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Abstract

The purpose of this study is to examine how short-term and medium-term inflation expectations evolved on a sustained basis 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 anchor of inflation expectations increased significantly after the Bank of Japan launched unprecedented monetary easing in April 2013. However, the increase was not only modest but also temporary. In contrast, the estimated anchor continued to rise after the global supply shocks became noticeable in April 2022. The estimated anchor has already exceeded 2% for short-term inflation expectations and is approaching 2% for medium-term inflation expectations. This means that the global supply shocks and the subsequent depreciation of the yen 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% 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

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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 (see, for example, Fukuda (2015) for an early assessment and Ito (2021) for an overall assessment of Abenomics). 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 natural resource and food prices surged worldwide, causing severe inflation (see, for example, Matsumoto et al. (2023) for the effects of commodity prices on global economic activity). As a result of global inflation and the subsequent depreciation of the yen, Japan's consumer price index (CPI) temporarily exceeded 4% in December 2022 and January 2023, the highest since 1991, suggesting that Japan is showing signs of a virtuous cycle after lost decades of stagnation. The Japan's CPI (all items excluding fresh food) 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 more than a quarter of a century. 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 certain items such as food and energy. Persistent inflation would occur if prices of a broad range of items rose. Thus, even with the current price increases, it is still far from clear whether the Japanese economy will truly normalize and break out of the "deflationary mindset" that has persisted for many years.

The purpose of this study is to examine how short-term and medium-term inflation expectations evolved on a sustained basis in Japan under the unprecedented monetary easing and the global supply shocks. To examine the sustainability 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 (Economy, Society, Policy) Forecast. For the BOJ to achieve its 2% price stability target, 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 inflation expectations on a sustained basis. Therefore, 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 without 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. 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.[1] 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 anchor of private inflation expectations.

First, the estimated anchor rose after the BOJ began unprecedented monetary easing in April 2013. Except for short-term expectations, the estimated anchor exceeded 1% after April 2013. This means that the unprecedented monetary easing succeeded in raising inflation expectations. However, the estimated anchor never reached the 2% target. Instead, it continued to fall after 2016. After it became clear that the 2% target was not feasible in the medium term, Japanese forecasters began to think that the 2% target was not realistic when forming their inflation expectations.

Second, the estimated anchor of inflation expectations continued to rise after the global supply shocks became noticeable in April 2022. The estimated anchor of short-term inflation expectations, which was close to zero in 2021, exceeded 2%. The estimated anchor of medium-term inflation expectations is also approaching 2%. This implies that the rise in the CPI amid the global supply shocks and the subsequent depreciation of the yen has significantly increased the anchor of inflation expectations. However, the increased anchor in long-term inflation expectations is still about the same as that in 2014-2015. Given that the upward shift did not continue in 2014-2015, it is not clear whether the Japanese economy will be able to achieve the 2% 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

[1] Rülke (2012) confirmed that professional forecasters applied the Phillips curve when forming their expectations in six Asian-Pacific countries.

al. [1999]). A number of empirical studies in other advanced countries have provided support for this view. For example, 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. Ehrmann (2015) showed that inflation expectations had been anchored with an inflation target even when inflation was persistently weak.

However, during the prolonged period of low inflation in Japan, the BOJ was a 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.[2] The sharp global supply shocks and the subsequent depreciation of the yen have changed this price-stable world in Japan. However, it is far from clear whether inflation targeting and the rise in consumer prices will permanently normalize medium-term inflation expectations, which is essential for achieving the 2% price stability target in the long run.

Even with a significant increase in the CPI, nominal wage growth has not kept pace with inflation in Japan. Real wage growth was negative from April 2022 to May 2024 for "total cash earnings" and from February 2022 to September 2024 for "contractual cash earnings". Inflation without wage increases inevitably hurt 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 enter a new normalized world with sufficiently high medium-term inflation expectations.

2. Alternative Inflation Expectations

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[2] Nishizaki et al. (2014) discussed the occurrence of a prolonged but mild deflation, reflecting various underlying structural features of the Japanese economy. Fujiwara et al. (2015) found no significant difference in public perceptions before and after the introduction of Abenomics. Hattori & Yetman (2017) found that the extent to which inflation expectations were anchored by the inflation target remained significantly lower in Japan than in a similar study of Canadian and U.S. forecasters. Watanabe & Watanabe (2018) argued that Japan failed to escape deflation because keeping prices unchanged was the default position for firms. Hogen & Okuma (2025) showed that declining inflation expectations improved under Abenomics, but not enough.

The following analysis examines the persistence of inflation in Japan using Japanese forecaster-level data in the ESP Forecast. 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. In the sense that it sends questionnaires to professional economists, the ESP Forecast is similar to the Consensus Forecast that 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 the Consensus Forecast. More importantly, the ESP Forecast includes forecaster-level data on 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.

There are several alternative ways of measuring inflation expectations. Consumer surveys, including those conducted by the BOJ and the Cabinet Office, provide useful information on how consumers feel about current and future prices. However, consumer surveys tend to significantly overestimate inflation expectations. For example, the BOJ's "The Opinion Survey on the General Public's Views and Behavior," which asks consumers about their inflation expectations for one and five years ahead, in addition to those for the current year. As shown in **Figure 2**, their averages have consistently been well above the actual inflation rate. During the period of the unprecedented unconventional monetary easing, the average inflation expectations were almost always above 4%, even after the actual inflation rate had fallen to close to 0%. Since the fall of 2022, when global supply shocks and the subsequent yen depreciation led to significant inflation, consumers' average inflation expectations have jumped to about 15% for the current year, 10% for the year ahead, and 8% for the five years ahead. This contrasts with actual inflation, which temporarily exceeded 4% but subsequently hovered around 2%. The overestimates are partly due to the extremely high expectations of some respondents. However, even when looking at median inflation expectations, which are not affected by extreme responses, consumers still tend to overestimate inflation rate.

On the other hand, business surveys, including those conducted by the BOJ and the Cabinet Office, provide useful information on how private firms view current and future prices. However, it is well known that firms in business surveys are pessimistic about the rate of increase in their own selling prices. For example, in "The Average of Enterprises' Inflation Outlook" of the BOJ's Tankan Survey, private firms were asked about their one-year, three-year, and five-year outlook for their selling prices as well as for overall prices in the economy. The outlook shows that the expected overall prices tended to change roughly in line with the actual inflation rate. However, except for the one-year outlook after the fall of 2022, the outlook shows that the expected changes in selling prices were much lower than those in overall prices. In particular, the three-year and five-year outlooks show that the expected selling price changes were much lower than the expected overall price changes, even after the fall of 2022.

Unlike consumer and business surveys, market-based expectations, which are average inflation expectations of market participants, change roughly in line with actual inflation. They are derived from financial instruments and provide real-time inflation expectations. Break-even inflation rates, which are calculated from the spread between the yield on government bonds and the yield on inflation-indexed government bonds of the same maturity, are widely used market-based inflation expectations for various time horizons. In Japan, the break-even inflation rates are close to the actual inflation rate and do not have serious biases. However, the mechanism behind the formation of market-based inflation expectations is a black box, and its determinants are more difficult to elucidate than the survey inflation forecasts.

The ESP Forecast has an advantage over these alternative inflation expectations in that it provides short- and long-term forecasts of future inflation, as well as forecasts of several other macroeconomic variables. By using forecasts for different macroeconomic variables simultaneously, it is possible to analyze the mechanisms behind the formation of expectations and their determinants. In addition, unlike surveys of consumers and firms, where extreme biases in expectation formation tend to occur, the ESP Forecast, which is based on surveys of economic forecasting experts, can provide reasonable expectations that are formed with a certain degree of "rationality".

3. Key Features of Inflation Forecasts in Japan

3.1. Monetary regimes

Before estimating the "anchored inflation expectations" using the ESP Forecast, this section provides an overview of how Japan's medium-term inflation forecasts have been biased under different monetary policy regimes from 2010 to 2023. As summarized in **Table 1**, the BOJ adopted a number of unconventional monetary policies after 2010.

When Mr. Shirakawa was governor, the BOJ launched "comprehensive monetary easing" on October 5, 2010. However, in the Shirakawa regime, the monetary easing was relatively moderate, as the implicit CPI inflation target was around 1% until the BOJ introduced the explicit 2% price stability target on January 22, 2013. In contrast, after Mr. Kuroda became governor, the BOJ became aggressive in its unconventional policies to achieve the 2% target. The Kuroda regime introduced "quantitative and qualitative monetary easing (QQE)" on April 4, 2013, and introduced two new monetary policy frameworks: "QQE with negative interest rate" on January 29, 2016, and "QQE with yield curve control (YCC)" on September 21, 2016. However, the 2% price stability target was never achieved until the global supply shocks and the subsequent depreciation of the yen pushed Japan's CPI well above 2% since April 2022. It was March 19, 2024 when the new governor, Mr. Ueda, ended the unconventional policies as CPI inflation continued to exceed the 2% target.

QQE of the Kuroda regime initially brought the inflation rate into positive territory. It also improved the negative GDP gap to positive. However, it failed to improve consumer sentiment and increase bank lending or risky investment to the corporate sector (see, for example, Harimaya & Jinushi (2023), Gunji (2024), and Mineyama & Tokuoka (2025)). The potential GDP growth remained low under QQE. Some critics argue that QQE was maintained for too long as the benefits had diminished and the side effects had increased. They also argue that the timing of the adjustment and eventual termination of unconventional policies was too late. Even in the Ueda administration, monetary policy normalization has been slow, although CPI inflation has continued to exceed the 2% target. However, an earlier normalization of monetary policy may remove various side effects of unconventional policies in Japan.

3.2. Forecast biases under different monetary policy regimes

We examine how medium-term inflation forecasts for the core inflation rate of CPI (all items less fresh food), which excludes the direct effects of consumption tax hikes, have been formed by the BOJ and private forecasters under these monetary regimes. In its Outlook for Economic Activity and Prices, the BOJ publishes the median of the Policy Board members' forecasts for the core inflation rate four times a year. The ESP Forecast, in which about 40 leading professional forecasters from private Japanese institutes participate, publishes the average of the forecasts for the after-tax core inflation rate every month. **Figure 3 (1)** shows the medium-term forecast error of the BOJ's Outlook and the ESP Forecast on the core-inflation rate in FY T+2, respectively. The BOJ's error is that of the April forecast formed in FY T for the core inflation rate in FY T+2, while the ESP Forecast's error is that of the July forecast formed in FY T for the core inflation rate in FY T+2.[3]

[3] Before T = 2012, both the BOJ's and he ESP Forecast's errors are those of the October forecast

The figure shows the BOJ's medium-term inflation forecast error when the forecast origin was from T = 2008 to T = 2022. The forecast error changed significantly depending on the monetary policy regime. In the Shirakawa regime, the BOJ's forecast error was not only modest, but also did not show any noticeable bias. In the Kuroda regime, however, the BOJ's forecast error took large positive values until T = 2019. This means that the BOJ's medium-term inflation forecast was significantly biased upwards for most of the Kuroda regime. This was because the BOJ raised its medium-term inflation forecasts after the announcement of the 2% price stability target, but realized inflation was much lower than the target rate until 2021. In contrast, the BOJ's forecast error took large negative values when the forecast origin was after 2020. This means that the BOJ's medium-term inflation forecast formed after 2020 was significantly biased downward. This happened because the global supply shocks and subsequent yen’s depreciation caused unexpectedly high inflation when the BOJ significantly lowered its medium-term inflation forecasts.

