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What Changes Deflationary Expectations? Evidence from Japanese Household-level Data

by

Masahiro Hori and Satoshi Shimizutani

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Economic and Social Research Institute
Cabinet Office
Tokyo, Japan

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Masahiro Hori
(Cabinet Office)

and

Satoshi Shimizutani
(Economic and Social Research Institute, Cabinet Office)[2]

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[2] Masahiro Hori, Cabinet Office; e-mail: masahiro.hori@mfs.cao.go.jp.
Satoshi Shimizutani, Economic and Social Research Institute, Cabinet Office, e-mail: satoshi.shimizutani@mfs.cao.go.jp.

Abstract

The Japanese economy has suffered from deflation since the mid-1990s. Despite the importance of overcoming deflation for policymakers and academics in Japan, there has been no recent research on what changes deflationary expectations in Japan. This study emphasizes fact-finding from a unique and rich quarterly household-level data set to estimate average price expectations, to examine what changes price expectations, and to look at how changes in price expectations affect household consumption.

Our empirical estimates indicate that price expectations ranges from minus 0.5 percent to zero percent for the period from 2001 to2003 in Japan, with the exception of a big hike in the first quarter of 2003. Price expectations are dependent on current price movements and lagged expectations. Awareness of monetary policy announcements does not largely change price expectations in Japan, since a series of quantitative easing caused revision of price expectations only for small portion, i.e., 5-10% of people surveyed. The jump in the first quarter of 2003 was caused by the Iraq war. We also confirm that deflationary expectations discourage household consumption, mainly durables, through postponing the timing of purchases.

Our findings suggest that the deflationary expectations should be upwardly revised to stimulate Japanese household consumption. However, a series of quantitative easing were not very much effective to alter the expectations of all households; rather, only the Iraq war was an influential impact to change price expectations. Note that the degree of revision for those who revised expectations was similar order among those events examined in this study, but that the share of households affected is very much different. Keeping this in mind, the monetary authorities should implement quantitative easing in more aggressive and understandable ways to change deflationary expectations.

1. Introduction

Among Japan's macroeconomic problems, combating deflation is surely one of the country's highest priorities. During the past decade of low growth, despite massive expansions in fiscal and monetary policies, we have not yet observed clear signs of recovery in the economy. Rather, the Japanese economy has suffered from deflation from the middle of the 1990s. For those who believe that deflation is harmful for the economy, the continued decrease in prices will cause the Japanese economy to get mired in "deflationary spirals".

The driving force of this vicious circle is deflationary expectations. Deflation invites deflationary expectations and they in turn exacerbate deflation. Thus, the key factor is price expectations; the remedy to stop the deflationary process should be drawn from an analysis on what changes deflationary expectations.

Surprisingly, however, there has been no serious research on the level and formation of price expectations in Japan. It is more surprising that monetary authorities operate their policies without announcing (or even knowing) current price expectations; it is akin to sailing in open seas without a chart. Despite the importance of measuring price expectations, most policy discussions assume *a priori* that current actual price changes reflect price expectations, and that both of them are the same. Obviously, there is no rationale for such a naïve assumption. Although several studies tackled the estimation of price expectations based on time series analyses or on Carlson and Parkin (1975) that utilizes some information from business survey data, those studies still rely on strong and unrealistic assumptions.

This study takes advantage of a unique and rich household level data set from the "Kokumin Seikatsu Monitors (National Life Monitors)" collected by the Cabinet Office since the second quarter of 2001. We emphasize fact-finding based on this innovative survey in Japan. Concretely, we address the following three issues.

First, we use the household-level data to estimate price expectations directly. This data set is unique in that it asks the respondents directly about their price expectations. A similar approach has been adopted by the Survey of Consumers performed by the Survey Research Center of the University of Michigan for more than 40 years. Without relying on any strong assumptions, we directly calculate average price expectations based on the responses. The calculated levels of price expectations themselves contain new information and serve as the chart for monetary policy.

Second, the panel structure of the data enables us to examine the causes of change in price expectations. We follow the same households and examine whether a household changes its price expectation compared with that in the previous quarter. We also have information on household responses to changes in monetary policy, or to some exogenous shocks such as the attack on Iraq by the United States and the United Kingdom.

Third, we also address the consequences of change in price expectation on household behavior. Especially, we will focus on the effect of change in price expectation on consumption and saving among households. Deflationary expectations may ease the budget constraints of households and stimulate consumption. On the other hand, if a household anticipates that deflation will continue in the future, it will deter the purchase of luxury goods, which dampens current consumption. Moreover, if a household combines deflationary expectations with anxiety toward the future regarding business cycles or

employment, deflationary expectations might discourage current consumption. Thus, the direction that deflationary expectations affect household consumption depends on empirical studies.

This study proceeds as follows. The next section provides some related literature on price expectations. The third section estimates quarterly average price expectations based on micro-level data from our unique data. The fourth section examines what changes price expectations, focusing on exogenous shocks such as monetary policy or change in international environments. The fifth section evaluates how changes in price expectations affect household consumption. The final section discussed policy implications drawn from our empirical studies and concludes.

2. Previous Studies on Measurement of Price Expectations

This section surveys previous studies to measure price expectations, mainly in Japan. Contrary to countless studies on inflation, there is relatively little literature on deflationary expectations in Japan. This is natural since the Japanese economy has only three experiences with deflation for more than 100 years, with the exception of the current one. More than 50 years has passed since the last experience in 1949-1950, referred to as the "Dodge line," which aimed to combat hyperinflation after World War II. The remaining two events took place during the Great Depression, following inflation caused by World War I. We must go back to the Meiji era, in the 1880s, to find another deflationary period, which was known as "Matsukata" deflation.

If we widen our scope of past studies to price expectations, regardless of inflation or deflation, there are several streams in the research that aim to measure price expectations

and that examine the expectation generating process. Regarding estimates of price expectations, there are four popular ways to measure them.

The first approach is to ask a respondent directly about price expectation in a consumer survey. This approach is straightforward, and does not need any strong assumptions to calculate average level of price expectation. This approach has been adopted by the University of Michigan's Survey of Consumers for more than 40 years. However, it has not been seriously considered in Japan. This study is probably the first attempt to adopt the consumer survey approach in Japan.

The second method is to use inflation indexed bonds to measure price expectations (Kitamura [1997]). This is also a straightforward approach, but we are not able to utilize it since such an index bond has not been issued in Japan.

The third way is to employ the expectation-augmented Phillips curve. Unfortunately, however, the estimated Phillips curves are sensitive to measurement of output or employment gaps in explanatory variables and do not fit well for the case of Japan, while price expectation based on the curve works well in the United States. (Fuhrer [1995], Gordon [1997, 1998]). Rather, the merit of the expectation-augmented Phillips curve approach is to measure structural changes in price expectations. Shimizutani and Yogi (2003) focus on an unusual experience in Okinawan history to evaluate the impact of devaluation on inflation expectations. When Okinawa's legal currency was the U.S. dollar, the Nixon shock of August 1971 caused a dramatic devaluation of the dollar. Their estimates demonstrate that devaluation increased price expectations by 5 to 7 percent.

The fourth and the most popular way in Japan to measure price expectations is to employ

the methodology by Carlson and Parkin (1975). Several studies on price expectations in Japan rely on this method (henceforth, C-P method). The C-P method assumes that the distribution of expectations is normal and agents have common symmetric thresholds to perceive change in price expectations[3]. Moreover, it required another assumption that price expectations do not deviate from actual price movements for a long time to justify that the moving average of expectations and actual price change is same for a certain period (for example, three years).

Around the beginning of the 1980s, some Japanese researchers introduced the C-P method to estimate price expectations (Shimpo, et.al.[1978], Toyoda [1979a, 1979b]), and some recent studies in Japan still depend on this methodology (Nakayama and Ohshima [1999] etc.). The merit of this method is that it requires the information only of the directions of price expectations[4]. However, it requires strong and implausible assumptions mentioned above whose applicability has never examined.

On the contrary, most studies on price expectation in the Untied States do not employ the C-P method but take advantage of price expectation data from a household survey called "Survey of Consumers" complied by the University of Michigan Survey Research Center, and from professional economists, called the "Livingston" survey. Those surveys directly collect price expectations data and are free from strong assumptions in the C-P method. Based on those surveys, countless studies examine the formation process of price expectations (i.e. rational vs. adaptive) and some of them compare them between households and professional forecasters, though there have been few recent works.

[3] Hori and Terai (2003) change the symmetric assumption to allow asymmetry of the thresholds and employ the maximum likelihood estimator to obtain d_t and r_t. Shimizutani and Terai (2003) apply the same methodology to measure firms' price expectations to obtain the real cost of capital.

[4] Fukuda and Keida (2001) find that the performance of the Phillips curve in Japan improves by adding the expectation term obtained from the C-P method.

[6] In general, the number of applicants is larger than that of openings. Each prefecture contracts with selected respondents to answer eight questionnaires a year and pays 12,000 yen (about US$100).

The recent representative study is Roberts (1998). He uses both surveys mentioned above to examine the formation of expectations. He concludes that expectations are neither perfectly rational nor as unsophisticated as simple autoregressive models would suggest. Moreover, a more recent work by Carroll (2003) employs Mankiw and Reis (2001, 2002) to show that empirical household expectations are not rational, but that dynamics in expectations are well explained by a model to assume that households' views derive from news reports or those of professional forecasters.

The lack of empirical data that directly collects price expectations in Japan has seriously hampered these types of studies on price expectations. Before examining the formation of expectations, they need construction of price expectation data based on strong assumptions. Therefore, our data set, as explained in the next section, serves as a breakthrough for research on price expectations in Japan.

3. Data

This study uses a unique and rich micro-level data from the "Kokumin Seikatsu Monitors (henceforth "monitors"). The Price Division of the Cabinet Office has those monitors to ask them timely questions about current policy matters, including price or consumer policy issues. The sample size is about 2,400 for each survey. The sample is allocated to each prefecture (47 prefectures in Japan) proportionally to its population size. The sample is not randomly chosen; each prefecture publicly recruits voluntary respondents, paying attention to unbiased distribution in age, employment, and regions in each prefecture[6]. The voluntary application to monitors motivates respondents to answer each survey to the best of their ability and increases the response rate to more than 90–95 percent.

From the second quarter of 2001, a monitor is surveyed quarterly (March, June, September and December 1st) about perception for the past 12 months and expectations for the next 12 months in income, consumption, price, and debt[7]. The survey was implemented nine times; the last one was performed on June 1st, 2003. Although some households are dropped after a fiscal year, most of them remain in the next year, which enables us to construct panel data.

