Aggregate Implications of Microeconomic Consumption Behavior

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Broad Overview

Two approaches to microfoundations of consumption:

- Saltwater
  - Start with micro theory and data, aggregate
  - Conclusion: Risk, heterogeneity change everything
  - Criticism: No real GE analysis
- Freshwater
  - Start with Rep Agent (RA) model, introduce risk
  - Conclusion: Risk, heterogeneity don't matter
  - Criticism: Totally unrealistic micro implications

Tidewater!

- GE Framework With ‘Serious’ Heterogeneity
- Salt and Fresh Water Frameworks are Special Cases
- Combines Advantages of Both Classes
  - Wealth Distribution ‘Matters’
  - Get ‘Excess Sensitivity’ of C
  - High MPC for c
  - Fully articulated GE

Talk Outline

- Saltwater: Microeconomic Consumption Behavior
  - Reference: Carroll (2004), Carroll (2001a)
- Freshwater: The Ramsey/Cass-Koopmans Model
  - Grad School!
- Tidewater
  - Reference: Krusell and Smith (1998), Carroll (2000a)
- Reseverations

Micro History of Thought

- Permanent Income Hypothesis of Friedman (1957)
  - $C = E[Y] + (Y - E[Y])\kappa$ for $\kappa \approx 0.3$
- Perfect Foresight Infinite Horizon PIH (Bewley (1977))
  - $C = (H + N)\kappa$ for $\kappa \approx 0.03$
- Buffer Stock Models (Deaton (1991),Carroll (1992))
  - As $M \downarrow 0$, $\kappa \uparrow 1$
  - As $M \uparrow \infty$, $\kappa \downarrow r$
- Evidence
  - For median household, $\kappa \approx 0.15 - 0.50$
  - For richer households, κ much smaller

Perfect Foresight Benchmark

$$\max \sum_{t=0}^{\infty} \beta^t u(C_t)$$

$$u(C) = C^{1-\rho}/(1-\rho)$$

Initial conditions: M_0 and P_0

$$\begin{aligned} A_t &= M_t - C_t \\ B_{t+1} &= A_t R \\ M_{t+1} &= B_{t+1} + P_{t+1} \\ P_{t+1} &= G P_t \end{aligned}$$

Perfect Foresight Solution

$$H_t = P_t \left(\frac{1}{1-(G/R)} \right)$$

$$\begin{aligned} \kappa &= (1-(R\beta)^{1/\rho}/R) \\ C(M_t,P_t) &= (H_t + \underbrace{M_t - P_t}_{=B_t})\kappa \end{aligned}$$

Benchmark parameter values

$$\begin{aligned} \rho &= 2 \\ R &= 1.03 \\ \beta &= 0.97 \end{aligned}$$

imply $\kappa \approx 0.03$.

Idiosyncratic Uncertainty

$$\begin{aligned} M_{t+1} &= B_{t+1} + P_{t+1}\xi_{t+1} \\ P_{t+1} &= GP_t\Psi_{t+1} \end{aligned}$$

Also assume:

- iid ξ and Ψ satisfy $E_t[\Psi_{t+n}] = E_t[\xi_{t+n}] = 1 \; \forall \; n > 0$
- With small probability p, $\xi = 0$ (unemployment)
- Impatience: $R\beta E[(G\Psi)^{-\rho}] < 1$

Normalized Solution

Problem has a solution of the form

$$C(M,P) = Pc(\underbrace{M/P}_{=m})$$

If we 'turn off' the uncertainty (assume $\Psi_t = \xi_t = 1 \; \forall \; t$), the solution is

