JCER Working Paper
AEPR series
No. 2025-1-2

This is the pre-peer- reviewed version of the following article: "The Evolution of Inflation Expectations in Japan", *Asian Economic Policy Review*, vol. 20, issue 2, which has been published in final form at https://onlinelibrary.wiley.com/doi/full/10.1111/aepr.12504 and DOI: 10.1111/aepr.12504.

The Evolution of the Anchor of Inflation Expectations in Japan: How did Monetary Policy and Global Supply Shocks Change Inflation Expectations?

Shin-ichi Fukuda (University of Tokyo)
Naoto Soma (Yokohama National University)

This paper was prepared for the Fortieth Asian Economic Policy Review (AEPR) Conference "The Normalization of Japan" on September 28, 2024, Tokyo.

July 2025

Asian Economic Policy Review
Japan Center for Economic Research

To authors

If you want to introduce the same working paper you wrote and presented at the AEPR conference held in Tokyo on Sep. 28, 2024, in your own/your affiliation’s website, please be aware the following requirements.

To ensure that all citations and references to your published article are captured by the SSCI (Social Sciences Citation Index), authors are required to amend the cover page of your working paper as soon as practical after publication in AEPR. The amended cover page should include the full article citation, journal name, volume and issue, and DOI, as well as a hyperlink to the published article. The cover page of JCER Working Paper AEPR series has been already amended after publication in AEPR. The face of this working paper is an example of an amended working paper cover page.

The Evolution of the Anchor of Inflation Expectations in Japan:

How did monetary policy and global supply shocks change inflation expectations? [*]

Shin-ichi Fukuda (University of Tokyo) and Naoto Soma (Yokohama National University)[**]

Abstract

The purpose of this study is to examine how the unprecedented monetary easing and global supply shocks have changed medium-term inflation expectations in Japan. In the analysis, we define the "anchor of inflation expectations" as inflation expectations excluding the expected effects of the GDP gap and supply shocks. We examine the extent to which the "anchor of inflation expectations" has changed since 2010 using Japanese forecaster-level data in the "ESP Forecast." The estimated anchors of inflation expectations increased significantly soon after the Bank of Japan launched unprecedented monetary easing in April 2013. However, the increase in each estimated anchor was not only modest but also temporary under the monetary easing. In contrast, the estimated anchors for inflation expectations continued to rise soon after the global supply shocks became noticeable in April 2022. The estimated anchor has already exceeded 2 percent for short-term inflation expectations and is approaching 2 percent for medium-term inflation expectations. This means that the global supply shocks have caused a dramatic change in inflation expectations. However, the increased anchor of medium-term inflation expectations is still about the same as in 2014-2015. Given that the upward shift did not continue in 2014-2015, the Japanese economy may not be able to achieve the 2 percent target on a sustainable basis unless there are additional changes, such as an improvement in consumer sentiment through real wage increases.

JEL code: E58, E31, E37

Key words: Inflation target, Unconventional monetary policy, Global supply shocks

---

[*] This paper is prepared for Asian Economic Policy Review (AEPR) Conference to be held in Tokyo on Saturday 28 September.

[**] Correspondence address: Shin-ichi FUKUDA, Faculty of Economics, University of Tokyo, 7-3-1 Hongo Bunkyo-ku Tokyo 113-0033, JAPAN. E-mail: sfukuda@e.u-tokyo.ac.jp.

1. Introduction

For more than a quarter of a century, from the mid-1990s to 2021, the Japanese economy experienced "low inflation," with the inflation rate hovering near 0% and sometimes negative. At the time, many pointed to the persistent "low inflation" coupled with a prolonged slump in growth as having a negative impact on the Japanese economy. Low inflation persisted even after the Bank of Japan (BOJ) embarked on unprecedented monetary easing under Abenomics, the economic policy of the Abe administration.[1] However, the rapid recovery of economic activity from the COVID-19 recession and the rise in import prices have changed this price-stable world; the consumer price index (CPI) in Japan has been rising well above the 2% price stability target since April 2022 (**Figure 1**). Accordingly, the BOJ ended the zero interest rate policy that had effectively lasted for over a quarter of a century. The purpose of this study is to examine how the change of monetary policy and the rise in consumer prices under the global supply shocks have changed medium-term inflation expectations in Japan.

With the rapid recovery of the global economy, inflation rates in many countries have risen dramatically since around 2021, especially after Russia's invasion of Ukraine, when the prices of natural resources and food skyrocketed worldwide, causing severe inflation in many advanced economies. As a result of global inflation, Japan's CPI temporarily exceeded 4 percent in December 2022 and January 2023, the highest since 1991, suggesting that Japan is showing a sign of virtuous cycle after lost decades of stagnation. However, while inflation has spread globally, price increases in Japan have not only been slower than in other advanced economies, but have also been skewed toward specific items such as food and energy. Persistent inflation would occur when prices of a broad range of items rise. Thus, even under the current price increases, it is still far from clear whether Japan will really break out of the "deflationary economy" that has persisted for many years.

To examine the persistence of inflation in Japan, the following analysis examines the extent to which the "anchor of inflation expectations" has changed since 2010, using Japanese forecaster-level data in the ESP Forecast. For the BOJ to achieve its 2% price target on a sustainable basis, it is essential to raise inflation expectations on a sustained basis. However, data on "inflation expectations" obtained from surveys and other sources are affected by temporary business fluctuations and supply shocks,

---

[1] Fukuda (2015) shows that foreigners' reactions initially made the first arrow of Abenomics, aggressive monetary policy, successful through the channels of the yen and stock prices. Ito (2021) provides overall evaluations of Abenomics, especially the first arrow.

and thus do not necessarily reflect medium-term inflation expectations. For this reason, in the following, we will revise the methodology proposed by Fukuda and Soma (2019) and remove the expected effects of temporary business fluctuations and supply shocks from the "inflation expectations" in the ESP forecast. In the analysis, we define the "anchor of inflation expectations" by inflation expectations excluding the expected effects of the GDP gap and supply shocks. We then derive the "anchor of inflation expectations", which shows the degree of persistence of inflation expectations.

The ESP Forecast, compiled by the Japan Center for Economic Research (JCER), is a monthly survey of the macroeconomic outlook for the Japanese economy, in which about 40 leading professional forecasters from private Japanese institutes participate. It includes forecaster-level data on the real GDP growth rate, the core CPI inflation rate, the yen-dollar exchange rate, and the NY WTI crude oil futures price. By estimating panel Phillips curves for alternative periods using the forecaster-level data, we derive how the anchor of inflation expectations has changed over time in Japan since 2012. In the analysis, we assume that professional forecasters use the same expectations-augmented Phillips curve when forecasting macroeconomic variables in Japan. We then estimate the reduced form of the Phillips curve using the forecaster-level panel data and derive "the anchor of inflation expectations" from the estimation results.

We find two notable changes in the formation of private inflation expectations. First, the estimated anchors increased soon after the BOJ launched unprecedented monetary easing in April 2013. Except for shortest-term expectations, the estimated anchor exceeded 1 percent soon after April 2013. This means that the unprecedented monetary easing succeeded in raising inflation expectations. However, the estimated anchors never reached the 2 percent target. Instead, they continued to fall after 2016. After it became clear that the 2 percent target was not feasible in the medium term, Japanese forecasters began to think that 2 percent inflation was not realistic when forming their inflation expectations.

Second, the estimated anchors of inflation expectations continued to rise soon after the global supply shocks became noticeable in April 2022. The estimated anchor of shortest-term inflation expectations, which was close to zero in 2021, exceeded 2 percent. Even the estimated anchors of medium-term inflation expectations are approaching to 2 percent. This implies that the rise in the CPI under the global supply shocks has substantially increased inflation expectations. However, the increase in longest-term inflation expectations is still roughly the same as in 2014-2015. Given that the upward shift did not continue in 2014-2015, the Japanese economy may not be able to achieve the 2 percent target on a sustainable basis unless there are additional changes, such as an improvement in consumer sentiment through real wage increases.

In the literature, a number of studies have argued that an explicit inflation targeting regime generates less uncertainty about future inflation rates than a monetary policy regime without an explicit numerical inflation target because it successfully anchors expectations (see, for example, Bernanke et al. [1999]). In other advanced economies, several empirical studies have supported this view.[2] However, during the prolonged period of low inflation, the BOJ was one central bank that adopted an explicit inflation target but faced serious difficulties in achieving it. This was true even after the BOJ embarked on unprecedented monetary easing under Abenomics.[3] The sharp global supply shocks have changed this price-stable world in Japan. However, it is still far from clear whether inflation targeting and the rise in consumer prices will permanently change medium-term inflation expectations, which are essential for achieving the 2 percent price stability target in the long term.

