

# **Is the Persistence of Japan's Low Rate of Deflation a Problem? \***

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## **Abstract**

This paper comprises two parts. In the first part, we discuss why the deflation rate that persists in Japan is small. The combination of this small rate and its persistence is the most remarkable feature of Japan's deflation in the last decade. We may interpret this deflation as a transition process from one inflationary steady state equilibrium to another inflationary steady state equilibrium. In the second part, it is shown that this weak deflation can significantly decrease corporate profits in the presence of wage rate rigidity. As a result, a long-term recession was generated.

## **1. A simple interpretation of Japan's deflation**

### **The Bank of Japan reduced the target rate of inflation but initiated deflation**

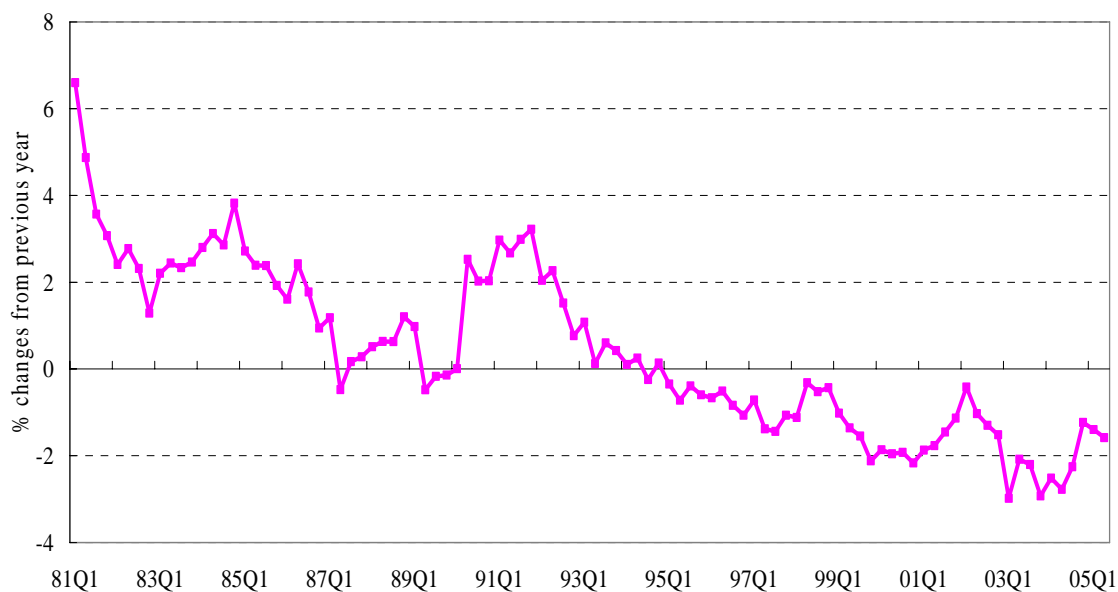
In Japan, deflation, as determined by changes in the GDP deflator from the previous year, began in the third quarter of 1994 and has continued over the 12 years to the present. This experience of continued falling prices for such a long time is unique since the end of World War II; in fact, it has not been observed since the Great Depression. However, the deflation generated during the Great Depression was much more serious in Japan and the United States. On the other hand, the deflation generated in Japan over last 12 years is only mild deflation, averaging about 1%. Because this deflation rate is quite different from that during the Great Depression, many economists in Japan believe that the present economic effect is quite different from that which occurred during the Great Depression. During the Great Depression, deflation took place at the same time as there was a severe fall in production activity. Compared with the previous peak, real GDP decreased about 50%

