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Comment on: The zero-interest-rate bound and the role of the exchange rate for monetary policy in Japan

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1. Introduction

At the Carnegie-Rochester conference in 1993 at which John Taylor first introduced the "Taylor rule," zero-nominal-interest-rate bounds were far from the minds of the participants. That conference program included a set of papers that focused on how to achieve and maintain low and stable rates of inflation. Coincidentally, 1993 was also the last year that the Japanese GDP price index recorded a positive increase (it rose at a 0.5% year-over-year rate). Today, with many countries having achieved low inflation, new concerns have arisen over the possible consequences of very low average inflation rates and the constraints on monetary policy posed by the zero lower bound on nominal interest rates.

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In their very interesting paper, Coenen and Wieland extend the existing literature on monetary policy in the face of the zero lower bound (ZLB) in several ways. First, they assess the consequences of this bound using a small, econometrically estimated model of the Japanese economy. The model is part of a three-country model, consisting of Japan, the United States, and the Euro Area, that the authors have specified and estimated in previous work (Coenen and Wieland 2002). Second, they use this model to assess the consequences of three alternative proposals that have been advanced for implementing monetary policy when the nominal rate is zero. Finally, because they employ a multi-country model, they are able to quantify the spillover effects of the alternative policy proposals on the U.S. and the Euro Area. Previous research on the ZLB has tended to use small, theoretical models or has employed large U.S. econometric models. The use of an estimated model of Japan to assess alternative policy recommendations is a particularly noteworthy contribution to our understanding of policy at the ZLB.

2. Overview of the estimated model

Coenen and Wieland use a multi-country model in which nominal wages are assumed to adjust in a staggered manner and the price level is a distributed lag of past nominal wages. The wage-price block of the U.S. model follows a Fuhrer-Moore specification while that of the Euro Area and Japan uses Taylor's wage contracting specification. The rest of the model consists of a backward-looking IS relationship and a term structure equation for each country block, the uncovered interest parity condition, and a monetary policy rule. In the authors' earlier paper (Coenen and Wieland 2002), the policy rules for the nominal interest rate were estimated. In the present paper, these rules are instead calibrated, with the monetary authority in each area following a Taylor rule with coefficients of 1.5 and 0.5 on inflation and the output gap.

Three aspects of the model are worth particular note. First, the aggregate demand specification is backward-looking. This specification implies the benefits of the expansionary policies analyzed in the paper will be delayed relative to what would be found using a forward-looking specification. Second, the price level used to define real wages corresponds to a domestic GDP deflator. There is no direct exchange rate effect on inflation, since inflation is measured by the GDP deflator and not by a consumer price index. This must be kept in mind when assessing Coenen and Wieland's simulations of alternative policies, since all the policies operate via exchange rate depreciations. Third, the model lacks a direct effect of foreign income on domestic exports and domestic income on imports. This aspect of the specification may be important, as the authors recognize, for their assessment of the spillover effects on the U.S. and the Euro Area of a Japanese depreciation (see McCallum 2002).

The international linkages that are present in the model operate through the interest parity condition and a direct exchange rate effect on domestic demand. Thus, depreciations lead to an increase in the demand for domestic output through the latter effect, and an expected depreciation leads to a rise in the nominal interest rate via the former.

3. Assessing the effects of the ZLB

Coenen and Wieland subject their model of Japan to a sequence of large, deflationary shocks, and outcomes are compared when the zero bound is ignored and when it is imposed. The results, summarized in their Figure 1, indicate that stabilization policy is severely hampered by the zero-bound. The output gap drops more dramatically and remains negative much longer when the nominal rate is restricted to remain nonnegative.

The shock sequence Coenen and Wieland employ consists of 20 quarters of negative shocks. The probability of 20 straight negative shocks is less than 0.0001 percent, so this simulation presents the outcome of a highly unusual event. Figure 1 suggests that the model economy recovers fairly rapidly as soon as the shocks stop. After quarter 20, the short-term nominal interest rate rebounds dramatically in the simulation that ignores the zero bound. When the ZLB is imposed, the real exchange rate depreciates as soon as the shocks end, and both output and inflation then recover. This property of the underlying model will be important to keep in mind when the model is used to simulate the effects of alternative monetary policy rules.

