What's Required to Stop Deflation?

Author
Tsutomu Watanabe

By Tsutomu Watanabe

Characteristics of Japan's Deflation

Let's begin by confirming the current state of deflation in Japan. *Chart 1* shows the year-on-year figures for the consumer price index (CPI) as the inflation marker for Japan. The CPI inflation rate trended down after the end of the bubble economy, turning negative in the mid-1990s. It briefly returned to positive in 2008 due to such factors as rising grain prices, but the overall trend remains one of falling consumer prices. This persistent fall in prices, i.e. deflation, continues.

Japan's deflation has two important characteristics. The first is its long duration. Prices have been falling for over 15 years, a situation that can be called long-term deflation. The pace of deflation, however, provides a different picture. The year-on-year CPI decline has averaged a little under 1%, reaching only 2% even at its peak. In short, Japan's deflation is mild. This is the second characteristic: it is marked by a slow but persistent decline in price levels.

These two characteristics become more evident in a comparison with the deflation in the United States during the Great Depression. *Chart 2* shows the CPI level in the US. The price level there fell from 1931 through 1933. We can see that this was a drastic period of deflation, as the CPI dropped more than 8% per year. The contrast between this and the 1% deflation rate in Japan could not be starker. On the other hand, US deflation during the Great Depression had a relatively short run, subsiding after a couple of years. Here again, the contrast with Japan's deflation is striking.

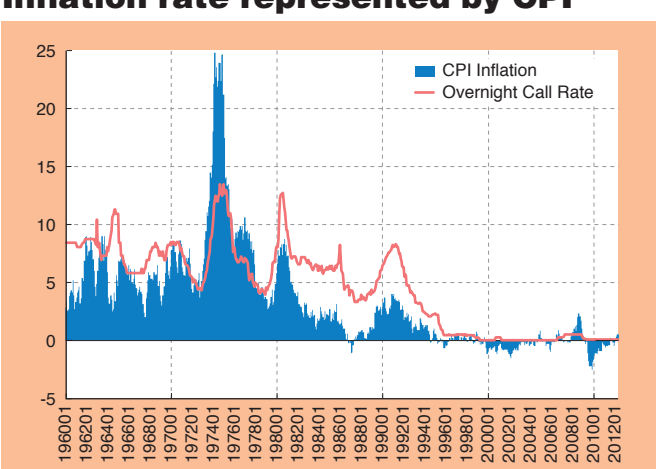
It is difficult to determine the causes of these differences in the rate and duration of deflation since they have taken place in different countries and different eras. That said, the difference in the price-setting behavior of manufacturers and distributors can be considered one of the reasons. Robert J. Gordon has pointed out that during the Great Depression firms in the US swiftly adapted prices to supply and demand conditions. In other words, prices were highly elastic. In Japan, by contrast, price elasticity has fallen in recent years, and there has been an increasing tendency on the part of firms not to alter prices immediately when supply and demand conditions change. For example, more than 90% of Japanese manufacturers in a 2008 survey responded that they "would not alter prices immediately even when supply and demand conditions change". Many of the responding firms noted that it was difficult to alter prices because of worries about the behavior of their competitors. The low deflation levels in Japan can be seen as the result of rising price rigidity that reflects the price-setting behavior of these firms.

Conditions on the Demand Side

Forward Guidance through Monetary Policy

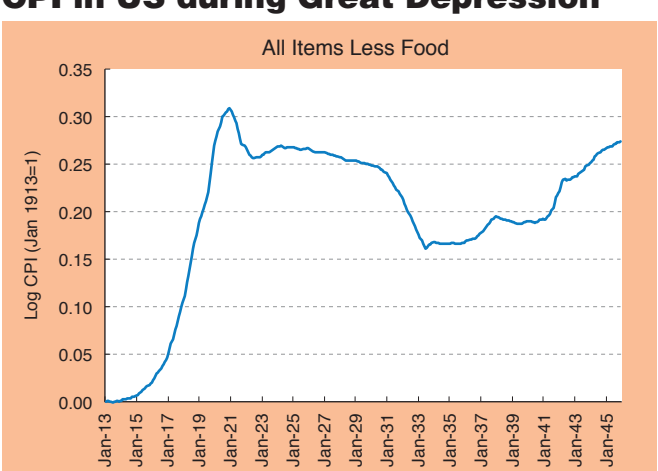
What, then, are the measures necessary to overcome deflation? Let's take a look at demand-side measures. There is no question that it is necessary to boost demand in order to overcome deflation. And given the limits to fiscal stimulus due to the high level of government debt, it is necessary to rely on monetary policy to a significant

