411-3 NOTES: CONSUMPTION 2

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1. MPC

- Empirical studies on MPC
- Johnson, Parker, Souleles, 2006

TABLE 2—THE CONTEMPORANEOUS RESPONSE OF EXPENDITURES TO THE TAX REBATE

	Panel A. Dependent variable: dollar change in expenditures on:					
	Food	Strictly nondurable goods	Nondurable goods	Food	Strictly nondurable goods	Nondurable goods
Estimation method	OLS	OLS	OLS	OLS	OLS	OLS
Rebate	0.109	0.239	0.373			
	(0.056)	(0.115)	(0.135)			
I(Rebate > 0)				51.5	96.2	178.8
				(27.6)	(53.6)	(65.0)
Age	0.570	0.449	1.165	0.552	0.391	1.106
	(0.320)	(0.550)	(0.673)	(0.318)	(0.548)	(0.670)
Change in adults	130.3	285.8	415.8	131.1	287.7	418.6
	(57.8)	(90.0)	(102.8)	(57.8)	(90.2)	(102.9)
Change in children	73.7	98.3	178.4	74.0	98.7	179.2
	(45.3)	(82.4)	(98.3)	(45.3)	(82.5)	(98.3)
RMSE	934	1680	2047	934	1680	2047
R^2 (percent)	0.6	0.6	0.6	0.6	0.6	0.6

- The rebate timing is random, so positive coefficient can be interpreted as a rejection of PIH
- The coefficient cannot interpreted as MPC, JPS warn us (because receipt anticipated)
- Still following literature often interprets them as MPC
- Bottom line: they are large
- Can standard Bewley-Aiyagari model produce large MPCs?
- Answer: it all depends on how you calibrate the asset supply and the credit availability
- What matters is what number you choose for

$$\int (a_i + \phi)\, di$$

- Smaller supply of assets: higher average MPC
- See Matlab simulations
- How can we choose asset supply?
- Traditional approach (Aiyagari): look at total capital stock K in economy

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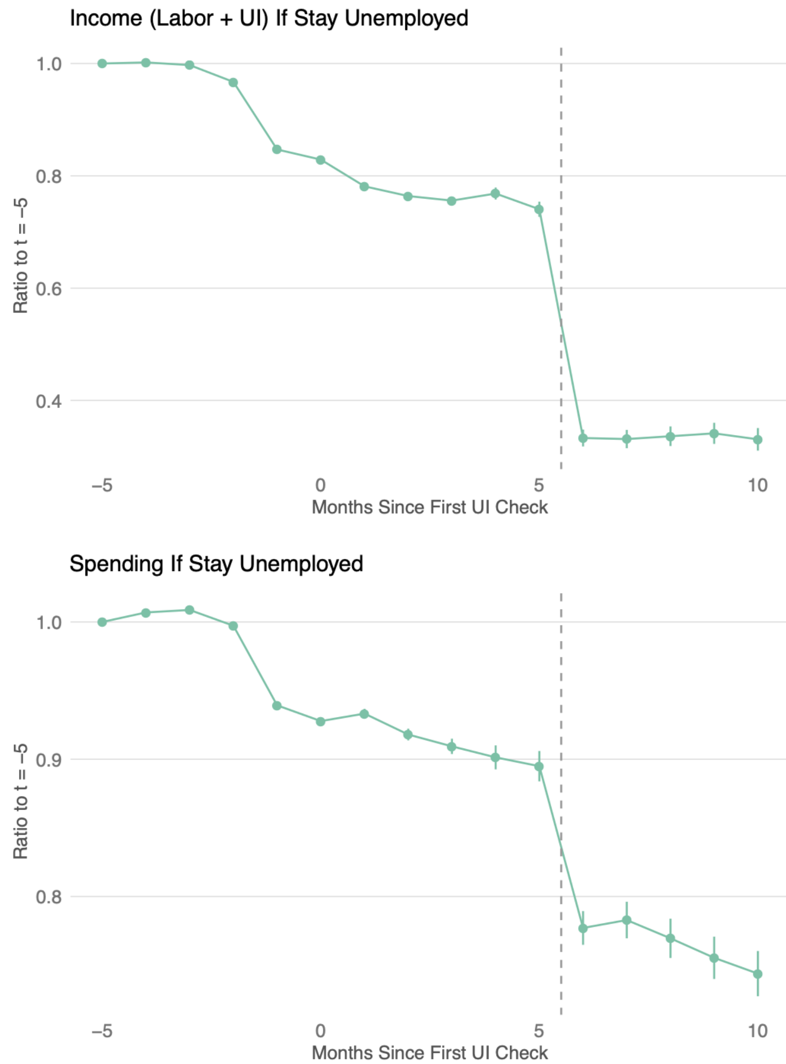
- Asset supply from
$$1+r=f'(K)+1-\delta$$
- General equilibrium
$$\int a_i di = K$$
- This yields a calibration with very low MPC
- How can we reconcile with data?
- What is household wealth: liquid assets (bank deposits) + housing wealth
- If we target $\int a_i di$ to total wealth same issue as above
- But we can think that housing is less liquid: rich hand-to-mouth consumers (Kaplan and Violante 2014)
- It is essentially analogous to setting $\int a_i di =$ liquid assets (excluding housing)
- All solved?
- Not really, recent evidence that challenges more deeply optimizing model
- Ganong and Noel, 2018
- Point toward behavioral models (Laibson, 1997)

