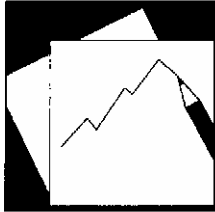


# Working Paper

---

INTERNATIONAL MONETARY FUND



WP/03/215

# IMF Working Paper

---

## Understanding the Costs of Deflation in the Japanese Context

*Taimur Baig*

**IMF Working Paper**

Asia and Pacific Department

**Understanding the Costs of Deflation in the Japanese Context**

Prepared by Taimur Baig<sup>1</sup>

Authorized for distribution by Saul Lizondo

November 2003

**Abstract**

The views expressed in this Working Paper are those of the author and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.

This paper examines the cost of deflation in the context of Japan's ongoing deflationary episode. The impact of deflation owing to the zero interest rate bound on monetary policy, wage rigidity, redistribution of wealth from debtor to creditor, and inflexibilities in the financial sector are examined. It is seen that the generalized decline in the Japanese price level, however gradual or mild, has substantially exacerbated the economy's adjustment process under already difficult economic conditions.

JEL Classification Numbers: D31, E31, E52, G10, J39

Keywords: Deflation, Monetary Policy, Wage Rigidity, Financial Sector

Author's E-Mail Address: [tbaig@imf.org](mailto:tbaig@imf.org)

---

<sup>1</sup> The author would like to thank David Burton, Dora Iakova, Kenneth Kang, Manmohan Kumar, Takuo Komori, Charlie Kramer, Saul Lizondo, and seminar participants at the Office of Asia and Pacific, Tokyo, in May 2003, for valuable comments and insights, as well as Janice Lee for outstanding research assistance.

	Contents	Page
I.	Introduction.....	<a href="#">3</a>
II.	Conceptual Issues.....	<a href="#">5</a>
III.	Development of Deflation in Japan .....	<a href="#">9</a>
IV.	Costs of Deflation .....	<a href="#">13</a>
V.	Conclusion .....	<a href="#">20</a>
	References.....	<a href="#">25</a>
 Figures		
1.	Price Developments.....	<a href="#">4</a>
2.	Real Interest Rate and Output Gap .....	<a href="#">6</a>
3.	Price Dynamics.....	<a href="#">11</a>
4.	One Step-ahead Forecast Errors, 1980-89.....	<a href="#">12</a>
5.	One Step-ahead Forecast Errors, 1990-2003.....	<a href="#">12</a>
6.	Actual and Taylor Rule-Based Interest Rates.....	<a href="#">14</a>
7.	Impact of the Zero Bound on Real Output.....	<a href="#">15</a>
8.	Real Wage Developments.....	<a href="#">16</a>
9.	Unemployment.....	<a href="#">16</a>
10.	Interest Rates.....	<a href="#">17</a>
11.	Average Open Interest Positions.....	<a href="#">18</a>
12.	CPI and its Components.....	<a href="#">21</a>

## I. INTRODUCTION

*“Thus Inflation is unjust and Deflation is inexpedient. Of the two perhaps Deflation is . . . the worse; because it is worse, in an impoverished world, to provoke unemployment than to disappoint the rentier.”*

—John Maynard Keynes (1923)

Measured in terms of either the GDP deflator or the consumer price index, deflation has continued unabated in Japan for over half a decade. Both price measures have been on downward paths in recent years: the GDP deflator has fallen by over 9 percent since 1995, while the CPI has fallen by 3 percent since 1998 (Figure 1).

For some time now, deflation and associated economic problems have been an integral part of the policy-related debate in Japan. The lengthy discussion, however, has not fully resolved some critical questions—have the persistent declines in the price level been very costly for Japan?<sup>2</sup> Or is deflation broadly tolerable? Resolving such questions is critical in framing the policy agenda, which has been unable to solve the economy’s deep-seated problems over the course of the past decade.

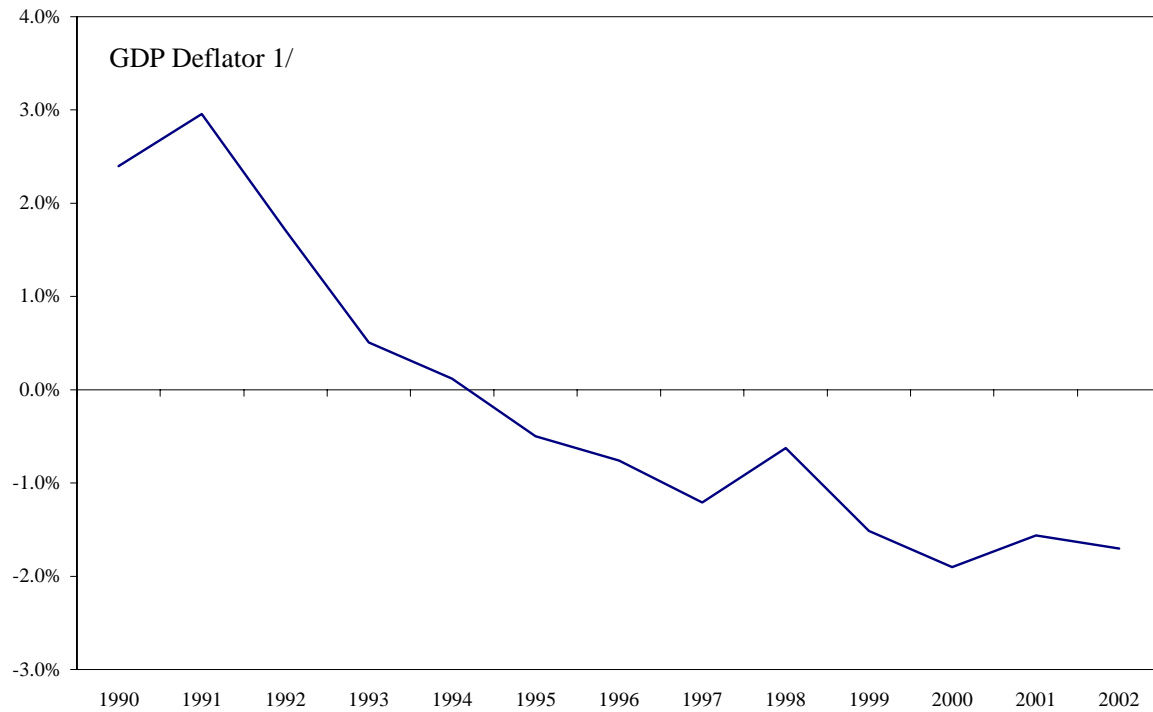
Some observers have downplayed the impact of the relatively modest decline in the price level vis-à-vis the sharp fall in asset prices through the 1990s. It has also been suggested that mild deflation is a sign of price stability, and has entailed very little cost as the economy has learned to live with falling prices in recent years. On the policy front, the necessity of a vigorous response to deflation has been questioned in some quarters on the grounds that the potential cost of aggressive policy measures is likely higher than the cost of allowing deflation to work its way through under the existing policy framework. Implicit in this line of reasoning is the notion that deflation in Japan is mild, largely unavoidable, and hardly pernicious.

While the dramatic declines in land and equity prices during the 1990s have unquestionably had far-reaching adverse impacts on the Japanese economy, the difficulties posed by a sustained decline of the price level have as well had multifaceted repercussions. Prolonged, unanticipated deflation has impeded monetary policy efficacy, hampered financial market activities, squeezed corporate profitability, and raised the real burden of private and public debt.

---

<sup>2</sup> See, for example, Ueda (2003).

Figure 1. Japan: Price Developments, 1990-2003  
(Year-on-year percentage change)



Sources: CEIC Database and staff estimates.  
1/ Data corrected for the 1997 consumption tax increase.

Deflation in Japan appears to reflect weaknesses in the economy, rather than positive supply shocks. That is, deflation is taking place not in the midst of a major spurt of productivity growth or a significant and large shift in its terms of trade, but rather in the context of a long-running economic malaise, characterized by slow growth and stagnant demand alternating with recession. The continuing generalized decline in the price level is hardly benign as, at the very least, it is hampering a sustained economic recovery by essentially putting a floor on the real interest rate in a period of a widening output gap (Figure 2).

This paper examines the cost of Japan's ongoing deflationary episode. Following a conceptual discussion, some salient characteristics of deflation in Japan are examined in light of historical developments. This is followed by a set of analytical arguments and empirical results that underpin the cost of deflation. The paper is organized as follows. In Section II, a set of theoretical arguments on the cost of deflation is analyzed. Section III is devoted to historical price-related developments in Japan. Section IV examines the evidence on the impact of deflation on Japan's monetary policy-making, labor market, financial market, households, and the public sector. Section V contains some concluding comments.

## II. CONCEPTUAL ISSUES

Is deflation just inflation with the sign reversed, or are there inherent asymmetries that make it different from inflation, and even disinflation (when the rate of inflation falls)? What are the theoretical and institutional factors that make deflation costly? The clearest asymmetry between inflation and deflation is the problem of a zero-bound on interest rates that tend to be associated with deflationary episodes. In this section, a number of factors beyond the zero-bound issue are discussed that also make deflation problematic.

