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Abstract

We document the determinants of the expectation heterogeneity of stock price forecasters on the TOPIX. Monthly panel data surveyed by QUICK Corporation in the Nikkei Group is utilized in the process. We examine the determinants of expectation heterogeneity by categorizing our sample into buy-side and sell-side professionals, and demonstrate that expectation heterogeneity arises as a result of the co-existence of different types of professionals within the same market. We show that the buy-side and the sell-side professionals, who have different business goals, differentiate the information contents as well as their interpretations of the same information in their forecasts, contributing to the expectation heterogeneity. In addition, we investigate the interactive expectations formulation of buy-side and sell-side professionals. We find that buy-side professionals incorporate the sell side's ideas regarding the future stock prices into their own forecasts, although they exclusively refer to their own ideas when relating foreign exchange rates to the future stock prices. Meanwhile, sell-side professionals tend to utilize buy-side professionals' ideas about future prices in order to improve their research and ingratiate themselves to their clients, i.e., the buy-side professionals. We demonstrate that this interactive expectations formulation also contributes to the generation of the expectation heterogeneity.

JEL classification: G14, D84

Keywords: Expectation heterogeneity, dispersion, survey data

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1.Introduction

In contrast with the common assumption about the traditional rational representative agent, several papers investigate survey data on professional forecasts of such macroeconomic series as inflation and GDP, as well as such financial series as stock prices and foreign exchange rates and find expectations to be heterogeneous.[1] While Mankiw, Reis, and Wolfers (2003) suggest that "disagreement may be a key to macroeconomic dynamics (p.242)," several recent agent-based models demonstrate that heterogeneity drives observed features in real stock markets that have not yet been sufficiently explained by traditional asset-pricing models under efficient market and rational expectation hypotheses, such as clustered volatility and fat tails of the return distribution.[2] Thus, providing better explanations of the factors determining the differences in expectations can facilitate a better understanding of risk management and option pricing in financial markets. While several studies have examined the determinants of expectation heterogeneity in inflation, GDP or foreign exchange rates, recent empirical research has faced the challenge of explaining expectation heterogeneity among stock market professionals. This paper empirically examines the determinants of expectation heterogeneity or "dispersion" in the Japanese stock market utilizing a panel dataset of monthly surveys of market professionals on the TOPIX forecasts, conducted by QUICK Corporation, a Japanese financial information vendor in the Nikkei Group.

The academic literature offers three explanations of the sources of expectation

[1] For example, Allen and Taylor (1990), Ito (1990), and Frankel and Froot (1990) identify expectation heterogeneity in foreign exchange markets, while Mankiw, Reis, and Wolfers (2003) and Capistran and Timmermann (2009) find heterogeneity in inflation expectations. Patton and Timmermann (2010) demonstrate expectation heterogeneity for GDP growth and inflation.

[2] For example, Hommes (2006) and LeBaron (2006) survey the literature on agent-based computational finance and explain the importance of heterogeneity in generating financial market phenomena.

heterogeneity.[3] One explanation is based on the idea that forecasters share the same information-processing technology, but have access to different sets of information about the current state of the economy (see, for example, Carroll, 2003; Kyle, 1985; Lucas, 1973; Mankiw and Reis, 2002). The second explanation in the literature indicates that agents who share the same information about the current state of the economy interpret it differently (see, for example, Laster, Bennett, and Geoum, 1999; Patton and Timmermann, 2010). A third possibility offered is that the forecast dispersion arises due to the existence of fundamentally different types of agents in the market (for example, in the noise-traders and rational-arbitrageurs model presented by De Long, Shleifer, Summers, and Waldmann (1990) and a series of fundamentalists and chartists models).[4] Due to the difference in types, agents in the third strand of literature not only observe different information, but also have different ways to interpret the same information. Thus, an implication in the third strand of literature overlaps the explanations in the first and second strands of literature. We investigate whether or not this third assertion in literature can be empirically validated in the Japanese stock market. In particular, we explore why professionals' expectations are heterogeneous by disaggregating the forecasts in our sample offered by professionals into those of fundamentally different types, namely, into buy- and sell-side professionals.

Buy-side professionals are those who work for investing institutions, such as mutual funds, pension funds, and insurance firms, which purchase securities on their own account. Buy-side analysts research and make recommendations to their own institutions' investors regarding purchasing securities. Buy-side recommendations are usually not available to the

[3] We refer to Frijns, Lehnert, and Zwinkels (2010) for categorizing the literature into three strands.

[4] See, for example, Hommes (2006) and LeBaron (2006), who survey papers on agent-based computational finance. Boswijk, Hommes, and Manzan (2007), Branch (2004), Frankel and Froot (1990), Menkhoff, Rebitzky, and Schröder (2009), and Reitz, Stadtmann, and Taylor (2009) empirically demonstrate that the existence of fundamentalists and chartists in the same market generates the forecast dispersion.

public. Sell-side professionals work for companies which sell investment services to investors, that is to say, the buy-side professionals, and provide recommendations to the public. Sell-side analysts work for brokerage firms; their research is used to promote securities to buy-side investors.[5] We demonstrate that our results are consistent with the explanations offered by the third strand of the literature in ways outlined below.

We first demonstrate that buy-side and sell-side professionals utilize different information to make their forecasts. Even if they observe the same information, they often interpret the information differently, resulting in varied expectations. Secondly, we demonstrate that certain forms of information exchanges take place between the buy-side and the sell-side professionals that generates heterogeneity in expectations. More precisely, we demonstrate that the buy-side professionals refer to the way in which sell-side professionals evaluate the market, particularly when the sell-side professionals share opinions that resemble to those of the buy-side professionals. Meanwhile, the buy-side professionals do not take this action when attempting to relate foreign exchange rates to future stock prices. On the other hand, sell-side professionals seek to share market views similar to those of their customers, that is to say, to buy-side professionals. Our results imply that expectation heterogeneity arises because buy-side and sell-side professionals having different business goals interact with one another and they differentiate the contents of the information as well as their interpretations of the same information in their forecasts. Thus, we conclude that the existence of fundamentally different types of professionals within the same market is a key to generating the dispersion.

In addition, we demonstrate the robustness of our results after controlling for important events in the Japanese economy during our sample periods, such as the Lehman

[5] For more information on the different activities in which buy-side and sell-side professionals engage, see Groysberg, Healy, and Chapman (2008) and Busse, Green, and Jegadeesh (forthcoming).

shock, the Bear Stearns shock, the Resona shock, the merger of the Mitsubishi Tokyo Financial Group and UFJ Holdings, the quantitative easing monetary policy, the settlement of the account in each fiscal year, and the January effect.

This paper makes the following six contributions. First, we empirically explain the determinants of the expectation dispersion among the Japanese stock market professionals. Several papers investigate the sources of the dispersion in expectations of exchange rates, inflation, GDP, and unemployment, but not specifically of the expectations of Japanese stock market professionals.[6] Second, we demonstrate the causes of the forecast dispersion related to the stock index using professionals' opinions about the various macroeconomic, political, and psychological factors that influence future stock prices. The QUICK corporation asks respondents to select the factors that influence future stock prices from among the following factors: "Business conditions," "Interest rates," "Foreign exchange rates," "Politics and diplomacy," "Internal factors and market psychology in stock markets," and "Stock and bond markets abroad." These macroeconomic, political, and psychological factors are among the most likely candidates to explain the stock index price forecasts. Our panel dataset enables us to directly relate professionals' ideas on these factors to the expectation dispersion. This approach is different from that in previous papers, such as Lamont (2002), which explains the expectation dispersion by using the forecasters' age and reputation.

Third, we empirically analyze both buy-side and sell-side professionals' dispersions of the stock index forecasts. Several papers investigate the behavior of sell-side investors from a cross-sectional viewpoint, but their efforts focus exclusively on the sell-side

[6] See, for example, Menkhoff, Rebitzky, and Schröder (2009) and Reitz, Stadtmann, and Taylor (2009) for heterogeneity in exchange rate expectations, Mankiw, Reis, and Wolfers (2003) and Capistran and Timmermann (2009), for heterogeneity in inflation, Patton and Timmermann (2008) and Döpke and Fritsche (2006) for heterogeneity in both GDP and inflation, and Lamont (2002) for the heterogeneity in GDP, inflation, and unemployment.

professionals.[7] Accordingly to Groysberg, Healy, and Chapman (2008), this action is due to a lack of data on buy-side professionals. Among the relatively limited amount of research conducted on buy-side professionals, Cowen, Groysberg, and Healy (2006) and Groysberg, Healy, and Chapman (2008) examine the forecasts made by both buy-side and sell-side professionals, but focus on individual stocks and do not characterize the forecast dispersion of buy-side and sell-side professionals.

Fourth, we empirically identify the types of professionals who actually drive the forecast dispersion. We demonstrate that the buy-side and sell-side professionals significantly impact the dispersion. The third strand of literature mentioned above poses the idea that the existence of different types of professionals within the same market generates the forecast dispersion, such as noise traders and rational arbitrageurs in the noise-trader model and fundamentalists and chartists in agent-based models. Nonetheless, those papers identify neither the type of financial institutions to which noise traders, rational arbitrageurs, fundamentalists, and chartists specifically belong nor their respective business categories.

Fifth, we demonstrate that a form of information exchange between buy-side and sell-side professionals exists, which determines the forecast dispersion. The research of sell-side professionals is usually available to the public in reality, whereas that of buy-side professionals is conducted exclusively for buy-side firms' portfolio managers (Cheng, Liu, and Qian, 2006). However, it is not empirically validated as to whether or not they utilize each other's analyses in making their forecasts. Even if they do, the information from the sell-side professionals that the buy-side professionals use and the information from the buy-side professionals that the sell-side professionals utilize in making their forecasts remain unknown.[8]

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[7] See, for example, Clement (1999) and Hong and Kubik (2003).

[8] Busse, Green, and Jegadeesh (forthcoming) find sell-side analysts' recommendations to be informative to the buy-side professionals but do not find the reverse to be true.