Similar features can be observed for inflation forecasts in the ESP Forecast, although the biases were relatively small in the Kuroda regime. The figure shows that the medium-term inflation forecast error of the ESP Forecast also changed depending on the monetary policy regime. As in the case of the BOJ forecast, the forecast error was not only modest but also showed no noticeable bias in the Shirakawa regime. In the Kuroda regime, however, the ESP Forecast showed upward biases in its medium-term inflation forecast until the forecast origin was T = 2019. The upward biases were much smaller than those of the BOJ, but still significant. That is, the BOJ's 2% price stability target partly raised the medium-term inflation forecasts in the ESP Forecast, even though realized inflation was much lower than the target rate. The BOJ's assessment of the economic outlook changed private expectations, as noted in Tanahara et al. (2023) and Yano et al. (2025). In contrast, the ESP Forecast showed downward biases in its medium-term inflation forecast formed after T = 2020. The downward biases were slightly larger than those of the BOJ. The larger biases occurred because the private forecasters had lower medium-term inflation forecasts than the BOJ before the outbreak of unexpectedly high inflation.

3.3. Comparison with GDP growth forecasts

In the previous subsections, we showed that the medium-term inflation forecast error, which was modest and less biased in the Shirakawa regime, had a large upward bias in the Kuroda regime and a

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formed in FY T for the core inflation rate in FY T+2.

large downward bias in the global supply shock regime. These features were common to both the BOJ forecast and the ESP Forecast. The purpose of this section is to examine whether similar regime-specific features can be observed in the GDP growth forecasts.

Both the BOJ's Outlook and the ESP Forecast release their forecasts for the real GDP growth rate when they release their forecasts for the inflation rate. **Figure 3 (2)** shows the medium-term forecast error of the real GDP growth rate of the BOJ's Outlook and the ESP Forecast when the forecast origin was from T = 2008 to T = 2022. The forecast error of the BOJ's Outlook is that of the April forecast formed T for the real GDP growth rate in FY T+2, while the error of the ESP Forecast is that of the July forecast formed in FY T for the real GDP growth rate in FY T+2. In both the BOJ's Outlook and the ESP Forecast, we can observe a large positive error in forecasting GDP growth in FY2020 when the COVID-19 caused an unexpectedly severe recession. We can also observe a slight tendency for the average forecast error to be positive. This means that GDP growth forecasts in the BOJ's Outlook and the ESP Forecast have been slightly optimistic throughout the sample period.

However, in contrast to the inflation forecasts, we do not observe any striking regime-specific biases in the GDP growth forecasts for either the BOJ's Outlook or the ESP Forecast. In the Kuroda regime, while the inflation forecasts had a large upward bias, the GDP growth forecasts had no such bias, except for the GDP growth forecasts in FY2020. After the global supply shocks caused unexpectedly high inflation, although the inflation forecasts had a large downward bias, the GDP growth forecasts had no such bias. This implies that the regime-specific biases in inflation forecasts were not due to biases in GDP forecasts, but to something else.

Unexpected supply shocks and the subsequent depreciation of the yen may have partly caused regime-specific biases in inflation forecasts, especially in the global supply shock regime. However, the regime-specific anchor of inflation expectations may be an alternative source of regime-specific biases in inflation forecasts. Therefore, it is worth investigating how the anchor of inflation expectations, especially that of medium-term expectations, has changed over time. The following analysis examines this question using the forecaster-level data in the ESP Forecast.

4. The Basic Model

The purpose of the following sections is to examine the extent to which the BOJ's unconventional policies 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, 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 is considered to be the 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 permanent underlying 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 1, we can derive the following equation:

$$(2) \quad E_{j,\tau}\Pi_{\tau+1} = \mu_\tau + \alpha_\tau E_{j,\tau}\Delta lnY_{\tau+1} + E_{j,\tau}U_{t+1} + \varepsilon_{j\tau},$$

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, $E_{j,\tau}U_{t+1}$ = j's forecast of τ+1 supply shocks at τ., and $\varepsilon_{j\tau}$ = the disturbance term to capture exogenous shocks which are not explicitly incorporated in the model. 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 $\alpha_\tau[(lnY_\tau - lnY_\tau^*) - \Delta lnY_{\tau+1}^*]$. We estimate equation (2) by using forecaster-level panel data. The estimated term, μ_τ, can change over time but is time invariant in each estimated estimation. Thus, to the extent that we can observe $E_{j,\tau}\Pi_{\tau+1}$, $E_{j,\tau}\Delta lnY_{\tau+1}$, and $E_{j,\tau}U_{\tau+1}$, the estimation results of equation (2) can derive "the anchor of inflation expectations" for each period.

5. Forecaster-level Data in the ESP Forecast

In the following sections, the "anchor inflation expectations" are derived by estimating equation (2) using Japanese forecaster-level data in the ESP Forecast. The Association for Economic Planning 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. 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.

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) as *j*'s forecasts of the core CPI inflation rate excluding consumption tax hikes and the real GDP growth rate, respectively. We can also observe two proxies of $E_{j,\tau}U_{\tau+1}$ as *j*'s forecasts of the yen-dollar exchange rate and the NY WTI crude oil futures price. We assume that the expected supply shocks are described by a linear combination of several current and past expected supply shocks, that is,

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\begin{aligned}
(3)\quad & E_{j,\tau}U_{\tau+1} \\
&= \beta_{1,\tau}(lnE_{j,\tau-1}EX_\tau - lnEX_{\tau-1}) + \beta_{2,\tau}(lnE_{j,\tau}EX_{\tau+1} - lnEX_\tau) \\
&+ \gamma_{1,\tau}(lnE_{j,\tau-1}WTI_\tau - lnWTI_{\tau-1}) + \gamma_{2,\tau}(lnE_{j,\tau}WTI_{\tau+1} - lnWTI_\tau),
\end{aligned}
$$

where $E_{j,\tau}EX_{\tau+1}$ is *j*'s forecasts of the period τ+1 yen-dollar exchange rate formed at period τ and $E_{j,\tau}WTI_{\tau+1}$ is *j*'s forecasts of the period τ+1 NY WTI crude oil futures price formed at period τ. We calculated the expected supply shock using not only current but also past expected supply shocks, allowing for the lagged transmission of various supply shocks to inflation.

The quoted forecasts are fixed-event forecasts, consisting of a panel of forecasts for a series of outcomes at different horizons. For the real GDP growth rate and the core CPI inflation rate in FY T, the forecast origin starts in June of FY T-2 and continues to May of FY T+1 when T ≥ 2015. Thus, there are 34 time-series data for the forecasts after T = 2015. For the yen-dollar exchange rate and the NY WTI crude oil futures price in FY T, the forecast origin starts in January of FY T-1 and continues until May of FY T+1, so that there are 29 time-series data for the forecasts.[4]

Table 2 summarizes the basic statistics of the forecasted real GDP growth rate and core CPI inflation rate formed from FY2010 to FY2023. It shows the average and standard deviation of the forecast values of FY T as quoted in January of FY T−1, July of FY T−1, January of FY T, July of FY T, and January of FY 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 FY T−1 and January of FY T+1. However, the standard deviation decreases as the forecast origin approaches January of FY 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 FY T. This suggests that the fixed event forecasts remain heterogeneous significantly until the realized values become available to the forecasters.

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 FY T−1 and July of FY 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 and the subsequent depreciation of the yen 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.

6. Fixed-event Forecast Data

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 the forecasts of the core CPI inflation rate excluding the consumption tax hikes for $E_{j,\tau}\Pi_{\tau+1}$. The sample period of the forecast origin is from January 2012 to March 2024. We start the sample period from January 2012 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

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

equation (2) when the BOJ changed its unconventional policy and the global supply shocks raised import prices.

The ESP Forecast provides fixed-event forecasts, which generally have a seasonal nature, where the number of forecast horizons varies depending on the month in which the forecast is quoted. The number of fixed events varies depending on the month in which the forecast is quoted. Since the ESP Forecast provides a panel of fixed-event forecasts at different horizons, the quoted forecast diverges monotonically from the long-term anchor point and converges to the actual value as the forecast horizon shortens. In particular, when the fixed events in FY τ are forecasted from January to May of FY τ+1, most of its components have already been realized. Even if the fixed events in FY τ are forecasted from June to December of FY τ, some of its components have already been realized. Therefore, we exclude these forecasts from the analysis. We then focus on the following four types of forecasts, as shown in **Figure 4**.

The first type (type I) is a set of forecasts of fixed events in FY τ, quoted from June to December of FY τ−2. They have a desirable property for deriving an anchor for medium-term inflation expectations in that their forecast horizons are more than one year ahead, which is the longest in the ESP Forecast. The second type (type II) is a set of forecasts of fixed events in FY τ, quoted from January to May of FY τ−1. Their forecast horizons are slightly shorter than those of the first type, but longer than the other two types. The third type (Type III) is a set of forecasts of fixed events in FY τ, quoted from June to December of FY τ−1. The timing of the quotes is the same as type I. 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 forecasts of fixed events in FY τ, quoted from January to May of FY τ. 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 FY τ. 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.

7. The Estimation Results

We estimated equation (2) using panel data of the four alternative forecast types. The ordinary least square method is commonly used for the four types. However, due to longer forecast horizons, we used the sum of the expected real GDP growth rates for the two consecutive fiscal years for $\Delta lnY_{\tau+1}$ when using panel data of types I, II, and III. 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 January 2012 to March 2024. **Table 3** 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 FYs. This implies that the forecaster-level data support our Phillips curve in most of the FYs. The estimated coefficient varies across forecast types due to 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 is FY2017 and FY2018. This suggests that the slope of our panel Phillips curve was relatively steep in the medium-term inflation forecasts in FY2017 and FY2018. However, the estimated coefficient took on an insignificantly negative sign when the forecast origin is FY2020 for Type I, FY2021 for Type II, and FY2019 and FY2022 for Type IV. This may be because the COVID-19 unexpectedly lowered the GDP growth rate and the global supply shocks unexpectedly increased the inflation rate. Under these circumstances, the forecasters formed their expectations taking into account various unobservable factors. It is likely that this may have made the Phillips curve unstable.

