Nominal GDP Targeting: Policy Rule or Ad-Hoc Splurge?

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1. Introduction

At our SOMC meeting about two years ago, I argued that nominal GDP targeting, which was at the time experiencing an upsurge of interest, would be an attractive method of conducting monetary policy. In doing so, however, I emphasized that there are two quite distinct versions of this proposal, one featuring a target of constant growth rates of nominal GDP period by period and the other featuring target levels that grow at a constant rate, i.e., versions featuring constant growth rates vs. constantly growing levels. Even with the same specified growth rate, these two versions yield quite different targets at any time at which the current level is significantly different from the value that had been planned for it at the outset of the regime. And, most importantly, they have highly different implications if the regime is begun at a time in which current GDP is highly different from the value with which one would wish to begin. In particular, the scheme that I would favor for *current* adoption in the U.S. is one in which the Fed would strive to achieve a growth rate of nominal GDP of (say) five percent per year in each quarter over the indefinite future, while several other economists have promoted a policy of having the Fed strive to return to a constant growth path that rises at 5% per year, starting at the level of actual GDP as of the third quarter of 2008 (or some other time before the beginning of our long current slump). In the latter case the current target value would be about 15 percent above the actual current level of nominal GDP.

2. Recent Developments

As a long-time promoter of nominal GDP targeting, I was quite interested to learn from national newspapers, a little over one year ago, that at the Kansas City Fed's 2012 Jackson Hole Conference Michael Woodford had expressed some support for a nominal GDP procedure. This was highly newsworthy, of course, because Woodford has probably been the most influential of all academic monetary economists over the past decade. Then after obtaining a copy of his paper, I was disappointed to see that it was the growing levels version that he was promoting. In particular, the appropriate path to strive for, in his version, would be defined by a log-linear line "fit to the data between the first quarter of 1990 and the third quarter of 2008

(that is, the last quarter before the zero lower bound became a binding constraint)." This seemed somewhat surprising, in light of Woodford's important development, first presented at the Jackson Hole Conference of 1999, of the concept of "timelessly optimal" monetary policy rules. To explain this issue will require a bit of explicit modeling. Readers who wish to move directly to our conclusions, thereby bypassing the technical analysis, may omit Section 3.

3. Analysis in Basic Model

Here we proceed by considering the implications of the level vs. growth-rate choice in the context of a simplified but explicit model of the type used as the starting point in a vast number of prominent publications including the treatise/textbooks of Woodford (2003), Walsh (2003, 2010), and Gali (2008), plus the highly influential articles of Clarida, Gali, and Gertler (1999) and Woodford (1999). Specifically, we adopt a system comprising a Calvo-type price-adjustment/aggregate supply relationship

(1) $\pi_t = \beta E_t \pi_{t+1} + \kappa \tilde{y}_t + u_t$,

together with an "expectational IS" relation built from an intertemporal Euler equation plus some simplifying assumptions regarding aggregate capital and government spending, viz.,

(2) $\tilde{y}_t = E_t \tilde{y}_{t+1} + b(R_t - E_t \pi_{t+1}) + v_t$.

In these equations the symbols are p_t = price level given by GDP deflator, $\pi_t = p_t - p_{t-1}$ = inflation (in period t), $\tilde{y}_t = y_t - \bar{y}_t$ is the output gap (output minus its "natural rate" value $\bar{y}_t$, and R_t = one-period nominal interest rate. In this setting we posit that the central bank manages the nominal interest rate R_t (or some other instrument) which is adjusted period by period so as to minimize the sum $\sum_{t=1}^{\infty} \beta^{t-1}[(\pi_t - \pi^*)^2 + \omega \tilde{y}_t^2]$;

beginning at an arbitrary date designated as $t = 1$.[2] Here π^* is the CB's average-inflation target while

[2] At this point it is being assumed that the economy is not in a "liquidity trap" situation in which the CB is powerless to affect aggregate demand. The issue here at hand concerns an appropriate target variable for monetary policy, not issues relating to the management of instruments.

$\tilde{y}_t = y_t - \bar{y}_t$ is the output "gap," i.e., the fractional departure of output from its flexible-price ("natural rate" or "full employment") value. To provide some analytical coherence, we assume a growth rate of this latter value that is a constant g plus white noise in the sense that $\bar{y}_t = \bar{y}_{t-1} + g + \varepsilon_t$, where $E\varepsilon_t = 0$ and $E\varepsilon_t\varepsilon_{t-1} = \sigma_\varepsilon^2$ for all t.[3]

In this linear-quadratic setup, certainty equivalence prevails for conditional optimality, so we can write the Lagrangian expression

$$(3) \qquad \mathcal{L}_1 = \sum_{t=1}^{\infty} \beta^{t-1} \{ \ [(\pi_t - \pi^*)^2 + \omega \tilde{y}_t^2] + \lambda_t \beta^{t-1} [\beta \pi_{t+1} + \kappa \tilde{y}_t + u_t - \pi_t] \ \},$$

and obtain, by differentiating with respect to $\tilde{y}_t$ and π_t, the following first order optimality conditions:

$$(4) \qquad 2\omega \tilde{y}_t + \kappa \lambda_t = 0 \qquad\qquad t = 1, 2, \ldots$$

