April 19, 2015
Bank of Japan

What We Know and What We Do Not Know about Inflation Expectations

Luncheon Speech at the Economic Club of Minnesota

Haruhiko Kuroda
Governor of the Bank of Japan

Introduction

It is a great pleasure to speak at the Economic Club of Minnesota. I would like to thank first of all Mr. Walter Mondale, former Vice President of the United States and Ambassador to Japan, for the kind introduction, and also I deeply thank Mr. Mark Kennedy, Chairman of the Club, and President Kocherlakota of the Federal Reserve Bank of Minneapolis for inviting me to the Twin Cities.

I assume many of you are aware that Japan has been suffering from mild but persistent deflation since the mid-1990s. While I am not going to go into the reasons for Japan's deflation, let me point out one simple fact, namely, that it lasted for almost two decades. During this period of protracted deflation, a deflationary mindset took hold among the public -- that is, the belief became entrenched that prices would not increase but continue to steadily decline.

Unfortunately, deflation is no longer a phenomenon that is unique to Japan. In the euro area, the year-on-year inflation rate has been negative for the past several months. Even in the United States, as noted by President Kocherlakota on several occasions, inflation has fallen below the 2 percent inflation target set by the Federal Open Market Committee (FOMC), creating a risk to the credibility of the target.[1] These developments highlight that a number of advanced economies are now facing the risk of very low inflation or even deflation.

The good news from Japan is that quantitative and qualitative monetary easing (QQE) implemented by the Bank of Japan is having the intended effects and the economy is making steady progress on its way to conquering deflation. QQE aims at affecting firms' and households' inflation expectations and re-anchoring them at 2 percent through the Bank's strong and clear commitment to achieving the price stability target and large-scale monetary easing to underpin the commitment. In the aftermath of the global financial crisis, central banks around the world adopted a variety of non-traditional monetary policy measures. Yet, it could be said that even among these, the configuration of QQE is quite

[1] See, for example, Narayana Kocherlakota, "Goal-Based Monetary Policy Report," speech delivered to the Financial Planning Association, Minnesota, January 2015.

innovative. I hope that by succeeding in getting the economy out of deflation through QQE, the Bank can provide a case in point that it is possible to overcome deflation through innovative monetary policy.

The importance of anchoring inflation expectations has been fully acknowledged. However, I recognize that, as the Bank proceeds with QQE, both in terms of academic research and central bank policy practice, various important issues with regard to inflation expectations need to be further explored. Against this background, I would like to talk about three issues today; (1) how to assess inflation expectations, (2) the expectation formation mechanism, and (3) policy measures.

I. Three Issues concerning Inflation Expectations

A. How to Assess Inflation Expectations

A natural question that arises is how to assess inflation expectations. While expectations are inherently unobservable, there are a number of indicators that we can rely on. These can be broadly divided into two types: market-based and survey-based indicators. Market-based indicators reflect the collective view of market participants. A well known example is the break-even inflation rates calculated from yields on Treasury Inflation-Protected Securities (TIPS). Such indicators provide useful information about inflation expectations in part because market prices are updated frequently. On the other hand, survey-based indicators also have their advantages. For example, they can be used to examine changes in the distribution of inflation expectations over time, providing critical information for the conduct of monetary policy during periods when expectations are changing considerably.

In this context, allow me to remind you of the so-called Volcker disinflation. Professor Gregory Mankiw and his colleagues noted that, during the period of Volcker disinflation, the inflation expectations of respondents to the Michigan survey did not change in a uniform manner.[2] Prior to the announcement of the new policy regime in 1979, the distribution of respondents' inflation expectations followed a bell shape. Following the

[2] Gregory N. Mankiw, Ricardo Reis, and Justin Wolfers, "Disagreement about Inflation Expectations" in Mark Gertler and Kenneth Rogoff, eds., *NBER Macroeconomics Annual 2003*, Volume 18, National Bureau of Economic Research, Massachusetts, 2004, pp. 209-248.

commencement of decisive monetary tightening, the survey distribution as a whole shifted leftward and dispersion increased, indicating significant disagreement among respondents in terms of their inflation expectations. During the transitional phase, the distribution displayed a bimodal shape, reflecting different expectations by two separate groups: those who believed in the regime change and updated their expectations, and those who did not. Over time, the distribution changed into a new bell shape with a significantly lower mode than during the pre-Volcker period.

