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Environmental Clean-up and Property Price Change

Emily Aronow
Economics Honors Thesis
Oberlin College

Spring, 1999

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Emily Aronow
Oberlin College

May 14, 1999

Hedonic Theory

In 1939, Congress debated taking anti-monopoly action against General Motors because it seemed that GM was artificially inflating its new car prices. In response, GM hired economist Andrew T. Court to prove that they weren't overcharging for their cars. In fact, the new car prices *were* rising much faster than inflation, and Court had to devise a way to prove that the price change legitimately reflected improvements in the quality of new cars. Building on Waugh (1929), Court created a model that divided the price of a car into prices for its characteristics, including "horsepower, braking capacity, window area, seat width, tire size, etc."[1] He proved that the relative prices of these characteristics did not increase, but only their amounts. He called his new model the 'hedonic' model and the prices of the characteristics 'hedonic prices.'

The hedonic approach presumes that there are two markets. Explicit markets are the ones with observed prices and transactions; for example, a car or a house. Implicit markets concern the production, consumption and exchange of characteristics such as size, safety, proximity to downtown, and noise level. The characteristics are traded in bundles, the bundles being the composite good like the car.

Hedonic modeling achieves two goals. The hedonic approach identifies a) how much of the difference in commodity value is due to a particular characteristic difference between the commodities and b) how much people are willing to pay for an improvement in the characteristic. With this information, one can figure out the social value of an improvement in a characteristic.[2] In the case of property and environmental health, I use the hedonic approach to estimate the household demand for environmental health, and I

[1] Court quoted in Berndt (111).
[2] Pearce (143).

$$\text{Property Price} = c + \beta_1\text{Property Characteristics} + \beta_2\text{Neighborhood Characteristics} + \beta_3\text{IBI} + u. \quad \textbf{(Eq. 2)}$$

β_3 is the implicit price of health of the Black River. If β_3 is statistically significantly different from zero, the health of the Black River has an effect of β_3 on local property prices. I also evaluate the welfare consequences of changes in environmental quality.

Study Site (see Fig. 1)

The Black River is a particularly interesting area to study because there is so much variation along its course. Waste water treatment plants, agricultural runoff, and intensive cleanup efforts intersperse within rural, urban, and suburban areas to create a mosaic of environmental health along its length. In addition, the Environmental Protection Agency did a comprehensive study in 1993 evaluating the health of the Black River, testing for chemical and biological pollutants, the health of the river's inhabitants, and the biotic integrity of the river community as a whole.

use the derived implicit price to estimate the social welfare consequences of cleaning up the environment.

Hypothesis

In my experiment, I am trying to find the value, to Lorain County property owners, of cleaning up the Black River which runs through Lorain County. This study involves a number of property variables, a number of neighborhood variables, and the environmental variables. The hedonic price function takes this general form:

$$\text{Property Price} = c + \beta_1\text{Property Characteristics} + \beta_2\text{Neighborhood Characteristics} + \beta_3\text{Environmental Characteristics} + u. \qquad \textbf{(Eq. 1)}$$

This equation says that the price of a piece of property is a function of several things: the characteristics of the property, the characteristics of the neighborhood it's in, and the characteristics of the environment. The slope coefficients β_1, β_2, and β_3 are the hedonic prices of the property, neighborhood, and environmental characteristics, respectively. *u* represents the combined effect of all the housing characteristics about which I have no information.

I hypothesize that the environmental health of the Black River is a commodity (or source of pleasure) in the housing bundle. At first, one might suspect that the health of a nearby stream is not considered when purchasing a house. However, recall that water moves in a hydrologic cycle. The Ohio EPA says, "the populations of fish in a river reflect the overall state of environmental health of the watershed as a whole. This is because fish live in water which has previously fallen on the cities, fields, strip mines, grasslands, and forests of the watershed."[3] The water and other solutes in the river are products of the land around a river. A river near an urban center that sends off sulfur and carbon monoxide will have elevated acidity because the rain washes the airborne pollutants into the river. The fish and insects will reflect this increased acidity. Therefore, the river is a good approximation of the health of the surrounding area.

In order to test this hypothesis, I determine the implicit price of the health of the Black River. In the regression

