SIMPLE DSGE MODELS OF "WORK" PART II

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BOTH EXTENSIVE AND INTENSIVE ADJUSTMENT

- A major challenge for RBC modeling: elasticity of "labor supply"
  - Intensive margin ("hours supply")
  - Extensive margin ("labor force participation")

- Cho and Cooley (1994)
  - Study RBC economy with both margins operating
  - Extensive margin: "number of days" worked within a period
    - Household pays a cost for each "day" it chooses to work
  - Intensive margin: hours worked per day worked
  - NOTE: No "frictions" in finding jobs
    - Key idea captured by labor search models (later…)

- Percent of total hours fluctuations accounted for by extensive fluctuations vs. intensive fluctuations
  - Cho and Cooley (1994): 75% extensive, 25% intensive
  - Hansen (1985): 55% extensive, 20% intensive (rest from cov term)

STATIC EXAMPLE

- General utility function $u(c)-\frac{a}{1+\gamma}n^{1+\gamma}e-\psi(e)e$

intensive extensive

Description of Economy	$\psi(e)$	Elasticity of equilibrium total hours
Both intensive and extensive margins	$(b/(1+\tau))e^{\tau}$	Intermediate
Only extensive margin (Hansen-Rogerson)	b	High
Only intensive margin ("typical" RBC model)	0 (also fix e = 1)	Low

- *e* denotes "employment rate" – fraction of days worked
- *n* denotes hours worked per day

STATIC EXAMPLE

- Consumer optimization

$$\max_{c,n,e} u(c) - \frac{a}{1+\gamma} n^{1+\gamma} e - \frac{b}{1+\tau} e^{1+\tau}$$

$$\text{s.t } c \le wne$$

- Combine with firm optimization and market clearing!
- Examining EQUILIBRIUM aggregate hours ("effective L^S")
  - Not "labor supply" ("notional L^S")

- Impose parameter values to capture three different cases
- Elasticity equilibrium total hours
  - Adjustment only at extensive margin: 4
  - Adjustment only at intensive margin: 0.36
  - Adjustment at both margins: 1.29
  - Recall common compromise value in macro models: 1

Business Cycle Implications

- Embed in standard RBC model
- Can approximate and simulate using “usual” methods
  - Cho and Cooley use LQ (linear-quadratic) approximation…

- Cho and Cooley results

Table 2

Calibration results, first parameterization.[a]

Series	U.S. Std. dev.	U.S. Corr. with output	Model Std. dev.	Model Corr. with output
Output	1.76	1.00	1.76 (0.17)	1.00 (0.00)
Consumption	1.29	0.85	0.53 (0.06)	0.88 (2.49)
Investment	8.60	0.92	5.63 (0.57)	0.98 (0.40)
Capital stock	0.63	0.04	0.47 (0.08)	0.07 (6.73)
Aggregate hours	1.74	0.77	1.06 (0.12)	0.98 (0.56)
Hours	0.46	0.76	0.25 (0.02)	0.98 (1.24)
Employment	1.50	0.81	0.81 (0.08)	0.98 (1.04)
Productivity	1.18	0.35	0.75 (0.08)	0.96 (0.81)
Agg. hrs/Productivity				
in physical units	1.47		1.42	
in efficiency units	1.42		1.42	

Both intensive and extensive adjustment: 1.06 / 0.75 = 1.42

HOME PRODUCTION MODELS

- **What else do individuals/households do with their time?**
  - **Aguiar and Hurst (2007 *QJE*): over 2 hours per day of nonmarket work (i.e., nonmarket LABOR)**
    - **Shopping**
    - **Cooking**
    - **Cleaning**
    - **Etc…**

- **"Household capital" expenditures also sizable**
  - **Investment in consumer durables and residential investment at least as large as investment in market capital**

- **"Home production" in RBC model**
  - **Overview by Greenwood, Rogerson, and Wright (1995)**
  - **Allow households to accumulate "home capital" and "work" at home (cleaning, cooking, etc.) in order to produce and consume "home goods" (distinct from "market goods")**