$$c(m) = (h_t + \underbrace{m_t - 1}_{b_t})\kappa$$

Effect of Uncertainty

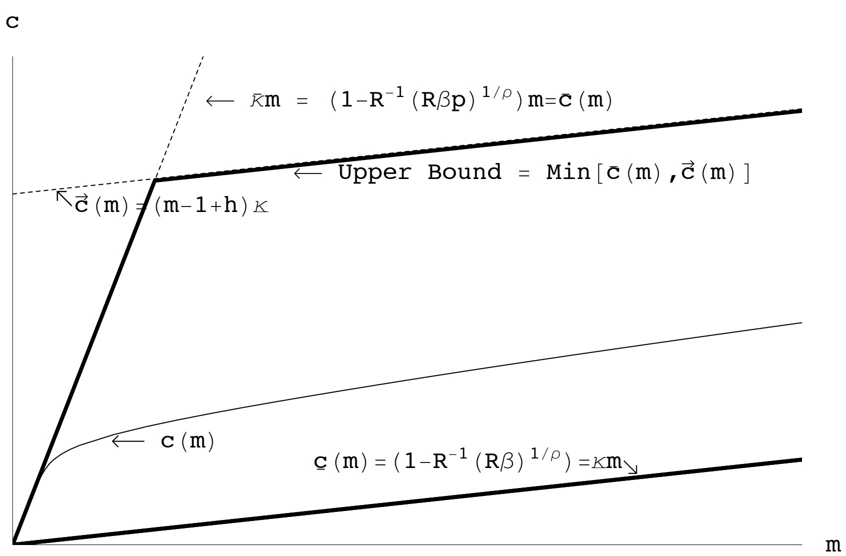

Figure: Concave $c(m)$ and Its Bounds

Marginal Propensity to Consume

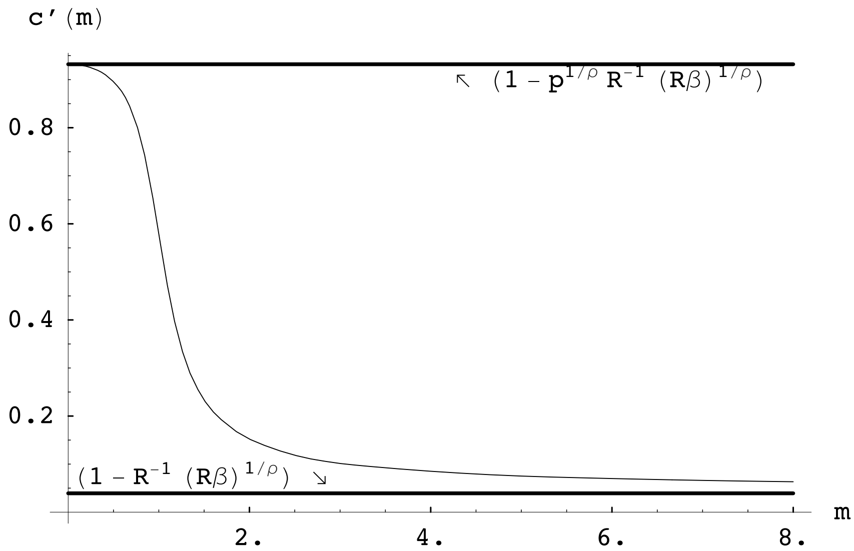

Figure: The MPC and Its Bounds

Key Intuition

- Impatience: At $m_t = \infty$, $C > P$ so $E_t[m_{t+1}] < m_t$
- Precaution: At $m_t = 0, C = 0 < P$ so $E_t[m_{t+1}] > m_t$

These imply:

- A 'target' level of wealth exists at which impatience exactly matches prudence, and $C = P$
- Actual wealth will be distributed around the target

Matching the Median Household

Income Growth Factor	Mean a	Median a	Aggregate Consumption Growth	Mean MPC	Frac With $a < 0$	Frac With $a = 0$
Panel A. Baseline Model, No Constraints						
G=1.03	0.43	0.40	1.030	0.330	0.000	0.000
G=1.00	2.26	2.06	1.000	0.064	0.000	0.000
Panel B. Strict Liquidity Constraints						
G=1.03	0.28	0.24	1.030	0.361	0.000	0.070
G=1.00	2.28	2.06	1.000	0.065	0.000	0.000
Panel C. Borrowing Up To 0.3 Allowed						
G=1.03	-0.03	-0.06	1.030	0.361	0.611	0.000
G=1.00	1.94	1.71	1.000	0.064	0.023	0.000

Source: Carroll (2001b)

Constraints Don't Matter . . .

