1 Overview

Income Fluctuation problem:

- Quadratic-CEQ
  → Permanent Income
- CARA
  → precautionary savings
- CRRA
  → steady state inequality
- borrowing constraints

- General Equilibrium:
  steady state capital and interest rate

2 Certainty Equivalence and the Permanent Income Hypothesis (CEQ-PIH)

2.1 Certainty

- assume $\beta R = 1$
  $T = \infty$ for simplicity
- no uncertainty:
  $$\max \sum_{t=0}^{\infty} \beta^t u(c_t)$$
  $$A_{t+1} = (1 + r)(A_t + y_t - c_t)$$
- solution:
  $$c_t = \frac{r}{1 + r} \left[ A_t + y_t \sum_{j=1}^{\infty} R^{-j} y_{t+j} \right]$$
2.2 Uncertainty: Certainty Equivalence and PIH

- tempting...
  \[ c_t = \frac{r}{1+r} \left[ A_t + y_t + E_t \sum_{j=1}^{\infty} \left( \frac{1}{1+r} \right)^t y_{t+j} \right] \]

- Permanent Income Hypothesis (PIH)
- Certainty Equivalence:
  \[ x \rightarrow E(x) \]
- valid iff:
  - preferences: \( u(c) \) quadratic and \( c \in R \)
- main insight:
  given “permanent” income
  \[ y_t^p \equiv y_t + E_t \sum_{j=1}^{\infty} \left( \frac{1}{1+r} \right)^t y_{t+j} \]
- \( c_t \) function of \( y_t^p \) and not independently of \( y_t \)
- innovations
  \[ \Delta c_t \equiv c_t - c_{t-1} = \frac{r}{1+r} \sum_{j=0}^{\infty} \left( \frac{1}{1+r} \right)^j \left[ E_t y_{t+j} - E_{t-1} y_{t+j} \right] \]
  \[ \rightarrow \text{revisions in permanent income} \]
- implications:
  - random-walk:
    \[ E_{t-1} [\Delta c_t] = 0 \]
  - no insurance...
    ...consumption smoothing \( \rightarrow \) minimize \( \Delta c \)
- marginal propensity to consume from wealth:
  \[
  \frac{r}{1 + r}
  \]

- marginal propensity to consume from innovation to current income depends on persistence of income process

* example: \( \{y_t\} \) is \( MA(2) \)
  \[
  y_t = \varepsilon_t + \beta_1 \varepsilon_{t-1} = \beta(L) \varepsilon_t
  \]

  \[
  \Delta c_t = \frac{r}{1 + r} \sum_{j=1}^{\infty} R^{-j} [\mathbb{E}_t y_{t+j} - \mathbb{E}_{t-1} y_{t+j}]
  \]
  \[
  = \frac{r}{1 + r} \{y_t - \mathbb{E}_{t-1} y_t + R^{-1}(\mathbb{E}_t y_{t+1} - \mathbb{E}_{t-1} y_{t+1})\}
  \]
  \[
  = \frac{r}{1 + r} \varepsilon_t + \frac{r}{1 + r} R^{-1} \beta_1 \varepsilon_t
  \]
  \[
  = \frac{r}{1 + r} [1 + R^{-1} \beta_1] \varepsilon_t
  \]

  where \( y_t = \varepsilon_t + \beta_1 \varepsilon_{t-1}, \mathbb{E}_{t-1} y_t = \beta_1 \varepsilon_{t-1} \) and \( \mathbb{E}_{t-1} y_{t+j} = 0 \) for \( j \geq 1 \) and \( \mathbb{E}_t y_{t+1} = \beta \varepsilon_t \)

  * ARMA
  \[
  \alpha(L) y_t = \beta(L) \varepsilon_t
  \]
  \[
  \rightarrow \Delta c_t = \frac{r}{1 + r} \beta(R^{-1}) \varepsilon_t
  \]

  * persistence \( \rightarrow \frac{\partial}{\partial \varepsilon_t} c_t > \frac{r}{1 + r} \)
  * with a unit root in \( y_t \)
    \( \rightarrow \) mg propensity to consume may be greater than 1