CHART 1
Inflation rate represented by CPI



Source: Compiled by author

CHART 2
CPI in US during Great Depression



Source: Compiled by author

degree. However, the nominal interest rate as a policy tool of the central bank is already close to zero, creating a situation close to what John Maynard Keynes termed the "liquidity trap". This is the situation that has prevailed in Japan since 1999 and the US since 2008. It goes without saying that it is not easy to boost demand under these conditions. However, various measures have been attempted in Japan and elsewhere, and evaluated accordingly. As a result, we have gained some understanding and experience of monetary policy under the shadow of the liquidity trap.

Forward guidance was the first option to gain attention under the situation where the nominal interest rate as a policy variable for the central bank had fallen to zero. In this option, the central bank raises inflation expectations by promising to maintain hyper-monetary easing in the future, thereby lowering real current interest rates and boosting demand. Paul Krugman was the first to identify the existence of this channel in a monograph published in 1998 ("It's Baaack! Japan's Slump and the Return of the Liquidity Trap", *Brookings Papers on Economic Activity* 2:1998). Later, I myself, Taehun Jung, Gauti B. Eggertsson and Michael Woodford all analyzed its properties in greater detail.

This channel is similar to what is known in Japan as the "time-axis effect". However, the time-axis effect differs in an important aspect from what Krugman's work and later studies have emphasized as the channel for policy effect. In pursuing the time-axis effect, the intention is to stimulate the economy by lowering present nominal long-term interest rates through the announcement by the central bank that it would lower future nominal long-term interest rates. Of course this channel exists in the models used by Krugman as well. However, more important is the channel through which an announcement by the central bank that future nominal interest rates will be set low changes price expectations on the part of firms and households, leading to a drop in the current real interest rate. In other words, when long-term interest rates are already near zero, leaving no room for lowering them, the time-axis effect cannot be hoped for. However, the forward guidance channel emphasized in the research by Krugman and others who followed him, in which raising the expected inflation rate lowers current interest rates, will still be effective.

This difference between the time-axis effect and forward guidance leads to a crucial difference in whose expectations they attempt to influence. The objective of forward guidance is to raise the price expectations of households and firms; thus, the central bank should try to influence households and firms. The objective of the time-axis effect, on the other hand, is to lower nominal long-term interest rates, so the central bank should try to influence the participants in the markets, such as the government bond market, that determine those interest rates. Of course, as actual policies go, it is desirable to approach both households and firms as well as markets. However, previous announcements by the Bank of Japan (BOJ) had attached too much importance to influencing market participants; it is possible that this has diminished the announcement effect.

There is another misunderstanding surrounding forward guidance: the notion that this is a channel that is different from those that central banks had used before and is in that sense unconventional. Actually, this channel is merely a variation of the interest rate channel that central banks had long been familiar with. With the interest rate channel, a central bank under normal circumstances seeks to boost demand through lower real interest rates generated by lowering current nominal interest rates. Under forward guidance, the central bank seeks to boost demand through lower real interest rates generated by higher expected inflation rates while maintaining nominal interest rates at zero. Although they are different in that one seeks to lower nominal interest rates while the other seeks to raise expected inflation rates, they both aim at lowering real interest rates.

Whether or not forward guidance should be called unconventional is an important matter that goes beyond a difference in name only. Since forward guidance is merely a variant of the interest rate channel, its effects can be evaluated quantitatively. Specifically, the real interest rate can be measured if the expected inflation rate can be measured appropriately. A central bank that has been using the interest rate channel has accumulated knowledge about how much, and with how great a time lag, investment and consumption respond depending on how much the real interest rate is lowered. This can be used to quantitatively identify the effect of forward guidance.

