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Should Central Banks Raise Their Inflation Targets? Some Relevant Issues

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The purpose of this article is to consider the merits and demerits of the recently renewed suggestion that central banks should, because of the difficulty of providing additional monetary stimulus when the policy interest rate is at its zero lower bound, raise their inflation rate targets—for example, from 2 percent per annum to 4 percent. As is well known, this suggestion has been put forth by several economists over the years,[1] but has recently attracted special prominence as the result of a working paper coauthored by Olivier Blanchard, who is not only a leading macroeconomist but is also currently serving as director of research of the International Monetary Fund. The article by Blanchard and coauthors (Blanchard, Dell'Ariccia, and Mauro 2010) does not explicitly promote this suggestion but discusses it in a distinctly sympathetic manner.

In considering the issue, one apparently needs to compare the magnitude of the benefits from occasionally being able to provide additional monetary stimulus against the costs of maintaining inflation at a higher value (on average) than would be chosen in the absence of the zero lower bound (ZLB). An extensive and sophisticated analysis relating precisely to this topic has recently been provided by Schmitt-Grohé and Uribe (2010), an article that will

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[1] Frequently cited examples are Summers (1991) and Fischer (1996). Also see Williams (2009) and Yellen (2009).

be drawn upon heavily in what follows. Our discussion begins in Section 1 with the usual starting point for such matters, the analysis underlying Milton Friedman's "optimal quantity of money" result, often termed "the Friedman Rule."[2] Next, in Section 2 attention is turned to the type of distortion emphasized more prominently in the mainstream New Keynesian literature of recent years, namely, resource misallocations brought about by the existence of nominal price stickiness that, in each period, affects some sellers but not others. Section 3 reports on the Schmitt-Grohé and Uribe (2010) analysis of one key question, namely, whether a steady inflation rate greater than 2 percent would be optimal, as indicated by recent formal analysis, when account is taken of the ZLB. Section 4 is concerned with suggestions to the effect that when the ZLB is a constraint on the usual one-period policy interest rate, other variables such as exchange rates or longer-term interest rates could be effectively used as the instrument variable. Then in Section 5 our focus shifts to a line of argument that contends that the ZLB is not in fact a necessary bound, i.e., that with modified institutions it would not be impossible for central banks to provide monetary stimulus even when the basic one-period interbank rate is zero. Finally, in Section 6 we take up matters not considered to that point, ones having to do with the essential role of central banks and other related political-economy issues. Section 7 concludes briefly.

1. TRADITIONAL THEORY: TAXATION DISTORTIONS

Most monetary economists are familiar with the basic idea of the Friedman-rule analysis: Valuable transaction-facilitating services are provided in larger amounts by larger holdings of real money balances, which will be chosen by agents when the interest-opportunity cost of holding money is lower. This cost can be varied by varying the ongoing inflation rate, which can be adjusted by varying the rate of nominal money creation. Accordingly, since different rates of (paper) money creation do not require different rates of usage of tangible resources, the rate should be chosen that leads agents to satiate themselves with the transaction-facilitating services provided by holdings of money balances.[3] This rate prevails when the opportunity cost of holding money is zero, i.e., when the real rate of return on money holdings is equal to the real rate of return

[2] It has been my preference to refer to this result as the "Chicago rule" because (i) there is a different "Friedman rule" that stipulates that the "total stock of money. . . rises month by month, and indeed, so far as possible, day by day, at an annual rate of X percent, where X is some number between 3 and 5" (Friedman 1962, 54) and (ii) the criterion of satiating the holders of money with the transaction-facilitating services of money balances had been put forth by Tolley (1957), who proposed interest on reserves—not deflation to drive the interest rate to zero—as the operative mechanism. In any event, Friedman's first clear statement of the optimal inflation rate rule appears in Friedman (1960, 70), not Friedman (1969).

[3] This argument does not, of course, require a model specification that implies monetary superneutrality.

on other assets. Since the real rate of return on money equals zero minus the inflation rate, this condition will prevail when the inflation rate plus the real rate of return equals zero, i.e., when the nominal interest rate equals zero.

This result is developed more formally, and under several assumptions, by Schmitt-Grohé and Uribe (2010).[4] Their analysis develops some points that involve variants of the basic reasoning and are perhaps unfamiliar to some readers. One of these concerns the role of nondistortionary (i.e., lump-sum) taxes. Schmitt-Grohé and Uribe emphasize that the basic Friedman result requires that the fiscal authority must maintain a negative value for the basic fiscal deficit minus bond sales to the public if it is to continually reduce the money supply by enough to bring about a deflation rate (one that yields a zero nominal interest rate). Thus, the basic reasoning presumes that the fiscal authority has available to it some form of lump-sum taxation.