3 Estimation and Tests

3.1 CEQ-PIH

* "random walk" (martingale):
  \[
  \Delta c_t = u_t
  \]
  \[
  \mathbb{E}_{t-1} u_t = 0
  \]
• $u_t$ perfectly correlated with news arriving at $t$ about the expected present value of future income:

$$\Delta c_t = u_t = \frac{r}{1 + r} \sum_{j=0}^{\infty} \frac{1}{(1 + r)^j} [E_t y_{t+j} - E_{t-1} y_{t+j}]$$

• Two main tests: (generally on aggregate data)
  - random walk $\rightarrow$ unpredictability of consumption violations = ‘excess sensitivity’ to predictable current income
  - propensity to consume
    too small given income persistence $= “excess smoothness”$

• both tests rely on persistence of income $\rightarrow$ controversial

• aggregation issues:
  - across goods
  - agents: Euler equation typically non-linear
    Attanasio and Weber $\rightarrow$ leads to rejection on aggregate data
  - time aggregation:
    data averaged over continuous time
    $\rightarrow$ introduces serial correlation

### 3.2 Euler Equations

• Hall: revolutionary idea:
  forget consumption function
  find property it satisfies
  $\rightarrow$ Euler equation!

$$u'(c_t) = \beta (1 + r) E_t [u'(c_{t+1})]$$

• Attanasio et al
4 Precautionary Savings

• idea: break CEQ

4.1 Two Periods

• two period savings problem:

\[ \max u(c_0) + \beta \mathbb{E}U(\tilde{c}_1) \]

\[ a_1 + c_0 = Ra_0 + y_0 = x \]
\[ \tilde{c}_1 = Ra_1 + \tilde{y}_1 \]

• substituting:

\[ \max_{a_1} \{ u(x_0 - a_1) + \beta \mathbb{E}U(Ra_1 + \tilde{y}_1) \} \]

f.o.c. (Euler equation)

\[ u'(x_0 - a_1) = \beta R \mathbb{E}U'(Ra_1 + \tilde{y}_1) \]

Figure 1: optimum: unique intersection \( k_1^* \)

Optimum: unique intersection \( k_1^* \)
• mean preserving spread: second order stochastic dominance
  replace \( \tilde{y}_1 \) with \( \tilde{y}'_1 = \tilde{y}_1 + \tilde{\varepsilon} \) with \( \mathbb{E}(\tilde{\varepsilon} \mid y) = 0 \)

![Graph showing mean preserving spread and its implications]

Comparative Static with \( u''' > 0 \): Mean Preserving Spread

• three possibilities:
  - \( U'(\cdot) \) linear \( \Rightarrow a_1^* \) constant
  - \( U'(\cdot) \) convex: RHS rises \( \Rightarrow a_1^* \) increases
  - \( U'(\cdot) \) concave: RHS falls \( \Rightarrow a_1^* \) decreases

• introspection: \( a_1^* \) increases \( \Rightarrow U'(\cdot) \) is convex \( U''' > 0 \)

• CRRA: \( U'(c) = c^{-\sigma} \) for \( \sigma > 0 \) is convex

• somewhat unavoidable:
  \( U'(c) > 0 \) and \( c \geq 0 \)
  \( \Rightarrow U'(c) \) strictly convex near 0 and \( \infty \)

4.2 Longer Horizon

• i.i.d. income shocks
  \( T = \infty \)
Bellman equation

\[ V(x) = \max \{ u(x - a') + \beta \mathbb{E} V(Ra' + \tilde{y}) \} \]

FOC from Bellman

\[ u'(c) = \beta R \mathbb{E} V'(Ra + \tilde{y}) \]

again: \( V' \) convex \( \rightarrow \) precautionary savings

but \( V'' \) endogeneous!

result: \( u'' > 0 \) then \( V'' > 0 \) (Sibley, 1975)

4.3 CARA

CARA preferences

\[ u(c) = -\exp(-\gamma c) \]

\[ V(x) = \max_a \{ u(x - a') + \beta \mathbb{E} V(Ra' + \tilde{y}) \} \]

no borrowing constraints (except No-Ponzi)

no non-negativity for consumption

guess and verify:

\[ V(x) = Au(\lambda x) \]

where \( \lambda \equiv \frac{r}{1+r} \)

note with CARA

\[ u(a + b) = -u(a) u(b) \]