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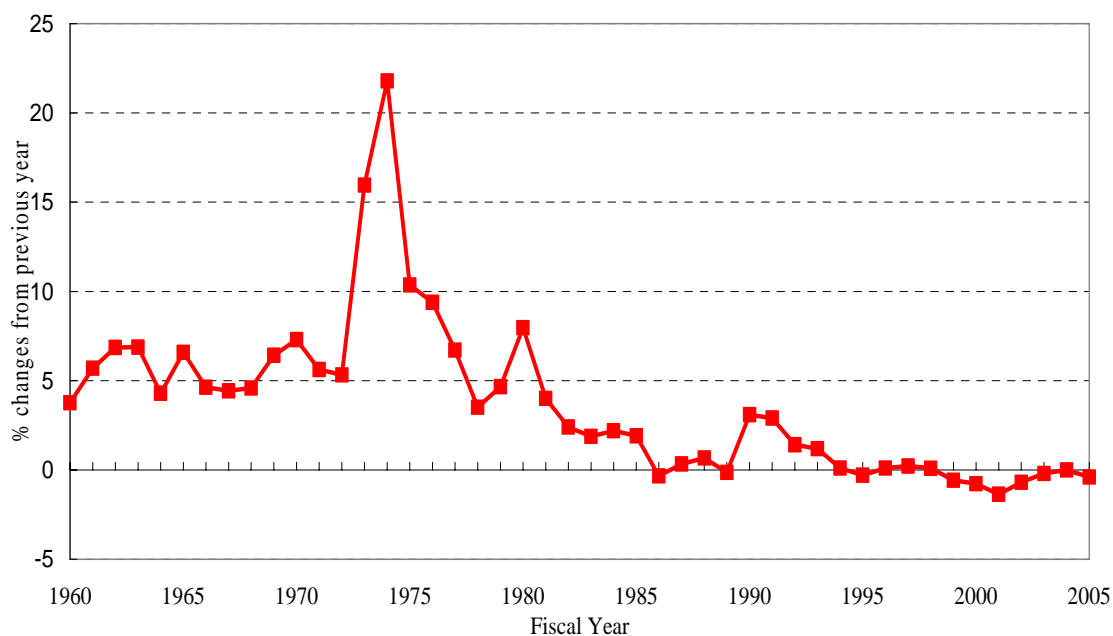
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in the United States during the Great Depression. The average rate of real GDP growth in Japan after 1991, when the long-run recession started, is significantly lower than the rate in the 1980s. However, about 1% or 2% growth of real GDP has been maintained. Moreover, to maintain the Gold Standard parity of currency during the Great Depression, the monetary policy was to reduce prices deliberately.

**Fig.1 Inflation Rate of GDP Deflator  
(Fixed-Based, excluding Consumption Tax)**



**Fig.2 CPI Inflation Rate excluding Consumption Tax**



The aim of Japan's monetary policy after 1990 was to reduce asset prices, and this was called the Bubble suppression. However, the policy did not reduce prices. It seems that the inflation rate in the 1980s was in the range of 2% to 3% in terms of GDP deflator. However, the range of the target after 1990 seems to have been reduced from 0% to 1%. If the reduction in the target inflation rate caused the deflation, even if deflation was not the goal, the change in the policy of the Bank of Japan was the reason for the deflation.

### **Inflationary steady state**

Let us consider an economy with a technological and population level permanently constant and with only the money stock increasing at a constant rate.<sup>1</sup> Subject to certain conditions, this economy would eventually reach a steady state equilibrium. Because all real variables become constant in this steady state equilibrium, the real stock of money also becomes constant. However, because the money stock increases at a constant rate, it is necessary to keep the inflation rate increasing at the same rate as the money stock so that the real stock of money is constant. Regardless of whether quantity theories of money are correct, the rates of change of prices equal to growth rate of money stock in the steady state equilibrium. When the inflation rate is determined, the nominal rate of interest becomes the total of the real rate of interest and the inflation rate. The nominal rate of interest, which is the opportunity cost of holding money, is included together with other real variables in the demand function of the real stock of money:

$$\frac{M}{P} = L(i, \Lambda)$$

Where M is a stock of money, P is price level, L is demand for real money balance, i is the nominal interest rate. The nominal money stock is determined each time by the central bank and, because the steady state equilibrium values of the variables in the money demand function are determined, the price level will be determined to satisfy the equilibrium condition of the monetary market.

