ECONOMIC POLICY IN THE UK

MACROECONOMIC POLICY

THE DEFINITION OF INFLATION TARGETING

Summary

Various possible definitions of an inflation targeting regime are outlined. A model is presented to illustrate the forward-looking nature of inflation targeting (inflation forecast targeting).

Reading

Bernanke, Ben (2004), "The logic of monetary policy" [also covers Taylor rules]
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Haldane, Andrew (1995), "Inflation Targets", *Bank of England Quarterly Bulletin*, (August) 250-9.
King, Mervyn (1996), "How should central banks reduce inflation? Conceptual issues", Bank of England Quarterly Bulletin, November, 434ff.
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http://www.princeton.edu/~svensson/papers/intermt.pdf

THE DEFINITION OF INFLATION TARGETING

The definition of inflation targeting is in part controversial. We discuss the definitions of Lars Svensson, the ECB, and Peter Bofinger, Ben Bernanke et al., and Mervyn King.

Svensson (2002, "Inflation targeting: should it be modeled as in instrument rule or a targeting rule?", European Economic Review, 46, 771-780)
defines inflation targeting in terms of 3 characteristics:

(1) Numerical inflation target – point (with/without 'tolerance interval', or range. Specific price index. Achievement of inflation target = primary goal or monetary policy (there may be secondary objectives too). No other nominal anchor.
(2) CB's inflation forecast has prominent role, instrument set so that this forecast (conditional on the instrument-setting) is consistent with the target. But output and output-gap forecasts can influence policy too.
(3) High degree of transparency and accountability. CB is accountable for achieving the inflation target and provides explicit and transparent monetary policy reports presenting forecasts and explaining policy.

An inflation target also involves an institutional commitment:
(1) Clear mandate for monetary policy to aim for low inflation.
(2) CB independence – at least in terms of instrument; CB could also define what low inflation means.
(3) CB accountability for achieving mandate.

The ECB defines inflation targeting as "a monetary policy strategy aimed at maintaining price stability by focusing on deviations in published inflation forecasts from an announced inflation target". (European Central Bank (2004, 2nd edn), *The Monetary Policy of the ECB*, ECB, p.113). They believe that in an inflation targeting regime, the inflation forecast is central to policy making and presentation: the CB "communicate[s] monetary policy decisions in terms of a more or less mechanical reaction to deviations in a forecast for a particular measure of inflation from a specific inflation target at a particular horizon" (p.56). The ECB believes that inflation targeting policy presentation would be relatively simple (p.68).

The ECB offers a critical analysis of inflation targeting (pp.56-57):
- "focusing entirely on a forecast inflation figure does not provide an encompassing and reliable framework for identifying the nature of threats to price stability", which is necessary as "the appropriate monetary policy response generally depends on the sources of these risks to price stability" – "as a minimum, it requires a deeper analysis of the underlying economic situation and behaviour than is captured in an inflation forecast alone"
- "various aspects of the textbook inflation targeting approach – such as the fixed horizon (e.g. two years) of the forecast from which monetary policy decisions feed back – are somewhat arbitrary"
- "it is difficult to integrate the information relevant for monetary policy contained in monetary aggregates into inflation forecasts that are based on conventional macroeconomic models"
- "relying on a single forecast would be unwise, given the considerable uncertainty relating to the structure of the euro area economy"

The ECB says it preferred to adopt "a diversified approach" drawing on "a variety of analytical methodologies" (p.57). We shall see more of this towards the end of this section of the EPUK module.

Bofinger (2001) distinguishes between the explicit and implicit rules of inflation targeting:

- explicit rule: keep the conditional inflation forecast for the target horizon of two years close to the target
- implicit rule: increase (decrease) interest rates if the conditional forecast exceeds (undershoots) the target

The explicit rule mirrors the mandate from the UK Chancellor to the Bank of England. The implicit rule is a (more explicit) feedback rule that tells the Bank how it should act. Again, the forecast is central.

Bofinger differs from the ECB in his assessment of the simplicity of this regime: "while this rule looks simple at first sight, … it is very different from a 'fast and frugal heuristic'" (p.257). He describes inflation targeting as like "a cookery book that, instead of providing concrete recipes, only contains pictures of the prepared dishes and the advice to buy the best ingredients and prepare them as skilfully as possible." (p.265). His grounds for believing that inflation targeting should not be characterised as a simple rule, but as a framework, are very similar to those of Bernanke et al.'s (1999).

