An examination of factors affecting forecast accuracy in Japan

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ABSTRACT

This paper examines the causes of changes in the time-series accuracy of analyst forecasts in Japan. Based on prior research, it is hypothesized that three primary factors drive changes in aggregate forecast accuracy over time: economic conditions, regulation changes and changes in analyst characteristics. During the 23 year sample period, the Japanese economy has experienced growth and recession, financial reporting has been impacted by the 'Big Bang' reforms and analyst characteristics have changed. Regression analysis is used to examine the impact of each of these factors on forecast accuracy. Results of analysis suggest that changes in forecast accuracy have been primarily the result of regulatory changes and economic conditions.

Keywords: Analyst Forecasts, Economic Conditions, Japan

INTRODUCTION

Japan, with the third largest economy in terms of GDP, has active capital markets and a large number of financial analysts that follow securities traded in these markets. Financial analysts are information intermediaries that play an important role in the efficiency of capital markets both in Japan and around the world. As such, it is interesting to explore factors that impact the accuracy of one of financial analysts' key outputs: earnings forecasts. This paper explores the effects of economic conditions, accounting standard changes and analyst specific factors on analyst's forecast accuracy in Japan over the past two decades.

Prior research has examined the effects of variations in economic conditions, accounting standards, and analysts' characteristics on the accuracy of analyst forecasts both in the US and abroad. In an international study, Hope and Kang (2005) found that economic conditions affect analysts' forecast accuracy. The adoption of new accounting standards have also been shown to affect forecast accuracy. A number of studies document changes in the accuracy of analyst forecasts in the European Union (EU) following the adoption of International Financial Reporting Standards (IFRS) (see, for example, Daske, Hail, Leuz and Verdi, 2008; Byard, Li and Yu, 2011). In Japan there are mixed results concerning analysts' forecast accuracy and changes to accounting standards. Herrmann, Inoue and Thomas (2007) show that analysts' performance improves after the change in consolidations standards, while Duangploy and Gray (2007) suggest that analysts' forecast errors increases in the short-term. Finally, research shows that individual analyst forecast accuracy is a function of analyst and broker characteristics (see for example Jacob, Lys and Neale 1999). More recent research suggests that changes in aggregate measures of analyst characteristics over extended periods of time affect the average accuracy of earnings forecasts in the U.S. (Myring and Wrege, 2009) and in Brazil, Russia, India and China (i.e. BRIC countries) (Athavale, Myring and Groeber, 2013).

While much research has been conducted on the association between economic conditions, accounting standards, analyst characteristics and forecast accuracy, there has not been a comprehensive examination of these relations using data from Japan. This study attempts to fill this void in the literature by examining the accuracy of analysts' forecasts in Japan. Japan provides a unique environment to examine variations in the performance of analysts over the past two decades due to both the period of economic turmoil and drastic changes to Japanese accounting standards. The 1990s in Japan, referred to as "the lost decade" by the Japanese, was a time of prolonged stagnation that followed the bubble's bursting in 1989 (Warren, 2013). From 2002 onward, however, Japan enjoyed its longest period of gradual economic expansion since World War II. In addition to the economic turmoil, starting in the late 1990s Japan embarked on substantial changes in financial accounting and reporting requirements that aligned Japanese GAAP with International Accounting Standards known as the 'Big Bang' (Duangploy and Gray 2007). These changing factors make it interesting to investigate the causes of time-series variations in analyst forecast accuracy.

Using analyst forecasts obtained from I/B/E/S, the hypotheses are tested examining the relation between forecast accuracy and economic conditions (H1), changes in accounting standards (H2) and analyst characteristics (H3). These hypotheses are tested by regressing average annual forecast accuracy on an indicator variable for economic conditions, an indicator variable representing the pre/post regulation period and proxies for analyst characteristics. The results of the analysis suggest that adverse economic conditions and the adoption of new accounting standards have reduced the accuracy of analysts' forecasts in Japan. Contrary to

previous research, the results do not document a relation between time-series changes in forecast accuracy and analysts characteristics.

The rest of the paper proceeds as follows: In the next section, relevant literature is reviewed. This is followed by the development of the hypotheses. The next section provides an overview of the sample selection and characteristics of the sample analysts. Finally, the models that are used to test the hypotheses are outlined, as well as the results of these tests.