Sixth, in addition to analyzing the relationship between professionals' behavior and the expectation dispersion, we examine the impacts of important economic and financial events on the dispersion. Those events include the global financial crises, the nationalization of Resona Bank, and the merger of the Mitsubishi Tokyo Financial Group and UFJ Holdings, that have caused important structural changes in the Japanese financial markets. Such an approach can be taken with our dataset, as our sample covers the past 10 years in which these events have occurred.

The paper is organized as follows. Section 2 presents literature review of the sources of dispersion. Section 3 introduces details regarding our dataset and derives various empirical hypotheses regarding the cause of dispersion. Section 4 tests these hypotheses, and Section 5 checks the robustness of our results. The last section contains concluding remarks.

2. Literature

One explanation for the expectation dispersion is that the dispersion arises when agents have access to heterogeneous information about the current state of the economy. For example, in the islands model presented by Lucas (1973), expectation heterogeneity with respect to prices and inflation arises when producers on separate islands have access to different information. The sticky-information models of Mankiw and Reis (2002) and Carroll (2003) suggest that agents' asynchronous updating of information sets generates the disagreement in expected inflation rate. In the field of market microstructure, for example, Kyle (1985) demonstrates that the asymmetry of the information available to informed and uninformed traders drives forecast dispersions. The second strand of the literature maintains that the dispersion arises when agents interpret the same information about the current state of the economy differently. For example, Laster, Bennett, and Geoum (1999) and Patton and Timmermann (2008) demonstrate by using their macroeconomic survey datasets that expectation dispersions arise in situations in which no difference exists in access to

information used to make forecasts.

The third strand of the literature centers on the idea that the forecasts are heterogeneous because agents are fundamentally different due to the diversity in their information sets and trading strategies. For example, according to the noise-trader model of DeLong, Schleifer, Summers, and Waldmann (1990), noise traders respond to noise, rather than to information on the current state of the economy, because they interpret the noise as useful information that will generate profits if they base trade on the noise. Meanwhile, rational arbitrageurs form fully rational expectations of the stock prices. Thus, expectations become heterogeneous in the noise trader model, due to the fact that noise traders and rational arbitrageurs utilize different information sets and different information-processing technologies in their trading strategies. Several agent-based models, popularly exemplified by a model created by Brock and Hommes (1998), assume two different types of agents in the market, termed fundamentalists and technical traders. Fundamentalists expect future prices to revolve around the fundamental price of the asset, whereas technical traders' expectations are positively related to recent price movements if agents are momentum traders and negatively related to recent price movements if they are contrarians. Expectations in the agent-based models are heterogeneous as a result of the differences in their information and information-processing technologies that fundamentalists and technical traders use in formulating their trading strategies. In this sense, the explanations by the third strand of literature cover implications from both of the first and second strands of literature.

Our empirical research is conducted in line with this third strand of the literature. We disaggregate our sample into buy-side and sell-side professionals, using the respondent information in our dataset as explained in Section 3.1., and determine the dispersions of the two types. Establishing the determinants of the buy-side and sell-side dispersions will contribute to explaining the forecast heterogeneity among all professionals. The next section will define the forecast dispersion as the standard deviation of the forecasts. But the

following decomposition of forecasts' variance shed further insights on understanding on the statement.

The variance of the forecasts by all professionals at *t* is given by:

$$V_t^{all} = \left(\frac{1}{n_t + m_t} \right) \left(\sum_{i=1}^{n_t} \left(F_t^{buy-side,i} - \overline{F}_t \right)^2 + \sum_{j=1}^{m_t} \left(F_t^{sell-side,j} - \overline{F}_t \right)^2 \right) \quad (1)$$

where $F_t^{buy-side,i}$ is the forecast by a buy-side professional *i*, $F_t^{sell-side,j}$ is that by a sell-side professional *j*, n_t is the number of buy-side professionals, and m_t is the number of sell-side professionals. $\overline{F}_t$ is the average forecast over all professionals, i.e., buy- and sell-side professionals, and is given by:

$$\overline{F}_t = \frac{1}{n_t + m_t} \left(\sum_{i=1}^{n_t} \left(F_t^{buy-side,i} \right) + \sum_{j=1}^{m_t} \left(F_t^{sell-side,j} \right) \right)$$

where the sum of n_t and m_t is the number of all professionals. Defining V_t^i as the variance of forecasts by *i* where *i* = all, buy-side or sell-side professionals, equation (1) is re-expressed as:

$$V_t^{all} = \left(\frac{n_t}{n_t + m_t} \right) V_t^{buy-side} + \left(\frac{m_t}{n_t + m_t} \right) V_t^{sell-side} + \frac{n_t m_t}{\left(n_t + m_t \right)^2} \left(\overline{F}_t^{buy-side} - \overline{F}_t^{sell-side} \right)^2 \quad (2)$$

where $\overline{F}_t^{buy-side}$ and $\overline{F}_t^{sell-side}$ are the mean forecasts of buy-side and sell-side professionals, respectively. The first and second terms in equation (2) are the weighted average of forecasts' variances of buy-side and sell-side professionals and the third term is the adjustment term of the level-difference of the mean forecasts of buy-side and sell-side professionals. Plugging the actual values into equation (2), the effects of forecasts' variances of buy-side and sell-side professionals on V_t^{all} look much larger than those of the fractions of the buy-side and sell-side professionals ($\left(n_t / n_t + m_t \right)$ and $\left(m_t / n_t + m_t \right)$, respectively) and the third term.

Computing the correlation coefficients between V_t^{all} and the variance of the forecasts by each professional, we find that V_t^{all} is highly and positively correlated with $V_t^{sell-side}$ (0.80) and $V_t^{buy-side}$ (0.96), respectively.[9] Thus, we focus on the determinants of the dispersions in the buy-side and sell-side professionals, in order to pin down the dispersion in all professionals.

While validating the assertion presented in the third strand of literature, we also characterize the forecasting behavior of buy-side and sell-side professionals. In particular, we investigate whether or not buy-side (sell-side) forecasters refer to and utilize information about the ways in which sell-side (buy-side) professionals evaluate the market in order to forecast future prices. This issue has not been satisfactorily clarified in previous empirical papers.[10] In order to achieve these goals, we present three hypotheses to test empirically after detailing our dataset in the next section.

3. Data and Hypotheses

3.1. Data

Our analyses rely on a monthly panel dataset gathered in surveys conducted by

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[9] The correlation coefficients between V_t^{all} and the fraction of the buy-side professionals, the fraction of the sell-side professionals, and the last term in equation (2) are 32%, -32%, and 36%, respectively.

[10] Previous papers, such as Clement (1999) and Hong and Kubik (2003), investigate sell-side behaviors, while recent literature examines both buy-side and sell-side behaviors, (see, for example, Busse, Green, and Jegadeesh, forthcoming; Cowen, Groysberg, and Healy, 2006; Groysberg, Healy, and Chapman, 2008). Cowen, Groysberg, and Healy (2006) and Groysberg, Healy, and Chapman (2008) mainly focus on the difference in the degree of optimism between buy-side professionals and sell-side professionals. They find that sell-side professionals make more optimistic forecasts and recommendations than do buy-side professionals. On the other hand, the findings of Busse, Green, and Jegadeesh (forthcoming) indicate that buy-side trades follow sell-side analysts' recommendations, whereas sell-side trades do not follow the recommendations of buy-side analysts.

QUICK Corporation. The dataset we use covers a period of 117 months, from June 2000 through February 2010 and includes the one-month ahead expectations for the TOPIX provided by a total of 1,132 professionals. The average number of respondents each month is 182.0, and each forecaster replied an average of 20.5 times. The survey is usually conducted at the beginning of each month over the course of three consecutive days, with the last of these days taking place on the first Thursday of the month, and the survey report released on the following Monday. The published report solely includes summarized survey results, such as the mean, standard deviation, median, minimum, and maximum of the forecasts, and so forth. However, our dataset contains the survey results of each respondent and also includes such information as the individual code and company code of each respondent, enabling us to track the forecast record of a particular individual and firm over time, although not all of the professionals replied to the survey for the full time period of the study.

3.1. Buy-side and sell-side professionals

We categorize the respondents into buy- and sell-side professionals, using the information for each respondent presented in two columns of the dataset, which are labeled "assigned work" and "business category."[11] With respect to the "assigned work" column, a respondent is categorized as the buy-side professional if he/she is in charge of managing: 1) "his/her company's own funds," 2) "pension funds," 3) "funds placed in trust (excluding pension purposes)," 4) "funds placed in trust (including pension purposes)," 5) "investment trust," or 6) "proprietary trading." (These subcategories are denoted B1, B2, B3, B4, B5, and B6, respectively). A respondent is defined as the sell-side professional if he/she is involved

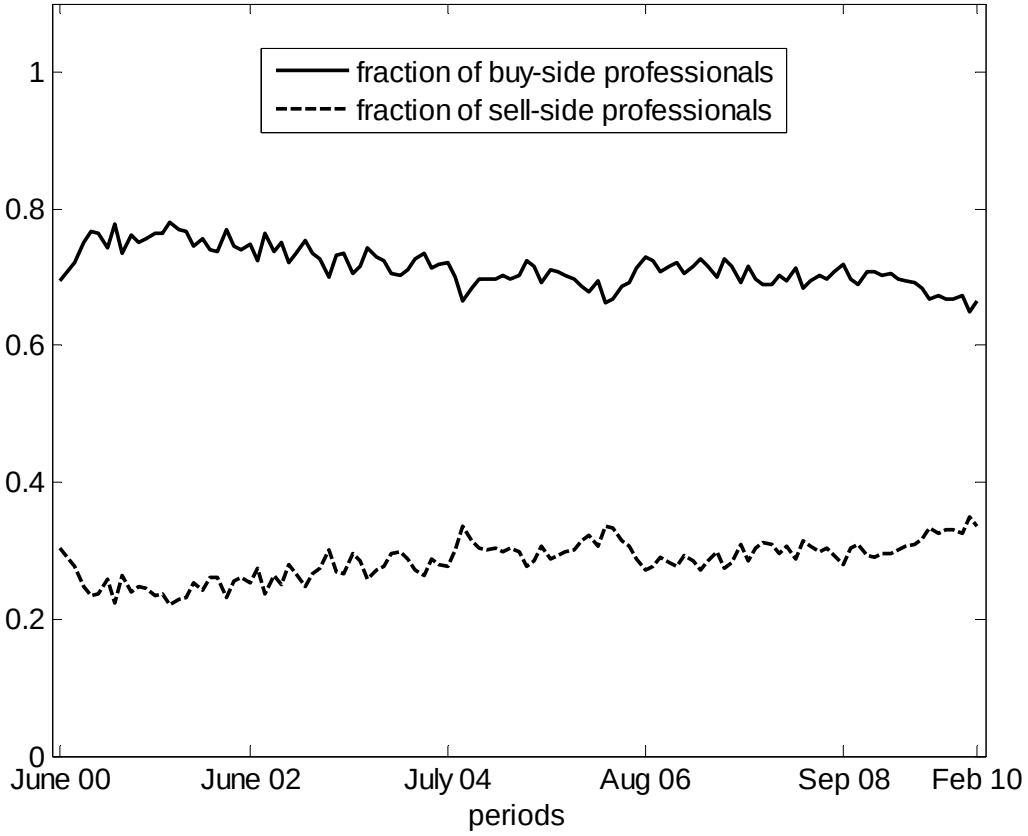
[11] This categorization is primarily based upon the papers reviewed in Section 2, such as that of Groysberg, Healy, and Chapman (2008). In addition, we asked various Japanese market professionals about our categorizations into buy-side and sell-side professionals. In particular, we thank Hidetoshi Ohashi (Morgan Stanley) for his helpful suggestions.

