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## Misconceptions Regarding the Zero Lower Bound on Interest Rates

Bennett T. McCallum\*

### Abstract

The paper reviews issues related to the zero lower bound (ZLB) on interest rates and argues that all of the following propositions are invalid: (i) in a ZLB situation, “shaping interest rate expectations is essentially the only tool that central bankers have” (Bernanke, et.al., 2004); (ii) fiscal policy actions such as “helicopter drops” are in theory more effective than monetary policy actions; (iii) the prominent “foolproof way” policy rule of Svensson (2001, 2003) is applicable more generally—i.e., even when exact uncovered interest parity holds—than the alternative exchange-rate rule of McCallum (2000); (iv) both of the exchange-rate strategies described in (iii) are open to the objection that they constitute “beggar-thy-neighbor” approaches, and (v) there is a significant danger of ZLB difficulties stemming from a “deflationary trap” type of equilibrium, as distinct from a “liquidity trap.”

**Keywords:** Interest Rates; Zero Lower Bound; Quantitative Easing; Expectations; Deflation Trap; Liquidity Trap

**JEL classification:** E52, E3, F41

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## **1. Introduction**

It is highly appropriate that the Institute for Monetary and Economic Studies has chosen a conference topic relating to the interaction of financial market and macroeconomic phenomena in a setting with very low interest rates, with special consideration given to recent experience in Japan. In studying this topic, as with most issues relating to policy, it is important to make use of structural models designed to mimic the behavior of real-world agents and markets. Accordingly, there needs to be some agreement about the nature of the relevant monetary and macroeconomic framework, as well as the nature of the Japanese experience.

There has been much progress during the past few years in the economics profession's understanding of the zero-lower-bound (ZLB) constraint on nominal interest rates and its implications for the conduct of monetary policy. Recent work by Auerbach and Obstfeld (2003, 2004), Eggertsson and Woodford (2003, 2004), Svensson (2001, 2003), Iwamoto (2004), Baba et. al (2004), Fujiwara et. al. (2005), Jung, et. al. (2005), and others has been noteworthy and constructive in this respect. There are still a few impressions, however, that seem to me to be rather widely-held and yet somewhat misleading. My talk will be about these. It will draw upon useful recent overview papers by Bernanke and Reinhart (2004) and Ueda (2005). I will not be offering any fundamentally new theoretical results, but will try to mention some points that might be of relevance in interpreting the experience of the past decade in Japan.

The main objective will be to argue that all of the following propositions are invalid or at least dubious: (i) in a zero-lower-bound (ZLB) situation, "shaping interest rate expectations is essentially the only tool that central bankers have" (Bernanke, et.al., 2004); (ii) fiscal policy actions such as "helicopter drops" are in theory more effective than monetary policy actions; (iii) the prominent "Foolproof Way" policy rule of Svensson (2001, 2003) is

applicable more generally—i.e., even when exact uncovered interest parity holds—than the alternative exchange-rate policy rule of McCallum (2000); (iv) both of the exchange-rate strategies described in (iii) are open to the objection that they constitute “beggar-thy-neighbor” approaches, and (v) there is a significant danger of ZLB difficulties stemming from a “deflationary trap” type of equilibrium, as distinct from a situation involving a “liquidity trap.”

## **2. Monetary Policy Stimulus at the ZLB?**

For discussion of currently prevailing views regarding monetary policy at the ZLB, I will take as representative the recent overview paper of Bernanke and Reinhart (2004). This choice is warranted not only because the authors are leading policymakers for the Federal Reserve—even more so now than in 2004 when the paper was presented!—but also because Bernanke has written on the topic earlier (Bernanke, 2000) and because the Bernanke-Reinhart paper has been treated as indicative of prevailing views by Ueda (2005), who was himself a major participant in the policymaking process at the Bank of Japan during much of the ZLB episode. (I hope that it is correct to use the past tense in speaking of this episode.) In their paper, Bernanke and Reinhart (2004, p. 85) “discuss three strategies for stimulating the economy at an unchanged level of the policy rate.” Their list includes (a) shaping interest-rate expectations, (b) altering the composition of the central bank’s balance sheet, and (c) expanding the size of the central bank’s balance sheet. The first of these is the approach featured by Eggertsson and Woodford (2003, 2004), who develop an irrelevance proposition for open-market purchases according to which “quantitative easing” is to no avail. Instead, “the key to effective central-bank action to combat a deflationary slump is the management of expectations” (2003, p. 8). At face value, this proposition seems to contradict results by Auerbach and Obstfeld (2003, 2004), Coenen and Wieland (2003), and others who