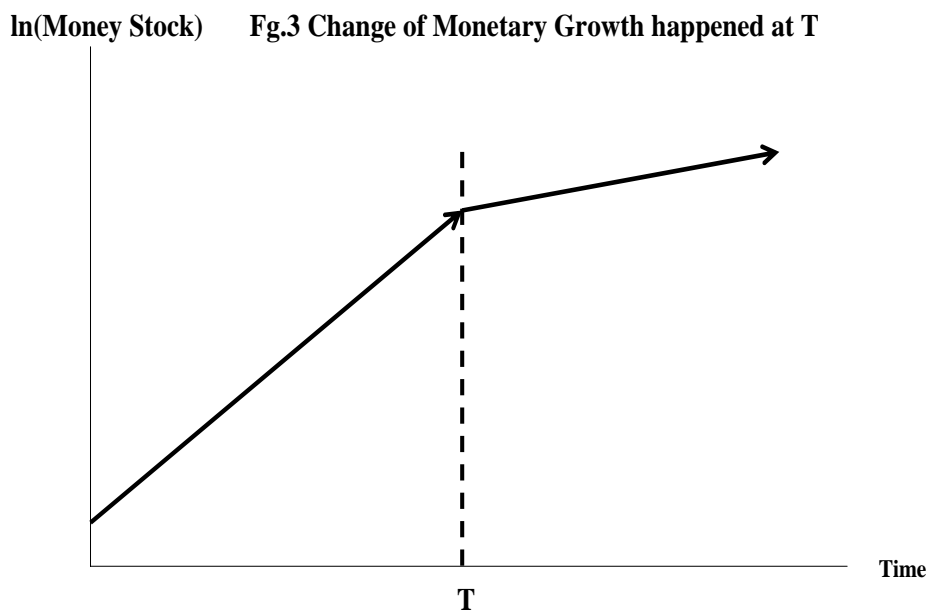
### **Reduction in the targeted rate of inflation**

Let us assume that the economy was in an inflationary steady state equilibrium. It is assumed that the central bank reduced the increasing rate of the money stock at the point

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<sup>1</sup> McCallum [1989], Chapter 6.

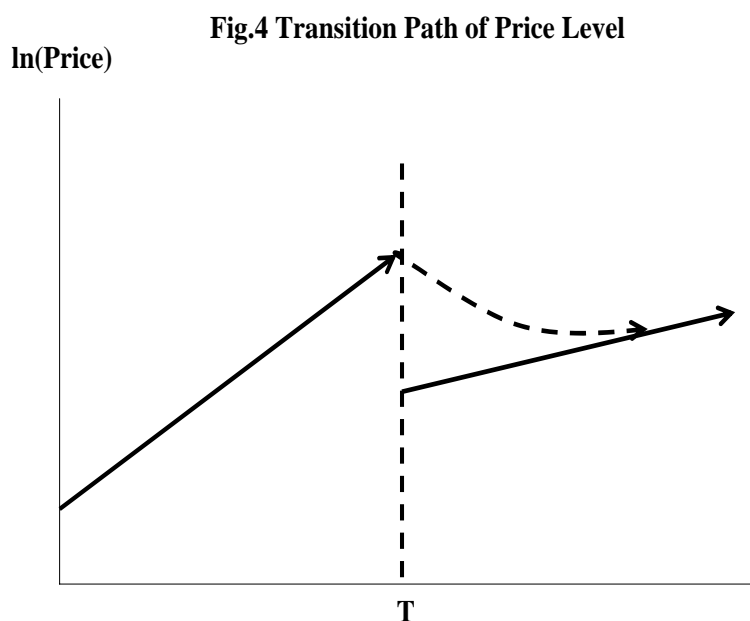
of time T. However, it is still assumed that the increasing rate of the money stock is a constant positive value after T. In other words, it is assumed that a deliberate deflationary policy of attempting to reduce the price level by decreasing the quantity of money is not adopted. Time is placed on the X axis and the natural logarithm value of the nominal money stock is on the Y axis. Then, the trajectory kink in T can be drawn in Fig.3.



The increasing rate of the money stock is written as  $\mu$ , the value before T is  $\mu_0$  and from T onwards it is  $\mu_1$ . In other words, it is assumed that  $\mu_0 > \mu_1$ . The inflation rate before T is constant at  $\mu_0$  from the assumption of a steady state equilibrium. Moreover, if enough time passes since T, the inflation rate will be  $\mu_1$ . The real rate of interest in both steady state equilibriums is of equal value and written as  $\rho^*$ . The nominal rate of interest  $i$  is  $i_0 = \rho^* + \mu_0$  before T. Moreover, it becomes  $i_1 = \rho^* + \mu_1$  after T in the following steady state equilibrium. Between these two nominal rates of interest, it is clear that the relation  $i_0 > i_1$  is verified. The real monetary demand is a function of not only real variables, but also of the nominal rate of interest. As a result, only the demand for the real money stock differs from other real variables in two steady state equilibriums. Because the nominal rate of interest is lower compared with the steady state equilibrium before T, the value of the real money stock in the new equilibrium is greater.

