Commentary: Inflation During and After the Zero Lower Bound

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I.   The Paper and My Discussion

With many economies having reached very low interest rates, policy has been constrained by the so-called zero lower bound (ZLB). Yet, not all ZLB experiences are alike. While in the United States the zero (policy) interest rate observed since 2008 has been associated with positive inflation, the ZLB experience in Japan since the end of the 1990s has been characterized by protracted deflation.

This paper asks whether the two historical episodes can be characterized as two different equilibria: respectively, an "inflation target" equilibrium with positive inflation (IT) and a deflationary equilibrium (DEF).

This "multiple equilibria story" is meant to capture the heterogeneity of the ZLB experiences as well as three stylized facts about inflation that standard linear models cannot match:

1.   Inflation is persistent;

2.   A large component of its dynamics can be characterized by a slowly changing trend, possibly related to policy regimes (the great inflation of the 1970s, the Great Moderation, … .);

3.   Inflation is hard to predict (relative to simple benchmarks).

The model the authors consider is a standard dynamic stochastic general equilibrium model. The ZLB constraint in such a model generates multiple equilibria. Exogenous shocks (sunspots) can make an economy switch between the IT and the DEF steady states. Sunspot shocks, although exogenous, may be interpreted as price expectation shocks.

Arouba and Schorfheide (AS) provide estimates for the United States, Japan and the euro area and compute the probability that the zero lower bound experience in any of these countries was generated by a deflationary equilibrium regime. This probability is compared with that of the deflationary outcome being generated by a sequence of negative shocks within the IT regime.

In my discussion I will first review the evidence, both that generated by the model estimates and some stylized facts about inflation expectation dynamics. I will then discuss the policy implications of the model. I will only focus on the United States and Japan since the ZLB in the euro area has been binding only since 2012 and therefore there are too few points on which to base the analysis (for evidence on this point, see Giannone et al. 2015).

II.   Evidence from the United States and Japan

The basic result from the estimates is illustrated in Chart 9 of AS's paper. The chart reports the data and the probability of the two regimes for each country.

The results are produced by estimating the model on the pre-ZLB data (1981:Q1-1994:Q4 for Japan and 1981:Q1-2007:Q4 for the United States) and simulating a long sequence of draws on the basis of those estimates. For each country, the chart shows on the one hand the contour plots of the ergodic distribution of inflation and interest rates generated by the model in the two alternative regimes and on the other the data: those used for the estimation (black dots in the chart) and the observed data in the ZLB sample (gray stars). There are three results which matter for the understanding of the Japanese and U.S. cases:

1. The deflation regime fits the data very poorly in both cases, which is to be expected, given that it is a relatively rare event.

2. The probability of the ZLB in the IT equilibrium is similar in the United States and Japan.

3. The probability of the joint occurrence of deflation and the ZLB is slightly higher in Japan for both regimes but the difference is very small.

Summarizing, the estimates for Japan do not point to a clear-cut story and, on the basis of the authors' own estimates, it is difficult to discriminate between two alternative interpretations about the ZLB experience in Japan: one pointing to a bad sequence of shocks leading the country to deflation within an IT regime and the other, preferred by the authors, pointing to a sudden shift of expectations leading to a DEF equilibrium. As we will see later, choosing the right interpretation matters for what policy to follow.

Let us then look at some auxiliary facts on the dynamics of inflation expectation to understand whether the story of a sunspot shock leading to a DEF equilibrium is plausible. An obvious question to ask is whether inflationary expectations in Japan have been suddenly shifted downward in the late 1990s. Chart 1 reports 10-year inflationary expectations and the GDP deflator. It shows that long-term inflationary expectations have been remarkably stable and solidly above zero throughout the period. As Chart 2 shows, this has not been the case for short-term household expectations, but again no sudden shift is visible. Instead this indicator of expectations has closely followed oil prices as indeed has been the case for the United States (Chart 3).