By contrast, there is little experience with policies such as quantitative easing that use the central bank's balance sheet; in that sense, they are unconventional. With no historical results to draw on, it is unclear how much effect they will have; no one knows what the outcome will be until they have actually been implemented. Regarding policies that use central bank balance sheets, the only thing that we could be sure of from a theoretical point of view was that they are not effective under certain assumptions. The opportunity cost of possessing money is the nominal interest rate; in that sense, the nominal interest rate represents the "price" of money. If that nominal interest rate is zero, then it means that the price of money is zero: that is, money has reached saturation point. Economic equilibrium will not be affected by augmenting an already saturated supply. This is the underlying logic behind this issue. The results of an examination of the policies of the BOJ and the Federal Reserve Bank show that the effect is highly limited, if not quite nonexistent.

The US Experience during the Great Depression

The conclusion from these considerations is that it is desirable to use forward guidance for boosting demand in order to overcome deflation. The key to this is how to influence the expectations of households and firms, not those of market participants. How, then, can the price expectations of households and firms be altered?

An analysis by Thomas J. Sargent is highly suggestive ("The Ends of Four Big Inflations" in *Inflation: Causes and Effects*, University of Chicago Press, 1983). The point of this study is to explore how to overcome deflation, but Sargent looks at the complete opposite of that question: how to end hyperinflation. Sargent undertook a painstaking analysis of the endgames of four major hyperinflation examples, including Germany and Austria, in the 1920s and found a common pattern of policy turnaround by the governments and the resultant reduction of inflation expectations on the part of the public. This policy overhaul is not about individual actions regarding monetary and fiscal policy but the replacement of the rules of the game for policy development: in other words, policy regime change.

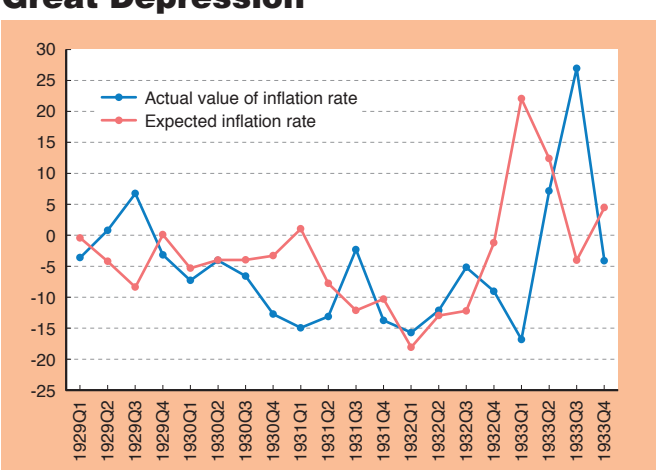
There are many examples of hyperinflation but there are very few cases of deflation. This means that examples of deflation cannot be compared to extract a common pattern. However, case studies of US deflation during the Great Depression have made significant headway, exposing several important facts about the mechanics of the deflation endgame. Peter Temin and Barrie A. Wigmore claim that the key to the successful American exit from deflation during the Great Depression was the massive policy-regime turnaround by President Franklin D. Roosevelt and its acceptance by the US public ("The End of One Big Deflation", *Explorations in Economic History*, 27 (4), 1990). Specifically, Roosevelt parted ways with the policy dogmas of Herbert Hoover's previous administration — the gold standard, balanced budgets, and small government — and abandoned the gold standard and accepted a devaluation of the dollar, simultaneously extolling the merits of "reflation" and adopting an expansionary fiscal policy. They claim that the deflationary expectations of the public under the old regime and inflationary expectations took hold as the result. Intriguingly, there are many aspects here in common with the facts that Sargent unearthed in the hyperinflation endgame.

Chart 3 displays the estimated values of the expected inflation rate during this period (according to calculations by Stephen G. Cecchetti in 1992). It shows that the actual inflation rate in 1932, just before Roosevelt's inauguration, was negative but that the expected inflation rate was much worse, with much larger negative numbers. However, in 1933, the expected inflation rate took a major turn into positive territory with figures over 10%. Moreover, reversal of the expected inflation rate preceded the reversal of the actual inflation rate, indicating that the change in the expected price levels became the starting point for the recovery of the real economy, which in turn reversed the actual price levels.