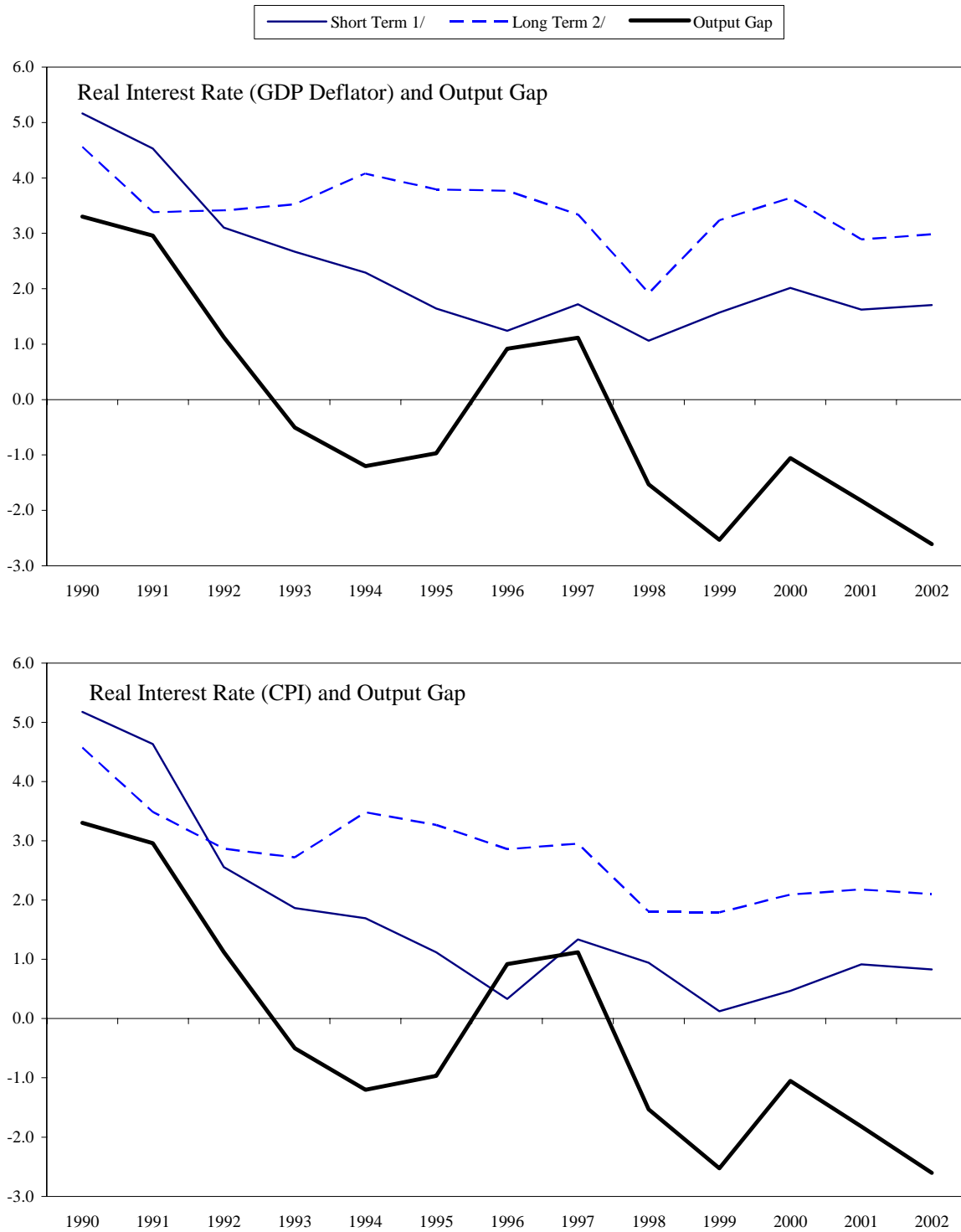
The costs of deflation depend on its source as well as its extent and duration. It is conceivable that under certain circumstances deflation may not entail significant costs. For example, temporary price declines due to a strong expansion in aggregate supply or productivity spurt may not be too problematic. Positive external shocks, such as falling import prices or aggressive trade liberalization, could push down domestic prices as well. In such cases, deflation is the manifestation of an adjustment to a new equilibrium in the context of rising incomes. It is therefore unlikely to become entrenched in agents' expectations and have sustained deleterious effects on domestic demand and the pace of activity. Recent developments in information technology, globalization, and deregulation have given a boost to productivity growth across a broad range of goods and services sectors, reducing inflationary pressures. Similar episodes of productivity spurts are believed to have played an important role in deflationary episodes during the 19<sup>th</sup> century.<sup>3</sup>

However, owing to various nominal rigidities, aggregate demand-driven deflation is likely to entail significant costs. These rigidities can be traced back to financial markets, including the

---

<sup>3</sup> For a detailed discussion on this, see Kumar et. al. (2003).

Figure 2. Japan: Real Interest Rate and Output Gap, 1990-2002  
(In percentage point)



Sources: Nomura database and staff estimates.

1/ Overnight call rate - Inflation (CPI)

2/ 10-year JGB yield - Inflation (CPI)



zero-interest rate floor, as well as in the labor market. While the estimates due to the former are considered to be significant although difficult to quantify precisely, studies of the downward rigidity of nominal wages suggest that deflation could impose costs amounting to several percentage points of GDP (Akerlof et. al., 1996).

### **Collateral and Balance Sheet Effects**

Fisher's (1933) debt-deflation theory highlights the adverse dynamics associated with declining prices. Unanticipated deflation leads to a redistribution of wealth from debtors to creditors. The losses of the debtors may not cancel out against the gains of the creditors since the collateral underlying the transaction loses value as well during deflation. The loss in collateral may be particularly severe when deflation is accompanied by sizable reductions in asset prices.<sup>4</sup> As collateral loses value and bankruptcies ensue, banks need to reevaluate their loan portfolios but may find it hard to distinguish between good and bad risks. As a result, they either raise financing charges (the external finance premium rises) or they cut back on lending that they might otherwise have undertaken, resulting in a fall in aggregate demand.

### **Sticky Wages**

Aggregate demand-induced deflation raises unemployment when nominal wages are rigid downwards. With sticky wages, price declines cause real wages to rise, profit margins to fall, and employment to be cut back.<sup>5</sup> Buiter (2003) notes that because of wage rigidities, an economy facing a demand shock would have to undergo a larger adjustment in output and employment under deflation than it would under a comparable magnitude of inflation.

Akerlof et. al. (1996) estimate that with a sustained 1 percent deflation and downward rigidities in nominal wages, unemployment in the United States could rise from a long-run equilibrium rate of 5.8 percent to 10.0 percent. Phillips curve estimates suggest that output losses could amount to a multiple of the roughly 4 percentage point loss in employment. Other studies of nominal wage setting estimate the costs to be smaller, yet of significant magnitude.<sup>6</sup>

---

<sup>4</sup> Deflation raises the real value of outstanding debt, but it generally does not raise the debtor's real capacity to service it. This can lead to bankruptcies and other economic costs, which in turn hurt asset prices.

<sup>5</sup> It is conceivable that the stickiness of wages could in fact limit expectations of declining prices and thus prevent a deflationary spiral. This however does not mitigate the economic costs owing to increases in unemployment.

<sup>6</sup> See Kumar et. al. (2003) for a survey of the literature on this issue. A caveat is the behavior of nominal wages during periods of inflation—which is most of the available evidence—may be different from the behavior of nominal wages in periods of deflation. There is some evidence that suggest that wage rigidity may be reduced during deflation.

## **Deflation versus inflation or disinflation**

Inflexibilities in the financial and labor markets force the asymmetry between the costs of deflation and inflation, regardless of the underlying economic shocks. The costs in terms of efficiency losses for resource allocation and an increase in uncertainty from moving from zero to very low inflation rates (say below 2 percent) are likely to be negligible. In contrast, the adverse effects due to sustained deflation can be substantial.

Deflation and disinflation have some similar effects on activity, but because of market imperfections, deflation—in particular, of the unanticipated variety—entails higher costs.<sup>7</sup> The zero interest rate floor is more likely to become a binding constraint under deflation than disinflation. Furthermore, the collateral and balance sheet effects may well be stronger under unexpected deflation than disinflation. For example, assessments of creditworthiness typically place a disproportionate weight on the latest loan-to-asset values or loan-to-income/profit ratios. While the fundamental ability of a debtor to service a loan may deteriorate to the same degree under unexpected deflation as under unexpected disinflation, banks are more likely to cut credit lines under deflation for fear of not recovering the book value of the loan principal. Also, the disintermediation that may follow the financial distress triggered by unexpected price related developments may be larger under deflation than under disinflation. Once deflation sets in, agents are more likely to recognize that there is scope for substantial additional increases in their real debt burden, and thus would form their consumption and investment decisions more conservatively. Finally, deflation, as opposed to disinflation, more likely reveals macroeconomic imbalances manifesting in a generalized decline in the price level.<sup>8</sup>

## **Institutional Factors**

Bernanke (2000) notes that the modern economic environment is substantially more credit dependent (especially long-term credit) than the economies in the classical gold-standard era. Deflation's impact, through the balance sheet channel by raising real debt burdens, is therefore much more potentially pronounced. Unlike earlier episodes, rising prices have been the norm in recent history, thus anchoring expectations and influencing the design of financial instruments accordingly. Agents, accustomed to long periods of rising prices, simply do not foresee deflation until it materializes.

