8. Inflation Targeting*

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May 16, 2006

Abstract

Notes for the course "Monetary Economics: Macro Aspects," Spring 2006. The relevant literature behind these notes is:

Bernanke and Mishkin (1997); Svensson (1997).
Recommended reading (not required): Svensson (1999, 2000a,b).

1 Inflation targeting: General concepts and implications

- A growing number of countries have adopted **inflation targeting** in recent years
  - Beginning with New Zealand in 1990 (or 1988?)....
  - ...followed by, e.g., Canada (1991), United Kingdom (1992), Sweden (1993).....
  - ...succeeded by, e.g., Peru (1994), South Africa (2000), Norway (2001), Hungary (2001), etc., etc.
- Clearly a new and growing "trend" in design of monetary policy strategies across a wide variety of countries. So what is it, and what is it not?
- Early warning: only one (and not terrible surprising) **common aspect:**
  - The definition of some **numerical specification** of the inflation rate monetary policy should aim to achieve (who makes the definition is not unique; some places the specification is made by the government, some places by the central bank itself)
- The ways of defining operationally the inflation target regime differ widely across countries:
  - Some specify a **range** to be targeted (and this range may in priciple be infinite in the case where only a maximum value of tolerated inflation is specified[1])
  - Some specify a **point target** with a **tolerance band** (e.g., aim at $3\% \pm 1\%$)
  - The **numerical values** for ranges and point target are **different** across countries and may vary over time within countries
  - The **inflation concept** to target differs (should it be producer-price-inflation, consumer-price-inflation, or some special index excluding specific components?)
  - The **horizon** at which monetary policy should "hit" target differs
  - "**Escape clauses**" may or may not exist
- In the legal mandates for monetary policy, the inflation target is often referred to as the "overriding" objective. This can be seen as a reflection of the view that monetary policy cannot affect real quantities in the long run, and that inflation is mostly a monetary phenomenon in the long run. Hence, monetary policy should aim directly at low and stable inflation, which is then believed to be conducive for good overall economic performance. However, it is fair to say that real-life inflation

[1] As is the case of the ECB that specifies that inflation should not *exceed* 2 percent. Note, however, that the ECB is *not* considering itself an inflation targeting central bank.

targeting central banks are rarely viewed as "strict inflation targeters;" i.e., as banks having inflation as the one and only objective of policy. Indeed, the adoption of tolerance bands, ranges, various horizons, adds to the portrait of inflation targeting as a "flexible" monetary regime, where the short- to medium-run effects of monetary policy on real quantities are acknowledged

  - I.e., the terminology "overriding objective" should be seen as referring to the **long run**

- Many, but not all, inflation targeting central banks are held **accountable** for the success of monetary policy

  - If they "don't deliver," they must "pay" or at least "explain"
  - Most famous "accountability example" is the one in New Zealand: The Governor can by law be **fired** in case of (policy) misconduct (credibility of such measures?)

- Note that targeting inflation is equivalent of going directly to the welfare relevant issue of (long run) monetary policy

  - Helps pin down inflation expectations (if credibility of the regime is established)

- The role of explicit intermediate targets are therefore downplayd in inflation targeting regimes. Nevertheless, variables good at forecasting inflation are, of course, used by central banks

  - This means that the **inflation forecast** becomes an intermediate target. If inflation is forecasted to exceed the target value (or move out of range), it is an indication that monetary policy should be tightened

- Many, but not all, inflation targeting central banks are characterized by high degree of openness about policy. I.e., high degree of **transparency** in policymaking. This typically takes the form of publications of **Inflation Reports** meticulously describing the deliberations leading to policy decisions

  - Clearly, such measures are helpful in enforcing accountability
  - Also, they (partly) make up for the democratic loss often associated with inflation targeting:
    - Monetary policy is put in the hands of bureaucrats; non-elected officials
    - So, even if the government decides on the "rules of the game" the central bank has instrument independence

  - It helps enlightening the public's understanding about what determines the course of policy