find a role for open market purchases of “unconventional” assets.<sup>1</sup> It will be argued below, however, that there is no actual theoretical inconsistency; that the different papers presume different types of policy experiments. Eggertsson and Woodford (E&W) have argued that the crucial distinction is whether or not the policy experiment considered involves a permanent change in some nominal variable. In that spirit, it will be shown below that if there is a credible rule change that, for example, increases the target inflation rate, then monetary policy can be effective in bringing an economy out of a ZLB situation even under the E&W assumptions.

The exact nature of the E&W result deserves attention. It involves analysis of the stabilization properties of an interest rate policy regime that is specified to incorporate “quantitative easing.” That term is taken by E&W (2003) to mean that the monetary base supply function, which implements their interest rate rule with given money demand behavior, includes an unusual nonlinear component that calls for extra open market purchases whenever the interest rate is zero. These purchases are immediately reversed, however, as soon as the interest rate rises above zero. (The interest rate in question, here denoted  $R_t$ , is “the riskless nominal interest rate on one-period obligations...” (E&W 2003, p. 10)). One could simply view this supply function as a policy rule for the monetary base, recognize the base money stock as a variable, and solve the model in a standard and familiar fashion, if it were not for the non-linear component and the associated restriction that the interest rate must be non-negative.<sup>2</sup> What E&W do with the resulting model is to show that the behavior of prices and output in the model’s rational expectations (RE) equilibrium is independent of any parameters that describe the

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<sup>1</sup> Assets, that is, that are not perfect substitutes for the short-term security that is normally used in open market operations. The Bernanke-Reinhart list does not include Goodfriend’s (2000, pp. 1013-18) suggestion of institutional changes to eliminate the ZLB.

<sup>2</sup> The model used by E&W is rather standard, relative to the recent monetary policy literature, but is slightly more “monetarist” than is usual in that the utility function, which includes real money balances as an argument, is not assumed to be separable.

quantitative-easing component of the base supply rule. Whatever the extent of the additional base-money supply specified by this component, then, there will be no effect on inflation or output in the RE equilibrium. That is the E&W irrelevance proposition. Note, crucially, that it pertains to the nature of a single ongoing RE equilibrium for a given policy rule that involves certain specified behavior when the ZLB is operative, not to the adoption of a new rule. The irrelevance proposition is perhaps unsurprising, given that any “extra” base money supplied (when  $R_t = 0$ ) is removed immediately, as soon as  $R_t > 0$ .<sup>3</sup>

It is, I believe, somewhat misleading for the E&W analysis to be described in terms of shaping interest-rate expectations; instead it is expectations of future values more generally—not just interest rates—that matter. In particular, expectations regarding future monetary aggregates or price levels could alternatively be made the focus of expectations management. Svensson (2004) develops this point very effectively.

To emphasize the importance of policy-rule changes that pertain to features of the rule other than the special nonlinear component, let us briefly discuss an extremely simplified example based on the following two-equation system, which is so familiar as to require only a brief explanation at this point:<sup>4</sup>

$$(1) \quad y_t = b_0 + b_1(R_t - E_t \Delta p_{t+1}) + E_t y_{t+1} + v_t \quad b_1 < 0$$

$$(2) \quad R_t = \mu_0 + \Delta p_t + \mu_1(\Delta p_t - \pi^*) + \mu_2 y_t \quad \mu_1 > 0; \mu_2 \geq 0.$$

Here  $y_t$  and  $p_t$  denote the logs of an output variable and the price level so  $\Delta p_t$  is inflation while  $R_t$  is the one-period nominal interest rate. The term  $v_t$  represents a preference shock that is generated by an exogenous stochastic process, which is assumed to be

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<sup>3</sup> It is my impression that proponents of quantitative easing for Japan have almost invariably had in mind a new policy that, among other features, would entail a target inflation rate that is higher than values experienced in Japan during the ZLB episode—and certainly high enough to imply a positive steady-state interest rate on overnight bank loans. Thus their recommendations would have implied a change in policy rule.

