

Applied Quantitative Method (II)

Department of Economics

National Taipei University

Spring Semester

Homework 4

(Due in Class on the Date Assigned)

Empirical Problem Set: This homework assignment is based on <http://www.the-smooth-operators.com/> and Henderson and Parmeter (2015). Answer the following questions using *data_for_homework_4*.

Modeling a hedonic price function for housing has long been an important issue in urban economics. In Rosen's (1974) seminal work on the theory of hedonic prices, he suggested that "it is inappropriate to place too many restrictions on the hedonic price at the outset." Given that the form of the hedonic price function for housing is unknown, this is a great place for nonparametric methods to contribute. In Anglin and Gencay's (1996) paper, they model the housing price in dollar (*sell*) as a semiparametric function of standard attributes of a home. The data comprise 546 observations from 1987 in the Windsor housing market in Canada. Here we do a full nonparametric practice and take three of their primary variables of interest as our explanatory variables: the lot size in square feet (*lot*), number of bedrooms (*bdms*), and whether or not the house is located in a preferred neighbourhood of Riverside or South Windsor (*reg*). Following Anglin and Gencay (1996), we take the logarithm of the price and the lot size, respectively.

1. Using the Hsiao, Li, and Racine (2007) test, test that the linear parametric specification is appropriate (use a wild bootstrap). Use the cross-validated bandwidth selector from the local-constant estimator with the Gaussian, Aitchison and Aitken, and Wang and van Ryzin kernels. Do you reject the null hypothesis?
2. Using the Racine, Hart, and Li (2006) test, test that the regressors are irrelevant *individually and jointly* (use a wild bootstrap). Use the cross-validated bandwidth selector from the local-linear estimator with the Gaussian, Aitchison and Aitken, and Wang and van Ryzin kernels. Do you reject these null hypotheses?

3. Using the cross-validated bandwidth selector from the local-linear estimator with the Gaussian, Aitchison and Aitken, and Wang and van Ryzin kernels, plot the fitted curves and gradients along with their confidence intervals in the following three cases.
 - (a) Suppose that the house has three bedrooms and is not located in a preferred neighbourhood of the city, plot the impact of the lot size on the price. Briefly illustrate the results.
 - (b) Suppose that the house has a median size of lot and is not located in a preferred neighbourhood of the city, plot the impact of the number of bedrooms on the price. Briefly illustrate the results.
 - (c) Suppose that the house has a median size of lot and three bedrooms, plot the impact of the housing location on the price. Briefly illustrate the results.

Theoretical Problem Set: The Aitchison and Aitken (1976) kernel function is given by the following.

$$l(x_i, x, \lambda) = \begin{cases} 1 - \lambda, & \text{if } x_i = x \\ \frac{\lambda}{c-1}, & \text{otherwise} \end{cases}$$

1. Show that the kernel function sums to one ($\sum_{x=1}^c l(x_i, x, \lambda) = 1$).
2. Show that the kernel density estimator sums to one ($\sum_{x=1}^c \hat{f}(x) = 1$).