Perhaps you may be interested in what household survey data for Japan suggest with regard to inflation expectations over the past two years. What these data indicate is that since the introduction of QQE, the distribution of inflation expectations has generally become less and less dispersed over time, with more and more households expecting prices to rise at an annual rate of 2 percent as they look ahead (Chart 1).

The Bank has been making continuous efforts to better assess inflation expectations by collecting a wide range of information. It has published household survey data on a quarterly basis. In addition, the Bank has recently added questions regarding firms' outlook for inflation in its long-standing business survey, the *Tankan* (Short-Term Economic Survey of Enterprises in Japan), which covers more than 10,000 firms. As data accumulate, these will provide us with useful information on inflation expectations.

B. The Expectation Formation Mechanism

The information set based on which firms and households form their inflation expectations includes the central bank's target rate of inflation, present and past developments in the inflation rate, and so forth. Strangely, the mechanism through which inflation expectations are formed has not been fully analyzed. A deeper understanding of the mechanisms underlying expectation formation will likely also be useful for designing appropriate monetary policy measures.

Let me introduce to you an interesting analysis on this topic. In a recent study, Mr. Jeffrey Fuhrer, Executive Vice President and Senior Policy Advisor at the Federal Reserve Bank of Boston, using U.S. time series data, finds that past inflation accounts for 40 percent of the

variation in four-quarter inflation expectations.[3] Looking at data for Japan, similar reduced form regressions tend to find that past inflation accounts for a significantly larger part of variations in inflation expectations. These contrasting results suggest that inflation expectations may be better anchored -- that is, less susceptible to developments in past inflation -- in the United States than in Japan.

As implied by Mr. Fuhrer's analysis, people update their expectations about inflation through observation of past inflation data. To better understand the dynamics of inflation expectations, it may be useful to incorporate Bayes' rule or Bayesian updating into investigating how people revise their expectations over time. Based on the Bayesian approach, one could examine the extent to which the inflation target set by a central bank, such as the 2 percent target adopted by the Bank of Japan and other major central banks, has gained credibility among the public. In the context of Japan's experience, since the introduction of QQE, a variety of indicators of inflation expectations have been rising in tandem with the rise in the consumer price index (CPI) inflation. A possible interpretation of this relationship between inflation expectations and developments in the CPI inflation is that typical Bayesian updating is at work. In non-technical terms, the unprecedented strong commitment to the 2 percent target by the Bank from the outset bolstered its credibility; or, in technical Bayesian terms, the commitment affected *prior beliefs* regarding the long-term inflation rate. Subsequently, with the CPI inflation registering consecutive increases, people's belief in the target has been strengthened further. In other words, the *likelihood* that long-term trend inflation in fact will be 2 percent is now perceived to be higher. Given this increased likelihood, people in turn regard it as more likely that the Bank will achieve 2 percent inflation. In Bayesian terms, the *posterior belief* has been updated (Chart 2).

The feedback loop among prior beliefs, the likelihood, and posterior beliefs is the basic mechanism underlying Bayesian updating. In the context of the transmission mechanism of QQE, the strong commitment raises people's prior belief in the 2 percent target and

[3] Jeffrey C. Fuhrer, "The Role of Expectations in Inflation Dynamics" in *International Journal of Central Banking*, Volume 8, Supplement 1, 2012, pp. 137-165. An earlier version of the paper is available as a FRB Boston Working Paper Series, paper no. 11-11, 2011.

people revise their inflation expectations upward as they observe the actual CPI inflation increasing. The Bayesian updating process fits well with what has been taking place in terms of inflation and inflation expectations in Japan. Thus, the mechanics of QQE can be comfortably interpreted as a certain type of learning-by-doing process. My hope is that there will be more research in this direction in the future.

C. Policy Measures

When a number of central banks, including the Federal Reserve, combated high inflation in the 1980s and eventually successfully conquered inflation, this was in no small part due to the application of de facto flexible inflation targeting. At the same time, it should be acknowledged that, alongside the simple setting of inflation targets, careful use of operational tools and effective communication played an important role. Then-chairman Volcker's efforts to improve communication between the Federal Reserve and the U.S. public are reflected in his well-known speech titled *A Time of Testing* delivered in 1979. His challenge was to tame high inflation in the face of high unemployment.

