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JAPANESE GDP FORECASTERS ARE PESSIMISTIC IN BOOM, OPTIMISTIC IN RECESSION, AND ALWAYS TOO JUMPY

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Japanese GDP Forecasters Are Pessimistic in Boom, Optimistic in Recession, and Always Too Jumpy

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This paper analyzes the rationality of Japanese macroeconomic forecasters. It finds that Japanese individual forecasters are pessimistic in boom and optimistic in recession, and that they over-react to new information. Across forecasters, the magnitude of average forecast revisions is not correlated with the magnitude of average forecast errors. These results together are consistent with neither the rational expectations hypothesis nor reputation models with rational and strategic forecasters.

Keywords: Rational expectation; Reputation; Over-reaction; Forecast.
JEL Classification Codes: C53, D84, D82.

1. Introduction

It is now one of the hottest issues in Japan whether Japanese economy is on the way to recover from the long recession. Many economists release forecasts of the Japanese real GDP growth rate, most of which are positive for fiscal year 2000. Recent research in financial economics, however, has shown that economic forecasts are subject to behavioral biases. De Bondt and Thaler (1990) find that security analysts' earnings forecasts are too optimistic and too extreme. Abarbanell and Bernard (1992) show that security analysts under-react to recent actual earnings. Amir and Ganzach (1998) show that analysts' forecast changes (i.e. earnings forecasts for the current year minus actual earnings in the previous year) tend to over-react and that their forecast revisions (i.e. new earning forecasts minus previous forecasts for the current year) tend to under-react. Ehrbeck and Waldmann (1996) find that forecast revisions of short-term interest rates have a tendency towards over-reaction. Since the same biases may affect Japanese economists, their forecasts need be carefully interpreted. This paper is the first attempt to investigate the effects of these biases on the GDP forecasts.

The paper is organized as follows. Section 2 explains the methodology. Section 3 explains data, and Section 4 reports the results. It finds that Japanese individual forecasters are pessimistic in boom and optimistic in recession. Furthermore, it finds that their forecast revisions have a strong tendency towards over-reaction. These are negative evidence against the rational expectations hypothesis. Section 5 tests whether reputation models can rationalize these results. When each forecaster's ability is private information, rational forecasters mimic what able forecasters will do. Thus forecasters over-react if and only if abler forecasters tend to do so. Consequently, if concern for reputation is the main reason for over-reaction, forecasters who change their forecasts by a large amount ought to have small forecast errors on average. The cross-sectional analysis in Section 5, however, finds that there is no correlation between each forecaster's mean squared forecast revision and mean squared forecast error. Reputation models cannot explain this result and the biases found in Section 4 together. Section 6 concludes.

2. Methodology

We follow Amir and Ganzach (1998) and consider two factors that influence forecast accuracy. If forecasters are optimistic, their forecast errors tend to be positive. If forecasters over-react to new information, their forecast errors tend to be positive (negative) when they obtain good (bad) news, i.e. in boom (recession). Therefore the joint effect of optimism and over-reaction on forecast errors is positive in boom and indeterminate in recession. Similarly, the joint effect of optimism and under-reaction on forecast errors is indeterminate in boom and positive in recession. Table 1 depicts these and other cases.

Table 1 reveals three important points. First, a positive forecast error does not necessarily indicate optimism. The reason is that pessimism plus over-reaction (under-reaction) may cause it when the forecast revision is positive (negative). Secondly, the set of a positive forecast revision and a negative forecast error needs not imply under-reaction. Over-reaction plus pessimism may cause it. Thirdly, the sign of the forecast revision is important when we investigate the joint effect of optimism/pessimism and over-/under-reaction. The analysis below divides the data into two sub-samples according to the sign of forecast revision.

In order to distinguish the effect of optimism/pessimism from the effect of over-/under-reaction, forecast errors are regressed on forecast revisions. Define $f_i^{t-2,t}$ as forecaster *i*'s initial forecast for year *t* in year $t-2$, $f_i^{t-1,t}$ as *i*'s revised forecast for year *t* in year $t-1$, and g^t as the actual growth rate of Japanese real GDP in year *t*. Then $FE_i^t \equiv f_i^{t-1,t} - g^t$ is *i*'s forecast error for year *t*, and $FR_i^t \equiv f_i^{t-1,t} - f_i^{t-2,t}$ is *i*'s forecast revision for year *t*. The regression is

(1) $$FE_i^t = \alpha + \beta \cdot FR_i^t + u_i^t$$

(Ehrbeck and Waldmann (1996) and Amir and Ganzach (1998) use the same equation). [1] The null hypothesis of rationality is $\alpha = \beta = 0$. Positive α implies optimism, while negative α implies pessimism. Positive (negative) β implies over-reaction (under-reaction) to new information.