Chart 4 displays the movement of the actual interest rate and the

CHART 3

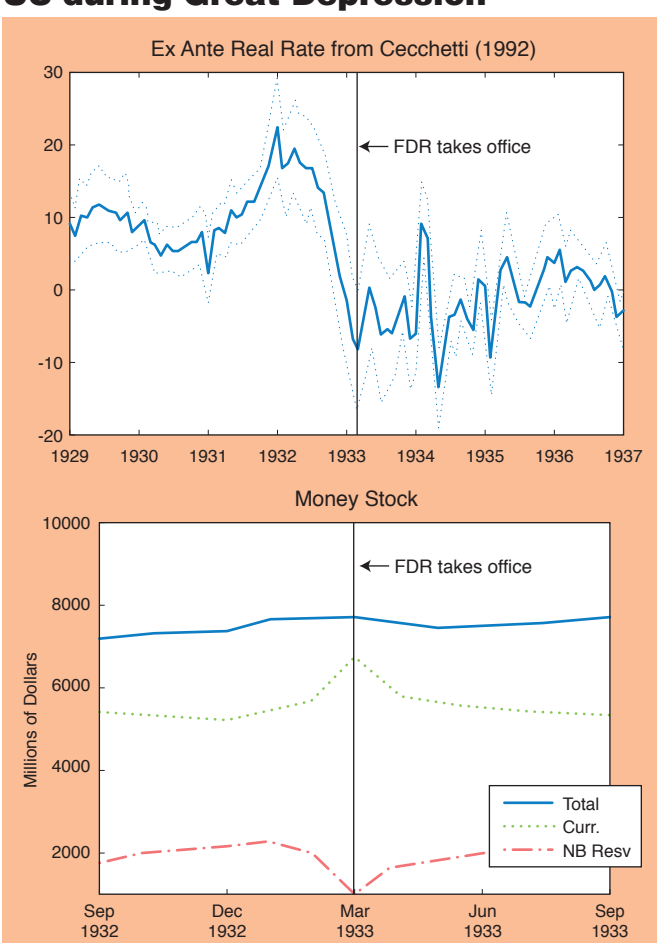
Expected inflation rate in US during Great Depression



Source: Cecchetti, Stephen G. (1992), "Prices During the Great Depression: Was the Deflation of 1930-1932 Really Unanticipated?" American Economic Review, 82(1): 141-156.

CHART 4

Real interest rate & money supply in US during Great Depression



Source: Eggertsson, Gauti B. (2008), "Great Expectations and the End of the Depression," American Economic Review, 98:4, 1476-1516.

money supply before and after Roosevelt's inauguration. It shows that the real interest rate had soared to over 20% in 1932. Although the nominal interest rate was at zero just like Japan today, the real interest rate was stuck at a high level because the expected deflation rate was also high, shackling the economic recovery. However, the real interest rate fell rapidly after Roosevelt's inauguration, reflecting the rise of the expected inflation rate. Eggertsson's analysis ("Great Expectations and the End of the Depression", *American Economic Review*, 98:4, 2008) indicates that this decrease in the real interest rate brought about the V-shaped turnaround in prices in 1933.

If we look at the money supply during this period *(Chart 4)*, the cash balance temporarily increased as a result of the increase in demand for cash due to bank runs, but the money stock as the sum of cash and non-borrowed reserves barely budged. This indicates that money played only a small role during the V-shaped recovery of prices in 1933.

Supply-Side Conditions

Flattening of the Phillips Curve

US deflation during the Great Depression and Japan's deflation have many things in common and there is much to learn from Roosevelt's policies in considering the path to overcoming deflation. However, as discussed already, there are ways in which the latter differs from the former. The slowness of deflation in particular is an important difference. The downward rigidity of prices, nominal wages in particular, is often given as a cause of the Great Depression. However, consumer prices actually fluctuated dramatically at the time, as we can see in *Chart 2*, and do not look rigid at all. Gordon measured how volume (real GDP) and price levels (GDP deflator) changed in response to changes in nominal GDP and pointed out that mainly price levels responded to changes in nominal GDP in the 1920s, and to a greater extent than in other periods to boot. In other words, price levels had become more sensitive to changes in demand (=nominal GDP) in the lead-up to the Great Depression; in that sense, it is possible that price rigidity had actually diminished. By contrast, Japan since the early half of the 1990s has seen price rigidity intensify in the sense that the price levels do not fall in proportion to economic downturns.