[3] OEPA 1987

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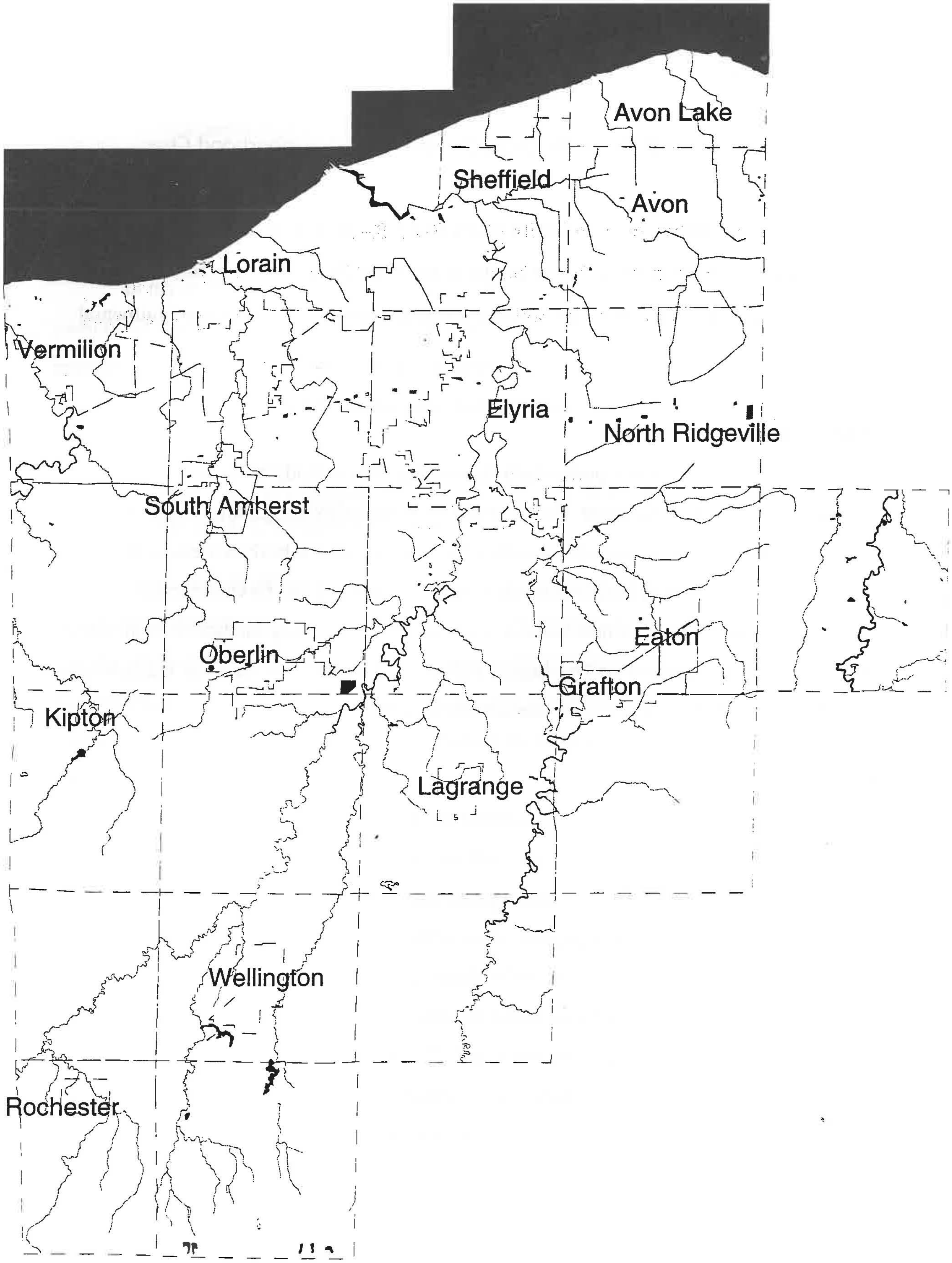


Fig. 1: The Black River watershed

Materials: Information About the Data

Information about the households of Lorain County, OH was obtained from the Lorain County Tax Assessor's office. The data, which included all property bought and sold in Lorain County since 1960, were narrowed down for the purposes of this study to include the 10,291 homes which satisfied the following conditions. Single family residences must have been sold after 1990 within the price range of $10,000 and $2 million. I excluded lot sizes above 80,000 sq. ft. and below 4,000 sq. ft., building sizes below 500 sq. ft. and above 11,000 sq. ft., and those records which listed no bedrooms. I also excluded the homes which had addresses not locatable by GIS. Each house record includes information about building and owner characteristics, as well as legal and school district information.

CPI data used to deflate the house sale price were obtained from the Department of Labor's web site. These data were monthly CPI with base year 1982 for the Cleveland area.

Locations of the testing sites were determined with GIS information using MapInfo. MapInfo provides the mapping data, which includes longitude and latitude information for the Black River and its tributaries (see Fig.2).

Finally, data on the health of the Black River and its tributaries were obtained from the 1993 Ohio EPA report *Biological and water quality study of the Black River (with selected tributaries) and Beaver Creek.* The EPA collected data on chemical levels, biotic indices, heavy metal levels, and organic compound levels. However, as will be explained later, the biotic compound levels as opposed to the other characteristics were used as the indicators of environmental quality in this study.