When we test the above null hypothesis, we must take account of error correlation across forecasters. Keane and Runkle (1990) and Ehrbeck and Waldmann (1996) argue that shocks to the aggregate economy produce forecast errors that are correlated across forecasters. Hence we estimate the variance-covariance matrix in the same way as Ehrbeck and Waldmann (1996). The estimated matrix V is

(2) $$V = (X'X)^{-1}\left(\sum_t^T \left[\left(\sum_i^N X_i^t \hat{u}_i^t\right)'\left(\sum_i^N X_i^t \hat{u}_i^t\right)\right]\right)(X'X)^{-1}$$

where X_i^t is $(1, FR_i^t)$ if FR_i^t is available and $(0,0)$ otherwise, X is the $TN \times 2$-stack of X_i^t, and $\hat{u}_i^t$ is the residual. Ehrbeck and Waldmann (1996, p.31) point out that "the resulting estimate of the variance-covariance matrix of beta [i.e. V] is unbiased under the null of rational expectations and a quadratic loss function. On the other hand, if forecast errors are predictable, the resulting estimate will be biased upward by a positive definite matrix. … They provide extremely robust tests with extremely low power."

3. Data

Toyo Keizai Inc. has published the forecasts of about 80 Japanese economists in the January or February issue of "Monthly Statistics (Tokei Geppo)" since 1987. [2] Each economist makes forecasts of the Japanese real GDP growth rate for the ongoing fiscal year and that for the next fiscal year. For example, January 1990 issue contains forecasts for fiscal year 1989 (from April 1989 to March 1990) and fiscal year 1990 (from April 1990 to March 1991). We treat the former as $f_i^{t-1,t}$ and the latter as $f_i^{t-1,t+1}$. We exclude the forecasts for fiscal years 1987 ($f_i^{t-2,t}$ is missing) and 2000 (g^t is missing), and use the forecasts for fiscal years 1988 to 1999. We exclude economists who participate in less than four consecutive surveys, leaving 79 economists. The total number of forecast sets ($\left(f_i^{t-2,t}, f_i^{t-1,t}\right)$) is 596, and the average number of observations per economist is 7.54.

Among them, the forecast revision is positive in 210 observations, zero in 37 observations, and negative in 349 observations. We split the full sample into two subgroups, $FR_i^t \geq 0$ and $FR_i^t \leq 0$. The observations with $FR_i^t = 0$ are classified according to the sign of the average forecast revision for year *t*. The subgroup of $FR_i^t \geq 0$ consists of 224 observations, while the subgroup of $FR_i^t \leq 0$ consists of 372 observations (Table A1 shows the summary statistics). [3]

As for the actual growth rate g^t, Keane and Runkle (1990) argue that the revised data introduces a systematic bias because the extent of revision is unpredictable for the forecasters. For this reason we use the initial announcement of Japanese government usually released in June.

4. Results

First we check the relation between forecast revisions and forecast errors. Table 2 shows that, although there is no bias in the full sample, forecast errors tend to be negative (positive) when forecast revisions are positive (negative). These results appear to (a) indicate under-reaction and (b) deny either optimism or pessimism, but Table 1 in Section 2 has shown the counter examples. Hence we use regression analysis below.

Table 3 summarizes the results of equation (1). The first row is the estimates of the pooled data. The second and the third rows are the estimates of the sub-samples with positive forecast revisions ($FR_i^t > 0$) and negative forecast revisions ($FR_i^t < 0$) respectively. OLS estimates of standard errors are in the upper parentheses, and the modified standard errors calculated by equation (2) are in the lower parentheses. Note that the actual standard errors lie between them.

