Price level target/Inflation target

$$c_t = \frac{\rho - r_t}{\theta} + E_t c_{t+1}$$

$$d_t = c_t + g_t = \frac{\rho - r_t}{\theta} + E_t c_{t+1} + g_t$$

$$P_i = \frac{\eta}{\eta - 1} MC$$

where $MC = \frac{W}{A}$. More generally

$$MC = \frac{W}{MPL}$$

$$\frac{W_t}{P_t}\frac{1}{C_t^\theta} = L_t^\sigma \Longrightarrow L_t = \left(\frac{W_t}{P_t}\frac{1}{C_t^\theta}\right)^{\frac{1}{\sigma}}$$

Start at Y_n and money supply increases. Long run? Short run? Assume prices fixed. What happens?

$$Y_i = \left(\frac{P_i}{P}\right)^{-\eta} \frac{Y}{N}$$

Each firm faces increase in demand. What will firm do? Can increase profits by producing more, so long as $P_i > MC$. Labour Demand increases.

To increase labour supply, wages must rise.

$$L_t = \left(\frac{W_t}{P_t}\frac{1}{C_t^{\theta}}\right)^{\frac{1}{\sigma}}$$

Given sticky prices, best thing it can do is still meet demand so long as $p > MC$ (as long as MC doesn't rise too much too much; i.e., to $p < MC$).

Now, turning to markups. Recall that target markup given implicitly by

$$P_i = \frac{\eta}{\eta - 1} W$$

$$P_i = \text{MARKUP } W$$

Firm really wants old markup $\frac{\eta}{\eta - 1}$. As MC rises, firm will ultimately change price to get old markup back.

Overall: Output is demand-determined. Classical Dichotomy breaks down.

Menu Costs (Nominal Rigidity)

But need *real rigidity*. What happens to real marginal costs?

1. IRS; externalities; (DRS in standard model).

2. Costs fall more generally; balance sheet effects. External finance premium: cost of capital lower.

3. Implicit Contracts: Wages play lots of other roles. Unions.

4. Immigration.

5. Desired markups change. Procyclical elasticities of demand.

6. Disutility of labour falls; social norm.

Advanced Model.

Always some price movement.

Sticky plans.

Marginal Costs and DRS.

$$P_i = \frac{\eta}{\eta - 1} MC$$

Derivation of New Keynesian Phillips Curve.

$$P_i = \frac{\eta}{\eta - 1} MC$$

$$\frac{P_i}{P} = \frac{\eta}{\eta - 1} \frac{MC}{P}$$

$$\frac{P_i}{P} = \frac{\eta}{\eta - 1} \frac{W}{P}$$

$$p_{it} = p_t + \log \frac{\eta}{\eta - 1} + \log \frac{W}{P}$$

Now, the optimal price in period 1 for firm i is:

$$p_{i1} = p_1 + \log \frac{\eta}{\eta - 1} + \log \left(\frac{W}{P} \right)_1$$

$$p^* = \frac{p_{i1} + E_1 p_{i2}}{2}$$

This way, we come as close as possible to maximizing profits each periods. Note, however, prices are now suboptimal each period.

Substituting:

$$p^* = \frac{1}{2}\left(p_1 + \log\frac{\eta}{1-\eta} + \log\left(\frac{W}{P}\right)_1\right.$$

$$\left. + E_1 p_2 + \log\frac{\eta}{1-\eta} + E_1 \log\left(\frac{W}{P}\right)_2\right)$$

In more advanced New Keynesian model.

Probability δ you adjust each period.

Firms discount the future (care more about today's profits).

$$p_{it}^* = p_t + \alpha(y_t - y_n)$$

$$\pi_t = \phi E_t \pi_{t+1} + \zeta(y_t - y_n)$$

Complete New Keynesian Model. First equation is New Keynesian IS Curve (NKIS), second is Taylor Rule, third is New Keynesian Phillips Curve (NKPC).

$$y_t = \frac{\rho - r_t}{\theta} + E_t c_{t+1} + g_t$$

$$r_t = r_n + \gamma(y_t - y_n) + \beta(\pi_t - \bar{\pi})$$

$$\pi_t = \phi E_t \pi_{t+1} + \zeta(y_t - y_n) + u_t$$

Shocks.

ζ depends on real and nominal rigidity.

$$y_t = \frac{\rho}{\theta} - \frac{1}{\theta}(i_t - E_t\pi_{t+1}) + E_t c_{t+1} + g_t$$

$$i_t = r_n + \pi_t + \gamma(y_t - y_n) + \beta(\pi_t - \bar{\pi})$$

$$\pi_t = \phi E_t\pi_{t+1} + \zeta(y_t - y_n) + u_t$$

Volcker Disinflation.

Large inflation in early 80's; $\pi \approx 12\% \gg \bar{\pi}$. According to Taylor rule, what should FED do? Raise interest rates (in reality, to about 20%). Then from NKIS curve, large decline in y_t. Then from NKPC, $y_t - y_n$ falls, so inflation falls. Volcker a hero today and takes credit for banishing inflation, though politically difficult at time.

Interest Rate smoothing.

Shocks.

Labour market: no unemployment, since labour market clears.

Lucas critique and Phillips curve/Effectiveness of monetary policy.

Weights in Taylor Rule determine how vigorous the central bank is in responding to deviations of inflation and output from target. These appear in impulse response function.

NK Phillips Curve is too forward looking. Inflation exhibits intertia (hybrid curve incorporates backward looking expectations).

Potential. Costless disinflation; if government announced 2 percent, then today 2 percent. Need credible commitment and rational expectations. Sargent argues this is reasonable for, say, new institutions reducing hyperinflation (fiscal reforms, making the commitment to reducing money growth credible).

Liquidity trap: can lead to a deflationary spiral, as real rate grows.