- Under uncertainty, prudence acts like a self-imposed liquidity constraint
- Eqbm behavior of consumers in a constrained model almost indistinguishable from eqbm behavior of consumers in the corresponding unconstrained model. (Carroll (2001b))

. . .Except When They Change

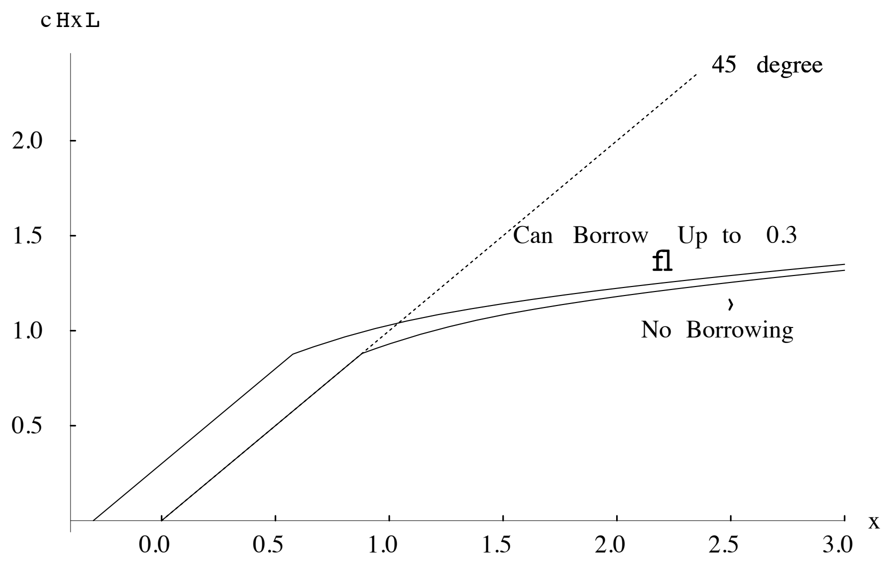

Figure: Strict and Looser Liquidity Constraints

Summing Up

- Theory says $c(m)$ is concave
  - High MPC for people with low wealth
  - Low MPC for people with high wealth
- Target assets a^* depend on patience
  - Small differences in G produce large a differences
- Distribution could matter a lot in SR
  - Tax changes targeting poor will have much bigger kick
- Constraints have modest long-run consequences
- Changes in constraints can have a big SR effect

The Stochastic Growth Model

- Turn off the transitory shocks: $\xi = 1$
- Aggregate production function: $F(K, P) = K^{\gamma} P^{1-\gamma}$
- Introduce depreciation: $K_{t+1} = A_t \daleth$

Normalize again, obtaining

$$\begin{aligned} k_{t+1} &= (\daleth / G\Psi_{t+1}) a_t \\ m_{t+1} &= k_{t+1} + k_{t+1}^{\gamma} \end{aligned}$$

Calibrating Stochastic Growth Model

$$\begin{aligned} \alpha &= 0.36 \\ \daleth &= 1.10 \\ G &= 1.00 \\ \beta &= 0.96 \end{aligned}$$

Bottom Line:

- Typically calibrated to match $K/Y \approx 3 \sim 4$
- RA is very rich!

