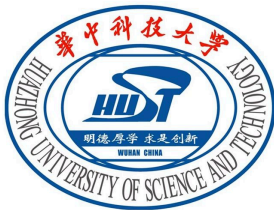


# Supplementary Notes on Chapter 6 of D. Romer's Advanced Macroeconomics Textbook (4th Edition)

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Question: How are  $y_t$ ,  $r_t$  and  $\pi_t$  mutually determined?

$$(6.8) \quad \ln Y_t = E[\ln Y_{t+1}] - \frac{1}{\theta} r_t$$

$$(6.10) \quad \frac{M_t}{P_t} = Y_t^{\theta/v} [(1 + i_t)/i_t]^{1/v} = Y_t^{\theta/v} \left[ \frac{1 + r_t + \pi_t^e}{r_t + \pi_t^e} \right]$$

- Two equations to solve three variables we are interested in?
- Solvable if  $\pi \equiv 0$ . Rigid prices?
- However,  $P_t \equiv \bar{P}$  obviously is unrealistic assumptions.
- An additional equation (with inflation in it) is called for.

## Option 1: Phillips (1958) Curve

$$(6.20) \quad W_t = AP_{t-1}$$

$$(6.21) \quad F'(L_t) = \frac{A}{1 + \pi_t}$$

- Unemployment-inflation trade-offs.
- Works for 1960s, but can not explain other periods in Figure 6.7 of textbook.
- Limitation: The government can always improve employment simply by keeping increasing the price level? How will workers accept rule (6.20) to determine their wage if they know that the government is pursuing an ever-continuing inflation policy?
- This leads us to option 2 below.

## Option2: Friedman (1968) and Phelps (1968)

$$(6.22) \quad \pi_t = \pi_t^* + \lambda(\ln Y_t - \ln \bar{Y}_t) + \epsilon_t^S, \quad \lambda > 0$$

$$(6.24) \quad \pi_t = \pi_t^e + \lambda(\ln Y_t - \ln \bar{Y}_t) + \epsilon_t^S,$$

$$(6.25) \quad \pi_t = \phi\pi_t^e + (1 - \phi)\pi_{t-1} + \lambda(\ln Y_t - \ln \bar{Y}_t) + \epsilon_t^S, \quad 0 \leq \phi \leq 1.$$

- $\pi^*$  is the core inflation, it denotes the inflation level when output is equal to its natural rate ( $\bar{Y}_t$ ) and there are no supply shocks.
- $\pi_t^* = \pi_{t-1}$  is often adopted. Or instead use a weighted average of inflation over the previous several periods.
- No permanent tradeoff between output and inflation exhibits in (6.22). (What if  $\pi_t \equiv \bar{\pi}$ ? Compared to the original Phillips curve?)
- (6.22) – expectations-augmented Phillips curve.

## Option2: Friedman (1968) and Phelps (1968) (Continued)

$$(6.22) \quad \pi_t = \pi_t^* + \lambda(\ln Y_t - \ln \bar{Y}_t) + \epsilon_t^S, \quad \lambda > 0$$

$$(6.24) \quad \pi_t = \pi_t^e + \lambda(\ln Y_t - \ln \bar{Y}_t) + \epsilon_t^S,$$

$$(6.25) \quad \pi_t = \phi\pi_t^e + (1 - \phi)\pi_{t-1} + \lambda(\ln Y_t - \ln \bar{Y}_t) + \epsilon_t^S, \quad 0 \leq \phi \leq 1.$$

- (6.22) explains Figure 6.7 better. However, given a government adopting ever-increasing inflations, what happens?
- The ever-increasing inflation will affect  $\pi_t^e$  in (6.24)! Meaning?
- (6.25) is a **hybrid** Phillips curve, reflecting the inertia in inflation.
- Long run - short run debates.

# AS-AD diagram

$$(6.26) \quad r_t = r(\ln Y_t - \ln \bar{Y}_t, \pi_t), \quad r_1(\cdot) > 0, r_2(\cdot) > 0.$$

$$(11.45) \quad r_t^{target} = \bar{r} + \phi_\pi(\pi_t - \pi^*) + \phi_y(\ln Y_t - \ln \bar{Y}_t).$$

- (6.26) is the MP curve, it replaces the previous LM curve.
- (11.45) is the famous Taylor's interest-rate rule (Taylor (1993)) with  $\phi_\pi = 1.5$  and  $\phi_y = 0.5$ .
- The revised phillips curve, (6.22) gives us the AS curve, IS-MP diagram gives us the AD curve.

# Self-fulfilling Equilibria

$$(6.31) \quad y_t = \phi E_t[y_{t+1}] + \phi \mu_t^{IS}$$

$$(6.35) \quad y_t = \frac{\theta}{\theta + b - \theta \rho_{IS}} \mu_t^{IS}$$

$$(bubble\ solution) \quad y_t = \frac{\theta}{\theta + b - \theta \rho_{IS}} \mu_t^{IS} + \frac{X}{\phi^t}, \quad \forall X \in \mathbf{R} \quad (1)$$

- In the system depicted in (6.27) – (6.30), if (6.35) is a solution to (6.31), why isn't the bubble solution (2)?
- Infinitely many equilibria!
- Recalling the asset-pricing model you've learned in Finance courses, where  $y$  here stands for asset price,  $\mu$  is next period's dividend?
- Economic intuition. Fundamental, self-fulfilling, sunspot, and correlated equilibria.

# Self-fulfilling Equilibria (Continued)

$$(6.31) \quad y_t = \phi E_t[y_{t+1}] + \phi \mu_t^{IS}$$

$$(6.35) \quad y_t = \frac{\theta}{\theta + b - \theta \rho_{IS}} \mu_t^{IS}$$

$$(bubble\ solution) \quad y_t = \frac{\theta}{\theta + b - \theta \rho_{IS}} \mu_t^{IS} + \frac{X}{\phi^t}, \quad \forall X \in \mathbf{R} \quad (2)$$

- Economic intuition. Fundamental, self-fulfilling, sunspot, and correlated equilibria.
- World is so complicated that **multiplicity problems** almost always happen, Economists behaves, using their theories, as **Equilibrium-Selection devices!** (Different schools may find different equilibria in favor.)
- [http://v.youku.com/v\\_show/id\\_XMjcOMTgwMTgw.html?from=s1.8-1-1.2](http://v.youku.com/v_show/id_XMjcOMTgwMTgw.html?from=s1.8-1-1.2).



To be continued ...

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