<sup>4</sup> The present system differs from the model of E&W, but without the quantitative easing feature, primarily by positing flexible prices, which is irrelevant to the point at issue.

autoregressive of order one with parameter  $\rho$ ,  $|\rho| < 1$ . Equation (2) is a Taylor-style rule in which the central bank is depicted as setting an interest rate instrument  $R_t$  each period so as to tighten policy when inflation exceeds its target value  $\pi^*$  and/or when output is high. In (1)(2),  $y_t$  should be interpreted as the output gap with the natural rate of output assumed constant at the value zero. With flexible prices we then have  $y_t = 0$  in each period and there are only two endogenous variables to be determined by the system,  $R_t$  and  $\Delta p_t$ . This model should be understood to also include the requirement that  $\Delta p_t$  must not approach  $-\infty$  as  $t \rightarrow \infty$ , because of a transversality condition that obtains in the underlying optimizing model.

To obtain a RE solution in the absence of any ZLB constraint, we first substitute out  $R_t$ , use  $y_t = 0$ , and assume that the central bank sensibly sets  $\mu_0$  to equal the long-run real rate of interest  $r = -b_0/b_1$ . Then the relevant solution is<sup>5</sup>

$$(3) \quad \Delta p_t = \pi^* - [b_1(1-\rho+\mu_1)]^{-1}v_t.$$

When the constraint  $R_t \geq 0$  is included, (3) is not in general the solution, but it will be (to a suitable approximation) if  $v_t$  has bounded support and the target inflation rate  $\pi^*$  is large enough relative to  $r$ . Then suppose that the economy is initially in a ZLB situation, but the central bank adopts a new policy rule such that  $\pi^*$  is sufficiently high that the ZLB will never be binding in the future. In that case, the new RE equilibrium will yield immediately an inflation rate high enough to escape the ZLB situation. Of course, it is rather implausible that such a new policy rule would be credible immediately, but that is another issue that we will touch upon below. The point here is to illustrate the major difference between a change in the inflation target, on the one hand, and a change in a parameter such as  $\mu_1$  in (2). The latter type of change would typically be ineffective in a ZLB situation because of the constraint that prevents any reduction in  $R_t$ . This latter type

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<sup>5</sup> See McCallum (2005, pp. 5-6) plus the discussion in Section 6 below.



of change is, in effect, what is being shown to be useless by the E&W policy irrelevance proposition.

With respect to Bernanke and Reinhart's strategy type (c), expanding the size of the central bank's balance sheet via open-market purchases, I would like to comment on their identification of this category with the term "quantitative easing." It is my impression that the latter term was introduced in the context of the Japanese experience, and with respect to proposals made by critics of the Bank of Japan's actual policy including, e.g., Goodfriend (1997), Taylor (1997), Meltzer (1999) and (especially) Nakahara.<sup>6</sup> It is my further impression that these individuals had in mind money creation together with the purchase of non-standard assets, so that their proposals actually amounted to applications of strategies (b) and (c) together. By the late 1990s, it was widely understood that open-market purchases of short-term government bills would have no expansionary impact, as these assets become near-perfect substitutes for base money when an economy is in a ZLB situation. In addition, I believe that they intended that the Bank of Japan also make public a commitment to conduct policy so as to avoid deflation, in both the present and the future.<sup>7</sup> Thus their proposals might be interpreted as implying rule changes of the type discussed above, which (if credible) would in theory have been effective (via strategy (a)). The extent to which the large expansion of the Bank of Japan's balance sheet during 1999-2005 met these proposals is a matter of continuing discussion.

### **3. Fiscal Transfers**

Some analysts (e.g., Ball (2005)) have suggested that a "helicopter drop" type of policy, in which transfers of money are given to the public in a lump-sum fashion, would

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<sup>6</sup> Mr. Nobuyuki Nakahara served on the Bank of Japan's Policy Board through much of the episode and offered many proposals at monetary policy meetings, almost all of which were voted down.

<sup>7</sup> See, e.g., Goodfriend (1997, p. 294), Meltzer (1999, p. 190). The proposals of Goodfriend and Taylor were presented at the 7th installment of this conference, held in October 1995.

be more effective than non-fiscal monetary-policy actions for escaping a ZLB situation. Is this position in fact supported by formal analysis? Here I argue very briefly that such a policy would be ineffective if the economy possesses Ricardian properties, as in the case of the canonical model used by E&W (2003) and many others. The first step of the argument is as follows.