Let us assume that it is well known that in the future the increasing rate of the

money stock would be reduced when the economy reaches T. As a result, the expected inflation rate decreases at once, and the nominal rate of interest also decreases. In addition, the real monetary demand will increase. However, the level of the nominal money stock does not increase with time T. As a result, the price level should decrease at T to maintain the equilibrium in the monetary market and the real stock of money will be increased.



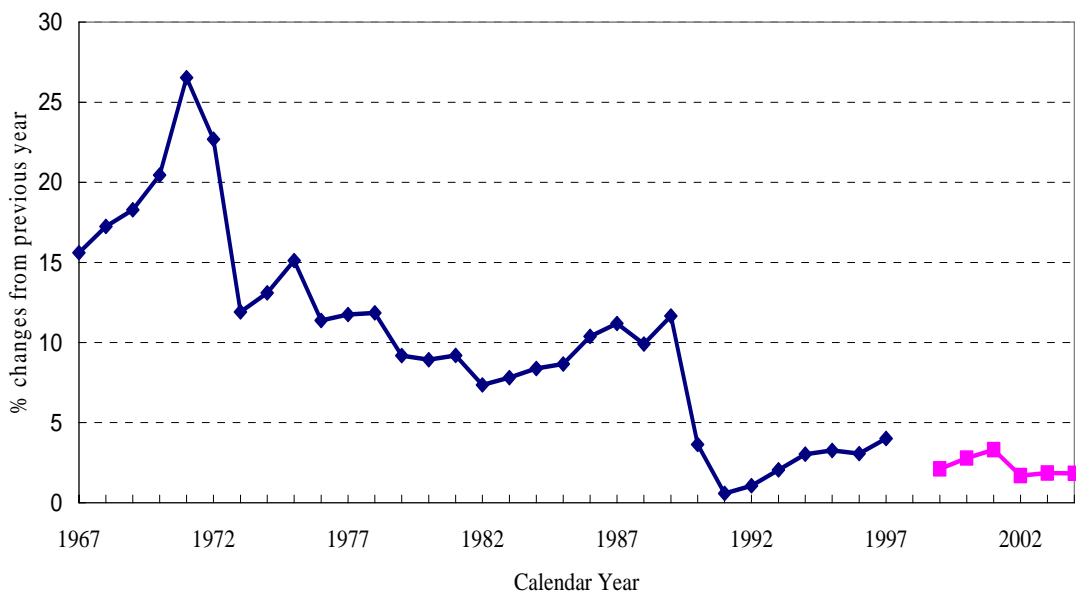
Of course, prices and the wage levels are more or less rigid in the real world and such a jump in the price level would not occur. The constant real variables that we require are not present and the fall in the price level and the decrease in the real variables are gradually absorbed at the same time as they are actually generated. Thus, it can be assumed that a new steady state equilibrium will be realized after this adjustment period is complete.

An important conclusion is that the price level will decrease, even if only the rate of increase in the money stock is lowered and the quantity of money does not decrease. In other words, changing the short-term money stock will not influence prices. The increasing rate of the money stock influences the current price level and the inflation rate by determining a new steady state equilibrium. Deflation will not end, even if the central bank, faced with the aforementioned type of deflation, temporarily raises the rate of increase in the money stock. Thus, in essence, it is a "liquidity trap" and, as Krugman [1998] pointed out,

the relationship between prices and the quantity of money does not exist.

The data in Japan reveal that the increasing rate of the money supply (M2 + CDs) in the 1980s changed by about 10%. However, this rate was suddenly lower after 1990 and averaged between 0% and 3%. If the time of the oil crisis was excluded in the 1980s' calculations, the inflation rate both CPI and GDP deflator were around 3%. However, the Bank of Japan changed its long-term inflation target to about 1% as stated in a recent Bank of Japan Policy Board meeting. It is not clear when the reduction in the long-term inflation target was widely recognized by the private sector. There is speculation that a change in inflationary long-term expectations by the private sector occurred about the middle of the 1990s, when deflation actually started to be accepted.