verifying

\[ V(x) = \max \{ u(x - a') + \beta \mathbb{E} u(\lambda (Ra' + \tilde{y})) \} \]
\[ V(x) = -u \left( \frac{r}{1+r} x \right) \max \left\{ u \left( - \left( a' - \frac{1}{R} x \right) \right) + \beta \mathbb{E} u \left( r \left( a' - \frac{1}{R} x \right) + \frac{r}{R} \tilde{y} \right) \right\} \]
\[ V(x) = -u \left( \frac{r}{R} x \right) \max \left\{ u(-a') + \beta \mathbb{E} u \left( r a' + \frac{r}{R} \tilde{y} \right) \right\} \]
where
\[ \alpha' = a' - x/R \] or equivalently
\[ c = \frac{r}{1 + r} x - \alpha' \]

confirms guess. Solving for \( A \) :
\[
A = \max \left\{ u(-\alpha') + \beta \mathbb{E} u \left( r\alpha' + \frac{r}{R} \tilde{y} \right) \right\}
\]
\[
u'(-\alpha') = r\beta \mathbb{E} u' \left( r\alpha' + \frac{r}{R} \tilde{y} \right)
\]
\[
u(-\alpha') = r\beta \mathbb{E} u \left( r\alpha' + \frac{r}{R} \tilde{y} \right)
\]

where we used \( u'(c) = -\gamma u(c) \)
\[
A = u(-\alpha') + \beta \mathbb{E} u \left( r\alpha' + \frac{r}{R} \tilde{y} \right)
\]
\[
= u(-\alpha') + \frac{u(-\alpha')}{r} = -\frac{1 + r}{r} u(-\alpha')
\]
(note \( A > 0 \))

coming back...

\[
u(-\alpha') = r\beta \frac{1 + r}{r} (-u(-\alpha')) \mathbb{E} u \left( r\alpha' + \frac{r}{R} \tilde{y} \right)
\]
\[
u(-r\alpha') = \beta (1 + r) \mathbb{E} u \left( \frac{r}{R} \tilde{y} \right)
\]
\[-\alpha' = \frac{1}{r} u^{-1} \left( \beta (1 + r) \mathbb{E} u \left( \frac{r}{R} \tilde{y} \right) \right)
\]
\[= \frac{1}{r} u^{-1} (\beta (1 + r)) + \frac{1}{r} \mathbb{E} u \left( \frac{r}{R} \tilde{y} \right) \]

• verifying \( c(x) = \lambda x + \alpha \) using Euler...

\[
u'(c_t) = \beta R \mathbb{E}_t u'(c_{t+1})
\]
\[1 = \beta R \mathbb{E}_t u'(c_{t+1} - c_t)
\]
\[1 = \beta R \mathbb{E}_t u'(c(x_{t+1}) - c(x_t))
\]
\[1 = \beta R \mathbb{E}_t u'(\lambda (x_{t+1} - x_t))
\]

since \( x_{t+1} = R a_{t+1} + y_{t+1} \) and \( a_{t+1} = \alpha' + x_t/R \)
\[x_{t+1} - x_t = R (\alpha' + x_t/R) + y_{t+1} - x_t = R \alpha' + y_{t+1}\]
\[ 1 = \beta R \mathbb{E}_t u'(r\alpha' + \frac{r}{R} y_{t+1}) \]

same as before

- Verifying value function (again)

  note that \( u'(c) = -\gamma u(c) \)

\[
 u'(c_t) = \beta R \mathbb{E}_t u'(c_{t+1}) \iff u(c_t) = \beta R \mathbb{E}_t u(c_{t+1})
\]

\[ \mathbb{E}_t u(c_{t+1}) = (\beta R)^{-t} u(c_t) \]

Then welfare \( \iff \) current consumption:

\[
 V_t \equiv \sum_{s=0}^{\infty} \beta^s \mathbb{E}_t u(c_{t+s}) = \sum_{s=0}^{\infty} \beta^s (\beta R)^{-t} u(c_t) = \frac{1+r}r u(c_t)
\]

Verifying

\[
 c_t = \lambda x_t \iff V(x) = \frac{1+r}r u(\lambda x - \alpha')
\]

- consumption function

\[
 c(x) = \lambda \left[ x + \frac{1}{r} y^* \right] - \frac{1}{r} \log \left( \beta (1+r) \right) / \gamma
\]

\[
 y^* \equiv \frac{1}{\lambda} u^{-1} \left[ \mathbb{E} u(\lambda y) \right]
\]

- suppose \( \beta R = 1 \)

  no CEQ...