The absence of a visible shift in inflation expectation in Japan in the late 1990s suggests that the shift in regimes generated by sunspots is not the best characterization of the ZLB experience in this country. Obviously this does not imply that inflation expectations do not matter but it suggests that there is a different plausible story about Japan.

Within AS's model, the deflationary outcome for Japan could have been generated in the IT steady state. So one story could be as follows:

Chart 1
Long-term Inflationary Expectations and Actual Inflation in Japan
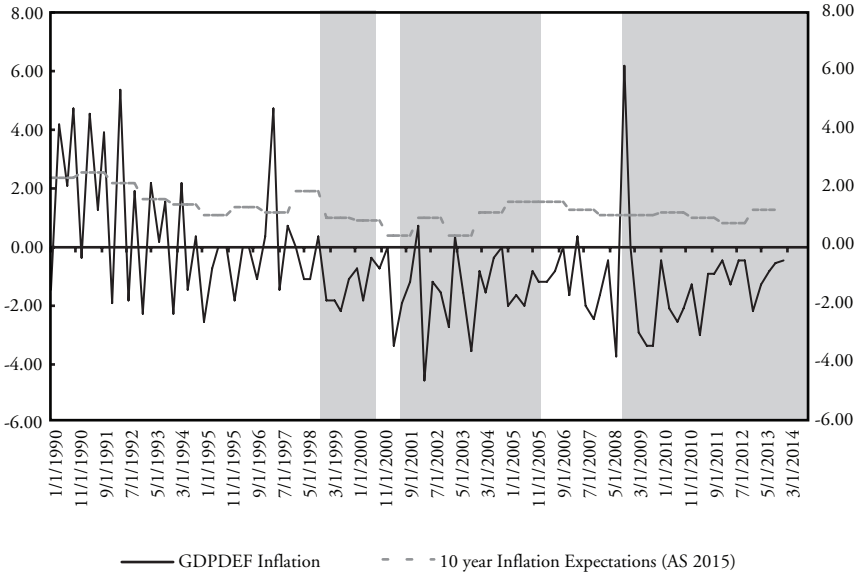


Note: Shaded areas indicate the ZLB sample.
Sources: FRED, Japanese Cabinet Office's Consumer Confidence Survey and Arouba and Schorfheide (2015).

Chart 2
Household Inflation Expectations and Oil Pricing in Japan
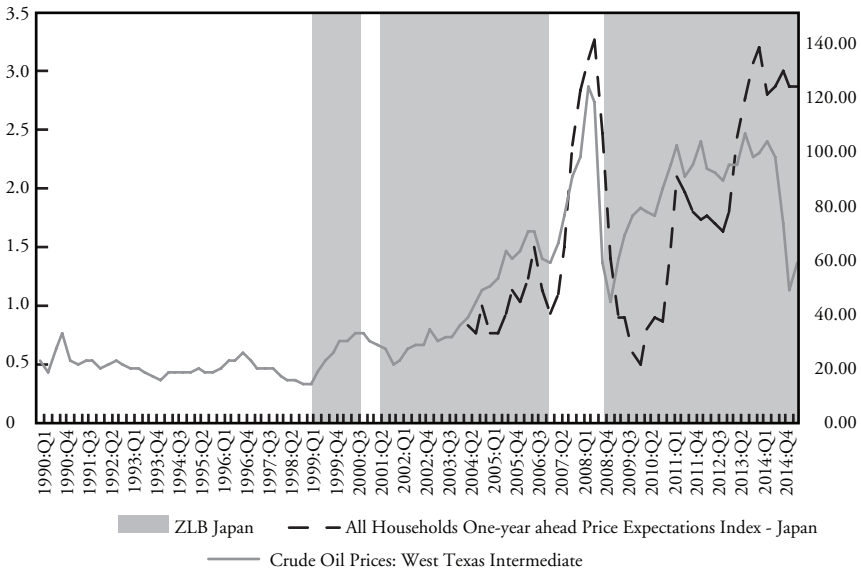
Sources: FRED and Japanese Cabinet Office's Consumer Confidence Survey.