in: 7) “brokerage of agency trades” or 8) “brokerage of principal trading and agency trades” (denoted as S7 and S8, respectively).

If a forecaster works for 9) “research and information,” 10) “planning for investment management,” or 11) “else,” we look at a column labeled “business category.” If he/she works at a “domestic or foreign security company,” then he/she is categorized as a sell-side professional (denoted as S1 and S2, respectively). Otherwise, for example, if he/she works at an “investment trust,” “commercial bank,” “trust bank,” in “life insurance,” “postal life insurance,” “pension fund,” or “else,” or he/she is “an investment advisor,” then he/she is categorized as a buy-side forecaster (B9, B10, and B11, respectively).

Our dataset includes 826 buy-side and 306 sell-side professionals. The average number of respondents each month is 130.1 buy-side and 52.0 sell-side professionals. The number of respondents does not change much over time. The standard deviation of the number of forecasts by buy-side professionals is 7.81, and that by sell-side professionals is 6.36. Figure 1 also confirms that the fractions of buy-side and sell-side professionals over all respondents do not vary over time. Each buy-side professional replied an average of 19.8 times, and each sell-side professional replied an average of 21.5 times throughout the sampling period. There are 9 types of buy-side professionals (B1–B6 and B9–B11) and 4 types of sell-side professionals (S1–2 and S7–8). Throughout our sample periods, the average fractions of these types in percentage are as follows: 18.6 percent for B1, 6.9 percent for B2, 4.6 percent for B3, 9.3 percent for B4, 10.0 percent for B5, 9.2 percent for B6, 7.3 percent for B9, 3.2 percent for B10, 2.4 percent for B11, 19.2 percent for S1, 2.4 percent for S2, 3.3 percent for S7, and 3.7 percent for S8.

Figure 1: Fractions of buy-side and sell-side professionals over all respondents



3.2. Dispersion

The expectation heterogeneity or dispersion among all professionals is measured in terms of the standard deviation of forecasts across all individuals at each point in time, referred to $dispersion_t^{all}$. The expectation dispersion among buy-side (sell-side) professionals is represented by the standard deviation of forecasts across all buy-side (sell-side) individuals at each point in time, denoted as $dispersion_t^{buy-side}$ ($dispersion_t^{sell-side}$).

Figure 2 presents the histograms of the dispersion for the 1 month-ahead forecasts of all professionals. The mean is 51.3 (yen), and the standard deviation is 11.0, indicating that the professionals' expectations are, in fact, heterogeneous.

Figure 2: Histogram of dispersion for 1 month-ahead expectations by all professionals

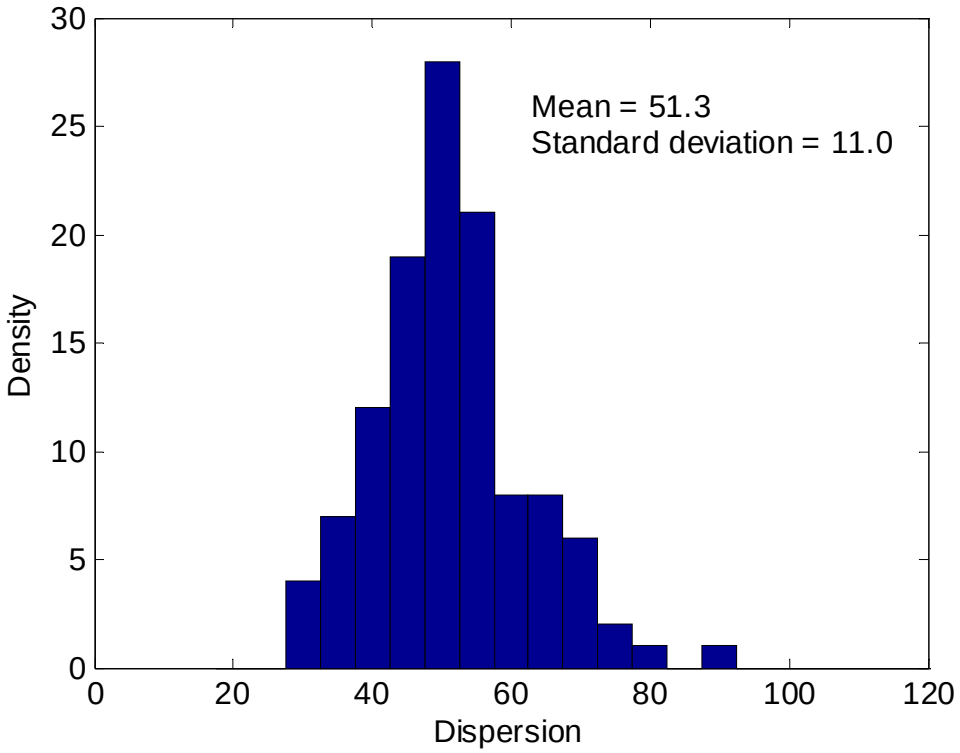


Figure 3: Histogram of dispersion for 1 month-ahead expectations by buy-side (bar) and sell-side (line) forecasters

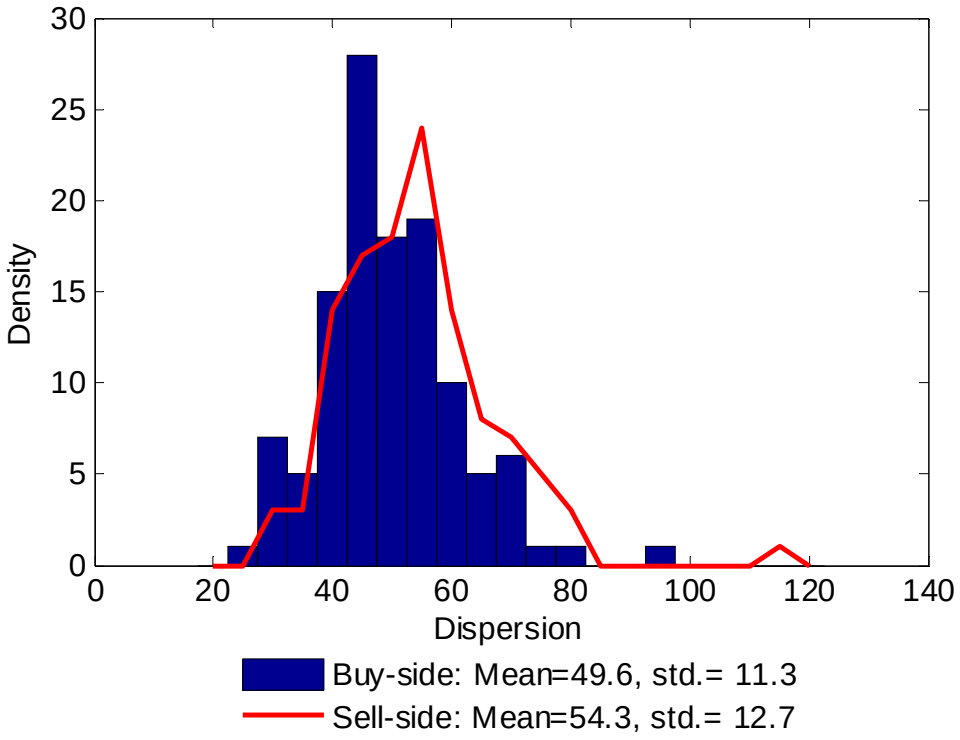
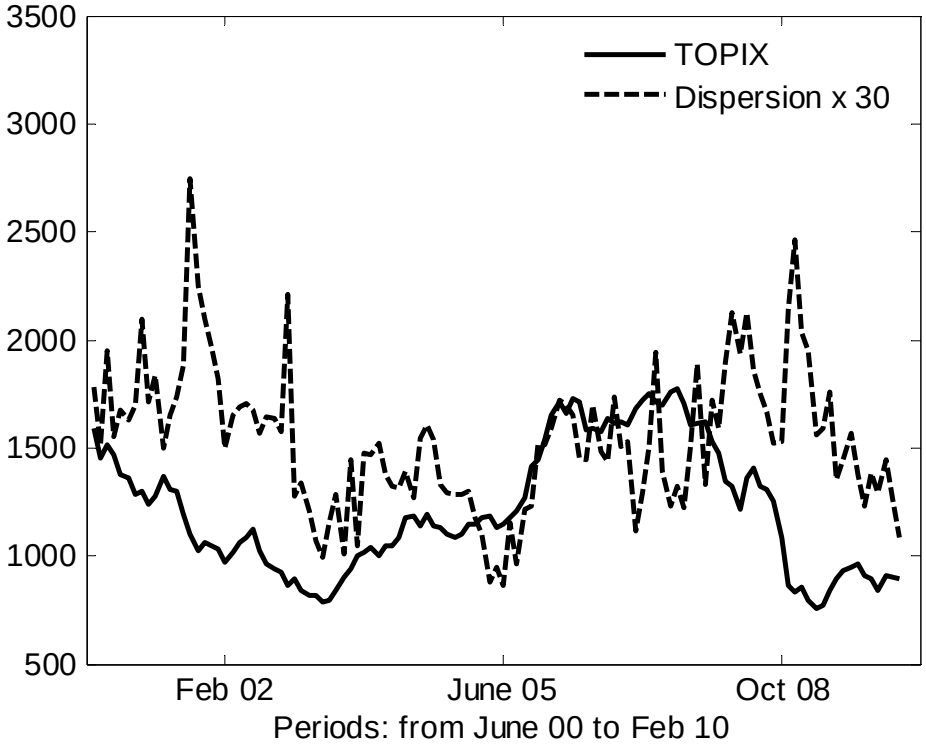
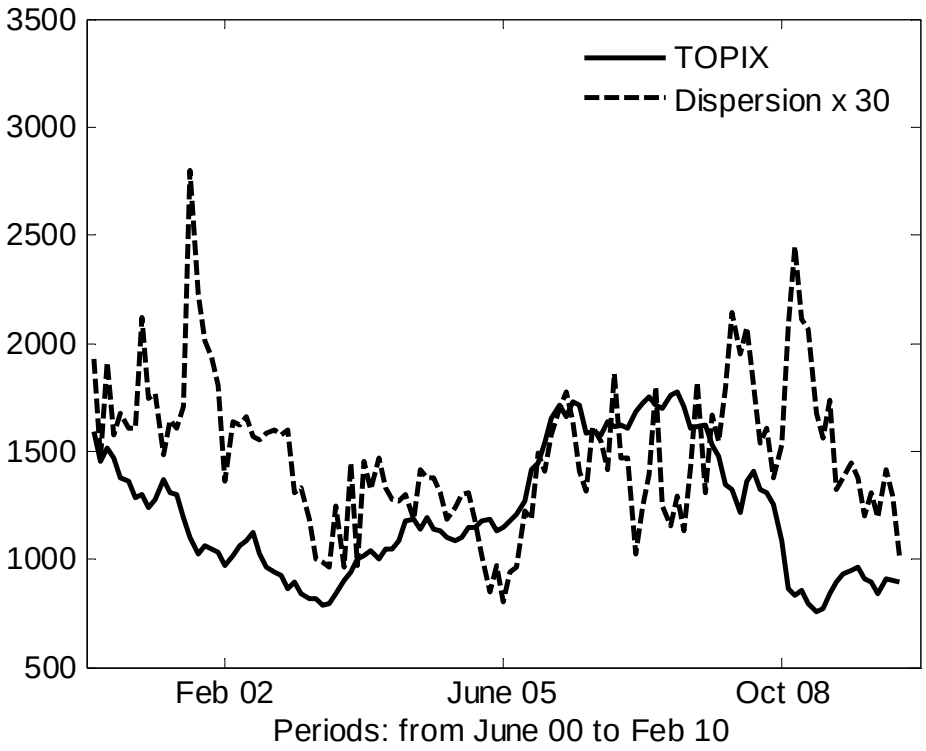