Japan's rising price rigidity can be confirmed from the changing Phillips curve. *Chart 5* plots the annual values of the unemployment rate (horizontal axis) and the inflation rate (vertical axis). The Phillips curve, also known as the aggregate supply curve, represents the price setting behavior of firms. As we can see, inflation rose when unemployment fell in the 1970s and 1980s. In other words, when demand rose, production rose and unemployment fell. As a result, the marginal cost of production rose, pushing up inflation. This was the relationship that prevailed at the time.

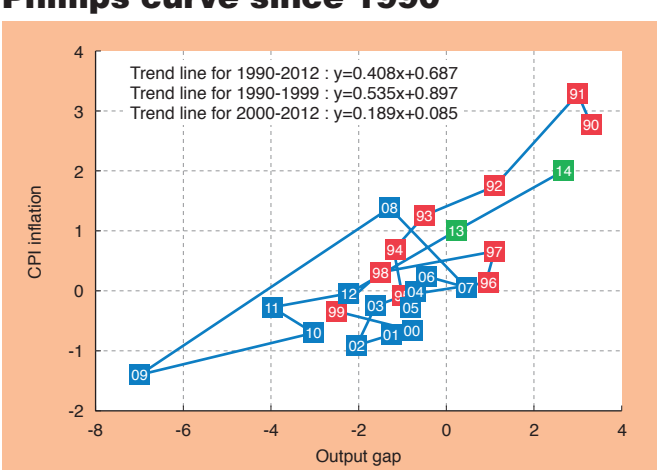
This relationship, however, has been weakening rapidly since the 1990s. The chart shows that the slope of the Phillips curve was much lower in the 1990s and has been virtually flat since 2000. Although the unemployment rate has fluctuated between 3.8% and 5.3% since 2000 tracking economic conditions, the CPI has remained in a narrow band between -1.4% (2009) and 1.4% (2008). The CPI has barely budged in many years. This phenomenon is called the flattening of the Phillips curve. Milton Friedman had noted the steepening of the Phillips curve during highly inflationary periods; the opposite, flattening, has been occurring in Japan since 2000.

Chart 6 confirms the same phenomenon, using the output gap as the horizontal axis. The output gap, the percentage point difference between potential and real GDP, is an index that represents the extent

CHART 5
Phillips curve

Source: Compiled by author

CHART 6
Phillips curve since 1990



Source: Compiled by author

to which labor, capital, and other factors of production are being utilized. IMF estimates are used for the output gap in this chart. The slope of the Phillips curve using the 1990-1999 data measured 0.53. In other words, the inflation rate increased 0.53% for every 1% rise in the production gap. However, the slope is 0.19 when the 2000-2012 data are used. Each 1% rise in the output gap generates a mere 0.19% rise in the inflation rate, a drastic fall.

What meaning does the flattening of the Phillips curve hold for overcoming deflation? Boosting demand by the means outlined above will widen the output gap accordingly. (The GDP level will rise in proportion to potential GDP.) However, a flatter Phillips curve makes it less likely that a growing production gap leads to rising prices. This makes it more difficult to overcome deflation.

Let's demonstrate this with actual numbers *(Table)*. The government and BOJ have set a 2% CPI inflation target. Since the current CPI inflation rate is approximately zero, it is necessary to raise the inflation rate by 2 percentage points. Since the slope of the Phillips curve measured using the 2000-2012 data is 0.19, it is necessary to raise the output gap by 10.5 percentage points in order to raise the inflation rate by 2 percentage points. Raising the output gap by 10.5 percentage points is the equivalent of generating approximately 50 trillion yen in demand. What must we do to achieve this rise in the output gap in two years? Assuming a 1% potential GDP growth rate in order to make the calculations simple, raising the output gap by 5.3 percentage points in one year requires a 6.3% annual real GDP growth rate and that high level must be maintained for two consecutive years. Even if the time period for achieving the inflation target is extended to three years, the necessary real GDP growth rate is still high, at 4.5% annually. In either case, the real GDP growth rate is high and is difficult to achieve no matter how efficiently demand is boosted.