A “helicopter drop” is a transfer (gift) of money to households. In this regard, note that a transfer of \$K is equivalent to the combination of two operations, namely, (I) A lump-sum tax reduction of \$K financed by the sale of \$K of T-bills to households (i.e., a gift of \$K of T-bills to households), and (II) An open-market purchase of \$K worth of T-bills.

But, it is well known that an operation of type (I) has no effect if the economy is Ricardian and also that one of type (II) has no effect at the ZLB (where base money and T-bills are perfect substitutes at the margin). Thus the combined operation—the helicopter drop—will have no effect in the ZLB situation.

The second part of the argument pertains to a sequence of such operations. Wouldn't an ongoing sequence of helicopter drops violate a transversality condition if there were no inflationary effect, since the nominal money stock would be growing without bound in the proposed experiment? Well, yes, it would if the ZLB situation were to go on forever. But analysis of ZLB issues typically pertains to situations in which an economy, assumed to have a positive steady-state nominal interest rate, is temporarily at the ZLB as the result of some negative shock.<sup>8</sup> In such cases, the economy will escape the ZLB of its own accord at some point in the finite future, after which time  $p_t$  will tend to grow in line with  $m_t$ . So, since transversality conditions pertain only to the infinitely distant future, they are not relevant to the question at hand.

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<sup>8</sup> Justification for this practice is discussed below, in Section 6.

Of course, the foregoing analysis does not deny that one could obtain effects from repeated helicopter drops by using a non-Ricardian model, such as the overlapping-generations model considered in McCallum (2000, pp. 876-880). Also, the argument presumes, perhaps incorrectly, that the T-bills under discussion do not provide “broad liquidity” services, of the type mentioned by Goodfriend (2000, pp. 1018-1028).

#### **4. The Exchange-Rate Channel**

In a conference paper of 1999 (McCallum, 2000), I proposed a strategy whereby central banks can avoid policy impotence at the ZLB via purchases of foreign exchange by using the exchange rate in place of the usual overnight interest rate as the policy instrument/indicator variable. My paper argued, by means of simulations with a quantitative model, that a policy rule for setting the exchange rate’s rate of depreciation, in response to inflation and output deviations from target values, could provide macroeconomic stabilization even if the interest rate were immobilized at zero. Subsequently, Lars Svensson (2001) put forth a closely related proposal—which he called “the foolproof way”—involving the exchange rate transmission channel. Svensson’s presentation was evidently much more effective than mine, as his paper has attracted a good bit of attention whereas mine is mentioned rather infrequently. Svensson (2001, p. 279) has explicitly recognized the close kinship of our two proposals, but has stated that his argument “does not depend upon any portfolio-balance effects of foreign-exchange interventions, in contrast to the argument of Meltzer (1999c) and McCallum (1999), and thus, it is more general.” It is my contention, however, that our two policy rules are equally open to the objection—an objection that I consider inappropriate—that they rely on portfolio-balance effects. Instead, the policy rules evidently rely upon departures from pure uncovered interest parity (UIP) to exactly the same extent; the main difference in the two proposals being that one is concerned with a shift in policy while the other involves the effectiveness of one ongoing rule.

To make this argument, let us consider the following model of a small open economy. This model, developed by McCallum and Nelson (1999), differs (inessentially) from most small-scale optimizing models by treating imports as raw materials used in the production process rather than consumer goods that are different from the bundle of domestically-produced goods. It can be summarized with the following 10 equations, in which  $s_t$  is the log of the home-country price of foreign exchange:

$$\begin{aligned}
(4) \quad c_t &= E_t c_{t+1} + b_0 - b_1 r_t + v_t & b_1 < 0 \\
(5) \quad y_t &= \omega_1 c_t + \omega_2 g_t + \omega_3 x_t & 0 < \omega_1, \omega_2, \omega_3 < 1 \\
(6) \quad q_t &= s_t - p_t + p_t^F \\
(7) \quad im_t &= y_t - \sigma q_t + \text{const} & \sigma > 0 \\
(8) \quad x_t &= y_t^F + \sigma^F q_t + \text{const} & \sigma^F > 0 \\
(9) \quad \bar{y}_t &= (1 - \alpha_2)^{-1} [\alpha_1 a_t - \sigma \alpha_2 q_t] + \text{const} & 0 < \alpha_2 < 1 \\
(10) \quad \Delta p_t &= (1 + \beta)^{-1} [\beta E_t \Delta p_{t+1} + \Delta p_{t-1}] + \kappa (y_t - \bar{y}_t) + u_t & \kappa > 0, 0 < \beta < 1 \\
(11) \quad R_t - R_t^F &= E_t \Delta s_{t+1} + \xi_t \\
(12) \quad r_t &= R_t - E_t \Delta p_{t+1} \\
(13) \quad R_t &= r + \Delta p_t + \mu_1 (\Delta p_t - \pi^*) + \mu_2 (y_t - \bar{y}_t) + \eta_t & \mu_1, \mu_2 \geq 0
\end{aligned}$$