In order to examine the extent to which the above factors fit into the Japanese case, it is first important to understand the salient characteristics underlying its deflationary episode. The

---

<sup>7</sup> If the actual real interest rate turns out to be higher than expected, the resulting debtor to creditor transfer of resources is identical regardless of whether there is deflation or disinflation. The cost is however magnified under deflation owing to the factors described above.

<sup>8</sup> For historical evidence on the complementarity between price and financial stability, see Bordo et. al., (2001).

following section describes the macro developments—in particular the boom-bust cycle—that have been associated with the downward trend in the price level. It follows by identifying a few key characteristics of deflation in Japan.

### III. DEVELOPMENT OF DEFLATION IN JAPAN

Japan's experience with low—and now negative—inflation is hardly recent. In the fifteen years prior to the onset of deflation in the mid-1990s, its annual core inflation rate averaged just 2.1 percent. This stands in contrast to the United States, where, over the same period, core inflation averaged nearly 4 percent. Indeed, during the mid-1980s, core inflation (CPI excluding food) in Japan fell to near zero, followed by several quarters of decline in the GDP deflator. Although demand was relatively strong during this period, a number of factors were associated with this phenomenon, including fairly tight monetary policy in the aftermath of earlier oil shocks, a rapid buildup in capacity, an appreciating yen, and a gradual removal of trade barriers.

During the mid- to late-1980s, strong growth took place amid an asset price boom but only modest CPI inflation. Economic activity picked up sharply from 1987 onward, coinciding with a tremendous run-up in asset prices, while the monetary policy stance remained relatively unchanged.<sup>9</sup> Broad indexes of land and equity prices peaked at the end of the decade, at four to five times their levels in 1980. The economy overheated, operating at 2–3 percentage points over potential GDP in the late-1980s and early-1990s, but goods and services prices were bid up only moderately in response.

Core inflation peaked at slightly above 3 percent in early 1991, and then began trending down. The previously exuberant markets succumbed to inevitable fatigue and a tightening of monetary policy, resulting in a collapse of asset prices and private demand. Bernanke and Gertler (2001) argue that monetary policy was behind the curve during this boom-bust cycle—the central bank waited too long before tightening monetary policy during the bubble period, and delayed in easing once the economy headed downward.<sup>10</sup>

---

<sup>9</sup> The uncollateralized overnight call rate was maintained at around 4 percent between 1986 and 1989.

<sup>10</sup> In their analysis, Bernanke and Gertler (2001) use a forward-looking Taylor rule estimation of the target interest rate. These findings have been questioned by Okina and Shiratsuka (2001), on the ground that they are only valid when using ex post realization of the data. The latter authors argue that policy appears to have been broadly appropriate if the analysis is restricted to data available ex ante.

The unraveling of the asset price boom affected the Japanese economy considerably. The sharp fall in land and equity prices was followed by real GDP growth coming to a crawl. A widening output gap, reflected in the sizable excess capacity in the manufacturing and construction sectors, exerted downward pressure on prices. Banks, which had lent heavily to real estate and construction companies, struggled under a mountain of bad loans and rapidly declining profitability. They focused on consolidating their balance sheets and became very cautious in extending further credit. Reflecting the loss of economic momentum, broad money (M2+CDs) growth declined rapidly, from over 11 percent in 1990 to 0.6 percent in 1992.

With demand in sharp decline, inflationary pressures virtually dissipated. Additionally, prices in the tradable sector were affected by the further opening of the economy and the resulting competitive pressures.<sup>11</sup> Prices in the nontradable sector also faced some downward pressures owing to deregulation and innovations. In its efforts to stimulate demand and prices, the Bank of Japan eased monetary policy, lowering the uncollateralized overnight call rate from 8.5 percent in early 1991 to 0.5 percent by late 1995, but that proved to be insufficient in the face of an unrelenting decline in asset prices and resulting associated problems.

Core CPI deflation materialized fully in 1998 with the onset of a recession, but the GDP deflator began its near-continuous decline earlier (in 1995). A short-lived economic recovery around the Y2K-related investment boom in the late-1990s did little to arrest deflation. Initiatives to help the economy recover fell short, and consumption and investment remained weak. As a result, asset prices continued to decline, with both land and equity prices sitting at two-decade lows in mid-2003. Inflation expectations, which remained positive until the beginning of actual price declines, subsequently turned negative and became entrenched as a sustainable economic recovery proved to be elusive.

Two key characteristics stand out with respect to Japan's price developments in recent years:

(i) *Deflation has been hard to predict*

Deflation was largely unanticipated in Japan, thus making the adjustment process particularly difficult. Ahearne *et al* (2002) note that as the rate of inflation fell through the mid-1990s, official and private forecasts consistently failed to anticipate the occurrence, and subsequently the magnitude and duration, of deflation. As a result of persistent deflation in recent years, surveys indicate that deflationary expectations have become entrenched.<sup>12</sup>

---

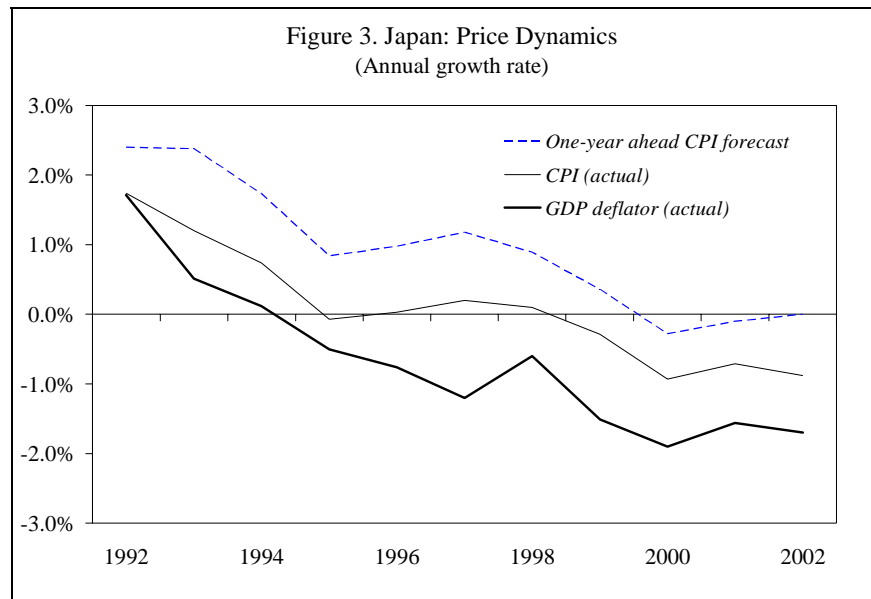
<sup>11</sup> Kamada and Hirakata (2002), estimating a comparative advantage model for Japan, show that some of the downward pressure on consumer prices in the mid- and late-1990s could be explained by the increase in international competition.

<sup>12</sup> The 2002 Nissan Business Conditions Survey, with over 3,000 companies responding nationwide, provides insight into firm-level perspectives on the impact of deflation.

According to the survey, over 80 percent of the respondents reported declining sales prices,

(continued...)

A time-series forecasting exercise suggests that deflation was difficult to predict. In this exercise, inflation expectations are assumed to be generated by a simple rule of the current period's inflation being the basis for next period's forecast. Examining monthly CPI (excluding food, and adjusted for the impact of the increase in consumption tax in 1989 and 1997) year-on-year inflation data from 1980 to present, it is seen that the recent deflationary period has been characterized by a distinct set of dynamics. One step-ahead forecasts obtained from a regression with a single lagged dependent variable show that through the 1980s and during the first half of the 1990s, the number of positive forecast errors were consistently equal or greater than negative errors, but incidence of the latter mounted in the late-1990s.

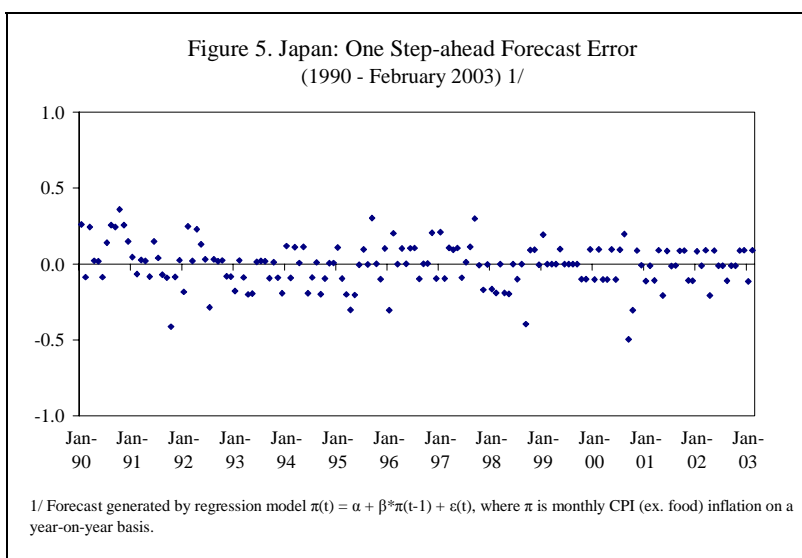
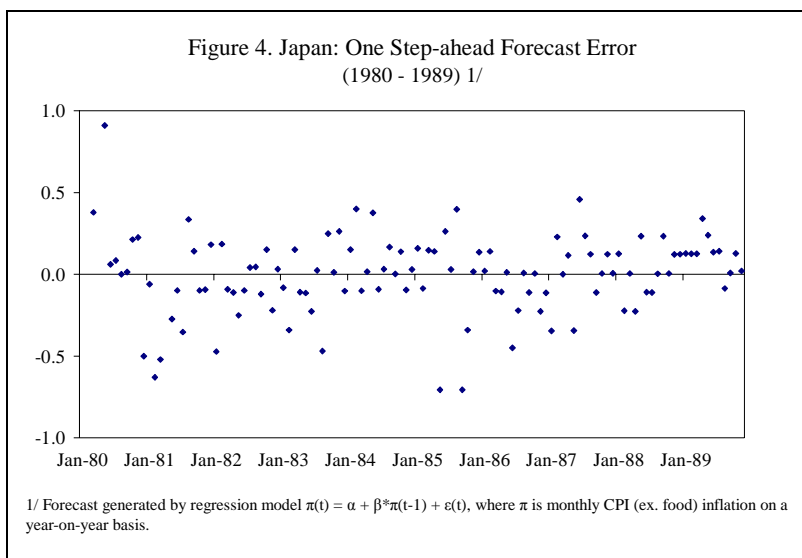