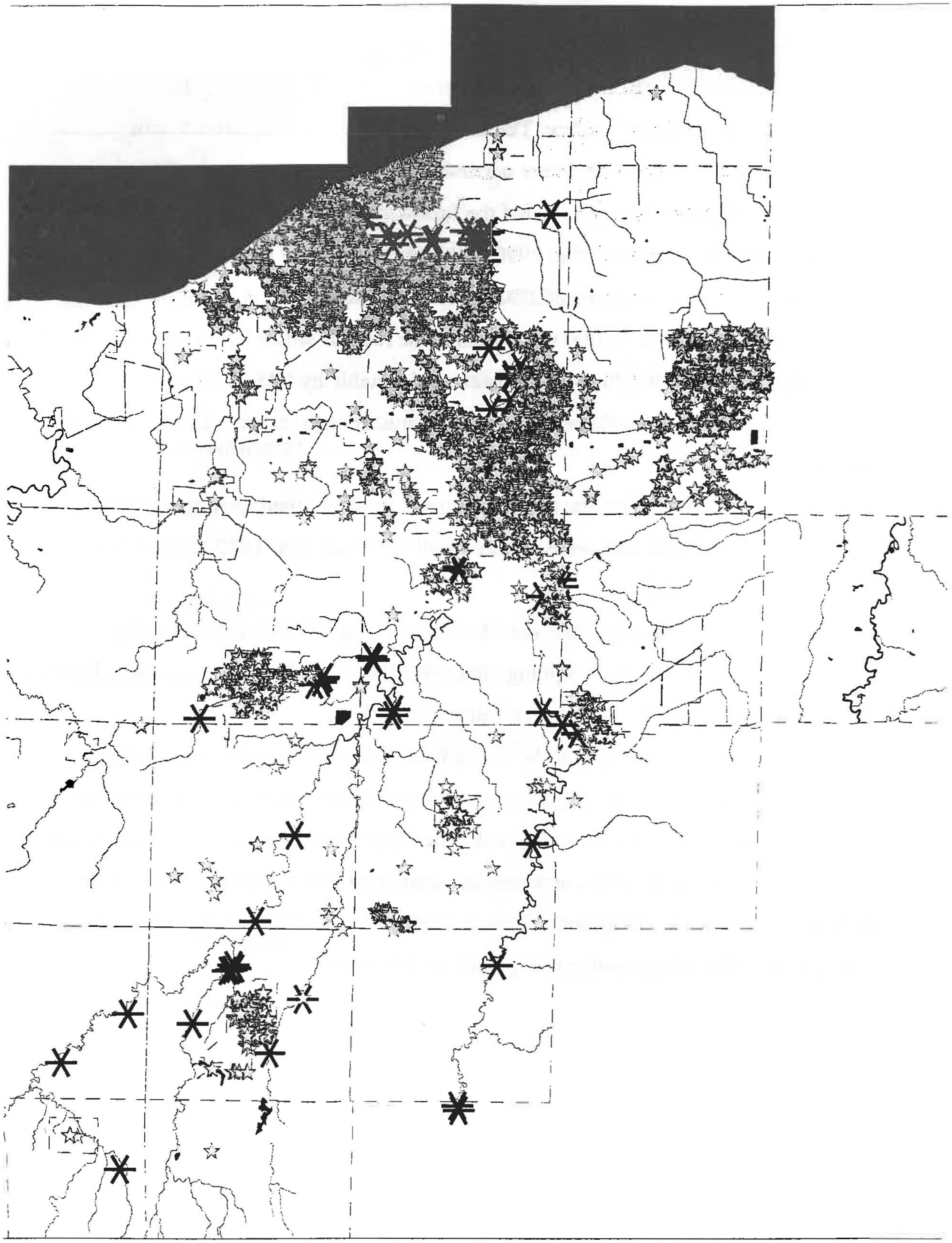


Fig. 2: Properties and test sites.
The ★ represents a house.
The ⚹ represents an EPA water quality testing site.

Definitions

Biological integrity describes the overall health of an ecosystem, such as the Black River. The Ohio EPA defines biological integrity as "the ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of the best natural habitats within a region."[4] In other words, a river is biologically integrated if it has all of the species of fish and insects and plants that similar rivers have. This definition of biological integrity doesn't strive for some 'pristine' condition, but rather uses as its standard what is within reach given our technology and uses of the river.

The Index of Biotic Integrity, or IBI, is the proxy I use for environmental health. The IBI incorporates measurements of 12 fish and macroinvertebrate characteristics. Each characteristic is rated from 1 (this community strongly deviates from what one would see at a site with minimal human influence) to 5 (this community approximates what one would see at a site with minimal human influence). Then all the metrics are added up to give the site a total score ranging from 60 (best) to 12 (worst).[5]

Variables

I use the following variables in my regression.

- A82_PRICE: the sale price in 1982 dollars.
- PRICE: the price on the date of sale.
- DOCDATE: the date of sale.
- AGE: the age of the house.
- LOTSQFT: number of square feet in the lot.
- TOTLVNGSF: total living square feet.
- DISTOSITE: the distance from the house to the closest EPA testing site on the river in feet.
- IBI: the rating on the Index of Biotic Integrity (from 12 to 60)

I took the logarithm of the continuous variables in order to linearize variables which might enter the equation non-linearly. Note that LOGPRICE =log(a82_PRICE) and LOGIPRICE = log(PRICE) (the inflated price). In addition, LOGNUMDATE = log(DOCDATE) and LOGFT = log(TOTLVNGSF) .

[4] OEPA 1987

I also generated dummy variables for the discrete characteristics.

- CGOOD = 1 if building is in good condition, 0 if not
- CAVG = 1 if building is in average condition, 0 if not
- CFAIR = 1 if building is in fair condition, 0 if not
- CPOOR = 1 if building is in poor condition, 0 if not
- AIR = 1 if has air conditioning, 0 if not
- TOPO = 1 if ground is level, 0 if ground is hilly
- GAS = 1 if has gas service, 0 if not
- SIDE = 1 if has sidewalk, 0 if not
- ELEC = 1 if has electrical service, 0 if not
- WBRICK = 1 if walls are brick, 0 if not
- WFRAME = 1 if walls are frame and brick, 0 if not
- WSTUC = 1 if walls are stucco, 0 if not
- WWOOD = 1 if walls are wood or aluminum, 0 if not
- PAVED = 1 if street is paved, 0 if not
- SCAM = AMHERST EX VILL school district is 1, 0 if not
- SCCL = CLEARVIEW LOCAL school district is 1, 0 if not
- SCEL = ELYRIA CITY school district is 1, 0 if not
- SCKE = KEYSTONE LOCAL school district is 1, 0 if not
- SCLO = LORAIN CITY school district is 1, 0 if not
- SCOB = OBERLIN CITY school district is 1, 0 if not
- SCWE = WELLINGTON EX V school district is 1, 0 if not

Functional Form

The relative importance of various property characteristics to home buyers is extracted by estimating the parameters in this multivariate regression equation.

$$\text{LOGPRICE} = \alpha_0 + \alpha_1\text{CAVG} + \alpha_2\text{CFAIR} + \alpha_3\text{CPOOR} + \alpha_4\text{AIR} + \alpha_5\text{ELEC} + \alpha_6\text{SCAM} + \alpha_7\text{SCCL} + \alpha_8\text{SCEL} + \alpha_9\text{SCKE} + \alpha_{10}\text{SCLO} + \alpha_{11}\text{WBRICK} + \alpha_{12}\text{WSTUC} + \alpha_{13}\text{WWOOD} + \beta_1\text{LOGAGE} + \beta_2\text{LOGDIST} + \beta_3\text{LOGFT} + \beta_4\text{LOGLOTFT} + \beta_5\text{LOGIBI} + u \quad \textbf{(Eq. 3)}$$

We can expect that the IBI level has a positive effect on the price of the house; that is, as the IBI level rises, so does the house price. In terms of the model's coefficients in Eq. 3,

H_o: $\beta_5 > 0$ H_a: $\beta_5 \leq 0$.