- As indicated, most (if not all) inflation targeters, are "flexible," i.e., put some weight on short-run fluctuation in economic activity
- Therefore, it is **not** — as emphasized by Bernanke and Mishkin — **a rule**
  - ...when a rule is understood as a rigid set of instructions and objectives
  - Like a "k% money growth rule" that Milton Friedman advocated long time ago
  - ....or some interest rate rule to be followed mechanically
- Instead, it should be viewed as a suitable *framework* for monetary policymaking; i.e.,
  - One that makes clear what the main objectives of monetary policy are
  - One that through openness and information sharing explains how they are attained (and which objectives monetary policy cannot achieve)
  - One that secures that missing the objectives will carry a cost for the practitioners (accountability)
  - One that explains when certain events may call for certain deviations from previous plans
  - ....i.e., it is a framework that appropriately "constrains discretion"
- Controversies:
  - What is the appropriate rate of inflation? 0%? 2%? 20%
  - Which inflation rate is appropriate to stabilize?
  - Is inflation at all controllable?
  - Cannot "misses" always be blamed on outside events?
- Is this in any case the one and only and best regime for monetary policy?
  - Time will show......(and of course, you can be a "bad" inflation targeter)
  - One undisputable positive thing about inflation targeting is how its emergence has put increased focus and debate on monetary policymaking
  - But note that a central bank, which according to most practitioners and academics has performed extremely well is the US Fed under Alan Greenspan. A bank *not* pursuing inflation targeting!

1.1 Concluding remarks

- Inflation targeting is wide-spread new policy framework for monetary policymaking
- Has helped to increase awareness about monetary policy issues
- Does not imply ignorance of the real economy in the short-to-medium run

2 Example of dynamic modeling of inflation targeting: The role of inflation forecasts

2.1 Introductory remarks

- A huge potential problem of inflation targeting is that inflation is only controllable with a "long and variable" lag. hence, what constitutes target misses? Are they due to "misconduct," or shocks outside the bank's control? This clearly poses a problem for monitoring and the associated accountability, which ultimately creates credibility problems
- In general, such a problem is obviously small — by reverse argumentation —if the target variable (here inflation) is closely controllable and readily verifiable. But small or big, is it an insurmountable problem?
- "No," according to Svensson (1997), who argues:
  - Inflation targeting implies **inflation forecast targeting**
  - The inflation forecast is then the **intermediate targeting variable**
  - It can become publicly known immediately, and thus form immediate basis for evaluation of policy performance
  - Accountability and credibility are restored
- When output fluctuations are of concern, one sees that the horizon for which inflation is expected to reach target increases. The definition of horizon length becomes proxy for the output weight in central bank's loss function
- The remainder reviews the central features of Svensson's (1997) model of inflation targeting that formalizes these ideas

2.2 The model

- Simple AS/AD model with control lags (to capture the idea that economic variables, realistically, cannot be affected instantaneously):

- Monetary policy (interest rate setting) affects demand with a one-period lag (say a year)
- Demand affects inflation with a one-period lag (say a year)
- This implies a two-year control lag from policy to inflation
- Captures realism and lack of controllability:
  * Inflation today is result of various shocks having hit the economy over the past years *and* monetary policy two years back
  * Inflation today says *nothing* about the quality of current monetary policy
  * *No basis* of using current inflation as a measure of the success of the inflation targeting regime

- What then?
  - The relevant measure of the "success" of current policy is whether inflation is **expected** to hit the target **at the control lag horizon**
  - (...assuming for the moment that inflation is all that matters for policy...)

- The model (excluding the exogenous variable x_t) is given by a Phillips curve and an IS curve (both are simple backward-looking types):

$$\pi_{t+2} = \pi_{t+1} + \alpha_1 y_{t+1} + \epsilon_{t+2}, \qquad \alpha_1 > 0 \tag{2.1'}$$

$$y_{t+1} = \beta_1 y_t - \beta_2 (i_t - \pi_t) + \eta_{t+1}, \qquad 0 < \beta_1 < 1, \qquad \beta_2 > 0 \tag{2.2'}$$

  To make some preliminary points, the simple case where inflation is all that matters is considered. Hence, the exclusive aim of monetary policy: Attain the inflation target π^*. This is modelled as minimization of

$$\mathrm{E}_t \sum_{\tau=t}^{\infty} \delta^{\tau-1} L(\pi_\tau), \qquad 0 < \delta < 1, \tag{2.4}$$

  where the per-period loss function is simply

$$L(\pi_\tau) \equiv \frac{1}{2} (\pi_\tau - \pi^*)^2$$

  This is what is usually referred to as "strict inflation targeting" (not realistic; cf. above, but makes things simple for the moment)