**Fig.5 Growth Rate of Money Stock (M2+CD's)**



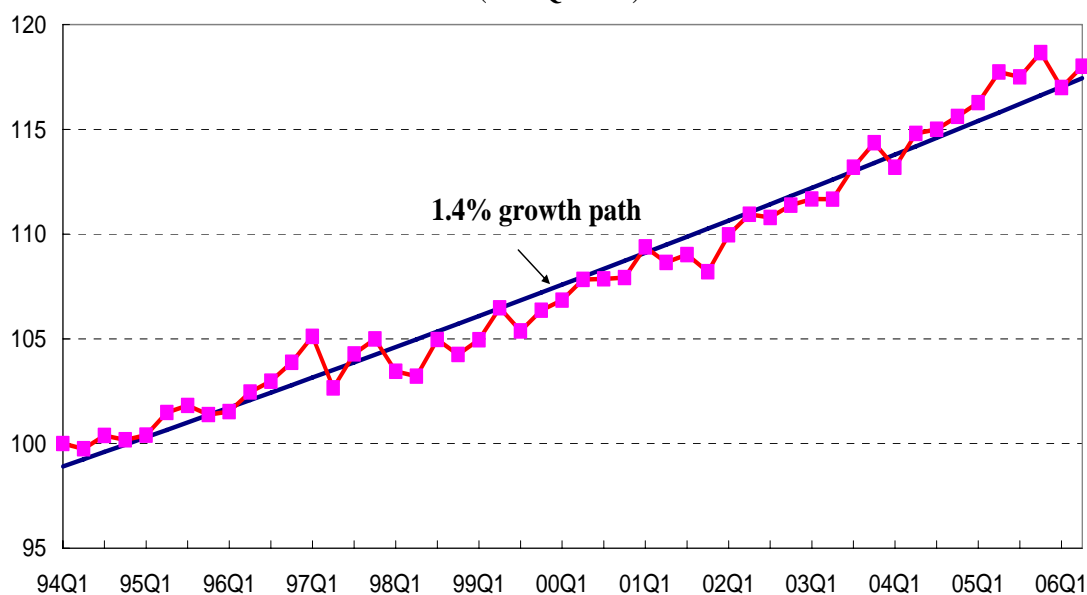
There is a possibility that the deflation started when the long-term inflation target was suddenly reduced, if it is assumed that there were rigidities in wages and prices as argued above. In addition, such a deflation need not lead to as severe an outcome as that caused by the decrease in the money stock during the Great Depression. However, deflation will continue until the necessary fall in the price level is achieved. Therefore, if deflation is gradual, it will continue over a long period. This deflation cannot be terminated by a temporary increase in the money stock. The economy will physically stagnate for a long period while maintaining a very low nominal rate of interest and gradual deflation.

## 2. Effects of gradual deflation

There is a possibility that long-term deflation would continue in the economy, although it would be gradual when the aforementioned rigidities are present in wage rates and prices and when the long-term target inflation rate is reduced by the central bank. The problem was not that gradual deflation of around 1% to 2% has a big influence on economy. Many economists in Japan, not only in the central bank but also in the private sector, thought that such a mild deflation did not produce serious adverse effects on the economy. When prices are thought of as the average of individual prices and the value of money is forgotten, it could be considered that the technological progress and deregulation that cause deflation are good for the economy. Therefore, many economists and policymakers thought that the deflation in the 1990s was a "good deflation".

Many economists believed that the most serious problem was not deflation but productivity. Hayashi and Prescott [2003] presented such a conclusion. They used growth accounting to show a decrease in the rate of growth of total factor productivity (TFP) in the 1990s and they insisted that the decrease in the TFP growth rate was the reason for the decrease in the growth rate of Japan's GDP in the 1990s. However, subsequent research,<sup>2</sup> found that the Hayashi and Prescott results are not necessarily true.

**Fig.6 Labor Productivity and Time Trend  
(1994Q1=100)**



<sup>2</sup> Jorgenson and Motohashi [2003]

Let us examine the change in labor productivity<sup>3</sup> by using the GDP statistics estimated by the chain deflator method, which became available for use after 1994. The following figure shows that labor productivity rose after 1994 at a constant rate. Of course, these data do not necessarily reflect a true structural parameter. However, after 1994, no large structural change in labor productivity was apparent.