Figure 4: Dispersion of All (top), Buy-side (bottom), and Sell-side (following page) professionals and TOPIX





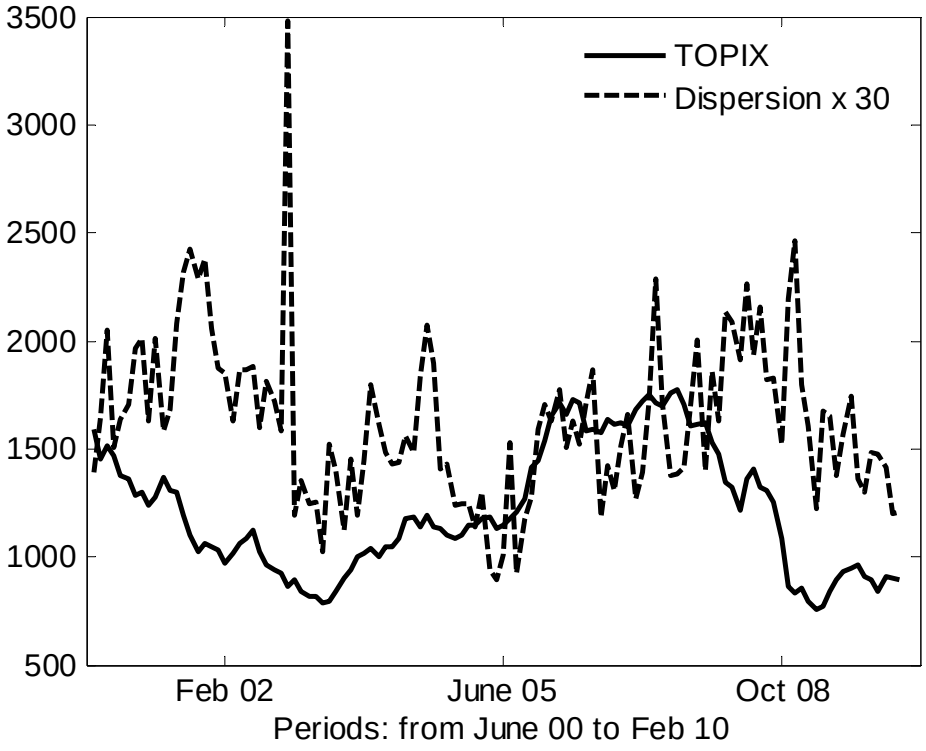


Figure 3 displays the histograms of the dispersion for the 1 month-ahead forecasts of buy-side and sell-side forecasters. The histogram for the buy-side professionals is marked with bars, while that for the sell-side professionals is represented with a line. They indicate that expectations among buy-side and sell-side professionals are heterogeneous as well and that the differences between buy-side and sell-side professionals are significant. The mean of the dispersion is larger (54.3) for sell-side professionals than for buy-side professionals (49.6). The standard deviations of the dispersion amount to 11.3 (12.7) for buy- (sell-) side professionals. These results indicate that disagreements among sell-side professionals tend to be more diverse than among the buy-side professionals and that the level of disagreement fluctuates more among sell-side professionals than among buy-side professionals. This tendency seems to be consistent with the fact that sell-side analysts have an incentive to differentiate their research from other sell-side analysts for their business (Hong and Kubik, 2003 and Michaely and Womack, 2005).

Figure 4 presents the time series for TOPIX and the dispersion for all, buy-side, and sell-side professionals. As in the survey data of several papers, such as those of Döpke and Fritsche (2006), Mankiw, Reis, and Wolfers (2003), Menkhoff, Rebitzky, and Schröder (2009), and Reitz, Stadtmann, and Taylor (2009), dispersions appear to be quite persistent in our dataset as well, suggesting that the autoregressive components should be included in the estimation model.[12]

3.3. Factors

The QUICK survey asks professionals to rate the extent to which they believe the following factors having influences on stock prices over the next 6 months: Factor 1: Business conditions; Factor 2: Interest rates; Factor 3: Foreign exchange rates; Factor 4: Politics and diplomacy; Factor 5: Internal factors and market psychology in stock markets; and Factor 6: Stock and bond markets abroad. Forecasters answer this question by numbering from 1 (strongly positive) to 5 (strongly negative). Thus, these factors give us six variables, since the respondents provide an answer for all 6 factors each period.[13]

In establishing the factor variables used in our empirical analysis, we also utilize individuals' identification of the factor that they deem most important each month. In our

[12] In addition, recall that equation (2) indicates that buy-side and sell-side dispersions as well as the fractions of each professional over all respondents determine the dispersion of all respondents. Figure 1 shows that fractions of buy-side and sell-side professionals over all respondents are stable over time, and Figure 4 suggests more volatile dispersion of buy-side and sell-side professionals than the fluctuations of the fractions. And then, rather than the fractions of buy-side and sell-side professionals over all respondents, dispersions for buy- and sell-side professionals essentially explain the dispersion for all professionals.

[13] Over our sample periods from June 2000 through February 2010, Factor 1 (Business conditions), Factor 2 (Interest rates), Factor 3 (Foreign exchange rates), Factor 5 (Internal factors and market psychology), and Factor 6 (Stock and bond markets abroad) tend to have positive influences on future price expectations presented by all of the professionals, i.e., the averages are less than 3 (2.61, 2.91, 2.97, 2.87, and 2.88, respectively). Politics and diplomacy (Factor 4) appear to cause all of the professionals to expect a downward trend in future prices, as the average is greater than 3 (3.23).

dataset, the respondents change over time, and the 5-point scaling used may involve subjective personal opinion. We tackle this problem by constructing a new variable as follows. First, we assign the variables of the various factors 1, -1, or 0, if respondents answer 1 or 2, 4 or 5, or 3, respectively. Second, these modified factors are multiplied by the binary dummy variable for the responses related to the most important factor, which is taken as one if the factor is deemed the most important and as zero otherwise. Thus, the new variable takes 0 if it is not deemed to be the most important variable and it takes 1 or -1 if it is considered to be the most important factor. We take averages of the new variable for buy-side and sell-side professionals each month, and construct time series of the averages of the new variables. Then, we have $Factor(j)_t^{buy-side}$ and $Factor(j)_t^{sell-side}$ at each month *t*, where *j* represents the factor from 1 to 6. For example, $Factor(1)_t^{buy-side}$ is the average of Factor 1, Business conditions, among buy-side professionals at time *t*. We further decompose $Factor(1)_t^{buy-side}$ into $Factor(1)_t^{buy-side,+}$ and $Factor(1)_t^{buy-side,-}$.

