〈Note〉

Inflation Expectation in Japan: Is It Rational?

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Abstract

The purpose of this paper is to examine whether or not inflation expectations are rational. This study found no evidence in favor of a lack of bias as agents' expectations, on average, systematically underestimate inflation. This study also found strong efficiency in Japan. Though this quality is difficult to judge, the assumption of rationality seems to hold in Japan.

1. Introduction

Inflation has received much attention. The stabilization of inflation is a key issue of economic growth; therefore, not only economic agents but also policymakers all over the world are very interested in this concept.

The analysis of economic agents' expectations is of great importance both in the real world and in academic fields. In the latter, we sometimes hypothesize that rational expectations always hold. The empirical assessment of expectations is an important issue; however, scant research has been conducted in this field and much research is needed.

The study of the expectations process is related to an understanding of how economic agents develop expectations. Several recent papers have shown evidence of an apparent statistical bias in inflation expectations and have interpreted these findings as overturning the rational expectations hypothesis (Andolfatto et al., 2008). The one that has received much

attention is this rational expectations hypothesis. This paper focuses on this issue as it concerns expectation theories.

The surge of quantitative surveys, related to improvements in data collection procedures, has increased the use of quantitative methods to predict expectations. The Carlson and Parkin (CP) method is one of the most widely employed. Many methods also appear to include the revised version of CP.

This paper has a twofold focus. One is to revisit the measurement of inflation expectations. The second is to assess whether or not agents' inflation expectations are rational. Inflation has received much attention for long time both in the world at large and also in Japan, which experienced high rates of inflation in 1950s and 1960s and has suffered from deflation for more than 20 years.

This paper is structured as follows. In section 2, the quantification of inflation expectation is reviewed. Section 3 provides the theoretical framework and performs rationality tests. Section 4 shows the empirical results. Finally this paper ends with a brief summary.

2. Inflation Expectations Formation

In general, regular economic surveys employ qualitative data to measure expectations. Inflation expectation is not exception. However, although the surveys ask consumers about their evaluations of future movements in consumer prices, the answers only refer to the agents' opinions about the direction of changes and not the degree of change. Therefore, the data collected are qualitative.

This section revisits the measurement of inflation expectations. The CP method is often used to convert qualitative data into quantitative data. The important assumption of the CP method is that each consumer, at each time, responds to the questionnaire according to a subjective probability density function associated with the variable of interest (Dias et al., 2010).

In the normal standard distribution, Pit is the proportion the answers that fall in the ith category at time t, and F is the cumulative normal distribution function. According to Batchelor and Orr (1988), the thresholds Tit can be written as

$$T_{1t} = F^{-1}t\,(1 - P_{1t}) \tag{1}$$

$$T_{2t} = F^{-1}t\,(1 - P_{1t} - P_{2t}) \tag{2}$$

$$T_{3t} = F^{-1}t\,(1 - P_{1t} - P_{2t} - P_{3t}) \tag{3}$$

$$T_{4t} = F^{-1}t\,(P_{5t}) \tag{4}$$

The expected inflation rate can be written as:

$$\pi_{et} = \frac{-T_{3t} - T_{4t}}{T_{1t} + T_{2t} - T_{3t} - T_{4t}}\,\pi_{pt-12} \tag{5}$$

where π_p is the perceived inflation rate, which plays a scaling role for the expected inflation rate.

This paper relies on this CP method. Next, the rational expectations theory is examined.

3. Theoretical Background for Rationality

The concept of rational expectations is based on assumption that expectations are similar to the informed predictions derived from relevant economic theory (Muth, 1961). The predictions should exploit as much as possible all available information in the data set. Moreover, related economic theory should include the underlying structural economic model.

Consider the following model for observed inflation:

$$P_t = \alpha + \beta P^e{}_t + \varepsilon_t \tag{6}$$

where P_t is the observed inflation rate and $P^e{}_t$ is the expected inflation rate. A test for lack of bias can be performed by joining testing $\alpha = 0$ and $\beta = 1$. The

rejection of this hypothesis indicates that the existence of bias in inflation expectation (Forsells and Kenny, 2002; Kurihara, 1995).