Table 3 demonstrates strong pessimism and strong over-reaction when the forecast revision is positive. Both coefficients are significant even if we use the over-estimated standard errors calculated by equation (2). On the other hand, Table 3 indicates strong optimism and strong over-reaction when the forecast revision is negative. α becomes insignificant but β remains significant when we use the over-estimated standard errors. [4] Overall, the regression results of equation (1) clearly reject the rational expectations hypothesis.

5. Rationality

Section 4 has shown that Japanese economic forecasters are jumpy in both boom and recession. An open question is whether they over-react for strategic reasons. To address this issue, let us consider the simple reputation model Ehrbeck and Waldmann (1996) present. Forecasters privately obtain signals about the growth rate of the ongoing year in March and August, and they make forecasts after receiving each signal. The quality of the signal received in March is identical for all forecasters, but the quality of the signal received in August varies across forecasters. Each forecaster's ability is private information.

In this model, abler forecasters attach larger weight on the second signal and thus make larger forecast revisions in August. Then (a) rational forecasters revise their forecast excessively in August to make them look able, but among them (b) incompetent forecasters make smaller revisions on average because they cannot rely on their low quality signals received in August. Consequently, the magnitude of average forecast revisions will be negatively correlated with the magnitude of average forecast errors across forecasters (We can obtain the same conclusion from other reputation models because rational forecasters have an incentive to over-react if and only if abler forecasters tend to over-react).

We test the above implication by the following regression:

(3) $$\overline{FE}_i = \alpha + \beta \cdot \overline{FR}_i + u_i$$

where $\overline{FE}_i$ ($\overline{FR}_i$) is the mean squared forecast error (forecast revision) of forecaster *i*. Table 4 reports the OLS estimates of this regression. It also reports the rank correlation coefficient of $\overline{FE}_i$ and $\overline{FR}_i$ since u_i in equation (3) is not normally distributed.

As shown in Table 4, there is little correlation between $\overline{FE}_i$ and $\overline{FR}_i$ in either sample. [5] It indicates that forecasters' strategic behaviors are not the cause of over-reaction found in Section 4.

6. Conclusions

This paper investigated the GDP forecast data of Japanese individual economists, and obtained the following results. First, they are pessimistic in boom and optimistic in recession. Secondly, they revise their forecasts excessively. Thirdly, there is no relation between the magnitude of average forecast errors and the magnitude of average forecast revisions. Since neither the rational expectations hypothesis nor reputation models can account for these results consistently, it lends considerable support for behavioral explanations.

Notes

1. De Bondt and Thaler (1990) and Amir and Ganzach (1998) analyze the relation between forecast changes and forecast errors. When we apply their analysis to GDP forecasts, the equation becomes

$$f_i^{t-1,t} - g^t = \alpha + \beta\left(f_i^{t-1,t} - g^{t-1}\right)$$

where g^{t-1} is the actual growth rate in year $t-1$. However,

$$\forall i \quad f_i^{t-1,t} - g^t = g^{t-1} - g^t + \left(f_i^{t-1,t} - g^{t-1}\right)$$

for given year *t*. Therefore the estimated coefficients have little theoretical meaning if the number of forecaster is large relative to the time-series dimension (β will be positive unless the data contains sufficient number of observations such that the absolute value of $f_i^{t-1,t} - g^{t-1}$ is large and $\left(f_i^{t-1,t} - g^t\right)\left(f_i^{t-1,t} - g^{t-1}\right) < 0$). The same problem occurs when we replace g^{t-1} with the average of $f_i^{t-2,t}$ as Ehrbeck and Waldmann (1996) do.

2. Ashiya and Doi (forthcoming) also use this data, and investigate the relation between economists' age and the degree of herding.

3. We obtain similar results when we exclude the observations with $FR_i^t = 0$ from the data.

4. Ehrbeck and Waldmann (1996) find over-reaction but do not find either optimism or pessimism in the U.S. bond market (They do not investigate the divided data). Amir and Ganzach (1998) investigate the earnings forecasts and find (a) optimism and under-reaction in the pooled data, (b) *over-reaction* in the sub-sample of $FR_i^t > 0$, and (c) optimism and strong under-reaction in the sub-sample of $FR_i^t < 0$. One reason why only security analysts in the sub-sample of $FR_i^t < 0$ tend to under-react is that, when they receive negative information, they have an incentive to shade their forecasts to retain good relation with company management (Francis and Philbrick (1993) find evidence that supports this argument). Of course, GDP forecasters in our sample are free from such pressures.