The real wage rate<sup>4</sup> shows a different change compared with labor productivity, which rose steadily. The nominal wage rate started to decrease in 1998 when the unemployment rate was 3% above the highest rate in the past. However, until 2002, the real wage rate was rising as a result of the decreasing GDP deflator.<sup>5</sup>

The relationship between the real wage rate and corporate profits is simple. If the real wage rate can be maintained at a constant ratio to labor productivity, the ratio of corporate profits to nominal GDP is constant. In this case, an increase in the rate of corporate profits is equal to the nominal growth rate. In the opposite case, corporate profits will increase below the nominal GDP growth rate if the real wage rate increase is greater than the increase in labor productivity. The nominal GDP growth rate may be assumed to be 0% as a result of the deflation and it was lower than the real GDP growth rates during the lost decade<sup>6</sup>. Therefore, the rise in the real wage rate has directly squeezed corporate profits. The movements in labor productivity and the real wage rate can be seen in Fig.7.

All increases in labor productivity before 2002 were absorbed by the rise in the real wage rate. The problem is that corporate profits did not recover sufficiently in 1994. In the normal business cycle, the real wage rate relatively decreases in the first stage of the expansion period, and corporate profits expand significantly. This adjustment proceeds as in a normal business cycle until the 1980s. The rise in the nominal wage rate stops in 1997 and starts to decrease. Corporate profits were likely to expand relative to wages if deflation did not take place. However, the real wage rate kept rising because of deflation until 2002. As a result, a mild deflation of about 1% disrupted the real recovery of corporate profits.

The decrease in the GDP deflator that started in 1994 completely erased the effect

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<sup>3</sup> Labor Productivity=Real GDP/Number of Employee/Average Hour Worked

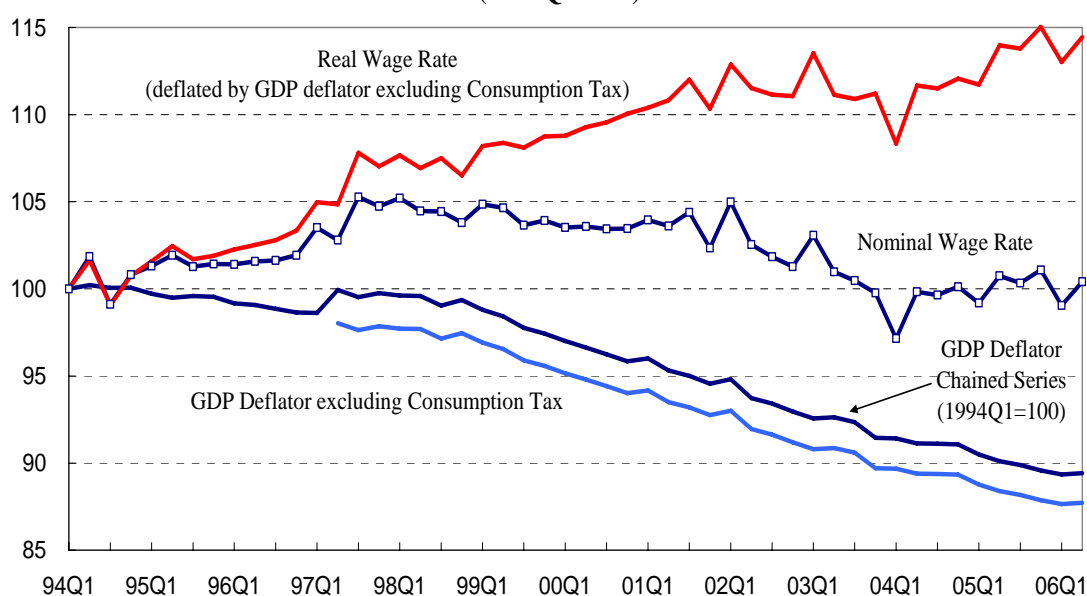
<sup>4</sup> Real Wage Rate=Compensation of Employee/Number of Employee/Average Hour Worked

<sup>5</sup> We have to consider the effect of the consumption tax. The rate was raised from 3% to 5% in April 1997. Here, we adopt the simplest measurement. The deflator before Q1 1997 is divided by 1.03, and the data from Q2 and onward is divided by 1.05.

<sup>6</sup> Hayashi and Prescott[2002]

of the reduction in the nominal wage rate. In the opposite case, deflation squeezed corporate profits by causing the real wage rate to increase and disrupted the recovery of asset prices, including stock prices. By having a weak recovery of corporate profits, capital investment was immediately decreased. Moreover, the net assets of the financial and nonfinancial institutions also decreased because stock prices decreased and, indirectly, because capital investment decreased. Thus, business deteriorated further and the unemployment rate rose to 5% in the latter half of 2001. In 1997, the decrease in the nominal wage rate because the unemployment rate exceeded 3%. As well, the high unemployment rate of up to 5% caused a large decrease in the nominal wage rate and eventually a decrease in the real wage rate was realized. As a result, the corporate sector's profit increased, even though nominal GDP did not increase. Thus, the rise of asset prices and the increase in capital investment continues even though deflation persists.