The second approach to assessing the impact of the ZLB involves using the estimated covariance structure of Japanese shocks to estimate the probability that the zero-bound will bind as a function of the average equilibrium level of the nominal interest rate. Coenen and Wieland conclude that the chances of hitting the ZLB are fairly high when the equilibrium nominal interest rate is low. With an equilibrium real rate of 2% and an inflation target of 0%, the ZLB is encountered about 20% of the time. Here their conclusion is in contrast to those obtained by Reifschneider and Williams (2000) who conclude, based on the FRB/US model, that "…such episodes (when open-market operations are insufficient) are fairly rare, even in a low inflation environment—about once every hundred years if the target rate of inflation is around zero…" (p. 962)

One difficulty with this exercise is that it does not allow one to determine whether the ZLB is a serious constraint or not. That is, knowing the frequency with which the constraint is binding is not the same as knowing how seriously the economy's performance is affected. To get at this issue, Coenen and Wieland report the means and standard deviations of the output gap, inflation, the real interest rate, and the real exchange rate as a function of the equilibrium nominal interest rate. As they show, the ZLB can, when the equilibrium nominal rate is low, lead to significant downward biases in average real output and inflation and upward biases in their standard deviations. The effects are, however, quite small. At an equilibrium nominal interest rate of 2 percent, the bias in mean output is -0.06 percent. This bias increases rapidly as the equilibrium nominal rate falls, however, reaching -0.18 percent for an equilibrium nominal interest rate of 1 percent.

In interpreting these results, it is important to keep in mind that the simulations assume the policy makers in Japan, the U.S., and the Euro Area are all committed to following ad hoc and presumably suboptimal policy rules.

4. The alternative policy prescriptions

A number of economists have proposed policies aimed at stimulating the Japanese economy when, due to the ZLB, traditional interest rate cuts cannot be employed. A major contribution of Coenen and Wieland's paper is that they can conduct a comparison of these policies using an estimated model of the Japanese economy *and* they can assess the effects of these policies on both the U.S. and Euro Area economies.

Three alternative proposals are investigated. All three involve a yen depreciation. The first policy, due to Orphanides and Wieland (2000), calls for an aggressive base money expansion when the nominal rate reaches zero. The second, due to McCallum (2000, 2001), proposes that the central bank switch to an exchange rate based Taylor rule when the ZLB is encountered, with the exchange rate adjusted in response to inflation and the output gap. Finally, Svensson (2001) has also called for a depreciation, followed by an exchange rate peg and an announced price-level target.

It is useful to embed the Orphanides and Wieland (OW) and McCallum (MC) policies into a common framework so that their difference can be seen more clearly. To do so, I will use a model that matches more closely the new Keynesian models analyzed by Clarida, Galí and Gertler (1999), Woodford (1999), and Svensson and Woodford (1999), and McCallum and Nelson (1999).

When the domestic nominal interest rate is equal to zero, the new Keynesian, open economy expectational IS curve can be written as

$$q_t = (1-q)\,\mathrm{E}_t\, q_{t+1} + q q_{t-1} + f\,\mathrm{E}_t\, p_{t+1} + y\, e_t + ds_t, \tag{1}$$

where q is the output gap, p is inflation, ds is a demand shock, and e is the real exchange rate. Defining $\hat{e}_t \equiv -y\, e_t / f$, this equation can be written as

$$q_t = (1-q)\,\mathrm{E}_t\, q_{t+1} + q q_{t-1} - f\left(\hat{e}_t - \mathrm{E}_t\, p_{t+1}\right) + ds_t. \tag{2}$$

Inflation is given by

$$p_t = (1-f)\,b\,\mathrm{E}_t\, p_{t+1} + f p_{t-1} + g\, q_t + cs_t, \tag{3}$$

where cs is a cost shock.

The first point to note is that *if* the monetary authority can control the real exchange rate, then equations (2) and (3) are identical to the standard new Keynesian closed economy model with $\hat{e}_t$ simply replacing the nominal interest rate as the instrument of monetary policy. Any output gap and inflation combination that could be achieved through a nominal interest rate policy can be achieved through an exchange rate policy. Coenen and Wieland specify a portfolio balance equation in which deviations from UIP are related to relative asset levels and in particular, to relative base money supplies. Thus, by controlling the monetary base, a country in a zero-nominal rate liquidity trap can still affect the real exchange rate.

