Analysts' awareness of systematic bias in management earnings forecasts: Empirical evidence from Japan

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Abstract: The effectively mandatory provision of management earnings forecasts (MEF) is an unique feature of Japan's financial disclosure system. The first objective of this study is to identify the determinants of systematic bias in MEF using a sample of nearly 25,000 one-year-ahead earnings forecasts announced by Japanese firms at the beginning of a fiscal year over the period 1979-1999. The examination of ex post management forecast errors shows that financial distress, firm growth, firm size, and prior forecast errors are all associated with bias in MEF. The second objective of this study is to investigate whether analysts are aware of these factors that are related to systematic bias in MEF. The examination of analysts' forecasts issued subsequent to the announcement of management forecasts reveals that analysts take these factors into consideration when they issue their own earnings forecasts. These findings indicate that analysts are well aware of the determinants of systematic bias in MEF and make correct adjustments that lead to the higher accuracy of analysts' forecasts than management forecasts.

Key Words: Management forecasts; Systematic bias; Analysts' awareness

1. Introduction

A major disclosure difference between Japan and other countries is that management of almost all listed firms in Japan provides forecasts of next period's earnings. This practice was initiated by the stock exchanges in 1974, at which time a letter was sent to listed firms requesting them to disclose forecasts of key accounting information. Although the forecasts are technically voluntary, most Japanese firms comply with the request and provide them. As a consequence, management forecasts of the upcoming period's sales, ordinary income, net income (earnings), earnings per share, and dividends per share are announced simultaneously with the most recently completed period's actual accounting figures in annual press releases.[1] This unique setting in Japan makes it possible to conduct a large-scale study on management forecasts over a long period of time.

While management forecasts are much less common in the U.S., a number of recent studies have investigated and found several factors that are associated with systematic bias in management earnings forecasts (hereafter referred to as MEF). For example, Frost (1997) and Koch (2002) find optimistic bias in MEF issued by financially distressed firms. Koch also finds that such forecasts are viewed by analysts with skepticism. In contrast to the U.S., there has been little research in Japan that examines the properties of management forecasts nor their impact on analysts' forecasts despite the fact that the provision of management forecasts is a major feature of the Japanese disclosure system. This lack of research on Japanese management forecasts is partly because the dataset is not readily available in an electronic form and needs to be collected manually. To my knowledge, this study is the first to explore the determinants of systematic bias in Japanese MEF and analysts' awareness of them.

[1] The term 'earnings' used in this paper indicates 'net income' unless otherwise stated.

The first objective of this study is to investigate the determinants of bias in MEF. Based on the findings from prior research on management forecasts, I investigate the effects of four factors, namely financial distress, firm growth, firm size, and persistence of prior forecast errors, on bias in MEF using a sample of nearly 25,000 forecasts announced by Japanese firms at the beginning of a fiscal year over the period 1979-1999. The examination of ex post management forecast errors reveals that these factors are all associated with systematic bias in MEF. The major findings of the analysis are: (i) financially distressed firms with high debt ratios and losses issue optimistic MEF; (ii) growth firms with high sales growth ratios and low book-to-market ratios announce pessimistic MEF; (iii) small firms issue optimistic MEF; and (iv) firms whose prior MEF were pessimistic (optimistic) tend to remain pessimistic (optimistic) in their current forecasts.

The second objective of this study is to investigate whether analysts are aware of the aforementioned systematic bias in MEF. Both management and analysts' forecasts used in this study are one-year-ahead earnings forecasts and are the first forecasts announced at the beginning of a fiscal year. Analysts' earnings forecasts (hereafter referred to as AEF) are publicized subsequent to MEF. Because of the information asymmetry that exists between managers and outsiders about future performance of firms, especially at the beginning of a fiscal year when little alternative information is available, it is both rational and practical for analysts to use MEF as a basis for their own forecasts. However, the comparison of AEF and MEF in forecast accuracy reveals that AEF are significantly more accurate than MEF, which implies that analysts make some adjustments that lead to smaller forecast errors. When the deviation of AEF from MEF is regressed on the previously identified four factors, the signs of the estimated coefficients are all consistent with those of the systematic forecast errors in MEF. These findings

indicate that analysts are well aware of the determinants of systematic bias in MEF and make correct adjustments that lead to the higher accuracy of analysts' forecasts.

Overall, the findings in this study suggest that analysts do not necessarily take management forecasts at face value, but rather pay close attention to the financial conditions of the issuing firms in formulating their own earnings forecasts. These efforts by analysts may account for the higher accuracy of analysts' forecasts than management forecasts.

The remainder of the paper is organized as follows. The next section provides some background on Japanese management forecasts. Section 3 develops the research hypotheses, while Section 4 discusses the estimation models based on the hypotheses. Section 5 describes the data, and Section 6 provides the empirical results. The final section summarizes the findings and concludes the paper.