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

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

Then for all periods after the startup is completed, both (4) and (5) must hold, so elimination [between (4) and (5)] of the Lagrangian multiplier λ_t yields

$$(7) \qquad (\pi_t - \pi^*) + (\omega/\kappa)(\tilde{y}_t - \tilde{y}_{t-1}) = 0. \qquad\qquad t = 2, 3, \ldots.$$

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

$$(8) \qquad (\pi_t - \pi^*) + (\omega/\kappa)\tilde{y}_t = 0 \qquad\qquad t = 1.$$

The difference between (7) and (8) arises because the latter is concerned, and the former is not, 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 model's simplified specification; in a more complex model it could be greater.

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[3] This growth rate could in principle be variable if it is exogenous, but there would be no gain from this increased complexity.

We now consider three 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 in this case is given by (7) and (8).[4] This approach is, however, dynamically inconsistent to an extent that might be termed *strategic incoherence*: each time this policy is reconsidered, after the startup period, the analysis yields with probability 1.0 an optimality condition (analogous to (8)) that is inconsistent with the one indicated (for that period) at the initiation of the policy action in the startup period t = 1 (or, indeed, whenever the strategy was most recently consulted).[5] This strategic incoherence manifests itself in a set of optimality conditions that are not time invariant—as shown by equations (7) and (8).

We turn next to the "discretionary" type of optimization, i.e., a fresh calculation in each period constrained only by currently existing conditions and formulated with the recognition that the same approach will be used in the future. In this case, the (startup) condition (8) will apply in every period, t = 1, 2, …. There is in this case no problem of strategic incoherence, because 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 mentioned at the start of this section, is that its performance in terms of CB objectives, here expressed in (3), is typically relatively poor. As a comparison of equations (7) and (8) reveals, the discretionary strategy specifies in each period a condition [i.e., (8)] that is quite different from the one that would be dictated by commitment [i.e., (7)] and which would prevail under commitment if the economy were in the vicinity of its steady state. For some illustrative quantitative magnitudes, see Woodford (1999), Jensen (2003), McCallum and Nelson (2004), and Giannoni

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[4] In this section, 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 (2005).

[5] It might be suggested that I simply say that the strategy is "time inconsistent." I prefer mostly to avoid that term, however, because it is used with very different meanings by (e.g.) Kydland and Prescott (1977) as compared with Woodford (2003, pp. 473, 508).

and Woodford, 2003.[6]

Thirdly, the "timeless perspective" (TP) strategy, introduced by Woodford (1999) (2003, pp. 468-475), 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.[7] This approach therefore specifies a rule that is time invariant—a property that should be possessed by any procedure that is intended to represent a coherent rule. It is admittedly unfortunate that it is not also "time consistent," in the Kydland-Prescott (1977) sense, which requires 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 given current conditions. This *timeless perspective* policy strategy [(7) for all t = 1, 2, …] is not, however, strategically incoherent [as is the case with (7) plus (8) i.e., full commitment]. Instead, applying (7) in each period τ after the startup yields a condition that *agrees with the condition for period τ that this policy strategy specifie*d *(or would have specified) in previous periods 1, 2, …, τ–1*.[8] Moreover, in terms of performance the TP policy gives outcomes that are superior to discretion (that is, application of (8) in all periods) for most reasonable parameter values—see McCallum and Nelson (2000)—although Blake (2001) has shown that discretion yields superior outcomes in some extreme cases.

How do these results relate to nominal income targeting? We see that they do so by recognizing that the timeless-perspective optimality condition—the most attractive of the policy strategies considered—coincides precisely with nominal income targeting *in terms of nominal income growth rates* if the parameters κ and ω satisfy $\kappa/\omega = 1$. To be explicit, note that with $\omega/\kappa = 1$ then equation (7) becomes

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[6] These references actually compare discretionary and "timeless perspective" policies, rather than discretionary and commitment policies, but the difference from an unconditional perspective is the same as for the comparison at hand.

[7] Woodford's strategy is closely related to the approach taken by King and Wolman (1999, pp. 377-380). Dennis (2001) has shown that there are many timeless perspective strategies, but Woodford (2003) argues that only one is time invariant.

[8] In Woodford's (1999) language, the TP approach features strategic policy continuity.

(7') $(p_t + y_t) - (p_{t-1} + y_{t-1}) = \pi^* + (\bar{y}_t - \bar{y}_{t-1})$

with the final term being equal to g, the average growth rate of capacity, plus the white noise shock ε_t. That is, we have $\bar{y}_t - \bar{y}_{t-1} = g + \varepsilon_t$ so $E_{t-1}(\bar{y}_t - \bar{y}_{t-1}) = g$.