A very brief description of each of these relationships will be provided. Equation (4) is a consumption ( $c_t$ ) Euler equation, reflecting intertemporal optimization, while (5) is a log-linear approximation to an identity that splits units of output  $y_t$ —not value added—into three components reflecting uses: consumption, government consumption  $g_t$ , and exports  $x_t$ .<sup>9</sup> Equation (6) defines the log of the real exchange rate  $q_t$  in relation to the log of the

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<sup>9</sup> That  $y_t$  reflects units of output, not value added, is apparent from the production function used in (7) and approximated in (9). Domestic investment would also be included in a model that distinguishes between consumption and investment spending. In the model, all variables except interest rates are logs of the underlying measures.

nominal exchange rate  $s_t$  and the logs of home and foreign price levels,  $p_t$  and  $p_t^F$ . Next, in (7) import demand  $im_t$  is given by cost minimization for a production function of the CES type with  $\sigma$  as the elasticity of substitution between imports and labor. An analogous relation (8) governs demand from abroad for home-country exports. Equation (9) specifies the natural rate (i.e., flexible-price) value of the log of real output,  $\bar{y}_t$ , with this value depending upon a stochastic term  $a_t$  that reflects the results of technology shocks (assumed to follow an exogenous AR(1) process with autocorrelation parameter 0.95) and the real price of imported inputs to production. A variant of the Calvo model of nominal price stickiness appears as (10) while (11) represents uncovered interest rate parity, with a stochastic disturbance. Finally, (12) is the Fisher identity that defines the one-period real rate of interest  $r_t$  in relation to the nominal rate  $R_t$  and expected inflation.

Together with the Taylor-style policy rule (13), this model provides 10 structural equations to generate values of the system's 10 endogenous variables, namely,  $c$ ,  $y$ ,  $g$ ,  $x$ ,  $im$ ,  $p$ ,  $s$ ,  $q$ ,  $R$ , and  $r$ . Now suppose that the interest rate instrument  $R_t$  is immobilized at the ZLB and thus is constant over time. In such a case, McCallum (2000) suggests that the central bank use as its instrument the exchange rate, with a rule such as

$$(13') \quad s_t - s_{t-1} = \Delta q + \Delta p_t - \mu_1(\Delta p_t - \pi^*) - \mu_2(y_t - \bar{y}_t) - e_t, \quad \mu_1, \mu_2 \geq 0,$$

where  $\Delta q$  is the average rate of depreciation of the real exchange rate. This policy rule calls for purchases or sales in the foreign exchange market, rather than the overnight interbank market, when macroeconomic conditions call for a loosening or tightening of policy. In my paper I presented simulations indicating that such a rule would be effective in stabilizing inflation and/or output relative to their target values, despite the immobilization of the interest rate.

Note, however, that if we assume that  $R_t$  continues to equal zero in each period, the system becomes overdetermined when (13') is included (or when (13) is included).

Accordingly, in the simulations I ignored the UIP condition (11). The justification for this step is explained below. But the point at hand is that exactly the same issue arises if instead of (13') we adopt the policy rule of Svensson's FPW strategy, say,

$$(13'') \quad s_t = s^{fpw} + \delta t$$

where  $\delta$  is the specified rate of depreciation and  $t$  indexes the passage of time, while  $s^{fpw}$  is a startup value. In that case, if  $R_t = 0$  is maintained, the system becomes overdetermined unless some equation from (4)-(12) is dropped or some other endogenous variable is recognized. But on p. 297, Svensson (2001) states that application of the FPW would have the central bank raising  $R_t$  above the ZLB to "a level corresponding to uncovered interest parity." In his scenario, this jump occurs promptly and there is no overdetermination because  $R_t = 0$  is not maintained. Thus the crucial difference in Svensson's argument and mine is that he discusses the effects of a rule change that immediately eliminates the liquidity trap whereas my discussion pertains to the performance of an ongoing rule under the constraint of an immobilized interest rate. If my rule were adopted anew it could and should be designed to imply (if instantly credible) a jump in conditions that would end the  $R_t = 0$  episode, just as in the case of the FPW. Then the UIP condition could be retained in the analysis, if the analyst believed it to be realistic.<sup>10</sup>