2. Background on Japanese management forecasts

The timing and extent of corporate disclosure in Japan is affected by legal and stock exchange policies. The Securities and Exchange Law, which covers companies listed on the security exchanges, requires firms to file annual securities reports ("Yuka Shoken Hokokusho") with the Ministry of Finance within three months of fiscal year end. The form and content of the annual securities report is prescribed by the Ministry of Finance Ordinance, and the report provides detailed information on business activities and financial condition of an enterprise in a fiscal year. Although the scope and amount of information being disclosed in the annual securities report is extensive and comprehensive, there is a three-month time lag between the disclosure of the report and the closing of the firm's fiscal year.

In order to supplement the lack of timeliness in statutory disclosure under the Securities and

Exchange Law, Japan's stock exchanges, which are self-regulatory organizations, request that listed firms publicize condensed financial statements ("Kessan Tanshin") immediately upon board of director approval of a draft of financial statements.[2] As a result, earnings figures are public well before the three-month legal deadline. For the vast majority of Japanese companies, earnings announcements take place 25 to 40 trading days after the fiscal year end. This practice of timely disclosure was initiated by the stock exchanges in 1974, at which time a letter was sent to listed firms requesting them to disclose key accounting information. Management earnings forecasts for the upcoming period are provided in the condensed financial statements together with current financial results (sales, ordinary income, net income, earnings per share, and dividends per share).[3] Thus, technically speaking, the provision of management earnings forecasts is voluntary without any legal backing. In fact, some financial institutions, especially securities firms, do not provide management forecasts, citing the difficulty of predicting the future business environment. However, as a whole, compliance has been so high that almost all firms provide earnings forecasts.[4] This is partly due to continuous efforts made by stock exchanges to comply with the request and partly due to the guidelines prescribed by the Ministry of Finance Ordinance regarding revisions of management earnings forecasts. Under the guidelines, firms are required to announce revised forecasts immediately when a significant change in previously published forecasts arises (e.g., ±10 per cent of sales, ±30 per cent of ordinary income, ±30 per cent of net income). As far as firms follow the guidelines, they are not to be held responsible for failing to meet their initial forecasts. This is in contrast with the safe

[2] The condensed financial statements ("Kessan Tanshin") are available from the Tokyo Stock Exchange (TSE) website (http://www.tse.or.jp).

[3] All forecasts are publicized in the form of point forecasts except for dividends per share that are sometimes provided in the form of range forecasts.

[4] A survey reports that by 1980, more than 90 per cent of listed firms excluding those in the financial sector provide management forecasts.

harbour for forward-looking statements in the U.S. (the Private Securities Litigation Reform Act of 1995)(Roake and Davidson,1996). The Reform Act was intended to encourage companies to make good faith projections without fear of a securities lawsuit but has been said to be ineffective due to ambiguity in interpretations (Rosen, 1998). In addition, shareholder litigations against companies and managements are traditionally less common in Japan. These factors seem to have contributed to create the favorable environment in which most firms issue earnings forecasts in Japan.

3. Hypothesis development

While management forecasts are much less common in the U.S., a number of studies have investigated and found several factors that are associated with systematic bias in MEF. The first factor is financial distress. Prior research has documented optimism in financial disclosures released by managers of financially distressed firms. Using a sample of 81 UK firms that received modified audit reports, Frost (1997) finds that managers of distressed firms make disclosures about expected future performance that are overly optimistic relative to actual financial outcomes. While Frost (1997) conducts an univariate analysis, Irani (2000) performs a multivariate analysis and finds a positive linear correlation between optimism in MEF and the degree of financial distress. Moreover, Choi and Ziebart (2000) find that firms reporting losses for the current period announce more optimistic earnings forecasts for the next year than those reporting profits. These results suggest that financially distressed firms are inclined to issue more optimistic earnings forecasts.

The second factor is firm growth. Prior research implies that high-growth firms have more incentives to announce pessimistic forecasts. Matsumoto (2002) and Richardson et al. (1999,

2004) investigate the propensity for firms to avoid negative earnings surprises and find that high-growth firms are more likely to guide analysts' forecasts downward to meet their expectations at the earnings announcement. Choi and Ziebart (2000) also find some weak evidence that high-growth firms tend to release pessimistic management forecasts. One possible explanation for these findings is that the stock market reaction to negative earnings surprises is particularly large for high-growth firms (Skinner and Sloan, 2002). These findings suggest that high-growth firms are inclined to issue more pessimistic earnings forecasts in order to avoid earnings disappointments.

The third factor is firm size. Several studies find firm size is associated with forecast behavior such as forecast precision and venue (Baginski and Hassell, 1997; Bamber and Cheon, 1998). Choi and Ziebart (2000) document that MEF are more optimistic for small firms than for large firms, though they do not give a theoretical explanation for it. I hypothesize that managers of large firms may regard publicized earnings forecasts as commitments to the investment community and other interested parties. Their projections, therefore, tend to be conservative in order to avoid missing the forecasts. On the other hand, managers of small firms may consider earnings forecasts as their targets for the upcoming period. As a result, their projections tend to be optimistic.