Even with a significant increase in the CPI, nominal wage growth has not kept pace with inflation in Japan. Real wage growth is negative from April 2022 to May 2024 for "total cash earnings" and from February 2022 to June 2024 for "contractual cash earnings". Inflation without wage increases inevitably hurts consumer sentiment. Various surveys show that consumer sentiment has remained pessimistic even as the economy has recovered from COVID-19 and the stock market has boomed. Given the pessimistic consumer sentiment, it is too early to conclude that the Japanese economy will move to a new world with sufficiently high medium-term inflation expectations.

2. The BOJ's Unconventional Monetary Policy

---

[2] Gürkaynak et al. (2010) found that inflation expectations had been more firmly anchored in the United Kingdom -a country with an explicit inflation target- than in the United States -a country with no such target- using the difference between far-ahead forward rates on nominal and inflation-indexed bonds. Using evidence from financial markets and surveys of professional forecasters, Beechey et al. (2011) showed that long-run inflation expectations were more firmly anchored in the euro area than in the United States because a quantitative inflation target could help provide a firmer anchor.

[3] Nishizaki et al. (2014) discussed the occurrence of a prolonged but mild deflation, reflecting various underlying structural characteristics of the Japanese economy. Fujiwara et al. (2015) found no significant difference in public perceptions before and after the introduction of Abenomics. Hattori and Yetman (2017) found that the extent to which the inflation targeting anchored inflation expectations remained significantly lower in Japan than in a similar study of Canadian and US forecasters. Watanabe and Watanabe (2018) argued that Japan failed to escape deflation because keeping prices unchanged was the default position for firms.

Before deriving "the anchor of inflation expectations", this section overviews the BOJ's monetary policy frameworks after 2010. The main objective of the BOJ in the past decades was to raise inflation expectations by implementing unprecedented monetary easing. As summarized in **Table 1**, the BOJ adopted a series of unconventional monetary policies after 2010. When Mr. Shirakawa was governor, the BOJ launched "comprehensive monetary easing" on October 5, 2010, and announced the introduction of an explicit 2% CPI inflation target on January 22, 2013. Since the previous target was an implicit rate of around 1 percent, the announcement of the 2 percent inflation target was a dramatic change in the BOJ's commitment. In particular, after Mr. Kuroda became governor, the BOJ became very aggressive in its unconventional policies. It introduced "quantitative and qualitative monetary easing (QQE)" on April 4, 2013, and pledged to achieve the 2 percent CPI price stability target "at the earliest possible time with a time horizon of about two years." It also expanded QQE on October 31, 2014, and introduced two new monetary policy frameworks, "QQE with a negative interest rate" on January 29, 2016, and "QQE with yield curve control (YCC)" on September 21, 2016. The two monetary policy frameworks continued until they were terminated by the new Governor Ueda on March 19, 2024.

In its Outlook for Economic Activity and Prices, the BOJ announces the median of the Policy Board members' forecasts four times a year: January, April, July, and October (or November).[4] Depending on the monetary policy framework, the BOJ changed the median of the forecasts on future inflation rates substantially. **Table 2** summarizes the median of the BOJ's forecasts on the after-tax core CPI inflation rate (CPI, all items less fresh food, excluding the direct effects of the consumption tax hikes) in each fiscal year after fiscal year 2011. The table shows two interesting features.

First, after the introduction of QQE, the BOJ's initial forecast increased dramatically and continued to overestimate the inflation rate until T = 2021. The initial forecast in October of year T-2 was well below 1 percent before QQE was introduced. At that time, the difference between the initial forecast in October of year T-2 and the final forecast in April of year T+1 was small and little biased: 0.4 percentage points in T = 2011, 0.8 percentage points in T = 2012, 0.3 percentage points in T = 2013, and 0 percentage points in T = 2014. In contrast, after Governor Kuroda's commitment to the 2% CPI price stability target, the BOJ continued to set the initial forecast in April of year T-2 at around 2% and

[4] After T = 2015, the forecast of the core CPI inflation rate in fiscal year T starts in April of year T−2 and continues through to April in year T+1, so that there are 12 forecasts for the same fixed event. Before T = 2014, the estimate starts in October of year T−2 through to April in year T+1, so that there are 10 forecasts for the same fixed event.

significantly overestimated the inflation rate until T = 2021. The overestimation amounted to 1.9 percentage points in T = 2015, 2.4 percentage points in T = 2016, 1.2 percentage points in T = 2017, 1.1 percentage points in T = 2018, 1.5 percentage points in T = 2019, 2.3 percentage points in T = 2020, and 1.6 percentage points in T = 2021. The overestimation occurred because, despite the dramatic increase in the monetary base, QQE failed to achieve the price stability target of 2 percent excluding the direct effects of the consumption tax hikes.

Second, the BOJ significantly lowered its initial forecast for the CPI inflation rate after T-2 = 2019, setting it at 0.7 percent for T-2 = 2020, 1.0 percent for T-2 = 2021, and 1.1 percent for T-2 = 2022. The BOJ lowered its initial forecast because it realized that the price stability target was not feasible in the short term. Ironically, however, soon after the BOJ lowered its initial forecast, the initial forecast began to significantly underestimate the inflation rate. It was not until T-2 = 2019 that the reduced initial forecast began to overestimate the inflation rate. However, after T-2 = 2020, the BOJ's initial forecast continued to underestimate the inflation rate. The difference between the initial forecast in April of year T-2 and the final forecast in April of year T+1 was substantial: 2.3 percentage points at T = 2022 and 1.8 percentage points at T = 2022. Even at T = 2023 and 2024, the BOJ revised up the initial forecast substantially in the following forecasts. The underestimation occurred because the global supply shocks unexpectedly raised the inflation rate. The realized inflation rate was 3.0 percent in fiscal year 2022 and 2.8 percent in fiscal year 2023.

In response to the rising inflation rates, the BOJ began to raise its initial forecast for the CPI inflation rate substantially after T-2 = 2023, setting it at 1.6 percent in T-2 = 2023 and 1.9 percent in T-2 = 2024. The upward revision, which led the BOJ to set its policy rate in positive territory, may increase the anchor of inflation expectations among private forecasters. However, unlike in fiscal years T = 2022 and 2023, it is likely that the global supply shocks will stabilize and not have a significant impact on the inflation rate in fiscal years T = 2024 and 2025. Therefore, it is worth investigating how the anchor of inflation expectations, especially medium-term expectations, changed among private forecasters under the global supply shocks. The following analysis examines this question using the forecaster-level inflation forecasts in the ESP forecast.

3. The Basic Model

The purpose of the following sections is to examine the extent to which the BOJ's unconventional policy and global supply shocks have raised "the anchor of inflation expectations" using Japanese forecaster-level data. For the BOJ to achieve its 2% price target on a sustained basis, it is essential to raise inflation expectations on a sustained basis. However, data on "inflation expectations" obtained from surveys and other sources are affected by temporary business fluctuations and supply shocks, and thus do not necessarily reflect permanent underlying inflation expectations. For this reason, in the following, we will remove the effects of temporary business cycle fluctuations and supply shocks from the surveyed "inflation expectations", and thereby derive "the anchor of inflation expectations," which are considered to be permanent underlying inflation expectations.

To remove the effects of temporary business cycle fluctuations and supply shocks from the surveyed "inflation expectations", the following analysis uses an expectations-augmented Phillips curve. Denoting the inflation rate by Π_t, the log-linearized GDP gap by $lnY_t - lnY_t^*$, and supply shocks by U_t, the Phillips curve is written as follows:

$$(1) \quad \Pi_t = \Pi_t^e + \alpha\,(lnY_t - lnY_t^*) + U_t.$$

where subscript t denotes time period. In equation (1), Y_t is real GDP and Y_t^* is potential real GDP. The term Π_t^e is the expected underlying inflation rate, which is independent of GDP gap and supply shocks. It differs from the surveyed expected inflation rate because it is net of the expected effects of GDP gap, $\alpha(lnY_t - lnY_t^*)$, and supply shocks, U_t, respectively. Since it has a feature of the medium-term expected inflation rate, we call Π_t^e "the anchor of inflation expectations".