[5] OEPA 1987

Economists who work with property hedonics generally use a linear functional form.[6] In keeping with the literature, the log-linear form is used in this analysis. There is no *a priori* reason to believe that any of these variables enter into the equation other than additively. I take the logs of the continuous variables to allow for variables which enter the equation geometrically.

To determine which variables to include as regressors, I first used all the variables, including dummies for tax districts (Oberlin, Elyria, etc). I found that the tax districts and the school districts were so similar that including just the school district gave the same results. Thus, the school district dummies capture the value of all city amenities. I also deleted any dummies that were insignificant, because that means they could basically be represented by the constant term. Finally, I created LOGDIST to control for the distance to the river. My theory is that as houses get farther from the river, the river health becomes less important (has a smaller slope coefficient). I test this by estimating two equations.

$$LOGPRICE = \alpha_0 + \ldots. + \beta_{1a}LOGDIST + \beta_{2a}LOGIBI + \ldots + u \qquad \textbf{(Eq. 4)}$$

and

$$LOGPRICE = \alpha_0 + \ldots + \beta_{2b}LOGIBI + \ldots + u \qquad \textbf{(Eq. 5)}$$

I hypothesize that $\beta_{2a} \neq \beta_{2b}$, because β_{2b} would be biased by the omitted, correlated variable LOGDIST.

Using OLS

OLS is best linear unbiased if the regression satisfies the Gauss-Markov assumptions. The Gauss-Markov assumptions are:

(1) The regression model is linear in the coefficients.
(2) The independent variables X1, X2, X3 ...XK are not constant.
(3) The independent variables X1, X2, X3 ...XK are not perfectly multicolinear.
(4) The residuals are uncorrelated with all independent variables.
(5) The residuals are homoskedastic.
(6) The residuals are not autocorrelated.
(7) The expected value of the residuals is zero.
(8) The model is correctly specified.
(9) The values of the regressors are fixed in repeated sampling.

[6] Palmquist 1991

The equation is linear in the coefficients as discussed previously. One can look at the data and see that assumption (2) is satisfied (see Appendix). A simple correlation matrix reveals little colinearity. In any case, near perfect colinearity does not affect my results that much because I have such a large sample size, so assumption (3) is satisfied. Notice that there is very little correlation between the residuals (RESID) and all other variables.

Table 1: Correlation matrix

	AGE	DISTOSIT	EGAGE	IBI	LOGLOTFT	LOTSQFT	SCCOMBN	TOTLVNGSF	LOGFT	RESID
AGE	1.000	-0.135	0.240	0.086	-0.066	-0.038	-0.104	-0.057	-0.071	0.074
DISTOSIT	-0.135	1.000	-0.416	-0.471	0.374	0.280	0.493	0.204	0.225	0.077
EGAGE	0.240	-0.416	1.000	0.259	-0.291	-0.182	-0.301	-0.120	-0.125	-0.141
IBI	0.086	-0.471	0.259	1.000	-0.378	-0.296	-0.692	-0.214	-0.231	-0.002
LOGLOTFT	-0.066	0.374	-0.291	-0.378	1.000	0.911	0.431	0.381	0.371	0.000
LOTSQFT	-0.038	0.280	-0.182	-0.296	0.911	1.000	0.341	0.294	0.275	-0.026
SCCOMBN	-0.104	0.493	-0.301	-0.692	0.431	0.341	1.000	0.227	0.231	0.009
TOTLVNGSF	-0.057	0.204	-0.120	-0.214	0.381	0.294	0.227	1.000	0.969	-0.001
LOGFT	-0.071	0.225	-0.125	-0.231	0.371	0.275	0.231	0.969	1.000	0.000
RESID	0.074	0.077	-0.141	-0.002	0.000	-0.026	0.009	-0.001	0.000	1.000

Maddala (1977) discusses the problem of omitted variables. Omitted variables bias the coefficient on the dependent variable only if the omitted variable is correlated with the dependent variable. Because the IBI is a composite of so many factors, it seems unlikely that it is systematically correlated with other factors. Proximity to an urban center might seem to be correlated with the IBI. While it certainly affects the IBI, it is not systematically correlated with the IBI, because different cities have different policies with regard to their river, different industries, etc. I believe that omitted variables are not a problem in this regression.

Since all the important Gauss-Markov assumptions are satisfied, OLS is B.L.U.E.

Interpreting the Regression Coefficients

In the general case, Hardy (1993) explains the interpretation of dummy coefficients when there are several categories of a single dummy characteristic, as in the model for this paper. The hedonic regression includes four construction types CGOOD, CAVG, CFAIR, and CPOOR represented by dummy variables. Notice that CGOOD is not included as a regressor. Category CGOOD is known as the reference category and is included in the constant term a_0.

$$\text{Ln PRICE} = a_0 + a_1\text{CPOOR} + a_2\text{CAVG} + a_3\text{CFAIR} + ... + u \qquad \textbf{(Eq. 2)}$$

In Eq. 2, the coefficient a_1 gives the price difference between poorly and well-constructed houses, while the a_2 coefficient gives the price difference between average and good construction. Thus, the coefficients on the dummy variables are interpreted with respect to the category that is included in the constant term. In these analyses I always include the dummies CGOOD, SCOB, and WFRAME in the constant term.

In terms of useful numbers, $a_1 = \ln(1 + d_1)$ [7] where d_1 is the percentage change in price as a result of being poorly constructed. For values near zero, a_1 is approximately d_1, but for values about .15 and higher (or -.15 and lower), one can take the antilog of a_1 to determine d_1. Here is a schedule of the dummy variables, their coefficients, and the value of d_i.