In contrast with the challenge of high unemployment faced by the Federal Reserve in the 1980s, the Bank's challenge is how to raise inflation expectations with nominal interest rates at the zero lower bound. Despite the different nature of the challenges facing the two central banks, the most appropriate policy response chosen both in the United States and in Japan is a goal-oriented one. Let me now turn to our challenges more in detail.

II. The Theory and Practice of QQE

As I mentioned at the outset, a deflationary mindset had taken hold in Japan during almost two decades of deflation. Against this backdrop, the Bank embarked on QQE, aiming to achieve the price stability target of 2 percent. Our strategy consists of two pillars. First, a clear commitment to the 2 percent price stability target. In fact, the Bank has made two types of commitments, namely, that (a) the Bank will achieve the price stability target of 2 percent in terms of the year-on-year rate of change in the CPI at the earliest possible time, with a time horizon of about two years; and that (b) the Bank will continue with QQE, aiming to achieve the price stability target of 2 percent, as long as it is necessary for maintaining that target in a stable manner. The second pillar of the Bank's strategy is

large-scale monetary easing to underpin the commitment. Specifically, the Bank has been conducting massive purchases of Japanese government bonds (JGBs) to exert downward pressure on nominal interest rates across the yield curve. In fact, the size of these asset purchases dwarfs the Large-Scale Asset Purchases (LSAP) in the United States. As a result of these purchases, the monetary base to GDP ratio in Japan has now reached around 55 percent, while the equivalent figure for the Unites States is around 20 percent.

Rising inflation expectations mean that there has been room for real interest rates to decline further. This, in turn, implies that the zero lower bound on nominal interest rates is not an insurmountable constraint on central banks' ability to influence real interest rates through monetary policy. The decline in real interest rates has stimulated private demand such as consumption and investment. The boost to private demand has led to an improvement in the output gap, which in turn has led to an increase in the actual CPI inflation rates. And observing the increase in actual inflation rates, the Japanese public has become increasingly convinced that the Bank can achieve the 2 percent inflation target. This positive feedback loop has been operating since the Bank introduced QQE two years ago.

Thus, the mechanism envisioned by the Bank has been working as intended. As a result, the annual CPI inflation, which was hovering around minus 0.5 percent when the Bank embarked on QQE, turned positive after several months, and remained around 1 percent for more than a year. Although the CPI inflation has declined to around zero mainly reflecting the significant decline in crude oil prices, there is no doubt that the underlying trend of inflation has improved markedly.

Concluding Remarks

There are a number of indications that the deflationary mindset -- that had taken hold in Japan -- is subsiding. A prime example can be found in the labor market. In Japan's labor market, there is a long-standing tradition of conducting wage negotiations between workers and management in a certain way. These wage negotiations -- the so-called spring offensive or *shunto* in Japanese -- take place in a synchronized manner every spring across industries. The practice of *shunto* is said to date back to the 1950s. Since the 1990s, however, that is, for nearly two decades, base pay during these negotiations has stagnated.

Yet, in the 2014 *shunto*, base pay was raised at many firms for the first time in about 20 years, and it looks likely that it will rise at even more firms in this year's round.

These recent labor market developments provide evidence that Japan's almost two decades of deflation are about to come to an end. QQE is starting to achieve what some may have thought impossible. If Japan can successfully overcome deflation and re-anchor inflation expectations, as it is now in the process of doing, this will represent a major step in monetary policy history not only in Japan but also around the globe. Thank you.