Apart from perception for the past year and expectations for the next year, the income questions also include uncertainty about employment, pensions, or social security. The consumption questions contain concrete reasons for increases or decreases in consumption for the past year and the next year. The price questions include the effect of change in monetary policy (i.e. quantitative easing) or exogenous shocks (i.e. the attack on Iraq) on price expectation and their reasons. The debt questions ask the burden of loans out of monthly salary and the effect of deflation on debt burdens.

In addition, we have detailed information on household characteristics such as head of household age, sex, employment status (industry if employed), residential status, family size, annual income level and regions. The basic characteristics of the monitors are summarized in Table 1. The average age of the surveyed households, i.e., respondents or their spouses, is around 50. The average annual income of head of household is around 5 million yen. About 90 percent of the monitors are female.

The most notable merit of this survey is to ask respondents directly not only directions but also changes in price, income, and consumption expectations in figures. As far as we know,

[7] A pre-survey to contain similar questions was performed in the first quarter of 2001. The remaining four surveys are performed on an ad-hoc basis.

all other consumer surveys in Japan ask only the direction of expectation (i.e. go up, unchanged, go down, uncertain). To obtain the price expectation, as discussed below, those studies need to rely on strong assumptions such as the normality of distribution and symmetry of thresholds to perceive change in directions. Surprisingly, the applicability of those assumptions has never been seriously examined in Japan.

4. Basic Facts on Price Expectations Based on Household-level Data

This section aims to estimate household-level price expectations from our unique survey. The exact wordings of the questions related to price in the "Kokumin Seikatsu Monitors" are as follows.

"During the next 12 months, do you think that prices in goods and services you frequently purchase on daily basis will go:

(1) up,

(2) remain the same,

(3) down

(4) uncertain?"

"If you answered 'up' or 'down,' how much do you think the price level will change during the past 12 months?"

"If you cannot provide an actual number, please select from among the following choices:

(1) less than 20 percent

(2) minus 10 percent to minus 20 percent

(3) minus 5 percent to minus 10 percent

(4) minus 2 percent to minus 5 percent

(5) minus 0 percent to minus 2 percent

(6) plus 0 percent to plus 2 percent

(7) plus 2 percent to plus 5 percent

(8) plus 5 percent to plus 10 percent

(9) plus 10 percent to plus 20 percent

(10) more than 20 percent

Figure 1-1 reports the estimates of average price expectation based on our survey. We have several interesting observations.

First, price expectations range from minus 0.5 percent to zero percent in 2001 and 2002. However, we see a big jump in the first quarter of 2003, followed by decline to almost zero in the second quarter. Those trends are similar when we either measure the expectation in actual figures or estimate it using the medium of multiple choices. Price expectation based on the household survey still remains below or nearly equal to zero, with the exceptions of a one-shot surge in the first quarter of 2003.

Second, current price was minus 1.5 percent to minus 2 percent until the first quarter of 2002. Although the value is still negative, the figures have gradually approached zero. The developments both in actual figures and in the medium of multiple choices are parallel, though the gap is slightly wider than that in price expectations.

Third, perception of current price is always lower than the price expectation. This might reflect that household price expectations always have an inflationary bias.

Fourth, perception of current price follows the development of the CPI well. In other words, responses capture the actual trend in price development quite well.

One might think that changes in the samples cause those trends. To address that issue, we also plot the figures from the households that responded in all nine surveys. Figure 1-2 demonstrates that this is not the case. The trends in plotted variables are very similar to those in Figure 1-1.

Next, we should address the gap in the estimates of price expectation between our survey and the C-P method.

First, we should suspect distribution of price expectations that is assumed to be normal in the C-P method. However, Figure 2 clearly shows that the distribution is not normal. We observe that the response of "unchanged" is dominant and fewer observations are in both tails. This fact implies that the normality assumption in the C-P method is unjustified.

Second, we should also investigate the C-P assumption that price expectations do not deviate from the actual price movements for a long period. The inflationary bias that we found in the averaged household price expectations strongly contradicts the assumption. Hori and Terai (2003) reports that consumption price expectation series obtained from the C-P method basically mimics the actual CPI movements. Our findings above indicate that this C-P result property is not necessarily realistic. [8].

[8] In addition, we also suspect the symmetry of thresholds in perception of change in price expectations. However, it is hard to test that symmetry using our data in a short period that does not include both inflation and deflation periods.

5. The Determinants of Change in Price Expectation

This section examines what changes price expectations. The goal of this section is to examine whether household price expectations are revised independently of income or past price movements. Concretely, we focus on the effect of exogenous shocks such as implementation and announcement of monetary policy after 2001. As explained in the data section, our data set has a panel structure. Therefore, we are able to examine the formation of price expectations clearly after controlling heterogeneity in households.

Before running regressions to test what determines price expectations, we preview some important factors that are plausibly related with the formation of expectations.

First, price expectations naturally depend on the lagged and current actual price developments. The correlation coefficient is 0.3 between the price expectations and the lagged expectations. This implies the persistence or inertia of price expectations; once deflationary expectations are generated, we observe that those expectations last for a time. The coefficient between price expectations and actual price movements is 0.4. This indicates an adaptive behavior of households in the formation of expectations.

Second, income expectation or current income might affect price expectations. The questions related with current income and income expectation have exactly the same structure as those in the price questions explained above, including the multiple choices. Figure 3-1 describes the obtained series on current income and income expectations. As clearly observed, current income and income expectations are negative and range from minus 1 percent to minus 3 percent. We should note that there is no “jump” in the first

quarter of 2003 when a surge in price expectations is observed. In this sense, we cannot explain the hike in price expectation by income factors[9].

Third, we should consider the exogenous factors that affect price expectations. Our survey asked the monitors directly about their responses to changes in monetary policy or to exogenous shocks such as the attack on Iraq by the United States and the United Kingdom. We should summarize the facts in the monetary policy first.

The Bank of Japan has performed "quantitative easing " to increase the money supply to combat deflation since March 2001. This policy includes (1) a change in the operating target for money market operations, (2) CPI guidelines for the duration of the new procedures, (3) an increase in the current-account balance at the Bank of Japan and declines in interest rates, and (4) an increase in outright purchase of long-term government bonds[10]. The policy goal was revised in August to raise the balance of current accounts from around 5 trillion yen to around 6 trillion yen, and to increase the amount of government bonds purchased from the current 400 billion yen per month to 600 billion yen per month[11]. In September 2001, the Bank of Japan revised its goal again to maintain the current –account balance at above 6 trillion yen and reduced the official discount rate from 0.15 to 0.10.[12]. In December 2001, the Bank of Japan additionally increased the goal of the current account balance at around 10 to 15 trillion yen and also increased its government bond purchase to 800 billion yen per month.[13]

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[9] This trend is unchanged if we look at the results based on the same households that responded in all the nine surveys. See Figure 3-2.

[10] " New procedures for money market operations and monetary easing" (http://www.boj.or.jp/en/seisaku/03/seisak_f.htm)

[11] "Change in the Guideline for Money Market Operations" (http://www.boj.or.jp/en/seisaku/03/seisak_f.htm)

[12] "Change in the Guideline for Money Market Operations and Reduction in the Official Discount Rate" (http://www.boj.or.jp/en/seisaku/03/seisak_f.htm)

[13] "Change in the Guideline for Money Market Operations" (http://www.boj.or.jp/en/seisaku/03/seisak_f.htm)

After 2002, the Bank of Japan began to consider a new policy package to purchase stocks directly from the market in September 2002. Further, in October 2002, the Bank set the operating target at around 15 to 20 trillion yen, and increased its bond purchase to 1.2 trillion yen per month, accompanied the government's policy package[14]. Moreover, it began to examine the possible purchase of asset-backed securities in April, 2003[15].

Our survey asked the monitors their responses to all those monetary policy shocks. Here we focused on the quantitative easing implemented since 2001. This type of monetary policy was brand new in Japan and, if we may say, a kind of regime change. The policy has been expected to contribute to alter the deflationary expectations and has been revised several times. As far as we know, there is no other survey to ask households about their responses to those policies directly.

Figure 4 summarizes household responses to the policy in the 2002 March survey. More than half of the respondents knew about the policy, and the share of those who recognized the policy gradually increased (omitted in Figure 4)[16]. However, out of those who knew about the policy, the share of respondents who revised their price expectations was less than 10 percent. About 70 percent answered that there was no effect on their expectations and a quarter responded that they were not sure of the effect. Further, the survey asked the reasons for the respondents who knew about but did not react to the policy. About 10 percent answered that the magnitude was too small. About a half recognized that the quantitative easing policy cannot affect the economy, and the remaining 30 to 40 percent

[14] "Change in the Guideline for Money Market Operations" (http://www.boj.or.jp/en/seisaku/03/seisak_f.htm)
[15] "Examination of Possible Purchase of Asset-Backed Securities" (http://www.boj.or.jp/en/seisaku/03/seisak_f.htm)
[16] The same questions were also asked in the second to fourth quarter in 2001 which of all observed the similar trend.

did not understand the mechanism of the policy effect. In addition, for those who responded that they were not sure of the effect, 60 percent did not understand the mechanism, and 30-40 percent did not know the extent of the effect.

Our survey also contains information on the respondents' answers to other type of exogenous shocks, such as terrorist attacks or the war in Iraq. Figure 5 reports the results. As regards the terrorist attack on the United States in September 2001, about 10 percent of respondents revised their expectations. About 40 percent responded they did not change their expectations and 20 percent lowered their expectations, probably due to anticipation of the future economy. On the other hand, the Iraq war made more than half of respondents revise their expectations. Naturally, this figure is much larger than the cases of monetary policy change.

Based on those previews on several candidates to explain price expectations, we employ the following specifications to test jointly whether those factors affect price expectations.

$$\mathrm{P}^{\mathrm{e}}{}_{\mathrm{it+1}} = a_0 + a_1 * P^{e}{}_{i,t} + a_2 * P_{i,t} + a_3 * \mathrm{Y}_{\mathrm{i,t}} + a_4 * M_t + a_5 * X_t + a_6 * Time + e_{i,t+1}$$

where $P^{e}{}_{it+1}$ is a household's price expectation for time t+1. P_{it} is the current actual price change and Y_{it} is the current actual income change. M_{it} is a monetary policy shock at time t. As stated above, we focus on the quantitative easing implemented in 2001. M_{it} takes two forms: a dummy for those who knew each change in monetary policy in 2001 surveyed right after those events (second to forth quarter in 2001 and first quarter in 2002) and a dummy for who revised their expectations in 2002 due to all four changes in monetary policy implemented in 2001. X_{it} refers other exogenous shocks such as the terrorist attack in 2001 and the Iraq war in 2003. X_{it} takes a form of a dummy variable

for respondents who revised their expectations[17]. *Time* contains dummy variables for each quarter to control macroeconomic factors. Although not reported, the squared age of head of households and logarithm of annual head of household income are included. The last is an error term.