Chart 3
Household Inflation Expectations and Oil Prices, United States

ZLB United States ——— Michigan One-year Ahead Inflation Expectation-United States

——— Crude Oil Prices: West Texas Intermediate
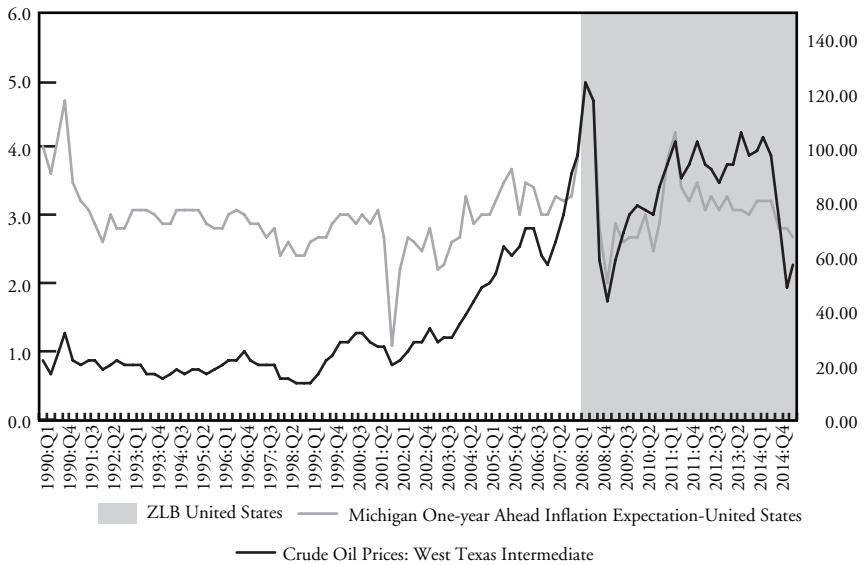
- The pre-ZLB estimated average discount factor is much higher in Japan than in the United States, pointing to a lower real equilibrium rate (see the estimates in Arouba et al, 2014).

- With the financial crisis of the 1990s, a large increase in the stochastic discount factor reflecting an increase in the risk premium and/or negative productivity shocks pushed the equilibrium rate even lower. At the ZLB this implies deflation.

- This, combined with a delay in the monetary policy response and mismanagement of expectations on the part of the Bank of Japan, led the country into a protracted deflation regime.

More information on parameter estimates and the size of shocks other than sunspots are needed to discriminate between the two stories.

III. Policy Analysis

III.i What To Do To Avert the Deflation Steady State?

A strong and controversial implication of the model is that increasing the policy rate when inflation falls below a threshold would avert the DEF steady state.

The mechanism here is driven by the Fisher effect. But is this reasonable policy advice or the consequence of unrealistic features of the model? For example, even if it were true that a policy of restricting liquidity which forces the nominal interest rate to be higher would be inconsistent with continuation in the DEF equilibrium, this does not tell us anything about where the economy would go instead. In AS's model, there is no equilibrium consistent with the higher interest rate, except one with higher inflation, and therefore such a policy change would necessarily push the economy to higher inflation. But it is not at all obvious how the economy would get there, and in particular not obvious whether it would get there right away, since plausible "learning dynamics" would push the economy away from the high-inflation equilibrium and not toward it (see Garcia and Woodford 2015 for a discussion of this point). Indeed, with unchanged expectations, a higher nominal interest rate should be contractionary and hence it should lower inflation, not increase it. But then, observing lower demand and lower inflation would make expectations of future demand and future inflation even lower which would make the high nominal interest rate even more contractionary and so even more deflationary, and so on. Even if one thinks that somehow people must eventually end up in a rational expectation equilibrium consistent with the new policy, if the central bank just stuck grimly to the policy until people's expectations got in line, there would be a substantial risk of perverse dynamics in the near term, and this in an economic situation when such perverse dynamics can hardly be afforded. A rather reckless policy, I suspect.

