Lecture 1

The New Keynesian Model of Monetary Policy

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The New Keynesian model of monetary policy is becoming increasingly standard in the analysis of monetary policy. This particular treatment follows Carl Walsh (2003), “Monetary Theory and Policy”, chapter 5.

Another good reference is by Richard Clarida, Jordi Galí, *and* Mark Gertler, “The Science of Monetary Policy: A New Keynesian Perspective”, *Journal of Economic Literature Vol. XXXVII* (*December 1999*), *pp. 1661–1707*

Key Features:

- Households consume a basket of goods and supply labour to imperfectly competitive firms.
- Firms only change prices after a random interval of time (i.e. prices are sticky).
- Since prices are sticky monetary policy can have real effects in the short-run.

Problems we need to analyse:

- Households' Problems: (1)allocation of spending across goods, and (2)allocation of spending across time.
- Firms Pricing/Production decision.

Households:

The utility function of the representative household is given by,

$$E_t \sum_{i=0}^{\infty} \beta^i \left[\frac{C_{t+i}^{1-\sigma}}{1-\sigma} + \frac{\gamma}{1-b} \left(\frac{M_{t+i}}{P_{t+i}} \right)^{1-b} - \chi \frac{N_{t+i}^{1+\eta}}{1+\eta} \right] \qquad (1)$$

Where C_{t+i} is a basket of goods, M/P are real money balances and N is labour supply.

The consumption basket is defined in the following CES form,

$$C_t = \left[\int_0^1 c_{jt}^{\frac{\theta-1}{\theta}} dj \right]^{\frac{\theta}{\theta-1}} \qquad (2)$$

where θ is the elasticity of demand for the individual goods and $\theta > 1$.

Problem 1 - The optimal allocation of a given consumption expenditure across the individual goods in the consumption basket.

This initial problem amounts to minimizing the cost of buying C_t,

$$\min_{c_{jt}} \int_0^1 p_{jt} c_{jt} dj \tag{3}$$

subject to,

$$C_t = \left[\int_0^1 c_{jt}^{\frac{\theta-1}{\theta}} dj \right]^{\frac{\theta}{\theta-1}} \tag{4}$$

Form the Lagrangian,

$$L_t = \int_0^1 p_{jt} c_{jt} dj + \psi_t \left(C_t - \left[\int_0^1 c_{jt}^{\frac{\theta-1}{\theta}} dj \right]^{\frac{\theta}{\theta-1}} \right) \tag{5}$$

The first order condition with respect to good j is,

$$\frac{\partial L_t}{\partial c_{jt}} = p_{jt} - \psi_t \left(\left[\int_0^1 c_{jt}^{\frac{\theta-1}{\theta}} dj \right]^{\frac{1}{\theta-1}} c_{jt}^{-\frac{1}{\theta}} \right) = 0 \tag{6}$$

Using the definition of the consumption basket,

$$p_{jt} - \psi_t C_t^{\theta} c_{jt}^{-\frac{1}{\theta}} = 0 \tag{7}$$

Rearranging,

$$c_{jt} = \left(\frac{p_{jt}}{\psi_t} \right)^{-\theta} C_t \tag{8}$$

From the definition of the composite level of consumption this implies,

$$C_t = \left[\int_0^1 \left[\left(\frac{p_{jt}}{\psi_t} \right)^{-\theta} C_t \right]^{\frac{\theta-1}{\theta}} dj \right]^{\frac{\theta}{\theta-1}} = \left(\frac{1}{\psi_t} \right)^{-\theta} \left[\int_0^1 p_{jt}^{1-\theta} dj \right]^{\frac{\theta}{\theta-1}} C_t \quad (9)$$

Solving for the lagrange multiplier,

$$\psi_t = \left[\int_0^1 p_{jt}^{1-\theta} dj \right]^{\frac{1}{1-\theta}} \equiv P_t \quad (10)$$

The lagrange multiplier can be considered to be the price index appropriate for the consumption bundle.

Substituting this back into the first order condition, (8) yields,

$$c_{jt} = \left(\frac{p_{jt}}{P_t} \right)^{-\theta} C_t \quad (11)$$

As $\theta \to \infty$ we move towards perfect competition and firms enjoy less market power. This equation is effectively the demand curve facing the firm j for its product.

Problem 2 - The Household's Intertemporal Problem:

Before maximizing utility we need to consider the households budget constraint. This is given, in nominal terms by,

$$P_t C_t + M_t + B_t = W_t N_t + M_{t-1} + (1+R_{t-1})B_{t-1} + \Pi_t \quad (12)$$

Where Π_t are the profits from the imperfectly competitive firms redistributed to households.

Dividing by the price level P, we can rewrite this in real terms as,

$$C_t + \frac{M_t}{P_t} + \frac{B_t}{P_t} = \frac{W_t}{P_t} N_t + \frac{M_{t-1}}{P_t} + (1+R_{t-1})\frac{B_{t-1}}{P_t} + \frac{\Pi_t}{P_t} \quad (13)$$

Therefore, forming the Lagrangian for the problem,

$$E_t \sum_{i=0}^{\infty} \left(\begin{array}{l} \beta^i \left[\dfrac{C_{t+i}^{1-\sigma}}{1-\sigma} + \dfrac{\gamma}{1-b}\left(\dfrac{M_{t+i}}{P_{t+i}}\right)^{1-b} - \chi \dfrac{N_{t+i}^{1+\eta}}{1+\eta} \right] \\ +\lambda_{t+i}\left(C_{t+i} + \dfrac{M_{t+i}}{P_{t+i}} + \dfrac{B_{t+i}}{P_{t+i}} - \dfrac{W_{t+i}}{P_{t+i}} N_{t+i} - \dfrac{M_{t+i-1}}{P_{t+i}} - (1+R_{t+i-1})\dfrac{B_{t+i-1}}{P_{t+i}} - \dfrac{\Pi_{t+i}}{P_{t+i}} \right) \end{array} \right)$$