Thus we see that my analysis involve the workings of an ongoing policy rule whereas Svensson's featured the adoption of a new rule, with the two rules designed to exploit the same transmission mechanism, working through the foreign exchange rate. Since a major objective in each case was to argue that Japan could use this mechanism to improve macroeconomic conditions, it is clear why Svensson chose as he did. What then, was the reason for my choice? In fact, my choice was predicated on the belief that use of the rational

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<sup>10</sup> It appears that the distinction between "foreign exchange interventions" and commitments to buy and sell foreign exchange at a stated price, mentioned in several places by Svensson (2001), is not pertinent. The latter method of implementation could be used with my rule (13') just as with the FPW, even if the quoted price is varying from period to period in response to current conditions (rather than growing steadily).

expectations condition is much more appropriate for the analysis of ongoing policy regimes than for the analysis of paths resulting from changes in a policy rule. It seems unlikely, that is, that any policy rule change will immediately be known about, believed, and understood, which is the implicit assumption for the latter type of exercise. In this respect, my practice was consistent with the position of Lucas (1980).<sup>11</sup>

To complete this discussion, let us briefly consider whether the Eggertsson and Woodford irrelevance proposition applies to a case in which the policy rule (13') is maintained by the central bank in a ZLB situation. In this context it does matter whether pure uncovered interest parity prevails, or instead equation (11) in the foregoing model needs to be modified to represent some type of portfolio-balance effect. This can be done by assuming that the disturbance  $\xi_t$  in (11) is not exogenous, but instead is related to the relative amounts of outside domestic and foreign nominal liabilities outstanding as in

$$\xi_t = \lambda[B_t - (B_t^F + s_t)] + \zeta_t$$

where  $B_t$  and  $B_t^F$  are logs of domestic and foreign government debt (including base money) and  $\zeta_t$  is exogenous. Substituting and recognizing that lags could be involved, we then write

$$(11') \quad R_t - R_t^F = (E_t s_{t+1} - s_t) + \lambda(L)[B_t - B_t^F - s_t] + \zeta_t$$

to replace (11). [Here  $\lambda(L)$  is a polynomial in the lag operator.] With this adjustment, the model features additional state variables, relative to the case in which pure UIP holds, and is therefore not one to which the E&W (2003, 2004) invariance proposition applies.<sup>12</sup>

### **5. Beggar-thy-Neighbor Effects?**

An objection to both of the proposals discussed in the foregoing section, raised by several commentators, is that use of the exchange-rate transmission channel would

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<sup>11</sup> In McCallum (2005) I modify the rule so as to be effective in normal circumstances, as well as in a ZLB situation.

<sup>12</sup> For additional discussion of the specification (11'), see the Appendix.

probably be highly unpopular with nations that constitute the relevant country's trading partners, since exchange-rate depreciation would improve its trade balance and thereby reduce the country's imports from its trading partners.<sup>13</sup> For this reason, such strategies have been said to rely upon "beggar-thy-neighbor" effects that are globally undesirable and politically objectionable. The premise of this argument is highly dubious, however, for a successful anti-ZLB policy will prevent a decline or stagnation in a country's real income level, which is the most important determinant of its imports. Furthermore, the exchange rate responses induced by a policy rule such as (13') above pertain to nominal exchange rates and will have only temporary real effects, other than those working through income, if the rule is effective in stimulating demand. Quantitative simulation results exemplifying this claim are reported as a major feature of McCallum (2003, pp. 16-23) for an expansionary increase in the target inflation rate  $\pi^*$ , with policy being conducted via the exchange rate rule (13').<sup>14</sup> Svensson (2003, pp. 163-164) also discusses this point. In a more recent contribution, he develops an argument indicating that use of the exchange-rate transmission channel will not have different import-export effects than any other monetary policy action, for the same degree of demand stimulus (Svensson, 2004, pp. 91-92). In sum, the "beggar-thy-neighbor" objection to use of the exchange-rate channel to escape ZLB difficulties seems to be fundamentally unjustified.

