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Lecture 12: Rules, Discretion & Reputation

I. OVERVIEW

- In our last lecture, we focused on the Barro/Gordon paper that showed that policy makers could achieve a better outcome under a policy rule than they could achieve under discretion. The primary intuition for this finding was that under discretion, in the Barro/Gordon model, the policy maker always had incentive to try and create surprise inflation: promises of zero inflation, for example, would not be believed by rational individuals. Since these individuals expect higher inflation, the end result was a rate of inflation greater than zero.

- This result was dependent upon some of the assumptions in the model, in particular the claim that policy makers were trying to push the economy to a level of unemployment lower than the natural rate. Nevertheless, the conclusions of the model are extremely important: BG seem to provide a convincing intuitive reason for why discretion may lead to worse outcomes than rules: namely that the policy maker will systematically try to create surprise inflation.

- However, that paper ignored an important feature of the relationship between a central banker and individuals in the economy, namely, the importance of reputation. A monetary policy maker, even under discretion, may not try to fool individuals in order to safeguard his reputation as being tough on inflation. Furthermore, individuals may not automatically perceive a discretionary monetary policy maker as being inclined to create surprise inflation; instead they may factor his reputation (based on past actions, in this case) in forming expectations.

II. INTRODUCTION TO THE SECOND BARRO/GORDON PAPER

- The motivation of this paper is to explore the importance of reputation in determining the level of inflation in an economy. The authors speculate that the reputational cost from creating surprise inflation may constrain policy makers from creating such inflation even under the case of discretion.

- In particular, the authors want to know whether incorporating the impact of reputation into the model enables us to achieve the rule outcome even under discretion. BG find that the optimal rule can't be achieved under discretionary policy even after factoring in reputation. They do show however, that the rate of inflation that is achievable under reputation is in between the rule solution and the discretionary solution. Furthermore, the less the policy maker discounts the future, the lower the rate of inflation that prevails under reputation; in the limit the reputation solution approached the rule solution.

- The model that BG use in this paper is a simpler version of the model in their first paper. In particular, they do not explicitly provide an equation that describes the structure of the economy. Instead, they assume that the policy maker minimizes a loss function of the form

$$Z_t = \frac{a}{2}\pi_t^2 - b\left(\pi_t - \pi_t^e\right)$$

- Note that BG actually allow b to vary over time. But in the bulk of their analysis, the variation of b does not matter. So you may as well treat b as a constant to get the basic jist.
- A macroeconomic model, similar to the first Barro/Gordon paper is implicit in this loss function. The policy maker is assumed to treat the fluctuation of inflation as a cost and surprise inflation as a benefit.The fact that surprise inflation is treated as a benefit implies that the policy maker still is trying to push unemployment below the natural rate. Recall that the first BG paper, described a relationship of the form $u_t = u_t^n - \alpha(\pi_t - \pi_t^e)$ for unemployment. So surprise inflation, by reducing real wages would push u below the natural rate. The fact that surprise inflation is a benefit, therefore, implies that the policy maker finds it desirable to push u below the natural rate, i.e. its the equivalent of the $k < 1$ assumption in the last paper.
- As always, the loss function should be treated as a metric, some measure that captures the cost to the policy maker and that can be used for relative comparisons.

III. THE DIFFERENT SOLUTIONS OF THE BARRO/GORDON MODEL

- In this section we explore the 3 solutions that will help us think about the importance of reputation. We will first describe the discretionary solution, then the discretionary solution and finally something called the "cheating solution" which describes the outcome when the policy maker promises a certain rate of inflation and then deviates from it.

The Discretionary Solution

- Recall that under discretionary policy, the monetary policy maker has no way of pinning down the expectations of individuals in the economy. Therefore, they have to treat the expectations as given in calculating their optimal rate of inflation. Rational individuals then make their expectations consistent with the rate of inflation that satisfies the policy maker first order condition.
- The policy maker's decision becomes

$$\text{Min}_{\pi_t} Z_t = \frac{a}{2}\pi_t^2 - b\left(\pi_t - \pi^e\right)$$

- The first order condition for this maximization is $a\pi_t - b = 0$, which simplifies to $\hat{\pi}_t = \frac{b}{a}$ where $\hat{\pi}_t$ is the rate of inflation that prevails in the economy under discretion.
- Since individuals in the economy are rational, they understand that policy makers choose inflation according to this first order condition. So $\pi_t^e = \hat{\pi}_t = \frac{b}{a}$. The loss function of the policy maker, which we denote $\hat{Z}_t$ becomes

$$\hat{Z}_t = \frac{a}{2}\hat{\pi}^2 - b\left(\hat{\pi} - \hat{\pi}\right) = \frac{b^2}{2a}$$