(14)

The first order conditions for consumption are given by,

$$\beta^{i}\left(C_{t+i}\right)^{-\sigma}+\lambda_{t+i}=0 \tag{15}$$

Money,

$$\gamma\beta\left(\frac{M_{t+i}}{P_{t+1}}\right)^{-b}+\lambda_{t+i}-\lambda_{t+i+1}\frac{P_{t+i}}{P_{t+i+1}}=0 \tag{16}$$

Labour Supply,

$$-\beta^{i}\chi N_{t+i}^{\eta}-\lambda_{t+i}\frac{W_{t+i}}{P_{t+i}}=0 \tag{17}$$

Bonds,

$$\lambda_{t+i}-\lambda_{t+i+1}(1+R_{t+i})\frac{P_{t+i}}{P_{t+i+1}}=0 \tag{18}$$

Using the equation of motion for the Lagrange multiplier we can obtain the Euler equation for consumption,

$$C_{t}^{-\sigma}=\beta(1+R_{t})E_{t}\left(\frac{P_{t}}{P_{t+1}}\right)C_{t+1}^{-\sigma} \tag{19}$$

Money,

$$\gamma\left(\frac{M_{t}}{P_{t}}\right)^{-b}=C_{t}^{-\sigma}\frac{R_{t}}{1+R_{t}} \tag{20}$$

Labour Supply,

$$\chi N_{t}^{\eta}=C_{t}^{-\sigma}\frac{W_{t}}{P_{t}} \tag{21}$$

Firms:

Firms are profit maximisers, but they face three constraints. Firstly they must work with a given production technology given by,

$$c_{jt} = Z_t N_{jt} \tag{22}$$

which is linear in labour input (there is no capital) and an aggregate productivity disturbance Z. The expected value of Z is 1.

Secondly, the face the downward sloping demand curve given by,

$$c_{jt} = \left(\frac{p_{jt}}{P_t} \right)^{-\theta} C_t \tag{23}$$

Finally, we are going to adopt nominal inertia in the form of Calvo (1983) contracts. In any period $(1-\omega)$ of firms are randomly chosen to be able to change their price. Therefore in setting prices, firms must take account of future economic conditions since the price they set today may still be in place tomorrow.

Since labour is the only input in the productive process the real marginal cost of production is given by,

$$MC_t = \frac{W_t / P_t}{Z_t} \tag{24}$$

The firm’s pricing problem then becomes,

$$E_t \sum_{i=0}^{\infty} \omega^i \Delta_{i,t+i} \left[\left(\frac{p_{jt}}{P_{t+i}} \right)^{1-\theta} - MC_{t+i} \left(\frac{p_{jt}}{P_{t+i}} \right)^{-\theta} \right] C_{t+i} \tag{25}$$

This problem is the same for all firms able to change their prices in period t.

The first order condition for the optimal price, p* is given by,

$$E_t \sum_{i=0}^{\infty} \omega^i \Delta_{i,t+i} \left[(1-\theta) \left(\frac{p_t^*}{P_{t+i}} \right)^{-\theta} - \theta MC_{t+i} \right] \left(\frac{1}{p_t^*} \right) \left(\frac{p_t^*}{P_{t+i}} \right)^{-\theta} C_{t+i} = 0$$

(26)

Flexible Price Equilibrium:

It is helpful to examine the equilibrium when prices are flexible.

When firms are able to adjust their prices every period then this reduces to, $\left(\frac{p_t^*}{P_t}\right)=\left(\frac{\theta}{\theta-1}\right)MC_t$ (27)

Where $\left(\frac{\theta}{\theta-1}\right)$ reflects the markup of prices over marginal costs due to the fact that firms enjoy market power.

Since, when prices are flexible, all firms will be setting the same price there are no relative price differences and using the definition of marginal cost this can be written as,

$$1=\left(\frac{\theta}{\theta-1}\right)\frac{W_t / P_t}{Z_t} \qquad (28)$$

Using the labour supply condition on the part of the household we obtain,

$$\frac{W_t}{P_t} = \frac{Z_t}{\theta/(\theta-1)} = \frac{\chi N_t^{\eta}}{C_t^{-\sigma}} \tag{29}$$

We now need to consider how to log-linearise. Take natural logarithms of both sides of equation (29) to obtain,

$$\ln \frac{Z_t}{\theta/(\theta-1)} = \ln \frac{\chi N_t^{\eta}}{C_t^{-\sigma}} \tag{30}$$

Taking the total derivative and evaluating at the steady-state yields,

$$\frac{1}{\overline{Z}} dZ_t = \frac{1}{\overline{N}} \eta dN_t + \frac{1}{\overline{C}} \sigma dC_t \tag{31}$$

Defining $\hat{x}_t = \frac{dx_t}{\overline{x}}$ as being the percentage deviation of variable x from its steady-state value allows us to write this condition as,

$$\hat{Z}_t^f = \eta \hat{N}_t^f + \sigma \hat{C}_t^f \tag{32}$$

where the f superscript denotes the fact that we are currently considering the flex price equilibrium. This is the loglinearised version of (29).

Doing the same to the production function yields,

$$\hat{y}_t^f = \hat{N}_t^f + \hat{Z}_t^f \tag{33}$$

Which since there is no government spending in the current model (so that $\hat{y}_t^f = \hat{c}_t^f$) we can combine these to yield,

$$\hat{y}_t^f = \left(\frac{1+\eta}{\sigma+\eta}\right)\hat{Z}_t^f \tag{34}$$

This describes the variations in output that emerge due to productivity shocks when prices are flexible.

Since this reflects optimal private sector responses to productivity shocks, there is no need for policy to attempt to offset these output fluctuations.

Now we return to consider the sticky price case.