The fourth factor is the persistence of prior management forecast errors. Williams (1996) reports that the accuracy of a prior management earnings forecast serves as an indicator to analysts of the believability of a current management forecast. Hirst et al. (1999) conduct an experimental study and find that prior forecast accuracy by management affects investors' earnings predictions when current management forecasts are given to them. Although these results do not provide direct evidence on the persistence of management forecast errors, they

indicate that analysts and investors believe in the persistence.

Thus, previous research on management forecasts is in favor of the existence of systematic bias in MEF, and this leads to my first prediction:

Hypothesis 1: *Management forecasts are systematically biased, and financial distress, firm growth, firm size, and prior forecast errors are all associated with the bias.*

Finding evidence in support of Hypothesis 1 confirms that management forecasts are systematically biased, and the question arises as to whether financial analysts are aware of the systematic bias and the contributing factors associated with it. There is some evidence that implies analysts' awareness of systematic bias in MEF. For example, Koch (2002) reports that MEF issued by distressed firms exhibit greater optimism and are viewed as less credible by analysts than similar forecasts made by non-distressed firms. The findings of Williams (1996) and Hirst et al. (1999) mentioned above are also indicative of analysts' awareness of the persistence of management forecast errors.

In a similar vein, a number of studies investigate the stock market's response to the predictable bias in management forecasts. Frost (1997) documents that investors discount financially distressed firms' optimistic announcements about restructuring and expected financial improvements. Rogers and Stocken (2005) also find evidence that investors filter out the predictable forecast errors in MEF. Ng et al. (2006) and Hutton and Stocken (2006) examine the effects of disclosure quality and reputation, measured by prior forecast accuracy, forecast precision, and forecast frequency, on the stock market's initial reaction to the announcement of management forecasts. They find that investors are more responsive to management forecasts of firms with higher disclosure quality and forecasting reputation.

Thus, the findings in prior research are indicative of financial analysts' awareness of the

determinants of systematic bias in management forecasts, and this leads to my second prediction:

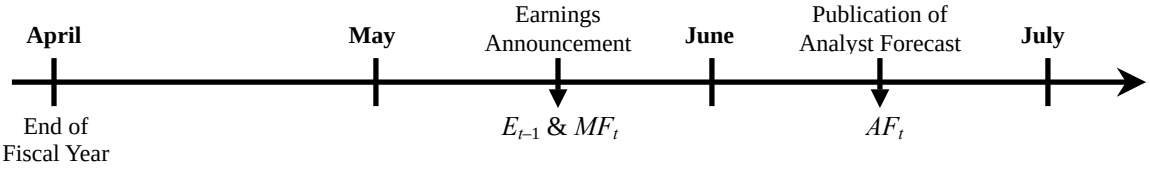
Hypothesis 2: *Analysts are aware of systematic bias in management forecasts and make correct adjustments in publicizing their own forecasts.*

4. Research design

4.1. Variable definitions

Figure 1 depicts the sequence of events using a March year-end firm, which is most common for Japanese firms. For a typical March year-end firm, the earnings announcement takes place in late May, at which time actual earnings for period $t - 1$ are announced simultaneously with MEF for period t. Analysts' forecasts of earnings for period t are publicized in mid June, by which time all management forecasts are announced. Since only one-year-ahead forecasts are available for both MEF and AEF, management forecasts in late May and analysts' forecasts in mid June are the first earnings forecasts available for period t.

Figure 1
Sequence of events



Note: E_t = actual earnings per share for period t, MF_t = management forecast of earnings per share for period t that is publicized simultaneously with E_{t-1} at the earnings announcement, and AF_t = analysts' forecast of earnings per share for period t that is issued subsequent to MF_t.

The ex post forecast errors of MEF and AEF are defined as the difference between actual and forecast earnings scaled by the share price at the beginning of the fiscal year.

$MFERR_t = (E_t - MF_t) / P_t$ and

$AFERR_t = (E_t - AF_t) / P_t$,

where:

$MFERR_t$ = management forecast error for period t,

$AFERR_t$ = analysts' forecast error for period t,

E_t = actual earnings per share for period t,

MF_t = management forecast of earnings per share for period t that is usually announced within 10 weeks into period t,

AF_t = analysts' forecast of earnings per share for period t that is issued subsequent to MF_t, and

P_t = share price at the beginning of period t.

Positive *MFERR* and *AFERR* indicate pessimistic forecasts, while negative *MFERR* and *AFERR* indicate optimisitic forecasts.

The ex post forecast accuracy of MEF and AEF is defined as the absolute difference between actual and forecast earnings scaled by the share price at the beginning of the fiscal year.

