Working through Fullerton + Rogers cons. model

Composite consumption good modeled as Stone-Geary function of the individual consumption goods:

$$\tilde{C}_t = \prod_{i=1}^{N} (c_{it} - b_{it})^{\beta_{it}} \quad (1)$$

N = # cons. goods

b_{it} = min required purchase of good i at age t

β_{it} = share parameter that varies w/ age
→ reflects changing composition of consumption over lifetime
→ NOTE: $\sum_{i=1}^{N} \beta_{it} = 1$

Fuller. + Rogers reference Starrett (1988) and Summers (1981) and say min cons helps w/ more realistic save behavior

→ FR give nice justification for this Stone form

consumer maximizes (1) s.t. budget constraint: price of age cons. good → prices vary by age since composition of composite good varies by age → age cons. demand

$$\sum_{i=1}^{N} p_i (c_{it} - b_{it}) = \tilde{p}_t \tilde{c}_t$$

p_i = gross of tax price of good i
→ constant in SS
→ what @ outside?
→ varies over transition path, but not dynamic

* Why don't min required purchases figure into the B.C.? i.e. why subtract b_{it} there?

↙ I guess makes sense since $\tilde{c}_t$ above defined as net of min cons and resulting demands do make sense

but do we need to adj cons. budget constraint → e.g. if $c_{it} = b_{it}$ $\forall i$ then $\tilde{c}_t = 0$, but still outlay to purchase $c_{it} = b_{it}$, right?

So do I do:

$$\sum_{i=1}^{N} p_i (c_{it} - b_{it}) = \tilde{p}_t \prod_{i=1}^{N} (c_{it} - b_{it})^{\beta_{it}}$$

$$\mathcal{L} = \prod_{i=1}^{N} (c_{it} - b_{it})^{\beta_{it}} + \lambda \left(\tilde{p}_t \tilde{c}_t - \sum_{i=1}^{N} p_i (c_{it} - b_{it}) \right)$$

$$\frac{\partial \mathcal{L}}{\partial c_{it}} = \beta_{it} \frac{\prod_{i=1}^{N} (c_{it} - b_{it})^{\beta_{it}}}{(c_{it} - b_{it})} - \lambda p_i = 0 \quad , \forall i, t$$

Calibrating consts

→ Note, only identify the $p_i b_{ij}$ → no bid separately as needed for model

→ normalize commodities such that a unit is worth $ per dollar → so all prices = 1

→ FR say this is the "benchmark equilibrium"

→ I suppose we can make this normalization

→ there are 12 eq'ns @ const. to each $i = 1, \ldots, N$

→ but $\sum_{j=1}^{N} p_j b_{ij} = 1$, so not indep eq'ns

→ so 12 unknowns ($b_{ij}, i = 1, \ldots, N$) but only 16 unique eq'ns

→ so need another identifying restriction

→ FR set $\sum_{j=1}^{N} p_j b_{ij} = \$8{,}000 \times t$

→ I think we do this → growing 1984-85 CEX to current need

→ do this by

$$\frac{\text{84-85 EGX cons}}{\text{12-13 CEX cons}} = \frac{8000}{X}$$

→ solve for X

calibrate cons

Data

→ 2 wave, four consec quarters
→ C4 } 5 quarters of interview data
→ Q1-Q1

King, 1979 J. of Econ & Business

→ Drop:
→ if less than full yr participate (in survey)
→ if recieve food stamps
→ if incomplete income reporting

F+R adjust

→ Fin services
→ I think more info on these now, so ignore

check

* → Durables
→ b/c expenditures reflect time of purchase, not flow of cons value
→ find avg. expenditures across groups then sub these avgs. for actual expenditures by group → Need to
① Define durables
② Define groups

* → Shelter
→ are homeowner's expend on shelter given in rental equiv?
→ if yes, then need to subtract from exp. on house prop taxes, insurance, and repairs which already are included in rent

→ Nonfood durables + OTC medical
→ adjust using detail from Diary surveys
→ let's just ignore and go w/ interview survey

check

Calibrate cons (cont'd)

Correct for underreporting

→ scale up all cons categories by ratio of

$$\frac{\text{CEX total}}{\text{PCE (NIPA) total}}$$

→ compare parameter estimates to F+K and King

→ adjust w/ nominal GDP ratios for comparison of b's