LITERATURE REVIEW

Financial analysts process a great deal of both internal and external information concerning companies they follow and provide a vital role in the capital markets. Seminal studies like Brown, Hagerman, Griffin and Zmijewski (1987) show the superiority of forecasts made by analysts and Abarbanell and Bernard (1992) examine the use of analysts' forecast by investors. In Japan, investors place a great deal of emphasis on the forecasts made by analysts (Covrig and Low, 2005). The authors examine the role of both financial statement information and analysts' forecasts in investors' decisions. The results show that investors use little financial statement information and rely more extensively on analysts' forecasts. The authors also examine the use of both financial statement information and analysts' forecasts for firms within a closely aligned network referred to as "keiretsu." Keiretsu relationships are unique to Japan and the firms within the network are usually aligned around one large central firm. The results show that financial statement information is less relevant for firms within a keiretsu than those not closely aligned with other firms. Financial analysts' forecasts are relevant for both types of firms.

Herrmann et al. (2007) examine the effect of the change in consolidation reporting in Japan on analysts' forecasts. As part of a series of financial reporting reforms known as the 'Big Bang,' the rule governing consolidations changed to include a greater emphasis on consolidated financial statements and include subsidiaries based on the extent of control the parent has over the subsidiary instead of percentage of ownership. The authors examine the association of contemporaneous earnings of both the parent and subsidiaries and year-ahead forecast errors. Specifically, the authors focus on analysts' perceived persistence of subsidiary earnings. The authors provide evidence that analysts correctly estimate the persistence of earnings of the parent company while underestimating the persistence of earnings of the subsidiary before the rule change. The authors also find that as a result of the rule change analysts' accuracy improves. However, the findings from Duangploy and Gray (2007) contradict those of Herrmann et al. (2007). Duangploy and Gray (2007) examine the magnitude of forecast errors before and after the implementation of the 'Big Bang.' The authors find that as implementation occurs, analysts' forecast errors increase. This result suggests that the transition of accounting rules to provide more transparency and disclosure may not increase the usefulness of financial reporting in the short term. Finally, Higgins (2002) analysis of forecast errors in seven countries reveal that more accurate and less biased forecasts are associated with countries requiring relatively more financial disclosures.

The Japanese capital market offers researchers an opportunity to examine analysts' forecasts in three areas: specific changes in accounting rules, economic turmoil and its unique environment. This study focuses on the effect of all three areas on financial analysts' performance. Many of the previous studies focused on one particular change in the rules or one aspect of the capital markets in Japan; this study contributes to the literature by examining

analysts' forecasts over a long time frame to identify trends and draw inferences concerning analysts' performance and changes in the information environment.

HYPOTHESES DEVELOPMENT

This study attempts to determine the impact of internal and external factors on the accuracy of earning forecasts in Japan. Based on a review of research on analysts' forecasts, three primary factors are expected to influence forecast accuracy in Japan over the research period. These factors are changes in economic conditions, the adoption of new accounting standards and variation in analyst characteristics. Each of these factors is examined in detail in the following sections.

Economic Conditions and Forecast Accuracy

In developing earnings forecasts, analysts must consider a wide range of information both about the firm and also the firm's operating environment. One important factor about the firm's environment is the health of the economy. Prior research shows economic conditions affect the accuracy of analyst forecasts. Specifically, Chopra (1998) examines the association between analysts forecast errors and economic growth in the United States. The results indicate forecast errors are smaller during times of strong economic growth than times of weak economic growth. Hope and Kang (2005) examine the effects of macroeconomic uncertainty and forecast accuracy. With a sample that includes firms from 21 different countries that are traded in the US markets, the authors find that analysts forecast accuracy is inversely related to macroeconomic uncertainty (as defined by the level of inflation and foreign exchange rate volatility).

Black and Carnes (2006) examine the association of analysts' forecasts and the World Economic Forum global competiveness rankings. The global competitiveness rankings capture the country's integration into the world economy. The authors find a positive association between forecast accuracy and the rankings. Given that these prior studies show economic factors are associated with forecast accuracy, this study adds to the literature by examining the forecast accuracy over time in Japan during periods of both strong and weak economic growth. Based on these studies, it is expected that analyst forecasts will be more accurate in periods of stable growth than recession. This leads to the first hypothesis (in null form):

H1: Analyst earnings forecasts will not be affected by economic conditions.

