Time Inconsistency of Monetary Policy

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Outline

1. Definition of time inconsistency
2. Simple model of time inconsistency of monetary policy
3. Methods of solving the problem of time inconsistency of monetary policy
4. The choice of the exchange rate regime and time inconsistency
A Greek parable:

Ulyses is lost. His ultimate objective is to go home. He also likes to listen to the music on the way. If he listens to the music a witch catches him and he will die and never reach home. If he does not listen he reaches home safely.

Listening to the music while going home is an inconsistent policy given his objective of reaching home.

Plugging the ear not to listen to the music is consistent but sub-optimal policy because he cannot enjoy music.

Example of illegal construction

- In the US – widespread building on flood-endangered areas although the government proclaims that it will not invest in flood protection of those areas
  ⇒ after houses built political pressure emerges which leads to investment in flood protection

- In Croatia – widespread illegal construction (without permits) – in expectance that illegally built houses would be legalised
  ⇒ Gov’t recently legalised houses built without permits
Time inconsistency - definition

- The problem of time inconsistency arises when an agent has an incentive to promise some action in the future, but when times comes does not do as promised.
- Other (rational) economic agents expect that the first agent will not behave as promised.

Examples

- Negotiating with terrorists
- Taxing capital investment
- Patent protection
- Parental threats / preannounced punishments for particular bad behavior
Illustration of the time consistency problem and the solution

2. Simple model of time inconsistency of monetary policy (rules-vs-discretion)

- Kydland Prescott (1977)
- sequential game:
  1. private agents set their expectations about future inflation
  2. government (central bank) sets optimal monetary policy – based on the initially set inflation expectations
- the way how expectations are set is essential:
  - in case of adaptive expectations, there is no problem
  - if expectations are rational, than government's behaviour is included in inflationary expectations
How does the government chooses the optimal inflation (given expected inflation)

Economy described using the Lucas curve:
\[ y_t = \alpha (\pi_t - \pi^e_t) \]  
(1)

Government cares about both output and inflation (minimizes the following loss function, given \( \pi_t \)):
\[ L_t = \pi_t^2 + \lambda (y_t - y^*)^2 \]  
(2)

- minimum where 1st derivation is zero:
\[ 2\pi_t + 2 \alpha \lambda (\alpha (\pi_t - \pi^e_t) - y^*) = 0 \]
\[ (1 + \alpha^2 \lambda) \pi_t = \alpha^2 \lambda \pi^e_t + \alpha \lambda y^* \]
\[ \pi_t = (\alpha^2 \lambda \pi^e_t + \alpha \lambda y^*) / (1 + \alpha^2 \lambda) \]  
(4)

⇒ the best outcome when \( \pi^e_t = 0 \), but inflation then is positive:
\[ \pi_t = \alpha \lambda y^* / (1 + \alpha^2 \lambda) > 0 \]  
(6)

Rational agents and inflation expectations

- if agents are rational they expect positive inflation:
\[ \pi^e_t = \mathbb{E}_{t-1} \pi_t = \pi_t > 0 \]  
(5&6)

- setting \( \pi^e_t = \pi_t \) the equilibrium inflation in the case of discretion is:
\[ \pi^D_t = (\alpha^2 \lambda \pi^D_{t-1} + \alpha \lambda y^*) / (1 + \alpha^2 \lambda) \]
\[ (1 + \alpha^2 \lambda) \pi^D_t - \alpha^2 \lambda \pi_t = \alpha \lambda y^* \]
\[ \pi^D_t = \alpha \lambda y^* > 0 \]  
(7)
Rules versus discretion

- The loss in the case of discretionary policy:
  \[ L^D_t = (\alpha \lambda y^* )^2 + \lambda y^{*2} = (1 + \alpha^2\lambda ) \lambda y^{*2} \] (8)

- If the gov’t could commit in advance to “zero” inflation and influence expectations \((\pi_t = \pi^e_t = 0)\), there would be the first-best solution:
  \[ L^C_t = \lambda y^{*2} \] (9)

- Inability of the gov’t to commit to zero inflation policy leads to unnecessary loss

Attempt to achieve the first-best solution \((L^P)\) leads to the third-best solution \((L^D)\)
Proactive monetary policy?

- Simple model shows that rules are superior to discretion
- In reality there exists a large number of shocks which hit the economy
  ⇒ monetary policy can reduce the negative impact of those shocks!