$MFACC_t = |E_t - MF_t| / P_t$ and

$AFACC_t = |E_t - AF_t| / P_t$,

where:

$MFACC_t$ = management forecast accuracy for period t and

$AFACC_t$ = analysts' forecast accuracy for period t.

The deviation of analyst forecast from management forecast is measured as the difference between AEF and MEF scaled by the share price at the beginning of the fiscal year.

$AFDEV_t = (AF_t - MF_t) / P_t$

where:

$AFDEV_t$ = analysts' forecast deviation from management forecast for period t,

A positive *AFDEV* implies that analysts consider the management forecast to be pessimistically biased, while a negative *AFDEV* implies that analysts consider it to be optimistically biased.

4.2. Models for testing hypotheses

I estimate the following regression model to test Hypothesis 1.

$$MFERR_t = \alpha_0 + \alpha_1 DEBTR_t + \alpha_2 LOSS_t + \alpha_3 \Delta SALE_t + \alpha_4 BMR_t + \alpha_5 SIZE_t + \alpha_6 MFERR_{t-1} + \alpha_7 MFERR_{t-2} + \alpha_8 IND1\text{–}28_t + \alpha_9 YEAR81\text{–}98_t + \varepsilon_t \quad (1),$$

where:

$DEBTR_t$ = total liabilities divided by total assets at the beginning of period t,

$LOSS_t$ = one if E_t is negative and zero otherwise,

$\Delta SALE_t$ = sales revenue for period t divided by sales revenue for period t–1,

BMR_t = book value of shareholders' equity divided by market value of equity at the beginning of period t,

$SIZE_t$ = log of inflation-adjusted market value of equity at the beginning of period t,

IND1–28 = a set of industry dummy variables, and

YEAR81–98 = a set of year dummy variables.

Equation (1) includes *DEBTR* (debt ratio) and *LOSS* to proxy for financial distress, *ΔSALE* and *BMR* (book to market ratio) for firm growth, *SIZE* for firm size, and lagged *MFERR*s for the persistence of management forecast errors. I use a pooled time-series cross-sectional regression framework, so *IND1–28* and *YEAR81–98* are also included to control for possible variation in

forecast errors across industry and over the years.

I expect the coefficient on *DEBTR* (α_1) to be negative, the coefficient on *LOSS* (α_2) to be negative, the coefficient on *ΔSALE* (α_3) to be positive, the coefficient on *BMR* (α_4) to be negative, the coefficient on *SIZE* (α_5) to be positive, and the coefficients on lagged *MFERR*s (α_6 and α_7) to be positive.

In testing Hypothesis 2, I use the following two models.

$$AFDEV_t = \beta_0 + \beta_1 DEBTR_t + \beta_2 LOSS_t + \beta_3 \Delta SALE_t + \beta_4 BMR_t + \beta_5 SIZE_t + \beta_6 MFERR_{t-1} + \beta_7 MFERR_{t-2} + \beta_8 IND1\text{–}28_t + \beta_9 YEAR81\text{–}98_t + \varepsilon_t \quad (2a),$$

$$ORDER_t = \gamma_0 + \gamma_1 DEBTR_t + \gamma_2 LOSS_t + \gamma_3 \Delta SALE_t + \gamma_4 BMR_t + \gamma_5 SIZE_t + \gamma_6 MFERR_{t-1} + \gamma_7 MFERR_{t-2} + \gamma_8 IND1\text{–}28_t + \gamma_9 YEAR81\text{–}98_t + \varepsilon_t \quad (2b),$$

where:

$ORDER_t$ = an ordered variable that takes the value of zero if $AFDEV_t$ is negative, one if $AFDEV_t$ equals zero, and two if $AFDEV_t$ is positive.

Equation (2a) is an OLS regression model, while Equation (2b) is an ordered probit model that uses an ordered variable *ORDER* as a dependent variable instead of a continuous variable *AFDEV*.

The explanatory variables included in Equations (2a) and (2b) are the same as those in Equation (1). If analysts were aware of the contributing factors to the systematic management forecast errors in Equation (1), analysts would make some adjustments to the recently announced management forecasts in publicizing their own forecasts. Therefore, I expect the signs of all estimated coefficients in Equations (2a) and (2b) to be the same as those in Equation (1).

5. Data

The sample is selected from the 1979 to 1999 time period using the following criteria:

(i) the firms are listed on one of the eight stock exchanges in Japan or traded on the over-the-counter (OTC) market,

(ii) the accounting period ends in March (78% of listed firms), and

(iii) banks, securities firms, and insurance firms are excluded (5% listed firms).

