Fried Chicken, Roy Rodgers, and Wendy’s. He also collected information that characterizes the neighborhood<sup>1</sup> in which the fast food restaurant is located: specifically he knows the proportion of black population (measured between 0 and 1) median family income (in US\$), and the proportion of population without a car (between 0 and 1). He also has information on the crime rate (between 0 and 1) and the population density of the town where the restaurant is located (nr of people per square mile). He presents the regression output in table A.1. (see attach)

- 1) Give a careful interpretation of the coefficients in the second column (sign, magnitude, significance). (3 points)

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<sup>1</sup> Neighborhood’s were defined as areas with the same zip code



- 7) True or False? The results provide evidence that indicates that fast food chains use price discrimination against African Americans and against high-income families? T/F. Explain. (2 points)
- 8) Write out a model that would allow you to test whether Wendy's restaurants discriminate more against African Americans than other restaurants. (2 points)
- 9) Is there other information that should be included in the model? If so, (and assuming you could find that information), write out a model that would improve the estimations. Explain. (2 points)



- 4) The researcher decided to use the observations from the rural and urban areas together in 1 regression.
- a. Does this cause a violation of any of the OLS assumptions? (2 points)
  - b. Explain in detail how you would test whether the relationship between the independent and the dependent variable is the same for rural and urban areas. (3 points)

- 5) The researcher also collected information on the religion of the women. She has a variable called, *relig*, that takes the value of 1 if the women is protestant, 2 if she is catholic, and 3 if she follows a traditional religion. Explain how the researcher could use this information to improve her regressions. (1point)

- 6) The researcher wonders whether the women have given her the correct information about the use of contraceptive methods. Explain why this might be a concern, and discuss the possible implications. (3 points)

**C. True or False (4 points)**

- 1) When all the Gauss-Markov assumptions hold, the t- and the F-statistics will always allow us to make accurate inferences. T/F? Explain. (2 points)
- 2) Autocorrelation is only a problem in time-series regressions when the model does not include a variable capturing the time trend. T/F? Explain. (2 points)

**D. Grade your teammates:**

On scale from 1(=a little) to 5(=a lot), how much did they contribute to the problem sets?

Name 1: \_\_\_\_\_ Grade: \_\_\_\_\_  
Name 2: \_\_\_\_\_ Grade: \_\_\_\_\_

## Regression results

### Part A:

**Table A1: Determinants of fries prices in fast food restaurants:**

Dependent variable: log (price) of small fries

	(1)	(2)	(3)	(4)	(5)
proportion black population	0.039 (1.23)	0.138 (3.96)	-0.024 (0.62)	-0.017 (0.51)	-0.327 (1.47)
log(median family income)		0.130 (5.71)	0.166 (5.42)	0.114 (4.20)	0.118 (4.33)
crime rate			0.256 (1.53)	0.186 (1.27)	0.175 (1.19)
population density			0.000 (3.65)	0.000 (3.29)	0.000 (3.23)
proportion of population without car			0.153 (1.46)	0.135 (1.46)	0.153 (1.64)
New Jersey dummy			0.083 (5.94)	0.090 (7.33)	0.078 (5.09)
(New Jersey dummy)*proportion black pop.					0.312 (1.41)
Burger King dummy				0.034 (2.53)	0.033 (2.43)
Kentucky Fried Chicken dummy				-0.029 (1.87)	-0.030 (1.95)
Roy Rogers dummy				0.116 (7.68)	0.115 (7.65)
Constant	-0.092 (13.42)	-1.493 (6.08)	-1.980 (6.00)	-1.461 (4.97)	-1.492 (5.07)
Observations	392	392	391	391	391
R-squared	0.00	0.08	0.25	0.43	0.43

Absolute value of t statistics in parentheses

### Part B: Stata output

#### \* VARIABLE DEFINITION AND DESCRIPTIVE STATISTICS

Contains data from C:\karen\teaching\metrics\_teaching\metrics\_data\FERTIL2.DTA

obs: 4,361  
vars: 7 17 Aug 1999 15:26  
size: 61,054 (94.2% of memory free)

variable name	storage type	display format	value label	variable label
age	byte	%8.0g		age in years
educ	byte	%8.0g		years of education
children	byte	%8.0g		number of living children
usemeth	byte	%8.0g		=1 if ever use birth control
heduc	byte	%8.0g		husband's years of education
urban	byte	%8.0g		=1 if live in urban area
kids2	float	%9.0g		=1 if more than 2 kids

Sorted by:

. sum

Variable	Obs	Mean	Std. Dev.	Min	Max
age	4361	27.40518	8.685233	15	49
educ	4361	5.855996	3.927075	0	20
children	4361	2.267828	2.222032	0	13
usemeth	4290	.5776224	.4939956	0	1
heduc	1956	5.144683	4.803028	0	20
urban	4361	.5166246	.4997808	0	1
kids2	4361	.3728503	.4836182	0	1

**\* REGRESSION 1**

. regress children age educ heduc urban usemeth, robust

Linear regression

Number of obs = 1908  
 F( 5, 1902) = 270.88  
 Prob > F = 0.0000  
 R-squared = 0.4424  
 Root MSE = 1.6999

children	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
age	.1618161	.0058674	27.58	0.000	.150309	.1733233
educ	-.102144	.0116235	-8.79	0.000	-.1249403	-.0793478
heduc	-.0499712	.0099902	-5.00	0.000	-.0695641	-.0303782
urban	-.3694232	.082796	-4.46	0.000	-.5318037	-.2070427
usemeth	1.099197	.093251	11.79	0.000	.9163123	1.282082
_cons	-1.469215	.1797136	-8.18	0.000	-1.821671	-1.116758

**\* REGRESSION2**

. regress kids2 age educ heduc urban usemeth, robust

Linear regression

Number of obs = 1908  
 F( 5, 1902) = 253.35  
 Prob > F = 0.0000  
 R-squared = 0.3104  
 Root MSE = .40652

kids2	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
age	.0278685	.0012127	22.98	0.000	.0254901	.0302469
educ	-.0187484	.0029311	-6.40	0.000	-.0244969	-.013
heduc	-.0107396	.0025848	-4.15	0.000	-.0158089	-.0056703
urban	-.0730406	.0201459	-3.63	0.000	-.1125511	-.0335302
usemeth	.2431552	.0204449	11.89	0.000	.2030584	.283252
_cons	-.2504485	.0452028	-5.54	0.000	-.3391008	-.1617961