The estimated coefficient of each supply shock was statistically significant in several cases. This indicates that the expected changes in the oil price and the yen-dollar exchange rate tended to shift the Phillips curve. This was true even after the outbreak of COVID-19 and the global supply shocks. It is likely that the forecasters formed their expectations by taking into account the expected supply shocks in most FYs. However, the sign of the estimated coefficients varied considerably over time. Due to complicated transition mechanisms, the way in which expected supply shocks are reflected in the formation of inflation expectations varies across macroeconomic environments.

More importantly, the estimated constant term showed considerable variation 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 originated in 2012. The negative value was particularly significant for short-term forecasts (i.e., types III and IV). This reflected deflationary expectations in the short run before the introduction of the 2% price stability target and QQE. Second, shortly after the introduction of the 2% price stability target and QQE, it became significantly positive and sometimes took large positive values. In particular, it became large in FY2014 and FY2015 for type I. This indicates an increase in inflation expectations, especially medium-term expectations, after the introduction of the 2% price stability target and QQE. Third, it decreased significantly when the forecast origin was FY2017 for types I, II, and III, and FY2018 for types II and IV. This may have occurred when it became clear that the 2% target was an unattainable target even under unprecedented monetary easing. Fourth, it increased dramatically when the forecast origin was after FY2022. This suggests a significant increase in inflation expectations in the global supply shock regime.

8. The Estimated Anchor of the Inflation Expectations

One of the key features of our expectations augmented Phillips curve is that the constant term in equation (2) is the sum of $\Pi_{\tau+1}{}^{e}$ and $\alpha\,[(lnY_{T} - lnY_{T}{*}) - \Delta lnY_{T+1}{*}]$, where T is the FY of the forecast origin. This indicates that for type I, the estimated anchor of inflation expectations is derived by subtracting $\hat{\alpha}\times$[GDP gap in FY T – potential GDP growth rate in FY T+1 – potential GDP growth rate in FY T+2] from $\hat{\mu}$, where $\hat{\alpha}$ is the estimated coefficient of the GDP growth rate forecast and $\hat{\mu}$ is the estimated constant term. Similarly, the estimated anchor is derived by subtracting $\hat{\alpha}\times$[GDP gap in FY T-1 – potential GDP growth rate in FY T – potential GDP growth rate in FY T+1] from $\hat{\mu}$ for types II and III, and by subtracting $\hat{\alpha}\times$[GDP gap in FY T-1 – potential GDP growth rate in FY T] from $\hat{\mu}$ for type IV.

In deriving the anchor for inflation expectations, we use the annual data for the potential GDP growth rate and the GDP gap, both of which are estimated by the Cabinet Office of the Japanese government. We also adjusted the effects of monthly time dummies to be neutral for the anchor. Based on the estimated results in Table 3, **Figure 5** shows the derived anchor for each type of forecast of the core inflation rate when the forecast origin is in FY T. For comparison, it also shows the mean in the ESP Forecast for each type of forecast of the core inflation rate when the forecast origin is in FY T. The derived anchor and the mean sometimes showed similar movements, but sometimes showed large deviations. There are three notable features in the figure.

First, the estimated anchors increased significantly for the core inflation rate in FY2013 and FY2014 and remained positive in the following years. With the exception of type I, inflation expectations were anchored around 0% before the BOJ announced the 2% target in January 2013. The announcement succeeded in anchoring inflation expectations in a positive range. Since the previous target rate was around 1%, the 2% target was a dramatic change in the BOJ's commitment. In particular, when QQE was introduced on April 4, 2013, the BOJ pledged to achieve the 2% CPI price stability target "at the earliest possible time." The BOJ's new policy regime was able to shift the anchor of inflation expectations significantly upward. However, the raised anchor never reached 2%. That is, the BOJ's commitment to the 2% inflation target failed to anchor inflation expectations at the target rate.

Second, the anchor of inflation expectations, which rose significantly after the introduction of QQE, began to decline in FY2016 and became almost 0% for type I in FY2017 and for other types in FY2018. It is worth noting that such a dramatic decline never occurred in the mean of inflation expectations. This is because the GDP gap improved significantly in FY2017 and FY2018, but the mean of inflation expectations did not. The Phillips curve predicts that the improvement in the GDP gap should be accompanied by an increase in inflation expectations. The undiminished mean of inflation expectations thus led to a dramatic fall in the anchor of inflation expectations. In spite of the improvement in the GDP gap, the forecasters lowered the anchor for inflation expectations when the 2% target turned out not to be feasible in the medium term.

Third, the estimated anchors continued to rise after the outbreak of the global supply shocks in FY2022. In particular, the estimated anchor of type IV (the shortest term) inflation expectations, which was close to 0% in FY2021, exceeded 2% after the CPI rose substantially. This is a remarkable normalization in the Japanese economy, as a similar change never occurred under QQE. The estimated anchors of longer-term inflation expectations are also approaching 2%. The global supply shocks have raised inflation expectations significantly, even when the effects of the expected GDP gap and supply shocks are excluded. However, even in FY2023, the anchor of type I (the longest-term) inflation expectations, which is slightly smaller than the mean of inflation expectations, is still well below the 2% target and only slightly higher than in FY2014. Given that the upward shift in FY2014-2015 has diminished considerably in subsequent periods, it is still not clear whether the anchor of inflation expectations will remain at around 2% on a sustainable basis.

Figure 6 depicts the type I and II anchors of inflation expectations and two types of inflation rates, the core inflation rate of CPI (all items less fresh food) and the core-core inflation rate of CPI (all items less food and energy). We exclude the direct effects of the consumption tax hikes in April 2014 and October 2019, as well as the policy-driven reduction in mobile phone prices in spring 2021, from the inflation rates. Our estimated anchors track the core-core inflation rate more reasonably than the core inflation rate over the period. In particular, they track the dramatic decline in the core-core CPI inflation rate from 2016 to 2018. This is in marked contrast to the core inflation rate and the mean of the inflation expectations in the ESP Forecast, both of which were significantly positive from 2017 to 2018. This implies that the type I and II anchors are adaptive to movements in prices excluding food and energy, in the sense that they almost followed the realized core-core inflation rate. However, the adaptive type I and II anchors were smoother than the core-core inflation rate and only partially tracked the realized core inflation rate when the inflation rose dramatically. As a result, they were much lower than the core-core inflation rate in 2014-15 and 2023-24. This may indicate that the increase in the core-core inflation rate after the global supply shocks was excessive and is likely to fall to the level of our estimated anchors in the medium term.

Even with a significant increase in consumer prices, nominal wage growth has not kept pace with inflation in 2023-24. Inflation without real wage increases inevitably hurts consumer sentiment. The "Consumer Confidence Index" of 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 is booming (**Figure 7**). 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.

9. Concluding Remarks

In this study, we examined how the anchors of inflation expectations have changed using Japanese forecaster-level data in the "ESP Forecast". The estimated anchors of inflation expectations increased after the BOJ launched unprecedented monetary easing in April 2013. However, the increase in each estimated anchor was temporary even under the unprecedented monetary easing. In contrast, the estimated anchors of inflation expectations rose significantly after the global supply shocks became noticeable in April 2022. The estimated anchor for short-term inflation expectations exceeded 2% after the CPI rose rapidly. However, the estimated anchors for longer-term inflation expectations have not yet exceeded 2% and is still about the same as in 2014-2015. This means that the significant increase in the CPI may be temporary and may not persist in the long run.

Amid rising prices, the BOJ ended its negative interest rate policy and 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, the BOJ is likely to maintain its ultra-low interest rate policy unless Japan's medium-term inflation expectations exceed 2% on a sustained basis. Despite a significant increase in the CPI, nominal wage growth has not kept 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. More importantly, the Japanese economy faces various structural problems, including a declining population, a fiscal deficit, and sluggish productivity growth, which are difficult to solve in the short term. It is fair to say that unless Japan takes serious measures to address these structural problems, inflation expectations may not remain at 2% on a sustainable basis.

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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 Basic Statistics of Forecasted Values

(1) Real GDP growth rate in FY T

		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 2. The Basic Statistics of Forecasted Values (continued)

(2) Core CPI inflation rate in FY T

		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 3. Basic Estimation Results

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

forecast origins	Constant term	Real GDP growth	USD/Yen ex rate	Lagged ex rate	NY WTI oil price	Lagged oil price	# of obs.	R-squared
2012 10-12	0.242*	0.310***	-1.176	1.024*	-3.390***	1.540***	199	0.391
	(0.145)	(0.035)	(0.760)	(0.564)	(0.816)	(0.385)		
2013 06-12	-0.042	0.229***	0.655	0.171	1.147	-0.926	94	0.265
	(0.153)	(0.051)	(1.638)	(0.585)	(1.098)	(0.574)		
2014 06-12	0.711***	0.106	3.313***	-0.030	1.369	2.976***	206	0.209
	(0.205)	(0.065)	(1.125)	(0.568)	(1.315)	(0.696)		
2015 06-12	0.831***	0.181***	-2.842**	0.354	3.135***	1.455***	220	0.179
	(0.150)	(0.058)	(1.112)	(0.332)	(1.020)	(0.529)		
2016 06-12	0.410***	0.298***	1.768**	0.353	-3.064***	0.236	194	0.500
	(0.111)	(0.032)	(0.835)	(0.243)	(0.884)	(0.256)		
2017 06-12	-0.147	0.531***	-2.488**	-0.297	2.123**	1.265***	218	0.387
	(0.160)	(0.065)	(1.132)	(0.487)	(0.873)	(0.361)		
2018 06-12	0.415***	0.425***	2.021***	0.383	-2.178**	-0.694*	200	0.422
	(0.122)	(0.047)	(0.630)	(0.404)	(1.032)	(0.361)		
2019 06-12	0.688***	0.135***	-1.467**	1.612***	2.585***	-0.261	214	0.302
	(0.089)	(0.051)	(0.622)	(0.254)	(0.708)	(0.241)		
2020 06-12	0.735***	-0.034	4.819***	-0.256	0.767	0.915**	202	0.187
	(0.125)	(0.022)	(1.821)	(0.168)	(1.031)	(0.352)		
2021 06-12	0.254**	0.126***	-5.446***	0.394	3.774***	0.003	203	0.298
	(0.124)	(0.028)	(1.281)	(0.311)	(1.068)	(0.211)		
2022 06-12	0.556***	0.176***	2.290***	1.034***	-3.616**	-0.747	178	0.297
	(0.167)	(0.061)	(0.740)	(0.308)	(1.633)	(0.485)		
2023 06-12	1.404***	0.263***	2.516***	0.545	1.180	1.045***	199	0.361
	(0.190)	(0.092)	(0.683)	(0.451)	(0.769)	(0.330)		