Alternatively, suppose that some government consumption is essential to optimality and that only non-lump-sum taxes on income (of various types) are available. Then it is often argued that an inflation tax (i.e., an inflation rate above the Friedman-rule magnitude) is necessary since optimality requires that the distortionary cost per unit of revenue raised must be the same at the margin for all utilized sources of taxation. Schmitt-Grohé and Uribe dispute this conclusion, associated with Phelps (1973), on the basis of a finding that, under certain specified conditions, the optimal inflation rate continues to equal the Friedman-rule magnitude even when some distorting taxes must be used to finance government consumption: They argue that "in contrast to Phelps's conjecture, negative inflation emerges as optimal even in an environment in which the only source of revenue available to the government, other than seigniorage revenue, is distortionary income taxation. Remarkably, the optimality of the Friedman rule obtains independently of the financial needs of the government. . . " (Schmitt-Grohé and Uribe 2010, 15). This interesting result apparently requires, however, the following assumptions: (i) exactly constant returns to scale in production, (ii) factors paid their marginal products, (iii) all factor incomes taxed at the same rate, and (iv) zero transaction costs for government consumption. The first three are interesting baseline assumptions, but (iv) seems unattractive: Are the resources used by government in shopping not valuable?

Before moving on, it is germane to point out some unorthodox opinions concerning the Friedman line of analysis that are expressed in the frequently cited piece by Summers (1991), mentioned earlier. Summers states: "I think

[4] Their initial and simplest statement is as follows: "In monetary models in which the only nominal friction takes the form of a demand for fiat money for transaction purposes, optimal monetary policy calls for minimizing the opportunity cost of holding money by setting the nominal interest rate to zero. This policy, also known as the Friedman Rule, implies an optimal rate of inflation that is negative and equal in absolute value to the real rate of interest" (Schmitt-Grohé and Uribe 2010, 1).

the view that inflation is costly is correct, but it has nothing to do with optimal tax theory. . . . A valid case for low inflation must have to do with the inefficiencies caused by allowing the monetary standard to vary and by the instability that results when the inflation trend is changed. Standard optimal tax issues along Ramsey lines are nth-order considerations. Inflation as a Ramsey tax may be the most overstudied issue in macroeconomics" (1991, 626–7). That I have some sympathy with one aspect of Summers's position may become apparent below.

2. MAINSTREAM NEW KEYNESIAN THEORY: CALVO-MODEL DISTORTIONS

In recent years, due in large part to the huge influence of Woodford's (2003) opus, less attention has been devoted to "nominal frictions" of the type discussed in the previous section, i.e., those having to do with the medium-of-exchange role of money.[5] Instead, the frictions focused upon pertain to posited stickiness of nominal prices of goods and, in some cases, labor. While other models of gradual price adjustment have been put forth,[6] the clear leader in this regard is the basic discrete-time version of Calvo (1983). As is well known, the stylized friction is that in each period only a fraction $1 - \omega$ of the economy's sellers, randomly selected, have the opportunity to change their prices, while others continue with the same prices as in the previous period. In any period, accordingly, there are sellers (of goods that have the same production cost functions) charging different prices in a setting of monopolistic competition. These features imply a misallocation of productive resources among the various sellers, which is the social cost of the nominal friction implied by the Calvo price specification. Only if monetary policy generates an average inflation rate that makes the average price of currently reoptimizing sellers equal to those of the other sellers (who are stuck with their previous prices) will this distortion be eliminated. Consequently, the optimal inflation rate in this environment (with no other nominal friction) equals zero.[7]

To consider the compromise between the Friedman-rule and Calvo-model optimal inflation rates, Schmitt-Grohé and Uribe adopt a specification that includes both types of friction and obtain results under various calibration assumptions. By and large, their results suggest that the tradeoff is such that

[5] Actually, there is an important sense in which these are "real," not nominal, frictions. That is, typical specifications posit that real transaction costs (either shopping time or real resource usage) are reduced when purchasers keep on hand additional quantities of money in real—not nominal—terms.

[6] The "sticky information" formulation of Mankiw and Reis (2002) and Reis (2009) has attained a fairly substantial following; my own favorite is discussed in McCallum (2008).

[7] For fleshed-out discussions see Woodford (2003, 392–419) and Schmitt-Grohé and Uribe (2010, 38–42).

the optimal rate is close to zero, i.e., that the importance of the price-setting friction is quantitatively greater, to a considerable extent, than the medium-of-exchange aspect featured in the Friedman-rule analysis. Their summary statement is: "We conclude that for plausible calibrations the price-stickiness friction dominates the optimal choice of long-run inflation" (Schmitt-Grohé and Uribe 2010, 51).

