$$i_{nl} = \underbrace{\frac{\sum_{z=1}^{z=n} E(r_z + \pi_z)}{n}}_{ET} + \underbrace{\rho_n}_{MST}$$

Portfolio Balance channel (stocks matter, not flows).

QE relies on segmented markets.

But these are big markets (40 Bn sterling intervention made little difference).

QE and Fed balance sheet.

Inflation.

Effects.

Announcement effect.

Raises asset prices (balance sheet effects).

Yields: rise or fall?

Bill Gross view.

One mechanism is that QE can add credibility to a policymakers promise to keep interest rates low.

Exchange Rate.

Risk taking.

Credibility/Forward guidance.

Joseph Gagnon

"We showed that Fed purchases of long-term agency and government bonds in 2008 and 2009 lowered a range of long-term interest rates. Woodford asserts instead that most or perhaps all of the declines in bond yields might have been caused by the markets interpretation of the Feds statements and actions as indicating that the path of future short-term interest rates would be lower than previously expected."

Bernanke

"To support continued progress toward maximum employment and price stability, the Committee expects that a highly accommodative stance of monetary policy will remain appropriate for a considerable time after the economic recovery strengthens."

Issues in Monetary Policy

- Gains to inflation (real wages/nominal rates/debt deflation).
- Risk premia and business cycle.
- Communication/monetary rules/forward guidance.
- Deflation ($r = i - \pi$).
- Lags (preemptive policy).
- Money multiplier/Koo (high levels of real debt lower aggregate demand; willing borrowers? Slope of AD).

- Target asset prices; e.g., $\frac{P}{D}$ ratio.

- Lucas critique.

- Dynamic inconsistency (history dependent policy; see quote above).

- Price level target/ Nominal gdp.

- Credit rationing/Moral hazard/Adverse selection.

New Keynesian Model. This is related to basic ISLM model, but everything is derived from microfoundations. Rationalized money nonneutrality (recall money market condition). Motivated by empirical evidence on money.

1. All Micro-Founded. Start with utility function and profit function.

2. Consumer optimization. Labour Supply decision.

3. Firm optimization gives labour demand. No capital for simplicity.

4. Market Clearing.

5. Demand-Determined Output (up to a point anyway).

6. Pricing decisions and sticky prices. Menu costs make price inertia optimal. Real Rigidity. Nominal Rigidity.

7. To have pricing decisions, we need price setters. Monopolistic competition. Since $p > MC$ they have leeway to increase production.

8. If prices flexible, money is still neutral.

9. Policy Rule. Monetary authority sets rates. Money supply endogenous. Money supply just accommodates Taylor rule.

10. Need to get back to long-run level of output/potential. Firms want initial markups back. The Phillips curve will do this.

- New Keynesian IS Curve.

- The Taylor Rule, which determines the interest rate (comes from minimization of banks loss function, subject to Phillips curve).

- The Phillips curve, which comes from firm's profit maximization problem.

N monopolistically competitive firms. N very large so firm takes aggregates Y and P as given. Key is all firms face downwardly sloping demand curves. (Not price takers, though take wage as given; wage depends on labour market conditions and is flexible).

For starters, think of economy at potential. Drop time subscripts.

The firms faces demand

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

So in a boom Y_i will rise, since Y is higher.

By choosing P_i firm implicitly chooses Y_i too.

Note that demand depends on *relative price*. This is what the firm will keep in mind. Even if firm has higher price, there is still demand.

Love of variety. η depends on substitutability between goods (and will determine markup).

Its production function is

$$f(L) = L$$

where L is number of workers hired by firm. $MPL = 1$: (Could also be $f(L) = AL$).

Thus if firm wants to produces Y_i units, it needs to hire Y_i workers.

Firms revenue is $P_i \left(\frac{P_i}{P}\right)^{-\eta} \frac{Y}{N}$. Its costs are $WL_i = WY_i$. Therefore, *if it sets a price of* P_i its profits are

$$P_i Y_i - WL_i$$

$$P_i Y_i - WY_i$$

where Y_i is given above. Only choice variable is P_i. Wage is exogenous to firm (will depend on national labour market). Nominal wages are flexible.

The answer will be

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

$(MR = MC)$ where

$$MC = W$$

But more generally

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

Hence to maximize profits firm sets

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

Firms target markup is $\frac{\eta}{\eta-1}$. *No matter what happens, the firm will always aim for this markup. This is a key point to consider especially when we deviate from equilibrium level.* Firms ideal relative price – what it really cares about – is then

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

This is firms *ideal* relative price if it were free to adjust. So if wages rose, $\frac{P_i}{P}$ would rise proportionally. It cares about relative price since that's what determines demand and real profits.

Substituting price into demand function gives firms demand: $Yi = \left(\frac{\frac{\eta}{\eta-1} W}{P} \right)^{-\eta} \frac{Y}{N}$

Household: Income/Substitution

$$E_0 \sum_{t=0}^{t=\infty} \beta^t \left(\frac{C_t^{1-\theta}}{1-\theta} - \frac{L_t^{1+\sigma}}{1+\sigma} \right)$$

$$W_t L_t + (1+i) B_{t-1} + \Pi_t = P_t C_t + B_t + T$$

$$\frac{W_t}{P_t} u'(C_t) = v'(L_t) \Longrightarrow \frac{W_t}{P_t} \frac{1}{C_t^{\theta}} = L_t^{\sigma}$$

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

$$\lim_{t \longrightarrow \infty} \beta^t u'(C_t) B_t = 0$$

B_0 given.

$$\underbrace{\frac{1}{P_t}u'(C_t)}_{pain} = \underbrace{\beta\frac{1+i}{P_{t+1}}u'(C_{t+1})}_{gain}$$

$$u'(C_t) = \beta(1+r_t)u'(C_{t+1})$$

Noting that $u'(C) = \frac{1}{C_t^\theta}$

$$C_t^{-\theta} = \beta(1+r_t)C_{t+1}^{-\theta}$$

where $\beta \equiv \frac{1}{1+\rho}$. Taking logs gives

$$-\theta \log C_t = \log \beta + \log (1+r_t) - \theta \log (C_{t+1})$$

Letting $c_t = \log C_t$

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