Monetary Economics

The Theory of Central Bank Independence

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Introduction

- How should a central bank conduct monetary policy?
- Rules versus Discretion - Why?
- This Lecture (actually the next two)
  - Time Inconsistency of Monetary Policy.
  - Inflation Bias under Discretion.
  - Inflation Bias Under Uncertainty

Romer - Advanced macroeconomics - Chapter 9
Kidland and Prescott (1977) "Rules Rather than Discretion: the Inconsistency of Optimal Plans"
Barro Gordon (1981) "A Positive Theory of Monetary Policy in a Natural Rate Model"

South Africa Constitution

223. Establishment: The South African Reserve Bank is the central bank of the Republic and is regulated in terms of an Act of Parliament.

224. Primary object: The primary object of the South African Reserve Bank is to protect the value of the currency in the interest of balanced and sustainable economic growth in the Republic. The South African Reserve Bank, in pursuit of its primary object, must perform its functions independently and without fear, favour or prejudice, but there must be regular consultation between the Bank and the Cabinet member responsible for national financial matters.

225. Powers and functions: The powers and functions of the South African Reserve Bank are those customarily exercised and performed by central banks, which powers and functions must be determined by an Act of Parliament and must be exercised or performed subject to the conditions prescribed in terms of that Act.

Questions

- Why do we need to specify the objective of the Bank in the constitutions?
- Why do we need to specify " The South African Reserve Bank, in pursuit of its primary object, must perform its functions independently and without fear, favour or prejudice"
- Answer: theory of time inconsistency and the inefficiency of discretionary monetary policy

The Concept of Time Inconsistency: Example

Time Inconcistency is the root of many models of crisis. Basic Mechanism

1. Agents have made a promise

Monetary authorities made the promise to convert national currency into foreign currency at fixed price; Bond issuers promise to convert bond at terminal date into cash at fixed conversion rate; Banks have promised to convert outstanding deposits into cash at fixed rate 1 to 1

2. Promises are not always time consistent; i.e. keeping promise reduces welfare compared to not keeping promise.
3. Agents (speculators, public, investors) realise that those who have made promise have incentive not to keep it - thus they attack currency, withdraw deposits, sells bonds
4. Attack raises cost of the defence by those who have made promise. Thus, incentive to renege increases - inflation, bankruptcy etc

TIME INCONSISTENCY CAN BE SOCIALLY INEFFICIENT

Time Inconsistency of Monetary Policy

- Kydland & Prescott first to think about issues of central bank credibility and the ability to precommit to policies.
- Without some means of committing in advance, central banks find that they face incentives to deviate from earlier plans and announcements.
- Policy is time consistent when action planned at time t for time $t + i$ is still optimal to implement when time $t + i$ actually arrives.
- So time inconsistency is important for positive theories of monetary policy (how it is actually implemented).
- If time inconsistency is important, then models that consider this issue are also important for normative theory of policy making institutions (how they should be).
- We will see that under some circumstances, discretionary policy (central bank is free to change its instrument setting at any time) leads to inflation bias.

The Problem of Time Inconsistency in Monetary Policy

Inflation Bias

- This means that equilibrium inflation exceeds the socially desired rate.
- The bias arises because of a desire for economic expansion above the economy's equilibrium output level and the inability of the central bank to credibly commit to low inflation.
- If the public were to expect low inflation, the central bank faces on incentive to inflate at a higher rate.
- But the public understands this incentive and will anticipate it (i.e. will anticipate a higher inflation rate).

Simple Model of Inflation Bias

- The Model
  - Phillips Curve relationship

$$y = y^* + b\left(\pi - \pi^e\right) \tag{1}$$

-
  - Policy Maker Loss function

$$\begin{aligned} L &= \frac{1}{2}\left[a\left(\pi - \pi^*\right)^2 + \left(y - ky^*\right)^2\right] \\ a &> 0, k > 1, \pi^* = 0 \end{aligned} \tag{2}$$