The price index evolves according to,

$$P_t^{1-\theta} = (1-\omega)\left(p_t^*\right)^{1-\theta} + \omega P_{t-1}^{1-\theta} \qquad (35)$$

Inflation is then determined by this definition and the expression for the optimal price,

$$\left(\frac{p_t^*}{P_t}\right) = \left(\frac{\theta}{\theta-1}\right) \frac{E_t \sum_{i=0}^{\infty} \omega^i \Delta_{i,t+i} MC_{t+i} \left(\frac{P_{t+i}}{P_t}\right)^{\theta}}{E_t \sum_{i=0}^{\infty} \omega^i \Delta_{i,t+i} \left(\frac{P_{t+i}}{P_t}\right)^{\theta-1}} \qquad (36)$$

Log-linearising the first equation yields,

$$\hat{P}_t = (1-\omega)\hat{p}_t^* + \omega \hat{P}_{t-1} \qquad (37)$$

Log-linearsing the second gives,

$$\hat{p}_t^* = E_t\left[\sum_{i=0}^{\infty} \omega^i \beta^i \left(\hat{M}C_{t+i} + \hat{P}_{t+i}\right)\right] \qquad (38)]$$

This can be quasi-differenced to yield a forward-looking difference equation in the optimal reset price,

$$\hat{p}_t^* = \omega\beta E_t \hat{p}_{t+1}^* + \hat{M}C_t + \hat{P}_t \qquad (39)$$

Combining the two equations gives,

$$\frac{\hat{P}_t}{1-\omega}-\frac{\omega}{1-\omega}\hat{P}_{t-1}=\omega\beta E_t\left(\frac{\hat{P}_{t+1}}{1-\omega_t}\right)-\omega\beta\frac{\omega}{1-\omega}\hat{P}_t+\hat{M}C_t+\hat{P}_t$$

(40)

Solving for inflation yields,

$$\pi_t=\beta E_t\pi_{t+1}+\tilde{\kappa}\hat{M}C_t \qquad (41)$$

where

$$\tilde{\kappa}=\frac{(1-\omega)(1-\omega\beta)}{\omega}$$

This is the New Keynesian Phillips curve embedded in a General Equilibrium model.

However, it is helpful to manipulate this futher.

Recall that marginal cost is given by,

$$MC_t = \frac{W_t / P_t}{Z_t} \tag{42}$$

Log-linearising yields,

$$\hat{MC}_t = \hat{W}_t - \hat{P}_t - \hat{Z}_t \tag{43}$$

Using the labour supply condition(30) gives,

$$\begin{aligned} \hat{MC}_t &= \hat{W}_t - \hat{P}_t - (\hat{y}_t - \hat{N}_t) \\ &= (\sigma + \eta)\left[\hat{y}_t - \left(\frac{1+\eta}{\sigma+\eta}\hat{Z}_t\right)\right] \end{aligned} \tag{44}$$

But from the definition of the flex price output, this can be further rewritten as,

$$\hat{MC}_t = (\sigma + \eta)(\hat{y}_t - \hat{y}_t^f) \tag{45}$$

Therefore, the NKPC can be re-written as,

$$\pi_t = \beta E_t \pi_{t+1} + \kappa(\hat{y}_t - \hat{y}_t^f) \tag{46}$$

where $\kappa = (\sigma + \eta)\tilde{\kappa} = (\sigma + \eta)\dfrac{(1-\omega)(1-\omega\beta)}{\omega}$

and the forcing variable is the ‘output gap’. This measures the extent to which actual output is different from the level that would occur under flexible prices.

The General Equilibrium:

Output is governed by the Euler equation in consumption,

$$\hat{y}_t = E_t \hat{y}_{t+1} - \frac{1}{\sigma}(\hat{R}_t - E_t \pi_{t+1}) \tag{47}$$

Which can also be rewritten in terms of the output gap,

$$x_t = E_t x_{t+1} - \frac{1}{\sigma}(\hat{R}_t - E_{t+1} \pi_{t+1}) + u_t \tag{48}$$

where $u_t = E_t \hat{y}^f_{t+1} - \hat{y}^f_t$ which only depends upon exogenous productivity disturbances, and $x_t = \hat{y}_t - \hat{y}^f_t$.

The New Keynesian Model for Monetary Policy Analysis:

Therefore the dynamic model consists of a description of AD,

$$x_t = E_t x_{t+1} - \frac{1}{\sigma}(\hat{R}_t - E_{t+1}\pi_{t+1}) + u_t \tag{49}$$

And AS,

$$\pi_t = \beta E_t \pi_{t+1} + \kappa x_t \tag{50}$$

and is completed by a description of monetary policy (which de scribes the setting of nominal interest rates, $\widehat{R}_t$ either directly or indirectly through control of monetary aggregates).

Lecture 2 - Policy Analysis in the New Keynesian Model:

The Monetary Policy Transmission Mechanism

In this subsection we simulate our basic New Keynesian model in order to understand the basic monetary policy transmission mechanism. With monetary policy following a simple rule,

$$\hat{R}_t = \delta \pi_t + v_t \tag{51}$$

and the policy shock following an autoregressive process

$$v_t = 0.5 v_{t-1} + \varepsilon_t$$

We adopt the parameters in Walsh Chapter 5. $\beta = 0.99$, $\sigma = \eta = 1$, $\delta = 1.5$ and $\omega = 0.8$.