Accounting Standards and Forecast Accuracy

Prior research shows that changes in accounting standards affect forecast accuracy. Much of this research centers on the adoption of IFRS in the EU. These studies commonly hypothesize that if the adoption of new accounting standards increases the quality and/or quantity of disclosure, the accuracy of earnings forecasts will be improved. Early studies using samples provide mixed evidence of the impact of IFRS adoption on forecast accuracy (see Daske et al., 2008 and Ashbaugh and Pincus, 2001). Later research finds more consistent results that IFRS adoption increases forecast accuracy. Using a sample of EU firms, Horton, Serafeim and Serafeim (2013) find that forecast accuracy improves after mandatory IFRS adoption. Similarly, Byard et al. (2011) find that analysts' earnings forecast errors decrease following the adoption of IFRS for firms incorporated in countries with large differences between domestic GAAP and

IFRS, as well as strong enforcement of accounting standards. There is also evidence that adoption of IFRS increases forecast accuracy in countries outside the EU. For example Cotter, Tarca and Wee (2012) find forecast accuracy improves after the adoption of IFRS in Australia.

In the 1990s, Japan experienced considerable economic turmoil. In response to this turmoil, the Japanese government introduced sweeping regulatory and accounting changes known as the Japanese 'Big Bang' (Asami, 2006). Thus, by the end of the 1990s, the importance of outside shareholders in Japanese companies and their role as capital providers was undisputed (Flatscher and Kha, 2010). One result of the increase in outside investment was heightened interest in financial analysts' forecast advice. The need for advice runs counter to tradition in Japan. Typically, Japan's financial statements were provided for the benefit of tax authorities and creditors with rules implemented by the government and not for the benefit of investors. Further, Japan's large corporations, organized with interlocking corporate governing bodies (*keiretsu*), held a large proportion of companies' shares, resulting in limited pressure to provide detailed financial information to the public (Black and Carnes, 2006). Global investing interests, however, pressured Japan into implementing a series of rules and regulation changes that increased information available to investors.

Among the many changes that occurred during the 'Big Bang' were key changes to the accounting treatment of consolidations, fair-value accounting and pensions (Asami, 2006). The changes to the rules concerning consolidations require firms to include the operations of subsidiaries based on the influence the parent organization has over the subsidiaries. Prior to this change, parent organizations could hide troubled assets and increase revenue through transactions with their subsidiaries. The second major change is the use of fair-value accounting for financial instruments. Finally, pension costs and liabilities must be recorded on an accrual basis under the new standards. The new rule required any unrecognized prior service cost to be expensed over a maximum of 15 years.

Conversely, these significant changes in accounting standards may reduce the accuracy of analysts' forecasts. For example, if the adoption of the 'Big Bang' standards in Japan increases the volatility of earnings, forecast errors may increase. Further, if the adoption of the new standards reduced the ability of management to 'smooth' earnings, forecast accuracy could also be reduced (He, Sidhu and Tan, 2010). This leads to the second hypothesis:

> H2: Analyst earnings forecasts will not be affected by the adoption of the 'Big Bang' Standards.

Analyst Characteristics and Forecast Accuracy

Analyst characteristics representing effort and expertise have been shown to be associated with variations in both relative and absolute forecast accuracy. Early research in this area provides evidence that analysts' attributes are significantly related to earnings forecast accuracy in the U.S. (Jacob et al., 1999 and Clement, 1999) and abroad (Barniv, Myring and Thomas, 2005). More recent research shows that aggregate changes in these characteristics over time affect forecast accuracy both domestically and abroad (see Myring and Wrege, 2009 and Athavale et al., 2013). This study examines the relation between forecast accuracy and analyst characteristics. A description of each analyst characteristics, as well as the expected relation with forecast accuracy is provided below.

- *Forecast age*: the number of calendar days between the last forecast date and the day that earnings are released. More recent forecasts are expected to be more accurate.
- *Frequency*: the number of forecasts an analyst provides for a company in a given year.
- *Specialization*: the percentage of companies followed by the analyst which are in the same industry, and is expected to be positively related to forecast accuracy.
- *Companies*: the number of companies that the average analyst follows. As the number of companies followed increases, so does the complexity of the analyst's job which may result in a decrease in forecast accuracy. Alternatively, analysts that outperform their peers are often assigned a greater deal of responsibility.

These expectations lead to the third hypothesis:

H3: Analyst earnings forecasts will not be affected by changes in analyst characteristics.

