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Comments on Bernanke, Reinhart, and Sack, "An Empirical Assessment of Monetary Policy Alternatives at the Zero Bound"*

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Abstract

The Bernanke-Reinhart-Sack paper mostly focuses on alternative policies in a liquidity trap to affect expectations of future *interest rates*. But the problem in a liquidity trap is rather to raise private-sector expectations of the future *price level*. Increased expectations of the future price level are likely to be much more affective in reducing the real interest rate and stimulating the economy out of a liquidity trap than further lowering of already very low expectations of future interest rates. Therefore, monetary-policy alternatives in a liquidity trap should be assessed theoretically and empirically according to how effective they are in affecting private-sector expectations of the future price level.

Bernanke, Reinhart, and Sack [3] is an important and interesting paper with a good theoretical discussion of and new empirical results on monetary-policy alternatives at the zero lower bound on nominal interest rates (ZLB). This paper is important and interesting also for the obvious reason that two of its authors are important and influential insiders of the Federal Reserve System. Regardless of the qualification that the views expressed are not necessarily shared by anyone else in the Federal Reserve System, the paper reveals some aspects of the thinking about and preparation for the possibility that the ZLB might bind at some future time.

I have no disagreements with the substance of the paper and the empirical results that the authors find. However, I believe that the focus and emphasis are not quite right.

Consider a liquidity trap—a situation when the ZLB is strictly binding, in the sense that it prevents the central bank from setting its instrument rate (the federal funds rate for the Fed) at its optimal level. *What is the problem in a liquidity trap?* The problem is that, even though the instrument rate is at zero, the real (short) interest rate is too high, and that the economy is in a

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recession and/or inflation is too low, perhaps even negative. The central bank would prefer a lower real interest rate and a more expansionary monetary-policy stance, if that were possible. *But, how can the problem be solved?* The real interest rate can be lowered by the central bank inducing private-sector expectations of a higher future price level. If expected inflation increases, the real interest rate falls, even if the nominal interest rate is unchanged at zero. *But, how can the central bank induce such expectations of a higher future price level?* Indeed, this is the real problem in a liquidity trap.

Consequently, in assessments of policy alternatives in a liquidity trap, the focus should be on how effective the policy alternatives are in affecting expectations of the future *price level*. In this paper, however, the focus is mostly on affecting private-sector expectations of future *interest rates*, which is likely to be much less effective.[1]

1. In a liquidity trap, the real interest is too high; the real interest rate can be lowered by expectations of a higher future price level

Let me use a small New Keynesian model for illustration. Let $x_t \equiv y_t - \bar{y}_t$ denote the output gap in the current period t, where y_t denotes (log) output and $\bar{y}_t$ denotes (log) potential output. Potential output is assumed to be an exogenous stochastic process. Let r_t denote the (short) real interest rate,

$$r_t \equiv i_t - \pi_{t+1|t} \equiv i_t - (p_{t+1|t} - p_t);$$

where i_t denotes the nominal interest rate, the instrument rate; $\pi_{t+1|t}$ denotes private-sector one-period-ahead inflation expectations; p_t denotes the (log) price level; and $p_{t+1|t}$ denotes the expected one-period-ahead (log) price level. Let $\bar{r}_t$ denote the neutral (real) interest rate—the Wicksellian natural interest rate, the real interest rate that would arise in a hypothetical flex-price economy with output equal to potential output. In the simplest case, the neutral interest rate is given by

$$\bar{r}_t \equiv \rho_t + \frac{1}{\sigma}(\bar{y}_{t+1|t} - \bar{y}_t),$$

where ρ_t is the rate of time preference (an exogenous stochastic process) and the positive constant σ is the intertemporal elasticity of substitution for consumption. Hence, the neutral interest rate is determined by the rate of time preference and expected potential-output growth. The output gap

[1] Although, in some cases, a particular path of future interest rates may induce desirable price-level expectations in equilibrium, this way of affecting price-level expectations is certainly very indirect and in practice fraught with many difficulties. Furthermore, an interest-rate commitment need not in itself be sufficient to uniquely determine the price level, as emphasized long ago by Sargent and Wallace [6] and more recently—in the context of a liquidity trap—by Benhabib, Schmitt-Grohé, and Uribe [1].