Table 1: Dummy coefficients of Eq. 2 and transformations

Dependent Variable: LOGIPRICE

Variable	Coefficient	Antilog	d (antilog-1)
C	-51.727	0.000	-1.000
CAVG	-0.172	0.842	-0.158
CFAIR	-0.582	0.559	-0.441
CPOOR	-0.793	0.453	-0.547
AIR	0.141	1.151	0.151
ELEC	0.133	1.143	0.143
SCAM	-0.100	0.905	-0.095
SCCL	-0.367	0.693	-0.307
SCEL	-0.065	0.937	-0.063
SCKE	-0.220	0.802	-0.198
SCLO	-0.250	0.779	-0.221
WBRICK	0.045	1.046	0.046
WSTUC	0.069	1.071	0.071
WWOOD	-0.072	0.931	-0.069

Interpretations of various coefficients are as follows. Poorly constructed houses sell for about 55% less than well-constructed houses. Having air conditioning raises the house price by about 15%. Houses in the Lorain school district sell for about 22% less

[7] Berndt *Econometrics* p 164

than houses in the Oberlin and Wellington school districts. Finally, brick construction raises the house price by about 5% over frame construction.

The coefficients of the continuous variables are the elasticities of the dependent variables with respect to the independent variable, holding all other variables constant.

Table 4: Coefficients on continuous variables from Eq. 2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGDIST	0.075	0.006	12.532	0.000
LOGFT	0.493	0.013	38.224	0.000
LOGIBI	0.125	0.028	4.421	0.000
LOGLOTFT	0.150	0.009	17.018	0.000

For example, the coefficient on LOGIBI in interpreted as follows. A 100% change in the closest IBI rating leads to a 13% change in the price of the house.

Results

Notice that all variables except stucco construction are statistically significant (the t-ratio on WSTUC simply indicates that WSTUC is not significantly different from WFRAME). The R^2 is .53 as it was in every combination of variables tested.

Table 5: Regression results for Eq. 2

Dependent Variable: LOGPRICE
Method: Least Squares
Date: 04/02/99 Time: 13:18
Sample(adjusted): 1 10290
Included observations: 10247
Excluded observations: 43 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.267	0.178	29.618	0
CAVG	-0.161	0.011	-14.719	0
CFAIR	-0.563	0.017	-33.388	0
CPOOR	-0.763	0.032	-24.095	0
AIR	0.140	0.009	15.617	0
ELEC	0.142	0.041	3.481	0.0005
SCAM	-0.101	0.030	-3.371	0.0008
SCCL	-0.363	0.025	-14.424	0
SCEL	-0.064	0.014	-4.436	0
SCKE	-0.221	0.025	-8.687	0
SCLO	-0.249	0.017	-14.616	0
WBRICK	0.049	0.019	2.635	0.0084
WSTUC	0.067	0.058	1.168	0.243

WWOOD	-0.072	0.011	-6.440	0
LOGAGE	-0.100	0.007	-15.009	0
LOGDIST	0.075	0.006	12.314	0
LOGFT	0.484	0.013	37.125	0
LOGIBI	0.125	0.029	4.372	0
LOGLOTFT	0.151	0.009	16.947	0

R-squared	0.513	Mean dependent var	10.648
Adjusted R-squared	0.513	S.D. dependent var	0.531
S.E. of regression	0.371	Akaike info criterion	0.855
Sum squared resid	1404.821	Schwarz criterion	0.868
Log likelihood	-4359.085	F-statistic	599.614
Durbin-Watson	1.588	Prob(F-statistic)	0.000

Table 6: Regression without LOGDIST

Dependent Variable: LOGPRICE
Method: Least Squares
Date: 04/02/99 Time: 13:26
Sample(adjusted): 1 10290
Included observations: 10247
Excluded observations: 43 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.323	0.157	40.292	0.000
CAVG	-0.159	0.011	-14.453	0.000
CFAIR	-0.575	0.017	-33.910	0.000
CPOOR	-0.768	0.032	-24.086	0.000
AIR	0.148	0.009	16.354	0.000
ELEC	0.181	0.041	4.418	0.000
SCAM	-0.033	0.030	-1.107	0.268
SCCL	-0.337	0.025	-13.350	0.000
SCEL	-0.102	0.014	-7.211	0.000
SCKE	-0.227	0.026	-8.872	0.000
SCLO	-0.239	0.017	-13.973	0.000
WBRICK	0.048	0.019	2.543	0.011
WSTUC	0.053	0.058	0.922	0.357
WWOOD	-0.071	0.011	-6.329	0.000
LOGAGE	-0.122	0.007	-18.750	0.000
LOGFT	0.475	0.013	36.200	0.000
LOGIBI	0.030	0.028	1.094	0.274
LOGLOTFT	0.156	0.009	17.410	0.000

R-squared	0.506	Mean dependent var	10.648
Adjusted R-	0.505	S.D. dependent var	0.531

squared			
S.E. of regression	0.373	Akaike info criterion	0.869
Sum squared resid	1425.650	Schwarz criterion	0.882
Log likelihood	-4434.490	F-statistic	616.880
Durbin-Watson	1.584	Prob(F-statistic)	0.000

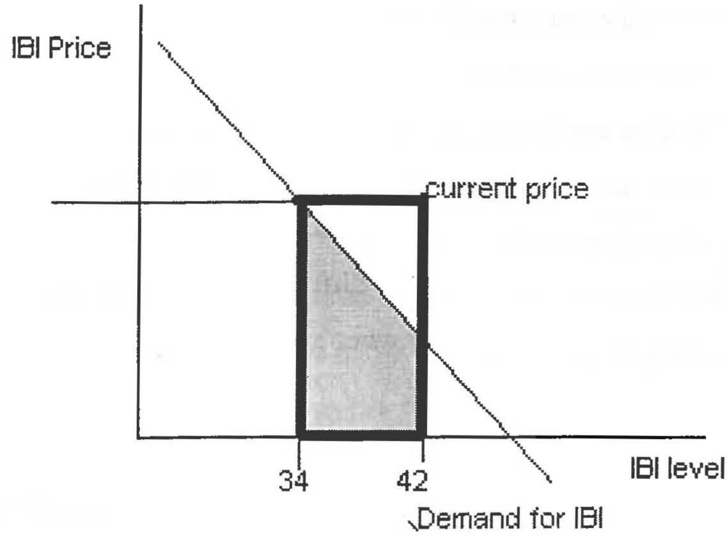
Notice that the coefficient on IBI is statistically significant when distance from the river is accounted for (Table 2) but it is not statistically significant when distance from the river is ignored (Table 3).