The Rule Solution

- When the policy maker is following a given rule, expectations are always consistent with that rule $\pi_t^e = \pi_t$. The general problem faced by the monetary policy maker can then be described as the following:

$$\text{Min}_{\pi_t} Z_t = \frac{a}{2}\pi_t^2$$

- This, of course, leads to a FOC of $\pi_t = 0$.
- So the optimal rule for the policy maker to follow is a rule where she sets inflation to be zero. If we use π_t^* to denote the inflation rate that prevails in the economy under a rule and Z_t^* to denote the corresponding loss function, we get the following results $\pi_t^* = 0$ and $Z_t^* = 0$.

The Cheating Solution

- The cheating solution is the final piece of the puzzle. This is the case where the policy maker succeeds in getting you to expect a certain promised rate of inflation and instead tries to "cheat" you by creating surprise inflation. Suppose the policy maker promised a rate of inflation $\bar{\pi}$ that people believe in.

Carrying out the Promise

- If the policymaker carries out the promise, it is as if she's following a rule, except that the rule is no longer necessarily the optimal rule of $\pi^* = 0$.
- In general, if the policy maker follows a rule of the form $\pi_t = \bar{\pi}$ then expectations are always consistent with that rule $\pi_t^e = \bar{\pi}$. Therefore the loss function of the policy maker is $\bar{Z}_t = \frac{a}{2}\bar{\pi}^2$
- Note that this is an expression that gives you the value of the loss function for a given rule. The optimal rule remains a rule with an inflation rate of zero.

Reneging on the Promise

- Keep in mind, however, that the policy maker wants to create surprise inflation once she gets individuals locked into these expectations.
- So her decision becomes

$$\text{Min}_{\pi_t} Z_t = \frac{a}{2}\pi_t^2 - b\left(\pi_t - \bar{\pi}\right)$$

- The first order condition for this maximization is $a\pi_t - b = 0$, which simplifies to $\tilde{\pi}_t = \frac{b}{a}$ where $\tilde{\pi}$ is the rate of inflation that prevails in the economy under cheating (note that this is identical to the discretionary solution but that it does not have to be the case always, it just happens to be the case here).
- The loss function of the policy maker, which we denote $\tilde{Z}_t$ becomes $\tilde{Z}_t = b\bar{\pi} - \frac{b^2}{2a}$

IV. THE REPUTATION SOLUTION OF THE BARRO/GORDON MODEL

- To summarize, we have four solutions: the Rule Solution (π^*), where the policymaker MUST deliver the specified inflation); the Discretion Solution ($\hat{\pi}$), where the policymaker has to treat expected inflation as given); the Cheating Solution ($\tilde{\pi}$) where the policymaker makes a promise and then reneges on it; and the Promise solution ($\bar{\pi}$) where the policymaker makes a promise and then sticks to it.

- Now that we have these four solutions, we can calculate the reputation solution. When we are thinking about the reputation solution, we have to find some way of describing the expectations of individuals in the economy, i.e. are individuals likely to trust the policy maker as long as she never cheats them, how long will it take for them to trust her again after she cheats them once etc.

- Possible examples are individuals who don't trust policy makers ever again after the first instance of cheating, policy makers who trust policy makers as long as they didn't cheat them in the near past regardless of what they may have done before then.

- The particular form of expectations that BG use is the following

$$\begin{aligned}\pi_t^e &= \bar{\pi} \text{ if } \pi_{t-1} = \pi_{t-1}^e \\ \pi_t^e &= \hat{\pi} \text{ if } \pi_{t-1} \neq \pi_{t-1}^e\end{aligned}$$

- This basically implies that individuals will believe the policy maker as long as she has not cheated them last year. If she does cheat them, then they would think that she is acting in a discretionary fashion and basically form expectations that way. Note that the punishment period is only 1 period long: if the policy maker cheats in period 1, then in period 2 individuals form expectations according to the discretionary solution; they will go back to expecting the promised rate of inflation in period 3, since in period 2 $\pi_{t-1} = \pi_{t-1}^e = \hat{\pi}$.

- Given that individuals from expectations this way we can then calculate the reputation solution. A policy maker will choose to deviate from the announced inflation path if the benefit from cheating individuals in this period is worth the cost of cheating individuals. The cost applies only for 1 period, since individuals only punish you for 1 period. Of course, if the structure of the expectations were different then the punishment would last longer.