In this regard, I would like to suggest that there is one feature of the standard Calvo model that is crucial for this finding and that should be considered questionable at best. In particular, I would argue that the basic version of the Calvo model is flawed, as a model of optimal price setting with the assumed type of friction, via its assumption that those sellers, who do not have an opportunity to reoptimize in a given period, leave their prices at the value charged in the previous period. This might make sense in a world in which the steady-state inflation rate is zero, but if that rate was (say) X percent per period, it would seem that a rational pricing policy would call for each seller who cannot reoptimize to have his selling price automatically rise from its previous level by an amount that implies an X percent increase.[8] For an example of one formulation of this type, but extended to non-steady-state conditions, see the pricing behavior assumed in Woodford (2008; 1,566–8).[9] Under such a formulation, the average dispersion of prices will be unaffected by the steady-state inflation rate, so the social optimum depends only on Friedman-rule considerations. To demonstrate this, suppose that the price-adjustment relationship is written, as in Woodford (2008), as

$$\Delta p_t - \bar{\pi}_t = \beta \left(E_t \Delta p_{t+1} - \bar{\pi}_{t+1}\right) + \kappa \left(mc_t\right), \tag{1}$$

where Δp_t is inflation in period t, $\bar{\pi}_t$ is the period-t expected value of the ongoing inflation rate in the economy under consideration with the monetary policy rule under consideration,[10] and mc_t is the fractional deviation of marginal production cost in t from its steady-state value. Also $0 < \beta < 1$, and $\kappa > 0$. That the cost of inflation in the usual version of the Calvo model, in which the $\bar{\pi}_t$ and $\bar{\pi}_{t+1}$ terms do not appear, is proportional to the unconditional expectation $E\pi_t = E\pi_{t+1}$ can be seen as follows. From a steady-state

[8] These automatic price adjustments would have been arranged earlier, on the basis of existing information concerning the prevailing steady-state inflation rate.

[9] It is well known that Yun (1996), in an important early paper, utilized a price adjustment model that is somewhat similar to the basic Calvo model but in terms of deviations of inflation from steady-state values. More recently, specifications embodying the same basic idea as (1), i.e., that automatic price adjustments for sellers unable to reoptimize should be part of an optimizing price strategy in the face of price stickiness, have been extensively developed by Calvo, Celasun, and Kumhoff (2003) and Freedman et al. (2010), among others.

[10] Woodford (2008; 1,568) notes that $\bar{\pi}_t$ can be operationally viewed as the Beveridge-Nelson (1981) value of the "stochastic trend rate of inflation," i.e., a stochastic growth rate for the price level, which is well defined so long as the inflation rate is difference-stationary with an unconditional mean of zero for its first difference, which is here assumed. This value is ultimately given by the central bank's inflation target.

perspective we have

$$\Delta p = \beta \Delta p + \kappa \, (mc) \, ; \tag{2}$$

so $mc = [(1-\beta)/\kappa]\Delta p$, which departs from zero in proportion to the ongoing inflation rate. Thus, in that setup, the costs are minimized if $\Delta p = 0$. In the modified model (1), however, we have—since $E\Delta p_t = E\Delta p_{t+1} = E\Delta p$ and $E\pi_t = E\pi_{t+1}$—the steady-state relation is

$$(1-\beta)\,(0) = (1-\beta)\,(0) + \kappa E\,(mc_t)\,, \tag{3}$$

which implies that the average dispersion cost equals zero for whatever steady-state rate prevails. With this specification, then, the steady-state cost of inflation depends (in the absence of the ZLB) only upon the Friedman-rule "shoe-leather" cost occasioned by non-satiation with the services of the medium of exchange.

3. OPTIMALITY IN THE PRESENCE OF THE ZERO LOWER BOUND

At this point we turn to the ZLB issue more directly. One significant accomplishment of the Schmitt-Grohé and Uribe (2010) article is to consider, by means of simulations of a rich calibrated model under various assumptions, quantitative aspects of the optimal rate of inflation in economies with more than one nominal friction. Indeed, one section of Schmitt-Grohé and Uribe (2010) is entitled, "Does the Zero Bound Provide a Rationale for Positive Inflation Targets?" A quotation from the article may be useful in judging the nature of their study:

> We believe... this argument is best evaluated in the context of an empirically realistic quantitative model of the business cycle. In Schmitt-Grohé and Uribe (2007b) we study Ramsey optimal monetary policy in an estimated medium-scale model of the macroeconomy. The theoretical framework employed there emphasizes the importance of combining nominal as well as real rigidities in explaining the propagation of macroeconomic shocks. Specifically, the model features four nominal frictions, sticky prices, sticky wages, a transactional demand for money by households, and a cash-in-advance constraint on the wage bill of firms, and four sources of real rigidities, investment adjustment costs, variable capacity utilization, habit formation, and imperfect competition in product and factor markets. Aggregate fluctuations are driven by three shocks: a permanent neutral labor-augmenting technology shock, a permanent investment-specific technology shock, and temporary variations in government spending (2010, 52).

Schmitt-Grohé and Uribe explain how parameter values used in these exercises are obtained and offer plausible justification. The basic finding is that

"the Ramsey optimal policy implies a mean inflation rate of −0.4 percent per year.... Under the Ramsey optimal monetary policy, the standard deviation of the nominal interest rate is only 0.9 percentage points at an annual rate... [while] the Ramsey optimal level of the nominal interest rate is 4.4 percent... [implying that] for the nominal interest rate to violate the zero bound, it must fall more than 4 standard deviations below its target level" (2010, 53). In this regard, the quoted results are for an assumed time-preference rate of 0.03 per year, smaller than that implied by the 0.99 quarterly discount factor that is typically used in monetary policy studies. Moreover, "lowering the subjective discount factor... to 1 percent per year results in a Ramsey-optimal nominal interest rate process that... [implies that]... the nominal interest rate must still fall by almost three standard deviations below its mean for the zero bound to be violated" (2010, 53).