What We Know and What We Do Not Know about Inflation Expectations

Luncheon Speech at the Economic Club of Minnesota

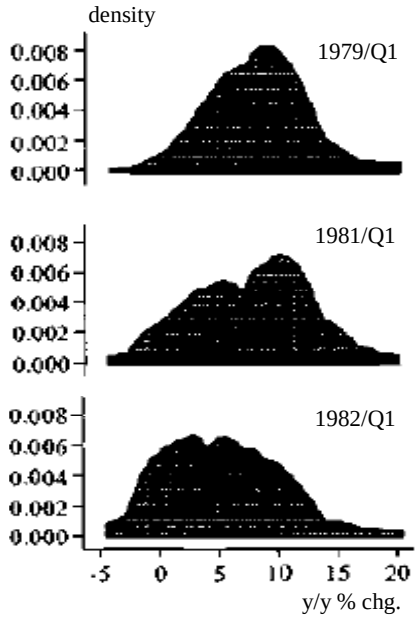
April 19, 2015

Haruhiko Kuroda
Governor of the Bank of Japan

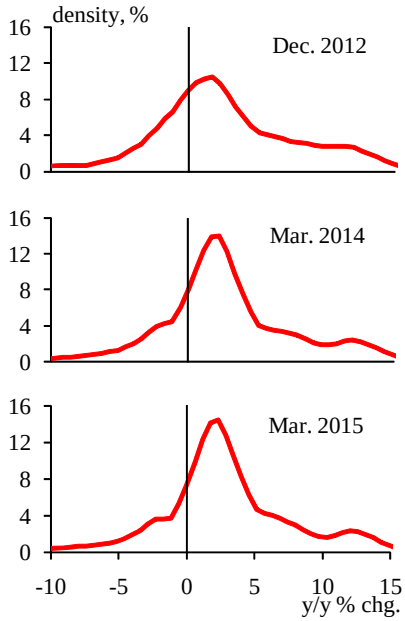
Chart 1

Distribution of Household's Inflation Expectations

United States
(Since the Volcker Shock)



Japan
(Since the Introduction of QQE)

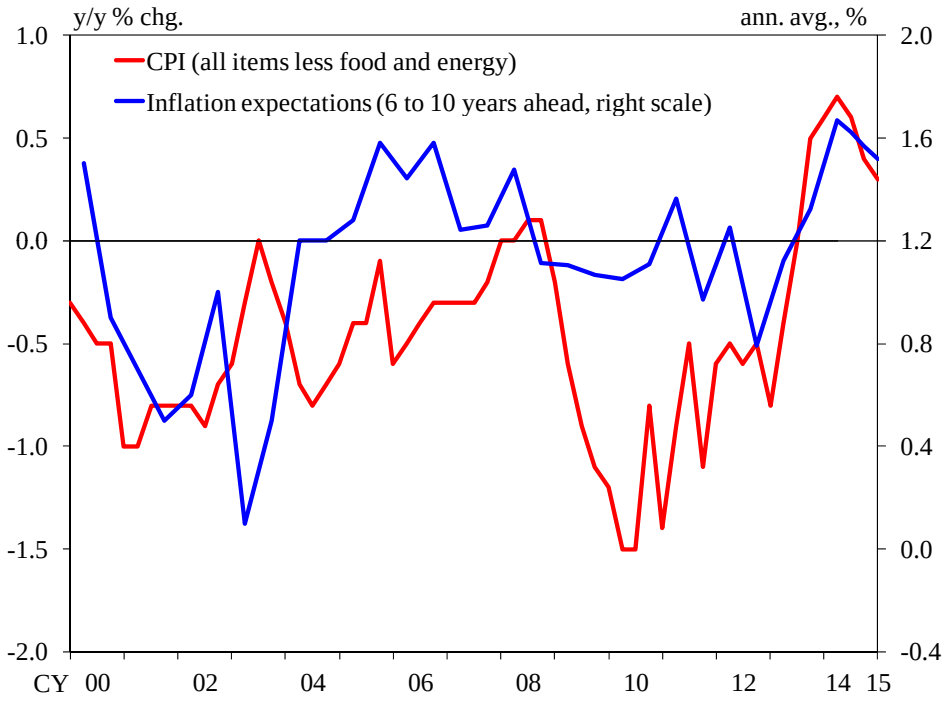


Note: Distribution of inflation expectations over the next year in the United States is calculated from the "Surveys of Consumers" conducted by the Michigan University. That of inflation expectations over the next five years in Japan is calculated from the "Opinion Survey on the General Public's Views and Behavior." For details, see "Disagreement in Households' Inflation Expectations and Its Evolution," Bank of Japan Review Series, 2014-E-1.

Sources: Mankiw, N. G., Reis, R., and Wolfers, J. (2004) "Disagreement about Inflation Expectations," *NBER Macroeconomics Annual 2003*, Volume 18; Bank of Japan.

Chart 2

Inflation Rate and Inflation Expectations in Japan



Notes: 1. Figures for the CPI are adjusted to exclude the effect of changes in the consumption tax rate. The latest figure (2015/Q1) is the January-February average.

2. Figures for inflation expectations are taken from the "Consensus Forecasts." Figures are compiled every January, April, July, and October. Those up through April 2014 were compiled every April and October. The latest figure is as of January 2015.

Sources: Consensus Economics Inc.; Ministry of Internal Affairs and Communications.