Recap Information 2: The Tobin effect and micro-founded, flexible-price models with money in the utility function

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The lecture slides associated with this part of the course provide the most comprehensive information about what I find of relevance. Nevertheless, this note briefly lists the key concepts that you are supposed to know and be able to explain. Subsequently, some discussion about the flavor of the potential questions for the exam are provided.

Key concepts you should know

The Tobin Model

- The simple budget accounting of the Tobin-Solow model
- How inflation erodes available resources
- Real money's effect on capital accumulation
- Steady-state inflation rate
- Impact of real money to capital ratio on steady-state capital
- Real money's postulated relationship vith inflation
- The Tobin effect: Inflation's impact on steady state capital labor ratio
- Monetary neturality versus superneutrality

Money in the utility function

- Dynamic programming method of deriving optimal household behavior
- Interpretation of the first-order conditions for optimal behavior
- Elimination of the partial derivatives of the value function
- Steady state properties of the simple MIU model
- Contrast with Tobin model
- Superneutrality or not?
- Real money holdings and the nominal interest rate
- The Fisher relationship
- The optimal rate of inflation
- The Friedman rule
- Welfare costs of inflation
- What can generate non-superneutrality in a MIU model?
- MIU model with endogenous labor; the consumption-leisure trade off
- Properties of utility function determining superneutrality or not
- Constant relative risk aversion utility function
- Distinction between effects of anticipated and unanticipated inflation
- Stochastic version of MIU model
- Requirement on money supply process to obtain non-supernetrality
- Role of money shocks for the real economy

Flavor of exam questions

General comments

For general comments, see "Recap Information 1," as these will not be repeated here.

Specific comments

What could be a candidate type of exam question for this part of the curriculum? This is a rather "model-heavy" part of the curriculum, so it can serve as a platform for lengthier, and more technical questions (but....as you know from the general comments in "Recap Information 1," technicalities are only a means for organizing your economics thoughts in a consistent manner). Well, a potential type of question could be:

Sample question 2

Assume a closed economy in discrete time, where households maximize

$$U = \sum_{t=0}^{\infty} \beta^t u\left(c_t, m_t, n_t\right) \tag{1}$$

with

$$u\left(c_t, m_t, n_t\right) = \frac{\left(c_t m_t\right)^{1-\Phi}}{1-\Phi} + \frac{\left(1-n_t\right)^{1-\eta}}{1-\eta}, \quad \Phi > 0, \quad \eta > 0,$$

subject to the budget constraints

$$f\left(k_{t-1}, n_t\right) + \tau_t + \left(1-\delta\right) k_{t-1} + \frac{1}{1+\pi_t} m_{t-1} = c_t + k_t + m_t, \tag{2}$$

where c_t is consumption, m_t is real money balances at the end of period t, n_t is labor supply, k_{t-1} is physical capital at the end of period $t-1$, τ_t are monetary transfers, $0 < \delta < 1$ is the depreciation rate of capital, and π_t is the inflation rate. The function f is defined as

$$f\left(k_{t-1}, n_t\right) = A k_{t-1}^{\alpha} n_t^{1-\alpha}, \quad 0 < \alpha < 1.$$

(i) Discuss why money may enter the utility function, and describe (2) in detail.

(ii) Derive the relevant first-order conditions for optimal choices of c, m, k, and n subject to (2) and the definition

$$a_t \equiv \tau_t + \frac{1}{1+\pi_t} m_{t-1}$$

For this purpose set up the value function $V\left(a_t, k_{t-1}\right) = \max\left\{u\left(c_t, m_t, n_t\right) + \beta V\left(a_{t+1}, k_t\right)\right\}$.

(iii) Interpret the first-order conditions intuitively, and show that they can be combined (along with the expressions for the partial derivatives of the value function) into

$$u_m\left(c_t, m_t, n_t\right) + \frac{\beta}{1+\pi_{t+1}} u_c\left(c_{t+1}, m_{t+1}, n_{t+1}\right) = u_c\left(c_t, m_t, n_t\right) \tag{3}$$

$$u_c\left(c_t, m_t, n_t\right) = \beta R_t u_c\left(c_{t+1}, m_{t+1}, n_{t+1}\right), \tag{4}$$

$$-u_n\left(c_t, m_t, n_t\right) = u_c\left(c_t, m_t, n_t\right) f_n\left(k_{t-1}, n_t\right), \tag{5}$$

where $R_t = f_k(k_{t-1}, n_t) + 1 - \delta$ is the gross real interest rate, which equals $(1 + i_t) / (1 + \pi_{t+1})$, with i_t being the nominal interest rate.

(iv) Using the specific functional forms for u and f, examine the properties of the steady state using (3), (4), and (5) together with the national account identity $c^{ss} = Ak^{ss^{\alpha}} n^{ss^{1-\alpha}} - \delta k^{ss}$. Assess under which circumstances the model exhibits superneutrality or not. Explain intuitively the transmission mechanism, which leads to potential non-superneutrality, and discuss whether the correlation between output and inflation is unambiguous or not.