In the following analysis, we assume that each professional forecaster applies equation (1) when forecasting macroeconomic variables in Japan. Then, as we show in the Appendix, we can derive the following equation:

$$(2) \quad E_{j,\tau}\Pi_{\tau+1} = \mu_\tau + \alpha_\tau E_{j,\tau}\Delta lnY_{\tau+1} + \sum_{i=1}^{N}\beta_{i,\tau}E_{j,\tau}\Delta lnX_{\tau+1}^{i} + \varepsilon_{j\tau},$$

where $E_{j,\tau}\Pi_{\tau+1}$ = j's forecast of τ+1 inflation rate at τ, $E_{j,\tau}\Delta lnY_{\tau+1}$ = j's forecast of τ+1 real GDP growth rate at τ, and $E_{j,\tau}\Delta lnX_{\tau}^{i}$ = j's forecast of τ+1 supply shock i at τ. The expectation operator $E_{j,\tau}$ suggests that forecaster j forms his or her own expectation at period τ to forecast the value at period τ+1.

Equation (2) is the forecaster-level reduced form of the expectations-augmented Phillips curve (1). It is worth noting that the term μ_τ in equation (2) is the sum of the anchor of inflation expectations

$\Pi_{\tau+1}{}^{e}$ and $\alpha_\tau[(lnY_\tau - lnY_\tau{*}) - \Delta lnY_{\tau+1}{*}]$.[5] We estimate equation (2) by using forecaster-level panel data. To the extent that we can observe $E_{j,\tau}\Pi_{\tau+1}$, $E_{j,\tau}\Delta lnY_{\tau+1}$, and $E_{j,\tau}\Delta lnX_\tau^i$, the estimation results equation (2) can derive "the anchor of inflation expectations" in each period.

4. The ESP Forecast

The following sections derive "the anchor inflation expectations" by estimating equation (2) using Japanese forecaster-level data in the ESP Forecast. The ESP (Economy, Society, Policy) Corporation started the survey in May 2004, and the JCER took over the survey in April 2012. The monthly survey is conducted around the beginning of each month, and the results are released in the middle of the month. In the sense that it sends questionnaires to professional economists, the ESP Forecast is similar to Consensus Forecast, which has been widely used in the literature. However, the economists surveyed by the ESP Forecast are more specialized in the Japanese economy than those surveyed by Consensus Forecast. Forecasted macroeconomic variables include the growth rates of real GDP and its components, the growth rate of the industrial production index, the current account balance, the core CPI inflation rate (year-on-year), the unemployment rate, the Nikkei stock index, the yen-dollar exchange rate, and the NY WTI crude oil futures price.

In the ESP Forecast, we can observe both $E_{j,\tau}\Pi_{\tau+1}$ and $E_{j,\tau}\Delta lnY_{\tau+1}$ in equation (2) by j's forecasts of the inflation rate and real GDP growth rate, respectively. We can also observe two proxies of $E_{j,\tau}X_\tau^i$ by j's forecasts of the yen-dollar exchange rate and the NY WTI crude oil futures price. Since only the forecast level is available for these supply shock proxies in the ESP forecast, we constructed $E_{j,\tau}\Delta lnX_{\tau+1}^i$ by taking the logged difference between the forecast future value and the realized current value for each proxy.

The quoted forecasts are fixed-event forecasts, consisting of a panel of forecasts for a series of outcomes of a series at different horizons prior to each outcome. For most variables, when quoting forecasts for the value in fiscal year T, the forecast origin starts in January of year T-1 and continues until May of year T+1, so that there are 29 time-series forecasts for the same fixed event. However, for the real GDP growth rate and the core CPI inflation rate, when the forecasts of the value in fiscal year T = 2015, 2016, 2017, and 2018 are quoted, the forecast origin starts in June of year T-2 and

[5] The constant term can change over time when τ changes. But to the extent that τ is fixed, it is time invariant in each estimated estimation.

continues to May of year T+1. Thus, for the real GDP growth rate and the core CPI inflation rate in fiscal year T, there are 34 time-series forecasts for the same fixed event after T = 2015.[6]

The fixed-event forecasts generally have a seasonal property where the number of forecast horizons is different depending on the month in which the forecast is quoted. It also has the property that the number of fixed events is different depending on the month in which the forecast is quoted. The forecast fixed event includes the values in fiscal years T-1, T and T+1 when the forecast origin is from January to May of year T, while it includes the values in fiscal years T and T+1 when the forecast origin is from June to December of year T. In addition, after T = 2013, it also includes the value in fiscal year T+2 for real GDP growth rate and core CPI inflation rate when the forecast origin is from June to December of year T.

Table 3 summarizes the basic statistics of the forecasted real GDP growth rate and after-tax core CPI inflation rate quoted from fiscal year 2010 to fiscal year 2023. It shows the average and standard deviation of the forecast values of fiscal year T as quoted in January of year T-1, July of year T-1, January of year T, July of year T, and January of year T+1. For both the real GDP growth rate and the core CPI inflation rate, the average forecast value shows considerable variation between January of year T-1 and January of year T+1. However, the standard deviation decreases as the forecast origin approaches January of year T+1. This occurs because forecasters frequently revise their forecasts to incorporate new information and eventually form an almost accurate forecast homogeneously. However, the standard deviations decline only modestly until July of year T. This suggests that the fixed event forecasts remain heterogeneous significantly until the realized values become available to the forecasters.

Comparing the average in January of year T-1 and January of year T+1, the initial forecasts seriously overestimated the real GDP growth rate in T=2020 due to the COVID-19 shocks. However, the initial forecasts of the real GDP growth rate were not seriously biased in the other fiscal years. In contrast, like the BOJ's forecasts in Table 2, the initial forecasts overestimated the inflation rate from T = 2014 to 2021. The overestimation occurred because private forecasters partly believed the BOJ's price stability target of 2 percent, which eventually turned out to be unattainable. However, the upward bias in the initial forecasts was less severe in the ESP forecast than in the BOJ's forecasts. More interestingly, like the BOJ's forecasts, the initial forecasts seriously underestimated the inflation rate

[6] Before T = 2014, the forecast origin started in January of year T−1 even for real GDP growth rate and core CPI inflation rate.

from T = 2022 to 2023. The underestimation occurred because of the global supply shocks. The downward bias of the initial forecasts in the ESP forecast was as severe as that in the BOJ forecast.

Comparing the standard deviations between the real GDP growth rate and the core CPI inflation rate, the forecasted real GDP growth rates were more heterogeneous than the forecasted core CPI inflation rate from T = 2010 to 2014 and from T = 2021 to T = 2023. However, the forecasted core CPI inflation rate became more heterogeneous than the forecasted real GDP growth rates in January of year T-1 and July of year T-1 from T = 2015 to 2020 and from T = 2024 to 2025. The introduction of the BOJ's unprecedented monetary easing reduced the heterogeneity of GDP growth expectations, but increased the heterogeneity of inflation expectations. The global supply shocks increased the heterogeneity of both GDP growth and inflation expectations. But they increased the heterogeneity of inflation expectations more than that of GDP growth expectations.

5. The Estimation Equation

In the following section, we derive the anchor of inflation expectations ${\Pi_{\tau+1}}^e$ by estimating equation (2) using the data for several alternative horizons in the ESP Forecast. In estimating equation (2), we use inflation forecasts of the after-tax core CPI for $E_{j,\tau}\Pi_{\tau+1}$. The sample period of the forecast origin is from June 2011 to March 2023. We start the sample period from June 2011 to exclude discontinuous changes in the ESP forecast caused by the CPI base year revision. The sample period allows us to see whether there were structural changes in equation (2) when the BOJ introduced several unconventional policies and the global supply shocks increased import prices.

As explained in Section 4, the ESP Forecast provides a panel of fixed event forecasts at different horizons. However, it is worth noting that the quoted forecast monotonically diverges from the long-term anchor point and converges to the actual value as the forecast horizon shortens. In particular, when the value in fiscal year T is forecast from January to May of year T+1, most of its components have already been realized. Even if the value in fiscal year T is forecast from June to December of year T, some of its components have already been realized. Therefore, we exclude these forecasts in the analysis and focus only on the following four types of forecasts.

The first type (type I) is a set of forecast values in fiscal year T+2, which are quoted from June to December of year T. They have a desirable property to be considered as anchors of medium-term inflation forecasts in that their forecast horizons are more than one year ahead, which are the longest in the ESP forecast. Unfortunately, the available forecast variables are limited to the real GDP growth rate and the core CPI inflation rate for the first type. Therefore, in calculating the anchor, we have proxied the effects of expected supply shocks of the first type by those of the third type that have the same forecast origins.