Table 3. Basic Estimation Results (continued)

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

forecast origins	Constant term	Real GDP growth	USD/Yen ex rate	Lagged ex rate	NY WTI oil price	Lagged oil price	# of obs.	R-squared
2012 01-05	-0.542***	0.220***	-0.114	-0.346	-0.694	-0.587	152	0.283
	(0.142)	(0.044)	(0.723)	(0.342)	(0.489)	(0.360)		
2013 01-05	-0.028	0.093*	1.074	1.042*	2.867***	-0.250	155	0.272
	(0.110)	(0.051)	(0.827)	(0.592)	(0.839)	(0.487)		
2014 01-05	0.348***	0.324***	0.447	-0.952	1.062	1.420***	153	0.270
	(0.130)	(0.053)	(1.505)	(0.729)	(0.944)	(0.529)		
2015 01-05	0.381	0.149**	6.104**	1.524***	2.106	1.021	161	0.208
	(0.235)	(0.076)	(2.498)	(0.438)	(2.176)	(1.010)		
2016 01-05	0.099	0.329***	-1.375*	0.232	5.254***	0.942***	162	0.321
	(0.144)	(0.050)	(0.774)	(0.320)	(1.823)	(0.298)		
2017 01-05	0.022	0.369***	-0.380	1.138***	1.048**	0.345	164	0.355
	(0.153)	(0.051)	(0.735)	(0.381)	(0.522)	(0.248)		
2018 01-05	-0.226	0.557***	2.461***	1.134**	-0.476	-0.954	178	0.356
	(0.145)	(0.065)	(0.891)	(0.468)	(0.665)	(0.594)		
2019 01-05	0.589***	0.282***	2.906**	-0.196	-2.049*	0.739**	153	0.324
	(0.127)	(0.083)	(1.149)	(0.305)	(1.076)	(0.343)		
2020 01-05	0.531***	0.061**	1.622	0.348	1.168	-0.178	124	0.372
	(0.051)	(0.031)	(2.641)	(0.225)	(1.206)	(0.215)		
2021 01-05	0.639***	-0.033	2.357*	0.371	2.261*	-0.144	142	0.108
	(0.217)	(0.041)	(1.206)	(0.280)	(1.229)	(0.189)		
2022 01-05	-0.187	0.200***	-1.041	0.378	-0.894	0.708*	146	0.309
	(0.174)	(0.034)	(1.110)	(0.302)	(1.319)	(0.367)		
2023 01-05	0.694***	0.193***	3.877***	2.274***	-0.578	-0.488	124	0.457
	(0.141)	(0.067)	(1.385)	(0.313)	(1.304)	(0.409)		
2024 01-03	1.227***	0.132	2.299	2.625**	-1.356	1.841**	80	0.248
	(0.248)	(0.136)	(1.901)	(1.000)	(2.159)	(0.826)		

Table 3. Basic Estimation Results (continued)

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

forecast origins	Constant term	Real GDP growth	USD/Yen ex rate	Lagged ex rate	NY WTI oil price	Lagged oil price	# of obs.	R-squared
2012 06-12	-0.445***	0.172***	0.006	0.158	0.478	-0.532*	224	0.208
	(0.141)	(0.037)	(0.326)	(1.243)	(0.697)	(0.316)		
2013 06-12	-0.565***	0.307***	0.811	-1.685	-1.231	1.401***	207	0.331
	(0.193)	(0.052)	(0.645)	(1.287)	(1.190)	(0.479)		
2014 06-12	0.401***	0.318***	-0.991	1.573	-1.508	0.704	230	0.226
	(0.141)	(0.048)	(0.673)	(1.442)	(1.406)	(0.602)		
2015 06-12	0.218	0.276***	0.001	-0.404	-0.415	-0.991	240	0.180
	(0.245)	(0.060)	(0.613)	(2.201)	(1.880)	(0.777)		
2016 06-12	0.472***	0.251***	0.533	2.661***	-4.093**	-0.721*	229	0.276
	(0.093)	(0.047)	(0.508)	(0.701)	(1.575)	(0.420)		
2017 06-12	0.113	0.303***	-0.237	-3.366***	2.661***	0.763**	253	0.267
	(0.189)	(0.074)	(0.446)	(0.900)	(0.526)	(0.302)		
2018 06-12	0.482***	0.336***	1.340***	4.533***	-2.973***	-1.199***	256	0.270
	(0.129)	(0.059)	(0.479)	(1.318)	(1.109)	(0.433)		
2019 06-12	0.354***	0.017	0.905	5.611***	2.786	-1.629***	228	0.256
	(0.099)	(0.071)	(0.661)	(1.662)	(1.754)	(0.577)		
2020 06-12	0.220	0.036	-0.322	2.564	2.549	0.439	209	0.074
	(0.140)	(0.024)	(0.299)	(2.904)	(2.005)	(0.564)		
2021 06-12	0.559***	0.003	0.157	2.823	2.301	-0.070	216	0.100
	(0.185)	(0.029)	(0.382)	(2.043)	(1.709)	(0.285)		
2022 06-12	0.711***	0.093**	0.327	4.066***	-5.305**	0.496	187	0.387
	(0.170)	(0.046)	(0.601)	(1.283)	(2.612)	(0.656)		
2023 06-12	0.915***	0.357***	3.780***	0.529	2.011	1.718**	201	0.476
	(0.160)	(0.060)	(0.761)	(1.076)	(1.384)	(0.663)		

Table 3. Basic Estimation Results (continued)

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

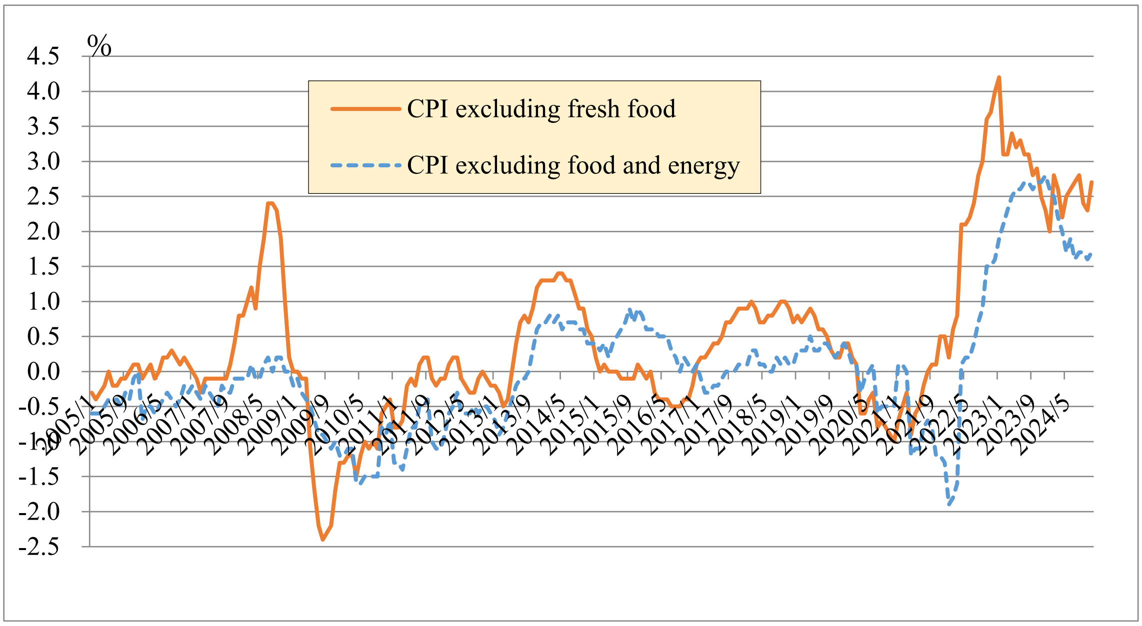
forecast origins	Constant term	Real GDP growth	USD/Yen ex rate	Lagged ex rate	NY WTI oil price	Lagged oil price	# of obs.	R-squared
2012 01-05	-0.505***	0.193**	0.748**	0.683	-0.316	-0.186	145	0.338
	(0.137)	(0.074)	(0.291)	(0.789)	(0.339)	(0.269)		
2013 01-05	-0.069	0.117*	0.413	0.616	-0.583	0.337	155	0.199
	(0.119)	(0.068)	(0.355)	(0.538)	(0.475)	(0.284)		
2014 01-05	0.634***	0.308***	-0.640	1.245*	0.430	1.294***	154	0.232
	(0.084)	(0.092)	(0.613)	(0.667)	(0.560)	(0.316)		
2015 01-05	0.564***	0.069	1.367***	-0.198	-0.114	0.005	161	0.388
	(0.164)	(0.076)	(0.322)	(1.108)	(0.683)	(0.358)		
2016 01-05	0.392***	0.110	0.621**	0.085	-0.622	0.351	167	0.476
	(0.139)	(0.081)	(0.247)	(0.795)	(0.672)	(0.235)		
2017 01-05	0.414***	0.282***	0.688*	0.614	0.513*	0.096	168	0.161
	(0.111)	(0.078)	(0.383)	(0.505)	(0.288)	(0.122)		
2018 01-05	-0.017	0.672***	0.862***	1.949***	-0.225	0.457**	169	0.408
	(0.136)	(0.107)	(0.295)	(0.577)	(0.376)	(0.214)		
2019 01-05	0.723***	-0.137	0.357	3.810**	-0.481	-0.067	159	0.248
	(0.104)	(0.122)	(0.349)	(1.565)	(0.837)	(0.288)		
2020 01-05	0.277***	0.108*	0.475	5.020**	0.503	-1.213**	133	0.619
	(0.086)	(0.057)	(0.291)	(2.138)	(0.882)	(0.573)		
2021 01-05	0.143	0.011	0.644*	3.851***	0.910	-0.320*	148	0.185
	(0.175)	(0.053)	(0.331)	(1.310)	(0.657)	(0.167)		
2022 01-05	0.922***	-0.034	0.704**	1.292	1.138	0.276	139	0.653
	(0.195)	(0.062)	(0.295)	(1.318)	(0.944)	(0.221)		
2023 01-05	1.632***	0.097*	1.629***	-2.253**	-0.873	0.500***	132	0.555
	(0.074)	(0.058)	(0.181)	(0.891)	(0.609)	(0.172)		
2024 01-03	2.016***	0.111	1.940**	1.337	1.546	-0.133	80	0.214
	(0.190)	(0.182)	(0.809)	(1.556)	(0.938)	(0.448)		

Note 1) “ex rate” denotes exchange rate.

2) Robust standard errors in parentheses.