In a Nutshell

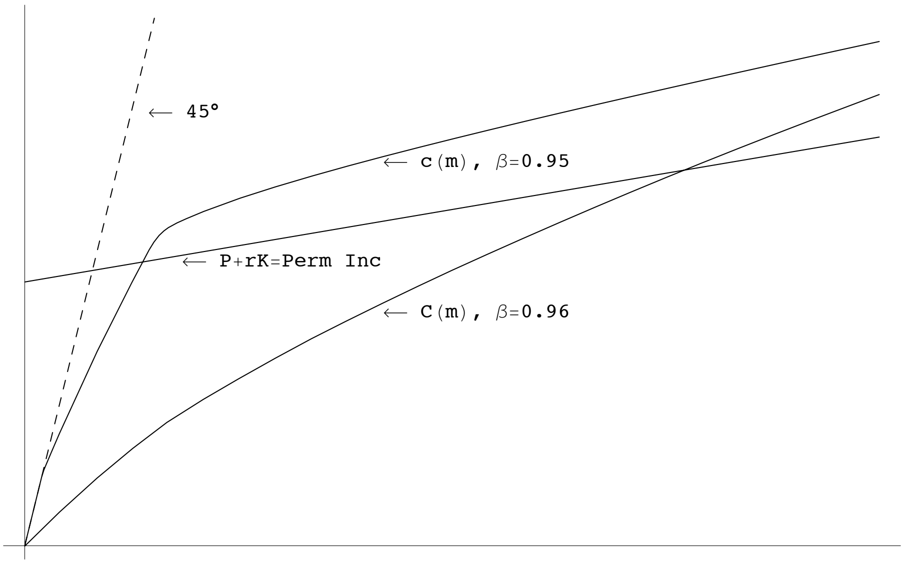

Figure: Salt and Freshwater Models

A Tidewater Model

- Take saltwater model and allow $F(K, L)$
- Take freshwater model and allow $\xi_{i,t}$
  Aiyagari (1994), Krusell and Smith (1998)
- Conclusion: Looks just like freshwater model
  - Eqbm K rises maybe 1 percent
  - MPC remains small, close to value in RCK model
  - Dynamics, impulse responses indistinguishable

Why?

Instead of 1 rep agent at SS K/Y ratio of 3.5

- Group of agents distributed around a K/Y of 3.0-4.0
- But behavior of these consumers is very similar to the RA consumer
- Looks nothing like micro data
  - Bottom 50 percent of HH's own 5 percent of wealth
  - Lots of evidence of high MPC's among them

Solution: 'Serious' Heterogeneity

- Uninsurable shocks aren't enough
- Need some people with low 'target' wealth
- Alternatives:
  - Patient vs impatient
  - Young vs old
  - Fast-growing vs slow-growing occupations
  - Low vs high rates of return on saving
- Long run K^* will depend on 'patient'
- Short run C will depend on wealth distribution

An Example: Krusell and Smith (1998)

- Proportion $\lambda = 0.66$ are impatient, $\beta = 0.90$
- Proportion $(1 - \lambda) = 0.34$ are patient, $\beta = 0.96$

		K/W By Percentile		Agg
Model	K/W	Bottom 66	Top 34	MPC
Fresh	3.929	-	-	0.043
Tide	3.963	3.48	4.95	0.045
Tide+Hetero	3.910	0.39	11.06	0.187

Source: Carroll (2000a)

Implications

- Fiscal policy
  - c' much higher for low income HH's
  - Stabilizing C depends on stabilizing m at bottom
- Monetary policy
  - Mainly works through effects on the 'patient'
    - The impatient finance most c through y
  - Caveat: This ignores durables

Implications (cont.)

- Uncertainty Matters
  - Plausible Movement in Uncertainty Can Move C
  - Worth trying to measure:
    - Consumer sentiment
    - Composition of spending
    - Read the newspaper!

Reservations: Excess Smoothness

- C is Still Too Predictable
  - Ludvigson and Michaelides (2001)
- Explanations:
  - Habit formation (Fuhrer (2000))
  - 'Sticky expectations' (Carroll (2003))

Sticky Expectations

- var($\Delta \log \psi$) $\approx$ 100var($\Delta \log \Psi$)

Suppose people only notice macro news with some probability γ
Then

$$\Delta \log C_{t+1} \approx (1-\gamma)\Delta \log C_t + \epsilon_{t+1}$$

which can explain excess smoothness

Reservations: Saving and Growth

- All these models imply $G \uparrow \Rightarrow S \downarrow$
  - If you're going to be rich, why save now?
- Data say $G \uparrow \Rightarrow S \uparrow$
  - Japan, Korea, HPAE's
  - OECD after pty slowdown
- Habits? (Carroll, Overland, and Weil (2000))

Reservations: Bill Gates

- About 1/4 of K owned by richest 1 pct
- No standard model can match this
- Two modifications seem necessary:
  - Entrepreneurship (e.g. Quadrini (1999))
    - Bill Gates isn't rich because he's patient
  - 'Capitalist spirit' utility
    - It's fun to be rich (Carroll (2000b))

Conclusions

- Micro
  - Tidewater model with serious heterogeneity
  - Behavior depends on wealth
- Macro Short Run
  - Excess Smoothness: Tidewater Goes Partway
  - Need Something Else
    - 'Sticky Expectations'
    - Habits
- Macro Medium Run
  - Saving and Growth
  - Capitalist Spirit

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