For further ease of comparison, forecast errors from two distinct three-year periods were chosen to be contrasted with the data from 2000–02. During the three-year periods between 1981–83 and 1993–95, the forecast errors were roughly equally frequent, whereas over 60 percent of the observations had negative errors between 2000–2002. Most strikingly, in the 12-month period starting from October 1997, following which prices began to decline continuously, there were no positive forecast errors (i.e., in each successive period, deflation was stronger than expected). This contrasts with any preceding period in Japan in the dataset. The data thus underscore the asymmetric nature (with respect to predictability) of the deflationary period in Japan.<sup>13</sup>

---

and felt that deflation was harmful to their respective businesses. Nearly 40 percent of the respondents saw deflation continuing for at least three more years.

<sup>13</sup> Despite being a low inflation country, rising prices had been the norm in Japan's recent history, thus anchoring expectations and influencing the design of financial instruments accordingly. It appears that agents, when accustomed to long periods of rising prices, simply do not foresee deflation until it materializes.



(ii) *Deflation has been broad-based*

The ongoing deflationary episode has been broad-based.<sup>14</sup> Very few items in the consumer price index have experienced increases or stability in prices. Items such as clothes and footwear, furniture, transportation and communication, private housing rent, reading and recreation have registered a declining trend (Figures 12A–12D). The general decline in price levels thus cannot be explained by factors affecting specific sectors, such as competitive pressure from abroad, or excess capacity and deregulation in certain industries. Rather, a

<sup>14</sup> The GDP deflator, which is a broader measure of prices, has declined even more than the CPI.

combination of these and other factors, including banking sector difficulties, insufficiently loose monetary policy, and stagnant demand, is more likely to have kept prices at bay in Japan.

#### IV. COSTS OF DEFLATION

##### Monetary Policy

Perhaps the most significant impact of deflation has been on monetary policy, which has been constrained by the zero bound on nominal interest rates. As already noted, in recent years, the Bank of Japan (BoJ) has responded to declining prices by lowering short-term interest rates to their floor. Moreover, since March 2001, it has pursued a quantitative easing framework, targeting bank and non-bank current account balances held at the central bank. The liquidity injection has been sizable, as evidenced from the 58 percent growth of the monetary base between March 2002 and June 2003, but it has so far fallen short of reviving inflationary expectations. The BoJ's difficulties in generating positive inflation expectations illustrate the problems faced by monetary authorities when prices are falling on a persistent basis. At the zero bound, it is not impossible, but certainly more challenging, for the central bank to successfully guide inflation expectations.

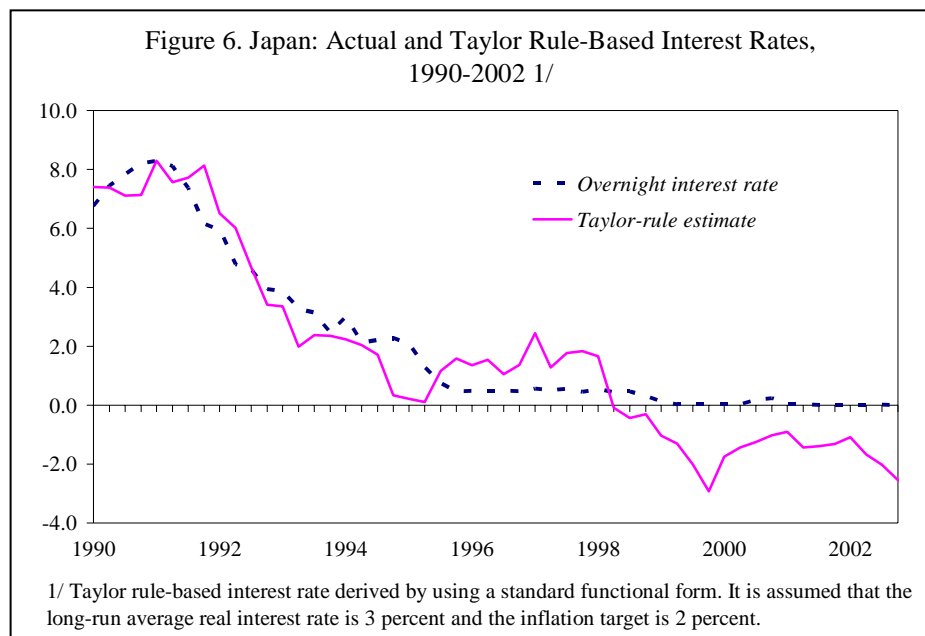
The costs associated with the zero bound are highlighted by Yates (2002). The author notes that reaching the zero bound in itself need not be costly from the perspective of monetary policy. If the economy is not facing a large output gap or sustained deflationary pressure, it is conceivable that a relatively short period of time spent at the zero bound could be entirely costless. However, the zero bound is likely to be reached precisely when the output gap is widening and deflation pressures are mounting, as seen in Japan's recent experience. Therefore, the cost of deflation from a monetary policy angle is a function of the time spent at the zero bound while additional interest rate stimulus is desirable. The loss in output when the economy needs an interest rate stimulus mounts as the duration at the zero bound increases. By this measure alone, the cost of deflation in Japan has been substantial, as the Taylor rule analysis below indicates the need for negative interest rates since 1998.

Following McCallum (2003), a standard Taylor rule prescription for the overnight call rate was derived:

$$R_t = 3 + \Delta p_t^a + 0.5(\Delta p_t^a - 2) + 0.5(y_t - \bar{y}_t)$$

where  $R$  is the call rate,  $\Delta p_t^a$  is the average inflation rate (using the GDP deflator) over the previous four quarters, and  $y_t - \bar{y}_t$  is the real GDP gap. The long-run annual average real rate of interest is assumed to be 3 percent, and the inflation target is set at 2 percent.

Using quarterly data from 1990 to 2002, the figure below compares the Taylor rule's prescribed interest rate with the actual rate. The estimates suggest the need for nominal rates to be negative since the second quarter of 1998, which is of course not feasible.<sup>15</sup> Indications by the Taylor rule that negative nominal interest rates are needed can be interpreted as underscoring the importance of short-term real rates to be negative in order to stimulate the economy and close the existing output gap. However, with the zero bound constraint under continued deflation, the challenge of providing the necessary stimulus has been magnified. In fact, as Figure 2 shows, real interest rates have been either steady or rising in recent years despite a widening of the output gap.

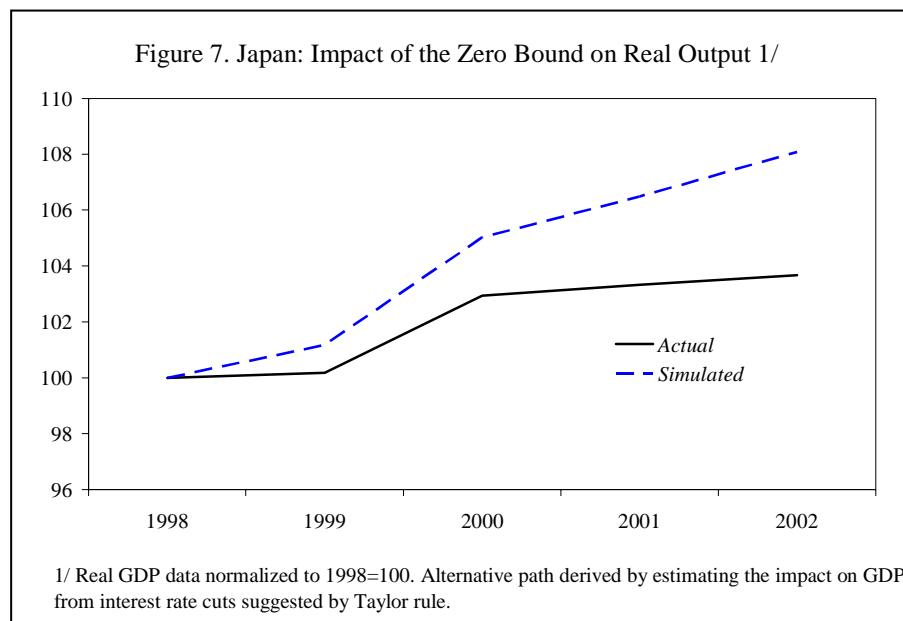


Interest rate elasticities were used to approximate the loss in output due to the zero bound. Using data from 1991 to 2002, the elasticity of output growth with respect to changes in the short-term interest rate was estimated to be around -0.5, i.e., a 100 basis points cut in the short-term interest rate raises real GDP growth by 0.5 percent with a one quarter lag. With the Taylor-rule estimates suggesting interest rate cuts by between 100 and 200 basis points from mid-1998, losses in output owing to the zero bound was imputed by simulating an alternative GDP path incorporating the impact of the rate cut. It is estimated that the cumulative loss was about 6 percent of GDP through 2002.<sup>16</sup>

<sup>15</sup> The estimates are broadly robust to a range of alternative long-term real interest rate and inflation target assumptions.