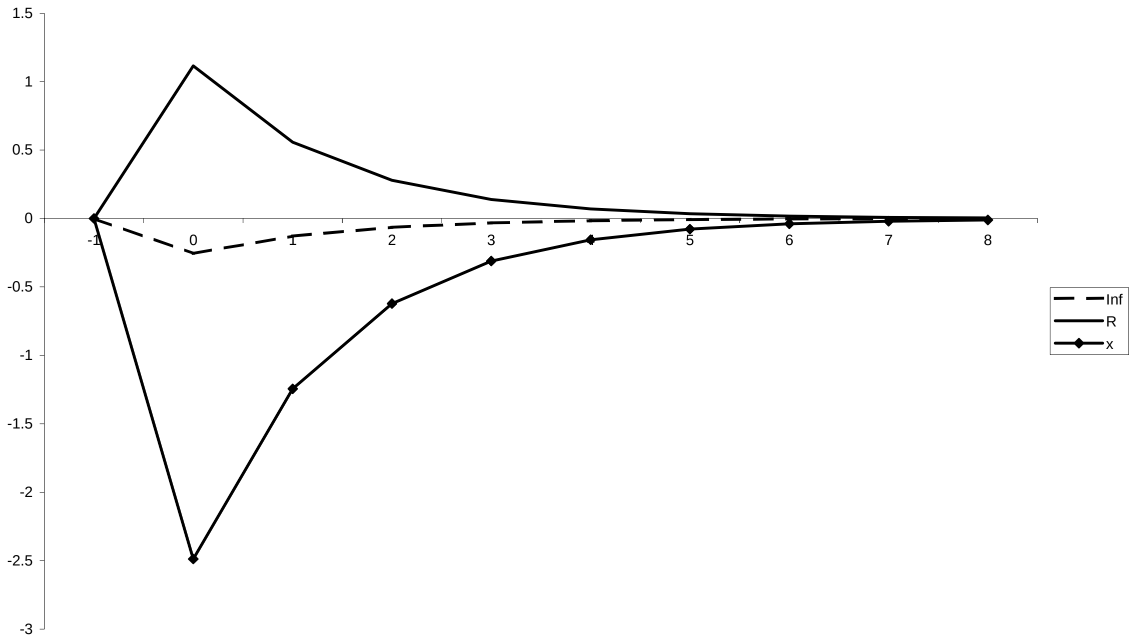


Fig1 – Autoregressive Shock

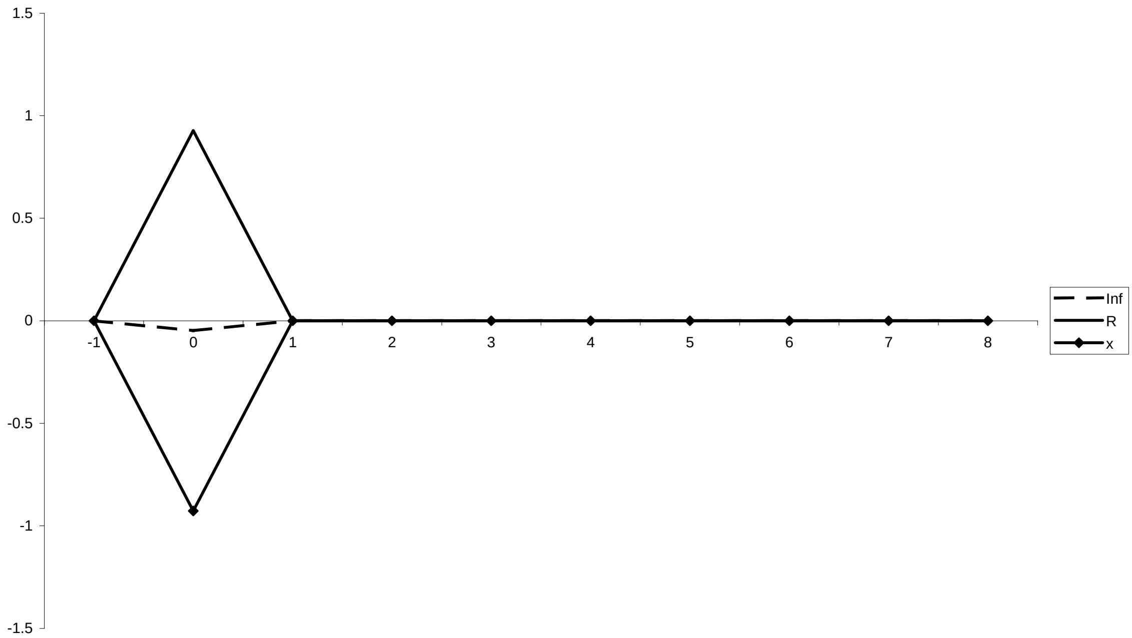
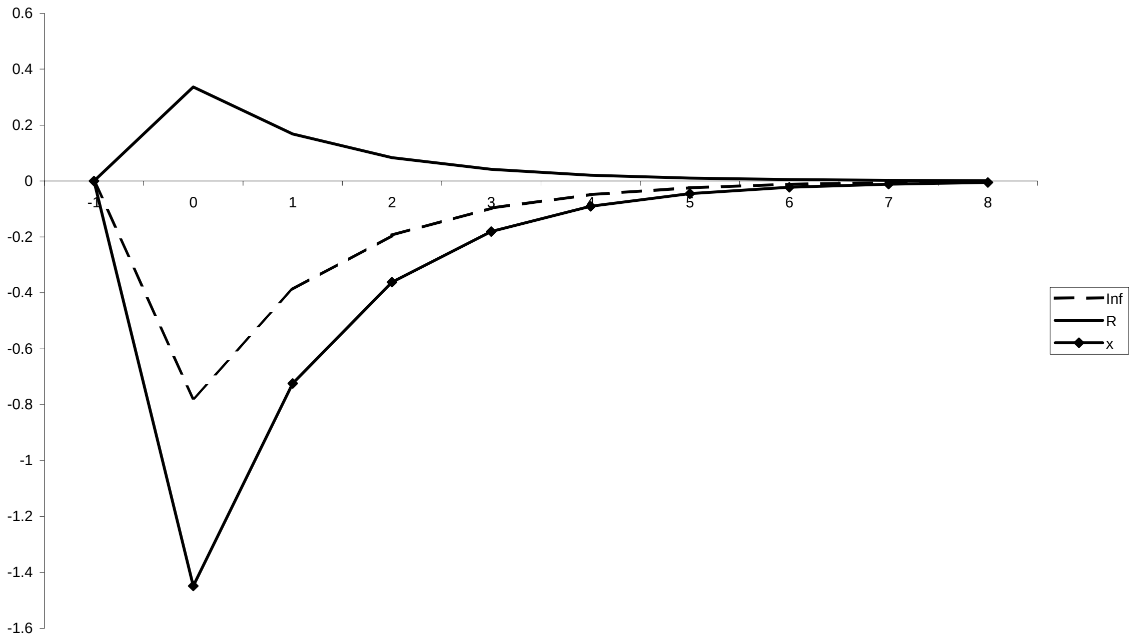


Fig 2 – iid With no autoregressive aspect to the policy shock the movements in variables are instantaneous.