3) *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

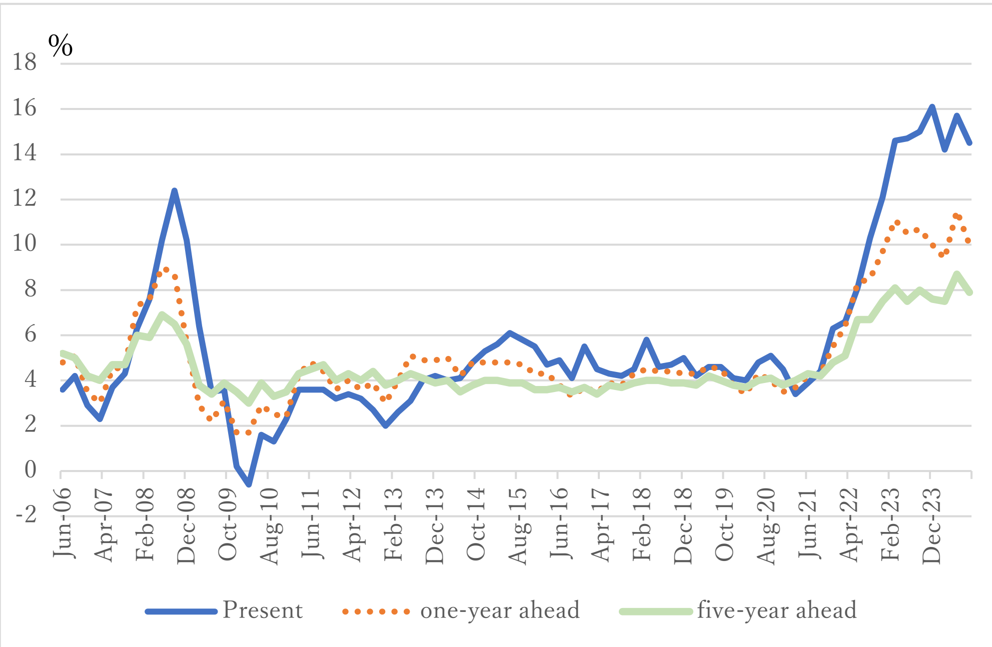
Figure 1. The CPI inflation Rate in Japan



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.

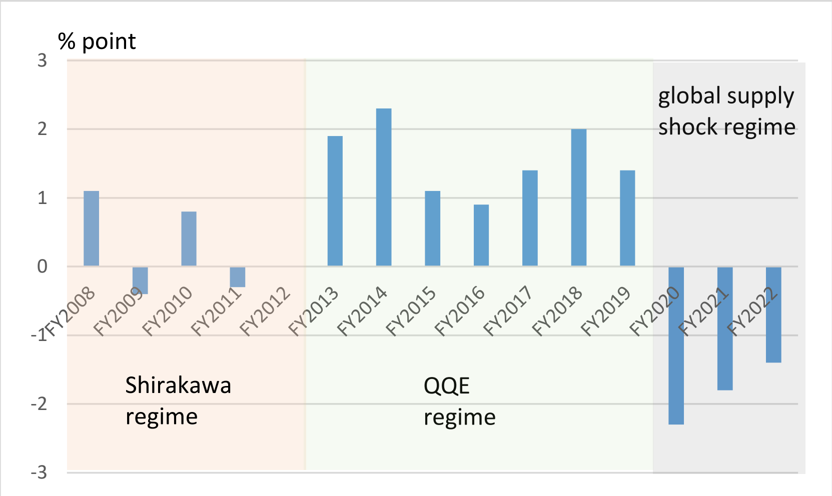
Figure 2. Inflation Expectations of Consumer Surveys



Source: The Opinion Survey on the General Public's Views and Behavior, The Bank of Japan.

Figure 3. The Forecast Errors in the BOJ's Outlook and the ESP Forecast

(1) Forecast error of the inflation rate



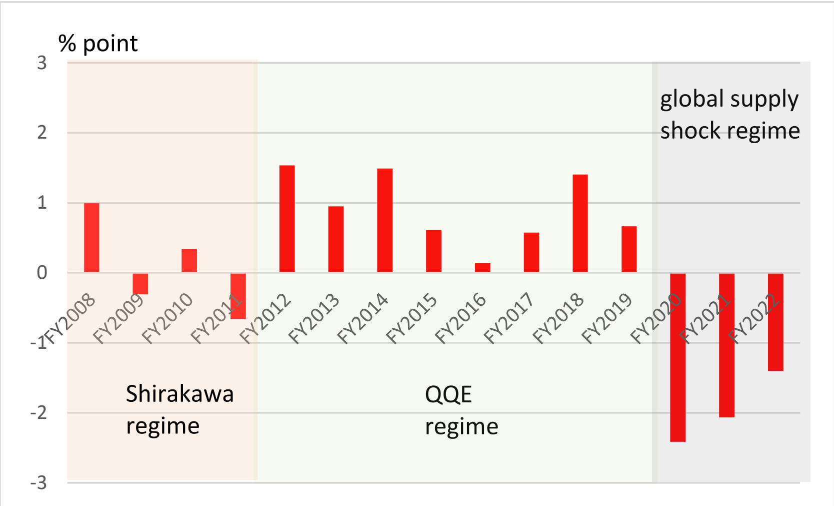
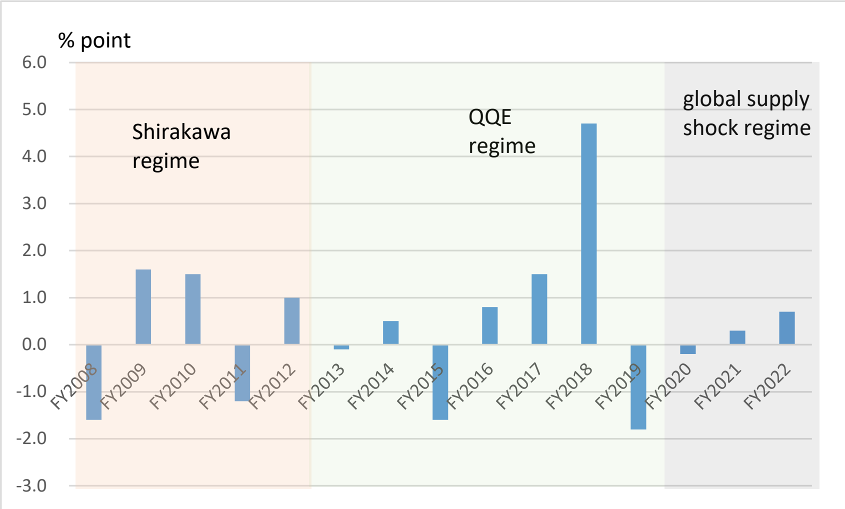
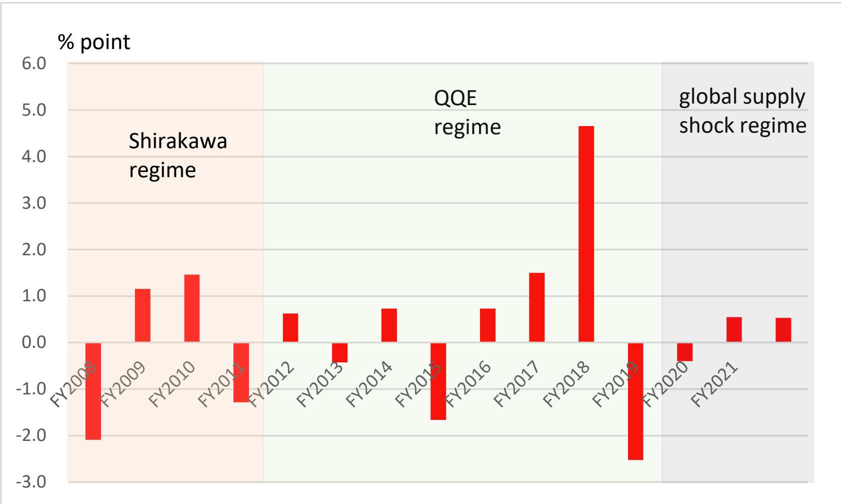


Figure 3. The Forecast Errors in the BOJ's Outlook and the ESP Forecast (continued)

(2) Forecast error of the real GDP growth

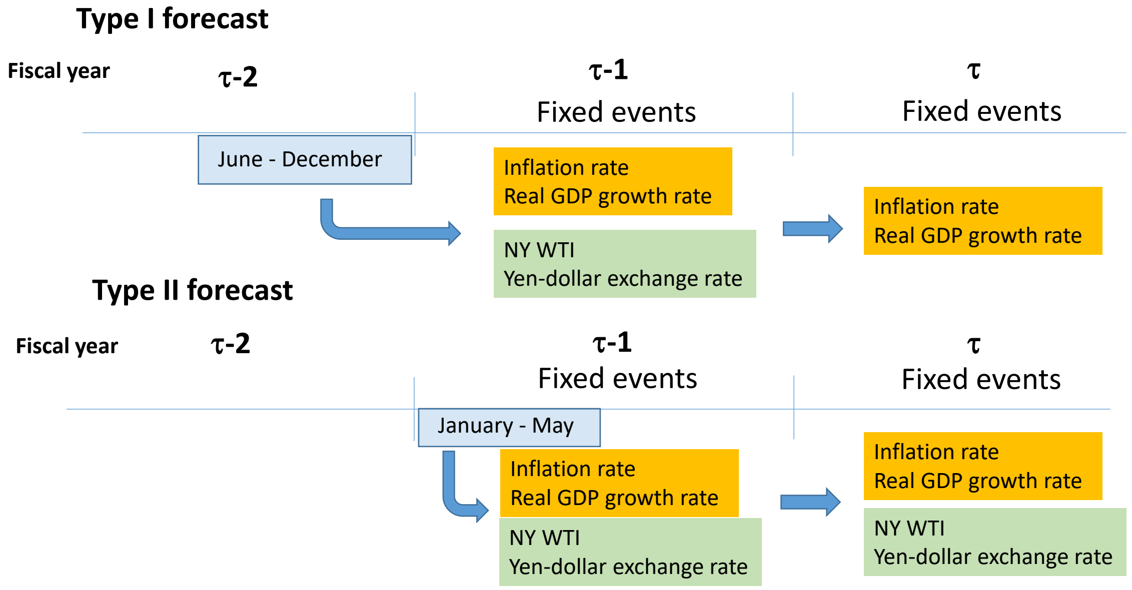




Note) The horizontal axis shows the fiscal year in which the initial expectations were formed.