<sup>16</sup> The simulation was carried out as follows: first, the Taylor rule interest rate for the first quarter of 1998 was derived. Then the requisite rate's impact on GDP was estimated and incorporated in the calculation of output gap for the following quarter (second quarter of  
(continued...)





The above exposition suggests that an end to deflation is required to bring about much needed negative real interest rates in Japan. However, with nominal rates at their floor, and real rates elevated by deflation, only a return to inflation and inflation expectations can accomplish this.

### Sticky Wages

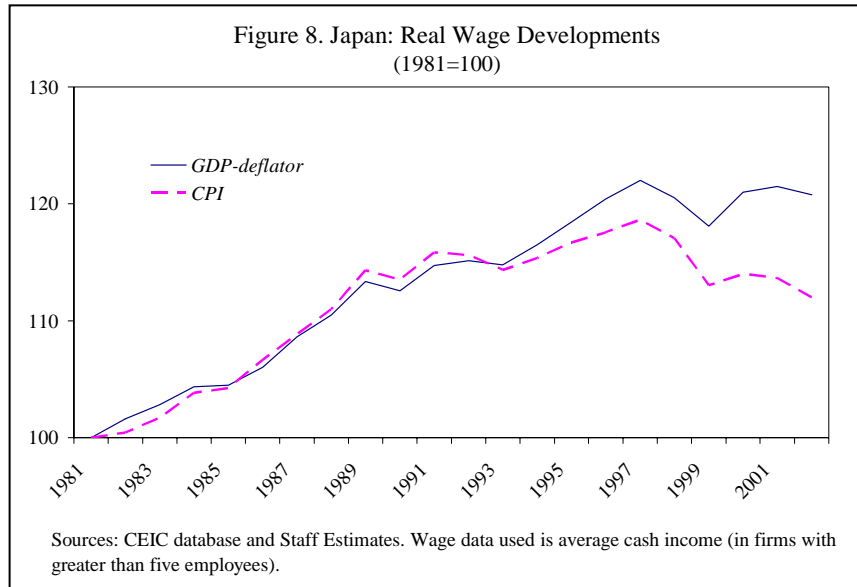
Labor market adjustment to deflation has been difficult in Japan owing to downward wage rigidities. Figure 8 shows different measures of real wage developments during the past decade. During the 1980s, real wages grew by about 15 percent in an environment of economic growth and price stability. During the post-bubble years, however, as growth slowed down and price pressures dissipated, real wages did not adjust commensurately.

Independent of the method of calculation, it can be seen that wages began to adjust in real terms from 1998 onward, but only at a very gradual pace. Despite signs in recent years that nominal wage rates have begun to decline in the face of prolonged deflation, real wages are still at about (or above) the levels prevailing at the peak of the bubble around 1990.<sup>17</sup> This is consistent with the results of Kuroda and Yamamoto (2003a and 2003b). Examining Japanese longitudinal labor market data, the authors find nominal wage change distributions to be statistically skewed to the right, which is indicative of downward wage rigidity.

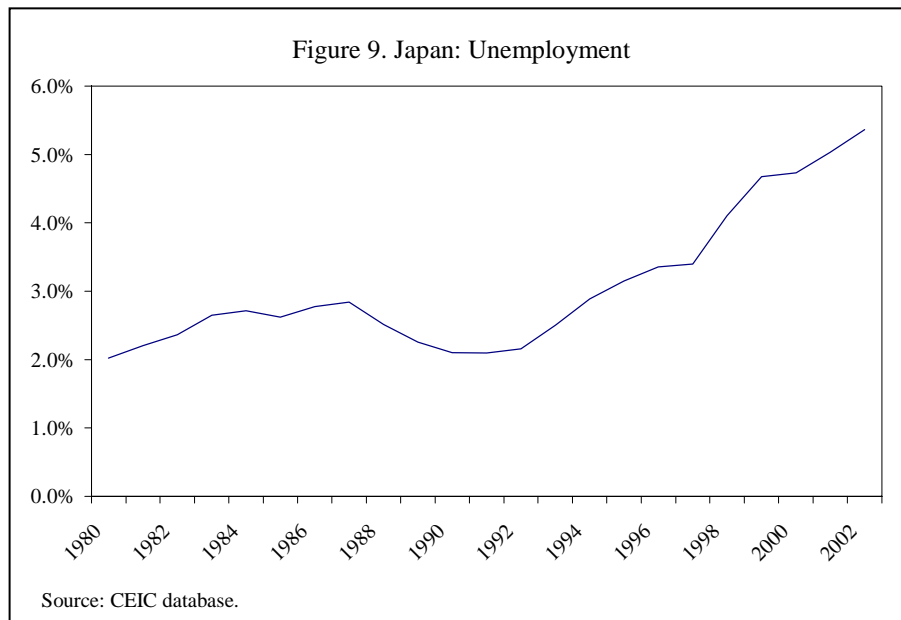
---

1998). An inflation-rate-to-output-gap elasticity (-0.4) was then applied to derive the inflation rate for the same quarter. With this information, the policy rate was derived for the second quarter of 1998, which was then used for the subsequent quarter and so forth. Iterating in this manner through the fourth quarter of 2002 yielded the alternative GDP path.

<sup>17</sup> Firms have reduced wages mainly in two ways: first, by switching from hiring full-time to recruiting part-time workers, as the latter group's compensation tends to be lower, and second, by cutting significantly the bonus component, thus reducing overall compensation.

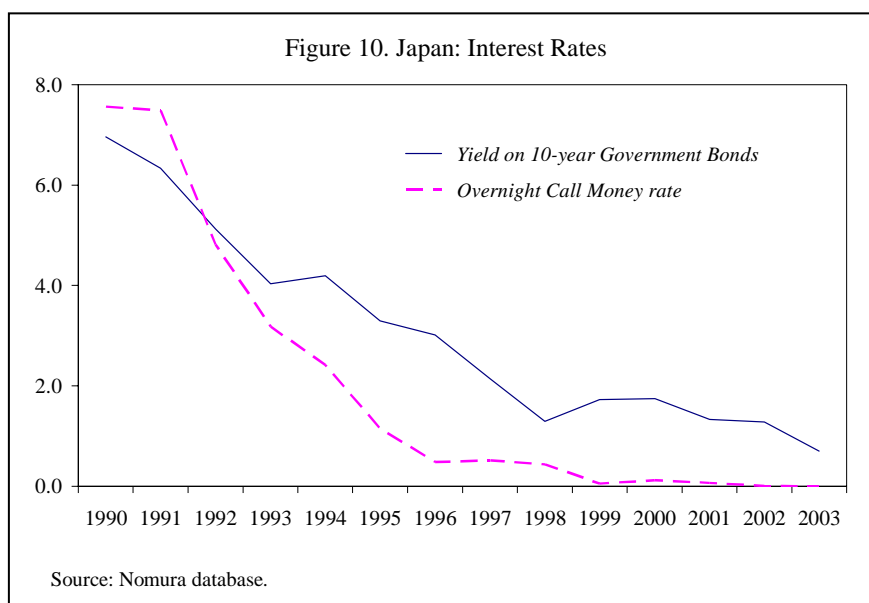


The relative inflexibility of wages has squeezed corporate profits, and may have been partly reflected in rising unemployment. Of course, an increase in unemployment in itself is not necessarily caused by deflation. However, to the extent that deflation requires firms to make even larger nominal wage cuts than they would have to under inflation (for a given real wage adjustment), it is plausible that in the presence of wage rigidities, they would be more inclined to lay off workers. The unemployment rate has risen markedly over the past ten years in Japan, from 2½ percent in 1993 to around 5½ percent in early 2003, imposing a range of social and economic costs, including rising real expenditures on safety net measures.



## Financial Sector

Low nominal interest rates are necessary to stabilize the financial system and to prevent an acceleration of deflation. Indeed, higher interest rates at the current juncture could have severe negative impact on the banking system and the economy in general. Nevertheless, the low interest rate environment has also had some adverse side effects on the financial sector. In Japan (and elsewhere), most debt instruments do not incorporate adjustment against deflation. Nominal returns on bank deposits and bonds are not designed to fall below zero, effectively putting a floor on real returns during deflation at the zero bound. Activity in the Japanese interbank money market has been dampened in recent years as zero short-term rates have caused transaction costs to outweigh returns.<sup>18</sup> Additionally, a flattening of the yield curve has compressed credit spreads, and thus put pressure on bank profitability. With deposit rates close to their floor, the franchise value of retail banking has declined as banks have been unable to bid at below market rates for deposits.