## **6. The Deflationary Trap**

Finally, I turn to the topic of the "deflationary trap" possibility, extensively discussed by Benhabib, Schmidt-Grohe, and Uribe in a series of papers including (2001, 2002). In this series, these authors have suggested that a ZLB situation could arise for

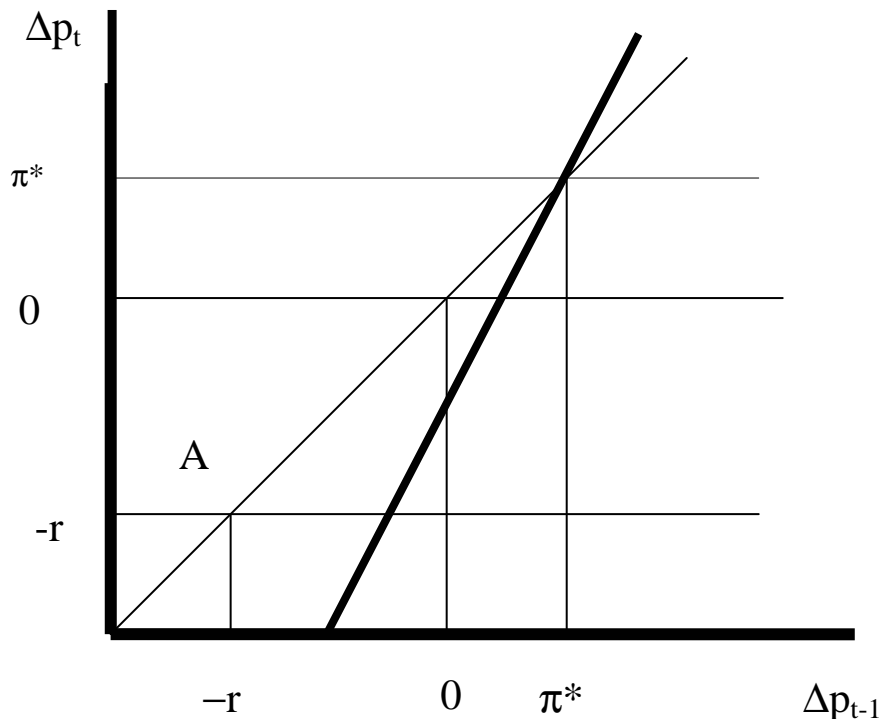
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<sup>13</sup> This frequently-heard objection is studied by Coenen and Wieland (2003) and mentioned (without endorsement) by Bernanke, Reinhart, and Sack (2004).

<sup>14</sup> Partially contradictory results are briefly reported by Coenen and Wieland (2003), but their policy experiment is quite different (with no policy response until after the ZLB constraint has been in effect for 10 quarters). In addition, their model's treatment of trade flows is somewhat problematic, as it does not recognize distinct import and export quantities.



reasons quite different from those presumed above. In the analyses of Krugman (1998), Eggertsson and Woodford (2003, 2004), Auerbach and Obstfeld (2004), Coenen and Wieland (2003), and most other writers on the ZLB issue, it is assumed that the relevant rational expectations solution is one in which inflation normally fluctuates around the target value specified by a standard, Taylor-style, interest rate policy rule. The discussions of Iwamoto (2005) and Fujiwara et. al. (2005), however, consider as well the possibility of a deflationary-trap equilibrium. An example taken from McCallum (2002) that assumes flexible prices and abstracts from stochastic shocks is given in Figure 1. There the dark upward-sloping line has slope  $1+\mu_1$ , representing rule (13) above, and the usual equilibrium is at this line's intersection with the 45-degree line (e.g., at  $\pi^*$  in Figure 1). If the target inflation rate ( $\pi^*$ ) plus the steady state real rate of interest ( $r$ ) is a moderately high value, such as 4-5 percent per year, unusually large shocks would then be required to push the system away from the  $\pi^*$  equilibrium to the vicinity of the ZLB for  $R_t$ , where inflation  $\Delta p_t$  equals  $-r$ . By contrast, Benhabib, Schmitt-Grohe, and Uribe suggest that there are multiple RE equilibria and the relevant one may instead approach or be located at point A, even in the absence of shocks. It is true that the latter pattern satisfies the first-order conditions for optimality, and also the relevant transversality condition. Nevertheless, my position, argued most extensively in McCallum (2002), is that this ZLB equilibrium is not plausible, because it fails to be E-stable in the sense developed by Evans and Honkapohja (2001). Such a failure implies that this



