

A NABE Teleconference:
“Monetary Policy in a Low Inflation Environment: Avoiding Deflation”
Featuring Janet Yellen
November 20, 2002

Janet L. Yellen, former Federal Reserve Governor will speak on this important and timely topic. Yellen is the Eugene E. and Catherine M. Trefethen Professor of Business Administration and Professor, Department of Economics at the Haas School of Business at UC Berkeley. Yellen served as Chair of the President’s Council of Economic Advisers from 1997-1999, and as Federal Reserve Governor from 1994-1997.

The question, “Should the Fed ease now, moving the funds rate even closer to its zero bound, or hold off to ensure that it could lower rates in response to an even more serious situation?”, takes on heightened importance in periods of historically low inflation and low interest rates. Recent staff research at the Federal Reserve has examined this topic from several perspectives. An International Finance discussion paper released in June heightened speculation that the Fed would ease in mid summer, which it did not.

Stuart Hoffman, Chief Economist at PNC will moderate the teleconference. Chris Varvares, President of Macroeconomic Advisers, will begin the teleconference by briefly reviewing recent Fed staff research. Then Janet Yellen will discuss the relevance of this research to the current U.S. experience. Specific questions we have asked her to address include:

- 1) How much cushion should there be in the explicit or implicit inflation target? (What is the appropriate inflation target for the Fed?)
- 2) How pre-emptive should the Fed be when there are asymmetric downside risks associated with being dragged against the zero nominal interest bound?
- 3) Given the distribution of policy risks facing the Fed, what do you expect them to do and what do you think they should do?

Synopsis of Recent Fed Research

Four recent papers are reviewed:

- 1) “Three Lessons for Monetary Policy in a Low Inflation Era”, September 1999, David Reifschneider and John Williams, *Fed Working Paper*
- 2) “Efficient Monetary Policy Design Near Price Stability”, December 1999, Athanasios Orphanides and Volker Wieland, *Finance and Economics Discussion Series*
- 3) “Monetary Policy When the Nominal Short-term Interest Rate is Zero”, November 2000, James Clouse, Dale Henderson, Athansios Orphanides, David Small and Peter Tinsley, *Finance and Economics Discussion Series*
- 4) “Preventing Deflation: Lessons from Japan’s Experience in the 1990s”, June 2002, Alan Ahearne, Joseph Gagnon, Jane Haltmaier and Steve Kamin, et al, *International Finance Discussion Paper*

Three Lessons – Reifschneider and Williams

Reifschneider and Williams (R&W) employ the Federal Reserve Board's econometric model of the US economy (FRB/US) to explore how macroeconomic stability and the level and variability of inflation are affected as the target rate of inflation is lowered under a variety of monetary policy rules. This is important in light of the zero nominal bound (the non-negativity constraint) on the fed funds rate and the shocks to aggregate demand and inflation that necessitate a monetary response. The lower the average level of inflation and nominal interest rates, the more likely that negative shocks to aggregate demand or inflation will require a cut in the fed funds rate greater than be achieved because the rate cannot be lower than zero. Reaching the zero nominal bound on the short-term interest rate seriously compromises the effectiveness of monetary policy in dealing with deflation and periods of economic weakness because monetary policy cannot lower real rates further using conventional methods.

The methodology employed in this paper involves performing a large number of stochastic simulations of a linearized version of FRB/US using representative shocks to the behavioral equations and exogenous variables to generate long time series of key economic variables. By performing these simulations under alternative policy rules, and alternative inflation targets within those rules, the authors can compare the properties of the distributions of inflation and output to gauge how the variance of output and inflation are impacted both by the level of the inflation targets and the form of the policy rule.

