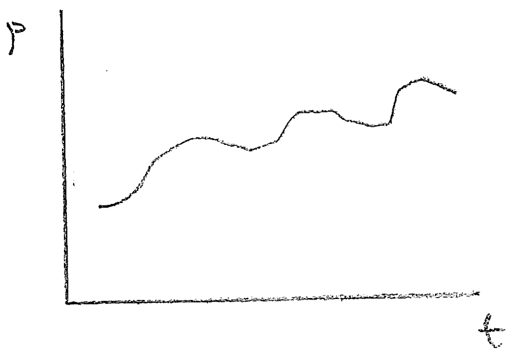
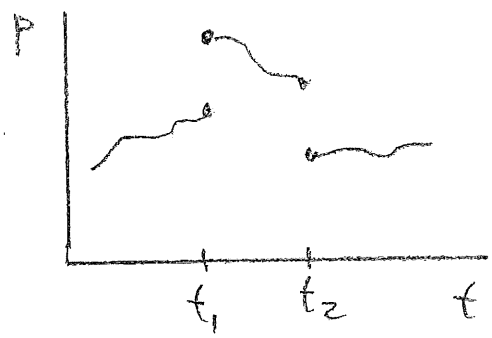
MONEY

How must P behave in a RBC type model?

In model where all markets always clear, P must sometimes "jump," big discontinuous change from one period to the next, so that at that moment $\pi = \infty$



Continuous change in P, so $\partial P/\partial t$ finite



Discontinuous changes in P, so $\partial P/\partial t = \infty$ at t_1, t_2

Keynesians believe this can't happen: mechanisms on "aggregate supply" side of economy make $\partial P/\partial t$ finite, price level is "sticky."

This gives Keynesian models, theory of business cycles

MONEY

How must P behave... (cont.)

Examples (Romer 12.1)

$\bar{Y}$ values from RBC type model. "Natural rates."
$\bar{r}$

$i \approx r + \pi^e$ ← (expected π

$\frac{M^D}{P} = L(\overset{-}{i}, \overset{+}{Y})$ like from money-in-utility function

minus sign

given M^s,

$\frac{M^s}{P} = L(\bar{i}, Y) = L(\bar{r} + \pi^e, \bar{Y})$

We'll take paths for $\bar{Y}$, $\bar{r}$, M^s as given, see what P has to do. Note: π^e must match what is happening to P, unless something happens unexpectedly, as a surprise.

For extra simplicity, sometimes assume:

$\frac{M^D}{P} = Ye^{-bi}$ "semilog form"

means $m^d - p = y - bi$

$\partial(m^d - p)/\partial y = 1 = \frac{\partial(M^D/P)/(M/P)}{\partial Y/Y} = 1$ ("income elasticity of money demand"

[Note this means, if i fixed, rate of growth of $(m^D - p)$ equals rate of growth of y

Money

How must P behave? (cont'd)

Price adjustments given path for M

$\bar{Y}, \bar{r}$ fixed, $M = M_0 e^{mt}$ (M grows at rate m)

Path for P that solves the system:

P grows at rate m

$\pi^e = m$

$\bar{i} = \bar{r} + m$

$$\overline{\left(\frac{M}{P}\right)} = L(\bar{r}+m, \bar{Y})$$

P_0 price level at time zero determined by:

$$\frac{M_0}{P_0} = L(\bar{r}+m, \bar{Y}) \Rightarrow P_0 = \frac{M_0}{L(\bar{r}+m, \bar{Y})}$$

$\bar{Y}, \bar{r}$ fixed, M grows at rate m, M "jumps" down at time t unexpectedly

Path for P:

P grows at rate m before & after jump

$\pi^e = m$

$$\overline{\left(\frac{M}{P}\right)} = L(\bar{r}+m, \bar{Y})$$

P jumps down at time t to keep $\left(\frac{M}{P_t}\right) = \overline{\left(\frac{M}{P}\right)}$

Money

How must P...?

Price adjustments given path for M (cont.)

$\bar{Y}, \bar{r}$ fixed, M grows at rate m,
at time t m falls unexpectedly from m_0 to m_1

Path for P:

Before time t,

P grows at rate m_0

$\pi^e = m_0$ ← we don't expect change in m

$\overline{\left(\frac{M}{P}\right)_0} = L(\bar{r} + m_0, \bar{Y})$

At time t,

$\pi^e = m_1$

$$\overline{\left(\frac{M}{P}\right)_1} = L(\underbrace{\bar{r} + m_1}_{\bar{i}_1}, \bar{Y}) > L(\underbrace{\bar{r} + m_0}_{\bar{i}_0}, \bar{Y}) = \overline{\left(\frac{M}{P}\right)_0}$$

$\frac{M}{P}$ needs to jump up! But at time t, M hasn't increased,

so P must ~~jump~~ down

$$\frac{M}{P_t} \Big/ \frac{M}{P_{t-1}} = \frac{L(\bar{r}+m_1, \bar{Y})}{L(\bar{r}+m_0, \bar{Y})} > 1$$

$$\frac{P_t}{P_{t-1}} = \frac{L(\bar{r}+m_0, \bar{Y})}{L(\bar{r}+m_1, \bar{Y})} < 1$$

$\boxed{\text{Note P jumps down before new, lower money growth rate has any effect on M!}}$

Money

How must P [illegible]

M^s fixed, $\bar{r}$ fixed, $\bar{Y}$ grows at g, semilog money demand

recall this means $\dfrac{\partial(M/P)/(M/P)}{\partial Y/Y} = 1$ ← income elasticity of money demand

For $\left(\overline{\frac{M}{P}}\right) = L(\bar{r} + \pi^e, \bar{Y})$ & any fixed π^e,

$\left(\overline{\frac{M}{P}}\right)$ must grow at rate g

means $\bar{P}$ falls at rate g

With M fixed that means

hence $\pi^e = -g$

$\left(\frac{M}{\bar{P}}\right) = L(\bar{r} - g, \bar{Y})$

same, but g falls unexpectedly from g_0 to g_1 at time t

In old LRE, $\pi_0^e = -g_0$ $\quad \bar{i}_0 = \bar{r} - g_0$

In new LRE, $\pi_1^e = -g_1$ $\quad \bar{i}_1 = \bar{r} - g_1 > \bar{i}_0$ because $g_1 < g_0$

$\left(\frac{M}{P}\right)_t = L(\bar{r} - g_1, \bar{Y}_t) < \left(\frac{M}{P}\right)_{t-1} = L(\bar{r} - g_0, \bar{Y}_t)$

fixed M means

$\dfrac{M}{\bar{P}_t} < \dfrac{M}{\bar{P}_{t-1}} \qquad \bar{P}_t > \bar{P}_{t-1}$

P must jump up at time t