With relatively less nominal inertia, $\omega = 0.6$.

Now output response is less, but inflation response is greater.

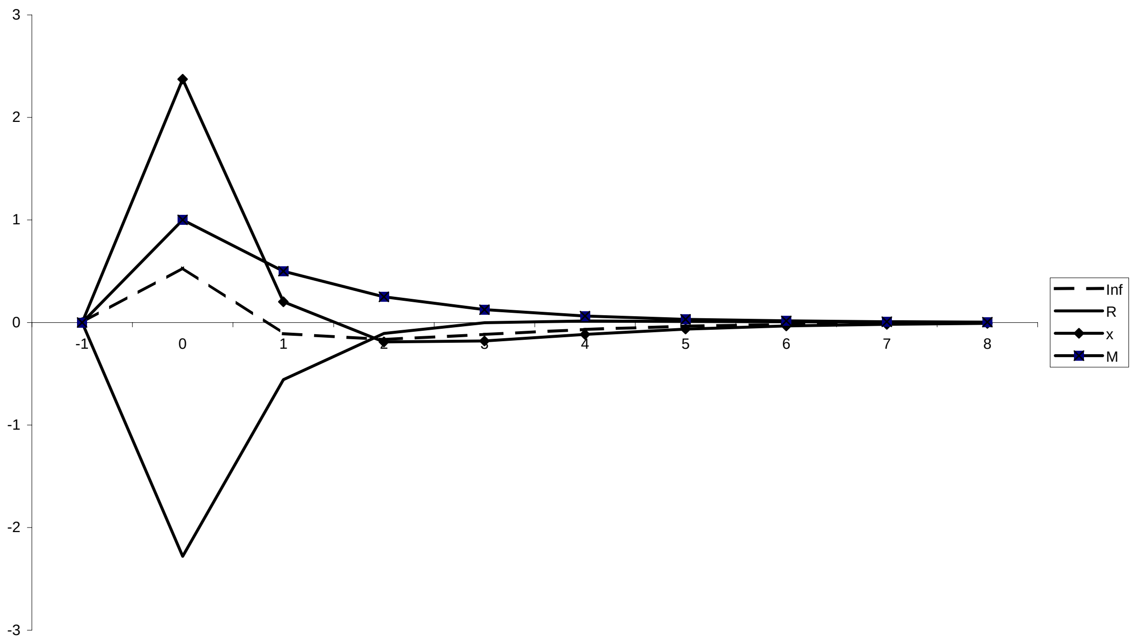
Consider monetary policy conducted using monetary aggregates

$$\hat{M}_t = 0.5\hat{M}_{t-1} + \varepsilon_t \tag{52}$$

Interest rates are then determined by the loglinearsed money demand equation,

$$b(\hat{M}_t - \hat{P}_t) = \sigma \hat{y}_t - \frac{1}{1+\bar{R}}\hat{R}_t \tag{53}$$

The impulse responses to a shock to the money stock are given below (assuming b=10 from Walsh page 58),



Policy Objectives:

Walsh considers the welfare of our representative household can be written as,

$$V_t = U(Y_t, Z_t) - \int_0^1 v(y_t(i), Z_t)di \qquad (54)$$

where the first term represents the instantaneous utility from consuming the consumption basket (given the level of the productivity shock) and the second term captures the disutility of supplying the various goods in the economy (i.e. the disutility of labour effort is proportional to output).

Walsh then follows Woodford (2003) to approximate the representative household's utility by the following quadratic loss function,

$$E_t \sum_{i=0}^{\infty} \beta^i V_{t+i} \approx -\Omega E_t \sum_{i=0}^{\infty} \beta^i \left[\pi_{t+i}^2 + \lambda (x_{t+i} - x^*)^2 \right] \quad (55)$$

where

$$\Omega = \frac{1}{2} \bar{Y} U_c \left[\frac{\omega}{(1-\omega)(1-\omega\beta)} \right] \left(\theta^{-1} + \eta \right) \theta^2 \quad (56)$$

and

$$\lambda = \left[\frac{(1-\omega)(1-\omega\beta)}{\omega} \right] \frac{\sigma + \eta}{(1+\eta\theta)\theta} \quad (57)$$

We will not formally derive this (see Woodford(2003) or Walsh(2003)) but it is useful to obtain some intuition for this specification.

Recall that x_t is the gap between output and the output level that would emerge under flexible prices, and x* is the gap between the steady-state efficient level of output and the actual steady-state level of output.

Although this looks like a standard quadratic loss function there are two crucial differences.

1.The output gap is measured relative to equilibrium under flexible prices rather than the simple steady-state output/trend output level of output.

In other words the flex price equilibrium incorporates the optimal consumption/leisure and labour supply responses to productivity shocks.

2.The reason for including inflation is now clear.
Sticky prices lead to a dispersion of prices and therefore output across firms.

This has two costs for economic agents:
(1)Because of diminishing marginal utility price dispersion has a direct utility cost (the utility gained from consuming more of the cheaper goods is less than the utility lost from consuming less of the expensive goods).

(2)Additionally, the cost of producing more of the cheap goods is also typically more than the reduced costs of producing less of the expensive goods (due to diminishing marginal product in production, or diminishing marginal utility of leisure if consumers/workers are attached to specific firms).

