MACROECONOMICS

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Week 11

Microeconomic foundation of money

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Model

- Micro foundation is difficult
- We use the simplest way possible
- Only external money is assumed
- We ignore the producer
- Demand for money is consumer’s demand for money
- MIU

Consumer

- Y is exogenous (for the sake of simplicity)
- Consumer consumes (C) and saves in nominal bonds (B^d) with return R, and in money (M^d) with return 0. Both assets are taken from one period to the other

$$U = \sum_{t=0}^{\infty} \beta^t \left(ln c_t + ln \frac{M_t^d}{P_t} \right)$$

$$c_t + \frac{B_t^d}{P_t} + \frac{M_t^d}{P_t} = Y_t - T_t + \frac{(1 + R_{t-1}) B_{t-1}^d}{P_t} + \frac{M_{t-1}^d}{P_t}$$

Consumer

$$L = \sum_{t=0}^{\infty} \beta^t \left(\ln c_t + \ln \frac{M_t^d}{P_t} \right) + \lambda_t \left(Y_t - T_t + \frac{(1+R_{t-1})B_{t-1}^d}{P_t} + \frac{M_{t-1}^d}{P_t} - c_t - \frac{B_t^d}{P_t} - \frac{M_t^d}{P_t} \right)$$

With respect to C_t

$$\frac{\beta^t}{c_t} = \lambda_t$$

B_t

$$\frac{\lambda_t}{P_t} = \frac{\lambda_{t+1}(1+R_t)}{P_{t+1}} \longrightarrow \lambda_t = \frac{\lambda_{t+1}(1+R_t)}{(1+i_{t+1})} \longrightarrow c_t = \frac{c_{t+1}}{\beta(1+r_t)}$$

The choice between consumption and saving is still determined by the real interest

Demand for money

$$\frac{\beta^t}{\frac{M_t^d}{P_t}}\frac{1}{P_t} - \lambda_t \frac{1}{P_t} + \lambda_{t+1}\frac{1}{P_{t+1}} = 0$$

$$\frac{\beta^t}{\frac{M_t^d}{P_t}} - \lambda_t + \lambda_{t+1}\frac{P_t}{P_{t+1}} = 0 \longrightarrow MU_{M/P} - MU_{ct} + \frac{MU_{ct+1}}{(1+i_{t+1})} = 0$$

$$\frac{\beta^t}{\frac{M_t^d}{P_t}} = \lambda_t - \lambda_{t+1}\frac{P_t}{P_{t+1}} = \lambda_t - \frac{\lambda_{t+1}}{(1+i_{t+1})}$$

$$\lambda_{t+1} = \lambda_t \frac{(1+i_{t+1})}{(1+R_t)}$$

Demand for money

$$\frac{\beta^t}{\frac{M_t^d}{P_t}} = \lambda_t \left(1 - \frac{1}{(1+R_t)}\right) = \lambda_t \left(\frac{R_t}{(1+R_t)}\right)$$

As

$$\frac{\beta^t}{c_t} = \lambda_t$$

Substituting, rearranging

$$\frac{M_t^d}{P_t} = c_t \frac{(1+R_t)}{R_t}$$

$$\frac{M^d}{P} = L\,(c, R)$$

Government

- The government's budget constraint: spending is financed either by taxation, or by borrowing, or by issuing money (seigniorage)

$$G_t = T_t + \frac{B_t^s}{P_t} - \frac{(1+R_{t-1})B_{t-1}^s}{P_t} + \frac{M_t^s}{P_t} - \frac{M_{t-1}^s}{P_t}$$

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Complete model

Behavioral equations

$$c_t = \frac{c_t + 1}{\beta(1 + r_t)}$$

$$\frac{M_t^d}{P_t} = c_t \frac{(1 + R_t)}{R_t}$$

$$c_t + \frac{B_t^d}{P_t} + \frac{M_t^d}{P_t} = Y_t - T_t + \frac{(1 + R_{t-1})B_{t-1}^d}{P_t} + \frac{M_{t-1}^d}{P_t}$$

$$G_t = T_t + \frac{B_t^s}{P_t} - \frac{(1 + R_{t-1})B_{t-1}^s}{P_t} + \frac{M_t^s}{P_t} - \frac{M_{t-1}^s}{P_t}$$

Budget constraints, consumer, government

Complete model

- Equilibrium conditions:
- $M^s = M^d$ and $B^s = B^d$ for all t.
- We have four equations. Given output, government spending, bond and money supply, these equations determine time paths for: C, T, P, and r. Mominal interest rate is given from time paths of r and P

Classical dichotomy

- Adding up the two budget constraints:

Determining real variables

$$c_t + G_t = Y_t$$

$$c_t = \frac{c_{t+1}}{\beta(1 + r_t)}$$

Determining nominal variables

$$\frac{M_t^d}{P_t} = c_t \frac{(1 + R_t)}{R_t}$$

$$G_t = T_t + \frac{B_t^s}{P_t} - \frac{(1 + R_{t-1})B_{t-1}^s}{P_t} + \frac{M_t^s}{P_t} - \frac{M_{t-1}^s}{P_t}$$

Steady state

- As G and Y are constant, in steady state C and r are also constat
- There is inflation, if M grows at a constant rate (in steady state this rate also has to be constant
- Growth rates of M and P are the same. It can also be zero

Neutrality

- Neutrality of money
- Meaning of the super neutrality of money
- Not just that changes in M are neutral, but changes in the rate of inflation also would not have any impact on real variables.
- Superneutrality does not follow from neutrality.
- It holds in MIU, it does not in CIA