R&W argue that FRB/US is well suited to this task because it is highly representative of the structure of the US economy and has a well-specified transmission mechanism. Key channels of monetary policy influence on the economy are real interest rate effects, wealth effects, exchange rate effects, all of which may be induced by expectational effects. Importantly however, the model contains limited credit-type and no real balance effects that may be important once the funds rate is pressed all the way to zero. To deal with the reduced effectiveness of monetary policy in simulated deflationary episodes, a "crisis" fiscal reaction function was assumed that insured significant fiscal expansions would occur in such episodes to help the economy recover. The model simulations were performed under the option of full model-consistent forward-looking expectations.

Some important intermediate findings are:

- 1) With monetary policy specified by a conventional Taylor Rule (with a 2½% equilibrium real rate) and observing the non-negativity constraint, the variability of output increases and there is a sharply higher frequency of severe contractions as the inflation target is lowered from 2% toward 0%, but the variability of output does not fall significantly when the inflation target is raised above 2%.
- 2) The lower the target inflation rate the greater the percentage of times the fed funds rate reaches zero in their simulations.
- 3) The variability of inflation is little affected by the level of the inflation target (at least in the range of 0% - 4% inflation targets considered in the paper).
- 4) Because of the non-negativity constraint, interest rates are on average too high, meaning that the notional inflation target in the Taylor rule would not be met on average. (Inflation turned out lower than the target.) Therefore the authors calibrated upward adjustments to the inflation

target for each notional inflation target to insure that the inflation target would be met on average.

5) Substituting a more aggressive Henderson-McKibbin (H-M) monetary policy rule (double the coefficient on the inflation gap and quadruple the coefficient on the output gap) does a better job of stabilizing output as the inflation target is lowered, but imposes more volatility on the fed funds rate.

6) The existence of expectational effects in the pricing of bonds and other assets suggests there is a possibility of compensating for the inability to lower short-term rates below zero by moving toward zero faster (i.e. acting preemptively) and staying near zero longer than the Taylor rule might prescribe. R&W try a simple augmented Taylor rule that does keep the funds rate lower for longer and insures that on average rates will be as prescribed by the Taylor rule, despite the non-negativity constraint. This has the effect of lowering nominal bond yields, raising inflation expectations, and effecting lower real (short and especially long) rates in periods of economic weakness. Importantly, and in contrast to the results with either the conventional Taylor rule or the H-M rule, lowering the inflation target (even below zero) has a negligible effect on inflation or output variability.

7) Finally, R&W examine a class of monetary policy rules that take account of all past deviations of inflation and output from their targets. That is, instead of containing terms in just the current inflation gap and current output gap, these rules are specified so that the setting of the funds rate responds to the (infinite) sum of all past inflation gaps and output gaps. Substituting such a rule with optimized weights on the cumulative inflation and output gap terms significantly lowers the standard deviation of inflation and the output gap relative to the other rules evaluated, and also shows little cost of the non-negativity constraint (in terms of higher output variability) as the target inflation rate is lowered. Notably, these rules are not forward looking and hence do not imply any sort of “pre-emptive” moves by the Fed.

8) In the case where the weight on the output gap is set to zero, this rule collapses to a price-level targeting rule. Credible adherence to such a rule means that financial markets would expect a period of faster inflation in the future as the Fed engineered a catch-up of the price level to its target, raising inflation expectations, and lowering real rates.

Three broad conclusions:

1) Because of the zero bound on the nominal funds rate, standard open market operations may be insufficient to restore equilibrium during particularly severe contractions, requiring fiscal policy or other stimulus.

2) Under a conventional Taylor rule, and a low inflation target, the zero nominal bound becomes a significant constraint on policy, increasing the variability of output and the frequency of severe contractions/deflations. Inflation variability is mostly unaffected by the choice of the inflation target.

3) In the case of “perfect credibility” a policy rule that takes account of cumulative output and inflation gaps dramatically reduces the negative effects of the zero nominal bound. Presumably a forward-looking rule would further reduce them.

Efficient Monetary Policy Design Near Price Stability - Orphanides and Wieland

Orphanides and Wieland (O&W) employ a simple calibrated open-economy macro model to numerically derive optimal policy rules. The initial version of the model considered has only interest and exchange rate channels of monetary policy. A second version of the model is also used which has been expanded to include quantity-of-money effects.