5. Ehrbeck and Waldmann (1996) find positive correlation between the mean squared forecast revisions and the mean squared forecast errors.

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Table 1. The joint effect of optimism (pessimism) and over-reaction (under-reaction) on forecast errors.

<table>
<tr><td rowspan="2"></td><td colspan="2">Positive revision</td><td colspan="2">Negative revision</td></tr>
<tr><td>Effect</td><td>Joint effect</td><td>Effect</td><td>Joint effect</td></tr>
<tr><td rowspan="2">Optimism & Over-reaction</td><td>+</td><td rowspan="2">+</td><td>+</td><td rowspan="2">?</td></tr>
<tr><td>+</td><td>–</td></tr>
<tr><td rowspan="2">Optimism & Under-reaction</td><td>+</td><td rowspan="2">?</td><td>+</td><td rowspan="2">+</td></tr>
<tr><td>–</td><td>+</td></tr>
<tr><td rowspan="2">Pessimism & Over-reaction</td><td>–</td><td rowspan="2">?</td><td>–</td><td rowspan="2">–</td></tr>
<tr><td>+</td><td>–</td></tr>
<tr><td rowspan="2">Pessimism & Under-reaction</td><td>–</td><td rowspan="2">–</td><td>–</td><td rowspan="2">?</td></tr>
<tr><td>–</td><td>+</td></tr>
</table>

Table 2: The outcome of forecast errors

	$FE_i^t < 0$	$FE_i^t = 0$	$FE_i^t > 0$	Total
Full sample	264	72	260	596
$FR_i^t > 0$	126	26	72	224
$FR_i^t < 0$	138	46	188	372

Note: $FE_i^t \equiv f_i^{t-1,t} - g^t$ and $FR_i^t \equiv f_i^{t-1,t} - f_i^{t-2,t}$

Table 3: The effect of forecast revision (FR_i^t) on forecast error (FE_i^t)

Model: $FE_i^t = \alpha + \beta FR_i^t$

	α (s.e.)	β (s.e.)	$\overline{R}^2$	Obs.
Full sample	0.038 (0.039) [a] (0.223) [b]	-0.012 (0.023) [a] (0.064) [b]	0.000	596
$FR_i^t > 0$	-0.376 (0.063)*** [a] (0.215)** [b]	0.224 (0.061)*** [a] (0.088)*** [b]	0.053	224
$FR_i^t < 0$	0.419 (0.080)*** [a] (0.502) [b]	0.154 (0.041)*** [a] (0.115)* [b]	0.034	372

Notes

a: OLS estimates.

b: Calculated without imposing restrictions on the variance-covariance matrix of forecast errors, except that forecast errors at different times are assumed to be uncorrelated.

***: Significant at the 0.01 level.

**: Significant at the 0.05 level.

*: Significant at the 0.10 level.

Table 4: Cross-sectional effect of average forecast revision

Model: $\overline{FE}_i = \alpha + \beta \cdot \overline{FR}_i$ where $\overline{FE}_i \equiv \text{avg}\left(FE_i^t\right)^2$ and $\overline{FR}_i \equiv \text{avg}\left(FR_i^t\right)^2$

	α (s.e.)	β (s.e.)	$\overline{R}^2$	Rank correlation [a]
Full sample	0.838 (0.078) [b]	-0.023 (0.025) [b]	0.000	-0.031
$FR_i^t > 0$	0.400 (0.070) [b]	-0.016 (0.048) [b]	0.000	0.096
$FR_i^t < 0$	1.091 (0.092) [b]	-0.024 (0.021) [b]	0.003	-0.118

Notes
a: Rank correlation is obtained from a separate regression replacing the variables with their ranks.
b: OLS estimates.

Table A1: Summary statistics

	Full sample	$FR_i^t > 0$	$FR_i^t < 0$
Avg. of FR_i^t	-0.6279	0.8411	-1.5124
S.D. of FR_i^t	1.5476	0.6157	1.2358
Avg. of FE_i^t	0.0453	-0.1879	0.1858
S.D. of FE_i^t	0.8789	0.5737	0.9934
Observations	596	224	372