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Abstract

In forward-looking models for monetary policy analysis, the conditions for full conditional optimality are not time invariant, and as a consequence imply an incentive each period for the central bank to depart from its previous optimized plan. The conditional "commitment" plan is therefore strategically incoherent. Discretionary optimality does not have this problem, but yields inferior performance. A "timeless perspective" policy rule proposed by Woodford is intended to overcome the incoherence and non-credibility of the commitment plan while yielding performance superior to that of discretionary policy behavior; this rule has received much attention. A fourth "fully timeless" alternative differs slightly from the timeless-perspective rule; it is unambiguously superior from an unconditional perspective but does not dominate from the conditional perspective. The paper discusses comparisons at some length and briefly considers the sustainability of these policy strategies.

1. Introduction

At a conference held by the Bank of Japan, with the topic of "incentive mechanisms for economic policymakers," it is natural to focus on incentives involving central banks. There are two levels at which central bank incentives could be considered, the private level and the social level. The former focuses on the self-interest of the central-bank institution or even the personal objectives of individuals in the central bank. This level is important because actual policy decisions are made by purposeful individuals or groups of individuals whose actions are strongly influenced by matters affecting their own income, prestige, working conditions, etc. It seems clear that a full understanding of policy behavior requires some attention to incentives at this level. But it also seems clear that a truly satisfactory analysis of the implied type would be extremely difficult, for policy-makers' objectives are in significant part concerned with attainment and retention of policy positions, the determination of which is part of a nation's political process. Adequate treatment of this aspect of behavior therefore requires an adequate model of the political system, including voter behavior. And despite many admirable efforts and considerable progress, the profession is still a long way from having a widely-accepted model of that type.

Accordingly, my paper will be concerned with the second level, in which we view the central bank as an altruistic entity that seeks to conduct monetary policy in a manner that will enhance social welfare. Specifically, I would like to briefly revisit the famous time-inconsistency problem introduced by Kydland and Prescott (1977), which involves the optimizing central bank's often-present incentive to depart from plans made in

previous periods. This is a much-studied problem that cannot be covered in its entirety, but there are some recent developments of interest that seem to warrant discussion.

The past few years (e.g., 1999-2005) have been marked by an outpouring of papers on the topic of optimal monetary policy, some of the more notable being Clarida, Galí, and Gertler (1999), Evans and Honkapohja (2003), Giannoni and Woodford (2005), Goodfriend and King (2001), Ireland (1997), Jensen (2002), King and Wolman (1999), Rotemberg and Woodford (1999), Svensson (1999, 2003), Svensson and Woodford (2005), Walsh (2003), and Woodford (1999, 2003).[1] These writers fail to agree, however, on the concept of optimality that is appropriate for monetary policy considerations. One obvious issue is whether it is desirable to use, as the monetary policymaker's objective function, the utility function of a representative individual agent as specified in the analyst's macroeconomic model. To do so would be rather natural, when considering social welfare. This is not, however, the issue on which the present paper is focused. Instead, the paper will be concerned with the appropriate perspective for monetary policy optimality, involving questions such as the following: Should optimization be unconditional or conditional on prevailing initial conditions? Should it or should it not presume some form of commitment by the monetary authority? If so, what form? What is the nature and relevance of Woodford's (1999, 2003) prominent "timeless perspective" approach? These and other related matters are the focus of this paper, which presumes that the policymaker's primary concern is with routine monetary stabilization, not a transition from (e.g.) a high-inflation to a low-inflation environment. It begins in Section 2 with the specification of an expository example, continues in Section 3 with a

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[1] Other relevant but less prominent items include Wolman (2001), Jensen (2001, 2003), Jensen and McCallum (2002), and McCallum and Nelson (2000).

delineation of some leading alternative approaches, and continues in Section 4 with a

discussion that contains much of the paper's analysis. Section 5 includes a very brief

discussion of sustainability issues and finally Section 6 provides a short summary. [2]

2. Example Model Specification

In order to illustrate more clearly the various possibilities, let us consider an

example based on a near-canonical model that appears very frequently in the literature.