DESCRIPTIVE STATISTICS

The data used in this analysis is collected from the I/B/E/S International Database. The I/B/E/S database contains actual and forecast earnings, as well as other firm specific data for companies traded in the US and around the world. Table 1 shows the descriptive statistics of the sample. The analyst specific attributes are defined in the section above. Forecast error is defined as the absolute value of the earnings per share (EPS) forecast made immediately prior to the earnings release less the actual EPS deflated by stock price 60 days prior to the earning announcement.

As shown in Table 1 (Appendix), the mean forecast error is relatively small, measuring 0.017. The average age of the forecasts is 145.28 days, or about 4.5 months. It is likely that most analysts update their earnings forecasts following the release of semiannual earnings announcements. Most analysts revise earnings forecasts between two and three times a year, with a median number of revisions of two per year. The average analyst follows almost 17 companies and many of these companies are in the same industry, with a mean industry specialization of 0.529.

Correlation analysis is shown in Table 2 (Appendix). The correlations between forecast error and analysts' characteristics reveal the expected relationships in the case of companies followed and industry specialization. However, the relation between the independent variables is high and in many cases significant, suggesting that including these variables together in regression analysis may result in multicollinearity.

Trends in the analyst specific variables (i.e., analyst forecast errors, forecast age, forecast frequency, companies followed and industry specialization) are analyzed over time graphically. A time-series graph of mean forecast accuracy is provided in Figure 1 (Appendix). Average forecast errors appear to increase over time. There are two main spikes in mean forecast errors. The first occurs between 1997 and 1998 and appears as if it is associated with the implementation of the 'Big Bang' reforms. Following the reforms, it seems that errors decrease in the mid-2000s and spike again in 2009, around the time of the global financial crisis.

The hypotheses indicate that forecast accuracy is a function of analyst characteristics, economic conditions and changes in accounting standards. In the following figures, the time-series changes in analyst characteristics are depicted. Figures 2 and 3 (Appendix) show the time-series changes in the forecast age and frequency variables. Recall forecast age is the number of

days between the last forecast and the announcement of earnings. Forecast age does not exhibit a consistent decline over time. It dips in the early 1990s. Following an increase in the mid-1990s, forecast age is relatively stable. It increases again in 2000 and then falls monotonically through the rest of the decade. The related variable, forecast frequency, measures the number of forecasts an analyst prepares during the year. It is inversely related with forecast age – the more forecasts that are prepared, the lower the average age of the forecast. As this inverse relation exists, it is not surprising that the variable shows an upward spike in the mid-1990s follow by an upward trend in the 2000s.

The next analyst characteristic examined is the number of companies followed. Considering this variable at an economy wide, aggregate level, it intuitively follows that if analysts follow a larger number of companies, they have less time to dedicate to any particular company, which may cause forecast accuracy to decrease. Figure 4 (Appendix) depicts the number of companies followed. It appears that the number of companies analysts follow increased substantially in the 1990s, from around twelve at the beginning of the decade and reaching a high of almost twenty in the mid-to-late 1990s. In the early 2000s the number of companies that analysts followed decreased to around fifteen and has trended up throughout the remaining years of the decade.

Average industry specialization is depicted in Figure 5 (Appendix). As shown in the graph, industry specialization has steadily decreased over time. Industry specialization reached a high of around 65% in the early 1990s, indicating that 65% of the companies that the average analyst followed were from the same industry. The degree of specialization has diminished over time, reaching a low of approximately 45% in the late 2000s. This decrease in specialization may negatively impact the accuracy of analyst forecasts.

RESULTS OF TESTS OF HYPOTHESES

In this section of the paper, the hypotheses are formally tested. This is accomplished through the regression of mean annual forecast errors on an indicator variable measuring changes in aggregate economy-wide corporate profits (*Economic Condition)*, an indicator variable for pre/post regulatory reform (*Post-Regulation)*, and the four analyst characteristics (*Forecast Age, Forecast Frequency, Companies Followed, and Industry Specialization)*. The data for the *Economic Condition* variable is obtained from the Bank of Japan's Outlook for Economic Activities and Prices. The *Economic Condition* indicator variable takes a value of "1" for years in which aggregate corporate profits are declining and a value of "0" for times in which corporate profits are increasing. The indicator variable *Post-Regulation* takes a value of "1" for the post-regulation period and a value of "0" for the pre-regulation period. Finally, the relation between analyst characteristics and forecast accuracy is examined by calculating the mean of the four analysts' attributes for each of the 23 years in the sample period.