The point is, then, that the Schmitt-Grohé and Uribe analysis suggests that the ZLB constraint will be binding so rarely that these authors are led "to conjecture that in an augmented version of the model that explicitly imposes the zero bound constraint, the optimal inflation target would be similar to the −0.4 percent per year that is optimal" in their model (2010, 53). In support of that view, Schmitt-Grohé and Uribe comment on the results of Adam and Billi (2006), as follows: "These authors compute the optimal monetary policy in a simpler version of the new Keynesian model.... An advantage of their approach is that they take explicitly into account the zero bound restriction in computing the optimal policy regime. They find that the optimal monetary policy does not imply positive inflation on average and that the zero bound binds infrequently.... We conjecture... that should a money demand be added to their framework, the average optimal rate of inflation would indeed be negative" (2010, 54).[11]

Results of the type cited in this section are optimistic in that they do not offer much—if any—support to the idea that raising the inflation-target objective (and with it the average inflation rate) would be desirable. Unfortunately, however, they are inherently open to challenge and/or reinterpretation.

A significant problem, for example, is the absence from the Schmitt-Grohé and Uribe analysis of the distinction between one-period interbank rates of interest and one-period rates of the "risk-free" or "purely intertemporal" variety that is relevant for intertemporal decisions. That is, in analysis that recognizes a banking sector that uses resources to make loans that finance its money issues—the central bank supplying this sector with base money—the discrepancy between these interbank and risk-free rates can be quite large. In

[11] Schmitt-Grohé and Uribe (2010, 54) also cite results of Reifschneider and Williams (2000) that are compatible. Recently, Williams (2009) has, by contrast, discussed considerations that are more favorable with respect to the proposal of a raised inflation target. Even more recently, Billi (2010) has demonstrated that an inability of the central bank to commit can raise the optimal inflation rate considerably.

the calibration of Goodfriend and McCallum (2007), for example, the difference between the (real) rates is $6.0 - 0.84 = 5.16$ percent per annum (2007; 1,492).[12] Since it is the lower interbank rate that is relevant for the ZLB problem, whereas the Schmitt-Grohé and Uribe analysis implicitly refers to the risk-free rate, recognition of this distinction could completely overturn the optimistic presumption that the analysis described above suggests that the ZLB would be binding only rarely.[13]

4. ALTERNATIVE MONETARY STRATEGIES

Before moving on to more drastic proposals, I should mention some proposed strategies for monetary policy management in the face of the ZLB constraint, taking it for granted that such a constraint exists. Here the prevailing view seems to be that of Eggertsson and Woodford (2003), who show that the output loss from a temporary ZLB constraint can be lessened by the use of a "history dependent" rule for the one-period policy interest rate, designed in a manner that has the effect of implying that policy will be kept more stimulative in the future than would otherwise (i.e., without the temporary ZLB constraint) be the case.

Alternatively, it has been argued by Svensson (2001) and McCallum (2000) that monetary demand management can be conducted effectively under ZLB conditions by appropriate exchange rate policies. The idea is that one-period risk-free bonds and foreign exchange are not perfect substitutes, presumably for reasons stressed in the "portfolio balance" literature of the 1970s.[14] Central bank purchases of foreign exchange will, accordingly, tend to depreciate the country's exchange rate. The central bank could then exploit that relationship to manage the (nominal) exchange rate in accordance with a policy rule expressed in terms of an exchange rate instrument—with the rate of exchange rate appreciation appearing in place of the policy interest rate in a Taylor-style rule.[15] Of course, real exchange rate depreciation appears in the "expectational IS" portion of a typical New Keynesian open-economy model, so with sticky prices this mode of policy behavior can have

[12] Here the 6.0 figure comes from assumed values of a 4 percent per annum (p.a.) time preference rate and a 2 percent p.a. growth rate of population. The 0.84 percent p.a. figure is close to the 1 percent that Campbell (1999; 1,241) reports for the real three-month Treasury bill rate for the United States over 1947.2–1996.4. (Somewhat confusingly, Campbell refers to this as the "risk-free" rate since he is also assuming the absence of costly banking.)

[13] Schmitt-Grohé and Uribe (2010) provide interesting analyses of several topics not mentioned in the present article, including the effects of foreign demand for domestic currency and of incorrectly estimated inflation rates.

[14] See, for example, Dornbusch (1980).

[15] To apply this rule the central bank would not need to know the specification of the portfolio balance relation between foreign exchange purchases and the rate of depreciation, just as Taylor-rule central banks do not need to know money demand functions to be able to implement interest-rate policy rules.

systematic effects on real aggregate demand in the economy under discussion, even with the one-period interest rate immobilized at zero. Simulations reported in McCallum (2000, 2003), for example, indicate that substantial stabilization can be effected in this manner.[16] Also, if the economy in question is small in relation to the world, the policy will not have "beggar-thy-neighbor" effects.