Its specification is not satisfactory for all issues, partly because it takes the average

inflation target as given, but is useful for exposition of the particular issues at hand.[3]

Thus we suppose that the monetary authority (i.e., the central bank, abbreviated CB)

seeks at time t = 1 to minimize

$$(1) \qquad L_1 = E_1 \sum_{t=1}^{\infty} \beta^{t-1}[(\pi_t - \pi^*)^2 + \omega y_t^2]$$

in an economy in which inflation π_t and the output gap y_t are related by the price

adjustment relation

$$(2) \qquad \pi_t = \beta_1 E_t \pi_{t+1} + \alpha y_t + u_t.$$

Here the output gap is measured as a fractional (or logarithmic) departure from the

"natural rate" value of output that would prevail if prices were fully flexible, while π^* is

the CB's inflation target value. Also, u_t is a stochastic shock, reflecting some sort of

inefficiency that, for simplicity, may be taken to be white noise with mean zero.[4] Note

that the private-sector discount factor is denoted as β_1, indicating that it could possibly

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[2] Some of these issues have been discussed by Wolman (2001). His article is skillfully executed and
clearly written, but reaches conclusions that in some ways differ from those presented below.
[3] We are, in other words, here concerned with the attainment of specified policymaker objectives, not the
determination of which objectives would maximize individual welfare. The latter topic is an important one,
but the considerations explored here are logically prior—i.e., would continue to apply.
[4] For a rationalizing discussion of this shock term, see Woodford (2003, pp. 448-455).

differ from that of the CB, which is β. Initially, however, we assume that $\beta_1 = \beta$. The model at hand also includes an intertemporal optimizing condition of the "expectational IS" type, but this third relation is not relevant to the policy optimality problem at hand.[5]

In this linear-quadratic setup, certainty equivalence prevails so we can utilize the Lagrangian expression

$$(3) \qquad \Lambda_1 = \sum_{t=1}^{\infty} \left\{ \ \beta^{t-1}[(\pi_t - \pi^*)^2 + \omega y_t^2] \ + \lambda_t \beta^{t-1}[\beta_1 \pi_{t+1} + \alpha y_t + u_t - \pi_t] \ \right\}$$

and obtain the following first order conditions:

$$(4) \qquad 2\omega y_t + \alpha \lambda_t = 0 \qquad\qquad\qquad t = 1, 2, \dots$$

$$(5) \qquad 2(\pi_t - \pi^*) + \lambda_{t\text{-}1} - \lambda_t = 0 \qquad\qquad t = 2, 3, \dots$$

$$(6) \qquad 2(\pi_t - \pi^*) - \lambda_t = 0 \qquad\qquad\qquad t = 1.$$

For all periods after the (one-period) startup is completed, elimination of the Lagrangian multiplier λ_t readily yields

$$(7) \qquad (\pi_t - \pi^*) + (\omega/\alpha)(y_t - y_{t\text{-}1}) = 0 \qquad\qquad t = 2, 3, \dots.$$

For the startup period, however, (4) and (6) imply

$$(8) \qquad (\pi_t - \pi^*) + (\omega/\alpha)y_t = 0 \qquad\qquad\qquad t = 1.$$

The difference between (7) and (8) arises because the latter is concerned with the transition from prevailing initial conditions toward the stochastic steady state in which the system tends to settle down. The length of the startup or transition episode is only one period in this example because of the simplicity of model's specification; in a more complex model it could be longer.

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[5] If it is included as another constraint in the optimization problem, the optimal values of the associated Lagrange multipliers equal zero for all periods.

