Yield Expectations and the Effects of Macroeconomy and Monetary Policy

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Just preliminary

Motivation

- How do forecasts respond to changes in macroeconomic variables and monetary policy?
- Look at not average but micro data of professional monthly forecasts of yields on the Japanese 10-yr Government Bond (JGB) surveyed by the QUICK.
- Understand if the respondents are identical or non-identical (significantly different each other).
About QUICK Survey

- QUICK Survey (QSS) surveys market participants, economists, and other professionals.

- QUICK Survey (QSS) surveys on their 1-month, 3-month, and 6-month forecasts of long term (10-yr) and short term interest rates at the end of each month.


- Not all the participants answer each month, so that the data set is the unbalanced panel data.

Notation

$r_t$: 10-yr JGB yield at $t$.

$r'_{i,t}$: 10-yr JGB yield at $t$ forecasted at $(t-6)$ by forecaster $i$.

$r'_{t}$: Average 10-yr JGB yield at $t$ forecasted at $(t-6)$.

(Average) forecast error: $r'_{t}r_t$

$$\text{RMSE} = \sqrt{\frac{1}{T} \sum_{t=1}^{T} (r'_{t} - r_t)^2}$$
Findings and questions

- Significant upper bias of forecasts against the actual data over time (from 1996 to 2008).
- RMSE of forecasters (0.355) > RMSE of simple flat (no-change) forecasts (0.324)
- The simple flat (no-change) forecasts outperform the professional forecasts.
- Are those errors idiosyncratic or common across forecasters?
Decomposition of errors by Bauer et al. (2006)

\( Y_t \): realized economic data assumed to be normally distributed with mean \( \mu_t \) and economy-wise common covariance matrix \( \Omega_{rt} \). \( \Omega_{rt} \) reflects the aggregate shocks affecting the realized value of \( \mu_t \).

\( Y_{it} \): individual forecast assumed to be normally distributed with mean \( \mu_t \) and forecast-wise covariance matrix \( \Omega_{ft} \). \( \Omega_{ft} \) reflects the discrepancy in forecasts across forecasters.

Forecast error of forecaster \( i \): \( X_{it} = Y_{it} - Y_t \)
- mean = 0
- variance matrix = \( \Omega_{rt} + \Omega_{ft} \)
  = common error + idiosyncratic error

Decomposing RMSE of 10-yr JGB yields

➢ Common factor is dominant.

![Graph showing decomposition of errors](image-url)
The similar tendency is observed in the case of the United States, but the forecasts and realized values cross over time.

What is of interest?

The majority of research on economic forecast focuses on whether forecast error is rational or not. — Mullineaux (1978), Zarnowitz (1985), Aggarwal et al. (1995), Ito (1990), Gordon (2008), Schrim (2003) and many others.

Japanese JGB market’s forecasts show upper bias mainly caused by common factors.

Particularly, forecasts $(r_{ft} - r_i)$ suggest that six-month later, 10-yr JGB yield is (almost always) higher than the present 10-yr JGB yield.

We define $(r_{ft} - r_{t-6})$ as “expectations (with upper tendency)” and explore what explains them. Ball and Croushore (2003) has the similar motivation.
Factors affecting forecasts are …

- QSS collects the information on which factors forecasters focus.

- Factors are (i) business cycles, (ii) prices, (iii) monetary policy, (iv) exchange rates, (v) foreign interest rates, (vi) stock prices.

- Forecasters can answer
  1. strongly positive
  2. positive
  3. neutral
  4. negative
  5. strongly negative
for each factor. Note that “negative” means that the factor has a negative impact on JGB price, so that “negative” has a positive impact on JGB yields.

- Find the proxy of each factor to conduct regression.
Business cycle factors

➤ When the economy is booming, a rise in yields expectation increases.

Correlation = 0.33

Price factors

➤ When prices increase, a rise in yields expectation increases.