$Factor(j)_t^i$ is assigned to $Factor(j)_t^{i,+}$ if $Factor(j)_t^i > 0$ and 0 is assigned to $Factor(j)_t^{i,+}$ otherwise. Similarly, $Factor(j)_t^i$ is assigned to $Factor(j)_t^{i,-}$ if $Factor(j)_t^i < 0$ and 0 is assigned to $Factor(j)_t^{i,-}$ otherwise. Thus, we construct two time series $Factor(j)_t^{i,+}$ and $Factor(j)_t^{i,-}$ for factor *j*'s variable that will be used in our empirical analyses, where *i* denotes buy-side and sell-side professionals. $Factor(1)_t^{buy-side,+}$ means that buy-side professionals believe on average at *t* that business conditions contribute to increasing the future stock prices, and $Factor(1)_t^{buy-side,-}$ refers that they believe on average at *t* business conditions to contribute to decreasing the future stock prices.

Table 1: Factors influencing the future stock price $Factor(j)_t^i$

Factors: j	i = All	i = Buy-side	i = Sell-side
1	0.1963	0.1950	0.1994
	(0.2864)	(0.2969)	(0.2705)
	[53.7%]	[55.0%]	[50.5%]
2	-0.0033	-0.005	0.0010
	(0.0235)	(0.0231)	(0.0366)
	[3.3%]	[2.9%]	[4.3%]
3	-0.0039	-0.0032	-0.0052
	(0.0294)	(0.0318)	(0.0375)
	[4.1%]	[3.6%]	[5.3%]
4	0.0030	0.0022	0.0052
	(0.0575)	(0.0565)	(0.0745)
	[9.9%]	[9.7%]	[10.4%]
5	0.0198	0.017	0.0273
	(0.041)	(0.0454)	(0.046)
	[8.7%]	[8.6%]	[9.1%]
6	0.0033	0.0018	0.0061
	(0.0534)	(0.0555)	(0.0631)
	[14.5%]	[14.5%]	[14.4%]

Notes: The numbers in the first row are the unconditional means, and the numbers in parentheses are the standard deviations. The percentages in the third row refer to the percentages of professionals who indicated that this particular factor is the most important among all six factors. Note that some professionals did not give an answer to the questions; thus, the sum of the percentages may not amount to 100%. The factors are categorized as follows: Factor 1: Business conditions; Factor 2: Interest rates; Factor 3: Foreign exchange rates; Factor 4: Politics and diplomacy; Factor 5: Internal factors and market psychology; and Factor 6: Stock and bond markets abroad.

Table 1 describes the summary statistics of factor variables $Factor(j)_t^i$ where j = 1, …, 6, and i = buy-side and sell-side professionals. The numbers in the first row are the unconditional means, and the numbers in parentheses are the standard deviations. The numbers in brackets refer to the percentages of professionals indicating this particular factor to be the most important among all six factors. Over our sample period from June 2000 through February 2010, more than 50% of respondents placed greater importance on "Business conditions" (Factor 1) increasing future prices (the average values are about 0.20

for all, buy-side, and sell-side professionals), whereas approximately 14.5% of them selected the "Stock and bond markets abroad" (Factor 6) as the most important factor to positively influence the future stock prices (the average values range from 0.002 to 0.006). "Interest rates" (Factor 2) and "Foreign exchange rates" (Factor 3) are selected as the most important factor by approximately 3-5% of respondents; however, this influence on future prices is regarded as negative (usually about -0.003 to -0.005). "Politics and diplomacy" (Factor 4) and "Internal factors and market psychology in stock markets" (Factor 5) are selected by 8-10% of respondents as having the most important influence on the future prices (with a positive influence ranging from 0.002 to 0.027).

3.4. Hypothesis

We explore the determinants of the forecast dispersion by characterizing the behavior of buy-side and sell-side professionals, and thus, uncover an explanation for the forecast heterogeneity among all professionals.

3.4.1. Hypothesis 1

This hypothesis is used to test the assertion made by the third strand of literature.

Hypothesis 1: Expectation heterogeneity arises because different types of professionals exist in the same market; that is to say, professionals utilize different information in their forecasts and interpret the same information on the current state of the economy differently.

If this assertion is correct, buy-side and sell-side professionals acquire different information on macroeconomic and political factors so that different factors are used to determine expectations and dispersions of buy-side and sell-side professionals. Or, on the other hand, a certain macroeconomic or political factor may influence the dispersion of the buy-side professionals without affecting the sell-side dispersion, or vice versa, because they interpret the information in different ways. We test this hypothesis using the following equation:

$$\ln\left(dispersion_t^i\right) = \alpha + \beta_+(Factor(j)_t^{i,+}) + \beta_-(Factor(j)_t^{i,-}) + \varepsilon_t \quad (3)$$

Recall that $Factor(j)_t^i$ represents the factors that influence future stock price forecasts, where *i* is *buy-side* or *sell-side*, and *j* =1, …., 6 and is the index of the factors. We have $Factor(j)_t^{i,+}$ if $Factor(j)_t^i$ >0, otherwise that takes 0. Similarly, we have $Factor(j)_t^{i,-}$ if $Factor(j)_t^i$ <0, otherwise that takes 0. This setup enables us to check the asymmetry of influences of each factor on forecasts.

If the hypothesis is correct, we should obtain the following two results. First, we should observe that the buy-side and sell-side professionals have different factors with significance that determine their dispersion. Each professional has access to different information, resulting in certain information on these factors influencing significantly the dispersion of one type, but not the other. Alternatively, buy-side and sell-side professionals gather the same information but employ it in different ways. As a result, we should observe that at least one factor will be statistically significant for one type of professional and not the other.[14]

3.4.2. Hypotheses 2 and 3

In the tests of the following Hypotheses 2 and 3, we first examine the interactive effect between buy-side and sell-side professionals. We then examine whether the determinants of

[14] We validate Hypothesis 1, for example, in a following case: The idea of buy-side professionals on "Foreign exchange rates," i.e., $Factor(3)_t^{buy-side}$, significantly influences their own dispersion, while that of the sell-side professionals, i.e., $Factor(3)_t^{sell-side}$, does not for the sell-side dispersion. At the same time, sell-side own idea on the other factors determines the sell-side dispersion.

our professionals' forecast dispersion are consistent with the assertion of the third strand of literature as being tested in Hypothesis 1.

Hypothesis 2: Buy-side professionals refer to the way in which sell-side professionals evaluate the market.

Buy-side professionals examine sell-side research and distill the information in order to utilize it in making their investment decisions (e.g., Busse, Green, and Jegadeesh, forthcoming). This fact indicates that the forecasts of buy-side professionals are, at least in part, affected by sell-side professionals' views. If such is the case, the ideas of sell-side professionals are indirectly reflected in the forecasts of buy-side professionals. To test this hypothesis, the following model is estimated:

$$\ln\left(dispersion_t^{buy-side}\right) = \alpha + \beta_+(Factor(j)_t^{sell-side,+}) + \beta_-(Factor(j)_t^{sell-side,-}) + \varepsilon_t \quad (4)$$

Hypothesis 3: Sell-side professionals can be rewarded for having market views similar to those of buy-side professionals, who are the sell-side professionals' customers.

According to Groysberg, Healy, and Chapman (2008) and many others, opportunities to interact with their clients, i.e., with buy-side professionals, enable sell-side professionals not only to improve their research but also to ingratiate themselves with their clients. Sell-side professionals thus attempt to understand how buy-side professionals evaluate the market, thereby most likely influencing sell-side professionals' forecasts. In order to test this hypothesis, we estimate the following model:

$$\ln\left(dispersion_t^{sell-side}\right) = \alpha + \beta_+(Factor(j)_t^{buy-side,+}) + \beta_-(Factor(j)_t^{buy-side,-}) + \varepsilon_t \quad (5)$$

In addition to finding the interactive effect, in the tests of Hypotheses 2 and 3, we expect to observe the following results that are consistent with the assertion of the third strand of the literature. In contrast to the interactive feature where one type refers to the ideas

of the other, buy-side or sell-side professionals should have at least one factor where each type does not refer to the idea of the other but their own idea determines their own dispersion. The result will be interpreted as follows. On the one hand, professionals would share the same information about a factor but interpret it in a different way so that one type utilizes their own information in their forecasts, while the other does not. On the other hand, as a result of the interaction, they obtain information from the other type about a factor but utilize their own information, which they each primarily had, in their forecasts. The latter implies that professionals utilize different information that determines or backs their own forecasts.

4. Testing Hypotheses

In this section, the three hypotheses discussed above are tested. In the process, two econometric issues are addressed. First, based on the Akaike Information Criterion (AIC) and the Schwarz-Bayesian Information Criterion (SBIC), autocorrelations of the dispersion are indicated at a lag of two in most buy-side regression cases. Meanwhile, autocorrelations are present at a lag of one or two in sell-side regression cases. As a consequence, we specify an AR(2) specification, estimate the regression models using OLS, and compute the *t*-statistics utilizing the Newey-West standard errors, which have been shown to be robust in the face of heteroskedasticity and autocorrelation (Newey and West 1987, 1994). Second, we focus on the one-month ahead forecast in order to avoid the overlapping forecast problem, in spite of the fact that the QUICK dataset contains one-month, three-month, and six-month ahead forecasts.

Our factor variables stem from the respondents' responses regarding the factors influencing the stock price over the next 6 months, indicating that the factor variables may influence the dispersion with certain lags. Thus, we computed the AIC and SBIC and determined the appropriate length of the lags to be 0 or 1 month. Therefore, factor variables at a lag of 0 or 1 are considered in our estimations.

We first conduct a univariate regression by including each factor variable independently in each regression, because our factor variables may possibly be correlated. Were they correlated, the multicollinearity problem should arise. The professionals' opinions about macroeconomic, political, and psychological factors that influence future stock prices may commove when certain systematic shocks hit the economy. However, in Section 5, we will demonstrate that our results do not change significantly even when we add all six factor variables at once in each regression.