We will estimate those regressions with two types of dependent variables. One is to perform the OLS estimation for this specification with price expectations as the dependent variables. The other is to employ the ordered probit estimation by replacing the dependent variable to a dummy variable to allocate 1 for an increase in price expectations, 0 for unchanged, and minus 1 for a decrease in price expectation, relative to the response in the previous quarter.

Table 2-1 reports the results. We notice that the coefficients on current price and lagged price expectations are positive and significant. Those on current price are around 0.3, and those on price expectation are around 0.2. In other words, price expectations have some elements of inertia of expectations and adaptive behaviors. On the contrary, the coefficients on current income are just marginally significant or insignificant and the estimated values are much smaller than those on price factors. Price factors matter for the formation of price expectations but they are not strongly correlated with current income.

Regarding monetary shocks, the dummy variable allocating 1 for those who knew about the quantitative easing policy is not significant. This result is guessed by the previews on household responses to those policies. However, they are effective for respondents who revised their expectations due to the monetary policy. The estimated coefficients are large and imply that those respondents raised their price expectations by 1.6-1.8 percent points.

[17] The survey assumes that all respondents knew those events.

On the other hand, the effects of terrorist attacks or the war in Iraq have large and significant effects on price expectations. Those shocks raised price expectations by more than one percent, which are comparable with the monetary shock effect for those who revised their expectations.

Table 2-2 reports the results on the ordered probit estimation. The dependent variable is a dummy variable to allocate 1 for an increase in price expectations, 0 for unchanged and minus 1 for a decrease in price expectation, relative to the response in the previous quarter. The explanatory variables are exactly same as those in the OLS estimation, except that we dropped the lagged independent variable.

Table 2-2 basically replicates the results in Table 2-1. The first two regressions do not include any exogenous shocks. Current price movements have still explanatory power. Note that the time dummy for the first quarter of 2003 is large and significant, which is consistent with Figure 1-1 and 1-2. This “jump” cannot be attributed to monetary shocks, since the coefficients are not significant (see third and fourth regressions). If we include the dummy variable for those who knew about the changes in monetary policy and revised their expectations, it is positive and significant. We should notice that the dummy for the first quarter of 2003 is still large and significant. Lastly, if we include the dummy for terrorist attacks and the war in Iraq, coefficients on those dummy variables are positive and significant. The 2003 first quarter dummy is still significant but the magnitude vastly decreased. This implies that the hike in the first quarter of 2003 was caused by those exogenous shocks.

In sum, what we found in this section is as follows. Current price developments and lagged price expectations contribute to form price expectations. Current income does not

have strong explanatory power. Those who knew about the quantitative easing policy did not revise their expectations, but the policy was effective for those who knew about the policy and actually revised their expectations. Other exogenous shocks such as terrorist attacks or the war in Iraq are influential on price expectations. The temporary surge of price expectations in the first quarter of 2003 was attributable to those events.

6. The Effect of Deflationary Expectations on Consumption

This section examines how price expectations affect household behavior. Naturally, we focus on the effect of deflationary expectations on household consumption. Deflationary expectations widen a household's budget constraints and stimulate consumption. On the other hand, if a household anticipates that deflation will continue in the future, it will deter the purchase of luxury goods, which dampens current consumption. Moreover, if a household combines deflationary expectations with anxiety toward the future regarding business cycles or employment, deflationary expectations might discourage current consumptions. Thus, what deflationary expectations affect household consumption depends on empirical studies.

In addition to quantitative evaluation of the effect of deflationary expectations on consumption, we also pay attention to what types of goods are more affected by price expectations. Moreover, we examine the difference in the effect for households with and without any loans to address the possibility that deflationary expectations raise the real debt burden that discourages consumption further.

Figure 6 reports the results from our survey data on consumption. As clearly observed, current and expected consumption was very weak from the fourth quarter of 2001 to the

third quarter of 2002. However, we observe a recovery in both current and expected consumption; they finally reached close to zero or slightly positive in the second quarter of 2003.

In what follows, we estimate consumption functions to examine the effect of price expectation on household consumption. The basic specification is as follows.

First of all, we employ the following specification to

$$C_{it} = a_0 + a_1 * Y^e_{i,t+1} + a_2 * Y_{i,t} + a_3 * P^e_{i,t+1} + a_4 * D_{it} + a_5 * Risk_{it} + a_6 * X_{it} + a_7 * Time + e_{i,t}$$

$$C^e_{it+1} = a_0 + a_1 * Y^e_{i,t+1} + a_2 * Y_{i,t} + a_3 * P^e_{i,t+1} + a_4 * D_{it} + a_5 * Risk_{it} + a_6 * X_{it} + a_7 * Time + e_{i,t+1}$$

where the dependent variable is consumption over the past year (C_{it}) or that over the next year (C^e_{it+1}). Those variables are measured both in actual figures and range choices[18].

The explanatory variables include income over the past year (Y_{it}), expected income over the next year (Y^e_{it+1}), and price expectation over the next year (P^e_{it+1}). Moreover, they contain debt payment ratio to income or a dummy for a household with any debt (D_{it}), risk perceptions ($Risk_{it}$) for being unemployed, future jobs and income, and for social security and pensions, respectively. In addition, X_{it} includes a variety of dummies to control a household's demographics such as change in family size, change in the number of workers in a household, change in tenancy status (renter to owner or vice versa), a squared age of head of household and the logarithm of head of household annual income level. The

[18] The range of each choice is same as that in price expectation. We transform the range choice to figures by using the medium of each choice. As in the previous sections, we excluded any samples whose answer is more or less than 50 percent.

independent variables also include time dummies for each quarter from the second of 2001 to the second of 2003.

We regress those equations by OLS. Table 3-1 reports the estimation results.

First, if we have consumption over the past year as the dependent variable, the coefficients on income over the year and expected income over the next year are positive and statistically significant. Those are larger for income for the past year. The coefficients on price expectations we should focus on are also positive and significant. In other words, inflationary expectation stimulates current consumption and deflationary expectations discourage consumption. Moreover, the coefficients on price expectations are larger than those on expected income. The coefficients on household debts are not significant. On the contrary, the dummies for risk to be unemployed are negative and significant with larger coefficients.

Second, what we observed for current consumption is basically applicable to the case of expected consumption as the dependent variable. The coefficients on price expectations are always positive and significant. Those on current income and expected income are also positive and significant but the latter is larger. In other words, expected income has a larger effect on expected consumption than current income. The results on household debt and the dummies for the recently unemployed are ambiguous.

Next, to examine what types of goods are more affected by price expectation, we focus on the durables. Our survey asks the following question to respondents.

(Question)

“Do you plan to purchase more durables over the next year relative to the past year?”

(Answer)

(1) plan to buy more

(2) remain the same

(3) plan to buy less

(4) uncertain

We create a new dummy variable to allocate 1 for choice 1, 0 for choice 2 and –1 for choice 3. We replace the dependent variables to the dummy variable. We estimate the regression by the ordered probit estimation.

The left hand side of Table 3-2 reports the results. This basically replicates the results in Table 3-1. The coefficients on current income and expected income are positive and significant. Consciousness of risk to be unemployed or concerns for future income or job clearly discourages durables goods purchase. Price expectation stimulates respondents to buy durable goods, which in turn implies that deflationary expectations discourage consumers to buy durables.

Further, the right hand side of Table 3-3 confirms these findings. The dependent variable is a dummy variable to allocate 1 for those who postpone purchase of durables and 0 for those who do not. The coefficients on price expectations are negative and significant. This means that deflationary expectations deter the timing of durables goods purchases.

In sum, the empirical findings in the section demonstrate deflationary expectations discourage household consumption including durables through postponing the timing of purchase.

7. Conclusion

This study takes advantage of a unique and rich quarterly household-level data to estimate price expectations, to examine what changes price expectations, and to explore how changes in price expectations affect household consumption.

Our empirical estimates demonstrate that average price expectations range from minus 0.5 percent to zero percent for the period from 2001 to 2003, with the exception of a big hike in price expectation in the first quarter of 2003. Price expectations are dependent on current price and lagged expectations. Regarding exogenous factors, knowledge about monetary policy change does not change average price expectations largely, A series of quantitative easing revised the expectations of only a small portion of respondents. Terrorist attacks and the Iraq war have comparably effects on expectations but the share of respondents that were affected to revise their expectations was much larger for the Iraq war case. Therefor the jump in the first quarter of 2003 was obviously caused by the war in Iraq.

The policy implications drawn from our results are as follows. We confirm that deflationary expectations discourage household consumption including durables through postponing the timing of purchase. Thus, deflationary expectations should be upwardly revised to stimulate household consumption. However, the series of quantitative easing did not alter the expectations of all households; rather, the Iraq war was quite effective in revising price expectations. Note that the degree of revision is similar for both of those who revised expectations due to those events, but the share of those households is different. Keeping this in mind, the monetary authorities should implement quantitative easing in a

more aggressive and understandable way to change deflationary expectations.

This study emphasizes fact-finding from a unique, household-level data set to uncover what we can observe about price expectations. Further research should address more formally the expectation-generating process and the effects of price expectation on the economy. Moreover, we should further examine the effect of exogenous shocks on price expectations, including other shocks.