3. Alternative Perspectives

We now consider four types of policy strategy, which represent different perspectives on the concept of optimal monetary policy. The first of these is full commitment on the basis of existing initial conditions at $t = 1$; the relevant optimal rule is given by (7) and (8).[6] This approach is, however, dynamically inconsistent to such an extent that I would call it "strategically incoherent:" each time this policy is reconsidered, after the startup period, it generates with probability one an optimality condition that is inconsistent with the one indicated at the initiation of the policy in the startup period $t = 1$ (or whenever the strategy was most recently consulted) and this can be recognized at time $t = 1$.[7] This strategic incoherence manifests itself in a set of optimality conditions that are not time invariant—as indicated by equations (7) and (8).

We turn next to the "discretionary" type of optimization, i.e., a fresh calculation each period constrained only by currently existing conditions. In this case, condition (8) will apply to every period, $t = 1, 2, \ldots$. There is then no problem of strategic incoherence, if each period's choice is based on the presumption that the decision maker will behave the same way again in each future period. The weakness of this strategy, as emphasized by Woodford (1999, 2003) and others, is that it fails to influence expectations usefully and thereby results in performance in terms of CB objectives that is often relatively poor. As a

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[6] In this paper, I will use the word "rule" to refer to optimality conditions; i.e., to optimal targeting rules in the terminology of Svensson (2003). For partial disagreements with some of Svensson's terminology and arguments, irrelevant to the issues of this paper, see McCallum and Nelson (2004).

[7] It has been suggested that I simply say that the strategy is "time inconsistent." I prefer usually to avoid that term, however, because it is used with very different meanings by (e.g.) Chari and Kehoe (1990) and Woodford (2003, pp. 473, 508). For the record, Kydland and Prescott (1977) simply said "inconsistent." It would appear that "dynamically inconsistent" has the same meaning as time-inconsistent. Strategically incoherent strategies are the same as those that do not possess the property of continuity (see below) but the former term emphasizes that the lack of continuity will be known at the outset.

comparison of equations (7) and (8) reveals, the strategy specifies, in each period after the

startup, a condition that is quite different from one that would prevail under commitment if

the economy were in the vicinity of its steady state. (For illustrative quantitative

magnitudes, see Woodford (1999), McCallum and Nelson (2000), Jensen (2003), and

Giannoni and Woodford (2005).[8])

Third, the "timeless perspective" strategy, introduced by Woodford (1999), seeks

to overcome these two problems by relying upon first-order conditions that would have

been chosen under a commitment regime if it had been adopted in the distant past, i.e., by

implementation of condition (7) in all periods including the startup period.[9] This

approach therefore specifies a rule that is time invariant. Consequently, the timeless

perspective (TP) policy strategy [i.e., (7) for all t = 1, 2, …] is not strategically incoherent.

Thus applying (7) in any period τ after the startup yields a condition that agrees with the

condition for that period that this policy strategy specified (or would have specified) in

previous periods 1, 2, …, $\tau-1$. This property, which Woodford terms "continuation," is

critically important in his approach to rule design in two respects. First, rules that feature

continuation are arguably much more conducive to credibility—rational believability by

the public—than ones that do not have that property. Second, by viewing the rule as an

ongoing strategy or process the TP approach permits the central bank to update the model

used in its policymaking without implying any departure from the prevailing rule. So it is

not the case that the central bank cannot update its model when new information about

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[8] These references actually compare discretionary and timeless perspective policies, but the differences
from an unconditional perspective are the same as for the comparison at hand.
[9] Woodford's strategy seems to be basically similar to the one suggested by King and Wolman (1999, pp.
377-380). Dennis (2001) has shown that there are many timeless perspective strategies, since there are
many periods in the past in which the startup could have occurred, but Woodford (2003) argues that only
one is time invariant.

the nature of the economy is developed. Nevertheless, the TP rule is not "time consistent," in the usual sense requiring that there is no incentive for the policymaker to depart from the prescribed condition (7) in any period. Instead, there exists an incentive in each period after the startup to apply the discretionary rule (8), rather than (7), since it is preferable in relation to current conditions.[10] In terms of performance, the TP policy rule gives outcomes that are superior to discretion for most reasonable parameter values—see McCallum and Nelson (2000)—although Blake (2001) pointed out that discretion yields superior outcomes in some extreme cases.