Bernanke et al.'s (1999) definition of inflation targeting:
"Inflation targeting is a framework for monetary policy characterised by the public announcement of official quantitative targets (or target ranges) for the inflation rate over one or more time horizons, and by explicit acknowledgement that low, stable inflation is monetary policy's primary long-run goal. Among other important features of inflation targeting are vigorous efforts to communicate with the public about plans and objectives of monetary authorities, and in many cases, mechanisms that strengthen the central bank's accountability for attaining those objectives" (p.4)
Note that this definition does not mention forecasting. Bernanke et al. are vague as to the role of explicit inflation forecasting in an inflation targeting regime.
It is worth noting that the Bank of Canada and the Bank of Australia are widely regarded as (and regard themselves as) inflation targeters, although they have provided only non-technical forecasts that hardly differ from statements that can be found in ECB publications. But these two differ from the ECB (and the Bundesbank), who are classified by Bernanke et al. as " 'hybrid' inflation targeters and monetary targeters", largely because of the emphasis placed by the ECB on monetary targets.

Bernanke et al. believe that inflation targeting is best characterised as a framework, not as a rule. They believe the rules-discretion distinction to be too sharp to capture the reality of monetary policy-making in practice: "there is no such thing in practice as an absolute rule for monetary policy" (p.5). They believe that inflation targeting has provided a framework that is "clearly articulated" and "in which the general objectives and tactics of the policy-makers – although not their specific actions – are committed to in advance" (p.6). This they term 'constrained discretion'. "By imposing a conceptual structure and its inherent discipline on the central bank, but without eliminating all flexibility, inflation targeting combines some of the advantages traditionally ascribed to rules with those ascribed to discretion" (p.6).

Why do Bernanke et al. think inflation targeting embodies discretion, and should not be characterised as a simple rule? "At a technical level, inflation targeting does not provide simple, mechanical operating instructions to the central bank. Rather inflation targeting requires the central bank to use structural and judgmental models of the economy, in conjunction with whatever information it deems relevant, to pursue its price-stability objective. In other words, inflation targeting is very much a 'look at everything' strategy, albeit one with a focussed goal." (p.22). No specific set of variables nor specific model are prescribed by inflation targeting.

Mervyn King (2004), in a response to a speech/paper by Alan Greenspan (Fed Chairman) on monetary policy, made some comments that clarify how he (and the Bank) view inflation targeting.

In his 1997 paper, King had argued that *any* sensible regime could be written as an inflation target plus a response to supply shocks. In other words, monetary policy should aim to maintain the optimal inflation rate, and should decide how quickly to get back to target after shocks. This characterisation underlies many of the models we will see (e.g. Haldane-Salmon (1996) algebra – see *Alternatives* notes; and Svensson

(1997) model to some extent – see below). The 'constrained discretion' that characterises such a regime "allows a central bank to get (close) to the optimal state contingent rule" (King (2004), p.5).

King (2004) argues that this is consistent with Greenspan's view that the actual behaviour of CBs doesn't vary much, whether or not they have an explicit inflation target.

King (2004) defines the difference that an inflation target makes as follows. The target:

- embodies willingness to be explicit about the long-run inflation rate that constitutes price stability
- helps establish political legitimacy – necessary when the CB is independent
- helps transparency and accountability
- makes it easier to 'manage' inflation expectations.

King (2004) also defines what features must be common to CBs:

- lags in transmission mechanism necessitate forward-looking policy
- this means that policy requires a forecast. [This is clearly contentious. King tries to identify such a forecast with non-econometric approaches by arguing that "a forecast is about probabilities, not point estimates. The key to communicating policy is to explain the nature of the risks to the outlook for inflation and output" (p.6).]
- policy is pre-emptive and involves managing risks
- the policy reaction function will change over time

King (2005, section 3) also defines an inflation targeting framework as constituting

- a precise numerical target for inflation in the medium term
- a response to economic shocks in the short term.