Indeed this is what the empirical experience of Japan in the late 1990s suggests. When the Bank of Japan, in order to get away from the ZLB, decided prematurely to raise its target for the call rate (the overnight interest rate), this caused an immediate contraction and further slowdown of inflation, not a movement out of a "low-inflation equilibrium" to some other, higher-inflation equilibrium.

III.ii An Alternative View of the Role of Policy in Japan

In Japan, the literature has pointed to the fact that quantitative easing (QE) was implemented late, the size of the program was relatively small and it was not supported by a clear communication policy (see

Chart 4
The Effect of QE in Japan, 2013

Shinzo Abe's Election Date

—— CPI Inflation   —— Consensus Inflation Forecast
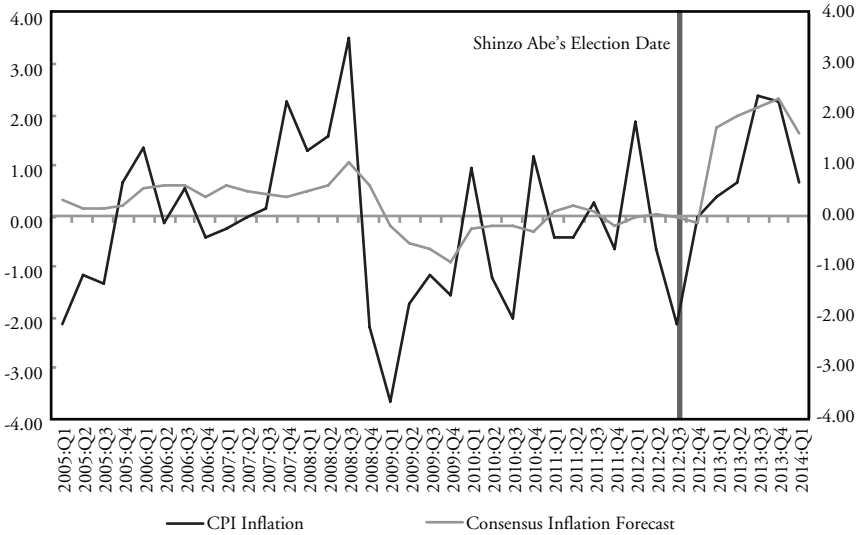
Note: The Bank of Japan launched II QE in April 2013.
Sources: OECD, Consensus Economics and Bank of Japan.

Ito et al. 2006 among others). Indeed a price stability target was introduced only in 2013. On the other hand, recent policies, especially the so-called QQE (qualitative and quantitative easing) implemented in April 2013, which introduced a massive program of asset purchases and a price stability target, was somehow successful in stabilizing expectations.

Charts 4 and 5 report some facts on inflation and inflation forecasts. Chart 4 reports data on consensus expectations while Chart 5 is reproduced from Kamada et al. 2015 (Figure 7 at page 47 in their paper) and is based on the authors' analysis of microdata on household inflation expectations. The chart shows that QQE succeeded in decreasing the variance of short-term expectations and increasing the kurtosis especially for long-term expectations. The evidence provides some support to the hypothesis that QQE has had some success in anchoring expectations.

My interpretation of the vast literature on QE in Japan and in the United States is that, when asset purchases have been combined with a clear communication policy, we have seen significant effects