  ...but simple deviation: constant \( y^* \)

- CARA, the good:
  - tractable
  - useful benchmark \( \rightarrow \) helps understand other cases
  - good for aggregation (linearity)

- CARA, the bad:
  - negative consumption
  - unbounded inequality
5 Income Fluctuation Problem

- iid income $y_t$
- $c_t \geq 0$
- borrowing constraints

5.1 Borrowing Constraints: Natural and Ad Hoc

- natural borrowing constraint
  maximize borrowing given $c_t \geq 0$
  $c_t \geq 0 + \text{No-Ponzi}$
  \[ \Rightarrow a_t \geq -\frac{y_{\text{min}}}{r} \]

- ad hoc borrowing constraint:
  \[ a_t \geq -\phi \]
  \[ \phi = \min\{y_{\text{min}}/r, b\} \]

- Bellman
  \[ V(x) = \max_{a' \geq -\phi} \{ u(x - a') + \beta EV(Ra' + y) \} \]

- change of variables
  \[ \hat{a}_t = a_t + \phi \text{ and } \hat{a}_{t+1} \geq 0 \]
  \[ z_t = R\hat{a}_t + y_t - r\phi \]
  \[ z_t = \hat{a}_t + c_t \]

- transformed problem
  \[ v(z) = \max_{\hat{a}' \geq 0} \{ u(z - \hat{a}') + \beta EV(R\hat{a}' + y - r\phi) \} \]

(dropping $\hat{}$ notation)

\[ v(z) = \max_{a' \geq 0} \{ u(z - a') + \beta EV(Ra' + y - r\phi) \} \]
5.2 Properties of Solution

\( \beta R = 1 \)

- CARA: \( \mathbb{E} [a_{t+1}] > a_t \) and \( \mathbb{E} [c_{t+1}] > c_t \)
- Martingale Convergence Theorem:
  If \( x_t \geq 0 \) and \( x_t \geq \mathbb{E} [x_{t+1}] \)
  then \( x_t \to \tilde{x} \) (note: \( \tilde{x} < \infty \) a.e.)
- Euler
  \[
  u' (c_t) = \beta R \mathbb{E} [u' (c_{t+1})]
  \]
  \( \Rightarrow u' (c_t) \) converges
  \( \Rightarrow c_t \to c \)
- if \( c < \infty \) contradiction with budget constraint equality
- \( a_t \to \infty \) and \( c_t \to \infty \)

\( \beta R < 1 \)

- Bellman equation
  \[
  v (z) = \max_{a'} \{ u (x - a') + \beta \mathbb{E} [Ra' + \tilde{y} - r \phi] \}
  \]
- \( v \) is increasing, concave and differentiable
- Preview of Properties
  - monotonicity of \( c (z) \) and \( a' (z) \)
  - borrowing constraint is binding iff \( z \leq z^* \)
  - if
    \[
    \lim_{c \to 0} \frac{u'' (c)}{u' (c)} = 0
    \]
    then assets bounded
- if $u \in HARA$ class $\Rightarrow c(z)$ is concave (Carrol and Kimball)

Figures removed due to copyright restrictions.


- borrowing constraints
  - certainty: $[0, z^*]$ large
    approached monotonically
  - uncertainty: $[0, z^*]$ relatively small
    not approached monotonically

- concavity of $v$
  $\Rightarrow$ concavity of $\Phi(a') = \beta \mathbb{E}v(Ra' + \bar{y})$
  $\Rightarrow$ standard consumption problem with two normal goods

  $$v(z) = \max_{c,a'} \{ u(c) + \beta \mathbb{E}v(Ra' + \bar{y}) \}$$
  $$c + a' \leq x$$
  $$a' \geq 0$$

  $\Rightarrow c(z)$ and $a'(z)$ are increasing in $z$
• FOC (Euler)
  \[ u'(x - a') \geq \beta R E u' (Ra' + \bar{y}) \]
  equality if \( a' > 0 \)

• define
  \[ u' (z^*) = \beta R \ E u' (\bar{y}) \]

\[ z \leq z^* \Rightarrow c = z \]
\[ \Rightarrow a' = 0 \]