These calculations are based on several assumptions and the numbers should be seen as having some variability. To ascertain how much variation there could be, we used the data for 1990-2012 to calculate the slope of the Phillips curve. The slope, at 0.41, means that the real GDP growth rate necessary is 3.5% in the two-year case and 2.6% in the three-year case. Although these are more realistic figures than in the previous case, these are still difficult numbers to achieve. (The green markers in *Chart 6* represent the numbers for 2013 and 2014 in the case where the inflation target is achieved in two years.)

Thus, modest changes in the assumptions do not make much of a difference in the results; a huge boost to demand is necessary to achieve the 2% inflation target. However, it is necessary to take note of the fact that these calculations are based on the assumption that the various decisions made by firms and households that underlie the Phillips curves that we observed do not change going forward. Particularly important is the assumption that the cautious price-setting behavior of manufacturers and distributors does not change.

TABLE
Real GDP growth rate necessary to achieve inflation target

	Achieve inflation target in 2 years	Achieve inflation target in 3 years
2000-2012 slope	6.3% / yr.	4.5% / yr.
1990-2012 slope	3.5% / yr.	2.6% / yr.

Note: The values in the table represent the real GDP growth rates necessary to achieve the 2% CPI inflation target. The slope of the Phillips curve is 0.189 for 2000-2012 and 0.408 for 1990-2012. The assumptions are 2% for the inflation target, 0% for the current inflation rate, and 1% for the potential GDP growth rate.
Source: IMF World Economic Database (October 2012)

In other words, the numbers in the *Table* should be read to the effect that they indicate the magnitude of the increase in demand necessary to overcome deflation purely by boosting demand *without changing the price-setting behavior of firms*. If it is impossible to try to overcome deflation by relying solely on boosting demand, it becomes necessary to change the behavior of price-makers. But how can that be achieved?

Real Price Rigidity

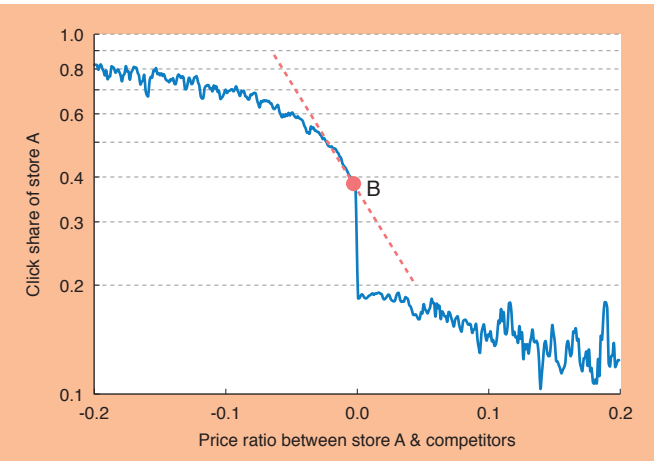
In order to find out, we must explore the cause of the flattening of the slope of the Phillips curve. Several hypotheses have been put forward as the cause. The most prominent hypothesis points to the competition between firms in the same business line. Manufacturers and distributors strongly fear that customers will leave them for their competitors if they raise prices. Thus, when faced with a little rise in demand or costs, they lack the courage to hike prices and leave them unchanged. All firms exhibiting this behavior end up with the phenomenon where price levels do not change despite rising demand and costs at the macro level. This is called real price rigidity.

Chart 7 shows an example of this phenomenon, the demand function that an online shop faces at the online mall Kakaku.com. The horizontal axis shows the deviation of the online shop A's prices from those of a rival firm. The zero point on the horizontal axis means that the price being offered at online shop A is equal to the price at the rival firm, -0.1 that it is 10% lower, and +0.1 that it is 10% higher. The vertical axis represents the number of clicks gained by online shop A at the respective prices. The number of clicks can be regarded as a proxy variable for demand volume since customers at Kakaku.com initiate their purchases by choosing desirable merchandise and clicking on it. The horizontal and vertical axes represent price and demand volume, respectively. Thus, this chart represents a demand function in which demand falls when price rises.