- The solution for inflation as a function of i_t:

$$\begin{aligned}
\pi_{t+2} &= [\pi_t + \alpha_1 y_t + \epsilon_{t+1}] + \alpha_1 y_{t+1} + \epsilon_{t+2} \\
&= [\pi_t + \alpha_1 y_t + \epsilon_{t+1}] + \alpha_1 [\beta_1 y_t - \beta_2 (i_t - \pi_t) + \eta_{t+1}] + \epsilon_{t+2} \\
&= a_1 \pi_t + a_2 y_t - a_4 i_t + (\epsilon_{t+2} + \epsilon_{t+1} + \alpha_1 \eta_{t+1})
\end{aligned} \tag{2.6'}$$

The solution to the policy problem is to choose sequence of interest rates that minimizes the intertemporal loss function. This can be viewed as a series of one-period problems:

– i_t affects π_{t+2} and inflation onwards; i_{t+1} affects π_{t+3} and onwards; etc.

– i_t should then make $\pi_{t+2} = \pi^*$ in expectation; i_{t+1} should then make $\pi_{t+3} = \pi^*$ in expectation; etc.

Indeed, solving

$$\min_{i_t} \mathrm{E}_t \delta^2 L(\pi_{t+2})$$

subject to (2.6'). The first-order condition:

$$\frac{\partial \mathrm{E}_t \delta^2 L(\pi_{t+2})}{\partial i_t} = -\mathrm{E}_t \delta^2 a_4 (\pi_{t+2} - \pi^*) = 0,$$

leads to the simple solution:

$$\mathrm{E}_t \pi_{t+2} = \pi^*,$$

or in alternative notation:

$$\pi_{t+2|t} = \pi^*. \tag{2.9}$$

The interest rate is set such that the period t two-period ahead inflation forecast equals the inflation target

- A policy problem that yields the same result is

$$\min_{i_t} \delta^2 L^i \left(\pi_{t+2|t}\right)$$
$$L^i \equiv \frac{1}{2}\left(\pi_{t+2|t} - \pi^*\right)^2$$

Hence, inflation targeting is in this model equivalent of *inflation forecast targeting.* This is intermediate targeting, with the inflation forecast being the intermediate target

- Implied instrument setting:

$$i_t = \pi_t + b_1 (\pi_t - \pi^*) + b_2 y_t \tag{2.13'}$$

Same form as a Taylor rule. Note: The variables in the instrument rule are not those being targeted! But they help predict the target variable: $\pi_{t+2|t}$ (this shows again that one should be cautious when interpreting observed policy rules in the data — they tell little about what is targeted).

- A simple policy prescription coming out of this model:

- If $\pi_{t+2|t} > \pi^*$, increase the interest rate
- If $\pi_{t+2|t} < \pi^*$, lower the interest rate
- Indeed, this is how many inflation targeting central bank explain their policy deliberations

- Note that due to shocks arriving after policy implementation, actual inflation in period $t+2$ will deviate from the inflation target. One has:

$$\pi_{t+2} = \pi^* + \left(\epsilon_{t+2} + \epsilon_{t+1} + \alpha_1 \eta_{t+1}\right) \tag{2.15'}$$

I.e., there are deviations from target due to shocks occurring within the control lag. These are *forecasting errors*, and should, of course, be kept at a minimum Here, they "are what they are," so by construction the forecasting error variance is minimal. The central bank, however, should be judged on its ability of attaining $\pi_{t+2|t} = \pi^*$, rather than $\pi_{t+2} = \pi^*$, which is inherently impossible in this model (and in the real world). So, one should monitor the forecasts and see if they are in line with the inflation target given the lags in policy transmission. I.e., implement transparency so as to facilitate this monitoring.

Monitoring with private goals

- In the above analysis there is actually no need for monitoring the central bank — it does a good job by definition
- Monitoring is generally thought to improve accountability and credibility
  - The model is therefore amended so as to create a role for monitoring
  - The central bank is assumed to have an **implicit time-varying** inflation target π^b; e.g., in order to capture occasional incentives for pushing output above the natural rate (cf. a Barro and Gordon story)
- Formally, the central bank's per-period loss function is amended to

$$L_t^b(\pi_t) = \frac{1}{2}\left(\pi_t - \pi_t^b\right)^2, \tag{3.1}$$

with

$$\pi_t^b = \pi^* + z_t, \tag{3.2}$$

$$z_{t+1} = (1-\rho)\,\widetilde{z} + \rho z_t + \xi_{t+1}, \qquad 0 < \rho < 1. \tag{3.3}$$