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Figure 1-1 Current Price and Price Expectations (Average,all samples)

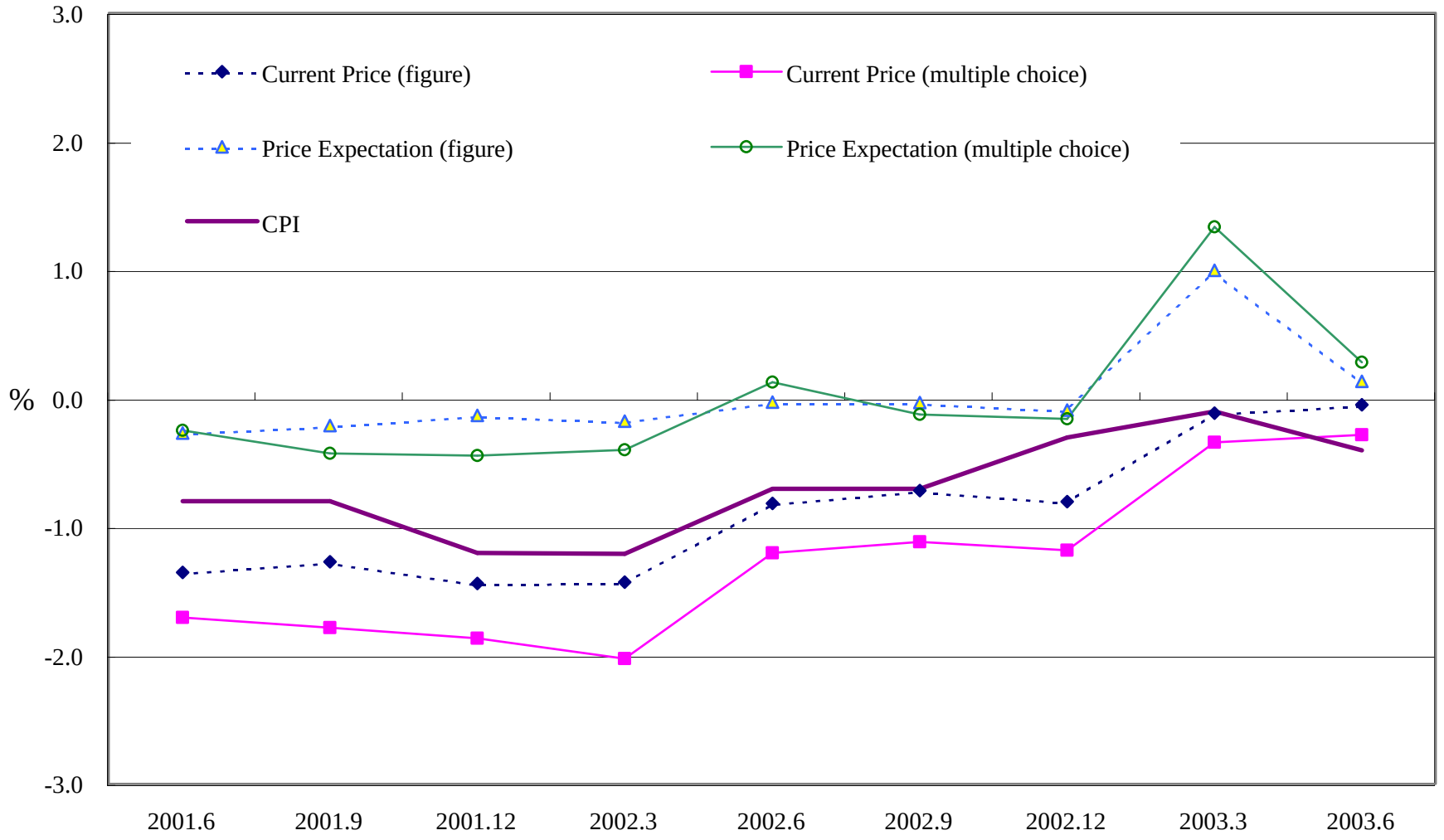


Figure 1-2 Current Price and Price Expectations (Average, full-cover samples only)

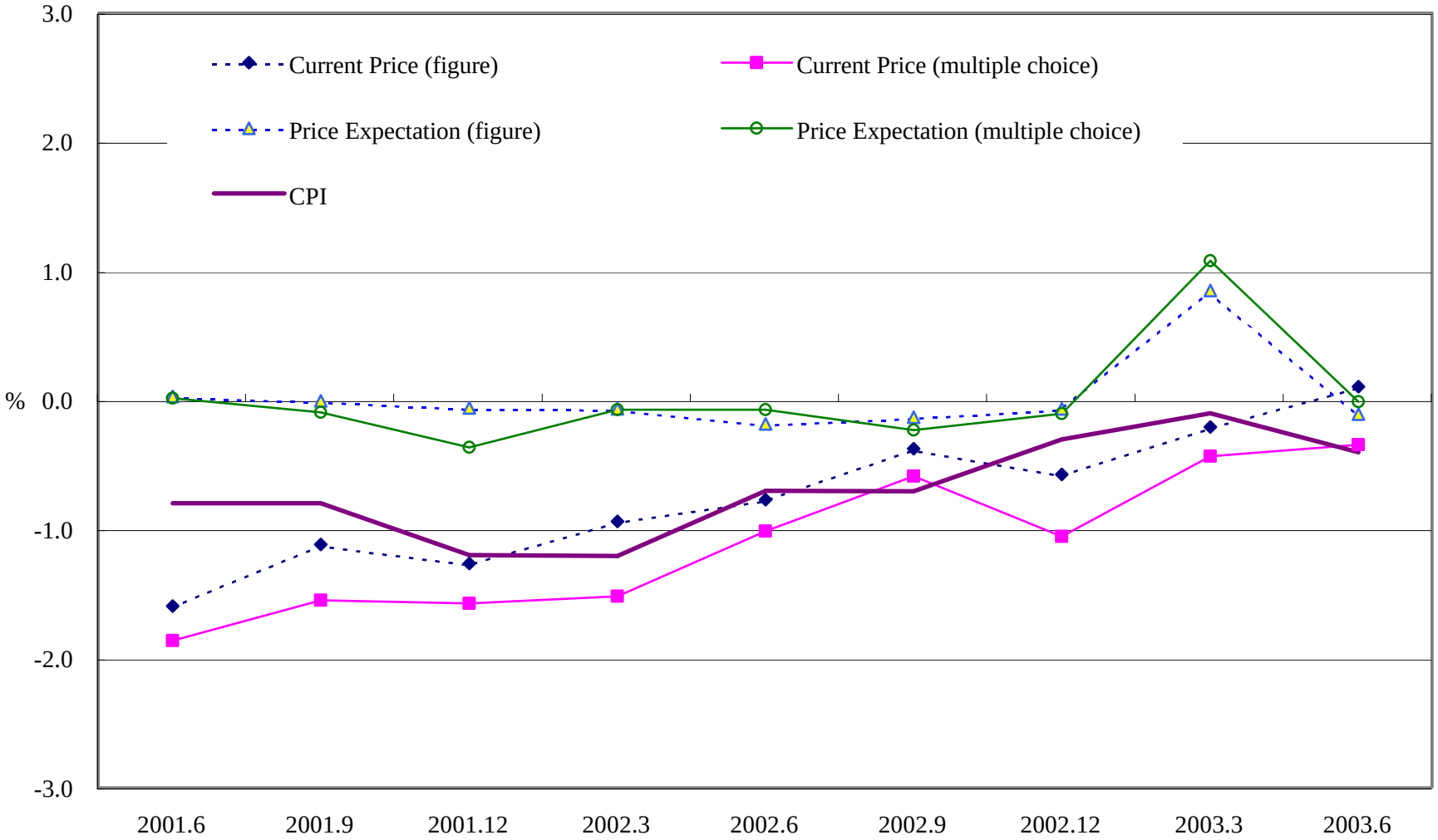


Figure 2-1 Price Expectations (Pooled data in Figures)

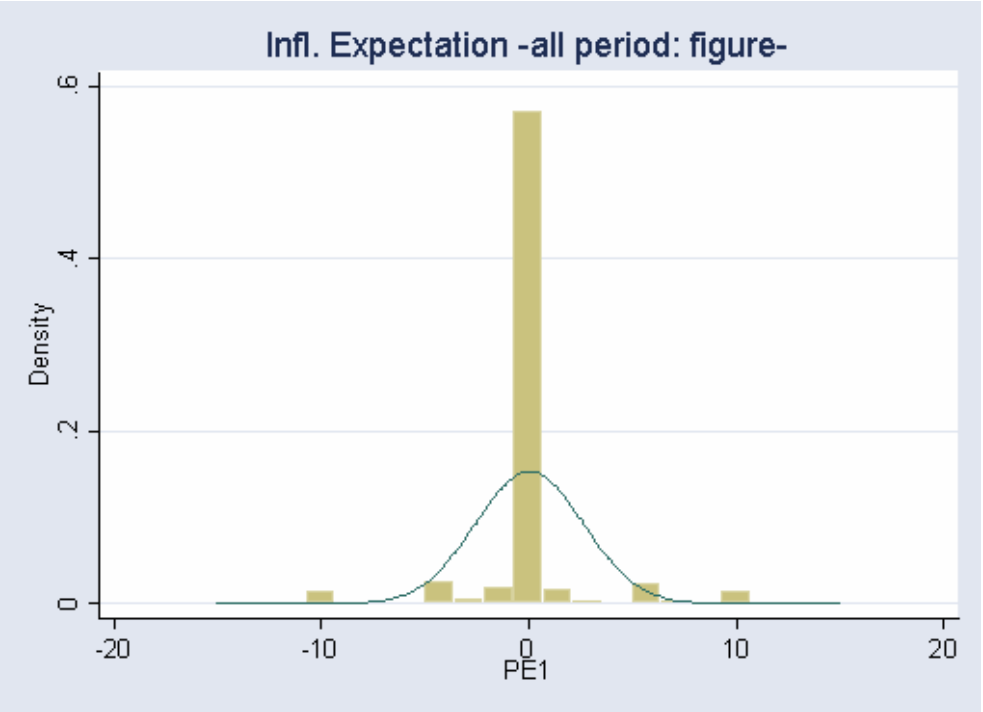


Figure 2-2 Price Expectations (Pooled data in multiple choices)

