Policy Options in a Liquidity Trap

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The specter of a "liquidity trap," originally proposed as a theoretical possibility by John Maynard Keynes (1936) but long considered to be of doubtful practical relevance, has recently created alarm among the world's central banks. In Japan, the overnight rate has been essentially at zero for most of the time since February 1999, making further interest-rate cuts impossible. Yet until well into 2003, growth remained anemic while prices continued to fall, suggesting a need for further monetary stimulus. Since March 2001, the Bank of Japan has supplemented its "zero-interest-rate policy" with a policy of "quantitative easing," under which additional bank reserves are supplied beyond those needed to keep overnight interest rates at zero. Yet an increase in base money of more than 50 percent failed to halt the deflation, suggesting a liquidity trap. More recently, other central banks, including the Fed, have come close enough to the zero bound to worry about how they would deal with a similar predicament.

Here we first discuss whether monetary policy should actually become ineffective when the zero bound on interest rates is reached. We argue that open-market operations, even of "unconventional" types, will be ineffective if they do not change expectations about the future conduct of policy; in this sense, a liquidity trap is possible. Nonetheless, a credible commitment regarding future policy can largely mitigate the distortions created by the zero bound. We fully characterize the optimal commitment in a simple example.

I. Ineffectiveness of Open-Market Operations

In a recent paper (Eggertsson and Woodford, 2003), we analyze the effects of open-market operations once the zero bound has been

reached, in a representative-household optimizing model of the monetary transmission mechanism with monopolistic competition and staggered price-setting. We assume preferences that allow for satiation in money balances at a finite level, so that it is possible to drive short-term nominal interest rates to zero, as the Bank of Japan has done. In this case, the standard money-market equilibrium condition must be replaced by a pair of inequalities,

$$(1) \qquad M/P \geq L(Y, i) \qquad i \geq 0$$

together with the requirement that at least one of the conditions holds with equality at any time. (Here M is base money, P the price level, Y aggregate output, and i the short-term nominal interest rate.) Conditions (1) imply that any monetary base above a certain minimum will be equally consistent with a zero-interest-rate policy; this makes it possible to pursue "quantitative easing" as a separate instrument of policy.

To examine the effects of such a policy, we let an operating target i^* be specified for the interest rate, as a function of the evolution of prices and output. The associated base supply rule is then assumed to be of the form

$$(2) \qquad M = PL(Y, i^*)\psi(P, Y, ...)$$

where the function ψ is never less than 1, and greater than 1 only if the interest-rate target i^* equals 0. Rule (2) implies that i^* is the unique solution to (1); but the form of ψ when i^* is zero can nonetheless be specified independently of the rule that determines i^*. We also allow for a very general specification of the assets that the central bank acquires when it expands the base; these may be different when i^* is zero than under normal circumstances, or when prices fall too far. Finally, we specify fiscal policy in a way that implies that open-market operations will not change the path of total government liabilities, except insofar as real activity, prices, interest rates, or asset prices change.

We then establish that the conditions that determine the rational-expectations equilibrium

paths of Y, P, i, and asset prices are completely unaffected by changes in the function ψ, or in the composition of the central bank's balance sheet. Hence, "quantitative easing" that implies no change in interest-rate policy should neither stimulate real activity nor halt deflation; and this is equally true regardless of the kind of assets purchased by the central bank.

Alan J. Auerbach and Maurice Obstfeld (2003) obtain an apparently different result in a similar model because they assume that an open-market operation *permanently* increases the monetary base. This means that the base is also increased at future dates at which the zero bound is not expected to bind, at which times the higher base implies that future interest-rate policy will be different; our irrelevance proposition shows that it is the commitment to expansionary policy in the future that is effective, and not the "quantitative easing" while overnight rates are at zero.

Might one nonetheless argue that it is reasonable for people always to expect such an increase in base money to be permanent? We give two examples of hypotheses about the central bank under which the "quantitative easing" would not imply any change in the future monetary base: if the central bank is expected to follow a Taylor rule once it exits from the trap, or if it is expected to pursue an inflation target. And in fact, there seems to be a common expectation that the recent massive increase in the Japanese monetary base will not be permanent.

Have we neglected *fiscal* effects of open-market operations? Auerbach and Obstfeld stress the additional benefit of being able to lower the tax burden, as a result of substituting money for interest-earning Treasury debt. This is indeed a further channel through which a permanent increase in the monetary base would be stimulative, but it does not provide any reason for "quantitative easing" while interest rates are zero to be beneficial. The flow government budget constraint can be written as

$$(3) \qquad L_t = P_t(\tau_t - g_t) + \frac{i_t}{1 + i_t} M_t$$
$$+ E_t[Q_{t,t+1} L_{t+1}]$$

where L_t is the beginning-of-period nominal value of total government liabilities, τ_t is real tax collections, g_t is government purchases, and $Q_{t,t+1}$ is the stochastic discount factor. If M_t is changed only in periods when i_t is zero, there is no change in the paths for taxes that are consistent with intertemporal solvency, even if the central bank acquires Treasury securities with a positive interest yield. Hence, our irrelevance proposition continues to apply, even when one takes account of tax distortions.

It may surprise some that we obtain the same result regardless of the type of assets purchased by the central bank. Should not purchases of assets with different risk characteristics than base money cause a "portfolio effect"? In representative-household asset-pricing theory, the answer is no. The value of an asset depends on the representative household's marginal utility of income in the states in which it pays off, and that depends on the economy's total supply of goods in those states, not on the quantity of assets that private households must hold. Of course, the representative-household model is an idealization, but it suggests that such effects may well be tiny in reality.