depends positively on the expected future output gap, $x_{t+1|t}$, and negatively on the real-interest-rate gap, $r_t - \bar{r}_t$, according to the aggregate-demand relation,

$$x_t = x_{t+1|t} - \sigma(r_t - \bar{r}_t),$$

which follows from a first-order condition for optimal consumption choice. The aggregate-demand relation can be solved forward to period $t + T$,

$$x_t = x_{t+T|t} - \sigma \sum_{\tau=0}^{T-1} (r_{t+\tau|t} - \bar{r}_{t+\tau|t}).$$

This expression shows that the current output gap depends positively on the expected output gap T periods ahead, $x_{t+T|t}$, and negatively on the sum of the current and expected future real-interest-rate gaps, $r_{t+\tau|t} - \bar{r}_{t+\tau|t}$, for the next T periods. I assume that the horizon T is chosen such that the economy is expected to then be back to normal, in the sense that the output gap is expected to then be approximately equal to zero, $x_{t+T|t} \approx 0$. The current output gap then only depends on the sum of the current and expected future real-interest-rate gaps for the next T periods. If the current output gap is negative, so there is a recession, this is because the sum of the current and expected future real-interest-rate gaps is too high—that is, because the current and expected real interest rates are too high relative to the natural interest rates.

Under the assumption that the economy is expected to be back to normal T periods ahead, the current output gap can be written as

$$x_t \approx -\sigma \sum_{\tau=0}^{T-1} (i_{t+\tau|t} - \pi_{t+1+\tau|t} - \bar{r}_{t+\tau|t}) = -\sigma \sum_{\tau=0}^{T-1} i_{t+\tau|t} + \sigma(p_{t+T|t} - p_t) + \sigma \sum_{\tau=0}^{T-1} \bar{r}_{t+\tau|t};$$

where the first equality uses the definition of the real interest rate, and the second equality uses the fact that the sum of future inflation equals the total change of the (log) price level. I also assume that the economy is expected to be in or close to a liquidity trap during the next T periods, so the expected instrument rates for that period are approximately zero, $i_{t+\tau|t} \approx 0$ $(0 \leq \tau \leq T-1)$. Then the first term on the right side is approximately zero. For a given current price level p_t (I assume that the current price level is sticky and in the short run approximately given), the output gap only depends on the expected price level T periods ahead, $p_{t+T|t}$, and the sum of the expected neutral interest rates during the next T periods. If the output gap is negative, so the economy is in a recession, this is for two reasons: The sum of the current and expected future neutral interest rates, $\sum_{\tau=0}^{T-1} \bar{r}_{t+\tau|t}$, is too low, and the sum of the current and expected future real interest rates, $\sum_{\tau=0}^{T-1} r_{t+\tau|t} \approx -(p_{t+T|t} - p_t)$, is too high. That is, the expected future price level, $p_{t+T|t}$, is too

low. It follows that the real interest rate can be lowered and the negative output gap be reduced or eliminated, if the central bank can induce private-sector *expectations of a higher future price level*.

However, this paper is mostly about reducing the negative output gap by inducing private-sector *expectations of lower future instrument rates*. Thus, in the case when the expected future instrument rates during the next T periods are not exactly zero but positive, they can perhaps be reduced further toward zero. However, they are already small, so what can be gained is small. Furthermore, perhaps the private-sector can be induced to expect instrument rates close to zero also *after* period T, after the liquidity trap is over. In the above framework, this would amount to creating expectations of a positive rather than a zero output gap T periods ahead, $x_{t+T|t} > 0$, which would reduce the current negative output gap. It seems likely that any such attempt to lower expectations of future instrument rates toward zero, when these expectations are already low to start with, will have very small, second-order effects on the current output gap.

In contrast, there is potentially a large first-order effect on the output gap from increasing expectations of the future price level. This is where I wish the focus of this paper would have been.

2. How can the central bank affect expectations of the future price level?

The insight that the principal solution to the problem of a liquidity trap involves affecting private-sector expectations of the future price level is due to Krugman [5]. Krugman also noted that this principal solution immediately encounters a practical problem, a credibility problem, in that it is not so easy for a central bank to purposely affect such private-sector expectations. In particular, a central bank that has built a reputation for consistent low-inflation policy finds it difficult to convince the private sector that it suddenly wants the price level to increase substantially.

2.1. Expanding the money supply

One potential way to affect expectations of the future price level is by increasing the money supply (what is referred to as affecting the *size* of the central-bank balance sheet in this paper). As Krugman noted, this is effective only if an increase in the money supply is perceived by the private sector to be *permanent*. Unfortunately, there is no commitment mechanism through which a modern central bank can commit itself to a particular future money supply.