Coenen and Wieland's portfolio balance equation takes the form

$$e_t = \mathrm{E}_t\, e_{t+1} + l_k (k_t - e_t) + v_t, \tag{4}$$

where k is the monetary base relative to GDP and the disturbance term v captures the effects of foreign interest rates and other factors affecting portfolio balance (all variables are expressed as log deviations around the steady-state). Under OW's policy rule, $k_t = -k_p p_t - k_q q_t$. Combining this with (4),

$$e_t = \left(\frac{1}{1+l_k}\right)\mathrm{E}_t\, e_{t+1} - \left(\frac{l_k}{1+l_k}\right)\left[k_p p_t + k_q q_t\right] + \left(\frac{1}{1+l_k}\right) v_t. \tag{5}$$

Under the MC policy rule, the rate of real depreciation can be expressed as

$$e_t - e_{t-1} = -(1+c_p) p_t - c_q q_t. \tag{6}$$

The choice between the OW and MC policies reflects a standard Poole-instrument-choice problem. As equations (5) and (6) show, the MC rule insulates the real exchange rate and the domestic economy from shocks to the portfolio balance equation; the OW rule does not. If such shocks are large, the MC policy will be preferred.

There is another important difference between the two policies. The MC policy, by making the current real exchange rate depend on its lagged value, introduces inertia; the OW policy does not. While neither of these policies is optimal, we do know that an optimal commitment policy in the presence of forward-looking expectations will display persistence (Woodford 1999). Thus, the inertia introduced by the MC policy may improve its stabilization properties. Under the MC rule, a real depreciation at time t increases both e_t and the expected future values of e. This effect on the expected future real exchange rate raises expected future output and inflation. In contrast, the real exchange rate under the OW policy is a purely forward-looking variable, and the OW rule does not introduce the inertial behavior that can improve policy trade-offs.

This comparison of the OW and MC policies may actually not be the relevant one. In the case of Japan, the pressing policy issue is less about stabilization policies than it is about jump starting the economy to get it out of the liquidity trap. Svensson's "foolproof" policy proposal is directed squarely at this problem (Svensson (2001). Svensson's proposal calls for a large depreciation and an announced target price path, followed by a crawling peg that is maintained until the price target is achieved. The Svensson policy has one weakness that is not shared by the other policies. A central bank that has failed to maintain price stability is to credibly commit to a future path for the nominal exchange rate. How this is to be achieved is left unspecified. As Coenen and Wieland demonstrate, the details of Svensson's method are critical, suggesting it might be less than foolproof.

In the policy simulations, the switch to the OW, MC, or SV policy occurs after the short-term nominal interest rate has been at zero for 10 quarters. Recall that the sequence of negative shocks ends after 20 quarters, after which Figure 1 showed that the economy recovers, even in the absence of a direct exchange rate policy. Inspection of Figures 6, 10, and 11 (for the OW, MC, and SV policies respectively) shows that all three policies limit the output decline during periods 10-20 (i.e., from the time policy is switched until the shocks end). For the calibration used in the exercise, the MC and SV policies appear to lead to faster recoveries, while the MC policy avoids the overshooting displayed under the SV policy.

5. Concluding comments

The use of an estimated, multi-country model is an important contribution to the literature on the ZLB problem. However, the policy proposals Coenen and Wieland analyze are ad hoc. It would be insightful to investigate the behavior of the economies under optimal policies. As it stands, one does not know how much better then the rules Coenen and Wieland analyze one might do. As John Taylor noted in his 1993 Carnegie-Rochester paper, a ZLB situation may face policy makers "… a world where simple, algebraic formulations of such rules cannot and should not be mechanically followed by policymakers." (Taylor 1993, page 213)

One must also ask whether this is the right model for studying Japanese stabilization policy. Most commentators attribute the length of the Japanese recession to its failure to address and resolve its banking sector crises, but the financial sector does not play a central role in the model. All the policy proposals *assume* the credit market is well functioning, so it would be useful to investigate outcomes of alternative policies in a model in which credit markets play more of a leading role.

As Coenen and Wieland's results make clear, there are policies that Japanese policymakers could follow that would stimulate the Japanese economy, even when the ZLB eliminates the traditional tool of monetary policy. Stimulating the Japanese economy is not a technical problem. Hence, the more interesting question, one not addressed by this paper, is one of political economy—why have Japanese policy makers not adopted policies to depreciate the yen?

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