Time Inconsistency of Government Policies

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Contents

1 Introduction 2
2 Fiscal Policy Example 3
3 Monetary Policy Example 4

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1 Introduction

Definition 1 Time Inconsistency. The problem that arises when a policy maker prefers one policy in advance but a different one when the time to implement arrives. Knowing this, others will not find the commitment to the first policy credible.

Kydland and Prescott (1977) [2] demonstrated that no matter how good are the intentions of policy makers are, they may fail to attain socially optimal outcomes because of dynamic inconsistency of Optimal plans. The reason is that policymakers may want to announce in advance the policy they will follow to influence the expectations of private decisionmakers, but later, after the private decisionmakers have acted on the basis of their expectations, these policymakers may be tempted to renege on their announcement. For example, suppose that the professor announces that there will be an exam next week (policy announced at \( t - 1 \)). The students study to prepare for the exam. When the exam date arrives, the professor announces to the class that the exam is cancelled - optimal policy at time \( t \), because the students have already benefitted from their study. The class can proceed to learn new material, and the professor is thankful not to grade the exams. This is the best social outcome, where both students and the professor benefit the most. However, soon the students anticipate that the exam may be cancelled. They do not study, and they learn nothing.

Kydland and Prescott (1977) [2] demonstrated that when a government announces a future policy, and if the people make choices accordingly, then the government wants to implement a different policy. Soon, the private sector realizes that government policy announcements are lacking credibility, and will change their behavior. Kydland and Prescott demonstrated that if governments are unable to make binding commitments regarding future policies will encounter a credibility problem. Specifically, the public will realize that future government policy will not necessarily coincide with the announced policy, unless the plan already encompasses the incentives for future policy change. In other words, sequential policy making faces a credibility constraint. Their work revolutionized the way central banks operate. Central bank reforms in countries such as New Zealand, Sweden, and the United Kingdom drew extensively on the conclusions from the academic literature initiated by Kydland and Prescott, as did discussions about the design of the new European Central Bank, ECB, in the European Union. There is also a close connection between the academic research on this topic and the increasing reliance on explicit inflation targets among central banks in developed as well as developing countries.

The main policy recommendations are (i) independence of the central bank from the federal government, in order to establish credibility, (ii) implement rules (laws) instead of discretionary policy, which would force the policy makers to follow announced policy. In the example of a professor who announces an exam next week, the university could implement a rule that requires all exam dates to be listed on course syllabi in advance, and that professors are obligated to strictly follow the policies listed in the syllabus. The next two sections give examples of how dynamic inconsistency can arise in fiscal and monetary policies, when the policy makers (government or central bank) are unable to commit to announced policies. Kydland and Prescott also made methodological contribution the study of macroeconomic policy, by analyzing policy questions within dynamic game theory framework.
2 Fiscal Policy Example

Suppose that at time $t - 1$ the private sector makes investment decision that affects capital at time $t$ according to the law of motion of capital:

$$k_t = (1 - \delta)k_{t-1} + x_{t-1}$$

Next, at time $t$ the government chooses the tax rates on capital income, $\tau_{kt}$ and labor income $\tau_{wt}$, to fund spending:

$$\tau_{kt}r_t k_t + \tau_{wt} w_t h_t = G_t$$

Suppose that at time $t - 1$ the government announced tax policy of $\tau_{kt} = \tau_{wt} = 30\%$, and the private sector made investment decisions believing the government. It is a well-known result from Ramsey (1927) [3] that optimal taxation requires higher rates on less elastic tax base:

$$\frac{\tau_{kt}}{(1 - \tau_{kt})} \leq \frac{\eta_{(w_t h_t), \tau_w}}{\eta_{(r_t k_t), \tau_k}}$$

This means that since the tax base of capital income $r_t k_t$ is totally inelastic at time $t$ (since it was determined by investment at $t - 1$), it is optimal to tax capital at $\tau_{kt} = 100\%$.