Correlation = 0.84
Forecasts look at …

- List of proxies for the factors.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Proxy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business cycle factor</td>
<td>Quarterly growth in industrial production</td>
</tr>
<tr>
<td>Price factor</td>
<td>Annual Growth in Corporate Goods Price index</td>
</tr>
<tr>
<td>Monetary policy factor</td>
<td>Overnight rate</td>
</tr>
<tr>
<td></td>
<td>QMEP dummy (01/3-06/3 = 1)</td>
</tr>
<tr>
<td>Exchange rates factor</td>
<td>Quarterly change in ¥$ exchange rate</td>
</tr>
<tr>
<td>Foreign interest rates factor</td>
<td>Spread between T-note yields and JGB Yields</td>
</tr>
<tr>
<td>Stock prices factor</td>
<td>Quarterly growth in TOPIX</td>
</tr>
</tbody>
</table>

Regression Model 1

Available when forecasting

\[
\tilde{r}_t^f - r_{t-6} = \alpha + \omega_{t-6}^r \beta + \epsilon_t
\]

- Simple OLS regression
- Explanatory variables x correspond to the six factors listed in the table in the previous slide.
- Sample period: 1999/1 – 2008/4
Regression Model 1  
\[ \bar{r}_{t}^{f} - r_{t-6} = \alpha + x_{t-6}^{l} \beta + \epsilon_{t} \]

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business cycle factor</td>
<td>-0.003</td>
<td></td>
</tr>
<tr>
<td>Price factor</td>
<td>0.014</td>
<td>*</td>
</tr>
<tr>
<td>Monetary policy factor 1</td>
<td>0.104</td>
<td></td>
</tr>
<tr>
<td>Monetary policy factor 2 (dummy)</td>
<td>-0.030</td>
<td></td>
</tr>
<tr>
<td>Exchange rates factor</td>
<td>0.004</td>
<td>***</td>
</tr>
<tr>
<td>Foreign interest rates factor</td>
<td>0.103</td>
<td>***</td>
</tr>
<tr>
<td>Stock prices factor</td>
<td>-0.001</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-0.171</td>
<td></td>
</tr>
</tbody>
</table>

R-sq = 0.292, # of observation = 118

Regression Model 2 (Panel, fixed effect model)

- Use survey results to obtain micro level mechanism and asymmetry of forecasts.

\[ r_{i,t}^{f} - r_{t-6} = \alpha_{i} + x_{i,t-6}^{l} \beta + \epsilon_{i,t} \]

- Unbalanced panel data regression

- Explanatory variables x correspond to the cross terms of each variable.
  - ex. Business cycle factor \cdot dummy 12  
    = business cycle factor if a forecaster answers
    1. strongly positive or 2. positive, else 0.
  - ex. Business cycle factor \cdot dummy 45  
    = business cycle factor if a forecaster answers
    4. negative or 2. strongly negative, else 0.

- Sample period: 1999/1 – 2008/4
Regression Model 2

\[ r_{i,t}^f - r_{t-6} = \alpha_i + x_{i,t-6}^f \beta + \epsilon_{i,t} \]

<table>
<thead>
<tr>
<th>Factor</th>
<th>Dummy 12</th>
<th>Dummy 45</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business cycle factor</td>
<td>-0.006**</td>
<td>0.004</td>
</tr>
<tr>
<td>Price factor</td>
<td>0.002</td>
<td>-0.004</td>
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<tr>
<td>Monetary policy factor 1</td>
<td>0.120***</td>
<td>0.106***</td>
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<tr>
<td>Monetary policy factor 1 * Monetary policy factor 2</td>
<td>-0.086***</td>
<td>0.003</td>
</tr>
<tr>
<td>Exchange rate factor</td>
<td>0.003**</td>
<td>0.006***</td>
</tr>
<tr>
<td>Foreign interest rates factor</td>
<td>-0.001</td>
<td>0.012***</td>
</tr>
<tr>
<td>Stock prices factor</td>
<td>-0.001</td>
<td>-0.001***</td>
</tr>
<tr>
<td>Constant</td>
<td>0.167***</td>
<td></td>
</tr>
</tbody>
</table>

R-sq = 0.05, # of observation = 3096

Findings from the panel regression

- Monetary policy factor has significant effects on “expectations”. This result might suggest that the BOJ’s commitment policy worked. During the QMEP, the BOJ committed that it would not raise short-term interest rates unless “three conditions (ex. Positive CPI)” were sufficed.

- Exchange rates factor also has significant effects on “expectations”. This result is consistent with the fact that Japanese economy has been depending on external demand.

- Business cycle, stock price, and foreign interest rates factors show somewhat mixed results. Price factor is not important.
Conclusion

- Japanese yield forecasts have a significant upper bias, which is common across forecasters.

- “expectations”, defined as the gap between the 6-month yield forecasts and the actual yields at the time when forecasts were done, are positive over time, as well.

- Monetary policy factor and exchange rates factors have significant effects on “expectations”.

- What are needed are
  1. conduct robustness check.
  2. try slope dummy (QMEP / non-QMEP).
  3. add theoretical explanation.
  4. give better name for \( r_{ft} - r_{t-6} \)