The second type (type II) is a set of forecast values in fiscal year T+1, which are quoted from January to May of year T. Their forecast horizons are slightly shorter than those of the first type, but longer than the other two types. More importantly, the second type includes forecast values of various macro variables, especially the yen-dollar exchange rate and the oil price. Thus, we can calculate the anchor of medium-term inflation forecasts after controlling for the effects of forecasted supply shocks in the second type.

The third type (type III) is a set of forecast values in fiscal year T+1, quoted from June to December of year T. The timing of the quotes is the same as the first type. Since the third type also includes forecasts of various macro variables, we can derive the anchor after controlling for the effects of supply shocks. However, since their forecast horizons are shorter, the anchor is likely to be that of short-term inflation forecasts.

The fourth type (type IV) is a set of forecast values in fiscal year T, quoted from January to May of year T. It also includes forecast values of various macro variables. The timing of the quotes is the same as in the second type. However, unlike the other types, Type IV forecasts are made after observing part of the realized values in fiscal year T. Because of this peculiarity, the forecast errors tend to be the smallest among the four types. We can interpret the forecast values as short-term inflation forecasts that partly reflect realized values. They are likely to be influenced by realized inflation and have very different characteristics from long-term expectations.

6. The Estimation Results

We estimated equation (2) using panel data of the four alternative forecast types. Since the quoted forecasts are fixed-event forecasts, we included monthly time dummies depending on the forecast origin. The sample period of the forecast origin is from June 2011 to March 2023.

Table 4 reports the estimation results for each forecast type. The estimated coefficient of the GDP growth rate forecast was positive and statistically significant in most of the periods before 2020. This implies that the ESP forecaster-level data supports our Phillips curve before the COVID-19 and the global supply shocks increased economic uncertainty dramatically. However, the estimated coefficient varies across different forecast types and different forecast origins. It tends to be large for types I and II, while it tends to be small for type IV. It also tends to be large when the forecast origin year is 2017 and 2018. This suggests that the slope of our panel Phillips curve was relatively steep in the medium-term inflation forecasts and in 2017 and 2018. However, the estimated coefficient of the predicted GDP growth rate sometimes became statistically insignificant or took a negative sign after the outbreak of COVID-19. During the pandemic of COVID-19 and the global supply shocks, the Japanese economy faced considerable unpredictable uncertainty. Under these circumstances, forecasters formed their expectations taking into account several unobservable factors. It is likely that this may have made the Phillips curve unstable.

The estimated coefficient of each supply shock was also significantly positive in most cases. This indicates that an expected increase in the price of oil and an expected depreciation of the Japanese yen tended to shift the Phillips curve upwards and increase inflation expectations in most periods. This characteristic held true even after the outbreak of COVID-19.However, the estimated coefficients varied considerably over time and sometimes became insignificant or had the wrong sign. It is likely that forecasters formed their expectations taking into account expected supply shocks in most of the periods, but not when the supply shocks did not play a key role in the Japanese economy.

More importantly, the estimated constant term showed substantial variations over time. In the table, the estimated constant term had four characteristics depending on when the expectations were formed. First, it was negative except for type I when the forecast origin was in 2012. The negative value was especially significant for short-term forecasts (i.e., type III and IV forecasts). This reflects deflationary expectations in the short run before the introduction of 2% price stability target and QQE. Second, it became significantly positive and sometimes took large positive values shortly after the introduction of 2% price stability target and QQE. In particular, it became large in 2014 and 2015 for type I forecast. This indicates a rise of inflation expectations, especially medium-term expectations, after the introduction of 2% price stability target and QQE. Third, it became unstable when the forecast origin was from 2016 to 2021. This may have occurred because when it became unclear whether the 2 percent target was a feasible target even under unprecedented monetary easing. Fourth, it increased dramatically when the forecast origin was after 2022. The changes of the estimated constant term were relatively modest for type I and II forecasts. But the estimated constant term exceeded 2 for type III and IV forecasts. This suggests a significant rise of inflation expectations, especially short-term expectations.

7. The Estimated Anchor of the Inflation Expectations

One of the key features in our expectations-augmented Phillips curve is that the constant term in equation (2) is the sum of $\Pi_{\tau+1}{}^{e}$ and α [($lnY_{\tau} - lnY_{\tau}$*) − $\Delta lnY_{\tau+1}$*], where τ is the period of the forecast origin. This indicates that we can derive the estimated anchor of inflation expectations subtracting $\hat{\alpha}$ × [GDP gap in period τ – potential GDP growth rate in period τ+1] from the estimated constant term, where $\hat{\alpha}$ is the estimated coefficient of the GDP growth rate forecast. In deriving the anchor of inflation expectations, we use the potential GDP growth rate and GDP gap both of which were estimated by Cabinet Office of Japanese government. For GDP gap, we first took average of the quarterly series from the third quarter in 2013 to the fourth quarter in 2014 to smooth out the effect of consumption tax hikes. We then converted the smoothed quarterly series into semi-annual series through taking their moving averages.[7]

Based on the estimated results in Table 4, we derive the anchor of inflation expectations for the four types of forecasts.[8] One problem in deriving the anchor of inflation expectations was that the coefficients of the predicted GDP growth rate and supply shocks infrequently took the wrong sign, especially after the outbreak of COVID-19. Since removing the effects of temporary business fluctuations and supply shocks is crucial in deriving the anchor for inflation expectations, we thus use the average coefficients of the predicted GDP growth rate and supply shocks in deriving the anchor for inflation expectations. **Figure 2** depicts how the derived anchor of inflation expectations changed over time for the four types of forecasts. The figure has two noteworthy features.

First, the estimated anchors increased moderately in 2013 and 2014 and remained positive in the following years. With the exception of the Type I forecast, inflation expectations were anchored at small values before the BOJ announced the 2 percent target in January 2013. The announcement of the 2 percent target succeeded in anchoring inflation expectations in a significantly positive range. Since the previous target rate was around 1 percent, the announcement of the 2 percent target was a dramatic change in the BOJ's commitment. In particular, when QQE was introduced on April 4, 2013,

---

[7] Specifically, we calculated the semi-annual series for types I and II by [(2nd quarter gap) + 3*(3rd quarter gap) + 3*(4th quarter gap)]/7 and the semi-annual series for types II and IV by [3*(1st quarter gap) + 2*(2nd quarter gap)]/5.

[8] In deriving each anchor, we adjusted the effects of monthly time dummies to be neutral for the anchor.

the BOJ pledged to achieve the 2 percent CPI price stability target "at the earliest possible time." The BOJ's new policy regime was able to shift the anchor of inflation expectations upward. However, the raised anchor never reached 2 percent. This means that the BOJ's commitment to the 2 percent inflation target could not anchor inflation expectations at the target rate. The CPI inflation rate, which turned positive after the introduction of QQE, began to decline in 2016. Forecasters no longer raised their anchored inflation expectations when the 2 percent target proved to be infeasible in the short run.

Second, the estimated anchors continued to rise after the global supply shocks became noticeable in 2022. In particular, the estimated anchor of type IV (the shortest-term) inflation expectations, which was close to zero in 2021, exceeded 2 percent after the CPI rose substantially. This is a remarkable change in the Japanese economy, as a similar change never occurred under QQE. The estimated anchors of longer-term inflation expectations are also approaching 2 percent. The global supply shocks raise the anchors of inflation expectations substantially when excluding the effects of the expected GDP gap and supply shocks. However, the increase in the anchor of type I (the longest-term) inflation expectations is still about the same as in 2014-2015. Given that the upward shift did not continue at in 2014-2015, it is still not clear whether the anchor of inflation expectations will remain at around 2 percent on a sustainable basis.

Even with a significant increase in the CPI, nominal wage growth has not kept pace with inflation in Japan. Inflation without real wage increases inevitably hurts consumer sentiment. The "Consumer Confidence Index" in the Cabinet Office's Consumer Confidence Survey still shows that consumer sentiment has not recovered sufficiently, even though the economy has recovered from COVID-19 and the stock market has been booming (**Figure 3**). Similar conservative views are confirmed by other surveys, such as the Cabinet Office's Economy Watchers Survey. Given the conservative consumer sentiment, it is too early to conclude that the Japanese economy will enter a new world with sufficiently high medium-term inflation expectations.