Cost-Benefit Analysis

The average price of a house (in 1982 dollars) is $69,976.32 (see Appendix). In 1999 dollars[8] the average house price is $78,878.45. The total number of houses along the Black River in 1990 was 62,781. The average IBI rating is 34. The maximum IBI rating in the sample is 42, so we know that level is attainable in Lorain County. Raising the average IBI level to 42 is about a 25% increase. A 25% increase in the IBI level causes a corresponding 3.25% increase in the property value. Therefore, if the county increases the average IBI level to today's attainable maximum of 42, the county increases property values by about $161 million.

However, this does not quite give the consumer surplus from a 25% improvement in the average IBI level. To determine the consumer surplus, household incomes are needed to determine the demand curve for IBI.

[8] ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt



I have estimated the square outlined in bold as $161 million. The consumer surplus is the shaded square. If Lorain County could improve the average river quality by 25% (from 34 to 42) at a lower cost than the consumer surplus, everyone stands to benefit.

Discussion

One might argue that the biggest 'hole' in my analysis is that we don't know whether the housing price and IBI level have a causal or just correlated relationship. In other words, one might say that the integrity of the stream and the housing prices are both a product of some third factor, like air pollution. This question is most significant with respect to public policy. Spending money in a way that cleans up the river but doesn't affect the third factor (say, dredging sediment) would actually have little to no effect on local property prices. If I had time to collect data on other aspects of the environment that affect both houses and the river, I could run a regression with all of them to see what was really affecting the house. I could run the regression using more specific factors than the IBI, such as specific chemical levels, to see if there is any specific chemical or pollutant source that has a particularly strong effect on housing prices. Public policy could then be directed toward targeting that pollutant anywhere in the biogeochemical cycle.

Something that I would like to investigate further is to see if the hedonic price of river integrity has changed over time. For that, I would need housing data for the early '80s and regress that on the 1982 Black River EPA report data. I could then test whether

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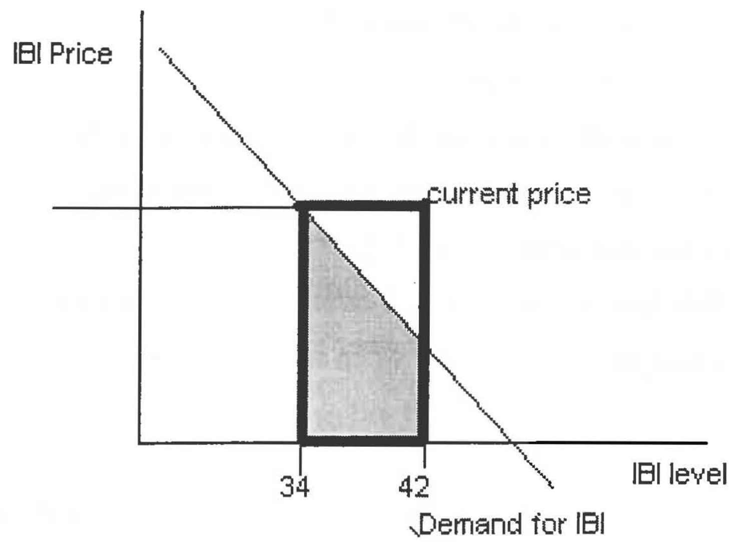


I have estimated the square outlined in bold as $161 million. The consumer surplus is the shaded square. If Lorain County could improve the average river quality by 25% (from 34 to 42) at a lower cost than the consumer surplus, everyone stands to benefit.

Discussion

One might argue that the biggest 'hole' in my analysis is that we don't know whether the housing price and IBI level have a causal or just correlated relationship. In other words, one might say that the integrity of the stream and the housing prices are both a product of some third factor, like air pollution. This question is most significant with respect to public policy. Spending money in a way that cleans up the river but doesn't affect the third factor (say, dredging sediment) would actually have little to no effect on local property prices. If I had time to collect data on other aspects of the environment that affect both houses and the river, I could run a regression with all of them to see what was really affecting the house. I could run the regression using more specific factors than the IBI, such as specific chemical levels, to see if there is any specific chemical or pollutant source that has a particularly strong effect on housing prices. Public policy could then be directed toward targeting that pollutant anywhere in the biogeochemical cycle.

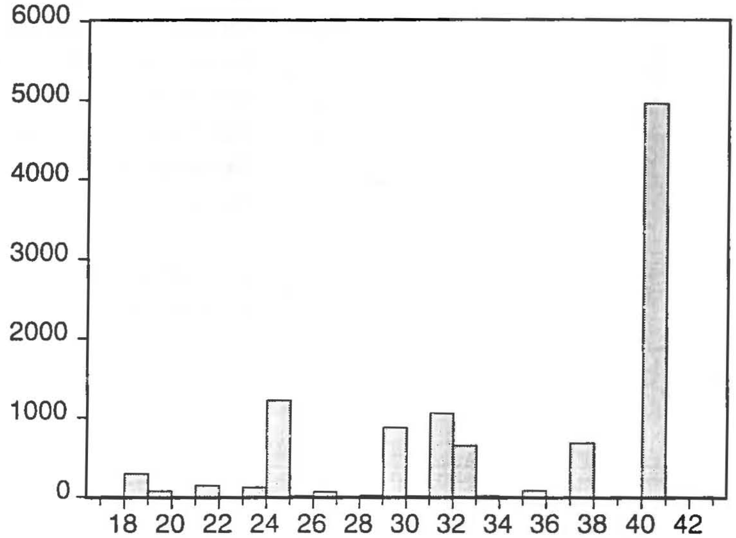
Something that I would like to investigate further is to see if the hedonic price of river integrity has changed over time. For that, I would need housing data for the early '80s and regress that on the 1982 Black River EPA report data. I could then test whether the slope coefficients (the price people are willing to pay for environmental health) has changed between the 1980's and the 1990's.