4.1. Testing Hypothesis 1

Table 2 summarizes the results of testing Hypothesis 1. We test whether buy-side dispersion can be explained by buy-side professionals' own ideas (their own factor variables) and we do the analogue for sell-side professionals. The positive sign of the coefficient estimates of $Factor(j)_t^{i,+}$ means an increase in the dispersion. But since $Factor(j)_t^{i,-}$ takes negative values, dispersion will increase if the sign of the coefficient is negative. For example, the coefficient estimate on $Factor(3)_{t-1}^{buy-side,+}$ is -1.93, meaning the dispersion among buy-side professionals decreases when the buy-side professionals consider foreign exchange rates as an important factor involved in increasing the future stock price. The coefficient estimate on $Factor(6)_t^{buy-side,-}$ is -0.93, meaning that the buy-side professionals' dispersion tends to widen when the buy-side professionals consider stock and bond markets abroad to be the most important factor decreasing the future stock price.[15]

[15] When the explanatory variable is negative and the parameter estimate has a negative sign, multiplication of the two terms results in a positive number, and thus, the dispersion will increase.

Table 2: Testing hypothesis 1

		Buy-side		Sell-side	
		+	-	+	-
Factor 1	t	0.03	-0.28 **	-0.10	-0.26
		(0.38)	(-1.99)	(-0.84)	(-1.11)
	t-1	0.08	-0.30 *	-0.01	0.00
		(1.04)	(-1.75)	(-0.08)	(0.03)
Factor 2	t	-1.19	0.36	0.72	-0.32
		(-0.53)	(0.72)	(0.90)	(-0.77)
	t-1	1.98	-0.26	0.02	-0.36
		(0.99)	(-0.46)	(0.03)	(-0.64)
Factor 3	t	-0.45	0.26	0.47	0.12
		(-0.84)	(0.64)	(0.60)	(0.22)
	t-1	-1.93 ***	0.10	-0.67	0.11
		(-3.41)	(0.25)	(-1.42)	(0.18)
Factor 4	t	0.46	0.67	0.85 ***	0.24
		(1.15)	(0.85)	(3.37)	(0.39)
	t-1	0.35	-0.23	0.58 ***	-0.19
		(1.14)	(-0.28)	(3.09)	(-0.43)
Factor 5	t	0.11	-1.31 **	-0.58	0.99
		(0.21)	(-2.49)	(-1.17)	(0.53)
	t-1	-0.34	-0.46	-0.34	0.27
		(-0.65)	(-0.78)	(-0.49)	(0.15)
Factor 6	t	-1.04 ***	-0.93 **	-0.34	-1.08 **
		(-2.99)	(-2.54)	(-0.96)	(-2.05)
	t-1	0.21	-1.05 ***	-0.13	-0.49
		(0.38)	(-3.04)	(-0.34)	(-0.94)

Notes: We test whether buy-side dispersion can be explained by their own ideas (their own factor variables) and do the analogue for sell-side dispersion. The numbers without parentheses are the estimates of the parameters on factor variables, and those with parentheses are *t*-statistics computed by utilizing Newey-West corrected standard errors. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively. The factors are categorized as follows: Factor 1: Business conditions; Factor 2: Interest rates; Factor 3: Foreign exchange rates; Factor 4: Politics and diplomacy; Factor 5: Internal factors and market psychology; and Factor 6: Stock and bond markets abroad.

In testing Hypothesis 1, we find that buy-side and sell-side professionals utilize different information about the various factors involved in order to make their predictions, since the various factors are significant in generating the dispersions among buy-side and sell-side professionals. This result also implies that even if the same factor's information is taken into consideration in the forecasting process, certain factors, which may not significantly contribute to the sell-side dispersion, determine the buy-side dispersion, and vice versa. In other words, the two groups interpret the same information in different ways. Thus, we conclude that the dispersion arises because the two different types of professionals co-exist within the same market.

Table 2 reveals that "Business conditions," "Foreign exchange rates," "Internal factors and market psychology in stock markets," and "Stock and bond markets abroad" to be significant factors in determining the buy-side dispersion. We confirm that the influence of the factors on the buy-side dispersion is asymmetric, based on the following three observations. First, when the buy-side professionals consider at *t* that "Business conditions" and "Internal factors and market psychology in stock markets" are factors that lower the future stock prices, the dispersion increases, meaning that the disagreement arises when the buy-side professionals expect a recession. The result is asymmetric because the buy-side dispersion is not influenced when the buy-side professionals consider these factors to result in higher future prices. Second, when the buy-side professionals regard "Stock and bond markets abroad" as a contributing factor to future price increases, the dispersion tends to decrease. However, expectations tend to diverge when the buy-side professionals take this factor to have a negative impact on the price. Third, when the buy-side professionals believe foreign exchange rates to be a key factor in increasing the future stock prices, that is to say,

they expect a depreciation of the yen, the expectations tend to converge.[16] But the expectation dispersion is not influenced when a yen appreciation is expected.

The last two columns in Table 2 demonstrate that the factors that explain the sell-side dispersion differ significantly from those on the buy-side professionals in the following two ways. First, in Table 2, we observe a significant impact from the buy-side idea on the fundamental factors, i.e., "Business conditions" and "Foreign exchange rates," influencing the buy-side dispersion. Nonetheless, the sell side's ideas on "Business conditions" and "Foreign exchange rates" do not influence their dispersion. This finding does not imply that these fundamental factors are irrelevant to their expectations; rather, it indicates that the sell-side professionals may change their expectations in a similar manner, leaving the difference in their expectations nearly unchanged. Second, the sell side's ideas about "Politics and diplomacy" and "Stock and bond markets abroad" are significantly and positively related to the sell-side dispersion, whereas the buy-side dispersion is not related to their ideas regarding "Politics and diplomacy." These results imply that buy-side and sell-side professionals may have different information or different information processing technology for making their forecasts that are consistent with the results of the third strand of literature on the determinants of the expectation heterogeneity.

Opinions of sell-side professionals on "Politics and diplomacy" and "Stock and bond markets abroad" diverge the sell-side forecasts. Thus, different forecasts are made among the sell-side professionals, when the information on "Politics and diplomacy" or "Stock and bond markets abroad" is used in forecasting. As described by Cheng, Liu, and Qian (2006), this finding implies that those on the sell-side professionals attempt to differentiate themselves from other sell-side professionals and hopefully establish a reputation on the market by

[16] As Japan has registered trade surplus for the last consecutive 30 years, depreciating yen is thought as a positive factor for stock prices and vice versa (Japan Center for Economic Research, 2011).

making forecasts that are distinct from those of others.

Table 3: Testing hypotheses 2 and 3

		Buy-side		Sell-side	
		+	-	+	-
Factor 1	t	-0.01 (-0.13)	-0.17 (-0.78)	-0.08 (-0.73)	-0.20 (-0.99)
	t-1	0.05 (0.55)	-0.22 (-1.20)	-0.01 (-0.07)	-0.14 (-0.89)
Factor 2	t	0.44 (0.61)	-0.43 (-1.33)	-0.15 (-0.06)	-0.66 (-1.23)
	t-1	0.05 (0.07)	0.29 (0.77)	4.20 ** (2.15)	-0.73 (-1.21)
Factor 3	t	-0.70 (-1.12)	0.62 (1.28)	-1.14 (-1.45)	-0.08 (-0.14)
	t-1	-0.87 (-1.30)	0.19 (0.39)	-0.98 (-1.62)	0.35 (0.66)
Factor 4	t	0.68 ** (1.98)	-0.01 (-0.03)	1.10 * (1.94)	0.68 (0.67)
	t-1	0.41 * (1.93)	0.09 (0.27)	0.34 (0.60)	0.04 (0.05)
Factor 5	t	-0.27 (-0.51)	-1.05 (-0.98)	0.10 (0.18)	-1.06 *** (-2.60)
	t-1	-0.46 (-0.97)	1.47 (1.25)	-0.85 * (-1.68)	1.18 (1.51)
Factor 6	t	-0.32 (-1.17)	-0.96 ** (-2.43)	-1.39 ** (-2.38)	-0.70 ** (-2.13)
	t-1	-0.23 (-0.52)	-0.46 (-0.90)	0.09 (0.19)	-0.93 ** (-2.54)

Notes: We test whether buy-side dispersion can be explained by the factor variables of sell-side professionals. The numbers without parentheses are the estimates of the parameters on factor variables, and those with parentheses are *t*-statistics computed by utilizing Newey-West corrected standard errors. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively. The factors are categorized as follows: Factor 1: Business conditions; Factor 2: Interest rates; Factor 3: Foreign exchange rates; Factor 4: Politics and diplomacy; Factor 5: Internal factors and market psychology; and Factor 6: Stock and bond markets abroad.

4.2. Testing Hypotheses 2 and 3

The results in the columns of Table 3, denoted as “Buy-side dispersion,” describe the test results for Hypothesis 2. First, we reveal that the buy-side professionals incorporate the ideas of the sell-side professionals about certain factors, such as “Politics and diplomacy” and “Stock and bond markets abroad,” when the buy-side professionals have an opinion similar to its own. In such cases, the buy-side dispersion tends to increase. Second, we demonstrate that for certain factors, such as the “Foreign exchange rates,” the buy-side professionals only take its own ideas into account when forecasting, while for the “Politics and diplomacy” factor, the buy-side professionals refer to sell side’s ideas regardless of their own ideas.

The details on the two results are explained in the following by comparing with the results in Table 2 and 3. First, the sell side’s ideas regarding the factors of “Politics and diplomacy” and “Stock and bond markets abroad” widen the buy-side dispersion, while those factors also determine the sell-side dispersion presented in Table 3. When the sell-side professionals consider “Stock and bond markets abroad” (and “Politics and diplomacy”) to be an important factor pushing in increasing or decreasing the future price, the sell-side dispersion increases, as shown in Table 2, and the buy-side dispersion also increases, as presented in Table 3. The results imply that the buy-side professionals refer to and utilize the sell side’s ideas in making their predictions, thereby influencing their dispersion, when the buy-side professionals have ideas similar to those of the sell-side professionals.

Second, Table 2 indicates that buy-side interpretations of “Foreign exchange rates” affect its own dispersion, while the results given in Table 3 indicate that the sell side’s ideas regarding foreign exchange rates do not influence on the buy-side dispersion. Thus, the buy side’s interpretations of this fundamental factor are exclusively related to its own dispersion.