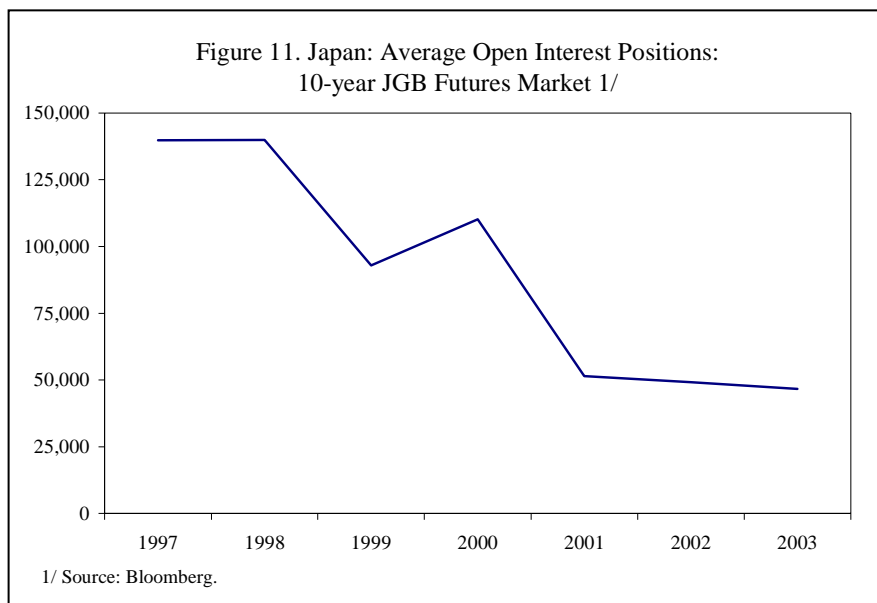


With short-term interest rates at their floor, Japanese financial institutions have found it increasingly difficult to price risk. Price discovery has been impaired in the market, and participants need to search for other ways to measure credit risk. This has caused some

<sup>18</sup> It is however open to debate whether it is necessarily preferable to have a “deep” interbank market with many private participants or simply have the central bank as the lone supplier of liquidity and perform essentially the same tasks of the private participants. While the central bank may be capable of providing ample liquidity to the market, it may still be inclined to see a functioning interbank market as such an environment provides banks with greater incentives to keep in place a sound liquidity management framework. Moreover, interbank activities provide valuable information to the central bank about market perceptions about its policy stance.

institutions to engage in bilateral trades or private placements instead of dealing through brokers. Thus with deflation and short-term interest rate at the zero bound, the search cost for information has been magnified substantially.

Low interest rates have also reduced liquidity in markets used to hedge interest rate risk. Interest rates at the zero bound have made it very difficult to find a counterpart to hedge transactions and obtain protection against a future rise in interest rates. The JGB futures market, which was highly active and liquid during the 1990s, has become dormant in recent years, with average open interest positions (weekly basis) falling by 66 percent between 1997 and May-2003.



### Redistribution of Wealth from Debtor to Creditor

Sustained unanticipated deflation has implied a substantial transfer of resources from debtors to creditors in Japan in recent years.<sup>19</sup> Following Bernanke (2000), a simple exercise is carried out below to illustrate the impact of unanticipated deflation on the borrowers. Assume that a borrower took a ten-year loan in 1997 at the interest rate of 2.1 percent, which was the yield on long-term government bonds during that period.<sup>20</sup> It would be reasonable to assume that the borrower's expectation of future price increases would have been in the range of about 1.1 percent inflation per year, which was the average of the previous decade. Subsequent deflationary developments would have however led to a significant increase in the borrower's real debt burden. Through 2003, the borrower's real obligations would have been 12 percent higher than anticipated. Even allowing for a trend decline in deflation in the

<sup>19</sup> A comparable magnitude of disinflation and deflation could have similar impact on the debt burden of borrowers. Hence this section does not exclusively deal with deflation's cost.

<sup>20</sup> The year 1997 has been chosen for this example as it is the last year before CPI deflation materialized in Japan.

coming years, it is estimated that by the time the loan matures in 2007, the real debt burden would be about 20 percent higher. Relaxing the assumptions, refinancing the loan in 2000 as interest rates come down and deflation set in, the borrower would have still found his debt burden to be about 7 percent higher by 2003 than anticipated at the beginning of the loan. Thus even the mild deflation seen in Japan in recent years has had a punitive impact on borrowers, possibly contributing to rising bankruptcies, and affecting spending and investment decisions.

The transfer of wealth from the borrower to the creditor is not frictionless owing to the value of collateral. In the post-bubble era, creditors have had difficulties recovering the value of defaulted loans owing to sharp declines in collateral value (especially land and stock). The borrower in the above illustration, if using land as collateral and expecting the asset to at least maintain its real value over the time path of the loan, would have found its real value to be 34 percent lower than anticipated through 2003.<sup>21</sup>

A combination of the increase in real debt burden and decrease in collateral value has been deleterious for financial intermediaries in Japan. Indebted households and corporates, faced with debt-service difficulties, curtailed spending and investment, and in some cases have entered bankruptcy, leaving banks in the aftermath saddled with bad loans with substantially lower recovery value.

### **Fiscal Costs**

Deflation has affected Japan's fiscal accounts in recent years. Japan's public gross debt stock has risen explosively over the past decade, from around 70 percent of GDP in the early 1990s to 160 percent of GDP at end-2002. The government's attempts to revive the economy from its doldrums through a number of tax cuts and spending measures have contributed to the increase in the debt stock, but deflation has also been a key factor. First, as a debtor, the government's real debt burden has increased owing to unanticipated deflation. Second, revenues have declined alongside a contracting nominal GDP, whereas expenditures have continued to rise. Declining prices and weak economic activities have put severe downward pressure on revenue collection, and revenue as a percentage of GDP fell from 31.8 percent in 1992 to 29.3 percent in 2002, a very large decline given the size of the economy.<sup>22</sup>

Government finances are inherently vulnerable to deflation as revenue items register a decline when prices fall, but expenditure items may not be indexed to make downward

---

<sup>21</sup> Asset price declines can have a balance sheet impact on corporates *independent* of consumer price deflation, although the adverse effects are compounded when the two factors combine.

<sup>22</sup> Some of the decline is also attributable to tax cuts.

adjustments accordingly.<sup>23</sup> Additionally, social security payments rise to the extent that unemployment increases accompany deflation. Even if unemployment does not rise, the real burden of such payments would increase with continued deflation.

Examining the government's borrowing needs in the late-1990s underscore the enormous fiscal cost of deflation. Between 1997 and 1999, the government of Japan issued bonds worth about 31 percent of GDP.<sup>24</sup> Following the approach used in the previous section, it is estimated that the unanticipated increase in the real debt burden owing to deflation from just these three years borrowing amounts to over 3 percent of GDP through 2003.<sup>25</sup>

## V. CONCLUSION

This paper examines the far-reaching costs of persistent unanticipated deflation in Japan in recent years. It is evident that the generalized decline in the price level, however gradual or mild, has created distortions in many parts of the economy and substantially exacerbated the adjustment process under already difficult economic conditions. Unanticipated deflation has led to substantial transfer of resources from debtors to creditors, but the latter have not benefited fully as the increased debt burden, compounded by falling collateral value, has contributed to defaults and diminished loan recovery value. Owing to wage rigidities, deflation has caused unemployment to mount. The normal intermediation process in the financial sector has been hampered by interest rates reaching their floor. Deflation has raised the public debt burden substantially, and constrained monetary policy. Japan's ongoing experience is a warning to policy-makers elsewhere about the costs of even mild deflation and the need to prevent it from manifesting rather than face the challenge of curing it. For Japan, the lesson is clear: deflation, however mild, continues to impose significant costs on the economy. Policies to revive inflation expectations are therefore critically needed.