It is, nevertheless, somewhat unclear why the TP policy, as developed by Woodford (1999) and extended by Svensson and Woodford (2005), is not designed to be more thoroughly "timeless." Its optimality rule is based on conditions obtained from a conditional optimality calculation, even though the initial conditions actually prevailing at the policy's startup date t = 1 are not the ones utilized. Yet the condition that is specified to prevail in all periods after the startup, i.e., in t = 2, 3, …, is different from the one that would be obtained from an optimality calculation that is fully timeless, in the sense of being based on unconditional optimality, and in that respect independent of startup conditions. That observation leads to a fourth perspective.

The simplest way of characterizing the fourth strategy or approach has been described by Wolman (2001) as optimal "steady state welfare," i.e., the most favorable expected value of the single-period objective function when compared across all feasible steady states. The inflation-rate emphasis of his paper led Wolman to discuss non-stochastic steady states, but basically the same considerations apply to a comparison of

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[10] Woodford (2003, pp. 23, 473) says that the TP strategy is time consistent, but under his terminology this means any strategy such that, if its reasoning were applied at a later date, it would result in continuation of the policy chosen in t = 1.

unconditionally-expected values of the loss function across stochastic steady states. In the present context the relevant policy rule would be the one that minimizes the unconditional expectation $E[(\pi_t - \pi^*)^2 + \omega y_t^2]$.

Suppose, then, that policy is designed to minimize $E[(\pi_t - \pi^*)^2 + \omega y_t^2]$. Then the policy rule—the optimality condition for model (2)—would be

$$(9) \qquad (\pi_t - \pi^*) + (\omega/\alpha)(y_t - \beta_1 y_{t-1}) = 0 \qquad\qquad t = 1, 2, 3, \ldots.$$

This condition cannot be readily derived analytically, but its optimality with respect to $E[(\pi_t - \pi^*)^2 + \omega y_t^2]$ has been established by Jensen (2001, 2003) and Blake (2001).[11] More generally, i.e., for other models as well at the one at hand, the fully timeless (unconditional) policy can be found by searching over candidate rules, a method utilized by Rotemberg and Woodford (1999) and (for many years) by Taylor (1979).

In what follows, it will be convenient to refer to these four concepts of monetary policy optimality with the following abbreviations: CC, for full conditional commitment optimality; DI for discretionary optimality; TP for Woodford-King-Wolman style timeless perspective optimality; and FT for Jensen-Blake fully timeless optimality.

4. Evaluation

As a starting point it is useful to note that an alternative and perhaps more appealing way to view the FT strategy is as one that minimizes the average value, across all possible startup-period initial conditions, of the policymaker's actual objective at $t = 1$, as given in expression (1).[12] In that case, by utilizing the law of iterated expectations, we have

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[11] See Jensen and McCallum (2002). Neither Jensen nor Blake was able to derive (9) analytically, but Blake verified using Maple that the condition is correct when $\beta = 1$.

[12] The probability distribution of the initial conditions is taken to be that obtaining unconditionally with respect to the process generated by the model in conjunction with the rule itself.

$$(10) \quad E\left\{E_1 \sum_{t=1}^{\infty} \beta^{t-1}[(\pi_t - \pi^*)^2 + \omega y_t^2]\right\} = E \sum_{t=1}^{\infty} \beta^{t-1}[(\pi_t - \pi^*)^2 + \omega y_t^2]$$

$$= \sum_{t=1}^{\infty} \beta^{t-1} E[(\pi_t - \pi^*)^2 + \omega y_t^2] = (1 - \beta)^{-1} E[(\pi_t - \pi^*)^2 + \omega y_t^2].$$

Thus the unconditional expectation of the conditional expected value (1) is proportional to the unconditional expected value of the single-period loss function. This equality provides an alternative perspective for the FT criterion.