- We can then calculate the gain from cheating. If the policy maker does not cheat, i.e. carries out her promise, her loss function in a given period is $\bar{Z}_t$. If she cheats, then her loss function (which is lower) is $\tilde{Z}_t$. The gain from cheating is then $\bar{Z}_t - \tilde{Z}_t$; basically the difference between the loss you would suffer anyway and the lower loss you suffer by cheating. [NOTE: Barro/Gordon report this as $Z_t^* - \tilde{Z}_t$ since initially they are considering a promise of zero, i.e. the rule].

- Similarly, we can also calculate the loss from cheating. The loss from cheating is incurred in the next period where instead of incurring a loss of $\bar{Z}_{t+1}$, the policy maker is forced to adopt the discretionary solution and incur a (higher) loss of $\hat{Z}_{t+1}$. So the loss from cheating, appropriately discounted back at a rate $0 \leq q \leq 1$ to the present, will be $q\left(\hat{Z}_{t+1} - \bar{Z}_{t+1}\right)$ [NOTE: Barro/Gordon report this as $\hat{Z}_{t+1} - Z_{t+1}^*$ since initially they are considering a promise of zero, i.e. the rule]

- Given that individuals from expectations this way we can then calculate the reputation solution. A policy maker will choose to deviate from the announced inflation path if the benefit from cheating individuals in this period is worth the cost of cheating individuals. The cost applies only for 1 period, since individuals only punish you for 1 period. Of course, if the structure of the expectations were different then the punishment would last longer.

- Expressions for the cost and benefit for any given rate of inflation $\bar{\pi}$ can be calculated as follows. The cost incurred by the policy maker (what BG call "enforcement") is given by the expression

$$\text{Cost } = q\left(\frac{b^2}{2a} - \frac{a}{2}\bar{\pi}^2\right)$$

- Correspondingly, the benefit to the policy maker from cheating, as a function of $\bar{\pi}$ (which BG term "temptation") is given by the expression

$$\text{Benefit } = \frac{a}{2}\bar{\pi}^2 - \left(b\bar{\pi} - \frac{b^2}{2a}\right) \equiv \frac{a}{2}\left(\frac{b}{a} - \bar{\pi}\right)^2$$

- Based on these answers, the only rates of inflation that can occur under reputation are values of $\bar{\pi}$ for which the costs exceed the benefits: i.e. values for which

$$\frac{a}{2}\left(\frac{b}{a} - \bar{\pi}\right)^2 < q\left(\frac{b^2}{2a} - \frac{a}{2}\bar{\pi}^2\right)$$

- We can simplify this expression and show that this inequality holds true when $\left(\frac{b}{a} - \bar{\pi}\right)^2 < q\left(\frac{b^2}{a^2} - \bar{\pi}^2\right)$. This further simplifies down to

$$\left(\frac{b}{a} - \bar{\pi}\right)^2 < q\left(\frac{b}{a} - \bar{\pi}\right)\left(\frac{b}{a} + \bar{\pi}\right) \Rightarrow \left(\frac{b}{a} - \bar{\pi}\right)\left[\left(\frac{b}{a} - \bar{\pi}\right) - q\left(\frac{b}{a} + \bar{\pi}\right)\right] < 0$$

- This corresponds to the following range of inflation values

$$\frac{(1-q)b}{(1+q)a} < \bar{\pi} < \frac{b}{a}$$

- As you can see, this range of inflation values shows that the outcome under reputation is better than under discretion but not as good as under a rule: the lowest possible value of

$$\bar{\pi} = \frac{(1-q)b}{(1+q)a}$$

- Furthermore, notice that the rule of 0 is not attainable. If the policy maker announced a desire to achieve a zero rate of inflation, her "temptation" would be $\frac{b^2}{2a}$, while her "enforcement" would be $q\left(\frac{b^2}{2a}\right)$. Thus a zero inflation promise is not credible.

- As Figure 1 of BG show, this rate is in between an inflation rate of zero and the discretionary rate of inflation. An important feature to note is that the more heavily you discount the future ($q \rightarrow 0$) the reputation solution approaches the discretionary solution $\bar{\pi} \rightarrow \frac{b}{a}$. The less you discount the future ($q \rightarrow 1$) the reputation solution approaches the rules solution $\bar{\pi} \rightarrow 0$.

- This result makes intuitive sense: basically it states that by factoring in the reputation of the policy maker, we can achieve an outcome better than discretion but not as good as a rule. However, the more the policy maker cares about the future (in some sense, the more her reputation matters) the closer the economy gets to the rule outcome. The less the policy maker cares about the future (the less she cares about her reputation), the more incentive she has to cheat and the closer the economy gets to the discretionary outcome.