Discussion of Ino & Kobayashi's "Deflationary equilibrium - an unintended consequence of expansionary policies"

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* The views expressed in this presentation are those of the author and should not be interpreted as those of the Federal Reserve Bank of Richmond or Federal Reserve System.

Overview of the paper

- Can commitment to long-term monetary *and* fiscal expansionary policies prevent persistent deflation?
- With representative agent/complete markets: Yes (because TVC will be violated; e.g., Benhabib Schmitt-Grohé Uribe 2002)
- With heterogeneous agent & incomplete markets: Not necessary; Certain commitment may even facilitate persistent deflation as an unintended consequence.
- Relevant research question. Relevant model, which helps us understand persistent coexistence of deflation & expansionary policies in Japan.

First main comment (from my "bubbly" perspective)

Key difference between the two scenarios is *whether government debt can be rolled over like a rational bubble*.

- Not in rep. agent/complete markets models (e.g., Santos Woodford 1997, Kamihigashi 2000)
  - TVC rules out bubble
- Yes in het. agent & incomplete market models
  - As individual discounting $\neq$ market discounting ($\beta^t u'(c_t^j) b_t^j \neq \frac{1}{\prod_{s=1}^t (1+r_s)} b_t$)
  - OLG (e.g., Samuelson 1958, Diamond 1965, Tirole 1985)
  - Infinitely-lived agents with borrowing constraint (e.g., Hirano Yanagawa 2016, Miao Wang 2018, Biswas Hanson Phan forthcoming)
  - Bewley Huggett Ayagari models
- Authors should relate their (key) TVC argument to this well known result from the bubble lit

Model recap

- Household chooses $a' = k' + b'$ subject to idiosyncratic ε'

$$V(a,\varepsilon) = \max_{a'}\{\frac{c^{1-\alpha}-1}{1-\alpha} + \beta E[V(a',\varepsilon')|\varepsilon]\}$$

$$\text{s.t. } c + a' = \underbrace{(1+r)}_{\text{non-contingent}} a + w\varepsilon - T$$

$$a' \geq \underbrace{\underline{a}}_{\text{credit constraint}}$$

- Competitive firms. Factor prices:

$$r = F_K(K,1) - \delta$$
$$w = F_L(K,1)$$

- Gov *can perfectly commit* to future policies
- Gov sets lump-sum tax T:

$$(1+r)b = b' + T$$

- Gov sets nominal rate $i \geq 0$. Prices are flexible. Inflation determined by Fisher eqn:

$$1+\pi = \frac{1+i}{1+r}$$

Surprise aggregate shock

- $t < 0$: stationary equilibrium at some $b_0 > 0$
- $t = 0$: unanticipated aggregate shock causes large drop in real rate
  - Specifically, shock to risk aversion ($\alpha \uparrow$)
  - causes $\uparrow$ demand for precautionary savings
  - causes real rate $r \downarrow$
  - Note: Other shocks would work too (e.g., $\sigma_\varepsilon \uparrow$, or collapse of bubble)

Forward guidance

- Gov responds to this shock with a commitment that $\forall t \geq 0$:
  - If current $\pi_t \leq 0$, will keep low i and low tax: $i_{t+1} = 0$ and $T_t = 0$
  - Else, $\forall s \geq t$ sets i to a Taylor rule

    $$1 + i_{s+1} = (1 + r_{s+1})(1 + \pi^*)$$

    and follows a "contractionary" tax policy:

    $$T_s = T^* > 0$$

- Authors call this "forward guidance" (which traditionally refers to policy commitment by central banks)

Preventing deflationary trap

- In a *representative* agent framework, commitment to fiscal expansion will prevent deflationary equilibrium (where $\pi = 0$ indefinitely)
  - Suppose otherwise. Then $T = 0$ (i.e., debt rolled over) indefinitely

$$\frac{b_t}{\prod_{s=1}^{t}(1+r_s)} = b_0 > 0$$

  - With representative agent, $\frac{1}{\prod_{s=1}^{t}(1+r_s)} = \beta^t \frac{u'(c_t)}{u'(c_0)}$
  - Hence TVC $\lim_{t\to\infty} \beta^t u'(c_t) b_t = 0$ is violated

- With heterogeneous agents, individual TVC does not rule out bubble
  - Market discounting $\frac{1}{\prod_{s=1}^{t}(1+r_s)}$ is not necessary the same as individual discounting $\beta^t \frac{u'(c_t^j)}{u'(c_0^j)}$ (identity of marginal investors can change between periods; simplest example: OLG)

Second main comment

- Model can be substantially simplified (may even become analytical)
  - by removing the no-borrowing constraint
  - and assuming CARA preferences and normal shocks (e.g., Caballero 1990, Wang 2003)

$$V(a,\varepsilon) = \max_{a'}\{\frac{e^{-\alpha c}}{-\alpha} + \beta E[V(a',\varepsilon')|\varepsilon]\}$$

$$\text{s.t. } c + a' = (1+r)a + \underbrace{w\varepsilon - T}_{y}$$

- Analytical solution from Acharya Dogra (forthcoming):

$$c = \underbrace{\mu \mathscr{C}}_{\text{aggr component}} + \underbrace{\mu}_{\text{mpc}} \cdot ((1+r)a + y)$$

  - where μ solves

$$\mu = \frac{\mu'}{\frac{1}{1+r} + \mu'}$$

  - and $\mathscr{C}$ is (with $\mathrm{PV}_t(X) := \sum_{s \geq 1} \frac{X_{t+s}}{\prod_{k=1}^{s}(1+r_{t+k})}$)

$$\mathscr{C}_t = \underbrace{\frac{1}{-\alpha} \mathrm{PV}_t \left(\frac{\ln[\beta(1+r)]}{\mu} \right)}_{\text{impatience}} + \underbrace{\mathrm{PV}_t(\bar{y})}_{\text{PIH}} - \underbrace{\frac{\alpha}{2} \mathrm{PV}_t(\mu \sigma_y^2)}_{\text{precautionary savings}}$$

Final comment

- Right now money is neutral, so no welfare cost of persistent deflation, and policy implications are not clear
- One simple potential solution: add downward nominal wage rigidity (as in Schmitt-Grohe Uribe 2016):

$$P_t w_t \geq \gamma P_{t-1} w_{t-1}$$

  where γ (≈ 1) is index of wage rigidity
  - Deflation makes rigidity constraint more likely to bind
- It is possible to derive analytical welfare functions in a heterogeneous agent model with incomplete markets and downward wage rigidity (e.g., Biswas Hanson Phan forthcoming)