- So, if $\widetilde{z} > 0$ the central bank has a higher inflation target on average than what is assigned. The underlying economic model is the same as before. The central bank's choice of interest rate is guided by first-order condition

$$-\delta^2 a_4 \left(\pi_{t+2|t} - \pi^* - z_{t+2|t}\right) = 0,$$

and thus

$$\pi_{t+2|t} = \pi^* + \left(1 - \rho^2\right) \widetilde{z} + \rho^2 z_t. \tag{3.5}$$

The corresponding period-t interest rate and actual period $t+2$ inflation are, respectively:

$$i_t = \pi_t + b_1 \left(\pi_t - \pi^* - \left(1 - \rho^2\right) \widetilde{z} - \rho^2 z_t\right) + b_2 y_t, \tag{3.6'}$$

and

$$\pi_{t+2} = \pi^* + \left(1 - \rho^2\right) \widetilde{z} + \rho^2 z_t + \left(\epsilon_{t+2} + \epsilon_{t+1} + \alpha_1 \eta_{t+1}\right). \tag{3.7'}$$

E.g., if $z_t > 0$ the **interest rate** will be **lower** and **inflation** two periods ahead be **higher** than socially optimal. Will **monitoring** of the central bank secure that this will not occur?

- In principle yes! Even if π^b is private information, the public observes i_t, π_t, and y_t and can infer $(1 - \rho^2) \widetilde{z} + \rho^2 z_t$. The public can also form $\pi_{t+2|t}$ and see how it deviates from π^* when $(1 - \rho^2) \widetilde{z} + \rho^2 z_t \neq 0$. I.e., the private sector can monitor a deviation in policymaking that compromises the inflation target π^*. This can then give rise to public criticism, firing of the governor(s); etc. Such a punishment is for simplicity modelled by adding a loss from deviation of the inflation forecast from π^*:

$$\varphi L^i \left(\pi_{t+2|t}\right), \qquad \varphi > 0.$$

The central bank's first-order condition is thus

$$-\delta^2 a_4 \left(\pi_{t+2|t} - \pi^* - \left(1 - \rho^2\right) \widetilde{z} - \rho^2 z_t\right) - \varphi a_4 \left(\pi_{t+2|t} - \pi^*\right) = 0,$$

and the forecast is

$$\pi_{t+2|t} = \pi^* + \frac{(1 - \rho^2) \widetilde{z} + \rho^2 z_t}{1 + \varphi/\delta^2}.$$

If a high φ can be imposed, the solution approaches the socially optimal

  - Note analogy with Walsh-contacts and Rogoff-conservativeness
  - The central bank's incentives are being shaped so as to induce better policymaking

2.3 "Strict" versus "flexible" inflation targeting

- The basic result $\pi_{t+2|t} = \pi^*$ from the previous section follows easily from the assumed "strict" inflation targeting regime. More realistically, inflation targeting is "flexible," i.e., output gap fluctuations are also considered costly. The per-period loss function is then

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

where $\lambda > 0$ is proxy for flexibility. Optimal monetary policy is characterized by (use dynamic programming) a variant of familiar first-order condition:

$$\pi_{t+2|t} - \pi^* = -\frac{\lambda}{\delta\alpha_1 k} y_{t+1|t} \qquad (6.6)$$

with $k \geq 1$ (see Appendix A on Svensson's appendix B where the dynamic programming computations are written out). A conventional "leaning-against-the-wind" condition:

  - If output is expected to contract at the control horizon (one period), the interest rate is set so as to allow for an overshooting of inflation target
  - The higher λ, the higher overshooting
  - Implication: The higher λ, the longer time before inflation returns to target in expectation. Hence, the horizon at which inflation should return to target can in real life be interpreted as a measure of the relative weight on output fluctuations versus inflation fluctuations

- To see the latter point, note that from the Phillips curve:

$$\pi_{t+2} = \pi_{t+1} + \alpha_1 y_{t+1} + \epsilon_{t+2},$$

$$\pi_{t+2|t} = \pi_{t+1|t} + \alpha_1 y_{t+1|t}.$$

Then use the first-order condition to eliminate $y_{t+1|t}$:

$$\pi_{t+2|t} = \pi_{t+1|t} - \frac{\delta\alpha_1^2 k}{\lambda}\left(\pi_{t+2|t} - \pi^*\right),$$

and thus

$$\pi_{t+2|t} - \pi^* = \pi_{t+1|t} - \pi^* - \frac{\delta\alpha_1^2 k}{\lambda}\left(\pi_{t+2|t} - \pi^*\right),$$

$$\pi_{t+2|t} - \pi^* = c\left(\pi_{t+1|t} - \pi^*\right), \qquad (6.8)$$

$$0 < c \equiv \frac{\lambda}{\lambda + \delta\alpha_1^2 k} < 1.$$

I.e., a difference equation in inflation forecasts. Hence, $\lambda > 0$ implies a **gradual return** of the inflation forecast to target. Higher λ, higher c and thus slower return (with $\lambda = 0$ we get the special case of "strict" inflation targeting of the previous section).