Many authors assume that x*=0 and achieve this by adopting some kind of fiscal subsidy to ensure that steady-state output is at its efficient level and the distortion due to imperfect competition has been eliminated.

In this case the central bank's loss function becomes,

$$E_t \sum_{i=0}^{\infty} \beta^i \left[\pi_{t+i}^2 + \lambda (x_{t+i})^2 \right] \tag{58}$$

In this case we have no inflationary bias, but we do have a stabilization bias which we illustrate below.

Optimal Policy Under Commitment

Firstly we consider optimal policy under commitment.

The bank has to minimize this loss function subject to the structural model of the economy,

Therefore the dynamic model consists of a description of AD,

$$x_t = E_t x_{t+1} - \frac{1}{\sigma}(\hat{R}_t - E_{t+1}\pi_{t+1}) + u_t \qquad (59)$$

And AS,

$$\pi_t = \beta E_t \pi_{t+1} + \kappa x_t \qquad (60)$$

Form the Lagrangian,

$$E_t \sum_{i=0}^{\infty} \beta^i \{ \left[\pi_{t+i}^2 + \lambda (x_{t+i})^2 \right] + \theta_{t+i} \left[x_{t+i} - x_{t+i+1} + \frac{1}{\sigma}(\hat{R}_{t+i} - \pi_{t+i+1}) - u_{t+i} \right]$$
$$+ \psi_{t+i} \left[\pi_{t+i} - \beta \pi_{t+i+1} - \kappa x_{t+i} - e_{t+i} \right] \}$$
(61)

The first order condition in respect of the interest rate is given by

$$\frac{1}{\sigma}E_t\theta_{t+i} = 0 \tag{62}$$

In other words, $E_t\theta_{t+i} = 0$ for i>=0 i.e. the lagrange multiplier for the Euler equation is zero since it does not impose any real constraint on monetary policy.

This implies that the policy could have been set up as if the central bank controlled the output gap rather than the interest rate (see for example Clarida et al, 1999).

Using this condition, the remaining first-order conditions are, for inflation at time t,

$$\pi_t + \psi_t = 0 \tag{63}$$

and for the inflation in subsequent periods,

$$E_t(\pi_{t+i} + \psi_{t+i} - \psi_{t+i-1}) = 0 \tag{64}$$

and the output gap,

$$E_t(\lambda x_{t+i} - \kappa\psi_{t+i}) = 0 \tag{65}$$

The potential time-inconsistency of policy is clear, since in period t the central bank would set inflation equal to $\pi_t = -\psi_t$ and promise to set $\pi_{t+1} = -(\psi_{t+1} - \psi_t)$. However when period t+1 arrives the bank would wish to set $\pi_{t+1} = -\psi_{t+1}$.

Timelessly Optimal Policy

Woodford suggests an alternative 'timeless perspective' where the central bank implements (64) and (65) even in the initial period- the bank behaves as if the policy had always been in place. Doing this, combining the two conditions yields,

$$\pi_{t+i} = -\left(\frac{\lambda}{\kappa}\right)\left(x_{t+i} - x_{t+i-1}\right) \tag{66}$$

Summing over the infinite horizon yields,

$$\sum_{i=0}^{\infty} \pi_{t+i} = -\left(\frac{\lambda}{\kappa}\right)\sum_{i=0}^{\infty} \left(x_{t+i} - x_{t+i-1}\right) \tag{67}$$

which implies,

$$p_{\infty} - p_{-1} = -\left(\frac{\lambda}{\kappa}\right)\left(x_{\infty} - x_{-1}\right) \tag{68}$$

In other words, since the output gap must eventually be eliminated, $x_{\infty} = 0$, and we can assume the initial value of the output gap before a shock hit was also zero, $x_{-1} = 0$, then this means that commitment policy will ensure,

$$p_{\infty} = p_{-1} \tag{69}$$

i.e. commitment policy will return the price level to its initial value following inflationary shocks.

Policy Under Discretion:

When the central bank operates under discretion it takes inflation expectations as given (since it cannot influence them as it can under commitment). Therefore it has an essentially static problem to minimize,