II. Signaling Future Monetary Policy

Our neutrality result, however, does not imply that there is nothing a central bank can do in a situation like Japan's. Expectations regarding the future conduct of monetary policy do make a great difference, and actions taken to change those expectations can affect the economy even without any change in the current level of overnight rates.

Expectations matter through several channels. First, as emphasized by Paul Krugman (1998), an increase in expected inflation can lower the real rate of interest associated with the current zero nominal rate. But other channels are important as well in a full intertemporal analysis. A commitment to keep rates low for a longer period of time can stimulate current spending, by affecting the determinants of longer-term interest rates and the exchange rate. And finally, the expectation that a boom will be created later should stimulate spending now, through permanent-income and accelerator mechanisms.

What kind of commitment regarding future policy is desirable? We compute the optimal policy for a simple numerical example. An exogenous real disturbance is assumed to lower
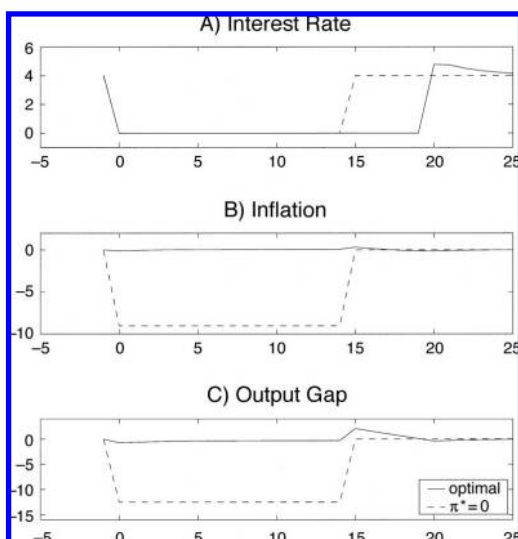
FIGURE 1. RESPONSES TO AN EXOGENOUS DISTURBANCE
THAT LOWERS THE NATURAL RATE OF INTEREST
FROM 4 PERCENT TO −2 PERCENT

the natural rate of interest from its normal level
(4 percent per annum) to −2 percent for a
random number of quarters, after which it re-
turns permanently to the normal level. It is not
possible to maintain zero inflation (the policy
that would be optimal in our model, if the
natural rate were always nonnegative) during
the period in which the natural rate is negative,
as this would require a negative nominal interest
rate. If the central bank is expected to maintain
zero inflation when this is consistent with the
zero bound (and otherwise keep interest rates as
low as possible), the result is severe deflation
and output contraction during the period when
the natural rate is mildly negative, as shown by
the dashed responses in Figure 1. (The figure
plots the responses in the case that the distur-
bance lasts for exactly 15 quarters.)

The responses under the optimal policy com-
mitment are instead shown by the solid lines in
the figure. The nominal interest rate is kept low
for five more quarters after the natural rate of
interest has returned to its normal level; this
causes a small output boom and a mild burst of
inflation, though inflation is soon returned to the
optimal long-run rate of zero. A credible com-
mitment to behave in this way *after* the zero
bound has ceased to bind dramatically reduces
the price and output declines that occur during

the period when the central bank is constrained
by the zero bound.

In general, of course, the optimal period for
which policy should be committed to remain
loose is not five quarters; it will depend on the
realized path of exogenous disturbances. Thus
the optimal commitment regarding future policy
should be conditional one, as argued by Ben S.
Bernanke and Vincent R. Reinhart (2004). We
show furthermore that the form of conditional
commitment that is optimal can usefully be
expressed as a form of price-level target.

Under the rule that we propose, the central
bank is committed to adjust overnight interest
rates each period so as to hit its output-gap-
adjusted price-level target, if this is consistent
with a nonnegative interest rate; and otherwise
to maintain rates as low as possible. The target
furthermore adjusts over time in response to
past target misses; when the target can be hit, it
does not change, but a period in which it is
consistently undershot causes the target price
level to be permanently raised. Following a
period in which the natural rate has been nega-
tive, this rule requires interest rates to be kept at
zero for a further period, as it is not imme-
diately possible to achieve the target price
level (both because prices have fallen and be-
cause the target has been adjusted upward)—
even though it would be possible, in our model,
for prices to be immediately stabilized at a
lower level.

It is sometimes argued that announcement of
a target for future price increases would be
pointless in a liquidity trap, as the central bank
lacks any instrument with which to hit its target.
We find otherwise. Under our proposal, the
target is not a promise about what price level
will be delivered at any particular date; rather, it
is a commitment regarding the conditions under
which the low-interest-rate policy will be aban-
doned. There is thus no loss of credibility from
failing to hit the target for several quarters in a
row, as long as low interest rates are maintained
as promised. Nor is it pointless to mention the
target when it is not thought likely that it will be
hit in any of the next several months, for aware-
ness of the target allows the private sector to
judge how long policy must remain loose.

Other actions by the central bank, such as
purchases of various assets, may also help; but
they will be effective, in our view, only to the
extent that they help to signal the nature of the

bank's commitments regarding future policy. Such signals are more likely to have the desired effect if they occur in the context of a clear articulation of the targets that the bank aims to achieve.

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