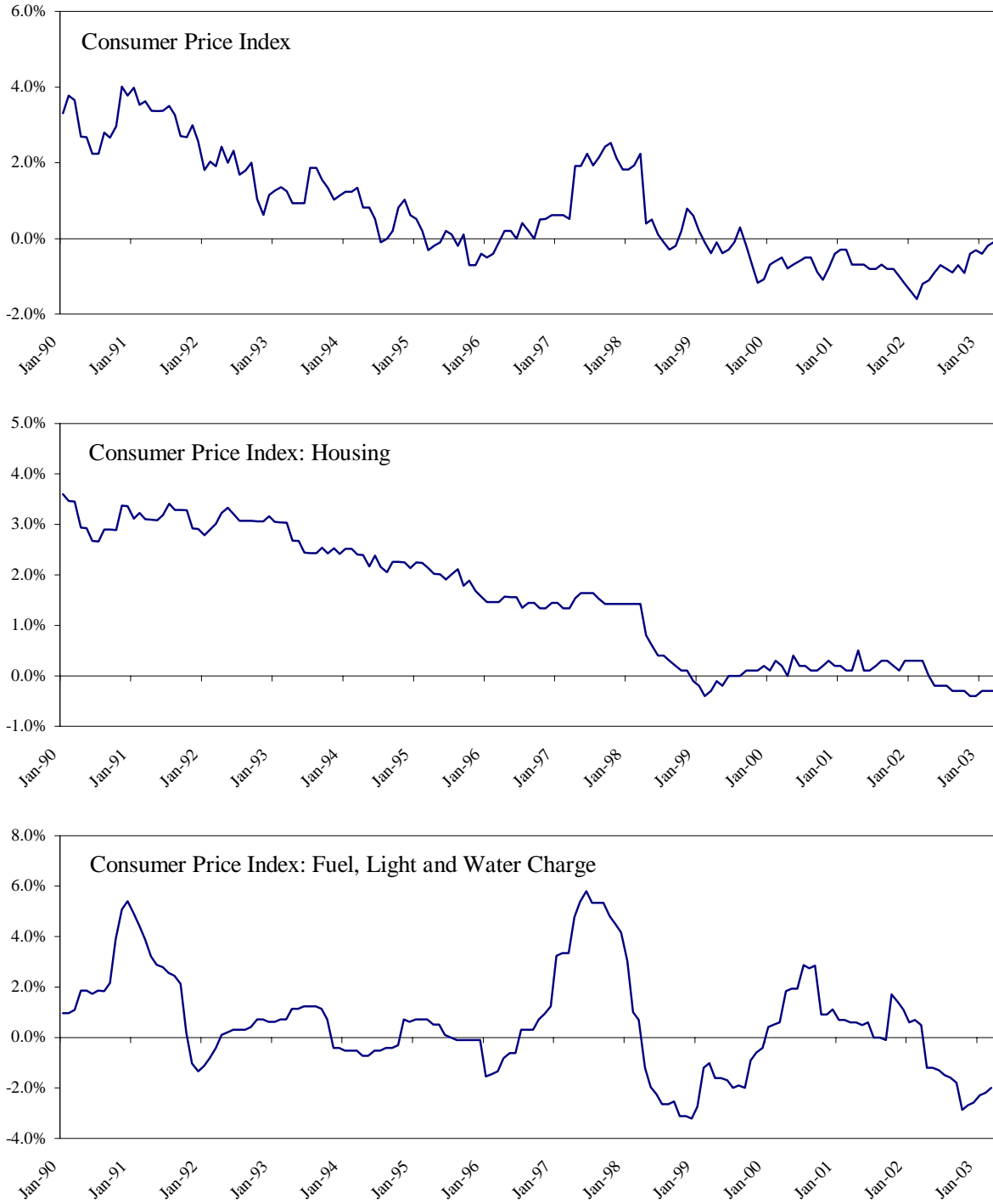
---

<sup>23</sup> An indexation scheme is indeed in place for social security payments in Japan. However, the scheme was suspended between 1998 and 2002. Otherwise the scheme would have necessitated a reduction in such payments in order to reflect the decline in the price level.

<sup>24</sup> The calculations done to obtain the increase in real debt burden is a better approximation of reality in the context of Japanese government debt than household debt, as the latter may be refinanced, whereas the former has been serviced without any such adjustment (barring some smoothing operation-related buyback of JGBs).

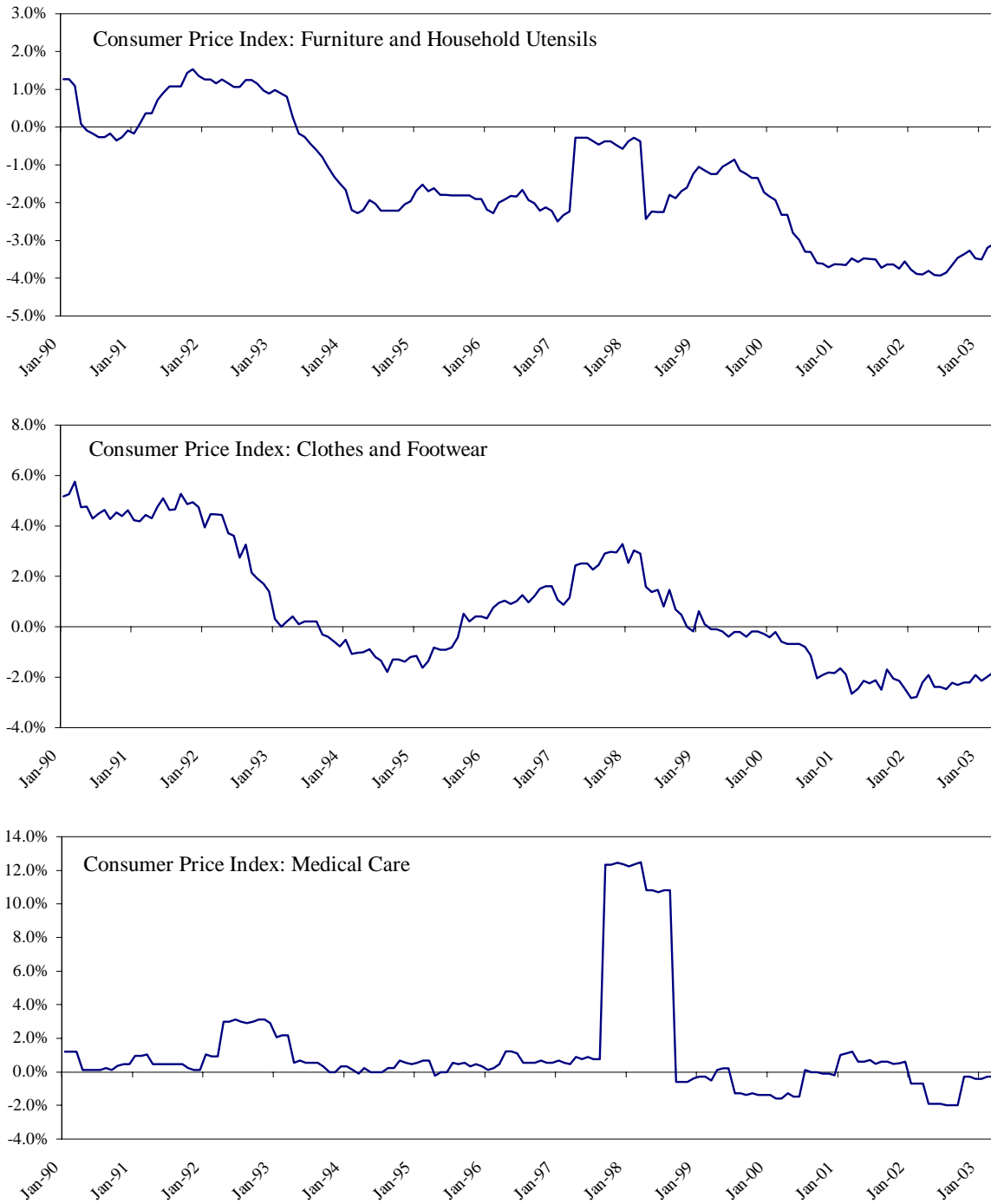
<sup>25</sup> Some of the unanticipated increase in the real debt burden may have been mitigated by the BoJ's purchasing of government bonds during this period, as some of the higher real payments owed on the bonds would have been offset through profit transfers from the BoJ's bond portfolio.

Figure 12A. Japan: CPI and its Components  
(Year-on-year percentage change)



Source: CEIC database. Data not corrected for the 1997 increase in consumption tax.

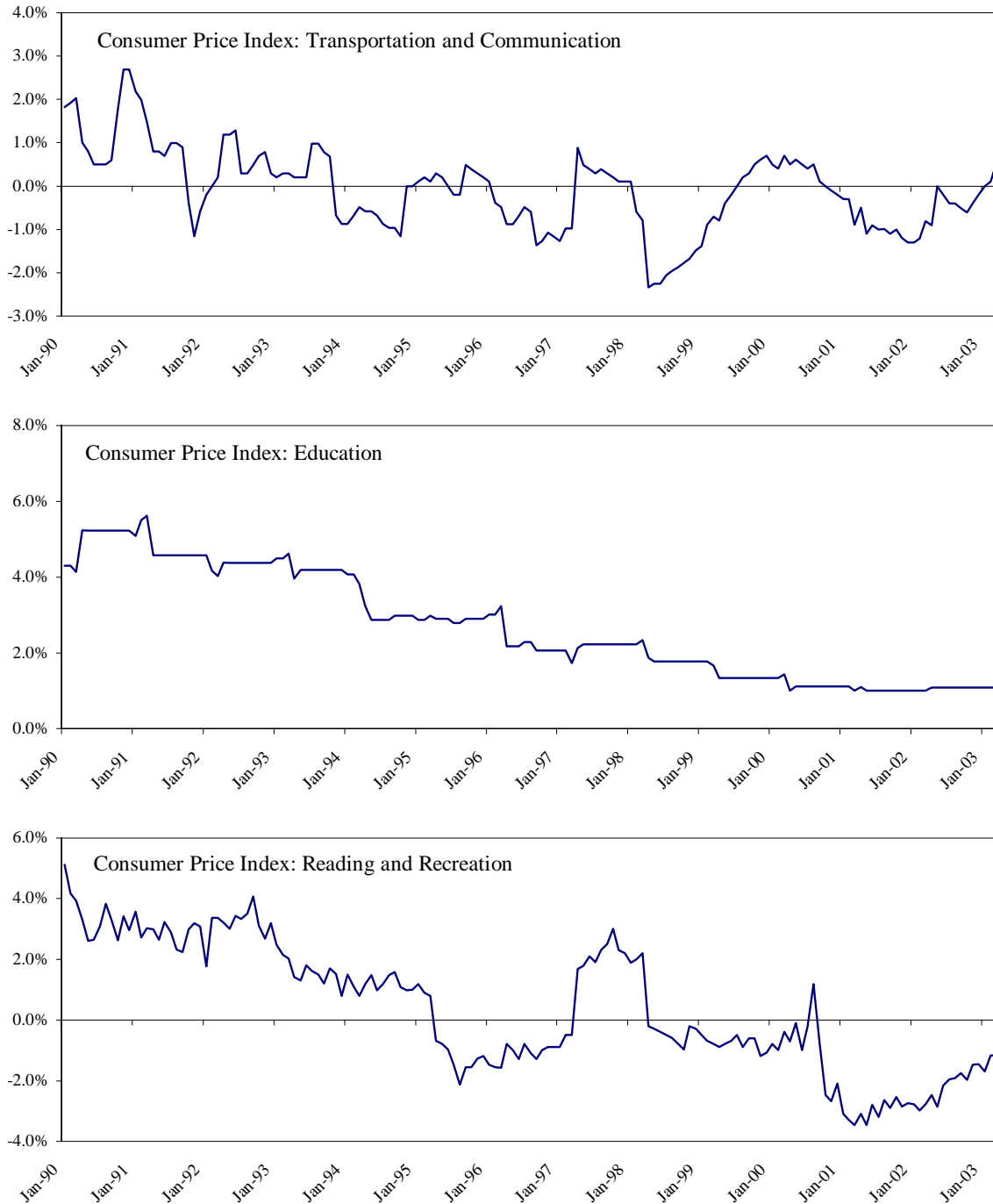
Figure 12B. Japan: CPI and its Components  
(Year-on-year percentage change)



