Saving and Liquidity Constraints

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Econometrica 1991

Motivation: How to reconcile the macro data and micro data?

- For the U.S. macro data, Flavin (1981) found evidence that changes in consumption are positively related to predictable changes in income.
- For the micro data, Hall and Mishkin (1982) found a negative correlation between the consumption growth and lagged income growth.

Resolution

- To introduce liquidity constraint. Consumption tracks income sometimes or for some individuals.
- To construct income processes which are negatively autocorrelated for individuals but positively autocorrelated for aggregate.
- Then we reconcile the pattern of macro data and micro date.

The Basic Model

$$MaxE\sum_{t=0}^{+\infty}(1+\delta)^{-t}u(c_t)$$

$$\text{s.t.} \quad A_{t+1} = (1+r)(A_t + y_t - c_t)$$

$$A_t \geq 0$$

where $\delta > 0$ is the time preference rate, $\delta > r$.

y_t is the labor income, which is a stationary random variable with compact support $[y_0, y_1]$, and $y_0 > 0$.

- Define x_t "cash on hand", by $x_t = A_t + y_t$.
- x_t evolves according to

$$x_{t+1} = (1+r)(x_t - c_t) + y_{t+1}.$$

i.i.d. income: some intuitions

- Let $p(x_t) = u'(c(x_t)), p(x_t)$ is the marginal utility of money or price of consumption.
- Euler equation

$$p(x) = \max\{u'(x), \frac{1+r}{1+\delta} E[p((1+r)(x - u'^{-1} p(x)) + y)]\}$$

- Consumption function, $\exists x^*$

  $c = x$, when $x \le x^*$;

  $c = c(x) \le x$, when $x \ge x^*$.

Simulation results: i.i.d. income

- Assets play the role of a buffer stock. The consumer saves and dissaves in order to smooth consumption in the face of income uncertainty.

Nonstationary income: i.i.d. growth rate

- Log income is a random walk.

$$\Delta \lg y_t = \varepsilon_t, \quad \varepsilon_t \sim N(g, \sigma^2).$$

Nonstationary income: regime switch

The growth rates mimic aggregate U.S. data.

Two states of economy: Boom and slump.

$$s = 1 : \Delta \ln y_t = g_1 + \varepsilon_t,$$

$$s = 2 : \Delta \ln y_t = g_2 + \varepsilon_t.$$

With transition probability,

$$\pi_1 = pr(s_t = 1 \mid s_{t-1} = 1); \pi_2 = pr(s_t = 2 \mid s_{t-1} = 2).$$

Failure of representative agent model

- Either there is no saving , when income is a random walk, or saving is contracyclical over the business cycle, when income changes are positively autocorrelated.
- A liquidity constrained representative agent cannot generate aggregate U.S. saving behavior if that agent receives aggregate labor income.

Heterogeneity of the agents

Introducing idiosyncratic component to individual income growth rate.

$$\Delta \ln y_t - g = z_{1t} + z_{2t} + z_{3t},$$

$$z_{1t} = \varepsilon_{1t} + \beta\varepsilon_{1t-1}, z_{2t} = \varepsilon_{2t}, z_{3t} = \varepsilon_{3t} - \varepsilon_{3t-1}, \beta > 0.$$

where z_1 is common to all consumers.

z_2 represents idiosyncratic permanent income.

z_3 represents idiosyncratic transitory income.

Micro Level

- The individual observes only the sum of the three components, which satisfies

$$\Delta \ln y_t - g = \eta_t - \psi \eta_{t-1}$$

where $\eta_t \sim N(0, \sigma_\eta^2)$ and $0 < \psi < 1.$

- For an individual, sometimes his consumption tracks income. The negative correlation between consumption change and income change comes from the assumption of individual income process.

Macro Level

- Aggregate income growth

$$\Delta \ln y_t - g = z_{1t}.$$

$z_{1t} = \varepsilon_{1t} + \beta\varepsilon_{1t-1}, \beta > 0.$

- Some individuals' borrowing constraints are binding. A fraction of aggregate consumption tracks income. A positive correlation between aggregate consumption growth and lagged income growth comes from the assumption of aggregate income process.

Conclusions of the paper

- Microeconomic income processes do not resemble their average.
- It it possible to construct a model of microeconomic saving under liquidity constraints which, at the aggregate level, reproduces many of the stylized facts in the actual data.

Comments and Possible Extension

- The interest rate is exogenous. The general equilibrium effect is not taken into account.
- To construct the income processes, the model puts restrictions on aggregate income shock and idiosyncratic income shocks.
- It can be extended to a general equilibrium model.