**Assets bounded above**

• not a technicality...
  ...remember CARA case

• idea: take \( a \to \infty \)
  income uncertainty unrelated to \( a \) (i.e. absolute risk)
  \[ \frac{u''}{u'} \to 0 \Rightarrow \text{income uncertainty unimportant} \]
  \( \beta R \) bites \( \Rightarrow a' < a \) falls

**Proof**
exist a \( z^* \) such that \( z_{\text{max}}' = (1 + r) a'(z) + y_{\text{max}} \leq z \) for \( z \geq z^* \)
Euler
\[ u' (c(z)) = \beta (1 + r) \ \frac{E u' (c(z'))}{u' (\bar{c}(z))} u' (\bar{c}(z)) \]
where \( \bar{c}(z) = c (z_{\text{max}}' (z)) = c (a'(z) + y_{\text{max}} - r \phi) \)

\[ \text{IF} \ \lim_{z \to \infty} \frac{E [u' (c(z'))]}{u' (\bar{c}(z))} = 1 \Rightarrow \text{DONE} \]

\[ 1 \geq \frac{E u' (c(z'))}{u' (\bar{c}(z))} \geq \frac{u' (c(z))}{u' (\bar{c}(z))} \geq \frac{u' (\bar{c}(z) - (\bar{c}(z) - c(z)))}{u' (\bar{c}(z))} \]

since \( a' \) is increasing

\[ \bar{c}(z) - c(z) = c (Ra'(z) + y_{\text{max}} - r \phi) - c (Ra'(z) + y_{\text{min}} - r \phi) < y_{\text{max}} - y_{\text{min}} \]
\[
1 \geq \frac{Eu'(c(z'))}{u'(\bar{c}(z))} \geq \frac{u'(\bar{c}(z) - (y_{\text{max}} - y_{\text{min}}))}{u'(\bar{c}(z))}
\]

Since \( z \to \infty \Rightarrow a'(z), c(z) \to \infty \) then \( \bar{c}(z) = c(a'(z) + y_{\text{max}} - r\phi) \to \infty \). Apply Lemma below. ■

**Lemma.** for \( A > 0 \)
\[
\frac{u'(c - A)}{u'(c)} \to 1
\]

**Proof.**
\[
\frac{u'(c - A)}{u'(c)} = 1 + \int_0^A \frac{u''(c - s)}{u'(c)} \, ds
\]
\[
= 1 - \int_0^A \frac{u'(c - s)}{u'(c)} \frac{u''(c - s)}{u'(c - s)} \, ds
\]
\[
= 1 - \int_0^A \frac{u'(c - s)}{u'(c)} \gamma(c - s) \, ds
\]
\[
\leq 1 - \int_0^A \gamma(c - s) \, ds
\]

since \( \frac{u'(c - s)}{u'(c)} > 1 \) for all \( t > 0 \)
\[
\int_0^A \gamma(c - s) \, ds \to 0
\]

so \( \frac{u'(c - A)}{u'(c)} \to 1 \). ■

\section{6 Lessons from Simulations}

From Deaton’s “Saving and Liquidity Constraints” (1991) paper:

- important
  borrowing constraint may bind infrequently
  (wealth endogenous)
- marginal propensity to consume
  higher than in PIH
Figure removed due to copyright restrictions.

See Figure 1 on p. 1228 in Deaton, Angus. “Saving and Liquidity Constraints.” *Econometrica* 59, no. 5 (1991): 1221-1248.
Figure removed due to copyright restrictions.

See Figure 2 on p. 1230 in Deaton, Angus. “Saving and Liquidity Constraints.” *Econometrica* 59, no. 5 (1991): 1221-1248.
Figure removed due to copyright restrictions.

See Figure 4 on p. 1234 in Deaton, Angus. “Saving and Liquidity Constraints.” *Econometrica* 59, no. 5 (1991): 1221-1248.
• consumption
  – smoother temporary shocks
  – harder with permanent shocks

7 Invariant Distributions
• initial distribution $F_0(z_0)$
• laws of motion
  \[ z' = Ra'(z) + y' \]
  generate
  \[ F_0(z_0) \rightarrow F_1(z_1) \]
  \[ F_1(z_1) \rightarrow F_2(z_2) \]
  \[ \vdots \]
• steady state: invariant distribution
  \[ F(z) \rightarrow F(z) \]
• result:
  1. exists
  2. unique
  3. stable
• key: bound on assets and monotonicity
• $A(r) \equiv E(a'(z))$
  – continuous
  – not necessarily monotonically increasing in $r$
    income vs. substitution; and $w(r)$ effect
    typically: monotonically increasing
  – $A(r) \rightarrow \infty$ as $R \rightarrow \beta^{-1}$
8 General Equilibrium

- GE effects of precautionary savings?
  → more $k$, lower $r$
- how much?