Figure 4. The Forecasted Fixed Event in the ESP Forecast

(1) Medium-term fixed-event forecasts (Type I and Type II)



(2) Short-term fixed-event forecasts (Type III and Type IV)

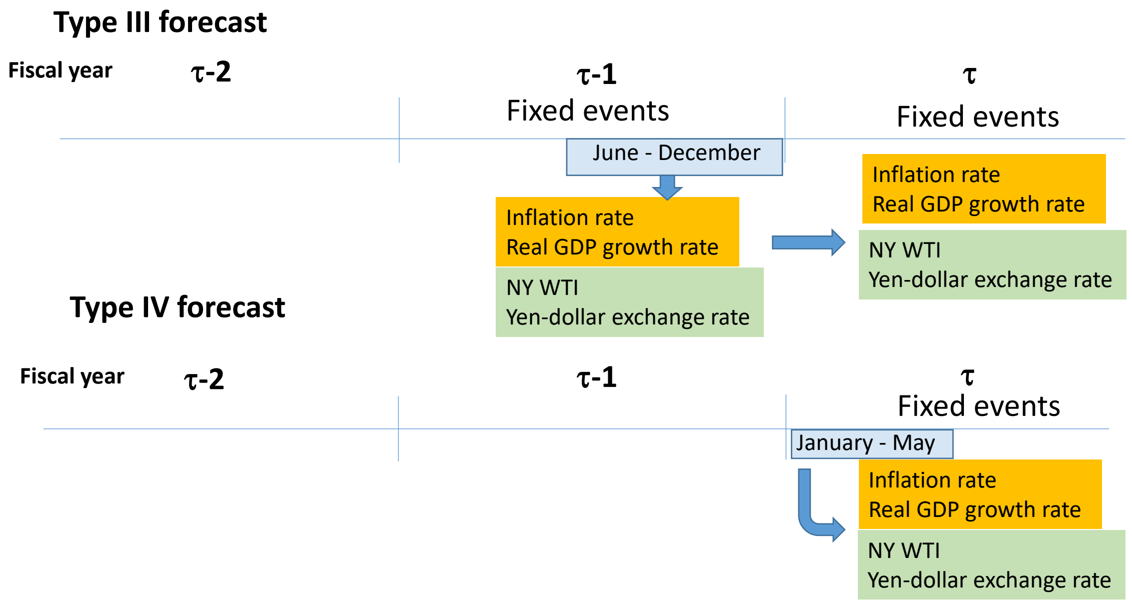
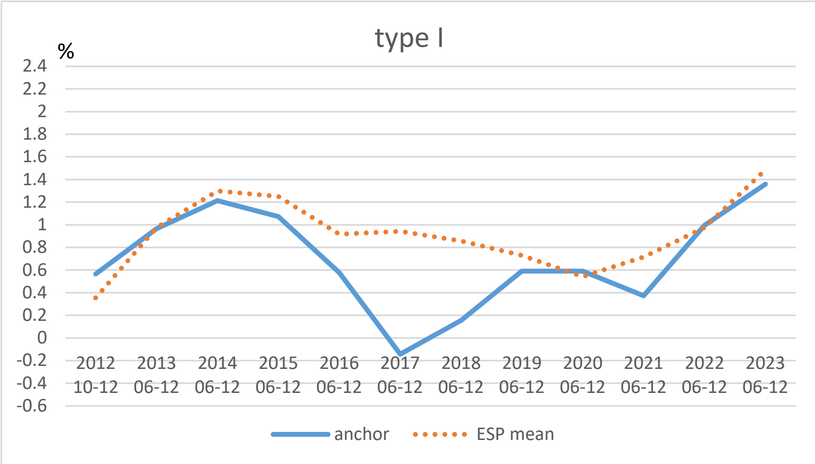


Figure 5. Estimated Anchor of Inflation Expectations

(1) Medium-term expectations



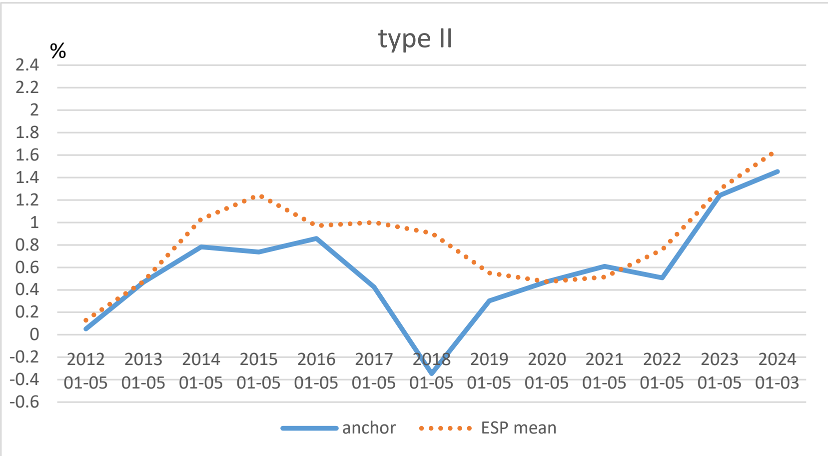
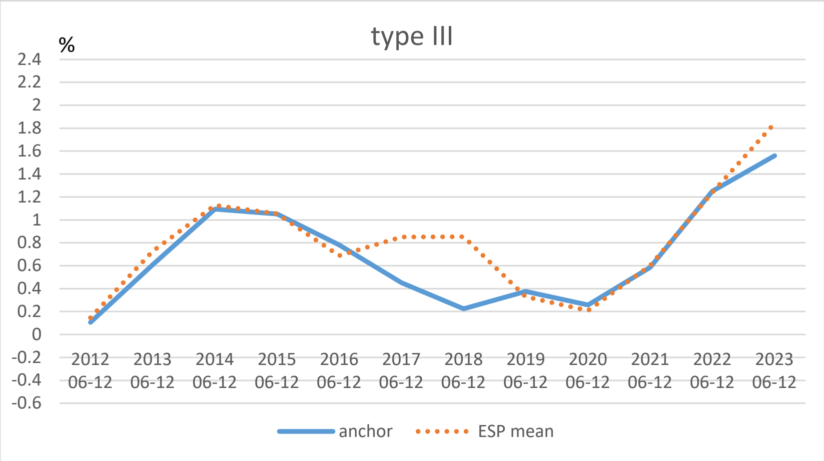
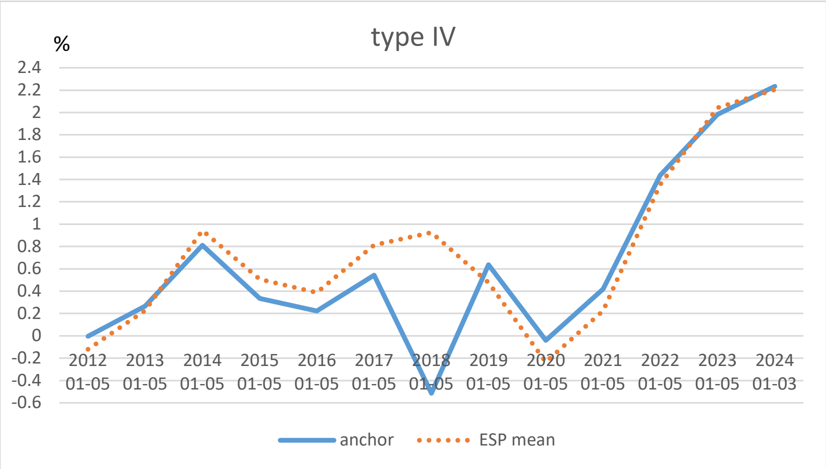


Figure 5. Estimated Anchor of Inflation Expectations (continued)

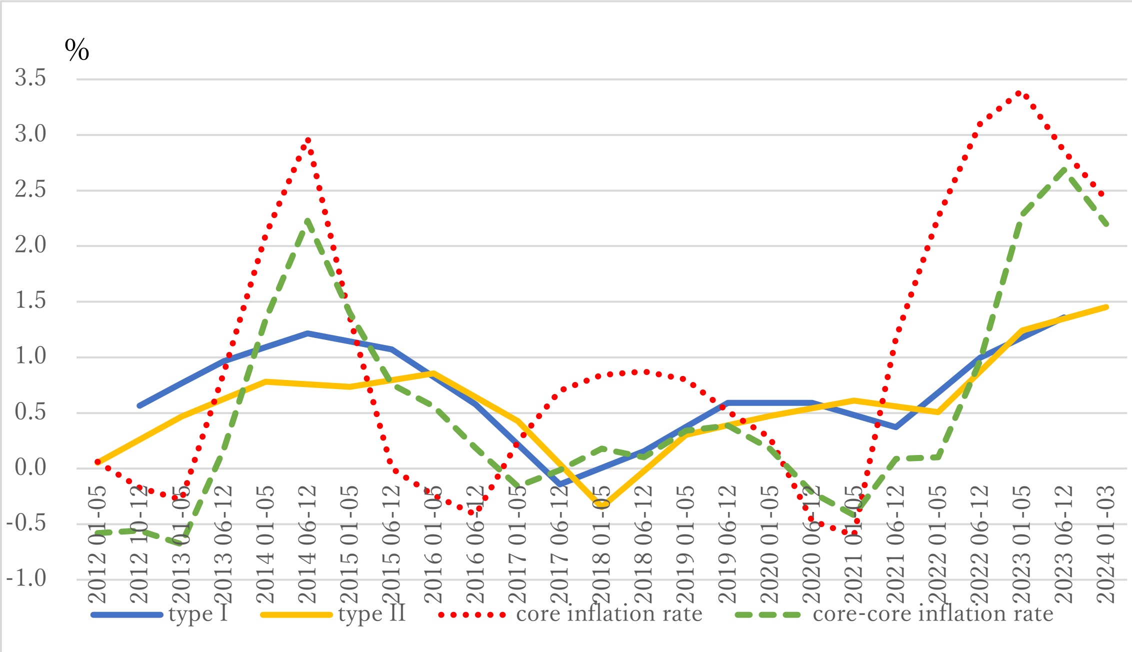
(2) Short-term expectations





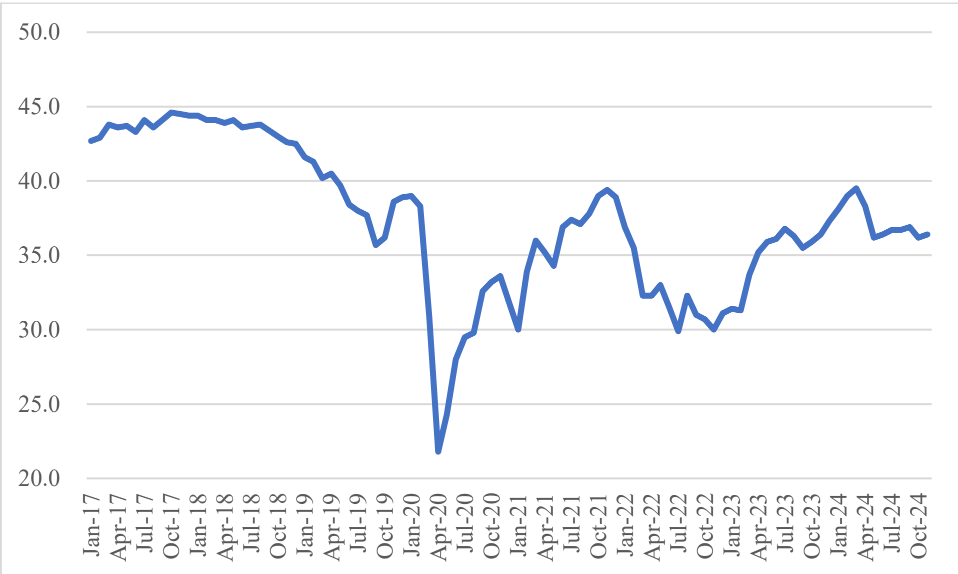
Note: The vertical axis is the estimated anchor of inflation expectations. The horizontal axis is the fiscal year in which the expectations were quoted.