The last two columns in Table 3, denoted as “Sell-side dispersion,” summarize the results for testing Hypothesis 3. We find that buy-side professionals have a significant influence on the forecast decisions of sell-side professionals. This implies that the sell-side

professionals often refers to the way in which buy-side professionals evaluate the market and possibly make their predictions that make their customers, that is, the buy-side professionals, satisfied. As consistent with the results in Groysberg, Healy, and Chapman (2008), having opportunities to interact with their clients, the sell-side professionals can not only improve their research but also ingratiate themselves to their clients. In particular, the sell-side dispersion tends to diverge when incorporating the buy-side opinions about the "Interest rates," "Politics and diplomacy," and "Stock and bond market abroad." We conclude that the buy side's ideas on a factor have impacts on the sell-side dispersion, and that the sell-side professionals utilize the buy-side's information, which would be obtained from the meeting with them, for making forecasts.

Certain variables are significant with a 1-month lag, meaning that the buy-side professionals' opinions have a persistent impact on the expectation formations of sell-side professionals. In particular, such a lag effect is clearly shown when the sell-side professionals attempt to acquire the buy-side opinion regarding "Interest rates" and "Stock and bond market abroad."

In Table 3, the buy-side ideas on "Foreign exchange rates" do not have a strong influence on the sell-side forecasts, while they influence their own dispersion as shown in Table 2. In Table 2, we have observed that the sell side's own ideas on "Foreign exchange rates" do not also affect the sell-side dispersion. The results imply that although both types of professionals exchange the ideas of certain factors with each other, both types have in some way different determinants on their forecast dispersion.

Overall, in the tests on Hypotheses 2 and 3, we found an interacting effect between the buy-side and sell-side professionals, where the buy-side and sell-side professionals refer to each other's ideas for making their forecasts. However, we have also found that both types of professionals have different determinants of the dispersions. For example, only the buy sides' factor variable on the foreign exchange rates determine the buy-side dispersion, but not on

the sell sides' dispersion. This implies that both types of professionals may have the same information linking foreign exchange rates to future stock price, but they interpret it in different ways or they obtain different information relating foreign exchange rates to future stock price, explaining the differences in expectations. Thus, from the results of the tests on Hypotheses 1-3, we conclude that the dispersion arises because of the co-existence of different types of professionals within the same market.

5. Robustness Check

This section reports the results of a sensitivity check conducted for our results. We first show the robustness of our results after controlling for several dummy variables, which are related to the events having significantly influenced the Japanese financial markets. They are the Lehman shock, the Bear Stearns shock, the GM bankruptcy, the Japanese quantitative easing monetary policy, the Resona shock, the UFJ shock, the settlement month effect, and the January effect. Next, we confirm that our results are fairly robust even when we simultaneously take into account all six factor variables into our estimations.

5.1. Robustness with the shocks on the Japanese economy

During our sample period from June 2000 to February 2010, the Japanese economy experienced several structural changes in the financial market. In addition to the current global financial crises, the Resona shock and the UFJ shock triggered by the problems associated with non-performing loans in the Japanese banking sector, greatly influenced the Japanese stock market.[17] With these important financial events in the Japanese economy, we

[17] The Resona shock refers to the fact that Resona Bank with capital ratio sufficiently exceeding the regulatory standards at the end of September 2002 decided to apply for public fund injection at the end of March 2003. The UFJ shock refers to the relief merger of the UFJ Holdings by the Mitsubishi Tokyo Financial Group.

investigate the effect of the quantitative easing monetary policy on open market purchases. We investigate these effects by constructing dummy variables, assigning it as 1 for the September 2008-June 2009 period, in which the Lehman shock took place and General Motors Corporation filed for Chapter 11 bankruptcy protection. We also ascribe 1 to the dummy variable for the period beginning with the Bear Stearns shock and ending with the GM bankruptcy, that is to say, for the period between March 2008 and June 2009. We assign the dummy variable 1 for May 2003 and 0 otherwise for the Resona shock, while the UFJ shock dummy variable is designated as 1 for August 2004 and 0 for other periods. With respect to the quantitative easing monetary policy, we assign the dummy variable 1 for the period between March 2001 and March 2006, and 0 for all other periods.

In Japan, the fiscal year ends at the end of March, and the Tokyo Stock Exchange listed companies release their earnings for the previous fiscal year in April and May; thus, we assign these two months 1 and other periods 0. We conjecture that this information influences forecasters' expectations, as well as the dispersion. The last variable is the dummy describing the so-called "January effect," one of the popular anomalies in the financial market, which suggests that security prices increase in January, thus encouraging investors to buy stocks prior to January and to sell them thereafter.[18] Thus, we assign the month of January 1 and all other months 0.

We have 2 types of professionals alongside 6 factor variables. We have utilized factor variables at *t* or *t-1*. Thus, we have 2x6x2 regression equations for Hypothesis 1 and 2x6 equations for Hypotheses 2 and 3, respectively. As a result, we conducted a total of 48 regressions for this robustness check. The robustness check is conducted by including each of the dummy variables and all of the dummies at once. The results for the robustness of the coefficient estimates in Hypotheses 1-3 are summarized in Table 4. In addition, the influence

[18] The January effect was originally described by Keim (1983).

of the dummies on the forecast dispersions is presented in Tables 5 and 6. The results labeled "Each variable" and "All variables" indicate the results attained by estimating each of the dummy variables independently and all of the dummies at once, respectively.

The second column of Table 4 lists the fraction of factor variables that are significant at a 5% level without dummies and that remain significant at a 5% level upon inclusion of the dummies. Thus, for example, 93.8% of the significant factor variables in the benchmark estimation remain significant, even after the Resona shock dummy is included. The numbers in parentheses indicate the change in the average *p*-values when the estimation is performed with the dummies. For example, the average *p*-value in the benchmark estimation is 0.019, while it amounts to 0.025 when estimated with the Resona dummy. The third column of Table 4 summarizes the numbers for those factor variables that were not significant at a 5% level but that appeared significant at a 5% level with the dummies, and indicates the change in the average *p*-values for the estimations performed with the dummies. For example, 2 variables that were not significant at a 5% level in the benchmark estimation became significant upon inclusion of the dummy of the quantitative easing monetary policy. The average *p*-value changed from 0.056 to 0.023. Overall, some factor variables became insignificant at a 5% level when certain dummies were included, and other variables became significant upon the inclusion of the dummies; however, the *p*-values themselves did not change significantly very much. These findings lead us to conclude that the quantitative features of our results are robust in the various variations.

Panels A and B in Table 5 describe the influences of the dummies on the forecast dispersions. The Resona and UFJ shocks are demonstrated to have significant impacts on the dispersion in more than 2/3 of the whole regressions, while significant impacts are usually not observed in other dummy variables. The Resona shock had the tendency to lower the dispersion (the estimates have a negative sign in 23-24 of the regressions), whereas 10 regressions indicate a widening of the dispersion. The decrease in the dispersion indicates that the nationalization of

Resona Bank had a calming effect on the stock market. As for the UFJ shock, all of the significant dummies were also found to have negative signs, indicating that the merger of the Mitsubishi Tokyo Financial Group and UFJ Holdings altered professionals' expectations in a similar manner, leading to a decrease in the forecast heterogeneity.

The expectation dispersion is not related to the quantitative easing monetary policy, the settlement month effect, and January effect. Although these factors are likely to have changed professionals' expectations, our results indicate that the direction and the magnitude of the changes in expectations remain ambiguous.

Table 4: Sensitivity Analysis 1

Each variable:	Still significant, even if dummies are included	Not significant in benchmark, but significant if dummies are included
Resona	93.8% (0.019 ➔ 0.025)	0
UFJ	87.5% (0.019 ➔ 0.019)	0
Quantitative easing	81.3% (0.019 ➔ 0.020)	2 (0.056 ➔ 0.023)
Settlement	93.8% (0.019 ➔ 0.021)	2 (0.056 ➔ 0.048)
January effect	93.8% (0.019 ➔ 0.020)	0
Global crisis: 9/2008-6/2009	93.8% (0.019 ➔ 0.019)	1 (0.056 ➔ 0.049)
Global crisis: 3/2008-6/2009	87.5% (0.019 ➔ 0.018)	2 (0.070 ➔ 0.038)
All variables:	81.3% (0.019 ➔ 0.023)	3 (0.065 ➔ 0.028)

Notes: The percentage numbers indicate the fraction of factor variables that are significant at a 5% level without dummies and that remain significant at a 5% level upon inclusion of the dummies. The numbers in parentheses indicate the change in the average *p*-value.

Table 5 Panel A: Sensitivity Analysis 2 (Each variable)

	Resona	UFJ	QEMP	Settlement	January	GFC (L)	GFC (B)
# of equations	48	48	48	48	48	48	48
# of Significant dummies	34	48	0	2	0	0	1
# of Positive dummies	10	0	0	0	0	0	0
# of Negative dummies	24	48	0	2	0	0	1

Note: QEMP (Quantitative easing monetary policy), GFC (L) (Global crisis: 9/2008-6/2009), and GFC (B) (Global crisis: 3/2008-6/2009)

Table 5 Panel B: Sensitivity Analysis 2 (All variables)

	Resona	UFJ	QEMP	Settlement	January	GFC (L)	GFC (B)
# of equations	48	48	48	48	48	48	48
# of Significant dummies	33	42	0	8	0	0	2
# of Positive dummies	10	0	0	0	0	0	0
# of Negative dummies	23	42	0	8	0	0	2

Note: QEMP (Quantitative easing monetary policy), GFC (L) (Global crisis: 9/2008-6/2009), and GFC (B) (Global crisis: 3/2008-6/2009)

Table 6: Global Financial Crises

	3/2008	9/2008	6/2009	3/2008-5/2008	9/2008-11/2008	6/2009-8/2009
# of equations	48	48	48	48	48	48
# of Significant dummies	25	38	26	19	42	0
# of Positive dummies	23	27	26	18	42	0
# of Negative dummies	2	11	0	1	0	0

The dummies for the global financial crises are not significant in nearly all of the regressions. This finding may stem from the fact that the Lehman shock and the Bear Stearns shock may have initially caused a large swing in professionals' expectations, thereby widening the dispersion; however, their expectations may later have converged, as they adjusted their expectations in a similar direction. We assigned 1 to certain periods (March 2008-June 2009 and September 2008-June 2009), in which the dispersion may have widened when the shock first hit the market, but later may have been mitigated as professionals' expectations converged. As a result, the influences of the dispersion are cancelled out, and thus, a significant effect of the dummies on the dispersion is not observed. In order to

investigate this idea, 3 dummies were created by assigning 1 for the month of the Lehman shock (September 2008), the Bear Stearns shock (March 2008), and the GM bankruptcy (June 2009) and 0 otherwise. In addition, the dummies for the 3 months following these shocks are designated with 1 for September-November 2008, March-May 2008, and June-August 2009 and 0 otherwise. The results are summarized in Table 6.