O&W posit that policy-makers possess a symmetric per-period loss function that is quadratic in the deviation of inflation from its target and the output gap. Policy makers are assumed to set policy so as to minimize the present discounted value of these losses (with a fixed discount rate). Initially ignoring the zero nominal bound, the resulting derived rule is similar in form to the Taylor rule. However, O&W can show that the optimal weighting parameters on the inflation and output gaps are a function of the underlying model parameters (including the policy-maker preference parameter that specifies how much weight is placed on missing the inflation target versus a non-zero output gap in the loss function and the discount rate). Using plausible parameter values they generate a Taylor-type policy rule where the weight on the inflation gap is 2.1 and 0.9 on the output gap (roughly four times and double the weight in Taylor's rule, respectively).

Next, O&W introduce a model augmented with quantity of money effects and a rudimentary money demand equation, and show that the monetary rule can be re-written in terms of the ratio of the monetary base to GDP (the Marshallian K). They also amend the rule to observe the non-negativity constraint on the interest rate. The quantity of money effects are meant to reflect a credit channel, an exchange rate channel (expected relative future supplies of domestic and foreign nominal money balances influence the exchange rate), and a real-balance effect (less than perfect asset substitutability implies that changing the quantity of money "directly" affects other financial asset prices, including bonds, even though the short-term rate is stuck at zero).

In this set-up the policy rule becomes asymmetric. Under normal circumstances macro stabilization is accomplished with relatively small changes in the federal funds rate, but policy shifts abruptly to involve large changes in the monetary base once the nominal interest rate bound is reached. O&W stress that knowing precisely how much the monetary base must be changed in this event is extremely difficult because of the high degree of uncertainty regarding the magnitude of the quantity of money effects. Nevertheless, they conclude that as inflation declines, optimal policy turns expansionary sooner and more aggressively to mitigate the costs associated with the zero nominal bound.

The nonlinearity of the optimal policy becomes more pronounced as the inflation target is lowered. The asymmetry in the policy response implies an upward bias in inflation relative to the target.

The existence of the zero nominal bound is found to imply a trade-off between the level and variability of inflation. If policy-makers aim for a low inflation target, they will more often find themselves less able to stabilize the economy (because of the zero nominal interest rate bound) and thus be forced to endure more output and inflation variability.

Monetary Policy When...Rate is Zero – Clouse, Henderson, Orphanides, Small, Tinsley

This paper is a fairly exhaustive survey of options available to the Federal Reserve for conducting monetary policy once the fed funds rate would meet the zero nominal bound.

The paper begins with a review of the historical record of interest rates in the US, paying special attention to the historical level of the policy buffer — the amount of room the Fed has to lower rates in the face of adverse demand shocks. Two alternative notions of the policy buffer are considered: 1) the 3-month T-bill yield at the onset of recessions, 2) the “equilibrium buffer” defined as the sum of the Fed’s inflation target and the equilibrium real rate. Given the impossibility of knowing the Fed’s inflation target, the authors opt for simply using the nominal T-bill rate as a measure of the policy buffer. They point out that the Great Depression was unusual not because there was little room to ease at the outset, but that the Fed ultimately ran out of room to ease, and because interest rates, although falling, fell more slowly than inflation so that real rates rose sharply. The authors note that despite relatively little room to ease in the recessions of 1953, 1957 and 1960 (196, 335, 299 basis points, respectively) the Fed had little difficulty in fostering an end to those contractions. The recent Japanese interest rate experience is briefly chronicled with special note of the relative stickiness of long-term yields until 1995-1997, despite earlier sharp declines in short-term rates.

The paper then turns to a catalog of monetary policy options available to the Fed and potentially useful in stimulating the economy even after the zero nominal interest rate bound is met. These are listed below.

I) Increase the monetary base via purchases of T-bills: When the T-bill rate is zero, T-bills and the monetary base are perfect substitutes so purchasing T-bills changes the composition of private portfolios but requires no re-balancing and thus has no effect on asset prices or rates.