In his influential treatise, Woodford (2003, pp. 508-509) has argued that a different criterion, which supports the TP rule, is more appropriate than the FT criterion (10). His argument hinges on a division of the sum in (1) into two components. The first of these pertains to "the deterministic component of the equilibrium paths of the target variables" and the second to "the equilibrium responses to unexpected shocks in periods after" the startup in $t = 1$. It can be seen that the TP rule (7) implied by the latter component involves different dynamic responses to shocks, after startup influences have worn off and conditions approximating a stochastic steady state have been achieved, than those implied by the FT rule (9).[13] My purpose now is to consider the relative merits of the TP and FT criteria.

To begin with, it is useful to note that when β_1 and β can differ, the TP optimality condition (obtained from the revised versions of (4)-(6)) is not (7) but instead

$$(7') \quad (\pi_t - \pi^*) + (\omega/\alpha)[y_t - (\beta_1/\beta) y_{t-1}] = 0, \qquad\qquad t = 1, 2, 3, \ldots.$$

of which (7) is a special case. It is apparent, then, that the two rules (7') and (9) differ only in that the latter presumes that the central bank does not discount future outcomes

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[13] In my notation, and with $\pi^* = 0$, this second component is $\sum_{t=1}^{\infty} \beta^{t-1}[E_1(\pi_t - E_1\pi_t)^2 + \omega E_1(y_t - E_1 y_t)^2]$. Because of the influence of initial conditions, the conditional variance terms may not be the same for all t so the discounting with β is potentially relevant.

relative to present ones. Note that this difference is relevant for both transitional and steady-state policy behavior. It would seem that for the transition episode the application of discounting would be inappropriate since the start-up conditions will almost certainly not be those for which (7) is fully optimal. That objection cannot be applied, however, to the steady-state situation. And for the stochastic steady state analysis it seems that if the central bank's preferences reflect discounting of the future, then it would be improper to set $\beta = 1$ in (7'), as is implicitly done in (9).

Another way to make the same point is as follows. In the basic example at hand, application of (7'), both in the start-up period and thereafter, fails to be fully optimal only because the <u>transition</u> from the initial conditions to the stochastic steady state is not optimal. But this difficulty would not be present if the start-up happened to occur when the previous period's y_t was by chance equal to zero, for then (7') would entail the same behavior as (8). If instead (9) were applied, it would again be true that there would be no start-up or transitional inefficiency [since (9), too, is the same as (8) when $y_0 = 0$]. But in this case the conditions [(7') and (8)] for full optimality would not be met by use of (9), presuming that $\beta \neq 1$, but would be met by use of (7').

The foregoing consideration suggests that I was wrong to argue in favor of the FT criterion in my comment (McCallum, 2005) on a major paper by Svensson and Woodford (2005). This special-case consideration is based, however, on the presumption that the early periods after the initiation of the rule are of no concern to the CB. But presumably any actual CB does in fact care about the outcomes in transition periods, even if its main concern is the steady-state performance of the system. If $t = 1$ is the startup period, then (1) is by assumption the CB's actual objective function. What is desired, then, is a rule

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that minimizes (1) subject to the constraint that it has the property of continuity. It is

natural, then, to look for a time-invariant rule of the form

(11) $(\pi_t - \pi^*) + \psi_1 y_t - \psi_2 y_{t-1} = 0,$ $t = 1, 2, 3, \ldots$

which includes (7') and (9) as special cases. Jensen (2003) has shown, however, that

such a rule will have coefficients ψ_1 and ψ_2 whose values depend upon the initial

conditions that happen to prevail at the startup date $t = 1$. But that finding implies that

the rule will not have the crucial property of continuity.

What, then, are the merits of the two candidate rules, (7') and (9), that do feature

continuity? From the discussion above we see that the TP condition (7') would be

optimal if the CB did not care about the component of losses that results from a startup in

which y_0 does not equal 0. But the conditional perspective of (1) implies that the CB

does in fact care about that component, and the FT condition (9) takes account of it—but

in a fashion that does not correctly discount distant periods relative to current periods.