Emphasising the importance of expectations, King (2005) remarks that "the inflation target provides a rule-like framework on which the private sector can anchor its expectations about future inflation" (p.13). Explaining the phrase 'constrained discretion', he argues that "the discretion in responding to shocks afforded by inflation targeting allows the central bank to adapt its strategy to new information … the great attraction of an inflation target is that it is a framework that does not have to be changed each time we learn about aspects of the economy such as the velocity of money or the underlying rate of productivity growth, as was the case in the past with frameworks based on targets for money aggregates or nominal GDP growth. It is a framework designed for a world of learning" (p.14).

King (2005) also emphasises the importance of transparency to inflation targeting: he terms inflation targeting a "framework for making and communicating decisions" (p.14), and notes three implications for communications:

- focuses attention on case for price stability (must be made all the time)
- forecast must be accompanied by explanation of MPC's thinking, as the MPC's underlying "model" [King's inverted commas] changes continuously
- no point in communicating time-invariant policy reaction function: it doesn't exist.

Alternative definitions of inflation targeting

Criterion	Svensson (1997,2002)	ECB (2001)	Bofinger (2001)	Bernanke et al. (1999)	King (2004)
Price stability is main target of monetary policy	Yes	Yes	Yes	Yes	Yes
Announcement of numerical target	Yes	Yes	Yes	Yes	Yes
Medium-term target	Yes	Yes	Yes	Unclear – could have more than one horizon	Yes
Intensive communication with public	Yes	Yes – simple	Yes – but difficult	Yes	Yes
Specific monetary policy rule	Inflation forecast targeting	Inflation forecast targeting	Explicit + implicit rules	Unclear	Inflation target + response to supply shocks
Published forecasts	Inflation and output	Inflation	Inflation and possibly output	Not required	Unclear
Goal dependence	Yes	Not required	Not desirable	Desirable	Not required
Instrument independence	Yes	Yes	Yes	Yes	Yes
Rule or discretion	Rule	Mechanical rule	Appears simple, but not. Comes close to pure discretion.	Constrained discretion.	Constrained discretion.

Source: Partly based on Bofinger (2001), p.259

A model of inflation targeting as inflation forecast targeting

Lars Svensson, *European Economic Review* 1997 argued that inflation targeting implies inflation forecast targeting. This has implications for the specification of an inflation target and how monetary policy should operate to achieve the target.

Final target = inflation
- has to be *future* inflation because of monetary policy lags

The CB's inflation forecast becomes an *intermediate target*
- an ideal intermediate target?

- inflation forecast = the current variable that is most correlated with the goal. By definition it minimises the variance of the forecast errors and uses all relevant information. But it is correct only to the extent that the CB's model is correct.
- if money growth / exchange rate targeting were optimal, these would automatically be implied by inflation targeting.
- Svensson: forecast = more controllable than the final goal. The instrument has the same effect on actual and forecast inflation. By definition the forecast is more controllable because its variance does not include the forecast errors.
- Svensson: forecast "can be made more [publicly] observable than the [final] goal" (p.3). Obviously you can observe the forecast now whereas you have to wait 2 years to observe the relevant actual inflation.
- forecast can be made transparent, can help expectations and credibility. The principles of inflation targeting – the operation of the target and the expected action of the CB once the forecast is known – are very simple, which aids monitoring. Svensson does however admit that "the construction of the forecast is difficult and resource-demanding" (p.15)

Svensson's (1997) model (simplified by removing an exogenous variable *x* which might affect inflation and output directly):

$$\pi_{t+1} = \pi_t + \alpha_1 y_t + \varepsilon_{t+1} \quad (1)$$

$$y_{t+1} = \beta_1 y_t + \beta_2 (i_t - \pi_t) + \eta_{t+1} \quad (2)$$

where π is inflation, *y* is an endogenous variable (output, relative to the natural output level which is normalised to zero), *i* is the monetary policy instrument, $\alpha_1 > 0; 0 \le \beta_1 < 1; \beta_2 < 0; \varepsilon, \eta$ are iid shocks.

(1): the rate of change of inflation is increasing in last year's output
(2): output is serially correlated and increasing in last year's real repo rate
The monetary policy instrument *i* affects output with a 1-year lag and inflation with a 2-year lag: the control lag in this model is 2 years.