In a nonstationary case, the rational expectations hypothesis means that the observed and the expected inflation rates move along, so that there is no persistent divergence between two variables. The lack of bias restriction requires cointegration between the observed and the expected inflation and that the cointegrating vector is equal to [0 1]. If one rejects the hypothesis of [0 1], the data suggest that expectations are biased (Dias et al., 2010).

Forsells and Kenny (2002) employed a weak- and strong-efficiency test to check the efficiency. To test weak efficiency requires evaluation of the statistical significance of past observed inflation values along with significant past inflation, with observed lag to improve inflation forecast accuracy.

For strong efficiency, a similar test framework is performed. In this case, however, the purpose is to examine whether a broader information set is orthogonal to the forecast errors. Consider this equation:

$$e_t = \alpha + \beta\Omega_{t-12} + \varepsilon_t \tag{7}$$

where $e_t = P_t - P^e_t$ and Ω_{t-12} means the information set available at the time expectations are made.

Assume the following static factor representation for D_t data generating process:

$$D_t = \gamma INFO_t + \varepsilon_t \tag{8}$$

where $INFO_t$ is the vector of nonobservable factors. γ is a matrix of unknown loading and ε_t is an N-dimensioned vector of the idiosyncratic components.[1]

This paper examines lagged forecast error terms and takes into account data publication lags by including the relative position of the series, so that at each time, the independent variables considered reflect the inflation available to the economic agents at the time of the survey. This paper is based on Dias

et al. (2010) and employs the following model:

$$e_t = \alpha + \sum_{i=1}^{a} X_i e_{t-i} + \sum_{j=1}^{b} \psi_j INFO_{j,t-12} + \zeta (P^e_{t-1} - P_{t-1}) + \varepsilon_t \quad (9)$$

where a is the number of autoregressive terms included in the examination of the autocorrelation, e^e_j is the jth common factor taken from the broad information set, and b denotes the number of common factors considered. Agents are strongly efficient if the hypothesis $\psi = 0$ is not rejected.

4. Empirical Results

The data are from OECD main economic indicators. The sample period is from 1980 to 2009. Although the Johansen test result shows the existence of cointegration between the observed and the expected inflation, the result clearly rejects the hypothesis of a cointegration vector being equal to [0 1]. Nevertheless, when we only check the condition of $\beta = 1$, this hypothesis is not rejected.

The table below presents the results of the tests for the dynamic adjustment of observed and expected inflation.

Table. Weak and Strong Exogeneity Test Results

P				P^e	
Weak Exogeneity		Strong Exogeneity		Weak Exogeneity	
$\zeta = 0$		$\zeta = 0, \psi_j = 0$		$\zeta = 0$	
Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
−0.010	0.070	0.15	0.095	−0.058	0.000***

Note. *** denotes significant at 1% level.

According to the results shown above, expected inflation adjustments for observed inflation rate are proven in the log run. Moreover, the reverse relationship does not seem to be significant.[2]

Conclusions

The purpose of this paper is to examine whether or not inflation expectations are rational.[3] The study found no evidence in favor of lack of bias in agents' expectations, on average, in systematic estimates of inflation. Efficiency is difficult to judge; however, the assumption of rationality seems to hold in Japan.

It would be interesting to examine the same data for other countries and other sample periods. Too much volatility has occurred during the sample period, so it may be necessary to divide the sample into two or three periods. Methods of calculation other than CP are necessary. The results would may change significantly depending on the methods. There is also some possibility of larger information set for inflation (Berk, 1999).

Further research is needed in this field.

Notes

1. See, for example, Stock and Watson (1998) and Liziak (2003).
2. The results are line with the Forsells and Kenny (2002).
3. Nunes (2010) estimated the Phillips curve and suggested that survey expectations can be a significant component of firms' expectations and inflation dynamics.

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