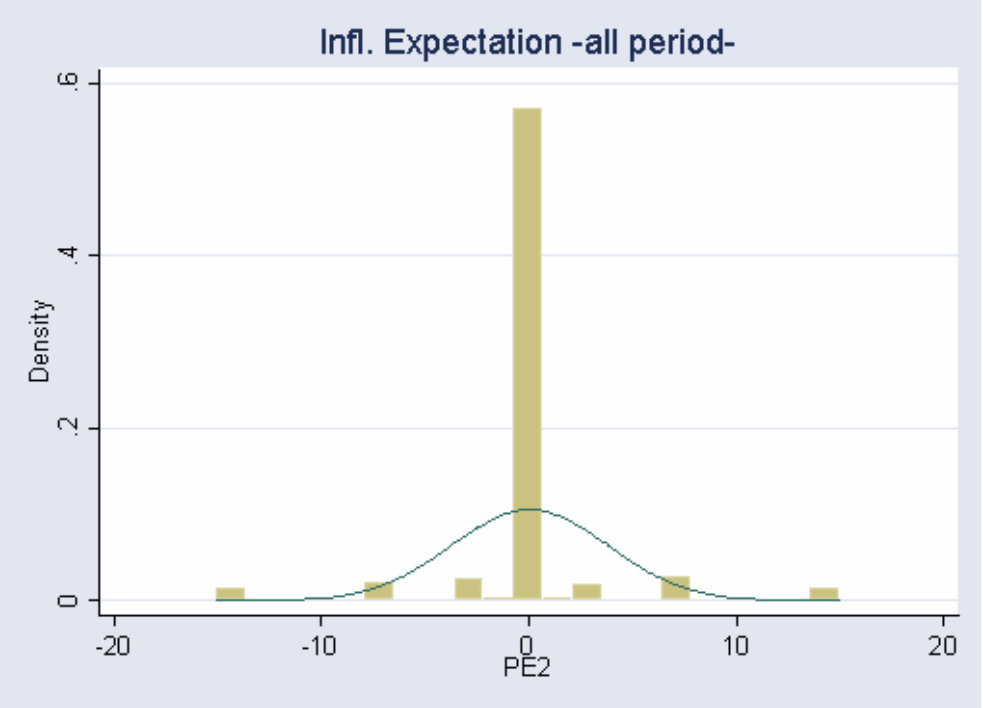
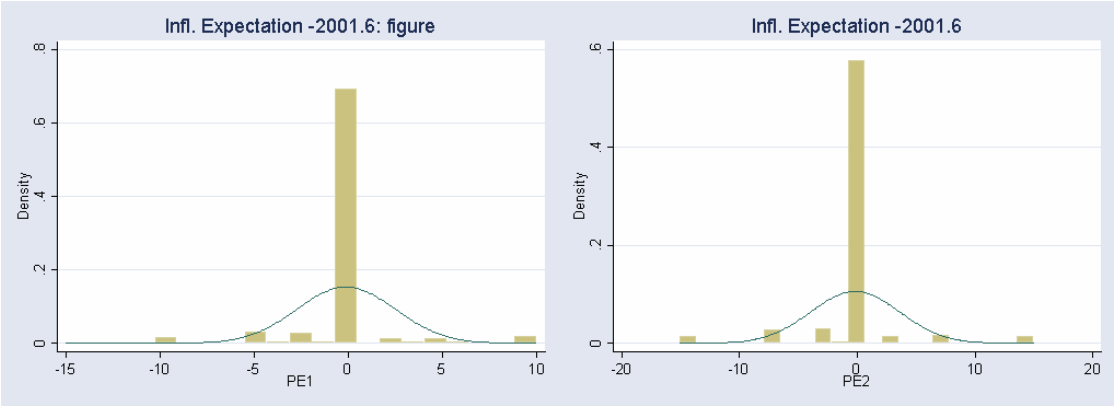
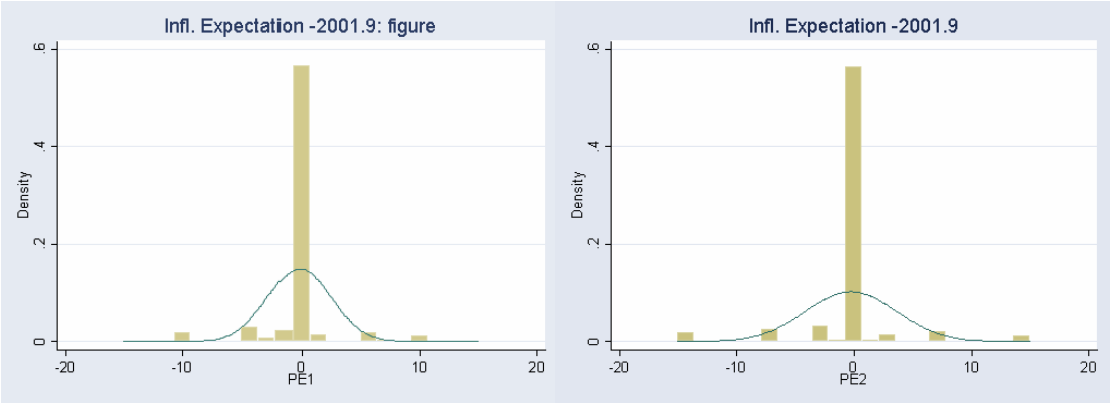


Figure 2-3 Price Expectations By Period
(left: figure based, right: multiple choice based)





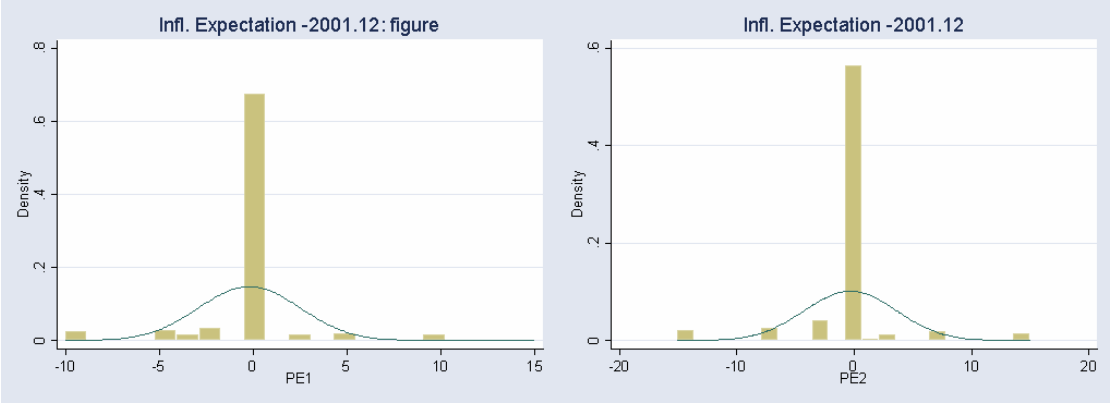
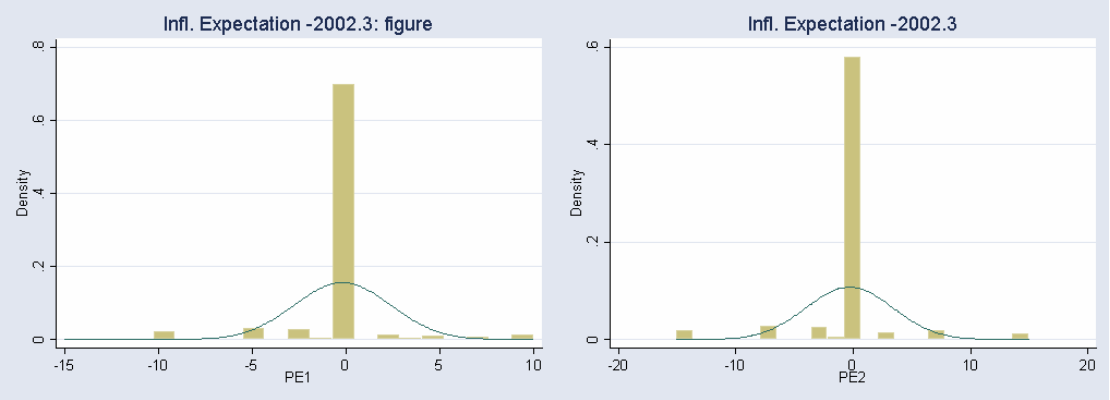
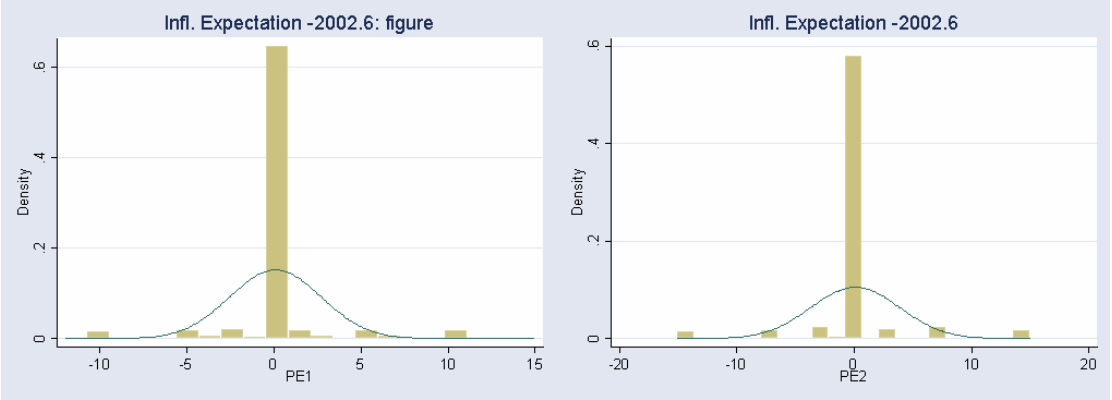


Figure 2-3 Price Expectations By Period
(left: figure based, right: multiple choice based) - continued





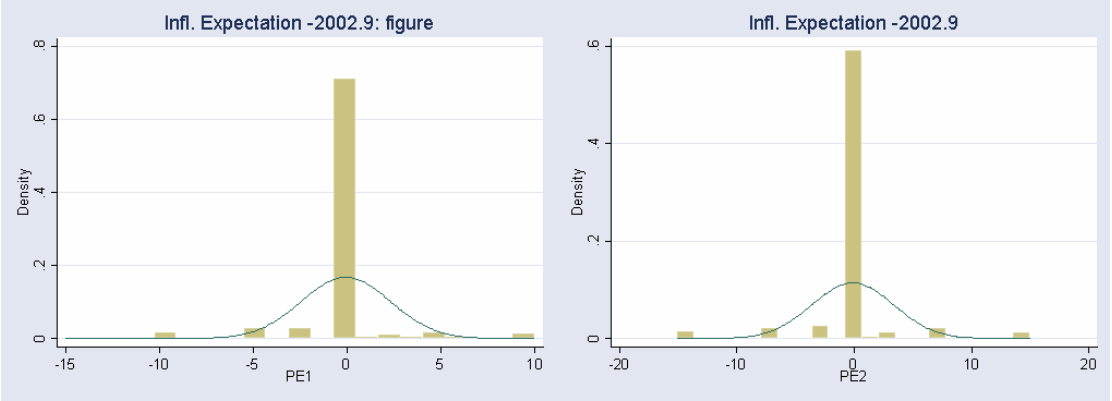
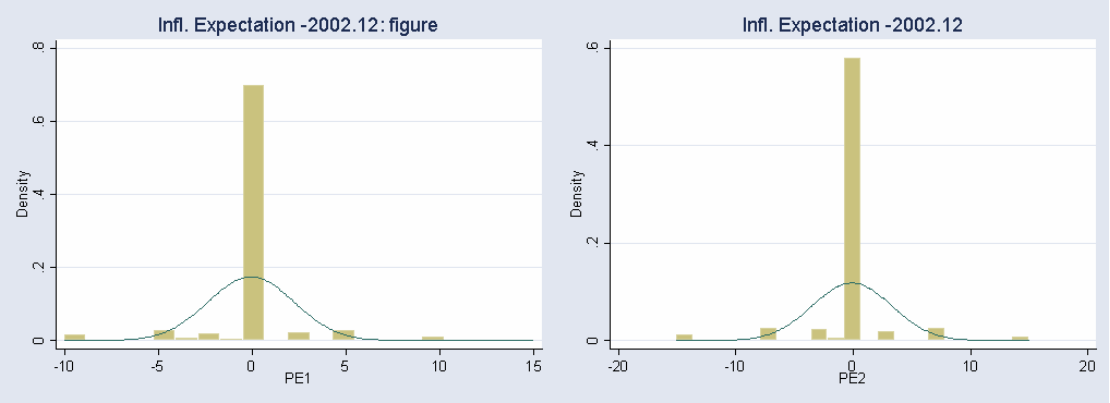
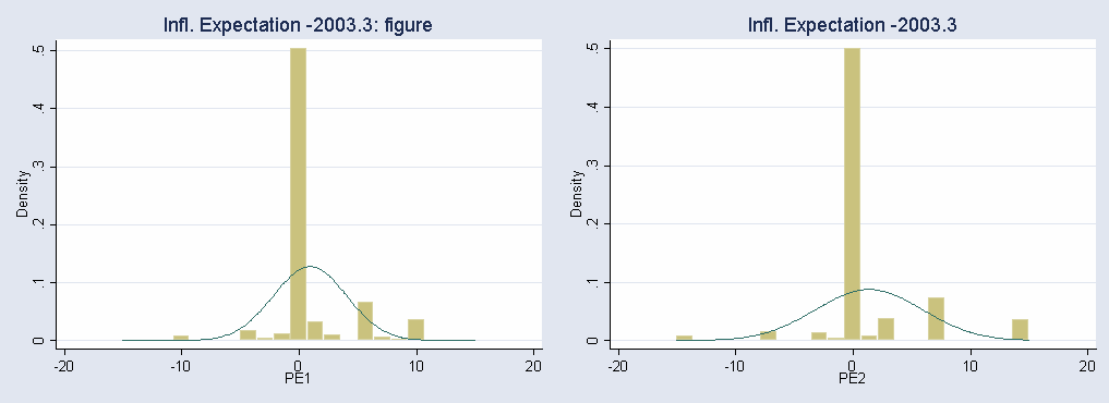