The results of the analysis are provided in Table 3 (Appendix). Four separate regressions are estimated, each containing only one of the analyst characteristics. This methodology is used to reduce the impact of heteroskedasticity. *H1* is tested by examining the significance of the coefficients on the *Economic Condition* indicator variable, *H2* is tested by examining the significance of the coefficients on the *Post-Regulation* indicator variable and *H3* is tested by examining the significance of the coefficients on the four analyst characteristics variables (*Forecast Age, Forecast Frequency, Companies Followed, and Industry Specialization)*. The

results of each of the four regressions have an adjusted-R^2 above 0.30, indicating that the models have a good deal of power.

Results of the tests of the first hypothesis, *H1*, suggest that economic conditions impact forecast accuracy. Recall that the *Economic Condition* indicator variable takes a value of one in the period when aggregate corporate profits are decreasing and a value of zero when profits are increasing. The coefficient on the indicator variable is between 0.007 and 0.008 in all four regressions, indicating forecast errors are larger in times of economic downturns. The coefficients in all four models are significant (at $p<0.10$ in three models and $p<0.05$ in one model). This provides evidence for the rejection of *H1* and suggests that when corporate profits in the economy are declining, analyst's ability to make accurate earnings forecasts decreases.

The second hypothesis, *H2*, is tested by examining the coefficients on the *Post-Regulation* indicator variable. Recall that this variable takes a value of one in the post-regulation period and a value of zero in the pre-regulation period. Regression results indicate that the coefficient on the *Post-Regulation* variable is positive and significant in all four regressions (at $p<0.05$ in three models and $p<0.01$ in one model). This provides evidence to support the rejection of *H2*, and suggests that the 'Big-Bang' regulations increase forecast errors. This result is somewhat contrary to expectations. Specifically, the new accounting standards were expected to increase the quality of firm's financial disclosures. As financial disclosures are a key input into the analyst forecasting process, it follows that an increase in the quality of this input would enhance the accuracy of forecasts. However, if accounting standards prior to the regulation reform allowed the smoothing and/or management of earnings, the increase in the forecast error may be an anticipated result (see He et al., 2010).

The final hypothesis, *H3*, is tested by examining the relation between analyst characteristics and forecast accuracy. Specifically, the impact of forecast age, forecast frequency, companies followed and industry specialization on forecast accuracy is examined. Recall that due to correlation across these variables, four separate regressions are estimated, each including only one analyst characteristic. Results of this analysis provide little evidence that analyst characteristics impact forecast accuracy changes over time in Japan. Specifically, the coefficients on *Forecast Age, Companies Followed,* and *Industry Specialization* are not significant at $p<0.10$. The coefficient on *Forecast Frequency* is significant, but in the direction contrary to expectations. The lack of a relationship between analyst characteristics and forecast accuracy is different than what is observed in the US and BRIC countries (see Myring and Wrege, 2009 and Athavale et al., 2013). This suggests that the Japanese analysts and their ability to accurately forecast earnings are different than what has been observed in other countries.

CONCLUSION

The purpose of this paper is to examine factors that impact the accuracy of analyst forecasts over a 23 year period in Japan. Based on a review of prior literature, it is hypothesized that three main factors impact forecast accuracy over time: economic conditions, regulation changes and variations in analyst characteristics. The time-series charts included in the paper show each of these variables has a substantial amount of variation over the sample period. The hypotheses are formally tested using regression analysis. The results of this analysis suggest that economic conditions and regulation changes are the primary factors that explain time-series variation in forecast accuracy in Japan.

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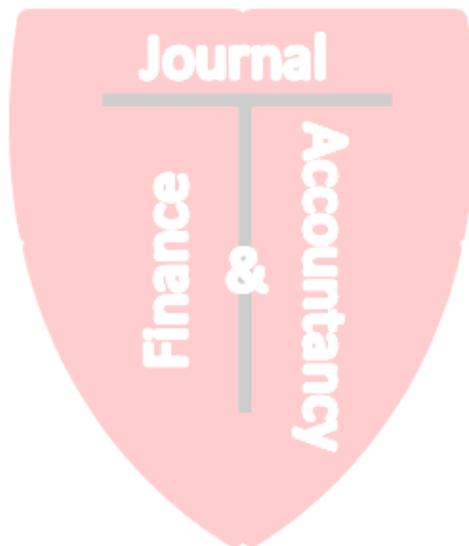
APPENDIX