Source: CEIC database. Data not corrected for the 1997 increase in consumption tax.

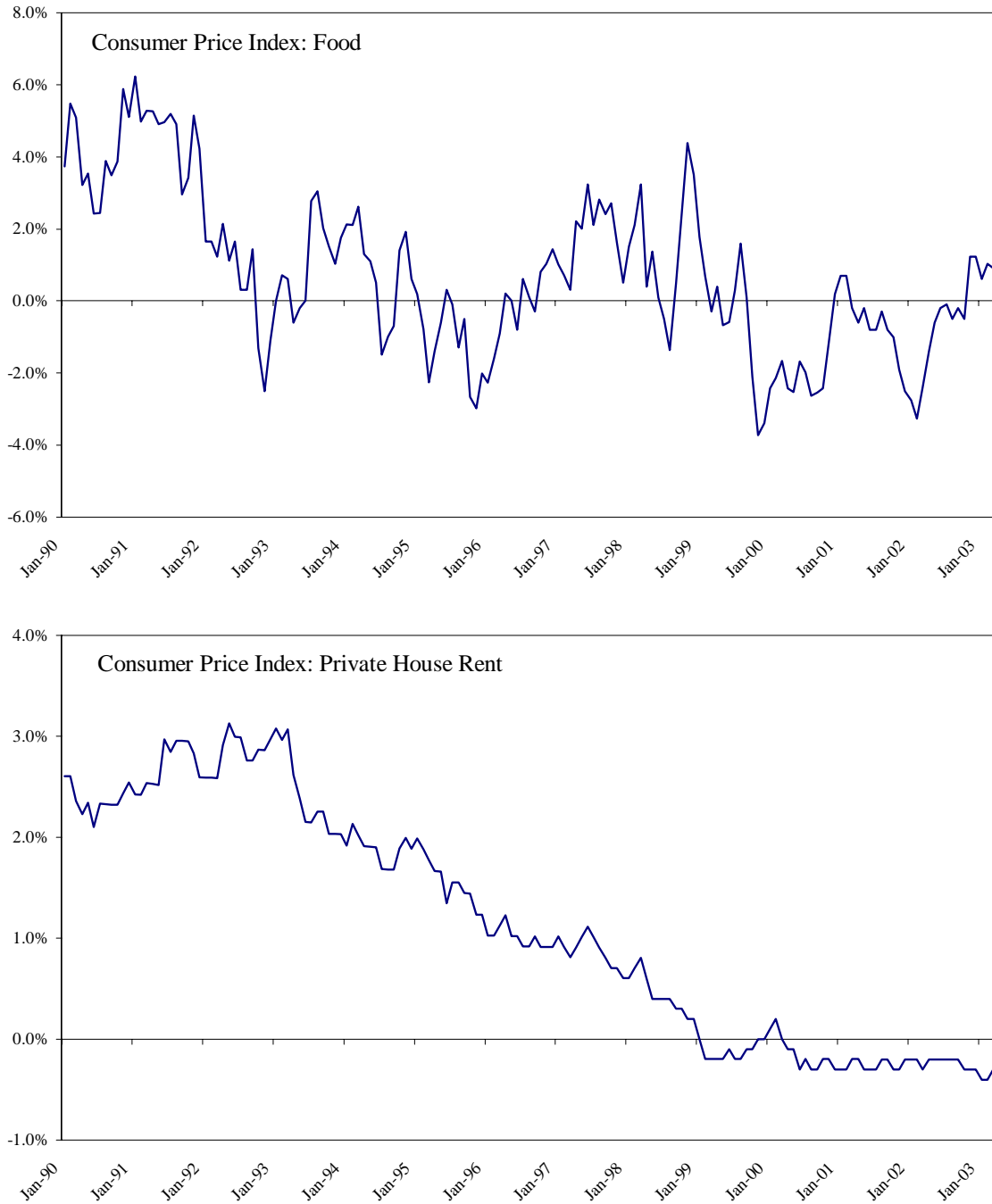


Figure 12C. Japan: CPI and its Components  
(Year-on-year percentage change)



Source: CEIC database. Data not corrected for the 1997 increase in consumption tax.

Figure 12D. Japan: CPI and its Components  
(Year-on-year percentage change)



Source: CEIC database. Data not corrected for the 1997 increase in consumption tax.

## REFERENCES

- Ahearne, Alan, Joseph Gagnon, Jane Haltmaier and Steve Kamin, 2002, "Preventing Deflation: Lessons from Japan's Experience in the 1990s," *International Finance Discussion Papers*, No.729, Federal Reserve Board (June).
- Akerlof, George A., William T. Dickens, and George Perry, 1996, "The Macroeconomics of Low Inflation," *Brookings Papers on Economic Activity*, Vol. 1, pp. 1–59.
- Bernanke, Ben, 1983, "Nonmonetary Effects of the Financial Crisis in the Propagation of the Great Depression," *American Economic Review* (June), pp. 257–276.
- \_\_\_\_\_, 2000, "Japanese Monetary Policy: A Self-Induced Paralysis?" *Japan's Financial Crisis and its Parallels to the U.S. Experience*, Edited by Ryoichi Mikitani and Adam A. Posen, Special Report No. 13, Institute for International Economics, Washington, DC, pp. 149–166, (September).
- Bernanke, Ben S. and Mark Gertler, 2001, "Should Central Banks Respond to Movements in Asset Prices?" *American Economic Review*, Vol. 91, No. 2, pp. 253–57.
- Bordo, Michael D., Michael J. Dueker, and David C. Wheelock, 2001, "Aggregate Price Shocks and Financial Stability: The United Kingdom 1796–1999," NBER Working Paper No. 8583.
- Buiter, Willem H., 2003, "Deflation: Prevention and Cure," NBER Working Paper No. 9623.
- Fisher, Irving, 1933, "Debt Deflation Theory of Great Depressions," *Econometrica*, Vol. 1, pp. 377–57.
- Kamada, Koichiro and Naohisha Hirakata, 2002, "Import Penetration and Consumer Prices," Research and Statistics Department Working Paper No. 02–01, Bank of Japan.
- Keynes, John Maynard, 1923, "Social Consequences of Changes in the Value of Money." Republished in *Essays in Persuasion: John Maynard Keynes*, W.W. Norton, New York.
- Kumar, Manmohan, Taimur Baig, Jörg Decressin, Chris Faulkner-MacDonagh, and Tarhan Feyzioglu, 2003, "Deflation: Determinants, Risks, and Policy Response," *IMF Occasional Paper No. 221*, International Monetary Fund (June).
- Kuroda, Sachiko and Isamu Yamamoto, 2003a, "Are Japanese Nominal Wages Downwardly Rigid? (Part I): Examinations of Nominal Wage Change Distributions," Institute for Monetary and Economic Studies, Bank of Japan, Discussion Paper No. 2003-E-3.

\_\_\_\_\_, 2003b, “Are Japanese Nominal Wages Downwardly Rigid? (Part II): Examinations Using a Friction Model,” Institute for Monetary and Economic Studies, Bank of Japan, Discussion Paper No. 2003-E-4.

McCallum, Bennett T., 2003, “Japanese Monetary Policy, 1991–2001,” Federal Reserve Bank of Richmond *Economic Quarterly*, Volume 89/1, Winter.

Mishkin, Fredric, 1978, “The Household Balance Sheet and the Great Depression,” *Journal of Economic History* (December), pp. 918–937.

Okina, Kunio and Shigenori Shiratsuka, 2001, “Asset Price Bubbles, Price Stability, and Monetary Policy: Japan’s Experience,” Institute for Monetary and Economic Studies, Bank of Japan, Discussion Paper No. 2001-E-16.

Ueda, Kazuo, 2003, “Japan’s Deflation and Policy Response,” Speech Delivered at the *Meeting on Economic and Financial Matters*, Nara Prefecture, April.

Yates, Tony, 2002, “Monetary Policy and the Zero Bound to Interest Rates: A Review,” European Central Bank Working Paper No. 190 (October).