Figure 2-3 Price Expectations By Period
(left: figure based, right: multiple choice based) - continued





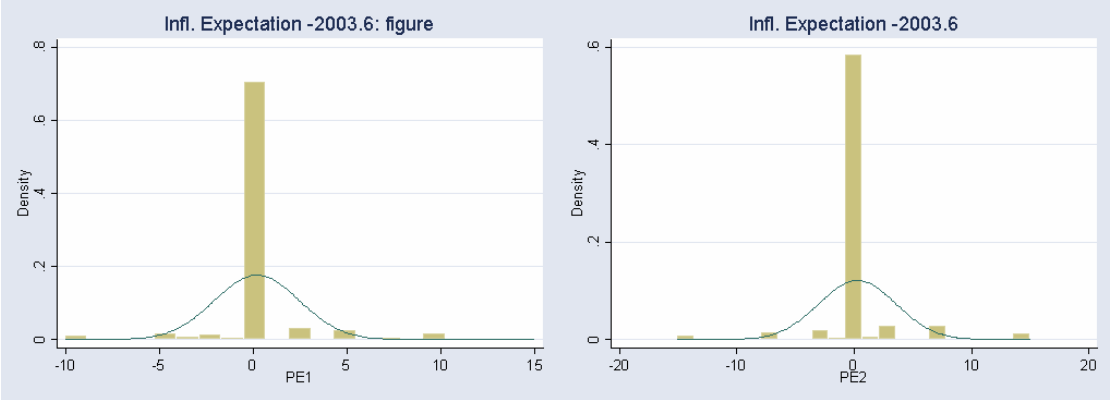


Figure 3-1 Current Income and IncAome Expectations (Average, all samples)

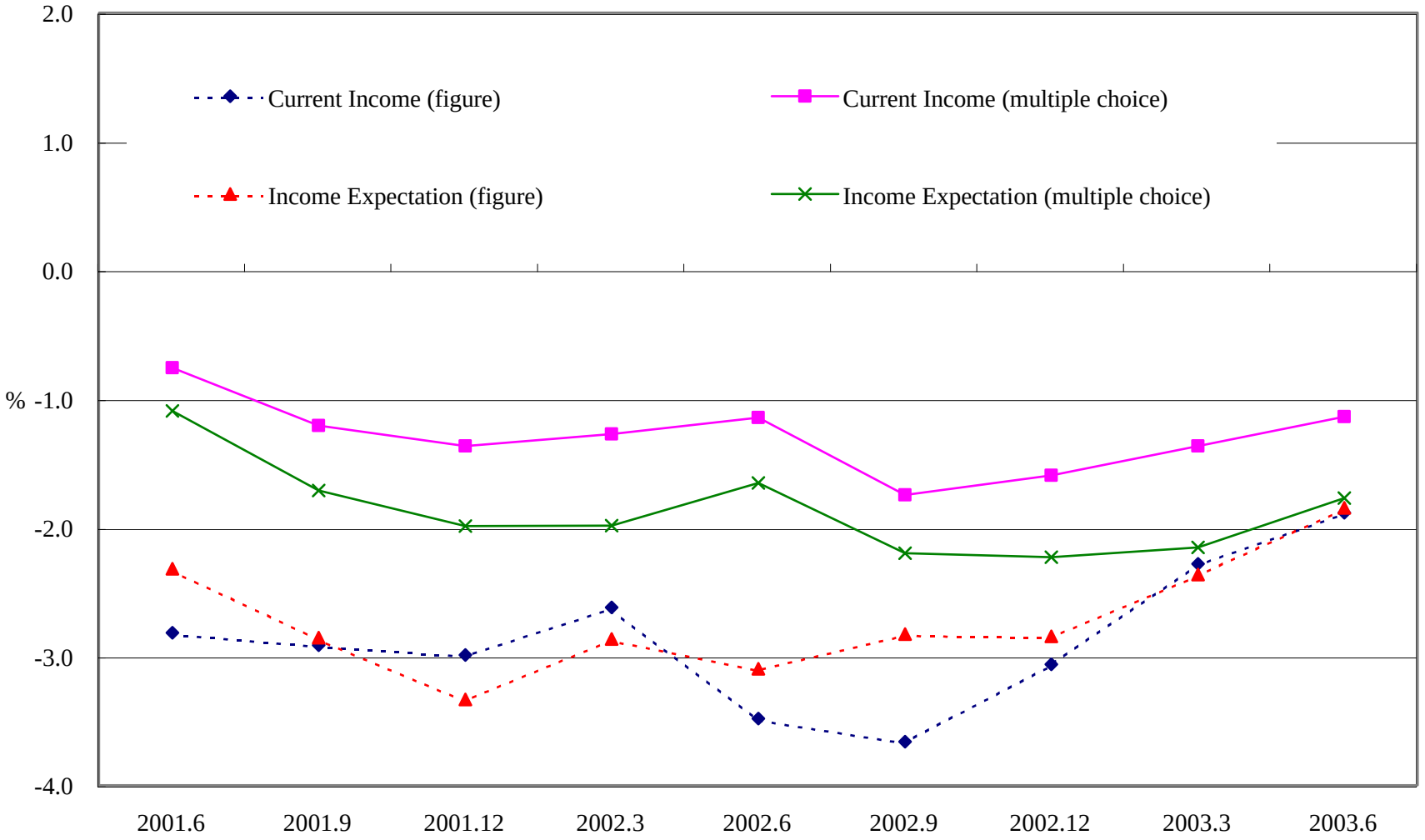


Figure 3-2 Current Income Income Expectations (Average, full-cover samples only)

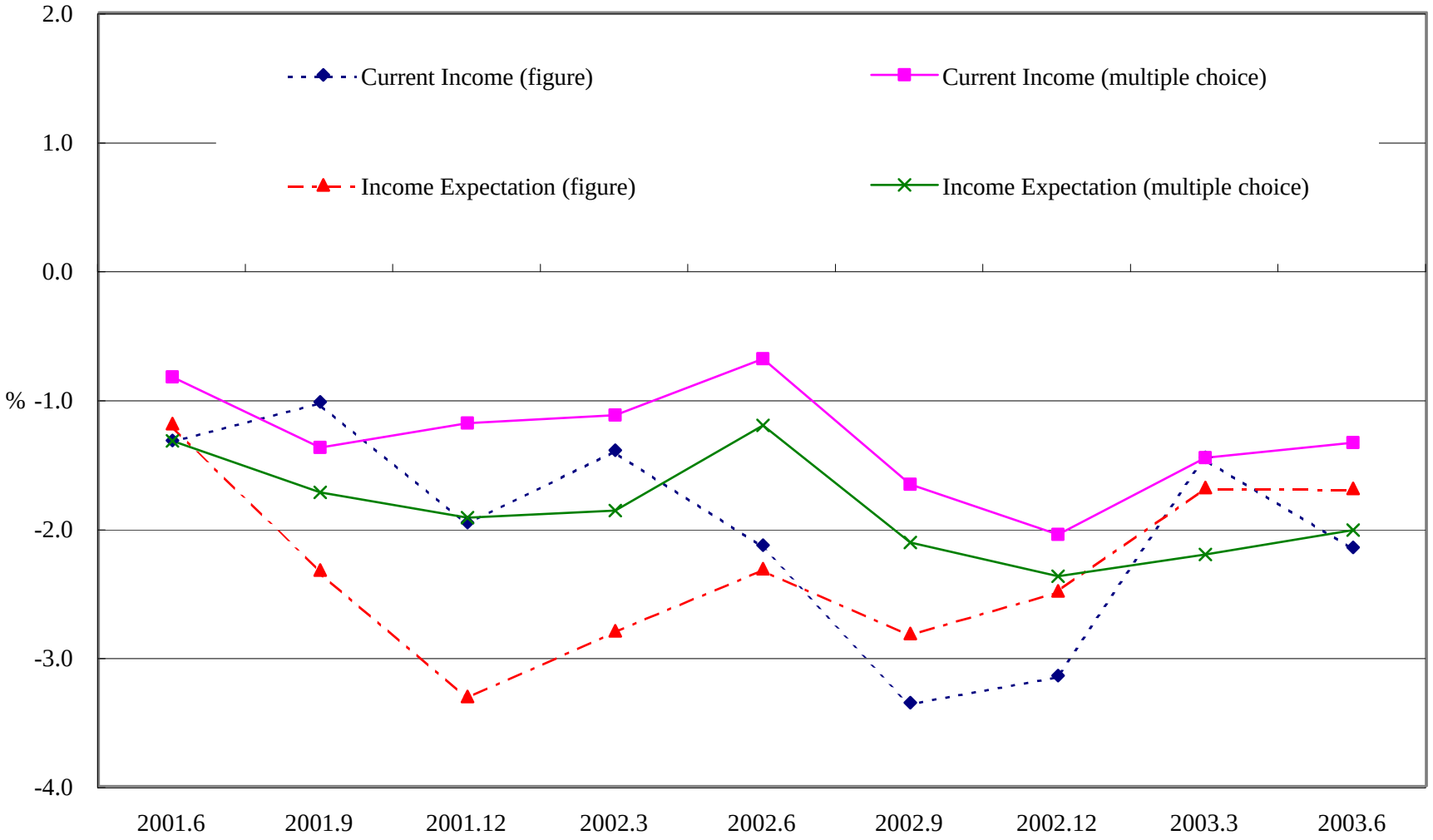
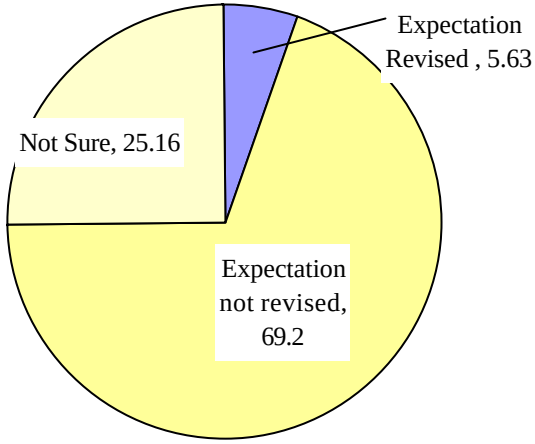