Liquidity effect: There is unlikely to be any liquidity effect. Banks would have no greater incentive to make loans after selling T-bills since there would be no decline in interest rates (which by assumption are already at zero). Banks would exchange T-bills for reserves as nearly perfect substitutes.

Inflation expectations: It is unclear whether additional open market purchases of T-bills could impact inflation expectations. Alternatively, if the Fed had an avowed price-level target, current weakness in prices would be expected to be followed by a period of (at least) temporarily higher inflation, i.e. inflation expectations would rise, helping to depress the real rate. In either case the Fed must credibly convince markets that it will continue to provide stimulus long enough to ensure a subsequent rise in inflation. (This is similar to the beneficial effect of compensating for the period during which the funds rate is constrained at zero that was implied by the augmented Taylor rule in R & W.)

Credit Channel: Proponents of the credit channel suggest that interest rate effects alone do not appear to fully explain the potency of monetary policy. Imperfect (asymmetric) information, and other frictions in credit markets imply that the amount of lending in credit markets may be at least partly independent of changes in interest rates. However, the authors argue that both main linkages between monetary policy and lending noted by proponents of the credit channel seem to rely on changes in interest rates. Via the balance sheet channel, monetary easing is thought to spur lending by improving the financial health of firms and households —increasing their credit worthiness — but this requires declines in interest rates. Via the bank lending channel, monetary easing is supposed to encourage bank lending. However, the authors argue that with no change in interest rates, there is no reason for banks to re-allocate their portfolios toward bank loans and away from excess reserves.

II) Open market operations in Treasury bonds

The impact on the monetary base would be identical to the case of T-bills. There may, however, be direct effects on bond prices. By the expectations theory of the term structure, bond yields should be a geometric average of expected future short-term rates plus a risk premium on long-term bonds. The purchase of T-bonds would not be expected to affect the risk premium, and the current short-term rate is fixed at zero. Thus, only if expectations of future short-term yields were affected by the open-market purchase of T-bonds, would T-bond yields fall. To the extent the purchase of bonds has a *signaling effect* that conditions expectations of future short rates, long-term yields could fall. The possible existence of *portfolio effects*, arising when T-bond and Bills are not perfect substitutes and relative large changes in relative supplies occurs, might allow declines in long-term yields to result from open market operations in T-bonds.

III) Write options on Treasury securities

The ability of the Fed to impact long-term rates when the short-rate is already at zero depends importantly on financial markets expectations. One way to convince markets that short-term rates will be held “low” for a period of time would be to write options. If rates rose above the level consistent with strike price, the purchaser of the option would benefit, and the Fed would be “penalized”. Such activity would provide a strong signal to the market of the “planned trajectory” of short-term interest rates intended by the Fed. Presumably such trajectory would be below the level initially implied by the yield curve, if the Fed was seeking to lower long-term yields.

IV) Policy Actions in Foreign Exchange

Direct intervention in foreign exchange markets could work to reduce the exchange rate even if market participants were risk neutral. This would require, as in the bond market, the intervention to provide a signal that the Fed intended to keep the bill rate lower on average than was the original expectation in the market. Similarly, a portfolio balance effect in the FX market might encourage a depreciation. Intervention against the dollar would raise the relative supply of dollars and increase the risk premium on dollars. However, because US rates are fixed at zero, the required increase in the expected relative rate of return on US bills can only be accomplished by a decline in the rate of return on foreign bills, which would require an immediate depreciation in the dollar. Unfortunately, while theoretically possible, empirically these effects appear to be small and not long lasting. This suggests that interventions of unprecedented size may be required to have the desired effect on the dollar.

V) Purchase debt of US financial services institutions

Purchases of Fannie and Freddie debt obligations and mortgage pass-thru securities is currently allowed and could reduce risk premia in yields on these assets.