Simple Model of Inflation Bias

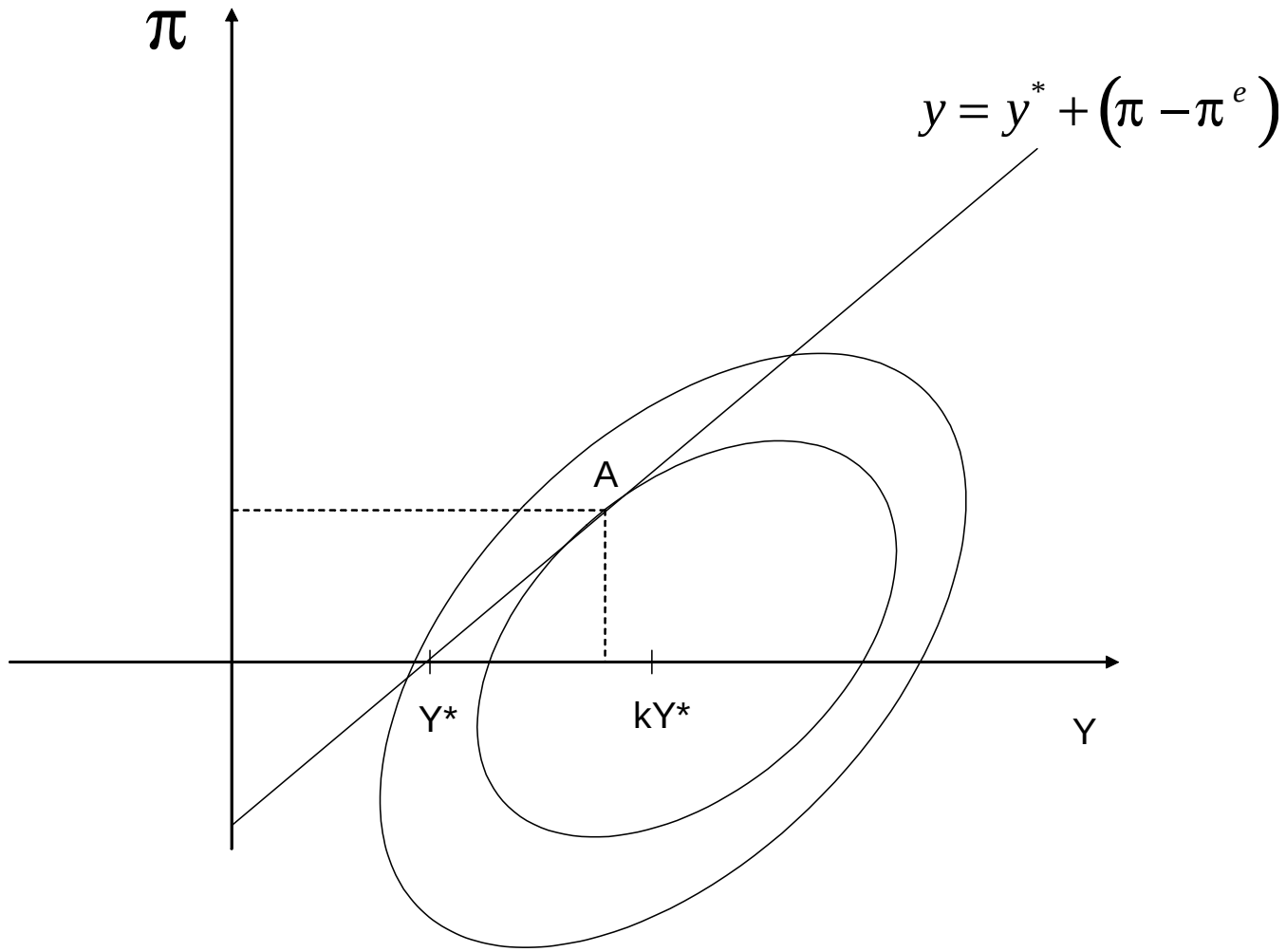

Figure: Barro-Gordon Model

Simple Model of Inflation Bias

- Solution of the policy problem - substitute (1) in (2) and optimize

$$L = \frac{1}{2}\left[a\left(\pi\right)^2 + \left(\left(1-k\right)y^* + b\left(\pi - \pi^e\right)\right)^2\right] \tag{3}$$

- Taking the derivative of (3) with respect to π we have the first order condition for an optimum, which is:

$$\frac{\partial L}{\partial \pi} = a\pi + b\left(\left(1-k\right)y^* + b\left(\pi - \pi^e\right)\right) = 0 \tag{4}$$

Simple Model of Inflation Bias

First order Condition given the expectations of the private sector π^e

$$\pi = \frac{b}{a + b^2} \left(b\pi^e + (k-1)\, y^* \right) \tag{5}$$

if, $\pi^e = 0$, than we obtain the equlibrium level of inflation and output substituing (5) in (1)

$$\pi^f = \frac{b}{a + b^2} \left((k-1)\, y^* \right) \tag{6}$$

$$y^f = y^* + \frac{b^2}{a + b^2} \left((k-1)\, y^* \right) = \frac{a + kb^2}{a + b^2} y^* \tag{7}$$

Simple Model of Inflation Bias

Inserting this equlibrium values in the loss function (2), we obtain the level of social welfare

$$\begin{aligned} L^f &= a\left[\frac{b}{a+b^2}\left(\left(k-1\right)y^*\right)\right]^2 + \left[\frac{a\left(1-k\right)}{a+b^2}y^*\right]^2 \\ &= \left(k-1\right)^2 y^{*2}\left[\frac{ab^2+a^2}{\left(a+b^2\right)^2}\right] \\ &= \left(k-1\right)^2 y^{*2}\frac{a}{\left(a+b^2\right)} \end{aligned} \tag{8}$$

Problem - $\pi^f > \pi^e = 0$ - People have been fooled!!