8.1 Huggett: Endowment

- endowment economy
- no government
- zero net supply of assets
- idea: any precautionary saving translates to lower equilibrium interest rate
- computational GE exercise:
  - CRRA preferences
  - borrowing constraints

8.2 Aiygari

- adds capital
- $y_t = w l_t$ and $l_t$ is random; $w$ is economy-wide wage
- $N$ is given by $N = \sum l^i p^i$
- define steady state equilibrium:
  3 equations / 3 unknowns: $(K, r, w)$

$$\int A(z, r, w) \, dF(z; r, w) - \phi = K$$

$$r = F_k(K, N) - \delta$$
$$w = F_N(K, N)$$
• solve $w(r)$ and substitute:

$$A^{GE}(r) = \int a(z, r, w(r)) \, d\mu(z; r, w(r)) = K$$

intersect with

$$r = F_k(K, N) - \delta$$

• $A^{GE}(r)$
  - continuous
  - not necessarily monotonically increasing in $r$
    (a) income vs. substitution; (b) $w(r)$ effect
    typically: monotonically increasing
  - $A(r) \to \infty$ as $R \to \beta^{-1}$

Figures removed due to copyright restrictions.

See Figures Ila and IIb on p. 668 in Aiyagari, S. Rao.

• comparative statics
  - $\frac{\partial}{\partial b} A(0, b) > 0$
    typically: $\frac{\partial}{\partial b} A(r, b) > 0$
- $\uparrow \frac{\sigma_y^2}{y} \Rightarrow \uparrow A$

Table removed due to copyright restrictions.


- wealth distribution: not as skewed
- transition? monotonic?

9 **Inequality**

- CEQ-PIH and CARA
  inequality increases linearly
  unbound inequality

- CRRA
  inequality increases initially
  bounded inequality
Figure removed due to copyright restrictions.

See Figure 2 on p. 444 in Deaton, Angus, and Christina Paxson. "Intertemporal Choice and Inequality." *Journal of Political Economy* 102, no. 3 (1994): 437-467.
Figure removed due to copyright restrictions.

See Figure 4 on p. 445 in Deaton, Angus, and Christina Paxson. "Intertemporal Choice and Inequality."
Figure removed due to copyright restrictions.

Figure removed due to copyright restrictions.

See Figure 1d) on p. 769 in Heathcote, Jonathan, Kjetil Storesletten, and Giovanni L. Violante. "Two Views of Inequality Over the Life-Cycle." *Journal of the European Economic Association* 3, nos. 2-3 (2005): 765-775.

Deaton and Paxson

Revisionisist (Heathcoate, Storesletten, Violante)
Guvenen
Storesletten, Telmer and Yaron:

10 Life Cycle: Consumption tracks Income

Carroll and Summers:

11 Other Features and Extensions

- Social Security:
- Medical Shocks: Palumbo (1999)
Figure removed due to copyright restrictions.

See Figure 1 in Guvenen, Fatih. "Learning Your Earning: Are Labor Income Shocks Really Very Persistent?" American Economic Review. (Forthcoming) http://www.econ.umn.edu/~econdept/learning_your_earning.pdf

Figure 9

Figure removed due to copyright restrictions.

See Figure 1 on p. 613 in Storesletten, Kjetil, Chris Telmer, and Amir Yaron. "Consumption and Risk Sharing over the Life Cycle." Journal of Monetary Economics 51, no. 3 (2004): 609-663.

Figure 10
Figure removed due to copyright restrictions.

See Figure 5 on p. 624 in Storesletten, Kjetil, Chris Telmer, and Amir Yaron. "Consumption and Risk Sharing over the Life Cycle." *Journal of Monetary Economics* 51, no. 3 (2004): 609-663.

Figure 11

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Figure 12
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Figure 13

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Figure 14
• Learning Income Growth: Guvenen (2006)
• Hyperbolic preferences: Harris-Laibson
• Leisure Complementarity
• Attanasio-Weber: Demographics and Taste Shocks