Is the $\kappa/\omega = 1$ condition likely to prevail in an actual economy of interest? Of course not—certainly not exactly—but that condition is precisely what the adoption of a nominal income criterion, whether in levels or growth rates, implicitly presumes. What Woodford (2013, p. 47) has to say in justification of this approach is (in part) as follows:

"Essentially, the nominal GDP target path represents a compromise between the aspiration to choose a target that would achieve an ideal equilibrium if correctly understood and the need to pick a target that can be widely understood and can be implemented in a way that allows for verification of the central bank's pursuit of its alleged target, in the spirit of Milton Friedman's celebrated proposal of a constant growth rate for a monetary aggregate. Indeed, it can be viewed as a modern version of Friedman's "k-percent rule" proposal in which the variable that Friedman actually cared about stabilizing (the growth rate of nominal income) replaces the monetary aggregate that he proposed as a better proximate target, on the ground that the Fed had much more direct control over the money supply…."

Next we contrast the foregoing with the case of nominal income targeting in terms of *levels*. In this regard, let us note that condition (8) can be written, again with $(\omega/\kappa) = 1$, as

(8') $p_t + y_t = (p_{t-1} + \bar{y}_{t-1}) + \pi^* + g + \varepsilon_t$

which would be viewed, with only lagged and exogenous terms on the right hand side, as nominal GDP targeting in terms of levels. Then, since the latter can be written as

(8'') $p_t + y_t = (p_{t-1} + y_{t-1}) + \pi^* + g + \varepsilon_t - \tilde{y}_{t-1}$

and since we have $E_{t-1}\varepsilon_t = 0$,we can make a comparison with (7') and note that whenever $\tilde{y}_{t-1}$ is negative, the left-hand side of (8'') is the larger of the two. From these we see that if $y_{t-1} < \bar{y}_{t-1}$, i.e., if the most

recent output rate is below capacity, then (8'') calls for a larger level of nominal gdp, point for point, in period t. Since this is a call to correct any existing discrepancy fully within one period, one might think of it as representing a "splurge."

Evidently, to continue, the discretionary strategy would also call for a stronger response than the timeless-perspective policy when the most recent output is above capacity. Thus it implies stronger responses to output departures from the flexible-price value in all cases. Is that desirable or undesirable? The answer is, according to the previous studies mentioned above, usually but not invariably, "no," instead the timeless-perspective strategy yields better outcomes on average.

4. Discussion

The forgoing pages have shown that, if percentage departures from target values of inflation and output are weighed equally ($\kappa/\omega = 1$), then in a stripped-down but neo-canonical model, targeting of nominal GDP in terms of growth rates is analytically equivalent to adoption of a monetary policy that is optimal from the "timeless perspective," in the sense developed and promoted by Woodford (1999, 2003) and widely utilized in recent monetary policy analysis. This result is, evidently, highly supportive of a monetary policy strategy based upon nominal GDP growth rate targeting.

In addition it is shown that when, in the same analytical framework, current conditions are such that the most recently observed output gap is negative—i.e., output is below its natural-rate value—then nominal GDP targeting in terms of levels will call for a more rapid expansion of nominal GDP than will targeting of growth rates. This result is not surprising, but is probably a contributor to the recent upsurge of interest in nominal GDP targeting, since the U.S. economy has been depressed over the past five years (as of 2013). This type of nominal GDP targeting is not, however, optimal from the timeless perspective but instead corresponds to the "discretionary optimization" type of policymaking that has been shown to be inferior to the former, on average and with most plausible formulations and calibrations, by Woodford (2003), McCallum and Nelson (2004), Walsh (2010), and other analysts.

5. Conclusions

It must be stated explicitly that the foregoing discussion does not point to any inconsistency on the part of Woodford. As he would perhaps emphasize, the discussion in Woodford (2013) is not concerned with policy rules of the type that is considered above in Section 3. Instead, in this more recent piece Woodford's main concern is to devise communication strategies for informing the public about policy actions to be taken in the future. In particular, the relevant topic is "forward guidance," defined as "explicit statements by a central bank about the outlook for future policy, in addition to its announcements about immediate policy actions that it is undertaking" (Woodford, 2013, p. 186). In this context it would be difficult to disagree with one of his positions, namely that "… the most effective form of forward guidance involves advance commitment to definite criteria for future policy decisions…," rather than mere forecasts.

This paper's body of research is very impressive, intellectually. To me, however, its focus on forward guidance seems to distract one from a larger issue, namely, that the Federal Reserve has not been willing to conduct policy in accordance with *any* clearly defined policy rule (such as the Taylor Rule). A nominal gdp target for this rule, rather than the weighted average of inflation and output gaps as embodied in the Taylor rule, would represent a slight simplification that might add clarity and could be helpful in communication with the public. Within that context, the discussion in Section 3 above indicates that the growth-rate version would be preferable.

More generally, an emphasis on the forward-guidance literature, with its subtle and indirect expectational effects, seems rather misguided. For many years, until the introduction of the Euro, the world's most respected central bank was the Deutsche Bundesbank. This was true despite the fact that its rhetoric was rather inconsistent with its actions. Its policy was effective, nevertheless, because the public knew, *from experience*, that it was dedicated to keeping inflation under control, at a reasonably low rate.

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