We can see this in the above framework. Let us assume that the horizon T is chosen such that the liquidity trap is expected to be over and interest rates are expected to be positive beginning in

period $t+T$, $i_{t+T|t} > 0$. To a first approximation, we may take demand for the monetary base to be proportional to nominal GDP when interest rates are positive. This implies (disregarding any constant),

$$p_{t+T|t} \approx m_{t+T|t} - y_{t+T|t},$$

where $m_{t+T|t}$ denotes the expected (log) monetary base T periods ahead. That is, the expected future price level is approximately directly related positively to the expected future monetary base and negatively to the expected future output level. If the central bank could affect private-sector expectations of the future monetary base, it would, everything else equal, also affect private-sector expectations of the future price level to the same extent.

Unfortunately, it is not easy for a central bank to directly affect expectations of the future monetary base. The Bank of Japan and the Japanese liquidity trap provide an unusually clear-cut example. In March 2001, the Bank of Japan instituted its new policy of "quantitative easing," a dramatic expansion of the monetary base. By the summer of 2004, the monetary base had increased by more than 60%. Suppose that the private sector would believe that this expansion of the monetary base is permanent. The private sector would then believe that, some time in the future (for concreteness, say in four years) when the Japanese liquidity trap is over, nominal GDP would be up by more than 60 percent. Suppose that the private sector believes that the Japanese GDP in the next four years will be up some 10–15 percent. The private sector would then believe that in four years the price level would be up by some 40–45 percent. If this were the case, either the yen would depreciate by some 40–45 percent or long Japanese interest rates would rise substantially, or some combination thereof would occur. Obviously, neither of these events has occurred. The obvious conclusion is that the private sector does not believe that the expansion of the monetary base is permanent. The quantitative easing has not affected price-level expectations. It appears to be a dramatic failure.

2.2. An inflation target or a price-level target

An inflation target or (better) a price-level target would be a fine solution, *if* it were credible. However, just announcing the target would not be enough: The announcement would have to be combined with statements and actions that make it credible. This seems to be a particular problem for central banks like the Federal Reserve and the Bank of Japan, since they have clearly demonstrated over many years their notorious aversion to any numerical target or other explicit commitment.

2.3. Fiscal policy

Regarding fiscal policy, a fiscal expansion—an increase in the fiscal deficit—may or may not be expansionary and increase aggregate demand, depending on the composition of the fiscal expenditure, the degree of Ricardian equivalence, and so fourth. Typically, Ricardian equivalence does not seem to hold, and a fiscal deficit is expansionary; however, private-sector behavior may be closer to Ricardian equivalence in a crisis situation with a perceived unsustainable fiscal and an expected immanent fiscal consolidation with increased taxes and/or reduced benefits. Japan has certainly tried an expansionary fiscal policy. This has not led to an escape from the liquidity trap, but it has certainly lead to a dramatic deterioration of Japan's public finances.

A money-financed rather than debt-financed fiscal expansion is often proposed as a remedy against a liquidity trap. But it is often not understood that, for a given fiscal deficit and aside from any debt-induced inflation incentives for government-controlled (rather than independent) central banks, money- or debt-financing matter through exactly the same mechanism as that discussed above in regard to expanding the money supply. Money financing of a fiscal expansion will have an effect on expectations of the future price level only to the extent that it is interpreted as a permanent expansion of the money supply. Again, since there is no commitment mechanism for the future money supply, current money financing of a deficit does not exclude that the money supply will be reduced in the future. Money-financing hence provides no separate mechanism to affect expectations of the future price level.

2.4. Empirical assessment of policy alternatives in a liquidity trap

In line with the above discussion, the empirical assessment of alternative policies in a liquidity trap should focus on their impact on price-level expectations. An obvious problem is that there very few examples, so only case studies seem feasible. The "Rooseveltian Resolve" 1933–34 (discussed by Bernanke [2]) seems a good case to examine from this point of view, with its devaluation, its new commitment to end deflation and to "reflate" the economy, and its associated impression of a regime change. It should be interesting to look at price-expectations data from this period. Generally, it seems more relevant and revealing to look at price-expectations data than interest-rate expectations data when assessing alternative policies in a liquidity trap. In particular, one may want to look at data on the effect of central-bank communication on price-level expectations.