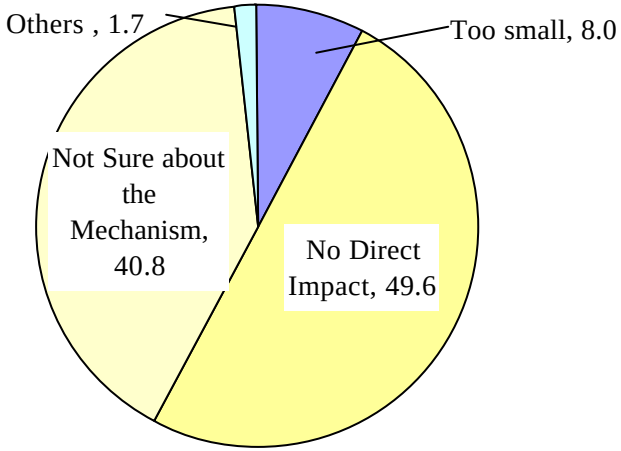
Figure 4 Knowledge and Reaction to the Easy Monetary Policy Announcement (March 2002 Survey)

(1) Do you know about the new easy monetary policy announcement by the bank of Japan?

(2) Reaction to the announcement of easy monetary policy.



(3) Reason why the people surveyed did not react to the monetary policy announcement.



(4) Main factor that affects price movements.

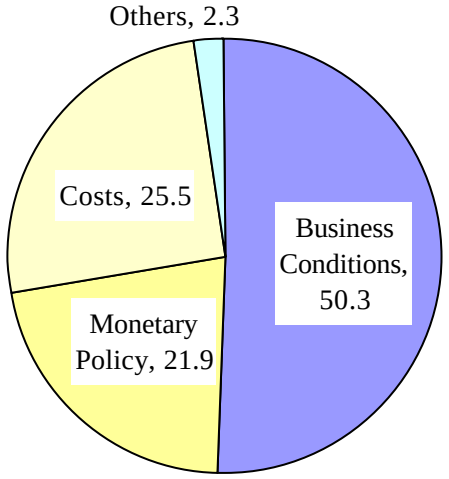
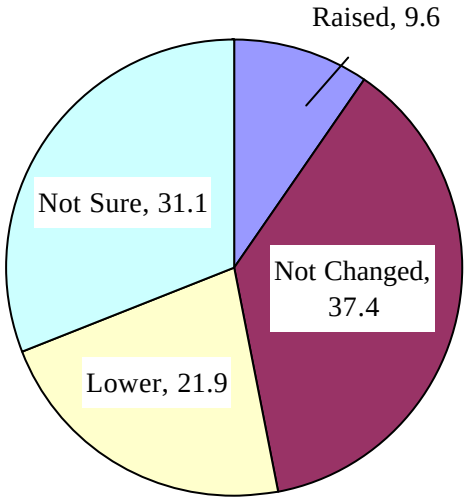


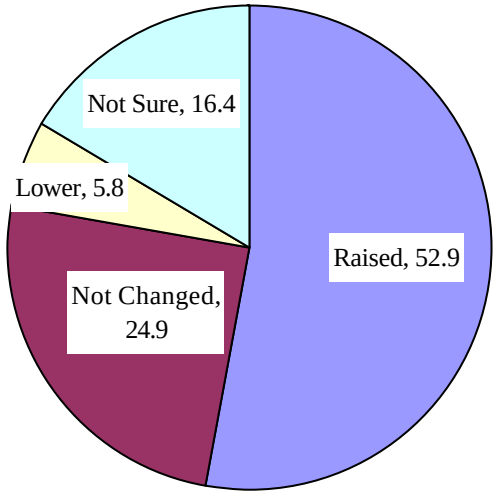
Figure 5 News (Terrorism, War) and Inflation Expectation

(1) September 11th Terrorism and Price Expectation



December 2001 Survey

(2) Iraq War and Price Expectation



March 2003 Survey

Figure 6-1 Current Consumption and Consumption Expectations (Average, All Samples)

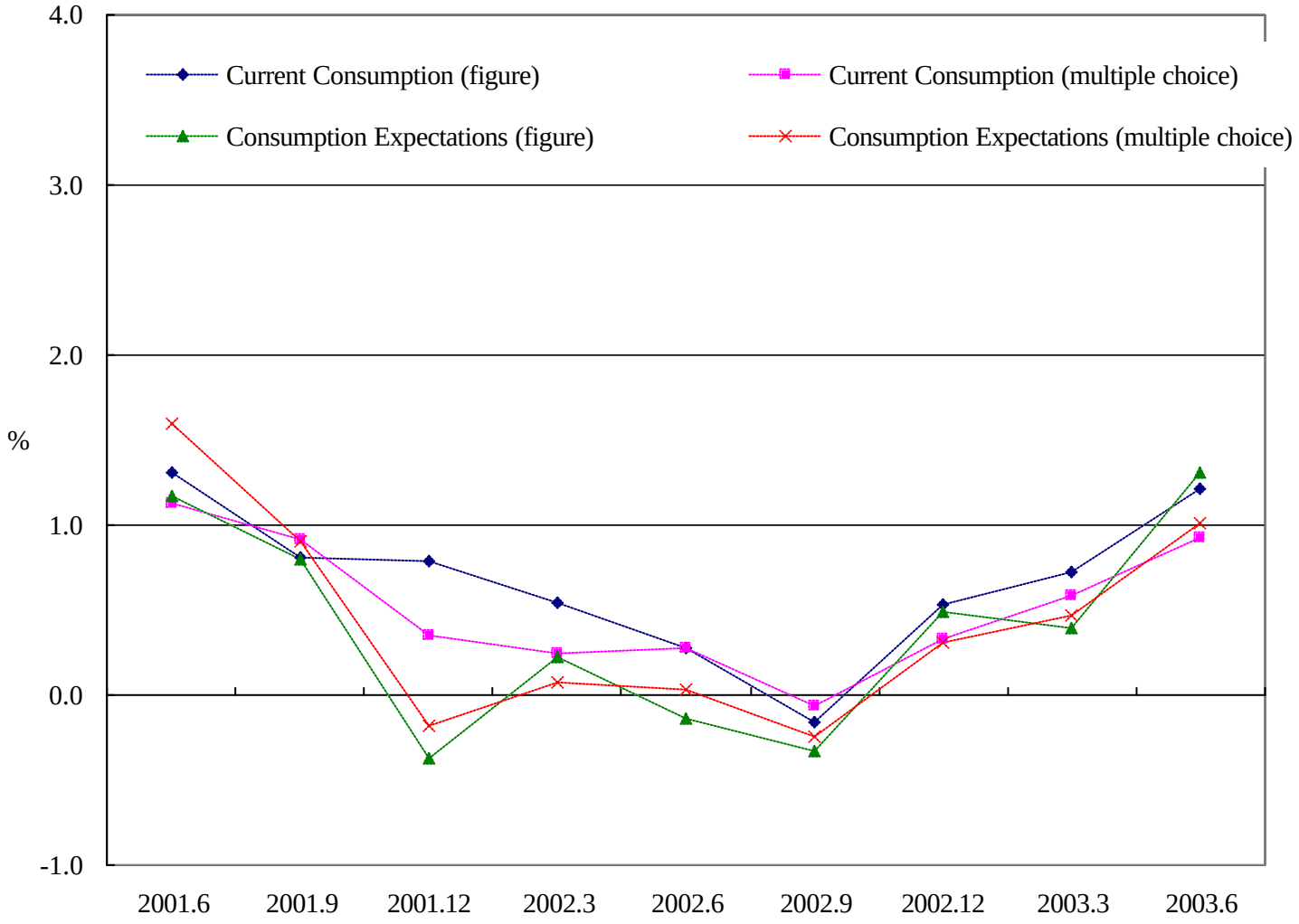


Figure 6-2 Current Consumption and Consumption Expectations
(Average, full-cover samples only)