An argument against this position might seem to be implied by Woodford's (2005) comment on the suggestion by McGough, Rudebusch, and Williams (2005) in "Using a Long-Term Interest Rate as the Monetary Policy Instrument." Specifically, Woodford criticizes the long-rate strategy and mentions that "similar comments apply to the proposal by Svensson (2003) that the exchange rate be used as the instrument of policy when an economy is in a 'liquidity trap.'"[17] The problem is that rules based on multiperiod interest rates (or on exchange rates) cannot expand the set of possibilities without driving the one-period rate into the negative (and therefore infeasible) range. That argument is, however, based on an assumed term-structure model in which the longer-term interest rates are related to one-period rates by a relationship that depends only upon expected yields, with no included "portfolio" terms involving quantities, such as those mentioned above. This same statement applies, moreover, to the uncovered interest parity relationship involving exchange rates. Thus, Woodford's argument apparently does not refute the one made above, which does presume the presence of portfolio-balance departures from the counterpart of the expectations theory as applied to exchange rates, i.e., uncovered interest parity.[18] In addition, the argument made here would apply also to the use of long-term domestic interest rates if the term-structure relationship involves relative quantities of different-maturity bonds. Emphasis on the exchange rate case would seem to imply a belief that foreign one-period bonds are more highly imperfect substitutes for domestic one-period bonds than are domestic long-term bonds.

The discussion to this point has been based on orthodox analysis with rather standard models, even if those in the present section involve portfolio-balance considerations that are not made explicit or quantified. It would appear to be the case, unfortunately, that all such arguments are unlikely ever to be conclusive—primarily because of the smallness of inflation costs in the range under discussion, the infrequency of ZLB situations, and the huge

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[16] For alternative results in much the same spirit, see Coenen and Wieland (2003).

[17] Presumably, the same objection would apply to the closely related proposal in McCallum (2000).

[18] My argument is, nevertheless, open to the objection that quantitative magnitudes relating to portfolio balance effects have not been established; e.g., my (McCallum 2003) simulations simply assume that the exchange rate depreciations called for by the policy rule can be implemented.

number of alternative model features that could be considered.[19] Accordingly, policy conclusions by many economists will be—and arguably should be—based largely upon their informal views concerning the basic role of a central bank and the social value of having a currency whose purchasing power does not change substantially over time. Such considerations are briefly treated below, in Section 6. Before turning to them, however, it will be appropriate to recognize, in Section 5, a different line of argument concerning the ZLB issue, one that questions the implicit assumption maintained above that the ZLB is an immutable aspect of reality.

5. IS THE ZLB ACTUALLY A GENUINE BOUND?

We ask, then, is it actually the case that zero represents a lower bound on nominal interest rates? Of course the precise lower bound may be slightly negative because of the cost of storing money, as mentioned by McCallum (2000, 875) and others, but this magnitude is small enough to be neglected. That is not the matter here under discussion. Instead, our concern now is the validity of the argument, developed by Goodfriend (2000, 2001) and Buiter (2003, 2010), that, with modern technology, institutions can be designed so as to permit payment of negative nominal interest on all forms of money, thereby making it possible to have negative (as well as positive) rates for the central bank's policy rate, and thereby *eliminating*—rather than surmounting—the putative problem of the ZLB. In this regard, Citi Research (2010, 5), presumably influenced strongly by Buiter (2009), states that "there are at least three administratively and technically feasible ways to eliminate the zero lower bound on nominal interest rates completely. . . The first is to abolish currency. The second is to. . . start paying interest, positive or negative, on currency. The third is to. . . end the fixed exchange rate. . . between currency and bank reserves or deposits with the central bank."

The abolishment of currency seems like an extremely radical step—almost unimaginable—until one contemplates it somewhat calmly. My own attitude has been influenced by a rather trivial aspect of my own routine—lunch each day at my university. Only a few years ago, my regular lunch companions and I used cash to pay for our lunches at the Carnegie Mellon Faculty Club, and I was annoyed when someone in line ahead of us chose to pay by credit card and thereby slowed the process noticeably. Then a new system for accepting credit card payments was adopted by the cashier, and the time needed for a credit card transaction decreased sharply. Next, a couple of years ago, I realized that one of my companions had adopted a routine of paying by credit card—and that this apparently involved no extra time at all. Finally, a

[19] It is, perhaps, this type of consideration that Summers (1991) had in mind in his provocative statement quoted in Section 1.

few months ago, I realized that all of my regular companions had switched to credit card payment as their usual mode of transaction—and that each of them was taking less of the cashier's time (and that of other customers) than I was imposing each day with my cash transaction! A second recognition was that taxi cabs now typically have facilities for accepting credit card payments, thereby eliminating an example that I used to mention in undergraduate classes as transactions for which one needed to carry cash.