Notice however that if the private sector understands that capital income will be taxed at 100%, they will not make any investment at $t - 1$, or ever, which would result in devastating outcome for society as a whole, as a result of inability of the government to commit to tax policy. However, if the government is able to commit to $\tau_{kt} = 30\%$, then the private sector would rationally expect $\tau_{kt} = 30\%$ and would make investments accordingly. To summarize, here are the possible outcomes under lack of commitment and with commitment:

<table>
<thead>
<tr>
<th></th>
<th>Gov. Unable to Commit</th>
<th>Gov. Able to Commit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Announced policy at $t - 1$</td>
<td>$\tau_{kt} = 30%$</td>
<td>$\tau_{kt} = 30%$</td>
</tr>
<tr>
<td>Government policy at time $t$</td>
<td>Optimal policy: $\tau_{kt} = 100%$</td>
<td>Rule: $\tau_{kt} = 30%$</td>
</tr>
<tr>
<td>Outcome for society</td>
<td>Bad, $x_{t-1} = 0$</td>
<td>Good, $x_{t-1} &gt; 0$</td>
</tr>
</tbody>
</table>

One can guess that our founding fathers and the writer of the U.S. constitution were aware of the time inconsistency of policies, and designed a government based on three branches that tie each others’ hands and make commitment possible. For example, while the federal government at time $t$ may want to raise the tax on capital, the congress is the branch of government that votes on tax laws, and the process involves two houses (house of representatives and senate).
3 Monetary Policy Example

Suppose that the relationship between inflation and unemployment is given by the expectations-
augmented Phillips curve:

\[ u_t = u^* - \alpha (\pi_t - \pi_t^e), \quad \alpha > 0 \]  

(1)

where \( u_t \) is actual unemployment rate at time \( t \), \( u^* \) is natural unemployment rate (i.e. the
only unemployment is frictional and structural, but no cyclical)\(^1\), \( \pi_t \) is the actual inflation
rate at time \( t \), and \( \pi_t^e \) is the inflation rate expected by the private sector at time \( t - 1 \).
Thus, if the realized inflation is above the expected, i.e. \( \pi_t > \pi_t^e \), the unemployment rate
falls below natural, \( u_t < u^* \). The reason could be that wage contracts are set at time \( t - 1 \)
based on expected inflation, so when actual inflation is higher than expected, the real wage drops,
\( (w_t/p_t) \downarrow \), and companies hire more workers. In addition, suppose that the central
bank (or the government) choose policies to maximize some social welfare function, which is
decreasing in inflation and distance of unemployment rate from target rate:

\[
\max_{u_t, \pi_t} S_t = -\frac{1}{2} (u_t - \theta u^*)^2 - \frac{1}{2} \gamma \pi_t^2
\]

Here \( \theta \in (0,1) \) represents the idea that government wants to target unemployment rate
lower than natural rate, perhaps for political gain. The parameter \( \gamma > 0 \) represents the relative
that policy makers assign to inflation. One can clearly see, even without first order
conditions, that the optimal discretionary policy at time \( t \) is \( u_t = \theta u^* \) and \( \pi_t = 0 \).

Kydland and Prescott (1977) [2] demonstrated that the central bank (or government)
may have difficulties implementing the optimal policy, because of time-inconsistency. They
suggest framing the issue as a game where the private sector strategy at time \( t - 1 \) is to set
form expectations about inflation \( \pi_t^e \), and set nominal wage contracts accordingly, while at
time \( t \) the government chooses inflation rate \( \pi_t \). If the private sector formed expectations
\( \pi_t^e \), then at time \( t \) the government solves:

\[
\max_{u_t, \pi_t} S_t = -\frac{1}{2} (u_t - \theta u^*)^2 - \frac{1}{2} \gamma \pi_t^2
\]

s.t.

\[ u_t = u^* - \alpha (\pi_t - \pi_t^e) \]

or, after substituting the Phillips curve in (1):

\[
\max_{u_t, \pi_t} S_t = -\frac{1}{2} [u^* - \alpha (\pi_t - \pi_t^e) - \theta u^*]^2 - \frac{1}{2} \gamma \pi_t^2
\]

or,

\[
\max_{\pi_t} S_t = -\frac{1}{2} [(1 - \theta) u^* - \alpha (\pi_t - \pi_t^e)]^2 - \frac{1}{2} \gamma \pi_t^2
\]

\( ^1 \)Frictional unemployment is the unemployment that arises from normal labor turnover—from people
entering and leaving the labor force and from the ongoing creation and destruction of jobs. For example, a
graduate interviewing for his first job.

