Average Difference Estimation of Nonlinear Pricing Models

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pirical evidence is limited. A promising approach for empirical analysis is to specify the formally iden

general, average compensation does not equal marginal compensation:

$$\frac{m(\ell_i)}{\ell_i} \neq \frac{\partial m(\ell_i)}{\partial \ell_i}. \tag{2.1}$$

In contrast, total earnings are the product of total hours worked and the market wage, denoted by w_i, if markets are competitive. This implies that average earnings equal marginal earnings, which are given by the equilibrium wage:

$$\frac{\partial m(\ell_i)}{\partial \ell_i} = w_i = \frac{y_i}{\ell_i}. \tag{2.2}$$

Given a sample of size N, we can then define a test statistic, $\;_N$, as the sample average of the difference between marginal and average compensation:

$$_N = \frac{1}{N}\sum_{i=1}^{N}\left[\frac{\partial m(\ell_i)}{\partial \ell_i} - \frac{y_i}{}\right.$$

bound of the support),

$$E\left[\bar{f}(\cdot)\right] = E\left[\frac{1}{h}\mathcal{K}\left(\frac{\cdot - x}{h}\right)\right]$$

$$=$$

bandwidth parameter tend to zero at a faster rate does not decrease the order of bias for points near the boundary. An analogous result holds for [illegible] $< h + L$.

To correct for the bias near the boundary, we use the boundary kernel, $K($[illegible]$)$, derived in Zhang and Karuhamuni (2000). The basic idea of this correction technique is to rescale the kernel near the boundary such that each term is deﬁned as

$$\hat{\gamma}_N = \frac{1}{\hat{\pi}_N N} \sum_{i=1}^{N} \hat{m}_i(\text{[illegible]}_i + \Delta) - \hat{m}_i($$

al. (1989) assume $f(fL)$

3 Data

The data set we use in this paper is from the 1989, 1994, and 1999 March supplements

Table 1: Average Income, Hours, and Weeks Worked

	No. of	Income	Hours	Weeks

Table 3: Demographic Summary Statistics

the latter term ensures that c

tend to inﬁnity slower than 2

First, we report estimates which are based on the plug-in using normal approximations of the density. Second, we compute all estimators for a large number of bandwidth choices and evaluateh w s ensitive thw mp i i a I n in s arwwi h te p et t the h i wof thwbandwidth parame

Table 5: Average Difference Estimates of

Figure 2: Average Difference Estimators—Fourth Order Boundary Kernel

Table 6: Average Difference Estimates of Wages
Under 50 & Non-Southerner

Figure 3: Average Difference Estimator—Second Order Boundary Kernel

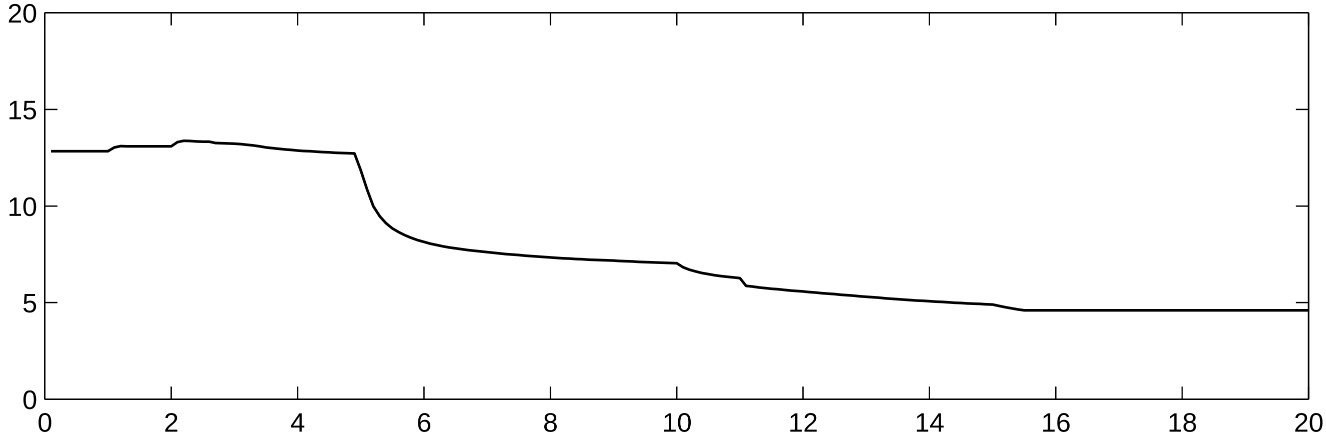

Table 7: Parametric Estimates

mation strategy. Using second order kernels improves our estimates on the margin. Failing to control for boundary effects is on the other hand immaterial. Measuring continuous

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Step 1: Linearization. Denote $\hat{\gamma}_N$ with $\hat{I}_i$ replaced with I_i, where

$$\begin{aligned} I_i &= 1\{f_i(\blacksquare_i + \Delta) > b_N, f_i(\blacksquare_i - \Delta) > b_N, L + \Delta \leq \blacksquare_i \leq U - \Delta\} \\ &= 1\{L + \Delta \leq \blacksquare_i \leq U - \Delta\} \qquad \text{(for small } b_N\text{)}, \end{aligned}$$

as

$$\bar{\gamma}_N = \frac{1}{N}\sum_{i=1}^{N} \Big[\blacksquare_i)(\Delta)$$

$$- \hat{g}_i(\ell_i - \Delta) \left[\hat{f}_i(\ell_i - \Delta) - f_i(\ell_i - \Delta \right.$$

$$p_{2,N}(v_i, v_j) = \frac{1}{2h^k} K\left(\frac{\bullet_i + \Delta - \bullet_j}{h}\right) \frac{m(\bullet_i + \Delta)}{f(\bullet_i + \text{[illegible]}}$$

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−

where

$$
\begin{aligned}
\rho_1(v_i) \quad = \quad & m(\blacksquare_i + \Delta) \; - \; m(\blacksquare_i - \Delta)]1\{L + \Delta \leq \blacksquare_i \leq U - \Delta\} \\
& + \frac{y_i f(\blacksquare_i - \Delta)}{f(\blacksquare_i)} 1\{\blacksquare_i \geq L + 2\Delta\}
\end{aligned}
$$

called a *boundary kernel* of order (p, q) if

$$\int_{-c_1}^{c_2} K(u)u^j\,du = \begin{cases} 0, & j = 0, \ldots, p-1, p+1, \ldots, q-1, \\ (-1)^p p!, & j = p, \\ \neq 0, & j = q. \end{cases}$$

Note that in general for points h r e e boundary e e sup r rt, e e function r l f c N d N if $d < h + L$,

$$K(u) = \begin{cases} \frac{20}{(1+c)^8} \; 1 + 10u + 30u^2 + 35u^3 + 14u^4 \\ - \; 1 \end{cases}$$

reduce to the first, which is the optimal fourth order kernel. In addition, $K'(\cdot)$ is a $(1,4)$ boundary kernel. A

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