CB wants to set the instrument $\{i_\tau\}_{\tau=t}^{\infty}$ to minimise the expected loss $E_t \sum_{\tau=t}^{\infty} \delta^{\tau-t} L(\pi_\tau)$, where $L(\pi_\tau) = \frac{1}{2}(\pi_\tau - \pi^*)^2$. CB wishes to minimise the expected sum of discounted squared future deviations of inflation from the target.

i_t affects $\pi_{t+2}, \pi_{t+3}, \ldots$; i_{t+1} affects $\pi_{t+3}, \pi_{t+4}, \ldots$; and so on. So we can find the solution to the CB's optimization problem by setting the instrument at *t* to hit the target in *t*+2, and the instrument next period to hit the target in *t*+3, etc. So the optimal instrument in period *t* is given

by $\min_i E_t\delta^2 L(\pi_{t+2})$, which clearly involves choosing i_t such that $E_t\pi_{t+2} = \pi^*$. This last expression is a rearranged f.o.c. for the optimization problem. The currently-expected (i.e. the current forecast for the) one-to-two year inflation rate should be set equal to the inflation target.

By substitution,

$$\pi_{t+2} = a_1\pi_t + a_2 y_t + a_3 i_t + (\varepsilon_{t+1} + \alpha_1\eta_{t+1} + \varepsilon_{t+2}) \quad (4)$$

where $a_1 = 1-\alpha_1\beta_2, a_2 = \alpha_1(1+\beta_1), a_3 = \alpha_1\beta_2$

And obviously $E_t\pi_{t+2} = a_1\pi_t + a_2 y_t + a_3 i_t$. (5)

Actual inflation will deviate from the target by the forecast error

$$\pi_{t+2} - \pi^*[= \pi_{t+2} - E_t\pi_{t+2}] = \varepsilon_{t+1} + \alpha_1\eta_{t+1} + \varepsilon_{t+2}; \quad (6)$$

these are disturbances that occur within the control lag, which the CB can do nothing about. At best the CB can control deviations of 2-year *forecast* (rather than actual) inflation from the target. Arguably, therefore, the CB should be held accountable for the deviations of *forecast* inflation from the target, rather than deviations of *actual (realised)* inflation from target. This requires that the CB's forecast be observable and verifiable.

Setting the inflation forecast (5) equal to the inflation target gives the CB's optimal reaction function

$$\begin{aligned} i_t &= \frac{1}{a_3}(\pi^* - a_1\pi_t - a_2 y_t) \\ &= \frac{1-a_1}{a_3}\pi_t - \frac{1}{a_3}(\pi_t - \pi^*) - \frac{a_2}{a_3}y_t \\ &= \frac{1-1-\alpha_1\beta_2}{\alpha_1\beta_2}\pi_t - \frac{1}{\alpha_1\beta_2}(\pi_t - \pi^*) - \frac{\alpha_1(1+\beta_1)}{\alpha_1\beta_2}y_t \\ &= \pi_t + b_1(\pi_t - \pi^*) + b_2 y_t \end{aligned} \quad (7)$$

where $b_1 = -\frac{1}{\alpha_1\beta_2}, b_2 = -\frac{1+\beta_1}{\beta_2}$.

Since we assumed $\alpha_1 > 0, 0 \le \beta_1 < 1$, and $\beta_2 < 0$, this implies $b_1 > 0$ and $b_2 > 0$.

Thus the interest rate should be set equal to the inflation rate, and should react positively to deviations of current inflation above target and positively to deviations of current output above the natural rate.

It is important that the instrument depends on the current inflation rate *not* because current inflation is targeted, but because current inflation and other variables in (6) influence (and hence forecast) future inflation.

If the CB follows this reaction function, the one-to-two year inflation forecast will equal the target, and realised inflation will deviate from the target as a result of the unpredictable shocks in (5).

What if the CB cares about growth too?