2. Durable goods

- Consumer maximizes
$$E\sum_{t=0}^{\infty}\beta^t u(c_t,h_t)$$
- Budget constraint
$$p_t h_t + a_t + c_t = p_t(1-\delta)h_{t-1} + (1+r)a_{t-1} + y_t$$
- y_t still follows a Markov process
- Euler equation
$$u_c(c_t,h_t) = \beta(1+r)E_t u_c(c_{t+1},h_{t+1})$$
- Optimality for h_t
$$u_h(c_t,h_t) = p_t u_c(c_t,h_t) - \beta E_t p_{t+1}(1-\delta)u_c(c_{t+1},h_{t+1})$$
- Suppose price of durable is non-stochastic
- Then, using Euler equation
$$u_h(c_t,h_t) = p_t u_c(c_t,h_t) - p_{t+1}(1-\delta)\frac{u_c(c_t,h_t)}{1+r}$$

or
$$\frac{u_h(c_t,h_t)}{u_c(c_t,h_t)} = p_t - \frac{p_{t+1}(1-\delta)}{1+r}$$

Figure 2: Income and Spending If Stay Unemployed



Notes: This figure plots income and spending for the sample that stays unemployed. In months $t = \{-5, -4, -3, -2, -1, 0\}$, this includes everyone who receives UI at date 0 and meets the sampling criteria described in Section 2.1. In month $t = 1$, this includes only households who continue to receive UI and excludes households who receive their last UI check in month 0. In month $t = 2$, this excludes households who receive their last UI check in month 0 or month 1, and so on. Employment status after UI exhaustion is measured using paycheck deposits. The vertical line marks UI benefit exhaustion. Income is positive after UI benefit exhaustion because of labor income of other household members. Vertical lines denote 95 percent confidence intervals for change from the prior month. See Section 3.1.1 for details.

FIGURE 1. Spending at expiration of unemployment benefits (from Ganong and Noel, 2018)

- Expression on the RHS is "user cost of capital". If you have

$$\rho_t = p_t - \frac{p_{t+1}(1-\delta)}{1+r}$$

you can borrow $p_t - \rho_t$, buy the asset today, resell it tomorrow and use the sale receipt to repay your debt as $p_{t+1}(1-\delta) = (1+r)(p_t - u_t)$, so u_t is the cost of using the asset for one period. In a frictionless world in which renting and owning provide the same services ρ_t should be equal to the rental rate

