- $y_1 = \beta y_2 + \varepsilon$

$y_2 = Z\pi + v$

$\Rightarrow$ run first stage and get $\hat{v}$

Run regression:

$y_1 = \beta y_2 + \alpha \hat{v} + \eta$

$\alpha = 0$? Control function approach

What about the nonlinear case?

Petrin:

Problems with BLP:

- It is complicated and might not give the right answer
- The inversion requires the idiosyncratic term to enter in linearly. Suppose it is: $\gamma p_j \xi_j + \gamma p_j^2 \xi_j$

Reduced form for prices:

- $p = p(\underbrace{Z_1}_{\substack{\text{dmd} \\ \text{shifters} \\ \text{(product} \\ \text{characteristics)}}}, \underbrace{Z_2}_{\substack{\text{cost} \\ \text{shifters} \\ \text{(instruments)}}}, \underbrace{\xi_j}_{\substack{\text{unobserved} \\ \text{heterogeneity}}})$ (1)

- Find some proxy $\tilde{\xi}$ obtained from inverting (1).
- This approach combines BLP with nonlinear IV
- Need conditions for this inversion to exist.

1 product case: Newey and Imbens (2003)

- can get this $\tilde{\xi}$ right away

Multiple product case is difficult

Petrin: For the additively separable case,

$P_{mj} = f_j(Z_m) + g_j(\xi_m)$, $f_j(Z_m)$ an unknown function.

$= E[P_j | Z_m] + g_j(\xi_m)$ (??)

- $\tilde{\xi}_m = (g_1(\xi_m), \ldots, g_j(\xi_m))$
- stack the residuals from each market
- use $\bar{\xi}_j = \underbrace{\Lambda' \tilde{\xi}_m}_{\text{scalar}}$ as a proxy in:

$\gamma p_j \xi_j + \gamma p_j^2 \xi_j$ equation

- why is this okay to do?