The effects of the Bear Stearns shock and the GM bankruptcy on the dispersion remain unclear, possibly because they may have changed professionals' expectations while leaving the difference in these expectations untouched. Nevertheless, our results indicate that the Lehman shock confused the Japanese stock market, thereby increasing the difference in expectations, as positive significant estimates of the dummy are found in 42 regressions.

5.2. Multivariate regressions: including all 6 factor variables at once

In Section 4, we have only investigated bivariate relations between the forecast heterogeneity and each of the factor variables in order to avoid multicollinearity. We now conduct multivariate regressions of forecast dispersion by including all six factor variables at once to show the robustness of our results.[19] Table 7 summarizes the results on testing Hypothesis 1 that are comparable with those of the univariate regressions in Table 2, while Table 8 is for testing Hypotheses 2 and 3 comparable with those in Table 3. Overall, the signs

[19] In addition, we have conducted a robustness check on our results by using an alternative measure of dispersion, the coefficient of variations, which are defined as the standard deviation of the forecasts over the mean forecast at each point in time. We run our univariate regressions of the coefficient of variations with factor variables that are significant in our benchmark regressions. We have confirmed that signs of all coefficients are the same as in the original estimations, while onlyone factor variable, $Factor(2)_{t-1}^{buy-side,+}$, is no longer significant with the alternative measure of dispersion. Thus, we conclude that our results are fairly robust qualitatively.

of coefficient estimates are the same except a few cases, even when including all factor variables into an estimation at once. When the coefficient estimates are significant in univariate regressions, the signs of the estimates are all unchanged in the multivariate regressions. The *t*-values usually do not change much.

The results on a few of the estimates have actually changed significantly when including all six factor variables into our estimations. For example, the estimate of $Factor(1)_{t-1}^{buy-side,+}$ does not significantly influence the buy-side dispersion (t-value is 1.04 in Table 2) in the univariate regression, but the t-value becomes 2.39 in the multivariate regression (Table 7). $Factor(4)_{t-1}^{buy-side,+}$ does not significantly widen the buy-side dispersion in Table 2 (t-value is 1.14), but it becomes significant in the multivariate regression (t-value becomes 2.60 in Table 7).[20] The changes in our results may come from a multicollinearity problem, since most of our factor variables are usually significantly correlated. Any systematic shocks on the global financial market, such as the Lehman shock, influence business conditions, foreign exchange rates, politics, market psychology, and macroeconomic policy in Japan as well as stock and bond markets abroad that can change the respondents' beliefs on those factors in a similar way, making our factor variables commove. However, even when taking into the possible multicollinearity problem, our results in the univariate regressions are fairly robust with those in the multivariate regression, because the signs of the significant coefficients are all the same and the significance levels do not vary much in those regressions.

[20] In addition, $Factor(1)_{t}^{buy-side,-}$ significantly influence the buy-side dispersion (*t*-value is -1.99 in Table 2) in the univariate regression, but the *t*-value becomes -1.38 in the multivariate regression (Table 7).

Table 7: Robustness check by including all six factor variables at once. Testing hypothesis 1

		Buy-side		Sell-side	
		+	-	+	-
Factor 1	t	0.08	-0.18	-0.06	-0.15
		(0.94)	(-1.38)	(-0.54)	(-0.85)
	t-1	0.25 **	-0.37 *	0.03	0.04
		(2.39)	(-1.92)	(0.24)	(0.20)
Factor 2	t	-2.27	0.55	1.05	-0.31
		(-1.18)	(1.30)	(1.19)	(-0.89)
	t-1	2.25	-0.12	0.42	-0.31
		(1.39)	(-0.23)	(0.49)	(-0.53)
Factor 3	t	-0.16	0.13	0.93	-0.43
		(-0.29)	(0.38)	(1.10)	(-0.66)
	t-1	-1.50 ***	-0.04	-0.45	-0.29
		(-2.84)	(-0.11)	(-0.79)	(-0.41)
Factor 4	t	0.68 *	0.51	1.00 ***	0.21
		(1.72)	(0.85)	(3.15)	(0.36)
	t-1	0.86 ***	-0.37	0.80 ***	-0.27
		(2.60)	(-0.47)	(2.84)	(-0.50)
Factor 5	t	0.18	-1.56 ***	-0.35	1.31
		(0.37)	(-2.73)	(-0.64)	(0.79)
	t-1	-0.47	-1.16 *	-0.26	0.53
		(-0.73)	(-1.82)	(-0.34)	(0.28)
Factor 6	t	-0.86 *	-1.12 ***	-0.50	-1.19 *
		(-1.95)	(-2.72)	(-1.12)	(-1.91)
	t-1	0.59	-1.04 ***	-0.10	-0.68
		(1.10)	(-2.88)	(-0.25)	(-1.12)

Notes: We test whether buy-side dispersion can be explained by their own ideas (their own factor variables). The numbers without parentheses are the estimates of the parameters on factor variables, and those with parentheses are *t*-statistics computed by utilizing Newey-West corrected standard errors. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively. The factors are categorized as follows: Factor 1: Business conditions; Factor 2: Interest rates; Factor 3: Foreign exchange rates; Factor 4: Politics and diplomacy; Factor 5: Internal factors and market psychology; and Factor 6: Stock and bond markets abroad.

Table 8: Robustness check by including all six factor variables at once. Testing hypotheses 2 and 3

		Buy-side		Sell-side	
		+	-	+	-
Factor 1	t	0.08 (0.69)	-0.07 (-0.27)	-0.08 (-0.78)	-0.02 (-0.09)
	t-1	0.05 (0.48)	-0.16 (-0.73)	0.05 (0.40)	-0.09 (-0.55)
Factor 2	t	0.63 (0.92)	-0.07 (-0.23)	-0.97 (-0.33)	-0.90 * (-1.77)
	t-1	0.47 (0.70)	0.25 (0.68)	4.01 * (1.81)	-0.90 (-1.56)
Factor 3	t	-0.18 (-0.24)	0.06 (0.10)	-0.79 (-1.07)	-0.40 (-0.86)
	t-1	-0.82 (-1.16)	0.05 (0.10)	-0.78 (-1.21)	0.10 (0.21)
Factor 4	t	0.85 * (1.92)	-0.03 (-0.09)	1.22 ** (1.98)	0.59 (0.66)
	t-1	0.59 ** (2.11)	0.10 (0.29)	0.63 (0.93)	0.01 (0.01)
Factor 5	t	-0.11 (-0.20)	-0.94 (-0.81)	0.21 (0.34)	-1.29 *** (-2.58)
	t-1	-0.46 (-0.93)	1.64 (1.24)	-0.89 (-1.62)	0.80 (0.87)
Factor 6	t	-0.17 (-0.54)	-1.14 ** (-2.34)	-1.25 ** (-2.48)	-0.99 ** (-2.43)
	t-1	-0.27 (-0.69)	-0.41 (-0.74)	0.24 (0.40)	-0.80 ** (-2.12)

Notes: We test whether buy-side dispersion can be explained by the factor variables of sell-side professionals and vice-versa. The numbers without parentheses are the estimates of the parameters on factor variables, and those with parentheses are *t*-statistics computed by utilizing Newey-West corrected standard errors. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively. The factors are categorized as follows: Factor 1: Business conditions; Factor 2: Interest rates; Factor 3: Foreign exchange rates; Factor 4: Politics and diplomacy; Factor 5: Internal factors and market psychology; and Factor 6: Stock and bond markets abroad.

6. Conclusion

This paper documents the determinants of the expectation heterogeneity of stock price forecasters on the Japanese Tokyo Stock Price Index. Monthly panel data surveyed by QUICK Corporation, a Japanese financial information vendor in the Nikkei Group, is utilized in the study.

We examine the determinants of expectation heterogeneity or dispersion by disaggregating our sample into buy-side and sell-side professionals and demonstrate that the sources of this expectation heterogeneity or dispersion can be attributed to the existence of different types of professionals within the same market. Buy-side and sell-side professionals possess heterogeneous information on stock markets or interpret the current state of the economy differently, in spite of potentially sharing the same information. In addition, we demonstrate the interactive effect between buy-side and sell-side professionals. Buy-side professionals refer to the way in which sell-side professionals evaluate the market in making their forecasts, although they tend to have views regarding foreign exchange rates that differ from those of sell-side professionals, thus contributing to a lower dispersion. Sell-side professionals tend to ascribe to market views similar to those of buy-side professionals in order to appeal to their clients. Thus, we conclude that the expectation heterogeneity arises because buy-side and sell-side professionals have different business goals, which cause them to differentiate the contents of the information used to make forecasts as well as to interpret the same information differently in the process of forecasting.

We have demonstrated these results to be robust after controlling for several dummy variables for the Lehman shock, the Bear Stearns shock, the GM bankruptcy, the quantitative easing monetary policy, the Resona shock, the UFJ shock, the settlement month effect, and the January effect. Our findings indicate that the forecast dispersion is not related to the Bear Stearns, the GM bankruptcy, the quantitative easing monetary policy, the settlement month effect, or the January effect. Although these events may have changed professionals'

expectations, our results suggest that the direction of the changes is ambiguous. However, the Lehman shock shock, the Resona shock, and the merger of the Mitsubishi Tokyo Financial Group and UFJ Holdings had significant effects on the dispersion. The Lehman shock shock caused a large swing in expectations, resulting in a greater dispersion. The Resona shock and the merger of the Mitsubishi Tokyo Financial Group and UFJ Holdings may have influenced the expectations of professional forecasters in a similar manner, leading to a decrease in the expectation heterogeneity.

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