2.4 Concluding remarks

- Bands around inflation target?
  - Necessary if accountability is based on actual inflation
  - Should be proportional to forecast errors....
  - ...and also widened when output stability is an objective
- Target rules versus instrument rules
  - Target rule: $\pi_{t+2|t} = \pi^*$
  - Instrument rule: $i_t = \pi_t + b_1 (\pi_t - \pi^*) + b_2 y_t$
  - The former is often argued to be much simpler and to require less information (holds also in case of output objective)
- Svensson's conclusion: Accountability can be attained and credibility secured by transparency and inflation forecast targeting
  - Lack of controllability of actual inflation not particular problem for the performance of inflation targeting
  - Openness about the inflation forecast and bands around the target can remedy the difficulties of accountability

Appendix

A On Appendix B in Svensson (1997)

Some may wonder about the relationship between minimization with respect to the nominal interest rate and then minimization of V with respect to output. Moreover, on page 1141 after equation (B5) the Envelope theorem is applied. The following hopefully clear up what is happening.

In that part of the appendix, Svensson considers a variant of the model from the main body of the paper, where the nominal interest rate in period t affects output immediately in period t (as opposed to the one-year control lag for output in the main text). He retains a one year transmission lag between output and inflation such that the Phillips curve is

$$\pi_{t+1} = \pi_t + \alpha_1 y_t + \epsilon_{t+1}. \tag{B.2}$$

Hence there is only a one-period control lag for inflation. In any case, as with the optimization exercises in Clarida et al. (1999, *Journal of Economic Literature*), it is not necessary to formulate the problem as one of choosing the nominal interest rate subject to the aggregate demand and supply curves. As the nominal interest rate affects period t output, but not inflation directly, one can safely take period t output to be the control variable. Subsequently, one can infer which nominal interest rate is consistent with the found optimal output value.[2]

Generally, think of the problem of maximizing

$$u(x, y)$$

with respect to z subject to

$$\begin{aligned} x &= f(z, y), \\ y &= g(x). \end{aligned}$$

Using z as the instrument, one would get the first-order condition

$$u_x(x, y) f_z(z, y) + u_y(x, y) g'(x) f_z(z, y) = 0,$$

or,

$$u_x(x, y) + u_y(x, y) g'(x) = 0$$

which together with $y = g(x)$ identify y and x. The control z is then found by $x = f(z, y)$. One could, however just as we had solved the problem by treating x as the instrument. The first-order condition would be:

$$u_x(x, y) + u_y(x, y) g'(x) = 0,$$

[2] Similarly, when he solves the model with a two-year control lag for inflation (on page 1142), he considers $y_{t+1|t}$ as the instrument, as that is the variable that the period t nominal interest rate can affect.

and the same results obtain (as long as $f_z(z, y) \neq 0$ which is a natural assumption to make when having a model where z is a policy control variable of interest)..

The use of the envelope theorem is made in order to identify the unknown parameter k in the conjectured "value function" (note that it represents *losses*). From (B.3) one immediately gets

$$V_\pi(\pi_t) = k(\pi_t - \pi^*). \tag{*}$$

Strictly speaking, this is not really an application of the envelope theorem, as it is simply by definition the first-order derivative of the conjectured value function with respect to the state variable π_t. We have from (B.1) that in an equilibrium the value function is by definition given by

$$V(\pi_t) = \frac{1}{2}\left[(\pi_t - \pi^*)^2 + \lambda y_t^2\right] + \delta \mathrm{E}_t V(\pi_{t+1}),$$

which by use of the Phillips curve becomes

$$V(\pi_t) = \frac{1}{2}\left[(\pi_t - \pi^*)^2 + \lambda y_t^2\right] + \delta \mathrm{E}_t V(\pi_t + \alpha_1 y_t + \epsilon_{t+1}),$$