Simple Model of Inflation Bias

What if the public can anticipate Central Bank incentives? Than

$$\pi^e = \pi^f \quad \text{and} \quad y = y^*$$

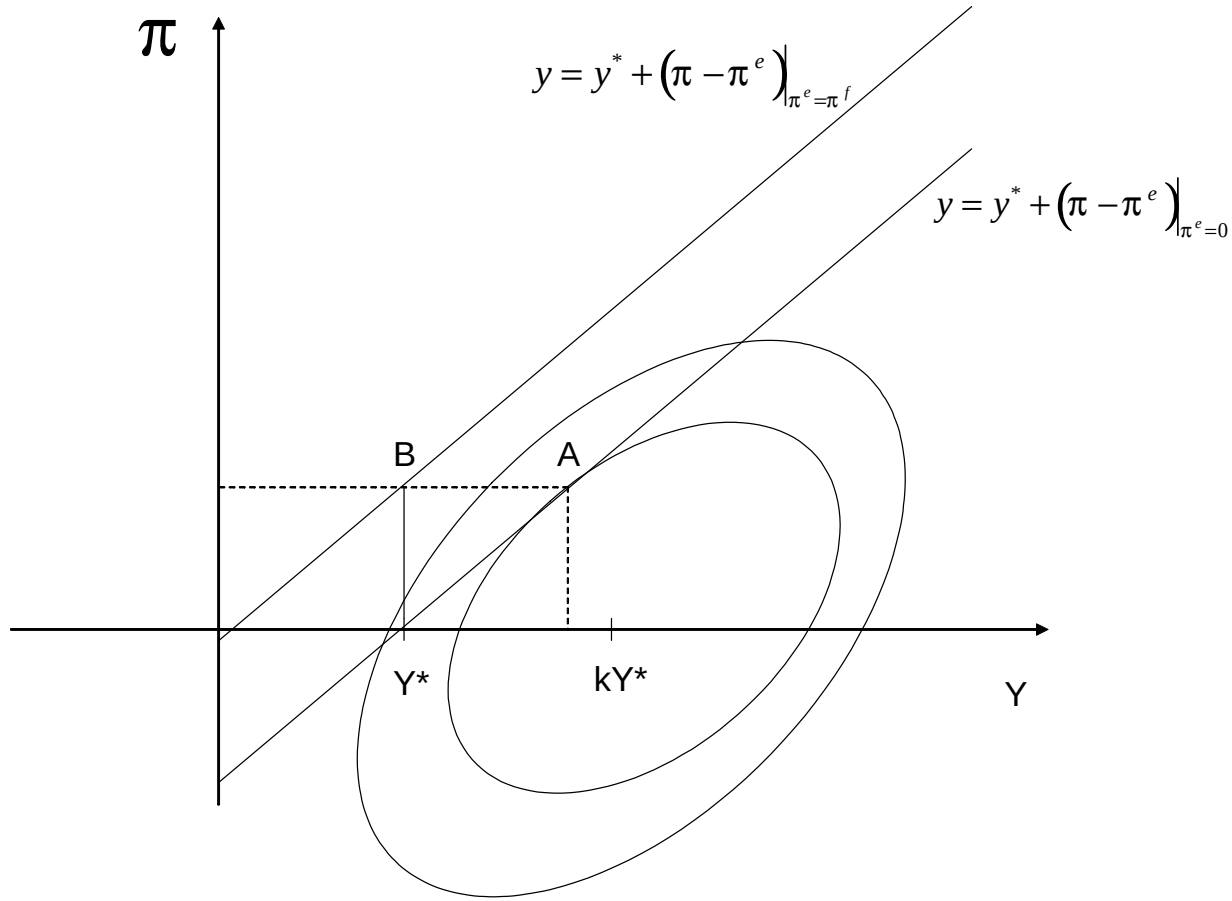

Figure: Barro Gordon with Rational Expectations

Simple Model of Inflation Bias

Formally substituting the expected inflation in equlibrium values in (5) we have:

$$\pi^c = \frac{b}{a + b^2} \left(b\pi^c + (k-1)\, y^* \right)$$

solving for π^c we have

$$\begin{aligned} \pi^c &= \frac{b}{a} \left((k-1)\, y^* \right) \\ y^c &= y^* \end{aligned}$$