$$\pi_t^2 + \lambda x_t^2 \tag{70}$$

subject to,

$$\pi_t = \beta E_t \pi_{t+1} + \kappa x_t + e_t \tag{71}$$

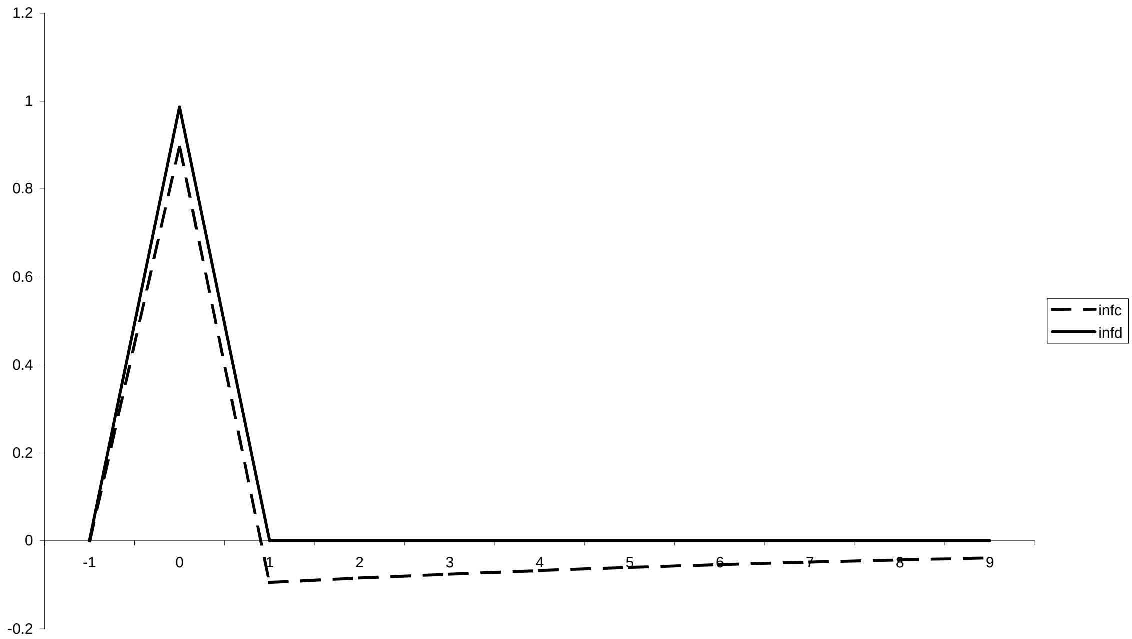
which gives,

$$\kappa \pi_t + \lambda x_t = 0 \tag{72}$$

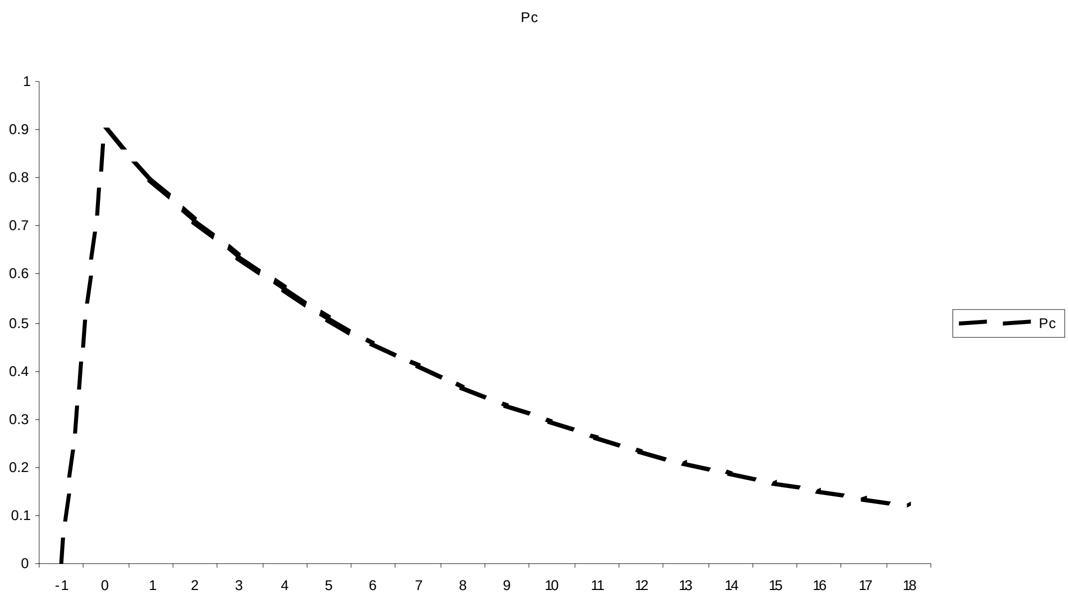
Note that this condition is the same as the initial condition at time t under commitment (ie. In the first period of commitment the central bank cannot affect initial expectations and so implements the discretionary solution).

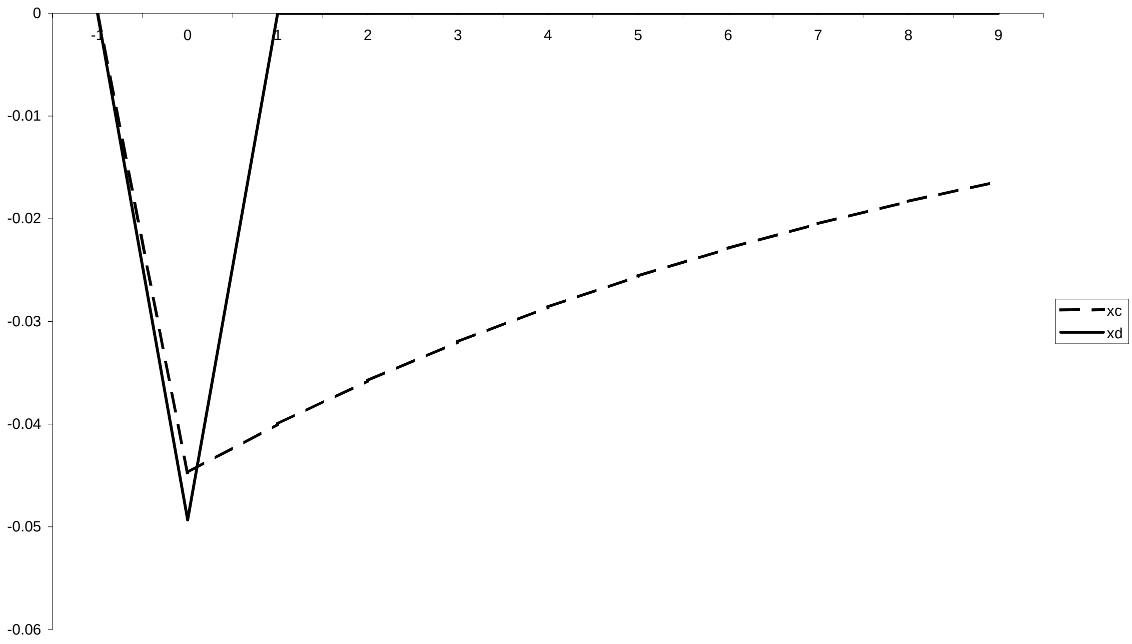
There is no promise on the part of the monetary authorities to return the price level to its initial value under discretionary policy.

Inflation response under precommitment less.