More generally, I have been impressed by the point that approximately 75 percent (by value) of U.S. currency outstanding consists of $100 bills. These are notes of the largest denomination available, of course—which are of greatest use to "...the underground economy, the criminal community, that is, those engaged in tax evasion, money laundering and the financing of terrorism, and those wishing to store the proceeds from crime and the means to commit further crimes out of sight and reach of the authorities" (Buiter 2010, 224). In the case of the euro, 59 percent of the value of euro notes outstanding in April 2009 was in the denominations of 100, 200, or 500 euros, while less than 10 percent of the stock value was in the form of 5, 10, and 20 euro notes (Buiter 2010, 223). Partly on the basis of these facts, Buiter develops a strong argument for the elimination of (government) currency. An important part of the argument is the suggestion, made in Goodfriend (2000, 224), that the central bank make available free transaction accounts to all legal residents, accounts that could be administered through "commercial banks, post offices, and other retail facilities." In that case, it would not be true that the institutional change would be devastating for the poorer members of the (legal) population.

A second approach would involve taxation of currency. Buiter (2009) stresses, however, that there are inherent problems with the administration of positive tax rates (i.e., negative interest rates) on negotiable bearer instruments that sharply reduce the attractiveness of this approach. Goodfriend (2000; 1,016) has suggested that "...a carry tax could be imposed on currency by imbedding a magnetic strip in each bill. The magnetic strip could visibly record when a bill was last withdrawn from the banking system... [with a tax] deducted from each bill upon deposit according to how long the bill was in circulation since last withdrawn...." Perhaps such a system could become viable in the future, but with today's technology it would appear excessively expensive.

A third approach of Buiter's is to unbundle—divorce—the medium of exchange (MOE) and the medium of account (MOA). The MOE consists in part of currency and claims to currency; the MOA is the entity in terms of which prices are quoted. Governments do not invariably have full control over either of these, but can retain control over the MOE if government currency is not issued to excess. Furthermore, by requiring that transactions with the government must be denominated in terms of an appointed MOA, it can most

likely gain acceptance for its choice of the latter. Then in each period it can specify interest rates for both, with the MOE interest rate kept non-negative but with no such stipulation for the MOA rate, by issuing bonds in terms of both media. Then the central bank can conduct policy in terms of its instrument, the MOA interest rate. If prices in terms of this MOA are the prices that are relevant for market supplies and demands, then the central bank will continue to be able to influence aggregate demand by variations in the policy interest rate even when the MOE rate is immobilized at zero.

Buiter (2009) devotes many words to analysis of this third approach, but it seems that his preference is probably for the abolition of currency.[20] Actually, it should be said, it is the abolition of a government-issued currency that Buiter and Goodfriend have in mind. Both evidently would favor regulations that would not rule out the possibility of private issuers attempting to put their own currency-like vehicles into circulation.[21]

In any event, it would seem entirely appropriate that serious thought be given to the Buiter and Goodfriend proposals, if it transpires that the ZLB constraint is more of a problem than the Schmitt-Grohé and Uribe analysis suggests—or simply to prepare for possible future developments.

6. THE DUTIES OF A CENTRAL BANK

Before the financial crisis of 2008–2009, monetary economists had become rather proud of the development of their subject over the preceding 10–15 years. There had been great progress in formal analysis and also in the actual conduct of monetary policy. Analytically, the profession developed an approach to policy analysis that centers around a somewhat standardized dynamic model framework that is designed to be structural—that is, respectful of both theory and evidence—and therefore usable in principle for policy analysis. This framework includes a policy instrument that agrees with the one typically used in practice and recognizes that, for imperfectly understood reasons, nominal price adjustments do not take place immediately, in which case monetary policy actions will have significant consequences for the behavior of real aggregate variables such as output and employment. Indeed, models

[20] In this regard, Goodfriend has remarked in conversation that "currency is the most unsanitary object that most of us handle on a regular basis."

[21] Before continuing, it should be noted that there are similarities but also (crucial) differences between Buiter's third approach and what I would term the Yeager-Greenfield system. The latter has been developed in a number of articles by Leland Yeager (1983, 1992), plus others that are co-authored with Robert Greenfield (Greenfield and Yeager 1983). A brief discussion is provided in McCallum (2010). One major difference is that the Yeager-Greenfield system was originally designed as one intended to eliminate, or reduce as far as possible, governmental influence on monetary affairs. A second is that a major objective of the Yeager-Greenfield system is to achieve "stability," in the sense of constancy through time, of the price level, whereas Buiter's approach is more concerned with avoidance of recessions.

of this type were being used (in similar ways) by economists in both academia and in central banks, where several economic researchers had gained leading policymaking positions. Meanwhile, in terms of practice, most central banks had been much more successful than in previous decades in keeping inflation low while also avoiding major recessions (with a few exceptions) prior to 2008. Furthermore, these improvements in science and application had been interrelated: The "inflation targeting" style of policy practice that had been adopted by numerous important central banks—and that arguably had been practiced unofficially by the Federal Reserve—is strongly related in principle to the prevailing framework for analysis.[22] Accordingly, one keystone of the "consensus" view was that central bank control of the inflation rate is the central ingredient in successful monetary policy practice, and that this control called both for inflation "stability," in the sense of little variation from year to year, and for a low average level—often in the range of 1 percent to 2 percent per annum. The crisis has, however, damaged—if not destroyed—that consensus; the Blanchard, Dell'Ariccia, and Mauro (2010) article is evidence of that.