Figure 6. Anchor Expectations and the Inflation Rates



Note: The horizontal axis for the anchors is the fiscal year in which the expectations were quoted, while that for the inflation rates is the fiscal year in which the inflation rates are realized.
Source: Consumer Price Index, Statistics Bureau, Ministry of Internal Affairs and Communications and the authors' own calculations based on the ESP Forecast.

Figure 7. Consumer Confidence Index in Japan



Source: Consumer Confidence Survey, Cabinet Office.

Appendix 1. 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 $\Pi_t{}^e$ 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 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, note that the term $\Pi_t{}^e$ 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 $E_{j,t-1}$ suggests that forecaster j forms his or her own expectation at period t-1 to forecast the value at period t.

Equation (A4) implies that forecaster j's inflation expectation formed in period t-1 consists of two components. One is [$\Pi_t^e + \alpha$ {($lnY_{t-1} - lnY^*$) – ΔlnY_t^*}] which is common to all j. It is the sum of the anchor of inflation expectations and α ×[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 α × forecaster j's GDP growth rate expectations and forecaster j's supply shock expectations. In the estimations, we define $\mu_{t-1} \equiv [\Pi_t^e + \alpha\ \{(lnY_{t-1} - lnY_{t-1}^*) - \Delta lnY_t^*\}]$. Then, equation (A4) leads to the following cross-sectional equation:

(A5) $$E_{j,\tau}\Pi_{\tau+1} = \mu_\tau + \alpha \cdot E_{j,\tau}\Delta lnY_{\tau+1} + E_{j,\tau}U_{t+1} + \varepsilon_{j\tau},$$

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 $E_{j,\tau}U_{t+1}$ = 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.

Appendix 2. The Instrumental Variable Estimations

In the main text, we derived the anchor of inflation expectations by estimating equation (2) using ordinary least squares method. However, the use of ordinary least squares method raises concerns about possible simultaneous biases in the estimation. The purpose of this appendix is to examine whether our results are robust even when estimating equation (2) using an instrumental variable method. Specifically, we estimate equation (2) using one-month lagged values of GDP growth rate forecasts, yen-dollar exchange rate forecasts, and crude oil futures price forecasts as instrumental variables to derive the anchor of inflation expectations. One problem with using the instrumental variable method is that no appropriate lagged value is available when the forecast originates in January for type II or IV forecasts and in July for type I or III forecasts. This is because the ESP forecast is a fixed-event forecast where the forecast horizons are different depending on the month in which the forecast is published. Thus, using the instrumental variable method, we estimate equation (2) using panel data from February to June for type II and IV forecasts and from August to December for type I and III forecasts.

Table A1 reports the estimation results for the four alternative forecast types. As in Table 3, the estimations were carried out with monthly time dummies. Due to the limited availability of instrumental variables, the number of observations was reduced. Compared to those in Table 3, the constant term tends to be less significant. However, most of the estimated coefficients remained statistically significant and were essentially the same as those in Table 3, even when we estimated using the instrumental variables. The estimated coefficient of the predicted GDP growth rate was positive in most cases but changed over time. More importantly, the estimated constant term increased significantly after the announcement of the 2% target and the experience of the global supply shocks. This indicates that the BOJ's unprecedented monetary easing and the global supply shocks shifted our panel Phillips curve upward. However, the estimated constant term began to decline around FY2015, when it became clear that the 2% target would not be feasible in the short run.

Based on the estimated results in Table A1, we derived the anchors of inflation expectations $\Pi_\tau{}^e$ for the four types of forecasts using the same methodology as in Section 8. **Figure A1** shows how the derived anchors of inflation expectations have changed over time. Although there are some slight differences, they are essentially the same as those in Figure 5. That is, the derived anchor increased significantly in FY2013 and FY2014, but declined in subsequent fiscal years. This implies that the announcement of the 2% target only temporarily anchored inflation expectations at positive values. After it became clear that the 2% target was not feasible in the medium term, Japanese forecasters began to think that the 2% target was not realistic when forming their inflation expectations. In contrast, after the global shocks, the derived anchors increased significantly and are approaching 2%. However, the increased anchor of medium-term inflation expectations is still about the same as in 2014-2015. Given the experience under the unprecedented monetary easing, we are still not sure whether the anchor has risen to the target rate on a sustainable basis.

Table A1. Estimation Results by Instrument Variables

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

forecast origins	Constant term	Real GDP growth	USD/Yen rate	Lagged rate	NY WTI oil price	Lagged oil price	# of obs.	R-squared
2012 10-12	-0.078	0.232***	0.998	-0.224	1.888	-0.655	62	0.340
	(0.176)	(0.075)	(1.838)	(0.690)	(1.544)	(0.645)		
2013 06-12	-0.009	0.309***	-1.158	0.944	-3.426***	1.587***	170	0.382
	(0.128)	(0.042)	(0.759)	(0.590)	(0.882)	(0.395)		
2014 06-12	0.672**	0.170**	3.625**	0.048	1.431	2.925***	176	0.210
	(0.264)	(0.073)	(1.614)	(0.639)	(1.522)	(0.712)		
2015 06-12	0.507**	0.167**	-3.639***	0.379	3.260***	1.339**	189	0.186
	(0.199)	(0.067)	(1.195)	(0.324)	(1.163)	(0.572)		
2016 06-12	0.265*	0.325***	1.279	0.349	-2.695***	0.232	166	0.526
	(0.136)	(0.035)	(0.827)	(0.245)	(0.888)	(0.246)		
2017 06-12	-0.031	0.567***	-2.152*	-0.287	2.313**	1.159***	189	0.367
	(0.163)	(0.073)	(1.203)	(0.525)	(0.938)	(0.376)		
2018 06-12	0.235***	0.458***	2.228***	0.237	-2.722**	-0.737**	171	0.443
	(0.090)	(0.050)	(0.683)	(0.424)	(1.129)	(0.364)		
2019 06-12	0.492***	0.110	-1.548**	1.536***	2.816***	-0.117	183	0.313
	(0.081)	(0.068)	(0.630)	(0.260)	(0.744)	(0.232)		
2020 06-12	0.668***	-0.019	4.966***	-0.389**	0.403	0.988***	173	0.200
	(0.145)	(0.030)	(1.890)	(0.182)	(1.125)	(0.358)		
2021 06-12	0.083	0.136***	-5.150***	0.543	3.340***	0.032	174	0.297
	(0.149)	(0.031)	(1.299)	(0.338)	(1.031)	(0.206)		
2022 06-12	0.917***	0.183**	2.083***	1.115***	-3.796**	-0.540	153	0.297
	(0.178)	(0.076)	(0.774)	(0.319)	(1.792)	(0.499)		
2023 06-12	1.221***	0.324***	2.485***	0.276	1.063	1.234***	170	0.348
	(0.197)	(0.110)	(0.745)	(0.498)	(0.801)	(0.385)		

Table A1. Estimation Results by Instrument Variables (continued)

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

forecast origins	Constant term	Real GDP growth	USD/Yen rate	Lagged rate	NY WTI oil price	Lagged oil price	# of obs.	R-squared
2012 01-05	-0.946***	0.318***	-1.236	-0.387	-0.114	-0.346	117	0.205
	(0.340)	(0.092)	(1.243)	(0.391)	(0.668)	(0.394)		
2013 01-05	0.131	0.105	0.204	1.452**	2.015**	-0.077	124	0.195
	(0.183)	(0.066)	(0.855)	(0.669)	(0.821)	(0.544)		
2014 01-05	0.311**	0.353***	0.102	-1.315	1.557	1.184**	123	0.272
	(0.137)	(0.063)	(1.748)	(0.901)	(1.054)	(0.593)		
2015 01-05	0.326	0.194**	7.402***	1.344***	0.568	0.092	130	0.213
	(0.287)	(0.089)	(2.687)	(0.470)	(2.185)	(1.239)		
2016 01-05	0.737***	0.325***	-1.723*	0.203	5.942***	1.182***	128	0.320
	(0.103)	(0.065)	(0.888)	(0.391)	(2.045)	(0.404)		
2017 01-05	0.051	0.390***	-0.673	1.329***	1.034**	0.369	132	0.353
	(0.184)	(0.060)	(0.825)	(0.403)	(0.519)	(0.297)		
2018 01-05	-0.021	0.554***	2.117**	1.292***	-0.442	-1.114*	143	0.386
	(0.142)	(0.067)	(0.902)	(0.496)	(0.709)	(0.641)		
2019 01-05	0.244*	0.268***	3.557**	-0.319	-2.018*	0.918**	120	0.289
	(0.128)	(0.102)	(1.479)	(0.379)	(1.152)	(0.359)		
2020 01-05	0.318*	0.128***	1.730	0.332	0.846	-0.141	99	0.276
	(0.186)	(0.042)	(2.772)	(0.237)	(1.496)	(0.282)		
2021 01-05	0.768***	-0.024	1.735	0.447	3.584***	-0.221	113	0.145
	(0.281)	(0.045)	(1.228)	(0.287)	(1.171)	(0.173)		
2022 01-05	-0.013	0.241***	-0.769	0.271	-1.085	0.692*	117	0.289
	(0.175)	(0.036)	(1.162)	(0.305)	(1.536)	(0.403)		
2023 01-05	1.229***	0.216***	4.888***	2.154***	-0.875	-0.643	99	0.462
	(0.193)	(0.082)	(1.554)	(0.343)	(1.406)	(0.419)		
2024 01-03	1.242***	0.078	2.022	3.522***	-4.366*	2.978***	52	0.310
	(0.340)	(0.172)	(2.202)	(1.119)	(2.593)	(1.108)		

Table A1. Estimation Results by Instrument Variables (continued)