Thus the TP rule (7') performs relatively better in terms of responding to shocks

(Woodford's criterion) whereas the FT rule performs relatively better on average with

respect to transitional effects (which continue indefinitely even though (7') and (9) differ

for only one period). Neither rule, accordingly, is entirely satisfactory. Both, however,

feature continuity and under many conditions yield outcomes superior to discretion.

Before moving on, it will be desirable to digress briefly to mention two lines of

argument that are in my opinion not useful in the present context. First, it has been

suggested to me that y_{t-1} and therefore initial conditions should be considered irrelevant

in models based on equation (2), since u_t is the only apparent state variable. I fully share

the implied enthusiasm for minimum-state-variable formulations, but I do not agree that

y_{t-1} is irrelevant and would argue as follows. In a model in which the policymaker's behavior is specified in terms of an instrument rule, the (minimum) list of state variables is unambiguous. But when the model includes forward-looking agents and it is specified that policy is conducted "optimally," given the rest of the model, the list of state variables is not immediately obvious. Instead, this list will depend upon what policy behavior is found to be optimal. In the model of equation (2), superior results can be obtained by the central bank if it takes into account y_{t-1}, as equations (4)-(8) illustrate. Therefore, y_{t-1} is a relevant state variable, if policy behavior is specified to be optimal, and that in turn implies that initial conditions (concerning y_{t-1}) are relevant.

Second, much of Wolman's (2001) discussion concerns the differing steady-state properties of policies that are analogous to the third and fourth of those considered above, the TP and FT policies. In his model, in which the target inflation value is derived rather than prespecified, the implied steady-state rates of inflation differ for these two policies with the TP policy implying a zero inflation rate and the FT policy implying a small positive rate. It can be shown, however, that this difference stems from a model specification that many analysts might consider inappropriate.[14] It stems, to be specific, from a property of the assumed price adjustment behavior that leads to violation of the natural-rate hypothesis concerning the output gap.[15] If the setup assumed that the prices, of those firms that are <u>not</u> choosing new prices in a given period, rise at the trend rate of inflation (or the previous period's rate of inflation) rather than staying constant, then the model's implication would be that the steady-state output gap is invariant to the steady-

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[14] See, for example, Yun (1996), Erceg, Henderson, and Levin (2000), and Christiano, Eichenbaum, and Evans (2001).

[15] See equation (2), according to which different maintained values of π_t imply different maintained values of y_t.

state rate of inflation.[16] This alternative formulation, which should arguably be regarded

as a more rational specification of private behavior, would then eliminate the difference

in steady-state rates of inflation under the TP and FT policies.[17]

5. Sustainability

A basic issue, neglected to this point, is whether any of the policies, other than the

discretionary and time-consistent regime implying the DI condition (8) in all periods, are

plausible since each of them involves a recurring temptation by the central bank to revert

to (8), with neglect of expectational effects. In game-theoretic terms, only policy (8) of

those discussed is subgame perfect. An analytical approach to this issue that I find

appealing, partly because it clearly recognizes that atomistic private agents do not behave

strategically with respect to the (non-atomistic) central bank, involves the notion of

sustainability, as developed by Chari and Kehoe (1990), applied by Ireland (1997), and

recently discussed and extended by Kurozumi (2005).

Roughly speaking, a candidate policy rule is sustainable if in each period the CB

finds it more desirable (i.e., the expected value of L_1 is smaller) to continue with this rule

than to switch permanently to the discretionary rule (8).[18] Kurozumi (2005) has

investigated the sustainability of equilibria that are CC optimal and found that, for

realistically calibrated values of model parameters and assumed stochastic properties of

the shock process u_t, unrealistically high values of β are required to make the CC

equilibrium sustainable. A similar result is reported to hold, moreover, for the TP rule—