It would seem, however, that the recent crisis is highly inappropriate as a centerpiece for reconsideration of an economy's monetary policy. To a considerable extent, the crisis was precipitated by events in the United States. There the primary root of the crisis was, arguably, a genuine macroeconomic imbalance that required correction, namely, the housing price boom. What were its origins? The situation in housing was largely brought about by deliberate government action designed to stimulate homeownership even among—actually, especially among—families that could not afford homeownership.[23] This sectoral imbalance was then turned into a macroeconomic collapse by unwise regulations and practices in financial markets that led to the freezing-up of the latter. In that regard, numerous practices of private enterprises in the financial industry may have been appalling, but again much of the problem can be traced back to an unwise governmental framework—one prominent example being regulations that gave undue importance to the ratings of a few private firms in the credit-rating industry. The point is that none of these failures had much, if anything, to do with monetary policy.[24] To drastically alter the objectives of monetary policy in response to the crisis would seem, accordingly, to be lacking in logic.

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[22] For an exposition that discusses this development, by an author who participated both as researcher and policymaker, see Goodfriend (2007).

[23] For short discussions, see Pinto (2010) and Wallison (2010).

[24] John Taylor (2009) has argued that monetary policy was unduly expansionary during the period 2003–2005 and that this mistake was an important cause of the crisis. I would agree that policy was inappropriate in that manner, but consider this policy mistake less egregious than the other items mentioned in the present paragraph. In any event, Taylor's argument would certainly appear to provide no support for an increase in the target inflation rate!

From a more general perspective, some lack of clarity about the monetary policy duties of a central bank has resulted from the drastic change in monetary arrangements—from metallic standards to fiat money arrangements—that took place during the 20th century. Under a metallic standard, a nation's central bank has basically no price-level duties so long as the standard does not break down. Behavior of the price level is governed primarily by the mint, whereas the central bank is just that—an intermediary intended to facilitate the financial activities of the nation's government. Under a fiat money arrangement, by contrast, price level trends are determined by the abundance of money in circulation relative to the quantity needed (i.e., useful) for conducting transactions, and modern central banks have been universally assigned the duty of price level management. For example, in the *Journal of Economic Literature's* recent "panel discussion" of Federal Reserve duties by Blinder (2010) and Feldstein (2010), both contributors take it for granted that central banks will be the makers of monetary policy and argue that they should have extensive independence in that role.[25]

In my opinion, one important justification for central bank independence is that generally—except in ZLB situations—the desirable effects of monetary policy loosening occur rapidly whereas the undesirable effects materialize only after a greater lag. When the central bank eases policy—i.e., makes monetary conditions more stimulative and aggregate demand stronger—the socially desirable effects arrive more promptly than do the undesirable effects. That is, there will normally be effects that can be thought of as expansions of output and employment (relative to what would have prevailed in the absence of the policy change) that will begin to occur within two or three months. Then after one or two years there will also occur upward pressures on the inflation rate. If instead the policy action is one that tightens policy, rather than loosening it, there will be relatively prompt reductions of output and employment, followed in a year or so by reductions in the inflation rate. Not surprisingly, it is the case that most economists, congressmen, commentators, and ordinary citizens consider expansions in the level of employment and output to be desirable and increases in the inflation rate to be undesirable. Accordingly, if monetary policy is required to be politically attractive, there is a tendency for policy to be more expansionary and inflationary the more *impatient* is the policymaker, i.e., the shorter is his effective time horizon. One way to avoid policies that give primary emphasis to short-run considerations is to place responsibility for monetary policy in an institution that is somewhat

[25] Consequently, the panel discussion referred to is mostly concerned with the regulatory responsibilities of a central bank. For an ambitious recent proposal for monetary policy strategy, see Goodfriend (2011).

sheltered from the stresses of day-to-day politics, and consequently able to take a longer-term perspective.[26]

An important ingredient in such a perspective is the understanding that there exists no usable long-run tradeoff between inflation and unemployment (or output)—i.e., that some version of the "natural rate hypothesis" is valid. Moreover, a major contribution of the "consensus" position of mainstream monetary economics that evolved in the 10–15 years prior to 2008 was the development of models that incorporated this natural-rate feature[27] while also reflecting the property that monetary policy has substantial short-term effects on the behavior of output and employment.[28]

But to adopt the position that the average ongoing inflation rate should be raised (as it certainly would be if the target were raised) in order to prevent or shorten recessions involving the ZLB, is to accept the notion that there does exist a type of long-run tradeoff that is usable and well-understood. It is based on a different mechanism than the Phillips Curve tradeoff, but in public debate and actual policy consideration this distinction would be lost. Thus, it might serve to overturn a basic message that the profession has been at great pains to present to policymakers, namely, that the overriding objective of monetary policy should be the prevention of inflation (positive or negative). This is the one important macroeconomic goal that the central bank—and only the central bank—has the power to deliver. The best thing that the central bank can do for employment and output, on a sustained basis, is to keep inflation close to a low and clearly specified target value. To some extent, this is an argument based on considerations of "communication," not science, but is nevertheless of great practical importance.