Structural unemployment is the unemployment that arises when changes in technology or international
competition change the skills needed to perform jobs or change the locations of jobs.

Cyclical unemployment is the fluctuating unemployment over the business cycle that increases during a
recession and decreases during an expansion. For example, during the recession of 2008–2009, many workers
were laid off as business activity declined.

Natural unemployment = frictional unemployment + structural unemployment.
FOC:
\[ \frac{\partial S_t}{\partial \pi_t} = -\frac{1}{2} [(1 - \theta) u^* - \alpha (\pi_t - \pi_t^e)] (-\alpha) - \frac{1}{2} 2\gamma \pi_t = 0 \]

Solving the above for \( \pi_t \):
\[ \alpha (1 - \theta) u^* - \alpha^2 (\pi_t - \pi_t^e) = \gamma \pi_t \]
\[ \alpha (1 - \theta) u^* + \alpha^2 \pi_t^e = \gamma \pi_t + \alpha^2 \pi_t \]
\[ \pi_t = \frac{\alpha (1 - \theta) u^* + \alpha^2 \pi_t^e}{\gamma + \alpha^2} \tag{2} \]

The above is the optimal ex-post (discretionary) policy of the government at time \( t \), given inflationary expectations \( \pi_t^e \). Thus, if the private sector expects \( \pi_t^e = 0 \) (and chooses nominal wage contracts accordingly), the government’s optimal policy (best response) is
\[ \pi_t = \frac{\alpha (1 - \theta) u^*}{\gamma + \alpha^2} > 0 \]

This is the time inconsistency problem, i.e. the optimal policy at time \( t - 1 \) is \( \pi_t = 0 \), but at time \( t \) it is \( \pi_t > 0 \). The private sector is assumed to be rational, and understands that government promises of \( \pi_t = 0 \) are not credible. Therefore, if the government is unable to commit at \( t - 1 \) to \( \pi_t = 0 \), and uses "discretion", then the rational-expectations sub-game perfect equilibrium is: \( \pi_t \) such that (i) \( \pi_t^e = \pi_t \) (i.e. inflation is consistent with expectations, and (ii) \( \pi_t \) satisfies the government discretionary policy in (2).

The rational-expectations sub-game perfect equilibrium:
\[ \pi_t = \frac{\alpha (1 - \theta) u^* + \alpha^2 \pi_t}{\gamma + \alpha^2} \]
\[ \gamma \pi_t + \alpha^2 \pi_t = \alpha (1 - \theta) u^* + \alpha^2 \pi_t \]
\[ \pi_t = \frac{\alpha (1 - \theta) u^*}{\gamma} \]

Observe that lower \( \gamma \) means that the government cares less about inflation and more about unemployment, and consequently the equilibrium inflation rate will be higher.

In their seminal work "Rules rather than discretion: The inconsistency of optimal plans."
Kydland and Prescott (1977) [2] proposed that the inability of the government (central bank) to commit in advance to optimal policy can be resolved by "rules", i.e. laws. For example, the central bank can be an independent authority which is by law required to keep inflation at a certain target rate, e.g. \( \pi_t = 0 \). In such case, the rational-expectations equilibrium is \( \pi_t^e = \pi_t = 0 \), and the resulting unemployment rate is at natural rate: \( u_t = u^* \), based on (1). This insight shifted the focus of policy analysis from the study of individual policy decisions to the design of institutions that mitigate the time inconsistency problem. Indeed, the reforms of central banks undertaken in many countries as of the early 1990s have their roots in the research initiated by Kydland and Prescott.
References