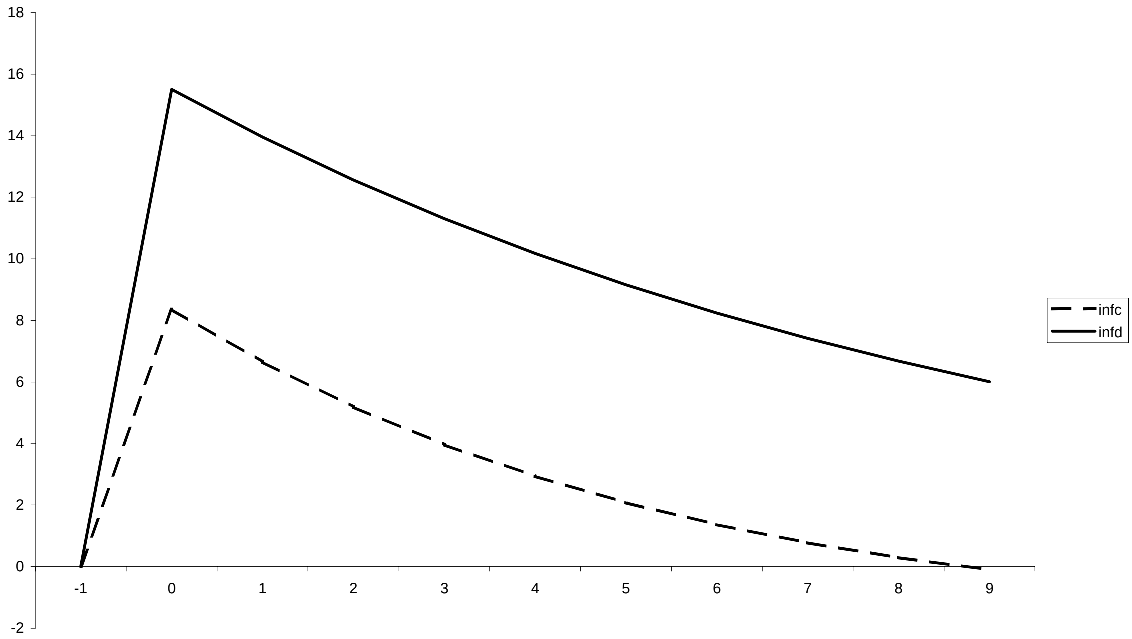
The Price Level under commitment –



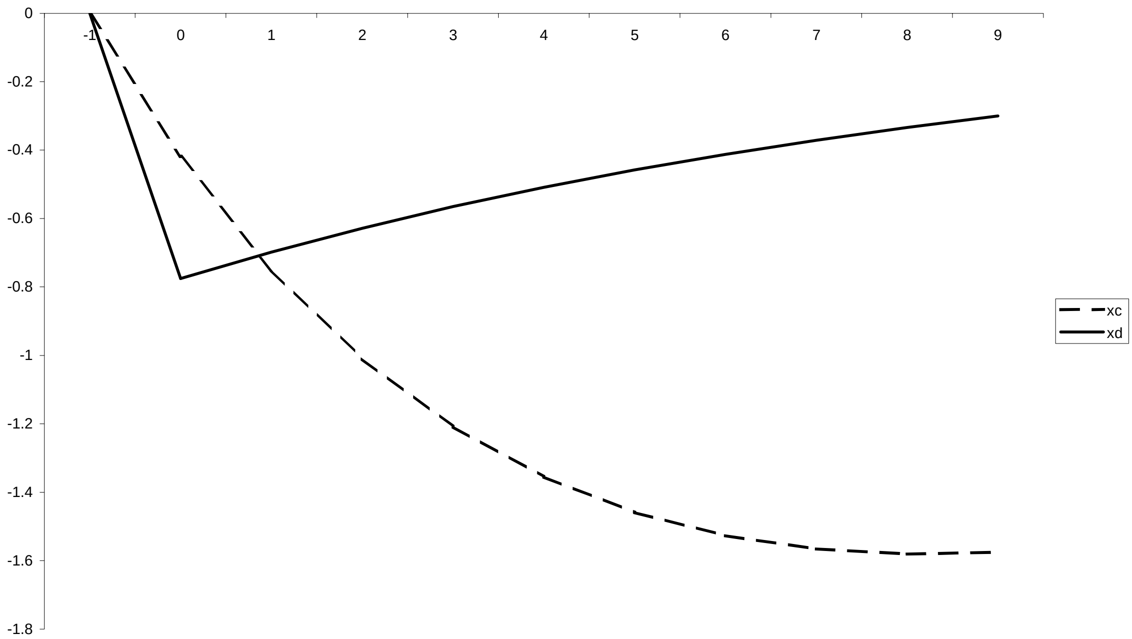


Output fall less under commitment, but more sustained.

Inflation paths with correlated shock with coefficient of 0.9



Again, output cost of stabilizing economy initially less under commitment, but more prolonged.



There is a clear welfare improvement under commitment given nature of loss function ($\lambda = 1$ for simplicity).

Price Level vs Inflation Targetting

We saw that the precommitment policy involved stabilizing the price level. Vestin shows that this solution can also be achieved by assigning a price level targeting objective to the central bank of the form, $p_t^2 + \lambda_{pl} x_t^2$. However, the benefits of price level targeting are not robust to allowing for a backward-looking element in the inflation adjustment equation see Walsh chpt 11.

<u>Instrument Rules</u>

An alternative approach to specifying optimal policy is to directly specify a rule for the policy instrument itself. The most famous of these is due to Taylor (1993),

$$R_t = \bar{r} + \pi^T + a_x x_t + a_\pi (\pi_t - \pi^T) \qquad (73)$$

However, inertia in policy instruments gets us closer to the commitment solution.

Conclusions

- The New Keynesian Model gives a micro-founded genereal equilibrium model with sufficient nominal frictions to make monetary policy interesting.
- Its microfoundations also allow the construction of a welfare function for policy analysis which is consistent with maximising the utility of the representative consumer/worker.
- Commitment policy typically tries to make policy history dependent and in this case adopts a policy of price level targeting despite the fact that this is not an explicit objective.
- The desire to make policy history dependent may also explain the observed inertia in interest rates.