I do need to alter my house age data. I have constructed the house age data as the number of years since the house was built. More importantly, people are interested in the age of the house when it was sold. Since my data set spans 6 years, I am counting new houses sold in 1990 through '96 as being 6 different ages when I should count them all as the same age, because they were all new when sold.

Conclusion

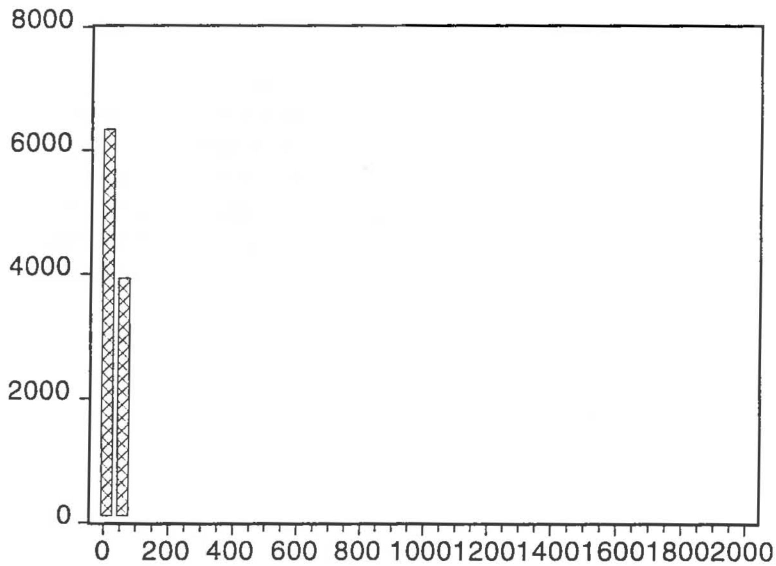
People in Lorain County *do* consider the health of the Black River a good in the housing bundle. Here in Lorain County, there might be room for the government to step in and improve the public welfare by taking advantage of the high value of environmental health. In this age of increasing environmental regulation, hedonic analysis can be used to help formulate the best public policy when dealing with non-market goods such as environmental health. Hedonic analysis is a useful tool to determine the value of goods not traded on the market.

Appendix: Data



Series: IBI
Sample 1 10290
Observations 10247

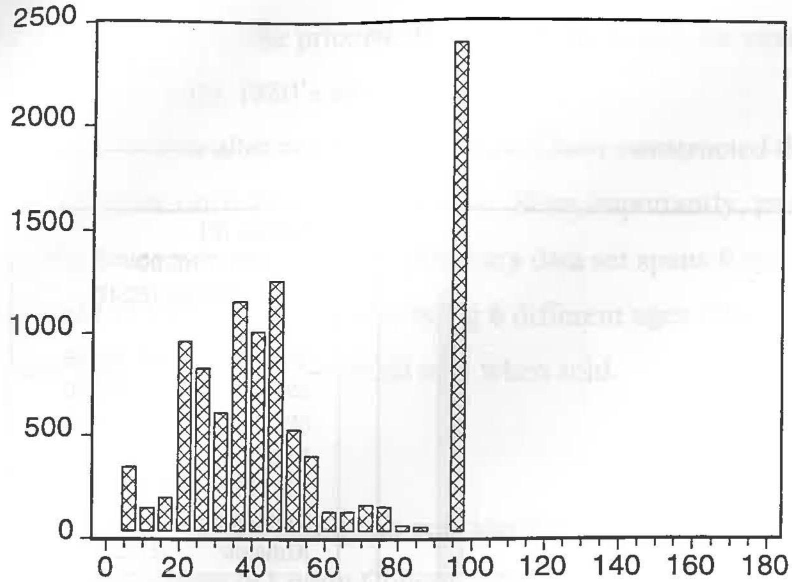
Mean	34.12908
Median	37.00000
Maximum	42.00000
Minimum	17.00000
Std. Dev.	6.822304
Skewness	-0.747482
Kurtosis	2.251424
Jarque-Bera	1193.470
Probability	0.000000



Series: AGE
Sample 1 10290
Observations 10290

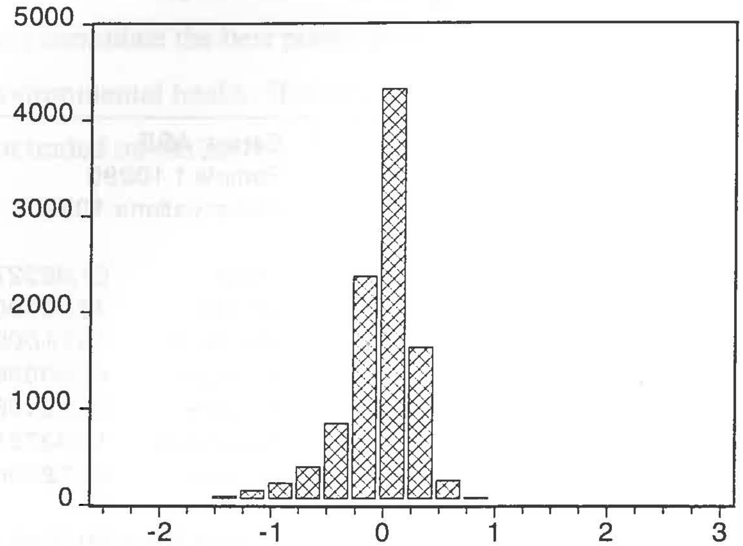
Mean	61.06327
Median	45.00000
Maximum	1999.000
Minimum	4.000000
Std. Dev.	127.5108
Skewness	14.32781
Kurtosis	217.8206
Jarque-Bera	20137981
Probability	0.000000

EGAGE is AGE without the outliers.