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[16] In terms of our setup, π_t in (1) and (2) would represent the difference between inflation and its target value, with π^* then equal to zero. In (2), the steady state value of π would be zero, so y = 0 would be implied.
[17] Both would equal zero if there were no "transaction frictions," or more generally would equal the negative of the steady state real rate of return so as to imply Friedman's (1969) optimal rate of inflation.
[18] Analytically, this description is actually an implication of the Chari and Kehoe (1990) definition of sustainability, which is based on the idea of sequentially rational equilibria under plausible information assumptions, with individuals behaving atomistically and the central bank as a leader.

and apparently the same would also be true for the FT rule. On the other hand,

Kurozumi's calculations appear to indicate that TP and FT rules could present attractive

options for central banks to adopt when recent values of y_t are close to zero. Extensions

of his calculations could be employed to determine some aspects of the sustainability of

TP and FT rules for given values of y_{t-1} under various assumptions, and perhaps other

rules of the form $\pi_t - \pi^* + (\omega/\alpha)(y_t - \zeta y_{t-1})$ for $0 < \zeta < 1$. Such calculations might

suggest rules superior to discretionary behavior that would promise improved

performance and have relatively attractive sustainability properties, i.e., high probabilities

that there will be no reversion to DI for many years.

I am, on the other hand, somewhat ambivalent about the appropriateness of

sustainability analysis. Because unrealistically high values of β are required for full

sustainability, some authors seem to suggest that there is something literally <u>infeasible</u>

about a policy that imposes (9) or (7) in each period. But that is not the case; there are no

physical constraints to prevent the CB from adopting such policies.[19] Yet, if rationality

expectations were to obtain beginning immediately in the startup period, the

unconditional expectation (average) of the loss function (1) would in most cases be

smaller with (9) than with the discretionary rule (8).[20] The legitimate objection to this

last observation is instead, I believe, that expectations of private agents may differ from

the CB's plans for a substantial number of periods, until the public becomes convinced

that the CB is going to continue with its behavior of type (9) or (7) and agents' forecasts

come to satisfy (approximately) rational expectations. But that is an issue concerning the

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[19] Writers in the area refer to "sustainability constraints," but these are actually conditions pertaining to assumed behavior (including expectation formation) of private agents, not literal constraints on central-bank policy.
[20] See Jensen and McCallum (2002).

transition period, and for the latter the hypothesis of rational expectations itself should be suspect. More appropriate, arguably, is the position taken by Lucas (1980) or Kydland and Prescott (1977) according to which the rational expectations assumption is relevant only for consideration of ongoing regimes after they have settled into stochastic steady states. Considerations of conditional optimality require, in a dynamic setting, some alternative assumption concerning expectation formation during any transition period that occurs between startup and (approximate) achievement of stochastic steady-state conditions. The same difficulty also pertains, evidently, to game-theoretic treatments of the problem. Thus their results, too, are highly suspect and provide an inadequate basis for drawing firm conclusions. Indeed, there seems to be at present no fully satisfactory method for plausible modeling of transition periods following the startup of a new policy regime.

6. Conclusions

The foregoing sections have reviewed considerations relevant to monetary policy optimality in economies with a forward-looking structure—i.e., inclusion of at least one structural equation that involves an expectation of some endogenous variable that will be realized in a future period. The discussion compares properties of four types of "optimal" monetary policy rules in the context of a near-canonical model with Calvo-type price adjustments. The four types of rules are: (CC) full commitment conditional upon prevailing conditions; (DI) discretionary optimality representing period by period re-optimization; (TP) the timeless perspective form of behavior championed by Woodford (1999, 2003); and (FT) a more "fully timeless" alternative due to Jensen (2001, 2003) and Blake (2001) that optimizes with respect to the unconditional expectation of the central

bank's objective function, which is itself the conditional expectation of the present value of current and future losses (these being quadratic in inflation and the output gap). The TP and FT strategies have the desirable property of continuity, whereby a central bank that reconsiders a policy plan at a later date but (using the same strategy) finds it desirable to continue with its plan. There still remains some temptation to revert to the discretionary regime, however, when the conditions for sustainability are not met. The paper discusses several considerations pertaining to the difference between TP and FT policy rules, concluding that both are attractive with neither dominating the other.

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