However, this demand function has a characteristic that is atypical of ordinary demand functions. Assume that the price at online shop A is at point B, indicated as a red dot. At point B, the prices offered by online shop A and the rival shop are identical. Let's assume that

CHART 7

Kinked demand curve



Source: T. Mizuno, M. Nirei, T. Watanabe, "Closely Competing Firms and Price Adjustment: Some Findings from an Online Marketplace," Scandinavian Journal of Economics, Volume 112, Issue 4, December 2010, 673-696.

online shop A starts from that point and lowers its price. As you can see from the chart, the volume of demand rises when the price is lowered, while the volume of demand falls when the price is raised. Up to this point, the situation is the same as in the case of ordinary demand functions; what is striking is the size of the decrease in demand volume when the price is raised. Online shop A gains 0.4 of the clicks at point B, but this figure drops by half to 0.2 when a price hike creates the smallest of differences with the rival shop. In an online mall, even a one-yen difference drives customers to rival shops since it is obvious at a glance which shop has the lowest price. When this kind of competition exists, the demand curve does not trace a smooth line but instead is bent at point B. A demand curve that has this characteristic is called a kinked demand curve.

Let's assume that shop A is at point B and consider how it responds to a rise in demand. Shop A wants to raise its prices since demand is rising. However, if shop A is the only shop that raises its prices and the rival shop leaves its prices unchanged, shop A will lose many customers since it will be overpriced. Thus, if the margin of increase is not very substantial, shop A will choose to forgo a price hike. The situation is the same at the rival shop, which will likewise forgo a price hike. In this manner, each shop will forgo a price hike even when demand rises when the demand function is kinked, and prices will not change for the market as a whole.

Chart 7 illustrates the demand function for Kakaku.com. At the basis of the kink is a feature of online malls that enables prices at all the shops to be taken in at a glance. However, conventional stores such as supermarkets and electronics retail stores also face increasingly harsh competition with rival stores, and it seems that features similar to those of online shops are being generated, with the difference being a matter of degree only. In a survey on deflation conducted by the Cabinet Office in 2002 ("Questionnaire Survey Concerning Business Behavior"), 67% of responding firms gave competition with firms and imports in the same business line as the reason for lowering sales prices. Increased competition appears to be generating price rigidity, which in turn is flattening the Phillips curve.

This understanding of the cause of the flattening of the Phillips curve brings the path to overcoming it into view. Specifically, the reason why shop A hesitates to raise its prices even when demand rises is because it thinks that the rival shop may not raise its prices and that it will lose many customers if it raises prices while its rival shop maintains its own. It is necessary to replace this bearish mindset with a bullish mindset that believes that the rival shop will raise its prices because demand is rising, so it can also raise its prices without fear of losing customers. Under the bearish mindset, "cooperation failure" between shops concerning price-setting occurs (prices do not rise despite rising demand), while under the bullish mindset, cooperation regarding price setting ensues in due course.

How, then, can the pattern of thinking by price setters (manufacturers and distributors) be transformed? It is necessary to change the price expectations of these firms. The reason why price setters fall into a bearish thought pattern is because they believe prices have fallen up until now and will continue to do so in the future. If this could be changed to the expectation that falling prices are about to come to an end and that an era of rising prices is about to arrive, then the mindset will change to a bullish one that expects rival firms to raise prices as well. If this switch can be effected, the slope of the Phillips curve will steepen and a rise in price levels commensurate with rising demand will be achieved.

The policy regime that Prime Minister Shinzo Abe's administration is undertaking aims at changing public expectations from deflation to inflation. This is an appropriate direction for overcoming deflation. As already mentioned, raising price expectations has two meanings. Raising price expectations on the demand side, i.e. households, firms and the like, lowers the real interest rate and boosts demand. The positive effect of raising price expectations in this sense has been extensively discussed and its importance is widely recognized. However, raising price expectations has another important effect. Specifically, by raising price expectations on the part of price setters, i.e. manufacturers and distributors, these firms can raise prices commensurate with rising demand without worrying too much about the behavior of their competitors. The challenge in overcoming deflation is, in addition to boosting demand, to establish the conditions that enable firms to set prices matching demand. JS

Tsutomu Watanabe is professor at the Graduate School of Economics at the University of Tokyo, and research associate of the Center on Japanese Economy and Business at Columbia University. He is also currently research director at the Canon Institute for Global Studies. His main research fields are macroeconomics and international finance.