To some readers a move to a 4 percent inflation rate may seem entirely innocuous. To emphasize the contrary possibility, let us ask the following question: What would be the United States price level now, in November 2010, if a steady 4 percent inflation rate had prevailed since 1792, the year in which a United States monetary standard was first established?[29] Since $2{,}010 - 1{,}792 = 218$, the price level today would be $1.04^{218} = 5{,}167.3$ times the price level of 1792 if inflation had been 4 percent each year. In fact, the actual

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[26] One obvious difference between central bankers and legislators is that typically the former are, by design, not elected officials and are appointed for rather lengthy terms.

[27] Actually, with the basic Calvo model of price adjustment, these models do not quite have the strict natural-rate property. The modification promoted in Section 5 does, however, satisfy a non-strict version as discussed by Andrés, López-Salido, and Nelson (2005).

[28] These effects are, however, poorly understood and are dependent on current values of the "output gap," which is not directly observable.

[29] Under the Articles of Confederation, the states did not share a national monetary standard. Implementation of the Constitutional provisions regarding money began with the Coinage Act of 1792.

consumer price index (CPI) today is only 23.54 times as high as in 1792.[30] Consequently, if a 4 percent inflation rate had prevailed since 1792, prices today would be 219.5 times as high as they actually are, on average. Of course, I would have to admit that in terms of pure economic analysis, this last fact alone is devoid of significance. At the same time, I believe (perhaps somewhat schizophrenically) that many citizens, even well-educated ones, are frequently confused in thinking about issues relating to inflation.[31] That being the case, it would seem highly desirable for a monetary system to have the property of being easy for an average citizen to understand and cope with. Under current conditions, a significant fraction of measured gross domestic product consists of the activities of persons seeking to profit from other individuals' lack of understanding of the causes and effects of inflation. A general, if somewhat elusive, discussion that emphasizes the medium-of-account role of money is provided by Niehans (1978, 118–31).

Finally, I would argue that in the United States, and also in many other countries, central banks have shown themselves in recent years to be the primary—indeed, only visible—source of intertemporal discipline in fiscal affairs. The point is that the overall government budget constraint implies that if the central bank maintains a low growth rate of the monetary base, it limits the extent to which the fiscal authority is able to engage in deficit finance.[32] If the Treasury seeks to exceed this limit by means of (excessive) borrowing (selling bonds), it will run into a constraint reflecting the implied violation of a transversality condition relevant for optimal behavior for private lenders. In this context, a switch to a higher target inflation rate would evidently represent one more move away from intertemporal discipline, a position that many economists would want to avoid.

7. CONCLUSION

A summary of the article's arguments can be presented briefly, as follows. First, in the absence of the ZLB, the optimal steady-state inflation rate, according to standard New Keynesian reasoning, lies somewhere between the

[30] The CPI, on the basis of a 100 value for 1982–1984, is reported by Measuring Worth (2010) to have equaled 9.72 in 1792, whereas the June 2010 value reported by the St. Louis Fed's FRED is 218.2.

[31] My own mother, who was the author of a well-respected work in U.S. history that was kept in print for two or three decades by a reputable university press, would occasionally express doubts that the inflation rate had recently fallen by stating that, "I know that [specific item] costs more now than it did at the same store a year ago."

[32] The fiscal deficit is identically equal to the amount of government revenue provided by bond sales plus the "inflation tax" revenue resulting from money issuance. The contention in the text presumes that the central bank is in fact given control of the monetary base, even when its desires conflict with those of the ministry of finance. It is my impression that this is the appropriate assumption for the United States and most other developed economies.

Friedman-rule value of deflation at the steady-state real rate of interest and the Calvo-model value of zero, with careful calibration indicating that the weight on the latter may be considerably larger. Second, however, an attractive modification of the Calvo model would imply that the weight on the second of these values should be zero, so that the Friedman-rule prescription would be optimal (in the absence of the ZLB). Third, even when the effects of the ZLB are added to the analysis, the optimal inflation rate is (according to this line of reasoning) probably negative. Fourth, there is probably some scope for activist monetary policy to be effective (via, e.g., an exchange rate channel) even when the one-period nominal interest rate is at the ZLB; but there exists professional disagreement on this matter. Fifth, while the ZLB is a genuine constraint under present institutional arrangements, these are not immutable. Elimination of traditional currency could be effected, in which case there would be no zero lower bound on one-period nominal interest rates and therefore no reason involving such losses for having an increased target rate of inflation. Sixth, increasing the target inflation rate for the purpose of avoiding occasional ZLB difficulties would constitute reversal of a central message, of recent monetary policy analysis, to the effect that there is no long-run benefit in terms of output or employment from the adoption of increased inflation rates. Seventh, such an increase in the target inflation rate would constitute an additional movement away from intertemporal discipline.

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