VI) Private Sector Credit Instruments

Current statute allows the Fed to purchase bankers acceptances, but not corporate bonds, bank loans, mortgages, credit-card receivables, or equities. The law requires that bankers acceptances be purchased in an “open market”. The number of bankers acceptances has shrunk to \$25 billion in 1996 and there is not a well defined “open market” although one could develop if the Fed announced an intention to begin purchasing bankers acceptances.

VII) Lending by the Fed to individuals, partnerships and corporations

Such lending is allowed but the required collateral (US obligations or obligations guaranteed by an agency if the US) could easily be sold so there is not much to be gained by the direct lending.

VIII) Money Rains – wealth creation
Works in the textbook, but not in practice.

IX) A money financed tax cut

Bonds issued to pay for a tax cut would be purchased by the Fed. The open-market operation itself would have no effect if rates were already at zero. However, if the stimulus from the tax cut were sufficient to raise the nominal rate, then the open-market operation could add some additional stimulus.

Preventing Deflation: Lessons from Japan...Ahearne, Gagnon, Haltmair, Kamin, et al

This paper surveys Japan's macroeconomic experience from just prior to the bursting of the equity and real estate bubbles in the early 1990s to early 2002, including the conduct of policy. The authors seem to take great care not to be too critical of Japanese economic policy. In addition to a recap of recent Japanese economic history the authors emphasize several points relevant for economic policy-makers that clearly benefits from the previous research done inside and outside the Fed.

First, the deflationary slump that gripped Japan in the early 1990s was not anticipated. Whether based upon Federal Reserve staff forecasts, private-sector forecasts, or evidence from Japanese bond markets, it appears there was little advance warning of the poor performance. The authors present the one- and two-year ahead staff forecasts and Consensus Economics forecasts compared to the actuals over the period 1991 to 2000. Over most of the period these forecasts expected significantly stronger real GDP and higher inflation. In addition, the stickiness of bond yields through 1995 is sighted as evidence that the financial markets also did not sniff out the magnitude of Japan's economic problems until well into them. The authors generalize this observation and caution that it may be difficult to recognize when an economy is transitioning into a sustained deflationary slump.

Second, when forecasts of inflation and GDP gaps are entered into a forward-looking Taylor rule, the prescribed level of the short-term rate is close to that engineered by the Bank of Japan. However, when actual values for the output gap and inflation are entered into a conventional Taylor rule, the level of rates, although declining, should have declined more quickly. (Moreover, the finding in the previously reviewed papers that the Taylor rule itself could be improved upon by more aggressive easing when the economy is weak and inflation is seen to be falling from already low levels, suggests that rates could have been lowered still more quickly.)

Third, they found no compelling evidence that the ability of policy to support the economy declined significantly. While acknowledging that most of the major channels through which monetary policy is thought to boost aggregate demand seemed not to respond, to declines in short-term rates, this is attributed to reasons other than the low level of inflation and/or rates. For example, stock prices failed to rise (in the post bubble environment) and the exchange rate did not fall significantly in response to the lowering of short-term rates. In addition, long-term rates did not decline much until after 1995. The authors do point out that the bursting of the real estate and equity bubbles damaged household and business balance sheets (as well as banks) and resulted in sharply curtailed lending. This probably did limit the ability of monetary policy to stimulate the economy.

Fourth, fiscal policy, after a slow start, did move toward stimulus, but given the low-inflation, low-rate environment, the policy buffer for monetary policy may have been increased if fiscal policy had been more stimulative.

In concluding the authors argue that although deflationary episodes may be difficult to foresee, appropriately aggressive policy responses, once the deflationary threat is recognized, could prevent the actual onset of such episodes.

The preferred approach is to use both monetary and fiscal policies.

Policy should take account of not only the “base forecast” but the distribution of risks to the forecast as well. When starting from a low inflation environment, policy, as suggested in the first two papers, should be asymmetric. Too much stimulus can be taken back if it turns out later not to have been needed; if too little stimulus is applied, once the economy slips into a deflationary cycle, monetary policy is compromised.