2.5. The Foolproof Way

In several papers (Svensson [7]-[9] and Jeanne and Svensson [4]), I have promoted the Foolproof Way to escape from a liquidity trap (FPW) as an effective policy. The FPW involves the announcement and the implementation of (1) a price-level target, (2) a currency depreciation and a peg consistent with price-level target, and (3) an exit strategy, when the price-level target has been reached, according to which the currency is floated and either inflation or price-level targeting is instituted.

In terms of the above framework, the idea is to induce private-sector expectations of a higher future price level, such that the real interest rate falls and the economy expands out of the liquidity trap. Let the price level target for period $t+T$, $\hat{p}_{t+T}$, be such that price-level expectations satisfying

$$p_{t+T|t} = \hat{p}_{t+T}, \tag{2.1}$$

and zero instrument rates during the next $T-1$ periods would be adequate to achieve the desired fall in the real interest rate and increased stimulus of the economy. Price-level expectations and exchange-rate expectations will be related according to

$$p_{t+T|t} = s_{t+T|t} + p^*_{t+T|t} - q_{t+T|t}, \tag{2.2}$$

where s_t denotes the (log) exchange rate, p^*_t denotes the (log) foreign price level, and q_t denotes the (log) real exchange rate. I assume that the horizon T is chosen such that the economy is expected to be back to normal; in particular, such that the real exchange rate is expected to be back to its natural/neutral/potential level, $\bar{q}_{t+T|t}$, and hence can be treated as exogenous from the point of current monetary policy. I also assume that the foreign price level can be taken as exogenous. Under these assumptions, the expected future price level and the expected future exchange rate are directly related and move together.

By interest parity, the current exchange rate is related to the expected future exchange rate and the interest-rate differential between the home and foreign interest rate, $i_t - i^*_t$, by

$$s_t = s_{t+1|t} - (i_t - i^*_t) = s_{t+T|t} - \sum_{\tau=0}^{T-1} i_{t+\tau|t} + \sum_{\tau=0}^{T-1} i^*_{t+\tau|t},$$

where the second equality follows from solving forward T periods. By (2.2), we get

$$s_t = p_{t+T|t} - \sum_{\tau=0}^{T-1} i_{t+\tau|t} + ... \ ,$$

where exogenous terms have been left out. Expected future instrument rates approximately equal to zero imply that the current exchange rate is directly related to and moves together with the

expected future price level. An increase in the expected future price level corresponds to an equal current depreciation of the currency. The exchange-rate peg of the FPW implements the exchange rate consistent with the future price-level target and the zero instrument rates.[2] If the FPW and its price-level target are immediately credible, the price-level expectations will rise to fulfill (2.1), and the currency will, by (2.2), depreciate by the same amount, and the peg will not be binding. Otherwise, the peg forces private-sector price-level expectations to be consistent with the price-level target.

Many comments on the FPW, including in this paper, have suggested that a potential improving effect on the trade balance of the peg's currency depreciation may be problematic for the trading partners. However, any effects on the trade balance are exactly the same as those that would result from a credible price-level target without any peg, or a lower instrument rate, if that were not prevented by the ZLB. The truth is, that any expansionary monetary policy would imply a currency depreciation and a trade-balance effect. Furthermore, any trade-balance net effect from expansionary monetary policy consists of income and substitution effects of opposite signs. In a liquidity trap and a deep recession, the income effect on the trade balance may be particularly strong and actually improve the trade balance for the trading partners. Finally, nothing prevents the trading partners from conducting expansionary monetary policy to counteract any contractionary effect from the FPW. In this way, an optimal world monetary expansion may be achieved (see Svensson [9] for an analysis of the international effects of the FPW).[3]

3. Changing the composition of the central-bank balance sheet

The paper also discusses changes in the composition of the central-bank balance sheet as a policy alternative in the ZLB.[4] The purpose of such a policy is to affect various risk premia through portfolio-balance effects. For example, consider the relation between the interest rate on a nominal

[2] The peg may need a rate of crawl to be exactly consistent with a zero home instrument rate. A constant peg would imply a home instrument rate equal to the foreign short interest rate, but the practial difference is small.

[3] One possible problem with the FPW is the possible incentive for the central bank to renege in the future by an unanticipated currency appreciation, so as to achieve a low inflation ex post. However, Jeanne and Svensson [4]—starting from (1) the fact that a currency appreciation depreciates the home-currency value of foreign exchange reserves and (2) the strong aversion towards negative central-bank capital revealed by central-bank officials and noted by central-bank commentators—show that a central bank can manage its capital such that it creates a commitment not to appreciate the currency in the future.