**Fig.7 Nominal and Real Wage Rate  
(1994Q1=100)**



## Conclusion

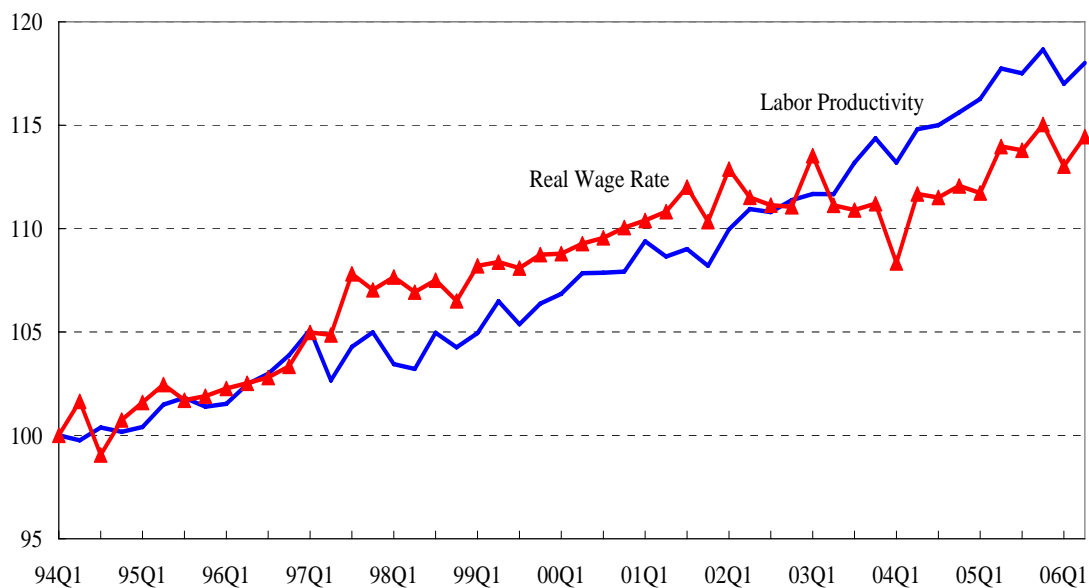
It is shown, without using complex dynamic macroeconomic modeling, that if the long-term money supply growth rate (or central bank's long-term inflation rate) is reduced, the economy falls into a state of deflation. In addition, even short-term increases in the quantity of money will not end this deflation. In other words, an essential part of the "liquidity trap" proposition proposed in Krugman [1998] is that there is no dependence in the model's

specific structure. As shown in this paper, the conditions necessary to generate a liquidity trap are: 1) an imperfection in the adjustment for prices and wages, and 2) having the nominal rate of interest included in the money demand function as an independent variable.

At the present stage, the short-run dynamic models of prices and wages that all economists have agreed to are not necessarily established. However, even though a dynamic model supported by all economists does not exist, by using a simple inflationary steady state model it becomes clear that a long-term change in monetary policy causes the liquidity trap.

It can also be thought that it was the gradual deflation that generated the long-term stagnation by greatly reducing corporate profits under the historical conditions that Japan had in place in the 1990s. Therefore, the persistence of Japan's low rate of deflation was the one of the most important factor to keep Japanese economy in stagnation over 10 years.

**Fig.8 Labor Productivity and The Real Wage Rate  
(1994Q1=100)**



## References

- Hayashi, F. and E. Prescott, 2002, "The 1990's in Japan: A Lost Decade," *Review of Economic Dynamics*, 5, pp. 206–235.
- Jorgenson, D.W. and K. Motohashi, 2003, "Economic Growth of Japan and the United States in the Information Age," *RIETI Discussion Paper Series 03-E-015*.
- Krugman, P. 1998, "It's Baak: Japan's Slump and the Return of the Liquidity Trap,"

Brookings Papers on Economic Activity, 2, pp. 137–187.  
McCallum, B. 1989, *Monetary Economics*, Macmillan.