Chart 5
Inflation Expectations in Japan
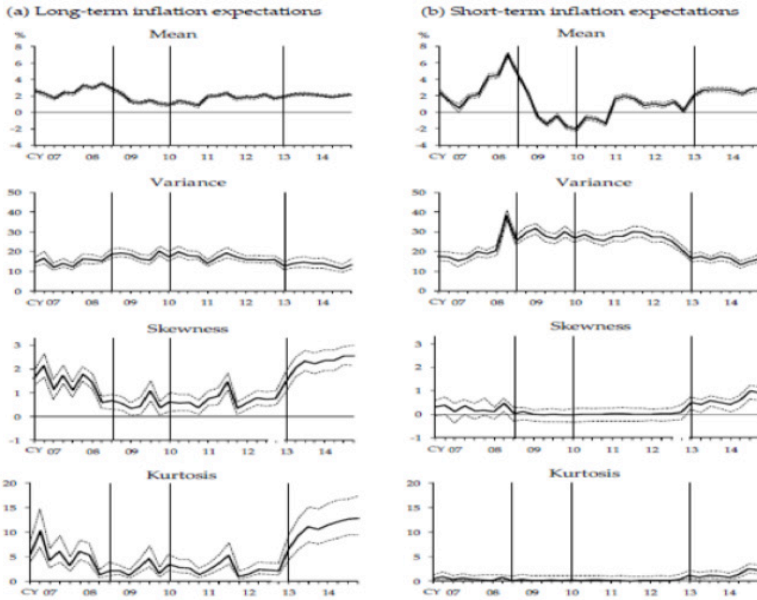
Note: The mail-method bias, 1 percent for both long-term and short-term inflation expectations, is corrected in the means. Dotted lines indicate 95-percent confidence intervals.
Source: Kamada et al., 2015.

on both inflation and economic activity and that differences in inflation at the ZLB between Japan and the United States may be due to differences in policy, including communication policy.

The question is whether sunspot shocks are a useful model device to understand expectation management as a policy tool. Indeed AS interpret them as expectation coordination shocks, possibly capturing expectation management by central banks through communication. I think this interpretation is misleading. Sunspots shocks are not a convincing modeling device for capturing management of expectations. The fundamental reason is that they do not signal any fundamental change, they are an arbitrary signal. To say that "forward guidance," for example, can be captured by a "sunspot shock" is like saying the central bank statement conveys no information about what future policy will be, as if it were a meaningless babbling, which would happen no matter what is causing people's expectations to change. Expectations in this story change not in anticipation of a

policy change but simply because there is anticipation that the economy will be in a different equilibrium, which is another possibility under the same policy.

Even accepting that any model necessarily provides a stylized story, this narrative does not seem to capture the essential elements of management of expectations by central banks.

III.iii Increasing the Inflation Target

Another policy that is evaluated in the paper is an increase in the inflation target as a way to decrease the probability of falling into a deflationary equilibrium. The analysis is performed on U.S. data. I have three remarks.

The first is that the exercise is based on implausible assumptions. Indeed, a key assumption that drives the results here is that, if the inflation target were increased to 4 percent, everyone would automatically index their prices to an increase at a steady rate of 4 percent. The consequence is that positive trend inflation leads to no increase in price dispersion of the kind analyzed by Ascari and Sbordone 2014, for example. This is quite implausible and, more importantly, the assumption of no change in price dispersion denies the main justification that central bankers normally give for not increasing the inflation target, namely that it is not at all trivial for people to correctly adjust for a constantly changing value of the monetary unit.

The second remark is that a higher inflation target doesn't eliminate the existence of the DEF steady state in the model. In their setup the problem is that expectations can always jump to the DEF steady state at any time, even though the real interest rate required for full employment is still positive. But then having a high inflation target doesn't help. A higher inflation target may help in a situation where the real interest rate required for full employment becomes really low, due to financial disruption, deleveraging and other factors. In that situation a higher inflation target may avoid getting the economy to a high real rate at the ZLB but this is a rather different story than that of the paper.

IV.   Conclusions

This is a very technical paper and the authors have to be praised for the non-trivial effort of estimating a multiple equilibria model. This, in line with previous work by the authors, is the contribution of the paper.

The key point of my discussion is whether the modeling approach is appropriate to analyze facts at the ZLB and policies to avoid deflation.

Models are inevitably stylized and their ingredients must reflect the key features of a story. The choice is inevitably arbitrary. I have argued that a model driven by exogenous sunspots fails to capture the essence of expectation management and therefore is not appropriate for a policy discussion on this topic. Similarly, the perfect foresight assumption does not allow a meaningful discussion of the role of policy in steering the dynamics of the economy.

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