There are eight stock exchanges in Japan, namely Tokyo, Osaka, Nagoya, Sapporo, Niigata, Kyoto, Hiroshima, and Fukuoka. The Tokyo Stock Exchange (TSE) is by far the largest among them. As of June 1999, 2,433 firms are listed on the stock exchanges in Japan, of which 1,854 firms are listed on the TSE. In terms of volume and value, the TSE accounts for 80-90% of the nation's trading. The OTC market (currently called the JASDAQ market after the NASDAQ market in the U.S.) consists of small and newly listed firms. As of June 1999, the number of issues listed on the OTC market stands at 853. However, it accounts for merely 2-4% of the trading volume and value in Japan.

Annual accounting data and share price data are extracted from *Nikkei-Zaimu Data* and *Kabuka CD-ROM 2000*. MEF are manually collected from the *Nihon Keizai Shinbun* (the leading business newspaper in Japan). AEF are also hand gathered from *Kaisha Shikihou* (June issues, Toyo Keizai Inc.), which is generally accepted by the Japanese securities industry as the standard publication source for analysts' forecasts (Conroy et al., 1998; Conroy et al., 2000). Other necessary data such as stock splits, capital reduction, and changes in par values are collected from *Kaisha Shikihou CD-ROM*.

The sample selection criteria produces an initial sample of 29,177 firm-year observations. Due to missing accounting data, particularly lagged variables, the sample is reduced to 24,524

firm-year observations. I also eliminate 279 observations with studentized residuals greater than 3 to control for outliers. This yields the final sample of 24,245 firm-year observations.

6. Empirical results

6.1. Descriptive statistics

(Table 1 about here)

Table 1 presents descriptive statistics and variable correlations. Panel A shows that the mean and median *MFERR*s are negative, –0.0132 and –0.0015, suggesting that management forecasts are generally optimistic. Panel B shows that *DEBTR*, *LOSS*, and *BMR* are negatively correlated with *MFERR*, while *ΔSALE*, *SIZE*, $MFERR_{t-1}$, and $MFERR_{t-2}$ are positively correlated with *MFERR*. The signs of univariate correlations are all consistent with Hypothesis 1.

6.2. Determinants of bias in management forecasts: test of Hypothesis 1

(Table 2 about here)

Table 2 reports the regression results from estimating Equation (1). The estimated coefficients on *DEBTR*, *LOSS*, and *BMR* are significantly negative, while those on *ΔSALE*, *SIZE*, $MFERR_{t-1}$, and $MFERR_{t-2}$ are significantly positive. The signs of the estimated coefficients are all consistent with the expected signs in the table that are based on Hypothesis 1.

The results from the estimation of Equation (1) suggest that firms in financial distress with high debt ratios and losses issue optimistic management forecasts, that growth firms with high sales growth ratios and low book-to-market ratios announce pessimistic management forecasts, that small firms publicize optimistic management forecasts, and that firms whose previous management forecasts were optimistic (pessimistic) tend to remain optimistic (pessimistic) in

their current forecasts.

Regarding the control variables, *IND1–28* and *YEAR81–98*, they are both statistically significant, indicating the need to control for variation in management forecast errors across industry and over the years.

Overall, the results presented in Table 2 suggest the existence of systematic management forecast errors and provide strong evidence for Hypothesis 1.

6.3. Forecast accuracy of management and analysts' forecasts

(Table 3 about here)

Panel A of Table 3 reports descriptive statistics of *MFERR*, *AFERR*, *MFACC*, and *AFACC*. The average *MFERR* and *AFERR* is –0.0132 and –0.0124 respectively. Negative average forecast errors indicate that both forecasts are optimistically biased, but analysts' forecasts are less optimistically biased than management forecasts. The average *MFACC* and *AFACC* is 0.0221 and 0.0219 respectively, suggesting analysts' forecasts are more accurate than management forecasts with smaller absolute forecast errors.

The differences between *MFERR* and *AFERR*, and *MFACC* and *AFACC* are statistically tested in Panel B of Table 3. The results of the parametric paired *t*-test and the non-parametric Wilcoxon signed rank sum test both indicate that analysts' forecasts are significantly less optimistic and more accurate than management forecasts. Since both management and analysts' forecasts are the first forecasts for the upcoming period and analysts' forecasts are released shortly after management forecasts, I expect analysts' perceptions about the firms' future earnings prospects are based on the recently published management forecasts.

The higher accuracy of analysts' forecasts appears to indicate that analysts make some

adjustments from current management forecasts in formulating their own forecasts.

6.4. Analysts' awareness of systematic bias in management forecasts: test of Hypothesis 2

The findings hitherto show that certain financial factors are related to systematic bias in management forecasts, and that the accuracy of analysts' forecasts is higher than management forecasts. This may indicate that analysts are aware of the financial factors that are associated with systematic bias in MEF. For example, MEF of loss-making firms (*LOSS*) are found to be optimistic (a negative *MFERR*). If analysts knew the fact, they would discount the earnings forecasts made by loss-making firms, which results in a negative deviation of AEF from MEF (a negative *AFDEV*). Therefore, if Hypothesis 2 that analysts are aware of systematic bias in management forecasts holds true, the regression of *AFDEV* on these financial factors would produce the estimated coefficients the signs of which are the same as those from Equation (1).