Monetary policy and stabilisation

- Aggregate shock – i.i.d. shock in Lucas curve:
  \[ y_t = \alpha (\pi_t - \pi^*) + \varepsilon_t \]  \hspace{1cm} (10)
- Gov’t minimizes:
  \[ L_t = \pi_t^2 + \lambda (\alpha (\pi_t - \pi^*) + \varepsilon_t - y^*)^2 \]  \hspace{1cm} (11)
- Shock appears after inflationary expectations are set but before the choice of monetary policy (actual inflation), shock is unexpected:
  - \[ E_{t-1} \varepsilon_t = 0, \text{ and expected inflation is the same as in the model without the shock:} \]
  \[ \pi_{t-1}^* = \pi_{t-1} = \alpha \lambda y^* \]
- Optimal inflation with discretionary policy:
  \[ \pi^*_t = (\alpha \lambda y^* - \alpha \lambda \varepsilon_t)/(1 + \alpha^2 \lambda) \]  \hspace{1cm} (14)
- If gov’t could pre-commit to zero inflation:
  \[ \pi^*_t = -\alpha \lambda \varepsilon_t/(1 + \alpha^2 \lambda) \]  \hspace{1cm} (15)
Rules vs. discretion in stochastic world

- Government must in advance choose whether to lead discretionary policy (output stabilisation) or policy of low inflation
- Expected loss (\(E_t-1L_t\)) in the case of discretion:
  \[
  E_t-1L_t^D = E_t-1\{ [\alpha_\lambda y^* - \alpha_\lambda \epsilon_t/(1+\alpha^2\lambda)]^2 + \\
  \lambda [\alpha(\alpha_\lambda y^* - \alpha_\lambda \epsilon_t/(1+\alpha^2\lambda) - \alpha_\lambda y^*) - y^*]^2 \}
  \]
  note that \(E_t-1\epsilon_t = 0\), \(E(x+y) = E(x) + E(y)\)
- Expected loss in the case of rules / zero inflation policy:
  \[
  E_t-1L_t^R = \lambda (y^2 + \sigma^2)
  \]
- Government will chose discretionary policy if
  \[
  E_t-1L_t^D < E_t-1L_t^D \Leftrightarrow y^2 < \sigma^2/(1+\alpha^2\lambda)
  \]

3. Credibility

- If monetary policy is “credible” then optimal inflation is 0 in the case of no shock and positive in the case of shock
- How to trust the good intentions of the government (politicians) ?
  - especially if it is difficult to measure the size of shock even ex post
1. Reputation
Barro i Gordon (1983)

- gov’t creates reputation through time by observing the dynamic loss function:
  \[ L = \sum_{t=0}^{\infty} \delta^t \left[ \pi_t^2 + \lambda (y_t - \bar{y})^2 \right] \]  

- in such a way policy in different periods is connected
- additional assumption about expectations formation (tit-for-tat):
  \[ \pi_e^t = \pi^0 < \alpha \lambda \bar{y}^* \quad \text{if} \quad \pi_{t-1} \leq \pi^0 \]
  \[ \pi_e^t = \alpha \lambda \bar{y}^* \quad \text{if} \quad \pi_{t-1} > \pi^0 \]

- not fully rational but if allows for the existence of cooperative equilibrium with low but positive inflation
  - gov’t accepts short term loss in order to achieve long term gain

Temptation and the cost of reputation building

Ivor: Walsh (1998), str. 340
2. Conservative central banker
Rogoff (1985)

- Gov't can achieve superior result if it leaves monetary policy to independent conservative central bank(er)

- Loss function of the conservative central bank:
  \[ L_{CB} = \pi_t^2 + \mu (y_t - y^*)^2, \, \mu < \lambda \]  
  (21)

- Inflation less than in the case of discretion:
  \[ \pi_{CB}^t = \alpha \mu y^* - \alpha \mu \epsilon_t / (1 + \alpha^2 \lambda) \]  
  (22)
- Less inflation bias \( \mathbb{E}_{t-1} \pi_{CB}^t = \alpha \mu y^* < \alpha \lambda y^* \), but less ability to lead stabilisation policy

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The choice of the level of conservatism of the central banker
3. Contract for central banker
Walsh (1995)

- Microeconomic analysis of principal and agent
  - Same preferences regarding inflation and output but additional incentive for central banker to achieve low inflation:
    \[ L_{U_t} = \pi_t^2 + \lambda(y_t - y^*)^2 - \phi + \varphi\pi_t \] (26)

- Minimizing:
  \[ (1 + \alpha^2\lambda)\pi_t^U = (\alpha^2\lambda\pi_t + \alpha\lambda(y^* - \varepsilon_t) - \phi)/2 \] (29)

- Private agents’ expected inflation:
  \[ \pi_e_t = E_{t-1}\pi_t = \alpha\lambda y^* - \phi/2 \]

- In order to achieve the zero inflation incentive is:
  \[ \varphi = 2\alpha\lambda y^* \Rightarrow \pi_t = -\alpha\lambda\varepsilon_t/(1 + \alpha^2\lambda) \] – first-best
4. Choice of the exchange rate arrangements and time inconsistency

- Nominal anchor
  - Ties Down Inflationary Expectations
  - Helps Avoid Time-Consistency Problem
    1. Arises from pursuit of short-term goals which lead to bad long-term outcomes
    2. Time-consistency resides more in political process
    3. Nominal anchor limits political pressure for time-consistency

- Exchange rate targeting
- Currency board and dollarisation

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