8. Concluding Remarks

In this study, we examined how the unconventional monetary policy and the global supply shocks have changed the anchors of inflation expectations using Japanese forecaster-level data in the "ESP Forecast". The estimated anchors of inflation expectations rose soon after the Bank of Japan launched unprecedented monetary easing in April 2013. However, the increase in each estimated anchors was temporary even under the unprecedented monetary easing. In contrast, the estimated anchors of inflation expectations rose significantly soon after the global supply shocks became noticeable in April 2022. The estimated anchor for the shortest-term inflation expectations exceeded 2 per cent after the CPI rose rapidly. However, the estimated anchors for longer-term inflation expectations still did not exceed 2 percent. This means that the rise in the CPI may significantly increase short-term inflation expectations, but may not sufficiently increase medium-term inflation expectations.

Amid rising prices, the BOJ ended its negative interest rate policy and yield curve control (YCC) in March 2024 and raised its policy rate to 0.25% in July 2024, moving toward a "normal monetary policy regime" in which interest rates are in positive territory. However, even after the end of the zero-interest-rate policy, it is likely that the BOJ will maintain its ultra-low interest rate policy unless Japan's medium-term inflation expectations exceed 2% on a sustainable basis. Despite a significant increase in the CPI, nominal wage growth did not keep pace with inflation. The spread of price increases, especially for daily necessities, became a major concern for the Japanese people, weakening consumer confidence and failing to break the vicious cycle of deflationary sentiment. In addition, the Japanese economy faces various structural problems, including a declining population and a fiscal deficit and resulting sluggish productivity, which are difficult to resolve in the short run. It is fair to say that unless Japan takes serious measures to address these structural problems, inflation expectations will not remain at 2 percent on a sustainable basis.

Appendix. Derivation of Equation (2) in the Basic Model

In this Appendix, we derive equation (2) by transforming an expectations-augmented Phillips curve (1). Denoting the inflation rate by Π_t, GDP gap by $lnY_t - lnY_t*$, and supply shock by U_t, the expectations-augmented Phillips curve is:

(A1) $\Pi_t = \Pi_t^e + \alpha\,(lnY_t - lnY_t*) + U_t.$

where the term Π_t^e is "the anchor of inflation expectations", which is independent of GDP gap and supply shocks.

We assume that forecasters form their inflation expectations based on equation (A1). We also assume that when forecasting the macroeconomic values at time t, they form their expectations based on both public and private information available at time t-1. Then, if we define the expectation operator of forecaster j's expectation operator based on information at time t-1 by $E_{j,t-1}$, we obtain

(A2) $$E_{j,t-1}\Pi_t = \Pi_t^e + \alpha \cdot E_{j,t-1}(lnY_t - lnY_t^*) + E_{j,t-1}U_t.$$

In the above equation, it is worth noting that the term Π_t^e has no subscript j. This is because the anchor of inflation expectations is an inflation forecast based only on public information at time t-1, so that it is common to all forecasters. We can interpret the superscript e as denoting the expectation operator based only on public information at time t-1.

We assume that potential real GDP, Y_t^*, grows without uncertainty in the short run. Then, it holds that

(A3) $$E_{j,t-1}(lnY_t - lnY_t^*) = E_{j,t-1}\Delta lnY_t - \Delta lnY_t^* + (lnY_{t-1} - lnY_{t-1}^*).$$

where $\Delta lnY_t \equiv lnY_t - lnY_{t-1}$ and $\Delta lnY_t^* \equiv lnY_t^* - lnY_{t-1}^*$. Substituting equation (A3) into equation (A2), we obtain

(A4) $$E_{j,t-1}\Pi_t = [\Pi_t^e + \alpha \{(lnY_{t-1} - lnY_{t-1}^*) - \Delta lnY_t^*\}] + [\alpha \cdot E_{j,t-1}\Delta lnY_t + E_{j,t-1}U_t].$$

where the expectation operator $E_{j,\tau}$ suggests that forecaster j forms his or her own expectation at period τ to forecast the value at period τ+1.

Equation (A4) implies that forecaster j's inflation expectation formed in period t-1 consists of two components. One is $[\Pi_t^e + \alpha \{(lnY_{t-1} - lnY^*) - \Delta lnY_t^*\}]$ which is common to all j. It is the sum of the anchor of inflation expectations and $\alpha\times$[realized GDP gap in period t-1 – potential GDP growth rate]. The other is $[\alpha \cdot E_{j,t-1}\Delta lnY_t + E_{j,t-1}U_t]$ which is heterogeneous across the forecasters. It is the sum of the $\alpha \times$ forecaster j's GDP growth rate expectations and forecaster j's supply shock expectations. In the estimations, we define $\mu_{t-1} \equiv [\Pi_t^e + \alpha \{(lnY_{t-1} - lnY_{t-1}^*) - \Delta lnY_t^*\}]$. We also assume that the expected supply shock is described by a linear combination of several expected supply shock, that is, $E_{j,t-1}U_t = \sum_{i=1}^{N} \beta_{i,t} E_{j,t-1}\Delta lnX_t^i$, where ΔlnX_t^i is supply shock i at period t. Then, equation (A4) leads to the following cross-sectional equation:

(A5) $$E_{j,\tau}\Pi_{\tau+1} = \mu_\tau + \alpha \cdot E_{j,\tau}\Delta lnY_{\tau+1} + \sum_{i=1}^{N} \beta_{i,t} E_{j,\tau}\Delta lnX_{\tau+1}^i + \varepsilon_{j\tau},$$

where $E_{j,\tau}\, \Pi_{\tau+1}$ = j's inflation forecast, $E_{j,\tau}\, \Delta lnY_{\tau+1}$ = j's real GDP growth rate forecast, and $E_{j,\tau} \Delta lnX^{i}_{\tau+1}$ = j's forecast of supply shocks, and $\varepsilon_{j\tau}$ = the disturbance term to capture exogenous shocks which are not explicitly incorporated in the model.

This derives equation (2) in the main text. In the main text, we estimated equation (A5) using forecaster-level data to derive the anchor of inflation expectations ${\Pi_{\tau+1}}^{e}$ in each period. The estimations were implemented by using the panel data in the ESP Forecast.

References

Beechey, M. J., B. K. Johannsen, and A. T. Levin, (2011), "Are long-run inflation expectations anchored more firmly in the Euro area than in the United States?" American Economic Journal: Macroeconomics, 3(2), pp.104–129.

Bernanke, B. S., T. Laubach, F. S. Mishkin, and A. S. Posen, (1999), Inflation Targeting: Lessons from the International Experience, Princeton University Press, Princeton, NJ.

Bundick, B., and A. Lee Smith, (2018), "Does communicating a numerical inflation target anchor inflation expectations? Evidence & bond market implications." Federal Reserve Bank of Kansas City, Research Working Paper no. 18-01, January.

Davis, S., (2014), "Inflation targeting and the anchoring of inflation expectations: Cross-country evidence from consensus forecasts." Globalization and Monetary Policy Institute Working Paper 174, Federal Reserve Bank of Dallas.

Ehrmann, M., (2015), "Targeting inflation from below: How do inflation expectations behave," International Journal of Central Banking, 11(S1), pp.213–249.

Fukuda, S., (2015), "Abenomics: Why was it so successful in changing market expectations?" Journal of the Japanese and International Economies, Volume 37, pp.1-20.

Fukuda, S., and N. Soma, (2019), "Inflation target and anchor of inflation forecasts in Japan," Journal of the Japanese and International Economies, Volume 52, Pages 154-170.

Fujiwara, I., Y. Nakazono, and K. Ueda, (2015), "Policy regime change against chronic deflation? Policy option under a long-term liquidity trap," Journal of the Japanese and International Economies, Volume 37, pp.59-81.

Gürkaynak R. S., A. T. Levin, and E. T. Swanson, (2010), "Does inflation targeting anchor long-run inflation expectations? Evidence from long-term bond yields in the U.S., U.K., and Sweden." Journal of the European Economic Association, 8(6), pp.1208–1242.

Hattori, M., and J. Yetman, (2017), "The evolution of inflation expectations in Japan," Journal of the Japanese and International Economies, Volume 46, Pages pp.53-68.

Ito, T., (2021), "An Assessment of Abenomics: Evolution and Achievements," Asian Economic Policy Review, Volume 16, Issue 2, pp.190-219.