(Table 4 about here)

Table 4 presents the regression results from estimating Equation (2a). The signs of the estimated coefficients are all consistent with the expected signs in the table that are from the estimation of Equation (1). The estimated coefficients are also all significant at the 5% level or higher except for the coefficient on *BMR*.

(Table 5 about here)

The estimated results from using the ordered probit model in Equation (2b) are reported in Table 5. They are qualitatively similar to those from estimating Equation (2a), although the statistical significance is somewhat weaker. As with Table 4, the signs of the estimated coefficients are all consistent with the expected signs. The estimated coefficients are all statistically significance at the 1% level except for those on *DEBTR* and *BMR*. Since Equation

(2b) is estimated using an ordered probit model, marginal effects are shown on the far right column of Table 5. For instance, other things being equal, if the management forecasts are made by loss-making firms rather than by profitable firms (*LOSS*), the probability of analysts' forecasts being lower than management forecasts (Downward) increases by 4.46% points. In the same manner, other things being equal, a one-unit increase in *ΔSALE* increases the probability of analysts' forecasts being higher than management forecasts (Upward) by 8.17% points.

In summary, the results reported in Table 4 and Table 5 suggest that analysts are well aware of the determinants of systematic bias in MEF and provide strong evidence in support of Hypothesis 2.

7. Conclusions

The provision of one-year-ahead earnings forecasts at the annual earnings announcement by management of practically all listed firms is a major feature of the Japanese financial disclosure system. Despite of their importance, limited data availability has thus far prevented a detailed analysis of Japanese management forecasts. In this study, I have attempted to shed some light on the properties of management forecasts announced by Japanese firms and their impact on analysts' perceptions about the firms' future earnings prospects . First, I investigate the determinants of systematic bias in MEF. The examination of ex post management forecast errors reveals that: (i) financially distressed firms with high debt ratios and losses issue optimistic MEF; (ii) growth firms with high sales growth ratios and low book-to-market ratios announce pessimistic MEF; (iii) small firms issue optimistic MEF; and (iv) firms whose prior MEF were pessimistic (optimistic) tend to remain pessimistic (optimistic) in their current forecasts.

Second, I investigate whether analysts are aware of these factors that have been found to be

related to systematic bias in MEF. When the accuracy of MEF is compared with that of AEF issued subsequent to management forecasts, the results show that analysts' forecasts are significantly more accurate than management forecasts. The higher accuracy of analysts' forecasts may be a manifestation of analysts' awareness of systematic bias in management forecasts. The following tests that examine the deviation of AEF from MEF reveal that analysts take the financial factors that have been found to be related to systematic management forecast errors into consideration when they publicize their own earnings forecasts.

Overall, the findings in this study suggest that analysts do not necessarily take management forecasts at face value. They appear to pay close attention to the current financial conditions of firms that announce management forecasts in formulating their perceptions of the firms' future performance. These efforts by analysts may account for the higher accuracy of analysts' forecasts.

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Table 1
Descriptive statistics and correlations

Panel A: Descriptive statistics

Variable	Average	S.D.	Min	1Q	Median	3Q	Max	#obs.
MFERR	–0.0132	0.0527	–0.9795	–0.0117	–0.0015	0.0029	0.3219	24,245
DEBTR	0.6278	0.2068	0.0096	0.4847	0.6467	0.7888	4.3515	24,245
LOSS	0.1191	0.3239	0.0000	0.0000	0.0000	0.0000	1.0000	24,245
ΔSALE	1.0260	0.1287	0.0934	0.9593	1.0229	1.0840	3.6775	24,245
BMR	0.6234	0.4873	–1.3008	0.3186	0.5075	0.7724	6.6521	24,245
SIZE	10.4199	1.5644	5.9219	9.2896	10.2850	11.4113	17.1108	24,245

Panel B: Pearson correlation coefficients

Variable	*MFERR*	*DEBTR*	*LOSS*	*ΔSALE*	*BMR*	*SIZE*	$MFERR_{t-1}$	$MFERR_{t-2}$
MFERR	1.0000							
DEBTR	–0.0486	1.0000						
LOSS	–0.2584	0.1516	1.0000					
ΔSALE	0.1630	0.0226	–0.2600	1.0000				
BMR	–0.2717	–0.3235	0.1124	–0.2475	1.0000			
SIZE	0.1797	–0.0740	–0.2134	0.1449	–0.3502	1.0000		
$MFERR_{t-1}$	0.3348	–0.0948	–0.4729	0.2130	–0.1571	0.1494	1.0000	
$MFERR_{t-2}$	0.1298	–0.1069	–0.1916	0.1013	–0.0536	0.1172	0.1603	1.0000