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

forecast origins	Constant term	Real GDP growth	USD/Yen rate	Lagged rate	NY WTI oil price	Lagged oil price	# of obs.	R-squared
2012 06-12	-0.423***	0.209***	-0.776	0.158	0.395	-0.552*	189	0.166
	(0.154)	(0.061)	(1.500)	(0.351)	(0.754)	(0.291)		
2013 06-12	-0.521**	0.312***	-2.002	0.345	-1.017	1.683**	175	0.307
	(0.264)	(0.066)	(1.562)	(0.715)	(1.348)	(0.660)		
2014 06-12	0.926***	0.389***	1.028	-1.470*	-0.642	0.611	194	0.218
	(0.218)	(0.058)	(1.710)	(0.780)	(1.816)	(0.663)		
2015 06-12	0.611	0.338***	-2.394	0.143	-1.920	-1.666**	205	0.179
	(0.402)	(0.074)	(2.411)	(0.617)	(2.119)	(0.826)		
2016 06-12	0.561***	0.264***	2.910***	0.461	-4.782***	-0.631	196	0.257
	(0.194)	(0.053)	(0.698)	(0.547)	(1.747)	(0.426)		
2017 06-12	0.158	0.341***	-3.413***	-0.483	2.670***	0.901***	219	0.266
	(0.277)	(0.085)	(1.026)	(0.454)	(0.554)	(0.316)		
2018 06-12	-0.248	0.500***	4.045***	1.476***	-2.086*	-1.439***	219	0.240
	(0.184)	(0.080)	(1.542)	(0.551)	(1.243)	(0.453)		
2019 06-12	0.727***	-0.013	6.982***	1.388*	1.896	-1.822***	195	0.290
	(0.190)	(0.080)	(1.562)	(0.746)	(1.654)	(0.600)		
2020 06-12	0.223**	0.042	3.281	-0.642*	1.596	0.239	179	0.097
	(0.088)	(0.031)	(2.979)	(0.368)	(1.971)	(0.604)		
2021 06-12	0.763***	-0.005	3.625	0.247	2.803	-0.108	185	0.120
	(0.228)	(0.036)	(2.343)	(0.407)	(1.862)	(0.316)		
2022 06-12	1.182***	0.128*	3.121**	1.094	-5.486*	1.303*	152	0.388
	(0.222)	(0.068)	(1.457)	(0.678)	(2.931)	(0.690)		
2023 06-12	0.422	0.444***	0.160	3.376***	1.626	2.619***	172	0.465
	(0.279)	(0.079)	(1.182)	(0.882)	(1.493)	(0.682)		

Table A1. Estimation Results by Instrument Variables (continued)

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

forecast origins	Constant term	Real GDP growth	USD/Yen rate	Lagged rate	NY WTI oil price	Lagged oil price	# of obs.	R-squared
2012 01-05	-0.521	0.279	0.508	0.963**	-0.099	-0.021	115	0.255
	(0.372)	(0.170)	(0.877)	(0.398)	(0.441)	(0.324)		
2013 01-05	0.028	0.124	0.175	0.175	-0.704	0.437	126	0.137
	(0.264)	(0.105)	(0.612)	(0.345)	(0.478)	(0.294)		
2014 01-05	0.603***	0.373***	1.385*	-1.191*	0.475	1.223***	126	0.200
	(0.098)	(0.113)	(0.758)	(0.618)	(0.633)	(0.375)		
2015 01-05	0.069	0.106	-0.294	1.294***	-0.131	-0.250	130	0.243
	(0.157)	(0.096)	(1.389)	(0.346)	(0.718)	(0.365)		
2016 01-05	0.048	0.104	0.269	0.766***	-0.133	0.330	132	0.326
	(0.097)	(0.102)	(0.824)	(0.276)	(0.701)	(0.268)		
2017 01-05	0.344**	0.308***	0.334	1.045**	0.664**	0.082	137	0.147
	(0.139)	(0.091)	(0.558)	(0.407)	(0.270)	(0.133)		
2018 01-05	0.069	0.711***	1.775***	0.810***	-0.079	0.334	137	0.456
	(0.144)	(0.127)	(0.558)	(0.314)	(0.382)	(0.223)		
2019 01-05	0.638***	-0.285*	6.686***	0.601	-1.356	-0.262	126	0.249
	(0.112)	(0.168)	(2.304)	(0.380)	(1.011)	(0.308)		
2020 01-05	-1.878**	-0.126	6.738**	0.444	0.962	-1.344	107	0.432
	(0.954)	(0.183)	(2.889)	(0.285)	(1.312)	(0.878)		
2021 01-05	0.110	0.060	2.791*	1.060***	1.270*	-0.241	120	0.200
	(0.328)	(0.087)	(1.531)	(0.373)	(0.760)	(0.175)		
2022 01-05	2.114***	-0.084	1.856	0.623**	1.225	0.238	113	0.541
	(0.192)	(0.078)	(1.487)	(0.298)	(1.176)	(0.223)		
2023 01-05	2.305***	0.006	-2.712***	1.866***	-0.702	0.524***	106	0.525
	(0.091)	(0.068)	(1.034)	(0.217)	(0.623)	(0.198)		
2024 01-03	2.324***	-0.049	-0.801	2.486***	1.707	-0.334	54	0.223
	(0.186)	(0.251)	(1.589)	(0.755)	(1.068)	(0.389)		

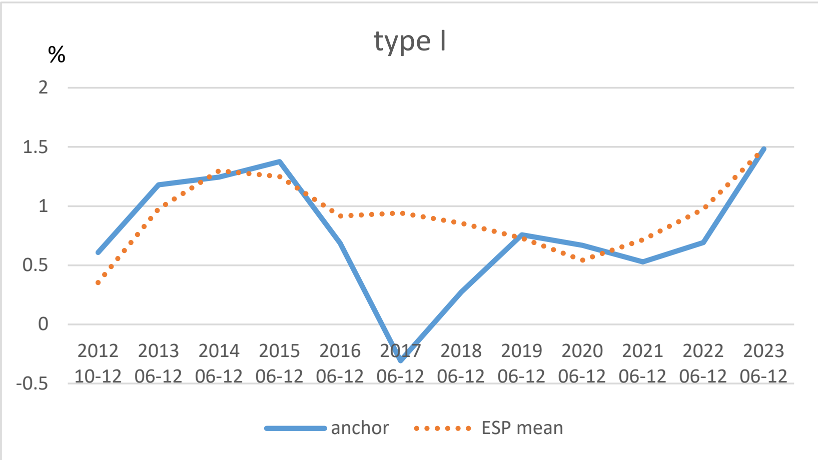
Note 1) “ex rate” denotes exchange rate.

2) Robust standard errors in parentheses.

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

Figure A1. Estimated Anchor: Instrument variable estimations

(1) Medium-term expectations



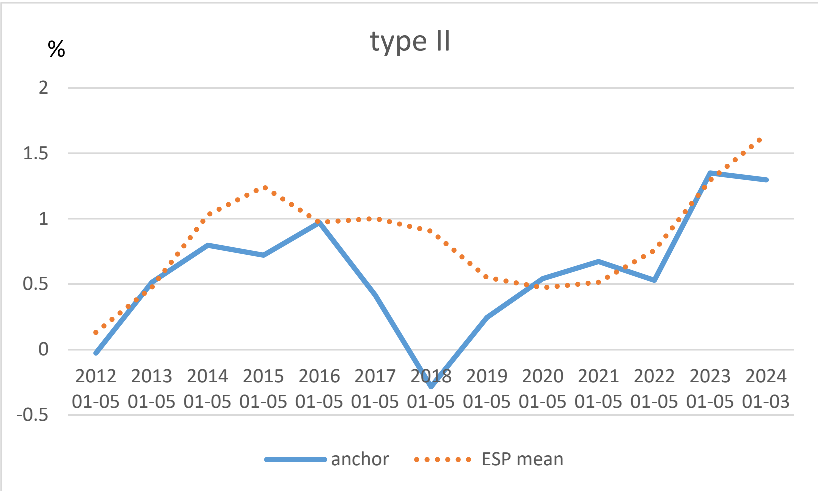
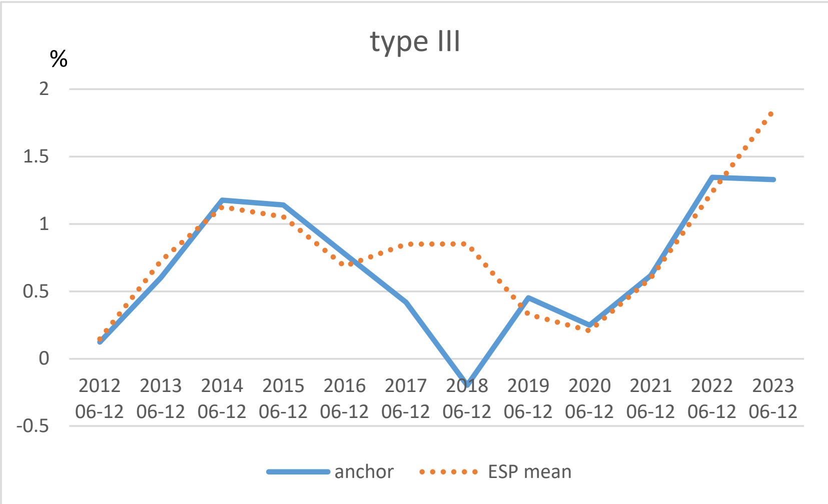
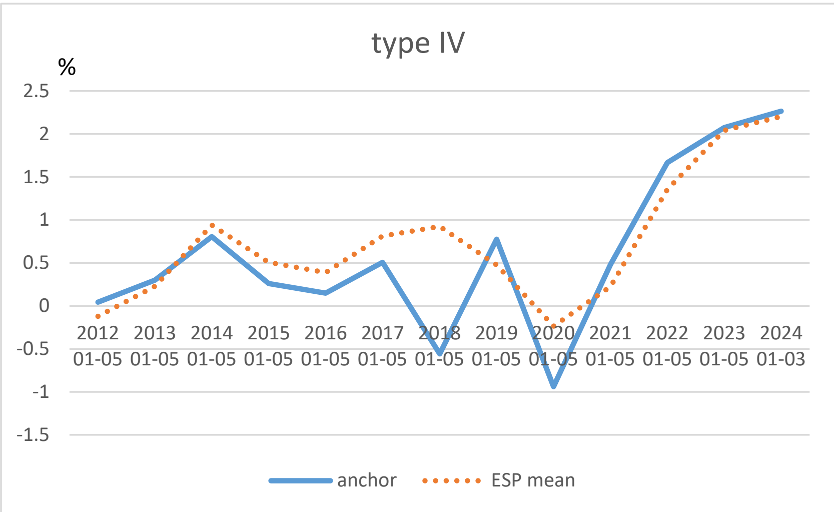


Figure A1. Estimated Anchor: Instrument variable estimations (continued)

(2) Short-term expectations





Note: The vertical axis is the estimated anchor of inflation expectations. The horizontal axis is the fiscal year in which the expectations were quoted.