Johnson, D. R., (2002), "The effect of inflation targeting on the behavior of expected inflation: Evidence from an 11 country panel," Journal of Monetary Economics 49 (8): pp.1521–38.

Kumar, S., H. Afrouzi, O. Coibion, and Y. Gorodnichenko, (2015), "Inflation targeting does not anchor inflation expectations: Evidence from firms in New Zealand." Brookings Papers on Economic Activity, Fall, pp.151– 225.

Nishizaki, K., T. Sekine, and Y. Ueno (2014) "Chronic deflation in Japan." Asian Economic Policy Review, 9(1), pp.20–39.

Rülke, J.-C., (2012), "Do professional forecasters apply the Phillips curve and Okun's law? Evidence from six Asian-Pacific countries," Japan and the World Economy, Volume 24, Issue 4, pp.317-324.

Watanabe, K., and T. Watanabe, (2018), "Why Has Japan Failed to Escape from Deflation?" Asian Economic Policy Review, Volume 13, Issue 1, pp. 23-41.

Yetman, J., (2017), "The evolution of inflation expectations in Canada and the US," Canadian Journal of Economics, vol. 50(3), pp.711-737.

Table 1. Timeline of Japan's Unconventional Monetary Policy

Date	Description		Governor
5-Oct-10	Comprehensive Monetary Easing		Shirakawa
22-Jan-13	The "2% Price Stability Target" under the Framework for the Conduct of Monetary Policy		Shirakawa
4-Apr-13	Introduction of the "Quantitative and Qualitative Monetary Easing (QQE)"	QQE1	Kuroda
31-Oct-14	Expansion of the Quantitative and Qualitative Monetary Easing	QQE2	Kuroda
29-Jan-16	Introduction of "Quantitative and Qualitative Monetary Easing with a Negative Interest Rate (the Negative Interest Rate Policy)"	NIRP1	Kuroda
21-Sep-16	New Framework for Strengthening Monetary Easing: "QQE with Yield Curve Control (YCC)"	NIRP2	Kuroda
19-Mar-24	Changes in the Monetary Policy Framework: Termination of QQE with YCC and the Negative Interest Rate Policy. The BOJ will encourage the uncollateralized overnight call rate to remain at around 0 to 0.1 percent.		Ueda
31-Jul-24	The BOJ will encourage the uncollateralized overnight call rate to remain at around 0.25 percent.		Ueda

Source: The Bank of Japan.

Table 2. The BOJ's Point Estimates of Core CPI Inflation Rates

forecast origin	Estimated fiscal year T							
	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018
April in T-2	NA	NA	NA	NA	1.9	2.1	1.9	1.9
July in T-2	NA	NA	NA	NA	1.9	2.1	1.8	1.9
Oct. in T-2	-0.4	0.6	0.5	0.8	1.9	2.1	1.8	1.7
Jan. in T-1	-0.2	0.6	0.5	0.9	1.9	2.2	1.8	1.7
April in T-1	0.1	0.7	0.7	1.4	1.9	2	1.7	1.7
July in T-1	0.1	0.7	0.7	1.3	1.9	1.9	1.7	1.5
Oct. in T-1	0.1	0.1	0.4	1.3	1.7	1.4	1.5	1.4
Jan. in T	0.3	0.1	0.4	1.3	1.0	0.8	1.5	1.4
April in T	0.7	0.3	0.7	1.3	0.8	0.5	1.4	1.3
July in T	0.7	0.2	0.6	1.3	0.7	0.1	1.1	1.1
Oct. in T	0.0	-0.1	0.7	1.2	0.1	-0.1	0.8	0.9
Jan. in T+1	-0.1	-0.2	0.7	0.9	0.1	-0.2	0.8	0.8
April in T+1	0.0	-0.2	0.8	0.8	0.0	-0.3	0.7	0.8
realized rate	0.0	-0.2	0.8	0.8	0.0	-0.2	0.7	0.8

forecast origin	Estimated fiscal year T							
	FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	FY2025	FY2026
April in T-2	1.9	1.8	1.6	0.7	1.0	1.1	1.6	1.9
July in T-2	1.8	1.6	1.6	0.7	1.0	1.3	1.6	1.9
Oct. in T-2	1.8	1.5	1.5	0.7	1.0	1.6	1.7	NA
Jan. in T-1	1.8	1.4	1.4	0.7	1.1	1.8	1.8	NA
April in T-1	1.8	1.3	0.35	0.8	1.1	2.0	1.9	NA
July in T-1	1.5	1.2	0.3	0.9	1.4	1.9	2.1	NA
Oct. in T-1	1.4	1.0	0.4	0.9	1.6	2.8	NA	NA
Jan. in T	0.9	0.9	0.5	1.1	1.6	2.4	NA	NA
April in T	0.9	-0.6	0.1	1.9	1.8	2.8	NA	NA
July in T	0.8	-0.6	0.6	2.3	2.5	2.5	NA	NA
Oct. in T	0.5	-0.7	0.0	2.9	2.8	NA	NA	NA
Jan. in T+1	0.4	-0.6	0.0	3.0	2.8	NA	NA	NA
April in T+1	0.4	-0.5	0.1	3.0	2.8	NA	NA	NA
realized rate	0.4	-0.5	0.1	3.0	2.8	NA	NA	NA

Source: Outlook for Economic Activity and Prices, the Bank of Japan.

Table 3. The Basic Statistics of Forecasted Values

(1) Real GDP growth rate

		Jan. in T−1	July in T−1	Jan. in T	July in T	Jan. in T+1
FY2010	average	1.21	1.11	1.25	2.47	3.22
	standard deviation	0.52	0.61	0.39	0.33	0.18
FY2011	average	1.65	1.81	1.39	0.17	−0.33
	standard deviation	0.38	0.43	0.33	0.40	0.27
FY2012	average	2.06	2.92	1.89	2.32	0.99
	standard deviation	0.30	0.35	0.43	0.22	0.15
FY2013	average	1.42	1.59	1.61	2.75	2.53
	standard deviation	0.51	0.39	0.43	0.25	0.12
FY2014	average	0.23	0.58	0.84	0.85	−0.60
	standard deviation	0.56	0.48	0.35	0.31	0.15
FY2015	average	1.35	1.35	1.75	1.66	1.05
	standard deviation	0.32	0.28	0.36	0.24	0.11
FY2016	average	1.63	1.73	1.44	0.62	1.21
	standard deviation	0.38	0.30	0.26	0.26	0.10
FY2017	average	0.06	0.84	1.12	1.40	1.88
	standard deviation	0.31	0.30	0.24	0.16	0.11
FY2018	average	1.02	1.10	1.26	1.08	0.69
	standard deviation	0.36	0.28	0.22	0.18	0.13
FY2019	average	0.77	0.8	0.70	0.53	0.88
	standard deviation	0.25	0.19	0.13	0.2	0.15
FY2020	average	0.58	0.48	0.51	−5.44	−5.46
	standard deviation	0.25	0.17	0.21	1.1	0.24
FY2021	average	0.68	3.29	3.31	3.63	2.72
	standard deviation	0.25	0.8	0.61	0.53	0.21
FY2022	average	1.71	2.66	3.07	2	1.61
	standard deviation	0.44	0.48	0.43	0.4	0.15
FY2023	average	1.38	1.42	1.06	1.15	1.52
	standard deviation	0.41	0.45	0.34	0.27	0.09
FY2024	average	0.96	1.07	0.89	NA	NA
	standard deviation	0.34	0.31	0.25	NA	NA
FY2025	average	0.90	NA	NA	NA	NA
	standard deviation	0.24	NA	NA	NA	NA

Table 3. The Basic Statistics of Forecasted Values (continued)