The definitions of the variables are
$MFERR_t$ = management forecast error for period t, and is defined as $(E_t - MF_t) / P_t$,
$DEBTR_t$ = total liabilities divided by total assets at the beginning of period t,
$LOSS_t$ = one if E_t is negative and zero otherwise,
$\Delta SALE_t$ = sales revenue for period t divided by sales revenue for period t–1,
$BMR_{,t}$ = book value of shareholders' equity divided by market value of equity at the beginning of period t, and
$SIZE_{,t}$ = log of inflation-adjusted market value of equity at the beginning of period t,
where
E_t = actual earnings per share for period t,
MF_t = management forecast of earnings per share for period t that is usually announced within 10 weeks into period t, and
P_t = share price at the beginning of period t.

Table 2
Determinants of bias in management earnings forecasts

Regression Model: $MFERR_t = \alpha_0 + \alpha_1 DEBTR_t + \alpha_2 LOSS_t + \alpha_3 \Delta SALE_t + \alpha_4 BMR_t + \alpha_5 SIZE_t + \alpha_6 MFERR_{t-1} + \alpha_7 MFERR_{t-2} + \alpha_8 IND1\text{-}28_t + \alpha_9 YEAR81\text{-}98_t + \varepsilon_t$ (1)

Variables	Expected sign [a]	Coefficient	*t*-statistic [b]	Wald statistic [b]
CONSTANT	?	–0.0060	–0.81	
DEBTR	–	–0.0281	–13.01**	
LOSS	–	–0.0133	–5.92**	
ΔSALE	+	0.0164	5.04**	
BMR	–	–0.0208	–10.39**	
SIZE	+	0.0007	2.97**	
$MFERR_{t-1}$	+	0.1679	8.49**	
$MFERR_{t-2}$	+	0.0448	3.58**	
IND1-28				668.49**
YEAR81-98				240.60**
adj.R^2	0.209			
#obs.	24,245			

The definitions of the variables are
$MFERR_t$ = management forecast error for period *t*, and is defined as $(E_t - MF_t) / P_t$,
$DEBTR_t$ = total liabilities divided by total assets at the beginning of period *t*,
$LOSS_t$ = one if E_t is negative and zero otherwise,
$\Delta SALE_t$ = sales revenue for period *t* divided by sales revenue for period *t*–1,
$BMR_{,t}$ = book value of shareholders' equity divided by market value of equity at the beginning of period *t*,
$SIZE_{,t}$ = log of inflation-adjusted market value of equity at the beginning of period *t*,
IND1-28 = a set of industry dummy variables, and
YEAR81-98 = a set of year dummy variables.
where
E_t = actual earnings per share for period *t*,
MF_t = management forecast of earnings per share for period *t* that is usually announced within 10 weeks into period *t*, and
P_t = share price at the beginning of period *t*.

[a] The expected signs are based on Hypothesis 1.
[b] *t*-statistics and Wald statistics are based on White's heteroskedastic-consistent covariance matrix.
* significant at the 0.05 level (two-tailed). ** significant at the 0.01 level (two-tailed).

Table 3
Forecast accuracy of management and analysts' forecasts

Panel A: Descriptive statistics

Variable	Average	S.D.	Min	1Q	Median	3Q	Max	#obs.
MFERR	–0.0132	0.0527	–0.9795	–0.0117	–0.0015	0.0029	0.3219	24,245
AFERR	–0.0124	0.0525	–0.9795	–0.0113	–0.0014	0.0030	0.6613	24,245
MFACC	0.0221	0.0497	0.0000	0.0022	0.0065	0.0176	0.9795	24,245
AFACC	0.0219	0.0494	0.0000	0.0022	0.0065	0.0174	0.9795	24,245

Panel B: Difference in forecast accuracy

	Difference	Parametric test [a]	Non-parametric test [b]
MFERR – AFERR	–0.0008	–11.06**	–20.12**
MFACC – AFACC	0.0002	3.58**	13.59**

The definitions of the variables are
$MFERR_t$ = management forecast error for period t, and is defined as $(E_t - MF_t) / P_t$,
$AFERR_t$ = analysts' forecast error for period t, and is defined as $(E_t - AF_t) / P_t$,
$MFACC_t$ = management forecast accuracy for period t, and is defined as $|E_t - MF_t| / P_t$, and
$AFACC_t$ = analysts' forecast accuracy for period t, and is defined as $|E_t - AF_t| / P_t$,
where
E_t = actual earnings per share for period t,
MF_t = management forecast of earnings per share for period t that is usually announced within 10 weeks into period t, and
AF_t = analysts' forecast of earnings per share for period t that is issued subsequent to MF_t, and
P_t = share price at the beginning of period t.
[a] For a parametric test, the paired t-test is used and its t-statistic is reported in this column.
[b] For a non-parametric test, the Wilcoxon signed rank sum test is used and its z-statistic is reported in this column.
* significant at the 0.05 level (two-tailed). ** significant at the 0.01 level (two-tailed).