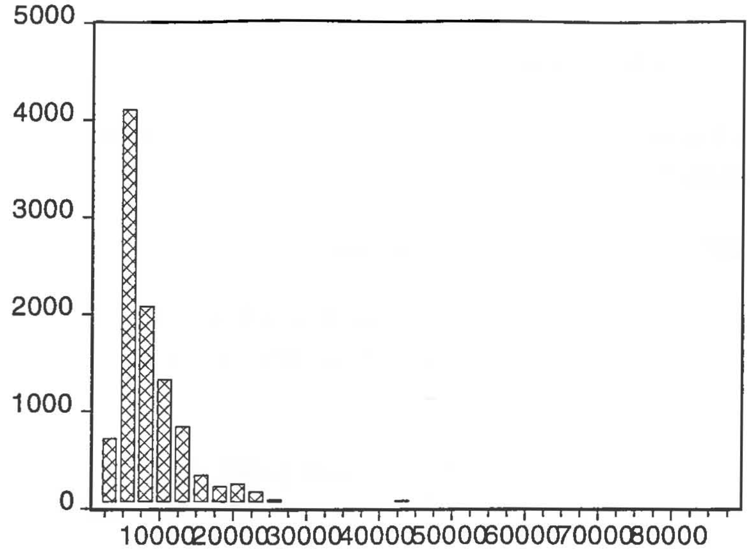
Series: EGAGE
Sample 1 10289
Observations 10247

Mean	53.12033
Median	45.00000
Maximum	179.0000
Minimum	4.000000
Std. Dev.	29.48477
Skewness	0.573925
Kurtosis	2.088119
Jarque-Bera	917.5713
Probability	0.000000



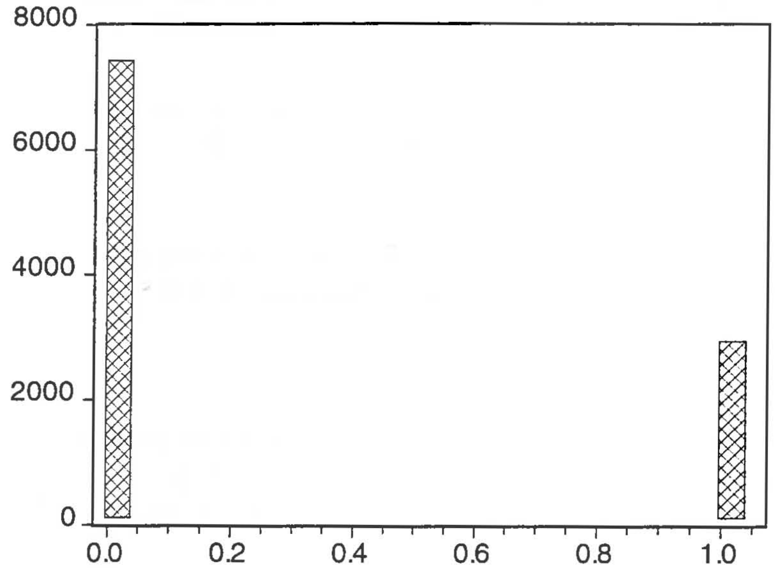
Series: RESID
Sample 1 10290
Observations 10247

Mean	2.82E-14
Median	0.066677
Maximum	2.791333
Minimum	-2.319533
Std. Dev.	0.373018
Skewness	-1.430559
Kurtosis	8.768856
Jarque-Bera	17704.13
Probability	0.000000



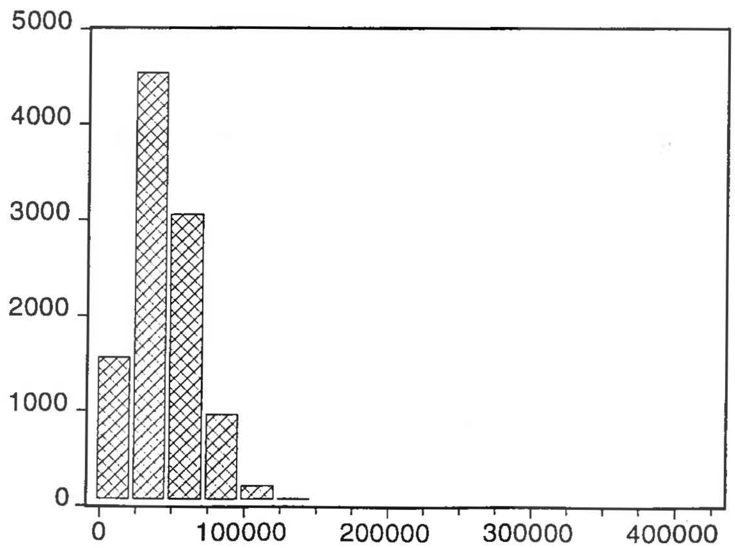
Series: LOTSQFT
Sample 1 10290
Observations 10290

Mean	10561.64
Median	7841.000
Maximum	87002.00
Minimum	4027.000
Std. Dev.	8427.372
Skewness	3.914571
Kurtosis	23.01669
Jarque-Bera	198066.9
Probability	0.000000



Series: AIR
Sample 1 10290
Observations 10290

Mean	0.282021
Median	0.000000
Maximum	1.000000
Minimum	0.000000
Std. Dev.	0.450006
Skewness	0.968829
Kurtosis	1.938630
Jarque-Bera	2092.740
Probability	0.000000



Series: A82_PRICE
Sample 1 10290
Observations 10290

Mean	47950.43
Median	45304.50
Maximum	424237.3
Minimum	6624.000
Std. Dev.	23715.73
Skewness	1.583445
Kurtosis	13.31239
Jarque-Bera	49895.61
Probability	0.000000

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