(2) Core CPI inflation rate

		Jan. in T−1	July in T−1	Jan. in T	July in T	Jan. in T+1
FY2010	average	0.19	−0.51	−0.93	−0.92	−0.85
	standard deviation	0.41	0.43	0.32	0.18	0.08
FY2011	average	−0.31	−0.05	−0.18	0.50	−0.10
	standard deviation	0.32	0.20	0.19	0.22	0.09
FY2012	average	0.14	0.33	−0.20	0.06	−0.15
	standard deviation	0.27	0.29	0.26	0.14	0.07
FY2013	average	0.14	0.20	0.10	0.36	0.72
	standard deviation	0.26	0.21	0.25	0.14	0.09
FY2014	average	2.34	2.71	0.88	1.12	0.95
	standard deviation	0.38	0.32	0.30	0.17	0.08
FY2015	average	0.97	1.79	0.84	0.33	0.11
	standard deviation	0.41	0.38	0.33	0.22	0.07
FY2016	average	1.27	1.22	0.82	0.03	−0.25
	standard deviation	0.48	0.41	0.33	0.24	0.06
FY2017	average	1.13	0.72	0.77	0.70	0.66
	standard deviation	0.35	0.42	0.24	0.15	0.08
FY2018	average	0.99	0.89	0.88	0.9	0.85
	standard deviation	0.35	0.31	0.28	0.19	0.09
FY2019	average	0.90	0.88	0.68	0.38	0.2
	standard deviation	0.40	0.35	0.33	0.26	0.15
FY2020	average	0.73	0.36	0.16	−0.94	−0.88
	standard deviation	0.31	0.36	0.21	0.32	0.2
FY2021	average	0.61	0.2	0.16	0.27	−0.01
	standard deviation	0.19	0.27	0.29	0.18	0.08
FY2022	average	0.48	0.54	0.80	2.11	2.81
	standard deviation	0.30	0.22	0.26	0.21	0.1
FY2023	average	0.65	1.07	1.79	2.61	2.84
	standard deviation	0.31	0.32	0.34	0.26	0.09
FY2024	average	1.15	1.67	2.19	NA	NA
	standard deviation	0.49	0.55	0.38	NA	NA
FY2025	average	1.63	NA	NA	NA	NA
	standard deviation	0.41	NA	NA	NA	NA

Table 4. Basic Estimation Results

(a). Type I (medium-term) forecasts

	Constant term	Real GDP growth	NY WTI oil price	USD/Yen rate	# of obs.	R-squared	Horizon dummies
2012 10-12	0.233**	0.299***	-0.605	1.399	96	0.207	YES
	(0.114)	(0.068)	(0.552)	(1.418)			
2013 06-12	0.301**	0.475***	1.895***	-0.619	221	0.272	YES
	(0.117)	(0.068)	(0.516)	(0.948)			
2014 06-12	0.955***	0.167	1.376***	3.993***	225	0.116	YES
	(0.160)	(0.103)	(0.478)	(1.299)			
2015 06-12	1.202***	0.090	0.764**	-2.015	223	0.070	YES
	(0.100)	(0.090)	(0.300)	(1.369)			
2016 06-12	0.355***	0.593***	0.528**	0.643	223	0.448	YES
	(0.077)	(0.048)	(0.227)	(0.682)			
2017 06-12	0.511***	0.626***	0.417	-2.406***	238	0.249	YES
	(0.109)	(0.096)	(0.424)	(0.906)			
2018 06-12	0.568***	0.449***	0.817**	2.327***	202	0.378	YES
	(0.088)	(0.058)	(0.345)	(0.567)			
2019 06-12	0.699***	0.281***	1.666***	1.191*	226	0.266	YES
	(0.080)	(0.085)	(0.312)	(0.679)			
2020 06-12	0.884***	-0.170***	-0.367**	6.530***	203	0.229	YES
	(0.108)	(0.043)	(0.149)	(1.300)			
2021 06-12	0.332***	0.308***	0.019	-3.885***	218	0.357	YES
	(0.067)	(0.031)	(0.313)	(1.075)			
2022 06-12	0.643***	0.452***	0.791***	2.124***	192	0.277	YES
	(0.123)	(0.090)	(0.277)	(0.653)			
2023 06-12	1.226***	0.528***	1.178***	3.582***	210	0.266	YES
	(0.171)	(0.172)	(0.369)	(0.541)			

Table 4. Basic Estimation Results (continued)

(b). Type II (medium-term) forecasts

	Constant term	Real GDP growth	NY WTI oil price	USD/Yen rate	# of obs.	R-squared	Horizon dummies
2012 01-05	-0.141	0.229***	0.206	-0.332	150	0.160	YES
	(0.098)	(0.057)	(0.605)	(0.064)			
2013 01-05	0.444***	0.153***	0.549	0.559	164	0.122	YES
	(0.061)	(0.049)	(0.595)	(0.083)			
2014 01-05	0.397***	0.457***	1.510	1.472***	158	0.289	YES
	(0.103)	(0.075)	(0.921)	(0.091)			
2015 01-05	0.210	0.350***	2.357**	1.879***	169	0.280	YES
	(0.164)	(0.101)	(1.106)	(0.095)			
2016 01-05	0.727***	0.378***	0.453	0.743***	168	0.247	YES
	(0.073)	(0.090)	(0.580)	(0.107)			
2017 01-05	0.329***	0.514***	-0.996**	1.067***	178	0.405	YES
	(0.087)	(0.077)	(0.490)	(0.067)			
2018 01-05	0.393***	0.734***	0.737	1.285***	182	0.383	YES
	(0.099)	(0.098)	(0.479)	(0.075)			
2019 01-05	0.286***	0.391***	1.487***	0.411	153	0.319	YES
	(0.089)	(0.110)	(0.493)	(0.098)			
2020 01-05	-0.405	-0.005	1.715	0.755***	126	0.413	YES
	(0.247)	(0.055)	(1.068)	(0.238)			
2021 01-05	0.913***	-0.152**	1.234*	0.337	144	0.138	YES
	(0.171)	(0.071)	(0.727)	(0.074)			
2022 01-05	0.271**	0.419***	-0.084	0.326*	145	0.418	YES
	(0.118)	(0.053)	(0.753)	(0.095)			
2023 01-05	1.290***	0.389***	2.504***	1.564***	133	0.409	YES
	(0.172)	(0.122)	(0.954)	(0.123)			
2024 01-03	1.645***	-0.038	-0.130	1.442*	84	0.061	YES
	(0.325)	(0.269)	(1.185)	(0.142)			

Table 4. Basic Estimation Results (continued)

(c). Type III (short-term) forecasts

	Constant term	Real GDP growth	NY WTI oil price	USD/Yen rate	# of obs.	R-squared	Horizon dummies
2012 06-12	-0.294***	0.234***	-1.079***	0.714***	228	0.266	YES
	(0.063)	(0.040)	(0.374)	(0.053)			
2013 06-12	0.436***	0.343***	0.144	1.065***	228	0.293	YES
	(0.058)	(0.062)	(0.510)	(0.063)			
2014 06-12	0.182	0.496***	1.076*	1.240***	245	0.289	YES
	(0.134)	(0.069)	(0.581)	(0.095)			
2015 06-12	0.217*	0.421***	-0.697	0.301	251	0.194	YES
	(0.128)	(0.082)	(0.971)	(0.095)			
2016 06-12	0.229***	0.321***	1.832***	1.093***	258	0.299	YES
	(0.082)	(0.069)	(0.329)	(0.064)			
2017 06-12	0.245**	0.513***	0.777*	0.767***	274	0.252	YES
	(0.122)	(0.096)	(0.423)	(0.068)			
2018 06-12	0.558***	0.247***	2.324***	0.957***	251	0.188	YES
	(0.079)	(0.093)	(0.449)	(0.078)			
2019 06-12	0.199***	0.031	2.892***	0.779**	234	0.178	YES
	(0.055)	(0.082)	(0.639)	(0.068)			
2020 06-12	-0.022	0.056*	2.260**	0.141	204	0.068	YES
	(0.109)	(0.031)	(1.117)	(0.102)			
2021 06-12	0.757***	0.012	0.637	0.514***	225	0.120	YES
	(0.137)	(0.044)	(0.955)	(0.067)			
2022 06-12	1.754***	0.088	2.007***	0.255	196	0.404	YES
	(0.102)	(0.065)	(0.484)	(0.085)			
2023 06-12	2.083***	0.248**	2.057***	1.696***	211	0.418	YES
	(0.114)	(0.101)	(0.546)	(0.095)			

Table 4. Basic Estimation Results (continued)