Simple Model of Inflation Bias

Welfare Losses

$$\begin{aligned} L^c &= a\left[\frac{b}{a}\left(\left(k-1\right)y^*\right)\right]^2 + \left[\left(1-k\right)y^*\right]^2 \\ &= \left(k-1\right)^2 y^{*2}\left(\frac{a+b^2}{a}\right) \end{aligned}$$

Notice that

$$\left(k-1\right)^2 y^{*2}\left(\frac{a+b^2}{a}\right) > \left[\left(k-1\right)y^*\right]^2$$

If the bank ad *Committed* to a policy of zero inflation and if the private sector had believed her, the society would have been better off.

Simple Model of Inflation Bias

Effects of Uncertainty

The result partly change when introducing uncertainty - trade-off between commitment and stabilization

Timing :

(1) Private sector form inflation expectations and fix wages.
(2) Shock to the economy are revealed and
(3) the Central Bank decides her monetary policy to stabilize the economy, togheter with achieving social output objectives.

Simple Model of Inflation Bias

Effects of Uncertainty

With Uncertainty the Phillips curve becomes:

$$y = y^* + b\left(\pi - \pi^e\right) + \epsilon$$

where ϵ is a random varialbe with mean equal to zero and variance equal to σ^2. Now the loss of the Central Bank can be written as:

$$L = a\pi^2 + \left(\left(1 - k\right)y^* + b\left(\pi - \pi^e\right) + \epsilon\right)^2$$

Simple Model of Inflation Bias

Effects of Uncertainty

The first order condition for an optimum will be equal to:

$$\begin{aligned} \frac{\partial L}{\partial \pi} &= 2a\pi + 2b\left((1-k)\,y^* + b\left(\pi - \pi^e\right) + \epsilon\right) = 0 \\ \pi &= \frac{b}{a+b^2}\left(b\pi^e + (k-1)\,y^* - \epsilon\right) \end{aligned}$$

Simple Model of Inflation Bias

Effects of Uncertainty

The private sector can anticipate the systematic part of policy but it cannot anticipate shocks.

Private sector expectations

$$\pi^e = \frac{b}{a}(k-1)\,y^*$$

Equlibrium level of inflation (after the shock) :

$$\begin{aligned}\pi^d &= \frac{b}{a+b^2}\left[\frac{b^2}{a}(k-1)\,y^* + (k-1)\,y^* - \epsilon\right] \\ &= \frac{b}{a}\left((k-1)\,y^*\right) - \frac{b}{a+b^2}\epsilon\end{aligned}$$

Equlibrium level of output

$$y^d = y^* - \frac{b^2}{a+b^2}\epsilon + \epsilon = y^* + \frac{a}{a+b^2}\epsilon$$

Simple Model of Inflation Bias

Effects of Uncertainty

Substituting these two values in the objective function we obtain the social losses of this policy

$$
\begin{aligned}
E\left(L^d\right) &= a\left[\frac{b}{a}\left(\left(k-1\right)y^*\right)-\frac{b}{a+b^2}\epsilon\right]^2 \\
&\quad +\left[b\left(\pi^d-\pi^e\right)+\left(1-k\right)y^*+\epsilon\right]^2 \\
&= \frac{b^2}{a}\left(k-1\right)^2 y^{*2}+\frac{ab^2}{\left(a+b^2\right)^2}\sigma^2 \\
&\quad +\left(k-1\right)^2 y^{*2}+\frac{a^2}{\left(a+b^2\right)^2}\sigma^2 \\
&= \left(k-1\right)^2 y^{*2}\left(\frac{a+b^2}{a}\right)+\frac{a}{a+b^2}\sigma^2
\end{aligned}
$$

Simple Model of Inflation Bias

Effects of Uncertainty

In the case of a simple rule of inflation equal to zero, the expected losses would be instead :

$$E\left(L^r\right) = (k-1)^2 y^{*2} + \sigma^2$$

Which policy is the best? Not obvious
(1) systematic losses due to output objective, worse with discretion (no zero inflation)

$$(k-1)^2 y^{*2} \left(\frac{a+b^2}{a}\right) > (k-1)^2 y^{*2}$$

(2) losses by the level of fluctuations better with discretion (no zero inflation)

$$\sigma^2 > \frac{a^2}{(a+b^2)^2}\sigma^2$$

Conclusion

- Discretionary monetary policy can produce inefficient outcomes
- Need to find institutional set up which provides commitment to low inflation
- Need also to find institutional set up that provides enough flexibility in bad times
- Is inflation targeting one of these institutional set up? Next Lecture