What is the New Keynesian Phillips curve?

The New Keynesian Phillips curve takes the form $\pi_t = \beta E[\pi_{t+1}] + \gamma \tilde{y}_t$
It emerges from three micro-foundation ingredients:

i) general price level and inflation determination from staggered 'sticky' price setting [Calvo] according to weighted dependence on a) expected inflation and b) marginal cost;
ii) real marginal cost taken to be a function $\gamma \tilde{y}_t$ of the output gap; and
iii) firms forming rational expectations.

The first component, of staggered price-setting, can be envisaged as *either* imperfectly competitive or monopolistically-competitive pricing, *or* as real-time price adjustment to equilibrium in the absence of a Walrasian auctioneer.

The second component, of real marginal cost as a function of the output gap, comes in because firms keep setting their prices at a fixed mark-up on marginal cost: if the ratio of marginal cost to price rises there is inflationary pressure because the firms resetting their prices are on average raising them.

This idea is not easy to test because data on real marginal cost are not readily found. However, *if* real marginal costs can be taken to be pro-cyclical, we can assume a relation to the output gap $\gamma \tilde{y}_t$.

Properties of the New Keynesian Phillips curve

1. Inflation leads the output gap. [before output gap]
2. Inflation is wholly forward-looking and its past is irrelevant to output (a striking difference from path-dependence in NAIRU).
3. Inflation is the discounted present value of all future expected output gaps (an 'asset-market' determination of inflation). ~ asset pricing.
4. *** There is no trade-off between inflation and output-gap stabilization.
5. Disinflation is output-costless.
6. Inflation responds immediately to money shocks. (credible MP)

But the empirical evidence suggests instead: ◊ The output gap leads inflation (Fuhrer and Moore, 1995). ◊ Disinflation entails large output losses (Balls, 1994). ◊ Inflation stabilization in the face of supply shocks requires large output fluctuations. ◊ The response of inflation to monetary shocks is hump-backed (i.e., initially slow, then full, and ultimately tailing off). ◊ Inflation displays inertia and is not a jumping variable.

persistence, explain Germany disinflation 1924-25.

What is Calvo pricing?

At any one time a random proportion θ of firms know that they are going to be stuck for some time ahead with whatever price they set z_t. (This could be for Cournot-Bertrand reasons, or absence of a Walrasian auctioneer, or just inconvenience in price-changing.)

series of price adjustments

- imperfect comp. (Chamberlin)

Ideally at time $t+k$ the firm would set p^*_{t+k} as its price but instead it may be stuck continuing with z_t. The firm's desired price can be assumed to be $p^*_{t+k} = m_{c_{t+k}} + \mu$, where m_c is marginal cost and μ a fixed mark-up (in accordance with Coutts, Godley, and Nordhaus).

In setting z_t the firm minimizes the loss function $\sum_t^\infty (\beta\theta)^k E_t(z_t - p^*_{t+k})^2$ where the quadratic is an approximation for profits in each period, $\beta < 1$ is the discount factor, and θ^k represents the probability that the price will have to be fixed until $t+k$.

The first order conditions yield $\sum_t^\infty (\beta\theta)^k z_t = \sum_t^\infty (\beta\theta)^k E_t p^*_{t+k}$, which can be rewritten $\frac{z_t}{1-\beta\theta} = \sum_t^\infty (\beta\theta)^k E_t p^*_{t+k}$, and which we can then rewrite as

$$z_t = (1-\beta\theta)\sum_t^\infty (\beta\theta)^k E_t\left(m_{c_t} + \mu\right)$$

So that firms set their prices as weighted averages of the prices they would wish to set in the future if there were no price stickiness.

The expression for the reset price z_t can be seen to be the first-order stochastic difference equation $z_t = \beta\theta E_t z_{t+1} + (1-\beta\theta)\left(m_{c_t} + \mu\right)$

Getting to the New Keynesian Phillips curve

The aggregate price level thus takes the form $p_t = \theta p_{t-1} + (1-\theta)z_t$ which implies $z_t = \frac{1}{1-\theta}(p_t - \theta p_{t-1})$ or, following on from the previous result,

$$\frac{1}{1-\theta}(p_t - \theta p_{t-1}) = \frac{\beta\theta}{1-\theta}(E_t p_{t+1} - \theta p_t) + (1-\beta\theta)\left(m_{c_t} + \mu\right)$$

which can then (in a couple of steps) be rearranged in terms of inflation as

$$\pi_t = \beta E_t \pi_{t+1} + \frac{(1-\theta)(1-\beta\theta)}{\theta}\left(m_{c_t} + \mu - p_t\right)$$

which is the New Keynesian Phillips curve if it is assumed the expression $\left(m_{c_t} + \mu - p_t\right)$, which is the real marginal cost, can be written as $\lambda\tilde{y}_t$ where $\tilde{y}_t$ is the output gap.

Under this important last assumption, the NKPC can then be written, as

$$\pi_t = \beta E_t \pi_{t+1} + \gamma\tilde{y}_t$$

where $\gamma = \frac{\lambda(1-\theta)(1-\beta\theta)}{\theta}$

Given that firms are taken to have rational expectations, the NKPC iterates into $\pi_t = \gamma \sum_t^{\infty} \beta^k E_t \tilde{y}_{t+k}$, so that (as in an asset-pricing model) inflation becomes the discounted present value of future expected output gaps

The implication of this formulation is that gradualism is not necessary in stopping inflation without discomfort. Sudden stops work without deflationary tears, providing the monetary authority persuades the public that it can be trusted not to try excess levels of aggregate demand. [We thus arrive at a Barro and Gordon result under price-setting imperfect competition.]

gentle/ gradual disinflation policy.

forward

reasons; γ: accounts for price stickiness.

sensitive CBer