**Figure 1**

(apparent) RE equilibrium would not be learnable in a setting that recognizes that individual agents are not miraculously endowed with knowledge of the economy's parameters, but need to learn about them over time by observation of the economy's behavior. The usual RE equilibrium, focused upon by the other papers mentioned above, is by contrast E-stable and learnable under standard assumptions.<sup>15</sup> On the basis of this contrast, I would argue that the usual RE equilibrium is the only one of these two candidates that is plausible as a description of the behavior of an actual economy, so that it is highly unlikely that a ZLB situation would develop unless monetary policy lets  $\pi^* + r$  fall too close to zero.<sup>16</sup>

<sup>15</sup> It should be noted that this argument regards the form of (least squares) learnability in question as a necessary, not sufficient, condition for plausibility. In particular, it emphasizes that the relevant learning process assumes that (i) agents are collecting an ever-increasing number of observations on all relevant variables while (ii) the system's structure is remaining unchanged. Furthermore, (iii) the agents are estimating the relevant unknown parameters with an appropriate estimator in (iv) a properly specified model. Thus if a proposed RE solution is not learnable by the process in question, it would seem distinctly implausible that it could prevail in practice.

<sup>16</sup> This conclusion is basically consistent with that of Woodford (2003, pp. 123-129), although the latter's argument is expressed rather differently.

## **7. Conclusion**

Let me conclude with a very brief summary. This paper argues that, in contrast with the beliefs of some analysts: (i) there are strategies for escaping ZLB situations other than “shaping interest rate expectations;” (ii) fiscal transfers are in theory no more effective than open-market monetary policy actions under assumptions implying Ricardian equivalence; (iii) the difference between Svensson’s (2001) “foolproof way” rule and the exchange rate policy rule of McCallum (2000) does not involve assumptions concerning uncovered interest parity but rather the type of policy experiment considered; (iv) it is likely that neither of the exchange-rate strategies in (iii) would lead to beggar-thy-neighbor effects; and (v) the deflationary-trap type of ZLB equilibria are much less plausible than those of the liquidity-trap type.

## Appendix

Here we are concerned with the modified UIP equation (11'), which was introduced in Section 4. Note that (11') is similar to equations prominent in several older writings by Dornbusch (e.g., 1987, p. 7) and others. These represented a “portfolio balance” approach that was initially prominent but waned in influence as a result of empirical studies that failed to find empirical support. Nevertheless, it is, I would argue, implausible to believe that no such relation obtains in fact, not even with weak or transitory effects of the  $B_t - B_t^F$  variable. Interestingly, models of this type have quite recently been utilized by several leading researchers,<sup>17</sup> while Mussa (2000) has recognized that the absence of any effect of the type hypothesized—i.e., the absence of  $B_t - B_t^F$ —implies that a nation can enrich itself to an unlimited extent by printing money and buying up foreign assets. The point is that if a relation such as (11') does prevail, then our simulation procedure in Section 4 is theoretically appropriate, since (11') indicates that even with  $R_t = 0$ ,  $s_t$  can be affected by central bank purchases of foreign exchange because they alter the value of  $B_t - B_t^F$ . Nevertheless, the precise specification of relation (11') need not be known, and the relation need not be included in the model, for basically the same reason that money demand functions are not needed in standard analyses that presume use of an interest rate instrument. Thus appending (11') to the model would have no effect on the implied behavior of  $\Delta p_t$ ,  $x_t$ ,  $y_t$ , or  $\Delta s_t$ ; it would merely specify the magnitude of open-market purchases of foreign exchange needed to implement the policy rule (13').

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<sup>17</sup> Essentially the same relation as (11') has recently been central to the analyses of Flood and Marion (2000), Flood and Jeanne (2005), and Blanchard, Giavazzi, and Sa (2005). Microeconomic support is provided by Jeanne and Rose (2002), and the prominent work of Evans and Lyons (e.g., 2002) is indirectly supportive.

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