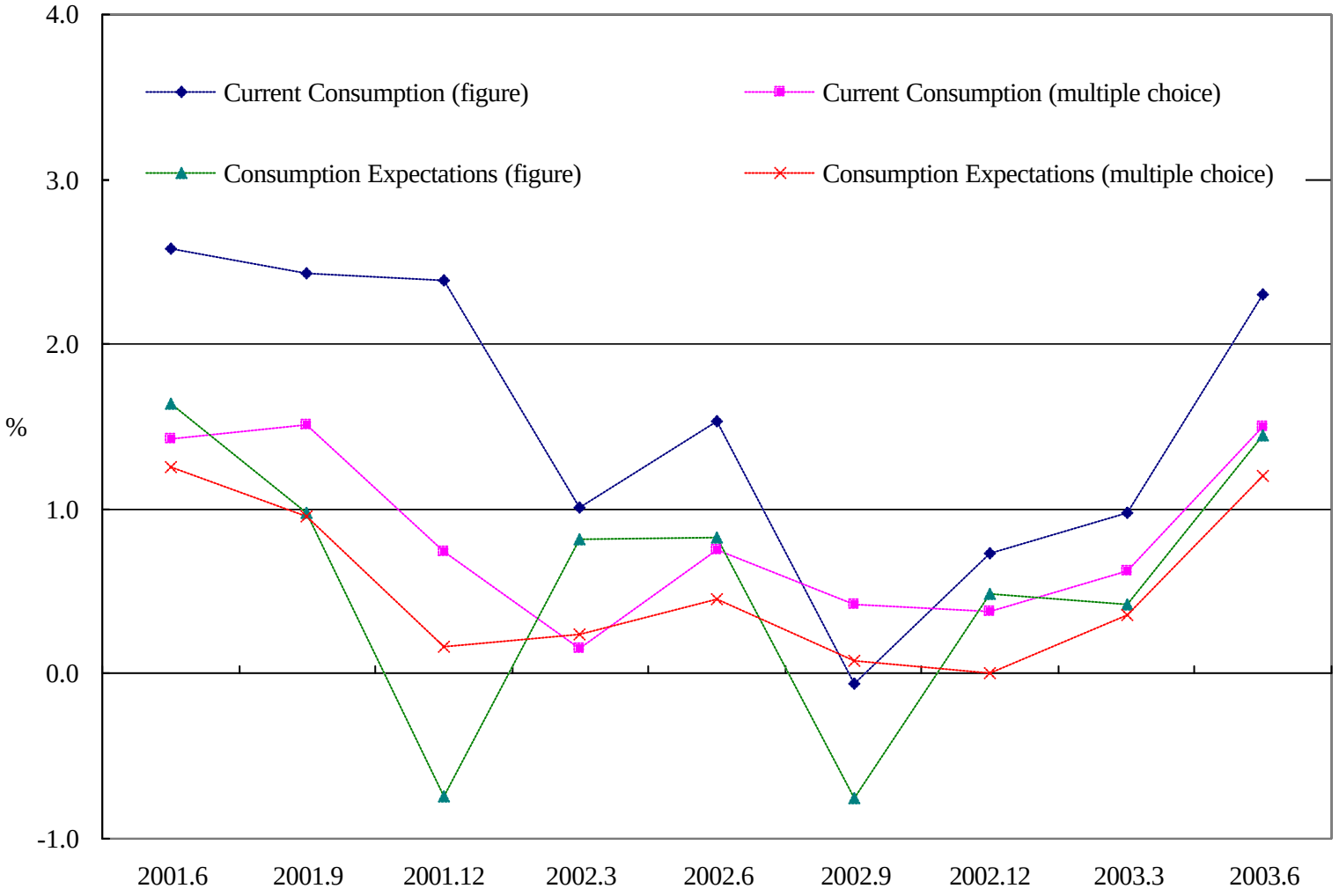


Table 1-1 Basic Characteristics of the Monitors (as of June 2003)

	Obs	Mean	Std. Dev.	Min	Max
Age of the Person Surveyed	2125	49.2	12.9	21	80
Age of Household Head	2140	51.8	12.9	21	89
Annual Income of Household Head (Class value)	2097	509.0	298.7	50	1900
Number of Family Members	2137	3.5	1.8	1	6

Table 1-2 Sex of the Person Surveyed (as of June 2003)

	Freq.	Percent
Male	227	10.7
Female	1890	89.3
Total	2117	100.0

Table 1-3 Distribution of Residential Status (as of June 2003)

	Freq.	Percent
Own house	1815	84.9
Rent house	233	10.9
Company house	60	2.8
Others	31	1.5
Total	2139	100

Table 1-4 Distribution of Residential Status (as of June 2003)

	Freq.	Percent
Village	880.0	41.8
Small City	628.0	29.8
Medium City	437.0	20.7
Large City	163.0	7.7
Total	2108	100

Table 1-5 Distribution of the Annual Income of Head of Household (as of June 2003)

	Freq.	Percent
Million yen	105	5.0
Million to Two Million yen	138	6.6
Two to Four Million yen	667	31.7
Four to Six Million yen	494	23.5
Six to Eight Million yen	354	16.8
Eight to Ten Million yen	218	10.4
Ten to Twelve Million yen	77	3.7
Twelve to Fourteen Million yen	23	1.1
Fourteen to Sixteen Million yen	8	0.4
Sixteen to Eighteen Million yen	5	0.2
Eighteen to Twenty Million yen	8	0.4
More than Twenty Million yen	7	0.3
Total	2104	100

Table 1-6 Distribution of Industries **(as of June 2003)**

	Freq.	Percent
Construction	169	9.0
Manufactures	288	15.4
Public Utility	42	2.2
Transportation and Telecommunications	100	5.3
Wholesale and Retail Sales	121	6.5
Finance	78	4.2
Services	339	18.1
Government	319	17.0
Others	416	22.2
Total	1872	100

Table 2-1 The determinants of price expectations (OLS estimates)

	OLS (Figures) Price Expectation (t)				OLS (Class) Price Expectation (t)		
	<1>	<2>	<3>		<4>	<5>	<6>
Current Price Movements(t)	0.300 **	0.331 **	0.324 **	Current Price Movements(t)	0.273 **	0.280 **	0.289 **
	(0.015)	(0.014)	(0.011)		(0.013)	(0.013)	(0.010)
Lagged Price Expectation	0.218 **	0.161 **	0.173 **	Lagged Price Expectation	0.274 **	0.225 **	0.225 **
	(0.015)	(0.013)	(0.011)		(0.015)	(0.014)	(0.011)
Income Growth	0.011 **	0.009 *	0.005	Income Growth	0.013	0.002	0.009
	(0.006)	(0.005)	(0.004)		(0.010)	(0.009)	(0.007)
Dummy of Monetary Policy (Aware / Not aware)	-0.081			Dummy of Monetary Policy (Aware / Not aware)	0.000		
	(0.098)				(0.016)		
Dummy of Monetary Policy (Affected /Not Affected)		1.640 **		Dummy of Monetary Policy (Affected /not Affected)		1.873 **	
		(0.224)				(0.269)	
Dummy affected by Terrorism			1.286 **	Dummy affected by Terrorism			1.721 **
			(0.118)				(0.139)
Dummy affected by War			1.025 **	Dummy affected by War			1.408 **
			(0.162)				(0.190)
Adj R-squared	0.264	0.249	0.275	Adj R-squared	0.253	0.228	0.273
Root MSE	2.312	2.431	2.333	Root MSE	3.184	3.204	3.086
Number of obs.	2381	3210	4891	Number of obs.	3220	4083	6224
Estimation Period	2001Q3-2002Q1	2002Q1-2002Q4	2002Q4-2003Q2	Estimation Period	2001Q3-2002Q1	2002Q1-2002Q4	2002Q4-2003Q2

Table 2-2 The determinants of price expectations (Ordered Probit estimates)

	Ordered Probit (Multiple Choice) Change of Price Expectation-Figure (1:Up, 0: No Change, -1: Down)				Ordered Probit (Multiple Choice) Change of Price Expectation-Class (1:Up, 0: No Change, -1: Down)		
	<1>	<2>	<3>		<1>	<2>	<3>
Current Price Movement (t)	0.032 ** (0.007)	0.045 ** (0.007)	0.043 ** (0.006)	Inflation(t)	0.021 ** (0.005)	0.024 ** (0.005)	0.026 ** (0.004)
Income Growth	0.002 (0.003)	0.001 (0.002)	0.001 (0.002)	Income Growth	0.001 (0.003)	0.002 (0.003)	0.003 (0.003)
Dummy of Monetary Policy (Aware / Not aware)	-0.026 (0.051)			Dummy of Monetary Policy (Aware / Not aware)	-0.038 (0.042)		
Dummy of Monetary Policy (Affected /not Affected)		0.310 ** (0.109)		Dummy of Monetary Policy (Affected /not Affected)		0.278 ** (0.097)	
Dummy affected by Terrorism			0.357 ** (0.060)	Dummy affected by Terro			0.376 ** (0.053)
Dummy affected by War			0.457 ** (0.084)	Dummy affected by War			0.450 ** (0.072)
Pseudo R2	0.007	0.032	0.036	Pseudo R2	0.006	0.024	0.032
Log likelihood	-1795.4	-2446.8	-3668.2	Log likelihood	-2792.5	-3459.8	-5000.1
Number of obs.	2381	3210	4891	Number of obs.	3220	4083	6224
Estimation Period	2001Q3-2002Q1	2002Q1-2002Q4	2002Q4-2003Q2	Estimation Period	2001Q3-2002Q1	2002Q1-2002Q4	2002Q4-2003Q2

Table 3-1 Estimates of Consumption Functions

	Consumption Growth (t)		Expected Consumption Growth (t+1)	
	(1) Figures	(2) Multiple Choice	(3) Figures	(4) Multiple Choice
Current Income Growth	0.220 **	0.173 **	0.114 **	0.049 **
	(0.013)	(0.014)	(0.031)	(0.015)
Expected Income Growth	0.030 **	0.050 **	0.221 **	0.225 **
	(0.014)	(0.015)	(0.034)	(0.016)
Price Expectation	0.226 **	0.107 **	0.205 **	0.147 **
	(0.035)	(0.019)	(0.082)	(0.019)
Debt Repayment Income Ratio	-0.013	0.003	-0.039 *	0.007
	(0.009)	(0.006)	(0.021)	(0.006)
Risk to be unemployed	-0.977 **	-0.573 **	0.356	-0.997 **
	(0.243)	(0.163)	(0.571)	(0.169)
Concerns on the future job & income	0.060	-0.036	-0.188	0.539 **
	(0.331)	(0.222)	(0.777)	(0.230)
Concerns about social sec. & pension	0.882 *	0.104	-1.231	-0.321
	(0.501)	(0.345)	(1.182)	(0.360)
Family member increase dummy	2.986 **	2.425 **	1.749	1.353 **
	(0.519)	(0.333)	(1.223)	(0.347)
Family member decrease dummy	0.245	-0.466	0.290	-0.409
	(0.444)	(0.307)	(1.060)	(0.323)
Adj R-squared	0.084	0.071	0.023	0.097
Root MSE	8.596	6.164	19.504	6.199
Number of obs.	7574	9041	7030	8492

Table 3-2 The Effect of Price Expectations on Durable Goods Purchase

	Ordered probit model Durable Consumption Prospect (1:Increase,0:No Change,-1:Decrease)	Probit model Timing of Consumption (1: Postpone, 0: Others)
Income Growth (t)	0.017 **	-0.017 *
	(0.003)	(0.009)
Expected Inc. Growth	0.018 **	0.004
	(0.003)	(0.009)
Expected Inflation	0.009 **	-0.026 **
	(0.004)	(0.009)
Debt Repayment Income Ratio	-0.005 **	
	(0.001)	
Risk to be unemployed	-0.147 **	
	(0.033)	
Concerns on the future job & income	-0.279 **	
	(0.044)	
Concerns about social sec. & pension	-0.106	
	(0.069)	
Family member increase dummy	0.030	
	(0.066)	
Family member decrease dummy	-0.020	
	(0.061)	
Pseudo R2	0.027	0.0186
Log likelihood	-6981.4	-603.0
Number of obs.	8290	901