- Assume borrowing constraint is just

$$a_t \geq 0$$

- Define total wealth

$$w_t = p_t (1-\delta) h_{t-1} + (1+r) a_t$$

- Then budget constraint becomes

$$\frac{1}{1+r} w_{t+1} + c_t + \rho_t h_t = w_t + y_t$$

and we have essentially an income fluctuation problem with 2 goods

- Now, assume $p_t = p$ constant and utility function

$$u(c,h) = \frac{1}{1-\gamma} \left(c^\alpha h^{1-\alpha} \right)^{1-\gamma}$$

- Define total spending

$$x_t = c_t + \rho h_t$$

- Solution of static allocation between c and h

$$c_t = \alpha x_t$$
$$h_t = \frac{1-\alpha}{\rho} x_t$$

so indirect utility function is equal (modulo a multiplicative constant) to

$$\frac{1}{1-\gamma} x_t^{1-\gamma}$$

- So we can just solve

$$E \sum \beta^t \frac{1}{1-\gamma} x_t^{1-\gamma}$$
$$\frac{1}{1+r} w_{t+1} + x_t = w_t + y_t$$
$$w_{t+1} \geq 0$$

- Effect of income shock on purchases of durables
- Consider i.i.d. shocks

$$x_t = X(w_t + y_t)$$

- Non-durable spending is

$$c_t = \alpha x_t$$

- Durable purchases are

$$h_t - (1-\delta)\, h_{t-1} = (1-\alpha)\frac{x_t}{p} - (1-\delta)\, h_{t-1}$$

- % response of non-durable purchases to a small temporary income shock dy_t is

$$\frac{dc_t}{c_t} = \alpha\frac{X'(w_t+y_t)}{c_t}dy_t = \alpha\frac{X'(w_t+y_t)}{c_t/x_t}\frac{y_t}{x_t}\frac{dy_t}{y_t} = X'(w_t+y_t)\frac{y_t}{x_t}\frac{dy_t}{y_t}$$

- % response on durable purchases is

$$\frac{dh_t}{h_t-(1-\delta)\,h_{t-1}} = \frac{h_t}{h_t-(1-\delta)\,h_{t-1}}X'(w_t+y_t)\frac{y_t}{x_t}\frac{dy_t}{y_t} = \frac{h_t}{h_t-(1-\delta)\,h_{t-1}}\frac{dc_t}{c_t}$$

  and if $h_t \approx h_{t-1}$

$$\frac{dh_t}{h_t-(1-\delta)\,h_{t-1}} \approx \frac{1}{\delta}\frac{dc_t}{c_t}$$

- Main takeaway: durables are more volatile, the more so the more durables they are (lower δ)
- The intuition is straightforward: consumers want to adjust durable services and non-durable consumption proportionally; durable services are proportional to the stock of durables, so consumers want to adjust the stock of durables proportionally to non-durable consumptionl; in steady state we only buy δ of the stock each period; so if we want to adjust the stock of, say, 1%, and in steady state we are buying $\delta = 5\%$ of the stock, that's a 20% increase in durable spending for a 1% increase in non-durable spending
- A second observation: durable spending is more responsive to interest rate changes
- We will talk about how x_t responds to changes in r_t in the next class
- For durables however, on top of the change in x_t we have the change in the user cost ρ_t
- Since

$$\rho_t = p\left(1 - \frac{1-\delta}{1+r_t}\right) \approx p\,(r_t+\delta)$$

  we have

$$\frac{d\rho_t}{\rho_t} = \frac{dr_t}{r_t+\delta}$$

- Since

$$h_t = (1-\alpha)\frac{x_t}{\rho_t}$$

  we have

$$\frac{dh_t}{h_t-(1-\delta)\,h_{t-1}} = \frac{h_t}{h_t-(1-\delta)\,h_{t-1}}\frac{dh_t}{h_t} = \frac{h_t}{h_t-(1-\delta)\,h_{t-1}}\left(\frac{dx_t}{x_t} - \frac{d\rho_t}{\rho_t}\right)$$

  or

$$\frac{dh_t}{h_t-(1-\delta)\,h_{t-1}} = \frac{h_t}{h_t-(1-\delta)\,h_{t-1}}\left(\frac{dx_t/dr_t}{x_t} - \frac{1}{r_t+\delta}\right)dr_t$$

- The second term in brackets amplifies the (negative) effect of r_t on x_t
- Second takeaway: durable spending is more sensitive to changes in the interest rate