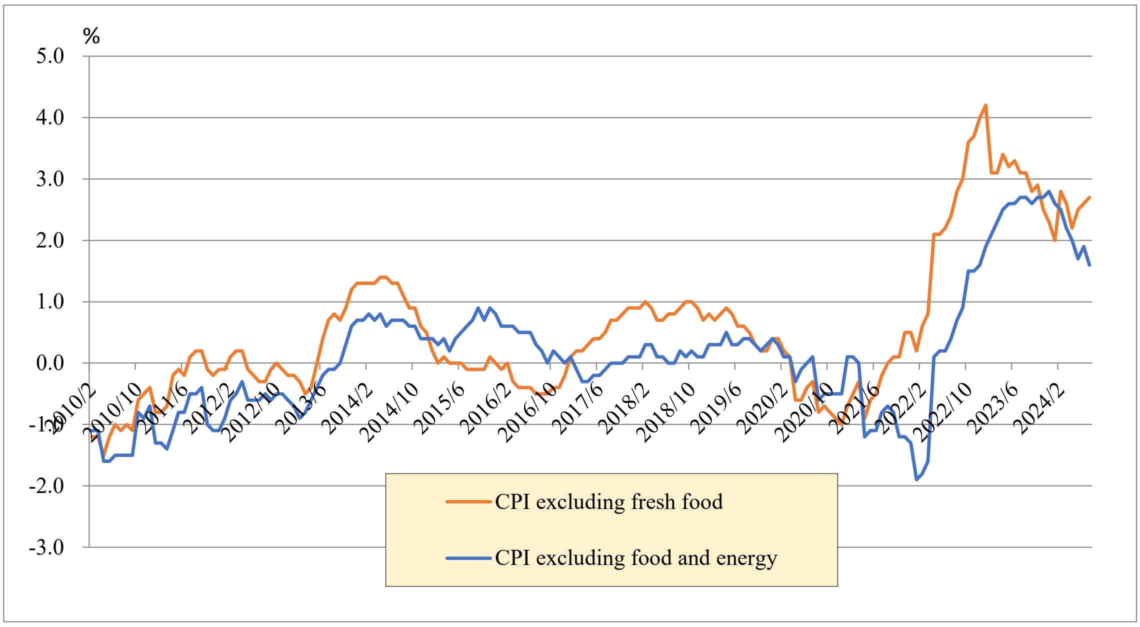
(d). Type IV (short-term) forecasts

	Constant term	Real GDP growth	NY WTI oil price	USD/Yen rate	# of obs.	R-squared	Horizon dummies
2012 01-05	-0.307**	0.174**	1.215	0.532**	167	0.323	YES
	(0.141)	(0.068)	(0.766)	(0.056)			
2013 01-05	0.032	0.106	0.688	0.658**	173	0.176	YES
	(0.159)	(0.065)	(0.516)	(0.081)			
2014 01-05	0.837***	0.175**	1.601**	0.520	175	0.106	YES
	(0.065)	(0.076)	(0.713)	(0.067)			
2015 01-05	0.069	0.114*	-0.247	1.322***	187	0.409	YES
	(0.116)	(0.068)	(0.952)	(0.067)			
2016 01-05	0.065	0.135*	0.305	0.642**	189	0.433	YES
	(0.082)	(0.079)	(0.812)	(0.090)			
2017 01-05	0.323***	0.319***	0.814*	0.788**	198	0.170	YES
	(0.117)	(0.076)	(0.453)	(0.056)			
2018 01-05	0.194*	0.647***	1.234**	0.877***	194	0.350	YES
	(0.116)	(0.096)	(0.545)	(0.054)			
2019 01-05	0.521***	-0.150	3.437***	0.442	166	0.262	YES
	(0.090)	(0.116)	(1.178)	(0.106)			
2020 01-05	-0.620**	0.099**	3.715*	0.394	144	0.598	YES
	(0.261)	(0.044)	(2.099)	(0.281)			
2021 01-05	0.171	0.018	4.463***	0.555*	170	0.182	YES
	(0.143)	(0.038)	(0.916)	(0.072)			
2022 01-05	1.849***	0.024	1.703	0.838***	160	0.662	YES
	(0.130)	(0.053)	(1.143)	(0.078)			
2023 01-05	2.349***	-0.006	-0.183	1.461***	155	0.403	YES
	(0.106)	(0.054)	(0.905)	(0.088)			
2024 01-03	2.391***	0.099	3.667**	2.046***	95	0.219	YES
	(0.141)	(0.162)	(1.623)	(0.121)			

Note 1) Robust standard errors in parentheses.

2) *** p<0.01, ** p<0.05, * p<0.1.

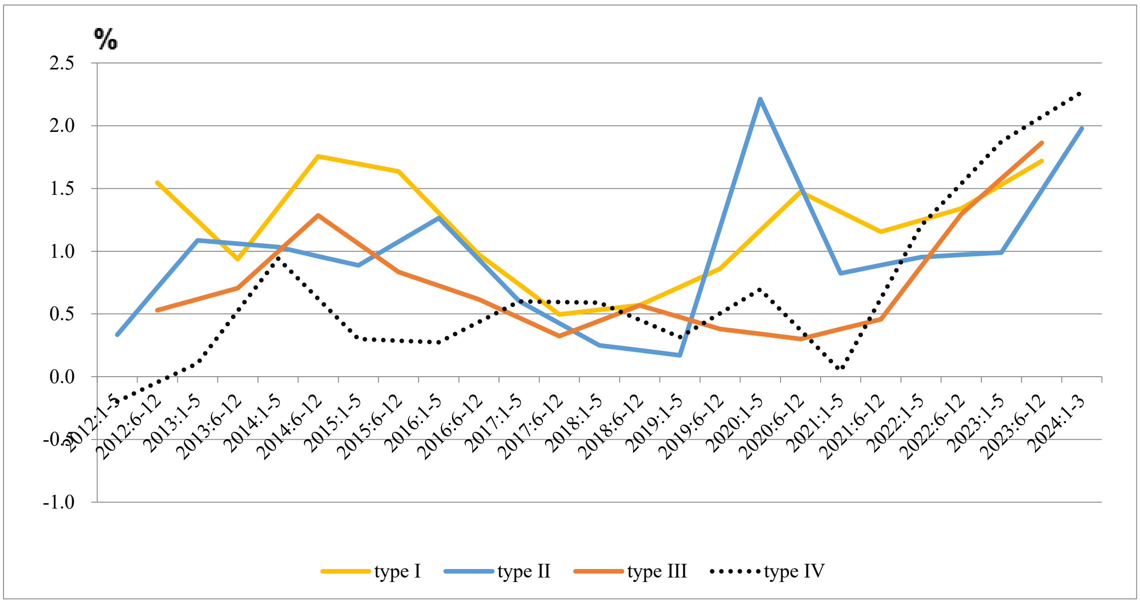
Figure 1. The CPI inflation Rate in Japan



Note: The direct effects of consumption tax hikes are excluded in the inflation rates.

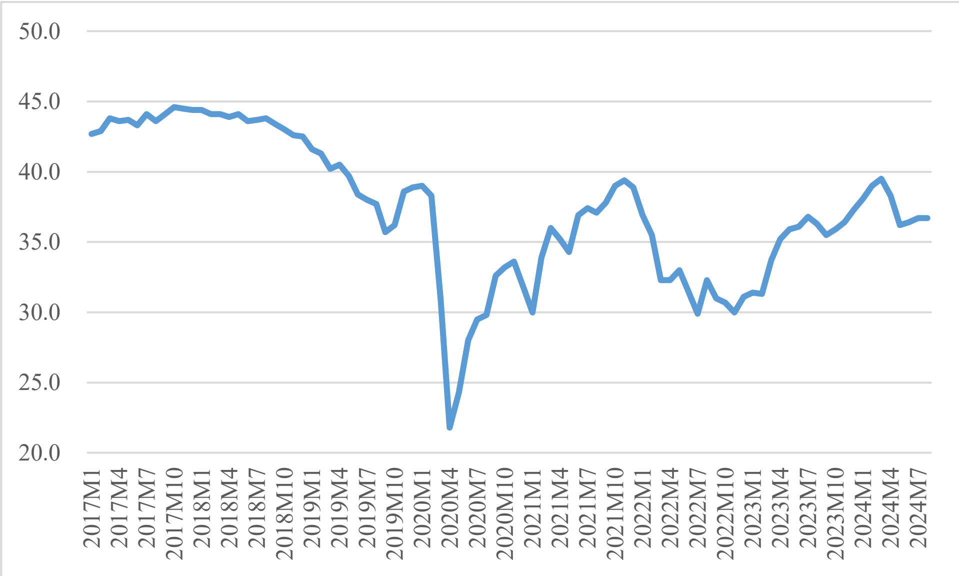
Source: Consumer Price Index, Statistics Bureau, Ministry of Internal Affairs and Communications.

Figure 2. Estimated Anchor of Inflation Expectations



Note: The vertical axis is the estimated anchor of inflation expectations.

Figure 3. Consumer Confidence Index in Japan



Source: Consumer Confidence Survey, Cabinet Office.