Table 4
Analysts' awareness of management forecast errors (Regression model)

Regression Model: $AFDEV_t = \beta_0 + \beta_1 DEBTR_t + \beta_2 LOSS_t + \beta_3 \Delta SALE_t + \beta_4 BMR_t + \beta_5 SIZE_t + \beta_6 MFERR_{t-1} + \beta_7 MFERR_{t-2} + \beta_8 IND1–28_t + \beta_9 YEAR81–98_t + \varepsilon_t$ (2a)

Variables	Expected sign [a]	Coefficient	*t*-statistic [b]	Wald statistic [b]
CONSTANT	?	–0.0044	–2.30*	
DEBTR	–	–0.0022	–4.52**	
LOSS	–	–0.0014	–3.62**	
ΔSALE	+	0.0024	3.37**	
BMR	–	–0.0009	–1.34	
SIZE	+	0.0002	4.60**	
$MFERR_{t-1}$	+	0.0192	3.46**	
$MFERR_{t-2}$	+	0.0097	2.47*	
IND1-28				139.65**
YEAR81-98				58.20**
adj.R^2	0.046			
#obs.	24,245			

The definitions of the variables are
$AFDEV_t$ = analysts' forecast deviation from management forecast for period *t*, and is defined as $(AF_t – MF_t) / P_t$,
$DEBTR_t$ = total liabilities divided by total assets at the beginning of period *t*,
$LOSS_t$ = one if E_t is negative and zero otherwise,
$\Delta SALE_t$ = sales revenue for period *t* divided by sales revenue for period *t*–1,
$BMR_{,t}$ = book value of shareholders' equity divided by market value of equity at the beginning of period *t*,
$SIZE_{,t}$ = log of inflation-adjusted market value of equity at the beginning of period *t*,
$MFERR_t$ = management forecast error for period *t*, and is defined as $(E_t – MF_t) / P_t$,
IND1-28 = a set of industry dummy variables, and
YEAR81-98 = a set of year dummy variables.
where
AF_t = analysts' forecast of earnings per share for period *t* that is issued subsequent to MF_t,
MF_t = management forecast of earnings per share for period *t* that is usually announced within 10 weeks into period *t*,
E_t = actual earnings per share for period *t*, and
P_t = share price at the beginning of period *t*.
[a] The expected signs are from the estimated results of Equation (1) reported in Table 2.
[b] *t*-statistics and Wald statistics are based on White's heteroskedastic-consistent covariance matrix.
* significant at the 0.05 level (two-tailed). ** significant at the 0.01 level (two-tailed).

Table 5
Analysts' awareness of management forecast errors (Ordered probit model)

Ordered Probit Model: $ORDER_t = \gamma_0 + \gamma_1 DEBTR_t + \gamma_2 LOSS_t + \gamma_3 \Delta SALE_t + \gamma_4 BMR_t + \gamma_5 SIZE_t + \gamma_6 MFERR_{t-1} + \gamma_7 MFERR_{t-2} + \gamma_8 IND1\text{–}28_t + \gamma_9 YEAR81\text{–}98_t + \varepsilon_t$ (2b)

Variables	Expected sign [a]	Coefficient	*t*-ratio	Wald statistic	Marginal Effect (%) [b] Downward	No change	Upward
CONSTANT	?	–0.1295	–0.74				
DEBTR	–	–0.0923	–1.77		1.63%	–0.48%	–1.15%
LOSS	–	–0.2271	–7.27**		4.46%	–1.98%	–2.48%
ΔSALE	+	0.6545	8.69**		–11.5%	3.37%	8.17%
BMR	–	–0.0349	–1.40		0.62%	–0.18%	–0.44%
SIZE	+	0.0506	7.79**		–0.89%	0.26%	0.63%
$MFERR_{t-1}$	+	0.4812	3.53**		–8.49%	2.48%	6.01%
$MFERR_{t-2}$	+	0.4275	2.85**		–7.54%	2.20%	5.34%
IND1-28				339.29**			
YEAR81-98				70.89**			
McFadden's R^2	0.040						
#obs.	24,245						

The definition of the variable is
$ORDER_{,t}$ = an ordered variable that takes the value of zero if $AFDEV_t$ is negative, one if $AFDEV_t$ equals zero, and two if $AFDEV_t$ is positive.
See Table 4 for definitions of other variables.
[a] The expected signs are from the estimated results of Equation (1) reported in Table 2.
[b] The marginal effects are evaluated at the mean values of the explanatory variables. For a dummy variable, *LOSS*, the marginal effects indicate the changes in the probabilities that result when the dummy takes 0 and 1.
* significant at the 0.05 level (two-tailed). ** significant at the 0.01 level (two-tailed).