

ECO 307: Introductory Econometrics
Instructor: Dr. James Murray
In-class Exercise: Regression Analysis
Fall 2015

Your Name: _____

Learning Objective: (LO 2) Construct, estimate, and interpret regression models to identify relationships between explanatory and outcome variables.

Directions: The questions on the following page use the dataset `discrim.csv` on the class website. The dataset includes zip-code level data on prices for various items at fast food restaurants, including the average price of soda, fries, entrees like burgers and chicken sandwiches, and a number of variables that may determine these price levels. The goal of the research project was to determine if there is racial discrimination in fast food prices. Do neighborhoods that have higher proportions of racial minorities experience higher fast food prices?

The reverse side of this cover sheet includes a list and description of all the variables.

Group Work Terms and Conditions: Work in groups of up to four people and answer the following questions. All papers will be collected, but only one member's paper will be randomly selected and graded and all members of the group will receive the same grade.

By signing below, you agree that the following work represents the efforts of everyone in the group, and you are willing to accept as your own grade for the group project the grade earned from this representation of your group's work. Every member must agree to these terms to earn a non-zero grade for this assignment.

_____ Signature Group Member 1	_____ Print Name	_____ Date
_____ Signature Group Member 2	_____ Print Name	_____ Date
_____ Signature Group Member 3	_____ Print Name	_____ Date
_____ Signature Group Member 4	_____ Print Name	_____ Date

Data Description: The variables below were collected for each of 410 different zip codes in New Jersey and Pennsylvania. The data includes information on prices of fast food, factors that influence fast food restaurants costs, factors that influence demand for fast food, and the proportions of each zip code that are black / African American.

Variable Name	Description
psoda	price of medium soda
pfries	price of small fries
pentree	price entree (burger or chicken)
wagest	starting wage, 1st wave
nmgrs	number of managers, 1st wave
nregs	number of registers, 1st wave
hrsopen	hours open, 1st wave
emp	number of employees, 1st wave
psoda2	price of medium soda, 2nd wave
pfries2	price of small fries, 2nd wave
pentree2	price entree, 2nd wave
wagest2	starting wage, 2nd wave
nmgrs2	number of managers, 2nd wave
nregs2	number of registers, 2nd wave
hrsopen2	hours open, 2nd wave
emp2	number of employees, 2nd wave
compown	1 if company owned
chain	BK = 1, KFC = 2, Roy Rogers = 3, Wendy's = 4
density	population density, town
crmrt	crime rate, town
state	NJ = 1, PA = 2
prpblck	proportion black, zipcode
prppov	proportion in poverty, zipcode
prpncar	proportion no car, zipcode
hseval	median housing value, zipcode
nstores	number of stores, zipcode
income	median family income, zipcode
county	county label
lpsoda	log(psoda)
lpfries	log(pfries)
lhseval	log(hseval)
lincome	log(income)
ldensity	log(density)
NJ	1 for New Jersey
BK	1 if Burger King
KFC	1 if Kentucky Fried Chicken
RR	1 if Roy Rogers

1. Estimate a linear regression that predicts the average price of a fast food burger or chicken entree in a zip code based on the following explanatory variables: starting wage for fast food workers, median family income, the proportion of the population that lives in poverty, the average crime rate (per 1000 in population), the population density, and the proportion of the population that is black / African American.

(a) Report the estimated regression equation.

(b) Is there statistical evidence that there is racial discrimination in fast food prices, after accounting for fast food workers wage, median family income, proportion of the population in poverty, crime rate, and population density? Test the appropriate hypothesis.

(c) Report the explanatory variables where you have statistical evidence that they influence the fast food prices.

(d) What percentage of the variability in fast food prices is accounted for by your explanatory variables?

- (e) Test the hypothesis that at least one of your regression variables is useful in explaining prices of fast food entrees.
- (f) What does your regression predict would be the change in fast food entree prices for each \$1,000 of additional median family income?
- (g) Predict the price of a fast food entree in a town with the following characteristics:
- Starting fast food wage = \$6.15
 - Median family income = \$41,000
 - Proportion of the population that lives in poverty = 10%
 - Crime rate = 5 per 1000.
 - Population density = 3800
 - Proportion black / African American = 30%
- (h) Report a statistic that provides a measure of how well the regression model fits your sample data.

2. Estimate a linear regression that predicts the *natural log of the* average price of a fast food burger or chicken entree in a zip code based on the following explanatory variables: starting wage for fast food workers, *the natural log* of median family income, the proportion of the population that lives in poverty, the average crime rate, the *log of the population* population density, and the proportion of the population that is black / African American.
- (a) The same outcome and explanatory variables are used in this problem as the previous problem, but the outcome variable and some of the explanatory variables are expressed instead as a *natural log*. How much variability in this transformed outcome variable is accounted for by your explanatory variables. How does this compare to the previous model.
- (b) With this new regression structure, is there statistical evidence that there is racial discrimination in fast food prices? Test the appropriate hypothesis.
- (c) Accounting for all the explanatory variables in your regression model, how does a 1% increase in median income influence fast food prices? Construct and interpret a 95% confidence interval.
- (d) Accounting for all the explanatory variables in your regression model, how does a 1% increase in population density influence fast food prices? Construct and interpret a 95% confidence interval.