Basic Home Production Model

- **Preferences**

"Usual" market consumption "Usual" market labor

$$E_0 \sum_{t=0}^{\infty} \beta^t u(c_{Mt}, c_{Ht}, n_{Mt}, n_{Ht})$$

"Home good" consumption "Home" labor

- **Technology**

"Usual" market productivity

$$f(n_{Mt}, k_{Mt}, z_{Mt}) \left(= k_{Mt}^{\alpha} (z_{Mt} n_{Mt})^{1-\alpha} \right)$$

"Usual" market production function

"Usual" market / business capital

$$g(n_{Ht}, k_{Ht}, z_{Ht}) \left(= k_{Ht}^{\gamma} (z_{Ht} n_{Ht})^{1-\gamma} \right)$$

"Home" production function

- Home output can ONLY be used for consumption

"Home" capital

"Home" productivity

- **Household Budget Constraint**

$$c_{Mt} + \left[k_{Mt+1} - (1-\delta_M) k_{Mt} \right] + \left[k_{Ht+1} - (1-\delta_H) k_{Ht} \right] = w_t n_{Mt} + r_t k_{Mt}$$

  - Unit relative price between market capital and home capital
  - All income earned through market-factor rental
  - Home consumption not "purchased" – produced at home!

BASIC HOME PRODUCTION MODEL

- **Other model details**
  - **(Constant) labor income and capital income taxation included (for calibration purposes)**
  - **Capital freely-allocatable every period between home and market/business uses**

$$k_t = k_{Mt} + k_{Ht} \quad \forall t$$

  - **Representative (market) firm:** $\max_{n_{Mt}, k_{Mt}} f(n_{Mt}, k_{Mt}, z_{Mt}) - w_t n_{Mt} - r_t k_{Mt}$
  - **See Greenwood, Rogerson, and Wright (1995) for calibration issues**

- **Business cycle implications**
  - **Approximate and simulate using "usual" methods**
  - **Main Results**
    - **SD(hours)/SD(productivity) matches data better than basic RBC**
    - **Corr(hours, real wage) matches data (≈ 0) better than basic RBC**
    - **Results rely on ability to substitute between c_{Mt} and c_{Ht} and incentive to do so**

Governed by CES elasticity over c_{Mt} and c_{Ht}

Governed by correlation between z_{Mt} and z_{Ht}

RBC Models and Labor Market Fluctuations

- **Can interpret as micro-foundation for Greenwood-Hercowitz-Huffman (1988) preferences (GHH preferences)**

$$u(c_t, n_t) = \ln\left(c_t - \frac{\psi}{1+\nu} n_t^{1+\nu}\right)$$

  - **Exhibits zero income effect on market hours n_t**
  - **Seems inconsistent with balanced-growth facts…**
  - **…unless z_M and z_H are growing at the same long-run rates, in which case there is no reason to substitute between home and mrkt work**
  - **(See Jaimovich and Rebelo (2009 *AER*) for generalization of GHH…)**

- **Can interpret as micro-foundation for a preference shifter**

$$u(c_t, n_t) = \ln c_t - \frac{a_t}{1+\nu} n_t^{1+\nu}$$

Exogenous, time-varying process affects (shifts) MRS between consumption and leisure – a mechanism emphasized by Hall (1997)

  - **Change in (endogenous) home outcomes → shift in individual's labor supply schedule in a "reduced-form" model with preference shock**

RBC Models and Labor Market Fluctuations

- **Standard model (intensive adjustment)**
- **Indivisible labor model (extensive adjustment)**
- **Home production model**
- **Alternative preference specifications**
- **Consequences of government spending fluctuations**
- **Overview by Hansen and Wright (1992 *Minneapolis Fed Review*)**
- **Labor search and matching frictions**
- **Efficiency wage models**