We know that in a solution, variables will be functions of the states; i.e. $y_t = y(\pi_t)$. Using this, and differentiating the value function yields

$$V_\pi(\pi_t) = (\pi_t - \pi^*) + \lambda y_t y'(\pi_t) + \delta \mathrm{E}_t V_\pi(\pi_{t+1})\left[1 + \alpha_1 y'(\pi_t)\right].$$

The envelope theorem gives us that the parts in front of $y'(\pi_t)$ are zero; indeed:

$$\lambda y_t + \delta \mathrm{E}_t V_\pi(\pi_{t+1})\alpha_1 = 0$$

is the first-order condition for optimal y_t. Clearly, in an optimum, a change in y_t as a consequence of a marginal change in the state variable, should leave the value function unchanged (otherwise $y(\pi_t)$ was not the optimal solution for output). We therefore get that

$$\begin{aligned} V_\pi(\pi_t) &= (\pi_t - \pi^*) + \delta \mathrm{E}_t V_\pi(\pi_{t+1}) \\ &= (\pi_t - \pi^*) + \delta k\left(\pi_{t+1|t} - \pi^*\right). \end{aligned} \tag{**}$$

Combining (*) and (**) gives

$$k(\pi_t - \pi^*) = (\pi_t - \pi^*) + \delta k\left(\pi_{t+1|t} - \pi^*\right). \tag{***}$$

Now, from the first-order condition

$$\pi_{t+1|t} - \pi^* = -\frac{\lambda}{\delta \alpha_1 k} y_t,$$

and the Phillips curve in expectation

$$\pi_{t+1|t} = \pi_t + \alpha_1 y_t,$$

one finds

$$\pi_{t+1|t} - \pi^* = -\frac{\lambda}{\delta\alpha_1^2 k}\left(\pi_{t+1|t} - \pi_t\right)$$

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

$$\pi_{t+1|t}\frac{\delta\alpha_1^2 k + \lambda}{\delta\alpha_1^2 k} - \pi^*\frac{\delta\alpha_1^2 k + \lambda}{\delta\alpha_1^2 k} = \frac{\lambda}{\delta\alpha_1^2 k}\left(\pi_t - \pi^*\right)$$

and thus

$$\pi_{t+1|t} - \pi^* = \frac{\lambda}{\delta\alpha_1^2 k + \lambda}\left(\pi_t - \pi^*\right)$$

This is inserted into (***):

$$\begin{aligned} k\left(\pi_t - \pi^*\right) &= \left(\pi_t - \pi^*\right) + \delta k\frac{\lambda}{\delta\alpha_1^2 k + \lambda}\left(\pi_t - \pi^*\right) \\ &= \left(1 + \frac{\delta k\lambda}{\delta\alpha_1^2 k + \lambda}\right)\left(\pi_t - \pi^*\right). \end{aligned}$$

This must hold for all possible states of the world, so k is the solution to

$$k = 1 + \frac{\delta k\lambda}{\delta\alpha_1^2 k + \lambda}.$$

B Key concepts you should know

What is inflation targeting?

- Numerical specification of policy objectives concerning inflation
- Point targets, tolerance bands, inflation concepts, horizon, escape clauses
- Flexible versus strict inflation targeting
- Accountability
- Downplay of monetary aggregates
- Inflation forecast as potential intermediate target
- Transparency
- A framework form of appropriate "constrained discretion."

A dynamic model of inflation targeting

- Simple AS/AD model with control lags
- Example with strict inflation target

  - Nominal interest rate set so as to set two-year ahead inflation expectations equal to target (the horizon at which the nominal rate affects inflation)
  - Inflation expectations (=forecasts) as intermediate target variable

- Implied instrument setting as a Taylor rule

  - Form of interest rate rule shows that variables entering the rule says little to nothing about the goals of monetary policy
  - Output gap is in the rule as it helps predicting future inflation
  - As in simple model: If inflation forecast is above (below) the inflation target, raise (lower) the nominal interest rate

- Monitoring performance based upon forecasts

- Monitoring when central bank has private goals

  - Public can infer the private goals and hold central bank accountable for target misses
  - E.g., modelled as a "punishment" term in the central bank's loss function
  - Equivalent to a Walsh contract and/or Rogoff conservativeness

- Example with flexible inflation targeting

- Conventional "leaning against the wind" first-order condition (taking control lags into account)

- The higher emphasis on output stabilization, the longer it takes for inflation expectations to return to target