[4] Note that the management of central-bank capital so as to create a commitment not to appreciate the currency discussed in Jeanne and Svensson [4] is an example of policy that changes the composition of central-bank capital (see footnote 3).

discount bond of a maturity of T periods, i_t^T, and the instrument rate,

$$i_t^T = \frac{1}{T}\sum_{\tau=0}^{T-1} i_{t+\tau|t} + \varphi_t^T.$$

Here, φ_t^T denotes a term premium, which may depend on the relative supply of maturity-T government bonds, denoted B_t^T. If initially i_t^T is positive, by changing the composition of its assets so as to increase the proportion of maturity-T bonds and to reduce the proportion of Treasury bills, the central bank can reduce the relative supply of maturity-T bonds and lower the term premium; thereby lowering i_t^T toward zero. It is in principle possible for central banks to lower the interest rate on longer bond rates somewhat this way. The paper provides very interesting empirical results on the Fed's attempts to affect long interest rates. But it is not clear that such attempts will have a substantial effect on the current output gap. We are probably talking about a few basis points, or at most a few tens of basis points, fall of long bond rates that are already probably small. Compared to the effect of changing price-level expectations, it seems to be a second-order effect. Although the empirical results in the paper on these effects are very interesting, and the analysis is very well done, it seems clear that we are talking about rather small effects.[5]

4. Conclusion

In conclusion, to me it seems obvious that, regarding monetary-policy alternatives in a liquidity trap, we should focus on policies that can affect expectations of the future price level rather than just affecting expectations of future interest rates. The effect of changing price-level expectations and related exchange rates seems much more powerful than that of changing long nominal interest rates or expectations of future short interest rates that are already rather close to zero. Obviously, there is no bound to price levels and exchange rates similar to that on nominal interest rates. I consequently wish there were more theoretical and empirical research on policies in liquidity trap with the focus on affecting price-level expectations.

References

[1] Benhabib, Jess, Stephanie Schmitt-Grohé, and Martín Uribe (2002), "Avoiding Liquidity Traps," *Journal of Political Economy* 110, 535–563.

[5] In the simple analytical framework used in this comment, it is not clear if it is i_t^T or $\sum_{\tau=0}^{T-1} i_{t+\tau|t}$ that matters more for the output gap. A more elaborate model, not using first-order approximation, is necessary to answer that.

[2] Bernanke, Ben S. (2000), "Japanese Monetary Policy: A Case of Self-Induced Paralysis?" in Adam Posen and Ryoichi Mikitani, eds., *Japan's Financial Crisis and Its Parallels to US Experience*, Special Report 13, Institute for International Economics, Washington, DC, 149–166.

[3] Bernanke, Ben S., Vincent R. Reinhart, and Brian P. Sack (2004), "An Empirical Assessment of Monetary Policy Alternatives at the Zero Bound," presented at the Brookings Panel on Economic Activity, September 9–10, 2004.

[4] Jeanne, Olivier, and Lars E.O. Svensson (2004), "Credible Commitment to Optimal Escape from a Liquidity Trap: The Role of the Balance Sheet of an Independent Central Bank," working paper, www.princeton.edu/∼svensson.

[5] Krugman, Paul (1998), "It's Baaack! Japan's Slump and the Return of the Liquidity Trap," *Brookings Papers on Economic Activity* 2:1998, 137–187.

[6] Sargent, Thomas J., and Neil Wallace (1975), " 'Rational' Expectations, the Optimal Monetary Instrument, and the Optimal Money Supply Rule," *Journal of Political Economy* 83, 241–254.

[7] Svensson, Lars E.O. (2001), "The Zero Bound in an Open Economy: A Foolproof Way of Escaping from a Liquidity Trap," *Monetary and Economic Studies* 19(S-1), 277–312.

[8] Svensson, Lars E.O. (2003), "Escaping from a Liquidity Trap and Deflation: The Foolproof Way and Others," *Journal of Economic Perspectives* 17–4, 145–166.

[9] Svensson, Lars E.O. (2004), "The Magic of the Exchange Rate: Optimal Escape from a Liquidity Trap in Small and Large Open Economies," working paper, www.princeton.edu/∼svensson.