Table 1: Descriptive Statistics

Variable	Observations	Mean	Median	SD
Forecast Error	106,273	0.017	0.005	0.040
Forecast Age	106,273	145.28	119.00	102.17
Forecast Frequency	106,273	2.541	2.000	1.689
Companies Followed	106,273	16.99	15.00	11.02
Industry Specialization	106,273	0.529	0.500	0.094

Notes: *Variables are defined as follows: Forecast error* is the absolute value of analyst *i*'s forecast EPS less firm *j*'s EPS deflated by stock price 60 days prior to earnings release. *Forecast Age* is the number of calendar days between analyst *i*'s last annual forecast and firm *j*'s earnings announcement date in year *t*.
Forecast Frequency is the number of forecasts issued by analyst *i* for company *j* in year *t*.
Companies Followed is the number of companies followed by analyst *i* in year *t*.
Industry Specialization is the percentage of companies followed by analyst *i* in year *t* with the same I/B/E/S industry code as company *j*.
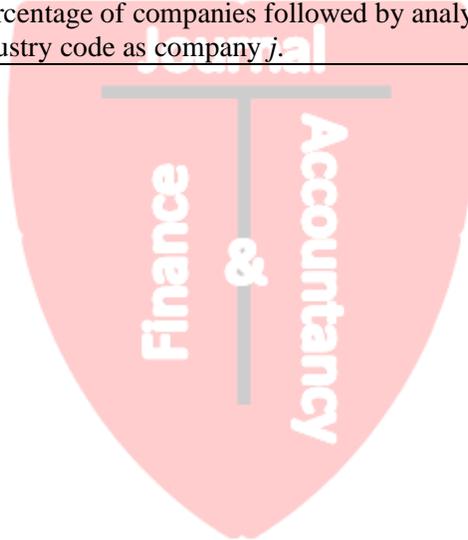
Table 2: Correlation Analysis

Variable	Forecast Error	Forecast Age	Forecast Frequency	Companies Followed	Industry Specialization
Forecast Error	●	-0.194	0.467	0.427	-0.483
Forecast Age		●	-0.720	-0.233	0.291
Forecast Frequency			●	0.111	-0.314
Companies Followed				●	-0.609
Industry Specialization					●

Notes: All variables defined in Table 1.
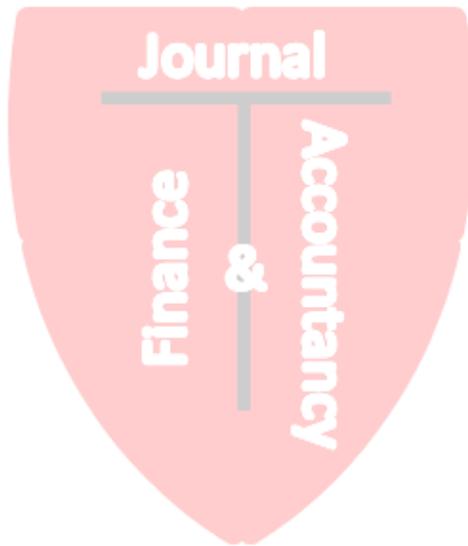
Table 3: Regression Analysis

Variable	(1)	(2)	(3)	(4)
Intercept	0.015	-0.014	0.003	0.001
	(1.03)	(-1.34)	(0.35)	(0.00)
Economic Condition	0.007	0.008	0.007	0.007
	$(2.06)^*$	$(2.61)^{**}$	$(1.75)^*$	$(1.93)^*$
Post-Regulation	0.010	0.007	0.010	0.011
	$(3.01)^{***}$	$(2.29)^{**}$	$(2.54)^{**}$	$(2.10)^{**}$
Forecast Age	-0.001			
	(-0.53)			
Forecast Frequency		0.008		
		$(1.96)^*$		
Companies Followed			0.001	
			(0.35)	
Industry Specialization				0.009
				(0.16)
R^2	0.338	0.441	0.333	0.329

Notes: *Economic Condition* is an indicator variable that takes the value of 1 in years when aggregate corporate profits in Japan declined. *Post-Regulation* is an indicator variable that takes the value of 1 in the post 'Big Bang" regulation period. All other variables defined in Table 1. t-statistics are provided in parenthesis. *** indicated that the variable is significant at the 1% level; ** indicated that the variable is significant at the 5% level; * indicated that the variable is significant at the 10% level.

Figure 1: Forecast Error

Figure 2: Forecast Age

Figure 3: Forecast Frequency

Figure 4: Companies Followed

Figure 5: Industry Specialization