Specifically, say the CB wants to stabilise output around its natural rate as well as stabilising inflation around target. This will modify the period loss function as follows:

$$L(\pi_t, y_t) = \frac{1}{2}[(\pi_t - \pi^*)^2 + \lambda {y_t}^2]$$

where $\lambda > 0$ is the relative weight placed on output stabilisation.
Eliminating the exogenous variable for simplicity from the above gives the reduced model:

$$\pi_{t+1} = \pi_t + \alpha_1 y_t + \varepsilon_{t+1} \quad (1')$$

$$y_{t+1} = \beta_1 y_t + \beta_2 (i_t - \pi_t) + \eta_{t+1} \quad (2')$$

The f.o.c. for minimising the intertemporal loss function

$$E_t \sum_{\tau=t}^{\infty} \delta^{\tau-t} L(\pi_\tau, y_\tau)$$

can be written

$$E_t \pi_{t+2} - \pi^* = -\frac{\lambda}{\delta \alpha_1 k} E_t y_{t+1}$$

where $k \geq 1$ is given by $k = \frac{1}{2}(1 - \frac{\lambda(1-\delta)}{\delta \alpha_1^2} + \sqrt{(1 + \frac{\lambda(1-\delta)}{\delta \alpha_1^2})^2 + \frac{4\lambda}{\alpha_1^2}})$.

The 1-to-2 year inflation forecast should equal the target only if the 0-to-1 year output forecast equals the natural rate. Otherwise, inflation should be allowed to exceed the target in proportion to how much the output forecast falls short of the natural rate. The degree of proportionality $\frac{\lambda}{\delta \alpha_1 k}$ is increasing in the weight the CB places on output stabilisation λ and decreasing in the short-run inflation-output trade-off α_1.

The model has implications for the optimal speed of adjustment of (forecast) inflation to target. When there is a positive weight on output stabilisation, the CB should let inflation return gradually to the (long-run) target. Adjusting the forecast all the way immediately would require greater output fluctuations. Obviously, the less the CB desires output fluctuations, the slower should be the adjustment of inflation to target.

An implicit rule for interest-rate setting can be derived, in the same way as for the case where the CB didn't care about output:

$$i_t = \pi_t - \frac{\alpha_1 \delta k}{\beta_2 \lambda}(E_t(\pi_{t+2}) - \pi^*) - \frac{1 + \beta_1}{\beta_2} y_t$$

But now the CB has to respond to deviations of the *two-year-ahead forecast* from target (whereas if it places no weight on output it should respond to deviations of current inflation from target). As before, the coefficients are positive (since $\beta_2 < 0$), so expected inflation above target and a positive output gap both imply higher interest rates.

Summary

- There are unpredictable shocks hitting inflation after the last time at which the monetary policy instrument (the interest rate) can affect inflation. Monetary policy cannot counteract these shocks. Actual inflation will deviate from the target, even if monetary policy is set optimally, as a result of these shocks. It would be unfair to judge the central bank on actual inflation performance compared to the target to the extent that there are these shocks.
- Instead, we could judge the CB on how its *forecast* compares with the target. The forecast should be made over the period in which monetary policy can no longer counteract shocks to inflation. If the forecasting model is correct, the only things that will move actual inflation away from the forecast (and also from the target since, ideally, forecast=target) are the unpredictable shocks occuring during the forecast horizon.

When the CB cares about output as well as inflation, the rate at which inflation adjusts towards target should be proportional to the weight on output stabilisation in the CB's loss function.

- zero weight on output implies setting instrument so that inflation forecast for the control lag always = target
- greater positive weight on output implies slower adjustment of forecast towards target (more / longer deviations of forecast from target allowed)

Finally, it is worth quoting Svensson (2004, "Asset prices and ECB monetary policy", www.princeton.edu/~svensson/papers/EP404.pdf, pp1-2) at length on his definition of the principles and assessment of the practice of good monetary policy:

"So, the principles of good monetary policy are simple: perform *flexible inflation targeting*, which means aiming to stabilize inflation around an explicit low positive numerical inflation target with some weight also on stabilizing the real economy, which can be expressed more precisely as stabilizing the output gap, that is, stabilizing output around a measure of potential output. Because of the lags between monetary-policy actions and the effect on inflation and output, the best way to do this is to look forward and perform forecast targeting. This means setting the central bank's instrument rate (more precisely, to choose an instrument-rate *plan*, a path for the current and future instrument rate) such that the corresponding inflation and output gap forecasts "look good", which in turn means that the inflation and output gap forecasts approach the inflation target and zero, respectively, normally some 1-3 years ahead (but, more precisely, the whole future forecast paths should look good, not just the forecast at some fixed horizon).

"Although these principles are simple … the practice of constructing forecasts, deciding on the appropriate instrument rate (plan), and communicating these to the general public and the market is quite complicated and difficult."